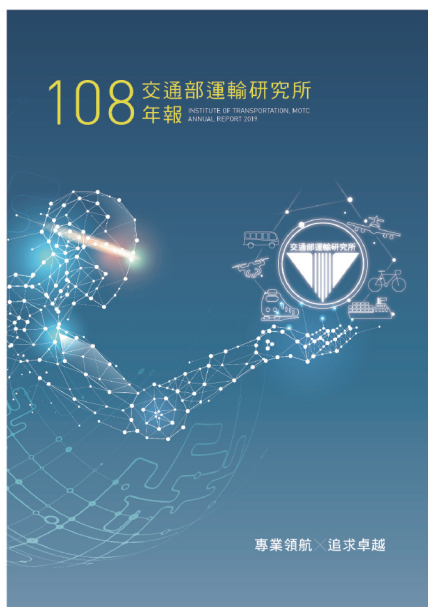# 108 交通部運輸研究所年報

交通部運輸研究所年報
INSTITUTE OF TRANSPORTATION, MOTC
ANNUAL REPORT 2019

交通部運輸研究所

專業領航 ╳ 追求卓越

設計理念:

　　光點及線條構圖，呈現「人」的形體樣貌，傳遞出交通服務「以人為本」的普世價值。以點線串聯具有「連結Connectivity」的意涵，代表交通服務跨領域、跨單位合作的特性。

　　頭部及眼部光芒意象設計，凸顯運研所扮演「交通智庫」的角色，輔以背景球體設計，同時具備掌握趨勢、接軌國際、洞悉未來、領航全球的前瞻視野。

　　躍出封面的設計，呈現運研所的「行動力Mobility」，連結過去，勇於奔向未來，發揮「專業領航-追求卓越」的組織願景。

　　手部延伸的設計，呈現出運研所在我國陸運、海運、空運交通政策擬定的關鍵角色。

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CONTENTS

壹｜所長的話

交通部當前努力的施政目標為秉持「做實事、接地氣、讓民眾有感」的施政態度，提供安全、效率、品質，以及符合環境永續的綠色交通服務，將人民感受放在最優先位置，朝「與民同行」、「連結共好」方向努力，成為名符其實能「交流」、會「溝通」的部會。簡言之，交通部係以服務民眾為中心的「人本交通」做為施政願景，並以「安全」、「效率」、「品質」及「綠色」等為當前四大施政主軸。

本所長期扮演交通部智庫角色，肩負三大任務，包括支援交通部擬訂運輸政策及帶動科技創新應用、協助部屬機關及地方政府落實運輸政策並結合產學各界擴大研究效益，以及建立運輸系統技術標準與資訊平臺並成立區域中心擴大產學能量。本所全體同仁皆當自我期勉，以「專業領航、追求卓越」做為團隊共識，以「政策、前瞻、基礎」三個面向研究，做為創新思維與深化專業的技能，同時兼顧經濟發展、環境保育及社會公平等永續發展方向，善用與整合最新的資通訊技術，以有效支援交通部提升整體運輸系統的安全與服務品質。

過去一年，本所配合交通部成立「交通科技產業會報」，陸續籌辦「無人機於交通運輸創新應用產業論壇」及「智慧公共運輸服務科技創新研討會暨高峰論壇」，並配合12月3日「全國交通科技產業會議」的召開，辦理完成「無人機科技產業小組」產業對話會議與成果展示；另協助交通部編撰完成並於12月18日公布「Koinonia

The current administration goal of the MOTC is based on the attitude of "Doing Practical Works, Connecting with People, and Making People Feel" to provide Safe, Efficient, Quality, and Eco-green transportation services in compliance with environmental sustainability, and put the people's feelings first on the premise of insisting on "Walking with People" and "Connecting for the Good," to become a Ministry capable of "Communicating" and "Connecting." In simple terms, the MOTC is based on people-centered service with "Humanity-Oriented Transportation Development" as the vision of administration, and takes "Safety," "Efficiency," "Quality" and "Eco-green" as the current four major policies of administration.

As the MOTC think tank over time, our three major duties include the formulation of transportation policies and driving the technological innovation and application, assistance for subordinate agencies and local governments to implement transportation policies and combining industry and academia to expand research benefits, establishment of technical standards and technical information platforms for the transportation system as well as establishing regional centers to expand industry and academia capabilities. All our colleagues shall self-encourage themselves based on "Professional Navigation, Pursuit of Excellence" as the team's consensus, and research the three aspects of "policy, foresight, and foundation" as innovative thinking and deepening professional skills, while taking into account economic development. Environmental conservation and social equity, and other sustainable development directions, make good use and integration of the latest information and communication technologies to effectively support the Ministry of Transportation and Communications to improve the safety and service quality of the overall transportation system.

Last year, the Institute of Transportation (IOT) cooperated with the MOTC to assemble the "Transportation Technology and Industry Committee," and successively organized the "UAV in Transportation Innovative Application Industry Forum" and the "Intelligent Public Transportation Service Technology Innovation Seminar and Summit Forum," and coordinated the convening of the "Taiwan Transportation Technology Industry Conference" on December 3rd, to complete the "UAV Technology Industry Group" industry dialogue meeting and results presentation; it also assisted the MOTC to complete the compilation of the "Koinonia: A Moving Form of Transportation – 2020 Transportation Policy

交通就是感動─2020運輸政策白皮書」，前瞻擘劃我國未來10年的運輸政策藍圖與行動方案。此外，本所亦持續協助交通部擔任APEC運輸工作小組、行政院永續會綠色運輸工作分組、交通部交通費率委員會、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幕僚，充分展現交通專業智庫角色。總結來說，面對交通部揭示的四大施政主軸，本所陸續完成重大施政規劃並協助推動相關計畫，包括：

一、在安全方面：擔任交通部協同飛安會改制「國家運輸安全調查委員會」法制作業之主要幕僚、因應108.10.1南方澳斷橋事件，推動橋梁安全策進作為，研擬院頒橋梁維護管理作業要點(草案)、協同規劃道安改善行動方案、辦理「臺灣地區易肇事路段改善計畫」、辦理路口行人安全改善工作坊、開發與精進鐵公路及港灣安全相關系統，以及進行離岸風電基地母港海氣地象觀測探討及船舶航安監測技術研發。

二、在效率方面：辦理「全國交通科技產業會議─無人機科技產業小組產業對話會議」及「智慧公共運輸服務科技創新研討會暨高峰論壇」，確認未來發展重要課題、發展藍圖與推動策略、辦理高雄港洲際貨櫃中心聯外交通改善計畫、推動「小客車租賃業數位轉型發展計畫」，協助小客車租賃業數位轉型升級，優化營運環境、研發運用近景攝影技術，結合無人飛行載具(UAV)等新科技，提升公路邊坡巡檢之品質與效率。

三、在品質方面：辦理高雄市交通行動服務(MaaS)示範建置計畫、推動「交通部補助學界成立區域運輸發展研究中心」計畫（108-

White Paper" on December 18th, forward-looking at the planning of the transportation policy blueprint and action plan for the next 10 years for our country. In addition, the Institute of Transportation (IOT) has continued to assist the MOTC in serving as the staffing role of the APEC Transportation Working Group Meeting, the Green Transportation Working Group of the National Sustainable Development Committee under the Executive Yuan, the MOTC Transportation Fare Committee, the Connected Transportation System Working Group of the Taoyuan Aerotropolis, and the staffing of the Integrated Planning Subgroup and Information Subgroup of the Bicycle Supervision Working Group, fully demonstrating the role of the professional transportation think tank. In conclusion, facing up the four main policies of administration promulgated by the MOTC, the Institute of Transportation (IOT) has successfully completed major administration plans and assisted in the promotion of related projects, including:

(1) Safety-related projects: Served major staffing of MOTC in coordination with the Aviation Safety Council in the legal operation for the reorganization of the "Taiwan Transportation Safety Board." Promoted bridge safety improvement measures, studied and planned for the Directions Governing the Bridge Maintenance and Management (Draft) in response to the Nanfang'ao Broken Bridge Incident on October 1, 2019. Coordinated planning of the road safety improvement action plan, conducted the "Project for Improving Accident-Prone Locations in the Taiwan Area," conducted the Pedestrian Crossing at Intersections Safety Improvement Workshop, developed and improved the railway, highway and harbor safety related systems, and performed the Oceanic and Meteorological Observation and Exploration of the Offshore Wind Power Base's Main Home Port as well as the research and development of ship navigation safety monitoring technology.

(2) Efficiency-related projects: Organized the "Taiwan Transportation Technology Industry Conference – UAV Technology Industry Group Industry Dialogue Meeting" and "Intelligent Public Transportation Service Technology Innovation Seminar and Summit Forum" to confirm important future development issues, develop blueprints and promotion strategies , conduct the Kaohsiung Intercontinental Container Terminal Access Traffic Improvement Project, promote the "Passenger Cars Rental Industry Digital Transformation Development Project," assist in the digital transformation and upgrading for the passenger cars rental industry and optimize the operating environment, develop and use close-range photography technology combined with unmanned aerial vehicles (UAV) and other new technologies to improve the quality and efficiency of road slope inspection.

(3) Quality-related projects: Conducted the Kaohsiung City

109年）、研擬「公路公共運輸服務升級計畫(110-114年)草案」、完成「汽車燃料使用費隨里程徵收之可行性研究」、辦理「北臺區域整體運輸規劃研究」獲得東亞運輸學會頒發「2019年傑出運輸建設獎 (Outstanding Transportation Project Award, OTPA)」，另增補編修「港灣構造物設計基準條文」。

四、在綠色方面：研提4年期(109~112年)環島自行車道升級暨多元路線整合推動計畫、完成2030電動大客車推動策略並協助交通部研訂「公路公共運輸補助電動大客車示範計畫作業要點(草案)」、依據行政院核定之「國家因應氣候變遷行動綱領」彙研運輸部門氣候變遷調適行動方案、辦理溫管法法定之運輸部門溫室氣體減量研議事項，並陳報行政院運輸部門溫室氣體排放管制行動方案執行成果報告。

展望未來，本所仍將持續扮演並強化交通部智庫角色，並在我國交通基礎研究、前瞻技術研發及運輸政策規劃等重要任務上持續精進，以提升重大政策研擬與決策支援實力；此外，本所亦將遵循交通部「Koinonia 交通就是感動─2020運輸政策白皮書」的指導，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，以支援運輸施政與技術創新並促進交通科技產業發展，奠立我國運輸服務優質升級之堅實基礎。

Mobility as a Service (MaaS) Demonstration Construction Project, promoted the "MOTC Financial Subsidy of the Academic Community to Establish the Regional Transportation Research and Development Center" project (2019–2020), drafted the "Highway Public Transportation Service Upgrade Project (2021–2025) Draft," completed the "Feasibility Study on the Distance-based Collection System of Vehicle Road Charge," and conducted the "Northern Taiwan Regional Overall Transportation Planning Study" and won the "2019 Outstanding Transport Project Award (OTPA)" from the Eastern Asia Society for Transportation Study, and added and revised the "Articles of Harbor Structure Design Standards."

(4) Eco-green-related projects: Proposed the 4-year term (2020–2023) Preliminary Plan of Upgrading and Diversifying Island Round Cycling Routes Integration and Planning, completed the 2030 electric bus promotion strategy and assisted the MOTC in the development of the "Directions Governing the Highway Public Transportation Financial Subsidy of the Electric Bus Demonstration Project (Draft)," in accordance with the "National Action Guideline for Climate Change" approved by the Executive Yuan organized and studied the climate change adaptation action plan of the transportation sector, conducted the research and discussion of greenhouse gas reduction in the transportation sector regulated by the Greenhouse Gas Reduction and Management Act, and reported the implementation the results report of the Executive Yuan Transportation Sector Greenhouse Gas Emission Control Action Plan.

Looking to the future, the Institute of Transportation (IOT) will continue and enhance our role as the MOTC think tank, and continue to improve important tasks of our country's basic transportation research, forward-looking technology research and development, and transportation policy planning to improve the capacity of major policy planning and decision support; furthermore, the Institute will also follow the guidance of "Koinonia: A Moving Form of Transportation 2020 Transportation Policy White Paper," continue to keep track of international trends, strengthen our planning capacity in sea and air transportation, and enhance research on transportation safety, public transportation, intelligent transportation, green transportation, and disaster prevention and adaptation, in order to support transportation administration and technology innovation, promote transportation technology industrial development in Taiwan, and so lay a solid foundation to upgrade the quality of Taiwan's transportation service.

交通部運輸研究所 所長

林繼國

Institute of Transportation, MOTC
Director General

Lin, Chi-Kuo

貳｜組織與職掌

02. Organization and Functions

一、沿革

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

　　由於運輸建設所需要的投資甚為龐大，且在整體經濟的考量下，可供運用的資金究屬有限，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，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.

59年8月1日 1970/08/01

74年 1月5日 1985/01/05

80年 1月30日 1991/01/30

88年 7月1日 1999/07/01

運輸計劃委員會（臨時編制）
Transportation Planning Board (Temporary Organization)

運輸研究所（運委會與交通研究所合併改制為常設機關）
Institute of Transportation (The Transportation Planning Board and the Institute of Traffic Research were merged and restructured into a formal branch of the government)

增設副所長為 2 人、新增綜合技術組
Added a Deputy Director-General to two Deputy Director-Generals, added the Interdisciplinary Research Division

增設港灣技術研究中心
（原省府港灣技術研究所改隸，並於90年8月1日納為派出單位）
Added Center of Harbor and Maritime Technology(Reorganized from the Institute of Harbor and Maritime Technology of former Taiwan Provincial Government, and has been included as an external agency of the Institute since August 1, 2001)

運輸計劃委員會係屬臨時編制單位，在行政運作上，在在受到經費及人力運用上的限制，委實無法因應日益遽增的運輸研究規劃業務。嗣乃奉令於民國 74 年元月 5 日，與原負責一般交通學術研究、交通幹部訓練、戰備器材管理運用及大陸交通資料蒐集研判等業務的交通研究所，合併改制為運輸研究所，成為政府常設機關，藉以健全編制，擴大規模，從而將經費與人力的運用納入常軌。民國 80 年元月 30 日，因業務大幅增加，奉准修改組織條例，增置副所長 1 人，並增設綜合技術組及加強中級研究規劃人力，以資因應。民國 88 年 7 月 1 日，因臺灣省政府功能業務與組織調整，原臺灣省政府交通處港灣技術研究所改隸本所，更名為港灣技術研究中心。民國 90 年 8 月 1 日，本所組織條例修正案，奉行政院核定施行，港灣技術研究中心與本所整併，並為本所之派出單位。

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 Execute Yuan, and since August 1, 2001 the organization level of the Center of Harbor and Maritime Technology has again been adjusted. According to the new arrangement, the Center is incorporated with the Institute of Transportation and becomes an external agency of the Institute of Transportation.

二、組織及人力

II. Organization and Human Resources

本所設置運輸計畫、運輸工程、運輸安全、運輸經營與管理、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，預算員額152人(含約聘人員3人，技工、工友及駕駛共19人)。

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 152 (including 3 contracted research employees and 19 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 missions 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

IV. Organization Framework

本所組織架構如下圖：

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
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人事室 主任
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運輸計畫組 組長
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運輸經營管理組 組長
陳其華 Chen, Chi-Hwa
Director of Transportation Operations & Management Division

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

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

所長 Director General **林繼國 Lin, Chi-Kuo**

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108年是本所成果豐碩的一年，在林所長的帶領下，集交通部與本所之力編撰完成「Koinonia交通就是感動—2020運輸政策白皮書」，前瞻擘劃我國未來10年的運輸政策藍圖與行動方案。有關6組1中心之年度研究主軸分述如下：

一、健全整體運輸規劃

辦理運輸規劃研究，精進計畫評估工具，優化自行車路網，以健全整體運輸發展為願景，運輸計畫組年度研究主軸如下：

1.辦理區域運輸規劃

辦理南臺區域(雲嘉南高屏)旅次特性調查分析(包括特殊吸引點、重要場站接駁及屏柵線交通量等調查)，做為後續建構南臺區域運輸需求模式與預測未來供需之基礎。

2.精進計畫評估工具

（1）更新並提升「運輸部門決策支援系統」運作效能，協助各機關辦理政策分析及交通計畫評估。

（2）辦理輕軌系統A、B型路權容量模式構建與案例分析，109年度規劃開發分析軟體、擴充編訂手冊，逐步完備整體臺灣鐵道容量系列研究。

（3）辦理高速公路獨立進出口分匯流區之車流特性調查，建立獨立進出口匝道類型之容量及服務水準分析方法。

（4）研議大眾捷運路網規劃流程與評估準則，編撰「捷運路網規劃設計參考手冊（初稿）」，俟109年度編訂完成，提供各縣市政府依循辦理。

3.優化自行車環島路網並擴充路線圖資

（1）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（109~112年）」，並規劃未來4年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。

2019 was a fruitful year for our Institute. Under the leadership of Director General Lin, combining the efforts of the MOTC and the Institute of Transportation (IOT) in compilation and completion of the "Koinonia: A Moving Form of Transportation – 2020 Transportation Policy White Paper," forward-looking and planning our Country's transportation policy blueprints and action plans for the next 10 years. The annual research guidelines of 6 Groups and 1 Center are:

I. Improve the Overall Transportation Planning

Based on the vision of improving overall transport development to conduct transportation planning research and improve plan evaluation tools, the annual research guidelines of the Planning Division, IOT are:

1.Conduct the regional transportation planning

Conduct the survey and analysis of Southern Taiwan Region (Yunlin, Chiayi, Tainan, Kaohsiung and Pingtung) trip characteristics (including surveys on special attraction locations, important station transfer connections and screen line traffic volume), as the basis for subsequent construction of the Southern Taiwan regional transportation demand model and prediction of the future supply and demand.

2.Refinement of evaluation tools

(1) Update and enhance the operating effectiveness of the Taiwan Transportation Decision Support System and assist individual agencies in policy analysis and transport program assessment.

(2) Conduct the construction and case analysis of the A and B right-of-way capacity models of the light rail system, develop analysis software for the year 2020 planning, and expand the compilation manual, to gradually complete the overall Taiwan railway capacity series research.

(3) Conduct the traffic flow characteristics survey for the freeway independent entrance and exit area, and establish the capacity and service level analysis methods for the independent entrance and exit ramp types.

(4) Propose the planning process and evaluation criteria of the Mass Rapid Transit road network; compile the "MRT Road Network Planning and Design Reference Manual (Preliminary Draft)," which will be completed in 2020 to provide the basis for all county and city governments to follow.

3.Optimize the cycling route road network and expand the route map information

(1) Assist the MOTC in proposing the "Cycling Route Road Upgrade and Multiple Route Integration Promotion Plan (2020–2023)," and plan the Cycling Route Road Network optimization project and schedule for the next 4 years, for the Right of Way Units to construct and strengthen the safety and friendliness of the cycling road network.

研究主軸一、健全整體運輸規劃
Main Scheme I - Improve the Overall Transportation Planning
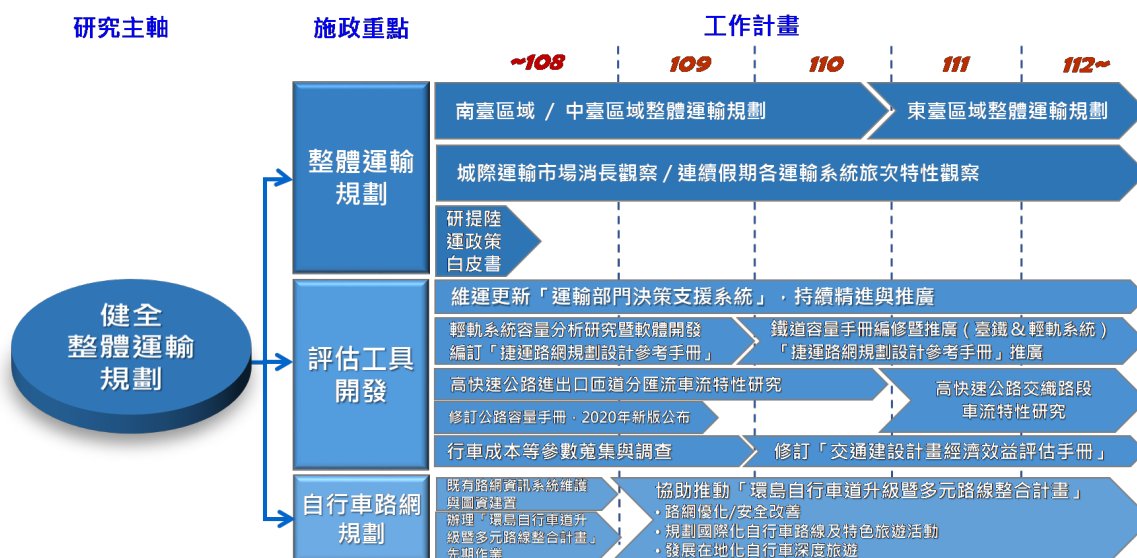
（2）研提國際化及在地化的多元自行車路線，供路權單位於後續4年改善及觀光部門辦理行銷推廣，帶動自行車與觀光產業發展。

（3）與觀光局合作辦理自行車路網資訊系統。

二、提升海空及軌道運輸發展

　　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；此外，軌道運輸亦需先進技術來提升營運效率。運輸工程組年度研究主軸如下：

1.掌握國際海空運發展趨勢

（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，提供決策參考。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精準全球貨櫃航線量化數據，例如：全球貨櫃航線大趨勢分析、洲際貿易路線之佈署趨勢分析、遠東主航線及區域航線之佈署趨勢分析、遠東主要港口歐美航線之佈署趨勢分析等；空運部分，提供民航局、桃園機場公司在政策評估所需及應業者要求之相關分析資料，例如：低成本航空公司在亞洲主要機場之營運情況、航空聯盟在亞洲主要機場之運作情況、香港機場旅客中轉主要目的機場及旅客量資料等。

(2) Propose international and localized diversified cycling routes for the Right of Way Units to improve in the next 4 years and the Tourism Sector to conduct marketing and promotion, to promote the development of bicycle and tourism industries.

(3) Cooperate with the Tourism Bureau to conduct cycling road network information system.

II. Improve the Development of Sea, Air and Rail Transportation

Sea and air transport are critical linkages of Taiwan's external transportation model; building up sea and air transport hubs is the vision for sea and air transport development. Furthermore, rail transport also requires advanced technology to improve its operating efficiency. The annual research guidelines of the Engineering Division, IOT are:

1.Grasp the development trend of international sea and air transportation

(1) Continue to maintain and update the international sea and air transportation database and provide decision-making reference information through quantitative data analysis. Achievements in terms of sea transportation are as follows: provide precise quantitative data over the global container line required by the Maritime Port Bureau and Taiwan International Ports Corporation (TIPC) for policy evaluation, such as: Global container line trend analysis, intercontinental trade route deployment trend analysis, Far East main route and regional route deployment trend analysis, European and American routes deployment trend analysis for Far East main ports, etc.; for air transportation, provide relevant analysis data required by the Civil Aeronautics Administration and Taoyuan International Airport Corporation Ltd. and do so according to the industry request, such as low-cost airline

（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，進行自行研究與資料蒐集，提供重要海空運議題之研析，支援交通部及部屬機關進行政策研擬，包括：新海運聯盟重組之航線變化與對我國港口之影響分析、2020限硫令對航運的影響、遠東地區海運貨櫃航線分析、機場航網與競爭力之分析、桃園及香港機場中轉現況比較、桃園機場與亞洲主要機場之航點機場涵蓋數量差異比較、航機電動滑行系統發展趨勢議題。

2.促進海空運發展

（1）因應國內外情勢變化，並蒐集產、官、學界意見，於 107 年度開始進行海、空運政策白皮書研擬工作，並於108年12月出版。

（2）辦理「商港整體發展規劃（111-115年）」，整體檢視我國港埠面臨的內外在環境變化之影響，分析我國商港整體發展面臨課題，研擬我國港埠中長期發展方向及前瞻的具體策略，作為各商港進 未來發展及建設計畫之上位計畫，使港埠資源能作最有效 用，提昇港埠服務水準， 低產業運輸成本，以提升我國港口國際競爭 。

（3）透過數據分析與時間序列預測模型以釐清航運市場在中美貿易紛爭期間之變化，並進一步分析中美貿易紛爭事件對全球航網與我國港口之影響。最後盤點我國航港層面所面臨之挑戰與機會並提出相關對策與建議，以做為港埠施政參考。

（4）完成國際機場陸側設施容量評估方法初探，初步確認影響機場陸側設施容量之主要影響因子、評估程序與評估方法，並透過相關單位訪談，評估適合我國國際機場容量評估方法及後續可研析課題，俾利實務應用參考。

operations in major Asian airports, operations of airline alliances in major Asian airports, major destination airports for passenger transfers at Hong Kong Airport and number of passenger data, etc.

(2) Addressing fast changes in the internal and external environment, we organize regular seminars and discussion on international sea and air transport journals and grasp global advanced technology and industrial development trends to conduct self-study and data collection, in order to provide analysis of important sea and air transport issues and support MOTC and its divisions in policy-making including: changes in the route after the reorganization of the new maritime alliance and operational impact on Taiwan's ports, the impact of the 2020 sulfur limit on shipping, the analysis of marine transportation, and container routes in the Far East region, the analysis of the airport network and competitiveness, the current transit status comparison of Taoyuan and Hong Kong airports, the comparison of the difference in the number of destination airports between Taoyuan Airport and major airports in Asia, and the topic of the development trend for in-wheel electric taxi system.

2.Promote the sea and air transportation development

(1) Addressing changes in the domestic and international situation and collecting opinions from industry, government and academic entities to draft the sea and air transportation policy white paper in 2018, and published in December 2019.

(2) Manage the "Commercial Harbor Overall Development Planning (2022–2026)," examine the overall impacts of internal and external environmental changes facing our Country's ports, analyze the issues facing the overall development of our country's commercial ports, and study the medium- and long-term development direction and forward-looking specific strategies as the top-level plan for future development and construction project of all commercial ports to enable the most effective use of port resources, improve port service standards, reduce industrial transportation costs, and enhance the international competitiveness for our country's ports.

(3) Clarify the changes in the shipping market during the China–US trade dispute with data analysis and time series forecasting models, and further analyze the impact of the China–US trade dispute on the global shipping network and our country's ports. Finally, check the challenges and opportunities faced by our country's ports at the port level and propose relevant countermeasures and recommendations as the reference for port administration.

(4) The preliminary study on the capacity assessment method of the international airport's landside facilities has been completed, and the main influencing factors, assessment procedures and assessment methods affecting the capacity of the airport's landside facilities were preliminarily confirmed. Evaluate the assessment method suitable for the capacity assessment of our country's international airports and subsequent study and analysis topics through interviews with relevant Units, in order to facilitate a reference for practical applications.

研究主軸二、提升海空運及軌道運輸發展
Main Scheme II - Improve the Development of Sea, Air and Rail Transportation
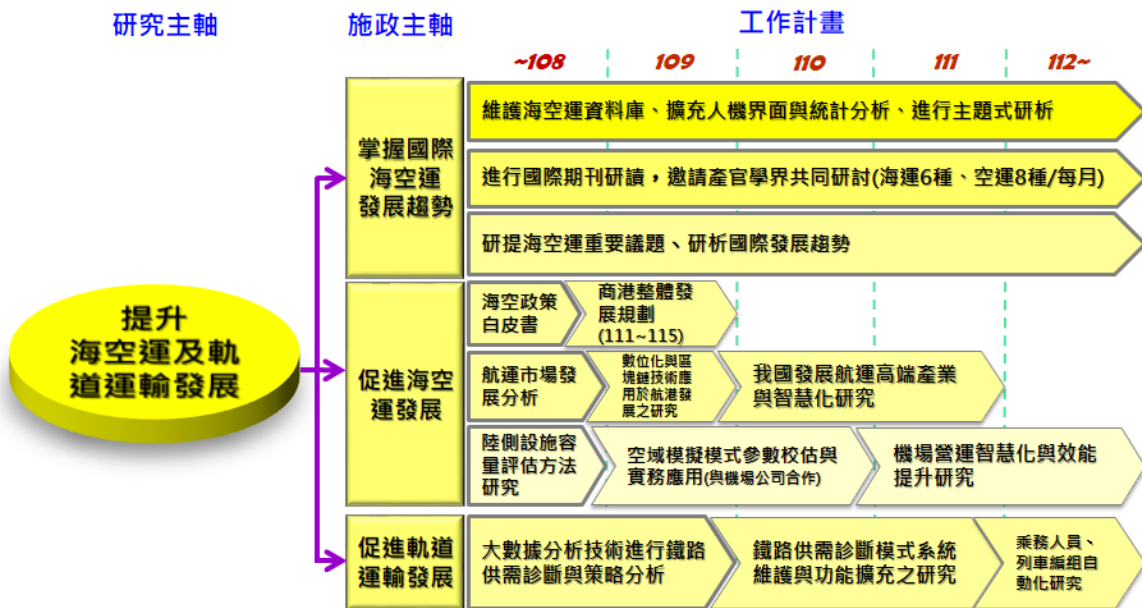
3.促進軌道運輸發展

108年度研究重點在藉由大數據分析技術，檢視臺鐵售票系統的歷史售票資訊，了解旅客運輸需求的分析方式，開發一套有系統的方法以整合鐵路系統之需求與供給，其目標為可得到適當貼近旅客需求之列車服務計畫。為此本計畫開發6組模式：（1）需求模式。（2）供給模式。（3）乘客選擇行為模擬模式。（4）乘客選擇參數校估模式。（5）解衝突模式。（6）系統運轉模擬模式。本階段已完成前4組模式之開發與實作，經數值測試結果良好。後續模式研發完成後，可據以診斷運輸供需現況，進行運能供給最佳化，達到提升軌道運輸效能之目標。

三、強化運輸安全管理

強化運輸安全管理，以建構安全與人本的交通運輸環境為願景，運輸安全組年度研究主軸如下：

1.安全用路人

（1）針對年輕族群特性，以手機平台設計機車安全教育遊戲，融入交通安全法規、路權等概念，以有趣、活潑的內容強化學習效果，並與地方政府、監理所站合作推廣，以創新教育模式提升安全認知。

3.Promote the development of rail transportation

The research focus of 2019 was to use big data analysis technology to examine historical ticket sales information of the Taiwan Railways ticketing system, understand the analysis methods of passenger transportation demand, and develop a systematic method to integrate the demand and supply of the railway system. The goal is to obtain a train service plan that appropriately meets passengers' requirements. For this purpose, the project develops 6 groups of models: (1) Demand model (2) Supply model (3) Passenger selection behavior simulation model (4) Passenger selection parameter calibration and validation model (5) Conflict resolution model (6) System operation simulation model. At this stage, the development and implementation of the first 4 groups of models have been completed, and the results of numerical tests are good. After the research and development of subsequent models are completed, the current situation of transportation supply and demand can be diagnosed, and the transportation capacity supply can be optimized to achieve the goal of improving the efficiency of rail transportation.

III. Enhance the Transportation Safety Management

Based on the vision of enhancing transportation safety management and setting up a safe and humanity-oriented transportation environment, the annual research guidelines of the Safety Division, IOT are:

1.Safe road user

(1) Address characteristics of younger generations to develop scooter safety driving training games for smartphones which combine transportation safety, regulation concepts and right of way enhance learning effects with interesting and lively content; conduct multiple campus competitions

（2）建立評估我國交通安全宣導活動之作業步驟，針對不同性質的宣導活動規劃適合的評估方式，以瞭解宣導活動及宣導對象所造成的影響，使交通安全宣導的資源能有效運用。

（3）應用各項智慧車載設備大規模蒐集國道客運駕駛實際行為資料，開發本土化駕駛行為安全指標及工具，歸納各項高風險駕駛行為態樣，並探討其空間集中特性，結合行為分析探討高風險地點改善策略。

2.安全道路環境

（1）利用諸如無人機、人工智慧影像辨識等先進技術，辨識道路風險型態與集中情形，以利提前於事故發生前先行分析改善其交通工程配置，以收防微杜漸的功效。

（2）發展各種不同事故型態的交通工程改善設計範例，以應用於路口事故之改善，提升道路交通安全改善能量，支援易肇事路段改善工作。

（3）優化交通工程設施管理，探討其在生命週期各階段之退化狀況，以及對道路交通安全之影響。

3.安全管理制度

（1）為推廣安全管理系統（SMS）以改善我國鐵道行車安全，參考過去研究成果（鐵道安全管理系統12要項），深入探討其中與安全保證相關之5要項，並研擬適用於我國鐵道機構的實務操作指引及教育訓練教材。

（2）參酌航空業與其他國家鐵道業界作法，規劃我國鐵道之安全管理系統（Safety Management System, SMS）應涵蓋之要項（例如：安全責任與關鍵人員、安全風險管理、變革管理等） 及其作業指引，提供鐵道營運機構運用並推動 SMS。

（3）強化運輸事故資料應用，透過建立海事安全資料蒐集機制、事故傷害嚴重度分類體系等，進一步分析應用，以作為安全管理之基礎。

and cooperate with local governments, vehicle offices to promote in order to enhance safety awareness with innovative education models.

(2) Establish operation steps for evaluating traffic safety publicity activities in our country, plan suitable evaluation methods aimed at different types of publicity activities to understand the impact of publicity activities and publicity targets, and enable the resources for traffic safety publicity to be used effectively.

(3) Collect, on a large-scale, national highway bus driver act data with smart vehicle-borne equipment to develop localized driving act safety indicators and tools; summarize various high-risk driving behavior patterns, and explore their spatial concentration characteristics, combined with behavior analysis to explore the improvement strategies for high-risk locations.
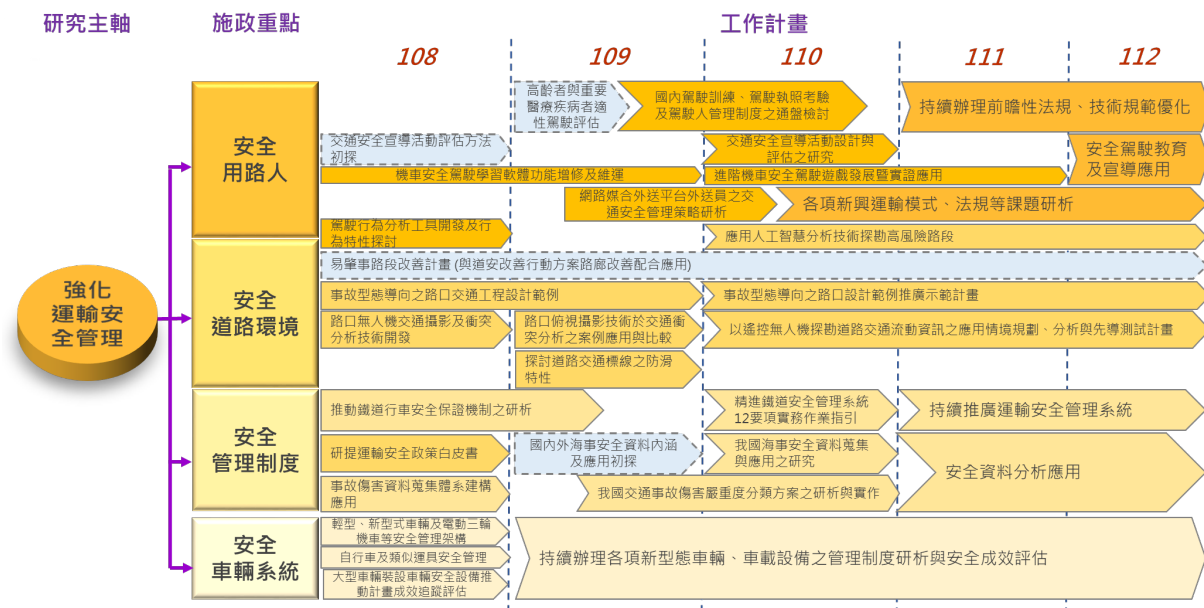
2.**Safe road environment**

(1) Use advanced technologies such as UAV and artificial intelligence image recognition to identify road risk patterns and concentration situations, in order to analyze and improve the traffic engineering configuration before an accident occurs.

(2) Develop various traffic engineering improvement design examples of different types of accident patterns, to be applied in the improvement of intersection accidents, enhance road traffic safety improvement energy, and support improving stretches of high incident rates.

(3) Optimize the management of traffic engineering facilities, and explore the degradation conditions at each stage of the life cycle and the impact on road traffic safety.

3.**Safety management system**

(1) In order to promote the Safety Management System (SMS) to improve the safety of railway vehicles in our country, refer to the past research results (12 important points of the Railway Safety Management System), the five important points related to safety assurance are discussed in depth and to develop the practical operation guidelines and educational training materials suitable to the railway organizations of our country.

(2) Set up items to be covered by our railway Safety Management System (SMS) by referring to the aviation industry and railway industry practices adopted by other nations (including: safety responsibility and involvement of key personnel, safety risk management, change management) and their operating guidelines for railway operators to apply and promote SMS.

(3) Strengthen the application of transportation accident data through the establishment of maritime safety data collection mechanism, accident injury severity classification system, etc., with further analysis and application, to be used as the basis of safety management.

研究主軸三、強化運輸安全管理
Main Scheme III - Enhance the Transportation Safety Management

研究主軸	施政重點		工作計畫				
		108	*109*	*110*	*111*	*112*

強化運輸安全管理

安全用路人
- 高齡者與重要醫療疾病者適性駕駛評估
- 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
- 持續辦理前瞻性法規、技術規範優化
- 交通安全宣導活動評估方法初探
- 交通安全宣導活動設計與評估之研究
- 機車安全駕駛學習軟體功能增修及維運
- 進階機車安全駕駛遊戲發展暨驗證應用
- 安全駕駛教育及宣導應用
- 網路媒合外送平台外送員之交通安全管理策略研析
- 各項新興運輸模式、法規等課題研析
- 駕駛行為分析工具開發及行為特性探討
- 應用人工智慧分析技術探勘高風險路段

安全道路環境
- 易肇事路段改善計畫 (與道安改善行動方案路廊改善配合應用)
- 事故型態導向之路口交通工程設計範例
- 事故型態導向之路口設計範例推廣示範計畫
- 路口無人機交通攝影及衝突分析技術開發
- 路口俯視攝影技術於交通衝突分析之案例應用與比較
- 以遙控無人機探勘道路交通流動資訊之應用情境規劃、分析與先導測試計畫
- 探討道路交通標線之防滑特性

安全管理制度
- 推動鐵道行車安全保證機制之研析
- 精進鐵道安全管理系統12要項實務作業指引
- 持續推廣運輸安全管理系統
- 研提運輸安全政策白皮書
- 國內外海事安全資料內涵及應用初探
- 我國海事安全資料蒐集與應用之研究
- 安全資料分析應用
- 事故傷害資料蒐集體系建構應用
- 我國交通事故傷害嚴重度分類方案之研析與實作

安全車輛系統
- 輕型、新型式車輛及電動三輪機車等安全管理架構
- 自行車及類似運具安全管理
- 大型車輛裝設車輛安全設備推動計畫成效追蹤評估
- 持續辦理各項新型態車輛、車載設備之管理制度研析與安全成效評估

4.安全車輛系統

（1）針對各種新型式運具及先進車輛設備，辦理管理制度研析，並追蹤安全成效，作為政策推動參據。

（2）發展自行車及各種類似運具之安全管理制度，探討法規適用性及相關課題，提供政策擬定參考。

四、優化陸路運輸產業

促進陸路客貨運輸發展，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，運輸經營與管理組年度研究主軸如下：

1.政策面改善經營環境

（1）研提第四期公運計畫草案（「公路公共運輸服務升級計畫」）向行政院爭取經費，賡續推動公共運輸發展，並落實2020年版運輸政策白皮書行動方案

（2）賡續辦理區域運輸發展研究中心計畫，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、接受地方政府諮詢並協助地方向公路總局提案申請經費，促成在地公共運輸之永續發展。

4.Safe vehicle system

(1) Conduct management system research and analysis for all new types of vehicles and advanced vehicle equipment, and track safety performance as the reference for policy promotion.

(2) Develop safety management systems for bicycles and various similar vehicles, explore the applicability of laws and regulations and related topics, and provide the reference for policy formulation.

IV. Optimize the Land Transport Industry

Based on the vision of optimizing the land transport industry to promote the development of passenger and freight transportation in land transport industry, improve the industry's operational environment and enhance the industry's operational performance, the annual research guidelines of the Operations and Management Division, IOT are:

1.Operational environment improvement policy

(1) Propose the fourth phase of the public transportation plan draft ("Highway Public Transportation Service Upgrade Plan") to seek funding from the Executive Yuan, continue to promote the development of public transportation, and implement the 2020 version of the Transportation Policy White Paper Action Plan.

(2) Continue carrying out the projects of regional transportation research & development centers to conduct transportation professionals training courses, counsel local governments to solve public transportation problems, and give advice for assisting local governments to apply for the fund from DGH, in order to enhance the cooperation among academic, industry, and government departments to achieve sustainable development of local public transportation.

（3）研擬陸運政策白皮書有關鐵公路客貨運輸部分內容，分析發展現況與課題，並擘劃未來發展願景、策略與行動方案，以支援交通部推動陸路運輸產業發展。

（4）研議汽車燃料使用費以里程計費之可行性，從技術、社會、政府、法令及財務等面向進行分析，並對收費政策方向提出建議。

（5）蒐集分析國外汽車貨運相關產業之整體法律體制，與利害關係人之意見，並配合新興科技載具與商業模式為產業帶來的影響觀察，納入行政管制原則之思維，檢視管制目的與手段之必要性與合理性。考量各項制度變革之成本等因素，將法規調適構想規劃為短中長期建議方案，供交通部政策擬訂參考。

2.技術面提升經營績效

（1）針對車載診斷系統（OBD）於運輸科技管理之應用進行探討，包括交通管理、交通安全、資料應用、環境保護等方面之可行性與策略分析，以提昇運輸產業、車輛及道路之使用效能及節能效率，確保政策之妥適性，並做為交通主管機關研擬相關科技管理政策之參據。

（2）探討智慧節能車機所能節省及產生的效益，結果顯示智慧節能車機可有效降低駕駛員的不良耗油行為，並提升燃油效率平均約5%，確可達成環境保護、節能減碳之目標。

（3）規劃預約式無障礙小客車特約車隊制度並開發執行面可操作之系統工具，協助並指導臺北、新北、桃園、臺中等4個直轄市政府試辦導入通用計程車特約車隊制度，透過新制度與新工具協助地方政府強化通用計程車推動策略，提升民眾對於施政信賴度，也為我國即將進入超高齡社會預為準備。

（4）進行「公共運輸縫隙掃描決策支援系統」維護、強化系統功能、新增家戶可及性分析、浮水印功能及應用成效填報三項功能。此外，舉辦8場次教育訓練以推廣本系統與培訓種子教官。

(3) Draft the policies about passenger and freight transportation of railways and vehicles in White Paper on Land Transport by analyzing the current development status and issues of this field and proposing the future development vision, strategies and action plans, in order to support MOTC to promote the development of land transport industry.

(4) Propose the feasibility of mileage-based charging for vehicle fuel fees; analyze from technical, social, government, legal and financial aspects; and make recommendations on the direction of charging policies.

(5) Collect and analyze other countries' overall legal systems of vehicle freight industries, and the opinions of stakeholders, cooperate with the observation of the impact of emerging technology vehicles and business models on the industry, incorporate the thinking of administrative control principles, and examine the purpose of control and the necessity and rationality of the means. Consider the cost of various system reforms and other factors, to bring the concept of legal adaptation into the short-, medium- and long-term recommendation programs for reference in the MOTC's policy formulation.

2.Operational efficiency improvement technology

(1) Explore the application of on-board diagnostic systems (OBD) in transportation technology management, including feasibility and strategy analysis in traffic management, traffic safety, data application, environmental protection, etc., to enhance the transportation industry, and use efficacy of vehicles and roads as well as energy-saving efficiency to ensure the appropriateness of the policy, and as a reference for the transportation authority to develop relevant technology management policies.

(2) Explore the savings and benefits of smart energy-saving devices. The results show that smart energy-saving devices can effectively reduce drivers' poor fuel consumption behavior and increase fuel efficiency by an average of about 5%, which can indeed achieve the goal of environmental protection and energy-saving carbon reduction.

(3) Plan the reservation-based accessible vehicle fleet system and system components to facilitate the operation of the fleet; assist and guide the four municipal governments including Taipei, New Taipei, Taoyuan, and Taichung to pilot the introduction of a general taxi special fleet system; enhance the people's trust in administration through the new system and new tools to assist local governments in strengthening the promotion strategy of general-purpose taxis, and also prepare for our country's upcoming entry into a hyper-aged society.

(4) Conduct maintenance of the "Public Transportation Gap Scanning Decision Support System," strengthen system functions, and add three functions of household accessibility analysis, watermark function, and application effectiveness reporting. In addition, 8 training sessions have already been held to promote the system and train seed instructors.

研究主軸四、優化陸路運輸產業
Main Scheme IV - Optimize the Land Transport Industry

（5）舉辦「智慧公共運輸服務科技創新研討會暨高峰論壇」，透過產、官、學、研各界成員的跨域交流與合作，促進智慧公共運輸產業發展、創新服務、治理與永續，進而達成公共運輸服務智慧化與自動化之目標，俾利於我國打造具國際競爭力的公共運輸服務產業及技術產業供應鏈。

五、整合智慧運輸服務

推動智慧運輸發展，以建立人本且永續的智慧交通生活環境為願景，運輸資訊組年度研究主軸如下：

1.科技發展與創新應用

（1）利用於基隆地區與中興新村所建置車聯網實驗場域，擴充對自動駕駛車的智慧道路行車輔助服務，並探討公共運輸車輛在整合先進駕駛輔助系統（ADAS）與車聯網（CV）後之行車安全強化等課題。

（2）應用資通訊技術滿足民眾行動服務需求，結合高雄市政府資源推動交通行動服務（MaaS）示範建置與服務擴充計畫。

(5) Hold the "Intelligent Public Transportation Service Technology Innovation Seminar and Summit Forum" to promote the development, innovative services, governance and sustainability of the intelligent public transportation industry through cross-domain exchanges and cooperation among members of industry, government, academia, and research institutions, to further achieve the goal of intelligence and automation of public transportation services, to facilitate our country in building an internationally competitive public transportation service industry and technology industry supply chain.

V. Integrate the Intelligent Transportation Services

Based on the vision of promoting intelligent transportation development and establishing a humanity-oriented and sustainable intelligent transportation environment, the annual research guidelines of the Information Systems Division, IOT are:

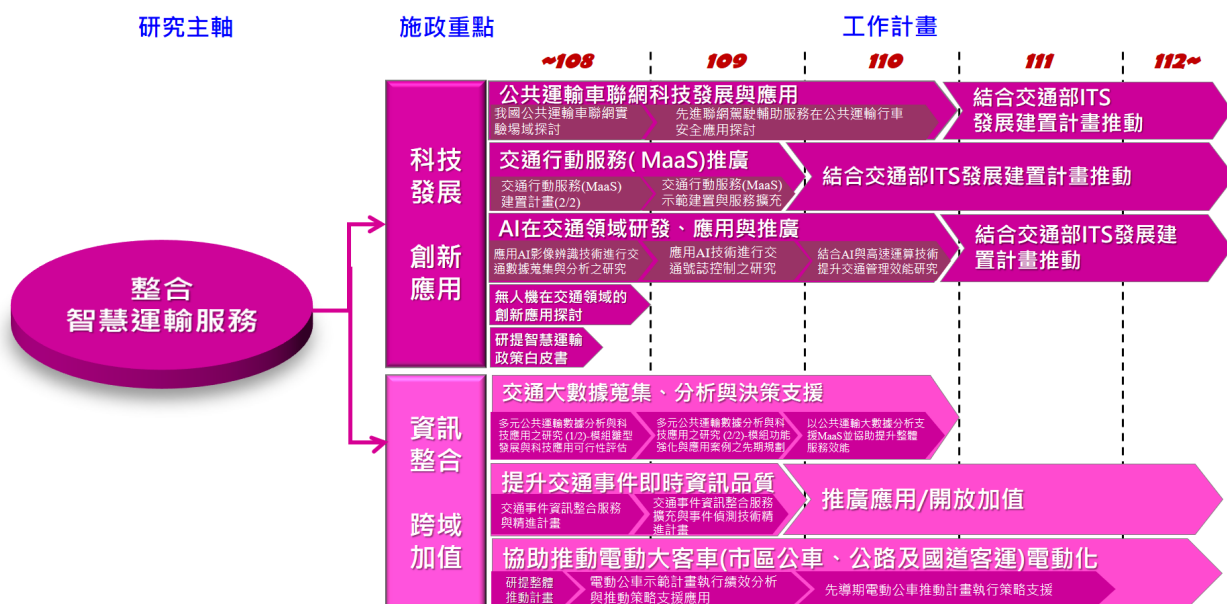### 1.Technology development and innovative application

(1) Use the Connected Vehicle experimental field built in Keelung and Zhongxing New Village, expand the intelligent road driving assistance services for autonomous vehicles, and explore the driving safety strengthening topics after the public transportation vehicles are integrated with the Advanced Driver Assistance Systems (ADAS) and Connected Vehicle (CV).

研究主軸五、整合智慧運輸服務
Main Scheme V - Integrate the Intelligent Transportation Services

研究主軸	施政重點	~108	109	110	111	112~
				工作計畫		

整合智慧運輸服務

科技發展 創新應用

- 公共運輸車聯網科技發展與應用
  - 我國公共運輸車聯網實驗場域探討
  - 先進聯網駕駛輔助服務在公共運輸行車安全應用探討
  - 結合交通部ITS發展建置計畫推動
- 交通行動服務(MaaS)推廣
  - 交通行動服務(MaaS)建置計畫(2/2)
  - 交通行動服務(MaaS)示範建置與服務擴充
  - 結合交通部ITS發展建置計畫推動
- AI在交通領域研發、應用與推廣
  - 應用AI影像辨識技術進行交通數據蒐集與分析之研究
  - 應用AI技術進行交通號誌控制之研究
  - 結合AI與高速運算技術提升交通管理效能研究
  - 結合交通部ITS發展建置計畫推動
- 無人機在交通領域的創新應用探討
- 研提智慧運輸政策白皮書

資訊整合 跨域加值

- 交通大數據蒐集、分析與決策支援
  - 多元公共運輸數據分析與科技應用之研究 (1/2)-模組雛型發展與科技應用可行性評估
  - 多元公共運輸數據分析與科技應用之研究 (2/2)-模組功能強化與應用案例之先期規劃
  - 以公共運輸大數據分析支援MaaS並協助提升整體服務效能
- 提升交通事件即時資訊品質
  - 交通事件資訊整合服務與精進計畫
  - 交通事件資訊整合服務擴充與事件偵測技術精進計畫
  - 推廣應用/開放加值
- 協助推動電動大客車(市區公車、公路及國道客運)電動化
  - 研提整體推動計畫
  - 電動公車示範計畫執行績效分析與推動策略支援應用
  - 先導期電動公車推動計畫執行策略支援

（3）應用AI影像辨識技術進行道路即時交通資訊蒐集與號誌控制，以及未來AI在交通領域之發展趨勢之研究。

（4）研提我國無人機在交通領域之發展藍圖與推動策略。

（5）研擬智慧運輸政策白皮書，擘劃未來發展願景、策略與行動方案，支援交通部推動智慧運輸系統發展建置計畫。

2.資訊整合與跨域加值

（1）應用高雄市交通行動服務（MaaS） 產生之大量旅運資料，透過巨量資料探勘分析，分析目標族群之旅運移動行為與現有大眾運輸服務缺口，同時發展整合式數據視覺化分析介面，提出MaaS營運改善策略建議。

（2）研擬都市交通事件資料庫擴充機制、推廣與強化道路交通事件資訊整合與發布平台，並持續執行事件通報內容品質優化之研析，以提升進道路即時資訊的透通性、行車便捷性和安全性。

（3）協助交通部研擬電動大客車推動策略與示範計畫，並進行示範計畫執行績效分析，逐步落實2030 年電動大客車全面電動化目標。

(2) Meet mobile service requirements of the general public with communication technology, combining Kaohsiung City government resources to promote the "Mobility as a Service" (MaaS) demonstration construction and service expansion project.

(3) Conduct real-time road traffic information collection and sign control by applying AI image recognition technology, and research on the future development trend of AI in the field of transportation.

(4) Propose the development blueprint and promotion strategy of our country's UAV in the field of transportation.

(5) Draft the intelligent transportation policy white paper, plan future development vision, strategy and action plan, and support MOTC to promote the intelligent transportation system development and implementation programs.

2.Information integration and value added cross-domain

(1) Use the massive travel data generated by the Kaohsiung City Mobility as a Service (MaaS), through massive data exploration and analysis to analyze the travel mobility behavior of the target group and the gaps in existing public transportation services, and develop an integrated data visualization analysis interface at the same time to propose MaaS operation improvement strategy recommendations.

(2) Develop an urban traffic incident database expansion mechanism, promote and strengthen the road traffic incident information integration and release platform, and continue to implement the research and analysis of the optimization of the content quality of incident notifications to improve the transparency of road real-time information and the convenience and safety of driving.

(3) Assist the MOTC to develop an electric bus promotion strategy and demonstration project, and conduct

六、營造潔淨運輸環境

營造潔淨運輸環境，以建立潔淨的交通生活環境為願景，綜合技術組年度研究主軸如下：

1.運輸部門減碳

（1）協助交通部推動第一期「運輸部門溫室氣體排放管制行動方案」三大策略及11項措施。

（2）陳報「運輸部門溫室氣體排放管制行動方案執行成果」（108年9月版），於108年12月4日奉行政院核定。

（3）修正運輸部門排放基線及減碳效益推估參數。

（4）綜整運輸部門研擬行動方案標準作業程序及研提第二期行動方案初擬草案（2021~2025年）。

2.交通空污減量

（1）完成歷年交通空污排放量變化趨勢與交通空污管理措施關聯性之研析。

（2）根據市區道路與國道交通空污熱點所構成之車種組成差異，分別對汽油小客車、機車（市區道路）與柴油大貨車（國道）提出交通空污改善措施建議。

（3）研究成果呼應「空氣污染防制行動方案計畫書」及「運輸政策白皮書-綠運輸分冊」相關交通空污改善管理策略，做為支持中央及地方相關機關推動交通空污改善策略之研究論述。

3.運輸系統調適

（1）完成運輸系統調適策略滾動檢討，包括四大構面15項策略，做為交通部與部屬機關研提行動方案之參據。

（2）更新鐵公路風險資訊，做為交通部相關部屬機關研提調適行動計畫之參據。

（3）完成鐵公路調適新科技應用之探討及建議。

performance analysis of the demonstration plan implementation, meeting the goal of total electrification of urban buses in 2030.

VI. Build up a Clean Transportation Environment

Based on the vision of building up a clean transportation and living environment, the annual research guidelines of the Interdisciplinary Research Division, IOT are:

1.Carbon reduction of the transportation sector

(1) Assist the MOTC in promoting 3 strategies and 11 measures of the first phase of the "Action Plan for Greenhouse Gas Emission Control in the Transportation Sector"

(2) Report the "Implementation Results of Action Plan for Greenhouse Gas Emission Control in the Transportation Sector" (September 2019 Edition), approved by the Executive Yuan on December 4, 2019.

(3) Revise the emission baseline of the transportation sector and the estimation parameters of carbon reduction benefits.

(4) Summarize the standard operating procedures of the transportation sector to develop the action plan and propose the preliminary draft of the second phase of the action plan (2021–2025).

2.Reduction of traffic air pollution

(1) Complete the research and analysis of the relationship between the change trend of traffic air pollution emissions and traffic air pollution management measures over the years.

(2) Propose recommendations for traffic air pollution improvement measures for gasoline passenger cars, scooters (urban roads) and diesel trucks (national highways) respectively based on the differences in vehicle type composition between urban roads and national highway traffic air pollution hot spots.

(3) The research results echo the relevant air pollution improvement management strategies of the "Air Pollution Prevention Action Plan" and the "Transportation Policy White Paper - Green Transport Volume," as a research discourse to support the central and local relevant authorities to promote traffic air pollution improvement strategies.

3.Adaptation of transportation system

(1) Complete the rolling review for the adaptation strategy of transportation system, framed with 4 dimensions and 15 strategies, in order to provide MOTC and its external divisions the reference of making relevant action plans.

(2) Update the risk information of railway and highway, in order to provide MOTC and its external divisions the reference of making relevant adaptation action plans.

