交通部運輸研究所106年年報

2017 Annual Report of the Institute of Transportation, MOTC

交通部運輸研究所
INSTITUTE OF TRANSPORTATION, MOTC

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所長的話

追求「環保節能」、「安全永續」、「便捷生活」、「協助產業」的運輸發展，為交通部當前重要施政方向。從國土規劃與永續發展的觀點，如何兼顧經濟發展、環境生態保育及社會公平等三個面向，並滿足民眾日常生活的機動性與可及性，必須要有創新與前瞻的思維，並善用資通訊以整合運輸系統的服務。

本所是交通部重要智庫，肩負協助交通部政策擬訂、統合協調運輸決策與執行計畫、支援各級運輸行政技術與研發創新，以及承擔運輸產官學研跨域溝通等工作。本所主管與同仁皆自我期勉，以「專業領航、追求卓越」做為團隊共識，以「政策、前瞻、基礎」三個層次研究，做為創新思維與深化專業的技能。

回顧過去一年，本所爭取並主辦 APEC 第 44 次運輸工作小組會議在臺北召開，同時，也籌劃出席 APEC 第 10 次運輸部長會議，藉由 APEC 平台取得國際間有關交通運輸發展之最新資訊，並延伸及加強我國在 APEC 各會員體間互動交流；另外，也完成未來 30 年軌道運輸發展願景，並推動桃園航空城核心計畫專案小組、道路交通秩序與交通安全改進方案、全國區域運輸發展研究中心、運輸部門減碳路徑及減碳策略、鐵公路氣候變遷風險評估指標、公路邊坡防災技術、國籍船舶風險管理規範等重大成果。顯示本所不僅盡責擔任交通部的智庫，更在我國交通基礎研究、前瞻技術研發、支援運輸政策規劃等重要任務上，達成具體的目標。

展望未來，本所將持續提升重大政策研擬與支援決策實力，同時，並應用資通訊科技發展智慧運輸服務，強化運輸安全研究以及海、空運輸規劃能力，以引領運輸施政與技術創新並促進產業發展，奠立我國運輸服務優質化之堅實基礎。

交通部運輸研究所 所長

吳玉珍

Message from the Director General

For the time being, the transportation development pursuing "environmental protection and energy saving," "sustainability of safety," "convenient life" and "assistance to industry" have been identified as important policies adopted by the Ministry of Transportation and Communications (MOTC). In terms of land use planning and sustainable development, to take care of the economic development, environmental ecology conservation and social justice and to satisfy the mobility and accessibility of the public daily life require innovations and foresight, and fair utilization of information and communication technology to integrate the transportation system services.

The Institute, as an important think-tank of MOTC, is responsible for helping MOTC research, draft, consolidate and coordinate transportation decisions and implementation plans, supporting all levels of transportation administrative technologies and R&D innovations, and also being in charge of communication tasks among the various transportation industries, officials, scholars and researchers across various fields. All of the Institute's officers and staff encourage themselves to achieve the "professional leadership and the pursuit of excellence" as a consensus among the team along with the three-level research of "policy, perspective, foundation" as the guidelines for innovative thinking and strengthening of professional skills.

Recalling the past year, the Institute organized the 44th APEC Transportation Working Group (TPT-WG) meeting in Taipei after making effort to strive for organizing it. Meanwhile, the Institute also plans to attend the 10th APEC Transportation Ministerial Meeting (TMM), in the hope of accessing the latest information about traffic and transportation development in the world through the platform, APEC, and also extending and enhancing the interaction and exchange between Taiwan and the other member economies of APEC. The Institute completed the railway transportation development vision for the next 30 years, and also boosted such important achievements as the taskforce dedicated to Taoyuan Aerotropolis Core Plan, the Road and Public Transportation and Safety Improvement Plan, Regional Center of Transportation Development and Research, carbon reduction routes and carbon reduction strategies of transportation authorities, indicators of evaluation on the risk over climate changes on railways and roads, road landside hazard mitigation technology and management regulations governing various ship risks. Apparently, the Institute has not only fulfilled its responsibility as the think-tank of MOTC but also achieved the specific objectives about Taiwan's transportation infrastructure research, R&D of foresight technology and support for transportation policy and planning.

Looking forward to the future, the Institute will continue to upgrade its strength in research and the drafting of important polices and supporting decisions. Meanwhile, the Institute will also apply the information communication technology to develop the smart transportation service and strengthen the transportation safety researches and its planning ability in marine and aerial transportations in order to lead the transportation policies and technology innovation and to upgrade the industrial development and thereby establish a solid foundation for optimization of Taiwan's transportation service.

Institute of Transportation, MOTC
Director General

Wu, Jennifer Yuh-Jen

02

組織與職掌

Organization and Functions

02

組織與職掌

Organization and Functions

一、沿革

臺灣地區自政府播遷來此，經歷長年的勵精圖治，各項建設莫不欣欣向榮，經濟發展更是突飛猛進。在此期間，有關運輸部門的投資比重及其成長速度，雖亦因之與時俱增，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，以適應未來的需求。

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 needs.

由於運輸方面所需要的投資甚為龐大，且在整體經濟的考量下，可供應用的資金究屬有限，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、服務品質等等，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。14 年中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。

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。

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.

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 Mainland China. Being a formal branch of the government, the Institute of Transportation is funded through a normal budgeting process.

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。

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

本所設置運輸計畫、運輸工程、運輸經營管理、運輸安全、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、主計室等部門。依照本所組織條例，編制員額計 177 人，預算員額 163 人。另有約聘人員 4 人，技工及工友共 25 人。

編制員額 177 人
authorized staff is 177

預算員額 163 人
budgetary staff is 163

約聘人員 4 人
4 contracted research employees

技工及工友 25 人
25 technicians and office workers

II. ORGANIZATION AND HUMAN RESOURCES

The Institute of Transportation comprises seven divisions and a Secretariat, a Personnel Office, and an Accounting Office. The seven divisions include Planning, Engineering, Operations and Management, Safety, Information Systems, Interdisciplinary Research and the Harbor and Maritime Technology Center. According to the organization act of the IOT, the total authorized staff is 177 and the budgetary staff is 163. In addition, there are 4 contracted research employees and 25 technicians and office workers.

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 IOT, the missions of the IOT 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

所長 Director General

吳玉珍

Wu, Jennifer Yuh-Jen

副所長Deputy Director General

黃新薰

Huang, Hsin-Hsun

副所長 Deputy Director General

陳天賜

Chen, Tien-Tsyh

主任秘書 Chief Secretary

蘇振維

Su, Cheng-Wei

人事室 主任

陳權榮

Chen, Chuan-Jung

人事室 Personnel Office

秘書室 主任

李淑惠

Lee, Shu-Hwui

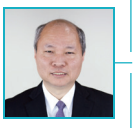
秘書室 Secretariat

主計室 主任

連小瑩

Lien, Hsiao-Ying

主計室 Accounting Office



公關室 主任

曹瑞和

Tsaur, Ray-Her

公關室 Public Relation Office

港灣技術研究中心 主任

邱永芳

Chiu, Yung-Fang

港灣技術 Harbor & 研究中心 Marine Technology Center

運輸計畫組 組長

張舜淵

Chang, Shuen-Yuan

運輸計畫組 Transportation Planning Division

運輸安全組 組長

張開國

Chang, Kai-Kuo

運輸安全組 Transportation Safety Division

運輸工程組 組長

許書耕

Hsu, Shu-Keng

運輸工程組 Transportation Engineering Division

運輸經營管理組 組長

張朝能

Chang, Chao-Neng

運輸經營管理組 Transportation Operations & Management Division

運輸資訊組 組長

陳其華

Chen, Chi-Hwa

運輸資訊組 Transportation Information Systems Division

綜合技術組 組長

曾佩如

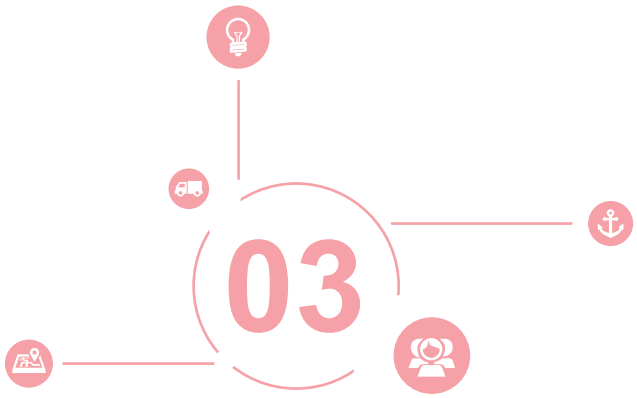
Tseng, Pei-Ju

綜合技術組 Interdisciplinary Research Division

03

年度施政概況介紹

Overview of Annual Administrative Implementation



年度施政概況介紹

Overview of Annual Administrative Implementation

以下分別從運輸系統研究規劃、運輸工程研究發展、運輸安全研究發展、運輸經營管理研究發展、運輸資料蒐集與資訊應用之研發推動、綜合技術研究發展以及港灣技術研究發展等 7 大項重要業務，概略說明本所 106 年施政計畫之實施狀況。

The implementation projects of the administrative plans for 2017 of this Institute are generally introduced in 7 major business fields: transportation system research and planning, transportation construction research and development, transportation safety research and development, transportation operation & management research and development, research promotion for transportation data collection and information application, comprehensive technology research and development, and harbor technology research and development.

一、運輸系統研究規劃

相關執行計畫如下：

- 反映實際交通情境之車輛動態能耗與碳排放特性研究 - 以小貨車為例 (1/2)
- 北臺區域整體運輸規劃 - 旅次特性調查與供需分析
- 鐵路立體化建設對交通及都市發展之影響分析
- 公路交通系統模擬模式調校與新版容量手冊研訂 (2/3)
- 106-108 臺灣公路容量分析軟體 (THCS) 優化與推廣 (106 年度)
- 郊區多車道公路車流特性調查
- 自行車友善環境路網整體規劃與評估 (2/3)

I. Transportation System Research Planning

Relative projects are as follows:

- A Study on the Characteristics of Real-life Energy Consumption and Carbon Emissions of Small Trucks (1/2)
- Comprehensive Transportation Planning of Northern Taiwan– Travel Survey and Demand & Supply Analysis
- An Impact Analysis of a Railway Grade Separation Construction on Traffic and Urban Development
- Develop and Calibrate the Highway Traffic Systems Simulation Model and Revise Taiwan Highway Capacity Manual (2/3)
- Optimization and Promotion of Taiwan Highway Capacity Analysis Software (2017)
- Survey of Traffic Characteristics on Rural Multi-Lane Highway
- An Integrated Technical Planning and Evaluation of Friendly Bike Lane Network (2/3)

- 自行車路網示範系統之圖資建置與行銷 (2/3)
- 運輸部門決策支援系統應用於重要議題分析之技術服務 (106 年)
- 建置高快速公路連絡道瓶頸快篩系統 - 以北臺運輸走廊為例
- 傳統暨區域鐵路系統容量分析軟體之升級改版與推廣作業 (1/2)
- 105 年西部城際陸路公共運輸消長觀察
- 2046 年我國軌道運輸發展願景分析
- 新式複合式軌道運輸系統發展分析
- 高雄國際機場旅次特性分析與周邊道路交通壅塞改善探討
- 107 年度交通及建設部門重大公共建設計畫先期作業審查報告
- 高速公路楊梅至新竹科學園區交通壅塞問題改善評析
- 高速公路連續假期夜間暫停收費相關議題分析
- 郊區雙車道公路非阻斷性路段車流特性之研究
- 機場捷運費率變化對周邊道路服務水準之影響分析
- 我國區域治理機制之探討 - 以交通運輸為例
- 浪漫台 3 線自行車道網絡規劃
- 東部整體礦砂石運輸改善策略

- Developing of Image Data for the Demonstration System and Marketing of Cycle Route (2/3)
- Applying Transportation Decision Support System on Important Issues Analysis (2017)
- Establishing a Bottleneck Fast Screening System for Expressway and Connection Roadway - A Case Study of North Taiwan Transport Corridors
- Upgrade and Promotion of Conventional Railway Capacity Software (1/2)
- The Market Share Changes of Intercity Public Transportation after HSR in Operation (2016)
- Taiwan 2046: A Global Vision for Railway Development
- Analysis on Development of Dual Mode Vehicle
- The Analysis of Travel Characteristics of Kaohsiung International Airport and the Improvement of Traffic Congestion Surrounding Roads
- Transportation and Construction Sector Major Public Construction Plan Budget Review Report (2017)
- The Improvement of Traffic Congestion on Highway from Yangmei to Hsinchu Science Park
- Comments on the Cancellation of the Suspension of Charges of National Freeway for Continuous Holiday Night
- Traffic Flow Characteristics of Taiwan's Rural Two-lane Highways with Uninterrupted Flows
- An Impact Analysis of Taoyuan Airport MRT Fare on the Road Traffic
- A Study of Regional Governance Mechanism in Taiwan - Taking Transportation as Example
- Bike Lane Planning on Hakka Romantic Avenue (Provincial Highway No.3)
- The Improvement Strategy for the Integrated Ore & Gravel Transportation of East Region

二、運輸工程研究發展

相關執行計畫如下：

- 國際航運網路模型功能擴充之研究
- 構建空域模擬模式之研究 - 以臺北終端管制區域為例
- 106 年度「國際海運資料庫」更新擴充及資料分析服務
- 106 年度「國際空運資料庫」更新擴充及資料分析服務
- 東部鐵路運輸排點精進作為可行性之初探
- 下一代飛航管理系統初探 - 以美國 FAA Next-Gen 為例
- 蘇澳港開闢貨櫃轉運業務可行性評估
- 國際機場旅客服務智慧化之評估研究
- 馬祖觀光發展與陸海空運輸整體規劃
- 國際航空碳排管制發展初析
- 前瞻軌道基礎建設引入 Tram-Train 適用法規之初探
- 我國海運政策與法令之研析
- 運輸經濟 - 理論與實務

II. Transportation Construction Research and Development

Relative projects are as follows:

- The Enhancement Application of the Network Model for Global Container Shipping Trends
- Research on Building Airspace Simulation Model- A Case Study of Taipei Terminal Approach Control Area
- Data Updating and Analyzing, and Function Expanding for International Maritime Transportation Database (2017)
- Data Updating and Analyzing, and Function Expanding for International Air Transportation Database (2017)
- A Preliminary Feasibility Study on Enhancement of Eastern Taiwan Railway Scheduling Timetable
- Air Traffic Management System of Next Generation- A Case Study of NextGen
- Feasibility Assessment for SUAO Port to Operate Container
- The Study and Evaluation on Passenger Smart Services of International Airports
- Matsu's Sightseeing Development and Integrated Planning of Land, Sea and Air Transport
- A Preliminary Analysis on the Development of International Carbon Emission Control
- A Study on the Applicable Regulations of Tram-Train System in Forwarding Track Infrastructure Development
- On the Research and Analysis of Policy and Laws of the Maritime Transport in Taiwan
- Transportation Economics- Theory and Practice

三、運輸安全研究發展

相關執行計畫如下：

- 大眾捷運系統獨立驗證與認證 (IV&V) 規範及其報告撰寫規範之研究
- 我國危險物品運輸安全管理機制之檢討與分析
- 交通事故傷害資料蒐集體系建構及應用 (2/2)
- 機車安全駕駛學習遊戲擴充與推廣應用
- 混合車流路口道路與交通工程設計範例 (1/4)
- 我國運輸業道路交通安全管理機制之研擬
- 代客駕車服務制度之研究
- 道路交通車流及事故風險偵測與分析工具之發展應用
- 「大型車輛裝設車輛安全設備推動計畫」成效追蹤評估計畫
- 第 35 期臺灣地區易肇事路段改善計畫
- 自動駕駛車輛道路測試規定之研議

III. Transportation Safety Research and Development

Relative projects are as follows:

- A Study in Metro System Regulations and Issued Reports by Independent Verification and Validation
- Review Analysis of the Administration Mechanism of Safe Transportation of Dangerous Goods in Taiwan
- Traffic Accident Injury Data Collecting System Establishment and Application
- The Expansion and Promotion of Motorcycle Safe Driving Learning Game
- Design Model on Road Traffic Engineering at Intersection under Mixed Traffic (1/4)
- Development of National Transportation Road Traffic Safety Management System
- A Study on Designated Driver Service Systems
- Application of Road Traffic Flow Analysis and Accident Detection
- Effect Evaluation of Large Vehicles Equipped Safety Devices Promotion Project
- The 35th Project for Improving Accident-Prone Locations in the Taiwan Area
- Study of Regulations for Automated Driving Vehicle Trials on Public Roads

四、運輸經營管理研究發展

相關執行計畫如下：

- 我國汽車貨運產業導入績效運籌模式之研究 - 以貨車租賃為例
- 預約式無障礙小客車運輸服務之整合研究 (1/2)
- 新興計程車營運模式納管機制與消費者保護之研究
- 汽車燃料使用費徵收制度之研究
- 公共運輸縫隙掃描決策支援系統應用健保及學籍資料之研究
- 國外鐵路車站營運發展趨勢之研究
- 服務貿易協定談判運輸服務業開放承諾初探
- 花蓮低碳綠能交通接駁工具建置計畫
- 導入社經指數下之計程車市場最佳化研究
- 高鐵與公車間時間無縫接駁評估之初探
- 汐止地區鐵公路複合運輸改善探討報告

IV. Transportation Operation & Management Research and Development

Relative projects are as follows:

- A Study of the Performance-based Logistics Model for the Trucking Industry in Taiwan - The Role of Truck Leasing
- An Integrated Study on Prearranged Wheelchair Accessible Transportation Services(1/2)
- A Study on Regulatory Policy and Consumer Protection of New Taxi Business Model
- The Research on the Collection System of Excise Fee on Motor Fuels
- The Study of Applying the National Health Insurance Database and the Student Enrollment Database to Strengthen the Function of Decision Support System for Scanning Public Transit Service Gaps
- Research on the Development Trend of Railway Station Operation in Foreign Countries
- A Preliminary Study on the Opening of Transport Service Industry by Negotiation of Trade in Service Agreements
- The Initial Research of Planning the Electric Bus Routes in Hualien
- Optimization of a Taxi Market with Socioeconomic Indicator
- A Initial Study of Transfer Time Integration between Railway and Bus
- The Study on the Improvement of Rail-Road Intermodal Transport in Taiwan Xizhi Area

五、運輸資料蒐集與資訊應用之研發推動

相關執行計畫如下：

- 中興新村「智慧運輸 - 車聯網」示範場域規劃建置
- 旅運時空資料分析與公共運輸服務應用發展計畫
- 科技應用計畫專案管理及監督審驗
- 交通行動服務（MaaS）示範建置計畫
- 研發成果智財權推廣應用與交通科技知識分享
- 交通旅運資訊多元整合服務計畫 - 都市交通事件資訊整合發布實作
- 106 年 APEC 運輸領域重點議題發展趨勢分析
- ITS 發展方向及策略探討
- 研考作業自動化程式試行與修訂
- 應用巨量時空資料於精進公共運輸研究

V. Research Promotion for Transportation Data Collection and Information Application

Relative projects are as follows:

- The Development of Connected Vehicle Test Bed in Chung-Hsing New Village
- Time-Space Data Analysis and Application of Public Transportation Project
- The Management and Supervising of Technology Application Plans
- Demonstration Project of the Mobility as a Service (Maas)
- Promotion and Application of the Intellectual Property Rights and Knowledge Sharing of the Transportation Technology Innovative Findings
- The Integration and Implementation of Urban Traffic Event Information Management System
- Significant Issues and Trend Analysis on Transportation Sphere in APEC for 2017
- The Trends and Strategies of Intelligent Transportation Service
- Implementation and Modification of the Automated Research Evaluation Programs
- The Application of Big Data to Improving Public Transportation

六、綜合技術研究發展

相關執行計畫如下：

- 都會運輸節能減碳策略評估模組開發及應用 (1/2)
- 快速公路 LED 路燈量測計畫與成本效益分析 (2/2)
- 鐵公路氣候變遷調適行動方案之研究
- 陸路運輸業能源消耗及溫室氣體排放推估及評估指標研析 (1/2)
- 運輸部門溫室氣體減量階段管制委託服務專案
- 交通環境之 PM2.5 暴露探討
- 貨運業避免左轉對空污及安全影響分析
- 氣候變遷對公路公共運輸服務影響之探討
- 評估「補助執行清除汽車積碳措施」之可行性
- 降低移動污染源管理措施彙析

VI. Comprehensive Technology Research and Development

Relative projects are as follows:

- Develop and Apply the Evaluation Model of Urban Transport Energy Saving and Carbon Reduction Strategies (1/2)
- Expressway LED Lamp Test Program and Cost-benefit Analysis (2/2)
- The Study on the Railway and Road Constructions Adaption Strategies for Climate Change
- Research on Assessment Indicator and Estimation of Energy Consumption and Greenhouse Gas Emission for Land Transportation Industry (1/2)
- Commissioned Service Project of Management for Greenhouse Gas Decrement of Transportation Sector
- Exposure Assessment of PM2.5 in Traffic Environment
- Analysis on the Impact of Avoiding Turn Left on Air Pollution and Safety in the Freight Transportation Industry
- The study of Climate Change Effect Road Public Transport Service
- Assess the Feasibility of "Subsidizing the Implementation of Measures to Eliminate Carbon Deposits in Vehicles"
- Analysis on the Management Measures for Reducing Mobile Pollution Sources

七、港灣技術研究發展

相關執行計畫如下：

- 離岸風電海下工程技術研發計畫 - 子計畫 1：離岸風電水下技術研發
- 離岸風電海下工程技術研發計畫 - 子計畫 2：離岸風電建置與航安技術發展
- 道路災害防治技術強化研究 - 子計畫 1：公路邊坡深層滑動無線感測網路監測系統研發
- 道路災害防治技術強化研究 - 子計畫 2：公路邊坡崩塌近景攝影測量自動判讀系統開發應用研究
- 道路災害防治技術強化研究 - 子計畫 3：海岸公路異常波浪特性及防災應用技術之研究
- 臺灣國內商港未來發展及建設計畫 (101-105 年)- 馬祖港埠建設計畫 - 子計畫 2：馬祖地區軟弱地質建構防波堤及碼頭之研究
- 工程資訊管理系統開發技術與運用之研究
- 近景攝影測量技術運用於巡檢及自動化監測資料管理系統建置之研究
- 花蓮港碼頭防波堤檢測及修復建議（延續性研究）子計畫 2：花蓮港港灣構造物維護管理系統之優化與擴充作業
- 公路早期防救災決策支援系統及鋼橋管理模組維護更新
- 綠色航運與航安資訊之整合研發 - 子計畫 1：船舶航行對沿岸及港域空污預測模式之建立
- 綠色航運與航安資訊之整合研發 - 子計畫 2：行動中繼傳輸技術應用於 AIS 系統之研發

VII. Harbor Technology Research and Development

Relative projects are as follows:

- Study of Developing Underwater Technology for Offshore Wind Turbine
- Offshore Wind Power Construction and Development of Navigation Safety Technology
- Development of Wireless Sensing Network for Deep Slide Failures of Highway Slopes
- Development and Application of Close Range Photogrammetry Automatic Interpretation System for Highway Slope Collapse
- Study for the Feature of Freak Wave of Coastal Highway and Application of Disaster Prevention
- Study on Harbor Structure Technique on the Weak Stratum in Matsu
- A Study on Technology Development and Application of Information Management System
- The Research on the Construction of Inspection and Automation Monitoring Data Management System with Close Range Photogrammetry Technology
- The Study for Field Surveying and Maintenance of Hualien Port Wharf and Embankment (Continuity Study), Sub-Project 2: Refinement and Expansion of Hualien Port Maintenance and Management Systems
- Trends Maintenance and Bridge Assessment Information Integration
- Establishment of Air Quality Forecasting System for Harbors and Coastline Ships
- The Study of Mobile Relay Transmission Technology Used in AIS System
- An Establishment of Oceanography Prediction System around Matsu Area
- Investigation of Sediment Transport, Marine Meteorology and Coastal Morphology in Taipei Harbor Areas, Subproject1: The Navigation Safety Analysis and Evaluation in Taipei Harbor Areas
- Investigation of Sediment Transport, Marine Meteorology and Coastal Morphology in Taipei Harbor Areas, Subproject2: The Plan of Coastal Monitoring and Investigation in Taipei Harbor Areas

- 馬祖水域海氣象預報系統之建置研究
- 臺北港 (106-110 年) 海岸漂沙調查及海氣象與地形變遷監測作業 - 子計畫 1：臺北港之港域航行安全分析與評估
- 臺北港 (106-110 年) 海岸漂沙調查及海氣象與地形變遷監測作業 - 子計畫 2：臺北港之海域地形變遷監測
- 臺灣港灣海象模擬技術研發與防災之應用 - 子計畫 1：港灣海象模擬技術及預警系統研發
- 港灣環境資訊系統 - 加值應用暨功能擴充及維護
- 橋墩保護工法之研究
- 公路早期防救災決策支援系統模組維護更新
- 臺灣地區金屬材料腐蝕環境調查研究
- 地震監測速報及地層下陷量測分析
- 工程基本資料網頁查詢系統擴建研究
- 港灣構造物設計基準修訂之研究
- 港灣碼頭與防波堤調查與維護管理之研究
- 臺中港發展港埠物流之探討
- 超大型貨櫃船對港埠之影響研究
- 綠色航運與航安資訊之整合平台研發
- 水波時尺或時頻分析法之比較與應用
- 港灣海象模擬作業評估之研究
- 港灣環境資訊網觀測風力資料檢核之研究
- 近岸港口之淤積機制分析與防治對策研究
- 106 年國際商港海氣象觀測與特性分析
- 106 年國內商港海氣象觀測與特性分析
- 106 年臺灣商港海氣象觀測資料年報

- Development of Harbor Meteorology Simulation Technique and Early Warning System
- Maintenance and Expansion of the Functions and Applications of the Harbor-Environmental Information Website
- Study on Crossing Bridge Piers Protection Works
- Trends Maintenance and Bridge Assessment Information Integration
- Metal Corrosion and Its Corrosive Environmental Investigation in Taiwan
- Development of the Regional Geological Database and Analysis of Subsidence Measurement
- Extension of Web Inquiry System on Harbor Engineering Basic Data
- Study on Revision of Design Criterion of Harbor Structure
- The Study for Field Surveying and Maintenance Management of Harbor Wharf and Embankment
- A Study on Developing the Distribution Center for the Port of Taichung
- Impact Analysis of Ultra Large Container Ship on Port
- E-Navigation with Ship Dynamics and Technology Platform
- Comparison Studies of Laboratory Tests on Eleven Armor Types
- Evaluation Study of Harbor Oceanographic Numerical Modeling Operational System
- Wind Data Quality Checks of Harbor Environment Information Website System
- Investigating the Causes of Sediment Silting on the Inshore Harbor Entrance Associated with the Control Countermeasures
- Analysis of Meteorological Observations near the International Harbors in Taiwan, 2017
- Analysis of Meteorological Observations in Taiwan Domestic Sea Commercial Port Waters, 2017
- Oceanographical Observation Data – Annual Report 2017 of Twelve Harbors

04

重點研究介紹

Introduction
of Key Research

04

重點研究介紹

Introduction of Key Research

本所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) 整體運輸規劃及規範研訂；(二) 海空運輸；(三) 永續運輸與運輸經營管理；(四) 運輸安全；(五) 交通大數據應用；(六) 災害防治。以下即針對本所配合執行之重點研究項目擇要進行介紹。

The institute cooperates with the current key policies and domestic traffic issues of the Ministry of Transportation and Communications (MOTC) in stipulating and executing relevant research plans in order to assist the completion of the promotion of the domestic traffic policies and to provide the research outcomes as reference for the administrative implementations of the traffic units of the central and local governments. The main topics of these current traffic policies include: (1) compilation of overall transportation plan and specification; (2) maritime & aerial transportation; (3) sustainable transportation and transportation operation & management; (4) transportation Safety; (5) application of transportation related big data; (6) hazard prevention. The following provides an introduction on the subjects of the key researches executed cooperatively by the institute.