研究主軸六、營造潔淨運輸環境
Main Scheme VI - Build up a Clean Transportation Environment
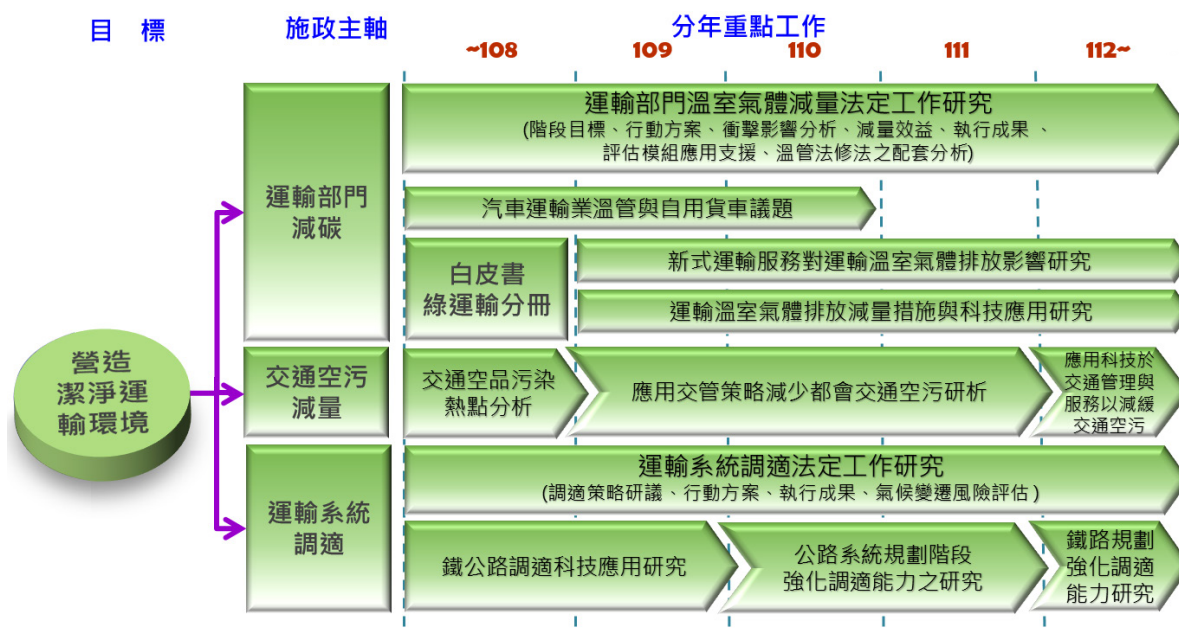
七、強化運輸技術研發

運用新興科技，強化運輸災防能力及管理效能，以提升海陸運輸安全並落實永續發展，港灣技術研究中心年度研究主軸如下：

1.研發防災技術

（1）檢監測技術研發： 在軌道防災研究上，建置軌道扣件缺失辨識系統，建立軌道扣件影像的蒐集設備，利用人工智慧辨識軌道扣件是否有缺失，定位缺失扣件並於Google Map上顯示，可達到軌道扣件影像辨識檢測的目的，亦開發雲端儲存、辨識、與查詢等功能，提供軌道管理單位巡檢實務應用。在公路邊坡防災研究上，開發地表監測預警技術，發展土壤邊坡監測模組並持續提升其效能，且應公路總局第四區養護工程處委託，搭配近景攝影技術，於台7線、台 7 甲線及台9線辦理 2 年期（107-108）的試辦計畫，將地質災害監測、預警以及應用新興科技輔助邊坡巡檢之研究成果，應用於該處公路邊坡維護管理作業。

(3) Complete the exploration and recommendations of adaptation to new technology applications for railways and highways.

VII. Enhance the Transportation Technology Research and Development

Adopt emerging technologies, enhance transportation disaster prevention capabilities and management effectiveness to improve safety of land and sea transportation and implement sustainable development, the annual research guidelines of the Harbor & Marine Technology Center, IOT are:

1.Research and development of disaster prevention technology

(1) **Research and development of inspection and monitoring technologies:** In the railway disaster prevention research, construct the track fastener deficiency identification system, establish a track fastener image collection device, use artificial intelligence to identify whether the track fastener is deficient, position the deficient fastener and display on Google Maps that can achieve the purpose of image identification and detection of track fasteners. Cloud storage, identification, and query functions have also been developed to provide the Track Management Units with practical applications for patrol inspection. In the research of highway slope disaster prevention, develop ground surface monitoring and early warning technology, develop soil slope monitoring module and continue to improve its efficiency, and undergo 2-year (2018–2019) test program on the provincial highway 7, 7A and provincial highway 9 with close-range photography technology as entrusted by the Directorate General of Highways Fourth Maintenance Office, and apply the research results of geological disaster monitoring and

（２）**港灣海象模擬**：提升海象預報模擬系統之
風浪子系統預報次數，預報由每日執行1
次，改成每日4次;針對花蓮港 105至107年
度颱風期間波浪觀測資料進行特性分析，
分離長浪資料進行探討與應用中尺度風浪
模組提供長浪預報研究；另完成臺東海岸
公路沿岸地形變遷因應對策研究，研擬臺
東台9線公路浪襲、侵蝕災害等災害潛勢因
應改善對策，提供公路總局參考應用。

（３）**金屬材料腐蝕環境研究**：持續進行大氣腐
蝕因子調查與金屬材料現地曝露試驗，
研究成果並發行年報，並精進擴充「臺灣
腐蝕環境分類資訊系統」，提供高速公路
局、公路總局、臺鐵局、台灣高鐵公司、
工程顧問公司及民間業者辦理公共工程防
蝕設計及維護之參考應用。

early warning, as well as apply the emerging technologies to assist slope patrol inspections to the location's highway slope maintenance management operation.

(2) **Harbor oceanographic phenomena simulation:** Increase the number of forecasts for the wind and wave subsystem of the oceanographic phenomena forecast simulation system, and change the forecast from once a day to 4 times a day; conduct characteristics analysis of the wave observation data during the typhoon in 2016 to 2018 at Hualien Port, separate the long-wave data for discussion and apply the mesoscale wind wave module to provide long-wave forecasting research; also complete the research on the countermeasures of the terrain changes along the Taitung Coastal Highway, and formulate the countermeasures to improve the potential response to disasters including wave attacks and erosion disasters on the Taitung provincial highway 9, to provide reference and application for the Directorate General of Highways.

(3) **Study on the corrosion environment of metal materials:** Continue to conduct atmospheric corrosion factor investigations and on-site exposure tests of metal materials, study results and publish annual reports, and improve the expansion of the "Taiwan Corrosion Environment Classification Information System" to provide reference and application for the Freeway Bureau, Directorate General of Highways, Taiwan Railways Administration, Taiwan High Speed Rail, Engineering Consulting Companies and Private Businesses to conduct anti-corrosion design and maintenance of public works.

（4）**離岸風電區防災**：配合離岸風電發展，於臺中港及鄰近海域進行 108 年度海氣象觀測及數值模擬，建立整合性觀測資料庫及控管資料品質，同時探討基地母港(臺中港)之漂沙機制並進行水工模型試驗。另運用陣 達船艦偵測技術，進行 達主動式船舶偵測與整合航港局船舶自動 別系統，完成電子海圖展示系統開發，整合資訊並已提供航港單位查詢與監控掌握船舶動態，提升船舶航 安全及碼頭營運效。

2.建立智慧航安

（1）**船舶航行安全預測模組**：利用大數據結合人工智慧分析技術，透過資料探勘技術挖掘AIS資料庫之船舶資訊，藉以研析我國海域範圍內船舶航行資訊及特性，建置船舶航行安全預測模組，避免船舶碰撞並提升偏航預警技術，改善船舶航行面臨的安全課題。

(4) **Offshore wind farm disaster prevention:** In conjunction with offshore wind power development, the Center has conducted in 2019 the observation and digital simulation of oceanographic phenomena at Taichung Port and adjacent sea area to establish an integrated observation database and data quality control, and to explore the drifting sand mechanism of the base home port (Taichung Port) and conduct hydraulic model tests. Also, use the array radar ship detection technology to conduct radar active ship detection and integration of the Maritime Port Bureau's automatic ship identification system, complete the development of the electronic chart display system, integrate information, and provide Maritime Port Units to query and monitor control the ship movement, improve the ship navigation safety and terminal operation efficiency.

2.**Establishment of smart ship navigation**

(1) **Ship navigation safety prediction module:** Use big data combined with artificial intelligence analysis technology to mine ship information in the AIS database through data exploration technology, so as to study and analyze ship navigation information and characteristics in our country's sea areas, and build a Ship Navigation Safety Prediction Module to avoid ship collisions and improve off-course early warning technology, to improve the safety tasks faced by ship navigation.

(2) **Harbor environmental information application:** the Center has completed the 2019 maintenance of the Harbor Environment Information System, to provide 7 information subsystem functions including harbor area oceanographic phenomena, blue highway, port image, port earthquake, port tsunami and port erosion information, and summarized national oceanographic phenomena instant observation information in 12 sea

（2）**港灣環境資訊應用**：完成 108 年度港灣環境資訊系統維護，提供港區海象、藍色公路、港區影像、港區地震、港區海嘯及港區腐蝕等 7 項資訊子系統功能，並綜整全臺12海域之海象即時觀測資訊。另為因應災防需求，運用LINE BOT（聊天機器人）技術，發展主動式訊息推播服務，提供整體與即時之港灣動態與靜態環境完整資訊，並配合行政院推行數位國家雲端化，移轉系統至機房（IDC）租用服務，維持網站服務不中斷及正常運作。

（3）**港區即時潮位資訊系統**：完成國際及國內商港（基隆港、臺北港、蘇澳港、花蓮港、臺中港、布袋港、安平港、高雄港、馬公港及龍門尖山港）各自建置之船席即時水深資訊系統，以供各港之即時潮位、船席、航道及迴船池等之即時水深與預測之顯示及查詢，進而提昇船舶進出港及停泊之航行安全性，增加各港營運競爭力。

3.落實永續發展

（1）**公路橋梁維護管理系統**：除持續精進臺灣地區橋梁管理資訊系統（TBMS）及行動裝置 APP 外，另辦理橋梁評鑑，導入外部稽核與培訓檢測人員，以及運用新興科技，強化及研發橋梁維護管理技術，協助提升橋梁安全。

areas of entire Taiwan. In addition, in response to disaster prevention requirements, use the LINE BOT (chat robot) technology to develop active message push notification service, and provide complete and real-time information on the dynamic and static environment of the harbors, and cooperate with the Executive Yuan to implement digital national cloud and transfer systems to the computer room (IDC) leasing service to maintain uninterrupted and normal operation of the website service.

(3) **Port area real-time tide level information system:** Complete the international and domestic commercial ports (Keelung Port, Taipei Port, Suao Port, Hualien Port, Taichung Port, Budai Port, Anping Port, Kaohsiung Port, Magong Port and Longmen-Jianshan Port) individually built Berth Real-time Water Depth Information System for display and query of real-time water depths and forecasts of real-time tide level, berth, navigation channel and turning basin, to thereby enhance the navigation safety of ships entering and exiting ports and berthing, and increase the operating competitiveness of all ports.

3.Implementation of sustainable development

(1) **Road bridge maintenance management system:** In addition, to continuously improve the Taiwan Bridge Management Information System (TBMS) and mobile device APP, the Center has also conducted bridge evaluation, introduced external audit and trained inspection personnel. Furthermore, for improving bridge safety, the Center has adopted emerging technologies to strengthen and develop bridge maintenance and management technology.

研究主軸七、強化運輸技術研發
Main Scheme VII - Enhance the Transportation Technology Research and Development
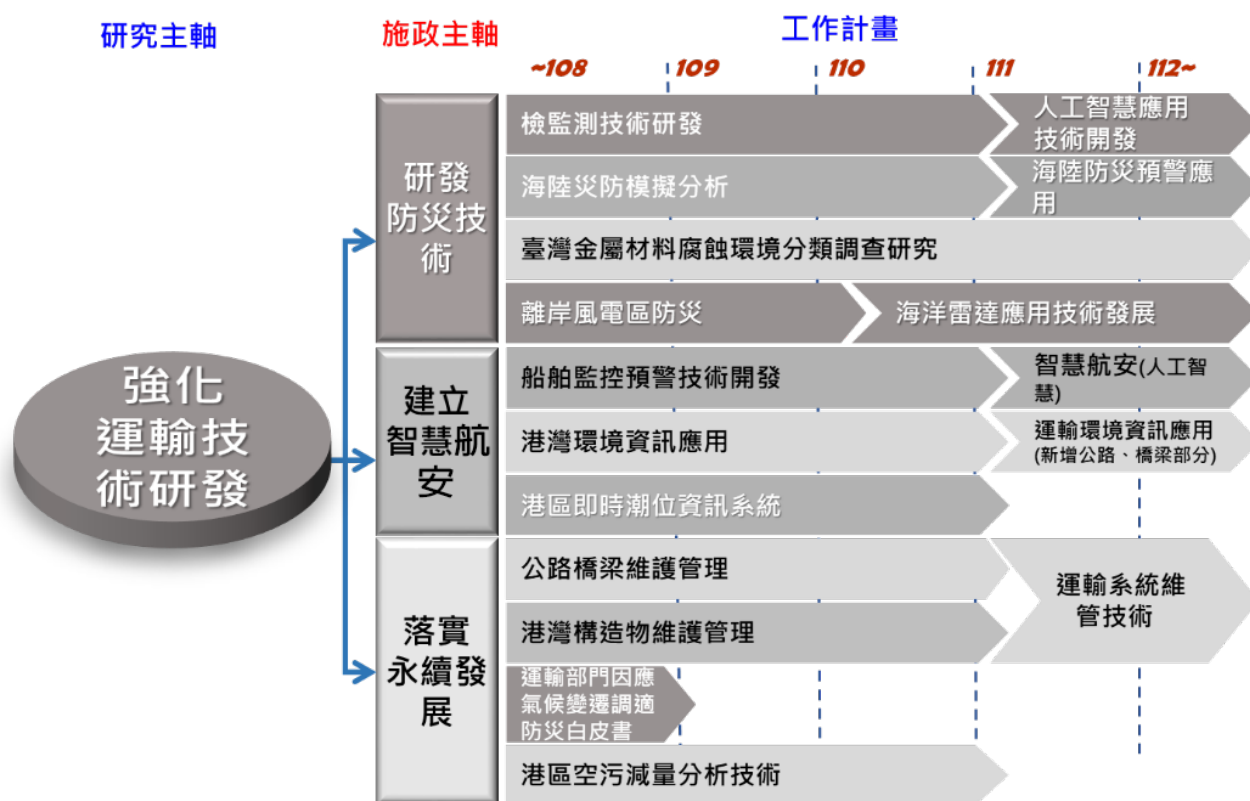
（2）港灣構造物設計基準編修：蒐集國內相關基準及研究成果與國外如英國 BS6349, 美國 CEM, 日本港灣設施基準同解說等設計規範，配合國內新規定及工程實務需求，108 年已依部頒規範格式，完成基準條文之修訂及初審，並於109年1月陳報交通部辦理複審作業。

（3）2020年版運輸政策白皮書：藉由匯集產官學研各界意見，邀請相關領域專家學者舉辦座談會，共同檢視、合力完成2020年版運輸政策白皮書「運輸部門因應氣候變遷調適與防災分冊」之編撰及出版工作。

（4）港區空污減量：結合交通部船舶自動識別系統、即時氣象資料、行政院環境保護署空氣品質測站資料，108年進行各主要港區及臨近海域船舶對臺灣地區空氣品質之全年影響案例分析，並運用三維空氣品質網格模式（CMAQ），建置即時氣象模組WRF，提供交通部航港局及港務公司等做為空污防制措施擬訂之參據。

(2) **Revision of harbor structure design standards:** the Center has collected relevant domestic benchmarks and research results, standards and design specifications of international harbor facilities (including British BS6349, US CEM, and Japanese harbor structure design guidelines) as well as aligned with new domestic regulations and practical engineering requirements to complete revision and preliminary review of the basic provisions according to MOTC required specifications and format in 2018, also reported to MOTC for review on January 2020.

(3) 2020 **Transportation policy white paper:** By collecting opinions from industry, government, academia, and research institutions, inviting experts and scholars in related fields to hold a symposium to jointly review to jointly complete the compilation and publication works of 2020 Transportation Policy White Paper "Transportation Sector in Response to Climate Change Adaptation and Disaster Prevention Volume."

(4) **Air pollution reduction in port areas:** Combined the Automatic Identification System (AIS), real-time meteorological data, and air quality data of EPA, Executive Yuan, the Center has analyzed annual impact of air quality over Taiwan area by main harbor areas and costal vessels in 2018. Furthermore, the Center has used the three-dimensional Community Multi- scale Air Quality Model (CMAQ) to build the real time meteorological module (Weather Research and Forecasting WRF), to provide the Maritime Port Bureau and TIPC with a reference in proposing air pollution prevention measures.

肆 | 重點研究介紹

04. Introduction of Key Researches

本所6組1中心配合交通部當前重點政策及國內交通問題，研擬及執行相關研究計畫，以協助完成國內交通政策之推動，並提供研究成果作為中央及地方政府交通單位施政之參考，這些當前交通政策重點包含：

（一）運輸規劃評估研究

（二）海空運及鐵路決策支援應用工具之創新發展

（三）道路交通安全創新研究與應用

（四）公路客貨運輸創新研究與應用

（五）智慧運輸科技發展與創新應用

（六）氣候變遷環境下運輸部門之因應作為

（七）港灣環境與船舶航行安全研究發展

以下即針對本所配合執行之重點研究項目擇要進行介紹。

一、 運輸規劃評估研究

（一）2020年版運輸政策白皮書-總論與專書

1.計畫概述

運輸政策為運輸建設與管理之根基，藉由運輸政策白皮書之訂定可讓運輸部門依循有據，有利推動現代化交通建設與服務。本所自民國82年起承交通部指示已辦理3次運輸政策白皮書之編撰及發布工作，本次為第4次辦理，特動員本所各業務單位以自辦案方式辦理編撰作業，本版(2020年版)運輸政策白皮書依據林部長佳龍揭櫫「人本交通、與民同行」的願景，「安全」、「效率」、「品質」及「綠色」的施政主軸出發，勾勒未來施政政策、策略與行動方案，擘劃運輸部門共同之施政藍圖，其內容包含總論，以及陸運、海運、空運、運輸安全、智慧運輸、綠運輸、運輸部門因應氣候變遷調適與防災7分冊。

總論綜整第2層為運輸系統，包含「陸運」、「海運」、「空運」分冊，以及第3層為當前重要施政議題，包含「運輸安全」、「智慧運輸」、「綠運輸」及「運輸部門因應氣候變遷調適與防災」分冊的重點，匯聚國際、城際、都市、離島

In line with the current key policies of the Ministry of Transportation and Communications and the domestic transportation issues, the Institute develops and implements relevant research projects to assist in completing the advancement of domestic transportation policies, and provides the research outcomes as the reference for the administration of central and local government transportation units. These current transportation policies emphases include:

I. Transportation Planning Evaluation Research

II. Innovative Development of Application Tools for Supporting Sea and Air Transportation and Railway Decision

III. Creative Research and Application on Road Traffic Safety

IV. Creative Research and Application on Highway Passenger and Cargo Transportation

V. Development and Innovation of Intelligent Transportation Technology

VI. Response of Transportation Sectors in Climate Change Environment

VII. Research and Development of Harbor and Maritime Environment and Ship Navigation Safety

I. Transportation Planning and Evaluation Research

(1) 2020 Transportation Policy White Paper – Summary and Volumes

1.Project Overview

Transportation policy is the foundation of transportation construction and management. The establishment of the Transportation Policy White Paper allows the transportation sectors to have the basis to follow, and to facilitate the promotion of modern transportation construction and services. Since 1993, the Institute has conducted the compilation and publication of the transportation policy white paper three times under the instructions of the Ministry of Transportation and Communications. This is the fourth time. The Institute's business units are specially mobilized to conduct the compilation operations in their self-managing manner. The 2020 Transport Policy White Paper is started according to the vision of "Humanity-oriented Transportation, Walking with People" and administration policies of "Safety," "Efficiency," "Quality, and "Eco-green" disclosed by Minister Lin, Chia-Lung to outline future administration policies, strategies and action plans, and plan for the common administration blueprint for the transportation sector, with the contents including Summary and seven volumes of Land Transportation, Sea Transportation, Air Transportation, Transportation Safety, Intelligent Transportation, Green Transportation, and Transportation Sector responding to Climate Change Adaptation and Disaster Prevention.

The Summary summarizes the Tier 2 Transportation Systems, including the "Land Transportation," "Sea Transportation," and "Air Transportation" volumes, and the Tier 3 is the current Key Administrative Issues, including the important points of "Transportation Safety," "Intelligent

與偏鄉及安全、智慧、綠運輸、調適與防災等8個單元,以重要議題方式進行編撰,共提出27項政策以及落實政策的107項策略,清楚勾勒完整的施政藍圖。

另,為了充分與民眾溝通,並讓普羅大眾都能親近運輸政策,本所特從人本交通思維出發,編撰經由林部長佳龍親自命名《Koinonia:交通就是感動-2020運輸政策白皮書》專書,以淺顯易懂的語言,揭示「強固運輸安全體系」、「健全調適防災作為」、「強化運輸系統效能」、「促進運輸產業發展」、「落實人本交通理念」、「支援觀光旅遊開展」、「推動智慧運輸應用」、「順應國際綠色潮流」等八大目標,並聚焦點出智慧運輸系統發展建設計畫、全國道安行動方案、藍色公路計畫、臺鐵智慧化4.0計畫、環島自行車道升級與多元路線整合計畫、蘇花公路安全提昇計畫、國家鐵路安全計畫、智慧海空及鐵公路防災預警系統、臺中港2.0計畫、環島鐵路網(西高鐵、東快鐵)、擴大需求反應式公共運輸服務計畫等重點行動方案,帶領民眾了解交通運輸新的未來。

2.研究成果

(1)2020年版運輸政策白皮書-總論綜整7分冊之精華,環顧近年來國內外交通運輸環境變遷,包含國際上中美貿易戰、美國提出的印太戰略、全球節能減碳意識抬頭等,以及國內少子化與人口老化,近期引發全國關注的運輸安全事件,與創新科技帶來應用上無限可能等,共界定出81項當前我國面臨的重要議題。

Transportation," "Green Transportation," and "Transportation Sector responding to Climate Change Adaptation and Disaster Prevention," which converges 8 units of international, intercity, urban, off-shore islands and rural areas, and safe, intelligent, green transportation, adaptation and disaster prevention, and is compiled in the form of important topics. A total of 27 policies and 107 strategies to implement the policies were proposed, to clearly outline the complete administration blueprint.

In addition, in order to fully communicate with the people and allow the general public to get close to the transportation policy, the Institute specifically started from the human-oriented transportation thinking to compile the volumes of "Koinonia: A Moving Form of Transportation – 2020 Transportation Policy White Paper" personally named by Minister Lin, Chia-Lung, announcing eight major goals: "Strengthening Transportation Safety System," "Building Comprehensive Adaptation and Disaster Prevention," "Enhancing Transportation Efficacy," "Bolstering Transportation Industry Development," "Implementing Human-oriented Transportation," "Supporting Tourism Development," "Advocating Intelligent Transportation," and "Pursuing Global Green Trends" in plain and easy-to-understand language, and focused on pointing out the key action programs of the Intelligent Transportation System Development and Construction Project, the National Road Safety Action Plan, the Blue Highway Project, the Smart Taiwan Railway Administration 4.0 Project, Island-round Cycling Routes Upgrade and Multiple Routes Integration Project, Suhua Highway Safety Improvement Project, State Railway Safety Program, Intelligent Marine Meteorology to Disaster Prevention Early Warning System of Sea, Air, Railway and Highway Transportation, Taichung Port 2.0 Project, Island-round Railway Network (High Speed Rail in the western corridor and express rail in the eastern corridor), expand the Demand Responsive Public Transit Services Project to lead the people in understanding the new future of transportation.

2.Research Outcomes

(1) With the 2020 Transportation Policy White Paper – Summary, which summarizes the essence of 7 volumes looking at the changes in the domestic and international transportation environment in recent years, including the international China–US trade war, the Indo-Pacific strategy proposed by the United States, and the rising awareness of global energy conservation and carbon reduction, etc., as well as the low birthrate and the aging population in Taiwan, the recent transportation safety incidents that have caused national attention, and the infinite possibilities of application brought by innovative technology, a total of 81 important issues facing our country are defined.

（2）總論依據安全、效率、品質、綠色四大施政主軸，於國際、城際、都市、離島與偏鄉，及安全、智慧、綠色，及調適與防災等八個單元內，分別針對已界定出的重要議題，提出27項政策。各策略之下亦列有短中長期行動方案，整體政策架構清楚勾繪出運輸部門未來的施政藍圖。

（3）專書將運輸政策歸納成「強固運輸安全體系」、「健全調適防災作為」、「強化運輸系統效能」、「促進運輸產業發展」、「落實人本交通理念」、「支援觀光旅遊開展」、「推動智慧運輸應用」、「順應國際綠色潮流」等八大施政目標，並各別繪製民眾易懂的議題與策略對應圖。明確勾勒各施政目標之議題、策略及重點行動方案，幫助民眾更貼近2020運輸政策白皮書。

3. 成果推廣與效益

（1）108年6月辦理「2020年版運輸政策白皮書座談會」。

（2）108年12月辦理「2020年版運輸政策白皮書新書發表會」。

（3）製作宣傳影片、海報與宣傳文宣製作與發送，讓民眾更易了解運輸政策。

4. 研究成果精華摘整

(2) The Summary is based on the four main administration policies of Safety, Efficiency, Quality, and Eco-green, aimed at eight units of international, intercity, urban, offshore islands and remote rural areas, as well as safety, intelligent, green, and adaptation and disaster prevention, to define important issues and propose 27 policies. Under each strategy, there are also short-, medium- and long-term action plans, and overall policy framework clearly outlines the future administration blueprint for the transportation sector.

(3) The volumes summarize transportation policies into eight major administration policies including "Strengthening Transportation Safety System," "Building Comprehensive Adaptation and Disaster Prevention," "Enhancing Transportation Efficacy," "Bolstering Transportation Industry Development," "Implementing Human-oriented Transportation," "Supporting Tourism Development," "Advocating Intelligent Transportation," and "Pursuing Global Green Trends," and draw the Issues and Strategies Corresponding Illustration that are easy for people to understand. Clearly outline the issues, strategies and key action plans of each administration goal, to help the people be closer to the 2020 Transport Policy White Paper.
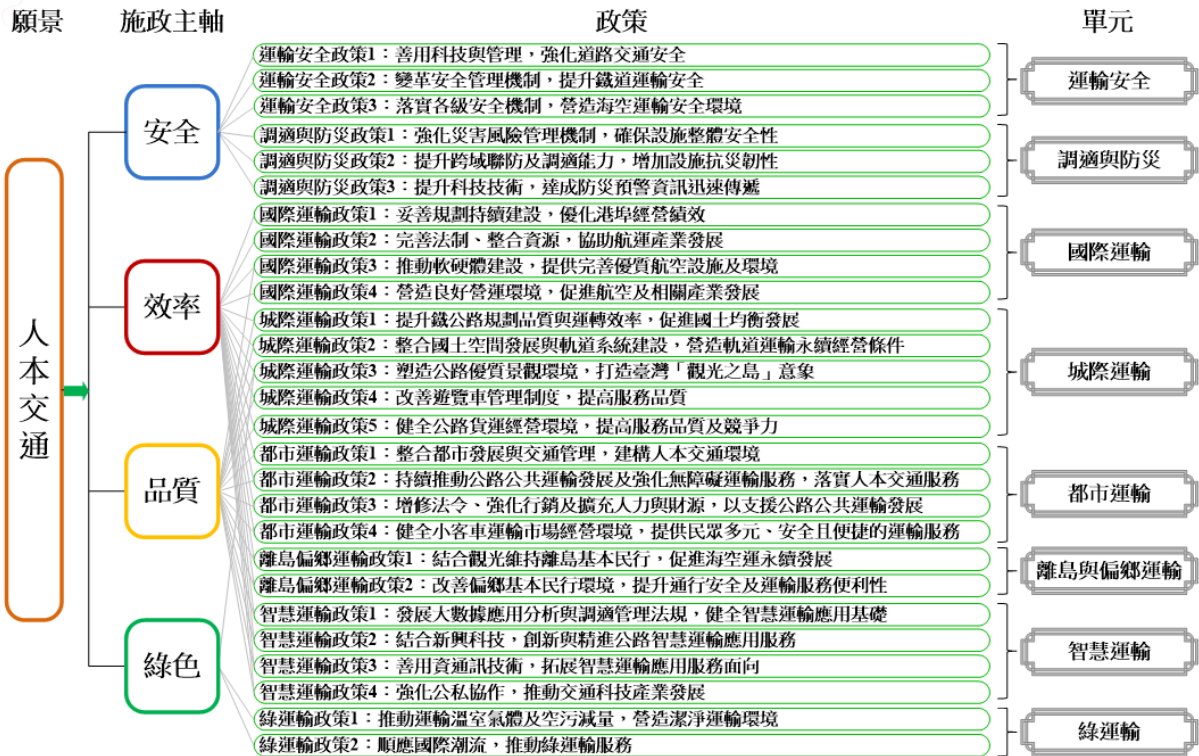
3. Promotion of Outcomes and Benefits

(1) Conducted the "2020 Transport Policy White Paper Symposium" in June 2019.

(2) Conducted the "2020 Transport Policy White Paper New Book Presentation" in December 2019.

(3) Produced publicity videos and posters, produced and distributed promotional materials to make it easier for the people to understand the transportation policies.

4. Summary of Research Outcomes

項次	總 冊	
1	陸運分冊	第 1 層為綜整各分冊的精要
2	海運分冊	第 2 層為運輸系統
3	空運分冊	
4	運輸安全分冊	第 3 層為當前重要施政議題
5	智慧運輸分冊	
6	綠運輸分冊	
7	運輸部門因應氣候變遷調適與防災分冊	

2020 年版運輸政策白皮書組成
Composition of the 2020 Transportation Policy White Paper

願景	施政主軸	政策	單元
人本交通	安全	運輸安全政策1：善用科技與管理，強化道路交通安全 運輸安全政策2：變革安全管理機制，提升鐵道運輸安全 運輸安全政策3：落實各級安全機制，營造海空運輸安全環境	運輸安全
		調適與防災政策1：強化災害風險管理機制，確保設施整體安全性 調適與防災政策2：提升跨域聯防及調適能力，增加設施抗災韌性 調適與防災政策3：提升科技技術，達成防災預警資訊迅速傳遞	調適與防災
	效率	國際運輸政策1：妥善規劃持續建設，優化港埠經營績效 國際運輸政策2：完善法制、整合資源，協助航運產業發展 國際運輸政策3：推動軟硬體建設，提供完善優質航空設施及環境 國際運輸政策4：營造良好營運環境，促進航空及相關產業發展	國際運輸
		城際運輸政策1：提升鐵公路規劃品質與運轉效率，促進國土均衡發展 城際運輸政策2：整合國土空間發展與軌道系統建設，營造軌道運輸永續經營條件 城際運輸政策3：塑造公路優質景觀環境，打造臺灣「觀光之島」意象 城際運輸政策4：改善遊覽車管理制度，提高服務品質 城際運輸政策5：健全公路貨運經營環境，提高服務品質及競爭力	城際運輸
	品質	都市運輸政策1：整合都市發展與交通管理，建構人本交通環境 都市運輸政策2：持續推動公路公共運輸發展及強化無障礙運輸服務，落實人本交通服務 都市運輸政策3：增修法令、強化行銷及擴充人力與財源，以支援公路公共運輸發展 都市運輸政策4：健全小客車運輸市場經營環境，提供民眾多元、安全且便捷的運輸服務	都市運輸
		離島偏鄉運輸政策1：結合觀光維持離島基本民行，促進海空運永續發展 離島偏鄉運輸政策2：改善偏鄉基本民行環境，提升通行安全及運輸服務便利性	離島與偏鄉運輸
	綠色	智慧運輸政策1：發展大數據應用分析與調適管理法規，健全智慧運輸應用基礎 智慧運輸政策2：結合新興科技，創新與精進公路智慧運輸應用服務 智慧運輸政策3：善用資通訊技術，拓展智慧運輸應用服務面向 智慧運輸政策4：強化公私協作，推動交通科技產業發展	智慧運輸
		綠運輸政策1：推動運輸溫室氣體及空污減量，營造潔淨運輸環境 綠運輸政策2：順應國際潮流，推動綠運輸服務	綠運輸

我國陸路運輸施政主軸、目標、政策及策略架構圖
Structural Chart for Vision, Main Scheme and Policy of Summary
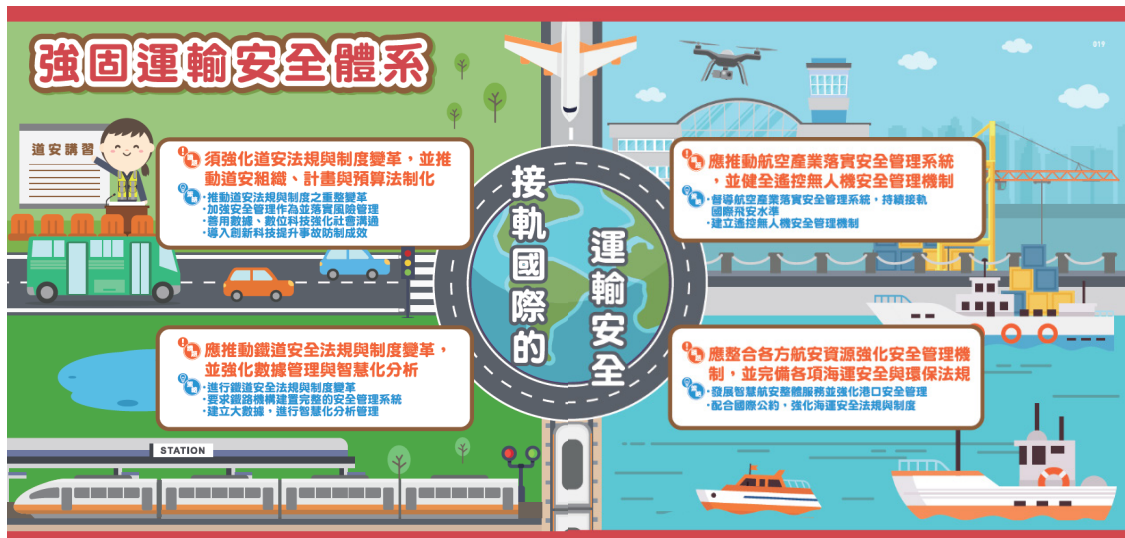
目標 1 - 強固運輸安全體系議題與策略對應圖
Goal 1 – Strengthening Transportation Safety System Issues and Strategies Corresponding Illustration

目標 2 - 健全調適防災作為議題與策略對應圖
Goal 2 – Building Comprehensive Adaptation and Disaster Prevention Issues and Strategies Corresponding Illustration

目標 3 - 強化運輸系統效能議題與策略對應圖
Goal 3 – Enhancing Transportation Efficacy Issues and Strategies Corresponding Illustration

目標 4 - 促進運輸產業發展議題與策略對應圖
Goal 4 – Bolstering Transportation Industry Development Issues and Strategies Corresponding Illustration

目標 5 - 落實人本交通理念議題與策略對應圖
Goal 5 – Implementing Human-oriented Transportation Issues and Strategies Corresponding Illustration

目標 6 - 支援觀光旅遊開展議題與策略對應圖
Goal 6 – Supporting Tourism Development Issues and Strategies Corresponding Illustration

目標 7 - 推動智慧運輸應用議題與策略對應圖
Goal 7 – Advocating Intelligent Transportation Issues and Strategies Corresponding Illustration

目標 8 - 順應國際綠色潮流議題與策略對應圖
Goal 8 – Pursuing Global Green Trends Issues and Strategies Corresponding Illustration

108 年 12 月 18 日新書發表會
Goal 8 – Pursuing Global Green Trends Issues and Strategies Corresponding Illustration

5.研究成果報告

· 2020年版運輸政策白皮書-總論(108年出版)。

· Koinonia：交通就是感動─2020運輸政策白皮書(108年出版)。

5.Report of Research Outcomes

· 2020 Transportation Policy White Paper - Summary Volume（published in 2019）

· Koinonia: A Moving Form of Transportation　2020 Transportation Policy White Paper (published in 2019)

（二）2020年版運輸政策白皮書-陸運

1.計畫概述

本次陸運政策白皮書編撰之願景、政策、策略、行動方案除植基於國家發展委員會「國土空間發展策略計畫」與內政部報院核定公布之「全國國土計畫」空間發展藍圖之上外，亦納入「前瞻基礎建設計畫」對於軌道、都市停車與道路品質之推動策略。

陸路運輸包含鐵、公路運輸系統的各組成要素。陸運政策白皮書，依陸運市場別，分為城際與都市運輸、公路公共運輸、偏鄉運輸、觀光運輸及貨物運輸分項編撰，而為促進各運輸系統間之友善整合，提升整體服務品質，本次編撰強調鐵公路系統間的跨域多元整合服務，特別是公共運輸系統（含幹線型的鐵道運輸系統與提供面狀服務的公路公共運輸系統）之無縫服務。此外，亦整合運輸安全、綠運輸、智慧運輸、防災與調適等分冊中與陸運政策有關之內容，以利於瞭解陸運政策的全貌與重要議題，以打造全方位優質陸運交通為核心價值，全光譜檢視各種運輸系統的相對重要性與缺口，並據此研擬相關運輸發展策略。

2.研究成果

本版陸運政策白皮書經考量國內外各項環境變遷與未來發展趨勢，同時依循行政院揭櫫「做實事，接地氣、讓民眾有感」之最高施政目標，以及本部重要政策與施政計畫，建立「以人為本的交通服務」的發展願景與核心價值，設定「安全」交通、「效率」交通、「品質」交通及「綠色」交通為四大施政主軸，致力追求「落實安全交通管理」、「提供效率便民服務」、「完善優質交通環境」及「發展綠色運輸及產業」等四大政策目標。

「安全」部分，整合人、運具、路等多元面向，規劃有效且完備之安全維護措施，並透過法規修訂及資訊精進風險管理等作為，善用智慧運輸、交通大數據分析等，加強落實交通運輸以及工程安全管理，並積極推廣公共運輸，全面降低風險、確保安全。

(1) 2020 Transportation Policy White Paper – Land Transportation

1.Project Overview

In addition to being based on the "Strategic Plan for National Spatial Development" by the National Development Council and the "National Spatial Plan" spatial development blueprint approved and announced by the Ministry of the Interior, the vision, policy, strategy, and action plan compiled in this Land Transportation Policy White Paper also incorporates the promotion strategies on railway tracks, urban parking and road quality specified in the "Forward-looking Infrastructure Development Program."

Land transportation includes various components of railways and highway transportation systems. The Land Transportation Policy White Paper is divided into intercity and urban transportation, highway public transportation, rural transportation, tourism transportation, and cargo transportation according to the land transportation market for compilation, and in order to promote the friendly integration of various transportation systems and improve the overall service quality, the compilation this time emphasizes the cross-domain, diversified and integrated services between the railway and highway systems, especially the seamless services of the public transportation systems (including the mainline railway transportation system and the highway public transportation system that provides surface services). In addition, it also integrates the contents in the volumes of transportation safety, green transportation, intelligent transportation, disaster prevention and adaptation related to land transportation policies, to facilitate the understanding of the overall picture

2.Research Outcomes

This edition of the Land Transportation Policy White Paper has considered various domestic and foreign environmental changes and future development trends, and follows the highest administration goal of "Doing Practical Works, Connecting with People, and Making People Move" disclosed by the Executive Yuan at the same time, as well as the important policies and administration plans of the Ministry, to establish the development vision and core values of "Humanity-oriented Transportation Services"; set "Safe" transportation, "Efficient" transportation, "Quality" transportation and "Eco-green" transportation as the four major policies; and strive to pursue four major policy goals of "Implement Safe Transportation Management," "Provide Efficient and Convenient Citizen Services," "Improve High-quality Transportation Environment" and "Develop Eco-green Transportation and Industry."

"Safety": Integrate multiple aspects of people, vehicles, and roads, to plan effective and complete safety maintenance measures, and make good use of intelligent transportation and traffic big data analysis to strengthen the implementation of traffic transportation and engineering safety management, through laws and regulations revisions and information improvement risk management, and actively promote public transportation, comprehensively reduce risks and ensure safety.

「效率」部分，廣為運用各項交通大數據分析，提供便民、智慧的效率服務，例如改善高速公路壅塞路段、提升用路便利性及順暢度、推廣偏鄉的幸福巴士等。

「品質」部分，積極規劃辦理各項交通建設工作，對建設工程品質嚴加把關，架構出人流、物流、資訊流等無縫運輸網絡，以提供人民有感之便利生活服務，並藉以帶動相關區域經濟及產業的發展。

「綠色」部分，維護人與環境共生的永續性，包括環保、減少空污等，並注重生活美學。除持續提供優質公共運輸服務外，並配合行政院宣示之「空氣污染防制行動方案」，推動大客車電動化，以及鼓勵電動汽機車發展；各項建設及服務措施將積極融入綠色相關元素，以提升施政質感，維護環境之永續發展。

在四大施政主軸下，總共提出相對應之18項政策與69項策略，並針對各項策略，研擬短中長期行動方案/措施。

3.成果推廣與效益

（1）108年6月，2020年版運輸政策白皮書座談會-陸運分冊。

（2）108年12月，2020運輸政策白皮書新書發表會。

"Efficiency": Widely use various traffic big data analysis to provide convenient and intelligent efficiency services, such as improving congested sections of highways, improving road use convenience and smoothness, and promoting happiness buses in rural areas.

"Quality": Actively plan and conduct various transportation construction work, strictly control the quality of construction projects, and construct seamless transportation networks for people flow, logistics, and information flow, in order to provide convenient life services that make people move, and to promote related regional economic and industrial development.

"Eco-green": Maintain the sustainability of the coexistence between humans and the environment, including environmental protection, air pollution reduction, etc., and attach importance to life aesthetics. In addition, to provide high-quality public transportation services continuously, and cooperate with the "Air Pollution Control Action Plan" promulgated by the Executive Yuan, to promote the electric buses and encourage the development of electric vehicles, actively incorporate eco-green elements into various construction and service measures to enhance the quality of administration and maintain the sustainable development of environment.

Under the four main policies of administration, propose a total of 18 corresponding policies and 69 strategies, and develop short-, medium- and long-term action plans/measures for each strategy.
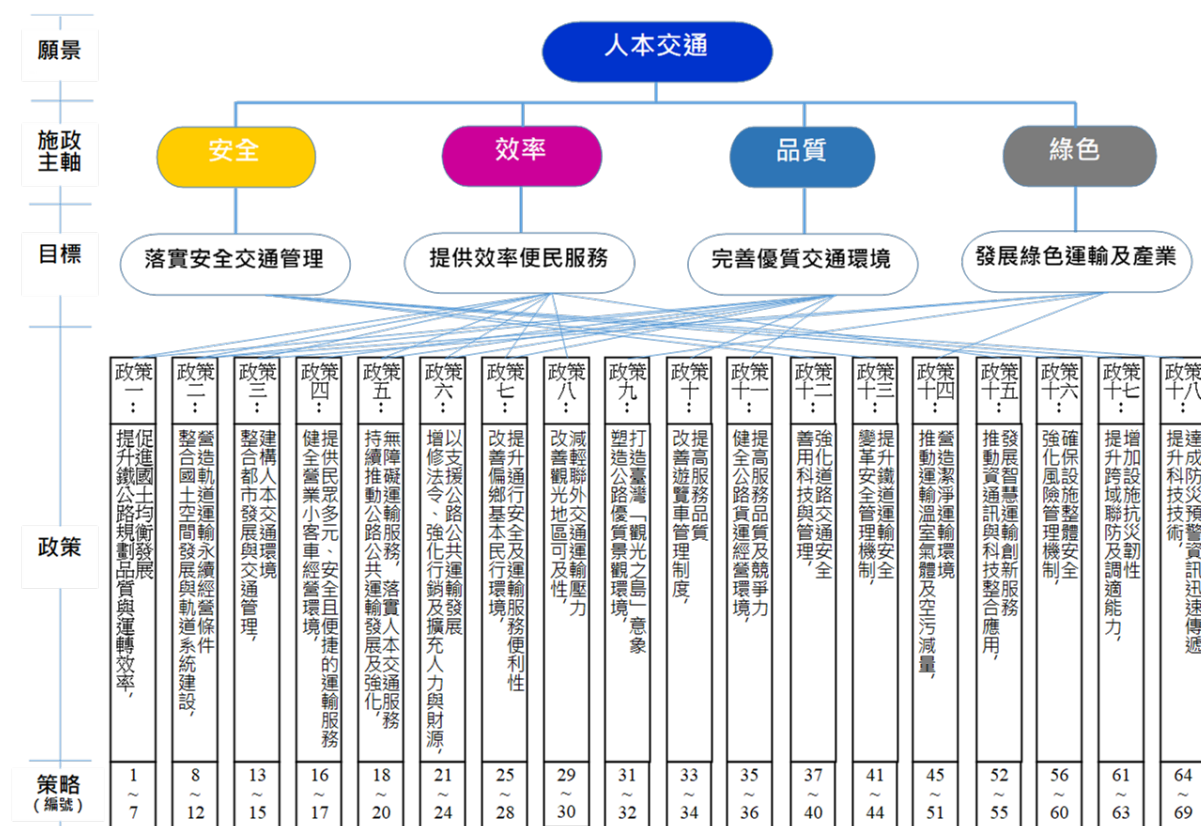
3.Promotion of Outcomes and Benefits

(1) June 2019, 2020 Transportation Policy White Paper Symposium – Land Transportation Volume

(2) December 2019, 2020 Transportation Policy White Paper New Book Presentation

4.研究成果精華摘整

4.Summary of Research Outcomes

我國陸路運輸施政主軸、目標、政策及策略架構圖

層級	內容
願景	人本交通
施政主軸	安全　效率　品質　綠色
目標	落實安全交通管理／提供效率便民服務／完善優質交通環境／發展綠色運輸及產業

政策與策略（編號）：

- 政策一：促進鐵公路均衡發展,提升國土規劃品質與運轉效率,　1~7
- 政策二：營造國土空間發展永續與軌道系統建設,　8~12
- 政策三：整合國土運輸發展經營條件,　13~15
- 政策四：建構人本交通環境與交通管理,　16~17
- 政策五：提供民眾多元、安全且便捷的運輸服務,健全營業小客車經營環境,　18~20
- 政策六：持續推動無障礙運輸公共服務,落實人本交通強化,　21~24
- 政策七：增修法令、強化行銷及擴充人力與財源,以支援公路公共運輸發展及強化,　25~28
- 政策八：改善偏鄉安全及運輸服務便利性,提升公路行車基本民行環境,　29~30
- 政策九：改善觀光地區可及性,減輕聯外交通運輸壓力,　31~32
- 政策十：塑造臺灣「觀光之島」意象,　33~34
- 政策十一：改善遊覽車品質管理制度,提高服務品質,　35~36
- 政策十二：健全公路貨運經營環境,提升服務品質及競爭力,　37~40
- 政策十三：善用科技道路交通管理及管理,交通安全,　41~44
- 政策十四：變革安全管理機制,提升鐵道運輸安全,　45~51
- 政策十五：推動運輸溫室氣體及空污減量,營造潔淨運輸環境,　52~55
- 政策十六：推動智慧運輸創新服務與科技整合應用,　56~60
- 政策十七：強化保設施風險管理機制,發展安全,　61~63
- 政策十八：提升科技技術,達成防災預警,資訊迅速傳遞,　64~69

我國陸路運輸施政主軸、目標、政策及策略架構圖
Structural Chart of Taiwan Land Transportation Administration Schemes, Goals, Policies and Strategies

5.研究成果報告

- 2020運輸政策白皮書-陸運(108年出版)

5.Report of Research Outcomes

- 2020 Transportation Policy White Paper - Land Transportation (published in 2019)

（三）北臺區域整體區域運輸規劃

(3) Overall Regional Transportation Planning of Northern Taiwan Region

1.計畫概述

本計畫為3年期計畫,主要係為掌握北臺區域(包含臺北市、新北市、桃園市、基隆市、宜蘭縣、新竹縣、新竹市及苗栗縣)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,針對北臺區域各運輸系統進行功能定位與檢討,並研提北臺區域陸路運輸服務均衡發展策略。

其中第1年期(105年)為蒐集北臺區域社經資料、重大建設計畫及模式建構先期研究,提出區域模式建構具體構想;第2年期(106年)主要進行旅

1.Project Overview

This project is a three-year project, mainly to grasp the weekday commute of work and school as well as business trip characteristics in the northern Taiwan region (including Taipei City, New Taipei City, Taoyuan City, Keelung City, Yilan County, Hsinchu County, Hsinchu City and Miaoli County), to establish a transportation demand model through investigation and collection of relevant trip characteristics data, to predict the supply and demand situation of the transportation system in the future, conduct functional positioning and review all transportation systems in the northern Taiwan region, and propose balanced service development strategies for land transportation in the northern Taiwan region.

Among them, the first year (2016) was to collect northern Taiwan regional social and economic data, major construction projects and model to construct preliminary research, and propose specific ideas for regional model construction; the

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及現況運輸系統供需分析；第3年期(107年)則建立北臺區域運輸需求模式，深入瞭解區域內重要路廊供需問題，並研擬運輸發展策略。

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「2018北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。

（3）提出北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北部縣市政府辦理相關運輸系統規劃與評估參考。

（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「北臺模式預測成果」及「北臺陸路運輸發展策略研擬方向與議題分析」於108年10月9日及108年11月15日召開2次專家學者座談會。

（2）辦理4場次教育訓練進行模式操作演練與推廣。

（3）發表「區域運輸需求模式與車輛動態能耗/碳排放推估模式整合應用實作」，中華民國運輸學會108年學術論文研討會。

（4）「北臺區域整體運輸規劃研究」於2019年斯里蘭卡舉辦之東亞運輸學會(EASTS)，榮獲「2019年傑出運輸建設獎(Outstanding Transportation Project Award, OTPA)」。

second year (2017) mainly conducted trip characteristics surveys and analysis, to grasp the changes in trip behavior in the region and complete the social and economic forecasts for the target year and the current transportation system supply and demand analysis through the survey of trip characteristics and screen line traffic volume; the third year (2018) was to establish northern Taiwan regional transportation demand model, to understand the supply and demand of important road corridors in the region in-depth, and develop the transportation development strategies.

2.Research Outcomes

(1) Grasp the trip characteristics of regional transportation (trip origin and destination distribution, trip length, vehicle usage status), which can reflect changes in various transportation markets under different policies.

(2) Construct the "2018 Northern Taiwan Regional Transportation Demand Model," complete the supply and demand forecast analysis of the transportation system to understand the competition and cooperation relationship of major transportation corridors, and analyze the traffic volume and observation points/screen lines passing volume of the road corridors between regions to meet the demands of the carrying capacity review for the connecting roads between the regions as the basis for the policy implementation and engineering improvement directions.

(3) Propose the results of the overall transportation planning for the northern Taiwan region, research and propose transportation system supply and demand analysis and development strategies, and provide reference for the planning and evaluation of related transportation systems conducted by the Ministry of Transportation and Communications and the subordinate agencies and the northern county and city governments.

(4) The relevant output is used as the reference for the National Development Council, the Ministry of the Interior (Spatial Planning), Transportation Agencies (Taiwan Railways Administration, Railway Bureau, Directorate General of Highways, Freeway Bureau, etc.) and Local Governments (MRT and metropolitan overall transportation planning, etc.) to conduct the planning and evaluation of the railways and highways transportation systems

3.Promotion of Outcomes and Benefits

(1) Two symposiums of experts and scholars were held on October 9, 2019 and November 15, 2019 for the "Predicted Results of the Northern Taiwan Model" and "Planning Direction and Issues Analysis of Northern Taiwan Land Transportation Development Strategies."

(2) Conduct four education and training sessions for model operation drills and promotion.

(3) Publish "Integrated Application Practice of Regional Transportation Demand Model and Vehicle Dynamic Energy Consumption/Carbon Emission Estimation Model," in the 2019 Academic Paper Symposium of the Chinese Institute of Transportation.

(4) The "North Taiwan Regional Overall Transportation Planning Research" was awarded the "2019 Outstanding Transportation Project Award (OTPA)" at the East Asian Transportation Society (EASTS) held in Sri Lanka in 2019.

4.研究成果精華摘整

4.Summary of Research Outcomes
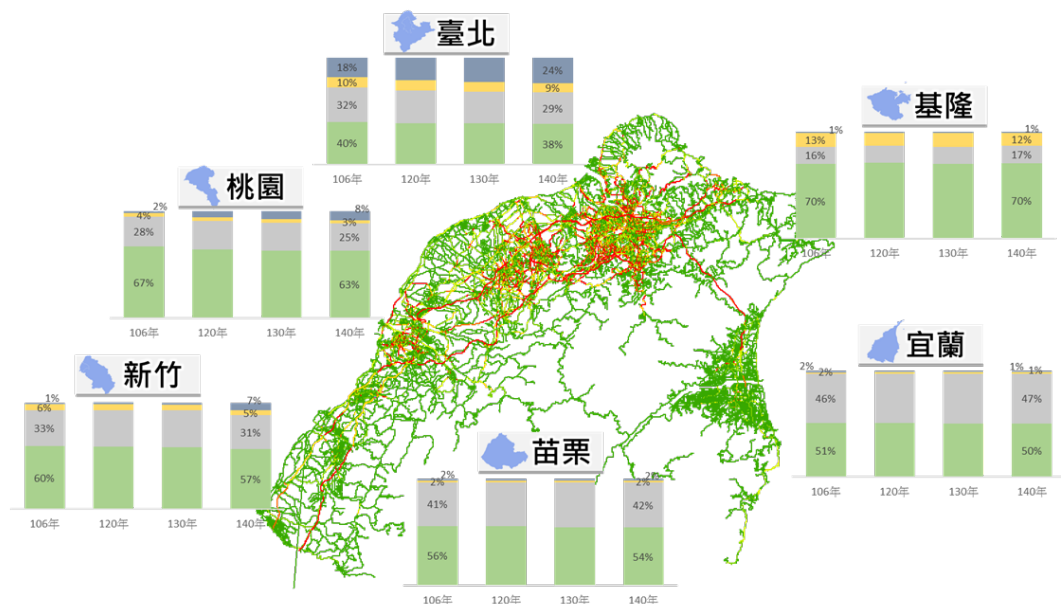
北臺區域各運輸系統市場占比
Market Share of each Transportation System in Northern Taiwan Region
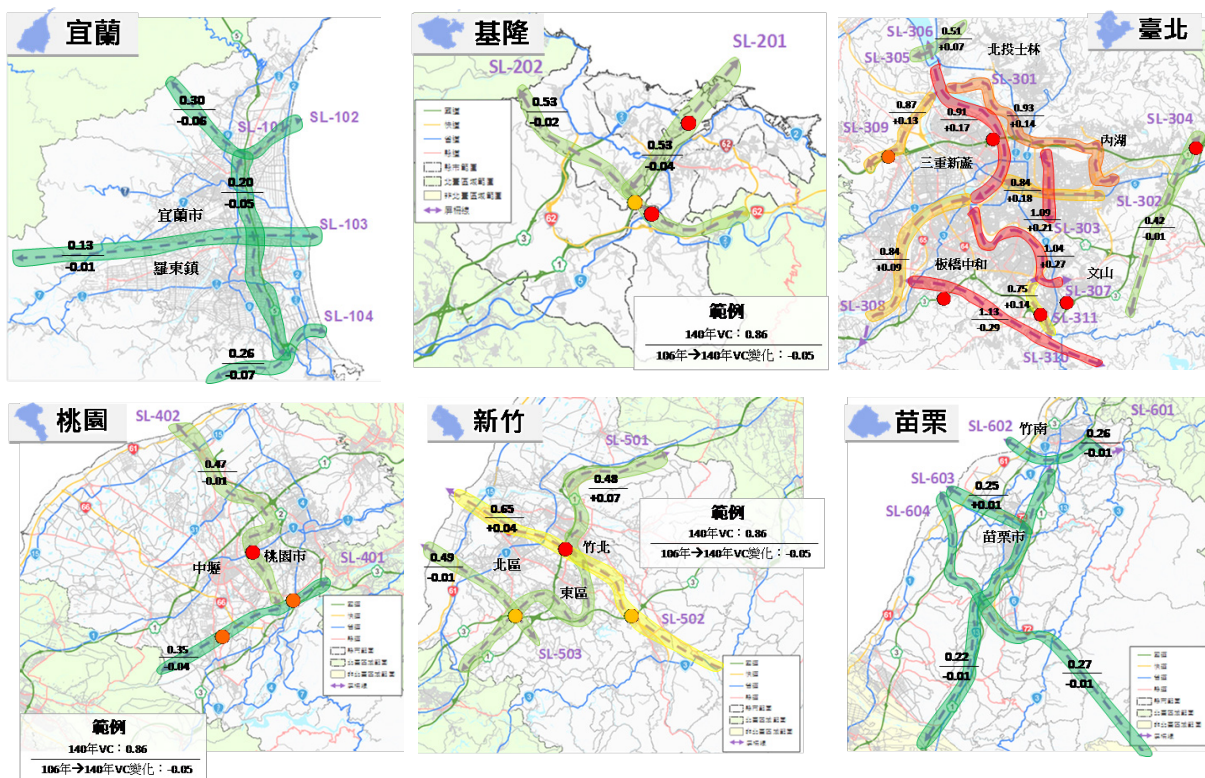
北臺區域公路屏柵線交通服務水準
Traffic Service Level of Northern Taiwan Regional Highway Screen Line

5.研究成果報告

· 北臺區域整體運輸規劃—旅次特性調查與供需分析(107年出版)

· 北臺區域陸路運輸服務均衡發展策略研究(109年出版)

（四）編訂「捷運路網規劃參考手冊」

1.計畫概述

臺北市捷運系統自民國85年開始營運，陸續通車之路線逐漸形成路網，改變臺北都會發展與城市風貌，而後國內其他都會區亦陸續發展捷運系統，如高雄捷運於97年通車、桃園機場捷運於106年通車，可見捷運系統已成我國都會區公共運輸政策之發展趨勢。

交通部107年修正發布「大眾捷運系統建設及周邊土地開發計畫申請與審查作業要點」，明訂地方主管機關辦理捷運系統建設可行性研究前，應先完成都市發展規劃、綜合運輸規劃作業程序，並提出大眾捷運系統整體路網評估計畫報告書送交通部審議。為使地方政府辦理捷運整體路網規劃有所依據，且能進行整體性的考量評估，辦理本計畫針對捷運路網之規劃進行探討，歸納大眾捷運路網規劃之作業流程及評估準則，編訂適合國情之捷運路網規劃設計參考手冊，以利後續捷運計畫推動及審查。

2.研究成果

（1）回顧過去各大都會區辦理之大眾捷運路網規劃成果案例，在方案評估時，多從運輸效益、都市發展、路網營運、財經效益、計畫執行、環境影響等六個層面發展評估準則與指標，此外早期的路網規劃因須辦理環境影響評估，故會進行比較完整的工程規劃、用地取得等分析評估，如今相關作業則是在個別路線的可行性研究與綜合規劃階段辦理。

· Comprehensive Transportation Planning of Northern Taiwan– Travel Survey and Demand & Supply Analysis (published in 2018)

· Study on Comprehensive Land Transportation Planning in Northern Taiwan (published in 2020)

(4) Compile the "MRT Road Network Planning Reference Manual"

1.Project Overview

The Taipei City MRT system has been in operation since 1996. The routes that have been opened to traffic gradually formed a route network, which changed the metropolis development and city style and features of Taipei, and later, other metropolitan areas in the country have gradually developed the MRT system; for example, the Kaohsiung MRT was opened to traffic in 2008, the Taoyuan Airport MRT was opened to traffic in 2017. It can be seen that the MRT system has become the development trend of public transportation policies in our country's metropolitan areas.