一、整體運輸規劃及規範研訂

（一）公路交通系統模擬模式調校與新版容量手冊研訂 (1/3)

1. 計畫概述

本所於 79 年根據美國 TRB 1985 年公路容量手冊之分析方法，出版第一版之「臺灣地區公路容量手冊」。隨後陸續以本土化車流之研究成果逐步更新內容，並於 2001 年及 2011 年出版更新之「臺灣公路容量手冊」，惟至今仍有部分章節尚未更新。本計畫主要修訂更新「郊區雙車道公路」之容量分析方法。

I. Compilation of Overall Transportation Plan and Specification

(I) Adjustment of highway transportation simulation mode and compilation of new version of capacity manual (1/3)

1. History

In 1990, according to the analysis methods of the American 1985 TRB Highway Capacity Manual "Taiwan Highway Capacity Manual" was published by this institute. Later on, its contents were amended gradually according to the research results on the localized traffic flow and the updated "Taiwan Highway Capacity Manual" was published in 2001 and 2011. In spite of this, some chapters still remain unchanged until now. The main purpose of this Plan is to update and modify the capacity analysis method for "Suburban dual-lane highway".

2. 研究成果

2011 年臺灣地區公路容量手冊第十二章郊區雙車道公路非阻斷性車流路段的分析方法須更新之原因如下：

(1) 分析方法引用美國 TRB 1985 年公路容量手冊之版本，而此版本即使在美國，因分析方法不適用，已被新的分析方法取代。

(2) 分析方法將郊區雙車道依所在地形分成平原區、丘陵區及山嶺區，無法反映同一地型內，因實際幾何設計 (如坡度、坡長、曲率半徑等) 造成交通運轉的差異。

(3) 分析方法缺乏本土性車流特性資料，也沒有適當的方法分析超車區、坡度路段及平曲線的影響。

新版「郊區雙車道公路」分析方法，於單純路段採分析性模式 (公式及圖表) 分析，於複雜路段 (有坡度或有一連串平曲線或有超車現象等) 仰賴模擬模式分析。

3. 成果推廣

公路容量手冊為交通界據以評估道路規劃設計及改善績效之依據。惟手冊內容涵括多種不同公路設施，計算公式圖表繁多，甚至需以模擬模式分析。為改善容量分析作業之效率，本所於 94 年起展開「臺灣地區公路容量分析軟體 (THCS)」之開發工作，近年配合更新章節開發子系統，並辦理教育訓練推廣容量分析方法。

105 年度開發新版「郊區雙車道公路」子系統，於 105 年 10 月邀集公路總局、縣市政府、顧問公司、學校等單位辦理教育訓練，透過教學課程及實機、實例操作讓使用者了解新版分析方法及軟體操作方式。

2. Research result

Described below are the reasons required for updating the analysis method established for "Chapter 12: Non-interruptive Traffic Flow Section for Suburban Dual-lane Highway" as specified in 2011 Taiwan Area Highway Capacity Manual.

(1) The analysis method is quoted from American 1985 TRB Highway Capacity Manual. Because the analysis method is not suitable for this edition in America, it has been replaced by the newly established analysis method.

(2) Based on the terrain, the suburban dual-lane traffic is divided into Plain Area, Hill Area and Mountain Area in the analysis method. Because of the difference in traffic flow as demonstrated in actual geometric design (e.g. gradient, slope length and curvature radius, etc.), it cannot be reflected in the same terrestrial landscape.

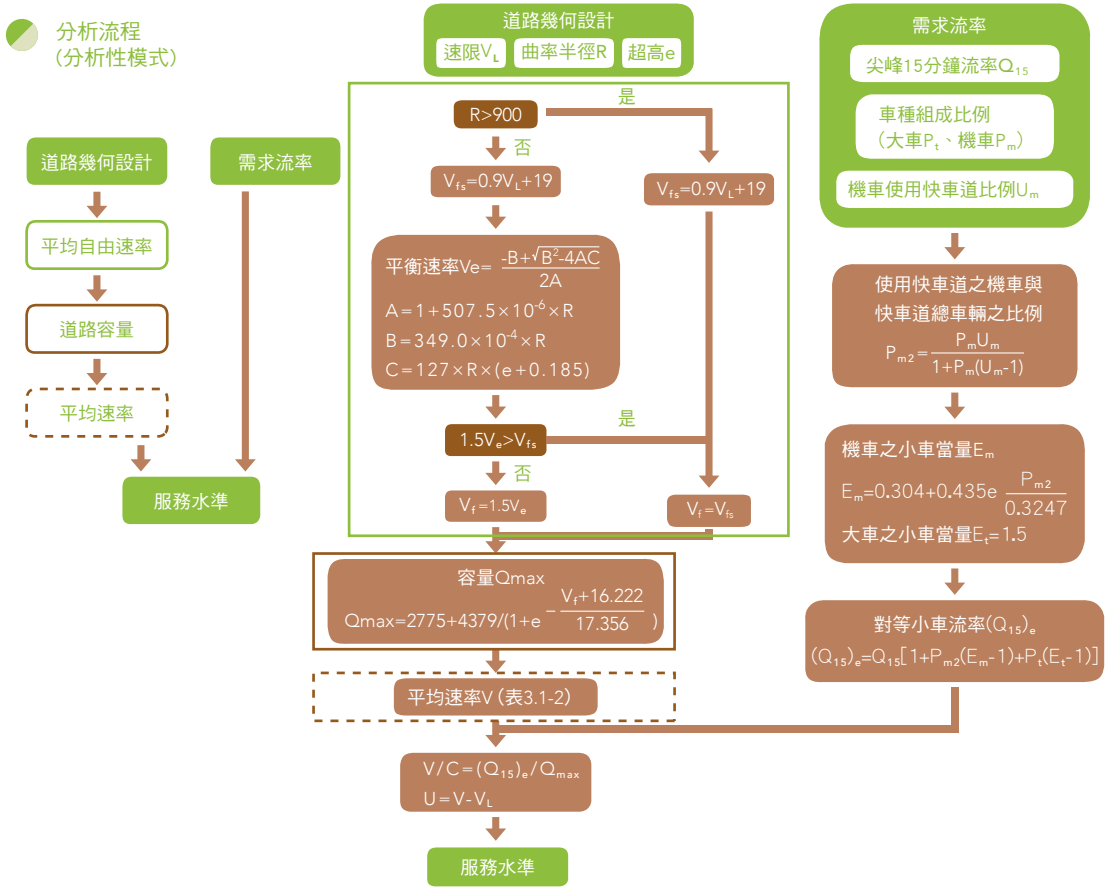
(3) The analysis method is lacking of characteristics for localized traffic flow. Further, appropriate method is also unavailable for analyzing the impact to the overtaking section, slope section and horizontal curve section.

In the updated "Suburban Dual-Lane Highway", the Analytical Mode (formula and chart) is based for simple road section and the Simulation Mode is applied for complicated section (comprising the slope or a series of horizontal curves or overtaking section, etc.).

3. Promotion of result

Using the Highway Capacity Manual as the traffic guidance in order to assess the planning design and the performance improvement. However, the manual contains a variety of highway facilities and all sorts of calculation formula and chart. Furthermore, it even uses the simulation mode for carrying out the analysis. To improve the efficiency of the capacity analysis, this Institute launched the development of "Taiwan Area Highway Capacity Analysis Software (THCS)" starting from 2005. In the meantime, we also developed the subsystem to support the chapter updating in recent years and provided the education and training in order to promote the capacity analysis method.

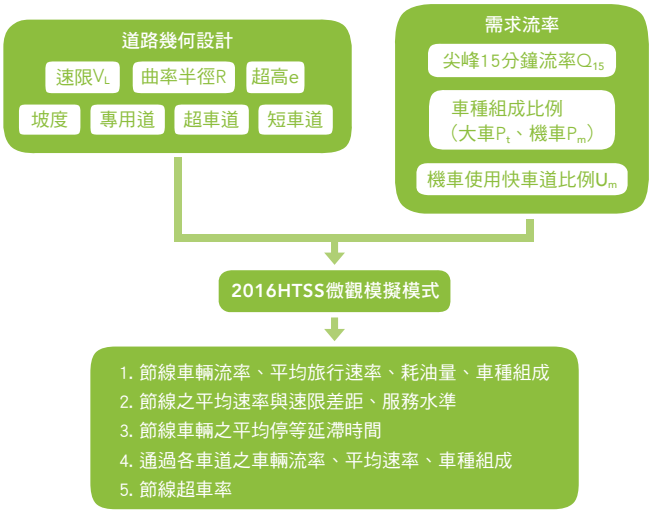
In 2016, we developed the new version of "Suburban Dual-Lane Highway" subsystem. In October 2016, we invited Directorate General of Highways, competent county/city government, consultant and schools for conducting the education and training. Through lecturing courses, physical model and hand-on operation, it is hoped that the users would understand the new version of analysis and software operation method.



新版「郊區雙車道公路」分析流程（分析性模式）

Analysis process of new version of "Suburban Dual-Lane Highway" (Analytical Mode).

• 分析流程(模擬模式)



新版「郊區雙車道公路」分析流程（模擬模式）

Analysis process of new version of "Suburban Dual-Lane Highway" (Simulation Mode).

（二）自行車友善環境路網整體規劃及路網示範系統圖資建置 (1/3)

1. 計畫概述

交通部 103 年 8 月 6 日奉行政院核定於 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」，並結合教育部體育署於 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，本所配合「交通部自行車督導協調推動小組」於 105~107 年進行路線檢視與調整，確認出經典示範路網，並整合臺鐵車站、風景區等區位進行相關路線銜接 (包括風景區及地方特色路線)、服務設施之改善與協調，以建構經典示範路網。同時建置「環騎圓夢」- 自行車道路網資訊系統，並加強系統的互動性及進行各項行銷，以打造本網站為民眾信賴與喜歡瀏覽之自行車入口網為目標。

2. 研究成果

(1) 完成 105 年自行車友善環境各區經典路網段路網規劃、檢視並提出改善建議。

(2) 完成「自行車環島 1 號線」沿線 (104~105 年) 之各區經典示範路網旅次特性及滿意度調查，並提出使用效益分析及績效評估。

(3) 完成 104-105 年自行車環島串連網圖資 (含現場環景影像) 之蒐集、建置與修正。

(4) 完成自行車路網示範系統網路版及行動版及手機應用程式版。

(5) 完成本自行車環島 1 號線網站之行銷，提升該網站之曝光率及點閱率。

(II) Overall planning of bicycle-friendly environment network and the implementation of maps for the model network system (1/3)

1. Overview

Based on the instructions of the Executive Yuan, the "Overall Planning of Island-wide Bicycle-friendly Environment Network & MOTC Bicycle Network Implementation Plan" was promulgated by MOTC on August 06, 2014 for promotion during 2015~2018. Under the support of Sports Administration, Ministry of Education, the construction of "No. 1 Circular Island Bikeway" was completed at the end of 2015. To establish a well based island-wide bicycle-friendly environment network, we cooperate with "MOTC Bicycle Supervision & Coordination Promotion Team" for carrying out the line checking and adjustment during 2016~2018 in order to confirm the model network. By doing so, the TRA stations and scenic spots are also planned for establishing the connection of lines (Including scenic spots and local-feature line) as well as improving and coordinating relevant service facilities in order to implement typical model network. In the meantime, we also implemented the bikeway network related information system to realize the "Circular Bike Dream". We also reinforced the interactive performance and all kinds of marketing activities for the system in order to create a bicycle gateway that will be trusted and frequently visited by general public.

2. Research result

(1) Complete the planning and inspection of bicycle-friendly environment for the typical network in each area by 2016 and proposed improvement suggestions.

(2) Complete the journey characteristics and satisfaction investigation for the typical network in each area along the "No. 1 Circular Island Bikeway" (2015~2016) and proposed the utilization effect analysis and performance assessment.

(3) Complete the collection, implementation and correction of maps for circular-island bicycle network during 2015~2016 (including site panoramic view).

(4) Complete the network version, mobile version and handset application program version of model network for the bicycle network system.

(5) Implemented the website for promoting the aforesaid "No. 1 Circular Island Bikeway" in order to enhance the exposure and clicking rate of such website.

3. 成果推廣

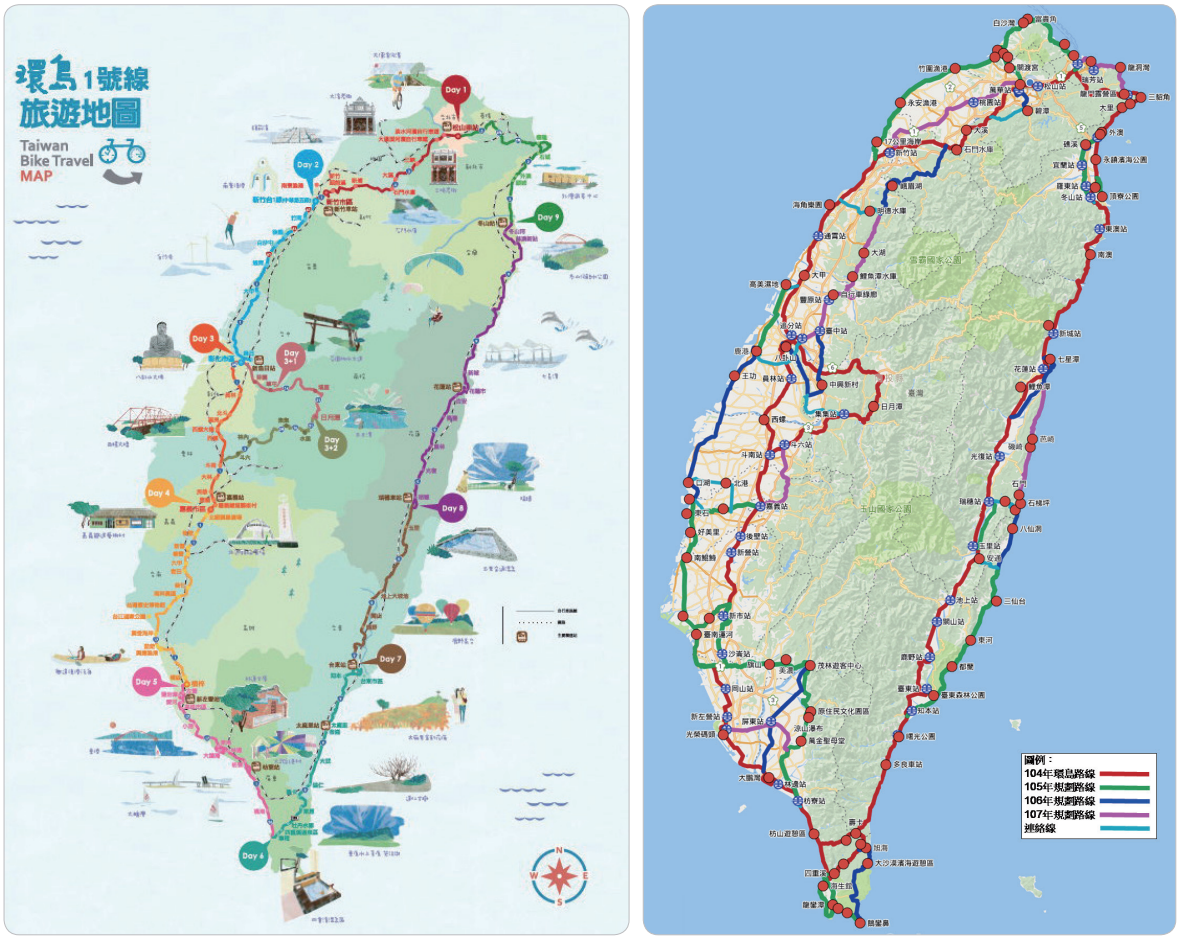
(1) 持續辦理自行車環島 1 號線網站行銷作業，提升該網站之曝光率及點閱率 (106~107 年分年依照不同行銷主題辦理行銷活動)。

(2) 本計畫編修之自行車系統規劃設計參考手冊，可供作自行車道路執行機關施工時之依據（預計 106 年 10 月出版）。

3. Promotion of result

(1) Continue the marketing of website for "No. 1 Circular Island Bikeway" in order to in order to enhance its exposure and clicking rate (the marketing activities will be executed for different activity themes separately in 2017~2018).

(2) The Bicycle System Planning & Design Referential Manual compiled for this plan can be used as the reference of for the competent bikeway construction authority (to be published in October 2017).



自行車環島 1 號線主幹路線旅遊地圖及 104~107 年路網圖

"No. 1 Circular Island Bikeway" main line touring map and 2015~2018 network map.

自行車環島 1 號線微電影、記者會及網站

Micro-film press conference and website of “No. 1 Circular Island Bikeway”.

（三）交通建設計畫經濟效益評估手冊(105 年版）與應用軟體更新

1. 計畫概述

本所自 96 年起陸續辦理「交通建設計畫經濟效益評估作業」系列研究，為使評估結果更具說服力，各項評估參數有必要定期檢視其與國家社會經濟發展之關連，必要時並得進行檢討修訂；另為提高交通建設計畫評估及審議作業效率，原有經濟效益評估工具應用軟體亦有必要配合各項參數修正同步進行更新，以期提高該應用軟體被使用之機會，進而發揮更大綜效。

2. 研究成果

(1) 完成交通建設計畫經濟效益評估重要參數之檢討及修正，並研提新版評估作業手冊以及開發軟體：可供交通部所屬機關、縣市政府以及顧問公司等單位使用，主要的貢獻為精進評估方法以及改良評估工具。相關成果請參閱次頁圖表。

(2) 促成國內交通建設經濟效益評估作業程序標準化以及參數一致性：避免交通建設個案計畫或交通政策因經濟效益評估作業缺乏客觀依據而導致評估結果不一，造成交通建設計畫編擬及審議作業上的困擾，有助於強化交通建設計畫編擬及審議決策之效能。

(3) 舉辦教育訓練：已於 105.11.17 舉行，計有交通部所屬機關、地方政府及民間主要顧問公司近 70 人次參加。藉由教育訓練，可提升我國交通規劃與計畫評估相關業務人員在經濟效益評估方面之觀念，增進其專案評估能力與素質，有助於提升交通建設計畫之編擬與審議效率。

(III) Cost-efficiency assessment manual for transportation construction plan (2016 edition) and application software updating

1. Overview

Since 2007, this Institute launched the research of the "cost-efficiency assessment manual for transportation construction plan". To provide more persuasive assessment result, it would be required to check the parameters and its connection with the social economic development regularly; and it may be reviewed and amended if required. To enhance the efficiency in the assessment of transportation construction plan and relevant review work, the original cost-efficiency assessment application software needs to be updated along with the correction of relevant parameters to increase the opportunity in using such application software so as to demonstrate more profound overall efficiency.

2. Research result

(1) Complete the review and correction of key parameters for the cost-efficiency assessment of transportation construction plan and study new version of assessment manual and develop the software for use by the units involved such as the agencies under MOTC, the competent county (city) government and the consultant, etc. Its main purpose is to refine the assessment method and improve the assessment tools. For relevant results, please refer to the chart in next page.

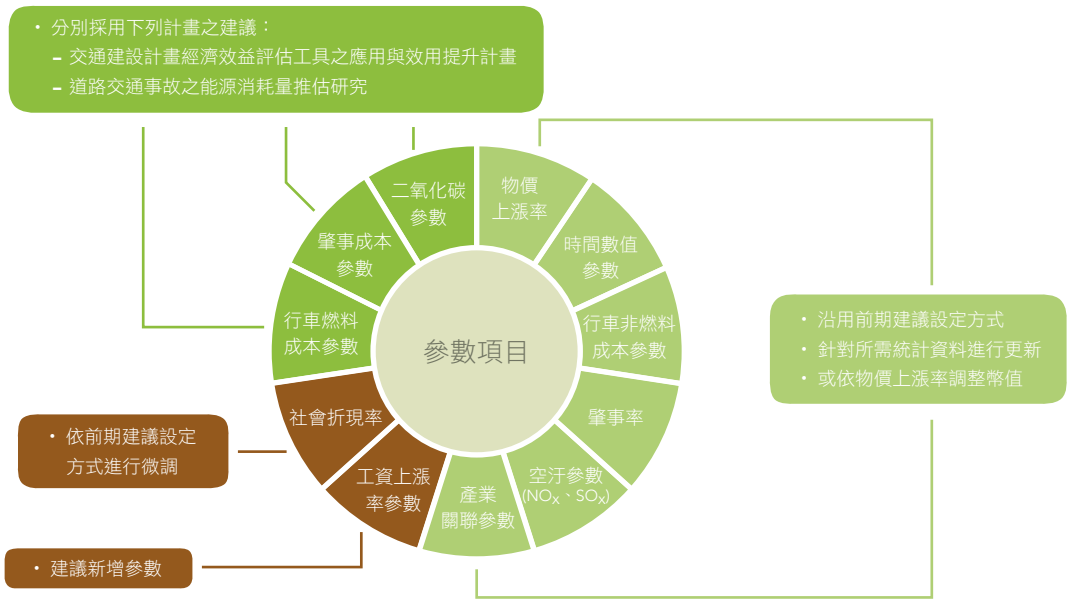
(2) Achieve the standardized cost-efficiency assessment and consistent parameters for the transportation construction in Taiwan. The purpose is to avoid inconsistent assessment result due to the lacking of objective data when assessing the cost-efficiency of each individual transportation construction plan or the transportation policies as to impede the compilation and review of transportation construction plan. In this way, it will contribute to a speedier compilation of transportation construction plan and more effective review decisions.

(3) Provide education and training: It has been conducted on November 17, 2016, covering nearly 70 attendants from the agencies under MOTC, local government and civilian consultant. The goal of education and training is to enhance the concept of relevant business operators in assessing the cost-efficiency of the transportation programming and plan in Taiwan. In result, it will enhance the efficiency in the compilation and review of transportation construction plan.

3. 成果推廣

3. Promotion of result

工作項目 (活動名稱) Job items (Name of Activity)	辦理方式 Execution Method	推廣應用對象 Target for Promotion and Application	預計辦理時程 / 說明 Forecasted schedule/description
內化至交通建設計畫審議 Promote to internal review of transportation construction plan.	配合交通建設計畫審議作業推廣實施 Promote the execution together with the review of transportation construction plan.	國發會本所參與審議作業同仁 Employees assigned by National Development Council for participating in the review activities conducted by this Institute.	1. 辦理所 研究會，優先向同仁推廣並進行意見交流。 2. 手冊公布後，輔導交通部所屬機關配合實務計畫審議。 1. Conduct the internal research seminar so that it will be firstly introduced to the associates for them to exchange ideals. 2. After publishing the manual, guide the agencies under MOTC to review the operation plan.
公布手冊 Announcement Manual	1. 通知交通部及縣市政府交通主管機關、顧問公司，本手冊將列為後續審查參據。 2. 提供手冊及軟體，供相關單位使用，促成交通建設經濟效益評估作業標準化。 1. Inform MOTC and the competent transportation authorities of county (city) government and the consultant to use this Manual as the reference for the subsequent review. 2. Provide the manual and the software to the units involved in order to realize the standardized cost-efficiency assessment for the transportation project.	國發會、交通部所屬機關、縣市政府以及顧問公司 National Development Council, agencies under MOTC, county (City) government and consultant.	106 年 12 月 December, 2017
新版手冊精進研討 Study of refined new version of manual	針對手冊中部分評估參數可再精進的作法及可激盪學界研究課題部分進行研討 Study more sophisticated parameter assessment method contained in the Manual and the method that can breed the issues for research by scholars. .	專家學者 (學界、顧問公司) Professional scholars (Scholastic sector, consultant)	手冊公布後 (1~2 場) After announcing the manual (1~2 sessions)



交通建設計畫經效評估重要參數修正方式之建議

Suggestions for the correction of key cost-efficiency assessing parameters in the transportation construction plan

❶ 計畫功能9大分類
速率提升/擁塞改善
服務品質提升
容量/運能提升
可靠度提升
安全提升
防/救災能力提升
營運效率提升
都市空間利用改善
環境友善度提升

❷ 手冊使用指南
手冊簡介
手冊適用範圍與對象
本次更新內容快覽

❸ 營運年期參考值
公路建設
軌道建設
航空建設
港埠建設

❹ 重要提醒常見錯誤

❺ 工資上漲率參數

❻ 參數資訊總覽表

❶ 行車成本節省效益
以二分之一法則為計算基礎

❷ 參數更新
依目前可取得之最新統計資料更新

❸ 國際海空運輸
成本效益分析
＋
總體經濟效果

❹ 產業經濟外溢效果
採外加方式處理

❺ 能耗與碳排估算
採用「車輛動態能耗碳排模式」

❻ 肇事成本
加計交通事故衍生之外部成本(公路)

❼ 油價預測
以EIA預測結果為推估基礎

❽ 參數設定資料
原則採用近5年平均值

新版交通建設計畫經效評估手冊主要增修內容

Main updating content for the new version of cost-efficiency assessment manual for the transportation construction plan.

（四）計程車產業發展分析模式之研究暨資訊平台建置

1. 研究成果

(1) 開發新式計費表內存營運資料下載裝置，可協助公路主管機關大規模蒐集計程車計費表內存營運資料。

(2) 完成計程車產業分析資訊平台，協助公路主管機關在短時間內掌握轄內計程車產業概況，提昇專業職能，與時俱進地研提產業發展策略，引導產業發展方向。

(3) 利用計程車上、下車時空資料，完成以下應用課題分析模式：

- 利用上車坐標形成熱點，與主管機關建置計程車招呼站坐標套疊，做為檢討現行招呼站設置區位之依據。
- 利用上、下車地點形成之路廊，與公共運輸營運資料比對，瞭解該路廊公共運輸服務情形，分析辦理計程車共乘之可行性。

(IV) Study of taxi industry development analysis mode and implementation of information platform

1. Research result

(1) Develop New version of Taxi Meter Stored Operation Data Unloading Device for retrieving the operation data allowing the competent highway authority to collect massive amounts of operation data stored in the taxi-meter.

(2) Complete the implementation of taxi industry analysis information platform to help the competent highway authority to control over general situation of the taxi industry in the respective jurisdiction area within short period of time. The purpose is to enhance the professional know-how for studying the industrial development strategies along with the trend in order to provide the development direction for the industry.

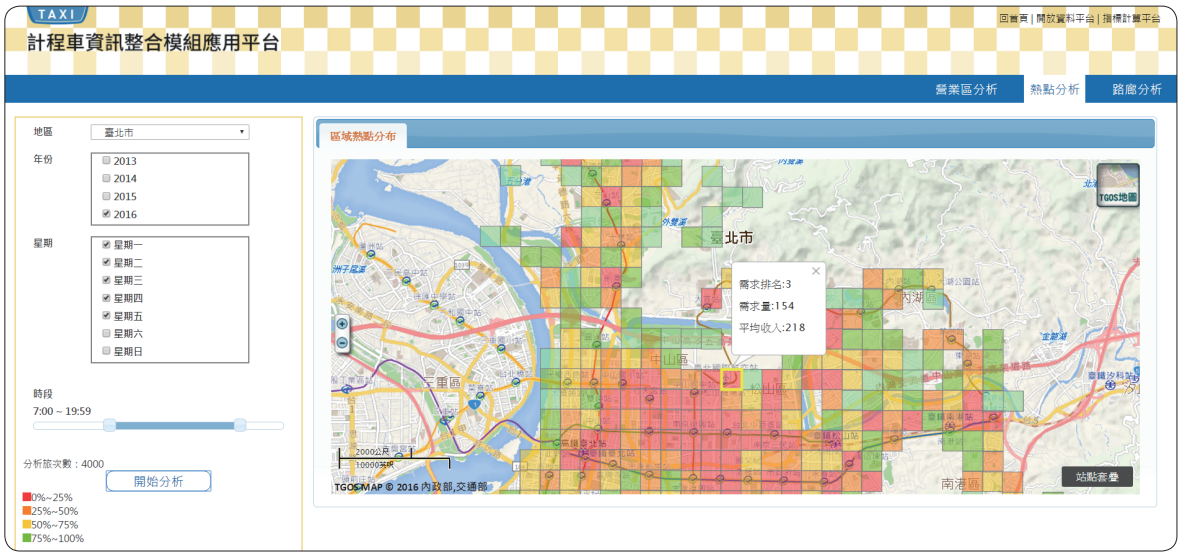
(3) Establish the following application issue analysis mode with the time and space related data logged for passengers boarding and alighting the taxi.

- Use the boarding coordinates to create hot spot for working with the competent authority to overlay the coordinates for the taxi stops. The result will be used as the reference for review the existing taxi stop location.
- Compare the gallery created by the boarding and alighting location with the public transportation operation data for understanding the public transportation service status in that gallery in order to analyze the feasibility of taxi pool service.

2. 成果推廣

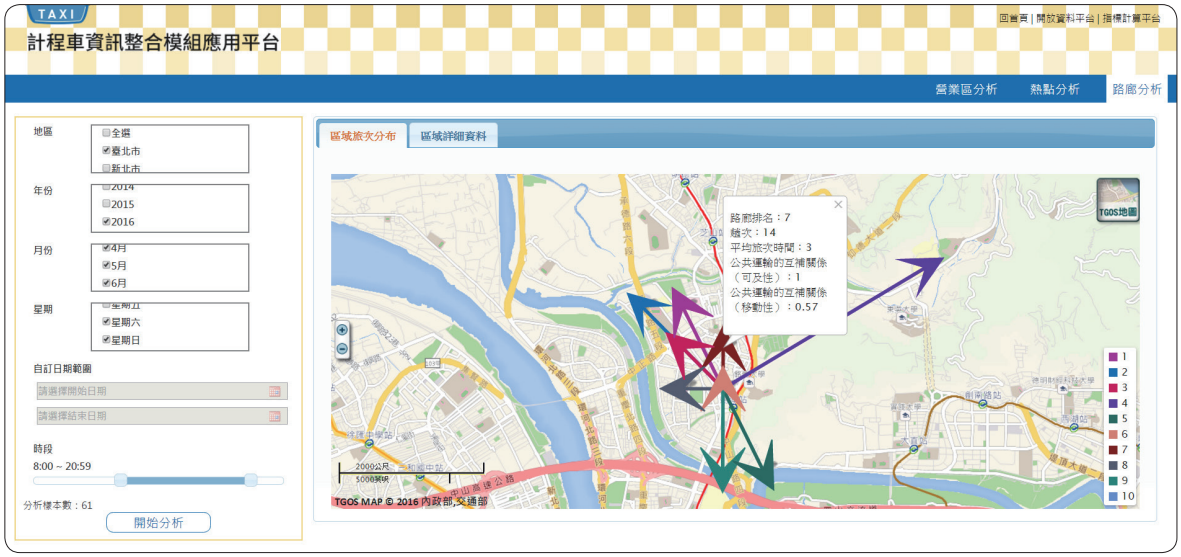
2. Promotion of result

活動名稱 Name of Activity	對象 Target	活動方式 Activity Method	永續性 Sustainability
成果發表座談暨教育訓練 Result Presentation Seminar and Education/Training	公路主管機關、計程車公會、業者 Competent highway authority, taxi association and operators	分別於北、中、南三區辦理座談會與教育訓練課程 Provide seminars and education/training programs in northern, central and southern areas respectively.	與會單位留存會議資料供參 The attendants for reference will retain the meeting documents.
公開「新式計費表內存營運資料下載裝置」硬體線路圖及原始碼 Disclose the hardware route map and the source code for the "New version of Taxi Meter Stored Operation Data Unloading Device".	一般民眾 General public	於政府資料開放平台公開硬體線路圖及原始碼 Disclose the hardware route map and the source code on the government information open platform.	永久公開 Permanent disclosure
協助新北市政府交通局利用本系統進行臺北地區計程車營運狀況調查 Help the Transportation Department of New Taipei City Government to investigate the taxi operation status in Taipei Area with this system.	新北市政府交通局人員、委辦調查計畫外執行人員 Attendants from Transportation Department of New Taipei City Government and the outsourced investigation plan execution personnel.	小組討論會議 Workshop Meeting	培育主管機關人力 Educate the manpower of the competent authority
輔導、協助臺北市公共運輸處利用本系統進行計程車招呼站設置位置體檢、計程車共乘營運路線分析 Guide and help Taipei City Public Transportation Office to conduct the examination of taxi stop setup position and the taxi pool-service route analysis with this system.	臺北市公共運輸處人員 Attendants from Taipei City Public Transportation Office	小組討論會議 Workshop Meeting	培育主管機關人力 Educate the manpower of the competent authority
推廣應用暨教育訓練 Application promotion seminar and education/training	臺中市、高雄市政府交通局人員 Attendants from the Transportation Department of Taichung City and Kaohsiung City	訪談、小組討論會議 Interview, Workshop Meeting	培育主管機關人力 Educate the manpower of the competent authority
評估系統是否有修訂、開發新功能、購置專業資料庫與伺服器硬體之必要 Check if it is required to modify the system, develop new function and purchase professional database and server.	公路主管機關是否廣泛蒐集計程車計費表資料，關係到本研究成果是否可以延續。本系統目前採用免費資料庫與老舊伺服器主機，效能有限但尚可應付小量需求使用。未來視使用量多寡與使用者之經驗回饋，評估系統是否有修訂、開發新功能、購置專業資料庫與伺服器硬體之必要。 The extensive collection of taxi-meter data by the competent highway authority concerns whether the research result can be continued or not. Currently, the free database and the outdated server are used by this system. In spite of limited effect, it can still deal with small amount of usage. Depending on the amount of usage and the experience feedback of the user, we will check if it is required to modify the system, develop new function and purchase professional database and server.		



熱點分析 - 熱點與招呼站套疊，檢視招呼站設置位置妥適性

Hot spot analysis: Overlaying between the hot spots and taxi stops. Check the appropriateness of the taxi stop setup location.



路廊分析 - 透過前 10 大熱門路廊展示平均旅行時間、與公共運輸之互補關係，可進一步評估是否規劃計程車共乘或引進公車服務。

Gallery analysis – Through the average traveling time and its complementary relationship with public transportation demonstrated for Top 10 most popular galleries, it will be able to assess whether to plot the taxi pool service or to introduce the bus service.

（五）公路貨運服務碳足跡排放係數建置計畫

1. 計畫說明

配合運輸部門節能減碳規劃及環保署碳足跡係數建置需求，針對公路貨運業者之溫室氣體排放進行調查。

2. 研究成果

(1) 完成「公路貨運服務碳足跡產品類別規則」，於 105 年 9 月 14 日經行政院環境保護署通過審議並公告，可作為貨運業者申請碳標籤依循。同時，輔導台灣宅配通向環保署提出碳標籤申請，並於 106 年 2 月取得碳標籤認證。

(2) 完成 10 組公路貨運碳足跡排放係數，於 106 年 1 月 23 日函送環保署納入「碳足跡公用係數資料庫」，並於 106 年 8 月起刊登，可作為各類商品計算碳足跡及申請碳標籤引用。

(3) 完成「公路貨運服務碳足跡計算手冊」及簡易計算工具，於 106 年 4 月函送公路總局轉請公路貨運業者參考應用。另於 105 年 11 月 11 日於本所國際會議廳辦理「公路貨運服務碳足跡成果發表會」，進行專題演講及經驗分享，產、官、學界約有 100 人響應參與。

(V) Highway cargo transportation service carbon footprint emission coefficient implementation plan

1. Description of plan

Corresponding to the demand for the energy conservation and carbon reduction planned by the transportation agency and the implementation of carbon footprint coefficient enforced by Environmental Protection Administration (EPA), the greenhouse gas emission will be investigated for highway cargo transportation operators.

2. Research result

(1) The "Highway Cargo Transportation Service Carbon Footprint Product Category Rules" was compiled. On September 14 2016, it was approved and announced by the examination of EPA. that the Executive Yuan can be used by the cargo transportation operators to apply for the carbon footprint label. In the meantime, we also guided Taiwan Pelican Express Co., Ltd. to apply for the carbon footprint label with EPA and the certification of carbon footprint label was secured in February 2017.

(2) Developed 10 sets of highway cargo transportation carbon footprint emission coefficient. On January 23, 2017, it was submitted to EPA for including in the "Carbon Footprint Common Coefficient Database". In August 2017, it was published for using in the calculation of carbon footprint and application for carbon footprint label.

(3) Developed "Highway Cargo Transportation Service Carbon Footprint Calculation Manual" and convenient calculation tool. In April 2017, it was submitted to Directorate General of Highways for transferring to highway cargo transportation operators for use. On November 11, 2016, we convened "Highway Cargo Transportation Service Carbon Footprint Result Presentation" in the international conference room of this Institute for conducting the theme lecture and experience sharing. The meeting comprises about 100 attendants from the industrial, official and scholastic sectors.

3. 計畫效益

(1) 對政府：掌握運輸業者溫室氣體排放情形，擬訂碳管理對策。

(2) 對企業：降低能源消耗及碳排，提升綠色企業形象及國際貿易競爭力。

(3) 對民眾：以消費行動支持企業提供環境友善之產品與服務。

3. Effect of the plan

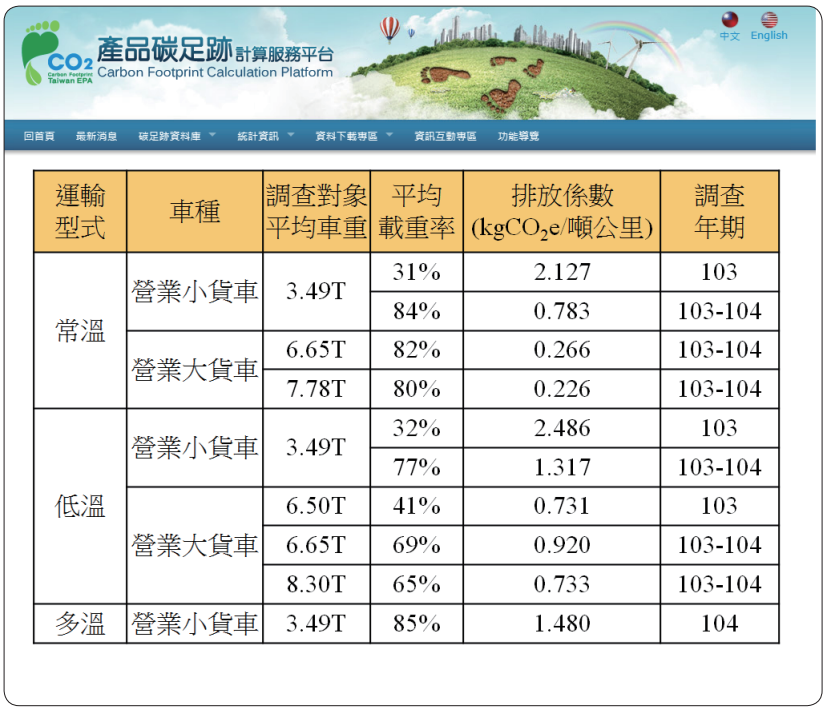
(1) For the government: Develop the carbon management approaches for controlling over the greenhouse gas emission status of transportation operators.

(2) For the industry: Reduce energy consuming and carbon emission for elevating the image of green industry and international trade competitiveness.

(3) For the general public: Support the industry in providing the eco-friendly products and services with consuming action.

公路貨運服務碳足跡於 105 年 9 月在環保署網站公告發布

The carbon footprint of highway cargo transportation services was published on EPA website in September 2016.



運輸型式	車種	調查對象平均車重	平均載重率	排放係數 ($kgCO_2e$/噸公里)	調查年期
常溫	營業小貨車	3.49T	31%	2.127	103
			84%	0.783	103-104
	營業大貨車	6.65T	82%	0.266	103-104
		7.78T	80%	0.226	103-104
低溫	營業小貨車	3.49T	32%	2.486	103
			77%	1.317	103-104
	營業大貨車	6.50T	41%	0.731	103
		6.65T	69%	0.920	103-104
		8.30T	65%	0.733	103-104
多溫	營業小貨車	3.49T	85%	1.480	104

環保署於 106 年 8 月將研究成果納入資料庫並刊登係數資料

In August 2017, EPA included the research result in its database and published relevant coefficient data.

（六）氣候變遷運輸設施風險評估暨風險資訊進階服務計畫

1. 計畫說明

評估氣候變遷鐵公路運輸系統風險，建立平台提供鐵公路管理機關查詢使用。

2. 研究成果

(1) 整合部外單位及交通部跨局處資料，加值產製鐵公路風險地圖：完成國道、省道、快速公路、臺鐵及高鐵在未來重現期雨量變大情境下，受到淹水及坡災導致中斷、影響社經程度的風險評估。透過 GIS 功能建置資訊平台，提供鐵公路管理機關上網查詢所轄設施氣候變遷風險等級。

(2) 篩選出未來氣候變遷下 200 年雨量重現期之熱點路段 (淹水路段佔 15.5%，坡災為 17.9%)，協助鐵公路管理機關有效配置養護人力及相關資源。

(3) 本計畫於 105.11.28 將鐵公路風險熱點資訊函送相關部屬機關，公路總局已參考本計畫成果，研擬公路設施改善相關措施，已 於 106 年 8 月奉行政院核示，將工程項目納入「省道改善計畫」檢討辦理。

3. 計畫效益

(1) 支援擬訂下一期國家氣候變遷調適行動計畫 (交通系統)。

(2) 篩選出未來氣候變遷下 200 年雨量重現期之熱點路段 (淹水路段佔 15.5%，坡災為 17.9%)，協助鐵公路管理機關有效配置養護人力及相關資源。

(VI) Assessment of risks to transportation facilities due to climate change & the advanced risk information service plan

1. Description of plan

Assess the risks to highway transportation system due to climate change, and establish the platform for checking by railway administration agencies.

2. Research result

(1) Integrated the data of external unit and the MOTC cross-sector data, value-added railway/highway risk map: Complete the risk assessment in the impact to social economy when the traffic of freeway, provincial highway, expressway, Taiwan Railway and High-Speed Railway is interrupted due to the flooding and slope hazard under the macro scenario of rainfall during the reproducing period in the future. Implemented the information platform through GIS function for the railway and highway administration agencies to check the risk levels to the subordinating facilities due to climate change.

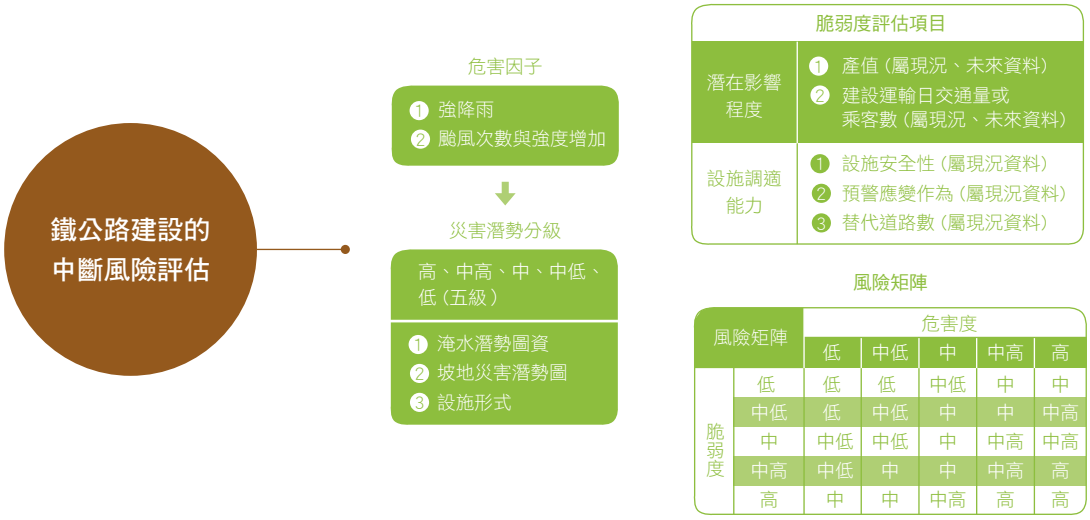
(2) Screened the hot-spot section of 200-year rainfall reproducibility under climate change in the future (15.5% for flooding section and 17.9% for slope hazard) in order to help the railway and highway administration agencies to deploy the curing manpower and relevant resources effectively.

(3) On November 28, 2016, we have submitted the railway and highway hot-spot related information to the competent agencies under MOTC. Based on the result of this Plan, the highway facility related improving measures were developed by Directorate General of Highways has developed. Under the approval rendered by the Executive Yuan in August 2017, the construction items were included in the "Provincial Highway Improvement Plan" for review.

3. Effect of the plan

(1) Support the development of next edition of National Climate Change Adaptation Plan (Traffic System).

(2) Help the railway and highway administration agencies control over the risk hot spots and causes of hot spots in order that the facility improving and curing measures will be submitted in due time so as to minimize the impact of the hazard.



鐵公路氣候變遷風險評估方法

Railway & Highway Climate Change related Risk Assessment Method

鐵公路氣候變遷調適資訊平台

railway & highway climate change adaptation information platform

（七）城際運輸節能減碳策略評估模組開發及應用 (2/2)

1. 計畫說明

開發城際運輸節能減碳策略評估模組，用以檢視節能減碳策略於城際運輸系統於不同區域與不同運具別之能耗及碳排放變化趨勢。

2. 研究成果

(1) 完成 2015 年運輸部門溫室氣體排放統計，俾利本所更新運輸部門排放基線，以及提供交通部推動「公路公共運輸多元推升計畫 (106~109 年)」之計畫減碳效益參考。

(2) 所開發之評估模組已納入本所「運輸部門節能減碳策略評估整合資訊平台」(網址 : http://dsstransport.iot.gov.tw/)，已將部分功能開放交通部部屬機關使用，並於 105.11.25 辦理平台推廣使用教育訓練。

(3) 完成「綠色運輸」網站 (網址 : http://greentransport.iot.gov.tw/) 改版，另配合該網站之臉書粉絲團，以及相關聯結功能持續維運，活絡網站人氣，增加民眾點閱瀏覽機會，以彰顯本所於推動綠運輸之成效。

3. 計畫效益

相關節能減碳措施案例評估結果，提供交通部配合「溫室氣體減量與管理法」推動相關業務，做為研議執行策略之參考。

(VII) Developing the energy conservation and carbon reduction strategy assessment module for inter-city transportation and application (2/2)

1. Description of plan

Develop the energy conservation and carbon reduction strategy assessment module for inter-city transportation in order to check the energy conservation and carbon emission strategies in assessing the variation trend in energy consumption and carbon emission for the inter-city transportation system in different areas and modals.

2. Research result

(1) Completed the greenhouse gas emission statistical data for the transportation agency in 2015 for this Institute to update the emission baseline stipulated by the transportation agency and provide a reference for MOTC to promote the carbon reduction efficiency specified in "Diversified Highway Public Transportation Promotion Plan (2017~2020)".

(2) The developed assessment module has been included in "Transportation Agency Energy Conservation & Carbon Reduction Strategy Integration Information Platform" (address: http://dsstransport.iot.gov.tw/) established by this Institute. The function of such part has been disclosed to the agencies under MOTC, and the platform promotion education and training was also conducted on November 25, 2016.

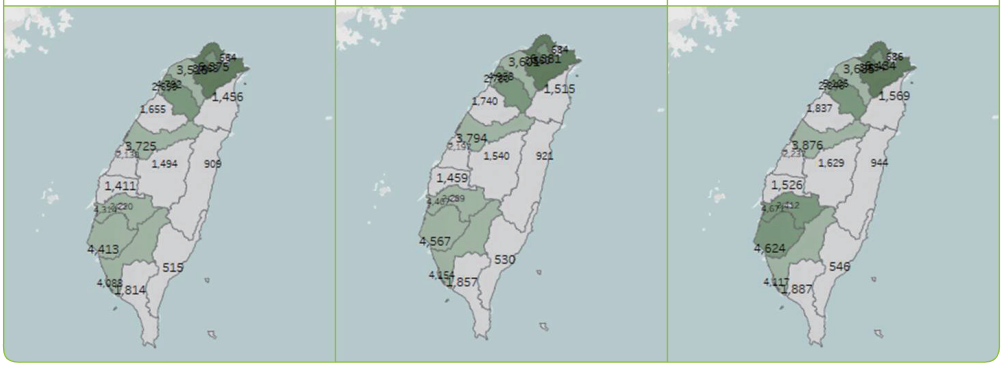
(3) Updated the "Green Transportation" website (address: http://greentransport.iot.gov.tw/). By coordinating with the Facebook fans group for such website and continuous operation of relevant coupling functions, the popularity of such website will be invigorated in order to increase the clicking and browsing opportunities of social public and to demonstrate the effect in promoting the green transportation being developed by this Institute.

3. Effect of the plan

The assessment result for the historical energy conservation and carbon reduction cases will be provided to MOTC for promoting relevant activities together with its "Greenhouse Gas Reduction & Management Method" and the result will be based for studying execution strategies.

公共運輸市占率提昇策略於2014年現況值為16%，假定分別提升比例

18%	19%	20%
2020	2025	2030

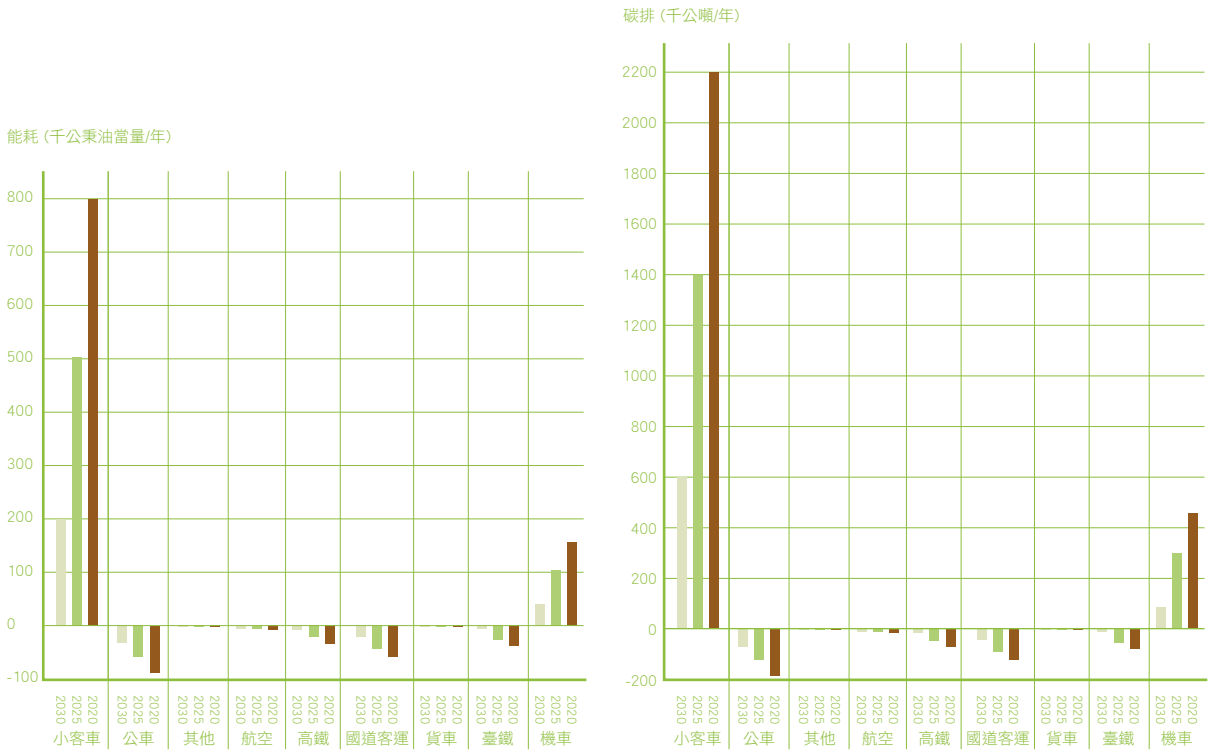


註：圖中數字代表圖中數字為碳排放量節省效益 (千公噸)

Note: The digits in the figure represent the conservation effect of carbon emission (k-ton)

公共運輸市占率提升對不同地區碳排放減量推估效果

Elevate the market share of public transportation for estimating the amount of carbon reduction for different areas.



公共運輸市占率提升對不同運具節省能耗 / 碳排推估效

Elevate the market share of public transportation for estimating the effect of energy conservation and carbon reduction for different modals.

（八）快速公路 LED 路燈量測計畫與成本效益分析 (1/2)

1. 計畫說明

實際量測 LED 路燈於快速公路之照明品質，分析 LED 路燈特性及節能減碳效益，提供經濟部及公路管理機關參考。

2. 研究成果

(1) 經實測，LED 路燈與現行高壓鈉燈比較，用電量可節省 40%~55%，由成本效益分析結果，測試道路 68 盞 LED 路燈每年可節省 4 萬度電。

(2) 解決現行 CNS15233 標準無法適用於高快速公路之問題，提高 LED 路燈發光效率、納入色度標準、採用低色溫、新增防水防塵等要求，提供經濟部制定「高快速公路 LED 路燈標準 (草案)」參考。

(3) 本研究成果提供國內光電產業界相關量測數據，協助改良產品設計以符合高快速公路需求，縮小與國際大廠間差距。

3. 計畫效益

分析 LED 路燈效能提供公路主管機關及經濟部制定法規參考，研究成果可協助光電產業界改良產品設計。

(VIII) Expressway LED lamp measuring plan and cost-efficiency analysis (1/2)

1. Description of the Plan

Measure the illumination quality of LED lamps deployed along the expressway in order to analyze the characteristics and the energy conservation and carbon reduction effect of these lamps for using as the reference by MOEA and competent highway administration agencies.

2. Research result

(1) After comparing the measured LED lamps and the existing high-voltage sodium lamp, the result indicated that some 40%~55% of power can be saved. Based on the cost-efficiency analysis result, some 40,000 KWH can be saved by 68 units of LED lamps per year.

(2) Solve the problem where the prevailing CNS15233 standard cannot be applied in the freeway and freeway systems, enhance the illumination efficiency of LEC lamps, include the chromatic standard, use low color temperature and add the water and dust resistant performance, etc. for use by MOEA in developing the "Freeway & Expressway LED Lamp Standard (Draft)".

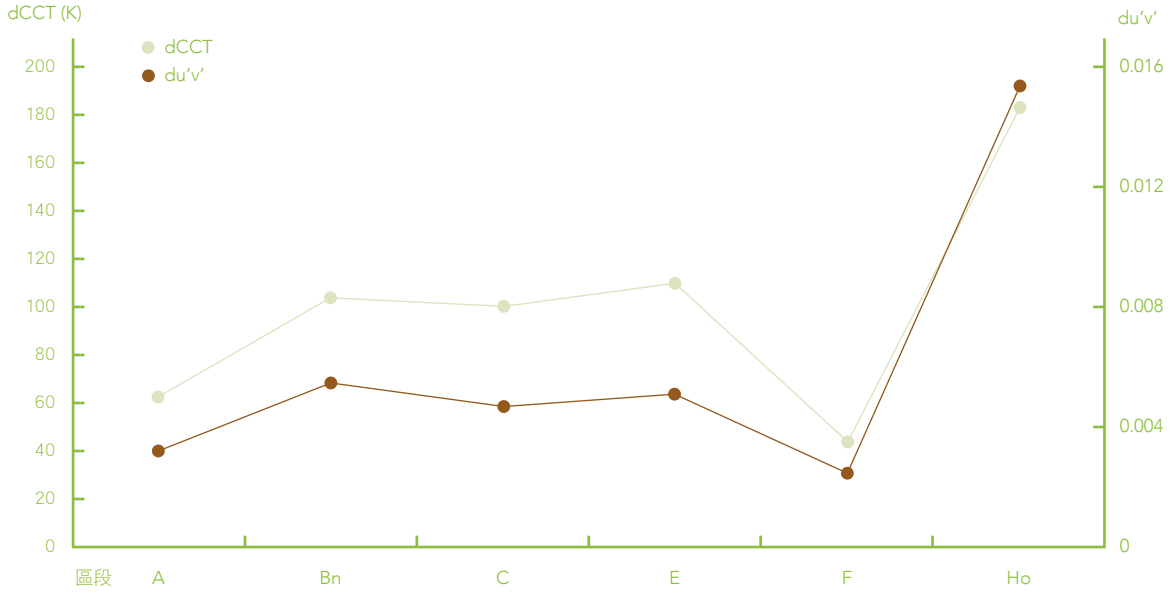
(3) The research result shall provide the measuring data required for the photoelectric industry in Taiwan to help improve the product design in order to meet the demand of freeway/expressway and shorten the gap with major international plants.