In 2018, the Ministry of Transportation and Communications revised and issued the "Directions Governing the Application and Review of the Mass Rapid Transit System Construction and Surrounding Land Development Plan," which clearly stipulated that the urban development plan and comprehensive transportation planning operation procedure shall be completed before the local competent authority conducts the feasibility study of the rapid transit system construction, and shall submit the Mass Rapid Transit System Overall Road Network Evaluation Plan Report to the Ministry of Transportation and Communications for review. In order to let the local government have a basis to conduct the MRT overall road network planning, and be able to conduct overall consideration and evaluation, conduct discussion on implementing this project aiming at the planning of the MRT road network, and summarize the operation process and evaluation guidelines of the MRT road network, to compile a reference manual for MRT road network planning and design suitable for the current state of our country, to facilitate the promotion and review of subsequent MRT projects.

2.Research Outcomes

(1) Reviewing the past cases of mass rapid transit road network planning results conducted in major metropolitan areas, the evaluation guidelines and indicators were mostly developed from six aspects including transportation benefits, urban development, road network operations, financial benefits, project implementation, and environmental impact during program assessment. Furthermore, the early road network planning must be done with the environmental impact assessment; therefore, relatively complete engineering planning, land acquisition and other analysis and evaluation were conducted. Now the related operations are conducted in the feasibility study and comprehensive planning stage of each individual route.

（2）目前進行中的捷運路線、路網規劃評估，審議時之重要考量議題包含：捷運計畫定位與都會區上位計畫及重大建設計畫之關聯性、人口及社會經濟預測合理性、與其他運具競合關係、捷運路線間系統整合、車站共構與轉乘整合、系統型式簡化與機廠設施共用、路網未來擴充發展之需求、各路線推動順序及對地方政府之財政負擔等。

（3）本計畫研擬捷運整體路網評估計畫之作業流程、規劃項目、路網替選方案評選方法及評估準則、路網系統型式評選方法及評估準則、路網整合規劃評估、路網分期排序評估準則及路網評估計畫之滾動檢討機制。

3.成果推廣與效益

（1）研究期間已邀請路政司、鐵道局、地方政府等相關單位參與各項工作及審查會議。

（2）本所持續參與協助地方政府提報交通部之捷運整體路網規劃報告審議作業。

（3）本計畫預計於109年底完成「捷運路網規劃參考手冊」之編訂，並於110年上半年出版成果報告。

(2) For the MRT route and road network planning assessment currently underway, the important topics to consider during the review include the positioning of the MRT project and the relevance of metropolitan high-level projects and major construction projects, reasonable demographic and socio-economic forecasts, competition and cooperation relationship with other transportation vehicles, system integration between MRT routes, station co-construction and transfer integration, system type simplification and depot facility sharing, the requirements of future expansion and development of the road network, the order of promotion of each route, and the impact on the financial burdens for local governments, etc.

(3) This project develops the operation process, planning items, alternative methods and evaluation criteria of the road network alternative plan, road network system type selection methods and evaluation criteria, road network integration planning evaluation, road network staging evaluation criteria and rolling review mechanism for road network evaluation plans.
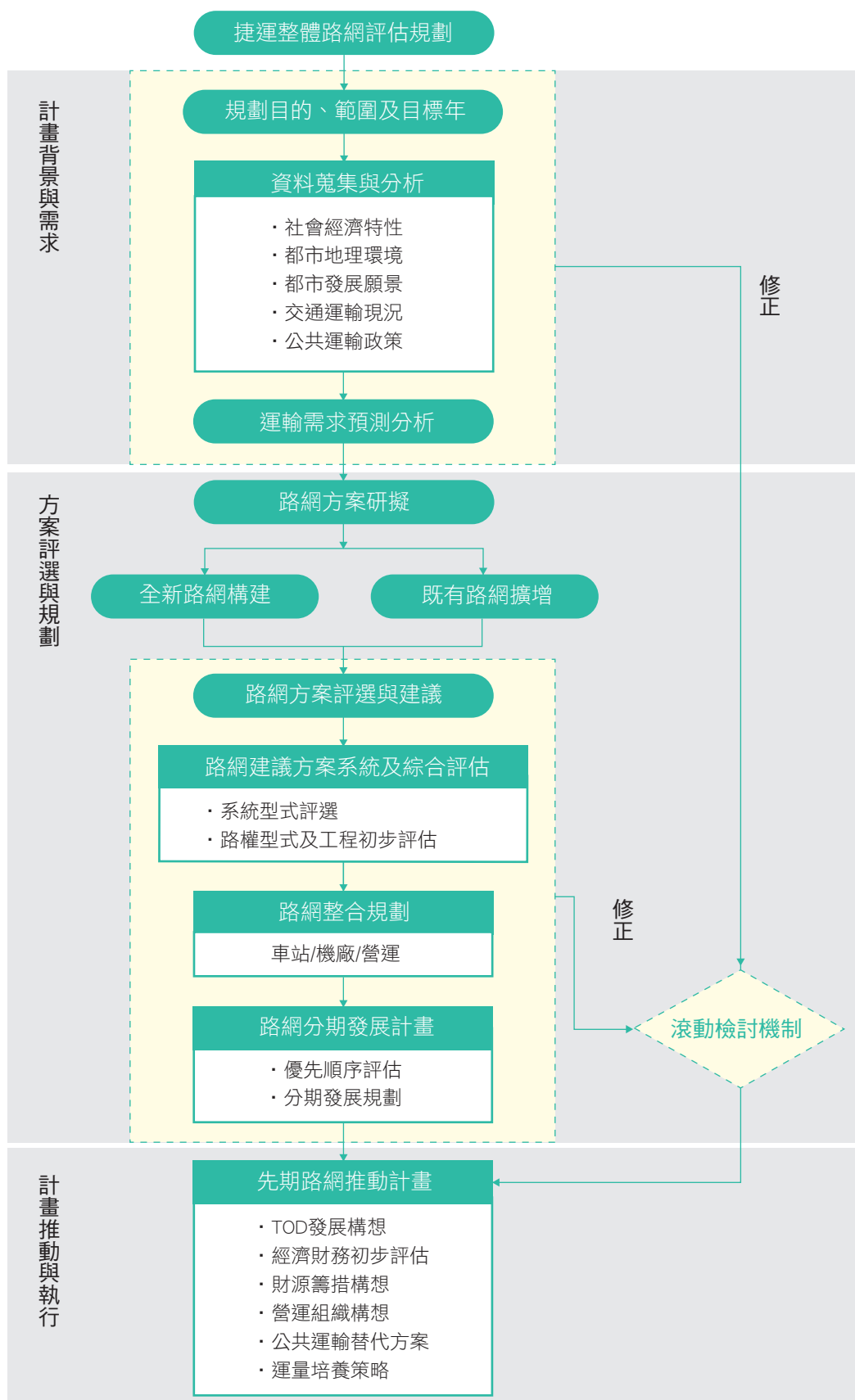
3.Promotion of Outcomes and Benefits

(1) The relevant units including the Department of Railways and Highways, Railway Bureau, and local governments have been invited to participate in various works and review meetings during the research period.

(2) The Institute continues to participate and assist the local governments to submit the MRT overall road network planning report review operations to the Ministry of Transportation and Communications.

(3) This project is expected to complete the compilation of the "MRT Road Network Planning Reference Manual" by the end of 2020, and publish the results report in the first half of 2021.
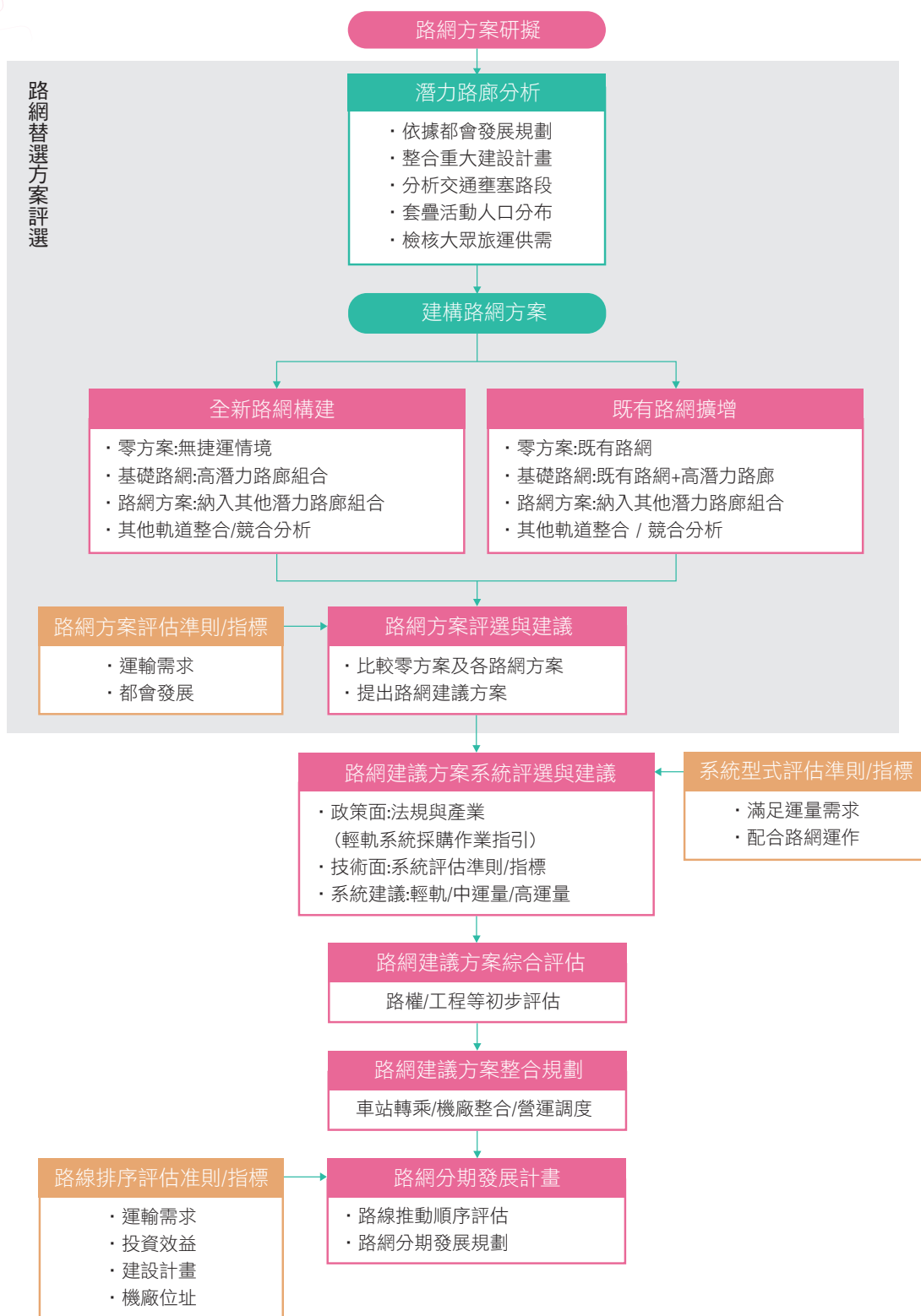
4.研究成果精華摘整

計畫背景與需求

- 捷運整體路網評估規劃
- 規劃目的、範圍及目標年
- 資料蒐集與分析
  - ・社會經濟特性
  - ・都市地理環境
  - ・都市發展願景
  - ・交通運輸現況
  - ・公共運輸政策
- 運輸需求預測分析

修正

方案評選與規劃

- 路網方案研擬
- 全新路網構建
- 既有路網擴增
- 路網方案評選與建議
- 路網建議方案系統及綜合評估
  - ・系統型式評選
  - ・路權型式及工程初步評估
- 路網整合規劃
  - 車站/機廠/營運

修正

- 路網分期發展計畫
  - ・優先順序評估
  - ・分期發展規劃

滾動檢討機制

計畫推動與執行

- 先期路網推動計畫
  - ・TOD發展構想
  - ・經濟財務初步評估
  - ・財源籌措構想
  - ・營運組織構想
  - ・公共運輸替代方案
  - ・運量培養策略

捷運路網評估規劃作業流程圖
MRT Road Network Assessment and Planning Operation Flowchart

路網替選方案評選

路網方案研擬

路網方案評選

潛力路廊分析
- 依據都會發展規劃
- 整合重大建設計畫
- 分析交通壅塞路段
- 套疊活動人口分布
- 檢核大眾旅運供需

建構路網方案

全新路網構建
- 零方案:無捷運情境
- 基礎路網:高潛力路廊組合
- 路網方案:納入其他潛力路廊組合
- 其他軌道整合/競合分析

既有路網擴增
- 零方案:既有路網
- 基礎路網:既有路網+高潛力路廊
- 路網方案:納入其他潛力路廊組合
- 其他軌道整合 / 競合分析

路網方案評估準則/指標
- 運輸需求
- 都會發展

路網方案評選與建議
- 比較零方案及各路網方案
- 提出路網建議方案

路網建議方案系統評選與建議
- 政策面:法規與產業
  (輕軌系統採購作業指引)
- 技術面:系統評估準則/指標
- 系統建議:輕軌/中運量/高運量

系統型式評估準則/指標
- 滿足運量需求
- 配合路網運作

路網建議方案綜合評估
路權/工程等初步評估

路網建議方案整合規劃
車站轉乘/機廠整合/營運調度

路線排序評估准則/指標
- 運輸需求
- 投資效益
- 建設計畫
- 機廠位址

路網分期發展計畫
- 路線推動順序評估
- 路網分期發展規劃

路網方案評選及整合規劃作業流程
Road Network Plan Selection and Integrated Planning Operation Process

5.研究成果報告

- 捷運路網規劃設計參考手冊之研究(1/2) (109年出版)

5.Report of Research Outcomes

- The Research of Rapid Transit Network Planning and Design Manual (1/2) (published in 2020)

（五）自行車路網規劃與資訊系統

1.計畫概述

　　交通部業奉核定於103年8月6日奉行政院104-107年推動「全國自行車友善環境路網整體規劃及交通部自行車路網建置計畫」，希望借鏡東部自行車路網示範計畫經驗，持續建置西部自行車休閒路網及西部自行車旅遊外，更希望將自行車風氣融入生活，進而從產業發展、交通運輸、教育文化等面向，逐步構建自行車島，達成騎乘大國目標。

　　交通部已結合教育部體育署及各縣市政府於104年底完成「自行車環島1號線」，為完善全國自行車友善環境路網，105~107年以「自行車環島1號線」為主幹路線並依照「全國自行車友善環境路網整體規劃及交通部自行車路網建置計畫」將全臺劃分為5大區域，共完成25條環支線。

　　為使民眾了解交通部自行車環島路線建置成果，方便查詢各路線相關資訊如景點、住宿、餐飲、醫療院所、自行車租賃站、便利商店等，本所另建置自行車環島專屬網站「環騎圓夢」，以利民眾查詢相關資訊

2.研究成果

（1）利用省道公路系統，納入在地特色優質路線，完成環島1號線及25條環支線，成功打造臺灣自行車路網。

（2）設計專屬的環島自行車路線指示標誌標線，打造安全性、連續性、直捷性的環臺自行車路網。

（3）串聯沿線優質特色補給站與休憩點，提供騎士友善的服務設施。

（4）改善臺鐵車站自行車友善設施，並鼓勵民眾分段環島。

（5）建置自行車環島專屬網站，從行前資訊的提供、行程規劃建議、環島路線狀況及沿線補給站查詢、路線資訊下載等，提供民眾全程資訊服務。

（6）拍攝宣傳影片宣導環島不是專業騎士才能作的事、利用環島路網串起大地與人文風

(5) Cycle Route Planning and Information System

1.Project Overview

　　The Ministry of Transportation and Communications promoted the "National Friendly Bike Lane Network Overall Planning and the Ministry of Transportation and Communications Cycle Route Construction Project" in 2015–2018 approved by the Executive Yuan on August 6, 2014, hoping to learn the experience from the Eastern Region Cycle Route Demonstration Project, continue to construct the Western Region Cycling Leisure Route and Western Region Cycling Tourism, also hoping to integrate the bicycle ethos into life, and then gradually construct a bicycle island from the aspects of industrial development, transportation, education and culture to achieve the goal of a great riding country.

　　The Ministry of Transportation and Communications completed the "Cycling Route No. 1" at the end of 2015 in conjunction with the Sports Administration, Ministry of Education and the county and city governments. In order to improve the National Friendly Bike Lane Network, from 2016 to 2018, based on the "Cycling Route No. 1" as the main route and according to the "National Friendly Bike Lane Network Overall Planning and the Ministry of Transportation and Communications Cycle Route Construction Project" to divide the entire Taiwan into 5 Regions and completed 25 branch routes.

　　In order to let people understand the results of the Ministry of Transportation and Communications Cycling Route construction, and to facilitate inquiries about various route-related information such as scenic spots, accommodation, food and drinks, medical hospitals and clinics, bicycle rental stations, convenience stores, etc., the Institute has also built an exclusive cycling route website "Taiwan Cycling Route" for people to inquire relevant information.

2.Research Outcomes

(1) Complete the Cycle Route No. 1 and 25 branch routes by using the provincial highway system and incorporating local-characteristic high-quality routes to successfully build the Taiwan Cycling Route Network.

(2) Design exclusive cycling route signs and markings around Taiwan to create a safe, continuous, and straightforward cycling route network.

(3) Connect high-quality and characteristic supply stations and rest spots along the route to provide riders with friendly service facilities.

(4) Improve cyclist-friendly facilities at Taiwan Railway Stations and encourage people to cycle around the island in sections.

(5) Build an exclusive cycling route website to provide people with full information services from the provision of pre-departure information, itinerary planning recommendations, the status of routes around Taiwan, query of supply stations along the routes, and route information download, etc.

(6) Filming promotional videos to promote cycling around Taiwan is not something the professional riders can do. Use the road network around Taiwan to connect the

景，並以帶狀舞台為拍攝理念，完成影片製作。

（7）發環島App讓車友更便利查詢路線、相關補給站點資訊，以及記錄騎乘歷程。並於105年出版環島1號線旅遊書-這樣的速度環島剛剛好，介紹環島路線之好吃好玩地點，做為車友行程規劃之參考。

3.成果推廣與效益

（1）104年12月30日於東北角暨宜蘭濱海國家風景管理處舉辦「自行車環島1號線」啟用記者會，宣導只要順著「自行車環島1號線」的專屬標誌標線騎乘，即可順利完成自行車環島壯舉。

（2）105年10月3日配合臺灣自行車節的活動，除發表「環島1號線旅遊書-這樣的速度環島剛剛好」外，並於當年10/17～11/30「環騎圓夢」粉絲團舉辦「分享環1旅程故事」活動，歡迎民眾、車友下載使用App參與活動，就有機會獲得限量的環1紀念鑰匙圈、頭巾、悠遊卡、旅遊書及單車商品券等多項大獎，行銷環島1號線。

（3）106年出版「『自行車道系統規劃設計參考手冊』2017修訂版」將「104年自行車環島串連路網標誌標線試辦計畫」法制化作業完成後之相關自行車標誌標線佈設原則及配合路口機慢車停等區等佈設納入，並因應「交通工程規範」、「市區道路及附屬工程設計規範」、「公路路線設計規範」相關法規條文修正，配合修正各章節中之相關內容，希望相關單位能依循手冊，就現有自行車道設施檢核其設置成效，並持續加以養護改善，以打造自行車之安全友善騎乘環境。

（4）109年出版「騎鐵馬 看山 看海 看臺灣」旅遊書，本書係考量自行車環島對一般民眾較為困難且具挑戰性，交通部以分段環島的概念，於105~107年陸續完成25條環支線；為吸引更多國內外遊客以輕鬆的心情漫遊臺灣，本所以主題式分段騎乘的方式，規劃出「北宜淡蘭之旅」、「客庄大道漫騎」、「媽祖文化騎行」、「嘉南西

earth and humanities landscape, and complete the film production with the belt-shaped stage as the filming concept.

(7) Published the Tour APP to make it easier for riders to query routes, relevant supply site information, and record riding history, and published "Cycling Route No. 1 Travel Book – Taiwan Bike Travel" in 2016 to introduce the places with delicious food and fun as a reference for riders' itinerary planning.

3.**Promotion of Outcomes and Benefits**

(1) On December 30, 2015, a press conference for the opening of "Cycling Route No. 1" was held at the Northeast and Yilan Coast National Scenic Area Administration, Tourism Bureau, to promote that as long as riding along the exclusive signs and markings of "Cycling Route No. 1," the magnificent feat of cycling around Taiwan can be completed successfully.

(2) Cooperating with the activities of the Taiwan Cycling Festival on October 3, 2016, in addition to publish the "Cycling Route No. 1 Travel Book – Taiwan Bike Travel," the "Share the Cycling Route No. 1 Journey Story" event was also organized by the "Taiwan Cycling Route" fan club from 10/17 to 11/30 of the same year. The people and riders are welcome to download and use the App to participate in the event, and they will have the opportunity to win multiple big prizes including limited edition Cycling Route No. 1 commemorative key rings, headscarves, EasyCards, travel books and bike merchandise coupons, for marketing Cycling Route No. 1.

(3) The "Bike Lane System Planning and Design Reference Manual" 2017 Revised Edition published in 2017 incorporated the related signs and marketing layout principles and cooperated with the motorcycle and slow lane waiting zone layouts after legalizing the "2015 Bicycle around Taiwan Connecting Road Network Signs and Markings Pilot Project," and responded to the article revisions of relevant laws and regulations including the "Traffic Engineering Code," "Urban Road and Auxiliary Engineering Design Code," and "Highway Route Design Code," and cooperated with the related contents in each revised chapter, hoping the relevant units can follow the Manual to inspect the installation effectiveness of the existing bike lane facilities, and continue to maintain and improve in order to create a safe and friendly riding environment for bicycles.

(4) The travel book "Riding a Bike, Watching the Mountains, Watching the Sea, Watching Taiwan" published in 2020 takes consideration of the difficulty and challenges of cycling around Taiwan for the general public – the Ministry of Transportation and Communications completed 25 branch routes successively from 2016 to 2018 based on the concept of cycling around Taiwan in segments. In order to attract more domestic and foreign tourists to tour Taiwan with a relaxed mood, the Institute has planned seven segments around Taiwan touring including "Northern Yilan Tamsui-Kavalan," "Hakka Avenue Touring Ride," "Mazu Cultural Ride," " Chiayi-Tainan Siraya Cultural History Exploration," "Kaohsiung-Pingtung Gaoping Mountain and

拉雅文史探索」、「高屏山海環騎」、
「國境之南小環島」、「漫遊花東縱谷
海之濱」等七個分段環島遊程，並編撰本
書，完整介紹環島1號線與25條環支線以及
鄰近的重要風景據點、國家風景區、國家
公園及地方特色路線。

Sea Ride," "Light Cycling the South Border," and "Touring the East Rift Valley of Hualien-Taitung, Coast of the Sea," and compiled this book to introduce the Cycling Route No. 1 and 25 branch routes completely as well as the nearby important scenic spots, national scenic areas, national parks and local-characteristic routes.

4.研究成果精華摘整

4.Summary of Research Outcomes

	環 1 主線	環支線	聯絡線	總計
104 年規劃建置	968.1	235.1	0.0	1,203.2
105 年規劃建置	-7.3	640.3	83.0	716.0
106 年規劃建置	0.0	387.1	75.0	462.1
107 年規劃建置	0.0	308.4	0.0	308.4
合計	960.8	1,570.9	158.0	2,689.7

104~107 年規劃完成 2,689.7 公里環島主幹路線 (含聯絡線)
Planned to complete 2,689.7 kilometers of Cycling Route Main Route (including Connecting Routes) from 2015 to 2018

專屬的環島自行車路線指示標誌標線
Exclusive Around-the-Island Cycling Route Signs and Markings

自行車環島專屬網站、App 及旅遊書
Cycling around Taiwan Exclusive Website, App and Tourism Book

5.研究成果報告

· 交通部自行車友善環境路網整體規劃技術服務
(一)(105年出版)

· 自行車友善環境路網整體規劃與評估(1/3) (106
年出版)

· 自行車友善環境路網整體規劃與評估(2/3) (107
年出版)

· 自行車友善環境路網整體規劃與評估(3/3) (108
年出版)

· 交通部自行車路網示範系統開發及其行銷服務
(一)(105年出版)

· 自行車路網示範系統之圖資建置與行銷(1/3)
(106年出版)

· 自行車路網示範系統之圖資建置與行銷(2/3)
(107年出版)

· 自行車路網示範系統之圖資建置與行銷(3/3)
(109年出版)

5.Report of Research Outcomes

· An Integrated Technical Planning of Friendly Bike Lane
Network around Island (I) (published in 2016)

· Overall Planning and Evaluation of Bicycle-Friendly
Bikeway Network (1/3) (published in 2017)

· Overall Planning and Evaluation of Bicycle-Friendly
Bikeway Network (2/3) (published in 2018)

· Overall Planning and Evaluation of Bicycle-Friendly
Bikeway Network (3/3) (published in 2019)

· The First Year Plan of Ministry of Transportation and
Communications for the Development of Demonstrate
System and Marketing Services of Cycle Route(published
in 2016)

· The Development of Image Data for the Demonstration
System and Marketing of Cycle Route (1/3) (published in
2017)

· The Development of Image Data for the Demonstration
System and Marketing of Cycle Route (2/3) (published in
2018)

· The Development of Image Data for the Demonstration
System and Marketing of Cycle Route (3/3) (published in
2020)

二、海空運及鐵路決策支援應用工具之創新發展

（一）2020年版運輸政策白皮書-海運

1.計畫概述

「海運政策」是政府依據當前海運運輸發展現況，在已知限制條件與預判未來可能變遷的情況下，為因應海運運輸需求與發展所提出的施政方針，也是為達成施政目標而訂的發展策略與作法。

國際海運發展與國際經濟情勢息息相關，由於主要國家間貿易摩擦、英國脫歐前景未明，以及部分新興國家外債負擔加重，金融風險上升等影響，致全球經濟動能減弱，廠商生產下單趨於保守，進一步影響海運市場需求，加上海運市場之船舶運力超額供給，使航運業經營面臨嚴峻挑戰，陸續發生併購與破產情事。港口部分，受到整體貨量成長趨緩，東亞地區新興貨櫃港口崛起影響，港口間的競爭也日益激烈。因此，航運發展、港口營運、海事安全等議題，運輸部門在施政上均須妥為因應。

2.研究成果

本白皮書藉由各種資料之統計分析，說明臺灣海運運輸發展之現況，據以診斷當前運輸發展重要的課題，接續從海運市場、海運安全與保全、港埠發展及營運、航海人員培育等面向，逐一探討問題之輕重與施政之緩急，據以擬定各項海運政策，期望整體運輸之施政，能由研提理念架構，至擬定政策、策略、行動方案，最後落實為各級運輸機關實際推動政令之執行計畫，由上而下整合於一體。簡述如下：

(1) 2020 **Transportation Policy White Paper – Sea Transportation**

1.**Project Overview**

"Sea Transportation Policy" is the administration policy proposed by the government to respond to the demand and development of sea transportation based on the current development of sea transportation, given the known constraints and predicted possible changes in the future. It is also the development strategies and practices established to achieve the administration goals.

The development of international sea transportation is closely related to the international economic situation. Due to impacts of trade friction between major countries, unclear prospect of Brexit, the increase in foreign debt burdens of some emerging countries, and the rise of financial risks, the global economic momentum has weakened, and manufacturers' orders have become conservative, further affecting the demand in the sea transportation market. Coupled with the excess supply of ship capacity in sea transportation, the shipping industry is facing severe challenges, and mergers and bankruptcies have occurred one after another. In the part of port, affected by the slowdown in overall cargo growth and the rise of emerging container ports in East Asia, competition among ports has become increasingly fierce. Therefore, the transportation sector must properly respond to issues of shipping development, port operations, and maritime safety, etc.

2.**Research Outcomes**

With statistical analysis of various data, this White Paper illustrates the current status of Taiwan's sea transportation development to diagnose important issues in the current transportation development, continuing from the aspects of sea transportation market, sea transportation safety and security, port development and operation, and seafarer training to discuss the importance of issues and the urgency of administration, as the basis to formulate various sea transportation policies, hoping that the administration of overall transportation can be from proposing the conceptual framework to developing the policies, strategies, and action plans, and finally to be implemented in the projects of practical promotion of the decree by the transportation agencies at all levels, to be integrated from top to bottom as briefly described below:

（1）願景與政策目標擬定：為擬訂務實且符合我國航港之發展願景，參考各國作法並嘗試從海運產業鏈角度分析未來發展方向。若將海運產業鏈概分為上游產業(航運交易及其服務業)、中游產業(海運業)、下游產業(港口服務業)，觀察全球主要航運中心發展歷程(如新加坡、英國倫敦、香港)，多以下游產業起步，而後逐步發展高附加價值的上游產業，但同時也通過轉型，適當保留中下游產業，以應付各種需求。臺灣目前國際海運發展，仍集中在中、下游，以貨物運輸與港口營運衍生之相關產業為主，且在航運或港口都面臨激烈競爭。然此為發展基礎，短中期仍需以鞏固航運業與港口營運為主；長期則可往上游高附加價值之航運交易及其服務業發展。爰提出我國海運發展願景為「推動航港產業升級，維持國際海運樞紐」。其下之政策目標設定，在航運發展部分，UNCTAD每年發佈之海運回顧，對各國所控制支配(Ownership)船隊規模進行排名(Ownership of world fleet ranked by dead-weight tonnage, 即一般所稱船東國排名)。依2018年數據，臺灣為全球排名第11大船東國，支配船隊規模5,042萬DWT。此值略可代表該國對於全球航運市場之影響力，爰可參採以提升支配船隊載重噸作為鞏固航運業發展之量化目標。在港埠發展部分，除持續爭取貨源維繫港口國際競爭力外，為有效發揮港口資源，拓展港口營運面向，爰採臺灣港群藍色公路年貨櫃裝卸量與國際郵輪跳島靠泊離(外)島艘次數作為提升港口營運量之量化目標。

（2）本次海運政策，其願景為「推動航港產業升級，維持國際海運樞紐」，目標則為「鞏固航運業發展：提升支配船隊載重噸於民國114年達5,500萬DWT」與「提升港口營運量：臺灣港群藍色公路年貨櫃裝卸量於民國114年累積成長達20%；國際郵輪跳島靠泊離(外)島艘次數於民國112年可達26艘次，114年達40艘次」。為達成政策目標，經與海運產官學等各界研商，並擬訂4項政策與17項策略，同時制定各項短、中、長期行動方案。

(1) Vision and Policy Goal Development: In order to develop a pragmatic development vision of our country's ports, we refer to the practices of various countries and try to analyze the future development direction from the perspective of the sea transportation industry chain. If the sea transportation industry chain is roughly divided into upstream industries (shipping transaction and its service industry), midstream industries (sea transportation industry), and downstream industries (port service industry), observe the development history of major global shipping centers (such as Singapore, London, and Hong Kong), mostly started from the downstream industries, and then gradually develop high value-added upstream industries, but at the same time, through transformation, appropriately retain the middle and downstream industries to meet various needs. Taiwan's current international sea transportation development is still concentrated in the mid- and downstream, mainly in the related industries derived from cargo transportation and port operations, and faces fierce competition in shipping or ports. However, this is the basis for development. In the short to medium term, it is still necessary to consolidate the shipping industry and port operations; in the long term, the upstream high value-added shipping transaction and service industries can be developed. Hence, the vision of our country's sea transportation development is "Promoting the Upgrade of Port Industry, Maintaining the Hub of International Sea Transportation." For the following policy goal setting, in the part of shipping development, the Review of Maritime Transport published by UNCTAD every year ranks the size of Ownership fleet (ownership of world fleet ranked by dead-weight tonnage, generally referred to as the ranking of the ship owner's country). According to 2018 data, Taiwan is the world's 11th largest ship owner country, with the Ownership fleet size of 50.42 million DWT. This value can slightly represent the country's influence on the global shipping market; hence, it can be referenced to increase the deadweight tonnage of the Ownership fleet as a quantitative goal to consolidate the development of the shipping industry. In the part of port development, in addition to continue to strive for the shipment to maintain the international competitiveness of the port, in order to effectively utilize the port resources and expand the port operation aspect, the annual container loading and unloading volume of the blue highways of the Taiwan port group and the number of international cruise ships island hopping, offshore (outer) island berthing as the quantitative goal for increasing port operations.

(2) The vision of this sea transportation policy is to "Promoting the Upgrade of Port Industry, Maintaining the Hub of International Sea Transportation," and the goal is to "Consolidate the Development of the Shipping Industry: Increase the Deadweight Tonnage of the Ownership Fleet to 55 million DWT by 2025" and "Increase Port Operation Volume: The annual container loading and unloading volume of the blue highways of the Taiwan port group to increase by 20% by 2025; the number of international cruise ships island hopping, offshore (outer) island berthing to reach 26 vessel times by 2023 and 40 vessel times by 2025." In order to achieve the policy goals, we have studied and discussed with the maritime industry, government and academia, and developed 4 policies and 17 strategies, and established various short-, medium- and long-term action plans.

3.成果推廣與效益

（1）108年6月辦理「2020年版運輸政策白皮書座談會-海運分冊」。

（2）108年12月辦理「2020年版運輸政策白皮書新書發表會」。

4.研究成果精華摘整

3.Promotion of Outcomes and Benefits

(1) Conducted the "2020 Transport Policy White Paper Symposium – Sea Transportation Volume" in June 2019.

(2) Conducted the "2020 Transport Policy White Paper New Book Presentation" in December 2019.

4.Summary of Research Outcomes

願景	政策目標	政策	策略
推動航港產業升級，維持國際海運樞紐	鞏固航運業發展	協助航運發展,成為產業堅強後盾	・健全航運產業經營環境 ・完整規劃航港海外投資布局 ・推動兩岸海運部門互動交流 ・完善綠能產業推動之相關海事法規與航港配套 ・整合航港、觀光資源推動客運海上藍色公路 ・加強培育海運產業專業人才
	提升港口營運量	積極固本拓源,發揮港口營運績效	・強化港埠建設及營運合作作為 ・以資源整合角度務實評估港口多角化經營樣態 ・以旅客導向優化港埠旅運設施與服務 ・推動離島港口建設與航線規劃
		善用資通優勢,推動航港智慧永續	・推動航港智慧轉型 ・推動港口之綠色與永續發展 ・以人本導向完善海運無障礙設施環境
		適時調整海事規範,營造安全優質經營環境	・強化自由港區國際供應鏈轉口及串聯國內外產業加值再出口服務之法規制度 ・發展智慧航安整體服務並強化港口安全管理 ・強化海運安全法規與制度 ・爭取加入海運相關國際組織

海運政策及策略
Sea Transportation Policies and Strategies

5.研究成果報告

・2020運輸政策白皮書-海運(108年出版)。

5.Report of Research Outcomes

・2020 Transportation Policy White Paper – Sea Transportation (published in 2019)

（二）2020年版運輸政策白皮書-空運

1.計畫概述

　　「空運政策」係政府依據當前空運運輸發展現況，在已知限制條件與預判未來可能變遷的情況下，為因應空運運輸需求與發展所提出的施政方針，也是為達成施政目標而訂的發展策略與作法。

　　近年來，在全球化及印太區域國家經濟逐漸崛起趨勢下，帶動航空運輸成長，加以兩岸直航及政府積極推動新南向等，使得國際空運市場版圖發生改變；國內運輸則因高鐵通車及陸路運輸之大幅精進，致城際運輸的市場結構為之改變。而飛航安全及航空保安，智慧化機場發展以及節能減碳等議題，運輸部門在施政上均須妥為因應。

2.研究成果

　　本此次擬訂空運政策，其願景、政策目標與政策發展面向分別為：

（1）願景

　　　　臺灣位於東北亞、東南亞航圈中心，具有地理位置優勢。如能將臺灣形塑成國際空運的樞紐，不但可創造上兆之經濟效益及數十萬個工作機會，更能帶動21世紀臺灣的經濟轉型，成為我國經濟發展的推動引擎。對於產業經濟發展陷入困境的當前，「成為國際空運樞紐，帶動航空產業發展」應係我國空運發展最企盼達成的願景。

（2）目標

　　　　要以空運發展帶動產業轉型，將臺灣形塑成國際空運樞紐，最核心的工作係拓展國際航網、增加航班密度、結合產業發展，在確保飛航安全，提供便捷、有效率的空運服務下，讓大量的國際航空客貨運得以聚焦臺灣。基於此，本次空運政策的主要目標有二，即「聚焦全球航網，提升國際航空客貨運量」及「接軌國際標準，落實航空安全管理」。

(2) 2020 Transportation Policy White Paper – Air Transportation

1.Project Overview

　　"Air Transport Policy" is the administration policies proposed by the government in response to the air transportation demand and development based on the current air transportation development status and under the known constraints and predicting possible changes in the future. It is also the development strategies and practices developed to achieve administration goals.

　　In recent years, the growth of air transport has been driven under the trend of globalization and the gradual rise of the economies of the countries in the Indo-Pacific region, plus the direct cross-strait flights and the active promotion of the new southbound countries by the government, which has caused changes in the international air transportation market; domestic transportation is due to the opening to traffic of high-speed rail and drastic improvement of land transportation, which has changed the market structure of intercity transportation. As for issues of air traffic safety and aviation security, smart airport development, and energy conservation and carbon reduction, the transportation sector must respond in the administration properly.

2.Research Outcomes

　　The vision, policy goals and policy development aspects of developing this air transportation policy are as follows:

(1) Vision

　　　　Taiwan is located in the center of Northeast Asia and Southeast Asia's aviation circle, and has the geographical advantage. If Taiwan can be shaped into an international air transportation hub, it will not only create trillions of dollars of economic benefits and hundreds of thousands of job opportunities, but also drive Taiwan's economic transformation in the 21st century, and become a driving engine for our country's economic development. Regarding the current difficulties in the development of the industrial economy, "Becoming the Hub of International Air Transportation, Driving the Development of Aviation Industry" shall be the most anticipated vision to be achieved for our country's air transportation development.

(2) Goal

　　　　To drive industrial transformation through the development of air transportation to shape Taiwan as an international air transportation hub, the core tasks are to expand the international air route network, increase flight density, and integrate industrial development, while ensuring air traffic safety and providing convenient and efficient air transportation services, allowing a large amount of international air passenger and cargo transportation to focus on Taiwan. Based on this, the main goals of this air transportation policy are two, namely "Focusing on the Global Aviation Network, Increasing the Volume of International Air Passengers and Cargo" and "Integrate with International Standards, Implement Aviation Safety Management."
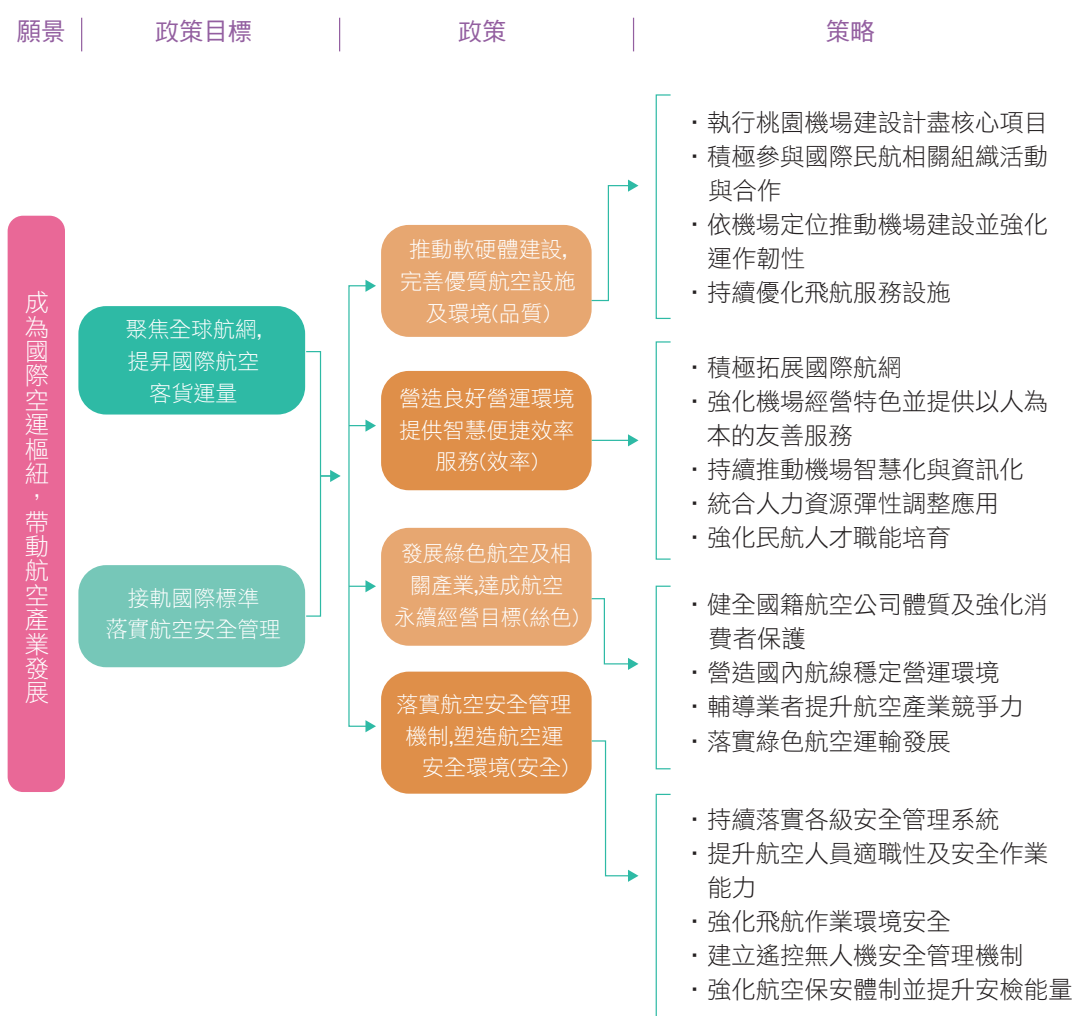
（3）在二大政策目標的確立下，研擬四大空運政策及18項策略。

(3) Develop four major air transportation policies and 18 strategies with the establishment of the two major policy objectives.

3.成果推廣與效益

（1）108年6月辦理「2020年版運輸政策白皮書座談會-空運分冊」。

（2）108年12月辦理「2020年版運輸政策白皮書新書發表會」。

3.Promotion of Outcomes and Benefits

(1) Conducted the "2020 Transport Policy White Paper Symposium – Air Transportation Volume" in June 2019.

(2) Conducted the "2020 Transport Policy White Paper New Book Presentation" in December 2019.

4. 研究成果精華摘整

4.Summary of Research Outcomes

願景	政策目標	政策	策略

成為國際空運樞紐，帶動航空產業發展

聚焦全球航網,提昇國際航空客貨運量

接軌國際標準落實航空安全管理

推動軟硬體建設,完善優質航空設施及環境(品質)
・執行桃園機場建設計盡核心項目
・積極參與國際民航相關組織活動與合作
・依機場定位推動機場建設並強化運作韌性
・持續優化飛航服務設施

營造良好營運環境提供智慧便捷效率服務(效率)
・積極拓展國際航網
・強化機場經營特色並提供以人為本的友善服務
・持續推動機場智慧化與資訊化
・統合人力資源彈性調整應用
・強化民航人才職能培育

發展綠色航空及相關產業,達成航空永續經營目標(綠色)
・健全國籍航空公司體質及強化消費者保護
・營造國內航線穩定營運環境
・輔導業者提升航空產業競爭力
・落實綠色航空運輸發展

落實航空安全管理機制,塑造航空運安全環境(安全)
・持續落實各級安全管理系統
・提升航空人員適職性及安全作業能力
・強化飛航作業環境安全
・建立遙控無人機安全管理機制
・強化航空保安體制並提升安檢能量

空運政策及策略
Air Transportation Policies and Strategies

5.研究成果報告

・2020運輸政策白皮書-空運(108年出版)。

5.Report of Research Outcomes

・2020 Transportation Policy White Paper – Air Transportation (published in 2019)

（三）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2019 Q4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。

（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5,203艘，涵蓋全球貨櫃船總數之97%。

（4）完成具資料統計分析及報、圖表產製功能之單機版查詢軟體。

（5）完成全球貨櫃航線大趨勢、洲際貿易路線之佈署趨勢、遠東主航線及區域航線之佈署趨勢及遠東主要港口歐美航線之佈署趨勢等分析。

3.成果推廣與效益

(3) International Maritime Transportation Database Update and Expansion and Data Analysis Services

1.Project Overview

　　The current global economic landscape changes rapidly, and the situation of maritime cargo transportation also fluctuates violently. Taiwan is located in the center of East Asia and surrounded by sea. Although we have enjoyed many years of maritime transportation, the changes in recent years have been quite unfavorable to Taiwan. In the ranking of the recent year's Global Container Ports, the Port of Kaohsiung remain stagnant, which warrants high attention and proper response from the government.

　　The formation and evaluation of high-quality policies requires high-quality scientific analysis, and high-quality data is an indispensable element of high-quality policies. Container transportation is the focus of maritime transportation for Taiwan, and maritime container transportation is global in nature, the "International Maritime Transportation Database" collects the main and regional navigation routes information of global ocean container transportation for the long term, cooperates with the building and improvement of the statistics analysis of related information and visualizes its functions, and conducts issue analysis based on the seasonal data changes of the current year at the end of year to grasp the overview and trends of the global shipping market. In addition, the system can also provide specific and objective quantitative data in order to support the perspective of the supply side of container shipping in response to current policy or business demands, such as the development and effectiveness evaluation of the new southbound policy.

2.Research Outcomes

(1) Collected information on international scheduled container navigation routes from Q2 2011 to Q4 2019.

(2) Collected about 600 shipping routes every quarter with the Far East as the center before 2016; expanded the collection of all regular container shipping routes around the world starting 2017, with about 1,500 to 1,550 routes every quarter.

(3) Included the English name, Chinese name, latitude and longitude, affiliated country, and trade zone of 1,015 ports around the world; about 5,203 ships used on the navigation route, covering 97% of the total number of container ships in the world.

(4) Completed the stand-alone query software with data statistical analysis and report and chart production functions.

(5) Completed the analysis of the general trend of global container shipping routes, the deployment trend of intercontinental trade routes, the deployment trend of Far East main and regional navigation routes information and the deployment trends of major Far East ports in Europe and America.

（1）配合航政司業務需要，提供我國及國籍航商與南向國家間運能、航線數、越南港口之航線等資料。

（2）配合航港局業務需要，提供我國至東南亞各國及紐澳之航線數、全球主航線及遠東有關貿易路線之、國籍航商與東協10國及印度之航線及運能等資料。

（3）配合臺灣港務公司業務需要，提供亞洲競爭港口近3年航線、2011年起越太平洋航線平均船型、最大船型(TEU)、各年度亞洲區域航線航線數量等資料。
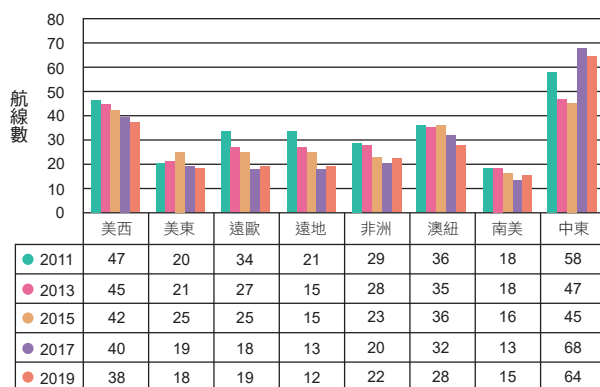
（4）於2019年12月2日召開「國際海運資料庫」座談會，邀請海運業產官學界與會，介紹資料庫內容及功能。

4.研究成果精華摘整

5.研究成果報告

3.**Promotion of Outcomes and Benefits**

(1) Cooperated with the business requirements of the Department of Navigation and Aviation; provided information on the transportation capacity, number of routes, and shipping routes of Vietnamese ports between our country and national ocean carriers and southbound countries.

(2) Cooperated with the business requirements of the Maritime Port Bureau, provided information on the number of routes from our Country to Southeast Asian countries and New Zealand and Australia, the main global navigation routes and trade routes related to the Far East, the routes and transportation capacity of national ocean carriers and the 10 ASEAN countries and India.

(3) Cooperated with the business requirements of the Taiwan International Ports Corporation, provided information on the navigation routes of the Asian competing ports in the past three years, the average ship type, the largest ship type (TEU), and the number of Asian regional navigation routes in each year since 2011.

(4) Held the "International Maritime Transportation Database" symposium on December 2, 2019; invited the maritime industry, government and academia to the symposium to introduce the content and functions of the database.

4.**Summary of Research Outcomes**

	美西	美東	遠歐	遠地	非洲	澳紐	南美	中東
● 2011	47	20	34	21	29	36	18	58
● 2013	45	21	27	15	28	35	18	47
● 2015	42	25	25	15	23	36	16	45
● 2017	40	19	18	13	20	32	13	68
● 2019	38	18	19	12	22	28	15	64

遠東地區與各貿易區之主航線數變化
Changes in the Number of Main Navigation Routes between the Far East and all Trade Zones
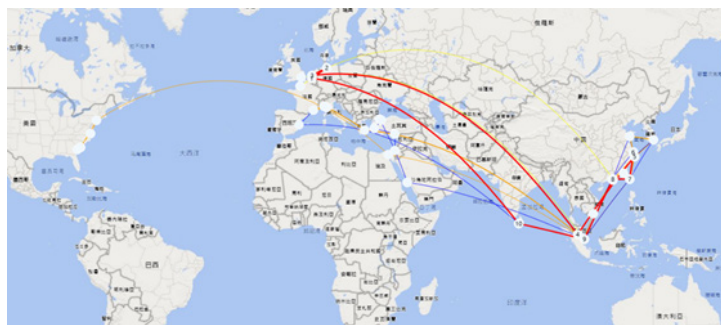
109 第 1 季經臺灣港口平均船型在 12,000-15,000TEU 之航線
The Navigation Route of Average Ship Type between 12,000 and 15,000 TEU through Taiwanese Ports in the First Quarter, 2020

・108年度「國際海運資料庫」更新擴充及資料分析服務期末報告(108年出版)

5.**Report of Research Outcomes**

・ International Maritime Database Annual report, 2019 Update, extension, and data Analysis (published in 2019)

（四）國際空運資料庫之更新擴充及資料分析服務

1.計畫概述

全球航空業重心轉移至亞太地區，預估2036年前亞太地區旅客量將占全球38％，我國門戶桃園機場及臨近競爭機場(包括香港、仁川、上海浦東、東京成田、新加坡等)，皆積極致力於強化樞紐地位，實需持續關注掌握國際空運市場發展趨勢及相關國際機場動態及運量變化。

「國際空運資料庫」之建置旨在長期蒐集包括機場及旅客起迄兩大部分之資料，機場部分資料包含國內外主要機場的基本資料、營運資料、運量資料、航網資料及設施資料；在旅客起迄資料部分，向國際航空運輸協會(IATA)市場檢索管道MarketIS購得旅客起迄運量與旅行路徑資料，進行相關統計分析及圖表式呈現，並運用資料探勘技術，活化資料庫應用範疇，進行議題分析協助本所進行空運相關研究。

2.研究成果

（1）掌握包括我國、新南向國家、兩岸直航及全球重要航點在內，合計187座機場的基礎設施、營運、航網及運量等資料。

（2）持續蒐集亞太及北美地區10餘座重要機場旅客起迄移動資料(超過200萬筆)，涵括桃園機場、鄰近競爭機場(仁川、香港、東京成田、新加坡樟宜、上海浦東)及北美重要門戶機場(洛杉磯、舊金山、紐約甘乃迪及溫哥華)，可由點到面掌握桃園及重要營運往來機場之直達、中轉全部航線、旅客數、航空公司等資訊。

（3）完成機場地圖、分析工具選單及資料庫條件篩選等功能。

（4）透過資料大數據分析，就政策與產業面議題進行主題式分析，研析成果可提供交通部航政司、民航局、桃園機場公司甚或航空公司做為策略研擬評估參考，並透過座談會將研究成果與相關單位及業者分享，另有重要分析議題包括「華航與長榮航空之營運比較分析」、「低成本航空公司在亞洲主要機場之營運分析」、「航空聯盟在亞洲主要機場的運作情況」。

3.成果推廣與效益

空運資料庫建置迄今，累積桃園機場及鄰

(4) International Air Transportation Database Update and Expansion and Data Analysis Services

1.Project Overview

The focus of the global aviation industry has shifted to the Asia-Pacific region. It is estimated that the Asia-Pacific region will account for 38% of the global passenger volume by 2036. The gateway of our country, Taoyuan Airport and nearby competing airports (including Hong Kong, Incheon, Shanghai Pudong, Tokyo Narita, Singapore, etc.) are all actively committed to strengthening the hub position; it is necessary to continue to pay attention to the development trend of the international air transportation market and the dynamics and changes of transportation volume of the relevant international airports.