3. Effect of the plan

Analyze the efficiency of LED lamps for the competent highway authority and MOEA in developing statutory rules. In the meantime, the research result can also help the photoelectric industry to improve the product design.

測試流程

Test process



註：經濟部已將色度變化 (du'v') 研究成果納入制訂標準參考

Note: MOEA has used the research result of chromatic change (du 'v') as reference for developing relevant standard.

測試區段內 LED 燈具之色溫色度狀況分析

Analysis of color temperature and chromatic conditions for LEC lamps in the test section.

二、海空運輸

（一）由國際航運網路模型探討臺灣港群之營運策略與未來發展

1. 研究成果

海運是全球競爭市場，以往在研判全球海運變化對我國港埠影響時，多藉由專家訪談或資料分析等方式進行趨勢發展的研判。本計畫完成國際航運網路模型構建，透過模型分析，將海運未來可能發展情境，以量化的方式呈現其影響。例如：

(1) 巴拿馬運河拓寬後對航運影響

2016 年拓寬完成的巴拿馬運河，經模型分析，顯示經巴拿馬運河東向美東之航線運量將有 19% 的成長，而美西航線將減少約 25%，其佔比亦有變動。當運河拓寬後可容納更大型的船隻，降低單位運輸成本，促使運河模式相較複合運輸模式（+ land bridge）更具競爭優勢。(2) 解決現行 CNS15233 標準無法適用於高快速公路之問題，提高 LED 路燈發光效率、納入色度標準、採用低色溫、新增防水防塵等要求，提供經濟部制定「高快速公路 LED 路燈標準 (草案)」參考。

(2) 東協運量增加對高雄港之影響

無論中國大陸一帶一路或是政府積極推動的新南向政策，都是著眼於東南亞發展潛力。東南亞也一直是我國港群重要的轉運市場，經模型分析，當東協運量增加 20% 時，高雄港轉運量將增加 6%；當其運量增加 50% 時高雄港轉運量卻反而減少 6%；其運量若增為 200%，高雄港轉運量進一步減少 59%。顯示當東協運量微幅增加時，將有助於提升高雄港的轉運量；然而，當其運量大幅增加因可開闢航線直送，不需再經由鄰近港口轉運集貨，將不利高雄港轉運量的提升。

II. Maritime & Aerial Transportation

(I) Study on the operation strategies and future development of harbors in Taiwan through international transportation network model

1. Research result

The maritime transportation resembles the global competition market. When judging the impact of changes in global maritime transportation to the harbors in Taiwan previously, it was mostly conducted by means of expert interviews or data analysis for judging the trend. In this plan, the international maritime transportation network model will be implemented to present the impact of potential development scenarios in future maritime transportation through quantitative method. Example:

(1) Impact to maritime transportation after widening the Panama Canal.

After the model analysis for the Panama Canal widened in 2016, it indicates that 19% of growth will be seen in the shipping capacity from east of Panama Canal to the east-coast line of America; however, 25% will be reduced for the west-coast line and its market share will also be changed. After being widened, the canal will only accommodate bigger ships to reduce the unit transportation cost but will also provide more competitive advantages through composite transportation mode (+ land bridge) for the canal mode.

(2) Impact of increased ASEAN shipping capacity to Kaohsiung Harbor

Whether the China's "One-belt-one-road" policy of the new southbound policy currently promoted by the government in Taiwan, both are focusing on the development potential in the SE Asia area. The SE Asia area has been the important transshipment market for the harbors in Taiwan. The result of model analysis indicated that when the shipping capacity of ASEAN increased for 20%, the transshipping capacity of Kaohshiung Harbor will also increase by 6%. On the contrary, when the ASEAN shipping capacity increased for 50%, the transshipping capacity of Kaohsiung Harbor will be reduced by 6%; by the same token, if the ASEAN shipping capacity increased for 200%, the transshipping capacity of Kaohsiung Harbor will reduce for 59% instead. It indicated that when the ASEAN shipping capacity slightly increases, that it will help elevate the transshipping capacity of Kaohsiung Harbor. When the ASEAN experiences dramatic increase in its shipping capacity, because new maritime line can be developed for realizing direct transportation without going through transshipment and cargo consolidation through the neighboring harbor, it will prevent the elevation of transshipping capacity through Kaohsiung Harbor.

2. 成果推廣

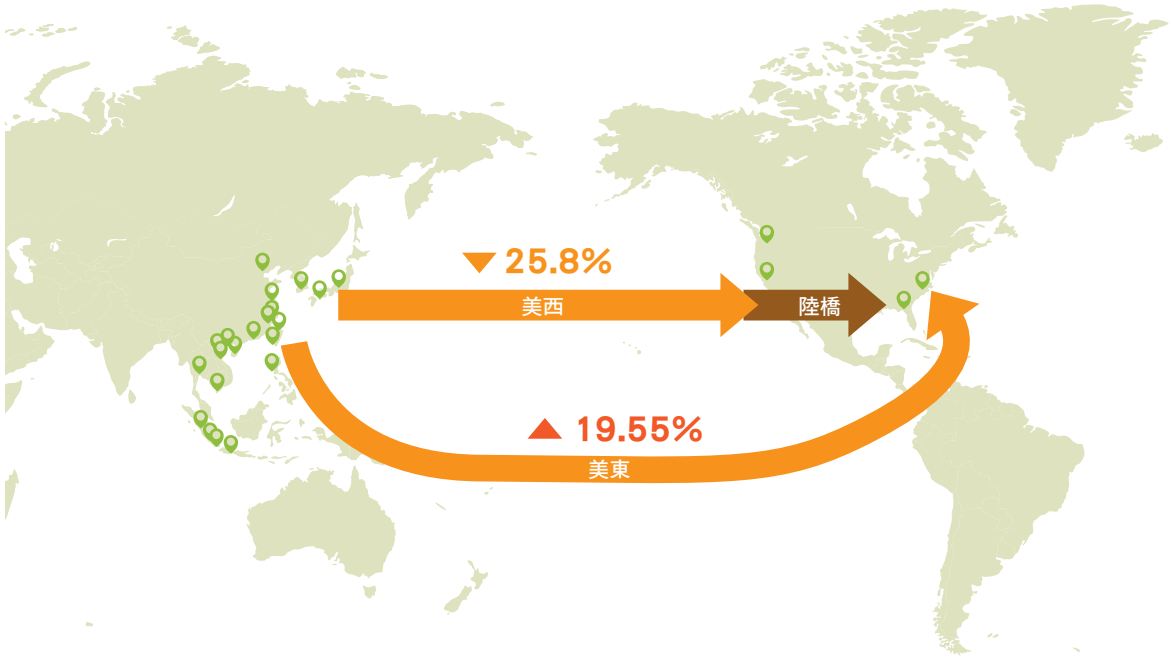
(1) 本計畫研究成果已納入「105 年海空運重要議題」陳報交通部。

(2) 研究成果已發表於運輸計劃季刊第 43 卷第 3 期，並於中華民國運輸學會 2017 年會暨學術論文研討會中發表。

2. Promotion of result

(1) The research result of this plan has been included in "Key Issues for Maritime & Aviation Transportation in 2016" for reporting to Ministry of Transportation & Communications (MOTC).

(2) The research result has been published in Transportation Planning Journal Vol. 43, No. 3 and was announced in 2017 Annual Conference of the Chinese Institute of Transportation.



巴拿馬運河拓寬後對越太平洋航線的影響

Impact of the widened Panama Canal to the Trans-Pacific Line

巴拿馬運河拓寬後對越太平洋航線的影響

Impact of the increased ASEAN shipping capacity to the transshipping capacity of Kaohsiung Harbor

情境 Scenarios	高雄港轉運量變動率 Transshipping capacity fluctuation rate in Kaohsiung Harbor
東協運量增加 20% When ASEAN shipping capacity increased for 20%	+6%
東協運量增加 50% When ASEAN shipping capacity increased for 50%	-6%
東協運量增為 200% When ASEAN shipping capacity increased for 200%	-59%

（二）臺灣國際機場引進機場協調整合決策 (A-CDM) 系統之研究

1. 研究成果

由國際間相關文獻資料可知，A-CDM 已在歐洲推行多年，並有相當不錯成效，如德國慕尼黑機場完成 A-CDM 的建置後，空中交通流量管制 (Air Traffic Flow Management) 的延誤減少，而滑行時間也減少 10%，且時間準確性也從 58% 提升至 80%。因此本研究也嘗試分析桃園機場是否也可以引進 A-CDM 技術。經過 1 年的研究，成果如下：

(1) 建置完成雛型系統

- 桃園機場 105 年 8 月 18 日起降航班的真實資料為基礎進行模擬，以動態方式呈現真實情境運轉狀況，同時利用推進速度管理模擬時間。
- 本雛型軟體有能力以動畫方式呈現桃園機場地面上各航機之動態。於畫面中可觀察各航機降落、滑行、進入停機坪、後推、滑行、至起飛之過程。
- 模式展現出供航管、機場、地勤、航空公司等不同單位使用的資訊顯示畫面，隨著時間之推進，各表格中之資訊亦會自動同步更新。

(2) 提供機場公司建置 A-CDM 之建議

依據短中長期資訊取得之難易程度及桃機之需要，研擬具體及可執行之里程碑建議，做為其建置 A-CDM 之參考。

(II) Research on the introduction of airport coordination and integration protocol (A-CDM) in the international airports in Taiwan

1. Research result

According to the literature circulated in international sectors, it is learned that the A-CDM has been launched in the European market for years with satisfactory effect achieved accordingly. Take German's Munich Airport for example, the implementation of A-CDM has contributed to the reduced delay of air traffic flow management and reduced taxing time for 10%. Further, the schedule accuracy is also elevated to 80% from 58% as well. In view of this, this research also seeks the possibility of introducing the A-CDM technology to Taiwan Taoyuan International Airport. Provided below is the result after one year of research

(1) Completed the implementation of prototype system

- Physical data of the take-off and landing flights logged on August 18, 2016 available in Taiwan Taoyuan International Airport was taken for conducting the simulation in order to present physical operation scenario by dynamic method. In the meantime, the advancing method was also employed to manage the simulation time.
- The prototype software is able to present the action of each aircraft moving around Taiwan Taoyuan International Airport by animation method. In the picture, it is allowed to observe the entire process of action performed by the aircraft such as landing, taxing, entering the apron, pushing, sliding and take off.
- The mode provides the information display screen required by different units such as aviation control, airport, ground service and airlines. The information in each table will be updated simultaneously along with the elapsing of time.

(2) Provide the suggestions for TIAC to implement the A-CDM system.

Based on the level of difficulty for securing the mid-term and long-term information and the demand of Taiwan Taoyuan International Airport, practical and executable mileage was suggested for using as the reference to implement the A-CDM system.

2. 成果推廣

(1) 本計畫研究成果已納入「105 年海空運重要議題」陳報交通部。

(2) 研究成果已刊登運輸計劃季刊，並於中華民國運輸學會 2017 年會暨學術論文研討會中發表。

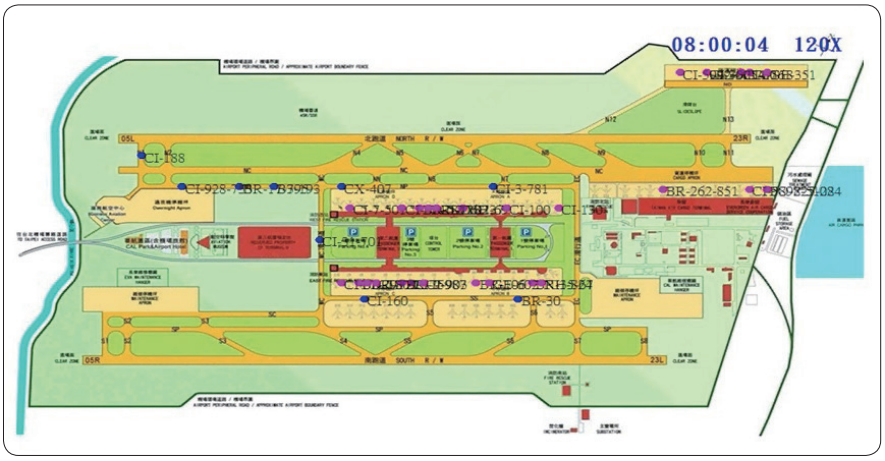
(3) 成果提供桃機公司「營運控制中心控制管理自動化 (AOCC)」工程計畫參考，並且不定期參與相關工作會議提供意見。

2. Promotion of result

(1) The research result was reported during the Joint Operation Report Meeting held by MOTC on February 23, 2017.

(2) In the meantime, the research result was published in the Transportation Planning Journal and was also presented during the 2017 Annual Conference of the Chinese Institute of Transportation.

(3) In the meantime, the research result was also provided to TIAC for reference of preparing its construction plan of "automated control and management for the Airport Operation Control Center (AOCC)". Furthermore, we also attended in relevant working meetings for providing opinions on irregular basis.



航機到離場動態模擬
Dynamic simulation from arrival to departure of the aircraft.

A-CDM 模擬畫面
A-CDM simulation picture

（三）105 年度「國際海運資料庫」更新擴充及資料分析服務

1. 研究成果

(1) 本所長期維運「國際海運資料庫」，持續強化軟體功能，工作包括：資料庫更新、改善使用者介面、擴充分析功能、評估介接國內相關航港資料庫、進行統計分析。

(2) 資料內容包含與亞太有關之 7 條貿易路線、營運航線約 600 條 (約佔全球 45%)、航商約 145 家、港口 473 處、船舶約 3500 艘 (約佔全球 58%)、總運能約 11 百萬 TEU(約佔全球 55%)，可以產製約 50 種報表。系統功能包含：弓形圖產製自動化、條件查詢、自動偵錯、容錯與糾錯能力。

(3) 運用資料庫進行四大議題研析，分別是：歐美航線之佈署趨勢、亞洲區域航線之佈署趨勢、巴拿馬運河拓寬對美東航線重組之影響、航線佈署趨勢對高雄港之影響。

2. 成果推廣

(1) 本資料庫建置迄今已蒐集 6 年 (共 24 季) 的海運數據統計資料，並持續辦理，更新收錄之資料以維持其價值，並以數量化方式呈現貨櫃海運市場變化之全貌。

(2) 為提升資料加值應用，已於 105 年舉辦座談會，邀集交通部、航港局、港務公司與學界與會交流，給予促進資料庫系統提升的發想及建議，並研商未來個別資料庫資料同步與共同分享之可行性。

(3) 後續短期以本資料庫收錄的資料進行各項議題分析，擇要提供給交通部、航港局及港務公司供決策參考。中期以資料庫為平臺，建立資料共享管道，擴大現有資料的分析範圍。長期俟資料庫成熟、研究量能充足，定期發行具公信力、指導性之評述我國航港發展刊物。

(III) Updating, expansion and data analysis services for "International Sea Transportation Database" in 2016

1. Research result

(1) During the past years, the "International Maritime Transportation Database" has been maintained by this Institute and we also updated the software functions such as updating the database, improving user interface, expanding analysis function, assessing the database required for interfacing with domestic harbors and executing the statistical analysis.

(2) The data comprises the content relating to the business with the Asian Pacific countries, including 7 lines of trading route, 600 lines of operation lines (about 45% in global market), some 145 shipping companies, 473 harbors, some 3500 units of ships (about 58% in global market) and total shipping capacity of 11 million TEU (about 55% in global market). Further, it can be used to produce about 50 different kinds of report. The system can provide the following functions: Automatic drafting of bow-shape diagram, term inquiring, automatic error detection, as well as error tolerance and correction ability.

(3) The database is implemented to analyze the following four major issues and they are deployment trend for European and American lines, deployment trend for Asian lines, impact of the widened Panama Canal to American east-coast line, and the impact of line deployment trend to Kaohsiung Harbor.

2. Promotion of result

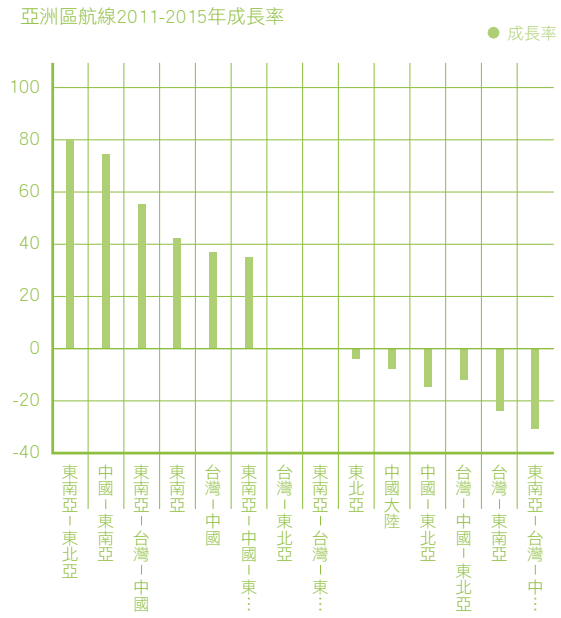
(1) Since the database was implemented, we have collected 6 years (Total of 24 quarters) of maritime statistical data and such task is being executed until now in order to update the collected data for maintaining its value. In the meantime, the quantitative method is also used to present the entire picture in the change of the maritime container market.

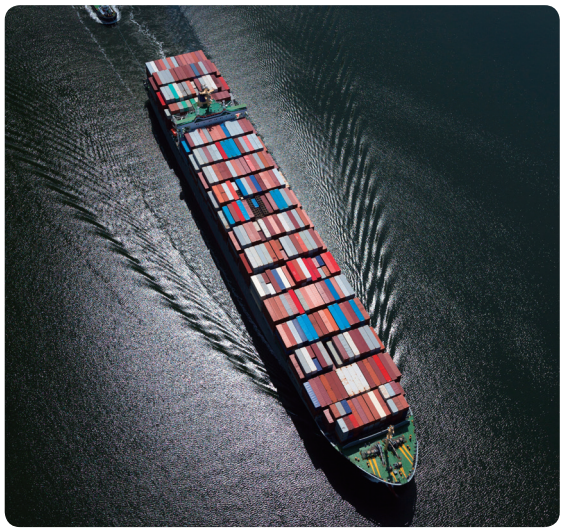
(2) To elevate the value-added application of data, a seminar was convened in 2016 where representatives from MOTC, Maritime Port Bureau, Taiwan International Ports Corporation, Ltd. were invited for information exchange, hoping that ideas and suggestions contributing to the elevation of database system could be obtained. During the meeting, the feasibility in synchronization of data among individual databases and common sharing were also discussed.

(3) In short-term, the data collected by the aforesaid database will be based for analyzing the respective issue and then submit key resolutions to MOTC, Maritime Port Bureau and Taiwan International Ports Corporation, Ltd. for making decisions. In mid-term, the database will be used as a platform for establishing data sharing channel in order to expand the existing data analysis scope. In long-term, the credible and directive kind of articles will be published regularly in order to describe the development of harbors in Taiwan.

亞洲區航線 2011-2015 成長率

Application analysis of "Asian Area Route Deployment Trend"





亞洲區域歷年主航線數及運能統計

Historical statistic data of main route number and shipping capacity in Asian Area

年度	貿易路線	營運航線數	船舶數	總運能 (TEU)	平均船型
2011 Q2	非洲航線	34	174	591284	3398.18
	澳紐航線	41	136	385796	2836.74
	遠歐航線	59	532	4015314	7547.58
	南美航線	20	150	678705	4524.7
	中東印巴航線	98	485	2803065	5779.52
	亞洲區域航線	361	586	727167	1240.9
	越太平洋航線	84	542	2879378	5312.51
2011 Q3	非洲航線	36	219	915733	4181.43
	澳紐航線	43	154	454500	2951.3
	遠歐航線	54	506	3841684	7592.26
	南美航線	19	149	715787	4803.94
	中東印巴航線	94	488	2765175	5666.34
	亞洲區域航線	359	579	723679	1249.88
	越太平洋航線	80	537	2892700	5386.78
2011 Q4	非洲航線	37	231	998702	4323.39
	澳紐航線	41	150	434871	2899.14
	遠歐航線	55	502	3804862	7579.41
	南美航線	21	179	925293	5169.23
	中東印巴航線	95	525	3011540	5736.27
	亞洲區域航線	359	592	742368	1254
	越太平洋航線	78	540	2944074	54

（四）105 年度「國際空運資料庫」更新擴充及資料分析服務

1. 研究成果

(1) 本資料庫目前計維護管理全球 185 個機場的基本設施、營運和運量資料 (包括我國機場、兩岸直航之大陸機場、全球各洲主要機場)，並持續更新資料並強化功能，包括維護資料庫、更新資料庫內容、改善使用者介面並擴充分析功能、進行資料之統計分析。

(2) 依據旅客起迄資料檢索桃園 (Taipei, TPE)、首爾仁川機場 (Seoul, ICN)、香港 (Hong Kong, HKG)、東京成田 (Tokyo, NRT)、新加坡樟宜 (Singapore, SIN)、上海浦東 (Shanghai, PVG)、杜拜 (Dubai, DXB)、洛杉磯 (Los Angeles, LAX)、紐約甘迺迪 (New York, JFK) 及溫哥華 (Vancouver, YVR) 等機場，瞭解該些機場旅客起迄路徑，並進行四項議題分析，包括：

- 桃園機場旅客進出分析；
- 中國大陸進出北美三大機場分析；
- 港澳及東南亞往返北美三大機場之分析；
- 亞洲重要中轉機場比較分析。

(IV) Updating, expansion and data analysis services for "International Air Transportation Database" in 2016.

1. Research result

(1) Until now, the infrastructure, operation service and shipping capacity of 185 airports all over the world (Including the airports in Taiwan, the China airports operating the straight-traffic and other major airports in the world) are preserved and managed in the aforesaid database. The data updating and function enhancing will be executed continuously, inclusive of database maintaining, database content updating, user interface improving, analysis and function expanding for a more effective statistical analysis of the data.

(2) Based on the passenger starting and destination data, the following airports are checked for understanding the starting and destination route of passengers, i.e. Taipei (TPE), Seoul (ICN), Hong Kong (HKG), Tokyo (NRT), Singapore (SIN), Shanghai (PVG), Dubai (DXB), Los Angeles (LAX), New York (JFK) and Vancouver (YVR), etc. Further, the following four issues are also analyzed, including:

- Analysis of passengers entering and exiting Taiwan Taoyuan International Airport
- Analysis of China passengers entering and exiting 3 major airports in North America.
- Analysis of Hong Kong, Macao and SE Asia passengers entering and exiting 3 major airports in North America.
- Comparison of key transfer airports in Asia.

2. 成果推廣

(1) 本資料庫建置以來，已蒐集 2012 年迄今主要國際機場出入境旅客真實起迄資料，據以瞭解桃園機場與主要競爭機場市場情形，並運用資料庫內容研析重要課題，同時以年度空運重要議題陳報交通部，如：

- 陸客來臺中轉之可能運量推估
- 國際航空客運起迄資料鏈結之分析－以東南亞往返北美主要機場為例；
- 桃園國際機場航空客運起迄分布分析與比較；
- 以大數據分析法初探我國與新南向國家航空客運市場供需情形。

此外，105 年 8 月及 106 年 2 月應民航局要求，協助提供國外主要機場設施與營運資料。

(2) 106 年 3 月及 5 月分別於 2017 海空運論文研討會上發表「big data 應用於國際空運領域之初探」，並於航運季刊刊登「桃園國際機場旅客起迄資料鏈結之分析」論文。

(3) 為提升資料加值應用，於 105 年 11 月 29 日舉辦座談會，邀集交通部、民航局、桃園機場公司與學界與會交流，就提升資料庫系統運用研提建議，並研討未來分析與精進方向。

(4) 後續短期以本資料庫收錄的資料進行各項議題分析，擇要提供給交通部、民航局及桃園機場公司供決策參考；中長期以資料庫為平臺，建立資料共享管道，擴大現有資料的分析範圍，定期發行國際空運評析報導。

2. Promotion of result

(1) Since the database was implemented, we have collected the true starting and destination data for the passengers entering and exiting major international airports from 2012 until now in order to understand the market competition status between Taiwan Taoyuan International Airport and other major airports in the world and to analyze key issues with the content of the database. In the meantime, we also report annual key air transportation issues to MOTC, such as:

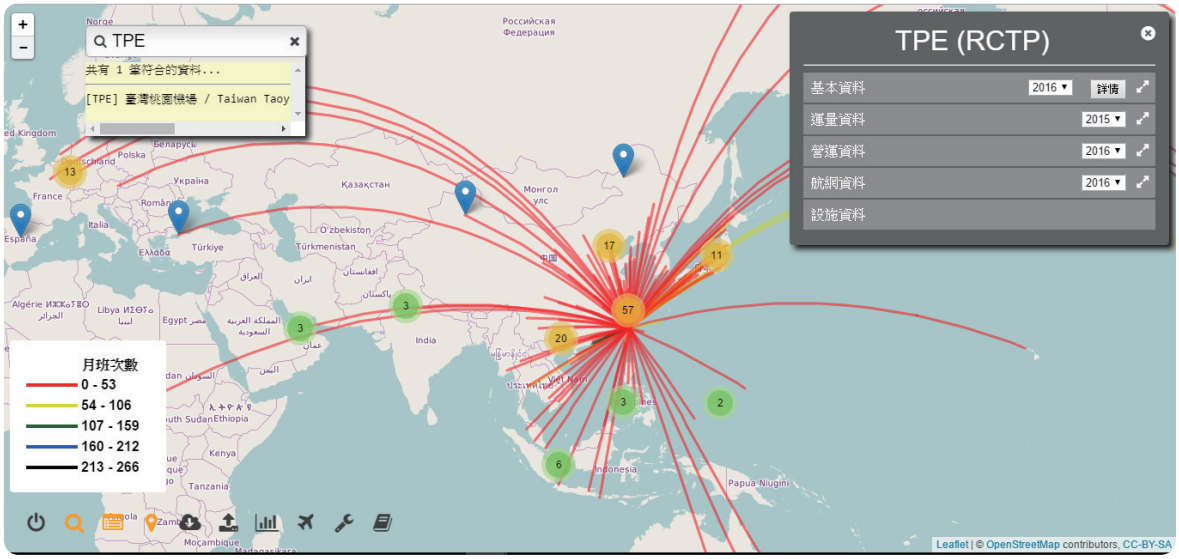
- Estimation of possible traffic of Chinese passengers that will make transfer trips in Taiwan.
- Starting and ending data link analysis for international aviation passenger transportation – taking passengers making round trip between SE Asian and major airports in North America.
- Starting and ending distribution and comparison for the air transportation in Taiwan Taoyuan International Airport.
- Analyze the supply-and-demand situation of air traffic market in Taiwan and the target countries for New Southbound Policy by big data analysis.

Being required by CAA (Civil Aeronautics Administration), we provided the facilities and operation service data for major airports of other countries in August 2016 and February 2017 respectively.

(2) In March and May 2017, we presented "Application of Big Data in the Initial Study on International Air Transportation" during "2017 Maritime & air Transportation Thesis Seminar" and also published the "Analysis of Passenger Starting & Ending Data Link for Taiwan Taoyuan International Airport" article in the Air Transportation Journal.