The establishment of the "International Air Transport Database" aims to collect two major parts of long-term data including the airports and the origin and destination of passengers. The data on the part of airports includes basic data, operating data, transportation volume data, aviation network data and facility data of major domestic and foreign airports; the data on the part of passenger origin and destination, purchased the passenger origin and destination transportation volume and travel route data from the Market Intelligence Services (Market IS), to conduct relevant statistical analysis and graphical presentation, use data exploration technology to activate the scope of database application, and conduct issue analysis to assist the Institute to perform air transportation related research.

2.Research Outcomes

(1) Grasp the data including the basic facilities, operations and traffic volume of 187 airports, including Taiwan, the new southbound countries, direct cross-strait flights and important global destinations.

(2) Continue to collect passenger origin and destination traveling data (over 2 million records) from more than 10 important airports in Asia Pacific and North America, including Taoyuan Airport, nearby competing airports (Incheon, Hong Kong, Tokyo Narita, Singapore Changi, Shanghai Pudong) and important gateway airports in North America (Los Angeles, San Francisco, New York Kennedy, and Vancouver), to grasp the data from point to surface of all direct and transit routes, number of passengers, airlines between Taoyuan and important operating incoming and outgoing airports.

(3) Complete functions including airport map, analysis tool menu and database condition screening.

(4) Through big data analysis, conduct thematic analysis on policy and industry issues. The research outcomes can be provided to the Department of Aviation Administration of the Ministry of Transportation and Communications, the Civil Aeronautics Administration and Taoyuan International Airport Corporation Ltd. or airlines as a reference for strategy research, development and evaluation, and the research outcomes can be shared with relevant units and industry operators through the symposium. Other important analysis issues include "Comparative Analysis of the Operation of China Airlines and EVA Air," "Operation Analysis of Low-cost Carriers in Major Asian Airports," and "Operating Status of Airline Alliances in Major Asian Airports."

近競爭機場與北美重要門戶機場旅運資料，有效掌握桃園機場與主要競爭機場市場情形，同時運用資料庫研析重要課題，並於期末舉辦座談會，邀集交通部、民航局、桃園機場公司、航空公司及學界交流，分享當年度資料庫研究成果，同時綜整系統應用需求，做為後續系統功能精進之參考。在資料提供部分，可因應使用需求提供相關資料數據，然受限資料來源契約約定，後續將於合乎約定範籌內，產製統整式圖表供交通部、民航局及桃園機場公司做為政策研擬參據。

4.研究成果精華摘整

5.研究成果報告

3.Promotion of Outcomes and Benefits

Since the establishment of the Air Transportation Database, the travel data of Taoyuan Airport and its neighboring competing airports and important gateway airports in North America have been accumulated to effectively grasp the market situation of Taoyuan Airport and major competing airports, and use the database to study and analyze important topics, and hold a symposium at the end of the term, inviting the Ministry of Transportation and Communications, Civil Aeronautics Administration, Taoyuan International Airport Corporation Ltd., airlines and academia institutions to share the research outcomes of the database of the year, and summarize the system application requirements at the same time as the reference for subsequent system function improvement. On the part of data provision, relevant information data can be provided in response to usage needs; however, due to being limited to the contractual agreement on the data source, the summarized diagrams and forms will be produced subsequently in compliance with the contractual scope to be provided to the Ministry of Transportation and Communications, Civil Aeronautics Administration and Taoyuan International Airport Corporation Ltd. as the reference for policy research and development.

4.Summary of Research Outcomes

低成本航空在桃園－日本航線營運情況
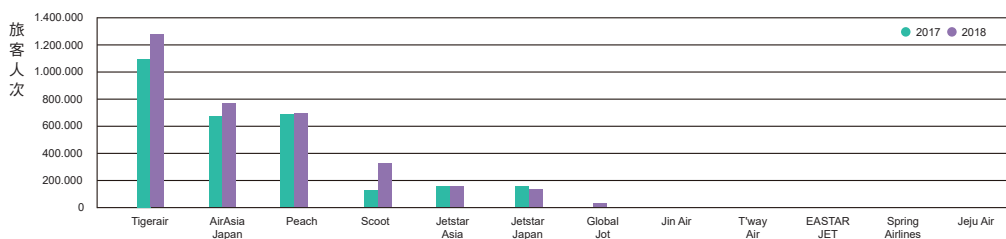
2016-2018 桃園機場起迄主要涵蓋國家 / 地區旅客人數（單位：百萬）
2016 – 2018, Number of Passengers of Primary Coverage of Origin and Destination Country/Region Mainly Covered by Taoyuan Airport (Unit: Million)

2016－2018桃園機場起迄主要涵蓋國家/地區旅客人數（單位:百萬）

2017			2018			2017–2018 人數成長率
航空公司	人數(萬)	人數%	航空公司	人數(萬)	人數%	
長榮航空	106	54.08%	長榮航空	129	56.88%	20.9%
中華航空	79	39.93%	中華航空	80	35.40%	1.9%
臺灣虎航	4.70	2.38%	臺灣虎航	6.04	2.66%	28.5%
全亞洲	0.92	0.47%	加拿大航空	3.09	1.36%	236.2%
加拿大航空	0.92	0.46%	酷航	1.47	0.65%	164.9%
日本亞洲航空	0.82	0.41%	全亞洲航空	1.22	0.53%	48.1%
樂桃航空	0.61	0.31%	樂桃航空	0.76	0.33%	24.0%
酷航	0.55	0.28%	越南航空	0.57	0.25%	37.9%
越南航空	0.42	0.21%	日本亞洲航空	0.45	0.20%	- 44.8%
新丰虎航(2017.7與酷航合併前)	0.41	0.21%	捷星亞洲航空	0.44	0.19%	19.9%
			聯合航空	0.42	0.18%	40.9%
捷星亞洲航空	0.37	0.18%	荷蘭皇家航空	0.32	0.14%	160.9%
聯合航空	0.29	0.15%	國泰航空	0.30	0.13%	131.5%
立榮航空	0.29	0.15%	越捷航空	0.28	0.12%	139.9%
亞洲航空	0.20	0.10%	法國航空	0.24	0.11%	–
國泰航空	0.13	0.06%	亞洲航空	0.21	0.09%	–
荷蘭皇家航空	0.12	0.06%	菲律賓亞洲航空	0.17	0.07%	120.9%
越捷航空	0.12	0.06%	立榮航空	0.16	0.07%	- 45.1%
遠東航空	0.10	0.05%	泰國獅子航空	0.14	0.06%	771.4%
酷鳥航空	0.09	0.05%	遠東航空	0.13	0.06%	28.1%
菲律賓亞洲航空	0.08	0.04%				
總計	197	100%	總計	227	100%	15.0%

以桃園機場為中轉航線營運航空公司
Operating Airlines with Taoyuan Airport as the Transit Route

· 108年度「國際空運資料庫」更新擴充及資料分析服務期末報告(108年出版)

（五）大數據分析技術進行鐵路供需診斷與策略分析（1/2）-診斷模式軟

5.Report of Research Outcomes

· International Air Transport Database Annual report, 2019 Update, extension, and data Analysis (published in 2019)

體雛型之建置

1.計畫概述

前瞻基礎建設特別條例業於106年7月7日由總統公布施行，其中前瞻軌道建設涵蓋五大推動主軸。我國在未來這幾年中將執行多項軌道相關建設。然而在同一個臺鐵系統中執行多項建設時，交通部及相關單位必須由系統面之立足點對臺鐵系統之供給、需求、與運轉作整體評估。

考量前瞻軌道基礎建設中含有多項鐵路相關建設工程，不但將同時影響臺鐵系統之運轉，而且彼此之間亦可能有相互影響之情形。因此本所辦理本計畫，研發可整體檢視、分析臺鐵全系統供需能力之軟體工具，以協助本所辦理相關鐵路建設計畫之經費審議。108年為計畫第1年度，以臺鐵東部系統為範疇，規劃與研發建置診斷模式軟體雛型。

2.研究成果

（1）本計畫蒐集臺鐵近3年售票紀錄及對應之每日班表資料，進行資料清洗及資料擷取、轉換、載入，建立歷史售票及班表資料倉儲。

（2）針對臺鐵東部及全線鐵路運輸供給與需求面之實務作情形，進行了多次訪談與討論，掌握臺鐵第四代票務系統票紀錄及相關分析功能，並探究鐵路供需診斷模式軟體後續與前述資料串接之可行性。

（3）本計畫蒐集了15項與臺鐵東部鐵路運輸相關之資訊系統、車輛採購及建設計畫。

（4）本計畫釐清進行供給與需求診斷與策略分析所需要的6組主要模式，分別為：需求模式、供給模式、乘客選擇行為模式、乘客選擇參數校估模式、解衝突模式、系統運轉模式，並完成其中前4項模式之實作與測試。最後，解衝突模式以及系統運轉模擬模式則待後續研究實作並做測試。

（5）本計畫並以臺鐵東部路段為範圍，設計情境案例以整體驗證研究成果整合供給與需求之能力及求解效果。測試以取自星期四及星期日等不同日期之售票紀錄作為需求

(5) Big Data Analysis Technology for Railway Supply and Demand Diagnosis and Strategy Analysis (1/2) – Construction of Diagnostic Model Software Prototype

1.Project Overview

The "Special Act for Forward-Looking Infrastructure" was promulgated by the President for implementation on July 7, 2017; the forward-looking track construction covers the five major promotion schemes. Our country will implement multiple track-related constructions in the next few years. However, when multiple constructions are implemented in the same Taiwan Railway system, the Ministry of Transportation and Communications and related units must conduct an overall assessment of the supply, demand, and operation of the Taiwan Railway system from the foothold of the system side.

Considering that there are multiple railway-related construction projects in the forward-looking track infrastructure, it will not only affect the operation of the Taiwan Railway system, but may also have the situation of affecting each other at the same time. Therefore, the Institute conducts this project with research and development of software tools that can comprehensively inspect and analyze the supply and demand capabilities of the entire system of Taiwan Railways, so as to assist the Institute in handling the funding review of relevant railway construction projects. 2019 was the first year of the project; the Institute planned, researched and developed and built the prototype of the diagnostic model software using the Eastern Region System of Taiwan Railway as the scope.

2.Research Outcomes

(1) This project collects the ticket sales records and corresponding daily schedule data of Taiwan Railways in the past 3 years, performs data cleaning, data retrieval, conversion, and loading, and establishes historical ticket sales and schedule data storage.

(2) Conducted multiple counts of interviews and discussions on the practical operation situation of the supply and demand side of railway transportation in the Eastern Region of Taiwan Railways and across the entire railways, grasped the ticket records and related analysis functions of the fourth-generation ticketing system of Taiwan Railways, and explored the feasibility of subsequent connection with the aforementioned data for the Railway Supply and Demand Diagnosis Model Software.

(3) This project has collected 15 information systems, vehicle procurement and construction design projects related to Taiwan Railway Eastern Region Railway Transportation.

(4) This project clarified the six main models required for supply and demand diagnosis and strategic analysis, namely, the demand model, supply model, passenger selection behavior model, passenger selection parameter calibration model, conflict resolution model, and system operation simulation model, and completed the implementation and testing of the first 4 models. Finally, the conflict resolution model and the system operation simulation model are subject to follow-up research, implementation and testing.

(5) This project takes the Eastern Region section of the Taiwan Railway as the scope, the designing scenario case is using the overall verification research results integrated

之來源數據，再分別於四種不同運轉策略進行8種不同情境之模式求解。測試結果顯示各模式確實具有整合運用之能力，而且能夠在所設定運轉資源之限制下，求解得到如何將有限的運能作最佳化的運用，並具體解得含配位資訊之服務計畫。未來以六大模式開發軟體平台，應可發揮鐵路建設方案之效益評估工具之效果。

3.成果推廣與效益

（1）研究期間邀請臺鐵局之相關單位參與各項工作會議，研究期間已納入臺鐵局及本所需求，將確保研究成果符合實務需求，並有助於未來成果推廣至臺鐵局。

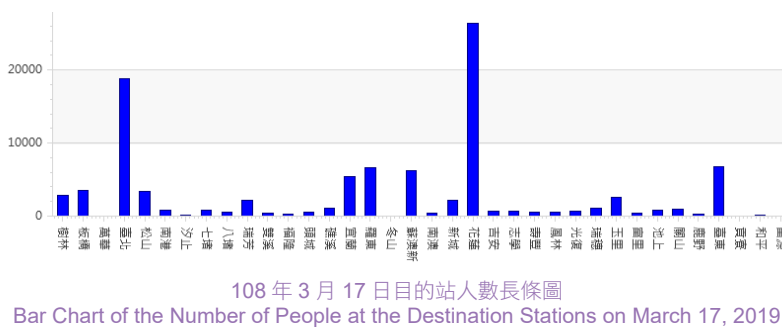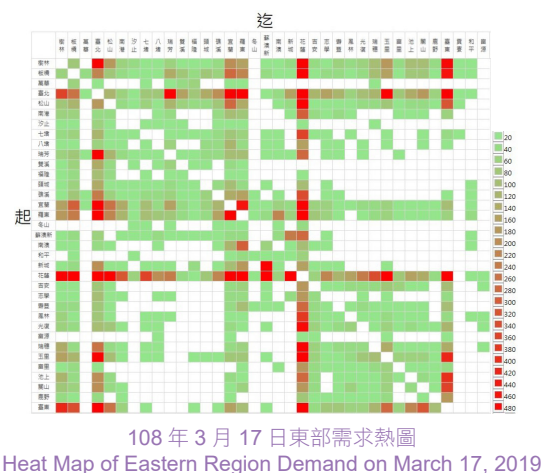（2）本所刻正辦理本研究第2年期作業，將辦理座談會以推廣研究成果。

4.研究成果精華摘整

5.研究成果報告

with the capabilities of supply and demand as well as the solution effect. The test uses ticket sales records taken from different dates of Thursday and Sunday as the source data of the demand, and then solves with the model eight different scenarios in four different operating strategies. The test results show that each model does have the ability to integrate and use, and it can solve how to optimize the use of limited transport capacity under the limitation of the set operating resources, and specifically solve the service plan with coordination information. In the future, the development of software platforms based on six major models shall be able to exert the effect of the benefit evaluation tool of the railway construction programs.

3.Promotion of Outcomes and Benefits

(1) During the research period, relevant units of the Taiwan Railways Administration are invited to participate in various working meetings. During the research period, the requirements of the Taiwan Railways Administration and the Institute are included. This will ensure that the research results conform to the practical requirement, and facilitate the promotion of future results to the Taiwan Railways Administration.

(2) The Institute is currently conducting the second-year operation of this research and will hold symposiums to promote the research outcomes.

4.Summary of Research Outcomes

108 年 3 月 17 日東部需求熱圖
Heat Map of Eastern Region Demand on March 17, 2019

108 年 3 月 17 日目的站人數長條圖
Bar Chart of the Number of People at the Destination Stations on March 17, 2019

· 大數據分析技術進行鐵路供需診斷與策略分析
(1/2)-診斷模式軟體雛型之建置(109年出版)

5.Report of Research Outcomes

· Railway Supply and Demand Diagnosis and Strategy Analysis with Big Data Technology (1/2)–Development of the Diagnostic Model Software Prototype (published in 2020)

三、道路交通安全創新研究與應用

（一）2020年版運輸政策白皮書-運輸安全

1.計畫概述

　　近年來國際與國內環境的變化，面對運輸安全法規制度國際接軌、運輸安全智慧科技發展、節能減碳意識抬頭、人口年齡結構改變、人本永續價值體現、運輸安全組織變革等內外在環境演進與挑戰，對於提昇運輸安全績效之觀念、方法與制度均產生持續影響。

　　基於安全是基本人權，提升運輸安全、保障人民福祉已是國際社會之共同價值，因應國際與國內的環境變化與發展，需檢討前一版運輸安全政策白皮書內容，重新診斷我國運輸安全面臨的課題，並擬定新的安全目標、政策主軸及策略方向，研提新版運輸安全政策白皮書，作為未來運輸安全施政之藍本。

　　本白皮書所稱「運輸安全」係以2020年版運輸政策白皮書之「總論」及「陸運」、「海運」、「空運」分冊為基礎，就道路、鐵道、海運及空運四大運輸系統，在法規制度架構、安全管理系統、安全資料分析應用及智慧科技導入等四大面向的重要課題，提出我國未來四大運輸系統之安全目標、政策、策略及行動方案，以減少運輸過程中所發生的事故以及嚴重性，提升我國運輸系統安全水準。

2.研究成果

（1）道路安全以追求道路交通「零死亡事故」為願景；中期目標設定為未來3年道路交通事故30日內死亡人數儘速「脫10」，即每10萬人口之道路交通事故死亡人數低於10人；長期目標設定為未來10年死亡人數減少30%，即2030年道路交通事故30日內死亡人數相較2019年減少30%。依據願景與目標，提出「完備道安法規制度，強化主動事前預防」及「善用科技與管理，強化道路交通安全」二大政策與10項策略，同時制定各項短、中、長期行動方案。

III. Creative Research and Application on Road Traffic Safety

(1) 2020 Transportation Policy White Paper – Transportation Safety

1.Project Overview

In recent years, the changes in the international and domestic environments, facing the internal and external environment evolution and challenges including transportation safety laws and regulations and systems international integration, development of intelligence technology in transportation safety, the rise of awareness of energy conservation and carbon reduction, changes in the age structure of the population, the expression of human-oriented sustainable values, and changes in transportation safety organizations have a continuous impact on the concepts, methods and systems for improving transportation safety performance.

Based on safety is the basic human right, improving transportation safety; protecting the people's well-being is the common value of the international community. In response to changes and developments in the international and domestic environment, it is necessary to review the contents of the previous version of transportation safety policy white paper, diagnose the issues facing our country's transportation safety, and develop new safety goals, policy main scheme and strategic directions, to propose the new version of the transportation safety policy white paper as the blueprint for future transportation safety administration.

The "Transportation Safety" referred to in this white paper is based on the "Summary" and "Land Transportation," "Sea Transportation" and "Air Transportation" volumes of the 2020 Transportation Policy White Paper, aiming at the important issues of four major aspects including laws and regulations system frameworks, safety management systems, safety data analysis applications, and introduction of smart technology regarding the four major transportation systems of roads, railways, shipping and air transportation, to propose the safety goals, policies, strategies and action plans of four major transportation systems of our country in the future, to reduce the occurrence and severity of accidents during the transportation process, and improve the safety level of our country's transportation systems.

2.Research Outcomes

(1) Road safety is based on the vision of pursuing "Zero Fatalities in Accidents" in road traffic; the medium-term goal is to reach "Less Than 10" as soon as possible in road traffic accident deaths within 30 days during the next 3 years, that is, the number of road traffic accident deaths per 100,000 population is less than 10; the long-term goal is set to reduce the number of deaths in the next 10 years by 30%, that is, the number of deaths in road traffic accidents within 30 days in 2030 will be reduced by 30% compared to 2019. Based on the vision and goals, the Institute proposes two major policies of "Complete Road Safety Laws and Regulations System, Strengthen Active Advanced Prevention" and "Make Good Use of Technology and Management, Strengthen Road Traffic

（2）鐵道安全以追求鐵道「零死亡事故」為願景；以零重大鐵道事故為整體安全目標，臺鐵另以及每百萬行車公里等效死亡逐年降低3％為目標。依據願景與目標，提出「變革安全管理機制，提升鐵道運輸安全」及「揭露鐵道安全資訊，強化鐵道安全智慧科技」二大鐵道安全政策與6項策略，同時制定各項短、中、長期行動方案。

（3）海運安全以追求海運「重大事故零容忍」為願景，設定未來5年我國國輪（商船）年平均海事案件低於30件為目標。依據願景與目標，提出「國際海運安全機制內國法化，強化本國海運安全管理」及「海運安全資料分析與科技智慧化，營造海運便捷及安全環境」二大海運安全政策與4項策略，同時制定各項短、中、長期行動方案。

（4）空運安全秉於「飛安零容忍」為願景，提出「國籍民用航空運輸業飛機零失事」及「強化普通航空業及新興飛行載具管理」二大空運安全政策與6項策略，同時制定各項短、中、長期行動方案。

3.成果推廣與效益

108年6月辦理「2020年版運輸政策白皮書座談會-運輸安全分冊」及108年12月辦理「2020年版運輸政策白皮書新書發表會」，透過產、官、學、研交流討論，形成運輸安全政策之共識。

Safety" and ten strategies, and establishes various short-, medium- and long-term action plans at the same time.

(2) Railway safety is based on the vision of pursuing "Zero Fatalities in Accidents" on railways, with zero major railway accidents as the overall safety goal, and Taiwan Railways has set the goal of reducing the equivalent deaths per million travel kilometers by 3% year by year. Based on the vision and goals, the Institute proposes two major railway safety policies of "Reform Safety Management Mechanisms, Improve Railway Transportation Safety" and "Disclose Railway Safety Information, Strengthen Railway Safety Smart Technology" and six strategies, and established various short-, medium- and long-term action plans at the same time.

(3) Sea transportation safety is based on the vision of pursuing sea transportation "Zero Tolerance for Major Accidents," and sets the goal of our country's ship (merchant ship) annual average maritime cases to be less than 30 in the next five years. Based on the vision and goals, the Institute proposes two major sea transportation safety policies of "National Legalization of International Sea Transportation Safety Mechanisms, Strengthen Domestic Sea Transportation Safety Management" and "Sea Transportation Safety Data Analysis and Technology Intellectualization, Create Convenient and Safe Environment for Sea Transportation" and six strategies, and establishes various short-, medium- and long-term action plans at the same time.

(4) Air transportation safety is based on the vision of "Zero Tolerance for Flight Safety," the Institute proposes two major air transportation safety policies of "Zero Accidents in National Civil Aviation Industry" and "Strengthen the Management of General Aviation Industry and Emerging Flying Vehicles" and six strategies, and establishes various short-, medium- and long-term action plans at the same time.

3.Promotion of Outcomes and Benefits

Conducted the "2020 Transport Policy White Paper Symposium – Transportation Safety Volume" in June 2019 and the "2020 Transport Policy White Paper New Book Presentation" in December 2019 to form the consensus for transportation safety policy through exchanges and discussions between industry, government, academia, and research institutions.
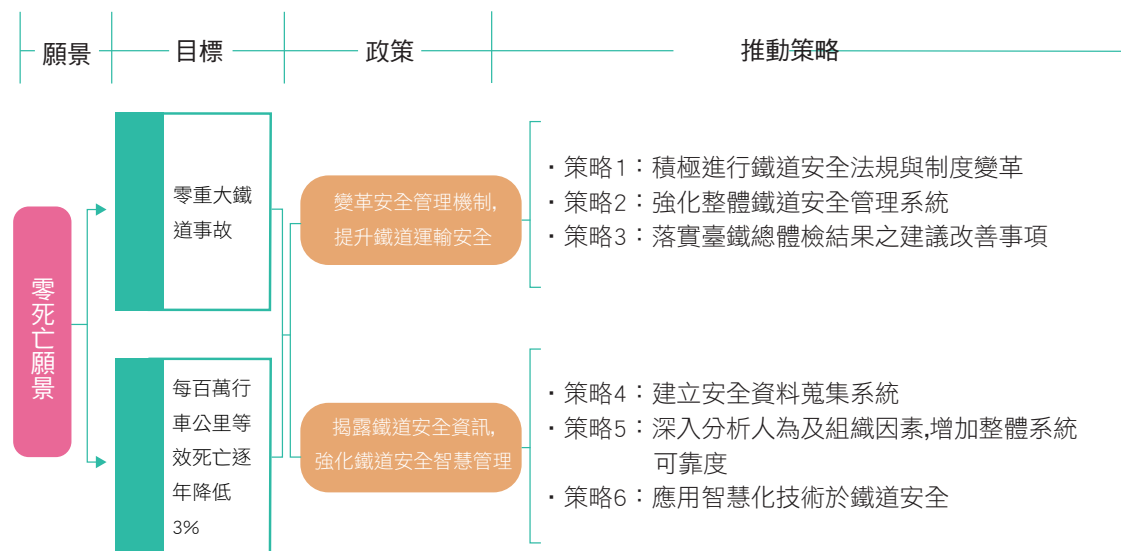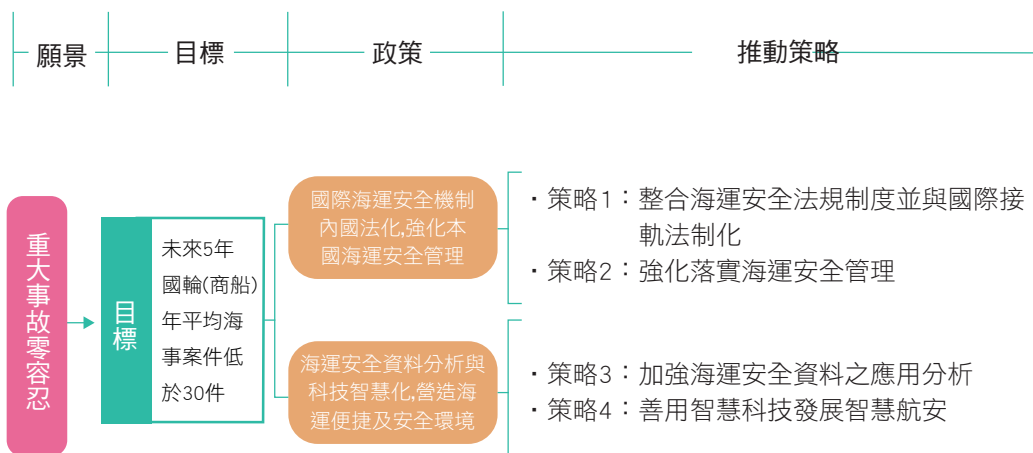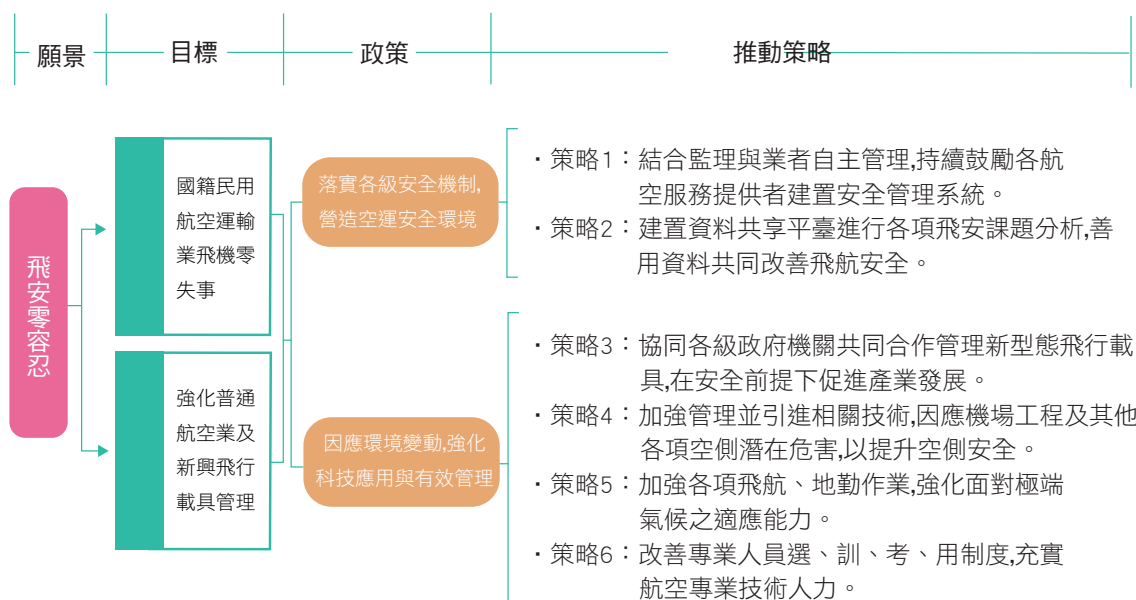
4.研究成果精華摘整

4.Summary of Research Outcomes

願景	目標	政策	推動策略

零死亡願景

中期目標：未來3年30日內死亡人數儘速「脫10」

完備道安法規制度,強化主動事前預防

- ・策略1：推動道安法規與制度之重整變革
- ・策略2：推動道安體制與國家級道安計畫與預算的法制化
- ・策略3：加強道安工作續效管理及合作機制
- ・策略4：深化交通安全教商及專業人才培力

長期目標：未來10年死亡人數減少30%

善用科技與管理,強化道路交通安全

- ・策略5：加強安全管理作為,落實風險管理
- ・策略6：發展更安全的運具設備
- ・策略7：持續安全人本的交通環境改造
- ・策略8：強化汽車運輸業之安全管理制度
- ・策略9：善用數據科學,強化社會溝通
- ・策略10：導入創新科技,提升事故防制成效
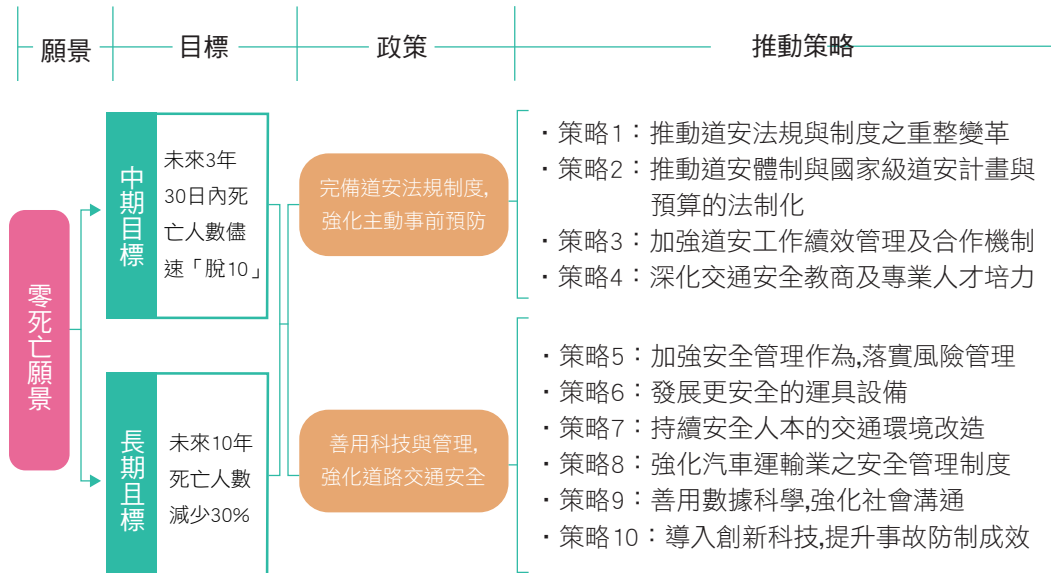
道路安全之願景、目標、政策與推動策略
Vision, Goal, Policy and Promotion Strategies of Road Safety

願景	目標	政策	推動策略

零死亡願景

零重大鐵道事故

變革安全管理機制,提升鐵道運輸安全

- ・策略1：積極進行鐵道安全法規與制度變革
- ・策略2：強化整體鐵道安全管理系統
- ・策略3：落實臺鐵總體檢結果之建議改善事項

每百萬行車公里等效死亡逐年降低3%

揭露鐵道安全資訊,強化鐵道安全智慧管理

- ・策略4：建立安全資料蒐集系統
- ・策略5：深入分析人為及組織因素,增加整體系統可靠度
- ・策略6：應用智慧化技術於鐵道安全

鐵道安全之願景、目標、政策與推動策略
Vision, Goal, Policy and Promotion Strategies of Railway Safety

願景	目標	政策	推動策略

重大事故零容忍 → 目標：未來5年國輪(商船)年平均海事案件低於30件

國際海運安全機制內國法化,強化本國海運安全管理
- 策略1：整合海運安全法規制度並與國際接軌法制化
- 策略2：強化落實海運安全管理

海運安全資料分析與科技智慧化,營造海運便捷及安全環境
- 策略3：加強海運安全資料之應用分析
- 策略4：善用智慧科技發展智慧航安

海運安全之願景、目標、政策與推動策略
Vision, Goal, Policy and Promotion Strategies of Sea Transportation Safety

願景	目標	政策	推動策略

飛安零容忍

國籍民用航空運輸業飛機零失事

落實各級安全機制,營造空運安全環境
- 策略1：結合監理與業者自主管理,持續鼓勵各航空服務提供者建置安全管理系統。
- 策略2：建置資料共享平臺進行各項飛安課題分析,善用資料共同改善飛航安全。

強化普通航空業及新興飛行載具管理

因應環境變動,強化科技應用與有效管理
- 策略3：協同各級政府機關共同合作管理新型態飛行載具,在安全前提下促進產業發展。
- 策略4：加強管理並引進相關技術,因應機場工程及其他各項空側潛在危害,以提升空側安全。
- 策略5：加強各項飛航、地勤作業,強化面對極端氣候之適應能力。
- 策略6：改善專業人員選、訓、考、用制度,充實航空專業技術人力。

空運安全之願景、目標、政策與推動策略
Vision, Goal, Policy and Promotion Strategies of Air Transportation Safety

5.研究成果報告

- 2020年版運輸政策白皮書-運輸安全（108年出版）

5.Report of Research Outcomes

- 2020 Transportation Policy White Paper - Transportation Safety (published in 2019)

（二）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

1.計畫概述

　　臺灣近10年之肇事件數約成長 90%，顯示交通安全問題已是刻不容緩的改善重點。本計畫針對混合車流情境下各種常發生的事故型態，進行交通工程設施的改善，同時建立設計範例。108年就非號誌化路口常見事故型態，研析相關改善方式，並選取示範路口進行改善方案的驗證，再進一步彙整改善示範案例。

2.研究成果

（1）經彙整各國針對非號誌化路口的管制措施及分析方法，並進行車流分析及肇事特性探討。歸納非號誌化路口肇事特性包括路口視距不足、行車速度較快、交叉口路權不明顯、主線與支線路幅差距大、無足夠左轉待轉空間以及照明不足等。

（2）經整理國內道路交通事故之主要碰撞事故型態，依序為側撞、擦撞、交叉撞及追撞，本計畫目前已完成右轉側撞、左轉側撞、左轉穿越側撞事故型態改善設計範例。

3.成果推廣與效益

（1）各事故型態改善設計範例，可供各級道路主管機關於完成易肇事路口事故特性分析後，精準掌握路口肇事型態，發掘肇事原因，並提出有效改善方案，提升易肇事地點改善品質與效率。

（2）本所於108年分別於北、中、南辦理分區教育訓練，邀集中央機關、各縣市政府、各工程顧問公司等，以推廣研究成果，供各界參用。

(2) **Design Model on Road Traffic Engineering at Intersection under Mixed Traffic** (3/4) – **Non-signal Intersection**

1.**Project Overview**

　　The number of accidents in Taiwan in the past 10 years has grown by about 90%, showing that traffic safety has become an urgent priority for improvement. This project aims at various accident types that frequently occur in mixed traffic flow situations, to conduct improvement of traffic engineering facilities, and establish design examples at the same time. In 2019, the common accident types at non-signal intersections were studied and analyzed for related improvement methods, and the demonstration intersections were selected to conduct verification of the improvement program, and then the improvement demonstration cases further summarized.

2.**Research Outcomes**

(1) After summarizing the control measures and analysis methods of various countries on non-signal intersections, and conducting traffic flow analysis and discussion on the characteristics of the accident, it is concluded that the characteristics of non-signal intersection accidents include insufficient range of visibility at intersections, faster driving speed, inconspicuous right of way at intersections, large road width difference between the main line and branch line, insufficient space for turning left, and insufficient lighting, etc.

(2) After putting the main types of collisions in domestic road traffic accidents, they are side collision, fender-bender, cross-collision and rear-end collision in order. The project has completed the design examples for the improvement of accident types including right-turn side collision, left-turn side collision, and left-turn cross-side collision accident types.

3.**Promotion of Outcomes and Benefits**

(1) The design examples for the improvement of various accident types can be provided to the road competent authorities at all levels to accurately grasp the types of accidents at intersections, discover the causes of the accident after completing the characteristics analysis of accident-prone intersections, and propose effective improvement programs to improve the quality and efficiency of the accident-prone locations.

(2) The Institute conducted education and training in North, Central and South Regions in 2019, and invited the central competent authorities, all county and city governments, and all engineering consulting companies to promote the research outcomes for the reference and use by all sectors.

4.研究成果精華摘整

4.Summary of Research Outcomes
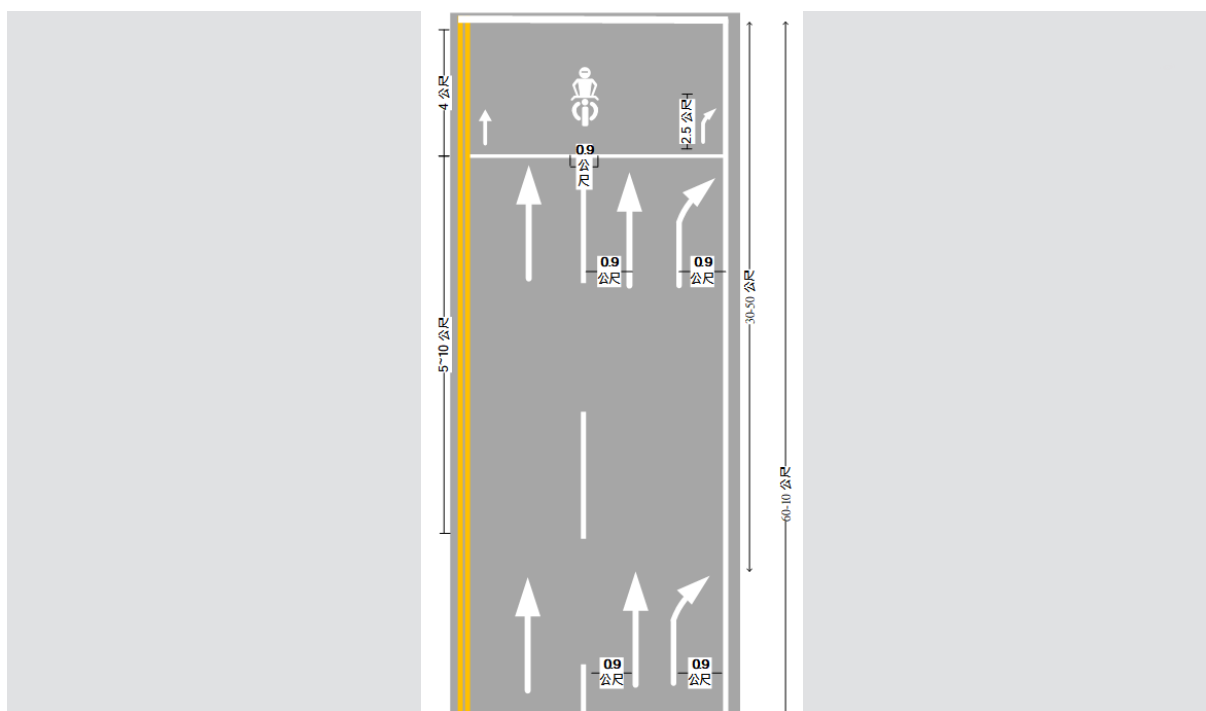
右轉側撞改善設計範例
Right Turn Side Collision Improvement Design Example
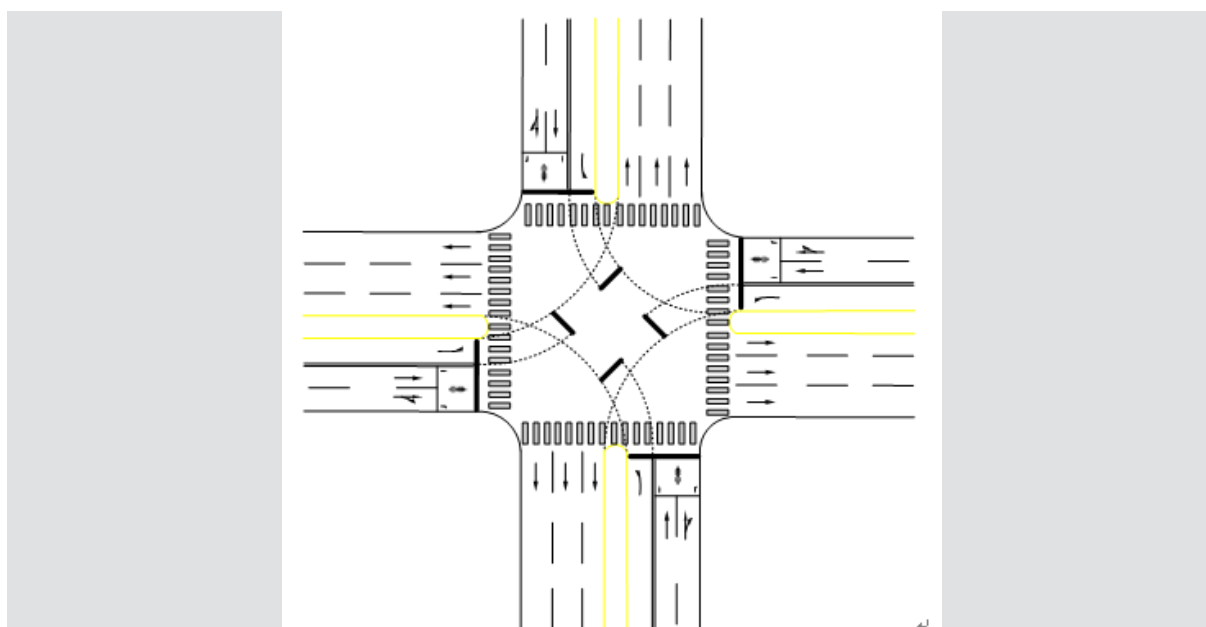
左轉穿越側撞改善設計範例
Left Turn Cross-side Collision Improvement Design Example

5.研究成果報告

· 混合車流路口道路與交通工程設計範例(2/4)
  (108年出版)

5.Report of Research Outcomes

· Typical Examples for Road and Traffic Engineering Design in Mixed-Traffic Situation(2/4) (published in 2019)

（三）路口無人機交通攝影及衝突分析技術開發

1.計畫概述

交通事故發生，輕者造成車損及交通阻塞，重者導致人員傷殘甚至喪失生命，使得家庭破碎，因此世界各國皆致力於新型道安防治技術的開發。本計畫運用交通衝突分析技術，並結合無人機空中拍攝、影像分析等新興技術，自動化找出人車流衝突事件及熱區，建立高交通事故風險地點的診斷分析工具。分析結果可供交通管理單位與道路設計者，評估交叉路口衝突或風險，俾能在交通事故發生前診斷出交通衝突問題，並做為研擬預防性交通改善之參考資訊，降低交通事故發生數及嚴重性。

2.研究成果

（1）本研究採用無人機進行交通觀測，充分運用無人機滯空拍攝無死角的優勢，提供影像分析最佳來源，最後針對最新無人機管理規範、無人機現場拍攝作業及號誌時相與影片對時作業等課題彙整成果。

（2）對四輪車輛採用Mask R-CNN技術偵測車輛範圍，對機車、自行車與行人則運用YOLOv3技術追蹤移動軌跡，皆能有80％以上的正確追蹤結果。

（3）採用SSAM V3.0開源程式做為衝突分析的計算基礎，再針對國內的交通的分析需求，根據衝突事件表結果，產生統計摘要（按衝突的嚴重程度及車種分類）、交通特性相關（平均車速分佈）、衝突熱點圖（密度分佈圖及斑點圖）。

3.成果推廣與效益

（1）本研究之衝突分析軟體主要能協助肇事診斷及初步改善方案，自動化的分析衝突事件及熱區圖，找出頻率及嚴重程度較高的衝突類型，協助交通安全專家進行肇事診斷。

（2）本研究軟體也適合用於實施與評估，透過改善前、改善後的衝突分析比較，能立刻評估出改善方案的成效，以及是否有使用

(3) Design Model on Road Traffic Engineering at Intersection under Mixed Traffic (3/4) – Non-signal Intersection

1.Project Overview

When traffic accidents occur, the minor ones cause damage to cars and traffic congestion, the more serious ones cause personal injury or even loss of life, causing broken families; therefore, countries all over the world are striving for the development of new road safety control technologies. This project uses traffic conflict analysis technology, combined with emerging technologies including UAV aerial photography and image analysis, to ascertain the conflict incidents between people and vehicles and hot spots automatically, and establish diagnostic analysis tools for high traffic accident risk locations. The analysis results can be provided to the traffic management units and road designers to evaluate intersection conflicts or risks, in order to diagnose traffic conflict problems before traffic accidents occur, and serve as reference information for the development of preventive traffic improvement, to reduce the number of occurrences and severity of traffic accidents..

2.Research Outcomes

(1) This study uses UAVs to conduct traffic observation, makes full use of the advantages of UAVs in the air without blind spots, provides the best source of image analysis, and finally summarizes the results aiming at the topics of latest UAV management specifications, UAV field photography operations and traffic signal phase and timing and video time tick operation.

(2) This study uses Mask R-CNN technology to detect the range of vehicles for four-wheeled vehicles, and use YOLOv3 technology to track movement trajectories for motorcycles, bicycles and pedestrians, all of which can have accurate tracking results of more than 80%.

(3) This study uses SSAM V3.0 open source program as the calculation basis for conflict analysis, and then aiming at the analysis requirements of domestic traffic, based on the results of the conflict event table, to generate the statistical summary (classified by the severity of the conflict and the type of vehicle), related traffic characteristics (average speed distribution), and conflict hot spot map (density distribution chart and spot diagram)

3.Promotion of Outcomes and Benefits

(1) The conflict analysis software in this study can mainly assist in the diagnosis of accidents and preliminary improvement programs, automatically analyze conflict events and hot spot maps to find the types of conflicts with higher frequency and level of severity, and assist traffic safety experts to conduct accident diagnosis.

(2) The software in this study is also suitable for implementation and evaluation; through conflict analysis comparison before and after the improvement, the software can evaluate the effectiveness of the improvement program immediately, and whether there is a change in the user behavior that causes the effect of transferring the risk of accident to other types.

者行為發生改變，導致事故風險轉移至其他型態的效應。

（3）109年11月12日辦理本案成果發表會，宣導本計畫研究成果。並於109年12月5~6日於中華民國運輸學會年會中設攤展示研究成果。

(3) The project results presentation was conducted on November 12, 2020, to promote the research outcomes of this project, and a booth was set up to display the research results at the annual meeting of the Chinese Institute of Transportation on December 5–6, 2020.

4.研究成果精華摘整

4.Summary of Research Outcomes

高雄市鼓山區裕誠路及博愛二路路口 TTC/PET 衝突熱點圖
TTC/PET Conflict Hot Spot Map at the Intersection of Yucheng Road and Bo'ai 2nd Road, Gushan District, Kaohsiung City

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年出版)

5.Report of Research Outcomes

· Application of Road Traffic Flow Analysis and Accident Detection (published in 2019)

（四）推動鐵道行車安全保證機制之研析

1.計畫概述

安全保證工作是安全管理系統(SMS, Safety Management System)開始推動後確保其有效運作的重要工作，本計畫目標為提出鐵道營運階段安全保證(Safety Assurance，參考民航局作法，採取積極名詞－安全保證，以取代消極名詞－安全確認)機制之推動作法，以強化鐵道安全管理系統。爰規劃SMS中5個要項（設備管理與作業管理、事故事件通報與調查、變革管理、內部稽核審查評估、持續改進）之細項實務操作指引，以及其教育訓練教材(含案例)。SMS架構及其12要項如圖1所示。

(4) Analysis on Promoting Railway Safety Assurance Mechanism

1.Project Overview

Safety assurance work is important work to ensure the effective operation after the Safety Management System (SMS) started its promotion. The goal of this project is to propose the promotion practice of the Railway Operation Stage Safety Assurance (refer to the practice of the Civil Aeronautics Administration in using the active term – Safety Assurance, to replace negative term – Safety Conformation) Mechanism to strengthen the railway Safety Management System. Therefore, plan the detailed practical operation guidelines of the five important points (Equipment Management and Operation Management, Accident Incident Notification and Investigation, Change Management, Internal Audit Review and Evaluation, Continuous Improvement) in SMS, as well as its education and training materials (including cases). The SMS framework and its 12 important points are as shown in Figure 1.

1）安全政策、目標與資源
2）安全責任與開鍵人員
3）安全風險管理
4）安全教育訓練與適任性管理
5）安全資訊傳達與溝通
6）設備管理與作業管理
7）安全文件
8）事件、事故通報與調查
9）變革管理
10）緊急應變
11）稽核、審查輿評估
12)持續改進

SMS 架構及其 12 要項
SMS Structure and Its 12 Important Points

2.研究成果

（1）提出以PDCA循環為架構之安全保證流程，如圖2。

（2）研擬我國安全保證實務操作指引，包含5要項（設備管理與作業管理、事故事件通報與調查、變革管理、內部稽核審查評估、持續改進等5個SMS要項）、19步驟及逾百項子步驟。

（3）以我國鐵路系統、捷運系統為案例，撰寫安全保證教育訓練教材。

2.Research Outcomes

(1) Propose the Safety Assurance Process based on the PDCA cycle, as shown in Figure 2

(2) Draft our country's Safety Assurance Practical Operation Guidelines, including five important points (five SMS important points of Equipment Management and Operation Management, Accident Incident Notification and Investigation, Change Management, Internal Audit Review and Evaluation, Continuous Improvement), 19 steps and over 100 sub-steps.

(3) Compose Safety Assurance education and training materials with our country's railway system and MRT system as the cases.

3.成果推廣與效益

（1）透過本研究所發展實務操作指引可協助營運機構進一步精進既有安全保證作業，思考如何從有（Present）到適當（Suitable），從有做（Operation）到有效（Effective）。

（2）以PSOE（Present、Suitable、Operation、Effective）檢核表盤點臺鐵局運、工、機、電四處的安全保證推動現況（含變革管理），並研提16項後續推動建議。

（3）透過制度化之安全保證作業，降低事故之發生。

4.研究成果精華摘整

3.Promotion of Outcomes and Benefits

(1) Through the Practical Operation Guidelines developed by the Institute, assist the operating organizations to further improve the existing Safety Assurance operations, thinking about how to go from Present to Suitable, and from Operation to Effective.

(2) Use the PSOE (Present, Suitable, Operation, Effective) checklist to check the Safety Assurance promotion status (including Change Management) of four Departments of the Taiwan Railways Administration, including Transportation, Construction, Rolling Stock, and Electrical Engineering Department, and propose 16 subsequent promotion recommendations.

(3) Reduce the occurrence of accidents through systematic Safety Assurance operations.

4.Summary of Research Outcomes

安全保證與相關要項於安全管理系統內之關係
The Relationship between Safety Assurance and Related Important Points in the Safety Management System

5.研究成果報告

· 鐵路運輸安全管理系統(SMS)制度化策略之研擬(108年出版)

5.Report of Research Outcomes

· A Study in Railway Safety Management System – the Development of Strategies for Building the Mechanism (published in 2019)

（五）運輸場站無障礙電梯改善方案評估

1.計畫概述

聯合國身心障礙者權利公約之宗旨闡明「應促進、保護和確保實現身心障礙者所有人權，尤其在維持自主、自立及其應擁有的社會權，不因生、心理上的損傷與各種障礙，阻礙其與他人充分、有效與獨立參與社會的平等性」；然而在近年蓬勃發展的各種高架、地下化運輸場站，卻造成行動弱勢族群使用不便，進而影響其透過公共運輸達成其社會、經濟活動的基本權力。

本研究以臺北捷運系統為例，探討各類電梯使用者的行為特性，研究發現行動弱勢族群必須等候超過一班電梯較一般使用者高4.8倍，且當需要禮讓時，近半數的狀況下，一般使用者不願意禮讓，顯示對行動弱勢族群而言，運輸場站無障礙電梯在使用上仍有相當壓力與不便。為改善運輸場站無障礙電梯之服務水準，本研究研提改善設施、優化管理、強化宣導三個主軸共計14項改善方案，並在其中歸納出以宣導與管理為主的4個優先推動、5項可視情況推動的改善方案，提供未來場站規劃、經營管理單位參考應用。

2.研究成果

（1）建立運輸場站無障礙電梯使用狀況調查程序及分析架構，可供未來運輸場站規劃、經營管理單用應用參考。

（2）整合行動弱勢族群及運輸場站規劃、經營管理者之觀點，歸納4項優先推動、5項可視情況推動的改善方案。

3.成果推廣與效益

（1）本所於108年11月15日至交通部性別平等專案小組第7屆第4次會議報告，發表本所相關成果，並獲得與會專家學者之高度認同。

（2）本所於109年1月13日辦理座談會，邀請運輸場站管理機關、行動弱勢族群參與，了解本案內容並就未來發展願景交流互動。

(5) Evaluation of Improvement Programs for Accessible Elevators in Transportation Stations

1.Project Overview

The purpose of the United Nations Convention on the Rights of Persons with Disabilities states "to promote, protect and ensure the realization of all human rights by all persons with disabilities, especially in maintaining autonomy, self-reliance and their due social rights, not due to their physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full, effective and independent participation in society on an equal basis with others."; however, various elevated and underground transportation stations that have been vigorously developed in recent years have caused inconvenience to the use of persons with mobility-disadvantage, which further affects their basic rights to participate in social and economic activities through public transportation.

This research uses the Taipei MRT system as an example to explore the behavioral characteristics of various elevator users. The study found that the persons with mobility-disadvantage must wait 4.8 times longer for one trip in an elevator than general users have to wait, and when comity is required, in nearly half of the cases, the general users are unwilling to give precedence out of courtesy, which shows that for the persons with mobility-disadvantage, the use of accessible elevators in transportation stations is still under pressure and inconvenience. In order to improve the service level of accessible elevators in transportation stations, this research has proposed a total of 14 improvement programs in the three main schemes of improving facilities, optimizing management, and strengthening publicity, and concluded four improvement programs to be promoted in priority, and five programs can be promoted depending on situations based on publicity and management, to provide a the reference for future transportation station planning and the operation management units.

2.Research Outcomes

(1) Establish a survey procedure and analysis framework for the use of accessible elevators in transportation stations; can be provided as the reference for future transportation station planning and the operation management units.

(2) Integrate the viewpoints of persons with mobility-disadvantage and transportation station planning, operation managers, to summarize improvement programs with four programs to be promoted in priority and five programs which can be promoted depending on the situation.

3.Promotion of Outcomes and Benefits

(1) On November 15, 2019, the Institute went to the 4th Meeting Report of the 7th Gender Equality Task Force of the Ministry of Transportation and Communications to present the Institute's relevant achievement, and was highly approved by the experts and scholars at the Meeting.

(2) The Institute held a symposium on January 13, 2020, inviting transportation station management agencies and persons with mobility-disadvantage to participate, to understand the content of this project and exchange and interact on the vision of future development.