(3) To enhance the value-added data application, a seminar was convened on November 29, 2016 where representatives from MOTC, Maritime Port Bureau and Taoyuan International Airport Corporation were invited for information exchange, hoping that suggestions contributing to the elevation of database system could be obtained. In the meantime, the future analysis and improving direction was also discussed.

(4) In short-term, we will analyze relevant issues according to the data collected in the database and then submit key issues to MOTC, Maritime Port Bureau and Taoyuan International Airport Corporation for making decisions. In mid-term, the database will be used as a platform for establishing data sharing channel in order to expand the existing data analysis scope and issue international air transportation analysis articles regularly.

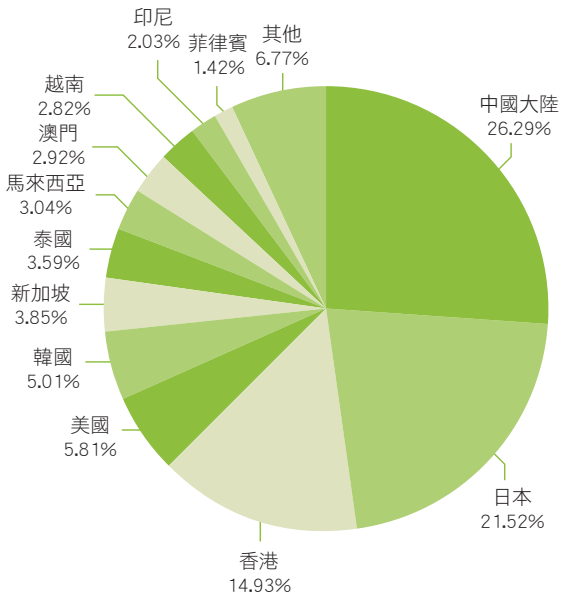


維護管理機場之航網 (航班)

Aviation network (Flight service) for the airport maintenance management

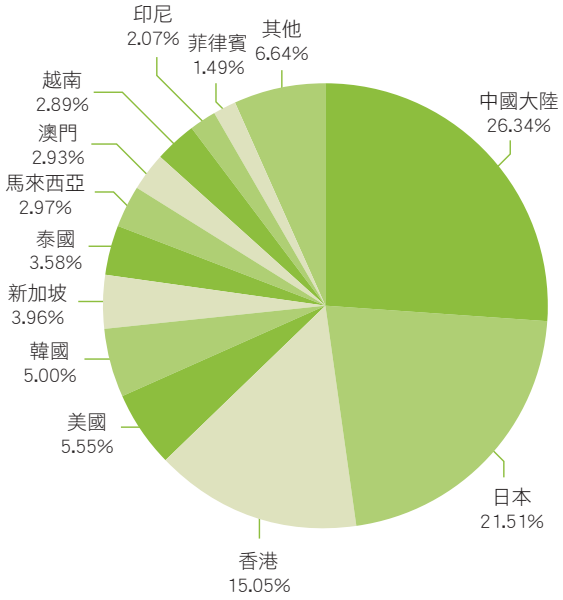
旅客來源國家

Passenger's source country



旅客目的國家

Passenger's destination country



桃園機場旅客進出國家分析

Analysis of source and destination countries for passengers in Taiwan Taoyuan International Airport

（五）國際船舶安全管理章程風險管理規範之推行策略

1. 研究成果

(1) 為與 2010 年 7 月 1 日新生效的國際海事組織 (IMO) 之 ISM Code 接軌，本所於 104-105 年度進行船舶安全之風險管理規範研究，已研擬完成我國籍船舶安全之風險管理規範範本。並經輔導實船試辦 (貨櫃、油輪、散裝及中小型貨船等) 及教育訓練 (航港局、臺灣港務公司、航運業者等)，以提昇範本之可用性。

(2) 研究成果可作為航政司、航港局、臺灣港務公司、航運業者推動船舶安全風險管理之教材，尤其可強化中小型航商的風險管理觀念。

(V) Promotional strategies for regulating the risk management specified in International Vessel Safety Management Rules

1. Research result

(1) To connect with the ISM Code of IMO (International Maritime Organization) newly effective from July 01, 2010, we conducted a research of the risk management specification for vessel safety in 2015~2016. For this purpose, we have developed a model copy of Risk Management Specification to protect the safety of vessels based in Taiwan. The aforesaid model copy was applied in the trial use on-board the ships (Container ships, oil tankers, bulk cargo ships and medium-smaller sized cargo ships) and education/training (for Maritime Port Bureau, Taiwan International Ports Corporation, Ltd. and shipping companies, etc.) to demonstrate the applicability of the said model copy.

(2) The research result can be used by Department of Transportation Administration, Maritime Port Bureau, Taiwan International Ports Corporation, Ltd. and shipping companies as the teaching materials in promoting vessel safety risk management, let alone it can enhance the risk management concept for medium-and-smaller sized shipping companies.

2. 推廣成果

(1) 交通部已將 NSM(國內航線) 納入船舶法修正草案中，推動 NSM 制度法制化，航港局也已研擬完成 NSM 管理要點 (規則)。但航港局目前完成之 NSM 管理要點尚未要求需藉助風險管理工具進行船舶安全風險管理。未來，本研究成果可進一步協助航政司、航港局、學界、業界提升 NSM 之安全管理至風險管理之層次。

(2) 提供航港局將風險管理納入船舶之安全管理程序。

2. Promotion of result

(1) By now, MOTC has incorporated the NSM (domestic lines) in the amended draft of Vessels Act in order to promote the legalized NSM System. In the meantime, However, the NSM Management Guidelines compiled by Maritime Port Bureau do not specify that the risk management tool should be used to execute the vessel safety risk management. In the future, we expect that our research result could help Department of Transportation Administration, Maritime Port Bureau, the scholastic sector and the shipping operators to upgrade the safety management concept of NSM to the risk management level.

(2) Provide the Risk Management Specification to Maritime Port Bureau for incorporating in its vessel safety management procedure.

表 1 初步風險評估表

初步風險評估 INITIAL RISK ASSESSMENT

船名 Ship Name XXXXXXXXXX　　紀錄編號 Record No. EX1-001

工作/行動項目 Working / Action 航行計畫　　評估區域 Work Area being assessed 駕駛台

任務編號 Task ID number	工作/動作 Work process/action undertaken in area	與工作/動作相關之危險 Hazards associated with activity	已採取之管控措施 Controls already in place	顯著風險確認 Significant risks identified	進一步評估之需求(是/否) Further assessment required (Y/N)

聲明 Declaration :
上列無顯著風險之處，即評估者已判斷為僅具非重要類別風險者無需更詳細之評估。
Where no significant risk has been listed，we as assessors have judged that the only risks identified were of an inconsequential nature and therefore do not require a more detailed assessment.

評估者 Assessor : ABC（C. Officer）　　船長或輪機長 Master or CE : XYZ（Captain）

資料來源：運研所[4]

初步風險評估表

Initial risk assessment form

表 2 詳細風險評估表

詳細風險評估 DETAILED RISK ASSESSMENT(範例 1)

船名 Ship name: XXXXXXXXXX

紀錄編號 Record number: EX1-001

本次評估日期 Current assessment date:

上次評估日期 Last assessment date:

評估之工作/動作 Work activity being assessed: 航行計畫

第一部份 Section 1

預定工作行動之危險分析 Hazards Analysis of the Intended Work Activity

危險編號 Hazard No.	確認危險描述 Description of identified hazards	現行保護人員之控制方法 Existing control measures to protect personnel from harm

第二部份 Section 2

評估風險因子 Assessment of Risk Factor

評估危險引起之風險 To assess the risk arising from the hazard:
1. 選擇最適合危險之可能性。Select the expression for likelihood which most applies to the hazard;
2. 選擇最適合危險之嚴重性。Select the expression for severity of harm which most applies to the hazard;
3. 使用風險評量表(左上)交叉對出風險程度。Cross reference using the Risk Estimator table (above left) to determine the level of risk.

傷害可能性 Likelihood of Harm	Severity of Harm 損害嚴重性		
	低度傷害 Slight Harm	中等傷害 Moderate Harm	嚴重傷害 Extreme Harm
很少發生 Very Unlikely (VU)	非常低風險 VERY LOW RISK	非常低風險 VERY LOW RISK	高風險 HIGH RISK
少發生 Unlikely (U)	非常低風險 VERY LOW RISK	中度風險 MEDIUM RISK	非常高風險 VERY HIGH RISK
會發生 Likely (L)	低風險 LOW RISK	高風險 HIGH RISK	VERY HIGH RISK
常發生 Very Likely (VL)	低風險 LOW RISK	非常高風險 VERY HIGH RISK	VERY HIGH RISK

危險編號 Hazard No.	傷害可能性 Likelihood of Harm	損害嚴重性 Severity of Harm	風險程度等級 Risk Factor

4. 如果風險因子為中度或以上，則應另外再填記第三部份加強控制方式 If the Risk Factor is MEDIUM or above additional control measures should be implemented and recorded in Section 3.

第三部份 Section 3 降低風險損害之加強控制方式

Additional Control Measures to Reduce the Risk of Harm

危險編號 Hazard No.	進一步之風險控制方式 Further Risk Control Measures	矯正行動日期 Remedial Action Date	復審日期 Review Date
1	應確實修正至轉向點（Current Way Point）		

額外建議 Additional comments:

評估者 Assessor: ABC（C/O）　　船長/輪機長 Master or CE: XYZ（Capt.）

資料來源：運研所[4]

1

詳細風險評估表單

Detailed risk assessment form

（六）結合動態船舶與環境資訊之綠色航路智慧領航計畫 (4/4)

1. 研究成果

本研究結合船舶動態、電子海圖與海氣象環境資訊，發展沿岸航路與進出港領航的綠色概念智慧化應用服務技術，作為航行風險控制與即時反應的一個重要指標，計畫主要成果如下：

(1) 完成 E- 化航行相關國際規範與技術發展最新資訊及轉譯發佈。

(2) 完成船舶溫室氣體及空污排放量估算。

(3) 建置海難資料庫平台並完成航路風險潛勢分析。

(4) 建置航路動態監測整合應用系統。

2. 解決問題

本研究之航路動態監測整合應用系統，以探勘分析所得的特徵參數設計的擱淺、碰撞、漂流、艏向異常、航速驟降、偏航、錨泊等自動化偵測警示功能，即時告知主管機關，可協助解決目前航安權責機關無監控臺灣海域船舶系統之困擾，進而掌握最新航安資訊。

(VI) Green route based intellectual navigation plan that combines dynamic vessel and environment information (4/4)

1. Research result

By combining the dynamic vessel action, electronic chart and ocean weather environment information, the green-based intellectual application service technology is developed in this research for the coastal line and the harbor entry/exit navigation in order that it will serve as an important indicator for navigation risk control and real-time reaction. Described below are main results of the plan:

(1) Complete the E-based international navigation specification and the latest information in technical development as well as relevant translation and announcement.

(2) Complete the estimation of vessel greenhouse gas and air contaminant emission.

(3) Implement the shipwreck database platform and complete the potential analysis for cruising route risks.

(4) Implement the dynamic monitoring and integration application system for cruising route.

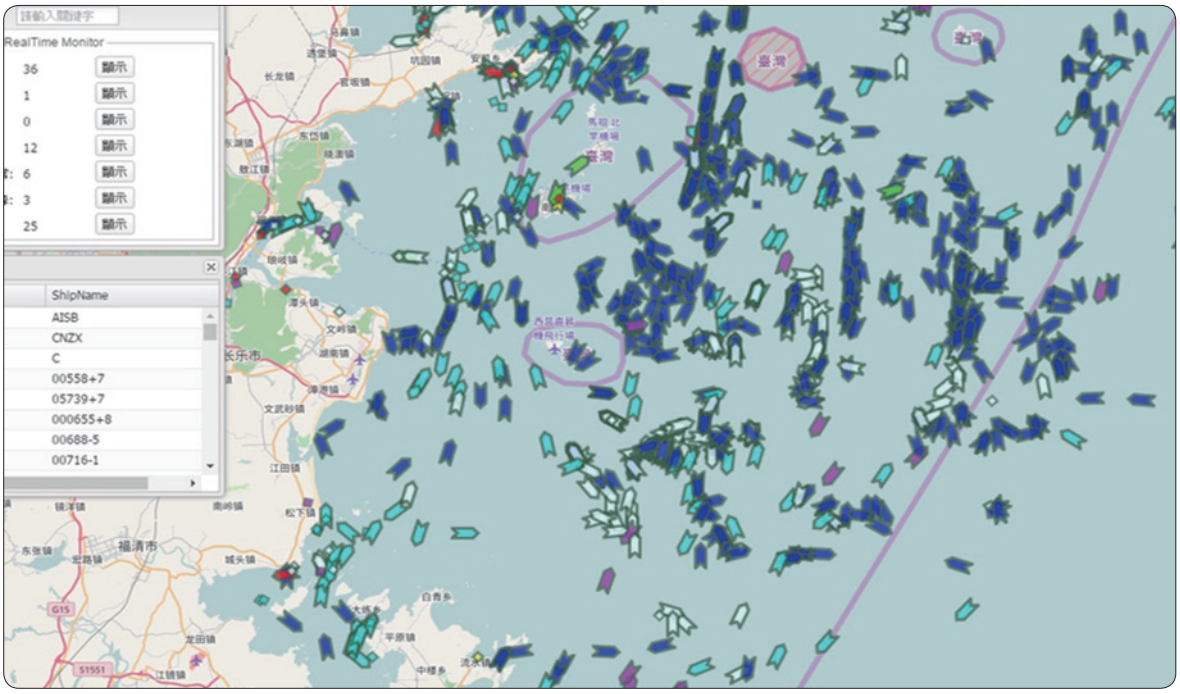
2. Solutions

The Cruising Route Dynamic Monitoring & Integration Application System used in this research is provided with automatic detection and warning function for reporting the stranding, collision, drifting, abnormal bow orientation, sudden speed dropping, off-course and anchoring parameters designed for the investigation analysis to the competent authority. In this way, it will be able to solve the problems where the Taiwan sea area vessel monitoring system is not installed for the competent navigation safety authority in order to control over the latest information in navigational safety.

3. 成果推廣

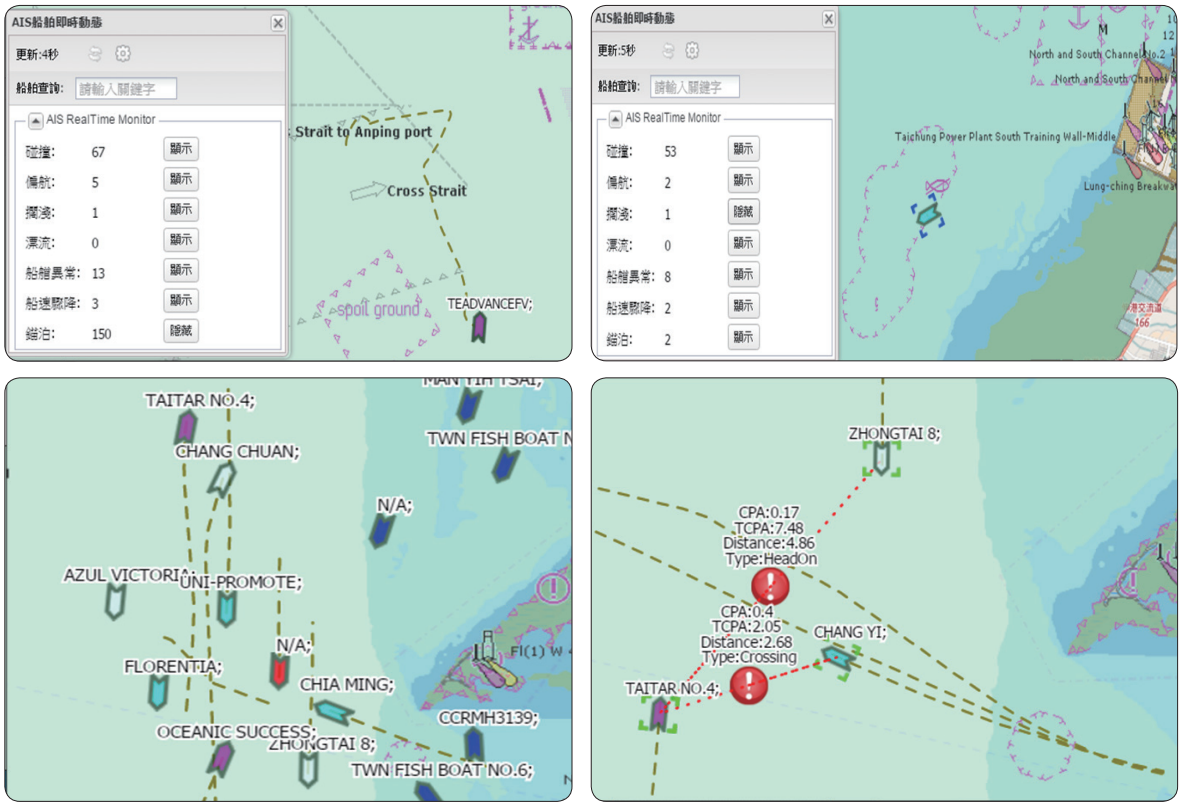
3. Promotion of result

項次 Item	名稱 Name	時間 Time	地點 Location	對象 Target	內容 Content
1.	出版研究報告書 Publication Research Report	106 年 4 月 April 2017		航港局、海巡署、臺灣港務股份公司、經濟部及漁業署等 Maritime Port Bureau, Coastal Guard Department, Taiwan International Ports Corporation, Ministry of Economic Affairs, and Fisheries Agency	藉由研究報告書推廣本計畫執行內容 Promote the execution content of this Plan through the Research Report.
2.	投稿國內期刊 (港灣季刊第 107 期) Submission to domestic periodicals (Harbor Quarter Journal, No. 107)	106 年 6 月 June 2017		航運界 Maritime transportation sector	藉由文章內容推廣本計畫執行內容 Promote the execution content of this Plan through the Article Content.
3.	辦理研究成果發表會 Convened Research Result Presentation	106 年 5 月 May 2017	花蓮、基隆、臺中與高雄港務分公司 Branch office of Taiwan International Ports Corporation in Hualien Port, Keelung Port, Taichung Port and Kaohsiung Port.	海巡署、交通部航港局及港務分公司 Coastal Guard Department, Maritime Port Bureau-MOTC and port branch office.	辦理「105 年度海洋與港灣領域研究成果發表會」 Convened "2016 Maritime & Harbor Territory Research Result Presentation".



航路動態監測整合應用系統

Cruising route dynamic monitoring and integration application system.



碰撞、漂流、艏向異常、偏航自動化偵測警示功能

Collision, drifting, abnormal bow orientation, automatic off-course detection warning function.

（七）我國港灣壓艙水污染問題管理法制化之研究 (4/4)

1. 研究成果

國際海事組織多年前制訂《國際船舶壓艙水及沈積物控管公約》。目前已有全球 60 個國家完成簽署，佔全世界商船總噸位的 68%。原定今年 9 月 8 日開始實施 D2 規定，因各國船東強烈要求，將實施日期延至 2019 年 11 月。就臺灣而言，各商港船舶在與國外各港運輸往來頻繁，為壓艙水污染高風險區，實有必要就相關法令制度研擬因應之道，計畫主要成果如下：

(1) 針對臺灣 7 個港口分析兩岸航線船舶之運輸型態，提供對兩岸航線壓艙水管理策略之參考。

(2) 分析公約及國外對於豁免壓艙水管理之規定、操作模式與案例，提出國內壓艙水法案及兩岸壓艙水管理互免之利弊。

(VII) Research on the legalized management act for the ballast water pollution problem occurs to the harbors in Taiwan (4/4)

1. Research result

The "International Vessel Ballast Water & Sediment Control Treaty" developed by MIO (Maritime International Organization) years ago. Until now, it has been signed by 60 countries all over the world, which takes 68% of total tonnage for the global commercial vessels. The D2 regulations are to be enforced starting from 8 September of this year, it will be postponed to November 2019 as being strongly requested by the ship owners of each country. As far as Taiwan is concerned, being experiencing frequent transportation businesses by commercial ships with the overseas harbors, it has been classified as high ballast water contamination area. Therefore, it is required to develop countermeasures according to the applicable laws and systems. Listed below is the main result of this Plan:

(1) Analyze the transportation pattern of ships traveling along the marine lines between both sides of the strait for 7 harbors in Taiwan in order to provide the result as the reference for developing the ballast water management strategies for the maritime transportation between both sides of the strait.

(2) Analyze the rules, operation mode and historical cases for the exemption of ballast water management as specified in relevant treaties and foreign rules in order to present the ballast water act practiced in Taiwan as well as the advantages and defects in mutual exemption of ballast water management between both sides of the strait.

2. 解決問題

目前航港局制訂三加一分級管理制度，即船方自主管理、常態進港管理、黑名單專案管理及壓艙水警戒管理等，但卻公告只需在離台灣沿岸 12 海里外交換即可，其所根據之法源不足。藉由本計畫調查提出壓艙水管理法草案及各相關子法，並針對《海洋污染防治法》、《商港法》及《船舶法》進行法源依據之修正，可解決我國管理船舶壓艙水適合具體修法之問題。

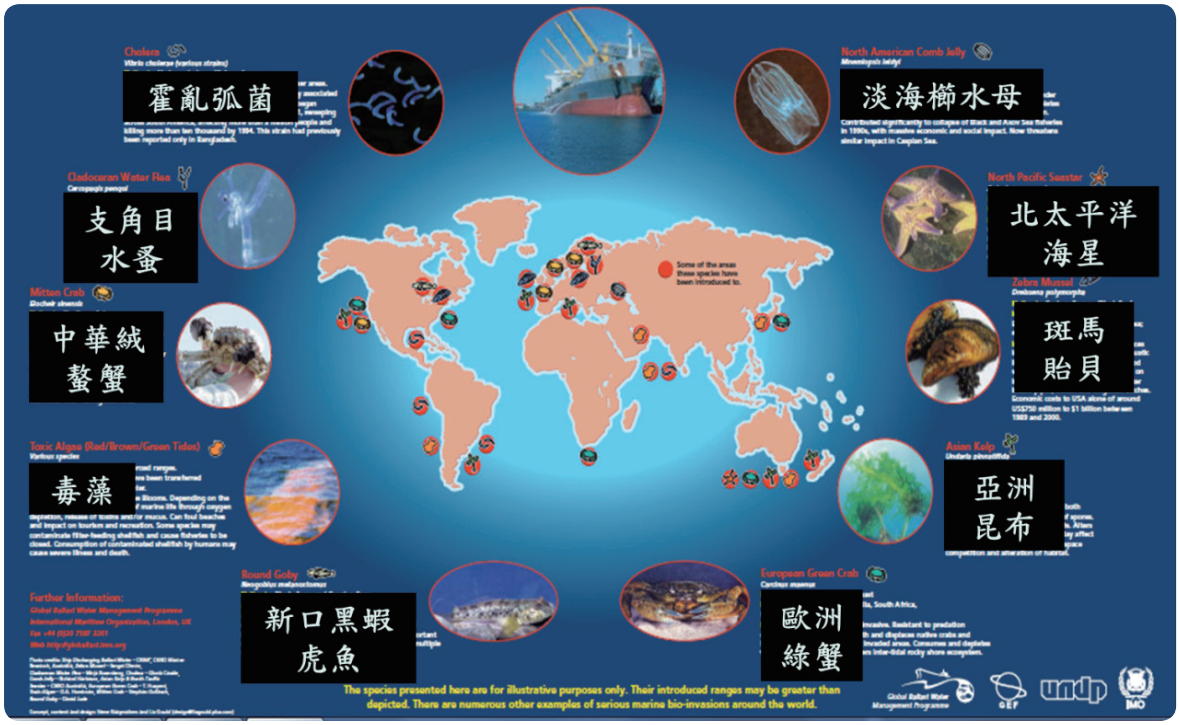
2. Solutions

Currently, the "3+1" classification management system has been established by Maritime Port Bureau MOTC, which specifies the ship's self-management, normal arrival management, Black List project management and ballast water alerting management, etc. However, it only specifies that the water can be replaced outside 12 sea miles off the coastal shore of Taiwan and the governing legal source is apparently insufficient. The draft of Ballast Water Management Act and relevant sub-act will be proposed through the investigation specified in this Plan. Furthermore, corrections will be made to the legal source for "Ocean Contamination Prevention Act", "Commercial Harbor Act" and "Vessel Act" in order to solve the problem hindering the modification of law for the vessel ballast water management in Taiwan.

3. 成果推廣

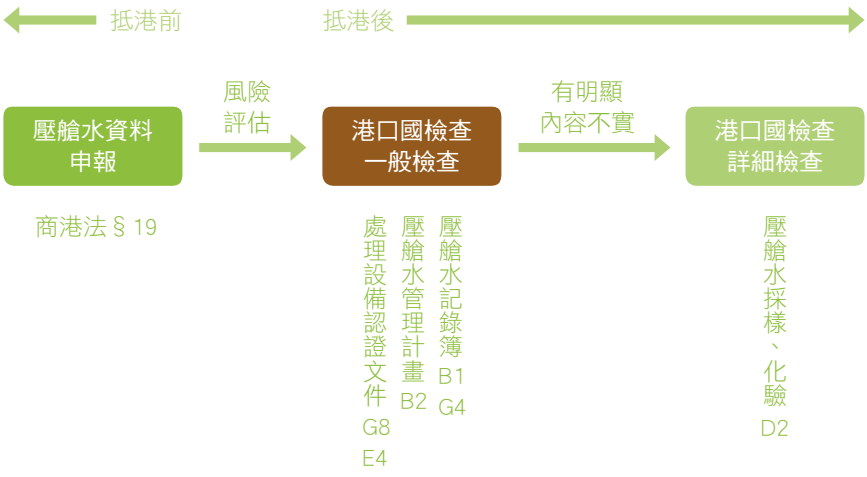
3. Promotion of result

項次 Item	名稱 Name	時間 Time	地點 Location	對象 Target	內容 Content
1.	出版研究報告書 Publication research report	106 年 4 月 April 2017		航港局、環保署、農委會、海巡署及衛福部 Maritime Port Bureau, Coastal Guard Department, Taiwan International Ports Corporation, Ministry of Economic Affairs, and Fisheries Agency.	藉由研究報告書推廣本計畫執行內容 Promote the execution content of this Plan through the Research Report.
2.	投稿國內期刊 (港灣季刊第 107 期) Submission to domestic periodicals (Harbor Quarter Journal, No. 108)	106 年 9 月 September 2017		航運界 Maritime transportation sector	藉由文章內容推廣本計畫執行內容 Promote the execution content of this Plan through the Article Content.
3.	辦理座談會 Convened the seminar	106 年 8 月 August 2017	交通部航港局 Maritime Port Bureau, MOTC	交通部航港局、環保署、農委會、海巡署及衛福部 Maritime Port Bureau MOTC, EPA, Council of Agriculture, Coastal Guard Department, and Ministry of Health and Welfare	藉由座談會方式推廣本計畫執行內容 Promote the execution content of this Plan by means of seminar.



壓艙水十大海洋入侵物種

Top 10 oceanic invasion species in the ballast water



壓艙水管理流程圖

Ballast water management flow chart

三、永續運輸與運輸經營管理

（一）都市軌道運輸系統型式發展之研究

1. 計畫概述

臺北捷運營運 20 年造就城市發展的翻轉，各地方政府也積極爭取捷運計畫，希望能達到同樣效果。惟鑒於軌道運輸系統投資成本龐大，若運量不如預期造成營運虧損，長期而言，對運輸設施是否有效利用及地方政府財政均是重大負擔。本研究希藉由蒐集國內外相關資料，探討國內都市運輸型態之軌道運輸系統型式，包含相關法規適用及未來國內技術開發及產業發展等，作為未來都市軌道運輸系統新的選項。

2. 研究成果

(1) 計畫蒐集國內外相關軌道運輸系統發展資料，評析各型都市公共運輸服務缺口，檢討軌道運輸系統引進空間，有助於交通部及地方政府了解目前軌道運輸系統之課題與發展趨勢。

(2) 以營運收支平衡之原則，訂定運量密度門檻，提供高鐵局後續修正大眾捷運系統審查作業要點之參考。

(3) 研析我國都市軌道運輸系統規劃與永續營運發展策略，提供中央審議及地方提報軌道運輸系統之參考。

III. Sustainable Transportation and Transportation Operation & Management

(I) Research on the type development for the metropolitan rail transportation system

1. Overview

The operation service of the Taipei MRT System over the past 20 more years has contributed to the turn-around effect for the city development. In view of this, aggressive action has been taken by local government to struggle for the MRT Project in the hope similar effect could be achieved. In view that the track transportation system requires enormous investment cost, it may lead to operation loss if the capacity is not as expected. In the long run, it would bring heavy burden to the financial status of local government and the worry on whether the transportation facilities could be used effectively. With the data collected from local and overseas markets, the type of track transportation system required for urban transportation system in Taiwan will be studied and its content shall also include the application of relevant laws as well as future technical development and industrial development in Taiwan. The result shall be used as one of the new options for the urban track transportation system in the future.