4.研究成果精華摘整
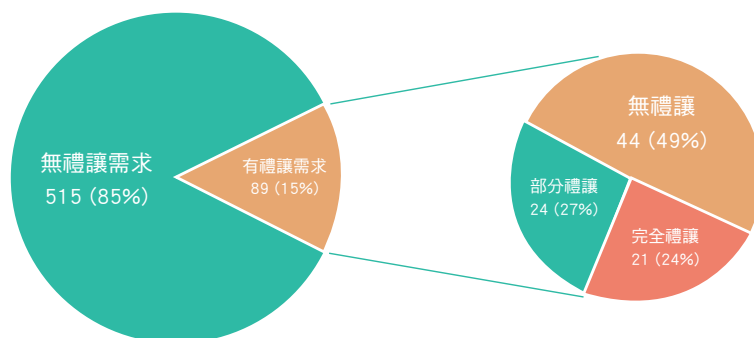
臺北捷運系統月臺無障礙電梯禮讓狀況
The Comity Status of Accessible Elevators on Taipei MRT Platform

	行動弱勢族群		場站規劃 / 經營管理	
	有效性	可行性	有效性	可行性
A：新設無障礙電梯，提高無障礙設施運能				
A1：改裝原月台中央處，增加電梯空間			∨	∨
A2：現有月台電梯旁，新設一電梯				∨
A3：於月台中央處，或其他進出站、轉乘動線上新設電梯				
A4：於轉乘、進出站動線外新設電梯				∨
A5：新設行動不便族群專用電梯				∨
B：優化管理，改善無障礙電梯服務品質				
B1：增加電梯彩繪	∨	∨	∨	∨
B2：強化優先等候區標示	∨		∨	
B3：增加尖峰時段 / 站點引導人員				
B4：尖峰時段 / 站點之月台電梯限制特定族群使用			∨	∨
C：加強宣導，提升國人禮讓文化				
C1：全天站內、車廂廣播	∨	∨		
C2：電梯前廣播				
C3：靜態海報宣導	∨	∨	∨	
C4：站內螢幕播放影片	∨	∨		
C5：各類多媒體、網路平台廣告	∨	∨		∨

捷運場站無障礙電梯改善方案有效性與可行性綜合比較
Comprehensive Comparison of Effectiveness and Feasibility of Accessible Elevators Improvement Program in MRT Stations

5.研究成果報告

- 公共運輸場站無障礙電梯使用狀況調查與改善方案評估：以臺北捷運為例 (109年出版)

5.Report of Research Outcomes

- An Observation on Accessible Elevator Users Behavior and Improvement Strategy Evaluation: A Case of Taipei MRT System (published in 2020)

（六）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之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，已列為交通部每年提昇道路安全之首要工作。

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，並委由運輸研究所自民國69年開始辦理第1期計畫，迄今已完成37期，並持續辦理報告研提及執行，第38期計畫，交通部已於108年12月17日核定。

本計畫主要係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，另結合本所「混合車流路口道路交通工程改善設計範例」，針對交通部及縣市政府所屬各級道路交通管理單位、各交通工程顧問公司有關交通工程從業人員為對象，進行易肇事路段改善技術方法提升的教育訓練。本計畫同時邀集交通部、內政部警政署、各縣市政府警察局、交通部公路總局、各縣市政府交通管理單位對於易肇事地點進行會勘，研議改善方式。

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

本計畫以105年(第34期)易肇事地點改善計畫之改善地點共計103處為例，其改善前之年肇事(104年)件數合計1,758件、死亡7人、受傷2,356人，改善工程完成後之年肇事(107年)件數1,030件、死亡4人、受傷1,367人，故改善前後之績效顯示，死亡人數減少3人、受傷人數減少989人。

(6) Improvement Plan for the Road Sections Prone to Accidents

1.Project Overview

With the development of our country's economy, the use of land around roads and industrial activities continues to change over time, and road construction, traffic conditions and traffic flow are also constantly shifting. Therefore, in order to respond to the changes in road environment and traffic conditions, and to effectively reduce the number of possible traffic accidents, to maintain road safety and to effectively and continuously improve road traffic facilities, it has been listed as work with top priority by the Ministry of Transportation and Communications for improving road safety every year.

This project is based on the "National Improving Road Traffic Order and Safety Plan" promulgated by the Executive Yuan, which is listed as a long-term task by the Ministry of Transportation and Communications, and commissioned the Institute of Transportation to manage the first phase of the project since 1980, with 37 phases completed to date, and continues to manage the report research proposal and implementation. The 38th phase of the project was approved by the Ministry of Transportation and Communications on December 17, 2019.

This project is mainly aimed at the areas of road sections prone to accidents within the jurisdiction of each county and city government as the scope of improvement. Starting from the 37th phase, the Ministry of Transportation and Communications has invested in relevant subsidy funding mechanisms to guide the improvement, and combined with the Institute's "Design Model on Road Traffic Engineering Improvement at Intersection under Mixed Traffic" targeting the relevant traffic engineering workers of the Ministry of Transportation and Communications, Road Traffic Management Units of all levels subordinated to the county and city governments and all transportation engineering consultant companies, to conduct education and training on the improvement technology methods for the road sections prone to accidents. The project also invites the Ministry of Transportation and Communications, the National Police Agency of the Ministry of the Interior, the police stations of all county and city governments, the Directorate General of Highways of the Ministry of Transportation and Communications, and the traffic management units of all county and city governments to conduct surveys on the locations prone to accidents, and discuss the methods of improvement.

2.Research Outcomes

(1) Complete the collection of data on road traffic accidents in the Taiwan area over the years, and analyze the number of accidents, the number of deaths, and the number of injuries on the road sections prone to accidents.

(2) Complete the site survey work of the road sections prone to accidents, and propose the improvement program summarized into a report to be delivered to all road competent authorities for implementation after approval by the Ministry of Transportation and Communications.

3.Promotion of Outcomes and Benefits

This project takes the improvement location prone to accident in the 2016 location improvement plan (34th Phase)

for a total of 103 locations as an example. The total number of accidents (2015) in the year before the improvement was 1,758, 7 people died, and 2,356 people were injured. In the year after the completion of the improvement plan (2018), there were 1,030 accidents, 4 people died, and 1,367 people were injured; hence, the performance before and after the improvement showed that the number of deaths decreased by 3 and the number of injured decreased by 989.

4.研究成果精華摘整

4.Summary of Research Outcomes
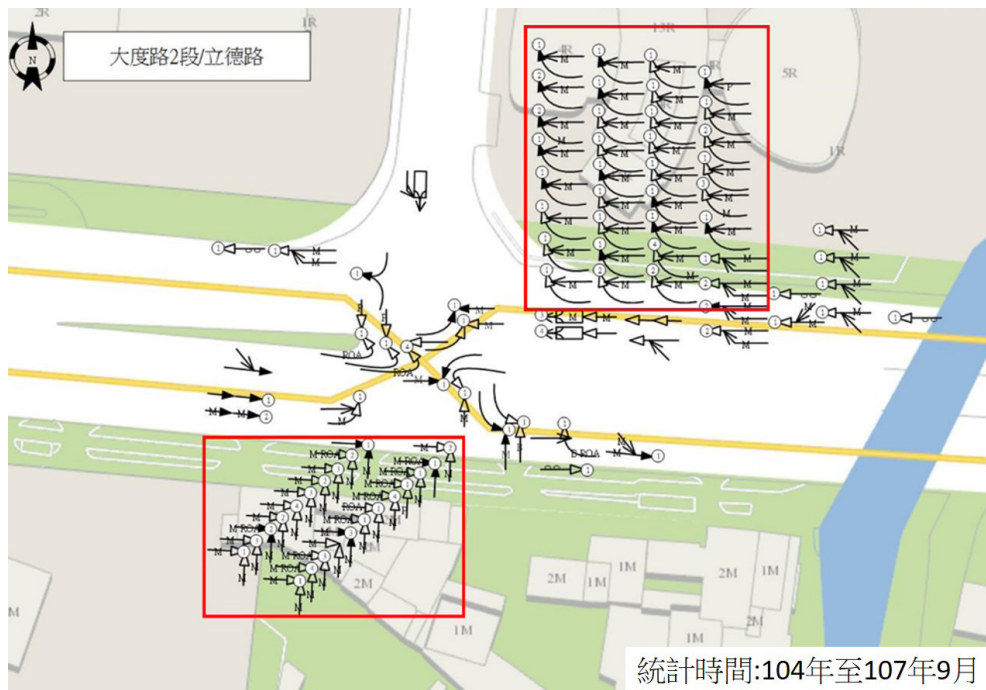
易肇事路段肇因分析技術 - 事故碰撞構圖
Accident Cause Analysis Technology of Road Sections Prone to Accidents – Accident Collision Composition

第 37 期臺灣地區易肇事路段改善計畫路口
Intersection of the 35th Improvement Plan for the Taiwan Area Road Sections Prone to Accidents

5.研究成果報告

5.Report of Research Outcomes

‧ 第37期臺灣地區易肇事路段改善計畫(109年出版)

‧ The 37th Project for Improving Accident-Prone Locations in the Taiwan Area (published in 2020)

四、公路客貨運輸創新研究與應用

（一）智慧節能車機應用於公共運輸產業發展之研究-以公車為例

1.計畫概述

節能減碳係我國目前正在推動之重大政策目標，而燃油成本為汽車客運業成本支出僅次於人事成本之項目，基於協助汽車客運業節能及減少燃油成本支出，本研究以擬訂智慧節能車機建議技術規範及開發智慧節能車機雛型機為重點，希望透過開發智慧節能車機雛型機，實際應用於市區汽車客運業及公路汽車客運業，除降低業者燃油成本外，亦有助於降低政府虧損補貼款之支出；另外，藉由智慧節能車機蒐集之數據，分析導正駕駛員駕駛行為，可協助客運公司達到節能及降低營運成本之目的。本研究開發之智慧節能車機，亦可提供產業界加值應用，期透過產業界創新之加值應用，提升發展車聯網產業能量。

爰此，本研究之目的係結合車機廠商及客運業者，開發以節能為目標之車機產品，並預留可介接車聯網相關資訊空間，擴大相關應用，以研究商品化為目標，成果以技術授權為主，帶動包括汽車客運業及車機產業之上中下游產業發展。

2.研究成果

（1）完成智慧節能車機軟、硬體系統建議技術規範，以及雛型機開發及測試。本研究透過實車測試之實驗方式，挑選台中客運304路及154路(含國道)兩條路線之10輛車進行為期83天(事前53天、事後30天)的測試，並進行相關資料之蒐集與分析，分析結果顯示事前之平均油耗效率為2.42(公里/公升)，事後平均油耗效率為2.54(公里/公升)，提升約5%；若只考慮手排車(即154路)部分，則油耗效率可提升5.82%(從2.75公里/公升增加至2.91公里/公升)，統計檢定的結果，亦顯示油耗效率之提升具有顯著性，故在節油部分，智慧節能車機確實可以達到具體的成效。此外，警示系統可提示駕駛者避免急加減速與低檔位高速等駕駛行為，在節油駕駛的同時亦可提升乘客搭乘之舒適度與降低車輛零部件之耗

IV. Creative Research and Application on Highway Passenger and Cargo Transportation

(1) The Study of Smart Energy Saving Telematics used in the Development of Public Transportation Industry – Taking the bus as an example

1.Project Overview

Energy-saving and carbon-reduction is a major policy goal currently being promoted by our country, and fuel cost is the item that is second only to personnel costs in the bus industry. Based on assisting the bus industry to save energy and reduce fuel costs, this research is based on formulating the smart energy-saving telematics recommended technology specifications and developing the smart energy-saving telematics prototype as the key point, hoping that through the development of the smart energy-saving telematics prototype, it can be used in the urban and highway bus industries, which will not only reduce the fuel costs for bus companies, but also help to reduce the expenditure of government subsidies for losses; in addition, the data collected by smart energy-saving telematics can be used to analyze and guide the driving behavior of drivers, which can help the bus companies achieve the purpose of saving energy and operating cost reduction. The smart energy-saving telematics developed in this research can also provide the industry with value-added applications, expecting that through the innovative value-added applications by the industry, the energy for the development of the Internet of Vehicles industry can be enhanced.

Therefore, the purpose of this research is to combine the telematics manufacturers and bus companies to develop telematics products with the goal of saving energy, and to reserve a space that can be interfaced with the Internet of Vehicles related information, and expand related applications, with research commercialization as the goal. The result is mainly for technology licensing to drive the development of upstream, midstream and downstream industries including the bus industry and the telematics industry.

2.Research Outcomes

(1) Completed the smart energy-saving telematics software, hardware system recommended technical specification, and the prototype development and testing. Through the experimental method of real vehicle testing, this research selected 10 buses for two routes of Taichung Bus Company 304 and 154 (including National Highway) to conduct testing for 83 days (53 days before the testing, 30 days after the testing), and collect and analyze the relevant information. The analysis results showed that the average fuel consumption efficiency was 2.42 (km/liter) before the testing, and the average fuel consumption efficiency was 2.54 (km/liter) after the testing, with an increase of about 5%; if only considering the bus with manual transmission (i.e. Route 154), the fuel consumption efficiency can be increased by 5.82% (from 2.75 km/liter to 2.91 km/liter). The statistical test results also show that the increase of fuel consumption efficiency is significant; therefore, in the fuel-saving part, smart energy-saving

損，增進客運業者之企業形象。

（2）完成智慧節能車機開發之專利技術授權行政作業程序、規範及申請方式之研擬，並於109年啟動專利申請程序。

3.成果推廣與效益

（1）本研究完成智慧節能車機系統軟、硬體規劃、設計與技術規範研議，研究成果將申請專利，俾利後續本所推廣應用，並提供交通部公路總局或地方縣市政府做為補助客運業者建置之參據。

（2）質化效益部分，智慧節能車機除了可以提醒駕駛者改善耗油駕駛行為、改善業者對駕駛者之駕駛行為管理及協助業者建立節能管理制度外，對於配合政府(公路主管機關)節能減碳政策並推動公共運輸產業發展，以及提供智慧型運輸系統前瞻技術發展之基礎，亦有相當正面之助益。

（3）量化效益部分，安裝智慧節能車機後，每車每月可節省新台幣$3,065元的油料成本，假如未來智慧節能車機能夠持續推廣並擴大安裝至台中客運510輛公車時，則公司每月可節省的油料成本將高達新台幣156萬餘元。另一方面，在設備投資成本的回收期部分，若假設目前每套車機設備之費用為新台幣4萬元，則不到14個月即可回收成本。

telematics can indeed achieve specific results. In addition, the warning system can remind the driver to avoid driving behaviors of rapid acceleration and deceleration and low transmission gears with high speeds, at the same time as fuel-efficient driving; it can also improve the comfort of passengers and reduce the wear and tear of vehicle parts, thereby enhancing the corporate image of the bus industry

(2) Completed the planning of administrative procedures, specifications and application methods for patented technology authorization of smart energy-saving telematics development, and started the patent application procedure in 2020.

3.Promotion of Outcomes and Benefits

(1) This research completes the smart energy-saving telematics software and hardware planning, design and technical specifications proposal, and applies for patents for the research outcomes, in order to facilitate the subsequent promotion and application by the Institute, and provides the Directorate General of Highways of the Ministry of Transportation and Communications or local county and city governments a reference to subsidize the building of bus companies.

(2) In terms of qualitative benefits, in addition to reminding drivers to improve fuel-consuming driving behavior, improving the management of driving behavior of the bus companies for their drivers, and assisting the bus companies in establishing an energy-saving management system, the smart energy-saving telematics also have positive benefits in cooperation with the government (the highway competent authority) energy conservation carbon reduction policies and promote the development of the public transportation industry, as well as provide the basis for the development of forward-looking technologies for smart transportation systems.

(2) In terms of quantitative benefits, after the installation of smart energy-saving telematics, each vehicle can save NT$3,065 in fuel costs per month. If the future smart energy-saving telematics can continue to be promoted and expanded with the installation in 510 buses of Taichung Bus, the company can save a fuel cost up to NT$ 1.56 million every month. On the other hand, in the payback period of the equipment investment cost, if assuming that the current cost of each set of telematics equipment is NT$40,000, the cost can be recovered in less than 14 months.
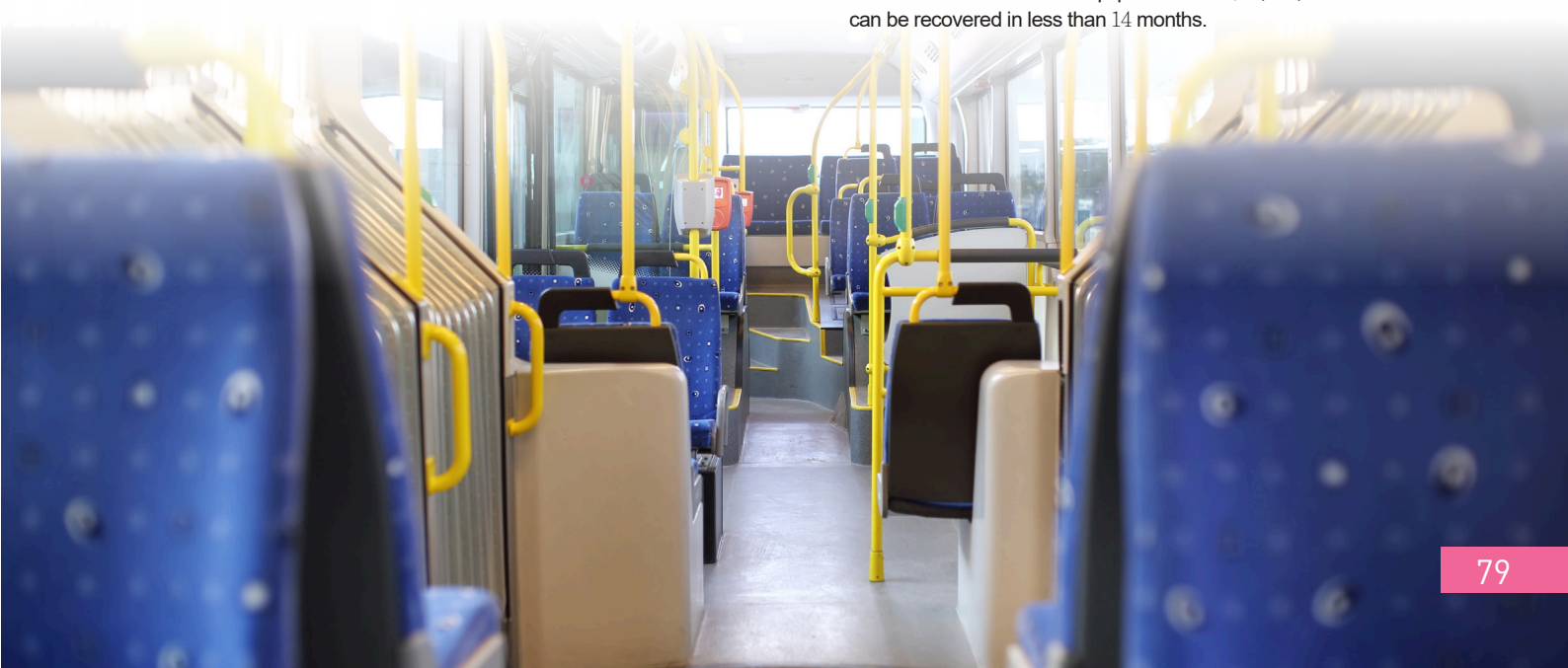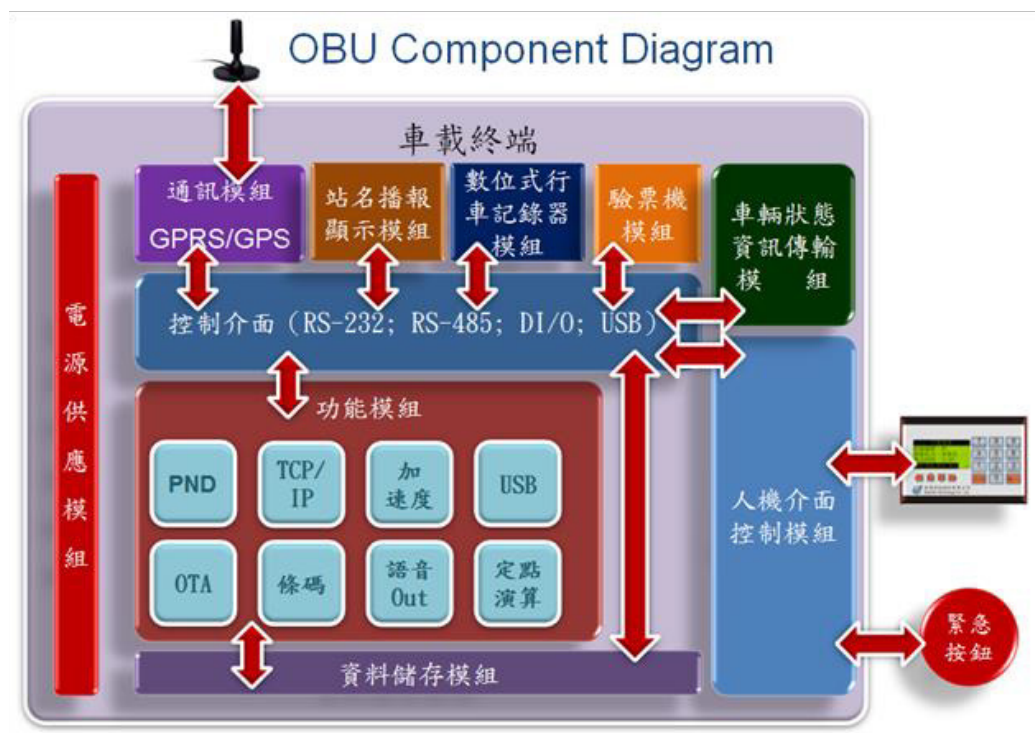
4.研究成果精華摘整　　　　　　　4.**Summary of Research Outcomes**

智慧節能車機軟硬體開發關聯性及功能説明
Relevance and Function Description of Software and Hardware Development of Smart Energy-saving Telematics

智慧節能車機終端設備功能架構示意圖
Schematic Diagram of the Functional Architecture of Smart Energy-saving Telematics Terminal Equipment

- 驗證智慧節能車機即時警示功能是否可改善駕駛行為及具節能效益
- 同時搭配車輛燃油效率(行駛里程/耗油量)進行節能成效驗證
- 最終針對受測者進行問卷訪談，以瞭解滿意度及相關建議

第一階段：行為資料蒐集 → 門檻值探討

第二階段：行為資料蒐集 → 事前事後差異性檢定

節能成效 = ƒ (駕駛行為指標值(採用智慧節能車機前)-駕駛行為指標值(採用智慧節能車機後))

智慧節能車機軟硬體開發關聯性及功能説明
Two-stage Verification Description for Energy Saving of Smart Energy-saving Telematics

■ 質化效益評估-業者實際應用與意見反饋

☐ 以燃油費用而言，每月每輛車可節省台幣約3000餘元，已超出原先的預期，對於公司的成本支出是有相當正面的助益。

☐ 節能車機確實可達到提醒駕駛員的功效，會相對較為注意駕駛行為，避免急加減速，乘客的舒適度也會有所提升，並有利提升企業形象。

☐ 台中客運對本計畫成效表達高度肯定，惟目前節能車機設備建置費用為計畫支應，未來投入與否仍須視設備購置相關商業模式而定。

智慧節能車機質
化效益説明 Description of the Qualitative Benefits of Smart Energy-saving Telematics

■ 量化效益評估(台中客運)

🚌 平均行駛里程數(107年)：6364 km/月/車

事前 新台幣 $64,884　　　事後 新台幣 $61,819

燃油費用節省比例：4.72 %
燃油費用節省 ：新台幣 $3,065 元/月/車

14個月即可回本(設備硬體投資4萬)
全車隊導入可節省約150萬/月 (500輛規模)

編號	分析項目	單位	數值	備註(公式)
A	受測車輛於107年月平均里程	公里/月/車	6364.79	-
B	108年9月份柴油均價	新台幣$元/公升	24.67	能源局網站
C	事前油耗效率	公里/公升	2.42	-
D	事前每車每月油耗量	公升/月/車	2630.08	(A/C)
E	事前每車每月油料費用	新台幣$元/月/車	64,884	(D×B)
F	事後油耗效率	公里/公升	2.54	-
G	事後每車每月油耗量	公升/月/車	2505.82	(A/F)
H	事後每車每月油料費用	新台幣$元/月/車	61,819	(G×B)
I	每車每月節省成本	新台幣$元/月/車	3,065	(E-H)
J	油料節省成本效益	%	4.72%	((E-H)/E)×100%

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智慧節能車機量化效益説明
Description of the Quantitative Benefits of Smart Energy-saving Telematics
5. 研究成果報告

5.研究成果報告

· 智慧節能車機應用於公共運輸產業發展之研究-以公車為例 (109年出版)

5.Report of Research Outcomes

· The Study of Smart Energy Saving Telematics used in the development of Public Transportation Industry - taking bus as an example (published in 2020)

（二）車載診斷系統（OBD）在運輸科技管理之應用研究

1.計畫概述

車載診斷系統(On-Board Diagnostic, OBD)自1996年發展至今，已經成為小客車及小貨車的標準配件，OBD可即時監控的行車狀況，包括車速、引擎轉速、冷卻水溫、含氧感知器等，若有廢氣控制相關元件故障，OBD會產生故障訊號，並亮起故障燈號，提醒駕駛人進行車輛維修，以降低環境污染。在政府主推智慧城市、物聯網的趨勢下，對行駛中的車輛監測數據進行反饋或是驗證，是一項無法避免的重要工作，OBD是目前唯一安全可靠，且經過國際ISO/SAE認證的標準介面，可用以讀取車輛資訊，因此OBD對於公共運輸的發展可發揮不可取代的關鍵角色。為強化我國OBD在運輸科技管理上的應用，本研究欲透過OBD所蒐集資料於運輸科技管理之應用，進行全面性的探討，包括交通管理、交通安全、資料應用、環境保護等方面應用之可行性與策略分析，以提昇運輸產業、車輛及道路之使用效能及節能效率，確保政策之妥適性，並做為交通主管機關研擬相關科技管理政策之參據。

2.研究成果

（1）本研究完成國內外與OBD相關之法規與應用案例分析，並盤點國內暢銷車型共26款之OBD產出資料格式、資料精度與開放資料，以利後續推廣與延伸研究之用。

（2）透過OBD所蒐集及彙整之資料，進行OBD於運輸科技管理之應用進行全面性的探討，包括交通管理、交通安全、資料應用、環境保護等方面之可行性與策略分析，並做為交通主管機關研擬相關科技管理政策之參據。

（3）實作一套OBD雲端故障診斷系統，該系統可以將受測車輛的OBD資料透過行動網路上傳至雲端運算平台進行解析，使用者可從雲端平台檢視該車目前車輛運轉訊息、故障預警以及故障診斷情況，對於後續推廣OBD的相關交通應用有所助益。

(2) Research on Application of On-board Diagnostic System (OBD) in Transportation Technology Management

1.Project Overview

The On-Board Diagnostic (OBD) has become a standard accessory for passenger cars and small trucks since its development in 1996. OBD can instantly monitor the driving conditions, including vehicle speed, engine speed, cooling water temperature, and oxygen sensor; if there is a fault of exhaust gas control components, the OBD will generate a fault signal and turn on a fault light to remind the driver to repair the vehicle to reduce environmental pollution. Under the trend of promoting smart cities and the Internet of Things by the Government, it is unavoidable and important work to feedback or to verify the monitoring data of vehicles in driving condition. OBD is currently the only safe and reliable standard interface that has passed the international ISO/SAE certification which can be used to read vehicle information, so OBD can play an irreplaceable role in the development of public transportation. In order to strengthen the application of OBD in transportation technology management in our country, this research intends to conduct a comprehensive discussion on the application of information collected by OBD in transportation technology management, including the feasibility and strategy analysis of applications in the area of traffic management, traffic safety, data application, and environmental protection to improve the transportation industry, efficiency of vehicle and road use as well as energy-saving efficiency, to ensure the appropriateness of policies, and to serve as the reference for the competent authorities in charge of transportation to develop relevant technology management policies.

2.Research Outcomes

(1) This research completed the analysis of domestic and foreign laws, regulations and application cases related to OBD, and checked the OBD output data format, data accuracy and open data for a total of 26 domestic best-selling models to facilitate the use of subsequent promotion and extended research.

(2) Through the data collected and summarized by OBD, a comprehensive discussion on the application of OBD in transportation technology management was conducted, including feasibility and strategic analysis in traffic management, traffic safety, data application, environmental protection, etc., and used as the reference for the competent authorities in charge of transportation to develop relevant technology management policies.

(3) Implemented a set of OBD cloud fault diagnosis systems, which can upload the OBD data of the tested vehicle to the cloud computing platform for analysis through the mobile network, and the user can view the current vehicle operation information and fault early warning and fault diagnosis condition of the vehicle from the cloud platform, which are helpful to the subsequent promotion of OBD related traffic applications.

（4）發表研究成果相關論文3篇，其中2篇為國內研討會論文，1篇為國際研討會論文，並有一篇國內研討會論文獲得佳作論文獎；本研究完成之「OBD車輛健康履歷系統」，其相關衍生作品參加專題實作競賽共獲獎4次。

3.成果推廣與效益

（1）於108年6月及7月舉辦兩場OBD教育訓練，推廣及說明OBD之演進歷程，並說明各國目前應用情形以及未來可能應用面向。

（2）於108年8月8日舉辦第一場專家學者座談會，邀請產官學各界人士，針對本研究階段性成果，包含國內外OBD相關法規與應用案例分析、盤點國內暢銷車款之OBD產出資料格式、OBD資料精度及開放資料與欄位配套作法、OBD雲端故障診斷系統實作等議題進行探討。

（3）於108年11月5日舉辦第二場專家學者座談會，邀請產官學各界人士針對本研究於OBD在運輸科技管理之應用領域進行探討，包括交通管理、交通安全、資料應用及環境保護等議題。

4.研究成果精華摘整

(4) Three papers were published related to research outcomes, of which two were domestic seminar papers, one was an international seminar paper, and one domestic seminar paper won the Excellent Paper Award; the derived papers related to the "OBD Vehicle Health History Record System" completed in this research participated in the thematic implementation competition were awarded four times.

3.Promotion of Outcomes and Benefits

(1) Organized two sessions of OBD training workshops in June and July 2019 to promote and explain the evolution history of OBD, and explain the current application situation and possible future application aspects in various countries.

(2) Held the first symposium of experts and scholars on August 8, 2019 inviting people from all sectors of industry, government and academia to discuss the issues aiming at the phased results of this research, including analysis of relevant domestic and foreign OBD laws, regulations and application cases, and inventoried the OBD output data format of the domestic best-selling car models, OBD data accuracy and open data and field supporting practices, and the implementation of the OBD cloud fault diagnosis system.

(3) The second symposium of experts and scholars was held on November 5, 2019, inviting people from all sectors of industry, government, and academia to discuss the issues aiming at the OBD in the application fields of transportation technology management in this research, including traffic management, traffic safety, data application and environmental protection.

（1）交通管理

（2）交通安全

4.**Summary of Research Outcomes**

(1) Traffic Management

微波車輛偵測器　　　　OBD

空間點位比對
擷取通過VD布設點位之OBD車速資料(點速率)

VD 資料驗證

平均數差異檢定
比較由VD偵測和
OBD資料計算所得之
每分鐘平均速率

變異數差異檢定
比較每小時內VD 所
偵測(每分鐘)速率分
布與 OBD 紀錄速率
分布
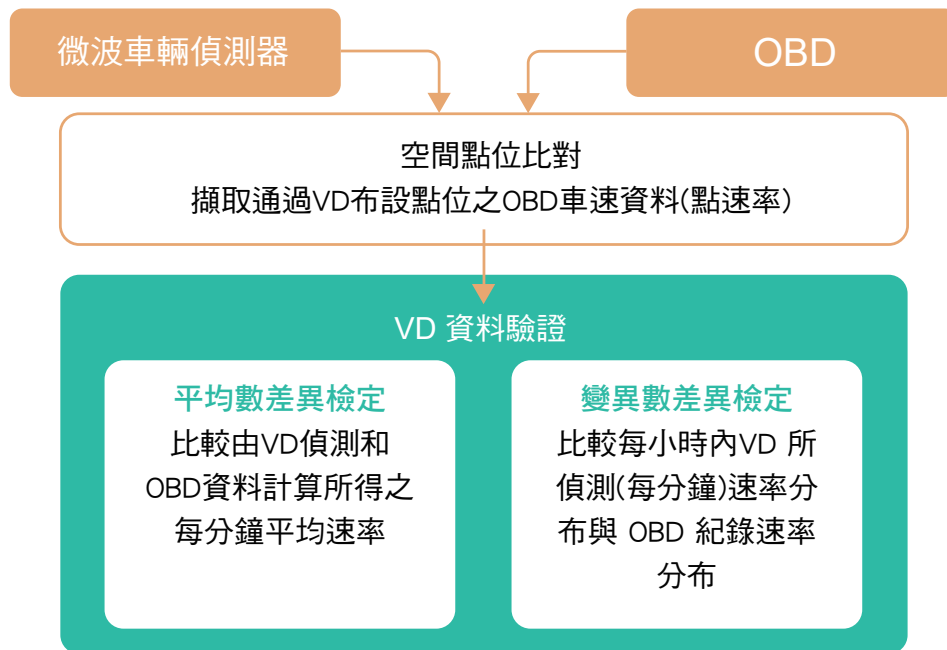
利用 OBD 進行車流偵測與管理並與傳統 VD 資料驗證與校估
Use OBD for Traffic Flow Detection and Management and Calibrate and Validate with Traditional VD Data
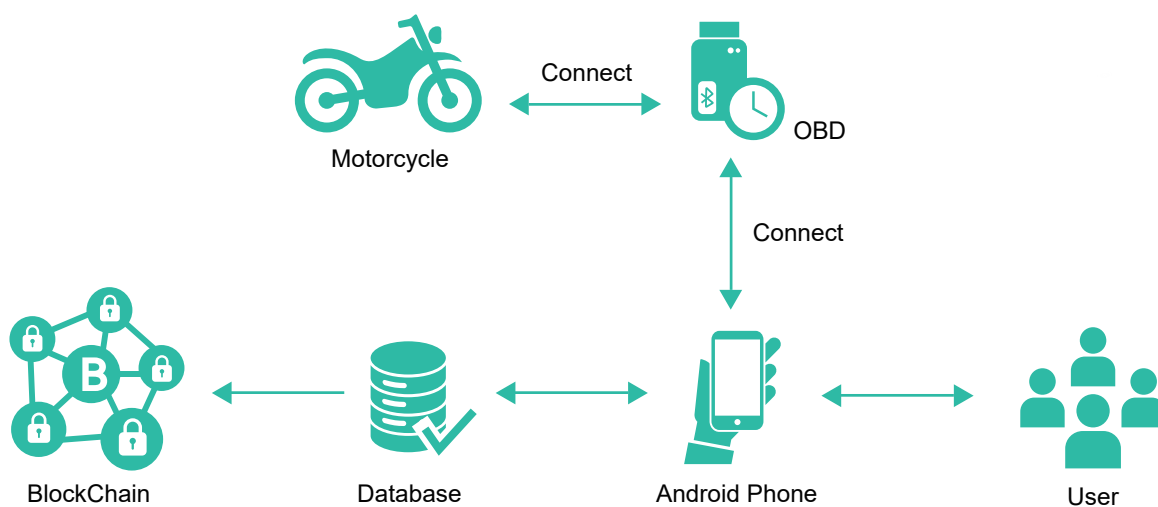
（3）資料應用

(2) Traffic Safety

OBU 資料指標
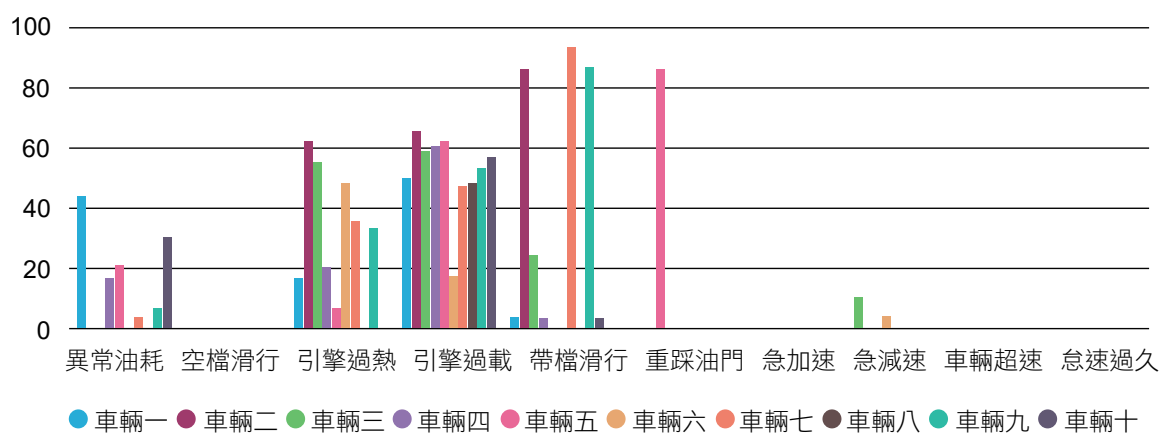
利用 OBD 進行駕駛行為分析並架構相關指標
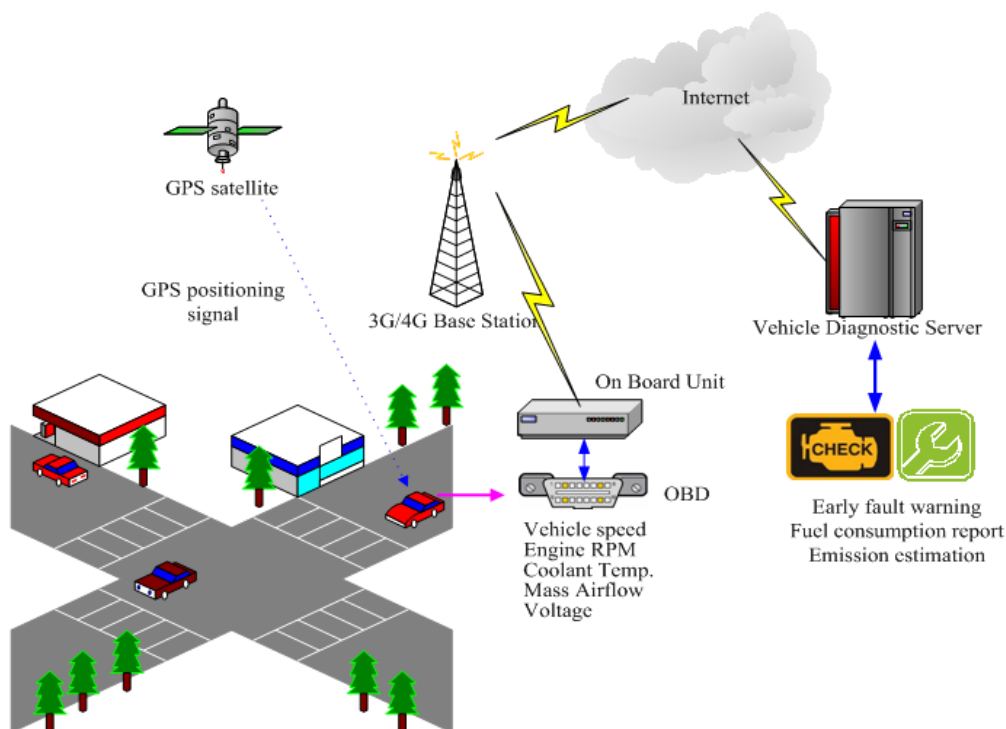Use OBD to Conduct Driving Behavior Analysis and Construct Relevant Index

（4）環境保護

(3) Data Application

利用 OBD 資料建置車輛健康履歷系統
Use OBD Data to Build Vehicle Health History Record System

5.研究成果報告

(4) Environmental Protection

利用 OBD 改良低排放區 (Low Emission Zone, LEZ) 管制方法
Use OBD to Improve the Low Emission Zone (LEZ) Control Method

‧車載診斷系統(OBD)在運輸科技管理之應用研
究 (109年出版)

**（三）公共運輸縫隙掃描決策支援系統
之維運、功能強化及教育訓練**

5.**Report of Research Outcomes**

‧ A Study of the Applications of On-Board Diagnostic System
(OBD) for Transportation Technology Management
(published in 2020)

1.計畫概述

　　為協助地方政府快速瞭解轄管地區之公車服務缺口狀況及評估運輸資源配置調整之影響，本所自101年起將交通部公路總局及各縣市公車動態資訊系統資料庫，結合地理資訊系統、人口分布資料及公車營運資料等進行加值應用，研發「公共運輸縫隙掃描決策支援系統」；系統可產製相關評估指標值及分析圖表，具有協助交通主管機關進行公車路網規劃之決策支援功能，可克服過去因相關資訊不足只能仰賴經驗法則所導致的管理盲點，使公車服務供給更符合民眾需求。本系統除供本所及交通部公路總局相關業務應用外，本所於103年11月起公告無償授權交通主管機關使用，截至108年已有17個縣市政府及6個區域運輸發展研究中心向本所申請授權使用。為利110年起將本系統維運工作移轉交通部公路總局負責，本所於108-109年進行本系統之維運、功能強化及教育訓練工作。

2.研究成果

（1）更新系統資料庫內容。

（2）強化系統功能：

　　a.提升系統運算效能，縮短系統產製相關分析圖表所需時間。

　　b.對於系統產製之分析圖表，增加浮水印功能以確認圖表產製來源。

　　c.對於家戶可及性之分析，評估以最小統計單元來進行分析。

　　d.對於重要地標移動性之分析，評估精進小汽車及公車行駛速率推估之方法。

（3）提供技術諮詢服務與教育訓練。

（4）依系統最新功能架構編撰操作手冊，

（5）建立推廣應用績效追蹤調查機制。

3.成果推廣與效益

（1）辦理教育訓練培訓6個區域運輸發展研究中

(3) Maintenance, Function Strengthening and Training Workshop of the Decision-making Support Systems on Scanning the Service Gap of Public Transportation

1.Project Overview

　　In order to assist the local governments to quickly understand the gap in bus services in the areas under their jurisdiction and assess the impact of adjustments in transportation resources allocation, since 2012 the Institute has taken the bus dynamic information system database of the Directorate General of Highways of the Ministry of Transportation and Communications and all counties and cities, combined with the geographic information system, population distribution data and bus operation data to conduct value-added applications, and develop the "Decision-making Support Systems on Scanning the Service Gap of Public Transportation." The system can produce relevant evaluation index values and analysis charts and has the decision-making support function to assist the competent authorities in charge of transportation in the planning of the bus road network, and it can overcome the management blind spots caused by the lack of relevant information and can only rely on the rules of experience in the past, so that the supply of bus services can be more in line with the needs of the people. In addition to the relevant business applications of the Institute and the Directorate General of Highways of the Ministry of Transportation and Communications, the Institute announced in November 2014 that this system is authorized for use by the competent authorities in charge of transportation free of charge. As of 2019, there have been 17 county and city governments and 6 regional centers for transportation research and development that have applied from this Institute for authorization to use the system. In order to facilitate the transfer of the maintenance work of this system to the Directorate General of Highways of the Ministry of Transportation and Communications starting 2021, the Institute conducted maintenance, function strengthening and educational training works of the system from 2019 to 2020.

2.Research Outcomes

(1) Updated the contents of the system database.

(2) Strengthened the system functions:

a. Improve system computing efficacy and shorten the time required for the system to produce relevant analysis charts.

b. Add the watermark function for the analysis charts produced by the system to confirm the source of the chart production.

c. For the analysis of the accessibility of households, the evaluation is analyzed in the smallest statistical unit.

d. For the analysis of the mobility of important landmarks, evaluate the method of improving the estimation for the driving speed of small passenger cars and buses.

(3) Provide technical consulting services and educational training.

(4) Compile the operation manual based on the latest functional architecture of the system,

(5) Establish the tracking and investigation mechanism to promote application performance.

心人員熟悉本系統操作，以利擔任種子教官輔導地方政府進行案例應用。上課對象尚涵括中央及地方交通主管機關人員等。

　　a.第一階段教育訓練：於108年8-9月辦理，計有臺北、新竹、臺中、臺南、高雄及花蓮6場次，參訓人數82人。

　　b.第二階段教育訓練：於108年11月辦理，計有臺北及臺中2場次，參訓人數19人。

（2）109年1月14辦理本所重點研究策勵研討會，與產官學研各界分享研發成果及應用案例。

（3）108年新增二縣市申請授權使用本系統。

4.研究成果精華摘整

5.研究成果報告

・公
　強

1. 發現服務縫隙　　2.了解當地社經資料　　3.改善計畫決策支援

6. 改善計畫評估　　5. 改善計畫模擬　　4.研擬改善計畫

公共運輸服務縫隙掃描決策支援系統應用步驟
Application Steps of Decision-making Support Systems on Scanning the Service Gap of Public Transportation

（四）交通部補助學界成立區域運輸發展研究中心計畫〔104-108〕

1.計畫概述

3.**Promotion of Outcomes and Benefits**

(1) Conducted training workshop to train the personnel of the six regional centers for transportation research and development to be familiar with the operation of this system, in order to serve as seed instructors to guide local governments in performing case applications. Classes include personnel from central and local competent authorities in charge of transportation.

　a. The First Stage Training Workshop: Conducted from August to September, 2019 with 6 sessions in Taipei, Hsinchu, Taichung, Tainan, Kaohsiung and Hualien, and 82 participants.

　b. The Second Stage Training Workshop: Conducted in November 2019, with 2 sessions in Taipei and Taichung, and 19 participants.

(2) Conducted the Key Research Driving Seminar of the Institute on January 14, 2020 to share the research and development results and application cases with the sectors of industry, government, academia, and research institutions.

(3) In 2019, added two new counties and cities that applied for authorization to use this system.

4.**Summary of Research Outcomes**

5.**Report of Research Outcomes**

・ The Maintenance, Functional Enhancement and Education Training of Decision Support System for the Scanning Public Transit Service Gaps (published in 2020)

為鼓勵大專院校運用豐沛之基礎研發設施及研究資源，與已累積之基礎研發能量及既有之設施，並配合交通部相關政策之推動，交通部於104年至108年配合匡列協助經費，責請本所辦理「交通部補助學界成立區域運輸發展研究中心計畫」計畫，成立六大「區域運輸發展研究中心」(以下簡稱「區域中心」)，以藉由區域中心推動地方運輸產業人才培訓，強化學界與產業、政府部門的研發合作促成在地公共運輸之永續發展。

2.研究成果

（1）辦理交通運輸專業人才培訓課程：105.12-108.12共開設641門實體課程，參與學員達14,204人次。另線上課程部分，共開設6門，觀看人次達1,714人次。

（2）協助地方政府進行公共運輸案例研析：105.12-108.12共協助地方政府進行公共運輸案例研析計38案。前期計畫(105.12-107.12)案例以提昇公共運輸使用，抑制私人運具使用為目標進行規劃與實作，了解公共運輸供需及私人運具使用現況，以探討可運用之推拉策略，並提出局部地區之實際試辦計畫；本期計畫(107.12-109.10)分別就「偏遠地區公共運輸環境健全發展策略」與「都市地區公共運輸載客量提升策略」兩項課題進行規劃與實作，著重探討各地方政府公共運輸策略作為與成效，針對各區域縣市提出因地適宜之觀點及未來建議策略。

（3）提供地方政、交通部公路總局所屬監理所、站與汽車客運業者府諮詢服務及輔導地方政府提案：105.12-108.12已提供778次之諮詢服務，其中280次有地方政府局處長層級人員參與。另輔導地方政府向交通部公路總局公共運輸計畫提案並獲核定計134案。

3.成果推廣與效益

（1）協助地方政府及業者構建運輸規劃能力，尤其是協助非六都縣市所獲公共運輸發

(4) MOTC Center for Transportation Research and Development Subsidy Program (2015–2018)

1.Project Overview

In order to encourage universities and colleges to use abundant basic R&D facilities and research resources, and the accumulated basic R&D energy and existing facilities, and to cooperate with the promotion of relevant policies of the Ministry of Transportation and Communications, the Ministry of Transportation and Communications has cooperated to allocate assistance funding from 2015 to 2019, and requested the Institute to manage the "MOTC Center for Transportation Research and Development Subsidy Program" and established six Regional Centers for Transportation Research and Development (hereinafter referred to as "Regional Centers") to promote local transportation industry talent training through the Regional Centers, strengthen R&D cooperation between the academia and industry, government departments to promote the sustainable development of local public transportation.

2.Research Outcomes

(1) Conduct the transportation professional personnel training courses: A total of 641 physical courses were set up between December 2016 and December 2019, with 14,204 students participating. Furthermore, for on-line courses, a total of 6 courses were set up with 1,714 views.

(2) Assist the local governments in conducting public transport case studies: December 2016 – December 2019, assisted the local governments in conducting public transportation case studies and analyzed a total of 38 cases. The early phase project (December 2016 – December 2018) cases conducted planning and implementation with the goal of improving the use of public transportation and restraining the use of private vehicles, understanding the supply and demand of public transportation and the current situation of the use of private vehicles, in order to explore applicable push–pull strategies, and propose the actual pilot project for part of the areas in the region; this phase of the project (December 2018 – October 2020) conducts planning and implementation on the two topics of "Rural Area Public Transportation Environment Robust Development Strategy" and "Urban Area Public Transportation Passenger Capacity Increase Strategy" respectively, focuses on exploring the actions and effects of various local governments' public transportation strategies, and proposes appropriate view points and future recommended strategies for the regions and cities.

(3) Provide consulting services for the Motor Vehicles Offices, Stations subordinated to the Directorate General of Highways of the Ministry of Transportation and Communications and bus companies and counseling local government proposals: December 2016 – December 2019, has provided 778 consulting services, of which there were personnel at Director level of the local government and bureau participating. In addition, counsel local government to submit public transportation project proposals to the Directorate General of Highways of the Ministry of Transportation and Communications, and 134 cases were approved.

展計畫平均補助金額比率從99-105年平均24%提升至106-107年平均29%，顯示在區域中心協助下，業促使非六都縣市地方政府透過公共運輸發展計畫發揮實質效益。

（2）在提升偏鄉人本公共運輸服務部分，105.12-108.12區域中心共計輔導23鄉鎮推動幸福巴士(DRTS)，並獲公路總局核定40案相關提案，由提升偏鄉地區公路公共運輸空間服務涵蓋率顯示，已從104年68.8%提升至108年81.63%，對於偏鄉基本民行的改善與落實，有相當助益。

（3）107年5月25日本所於交通部例行記者會說明北區區域中心與豪泰客運合作導入健康管理機制之成效，係規定駕駛員每日發車前使用心臟頻譜血壓計進行量測，並針對心血管異常或危險狀態之駕駛員採取適當的管理處置措施。日後若能順利推動至其他客運業者，將有助於提升公共運輸的安全性與服務品質，讓民眾安心使用公共運輸運具。並獲公視、中廣、台灣新生報等媒體報導。

（4）107年12月6日本所「交通部補助學界成立區域運輸發展研究中心」計畫(104-107年)，於中華民國運輸學會年會獲頒107年度「傑出交通運輸計畫」獎項。

（5）108年10月6日中區區域中心舉辦「集食行樂-搭總達 遊趣集集」體驗啟用典禮，「綠色隧道線」與「山蕉線」之公車旅遊行程係由中區區域中心與南投縣政府、集集鎮公所、臺灣鐵路管理局及日月潭國家風景區管理處共同推動，自10月6日起開始服務，方便遊客依照建議時間搭公車遊玩集集鎮景點，並促進公共運輸發展。

4.研究成果精華摘整

（五）研提第四期公路公共運輸計畫

1.計畫概述

3.**Promotion of Outcomes and Benefits**

(1) Assisted local governments and businesses in building transportation planning capabilities, and especially assisted the counties and cities outside of six Special Municipalities to increase the average subsidy percentage of public transportation development projects from an average of 24% in 2010–2016 to 29% in 2017–2018, showing that with the assistance of the Regional Centers, the counties and cities outside of six Special Municipalities have been encouraged to exert substantial benefits through the public transportation development projects.

(2) In the part of improving humanity-oriented public transportation services in rural areas (December 2016 – December 2019), the Regional Centers assisted 23 villages and townships to promote the Happiness Bus (DRTS), and 40 related proposals were approved by the Directorate General of Highways. The coverage rate of improving the rural area highway public transportation space service shows that it has increased from 68.8% in 2015 to 81.63% in 2019, which has many benefits in the improvement and implementation of basic people mobility in rural areas.

(3) In the Ministry of Transportation and Communications regular press conference on May 25, 2018, the Institute explained the effectiveness of the Northern Region Regional Center cooperation with HowTai Transportation in introducing a health management mechanism, which requires the drivers to use a Blood Pressure Monitor with Spectrum for measurement before departure, and take appropriate management and processing measures for drivers with abnormal cardiovascular or dangerous conditions. If it can be successfully promoted to other bus companies in the future, it will help improve the safety and service quality of public transportation, so that the people can use public transportation vehicles with peace of mind. It has also been reported by the media including Public Television Service, Broadcasting Corporation of China, and Taiwan Shin Sheng Daily News.

(4) On December 6, 2018, the Institute's "MOTC Center for Transportation Research and Development Subsidy Program" (2015–2018), won the 2018 "Outstanding Transportation Project" award at the annual meeting of the Chinese Institute of Transportation.

(5) On October 6, 2019, the Central Regional Center held the opening ceremony of the "Eating Together and Indulging in Pleasures – Riding All Day Bus and Having Fun Touring Ji Ji" experience. The bus tour itinerary of the "Green Tunnel Route" and "Ji Ji Banana Route" is jointly promoted by the Central Region Regional Center and Nantou County Government, Jiji Township Office, Taiwan Railways Administration and Sun Moon Lake National Scenic Area Administration, and the service started on October 6 to facilitate tourists in taking a bus visiting the attractions of Jiji Township according to the recommended time and promoting the development of public transportation.

自98年起交通部指示本所研擬計畫向行政
院申請公共建設計畫經費以推動公路公共運輸

4.**Summary of Research Outcomes**

區域	學校	區域涵括之縣市
北 區	海洋及交通大學	臺北市、新北市、基隆市、宜蘭縣、連江縣、金門縣
桃竹苗	中華及開南大學	桃園市、新竹市、新竹縣、苗栗縣
中 區	逢甲大學	臺中市、彰化縣、南投縣
雲嘉南	成功大學	雲林縣、嘉義市、嘉義縣、臺南市
高屏澎	中山大學	高雄市、屏東縣、澎湖縣
東 部	東華及東星大學	花蓮縣、臺東縣

104~107年　108~109年

104/10/1　105/12/16　107/12/17

第一期計畫【試辦期】　第二期計畫　賡續辦理第三期計畫

執行13個月
4.5千萬元經費

執行24個月
6千萬元經費

執行22.5個月
5.2千萬元經費
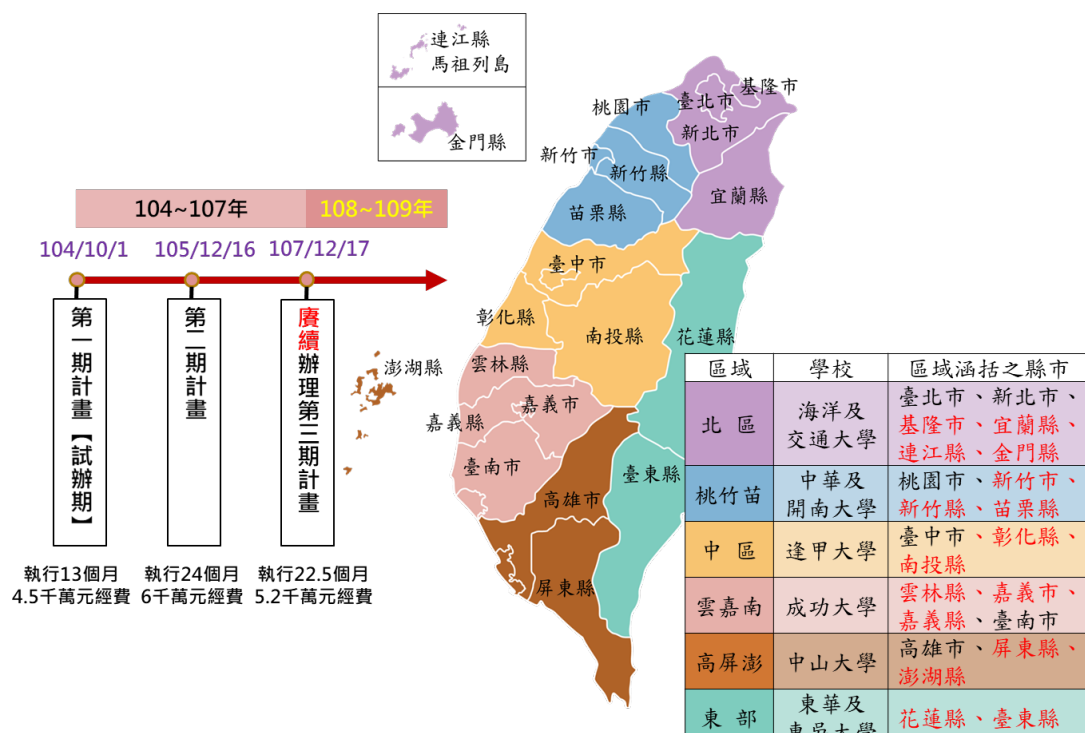
六大區域中心輔導範圍
Guidance Area of Six Regional Centers

104–107年

104/10
全國成立六大區域中心

持續實地下鄉辦理公路公共運輸協助會議

107/5
召開記者會推廣「駕駛健康管理系統」

107/12
獲得中華民國運輸學會年會頒發107年度「傑出交通運輸計畫」獎項

107/12
賡續辦理區域中心計畫

108年

4.11
雲嘉南區域中心主辦「公共運輸載客量提升策略之跨區論壇」

4.29
北區區域中心主辦「偏鄉公共運輸環境之健全跨區論壇」

12.17
東部區域中心主辦「偏鄉公共運輸環境之健全跨區論壇」

12.19
中區區域中心主辦「公共運輸載客量提升策略之跨區論壇」

・辦理交通運輸專業人才培訓課程
・提供諮詢服務及協助地方政府提案申請公運計畫補助經費
・研提改善案例，輔導地方政府解決在地公共運輸問題

・擴增線上課程
・辦理主題式案例研討會
・協助交通部研提公共運輸發展策略或政策宣導

展現108年協助地方政府推動公共運輸之階段性成果

六大區域 104-108 年辦理情形與重要成果
The Project Management Situation and Important Achievements of the Six Regions from 2015 to 2019

發展，截至目前已有三期計畫經行政院審議核定進行推動，包括「公路公共運輸發展計畫(99-101年)」(經費150億元)、「公路公共運輸提昇計畫(102-105年)」(經費200億元)、「公路公共運輸多元推升計畫(106-109年)」(經費150億元)，大幅擴增交通部及縣市政府推動公路公共運輸發展之財源，堪稱我國史上規模最大的公路公共運輸重建運動（Public Transportation Rebuild Campaign）。在中央與地方政府及公車業者之努力合作下，三期公路公共運輸計畫已顯著提升公路公共運輸服務之品質與運量。由於第三期計畫將於民國109年屆滿，為延續其執行成效，本所奉交通部指示研提新一期計畫向行政院爭取經費，以賡續推動公共運輸發展並落實2020年版運輸政策白皮書行動方案。

2.研究成果

本所依交通部指示蒐集國際及國內公共運輸發展情勢，洽徵相關單位意見及評估合適預算規模，撰擬「公路公共運輸服務升級計畫」草案，除歷經多次工作會議與交通部相關單位詳加討論確認計畫內容外，並召開2次座談會洽徵專家學者、行政院相關單位、各縣市政府、各區域運輸發展研究中心及客運業者之意見，做為增修計畫(草案)之參據，達到凝聚各界共識之效果。計畫草案於108年12月31日經交通部陳報行政院進行審議，已於109年6月12獲行政院核定，成功爭取了4年245億元之計畫經費，後續將交由公路總局編列預算執行，以賡續協助各縣市政府及汽車客運業者推動公路公共運輸發展。

「公路公共運輸服務升級計畫（110-113年）」以無縫、安全、永續、精緻為公路公共運輸服務升級之目標，辦理重點包括強化跨運具服務整合、完善無障礙乘車及候車環境、改善偏鄉交通協助地方創生、推廣電動大客車以利空污防制、導入先進設備預防事故發生等。

3.成果推廣與效益

「公路公共運輸服務升級計畫（110-113年）」係做為交通部及公路總局辦理公路公共運輸相關補助計畫之依據，有助於協助地方及客運業者推動公路公共運輸發展，強化公車服務品質

1.Project Overview

Since 2009, the Ministry of Transportation and Communications has instructed the Institute to plan the project for applying public construction project funding from the Executive Yuan to promote the development of highway public transportation. Up to now, there are three phases of the project which have been reviewed and approved by the Executive Yuan for promotion, including the "Development Project of Public Transportation of Highways (2010–2012)" (NT$ 15 billion funding), "Improvement Project of Public Transportation of Highways (2013–2016)" (NT$ 20 billion funding), and "Multiple Enhancement Project of Public Transportation of Highways (2017–2020)" (NT$ 15 billion funding), which greatly expanded the financial resources of the Ministry of Transportation and Communications and the county and city governments to promote the development of road public transportation. It can be called the largest Public Transportation Rebuild Campaign in the history of our country. With the joint efforts of the central and local governments and bus companies, the third phase of the Highway Public Transportation Project has significantly improved the quality and volume of highway public transportation services. Since the third phase of the project will expire in 2020, in order to continue its implementation effectiveness, the Institute was instructed by the Ministry of Transportation and Communications to propose a new phase of the project to seek funding from the Executive Yuan to continue to promote the development of public transportation and implement the 2020 Transportation Policy White Paper Action Plans.

2.Research Outcomes

The Institute collects the development situation of international and domestic public transportation in accordance with the instructions of the Ministry of Transportation and Communications, consults the opinions of relevant units and evaluates the appropriate budget scale, and composes the draft of "Service Upgrade Project of Public Transportation of Highways," in addition to many working meetings with relevant units of the Ministry of Transportation and Communications to discuss and confirm the content of the project in detail; two symposiums were also held to consult opinions from experts and scholars, relevant units of the Executive Yuan, various county and city governments, various regional centers for transportation research and development and bus companies, as the reference for the revision project (draft), to achieve the effect of garnering consensus from all sectors. The draft project was submitted by the Ministry of Transportation and Communications to the Executive Yuan for review on December 31, 2019, and approved by the Executive Yuan on June 12, 2020, successfully securing the project funding for four years of NT$ 24.5 billion, which will be handed over to the Directorate General of Highways to prepare budgets for implementation, and continue assisting the county and city governments and bus companies to promote the development of highway public transportation.

The "Service Upgrade Project of Public Transportation of Highways (2021–2024)" is based on seamless, safe, sustainable, and exquisite as the goal of highway public transportation service upgrade. The important points for managing include strengthening cross-transportation vehicle service integration, improving accessible rides and waiting environment, improving transportation in rural areas to assist local creation of livelihood, promoting electric buses to facilitate air pollution control, and introducing advanced equipment to prevent the occurrence of accidents.

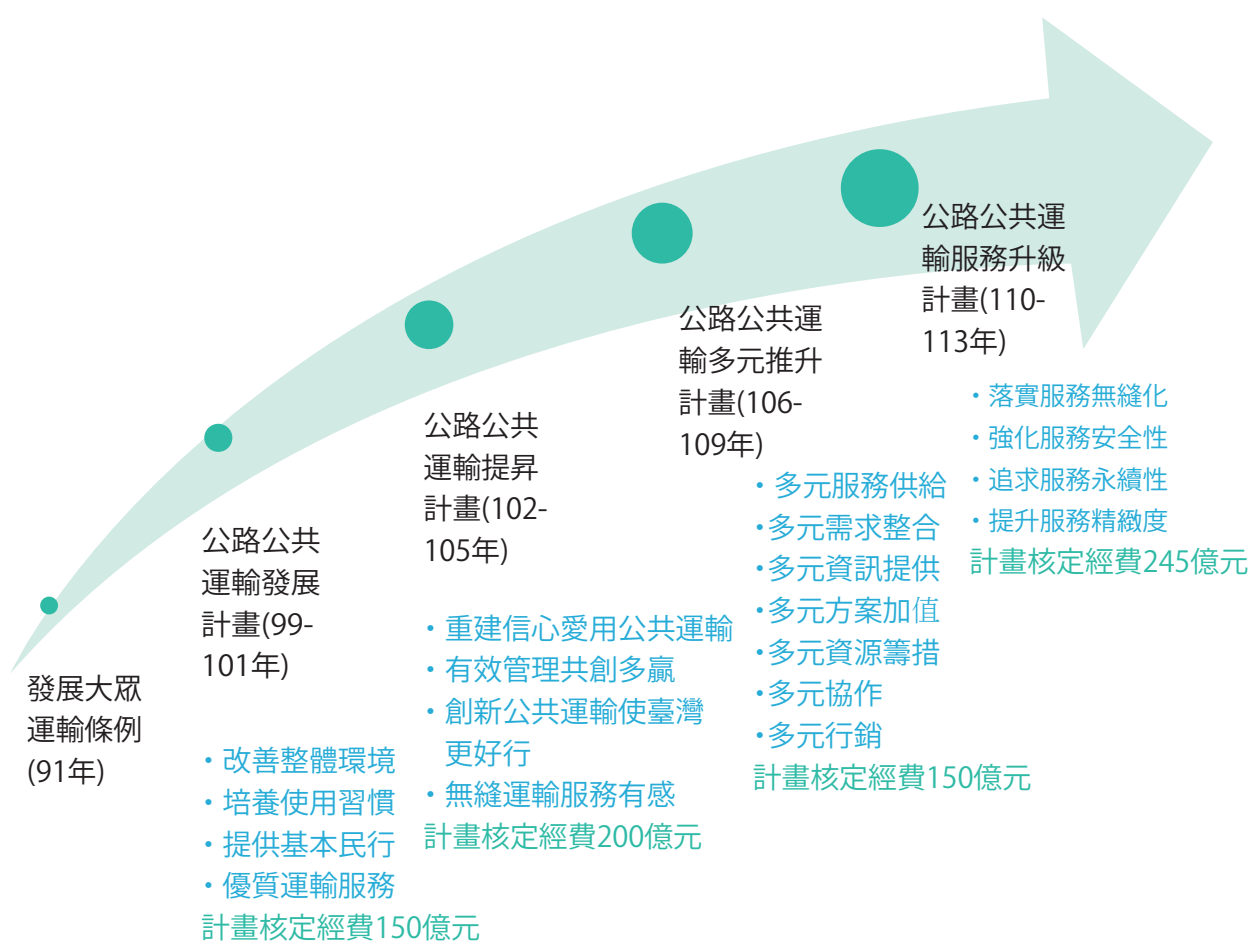與競爭力,提高民眾搭乘意願,以利達成改善交通壅塞、拉近城鄉發展差距、促進節能減碳與空污防制等政策。

4.研究成果精華摘整

5.研究成果報告

· 「公路公共運輸服務升級計畫(110-113年)」
(109年6月行政院核定)

3.Promotion of Outcomes and Benefits

The "Service Upgrade Project of Public Transportation of Highways (2021–2024)" serves as the basis for the Ministry of Transportation and Communications and the Directorate General of Highways in managing highway public transport-related subsidy programs, helping the local and bus companies to promote the development of highway public transportation, strengthen the bus service quality and competitiveness, and increase people's willingness to ride, in order to achieve policies of improving traffic congestion, narrowing the development gap between urban and rural areas, and promoting energy conservation, carbon reduction, and air pollution control.

4.Summary of Research Outcomes

公路公共運輸服務升級計畫(110-113年)
· 落實服務無縫化
· 強化服務安全性
· 追求服務永續性
· 提升服務精緻度
計畫核定經費245億元

公路公共運輸多元推升計畫(106-109年)
· 多元服務供給
· 多元需求整合
· 多元資訊提供
· 多元方案加值
· 多元資源籌措
· 多元協作
· 多元行銷
計畫核定經費150億元

公路公共運輸提昇計畫(102-105年)
· 重建信心愛用公共運輸
· 有效管理共創多贏
· 創新公共運輸使臺灣更好行
· 無縫運輸服務有感
計畫核定經費200億元

公路公共運輸發展計畫(99-101年)
· 改善整體環境
· 培養使用習慣
· 提供基本民行
· 優質運輸服務
計畫核定經費150億元

發展大眾運輸條例(91年)

各期公路公共運輸計畫之演進
The Evolution of Highway Public Transportation Projects of All Phases

5.Report of Research Outcomes

· Service Upgrade Project of Public Transportation of Highways (2021–2024)" (Approved by the Executive Yuan in June, 2020)

五、智慧運輸科技發展與創新應用

（一）2020年版運輸政策白皮書–智慧運輸

1.計畫概述

近年來隨著網路應用及資通訊技術的發展，ITS的應用及發展，已跳脫以往單一應用的方式，跨域資源整合、引導關聯產業投入、行動服務需求的滿足等已成為未來智慧化發展的重要趨勢，目前智慧運輸發展所形成的智慧聯網(Internet of Things, IOT)及其所應用之雲端運算(Cloud computing)、巨量資料(Big data)、新一代通訊技術、人工智慧等科技將扮演更重要角色。

在智慧運輸應用發展成果、考量當今發展趨勢及所面臨之交通課題等基礎上，運輸部門在施政上均須妥為因應。準此，本部以「運輸政策白皮書-總論」、「運輸政策白皮書-陸路運輸」、「運輸政策白皮書-空運」及「運輸政策白皮書-海運」為根基，提出智慧運輸政策白皮書，期能綱舉而目張，讓各運輸部門依循有據，並期民間亦能協同配合，共策其成。

衡諸世界各國之經建計畫，能有效落實、成功推展者，多以4至6年為期，持續追蹤推動並滾動檢討，智慧運輸施政亦復如此。面對國際與國內環境如此巨幅的變化，本白皮書在前述發展概念及觀點之下，研擬未來智慧運輸發展的主軸，以期我國智慧運輸服務得以均衡發展，打造幸福家園生活環境。

2.研究成果

本白皮書以「運輸政策白皮書-總論」、「運輸政策白皮書-陸路運輸」、「運輸政策白皮書-空運」及「運輸政策白皮書-海運」為根基，進一步說明臺灣地區智慧運輸發展之歷程、應用成果及下一階段發展趨勢，並探討目前所面臨之課題，據以擬定各項智慧運輸發展方向及策略，期望整體運輸之施政，能由研提理念架構，至擬定政策目標、策略、行動方案，最後落實為各級運輸機關實際推動政令之執行計畫，由上而下整合於一體。

V. Development and Innovative Application of Intelligent Transportation Technology

(1) 2020 Transportation Policy White Paper – Intelligent Transportation

1.Project Overview

In recent years, with the development of internet applications and information and communication technologies, the application and development of ITS have moved beyond the previous single application method. Cross-domain resource integration, guidance of related industry involvement, and satisfaction of mobile service needs have become the important trend of future intelligence development. The current Internet of Things (IoT) formed by the development of intelligent transportation and the cloud computing, big data, new generation communication technology, artificial intelligence and other technologies it applies will play a more important role.

Based on the development results of intelligent transportation applications, considering the current development trend and the transportation issues to be faced, the transportation sector must appropriately respond in terms of administration. According to this, the Ministry takes the "Transportation Policy White Paper – Summary," "Transportation Policy White Paper – Land Transportation," "Transport Policy White Paper – Air Transportation" and "Transport Policy White Paper – Sea Transportation" as the foundation, to propose the Intelligent Transportation Policy White Paper, expecting once the key is grasped, everything else falls into place, to let all the transportation sectors to have a basis to follow, and expecting that the private sector is also able to coordinate and cooperate to achieve the results.

Examine the economic construction projects of all countries in the world, the one can be effectively implemented and successfully promoted, is mostly taken the period of 4 to 6 years to continue the tracking and promotion and rolling review, the intelligent transportation administration is also the same. Facing such dramatic changes in the international and domestic environments, this White Paper develops the main scheme of future development for intelligent transportation based on the aforementioned development concepts and viewpoints, expecting balanced development of intelligent transportation services in our country, and creating a happy home living environment.

2.Research Outcomes

This White Paper is with the "Transportation Policy White Paper – Summary," "Transportation Policy White Paper – Land Transportation," " Transportation Policy White Paper – Air Transportation" and "Transportation Policy White Paper – Sea Transportation" as the foundation to further explain the course, application results of the intelligent transportation development in the Taiwan area and the trend of development for the next phase, and explore the issues faced today as the basis to develop various intelligent transportation development directions and strategies, expecting the administration of

（1）課題探討：為盡可能解決民眾交通問題、改善當前交通環境、因應需求與科技之轉型，及在前述國內應用成果、下一階段發展趨勢等基礎下，將重新審視我國當前智慧運輸服務發展課題，並以「需求轉型」、「科技轉型」、「服務模式」、「交通管理」、「交通安全」及「執行環境」等面向，進行智慧運輸發展課題之探討。

（2）願景及政策目標：未來ITS發展定位將以「智慧創新」為理念核心，以「建立人本且永續的智慧交通環境」為願景，並結合雲端運算、資通訊技術、物聯網科技、大數據分析、數位匯流、人工智慧等新興科技，除改善當前面臨之重大課題外，亦期望能建立無縫且順暢的交通環境、提升交通安全與效率及達成資訊的共享，並促進產業加值等相關之應用，擴大應用服務廣度與深度。據此，以「交通安全」、「交通順暢」、「交通無縫」及「產業發展」做為四大政策目標。

（3）政策與策略：提出「發展大數據應用分析與調適管理法規，健全智慧運輸應用基礎」、「結合新興科技，創新與精進公路智慧運輸應用服務」、「善用資通訊技術，拓展智慧運輸應用服務面向」、「強化公私協作，推動交通科技產業發展」等四大發展政策，及「推動交通數據匯流及資料開放」、「推動大數據分析及相關應用」、「推動交通行動服務(MaaS)」、「推動整合式運輸路廊交通管理」、「發展協同式智慧運輸系統」、「發展自動駕駛車輛應用測試與服務」、「發展人工智慧相關應用」、「推動交通科技產業發展」、「持續推動機場智慧化與資訊化」及「優化資訊服務系統，推動航港智慧轉型」等11項推動策略。

overall transportation can be from the proposing the conceptual framework to developing the policy goals, strategies and action plans, and finally implemented as the implementation plan for the actual promotion of the decree by the transportation agencies at all levels to integrate into one body from top to bottom.

(1) Topic Discussion: In order to solve the traffic problems for the people as much as possible, improve the current traffic environment, respond to demand and technological transformation, and on the basis of the aforementioned domestic application results and the next phase of development trends, the current intelligent transportation service development topics of our country will be reviewed again, and discussion conducted of intelligent transportation development topics based on the aspects of "Demand Transformation," "Technology Transformation," "Service Mode," "Traffic Management," "Traffic Safety" and "Implementation Environment."

(2) Vision and Policy Goals: The future development positioning of ITS will take "Intelligent Innovation" as the core concept, with the vision of "Building a Humanity-oriented and Sustainable Intelligent Transportation Environment," and combine with emerging technologies of cloud computing, information communication technology, the Internet of Things, big data analysis, digital convergence and artificial intelligence, not only to improve currently faced major issues, also expect to build a seamless and smooth transportation environment, improve traffic safety and efficiency, as well as achieve information sharing, and promote industry value adding, and other related applications, and expand the breadth and depth of application services. Accordingly, the "Traffic Safety," "Smooth Traffic," "Seamless Traffic" and "Industrial Development" are used for the four major policy goals.

(3) Policies and Strategies: Propose four major development policies including "Develop big data application analysis and adaptation management laws and regulations, Improve the foundation for intelligent transportation applications," "Combine emerging technologies, Innovate and improve highway intelligent transportation application services," "Make good use of information and communication technologies, Expand intelligent transportation application service aspects," and "Strengthen public-private collaboration, Promote the development of transportation technology industry"; and 11 promotion strategies including "Promote traffic data convergence and open data," "Promote big data analysis and related applications," "Promote Mobility as a Service (MaaS)," "Promote integrated transportation corridor traffic management," "Develop collaborative intelligent transportation systems," "Develop automated driving vehicle application testing and services," "Develop artificial intelligence related applications," "Promote the development of the transportation technology industry," "Continue to promote airport intelligence and information" and "Optimize information service systems, Promote intelligent transformation of air and maritime ports."

3.成果推廣與效益

（1）108年6月10日辦理2020年版運輸政策白皮書座談會，邀集產官學研及地方交通主管單位參與討論，凝聚白皮書內容共識，。

（2）108年12月18日辦理《Koinonia：交通就是感動─2020運輸政策白皮書》新書發表會。

（3）製作宣傳影片、海報與宣傳文宣製作與發送，讓民眾更易了解運輸政策。

4.研究成果精華摘整

3.Promotion of Outcomes and Benefits

(1) Conducted the 2020 Transport Policy White Paper Symposium on June 10, 2019, invited the industry, government, academia, research institutes and local competent authorities in charge of transportation to participate in the discussion to garner the consensus on the content of the white paper.

(2) Conducted the "Koinonia: A Moving Form of Transportation – 2020 Transport Policy White Paper" New Book Presentation on December 18, 2019.

(3) Produced publicity videos and posters, produced and distributed promotional materials to make it easier for people to understand the transportation policies.

4.Summary of Research Outcomes

達成推動智慧運輸應用目標之策略架構圖
Strategic Framework Diagram of Achieving the Goal of Advocating Intelligent Transportation Applications

5.研究成果報告

· 2020年版運輸政策白皮書–智慧運輸 (108年出版)

5.Report of Research Outcomes

· 2020 Transportation Policy White Paper – Intelligent Transportation (published in 2019)

（二）交通行動服務（MaaS）示範建置計畫

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）更相逕啟動MaaS計畫。

本所與高雄市政府交通局合作，依據高雄市民「行」的需求，於106年度啟動我國第一個MaaS計畫，並以Men Go為名，將民眾日常生活會用到的所有運輸工具整合成為單一運輸服務，包括高雄捷運、7家市區公車、公路客運、輕軌、渡輪、共享自行車、共享電動機車、停車場（P&R）以及專屬計程車（Men Go TAXI）。Men Go服務在107年9月28日正式啟用，高雄市成為亞洲第一個MaaS服務區，民眾只要透過一卡通以及智慧型手機APP，即可在高雄地區方便使用所有的運輸服務。

本計畫接續進行Men Go服務持續營運、服務內容與範疇擴充等，以做為後續推動國內都市地區MaaS交通行動服務之適用服務模式、應用範疇、適用場域以及推動策略等之修正參考依據，除了持續營運前期所建構之服務外，接續擴充計程車、輔助運具服務、Park & Ride停車場服務與共享電動機車租用服務，服務產品型態也從通勤(學)月票商品擴大至發行「學生7日票」。

2.研究成果

（1）跨單位與系統協調，完成多元運具整合

整合政府跨部門資源與多元運具成為單一運輸移動服務，民眾只要透過一卡通以及智慧型手機APP，即可在高雄地區方便使用所有的運輸工具，真正實現運輸及門(door to door)服務。

1.**Project Overview**

In recent years, since the economic development has promoted the improvement of people's living standards, the traditional urban public transportation service types (fixed routes and fixed schedule) have been unable to meet the people's "transportation" needs. Therefore, based on the concept of Mobility as a Service (MaaS) proposed in 2014, the city of Helsinki, Finland integrated multiple vehicles into a single transportation mobile service, to provide transportation services that meet the people's needs through long-term package ticket discounts and mobile devices. The innovative concept of MaaS integrated transportation is not only highly valued by the world's transportation sector, but the advanced countries in Europe (such as the United Kingdom, Germany, Sweden, and Belgium) and the USA have also successively launched the MaaS project.

In cooperation with the Transportation Bureau of the Kaohsiung City Government, the Institute launched the first MaaS project of our country in 2017, based on the needs of Kaohsiung citizens for "transportation," and named as Men Go, to integrate all means of transportation used in daily life, including Kaohsiung MRT, 7 city buses, highway buses, light rail, ferry, shared bicycle, shared electric motorcycle, Parking Lot Park and Ride (P&R) and Men Go TAXI into a single transportation service. The Men Go service was officially started on September 28, 2018. Kaohsiung City has become the first MaaS service area in Asia. People can use all transportation services in the Kaohsiung area conveniently with an iPASS card and smart phone APP.

This project continues to conduct Men Go service continuous operation, service content and scope expansion, etc., to serve as the basis for revision reference of the suitable service model, application scope, suitable field, and promotion strategy for the subsequent promotion of Mobility as a Service (MaaS) in the domestic urban areas. In addition to continuing the services set up in the previous phase, taxis, auxiliary transportation vehicle services, Parking Lot Park and Ride services and shared electric motorcycle rental services are continually expanded. The service product type has also been expanded from work (school) commuting monthly pass products to the issuance of the "Student 7 Day Ticket."

2.**Research Outcomes**

(1) Cross-unit and system coordination to complete the integration of multiple transportation vehicles

Integrating the government's cross-departmental resources and multiple transportation vehicles into a single transportation mobile service, the people can use all transportation vehicles in Kaohsiung conveniently with the iPASS card and smart phone APP, to truly realize the transportation door to door services.

（2）突破法規限制，將計程車納入 Men Go 服務

本計畫突破法規限制將計程車納入 Men Go 服務，並以 Men Go point 補助民眾搭乘計程車起始里程費用，藉以彌補公共運輸第一哩/最後一哩服務縫隙，同時可增加計程車司機收入。

（3）學校與標竿企業支持

本計畫共獲得包括中山大學、輔英科技大學、樹德科技大學、正修科技大學等四所學校，以及中鋼與日月光等二家標竿企業的支持。

（4）德國萊茵認證

德國萊茵認證具有全世界公信力，但因該公司認證作業極為複雜嚴謹且價格昂貴，因此國內除了大型交通建設之外，智慧交通系統鮮少有系統獲得德國萊茵認證。為能使 Men Go 資訊系統與服務品質達到國際水準，本計畫資訊系統與服務功能目前正接受德國萊茵認證作業。

3.成果推廣與效益

（1）推廣行銷：本計畫針對高雄旅運特性，初期鎖定包括大專學校以及地區大型企業做為特定目標族群，並加強計畫推廣行銷作業。目前已有包括中山大學、樹德科大、輔英科大以及正修科大等四所大學做為高雄 MaaS 計畫標竿示範學校；標竿示範企業包括中鋼與日月光，獲得高雄市民眾的支持與肯定。

（2）交通運輸：透過本計畫月票方案之推動，民眾除在月票效期內主要運具(捷運、公車及輕軌)可無限使用，能有效提昇公共運輸使用率外，同時也搭配輔助運具(計程車、渡輪、轉乘公共運輸停車 P&R、共享自行車、共享電動機車等)使用優惠方案，吸引更多輔助運具業者投入服務。

(2) Break through legal restrictions and include taxis in Men Go services

This project breaks through legal restrictions and incorporates taxis into Men Go services, and uses Men Go points to subsidize the people for the initial mileage of taxi rides, so as to make up for the gap between the first mile/last mile of public transportation and increase the income of taxi drivers.

(3) Support from universities and benchmark enterprises

This project has received support from four universities including National Sun Yat-sen University, Fooyin University, Shu-Te University, and Cheng Shiu University, as well as two benchmark enterprises including China Steel Corporation and ASE Technology.

(4) German Rheinland Certification

TÜV Rheinland Certification has worldwide credibility, but because the company's certification operations are extremely complex, rigorous and expensive, few domestic intelligent transportation systems have obtained TÜV Rheinland Certification except for large-scale transportation construction. In order to enable Men Go's information system and service quality to reach international standards, the project's information system and service functions are currently undergoing German Rheinland Certification.

3.Promotion of Outcomes and Benefits

(1) Promotion Marketing: This project aims at the travel characteristics of Kaohsiung, initially targeting colleges and universities and area large enterprises as specific target groups, and strengthening the project promotion marketing operation. Currently, there are four universities including National Sun Yat-sen University, Shu-Te University, Fooyin University, and Cheng Shiu University as the benchmark demonstration universities for the Kaohsiung MaaS project; benchmark demonstration enterprises include China Steel Corporation and ASE Technology, which have received the support and affirmation by the people of Kaohsiung City.

(2) Transportation: Through the promotion of the monthly pass program of this project, not only can the people use the main transportation vehicles (MRT, bus and light rail) indefinitely during the monthly pass validity period, it can also effectively increase the utilization rate of public transportation, and also pair with the auxiliary transportation vehicles (taxi, ferry, transit public transportation parking P&R, shared bicycles, shared electric motorcycles, etc.) to use the discount programs, which attracts more auxiliary transportation vehicle companies to invest in the services.

（3）大數據分析優化交通服務：透過本計畫所蒐集之民眾旅次資訊大數據並進行交通需求分析，可進一步調整改善現有公共運輸路網、路線及班次時刻等，進而有效改善公共運輸之服務品質，促使民眾更加提昇MaaS服務之滿意度及購買意願，造成整體公共運輸服務之良性循環。

（4）社會經濟：本計畫之推動，可有效吸引通勤通學者樂於使用公共運輸及共享運具，除可減少自行開車所產生的負面經濟效益(如車輛持有稅費、停車費用與停車空間不足等)外，同時藉由蒐集分析使用者之搭乘行為與需求，可以彈性調整改善現有公共運輸路線班表等服務內容，進而吸引原非公共運輸使用者加入、增加公共運輸使用、降低交通意外事故、降底空氣　染與尖峰時間的道路壅塞等。

4.研究成果精華摘整

(3) Big Data Analysis Optimized Transportation Services: Through the big data of people's trip information collected by this project and analysis of transportation needs, the existing public transportation network, routes, and schedules can be further adjusted and improved, thereby effectively improving the service quality of public transportation, and promoting the people's satisfaction and willingness to purchase MaaS services, which results in a virtuous circle of overall public transportation services.

(4) Social Economy: The promotion of this project can effectively attract work and school commuters to enjoy using public transportation and shared transportation vehicles, not only to reduce the negative economic benefits generated by driving a private car (such as vehicle ownership taxes, parking fees and lack of parking space, etc.,), but it also can flexibly adjust and improve the service content of existing public transport routes and schedules through collecting and analyzing users' riding behaviors and needs at the same time, thereby attracting the non-public transport users to join in, increasing the use of public transportation, thus reducing traffic accidents, air pollution and road congestion during peak hours, etc.

4.Summary of Research Outcomes

MaaS 服務以手機及月票卡整合多元運輸系統
MaaS Service Integrates Multiple Transportation Systems with Smart Phones and Monthly Pass Cards

5.研究成果報告

・交通行動服務(MaaS)示範建置計畫 (108年出版)

・交通行動服務(MaaS)示範建置計畫(2/2) (109年出版)

5.Report of Research Outcomes

・ Demonstration plan of MaaS (Mobility as a Service) (published in 2019)

・ Demonstration Plan of Mobility as a Service (MaaS) (published in 2020)

（三）交通事件資訊整合服務與精進計畫（2/2）

1.計畫概述

本計畫遵循行政院國家時空資訊雲落實智慧國土政策綱領，配合交通部推動105-109年度「時空資訊雲落實智慧國土計畫」，自105年度起辦理都市交通事件資訊整合服務系列計畫，以交通事件資訊為計畫標的，制訂相關資訊標準化作業、規劃合適之通報機制與工具，並選擇高雄市(交通局)與臺南市(交通局)合作辦理即時交通事件資訊通報解除與發布實作，期能強化即時道路資訊之蒐集與多元整合。

此外為能提昇交通事件初報、續報與結報之內容品質，本計畫嘗試運用影像辨識結合人工智慧(AI)等技術，針對交通事件發生前後的時空影響進行事件偵測與事件續報/解除之研究與實作，透過視覺化事件管理平台來呈現各單位事件資料，除可即時掌握事件資訊外，更能節省許多橫向溝通時間，進而提升交通管理效益。

2.研究成果

（1）本計畫已於108年度將高雄市交通事件整合服務成果複製移轉至臺南市，並完成中央與地方(高雄市與臺南市)之「交通事件整合資訊流通服務平台」開發建置，提供圖台查詢即時事件服務、資訊流通模組、活動通報模組與會員管理機制等功能。

（2）此外為能提昇交通事件初報、續報與結報之資訊品質，本計畫自107至108年度嘗試運用影像辨識結合人工智慧等技術，針對交通事件發生前後的時空影響進行事件偵測與事件續報/解除之研究與實作，截至108年底之階段性偵測成果，在車流量方面準確率平均可達96%、在速率方面準確率平均可達97%、在事件偵測方面增加偵測類別，整體準確度約為90%。

3.成果推廣與效益

（1）本計畫成果「交通需求導向之AI影像辨識技術研發與應用」榮獲「2020智慧城市創新應用獎」政府智慧治理組優勝獎項。

(3) The Service and Enhancement Project for the Information Integration of Traffic Events (2/2)

1.Project Overview

This project follows the Executive Yuan's National Space-Time Information Cloud Implementation in Intelligent Homeland Policy Guidelines, cooperates with the Ministry of Transportation and Communications to promote the 2016–2020 "Space-Time Information Cloud Implementation in Intelligent Homeland Project," and has implemented the Urban Traffic Incident Information Integration Service Series Project since 2016 with traffic incident information as the project target to establish relevant information standardization operations, plan suitable notification mechanisms and tools, and select Kaohsiung City (Transportation Bureau) and Tainan City (Transportation Bureau) to cooperate in conducting real-time traffic incident information notification release and announcement practices, expecting to strengthen the collection and diversified integration of real-time road information.

Besides this, in order to improve the content quality of the initial, subsequent and final report of traffic incidents, this project attempts to use image recognition combined with artificial intelligence (AI) technologies to conduct research and implementation of incident detection and incident subsequent report/release aiming at the time and space impact before and after the occurrence of traffic incidents through the visualized incident management platform to present the incident data of each unit. In addition to providing a real-time grasp of incident information, it can also save a lot of horizontal communication time, thereby enhancing the efficiency of traffic management.

2.Research Outcomes

(1) This project has duplicated the results of Kaohsiung's traffic incident integration service and was transferred to Tainan City in 2019 and the development and establishment of the "Traffic Incident Integration Information Circulation Service Platform" of the central and local governments (Kaohsiung City and Tainan City) completed to provide the picture platform for inquiry of the functions including real-time incident service, information circulation module, activity notification module and member management mechanism.

(2) In addition, in order to improve the information quality of the initial report, subsequent and final report of traffic incidents, this project has tried to use image recognition combined with artificial intelligence technologies from 2018 to 2019, to conduct research and implementation of incident detection and incident subsequent report/release aiming at the time and space impact before and after the occurrence of traffic incidents. As of the end of 2019, the phased detection results have an average accuracy of 96% in terms of traffic flow, an average accuracy of 97% in terms of speed, and an average accuracy of about 90% by adding detection category to the incident detection.

3.Promotion of Outcomes and Benefits

(1) The result of this project, "Traffic Demand Oriented R&D and Application of AI Image Recognition Technology" won the "2020 Smart City Innovation Application Award" as the winning award in the Government Smart Governance group.

（2）108年10月於1752次部務會報中提報，可供部內單位或部屬機關辦理交通事件或即時路況相關案件之業務推廣應用。

（3）108年12月舉辦年度計畫「成果經驗分享說明會」，使相關單位能夠瞭解本計畫重要研究成果，更進一步分享AI 影像偵測技術於交通事件辨識偵測之應用經驗。

（4）計畫成果已摘錄論文於「運輸計劃季刊」發表相關研究規劃成果，以提供各界瞭解及研討與應用。

4.研究成果精華摘整

(2) Submitted report in the 1,752th Ministry Affairs Meeting in October, 2019; can be used for business promotion and application of cases related to traffic incidents or real-time road conditions by the units internal to the Ministry or subordinate agencies.

(3) Organized the annual project "Achievements and Experience Sharing Explanatory Meeting" in December 2019 to let the relevant units understand the important research results of this project, and to further share the application experience of AI image detection technology in traffic incident recognition and detection.

(4) The project results have been extracted into papers in the "Transportation Planning Quarterly" to publish related research planning results for all sectors to understand, discuss and use.

4.Summary of Research Outcomes

交通事件整合資訊流通服務平台
Traffic Incident Integrated Information Circulation Service Platform

AI 影像辨識偵測車流與事件之成效示意圖
Effectiveness Schematic Diagram of AI Image Recognition in Detecting Traffic Flow and Incidents

5.研究成果報告

・交通事件資訊整合服務與精進計畫(1/2) (108年出版)

・交通事件資訊整合服務與精進計畫(2/2) (109年出版)

5.Report of Research Outcomes

・ The Service and Enhancement Project for The Information Integration of Traffic Events(1/2) (published in 2019)

・ The Service and Enhancement Project for The Information Integration of Traffic Events(2/2) (published in 2020)

（四）多元公共運輸數據分析與科技應用之研究

1.計畫概述

　　各先進國家為提供民眾多元公共運輸之整合服務，皆積極推動交通行動服務（Mobility as a service, MaaS），我國亦刻正在高雄市推動MaaS，目前已串聯與整合了多樣化運具服務，並產生多元公共運輸數據（如客運動態、電子票證與會員點數）。本研究針對高雄市MaaS系統所產生之多元公共運輸數據，發展MaaS大數據視覺化分析介面，以高雄都會區MaaS使用者為目標族群（如大學生通勤族），應用本案MaaS大數據分析結果於研提交通行動服務之相關策略，俾利高雄MaaS營運單位未來可自行運用相關資料與本案發展之分析介面，定期檢視整體人流之動向趨勢及運具使用，以提出MaaS營運改善與相關科技應用策略。

2.研究成果

（1）本計畫蒐集高雄MaaS專案相關資料集，分別從會員屬性、方案效期、轉乘分析及服務改善等面向設計視覺化分析介面，並據以提出MaaS營運改善與相關科技應用策略

（2）以會員屬性分析介面為例，自該介面可發現目前16~18歲會員較多，而且會齡高達8~9個月，並間接瞭解MaaS服務開辦時吸引了許多學生加入，顯見目前MaaS對此族群有高度吸引力，須設法持續鞏固與強化宣導，並結合電子商務之精準行銷概念，依據數據分析在適當時間提供適當客制化優惠給學生會員。

（3）本研究亦透過問卷填答敘述統計與多元運具搭乘數據交叉分析，自政府面、業者面與民眾面等三個面向歸納，在政府關注的公共運輸使用次數由1.7萬次提昇至3.6萬次；在業者考慮的營收方面也有約24%之成長；民眾也認為物超所值，平均每負擔100元的方案套票費用搭乘了約152元，由上述三面向之評估可確定MenGo能共創政府/業者/民眾三贏局面，值得持續推動。

(4) Research on Diversified Public Transport Data Analysis and Technology Applications

1.Project Overview

In order to provide integrated services of diversified public transportation for the people, all advanced countries are actively promoting Mobility as a Service (MaaS). Our country is also promoting MaaS in Kaohsiung City, and has connected and integrated diversified transportation vehicle services currently, and also generated multiple public transportation data (such as bus movements, electronic tickets and membership points). Based on the diversified public transportation data generated by the MaaS system in Kaohsiung City, this research develops a MaaS big data visual analysis interface, targeting MaaS users (such as college commuting students) in the Kaohsiung metropolitan area, applying the MaaS big data analysis results of this project to propose related strategies for Mobility as a Service. To facilitate the MaaS operating unit in Kaohsiung capable of using the relevant information and the analysis interface developed by this project in the future to regularly review the overall flow of people and the use of vehicles to propose MaaS operational improvements and related technology application strategies.

2.Research Outcomes

(1) This project collects data sets related to the Kaohsiung MaaS project, to design the visual analysis interfaces from the aspects of member attributes, program validity, transit analysis and service improvement, as the basis to propose MaaS operation improvement and related technology application strategies.

(2) Take the membership attribute analysis interface as an example. From this interface, it can be found that there are currently many members aged 16 to 18, and the membership period is as high as 8 to 9 months, and indirectly understand that the MaaS service has attracted many students to join when it was launched; it can be seen that MaaS is highly attractive to this group, and it must be attempted to continue to consolidate and strengthen its promotion, and combine the precise marketing concept of e-commerce, to provide appropriate customized discounts to the student members at the appropriate time based on data analysis.

(3) This research also made conclusions in three aspects from the government, business and people through the questionnaire survey description statistics and cross analysis of diversified transportation vehicle riding data. In the concern of the government, the number of public transportation uses has increased from 17,000 to 36,000 trips; in the consideration of business, the revenue has also increased by about 24%; the people also believe that it is excellent value for money, for every program ticket package of NT$ 100 spent actually can ride the trips for about NT$ 152. From the evaluation of the aforementioned three aspects, it is confirmed that Men Go can create a win-win-win situation for the government/industry/people and it is worth continuing the promotion.

3.成果推廣與效益

（1）109年6月辦理MaaS聯合工作會議，對象為高雄市政府相關業務局處、MaaS執行團隊，透過溝通與共同分析，推廣本案成果與提供應用面向之設計參考。

（2）109年11月辦理MaaS大數據分析介面之教育訓練，以使MaaS營運團隊充分瞭解本案模組與介面之相關功能，俾利MaaS營運團隊未來自行評估是否於MaaS後臺建置相關模組與介面，來定期運用MaaS資料庫與後臺於檢視與分析MaaS使用者特性。

（3）109年12月於高雄市政府交通局，舉辦「MaaS大數據分析與應用」成果發表會議，獲得高雄市政府肯定，認同MaaS營運數據分析成果對於精準行銷、產品擴充與點數應用與個資保護等議題探討上具實用效益，有助未來各方合作下使MaaS服務更加全面。

4.研究成果精華摘整

3.Promotion of Outcomes and Benefits

(1) The MaaS joint work meeting was held in June 2020 with the target of relevant business bureaus and department of Kaohsiung City Government and the MaaS implementation team, to promote the results of this project and provide the design reference for the application aspect through communication and joint analysis.

(2) The training workshop of Maas big data analysis interface was organized in November 2020, to allow the MaaS operation team to fully understand the relevant functions of the module and interface in this project, to facilitate the MaaS operation team to self-evaluate whether to build relevant modules and interfaces in the MaaS backend in the future, and to use the MaaS database and backend regularly to view and analyze MaaS user characteristics.

(3) The "MaaS Big Data Analysis and Application" results presentation meeting was held at the Transportation Bureau of Kaohsiung City Government in December 2020, and it was affirmed and approved by the Kaohsiung City Government that the results of the MaaS operation data analysis have practical benefits for the topic discussions including precision marketing, product expansion, use of point and personal information protection, and will help all parties to cooperate in the future to make MaaS services more comprehensive.

4.Summary of Research Outcomes
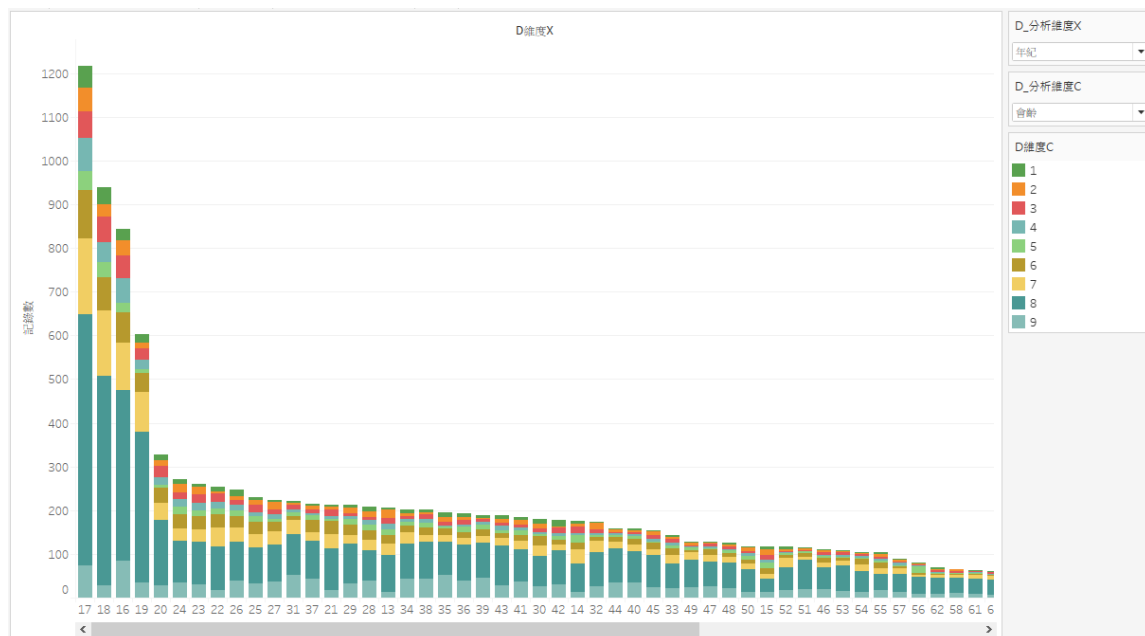
MaaS 會員屬性視覺化分析介面
MaaS Member Attribute Visual Analysis Interface

計程車上車
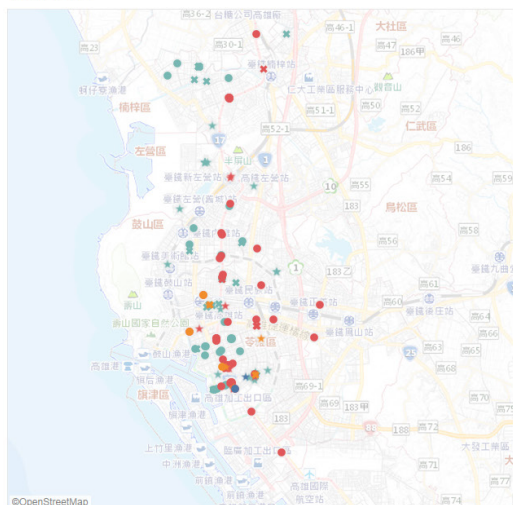
計程車下車處
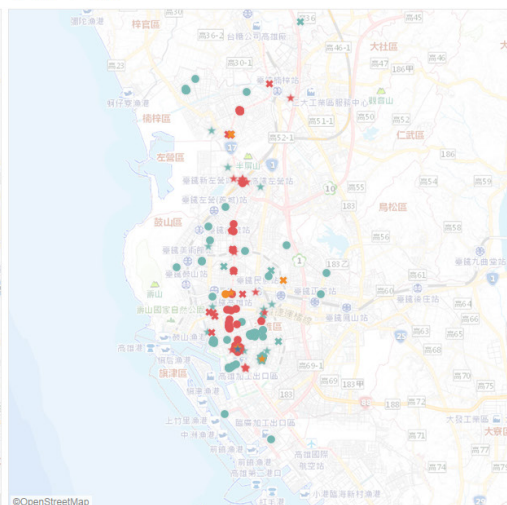
搭車前運具
■ BIKE
■ BUS
■ MRT
■ None

卡片類型
● 一般卡
✖ 數位學生卡
★ 學生卡

搭車後運具
■ BIKE
■ BUS
■ MRT
■ None

轉乘方式
☐ (全部)
☑ 公車+計程車
☑ 公車+計程車+公車
☑ 自行車+計程車
☐ 計程車
☑ 計程車+公車
☑ 計程車+自行車
☑ 計程車+捷運
☑ 捷運+計程車
☑ 捷運+計程車+公車
☑ 捷運+計程車+捷運

MaaS 多元運具轉乘視覺化分析介面
MaaS Multiple Transportation Vehicles Transit Visual Analysis Interface

5.研究成果報告

· 多元公共運輸數據分析與科技應用研究 (109年
出版)

5.Report of Research Outcomes

· Multiple public transit data analysis and technology application (published in 2020)

（五）電動公車示範計畫執行績效分析與推動策略支援應用（1/2）

1.計畫概述

近幾年，電動公車之技術發展逐漸成熟，且全球之銷售量亦持續成長，對於國內各客運業者來說，車輛關鍵系統穩定性與基礎設施配合、營運規劃隨經營環境之客製化等，皆有賴於營運績效數據之持續蒐集與分析，而透過各車廠妥善率、用電效率與續航力等性能之比較，可藉以提出國內電動公車之導入指南提供業者參考，並作為政策推動與資源配置之滾動檢討依據。爰此，交通部已規定自108年起所有電動公車補助(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。本計畫主要目的在於協助蒐集電動公車之示範計畫與一般型計畫執行期間的系統資訊，並建置營運數據監控管理平台，進而透過平台分析電動公車各式營運及行車數據，提供示範計畫與一般型計畫分年檢核資料參據，並掌握營運關鍵指標及關鍵課題。此外，亦同步檢討電動公車經營環境與基礎設施缺口，期藉由本計畫執行累積本土電動公車實際營運數據，研擬電動公車導入指南，提供地方政府後續擴大推動執行參據。

2.研究成果

（1）累積我國電動公車實際營運數據資料，開放至「公共運輸整合資訊流通服務平臺」，作為後續政策推動或相關研究之基礎資源。

（2）訂定電動公車車載機及充電設施之資料蒐集項目及傳輸機制，提升數據資料蒐集效率與品質。

（3）追蹤示範計畫電動公車營運績效，作為分期檢核與營運補助之參據。

（4）建置電動公車營運數據監控管理平台，透過數據分析掌握不同營運情境之關鍵指標，提供電動公車推動策略、客運業者營運方式調整及電動公車製造業者產品開發之參據。

（5）訂定電動大客車推廣導入作業，並滾動檢討電動大客車推廣策略與導入推動，及制定補助電動大客車示範計畫作業程序。

(5) Performance Analysis of the Promotion Strategy Support Applications for the Implementation of Electric Bus Demonstration Project (1/2)

1. Project Overview

In recent years, the technological development of electric buses has gradually matured, and global sales also continued to grow. For the domestic bus companies, the stability of the bus's key systems and coordination with the infrastructure, and the customization of operation planning according to the business environment all rely on the continuous collection and analysis of operating performance data, and through the comparison of the performance including availability, power efficiency and operating range of various bus manufacturers, it can be used to propose the introduction guidelines for the domestic electric buses for the business's reference, and serve on a policy promotion and resource allocation basis for rolling review. Therefore, the Ministry of Transportation and Communications has stipulated that all electric bus subsidies (including demonstration projects and general projects) from 2019 onwards must provide relevant data for analysis by the Institute and the Directorate General of Highways. The main purpose of this project is to assist in collecting system information during the implementation of demonstration projects and general plans for electric buses, and to build the Operation Data Monitoring and Management Platform, and then to analyze various operation and driving data of electric buses through the platform, to provide the reference for annual inspection data of demonstration plans and general plans, and grasp key indicators and key issues for the operation. In addition, it also simultaneously reviews the gaps of operation environment and infrastructure of electric buses, hoping to accumulate actual operation data of local electric buses through the implementation of this project, to develop the Introduction Guidelines of Electric Buses, and provide local governments with reference for subsequent expansion and implementation.

2. Research Outcomes

(1) Accumulate data on the actual operation of electric buses in our country and open to the "Public Transport data eXchange" as a basic resource for subsequent policy promotion or related research.

(2) Formulate the data collection items and transmission mechanisms for electric bus on-board devices and charging facilities to improve the efficiency and quality of data collection.

(3) Track the performance of the electric bus operation of the demonstration project as a reference for the phased inspection and operation subsidy.

(4) Build the Electric Bus Operation Data Monitoring and Management Platform to grasp key indicators of different operating scenarios through data analysis, and provide the reference for the promotional strategies of electric buses, the adjustment of operation methods for the bus companies, and the product development of electric bus manufacturers.

(5) Formulate the promotion and introduction operations of electric buses, perform rolling review of the promotion strategy and introduction of electric buses, and establish the operating procedures of subsidizing the electric buses demonstration project.

3.成果推廣與效益

（1）藉由長期性累積我國電動公車營運數據資料，提供車廠提升產品性能、業者經營管理及滾動檢討電動公車推動政策依據，提升電動公車整體營運品質。

（2）依循本計畫建立電動公車營運數據監控管理平台資料傳輸作業規範，進行電動公車營運數據資料蒐集，以達到資料蒐集便利及一致性。

（3）透過電動公車導入指南，健全我國審驗、檢測及補助制度，建構電動公車導入環境與提高使用意願，達到改善空污之目標。

（4）應用電動公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。
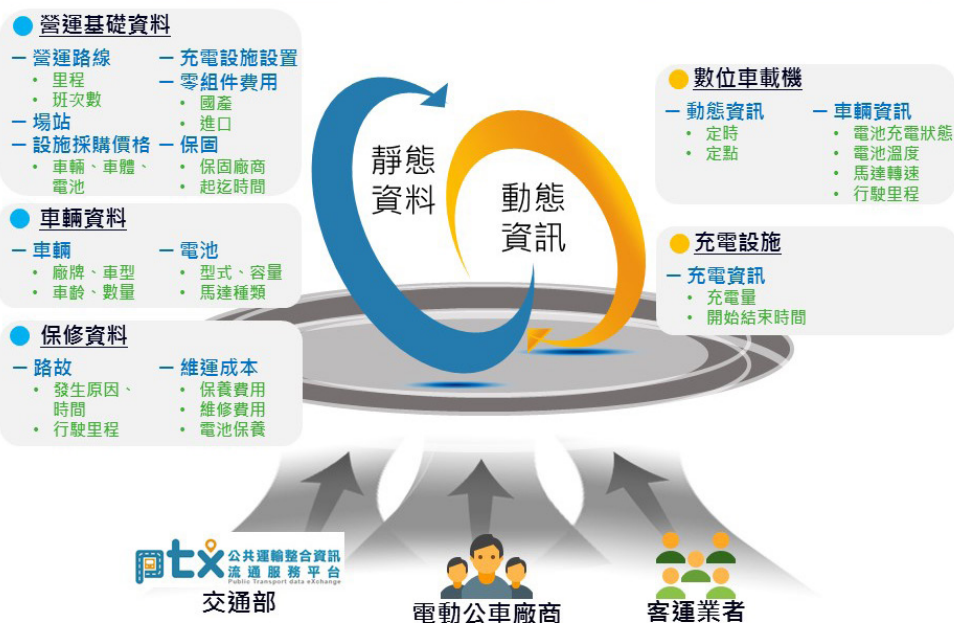
（5）引進國際先進技術並整合國內研發資源，促進產官學研間之合作。

4.研究成果精華摘整

3.Promotion of Outcomes and Benefits

(1) Provide the bus manufacturers with the basis for improving the product performance and business management, and perform rolling review on the electric bus promotion policy through the operation data accumulation of the electric buses in our country to improve the overall operating quality of electric buses.

(2) Collect the electric bus operation data according to the Data Transmission Operation Specifications of the Electric Bus Operation Data Monitoring and Management Platform established by this project to achieve the convenience and consistency of data collection.

(3) Through the Introduction Guidelines of Electric Buses, improve our country's inspection, testing and subsidy system, build the environment for electric buses introduction and increase the willingness of use through the Introduction Guidelines of Electric Buses to achieve the goal of improving air pollution.

(4) Use the Electric Bus Operation Data Monitoring and Management Platform to track and check the operation performance of the demonstration project, which can assist the management unit to conduct operation status audit of the bus companies.

(5) Introduce international advanced technology and integrate domestic R&D resources to promote cooperation between industry, government, academia and research institutions.