2. Research result

(1) In this plan, the development data of track transportation system are collected from local and overseas markets for analyzing the service gap of all types of urban public transportation in order to review the room for introducing the track transportation system. With such, we hope that it will help MOTC and local government to understand the issues and development trend of the track transportation system in modern days.

(2) Set the capacity density threshold according to break even principle for use by Bureau of High Speed Rail (BOHSR) as reference of amending the "MRT System Review Operation Guidelines" in the future.

(3) Analyze the strategies required for the planning and the sustainable operation of the urban track transportation system in Taiwan. The result will be used as the reference for examination by competent central authority and for local government to report the construction of track transportation system.

3. 成果推廣

(1) 發表「國內都市軌道運輸系統建設發展趨勢與課題」，中華民國運輸學會 105 年學術論文研討會，105 年 12 月。

(2) 於相關場合宣傳推廣研究成果：

2. Promotion of Result

(1) The "Construction Development Trend and Issues for Urban Track Transportation System in Taiwan" was presented in 2016 Annual Conference of the Chinese Institute of Transportation in December 2016.

(2) The research result was presented and promoted in relevant occasions:

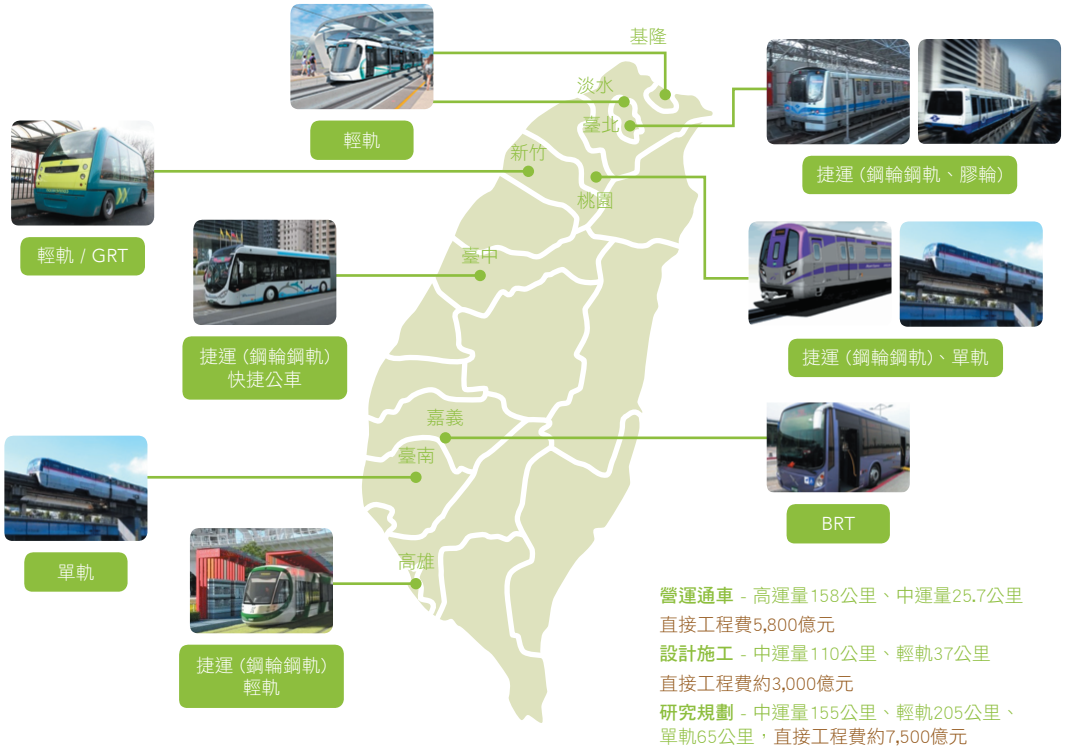
時間 Time	地點 Location	目的 Purpose
105.12.30 December 30, 2016	中華顧問工程司 CECI (China Engineering Consultants, Inc.)	當前軌道重要議題專家學者座談會 - 報告產業研究內容及日本中國大陸產業發展狀況 Expert & Scholar Seminar for Contemporary Key Rail Transportation Issues –reporting the industrial research content and the industrial development status in Japan and China.
106.2.14 February 14, 2017	高鐵局 Bureau of High Speed Rail (BOHSR)	當前軌道重要議題專家學者座談會 - 報告國外捷運人口規模及運量密度門檻 Expert & Scholar Seminar for Contemporary Key Rail Transportation Issues –reporting the scale of MRT population in Taiwan and other countries as well as the transportation capacity density threshold
106.2.24 February 24, 2017	行政院 Executive Yuan	有關都會捷運運量密度門檻之思維，已納入向院長簡報「前瞻基礎建設 - 軌道部分」內容。 The conception for the metropolitan MRT capacity density threshold has been included in the "Perspective Infrastructure –Rail Transportation" briefed to the Premier of Executive Yuan.

(3) 資料彙整納入「未來 30 年我國軌道運輸發展願景」案處理。

(4) 後續高鐵局修正「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」之參考。

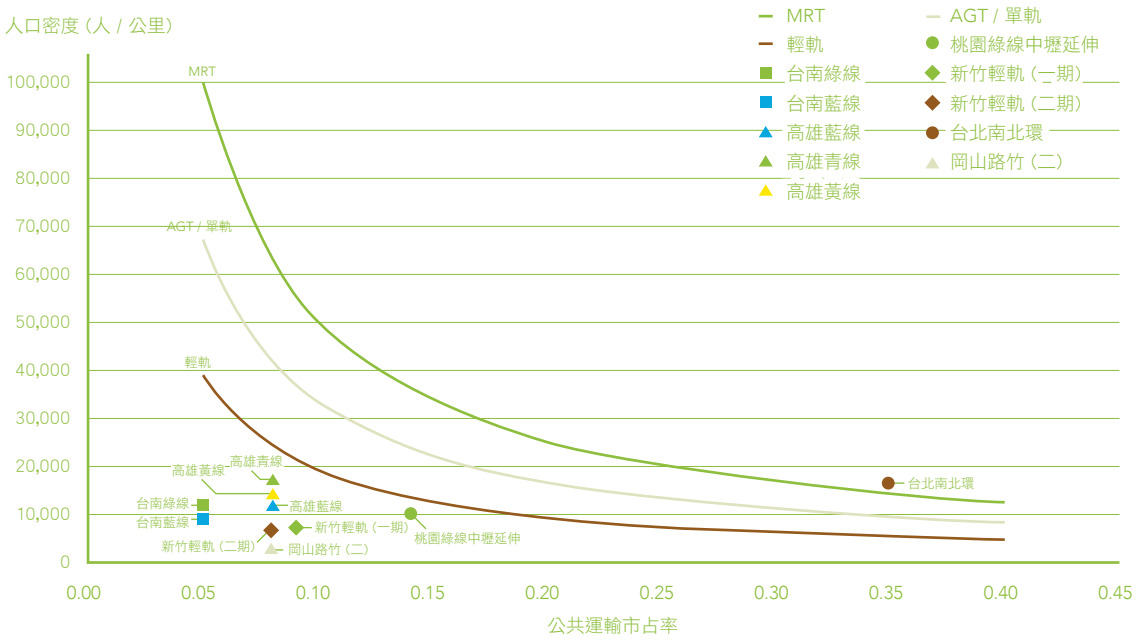
(3) The data has been collected and summarized and incorporated in "Vision for Track Transportation Development in future 30 years" for processing.

(4) It will be used as the reference by BOHSR for amending "Application & Review Operation Guidelines for the MRT System Construction and Peripheral Land Development Plan".



現行都市軌道發展現況(提供各運輸工具的照片即可)

Development of current urban rail transportation



運量門檻圖

Capacity threshold chart

（二）以責任保險角度探討汽車運輸業經營管理之研究

1. 研究成果

(1) 本研究針對目前我國汽車運輸業責任保險相關管理機制之現況及國內外文獻或先進國家制度規範進行分析與檢討。針對計程車客運業納保旅客責任險部分，本所在歷次會議中均已邀請計程車相關公、工會代表及交通部、公路總局、學者專家等單位代表參與討論並獲致共識，本研究提出公路法修正條文對照表，具體建議修正公路法第 65 條第 4 項，將旅客責任險納入計程車客運業強制納保之內容，以維護旅客之權益。

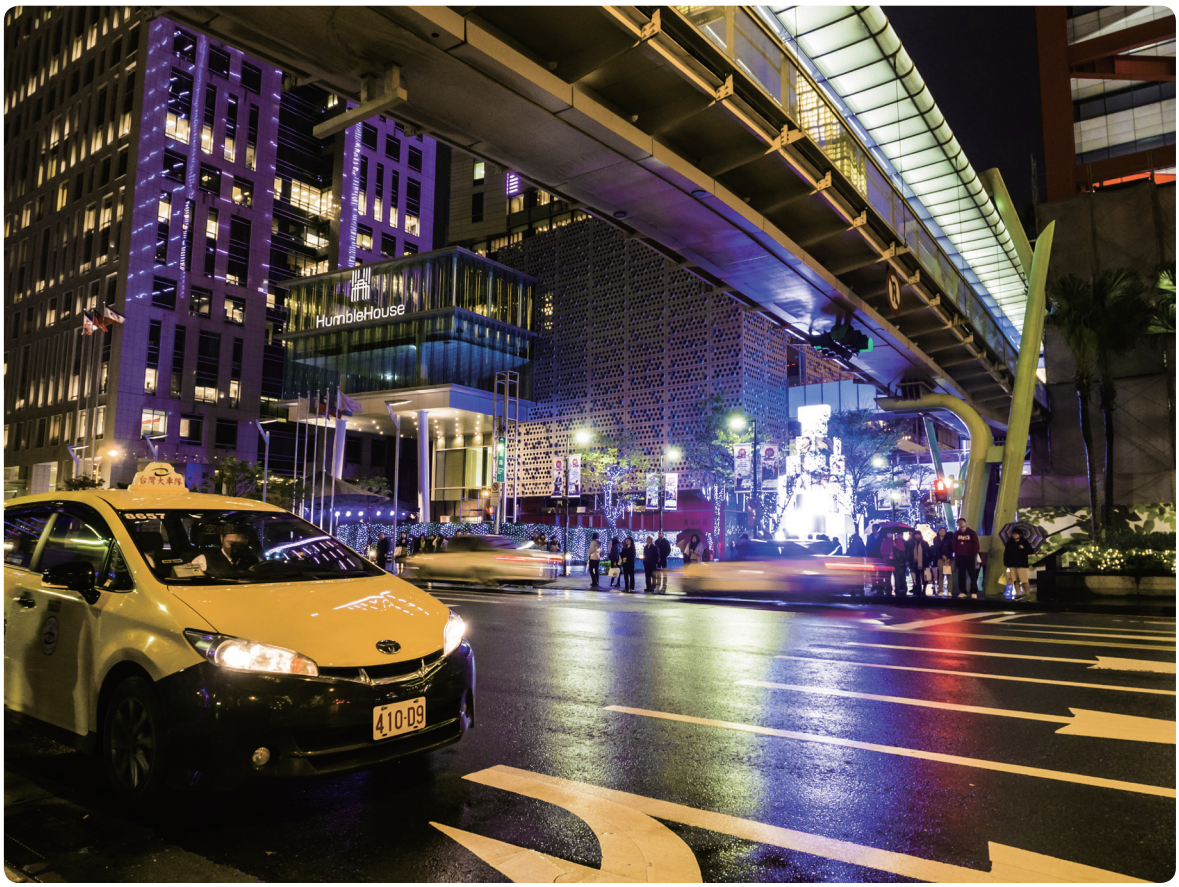
(2) 至於是否可以責任保險證明做為汽車運輸業申請籌設條件部分，本研究建議輔導以遊覽車客運業者及計程車客運業進行後續試辦。目前保險主管機關及相關產險公司刻正透過計程車駕駛行為分析數據，作為建立公平費率機制之依據，以優惠保費鼓勵交通事故降低及駕駛行為改善。未來建議此一方式可擴及遊覽車客運業，並將駕駛行為數據分析結果及減少車禍肇事之誘因，落實於計程車及遊覽車客運業保單之實際費率優惠，將有助減少靠行問題，並提高汽車運輸業責任保險對於第三人之保障。

(II) Research on the operation & management of automobile transportation business from the angle of liability insurance

1. Research result

(1) In this research, the analysis and review are executed for the current status of the liability related management mechanism for the automobile transportation business in Taiwan and local/overseas literature or the system specification in advanced countries. Regarding the passenger liability insurance to be secured by the taxi transportation business, we have invited the representatives from taxi associations and league as well as the representatives from MOTC, Directorate General of Highways, scholars and experts to participate in the discussion with a consensus reached as well. In the meantime, we also submitted the Amended Clause Comparison Table for Highway Law where Item 4 under Article 65 of Highway Law was amended for including the passenger liability insurance in the compulsory insurance clauses for the taxi passenger transportation business in order to protect passenger's rights.

(2) As for the issue on whether the liability insurance should be used to prove the incorporation conditions requested by the automobile transportation business, we suggest that the limousine and the taxi should be guided for the trial test in the future. Currently, the analysis data obtained from taxi driving behaviors is quoted by the competent insurance authority and relevant property insurance firm for establishing an impartial fare charging mechanism through which, favorable insurance premiums will be offered for encouraging the drivers to reduce traffic accidents and improve their driving behaviors. We suggest that such methods should be promoted to the limousine passenger transportation business in order to apply the analyzed driving behavior data and traffic accident reduction incentives to the favorable premiums indicated in the insurance policy secured by the taxi and limousine passenger industries. As a result, it will not only reduce the fleet taxi problem but will provide higher protection for the third party that will be offered by the liability insurance secured by the automobile transportation business.



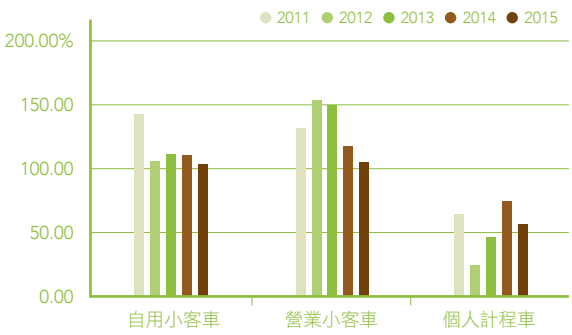
2. 推廣成果

2. Promotion of result

活動名稱 Name of Activity	對象 Target	活動方式 Activity Method	永續性 Sustainability
計程車客運業強制納保旅客責任險座談會 Compulsory Passenger Liability Insurance Seminar for Taxi Passenger Transportation Business	交通部路政司、公路總局、學者專家及計程車公、工會代表 Representatives from Department of Highways & Railways-MOTC, Directorate General of Highways as well as scholars, experts and representatives from taxi association and league.	辦理 1 場座談會議 One session of seminar will be convened.	獲致具體結論後，建議修訂公路法第 65 條第 4 項。 After reaching solid conclusions, it is suggested that Item 4 under Article 65 of Highway Law should be amended.
以責任保險證明做為汽車運輸業申請籌設條件之推廣 The liability insurance certificate should be used for encouraging the automobile transportation business to apply for the incorporation.	遊覽車客運業及計程車客運業公會 Limousine passenger transportation and taxi passenger transportation association.	辦理 1-2 場說明會 1~2 sessions of seminar will be convened.	提供以責任保險證明做為汽車運輸業申請籌設條件之一之建議，做為未來汽車運輸業管理規則修訂之參考。 The liability insurance certificate should be used as one of the conditions for encouraging the automobile transportation business to apply for the incorporation, in order that the result will be used as the reference for amending the Automobile Transportation Business Management Rules

主要研究成果 Main research result

公路法第六十五條建議修正條文草案 Draft of amended clauses for Article 65 of Highway Law.	
修正條文 Amended clauses	汽車所有人應依強制汽車責任保險法之規定，投保強制汽車責任保險。 電車所有人應於申請公路主管機關發給牌照使用前，依交通部所定之金額，投保責任險。 公路汽車客運業、市區汽車客運業與遊覽車客運業，皆應投保旅客責任保險；其最低投保金額，由交通部定之。未依規定投保乘客責任保險者，處新臺幣十萬元以上五十萬元以下罰鍰。 經營計程車客運業、計程車客運服務業，應投保旅客責任險；其最低投保金額與實施辦法由交通部定之。（新增） The car owners must secure the Compulsory Automobile Liability Insurance pursuant to the regulations of Compulsory Automobile Liability Insurance Law. Before applying for the license from the competent highway authority, the motorcycle owner shall secure the liability insurance according to the amount stipulated by MOTC. The highway automobile passenger transportation business, city automobile passenger transportation business and limousine passenger transportation business shall secure Passenger Liability Insurance and the minimum premiums shall be stipulated by MOTC. If failing to secure the required Passenger Liability Insurance, then the offender shall be imposed with a sum of NTD100,000 up to NTD500,000 as the penalty fine. The operator is required to secure Passenger Liability Insurance when running taxi passenger transportation business or taxi passenger service business, and the minimum premiums and the execution method shall be stipulated by MOTC. (Addition)
說明 Description	新增第四項，鑒於現行「計程車客運服務業申請核准經營辦法」第六條規定，申請經營派遣業務（車隊）者需投保每人新台幣一百五十萬元以上的旅客責任險，意即現行交通部已強制「車隊計程車」投保乘客責任險，但目前僅有 38% 的車輛加入車隊，換言之，全國民眾有 6 成的機率搭到未有乘客險的車輛，無法受到保障，爰此新增本條第四項，使經營計程車客運業、計程車客運服務業，皆應投保旅客責任險，使所有搭乘計程車民眾都能獲得保障。 Added Item 4. In Article 6: “Operation Approval Method for Taxi Passenger Service Business”, it specifies that the businesses applying for the dispatch business (The fleet business) must secure the Passenger Liability Insurance in coverage amount over NTD1,500,000.00 for each person and it means that the “fleet taxi business” is required by MOTC to secure the Passenger Liability Insurance. However, only 38% of vehicles have joined the fleet business by now and it means that nearly 60% of taxis used by ordinary passengers in Taiwan are not provided with the Passenger Liability Insurance. Due to this reason, Item 4 is added in this article to stipulate that the companies running the taxi passenger transportation and taxi passenger service business should secure the Passenger Liability Insurance in order to protect the passengers when using the taxi as transportation tool.



小客車風險群體任意汽車第三人責任險 (體傷) 五年損失率

5-year loss rate of random automobile third party liability insurance (bodily injury) for private car risk group

（三）臺北都會區至宜蘭地區多點國道客運路線需求調查分析暨假日景點公車路線之檢討規劃

1. 研究成果

(1) 為了解決宜蘭地區假日壅塞的狀況，在本研究計畫中，本所協助宜蘭縣政府透過問卷調查，針對台北都會區至宜蘭地區多點國道客運路線需求進行分析及檢討，進而對現有國道客運進行調整。其次，依據各路線與景點之需求分布狀況，進行縣境內假日景點公車路線調整與規劃，並將其結果繪製成捷運路網圖及標註沿途景點以方便民眾參閱，以期更能符合民眾之需求。

(2) 本研究計畫之成果已實際應用於宜蘭縣境內路線調整規劃，並於 105 年 7 月起實際執行，其成效顯示運量已有顯著的改善，未來再進行推廣時更能以此作為典範，可提供交通部各相關單位及各縣市政府強化公共運輸發展施政之重要參考依據，更可以提供公路及市區客運業者或其他相關產業做為規劃、輔助日常營運資料參考。

(III) Multi-point investigation and analysis for freeway- passenger route demand from Taipei Metropolitan Area to I-Lan Area & the review and planning for the scenic bus route during holidays

1. Research result:

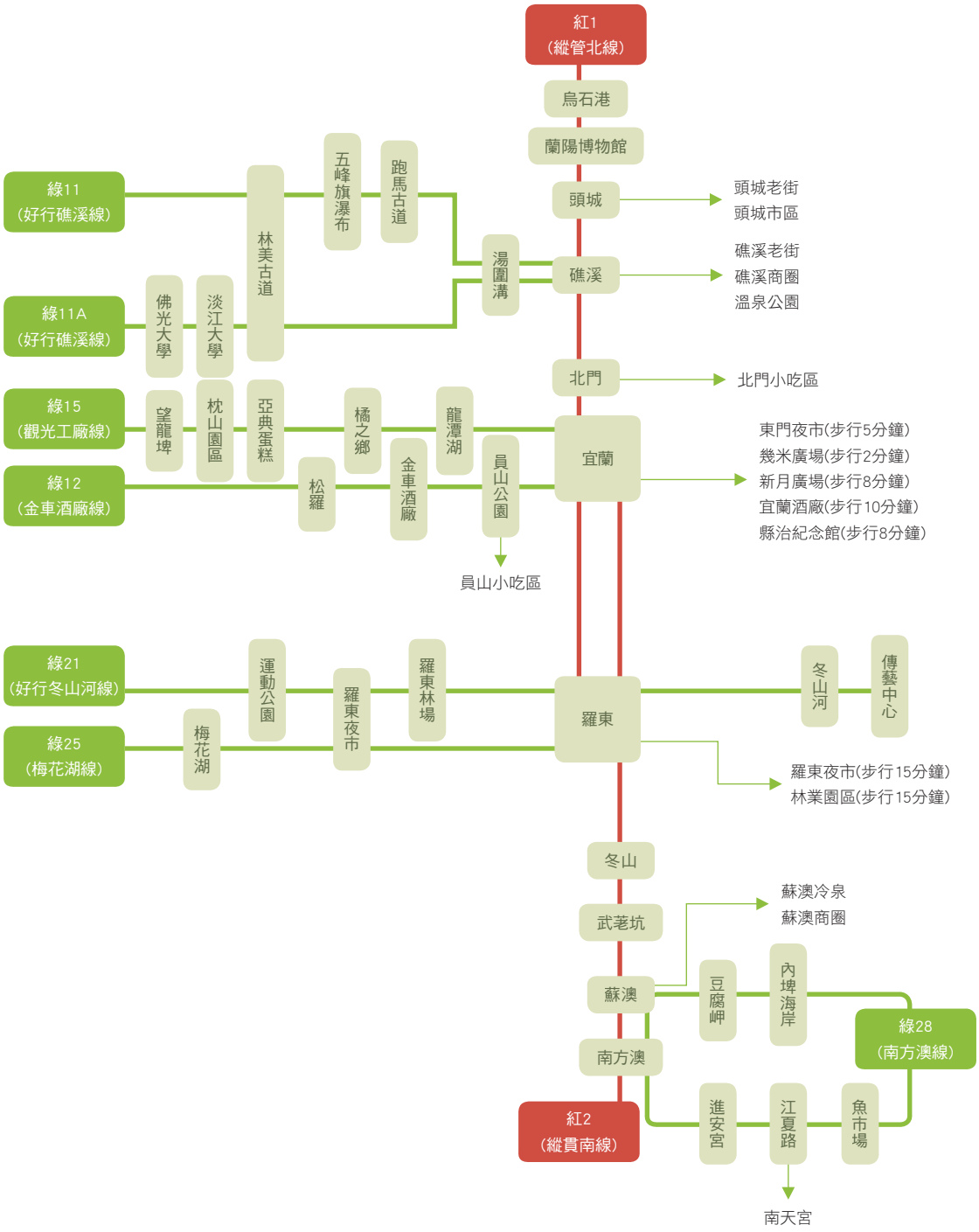
(1) To solve the congestion problem in I-Lan area during holidays, we helped I-Lan County Government to carry out multi-point analyze and review for freeway passenger transportation route demand from Taipei Metropolitan Area to I-Lan Area through questionnaire survey in order to adjust the status of passenger transportation on the freeway. Based on the demand distribution of each route and scenic spot, the scenic bus route in I-Lan County during holidays was adjusted and planned. So far we have drafted the results into the MRT Network Map, where the scenic spots along the way are also marked for an easier reference by passengers, in order to satisfy their true demands.

(2) By now, the result obtained in this research plan has been applied to the bus routes in I-Lan County for further adjustment and planning. Starting from July 2016, it has been put into operation and has demonstrated significant improvement in transportation capacity. Therefore, it can be used as the model example for the promotion in the future in order to provide important reference for the competent agencies under MOTC and the respective county (city) government in strengthening their development of public transportation. In the meantime, the highway and city passenger transportation operators or relevant industries can also use it as a reference in planning and supporting their routine operational data.

2. 成果推廣

2. Promotion of result

活動名稱 Activity	對象 Target	活動方式 Method	永續性 Sustainability
北臺區域發展推動委員會「交通管理經驗分享與技術交流合作計畫」 "Transportation Management Experience Sharing & Technical Exchange Cooperation Plan" produced by Northern Taiwan Development Promotion Committee.	地方交通主管機關 Competent local transportation authority	進行簡報將計畫內容推廣予北臺八縣市 Provide briefing for promoting the plan content to these 8 counties and cities in Northern Taiwan.	培育主管機關人力 Educate the manpower of the competent authority
推廣研究計畫產製之「宜蘭縣公車類捷運路網圖」 Promote the "I-Lan Bus-type MRT Network Map" produced according to the Research Plan.	各縣市政府 County/city government	說明並推廣本案績效，並請六大「區域運輸發展研究中心」協助地方政府提案 Explain and promote the performance of this Case and ask six main "regional transportation development research centers" to support local government in submitting the plan.	培育主管機關人力 Educate the manpower of the competent authority



接駁公車整體改善成果

Overall shuttle bus improvement result

（四）交通旅運資訊多元整合服務計畫-都市交通事件資訊發展規劃與實作

1. 研究成果

(1) 本計畫擇定高雄市作為示範標竿城市，完成高雄市轄內各類道路事件資訊通報 / 發布 / 解除納入行政流程作業之機制規劃，整合交通局、工務局、警察局、消防局等跨單位的即時交通資訊，完成跨單位之多元道路事件資訊整合發布平台規劃與雛型系統規劃，截至 105 年底已彙整蒐集高雄市約 80% 道路事件資訊，成為全國性道路事件蒐集與應用的標竿計畫。

(2) 本計畫執行成果可提供各縣市政府交通管理單位作為都市交通事件資訊通報 / 發布 / 解除機制與實作之用，並規劃交通事件資訊整合與發布平台，以提供即時交通事件資訊多元整合服務，促進道路即時資訊的透通與駕駛者之行車便捷性與安全性。

(IV) Diversified transportation travel information integration service plan – planning and practical operation information development for city transportation events

1. Research result

(1) In this plan, Kaohsiung City was selected as the Model Benchmark City. In result, we have completed the followings: The mechanism of incorporating the reporting/ announcing/ releasing of road event information in the administrative process; the integration of cross-sector real-time transportation information from Department of Transportation, Department of Construction, Department of Police and Fire Department; the planning of integration and announcing platform for cross-sector diversified road event information; and the planning of prototype system. Until the end of 2016, we have collected about 80% of road event information in Kaohsiung City and now it has become the Benchmark Plan for the collection and application of nationwide road event.

(2) The competent county/city transportation management authority to report/announce/ release the information of city traffic events can use this plan. In the meantime, it can also be used for planning the traffic event information integration and announcement platform in order to provide diversified integration service for the real-time traffic event information. In result, it will achieve the triggering of real-time road information as well as the convenience and safety for drivers when operating their cars.

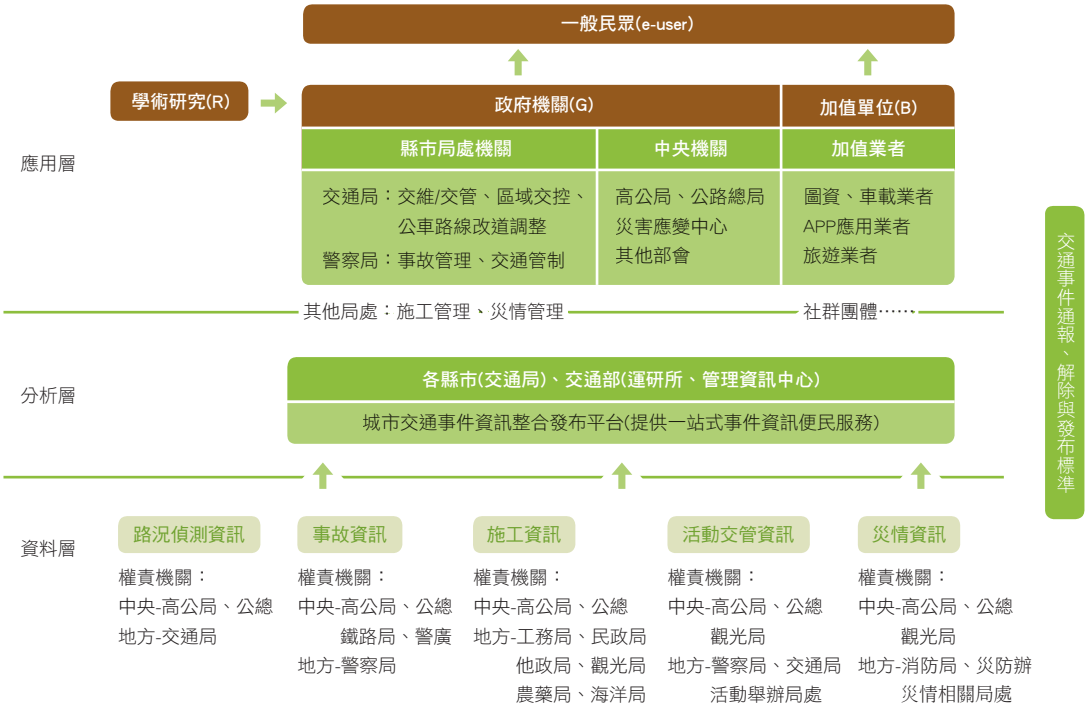
2. 成果推廣

就高雄市示範案例 (預計 106 年底完成) 之推廣應用，擬規劃辦理以下推廣應用活動：

2. Promotion of result

With the promotion application in the model case executed for Kaohsiung City (To be completed by the end of 2017), the following promotion application activities will be planned:

預計辦理時程 Estimated schedule	活動類型 Activity type	預計辦理地點 Estimated execution location	對象 Target	永續性 / 效益 Sustainability / Effect
106 年 5 月 May 2017	都市交通事件標準宣導工作坊 Promotion workshop	運輸研究所 Institute of Transportation, MOTC	高公局、公路總局、高雄市政府、加值應用單位 Taiwan National Freeway Bureau, Directorate General of Highways, Kaohsiung City Government, value-added application unit.	推廣事件標準、廣泛了解加值應用課題所需資訊 Event promotion standard to extensively understand the information required for the value-added application issues.
106 年 12 月 December 2017	研究成果投稿 Submission of research result)	國內外期刊、學術研討會 Local/overseas publication, scholastic seminar	產官學研各界與民眾 Industrial, official, scholastic and research sectors and social public.	宣導計畫成果 Disseminate the plan result
106 年 12 月 December 2017	成果發表會 / 研討會 / 論壇 Result Presentation / Seminar / Forum	高雄市政府 Kaohsiung City Government	中央機關、地方政府、立委助理 Competent central authority, local government, assistants of legislators	宣導計畫成果、輔導地方政府導入事件整合發布平台 Disseminate the plan result; guide the local government in introducing the event integration and announcement platform.
107 年 6 月 June 2018	事件資訊加值應用競賽 Competition of event information value-added application	運輸研究所 Institute of Transportation, MOTC	加值應用單位 Value-added application unit	推廣計畫成果、了解加值應用需求 Promote the plan result and understand the demand for value-added application



都市交通事件資訊匯流概念

Concept in the collection of urban traffic event information

資料產製整合與發布應用效益

Information production, integration and announce the application effect.

（五）先進交通管理與車路整合技術創新應用 (2/4)

1. 研究成果

(1) 延續 104 年計畫成果，在基隆市台 62 銜接基金二路的連續 4 個路口以及國道 1 號大華系統交流道構建實驗場域，透過架設於道路與車輛上的 DSRC 通訊設備進行危險路段、減速 / 施工區、彎道、異常天候、道路標誌指示等交通安全即時警示，以及實驗路段交通壅塞資訊。

(2) 並藉由透過車路整合 DSRC 所廣播之即時號誌時相秒數資料進行路口行人通行與行車闖紅燈警示，以及節能駕駛行車建議等。在交通管理上，在高速公路上發展車流均勻行駛速率的行車建議。

(V) Innovation and application of advanced transportation management and road integration techniques (2/4)

1. Research result

(1) By succeeding the plan result of 2015, a number of 4 road junctions connecting Tai-#62 Route at Keelung City and Keejing 2nd Road as well as Dahwa System interchange at #1 Freeway were selected as the experiment location for conducting the real-time traffic safety warning as well as displaying the traffic congestion information at the dangerous section, low-speed/construction area, curve section, abnormal weather and road signage area with the DSRC communication equipment installed beside the road and on the vehicle.

(2) Based on the live time-phase signal duration data which is broadcasted by the integrated road DSRC, the pedestrian passing and red light running warning together with energy-conservation driving are also proposed. In transportation management, present the suggestions for developing the running speed in achieving uniform traffic flow along the freeway.

2. 成果推廣

(1) 本計畫執行成果在 105 年科發基金「中興新村『智慧運輸 - 車聯網』示範場域規劃建置」計畫在車聯網部分沿用。

(2) 105 年計畫執行過程辦理 3 場論壇與 1 場成果發表會。

2. Promotion of result

(1) The execution result will be planned and implemented in the model site contained in "Zhong Shin New Village Smart Transportation – Internet of Vehicle" established by Scientific Development Fund in 2016 and it will be used on Internet of Vehicle.

(2) In 2016, we have conducted 3 sessions of forum and 1 session of Result Presentation during the plan execution process.

辦理時程 Estimated schedule	活動類型 Activity type	辦理地點 Estimated execution location	對象 Target	永續性 / 效益 Sustainability / Effect
105/7/6	運輸需求面論壇 Transportation Demand Aspect Forum	運輸研究所 Institute of Transportation, MOTC	公部門 Official agency	介紹車路整合在交通安全與交通資訊應用，蒐集公部門對此科技應用需求 Introduce the road integration in the application of traffic safety and traffic information, and collect official agency's application demand for such technology.
105/7/20	第 1 次產業論壇 1St Session of Industrial Forum	運輸研究所 Institute of Transportation, MOTC	運輸領域與機車 / 雷達之產業界 Transportation and motorcycle/radar industry	介紹本所前期車路整合成果，蒐集產業界意見 Introduction of road integration result in previous session and collect the opinions from the industry.
105/10/20	第 2 次產業論壇 2nd Session of Industrial Forum	運輸研究所 Institute of Transportation, MOTC	運輸 / 導航 / 電子等領域之產業界 Competent central Transportation, navigation and electronic industries	介紹本所前期車路整合成果，蒐集產業界意見 Introduction of road integration result in previous session and collect the opinions from the industry.
105/12/26	成果發表會 Result Presentation	運輸研究所 Institute of Transportation, MOTC	公部門與產業界 Official agencies and industrial sector	介紹本案計畫成果 Introduction of the plan result

- 驗測場域擴充
  - 以前期驗測場欲為基礎進行擴充
  - 涵蓋高快速公路上4公里區域範圍
  - 包括交流道等易造成瓶頸區域
- 驗測情境
  - 交通服務類：
    - 路徑導引、旅行時間、路況影像、交通標誌、交通資訊蒐集
  - 交通安全類：
    - 前方交通壅塞資訊、多事故路段警示道路施工與障礙物、異常天候資訊、緊急路況資訊
  - 交通管理類：
    - 車流均勻建議速度
  - 節能減碳類：
    - 應用SPaT節能駕駛
- 驗測設備
  - 雛型平台
  - ITRI RSU/OBU
  - Cohda RSU/OBU

車路整合運作驗測場域

Road integration and operation examination site

- 號誌時相秒數資訊輔助節能駕駛
  - 畫面顯示即時路口時制與剩餘秒數、路口距離、瞬時燃油效率、平均燃油效率與建議速度，每一秒更新一次，建議速度部分以色區分為
    - 紅色：減速
    - 綠色：定速
    - 藍色：加速
- 均勻車流速度建議
  - 道路分段：每250公尺劃分為一路段，同時依據RSU通訊的範圍，將每個路段分配給個別的RSU負責，RSU以固定的週期(如每30秒)計算每個路段的平均車速。
  - 依據相鄰兩路段的速差決定給予壅塞警示或建議速度的判斷條件
    - 上下段速差>30km，表示有危險，應該給予前方壅塞警示，提醒駕駛煞車。
    - 上下段速差<30km，依據速差給予建議速度。
  - 當路段車速達到壅塞條件(例如連續2個30秒週期，平均車速低於60km)，RSU會發布道路壅塞事件警示。
  - 當給予的建議速度與行駛車速差距>10km，利用語音提醒駕駛加速或減速

節能駕駛行車與車流均勻行駛數率建議

Suggestions in energy saving driving and running speed in achieving uniform traffic flow.

（六）研發成果智財權管理推廣與交通科技知識分享服務

1. 研究成果

本計畫針對本所105年度創新研發成果進行智財權研究，提供專利申請與技術授權協助，並配合國內交通科技發展主題完成專利地圖分析。此外，本計畫完成本所知識管理系統資料庫更新維護作業，並與交通領域相關公、協會洽談知識文獻授權分享，連同本所交通科技研究計畫成果與上揭專利地圖分析成果，彙整於「交通科技知識分享服務網」提供知識分享服務。105年度主要成果如下：

(1) 完成「區域公共運輸服務環境評估系統」專利技術授權，獲授權金7萬5000元。

(2) 完成「車隊營運管理系統」、「交通資訊發佈系統」及「橋梁管理資訊系統及其方法」等3項專利申請事宜。

(3) 完成安全駕駛計費保險(Usage-Based Insurance, UBI)相關技術專利地圖分析及成果發表會。

(4) 完成中興工程顧問社「中興工程季刊」授權本所「交通科技知識分享服務網」提供知識文獻分享。

(5) 完成「交通科技知識分享服務」網頁維護更新，提供最新交通科技相關資訊與文獻查詢服務。

(6) 辦理完成「智慧財產權」相關議題教育訓練課程1場次。

(VI) Promotion of intellectual property right management for the research result and the sharing of transportation technological knowledge

1. Research result

The research of intellectual property right was conducted for 2016 innovation research result in order to provide the assistance in applying for the patent and technical authorization. So far we have completed the analysis of patented maps by coordinating with the subject in domestic transportation technological development. In the meantime, we have also completed the updating and maintaining work for the database of our knowledge management system. Furthermore, we have also discussed with the transportation related official and private associations for negotiating the knowledge and literature authorization and sharing. Together with the result of our transportation technological plan and that of the aforesaid patented map analysis, the result was incorporated in "Transportation Technology Knowledge Sharing Service Net" in order to provide the knowledge sharing services. Listed below are main result completed in 2016:

(1) Completed the authorization of patented technology for "Environment Assessment System for Regional Public Transportation Service", with NTD75,000 of loyalty awarded.

(2) Completed the application for the following 3 patents, i.e. "Fleet Operation Management System", "Transportation Information Announcing System" and "Bridge Management Information System & Method"

(3) Completed the analysis of technical patented map and the Result Presentation for UBI (Usage-Based Insurance).

(4) Completed the authorization of "CECI Journal" to the "Transportation Technological Knowledge Sharing Service" for sharing the knowledge and literature.

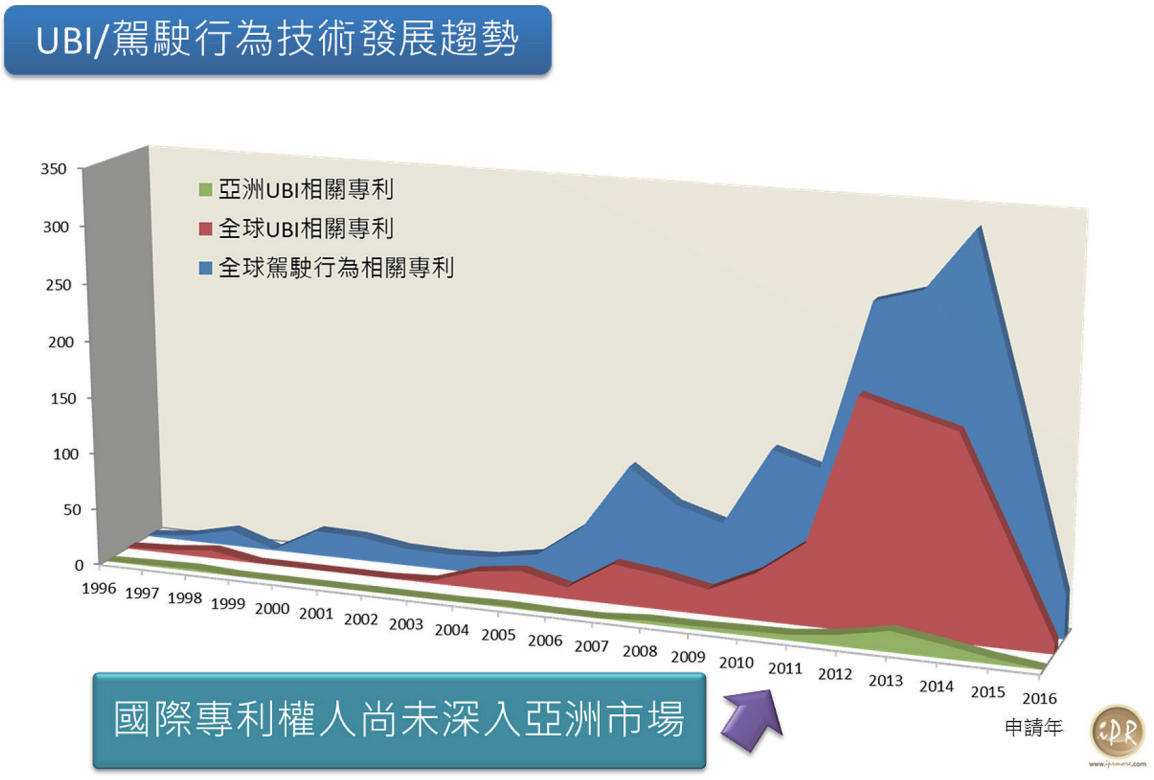
(5) Completed the maintenance and updating of "Transportation Technological Knowledge Sharing Service" page in order to provide the latest information regarding transportation technology and the literature checking services.

(6) Provided one session of education and training courses for the "Intellectual property right"

2. 推廣成果

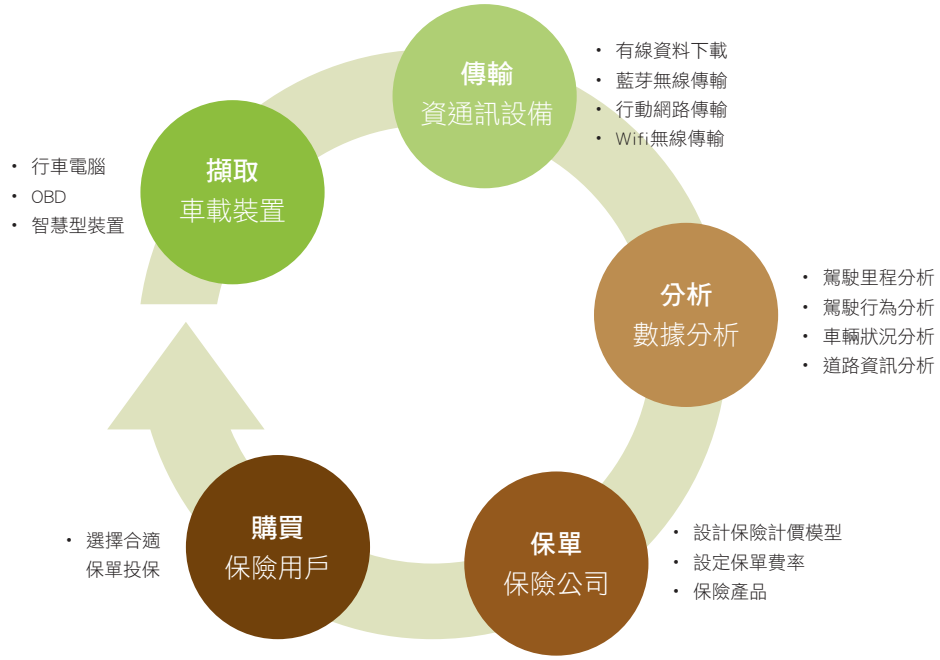
2. Promotion of result

辦理時程 Schedule	辦理地點 Event Location	服務對象 Service Target	活動類型 Activity type	效益 Effect
105 年度 2016	運輸研究所 Institute of Transportation, MOTC	交通領域產官學研各界人員 Representatives from the transportation-related industry, official, academic and research sectors.	1. 針對智慧交通技術專利地圖分析成果，辦理成果推廣說明會。 2. 針對本所專利技術，辦理授權應用推廣說明會 1. Conduct Result Promotion Seminar for the analysis result obtained from the patented map of smart-based transportation technology. 2. Conduct Authorization Application Promotion Seminar for the patented technical developed by this Institute.	1. 增進國內產官學研各界了解智慧交通產業科技技術發展趨勢。 2. 提升本所專利技術成果推廣應用績效。 1. Allow the industrial, official, scholastic and research sectors to understand the technical development of the smart-based transportation industrial technology. 2. Elevate the application performance in the promotion of patented technology developed by this Institute.



駕駛行為計費保險 (Usage-Based Insurance, UBI) 專利技術發展趨勢

Technical development trend for UBI (Usage-Based Insurance) patent.



駕駛行為計費保險 (Usage-Based Insurance, UBI) 技術供應鏈

UBI (Usage-Based Insurance) technical supply chain.

四、運輸安全

（一）道路交通安全管理 (ISO 39001) 規範之評估及推廣

1. 研究成果

(1) 本所於 104 年就 ISO 39001 規範內容進行瞭解，並於同年 10 月輔導首都客運通過 BSI(英國標準協會) 台灣分公司驗證，業者可透過「P(規劃)、D(實施)、C(檢查)、A(執行)」之循環過程，持續發掘公司內部作業風險並改善。

(2)105 年則延續進行該規範之評估及推廣，瞭解及評估首都客運將該規範導入其內部管理之執行績效，並持續輔導桃園客運及亞慶物流兩家運輸業者導入，建立道路交通安全管理系統之相關資料，期能協助運輸業者提升自我安全管理能力。

(3) 完成運輸業者導入 ISO 39001 規範之課程規劃，以及教材編撰和相關表單設計，後續可提供輔導機構協助運輸業者，或由運輸業者自行導入該規範時予以運用。

2. 成果推廣

(1) 持續輔導運輸業者，並培養其他具有輔導運輸業者導入能力之機構，以加速推廣 ISO 39001 規範。另綜整輔導運輸業者之資料及經驗，研擬導入 ISO 39001 規範之參考手冊，以利運輸業者瞭解該規範並導入公司內部管理。

(2) 研提 ISO 39001 規範推廣方法，分階段透過納入評鑑、補助業者申請驗證、列入路線申請或虧損補貼審核之必要條件、法規強制業者建立安全管理系統等方式，逐步提升業者管理能力。

IV. Transportation Safety

(I) Assessment and promotion of Road Transportation Safety Management Specification (ISO 39001)

1. Research result

(1) In 2015, we studied the content ISO 39001 standard for further understanding. In October of the same year, we guided Capital Bus Co., Ltd. to pass the verification conducted by BSI Taiwan Branch Office. Based on the cycling procedure of P (Plan), D (Detect), C (Check) and A (Action), the operator will be allowed to discover the risks of its internal operation and make continuous improvements.

(2) In 2016, the assessment and promotion provided in the aforesaid standard will be conducted continuously in order to understand and assess the execution performance of Capital Bus in introducing such standards in its internal management. In the meantime, we also guided Taoyuan Bus Co., Ltd. and A-Kin Alliance Logistics Corp., the transportation operators, for introducing the aforesaid process in order to set up the data required for the Road Transportation Safety Management System. In this way, we may help the transportation operators to enhance their ability in self-safety management.

(3) We have helped the transportation operators introduce the program planning for ISO 39001 as well as the teaching material compilation and table design. In the future, it will be provided to the instruction unit for helping the transportation operators or used by the transportation operator after introducing such standards.

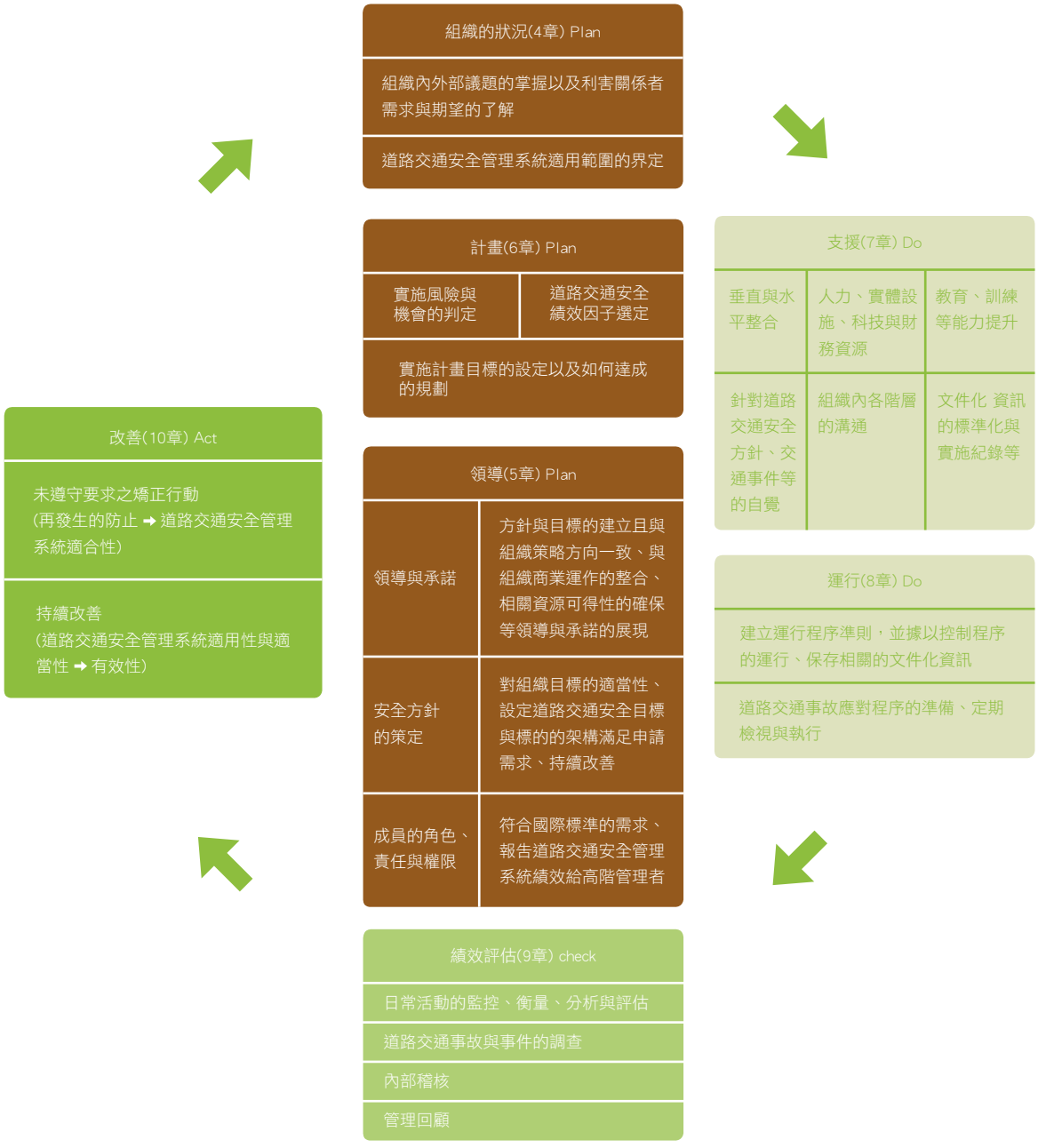
2. Promotion of result

(1) Guided the transportation operators continuously and set up other mechanisms that can help the transportation operator introduce the aforesaid standard in order to speed up the promotion of ISO 39001. Based on the data and experiences in guiding the transportation operators, we developed a referential manual required for introducing ISO 39001 for the transportation operators to comprehend such standard and then introduced it into the internal management.

(2) We studied and developed the promotional method for ISO 39001 in order to enhance the operator’ s management ability. For example, covered in the assessment in separate stages, subsidizing the operators in applying for the verification, including the preconditions required for route application or deficit subsidy review, as well as requiring the operators to set up Safety Management System by the law, etc.

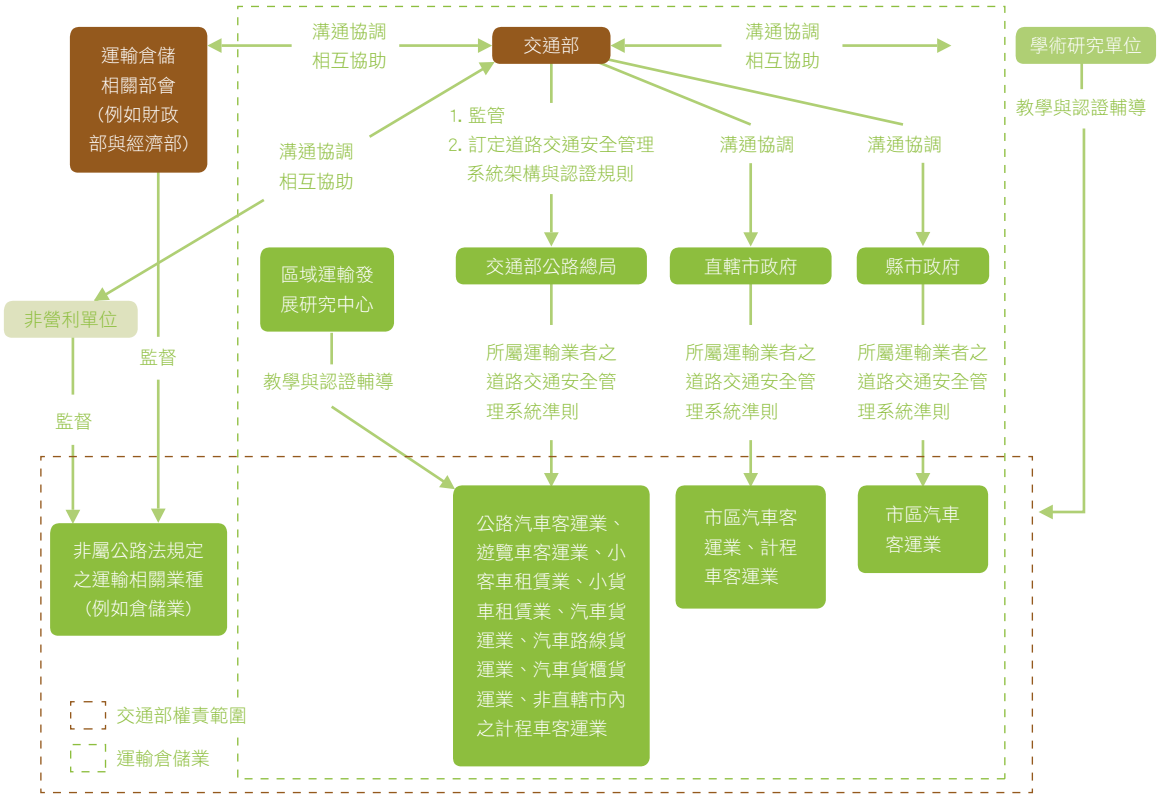
(3) 舉辦推廣說明會，向政府機關、運輸業者及相關單位說明 ISO 39001 規範之內容、推動方式及導入經驗分享，讓運輸業者更加瞭解該規範內容，並作為是否導入之參考。

(3) Conducted promotional seminar for explaining the content of ISO 39001 to government agencies, transportation operators and the units involved as well as the promotional method and the experience sharing, hoping that the transportation operators will get deeper understanding of the specification and use it as the reference for introducing.