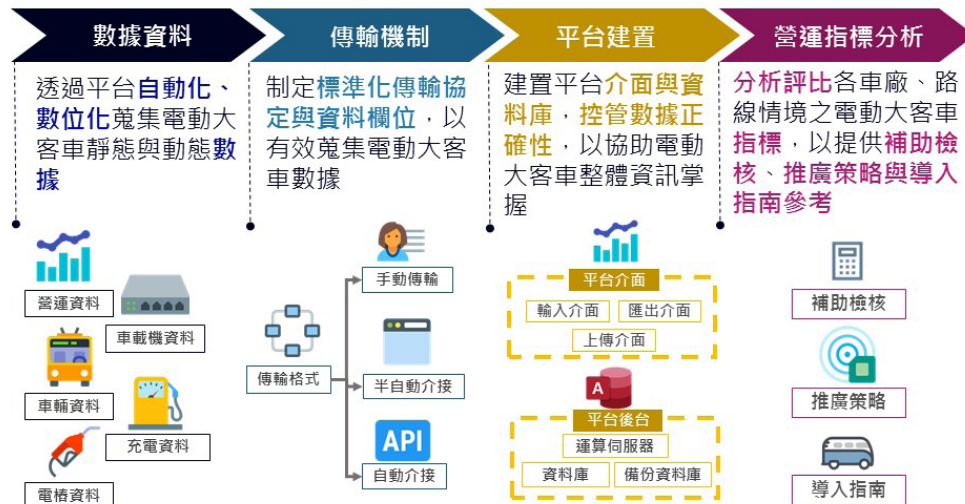## 4.Summary of Research Outcomes

電動大客車營運數據監控管理平台資料蒐集項目
Data Collection Items of the Electric Bus Operation Data Monitoring and Management Platform

客運數據監控管理平台建置執行

建置監控管理平台，蒐集營運數據、分析營運指標特性，以提供補助檢核、推廣策略與導入指南參考

數據資料	傳輸機制	平台建置	營運指標分析
透過平台**自動化、數位化**蒐集電動大客車靜態與動態**數據**	制定**標準化傳輸協定與資料欄位**，以有效蒐集電動大客車數據	建置平台**介面與資料庫**，**控管數據正確性**，以協助電動大客車整體資訊掌握	**分析評比**各車廠、路線情境之電動大客車**指標**，以提供**補助檢核、推廣策略與導入指南參考**

營運資料
車載機資料
車輛資料
充電資料
電樁資料

傳輸格式
手動傳輸
半自動介接
API
自動介接

平台介面
輸入介面　匯出介面
上傳介面
平台後台
運算伺服器
資料庫　備份資料庫

補助檢核
推廣策略
導入指南

電動大客車營運數據監控管理平台建置執行步驟
Implementation Procedures for the Establishment of Electric Bus Operation Data Monitoring and Management Platform

營運數據監控管理平台資料庫架構

整合資料庫

維運
路故原因　路故時間
路故里程　維護成本

數位車載機
充電狀態　電池溫度
速率　馬達負載
即時位置

車輛零組件費用
零件產品別　總成名稱
零件名稱　製造商
單價　數量

依照定位
● 暫存儲存庫
● 即時資料庫
● 歷史資料庫

電動公車車輛
車輛數　車型
車輛廠牌　車齡
使用時間　電池
馬達種類　安全電量
電池型式與數量

充電站及充電設施
設置地點　建置費用
契約容量　充電時間
充電方式　充電時段
充電設備數量
單一充電座及充電柱功率

公車營運
運行路線　車牌號碼
班次數　營運里程
停車場位置　可停車輛數
公車售價　保固

依照功能
● 維運
● 數位車載機
● 車輛零組件
● 電動公車車輛
● 充電站及設施
● 公車營運
● 系統
● 統計

系統
系統權限
介接權限
介接交易
資料監控
紀錄監控

統計

指標觀察
成本分析　車輛妥善率
用電效率　續航力
電池異常　充電效率
電力分析　充電時間
充電設施妥善率

關鍵檢核
示範計畫執行狀況
補助資料　車輛評比

資料上傳
勤態資料管理
主檔資料管理

電動大客車營運數據監控管理平台資料庫架構
Database Architecture of Electric Bus Operation Data Monitoring and Management Platform

5.研究成果報告

· 電動公車示範計畫執行績效分析與推動策略支援應用(1/2) (109年出版)

5.Report of Research Outcomes

· The Analysis of Project Performance and Application of Promotion Strategy Support in the Pilot Project of Electric Bus (1/2) (published in 2020)

六、氣候變遷環境下運輸部門之因應作為

（一）2020年版運輸政策白皮書-綠運輸

1.計畫概述

　　綠運輸政策的宗旨在於建構永續低碳運輸環境，減少溫室氣體排放並改善空氣污染，以提升民眾生活品質。2020年運輸政策白皮書-綠運輸分冊係配合104年7月1日公布實施之「溫室氣體減量及管理法」（以下簡稱溫管法），及民國106年12月21日行政院宣示之「空氣污染防制行動方案」與107年8月1日修正公布之「空氣污染防制法」相關規定，為落實運輸部門之溫室氣體減量管理事項及推動移動污染源防制工作等而編撰研提，做為交通部綠運輸發展之指導施政方針。

　　本計畫經檢視近年國外運輸部門綠運輸政策，以掌握我國運輸部門能源消耗、溫室氣體與空氣污染排放趨勢，分析歸納我國運輸部門節能減碳暨減污之重要課題，訂定未來綠運輸發展之願景與目標及據以研訂各項綠運輸發展政策、策略及行動方案，以爭取民眾對政府推動運輸部門節能減碳暨減污施政方向之支持與認同。

2.研究成果

（1）回顧綠運輸發展現況與內外在環境之變化：

　　回顧運輸部門能源消耗消長、分析運輸部門之溫室氣體排放及空氣污染排放情形，並探討公共運輸與私人運具使用情形、車輛能源效率標準與電動化、自行車、空運、海運等綠運輸發展情形。

（2）蒐整歸納綠運輸現況發展之課題：

　　研析並提出綠運輸發展面臨之八大課題，俾利提出相對應之政策、策略與行動方案。

VI. Response of Transportation Sectors in Climate Change Environment

(1) 2020 Transportation Policy White Paper – Green Transportation

1.Project Overview

　　The purpose of the green transportation policy is to build a sustainable low-carbon transportation environment, reduce greenhouse gas emissions and improve air pollution, so as to improve the quality of life of the people. The 2020 Transportation Policy White Paper – Green Transport Volume is to cooperate with the "Greenhouse Gas Reduction and Management Act" promulgated and implemented on July 1, 2015 (hereinafter referred to as "the Act"), and the "Air Pollution Control Action Plan" promulgated by the Executive Yuan on December 21, 2017 and the relevant regulations of the "Air Pollution Control Act" amended and promulgated on August 1, 2018, compiled and proposed for implementing the greenhouse gas reduction management matters of the transportation sector and promoting the mobile pollution source control work as the guiding administration policy for the development of green transportation of the Ministry of Transportation and Communications.

　　After reviewing the green transportation policies of foreign transportation departments in recent years, this project grasps the energy consumption, greenhouse gas and air pollution emission trends of our country's transportation sectors to analyze and summarize the important topics of energy conservation, carbon reduction and pollution reduction of our country's transportation sectors, and to set the vision and goals of future green transportation and as the basis to research and develop various green transportation development policies, strategies and action plans, to strive for people's support and approval of the promotion of administration directions in energy conservation, carbon reduction and pollution reduction in the transportation sectors.

2.Research Outcomes

(1) Review the current development condition of green transportation and the changes in internal and external environments:

　　Review the change of energy consumption in the transportation sectors, analyze the greenhouse gas emissions and air pollution emissions in the transportation sectors, and explore the development of green transportation including the condition of public and private transportation vehicles, vehicle energy efficiency standards and electrification, bicycles, air transportation, and sea transportation.

(2) Search and summarize the current development topics of green transportation:

　　Study and analyze and propose eight major topics faced by the development of green transportation, in order to propose corresponding policies, strategies and action plans.

(3) Propose the green transportation development vision,

（3）提出綠運輸發展願景、目標、政策、策略與行動方案：

　　以「營造潔淨運輸環境」為願景，以「減少能源消耗及溫室氣體排放」、「減少空氣污染排放」為政策目標，提出「發展公共運輸系統，強化需求管理」、「建構低碳、低污染之運輸環境」、「提升運輸系統與運具能源使用效率」三大政策9項策略及59項行動方案。

3.成果推廣與效益

（1）於107年12月13日召開「運輸政策白皮書─綠運輸分冊」策略篇討論會議，邀集專家學者及相關機關進行討論。

（2）於108年6月10日辦理「2020年版運輸政策白皮書研討會-綠運輸分冊」，針對綠運輸內容進行交流討論，形成綠運輸政策之共識。

（3）108年12月辦理「2020年版運輸政策白皮書新書發表會」，推廣成果。

4.研究成果精華摘整

goals, policies, strategies and action plans:

　　With the vision of "Creating a clean transportation environment," with the policy goals of "Reducing energy consumption and greenhouse gas emissions" and "Reducing air pollution emissions," propose three major policies of "Developing public transportation systems, Strengthening demand management," "Building the transportation environment of low carbon and low pollution," and "Improving energy use efficiency of transportation systems and vehicles," with 9 strategies and 59 action plans.

3.Promotion of Outcomes and Benefits

(1) Held a discussion meeting on the strategy section of the "Transportation Policy White Paper – Green Transport Volume" on December 13, 2018, and experts, scholars and relevant agencies were invited for discussion.

(2) Conducted the "2020 Transport Policy White Paper Seminar – Green Transportation Volume" on June 10, 2019 to exchange and discuss the content of green transportation and form the consensus on green transportation policies.

(3) Conducted the "2020 Transport Policy White Paper New Book Presentation" in December 2019 to promote the results.

4.Summary of Research Outcomes

| 願景 | 政策目標 | 政策 | 策略 |

綠運輸發展政策核心架構圖
The Core Structural Chart of Green Transportation Development Policy

5.研究成果報告

· 2020運輸政策白皮書-綠運輸分冊(108年出版)。

5.Report of Research Outcomes

· 2020 Transportation Policy White Paper-Green Transportation Volume (published in 2019)

（二）運輸部門第一期溫室氣體排放管制目標之減量作為

1.計畫概述

為配合國家推動溫室氣體減量政策，交通部依溫管法暨施行細則規定，擬定運輸部門溫室氣體排放管制行動方案，作為我國運輸部門推動溫室氣體減量之依循，並作為直轄市、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，占比達95.5%；公路運輸排放又以小客車51% 最高、其次是大貨車18%。為推動溫室氣體減量工作，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11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。

2.研究成果

（1）陳報「運輸部門溫室氣體排放管制行動方案執行成果」(108年9月版)，於108年12月4日奉行政院核定。

（2）配合環保署研訂溫室氣體排放第二期階段管制目標，協助推估運輸部門能源消費量、各減碳策略節能量。

（3）綜整運輸部門研擬行動方案標準作業程序及研提第二期行動方案初擬草案(2021~2025年)。

3.成果推廣與效益

（1）108年4月製作運輸部門溫室氣體減量執行成果亮點圖卡，送環保署轉陳行政院辦理相關廣宣事宜。

（2）透過交通部、環保署、經濟部等部會執行相關措施，106年、107年運輸部門溫室氣體排放量降為3,783萬公噸及3,713萬公噸，低於105年3,816萬公噸，顯示運輸部門推動溫室氣體減量工作已見成效。

(2) The Reduction Action of the First Phase Greenhouse Gas Emission Control Targets for the Transportation Sector

1.Project Overview

In order to cooperate with the country's promotion of greenhouse gas reduction policies, the Ministry of Transportation and Communications has developed the greenhouse gas emission control action plan in accordance with the regulations of the Greenhouse Gas Reduction and Management Act Enforcement Rules for the transportation sectors of our country to follow in promoting greenhouse gas reduction, and as the basis for the municipality or county (city) to set the greenhouse gas control implementation program in accordance with the Greenhouse Gas Reduction and Management Act.

The transportation sector is the fourth largest sector of greenhouse gas emissions in our country, with highway transportation emission as the highest, accounting for 95.5%; among highway transportation emissions, the small passenger cars are the highest with 51% of passenger cars, followed by large trucks with 18%. In order to promote greenhouse gas reduction, the transportation sector adopts three major strategies of "Developing public transportation systems, Strengthening transportation demand management," "Building green transportation networks, Promoting the use of low-carbon transportation vehicles, Building a green transportation-oriented transportation environment" and "Improving transportation systems and transportation vehicle energy use efficiency" with 11 measures. Conduct rolling review on the implementation results of the action plan every year and submit the implementation results report.

2.Research Outcomes

(1) Report the "Achievements of the Transportation Sector Greenhouse Gas Emission Control Action Plan Implementation" (September 2019 version), approved by the Executive Yuan on December 4, 2019.

(2) Cooperate with the Environmental Protection Administration to develop the second phase control targets of the greenhouse gas emissions, and assist in estimating the energy consumption of the transportation sectors and the energy savings of various carbon reduction strategies.

(3) Summarize the standard operating procedures for developing the action plan by the transportation sectors and propose the preliminary draft of the second phase of the action plan (2021–2025).

3.Promotion of Outcomes and Benefits

(1) Produced the Highlights chart card for the implementation results of greenhouse gas reduction by the transportation sectors in April 2019, and sent it to the Environmental Protection Administration to forward to the Executive Yuan to manage the related publicity matters.

(2) Through the implementation of relevant measures by the Ministry of Transportation and Communications, the Environmental Protection Administration, and the Ministry of Economic Affairs, the greenhouse gas emissions of the transportation sector in 2017 and 2018 were reduced to 37.83 million metric tons and 37.13 million metric tons, respectively, down from 38.16 million metric tons in 2016, showing the efforts by the transportation sectors to reduce greenhouse gas emissions have achieved results.
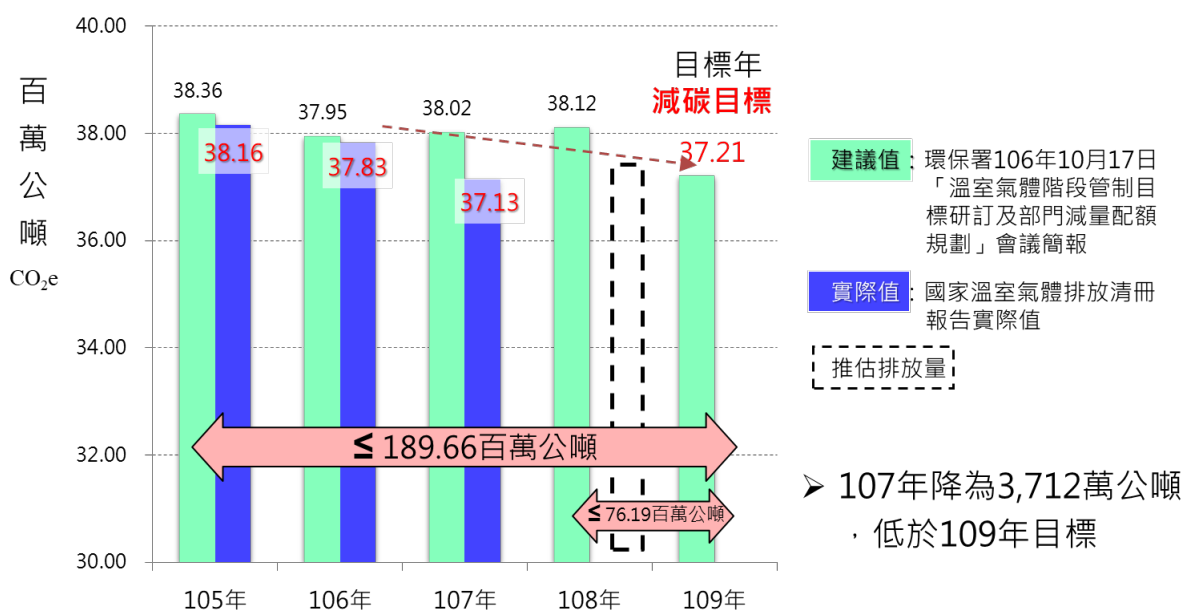
4.研究成果精華摘整

推動策略　　　　減碳措施
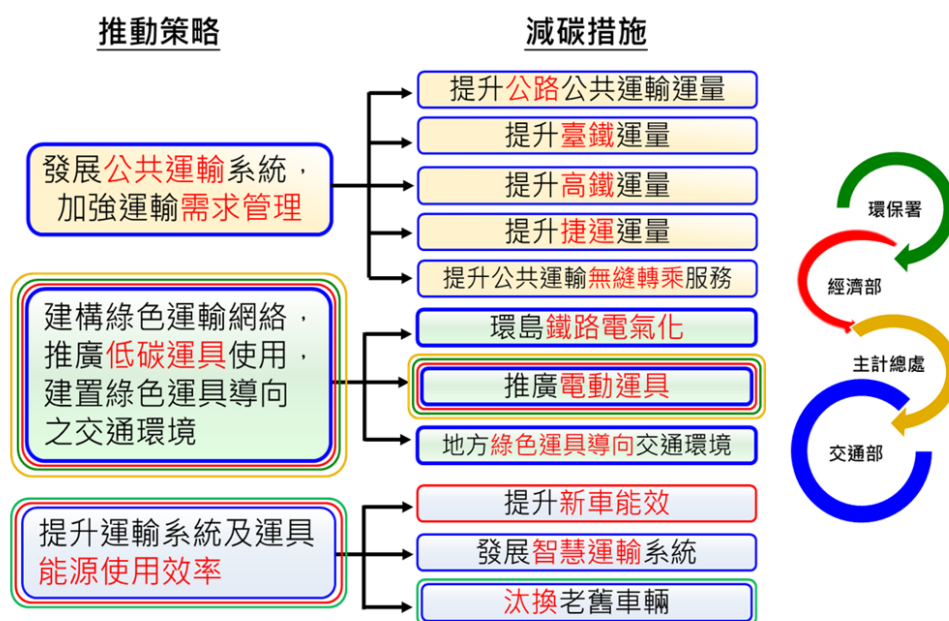
運輸部門溫室氣體排放管制行動方案
Transportation Sector Greenhouse Gas Emission Control Action Plan

運輸部門減碳執行成果
Transportation Sector Carbon Reduction Implementation Results

5.研究成果報告

- 運輸部門溫室氣體減量策略成效研析 (109年出版)
- 運輸部門溫室氣體排放決策支援系統功能擴充與維運 (109年出版)

5.**Report of Research Outcomes**

- A Study and Analysis on the Results of Greenhouse Gas Reduction Strategies Raised by Transportation Sectors (published in 2020)

- Maintaining and Expanding Decision Support System of Greenhouse Gas Emissions in Transportation Sector (published in 2020)

（三）交通污染排放量推估與污染熱點分析

1.計畫概述

車輛空污排放屬於近地排放，貼近民眾生活環境，因應行政院「空氣污染防制行動方案」推動，且大氣環境中PM2.5濃度，推估約27.5％屬車輛排放影響。然交通空污改善工作涉及運具管理、私人汽機車輛使用管制及地區性交通規劃，爰政府空污防制需交通單位之配合。

此外，交通空污排放管制及政策推動，皆與空污排放量分布相互聯結，為協助交通部掌握交通空污狀況，本計畫解析全臺主要的交通污染排放影響熱區及成因，並研提降低交通污染管理策略建議。

2.研究成果

（1）應用空氣污染排放總量資料庫清冊系統(Taiwan Emission Data System, TEDS)移動源參數資料、全臺空氣品質測站觀測資料及氣象與空氣品質模擬資料進行比對分析，皆指向交通空污熱區多集中於市中心區域，其中又以六都之市中心較為明顯，因此交通空污之減量管理宜優先從人口密集之都會區著手，以有效降低空污濃度與民眾暴露。

（2）根據車種組成與道路型態之分析，可發現各地區交通空污熱點成因有所不同，北部地區都會區係以私人運具之汽油小客車、機車為主，道路型態多為市區道路；而在中南部地區則以柴油大貨車為主，道路型態多分布於國道。

（3）根據交通空污熱點成因不同提出相關減污措施建議，當交通空污熱點多為市區道路，車種組成多為汽油小客車、機車時，應針對降低私人運具使用、強化公共運輸、推動低污染運具、分散車流減少壅塞等層面之改善；當熱點多為國道，並車種組成多為柴油大貨車時，應透過改善柴油大貨車排污防制設備或汰換老舊車輛，以降低車輛排污為主。

(3) Traffic Pollution Emissions Estimation and Pollution Hot Spots Analysis

1.Project Overview

Vehicle air pollution emissions are near-ground emissions, which are close to the living environment of the people. In response to the promotion of the "Air Pollution Control Action Plan" by the Executive Yuan, it is estimated that about 27.5% of PM2.5 concentration in the atmospheric environment is an impact of vehicle emissions. However, the traffic air pollution improvement work involves the transportation vehicle management, the use control of private vehicles and motorcycles and the regional traffic planning; therefore, the government's air pollution control requires the cooperation of transportation units.

Besides this, traffic air pollution emission control and policy promotion are linked to the distribution of air pollution emissions. In order to assist the Ministry of Transportation and Communications in grasping the status of traffic air pollution, this project analyzes the major traffic pollution emissions impact hot spots and causes in Taiwan, and proposes the recommendations on management strategies to reduce traffic pollution.

2.Research Outcomes

(1) Use the Taiwan Emission Data System (TEDS) mobile source parameter data, observation data of the Air Quality Observatory across Taiwan as well as the meteorological and air quality simulation data to conduct comparison and analysis, all pointing to traffic air pollution hot spots which are concentrated in the city center area, and more obvious in the city center of six municipalities; therefore, the management of air pollution reduction shall be given priority to the densely populated metropolis to effectively reduce the air pollution concentration and public exposure.

(2) According to the analysis of vehicle type composition and road types, it can be found that the causes of air pollution hot spots in different regions are different. In the northern region metropolitan area it is mainly caused by the gasoline passenger cars and motorcycles for private transportation vehicles, and the road types are mostly urban roads; while in the central and southern regions, it is mainly caused by the diesel trucks, and the road types are mostly distributed on national highways.

(3) Propose relevant pollution reduction measures and recommendations according to the different causes of air pollution hot spots. When the air pollution hot spots are mostly the urban roads and the vehicle type composition is mostly gasoline passenger cars and motorcycles, it shall be aiming at the improvement at the levels of reducing the use of private transportation vehicles, strengthening the public transportation, promoting low-pollution vehicles, and dispersing the traffic flow to reduce congestion; when the hot spots are mostly national highways, and the vehicle type composition is mostly diesel trucks, it shall be mainly through the improvement of the pollution control equipment in the diesel trucks or the replacement of old vehicles to reduce the vehicle emissions.

3.成果推廣與效益

（1）連結「空氣污染防制行動方案計畫書」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，做為支持中央及地方環保交通管理機關(如交通部、環保署、地方交通局與環保局)推動前述政策之研究論述。另可提供中央/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。

（2）另為推廣本所減少交通空污相關研究成果，本計畫辦理5場次減少交通環境空污暴露之推廣工作坊，促使交通管理單位將交通空污減量思維納入交通管理措施之規劃。有91%以上與會者對整體收穫感到滿意，96%以上與會者建議未來應持續辦理相關研究推廣，以持續提升臺灣空氣品質，維護民眾健康。

4.研究成果精華摘整

3.Promotion of Outcomes and Benefits

(1) Link the relevant air pollution reduction management strategies of the "Air Pollution Control Action Plan" and the "Transportation Policy White Paper – Green Transportation Volume" to support the central and local environmental protection and traffic management agencies (such as the Ministry of Transportation and Communications, the Environmental Protection Administration, and the local Transportation Bureau and Department of Environmental Protection) to promote the research discussion of the aforementioned policies. In addition, it can provide the central/local transportation competent authorities to propose traffic management measures to improve air quality according to local conditions, and improve the air quality of the local traffic environment and the health of people.

(2) Besides this, in order to promote the research results related to the reduction of traffic air pollution of the Institute, this project organized five promotion workshops to reduce air pollution exposure in the traffic environment, and to urge the traffic management units to incorporate the thinking of air pollution reduction in the planning of traffic management measures. More than 91% of the participants were satisfied with the overall gains, and more than 96% of the participants suggested that relevant research and promotion shall be continued in the future to continue the improvement of air quality in Taiwan and maintain the health of people.

4.Summary of Research Outcomes

交通空污熱點主要區域及成因分析流程
Main Areas of Traffic Air Pollution Hot Spots and Causes Analysis Process
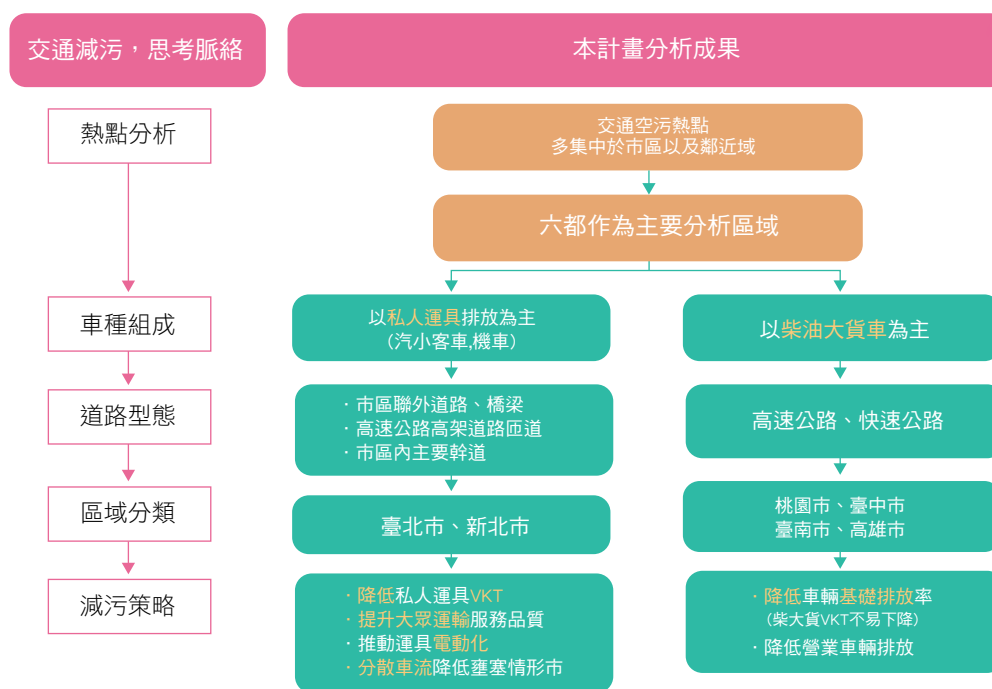
交通空污熱點減污措施思維
Thinking of the Traffic Air Pollution Hot Spots Pollution Reduction Measures

5.研究成果報告

· 交通污染排放量推估與污染熱點分析 (109年出版)

（四）運輸系統調適策略研究

1.計畫概述

為落實氣候變遷調適，我國於104年7月公布施行《溫室氣體減量及管理法》，其中第13條明定中央目的事業主管機關應進行調適策略之研議，係屬部層級之施政策略方向，需對於整體運輸系統有上位政策之探討。

本所已於107年辦理完成「運輸部門氣候變遷調適策略研議計畫」，提出四大構面及15項調適策略建議。惟為因應國際調適新趨勢、設施管理機關之調適新方向及新科技之發展，本計畫滾動檢討107年計畫研擬之運輸部門調適策略，並持續更新鐵公路氣候變遷風險資訊，完成鐵公路調適新科技應用之探討及建議，提供設施管理機關參考。

5.Report of Research Outcomes

· Estimation of Traffic Air Pollution Emissions and Analysis of Air Pollution Hot Spots (published in 2020)

(4) Research on the Adaptation Strategy of Transportation System

1.Project Overview

In order to implement climate change adaptation, our country promulgated and implemented the "Greenhouse Gas Reduction and Management Act" in July 2015, of which Article 13 clearly stipulates that the central industry competent authorities shall develop the adaptation strategies, which is a ministerial-level implementation policy direction, and it is necessary to have a high-level policy discussion on the overall transportation system.

The Institute completed the "Climate Change Adaptation Strategies for the Transportation Sector" in 2018, and proposed 4 major aspects and 15 adaptation strategy recommendations. However, in response to the new trend of international adaptation, the new direction of adaptation for the facility management agencies and the development of new technologies, this project performs rolling reviews on the transportation sector adaptation strategies developed in the 2018 project, and continues to update the railway and highway climate change risk information, to complete the exploration and recommendations for the railway and highway adaptation new technology application, to provide a reference for the facility management agencies.

2.研究成果

（1）完成運輸系統調適策略滾動檢討：

以本所「運輸部門氣候變遷調適策略研議計畫」所研提之調適策略為基礎，依據國外調適趨勢、國外新科技應用案例及部屬機關建議，擴大策略構面之範疇，調整8項策略內容並補充相關說明。

（2）完成鐵公路調適新科技應用之探討及建議：

蒐集國外與我國類似氣候狀態，如強降雨、高溫的國家運用新科技於調適的案例，如應用感應器、大數據與物聯網等維護鐵公路系統、耐高溫的公路鋪面材料與鐵路塗層等，分析優缺點及國內適用性。

（3）完成鐵公路氣候變遷風險資訊更新：

延續本所「運輸部門氣候變遷調適策略研議計畫」之研究方法、氣候變遷情境設定及風險評估指標，更新鐵公路風險資訊，提供管理機關查詢所轄設施在氣候變遷不同重現期雨量下各路段之危害度、脆弱度及風險等級。

3.成果推廣與效益

（1）完成「運輸系統氣候變遷調適趨勢探討」論文，發表於「中華民國都市計畫學會、中華民國區域科學學會、中華民國地區發展學會、中華城市管理學會2019聯合年會暨論文研討會」。

（2）邀集部屬機關辦理氣候變遷調適知識教育訓練，並召開專家學者座談會，推廣氣候變遷調適概念，分享氣候變遷的影響與可採取之對策，以深化部屬機關人員對調適的認識，俾利推展運用於實際設施新建規劃及管理養護業務。

（3）本計畫主要成果係在鐵公路設施管理機關人力及資源有限下，提供其快速掌握全臺路網大尺度之風險資訊，並推廣提供公路總局、高速公路局、鐵道局、臺鐵局及高鐵公司等單位，進一步檢視確認高風險成因及推動具體改善計畫，以有效提升鐵公路系統調適能力。

2.Research Outcomes

(1) Completed the rolling review of the transportation system adaptation strategy:

Based on the adaptation strategy developed by the Institute's "Climate Change Adaptation Strategies for the Transportation Sector," and based on international adaptation trends, international new technology application cases, and recommendations from subordinate agencies, to expand the scope of the strategy dimension, adjust 8 strategy contents and supplement related descriptions.

(2) Completed the exploration and recommendations on the application of new technologies for railway and highway adaptation:

Collected similar weather conditions abroad and in our country, such as the cases of heavy rainfall; high temperature countries using new technology in adaptation, such as the use of sensors, big data and the Internet of Things, etc., to maintain the railway and highway system; high temperature resistance highway paving materials and railway coatings and so on, and analyze the advantages and disadvantages and domestic applicability.

(3) Completed the risk information update for the railway and highway climate change:

Continued the research methods, climate change scenario setting and risk assessment indicators of the Institute's "Climate Change Adaptation Strategies for the Transportation Sector," to update the railway and highway risk information, and provide the management agencies to query the degree of harm, vulnerability and risk level of the various road sections of the facilities under their jurisdiction in different recurrence periods of climate change.
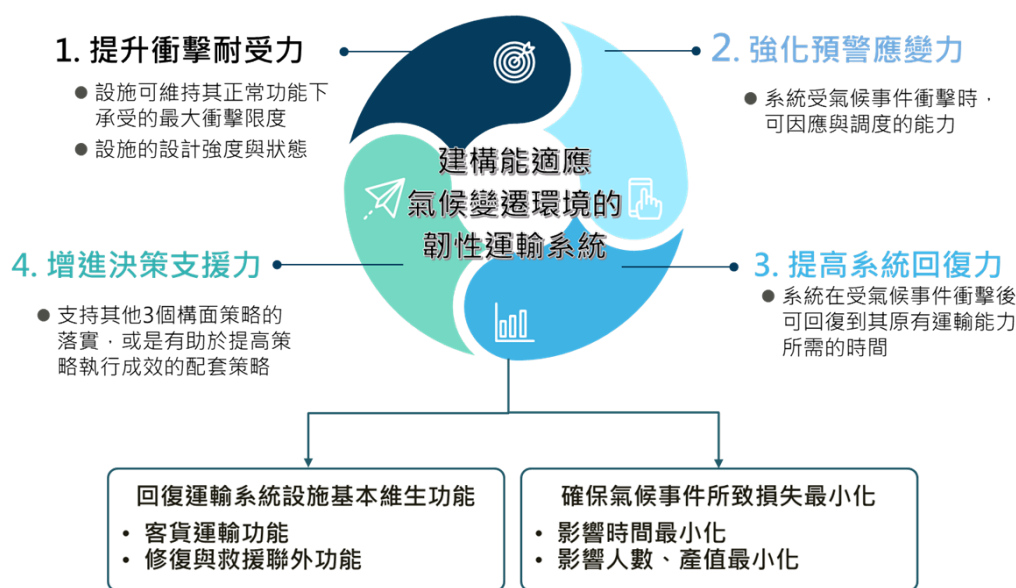
3.Promotion of Outcomes and Benefits

(1) Completed the paper "Exploration on the Trends of Climate Change Adaptation for the Transportation System," published in the "Taiwan Institute of Urban Planning, Chinese Regional Science Association – Taiwan, Association of Glocal Development, Chinese Association of Urban Management 2019 Joint Annual Meeting and Paper Seminar."

(2) Invite the Ministry subordinated agencies to conduct climate change adaptation knowledge educational training, and hold a symposium with experts and scholars to promote the concept of climate change adaptation, share the impact of climate change and possible countermeasures, so as to deepen the understanding of the adaptation for the personnel of the Ministry's subordinated agencies, in order to promote and apply it to the actual facility new construction planning and management maintenance business.

(3) The main result of this project is to provide a rapid grasp of the large-scale risk information of the entire Taiwan road network under the limited manpower and resources of the railway and highway facility management agencies, and extend and provide the units of the Directorate General of Highways, Freeway Bureau, Railway Bureau, Taiwan Railways Administration and Taiwan High Speed Rail Corporation to further review and confirm the high-risk causes and promote specific improvement plans to effectively improve the adaptation ability of the railway and highway systems.

4.研究成果精華摘整

4.Summary of Research Outcomes

1. 提升衝擊耐受力
- 設施可維持其正常功能下承受的最大衝擊限度
- 設施的設計強度與狀態

2. 強化預警應變力
- 系統受氣候事件衝擊時，可因應與調度的能力

建構能適應
氣候變遷環境的
韌性運輸系統

4. 增進決策支援力
- 支持其他3個構面策略的落實，或是有助於提高策略執行成效的配套策略

3. 提高系統回復力
- 系統在受氣候事件衝擊後可回復到其原有運輸能力所需的時間

回復運輸系統設施基本維生功能
- 客貨運輸功能
- 修復與救援聯外功能

確保氣候事件所致損失最小化
- 影響時間最小化
- 影響人數、產值最小化

四大調適策略構面
Four Major Adaptation Strategy Aspects

四大構面	15項策略	類別
提升衝擊耐受力	1. 迴避高風險潛勢地區並考量周邊環境關係（同時適用軟、硬體設施）	設施建設
	2. 檢討並修訂規劃、設計、施工及養護相關規範	設施建設
	3. 運用或研發有助提升衝擊耐受力的材料、工程與設備	設施建設
	4. 檢討並調整巡檢制度與風險監測	營運管理
	5. 強化跨運輸系統介面及重要維生基礎設施聯外/聯絡道路衝擊耐受力	設施建設
強化預警應變力	6. 運用或研發有助提升預警精度與速度的科技與設備	營運管理
	7. 建立運輸系統設施的備援方案	營運管理
提高工程回復力	8. 運用或研發有助提升復建效率的科技、工法與材料	設施建設
	9. 建立分等級復建原則	設施建設
增進決策支援力	10. 建立設施安全性與風險評估方法並定期評估	營運管理
	11. 建立氣候變遷調適計畫投資決策評估方法	營運管理
	12. 建置風險管理所需資料庫及支援系統工具	營運管理
	13. 建立氣候變遷風險管理與調適專業組織及培育人才	營運管理
	14. 建立氣候變遷調適跨域整合推動平台與機制，加強資訊共享	營運管理
	15. 針對利害關係人進行氣候變遷風險溝通	營運管理

15 項調適策略
15 Adaptation Strategies

七、港灣環境與船舶航行安全研究發展

（一）2020年版運輸政策白皮書-防災與調適

1.計畫概述

　　囿於現今氣候變遷之考驗加劇，如何面對所帶來衝擊，已成為國際主要焦點及各國重要施政議題之擬定方向。依據我國交通部中央氣象局網站統計資料及科技部發布的「臺灣氣候變遷科學報告」指出，臺灣目前亦正面臨氣候變遷的挑戰。比如過去一百年內均溫上升約攝氏1.3度，極端高溫每年發生日數可能超過100天；海平面上升速度，由過去近20年間測得數據顯示，約為每年3.4公釐，且上升幅度有增快趨勢；強降雨事件上，短延時強降雨頻率逐漸增加等。

　　爰此，運輸系統在面臨氣候變遷時的調適與防災作為至關重要，因為其不僅與人民日常生活息息相關，亦是影響國家能否維持正常運作的重要關鍵。故2020年版運輸政策白皮書配合當前氣候變遷重大議題，新增「運輸部門因應氣候變遷調適與防災」分冊，期於出版後能提供各運輸系統在面對氣候變遷下之極端氣候，擬定發展願景與政策、界定重要課題、研擬因應策略與短中長期行動方案，以及增加民眾對於政府未來施政方向的瞭解。

2.研究成果

（1）彙整國內外相關調適與防災現況

　　本計畫以運輸系統(公路、鐵路、商港、機場)對於氣候變遷下，因應極端氣候之調適與防災現況及作為，進行資料之蒐整及審視。研究對象為國外各相關運輸部門及國內之公路總局、高速公路局、臺灣鐵路管理局、臺灣高鐵公司、航港局、港務公司、民航局及桃機公司等單位。

VII. Research and Development of Harbor and Maritime Environment and Ship Navigation Safety

(1) 2020 Transportation Policy White Paper – Disaster Prevention and Adaptation

1. Project Overview

　　Limited by the intensified test of today's climate change, how to deal with the impact has become a major international focus and the proposed direction of important administration issues in various countries. According to statistics data from the website of the Central Weather Bureau of the Ministry of Transportation and Communications as well as the "Taiwan Climate Change Scientific Report" issued by the Ministry of Science and Technology, Taiwan is also currently facing the challenge of climate change. For example, in the past 100 years, the average temperature has risen by about 1.3 degrees Celsius, and the number of days of extreme high temperature may exceed 100 days per year; the sea level rise rate, measured from the data in the past 20 years, is about 3.4 mm per year, and there is an increasing trend in the sea level rise; in the event of heavy rainfall, the frequency of short-delay heavy rainfall increases gradually.

　　Therefore, the adaptation and disaster prevention action for the transportation system facing climate change is extremely important, because it is not only closely related to the daily life of the people, but also an important key to the normal operation of the country. Therefore, the 2020 Transportation Policy White Paper is in line with the current major issues of climate change, and a new volume "Transportation Sector Climate Change Adaptation and Disaster Prevention" is added, expecting after it is published that it will be able to provide for various transportation systems in facing the extreme climate under climate change to develop vision and policies, define important topics, plan for response strategies and short-, medium- and long-term action plans, as well as increase the people's understanding of the government's future administration direction.

2. Research Outcomes

(1) Summarize the current status of domestic and international adaptation and disaster prevention:

　　This project takes the current status and actions of adaptation and disaster prevention of the transportation systems (highways, railways, commercial ports and airports) in response to extreme climate toward the climate change, to conduct data collection and review. The research objects are related foreign transportation sectors and domestic units including the Directorate General of Highways, Freeway Bureau, Taiwan Railways Administration, Taiwan High Speed Rail Corporation, Maritime and Port Bureau, Taiwan International Ports Corporation, Civil Aeronautics Administration, and Taoyuan International Airport Corporation.

（2）界定各運輸系統所面臨的氣候變遷影響衝擊及課題

　　　透過前揭現況的探討，並邀集專家學者、所涉部屬機關及地方政府等，一同召開研商會議及產官學研座談會。藉此協助檢視內容、凝聚共識，進而提出當前運輸系統共計25項調適與防災重要課題。

（3）提出調適與防災政策、策略與行動方案

　　　針對課題分析結果，綜合提出調適與防災三大政策，包含「強化災害風險管理機制，確保設施整體安全性」、「提升跨域聯防及調適能力，增加設施抗災韌性」、「提升科技技術，達成防災預警資訊迅速傳遞」，而其相對應之調適與防災策略，共計14項。並發展短中長期行動方案，供各運輸設施主管機關參採，落實於各級運輸機關實際推動政令之執行計畫，由上而下整合於一體。

3.成果推廣與效益

（1）108年6月10日召開2020年版運輸政策白皮書座談會。

（2）108年12月18日召開2020年版運輸政策白皮書新書發表會。

（3）參與宣傳影片、海報與文宣製作與發送，並於公開活動中進行推廣。

4.研究成果精華摘整

(2) Define the impacts and issues of climate change faced by various transportation systems:

　　Through the discussion of the aforementioned situation, the experts and scholars, the Ministry subordinated agencies and local governments are invited to jointly convene the research meetings and industry, government, academia and research institution symposium, to help review the content, garner consensus, and further propose a total of 25 important issues for the adaptation and disaster prevention for the current transportation systems.

(3) Propose adaptation and disaster prevention policies, strategies and action plans

　　Aiming at the results of the issue analysis, three major policies for adaptation and disaster prevention were comprehensively proposed, including "Strengthen the disaster risk management mechanisms, Ensure the overall safety of facilities," "Improve the cross-domain joint defense and adaptation capabilities, Increase the resilience of facilities to disasters," and "Improve technology, Achieve disaster prevention and early warning information speedy transmission," and the corresponding adaptation and disaster prevention strategies total 14 items. And develop short-, medium- and long-term action plans for the reference of use by the competent authorities of various transportation facilities, and implement the implementation plan of the actual promotion of the decree by the transportation agencies at all levels, and integrate it from top to bottom.

3.Promotion of Outcomes and Benefits

(1) Convened the 2020 Transportation Policy White Paper on June 20, 2019.

(2) Convened the 2020 Transportation Policy White Paper New Book Presentation on December 18, 2019.

(3) Participate in the production and distribution of publicity videos and posters, and promotional materials and conduct promotion in public activities.

4.Summary of Research Outcomes

氣候變遷調適與防災策略規劃基本原則
Basic Principles of Climate Change Adaptation and Disaster Prevention Strategy Planning

政策一：強化災害風險管理機制,確保設施整體安全性
- 策略1・建立或精進運輸設施安全性與風險評估方法並定期評估
- 策略2・強化災害情查機制與應變作為
- 策略3・運輸設施考量周遭環境關係,並盡量迴避高災害潛勢地區
- 策略4・強化並滾動檢討現行災前整備作業
- 策略5・優化設施管理資料庫及系統

調適與防災

政策二：提升跨域聯防及調適能力,增加設施抗災韌性
- 策略1・健全氣候變遷調適跨域整合聯繫機制
- 策略2・研商並建立運輸系統設施間備援方案
- 策略3・強化跨運輸系統介面及重要維生基礎設施聯外/聯絡道路衝擊耐受力

政策三：提升科技技術達成防災預警資訊迅速傳遞
- 策略1・精進災防預警系統與技術
- 策略2・應用科技強化運輸設施之巡檢與監測
- 策略3・研發及運用有助提升沖擊耐受力的材料、設備與工法
- 策略4・持續導入及應用各項新興科技
- 策略5・強化培育氣候變遷調適、防災專業人才
- 策略6・持續進行國內外調適與防災資訊交流

運輸部門氣候變遷調適與防災發展政策核心架構圖
Core Structural Chart of Climate Change Adaptation and Disaster Prevention Development Policies in the Transportation Sectors

5.研究成果報告

・2020運輸政策白皮書-運輸部門因應氣候變遷調適與防災(108年出版)

5.Report of Research Outcomes

・2020 Transportation Policy White Paper - climate change adaptation and disaster prevention (published in 2019)

（二）軌道扣件缺失辨識系統建置研究

1.計畫概述

本計畫建置軌道扣件缺失辨識系統，建立軌道扣件影像的收集設備，利用人工智慧辨識軌道扣件是否有缺失，定位有缺失之扣件並於Google Map上顯示，可達到軌道扣件影像辨識檢測的目的。本計畫亦開發雲端儲存、辨識與查詢等功能，提供軌道管理單位巡檢實務應用。

2.研究成果

（1）建立軌道扣件影像的收集設備，於夜間時速30公里下獲取足供AI辨識之清晰影像。

（2）建立軌道扣件缺失辨識系統，錄製70公里軌道扣件影像，利用人工智慧辨識扣件缺失，扣件影像辨識準確率為86.7%，並於Google Map上定位有缺失之扣件。

（3）開發雲端儲存、辨識與查詢等功能，提供軌道管理單位巡檢實務應用。

(2) Research on Construction of Track Fastener Fault Identification System

1.Project Overview

This project builds a Track Fastener Fault Identification System, establishes the track fastener image collection device, uses artificial intelligence to identify whether the track fasteners are faulty, locates the faulty fasteners and displays them on Google Maps to achieve the purpose of track fastener image recognition and inspection. This project also develops functions of cloud storage, identification and query to provide practical applications for the track management units to perform patrol inspection.

2.Research Outcomes

(1) Establish the track fastener image collection device to obtain clear images sufficient for AI identification at a speed of 30 kilometers per hour during nighttime.

(2) Establish the Track Fastener Fault Identification System to record 70 kilometers of track fastener images, and use artificial intelligence to identify fastener deficiency with the accuracy of fastener image identification of 86.7%, and position faulty fasteners on Google Maps.

(3) Develop functions of cloud storage, identification and query to provide practical applications for the track management units to perform patrol inspection.

3.成果推廣與效益

（1）108年10月6日於IEEE ECICE研討會發表「Railway Track Fasteners Fault Detection using Deep Learning」並獲得最佳論文獎。

（2）109年3月3日於交通部例行記者會，發表「軌道扣件缺失辨識系統之建置與應用」新聞稿。

（3）109年6月於港灣季刊發表「軌道扣件缺失辨識系統之建置研究」。

（4）研究成果可協助軌道扣件巡檢判釋，可提供鐵路養護巡檢單位使用，可提昇軌道巡檢效能，減少現場人工勘查及增進管理效能。

4.研究成果精華摘整

3.Promotion of Outcomes and Benefits

(1) Published "Railway Track Fasteners Fault Detection using Deep Learning" at the IEEE ECICE Symposium on October 6, 2019 and won the Best Paper Award.

(2) Issued a press release of "Construction and Application of Track Fasteners Fault Identification System" on March 3, 2020 at the regular press conference of the Ministry of Transportation and Communications.

(3) Published the "Research on the Establishment of the Track Fasteners Fault Identification System" in the Harbor and Marine Report Quarterly in June 2020.

(4) The research outcomes can assist track fastener patrol inspection and interpretation, and can be used by the railway maintenance patrol inspection units, which can improve the efficiency of track patrol inspection, reduce on-site manual inspections and improve the management efficiency.

4.Summary of Research Outcomes

軌道扣件缺失辨識系統
Track Fasteners Fault Identification System

（a）系統網頁

（b) 上傳影像自動辨識扣件缺失

軌道扣件影像自動缺失辨識
Automatic Fault Identification Track Fasteners Images
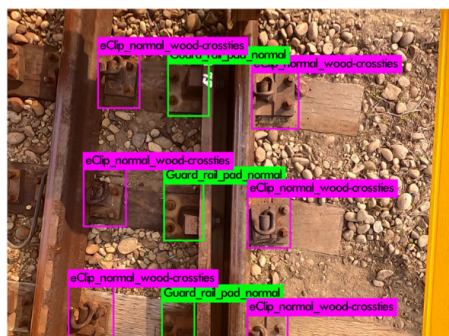
（a）軌道扣件影像自動辨識
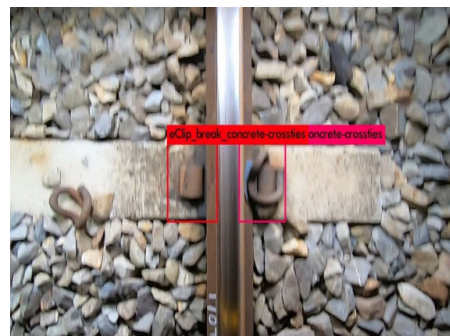
（b) 左為有缺失之扣件，右為正常扣件

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年出版)

（三）船舶航行安全大數據資料庫應用與分析

1.計畫概述

本計畫為提升臺灣海域之船舶航行安全，利用航港局船舶動態系統(Automatic Identification System，AIS)資料，進行蒐集之我國海域範圍內船舶航行資訊，結合人工智慧(Artificial Intelligence，AI)與大數據分析技術，建置一套AI智慧化船舶航行安全監測與預測系統。透過資料探勘技術，挖掘AIS資料庫之船舶資訊，藉以研析我國海域範圍內船舶航行資訊及特性，建置之船舶碰撞、錨泊及偏航預測模型，可提供AIS監測與預測船舶航行異常行為之應用，改善船舶航行面臨的安全課題。

2.研究成果

（1）完成船舶航行安全大數據資料庫建置研究，建立船舶航行安全大數據資料庫之資料預處理、資料清理、資料轉換、資料精簡等功能。

（2）建置船舶航行安全大數據資料庫之船舶航行安全資料分析、預測模組，開發船舶航行位置預測、船艏異常監測、偏離航道監測及船舶碰撞預測等功能，有效協助找出船舶航行異常行為並評估其潛在威脅。

（3）藉由系統建置與監測，得以在船舶發生違規航行、海上事故、需要水上救援等異常事件前，岸台監控的當值人員能有足夠預警時間，反饋給有關單位及時處理，提升船舶航行安全。

3.成果推廣與效益

（1）建立船舶航行安全監控機制，有效提升船舶航行安全，研究成果提供交通部航港局、臺灣港務公司及海洋委員會海巡署取得完整且詳細的船舶航行安全資料，有助

5.Report of Research Outcomes

· Railway Track Fastener Inspection System Establishment (1/2) - A Research on the Establishment of a Defective Fasteners Detection System (published in 2020)

(3) Application and Analysis of Ship Navigation Safety Big Data Database

1.Project Overview

In order to improve the safety of ship navigation safety in the Taiwan sea area, this project uses the Automatic Identification System (AIS) data of the Maritime and Port Bureau to collect information on the navigation of ships in the sea area of our country, combining with artificial intelligence (AI) and big data analysis technology, to build an AI intelligent ship navigation safety monitoring and prediction system. Through the data exploration technology, the ship information in the AIS database is excavated to analyze the navigation information and characteristics of ships in the sea area of our country. The constructed ship collision, anchoring and deviation of waterway prediction models can provide the applications for the AIS to monitor and predict abnormal ship navigation behaviors, to improve the safety issues faced by ship navigation.

2.Research Outcomes

(1) Completed the research on the establishment of the ship navigation safety big data database, and established the data preprocessing, data cleaning, data conversion, and data streamlining functions of the ship navigation safety big data database.

(2) Established the ship navigation safety data analysis, prediction module of the ship navigation safety big data database, developed the functions of ship navigation position prediction, ship bow abnormality monitoring, deviation of waterway monitoring and ship collision prediction, etc., to effectively assist in finding the abnormal behavior in ship navigation and assess its potential threat.

(3) Through the system construction and monitoring, the shore station monitoring personnel on duty can have enough early warning time before the occurrence of irregular navigation, maritime accidents, requested water rescue and other abnormal incidents of ships, and feed back to relevant units for timely handling to improve ship navigation safety.

3.Promotion of Outcomes and Benefits

(1) Establish the ship navigation safety monitoring mechanism to effectively improve the ship navigation safety. The research outcomes were provided to the Maritime and Port Bureau of the Ministry of Transportation and Communications, the Taiwan International Ports Corporation and the Coast Guard Administration of the Ocean Affairs Council to obtain complete and detailed ship navigation safety information, to help improving the ship management of the sea area in our country's jurisdiction.

提升我國所轄海域之船舶管理。

（2）於108年12月「運輸年會暨國際學術研討
會」進行宣傳。

(2) Publicized in the "Transportation Annual Meeting and International Academic Symposium" in December 2019.

4.研究成果精華摘整

4.Summary of Research Outcomes
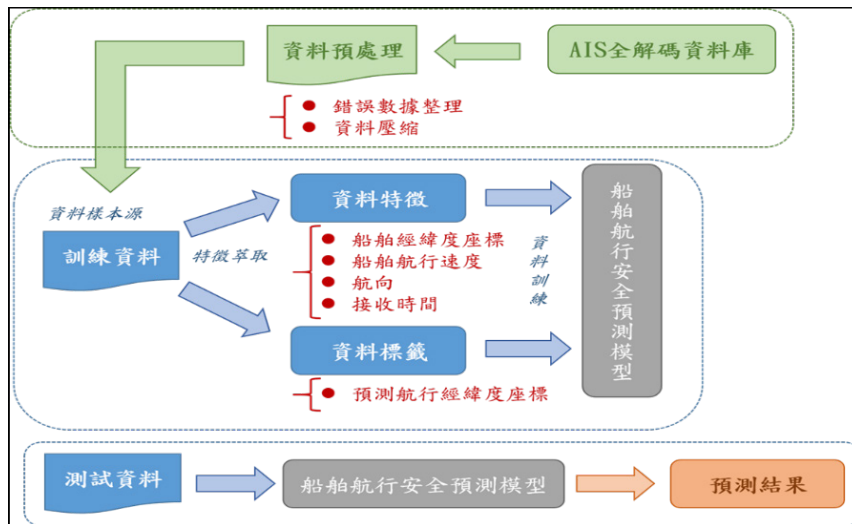
智慧化船舶航行安全系統架構
Intelligent Ship Navigation Safety System Architecture

智慧化船舶航行安全系統模型預測異常示意圖
ISchematic Diagram of Predicting Abnormality of Intelligent Ship Navigation Safety System Model

5.研究成果報告

- 綠色航運與航安資訊之整合平台研發(106年出版)
- AIS系統訊號干擾研究與訊號全解碼資料庫建置(108年出版)
- 船舶航行安全大數據資料庫應用與分析(109年出版)

5.Report of Research Outcomes

- E-Navigation with Ship Dynamics and Technology Platform (published in 2017)
- The research of AIS system signal interference and the creation of signal data full decoding database (published in 2019)
- An analysis of ship navigation safety big data database (published in 2020)

（四）臺東海岸公路溢淹及沿岸地形變遷特性研究

1.計畫概述

台9線為臺東至西部主要道路，其新建臨海部分路段近年受到颱風波浪侵襲而造成通行人員傷害或封閉。為提升浪襲防災應變時間，本計畫研發推算海岸公路波浪溯上技術，俾以提供颱風期間浪襲路段通行安全所需之防災預警資訊。

除整合本所發展之臺灣海象即時觀測作業系統、臺灣近岸海象模擬作業系統、臺東海岸公路波浪溯上系統，建置「臺東海岸公路浪襲預警系統」外，本計畫並以簡易網頁方式，提供台9線浪襲易致災路段(多良段、南興段)於颱風期間預警資訊，做為浪襲封路之決策輔助參考。另分析臺東台9線中長期地形變遷趨勢，針對「公路浪襲」、「侵蝕災害」與「淤積災害」等災害潛勢研擬因應改善對策，提供公路總局參考應用。

2.研究成果

（1）整合臺東鄰近觀測、模擬資料及波浪溯上系統，建置「臺東海岸公路浪襲預警系統」，以簡易網頁方式提供多良、南興段的24小時浪襲預警資訊，做為浪襲封路之輔助決策參考，可改善僅仰賴即時觀測之封路作業，讓人員有充分時間做應變及調度。

（2）利用「近岸水動力模式」、「地形變遷模式」、「粒子追蹤數值模式」分析臺東台9線中長期地形變遷趨勢，標示「公路浪襲」、「侵蝕災害」與「淤積災害」等災害潛勢區。

（3）透過分析往昔改善對策與現階段工法，訪談工程設計單位與勘查現場，針對「公路浪襲」、「侵蝕災害」與「淤積災害」等災害潛勢，利用數值模式進行臺東台9線海岸公路(南興、多良段)改善對策可行性評估，提供公路總局研擬長期改善臺東海岸公路海岸區域防護策略參考應用。

3.成果推廣與效益

（1）研究成果已提供交通部公路總局第三區養

(4) Research on the Characteristics of Over-flooding and Coastal Terrain Change of Taitung Coast Highway

1.Project Overview

The Provincial Highway No. 9 is the primary highway from Taitung to the west. However, some of the newly constructed seafront road sections have been damaged or closed by the typhoon wave attacks in recent years. In order to improve the disaster prevention and response time of wave attacks, this project researches and develops the coastal highway wave run-up estimation technology, to provide the disaster prevention warning information needed for the passage safety of road sections attacked by waves during typhoons.

In addition to integrate the Taiwan Marine Real Time Observation Operation System developed by the Institute, Taiwan Coastal Marine Simulation Operation System, and Taitung Coastal Highway Wave Run-up System, we have constructed the "Taitung Coastal Highway Wave Attack Early Warning System," this project also has a simple webpage to provide early warning information for the road sections of Provincial Highway No. 9 (Duoliang section, Nanxing section) prone to wave attack disaster during typhoon as a reference to assist decision making of road closures during wave attacks. In addition, this project also analyzes the trend of medium- and long-term terrain change in Taitung Provincial Highway No. 9, and develops corresponding improvement measures for the disaster potential of "Highway wave attack," "Erosion disaster" and "Siltation disaster," and provides reference applications for the Directorate General of Highways.

2.Research Outcomes

(1) To integrate Taitung's proximity observation, simulation data and wave run-up system, we have constructed the "Taitung Coastal Highway Wave Attack Early Warning System" with a simple webpage to provide 24-hour wave attack early warning information for the Duoliang and Nanxing Sections as a reference to assist decision-making of road closure during wave attacks, which can improve the road closure operations that rely solely on real time observations, allowing personnel to have sufficient time for emergency response and dispatch.

(2) Use "Near shore hydrodynamic model," "Terrain change model," and "Particle tracking numerical model" to analyze the mid-to-long-term terrain change trend of Taitung Provincial Highway No. 9, and mark the disaster potential area with "Highway wave attack," "Erosion disaster" and "Siltation disaster."

(3) Through analysis of past improvement countermeasures and current construction methods, interviewed with engineering design units and survey sites, aiming at the disaster trends of "Highway wave attack," "Erosion disaster" and "Siltation disaster," use numerical models to conduct improvement countermeasure feasibility assessment for the Taitung Provincial Highway No. 9 coastal highway Evaluation of the feasibility of improvement measures for coastal roads (Nanxing and Duoliang Sections), to provide the reference applications for the Directorate General of Highways to develop long-term improvement of the coastal area protection strategies of the Taitung Coastal Highway.

3.Promotion of Outcomes and Benefits

(1) The research results have been provided as a disaster prevention emergency response reference for the Third Maintenance Office, Directorate General of Highways,

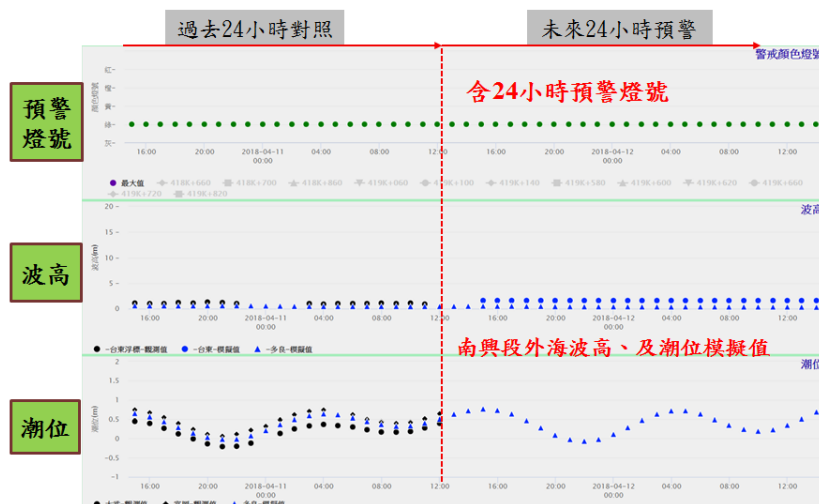護工程處，做為防災應變參考，降低颱風期間現場人員監測之安全風險，並有充分時間做應變及調度，109年1月並於第三區養護工程處辦理相關推廣教育訓練。

（2）107年5月10日於交通部部務會報進行報告，成果推廣提供相關鐵公路主管機關，如：高速公路局、公路總局、臺灣鐵路管理局等，於海岸鐵公路之檢、監測管理使用。

（3）107年8月及109年4月，分別於交通部例行記者會，發表「浪襲預警有撇步！臺東海岸公路浪襲預警系統」及「臺東海岸公路沿岸地形變遷因應對策研究」新聞稿。

4.研究成果精華摘整

「臺東海岸公路浪襲預警系統」畫面圖

台 9 線海岸公路供沙養灘模擬及離岸潛堤評估結果

5.研究成果報告

· 海岸公路異常波浪特性及防災應用技術之研究(107年出版)

· 臺東海岸公路溢淹及沿岸地形變遷特性研究(108年出版)

· 臺東海岸公路沿岸地形變遷因應對策研究(109年出版)

Ministry of Transportation and Communications as a reference for disaster prevention and response, to reduce the safety risks of on-site personnel monitoring during typhoons, and to have sufficient time for emergency response and dispatch. The Third Maintenance Office organized promotional education and training in January 2018.
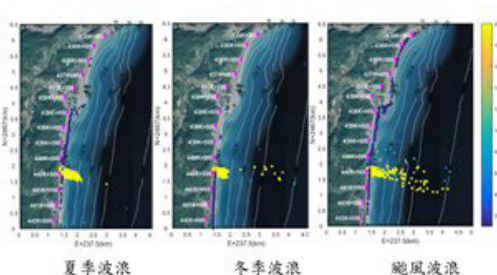
(2) Conducted report in the Ministry of Transportation and Communications Ministry Affairs Meeting on May 10, 2018, and the outcomes were promoted and provided to relevant railway and highway competent authorities, such as the Freeway Bureau, Directorate General of Highways, Taiwan Railways Administration, etc., for inspection and monitoring management of the coastal railways and highways.

(3) Issued press releases of "There is a trick for wave attack early warning! – Taitung Coastal Highway Wave Attack Early Warning System" and "Research of Countermeasures on Taitung Coastal Highway Coastal Terrain Change" respectively in August 2018 and April 2020.

4.Summary of Research Outcomes

Screenshot of "Taitung Coastal Highway Wave Attack Early Warning System"

Evaluation Results of Feed Sand Beach Nourishment Simulation and Offshore Submerged Breakwater of Provincial Highway No. 9 Coastal Highway

5.Report of Research Outcomes

· Study for the Feature of Freak Wave of Coastal Highway and Application of Disaster Prevention (published in 2018)

· The study on the characteristics of the coastal highway flooding and the nearshore morphology (published in 2019)

· Study of the hazard countermeasures in response to the morphological changes near the coastal highway in Taitung (published in 2020)

（五）港灣環境及防災資訊服務應用研究

1.計畫概述

　　本所港灣環境資訊網包括港區海象、全國海象、藍色公路、港區影像、港區地震、港區海嘯及港區腐蝕資訊等7項查詢功能，提供整體性、即時性海象資訊供政府單位及一般民眾參考。基於海象資料之立即性應用並轉化為可靠之資訊需求越趨強烈，整合各單位的觀測資料、資料品管、資料即時展示及資料檢核、統計分析工作有其落實之必要性。

2.研究成果

（1）彙整國內包括中央氣象局及經濟部水利署等單位即時觀測海象資料，整合成港灣環境大數據資料庫，透過全臺12海域分區資訊專區，提供全國各商港外船舶航行海域即時觀測及模擬預報海氣象資訊。

（2）運用LINE BOT(聊天機器人)技術，主動提供「海象示警」、「海象模擬」、「海嘯模擬」、「海氣象資料品管」及「海氣象資料中斷」訊息推播功能，依不同的觸發機制，通知不同的使用者族群，提升通報應變資訊的即時性，不再以被動式網頁展示重要海氣象資訊，可縮短管理單位因應災害防治之處置時間與提升資料即時性，進一步完善港埠災防資訊服務目的。

（3）配合行政院推行數位國家雲端化，將系統移轉至中華電信機房(IDC)租用服務，實現網站服務維持不中斷及正常運作。

3.成果推廣與效益

（1）108 8月28日召開「108 港灣環境資訊服務系統使用者會議」，簡介本所港灣環境資訊系統項下海象觀測、海象模擬、港區地震、港區腐蝕及系統操作，透過綜合討 與滿意 問卷調查，綜整各單位對系統需求功能開發建議，優化本所系統資訊服務。

（2）108年11月18日，由 所長繼國 員出席海洋委員會國家海洋研究院，與交通部運輸研究所簽署「海洋及港灣資 與科技研究合作備忘 」會議。

(5) Research of Harbor Environment and Disaster Prevention Information Service Applications

1.Project Overview

　　The Institute's harbor environment information network includes 7 query functions including harbor area oceanographic phenomena, national oceanographic phenomena, blue highway, port image, port earthquake, port tsunami and port erosion information, to provide overall and real-time oceanographic phenomena information as the reference for the government units and the general public. Based on the demand for the immediate application and transformation of oceanographic phenomena data into reliable information becoming stronger, it is necessary to integrate the observation data, data quality control, real-time data display, data verification, and statistical analysis of various units.

2.Research Outcomes

(1) Summarize the real-time observation oceanographic phenomena data of domestic units, including the Central Weather Bureau and the Water Resources Agency of the Ministry of Economic Affairs, and integrate them into a big data database for the harbor environment, to provide real-time observation of ships sailing outside commercial ports across the country and simulated forecast marine meteorological information through the information zone of 12 sea areas across Taiwan.

(2) Use LINE BOT (chat robot) technology to actively provide "oceanographic phenomena warning," "oceanographic phenomena simulation," "tsunami simulation," "marine meteorological information quality control" and "marine meteorological information interruption" message push broadcast functions, depending on the different trigger mechanisms to notify different user groups, improve the timeliness of reporting response information, and to no longer display important marine meteorological information on passive web pages, which can shorten the management unit's handling time for disaster prevention and improve the timeliness of data, and further improve the purpose of harbor disaster prevention services.

(3) Cooperate with the Executive Yuan to implement digital national cloud, to transfer the system to the Chunghwa Telecom IDC leasing service, and realize the uninterrupted and normal operation of website services.

3.Promotion of Outcomes and Benefits

(1) Convened the "2019 Harbor Environment Information Service System User Conference" on August 28, 2019 to introduce the oceanographic phenomena observation, oceanographic phenomena simulation, port earthquake, port erosion information and system operation under the Institute's Harbor Environment Information System. Summarize the recommendations by all units on the system requirements and function development through comprehensive discussion and satisfaction questionnaire survey, and optimize the Institute's system information services.

(2) Led by the Director General Lin, Chi-Kuo to attend the meeting of signing the "Memorandum of Cooperation on Marine and Harbor Information and Technology Research" on November 18, 2019 with the National Academy of Marine Research of the Ocean Affairs Council and the Institute of Transportation of the Ministry of Transportation and Communications.

4.研究成果精華摘整

4.**Summary of Research Outcomes**

港灣環境資訊系統之七項子系統
Seven Subsystems of Harbor Environmental Information System
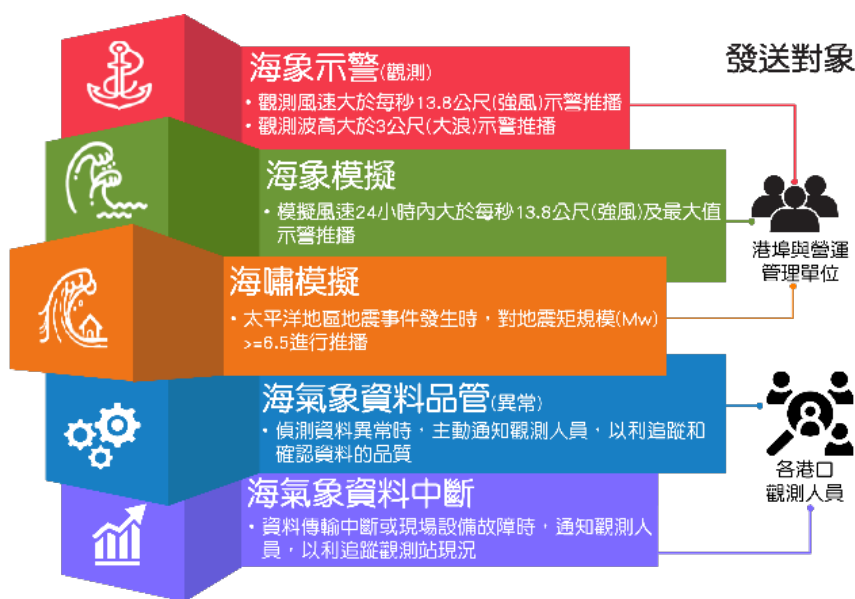
港灣環境資訊 LINE 訊息推播應用
Harbor Environment Information LINE Message Push Broadcast Application

5.研究成果報告

- ・港灣環境資訊系統—加值應用暨功能擴充及維護(107年出版)
- ・107年港灣環境資訊系統維護--功能提升(108年出版)
- ・108年港灣環境資訊系統維護-功能提升(109年出版)

5.**Report of Research Outcomes**

- ・ Maintenance and Expansison of the Functions and Applications of the Harbor Environmental Information Website (published in 2018)
- ・ Maintenance and Expansison of the Functions and Applications of the Harbor Environmental Information Website (published in 2019)
- ・ Maintenance and Expansison of the Functions and Applications of the Harbor Environmental Information Website (published in 2020)

伍｜研討與成果推廣活動

05. Study and Results Promotion Activities

伍、研討與成果推廣活動

項次	日 期	主 題	Topic
1	1 月 24 日	「臺灣港埠船舶減速查核系統」教育訓練	Training Workshop: Vessel Speed Reduction Surveillance System in Taiwan
2	3 月 4 日	「駕駛行為分析工具開發及行為特性探討」成果推廣說明會	Seminar: Development of Driver Behavior Analysis Tool and Analysis of Driving Behavior
3	3 月 5 日	108 年 3 月空運期刊研討會	Seminar: March 2019 Air Transport Journal
4	3 月 12 日	108 年 3 月海運期刊研討會	Seminar: March 2019 Maritime Journal
5	3 月 14 日	「ArcGIS」教育訓練 (第一梯次)	Training Workshop: Introduction of ArcGIS (1st Session)
6	3 月 28 日	「ArcGIS」教育訓練 (第二梯次)	Training Workshop: Application of ArcGIS (2nd Session)
7	4 月 1 日	臺東縣達仁鄉幸福巴士通車典禮	Opening Ceremony of Happiness Bus in Daren Township, Taitung County
8	4 月 9 日	108 年 4 月海運期刊研討會	Seminar: April 2019 Maritime Journal
9	4 月 10 日	108 年 4 月空運期刊研討會	Seminar: April 2019 Air Transport Journal
10	4 月 11 日	公共運輸載客量提升策略之跨區論壇	The Regional Forum on Strategy to Increase Passengers in Public Transport
11	4 月 24 日	「機場旅客航廈服務水準與容量分析」專題講座	Lecture: Analysis on Levels of Service and Capacity of Airport Passenger Terminal
12	4 月 24 日	高速公路基本路段車流特性及模擬分析技術講習	Seminar: Traffic Flow Characteristics of Freeway Basic Segments and Simulation Analysis
13	4 月 26 日	「海洋即時監測與應用」教育訓練	Training Workshop: Application of Real-time Oceanographic Phenomena Monitoring System
14	4 月 29 日	偏鄉公共運輸環境之健全跨區論壇	The Regional Forum to Improve Rural Towns in Public Transport
15	5 月 7 日	108 年 5 月空運期刊研討會	Seminar: May 2019 Air Transport Journal
16	5 月 10 日	「公共運輸時間無縫　轉乘好便利」記者會	Press Conference: Introduction of "System for Detect Public Transit Transfer Time Gap "
17	5 月 14 日	108 年 5 月海運期刊研討會	Seminar: May 2019 Maritime Journal
18	5 月 28 日	「臺灣港區碼頭即時水深系統操作」教育訓練	Training Workshop: Application of Real-time Tidal Level Predict System for Ports in Taiwan
19	5 月 28 日	屏東縣霧臺鄉幸福巴士通車典禮	Opening Ceremony of Happiness Bus in Wutai Township, Pingtung County
20	5 月 29 日	「遙控無人機於災防之應用」研討會	Seminar: Application of Remote Control Drone in Disaster Prevention
21	5 月 29 日	「臺灣地區各港潮位資料調和分析及潮汐預測作業」教育訓練	Training Workshop: Harmonic Analysis and Prediction of Tides around Taiwan
22	5 月 31 日	雲林縣古坑鄉幸福巴士通車典禮	Opening Ceremony of Happiness Bus in Gukeng Township, Yunlin County

項次	日　期	主　　題	Topic
23	6 月 4 日	108 年 6 月空運期刊研討會	Seminar: June 2019 Air Transport Journal
24	6 月 11 日	108 年 6 月海運期刊研討會	Seminar: June 2019 Maritime Journal
25	6 月 13 日	「日本空運創新作法」專題講座	Lecture: Innovative Actions of Japan Air Transport
26	6 月 13 日	「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」教育訓練臺中場	Training Workshop (Taichung):Design Model on Road & Traffic Engineering at Intersection under Mixed Traffic(3/4)-Unsignalized Intersections
27	6 月 14 日	「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」教育訓練臺南場	Training Workshop (Tainan):Design Model on Road & Traffic Engineering at Intersection under Mixed Traffic(3/4)-Unsignalized Intersections
28	6 月 18 日	「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」教育訓練臺北場	Training Workshop (Taipei):Design Model on Road & Traffic Engineering at Intersection under Mixed Traffic(3/4)-Unsignalized Intersections
29	6 月 26 日	「遙控無人機於智慧運輸之應用」研討會	Seminar: Application of Remote Control Drone in Smart Transportation
30	7 月 4 日	公務人員專書閱讀推廣活動「創造力是性感的」讀書會	Recommended book reading and sharing: Alluring Creativity
31	7 月 9 日	108 年 7 月海運期刊研討會	Seminar: July 2019 Maritime Journal
32	7 月 14 日 -7 月 19 日	「閃電落雷系統」教育訓練	Training Workshop: Introduction of Integrated Meteorological System – Lightning Module
33	7 月 16 日	108 年 7 月空運期刊研討會	Seminar: July 2019 Air Transport Journal
34	7 月 17 日	「遙控無人機於物流運送之應用」研討會	Seminar: Application of Remote Control Drone in Logistics Transportation
35	7 月 17 日	「機場陸側設施規劃實務」專題講座	Lecture: Airport Landside Facilities Planning Practices
36	7 月 24 日	智慧交通之區塊鏈技術應用趨勢與專利技術解析暨專利成果推廣說明會	Seminar: Block Chain Technology Application and Patent Analysis of the Intelligent Traffic System
37	8 月 6 日	108 年 8 月空運期刊研討會	Seminar: August 2019 Air Transport Journal
38	8 月 13 日	108 年 8 月海運期刊研討會	Seminar: August 2019 Maritime Journal
39	8 月 16 日	路口行人安全改善工作坊	Training Workshop: Improvement of Pedestrian Safety at Road Junctions
40	8 月 20 日	軌道地下型車站室內空氣品質維護工作坊	Training Workshop: Indoor Air Quality Control of Underground Railway Stations
41	8 月 28 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第一階段臺中場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—PhaseⅠ: Taichung Session
42	8 月 28 日	108 年度港灣環境資訊服務系統使用者會議	User Conference :2019 User Conference of Harbor Environmental Information System
43	8 月 29 日	第四期公路公共運輸計畫 (草案) 第 1 次座談會	Experts Meeting Ⅰ: The 4th Promotion Program of Bus Transit System(Draft Version)

項次	日 期	主 題	Topic
44	8 月 30 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第一階段臺北場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—PhaseⅠ: Taipei Session
45	8 月 30 日	運輸部門決策支援系統 (108 年) 第 1 場次教育訓練	Training Workshop (1): Maintenance of the Decision Support System and Integrated Database for Transportation Infrastructure Deliberations (2019)
46	9 月 3 日	108 年 9 月空運期刊研討會	Seminar: September 2019 Air Transport Journal
47	9 月 5 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第一階段臺南場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—PhaseⅠ: Tainan Session
48	9 月 6 日	「鐵公路氣候變遷調適資訊平台」推廣教育訓練	Promotion and Training Workshop: Climate Change Adaptation Information Platform for Railway and Highway
49	9 月 10 日	108 年 9 月海運期刊研討會	Seminar: September 2019 Maritime Journal
50	9 月 11 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第一階段高雄場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—PhaseⅠ: Kaohsiung Session
51	9 月 12 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第一階段新竹場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—PhaseⅠ: Hsinchu Session
52	9 月 20 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第一階段花蓮場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—PhaseⅠ: Hualien Session
53	9 月 20 日	第四期公路公共運輸計畫 (草案) 第 2 次座談會	Experts Meeting Ⅱ: The 4th Promotion Program of Bus Transit System(Draft Version)
54	9 月 23 日	減少機車污染排放暴露交通管理思維工作坊	Training Workshop: Traffic Management of Reducing the Air Pollution Emitted by Scooters
55	10 月 4 日	「運輸部門決策支援系統」(108 年) 第 2 場次教育訓練	Training Workshop (2): Maintenance of the Decision Support System and Integrated Database for Transportation Infrastructure Deliberations (2019)
56	10 月 4 日	108 年臺灣公路容量分析軟體教育訓練 - 臺北場	Training Workshop (Taipei): Taiwan Highway Capacity Analysis Software (THCS) for Northern Area 2019
57	10 月 5 日	2021 自行車旅遊年策勵營 (多元自行車路線規劃場次)	Training Workshop: Northern Taiwan, Transportation Demand Model
58	10 月 7 日	108 年臺灣公路容量分析軟體教育訓練 - 臺南場	Training Workshop (Tainan): Taiwan Highway Capacity Analysis Software (THCS) for Southern Area 2019
59	10 月 8 日	108 年 10 月海運期刊研討會	Seminar: October 2019 Maritime Journal
60	10 月 9 日	108 年 10 月空運期刊研討會	Seminar: October 2019 Air Transport Journal
61	10 月 14 日	「國際及國內商港即時潮位系統」教育訓練	Training Workshop: Real-time Tidal Level System for International and Internal Harbors in Taiwan
62	10 月 16 日	APP 數據加值應用分析研討會	Seminar: Application and analysis of app data

項次	日 期	主　題	Topic
63	10 月 22 日	「運輸系統調適策略研究」專家學者座談會 (鐵路場次)	Experts Meeting: Research on Adaptation Strategies of Transportation Systems – Railway session
64	10 月 24 日	「近景攝影測量技術與均質土壤淺層滑動無線監測系統公路邊坡檢監測試辦計畫」教育訓練	Training Workshop: Pilot Project of Close Range Photogrammetric Techniques and Monitoring of Highway Slopes with Wireless Monitoring System for Homogenous Soil Shallow Landslides
65	10 月 25 日	臺灣腐蝕環境分類資訊系統與橋梁防蝕工法應用研習會	Training Workshop: Taiwan Corrosion Environment Classification Information System and Application of Bridge Anti-corrosion Construction Method
66	10 月 28 日	「運輸系統調適策略研究」專家學者座談會 (公路場次)	Experts Meeting: Research on Adaptation Strategies of Transportation Systems – Highway session
67	10 月 30 日	減少交通空污暴露之管理思維工作坊 (南部場次)	Training Workshop: Management of Reducing the Exposure of Traffic Air Pollution (South Taiwan Session)
68	10 月 31 日	「108 年度馬祖港維護管理系統」教育訓練	Training Workshop: Matsu Port Maintenance Management System in 2019
69	10 月 31 日	「氣候變遷對運輸系統的衝擊與調適作為」推廣教育訓練	Promotion and Training Workshop: Adaptation Measures for Climate Change Impacts to Transportation System
70	11 月 4 日	「多元自行車路網規劃及導引系統規劃說明暨討論會議」- 北部場	Experts Meeting: The Guide Signs and Markings of Diversifying Bicycle Routes Planning – The Northern Region
71	11 月 5 日	減少交通空污暴露之管理思維工作坊 (北部場次)	Training Workshop:Management of Reducing the Exposure of Traffic Air Pollution (North Taiwan Session)
72	11 月 6 日	「多元自行車路網規劃及導引系統規劃說明暨討論會議」- 中部場	Experts Meeting: The Guide Signs and Markings of Diversifying Bicycle Routes Planning – The Central Region
73	11 月 6 日	「南臺區域運輸需求模式資料蒐集及應用」教育訓練	Training Workshop: Transportation Demand Model of Southern Taiwan Region - Data Collection and Application
74	11 月 6 日	108 年 11 月空運期刊研討會	Seminar: November 2019 Air Transport Journal
75	11 月 12 日	「路口無人機交通攝影及衝突分析技術開發」成果發表會暨教育訓練	Results Presentation and Training Workshop: Development of Traffic Conflict Analysis Using UAV Aerial Videography for Intersections
76	11 月 12 日	「臺灣地區橋梁管理資訊系統」系統功能教育訓練	Training Workshop: Taiwan Bridge Management System
77	11 月 12 日	108 年 11 月海運期刊研討會	Seminar: November 2019 Maritime Journal
78	11 月 12 日	運輸部門決策支援系統 (108 年) 第 3 場次教育訓練	Training Workshop (3): Maintenance of the Decision Support System and Integrated Database for Transportation Infrastructure Deliberations (2019)
79	11 月 12 日	運輸部門溫室氣體減量策略評估資訊平台教育訓練	Introduction and Training of the Information Platform for Evaluating Greenhouse Gas Reduction Strategy in Transportation Sector

項次	日 期	主 題	Topic
80	11 月 14 日	「感潮河段橋梁梁底檢測工具研發建置計畫」、「人工智慧及新興設備與技術整合應用於公路養護巡查之研究」、「近景攝影測量雲端服務系統開發與應用之研究 - 以公路邊坡為例」聯合成果發表會	Seminar: The Project of Bridge Beam Inspection Equipment in Tidal River Section , Research on the Integration of Artificial Intelligence and Emerging Equipment and Technology to Integrate Highway Maintenance Inspections , Research on Development and Application of Close-range Photogrammetry Cloud Service System - Taking Highway Slope as an Example
81	11 月 15 日	「船舶斷纜預警系統建置及繫纜方式研擬」教育訓練	Training Workshop: Study on Ship Broken Cable Early Warning System Establishment and Cable Tethering Method Investigation
82	11 月 21 日	「運輸需求模式移轉」第 1 場次教育訓練	Training Workshop (1): Transportation Demand Model Transfer
83	11 月 22 日	智慧公共運輸服務科技創新研討會暨高峰論壇	Seminar and Summit Forum :SMART Public Transport Service Technology Innovation
84	11 月 25 日	「運輸需求模式移轉」第 2 場次教育訓練	Training Workshop(2): Transportation Demand Model Transfer
85	11 月 26 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第二階段臺中場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—Phase Ⅱ: Taichung Session
86	11 月 26 日	「港灣構造物維護管理系統與工程基本資料擴充與精進」教育訓練	Training Workshop: Expansion and Improvement of Harbor Structure Maintenance Management System and Engineering Basic Data.
87	11 月 27 日	「建立即時氣象模組及船舶排放之三維空氣品質模擬系統」教育訓練	Training Workshop: Establishment of Real-Time Three-dimensional Meteorological and Air Quality Forecasting System for Ship Emission
88	11 月 29 日	「公共運輸縫隙掃描決策支援系統」教育訓練—第二階段臺北場	Training Workshop: Decision Support System for Scanning Public Transit Service Gaps—Phase Ⅱ: Taipei Session
89	11 月 29 日	108 年度「國際空運資料庫」更新擴充及資料分析服務座談會	Experts Meeting: Expanding, Updating and Data Analyzing of International Air Transport Database of 2019
90	12 月 2 日	108 年度「國際海運資料庫」更新擴充及資料分析服務座談會	Experts Meeting: Expanding, Updating and Data Analyzing of International Maritime Database of 2019
91	12 月 5 日	「臺灣地區橋梁管理資訊系統」系統功能教育訓練	Training Workshop:: Taiwan Bridge Management System
92	12 月 10 日	「船舶航行安全大數據資料庫應用與分析」教育訓練	Training Workshop: Analysis of Ship Navigation Safety Big Data Database
93	12 月 11 日	「商港整體發展規劃 (111-115 年)」第一次專家座談會	Experts Meeting: The Integrated Overall Development Plan of Commercial Ports (2022-2026) (1st Session)
94	12 月 17 日	「交通事件資訊整合服務與精進計畫 (2/2)」成果經驗分享說明會	The Service and Enhancement Project for The Information Integration of Traffic Events (2/2) Experience Sharing Seminar

108 年度大事紀要
2019 Calendar of Events

日期 Date	重要記事 Event

03
March

●**26**

本所交通行動服務(MaaS)-高雄MeN Go計畫獲得2019智慧城市創新應用獎，頒獎典禮中由陳副總統建仁親自頒獎，本所林所長繼國親自代表領獎。另在會場中亦展示MaaS計畫研究與推廣成果。

The Institute's Mobility as a Service - Kaohsiung MeN Go project won the 2019 Smart City Innovation Application Award. Vice President Chen Chien-Jen presented the award in person at the award ceremony, and the Director General Lin Chi-Kuo accepted the award in person on the Institute's behalf. Also the MaaS project research and promotion results were displayed in the venue.

●**29**

本所「運輸計劃季刊」獲得國家圖書館108年「知識傳播獎」。國家圖書館於「臺灣學術資源影響力發布會」上頒獎，由本所林所長繼國親自代表領獎。

The Institute's "Transportation Planning Journal" won the 2019 "Knowledge Dissemination Award" from the National Central Library. The National Central Library presented the award at the "Taiwan Academic Resources Influence Conference ", and Lin Chi-Kuo, Director General of the Institute, accepted the award in person on the Institute's behalf.

日期 Date	重要記事 Event

04 April

- 23
- 24
- 25
- 26
- 27
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「APEC第47次運輸工作小組會議(TPT-WG47)」於本(108)年4月24~26日在加拿大溫哥華(Vancouver)召開,期間舉行領隊會議、開/閉幕會議、4個專家小組會議及1個周邊會議,共計8場會議。本所統籌我國出席代表團工作,成員包括政府部門及民間相關單位代表共計18員。我國代表團各單位出席代表分別於相關專家小組報告於TPT-WG錄案計畫辦理情形 (計1件)、報告我國各運輸領域發展情形(計3件)、吸收他國觀念,俾作為推動相關事務參考,代表團已依原訂計畫圓滿達成任務返國。

"APEC 47th Transportation Working Group Meeting (TPT-WG47)" was convened in Vancouver, Canada from April 24 to 26, this year (2019), with a total of 8 meetings were held during the course of the Meeting, including the Team Leader Meeting, Opening/Closing Ceremonies, and 4 Expert Group Meetings and 1 Perimeter Meeting. The Institute conducted over planning works for our country's delegation, with total members of 18 representatives from government departments and private organizations. The attending representatives from various units of our country's delegation report in the relevant expert groups the status of the TPT-WG recorded project (1 project), report our country's development in various transportation fields (3 pieces) respectively, to absorb ideas from other countries as the reference to promote related business, the delegation has satisfactorily fulfilled the mission according to the original plan and returned to the country.

05 May

- 28

本所參與「行政院災害防救應用科技方案第二期(104-107年)」計畫之推動,成果受肯定,行政院為表揚業務推動有功單位,特於28日假中油大樓召開總成果發表會,並由行政院陳其邁副院長於會中表揚各獲獎單位,本所由林所長繼國代表出席領獎。另配合成果發表會活動,本所除於會中發表近年防災研究成果外,並於會場設立攤位,展示「近景攝影測量雲端服務系統-以公路邊坡巡檢為例」、「臺東海岸公路浪襲預警系統」、「海難救助DSC(數位選擇傳呼)與AIS(船舶自動辨識)整合系統」等研發成果,供各界參採。

The Institute participated in the promotion of the "Executive Yuan Disaster Prevention and Rescue Application Technology Program Phase II (2015-2018)" project and the results were affirmed. In order to commend the units have rendered great services in business promotion, the Executive Yuan specially held the overall results presentation in the CPC Building on the 28th, and the Vice Premier, Chen Chi-Mai, of the Executive Yuan commended the award-winning units at the conference. The Institute is represented by Director General, Lin Chi-Kuo, to receive the award. Also, in coordination with the results presentation activities, in addition to publish the results of recent disaster prevention research at the conference, the Institute also set up booths at the venue to showcase the R&D achievement of "Close-up Photogrammetric Survey Cloud Service System - Taking Highway Slope Patrol Inspection as an Example", "Taitung Coastal Highway Wave Attack Early Warning System" and "Marine Disaster Rescue DSC (Digital Selective Calling) and AIS (Automatic Identification System) Integrated System" to provide reference to be adopted by all sectors.

日期 Date	重要記事 Event

06
April

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　　為擘劃未來交通運輸的施政藍圖，交通部特責成本所負責2020年版運輸政策白皮書編撰作業。本所於108年6月10日召開「2020年版運輸政策白皮書座談會」，本次座談會共分成陸運、海運、空運、綠運輸、智慧運輸、運輸安全及運輸部門因應氣候變遷調適與防災7個場次，每場次邀請3位該領域學者專家擔任與談人，並邀請包含中央相關部會署、交通部部內單位及部屬機關、22直轄市及縣(市)政府、企業、公(工)協會共計250人參加。藉由本次座談會除凝聚共識，並讓各界更了解交通部的運輸政策及理念外，會中相關意見已納為精進2020年版運輸政策白皮書之參據。

　　In order to plan for the blueprint for the future transportation policy, the Ministry of Transportation and Communications specifically instructs this Institute to be responsible for the compilation of the 2020 Transportation Policy White Paper. The Institute convened the "2020 Transportation Policy White Paper Symposium" on June 10, 2019. This symposium is divided into 7 sessions of Land Transportation, Sea Transportation, Air Transportation, Green Transportation, Intelligent Transportation, Transportation Safety and Transportation Sectors in Response to Climate Change Adaptation and Disaster Prevention. For each session, 3 scholars and experts in the field are invited to serve as panelists in every session, and invited a total of 250 personnel to participate including personnel from relevant central ministries and administrations, units and agencies of the Ministry of Transportation and Communications, 22 municipalities and county (city) governments, enterprises, and public (industrial) associations. Through this symposium, in addition to building consensus and letting people from all sectors better understand the transportation policies and concepts of the Ministry of Transportation and Communications, the relevant opinions in the Symposium have been incorporated into the reference of the 2020 Transportation Policy White Paper.

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　　交通部黃政務次長玉霖蒞臨本所聽取業務簡報，勉勵本所有諸多先進的研究，在原有豐碩成果與基礎上，集結陸、海、空三方面完整的運輸研究人才，是國家最重要的交通智庫，如何善用交通部龐大資源，結合產官學研等機關(構)，進行跨域合作及科技整合，辦理系統開發、整合、測試，乃重要任務與課題。

　　The Political Deputy Minister, Huang Yu-Lin, of the Ministry of Transportation and Communications visited the Institute to listen to the business briefing, and encouraged all the advanced research of the Institute, based on the original fruitful results and foundation to assemble complete transportation research talents of the area of land, sea and air which is the most important transportation think tank of the country. How to make good use of the huge resources of the Ministry of Transportation and Communications, combine with industry, government, academia and research agencies (institutions) to conduct cross-domain cooperation and technology integration, and manage system development, integration, and testing are the important tasks and topics.

日期 Date	重要記事 Event

07 July

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11
22

交通部黃政務次長玉霖主持「2020年運輸政策白皮書分冊會議」，邀集相關部內單位及部屬機關高階主管，從政策面(由上而下Top-down)角度，對初稿階段版本進行深度檢視與研商，以求共識，並讓各項政策具體可行。

The Political Deputy Minister, Huang Yu-Lin, of the Ministry of Transportation and Communications hosted the "2020 Transportation Policy White Paper Volume Conference", inviting senior executives from relevant units in the Ministry and agencies subordinated to the Ministry to conduct in-depth review and discussion on the first draft version from the angle (top-down) of policy aspect to seek consensus and make various policies concrete and feasible.

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林部長佳龍蒞所進行業務視察，除由本所林所長繼國進行業務簡報外，並由同仁講解及示範本所駕駛模擬儀、機車安全駕駛學習工具 (VR行動版) 、交通事件資訊整合服務、公共運輸健檢系統等相關研究成果。林部長非常認同本所的研究能量，並期許本所能積極行銷研究成果。

Minister Lin Chia-Lung visited the Institute for a business inspection visit. In addition to conduct the business briefing by the Director General of the Institute, Lin Chi-Kuo, also let the colleagues to explain and demonstrate the Institute's driving simulator, motorcycle safety driving learning tool (VR mobile version), and traffic incident information integration service , public transportation health inspection system and other related research results. Minister Lin very much agrees with the research energy of the Institute and expects that the Institute can actively market the research results.

08 August

16

本所與內政部營建署就路口行人安全相關研究成果，以及地方政府實際改善案例，辦理工作坊邀請中央及地方道路相關管養單位及顧問業界，共同參與討論交流如何改善路口行人安全，共有百餘人參加，林部長佳龍及內政部營建署吳欣修署長均親自到場致詞。

The Institute and the Construction and Planning Agency of the Ministry of the Interior organized the workshops on the Pedestrian Safety at Intersection related research results as well as actual improvement cases by local governments, inviting the central and local road related management and maintenance units and consultant sector to participate in discussions and exchanges on how to improve pedestrian safety at intersections, with a total of over one hundred people participated, both Minister Lin Chia-Lung and Construction and Planning Agency of the Ministry of the Interior Action Director General Wu Hsin-Hsou attended the workshop to deliver speeches.

日期 Date	重要記事 Event

08 August

28

本所辦理高雄市MaaS示範建置計畫記者座談會暨行銷活動，並由臺灣德國萊因頒發全球首座MaaS資訊系統認證及獎座予本所；行銷活動主題為學生7日票上市及擴增悠達(UrDa)共享電動機車服務。

The Institute conducted the Kaohsiung City MaaS Demonstration Construction Project press conference and marketing event, and Taiwan, German(TUV) Rheinland awarded the world's first MaaS information system certification and trophy to the Institute; the theme of the marketing event was the Student 7-day Ticket available on the market and the expansion of UrDa shared electric motorcycle service.

10 October

05

本所林所長繼國陪同林部長佳龍出席中華民國小客車租賃商業同業公會聯合會主辦之「租賃小客車數位轉型產業升級記者會」，宣示交通部與經濟部合作，協助小客車租賃業數位轉型升級，以優化營運環境。藉由線上營運及提升同業/異業結盟之機會，提供消費者更便利的行動租車服務，期能提升整體產業競爭力，以提高服務品質與擴大產值。

The Institute's Director General, Lin Chi-Kuo, accompanied Minister Lin Chia-Lung to attend the "Rental Car Digital Transformation Industrial Upgrade Press Conference" organized by the National Joint Association of Rental Car of R. O. C., declared the cooperation between the Ministry of Transportation and Communications and the Ministry of Economic Affairs to assist in the digital transformation upgrade for the rental car industry, to optimize the operating environment. Through online operations and enhancing the opportunities for industry/cross-industry alliances, it will provide consumers with more convenient mobile car rental services, which can enhance the overall industry competitiveness to improve service quality and expand output value.

日期 Date	重要記事 Event

10 October

●05
●06

本所配合交通部自行車督導小組，協助觀光局辦理「2021自行車旅遊年策勵營」，除展現交通部建置環島自行車路網具體成果，更說明未來推動方向。2天的會議邀集產官學界各領域專家與各縣市政府代表一起分享推動自行車旅遊及產業的經驗。

The Institute cooperates with the Bicycle Supervision Working Group of the Ministry of Transportation and Communications to assist the Tourism Bureau in organizing the "2021 Bicycle Tourism Year Encouragement Camp". In addition to show the concrete achievements of the Ministry of Transportation and Communications in constructing the around the island cycling route, it also explains the future direction of promotion. The two-day conference invited experts from various fields of industry, government, academia, and representatives of county and city governments to share their experience in promoting bicycle tourism and industry.

●06

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，中區區域運輸發展研究中心(逢甲大學)於108年10月6日舉辦「集集支線遊憩公共運輸提升策略」案例成果--「集食行樂-搭總達 遊趣集集」體驗啟用典禮，「綠色隧道線」與「山蕉線」之公車旅遊行程自本日起開始服務，方便遊客依照建議時間搭公車遊玩集集鎮景點，並促進公共運輸發展。

The Institute conducts the "MOTC Center for Transportation Research and Development Subsidy Program" project. On October 6, 2019, the Central Region Regional Transportation Development Research Center (Feng Chia University) organized the "Jiji Branch Line Recreational Public Transportation Improvement Strategy" case results - Opening ceremony of the "Eating Together and Indulging in Pleasures - Riding All Day Bus and Having Fun Touring Ji Ji" experience. The bus tour itinerary of the "Green Tunnel Route" and "Ji Ji Banana Route" started service on this day, to facilitate tourists to take a bus visiting the attractions of Jiji Township according to the recommended time and promote the development of public transportation.

11 November

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本所分別於11月6日及11日召開交通科技產業會報-無人機科技產業小組第1次及第2次委員諮詢會議，確認我國無人機科技產業發展之重要議題(3項)、推動策略(8項)及各項策略之短中長期行動方案。

The Institute convened the 1st and 2nd Committee Consultation Meetings of the Transportation Technology Industry Report-UAV Technology Industry Group on November 6 and 11, respectively, to confirm the important issues (3 issues) and promotion strategies (8 strategies) for the development of our country's UAV technology industry and short, medium and long-term action plans for all strategies.

日期 Date	重要記事 Event

11 **November**

●18

本所與海洋委員會國家海洋研究院進行多次協商，雙方就海氣象資料共享、航安技術支援、水工模型試驗、建立海洋資料庫與推動海洋研究等交流合作議題簽署備忘錄，雙方可據此進行多元深化合作，促成在港灣及海洋領域的共同研究，強化雙邊人才、技術與知識交流，達到創造雙贏、專業加乘之目標。

The Institute and the National Academy of Marine Research of the Ocean Affairs Council have conducted multiple consultations. Both parties signed a memorandum of exchange and cooperation issues on marine meteorological information sharing, aviation safety technical support, hydraulic model testing, establishment of a marine database, and promotion of marine research for both parties to conduct diversified and deepened cooperation based on the memorandum, promote joint research in the fields of harbors and oceans, strengthen bilateral exchanges of talents, technology and knowledge, to achieve the goal of creating a win-win situation and multiplying professionalism.

●18
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由本所黃副所長新薰擔任代表團領隊，出席2019年11月18日~11月21日於俄羅斯莫斯科市召開之「APEC第48次運輸工作小組會議(TPT-WG48)」。代表團成員包括政府部門及民間相關單位代表共計19員。我代表團各單位出席代表分別於相關專家小組報告於TPT-WG錄案計畫辦理情形(計1件)、報告我國各運輸領域發展情形(計4件)、會中並吸收他國觀念，俾作為推動相關事務參考，代表團已依原訂計畫圓滿達成任務返國。

The delegation led by the Deputy Director-general, Huang Hsin-Hsun, of the Institute attended the "APEC 48th Transportation Working Group Meeting (TPT-WG48)" held in Moscow, Russia from November 18 to November 21, 2019. The members of delegation include 19 representatives from the government departments and private sector related units. Representatives of each unit of our delegation reported to the relevant expert groups on the status of the TPT-WG record plan (1 case), the development of our country's various transportation fields (4 cases), also absorbed ideas from other countries in the meeting to be used as the reference for promoting related business affairs, The delegation has successfully completed the mission according to the original plan and returned to the country.

●22

本所辦理「智慧公共運輸服務科技創新研討會暨高峰論壇」，邀請林部長佳龍、經濟部次長、產業界及學界代表進行高峰對話，針對我國智慧公共運輸服務產業之發展提出初步策略及藍圖。

The Institute organized the "Smart Public Transportation Service Technology Innovation Seminar and Summit Forum", invited the Minister Lin Chia-Lung, Deputy Minister of the Ministry of Economic Affairs, industry and academic representatives to have a summit dialogue, and propose the preliminary strategies and blueprints for the development of our country's smart public transportation service industry.

日期 Date	重要記事 Event

12 October

04

行政院核定「運輸部門溫室氣體排放管制行動方案成果報告(108年9月版)」，在各相關部會推動下，公共運輸明顯成長，民眾對電動機車接受意願提高。規範車輛能效標準的「車輛容許耗用能源標準及檢查管理辦法」部分條文已修正發布，運輸部門溫室氣體排放量由105年3,816萬噸CO_2e降為106年3,783萬噸CO_2e，107年再降為3,716萬噸CO_2e，已呈現減碳成效。

The Executive Yuan approved the "Transportation Sector Greenhouse Gas Emission Control Action Plan Results Report (September 2019 Version)". With the promotion by relevant Ministries, the public transportation has grown significantly and the people's willingness to accept electric motorcycles has increased. Some articles of the "Fuel Economy Standards and Regulations on Vehicle Inspection and Administration" that regulate vehicle energy efficiency standards have been revised and published. The Transportation Sector Greenhouse Gas Emission has been reduced from 38.16 million tons of CO_2e in 2016 to 37.83 million tons of CO_2e in 2017 and again reduced to 37.16 million tons of CO_2e in 2018 which has shown the carbon reduction effects.

05

本所「北臺區域整體運輸規劃研究」榮獲國際組織東亞運輸學會EASTS「2019年傑出運輸計畫獎(Outstanding Transportation Project Award, OTPA)」，這是我國首次由中央級機關獲獎的研究計畫。本計畫係經中華民國運輸學會推薦代表我國參選，該學會並在今(108)年的年會會員大會中頒獎表揚。

The Institute's "Northern Taiwan Regional Overall Transportation Planning Research" won the "Outstanding Transportation Project Award (OTPA) in 2019" from the international organization Eastern Asia Society for Transportation Study (EASTS), and this is the first research project awarded by the central authority of our country. This project was recommended by the Chinese Institute of Transportation to represent our country to participate in the award, and the Institute will present the award and commendation at this year's (2019) annual meeting.

日期 Date	重要記事 Event

12
October

18

舉辦2020年版運輸政策白皮書新書發表暨記者會，會中由林部長佳龍率交通部各部門首長啟動簽書儀式，出席人員包含地方政府及產官學研各界。藉由本白皮書之發布，以利未來中央與地方，透過公私協力，共同合作推動運輸政策。

Hold the 2020 Transportation Policy White Paper New Book Presentation and Press Conference. Minister Lin Chia-Lung led the senior officials of various departments of the Ministry of Transportation and Communications to start the signing ceremony. The attendees included all sectors of local governments, industry, government, and academia research institutions. With the release of this White Paper to facilitate the central and local governments to collaborate in promoting the transportation policies through the joint efforts of public and private sectors in the future.

柒 | 附錄：年度研究計畫

07. Appendix: Annual Research

柒、附錄：年度研究計畫

項次	計畫名稱	Project Title
1	自行車路網示範系統之圖資建置與行銷	The Development of Image Data for the Demonstration System and Marketing of Cycle Route.
2	環島自行車道升級暨多元路線整合規劃先期作業	A Preliminary Plan of Upgrading and Diversifying Island Round Cycling Routes.
3	南臺區域整體運輸規劃系列研究 (1/2) －旅次特性調查分析	A Series of Studies on the Overall Transportation Planning of Southern Taiwan (1/2)-Investigation and Analysis of Trip Characteristics
4	輕軌系統容量分析暨應用研究 (1/2)-A、B 型路權容量模式構建	Light Rail Transit Capacity Analysis and Its Applications (1/2) - Capacity Model Development for A-Type and B-Type Right-of-Way
5	捷運路網規劃設計參考手冊之研究 (1/2)	The Research of Rapid Transit Network Planning and Design Manual (1/2)
6	高快速公路匝道分匯流區容量及服務水準分析之研究 (1/3)- 獨立進出口分匯流區	Capacity and Level of Service Analysis of Freeway and Expressway Merging and Diverging Area (1/3) – Isolated Merging Area for On-ramp and Isolated Diverging Area for Off-ramp
7	108-109 年臺灣公路容量分析軟體與專區網站更新維護服務 (108 年度)	Updating and maintenance service of Taiwan Highway Capacity Analysis Software and website from 2019 to 2020(2019)
8	運輸部門決策支援系統維運技術服務 (108 年)	Maintenance of the Decision Support System and Integrated Database for Transportation Infrastructure Deliberations (2019)
9	國內行車成本調查蒐集 (1/2)	Vehicle Operating Cost Survey and Analysis of Taiwan(1/2)
10	107 年城際運輸消長觀察	Taiwan intercity transport statistics 2018
11	春節連假高速公路與鐵公路客運旅次特性觀察	Observations on trip characteristics of freeway, railway, and freeway schedule bus service during Chinese New Year holidays
12	高齡者旅運行為之初探	A Preliminary Study of Travel Behavior of Senior Citizens.
13	高雄港洲際貨櫃中心聯外交通改善策略之研究	The study of access road improvement for Kaohsiung Intercontinental Container Terminal
14	108 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 Transport Database of 2019
15	109 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 Maritime Database of 2019

項次	計畫名稱	Project Title
16	大數據分析技術進行鐵路供需診斷與策略分析 (1/2)- 診斷模式軟體雛型之建置	Analysis of Railway Demand and Supply with Big Data Technology (1/2) – Development of a Diagnostic Model Prototype
17	商港整體發展規劃 (111-115 年)	The Integrated Overall Development Plan of Commercial Ports (2022-2026)
18	我國船舶政策推動措施研析	Analysis of Taiwan's Ship Policy Promotion Measures
19	各國因應 2020 年船舶低硫燃油規定策略之研析	The Measures of Countries in Response to the IMO 2020 Sulfur Limit
20	全球主要貨櫃港口營運概況與績效評析初探	Operation Overview and Performance Evaluation of Global Major Container Ports
21	郵輪旅遊發展與經濟產值初探	Study on the Development and Economic Contribution of Cruise Tourism
22	中美貿易戰對航運市場影響之研究	A Study on the Impact of Sino-US Trade War on the Shipping Market
23	人臉辨識技術於航空客運之發展趨勢初探	The Development Trend of Face Recognition Technology in Air Passenger Transportation
24	國際機場陸側設施容量評估方法初探	Preliminary Study on the Assessment Methods of Landside Facilities Capacity of International Airports
25	機場航網與競爭力關係之研究	Preliminary Study on the Distribution of Air Networks in Major Asian Airports by Connectivity
26	空中計程車發展趨勢初探	Preliminary Analysis of Flying Taxi
27	亞太地區主要樞紐機場營運績效之初探	A study of Operational Performance of Major Hub Airports in Asia Pacific
28	「Koinonia: 交通就是感動─ 2020 運輸政策白皮書」專書、「總論」及「陸運」、「海運」、「空運」、「運輸安全」、「智慧運輸」、「綠運輸」及「運輸部門因應氣候變遷調適與防災」7 分冊	"Koinonia: A Moving Form of Transportation　2020 Transportation Policy White Paper"、 summary volume and seven different volumes ranging from land transportation, sea transportation, air transportation, transportation safety, intelligent transportation, green transportation, to climate change adaptation and disaster prevention.
29	公共運輸場站無障礙電梯使用狀況調查與改善方案評估：以臺北捷運為例	An Observation on Accessible Elevator Users Behavior and Improvement Strategy Evaluation: A Case of Taipei MRT System
30	駕駛行為分析工具開發及行為特性探討	Development of Driver Behavior Analysis Tool and Analysis of Driving behavior
31	自行車及類似運具安全管理之研究	Study of Safety Management of Bicycles and Similar Modes of Transport
32	「道路交通標誌標線號誌規則」架構之研析	A Study on the Framework of Road Traffic Signs, Markings, and Signals Regulation

項次	計畫名稱	Project Title
33	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	Design Model on Road Traffic Engineering at Intersection under Mixed Traffic(3/4)-Unsignalized Intersections
34	路口無人機交通攝影及衝突分析技術開發	Development of Traffic Conflict Analysis Using UAV Aerial Videography for Intersections
35	載客船舶航行作業相關危險情況資料調查蒐集服務	Investigation and collection of hazard data related to the navigation operations of passenger ships.
36	規劃我國籍載客船舶航行安全風險管理輔導教材與實船示範計畫	Planning passenger ship navigation safety risk management counseling materials and practical ship demonstration plan.
37	電動三輪機車及輕型車輛發展現況與趨勢資料之蒐集與分析	A Study on the Current Development and Trend of three-wheeled electric vehicles and light duty vehicles
38	「大型車輛裝設車輛安全設備推動計畫」成效追蹤評估計畫	The effect evaluation of "Promotion Plan of Installing Safety Equipment for Large Vehicles" project
39	推動鐵道行車安全保證機制之研析	A Study on Railway Safety Assurance Mechanism Promotion
40	汽車燃料使用費隨里程徵收之可行性研究	The Feasibility Study for Collecting Mileage-based Motor Vehicle Fuel Usage Charge
41	我國汽車貨運業特許制度檢討之研究	Study on the Legal Concession System of the Automobile Freight Industry in Taiwan
42	智慧節能車機應用於公共運輸產業發展之研究 - 以公車為例	The Study of Smart Energy Saving Telematics used in the development of Public Transportation Industry - taking bus as an example
43	車載診斷系統 (OBD) 在運輸科技管理之應用研究	A Study on the Application of On-board Diagnostic System (OBD) for Transportation Technology Management
44	預約式通用小客車運輸服務之試辦與推廣應用	Pilot project of promoting pre-arranged wheelchair accessible taxi service
45	公共運輸縫隙掃描決策支援系統之維運、功能強化及教育訓練 (1/2)	The Maintenance, Functional Enhancement and Education Training of Decision Support System for the Scanning Public Transit Service Gaps
46	研提第四期公路公共運輸計畫	Drafting the 4th Promotion Program of Bus Transit System
47	跨公共運輸運具轉乘需求推估方法之初探	The Preliminary Study on Estimation of Public Transportation Transfer's Demand
48	影響公共運輸定期票選擇行為因素之探討	The Study of the Contributing Factors for Choice Behavior Affecting Public Transportation Fixed Term Passes
49	APEC 供應鏈連結架構行動方案 II 運輸議題因應策略之研析	A Study on Response Strategies for Transport Issues of APEC Supply Chain Framework Action Planning II

項次	計畫名稱	Project Title
50	解決偏遠地區公共運輸可行策略探討	The Study of Accessible Public Transit Strategy in Rural Area
51	交通行動服務 (MaaS) 示範建置計畫	Demonstration plan of MaaS (Mobility as a Service)
52	應用人工智慧 (AI) 影像辨識技術進行交通數據蒐集與分析之研究	A Research of Applying the Technology of AI Image Detection on Traffic Data Collecting and Analysis
53	交通事件資訊整合服務與精進計畫 (2/2)	The Service and Enhancement Project for The Information Integration of Traffic Events(2/2)
54	我國公共運輸車聯網實驗場域探討	The Study of Connected Vehicle Experiment Field of Public Transportation in Taiwan
55	多元公共運輸數據分析與科技應用之研究	Multiple public transit data analysis and technology appilcation
56	電動公車示範計畫執行績效分析與推動策略支援應用 (1/2)	The Analysis of Project Performance and Application of Promotion Strategy Support in the Pilot Project of Electric Bus (1/2)
57	科技計畫研發成果管理推廣與知識分享	Promotion and Management of the Intellectual Property Rights and Knowledge Sharing of the Transportation Technology Development Project Findings
58	運輸部門溫室氣體減量策略成效研析	A Study on the Results of Greenhouse Gas Reduction Strategies Raised by Transportation Sectors
59	運輸部門溫室氣體排放決策支援系統功能擴充與維運	Maintaining and Expanding Decision Support System of Greenhouse Gas Emissions in Transportation Sector
60	交通污染排放量推估與污染熱點分析	Estimation of Traffic Air Pollution Emissions and Analysis of Traffic Air Pollution Hot Spots
61	運輸系統調適策略研究	Research on Adaptation Strategies of Transportation Systems
62	地工織物應用於橋墩基礎保護之可行性研究	Study on Feasible Application of Geotextiles to the Protection of Bridge Piers Foundation
63	108 年臺灣沿岸地區金屬材料腐蝕環境調查研究	Investigation on Corrosive Environment of Metal Materials in Coastal Areas of Taiwan in 2019
64	108 年港區震災速報系統維護及地層下陷調查分析研究	Analysis and Research on the Maintenance of the Earthquake Disaster Rapid Reporting System in the Harbor Area and Strata Subsidence Survey in 2019
65	高雄港港區工程基本資料網頁查詢模組建置	Establishment of Web-based Inquiry System of Kaohsiung Harbor's Basic Engineering Data
66	臺中港港灣構造物維護策略探討與管理系統擴建	Study on the Maintenance strategy and Management system of Taichung harbor structures

項次	計畫名稱	Project Title
67	地層下陷與地下水位之關聯性研析	Correlation Analysis of Land Subsidence and Groundwater Level
68	港灣構造物設計基準條文增補研議與編修擬訂	A Discussion on the Amendments to and Revision of the Harbor Structure Design Criteria
69	軌道扣件巡檢系統建置 (1/2)- 扣件缺失辨識系統建置研究	Railway Track Fastener Inspection System Establishment (1/2) - A Research on the Establishment of a Defective Fasteners Detection System
70	公路土壤邊坡崩塌監測系統維護及模組功能提升	Maintenance of highway soil slope landslide wireless monitoring system and upgrading of module
71	108 年國際商港風波潮流觀測與特性分析	Analysis of meteo-oceanographic observations near international harbors in Taiwan (2019)
72	108 年國內商港風波潮流觀測與特性分析	Analysis of 108 years of meteorological observations in Taiwan domestic sea commercial port waters
73	臺灣周圍海域及港口之船舶 AIS 應用分析	E-Navigation with Ship Monitoring and Warning Systems
74	船舶斷纜預警系統建置及繫纜方式研擬	Study on ship broken cable early warning system establishment and cable tethering method investigation
75	建立即時氣象模組及船舶排放之三維空氣品質模擬系統	Establishment of Real-Time Three-dimensional Meteorological and Air Quality Forecasting System for Ship Emission
76	船舶航 安全大 據資 庫應用與分析	An analysis of ship navigation safety big data database
77	水波時尺或時頻分析法之比較與應用	The Best Wavelet for Water Waves and Its Optimization –Wavelet Coherences versus Fourier Coherences
78	港灣風波潮流模擬及長浪預警之研究 (2/4)- 模擬評估及長浪預報研究	Sea Simulation and Long Wave Early Warning Research of Harbor(2/4)- Simulation Evaluation and Long Wave Forecasting Research
79	臺灣東部近岸港口外廓配置對毗鄰海灘沖淤之影響評估	The assessments of harbor entrance siltation and adjacent beach erosion induced by the inshore harbor configurations in the eastern coasts of Taiwan.
80	臺東海岸公路沿岸地形變遷因應對策研究	Study of the hazard countermeasures in response to the morphological changes near the coastal highway in Taitung
81	108 年海氣象自動化預報模擬系統作業化校修與維運	Operational calibration and maintenance of the marine meteorology automatic forecast simulation system, 2019
82	108 年港灣環境資訊系統維護 - 功能提升	2019 Maintenance and Enhancement of Harbor Environmental Information Website

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