ISO 39001 之 PDCA 流程

PDCA Process of ISO 39001



各單位在推動道路交通安全管理系統之關係

Relationships between different units in promoting the Road Transportation Safety Management System.

（二）混合車流情境路口交通工程設計範例

1. 研究成果

(1) 我國的機車數量與持有率皆高，早已成為國人主要交通型態，同時機車肇事也占有極高的比例。本研究即針對混合車流情境下各種常發生的肇事型態，進行交通工程設施設計的改善，同時建立設計範例。105年就路口側撞事故型態，進行肇事診斷分析，研提改善示範案例。

(2) 針對路口常見的左轉彎側撞事故，在道路寬度充裕，汽機車衝突量大，且機車左轉量大，機車左轉待轉區無法容納的路口，研議可設置機車左轉專用車道的整體規劃設置方案以及相關設置條件。

2. 成果推廣

(1) 後續將研選合適試辦路口，研提改善試辦計畫，並進行路口實地改善驗證。

(2) 研究驗證成果將於各期臺灣地區易肇事路段改善計畫中，於各肇事地點之分析與改善會勘工作中推廣應用。

(3) 舉辦教育訓練說明會，向各級道路主管機關、各交通工程顧問公司及相關單位說明改善適用條件與交通工程配套設計。

(II) Example of road junction transportation engineering design for the mixed traffic flow scenario

1. Research result

(1) Taiwan is now experiencing a higher number and ownership of motorcycles, and it has become the primary traffic pattern for people in Taiwan. In the meantime, the motorcycle accident also accounts for extremely high percentages. Aiming at the accident type frequently seen under the Mixed Traffic Flow Scenario, this research proposed the improvement method for the design of transportation construction equipment while establishing the design sample. In 2016, the accident diagnostic analysis was conducted for accidents caused by side impact at the junction in order to submit the model improvement examples.

(2) Aiming at the left-turn side impact accident frequently seen at the junction, the solutions and conditions for setting up motorcycle left-turn lane are planned for the road junction subjecting to sufficient road width, frequent motorcycle impact and massive motorcycle left-turn and where the left-turn waiting zone is not allowed.

2. Promotion of result

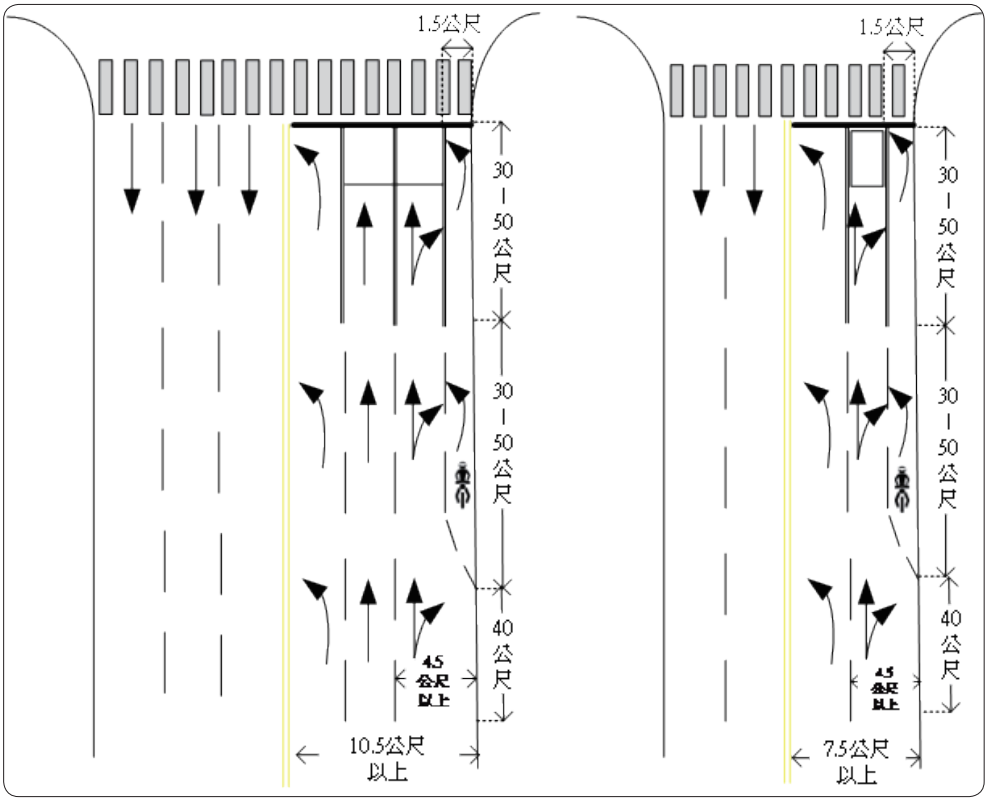
(1) In the future, suitable road junctions will be selected for studying the improvement trail execution plan in order to verify the improvement at the road junction.

(2) The verification result will be included in the respective Frequent Accident Section Improvement Plan in the Taiwan Area in order that it will be promoted and applied in the analysis and joint improvement inspection at the accident location.

(3) Conduct the education & training seminar for reporting the applicable improvement conditions and the transportation project package design to the respective level of the competent authority, transportation construction consultant and the units involved.

左轉機車量過大，左轉待轉區無法容納

Massive number of left-turn motorcycles that is beyond the capacity of left-turn waiting zone.



機車左轉專用道設計

Motorcycle left-turn specific lane design

（三）機車危險感知學習工具開發與應用

1. 研究成果

(1) 結合情境學習、嚴肅遊戲、角色扮演等學習理論，運用平板、手機等行動載具，以年輕新手駕駛為使用對象，配合院頒方案重點訴求「讓車」為學習主題，在不同遊戲路線中設計讓車的風險情境，完成機車安全駕駛學習之互動遊戲軟體設計及開發製作。

(2) 以實驗設計方法，就學習認知、學習行為、心流、學習態度等進行成效評估。初步實驗發現年輕族群透過機車駕駛遊戲系統學習後，在機車安全認知知識程度方面有提升效果，在機車駕駛行為方面也有錯誤導正的效果，顯示機車遊戲系統具有正向之學習成效。

2. 成果推廣

(1) 106 年預定持續就遊戲系統進行改善擴充外，並規劃辦理校園推廣活動，包括宣傳會、競賽活動等，鼓勵高中職、大專院校學生組隊參加比賽，並規劃透過 Facebook 社群網路進行訊息擴散，提升遊戲系統之知名度。

(2) 與監理機關、駕訓班、機車業者或安駕中心等單位合作，於其訓練、講習或教育宣導作業中導入本遊戲 APP。106 年預定與第 12 期院頒方案先導型補助計畫核定之監理單位嘉義區監理所合作，協助於其講習班進行試辦。

(III) Development and application of motorcycle danger sensing learning tools

1. Research result

(1) It combines the learning theory in scenario learning, serious game and role acting supported with tablet and cell phone mobile carriers in which the young novice drivers are selected as the target. By using "Yielding traffic", which is the main appealing point in the solution announced by the Executive Yuan, and the yielding traffic risk scenario designed for different game routes, the design, development and production are completed for the interactive game software required for the safe motorcycle driving learning.

(2) The effect is assessed for the learning comprehension, learning behavior, and the mindset and learning attitude according to the method designed for the experiment. The initial experiment result indicated that after learning the motorcycle driving game system, the level of comprehension for the motorcycle safety is enhanced in younger groups. As for the motorcycle driving behavior, it also achieved error correction effectiveness, and it justifies the positive learning effect for the motorcycle game system.

2. Promotion of result

(1) In addition to continuous improvement and expansion for the aforesaid game system in 2017, the school promotional activities will be conducted as well, including the dissemination and competition activities, etc. in order to encourage the senior high, vocational senior high and college students to organize their teams for participating in the competition. In the meantime, we will also plan the message spreading through Facebook community network in order to elevate the awareness of the game system.

(2) We will also cooperate with the vehicle administration agency, driving training centers, motorcycle manufacturers and safe driving promotion centers in order to introduce the game APP in their training, lecturing or educational and promotional activities. In 2017, we plan to cooperate with Chiayi Area Vehicle Administration Office approved according to the Pilot Subsidy Plan contained in Term 12 solution announced by MOTC for helping such units to conduct the training at its Workshops.

機車安全駕駛學習遊戲

Motorcycle safety driving learning game

機車駕駛第一人稱視角之遊戲場景

Game scene for first person vision in motorcycle driving

（四）交通事故傷害資料蒐集體系建構及應用 (1/2)

1. 研究成果

(1) 提出我國交通事故傷害嚴重度的定義，以是否住院 24 小時做為輕傷和重傷的標準，在有限的處理時效內能正確且立即分辨傷者傷害嚴重度。使交通事故輕重傷件數得以區分，並提供交通、醫療及急救部門研擬減少傷害嚴重度的對策。

(2) 由新北市消防隊及合作醫療院所完成蒐集交通事故傷害資料的流程評估，未來可朝建立由員警、緊急救護技術員及醫護人員的分工以建立資料蒐集體系，使事故傷害的資料能更完整及具時效性，以提供數據分析基礎。

(3) 完成影響機車事故傷害嚴重度的初步樣本分析，重覆受傷的高發生率、3C 產品的使用、藥物的使用及某些駕駛行為及習慣，與傷害嚴害度都有相當程度的相關。可提供醫療部門、民眾瞭解機車駕駛危險的因子，透過行為矯正以減少交通事故風險。

(IV) Implementation and application of injury data collection system for traffic accident (1/2)

1. Research result

(1) Submit the definition of severity for the traffic accident injuries in Taiwan where the 24-hour hospitalization will be based for determining minor and serious injuries in order to immediately distinguish the severity of the injury within the limit processing time. In this way, the number of minor and serious injuries caused by traffic accident can be defined in order to provide the traffic and medical treatment. Furthermore, it will help the rescue department develop the correct measures for reducing the severity of injury.

(2) The assessment will be conducted according to the traffic accident injury data process established by New Taipei City Fire Squad and the collaborate hospitals/clinics. In the future, it is hoped that a job delegation system could be established for the police, emergency rescue technician and medical person in order to set up a sound data collection system. In this way, we may achieve more complete and more time-demanding accident injury data to provide a foundation for data analysis.

(3) Complete the initial sample analysis that will affect the severity of injury caused by motorcycle accidents. In the meantime, the repeated higher injury probability, the use of 3C product, the use of drugs, the driving behavior and the habitude, as well as the injury severity are also closely concerned. Allow the medical unit and social public to understand the hazardous factors in motorcycle driving in order that such behavior could be corrected to minimize the risks of traffic accidents.

2. 成果推廣

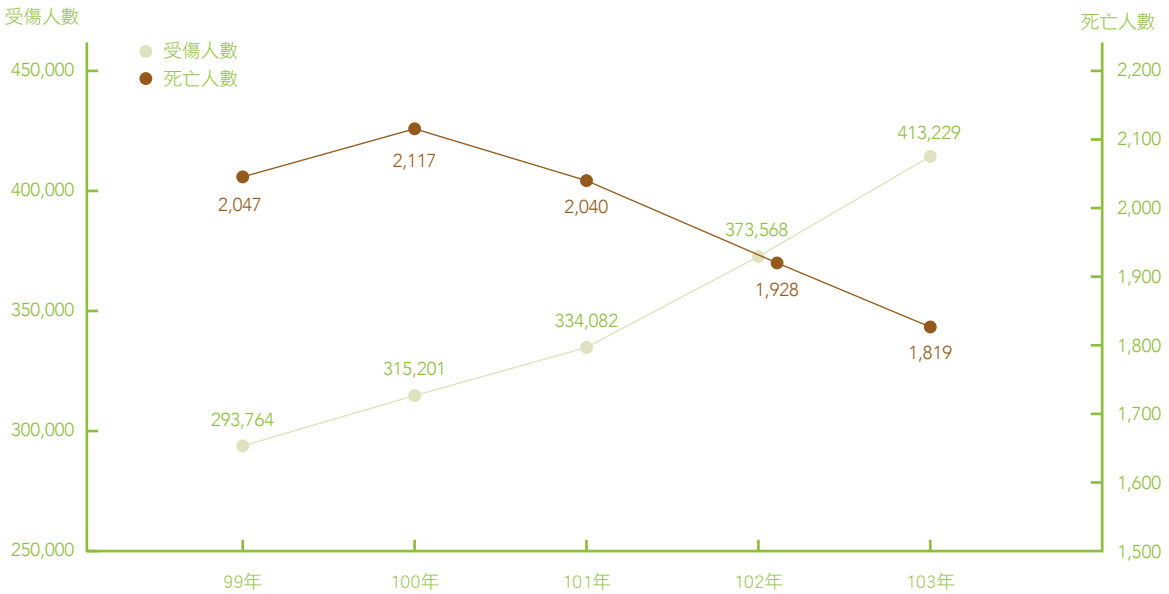
(1) 106 年預定透過研究成果的發布及宣導，期盼引發民眾、利害關係人及團體對切身權益的關注，與政府部門就機車安全議題合作及投入資源，成為宣導教育的力量來源。

(2) 106 年持續進行合辦研究計畫「交通事故傷害資料蒐集體系建構及應用 (2/2)」，持續與醫療院所、警政機關合作蒐集資料，並擴大分析機車事故傷害嚴重度的樣本，以深化前期研究成果，提出更具體的機車事故危險因子。

2. Promotion of result

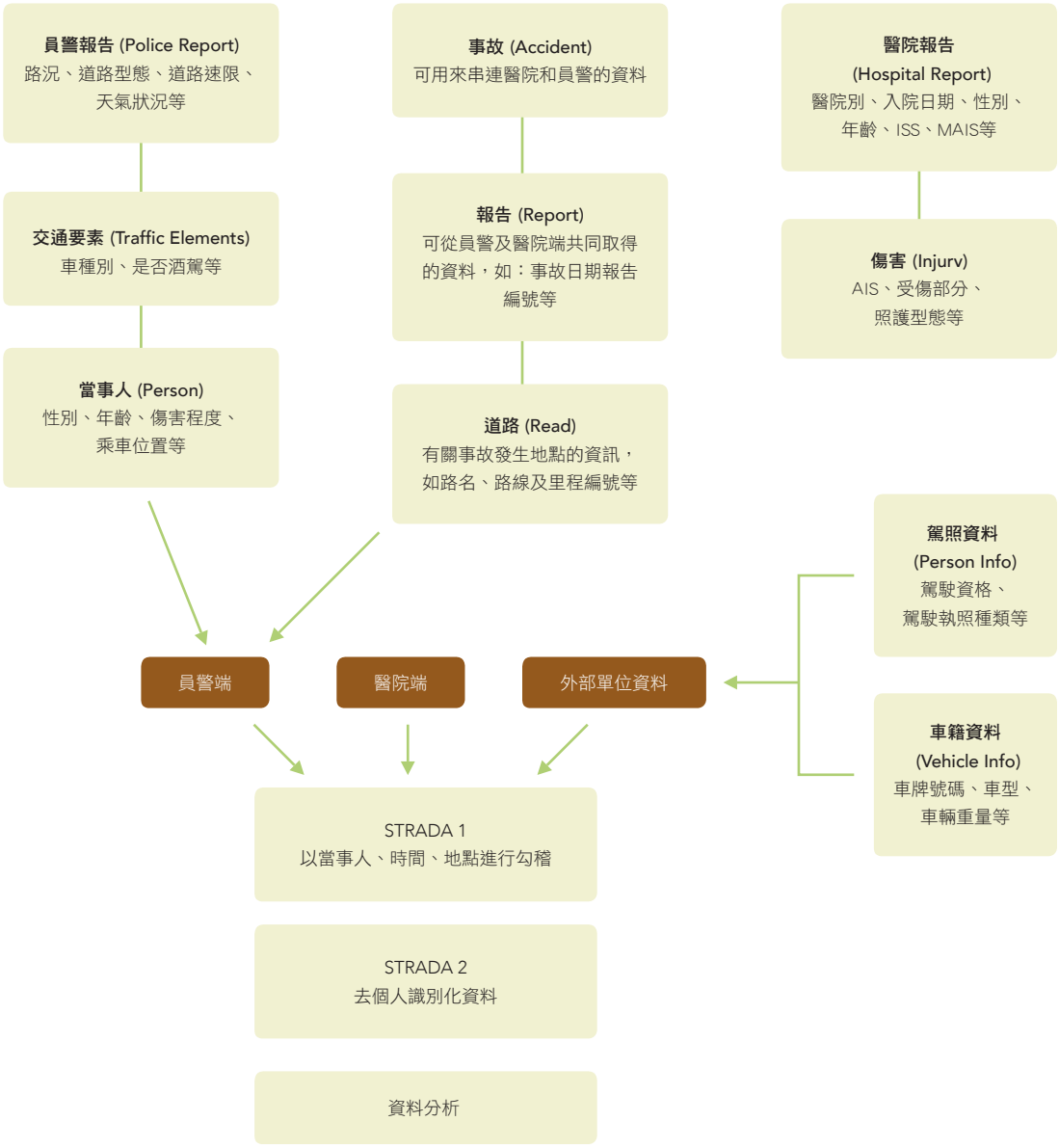
(1) Through the announcement and dissemination of research results in 2017, we hope that it will inspire the concern of people, stakeholders and groups for their own interest so that they will cooperate with the competent government agencies in dealing with the motorcycle safety issues and contribute the required resources. To this extent, they may serve as the supporting source for promotional education.

(2) In 2017, we will continue the joint research plan for the “ Implementation and application of injury data collection system for traffic accident (2/2)” in order that we may cooperate with the medical facilities and police agency to collect data and execute wider analysis of injury severity samples relating to the motorcycle accident. In this way, we may obtain more intensive result from the existing research in order to present more realistic hazardous factors for motorcycle accident.



歷年道路交通事故趨勢

Historical road traffic accident trend



蒐集體系示意圖 (瑞典建立架構)

Collection System Schematic (The structure established by Sweden)

五、交通大數據應用

（一）海量資料分析於交通建設計畫審議決策之應用服務

1. 計畫概述

自 98 年起本所開始執行運輸部門中長程公共建設發展作業評估，配合國家政策及發展方向，辦理整體運輸發展藍圖及決策支援系統之相關規劃作業，建置「運輸部門中長程計畫審議決策支援系統」與整合型資料庫，並於 100-105 年間持續維護該決策支援系統，並提升系統運作效能，藉由更新運輸系統基礎資料與圖資，累積相關經驗與知識，進而強化支援決策品質與速度。

2. 研究成果

(1) 運輸規劃整合資料庫：辦理運輸規劃所需之 GIS 圖資、社會經濟資料、運輸營運資料、運輸需求模式、研究專區等資料庫建置與更新。

(2) 運輸部門決策支援系統：提供網路平台介面供使用者運用整合資料庫相關資料，提供縣市趨勢分析、計畫研析、數據庫、知識庫、統計地圖及系統管理等功能。

(3) 運輸規劃展示及出圖系統：以 SuperGIS Desktop 為基礎彙整交通基礎圖資、底圖、參考圖、主題圖、應用擴充模組等客製化圖層集，提供快速產製相關研析工作所需空間圖資。

V. Application of Transportation related Big Data

(I) Application of capacity data analysis in the review decision for the transportation construction plan.

1. Overview

Since 2009, we started the assessment of the long-term and mid-term construction development for the competent transportation authority. Based on the country's policies and development direction, we provided the planning service for plotting the blueprint of overall transportation development and the decision support system in order to implement the "Long-Term & Mid-Term Plan Examination Decision Support System for the Competent Transportation Authority" and the integrated database. During 2011~2016, we continued our service in maintaining the aforesaid decision support system in order to enhance the system operation efficiency. It is hoped that practical experiences and know-how could be accumulated through the updating of fundamental data and drawings in order to strengthen the quality and the speed of the decision support system.

2. Research result

(1) Integrated database for transportation planning: Implemented and updated the database required for the transportation planning such as GIS drawing data, social economic data, transportation operation data, transportation demand mode and special research area, etc.

(2) Decision support system for the competent transportation authority: Provided the network platform interface for the users to employ and integrate the data contained in the database as well as provided the functions required for the county/city trend analysis, plan analysis, data bank, knowledge bank, statistical map and system management, etc.

(3) Transportation planning related demonstration and drawing production system: The SuperGIS Desktop is used for collating the custom-made photo-shop set such as the fundamental transportation drawing, transparencies, referential drawings, thematic drawings and application expansion module, etc. in order to provide speedier function to produce the spatial drawings required for the research and analysis.

3. 成果推廣

(1) 本計畫已持續與其他機關系統平台資源共享 (包括：內政部 TGOS，交通部資訊中心 GIS-T 與交通數據匯流平台，鐵工局鐵道網，營建署永續生活圈建設評估管理作業與地區運輸模型規範，本所綜技組氣候變遷評估指標展示及運輸部門節能減碳策略評估整合資訊等平台)，後續將滾動檢討整合分享之圖資與數據。

(2) 106 年度計畫期中、期末審查會議邀請交通部部屬單位 (含鐵、公路主管機關) 參與審查。

(3) 於 106 年 6 月 2 日假逢甲大學辦理成果推廣，邀請交通部部屬鐵、公路管理機關，中彰投雲嘉 6 縣市政府運輸規劃相關單位，逢甲大學智慧運輸與物流創新中心、中區區域運輸發展研究中心，介紹計畫成果與應用案例說明。

(4) 於運輸學會 2016 年年會暨學術論文研討會發表「運輸部門決策支援系統效能提升介紹」，及於 2017 工程永續與土木防災研討會發表「運用文字探勘技術於交通建設計畫輿情分析初探」，讓外界瞭解並參考應用。

3. Promotion of result

(1) By now, this Plan is now shared by the system platform resources of other agencies (Including the following platforms: TGOS by Ministry of the Interior, GIS-T and transportation data conglomerating platform by MOTC, railway network by Railway Reconstruction Bureau, sustainable life circle construction assessment management and regional transportation model specified by Construction & Planning Agency, demonstration of climate change assessment indicator, as well as the integrated assessment information for the energy conservation/carbon reduction strategy assessment). In the future, we will continuously integrate the secured drawings and data by means of scroll review.

(2) We invited the agencies (Including competent railway and highway authorities) under MOTC to participate in the "2017 Plan Mid-Term & End-Term Review Meeting".

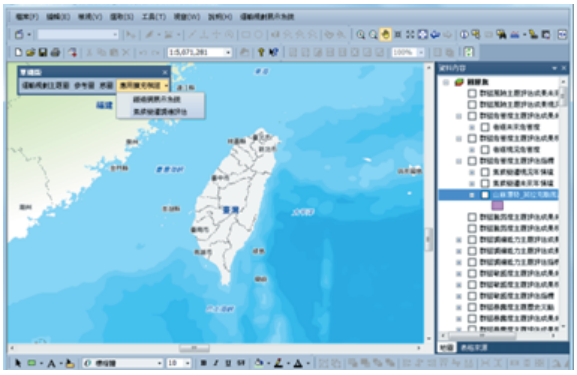
(3) On June 2, 2017, a result promotion seminar was conducted at Feng Chia University for which, attendants from the competent railway and highway management authorities of MOTC, the transportation planning agencies of the following 6 counties/cities governments (Including Taichung, Changhwa, Nantou, Yunlin and Chiayi), the Smart-based Transportation & Logistics Innovation Center of Feng Chia University and Central Taiwan Transportation R&D Institute were invited. During the seminar, the plan result and historical application cases were introduced and explained.

(4) During "2016 Annual Conference of the Chinese Institute of Transportation, the "Introduction on the Enhancement of Decision Support System Efficiency for Competent Transportation Authority" was announced. In the meantime, the "Implementation of Text Investigation Techniques in Preliminary Analysis of Social Public Comments for the Transportation Construction Project" was also announced in "2017 Engineering Sustainability & Civil Engineering Hazard Prevention Seminar" for communicating to the industries involved in order that it will be used in practical application.

系統架構

	運輸營運	城際運輸需求模式	法規技術手冊
	社經資料	亞洲大陸趨勢	國家整體計畫
交通建設計畫	土地使用	經濟效益評估	審議指標
土地開發計畫	觀光	鐵道網	特殊議題
計畫資料	規劃資料	規劃工具 / 研究	審議規範 / 知識

運輸規劃
整合資料庫



運輸部門計畫決策支援系統

運輸規劃圖展示輸出系統

運輸部門決策支援系統架構示意圖
Decision support system structural schematic for competent transportation authority

合作平台 / 系統主辦單位	合作平台 / 系統名稱	本系統分享支元件 / 資料	合作平台 / 系統回饋資料
交通部管理資訊中心	GIS-T 交通網路地理資訊倉儲系統	交通個案建設設計畫區位 SHP 檔	提供本系統所需之基礎國資
		國省道縣交通串資料	
		全臺各鄉道二三級及業人口數	
		已核定之公路與軌道建設計畫主題圖 WMS 與 SJP 檔	
		氣候變遷風險主題圖 WMS	
	交通數據匯流平台	運輸營運資料庫 (軌道票證資料)	公總 VD 交通量資料
鐵工局	鐵道網規劃支援系統 (WEB 版)	部分整合資料庫	鐵道網單機版產製之國資
	鐵道網 GIS 展示系統 (單機版)		軌道個案計畫
內政部營建署	永續生活圈建設評估管理作業與丅地區運輸模型規範	重大建設計畫、土地開發計畫	系統分析成果
本所綜技組	氣候變遷評估指揮展示系統 (單機版)	單機版開發元件	氣候變遷評估指標展示系統產製之國資
		部分整合資料庫	
	運輸部節能減碳策略評估整合資訊平台	社經資料庫	城際運輸節能減碳策略評估模組分析成果 (結合 GIS 展示)
			策略評估成果視覺華分析產製之國資
本所運計組	運輸走廊預警數據平台	運輸營運資料庫	運輸走廊預警數據平台分析成果

運輸部門決策支援系統與相關平台系統分工開發資源整合共用機制

Job delegation & development resource integration sharing mechanism between the decision support system for competent transportation authority and relevant platform.

（二）應用大數據技術建置重要瓶頸路段及運輸走廊之交通預警機制

1. 計畫概述

本計畫透過探勘國省道 ETC、VD 等巨量交通資料，並進一步分析氣象、活動、事故與交通特性之關聯，建立宜蘭及墾丁地區之交通預測模式及預警機制。透過導入大數據分析技術，提供交通預報與即時交通徵兆資訊，相關道路主管機關可先預擬對策，並即時提醒用路人避開壅塞路段與替代資訊，進而紓緩瓶頸路廊之壅塞程度。

2. 研究成果

(1) 運透過路側設備蒐集之交通資訊，並考量運輸系統別、日期型態、季節、活動及其他可能變數，藉由數據探勘挖掘路段之交通特性，研擬重要瓶頸路段及運輸走廊交通預警機制。

(2) 本計畫建立連續假期交通歷史及預報之儀表板，可針對未來連續假期預測路段上不同時間點之交通流量、壅塞瓶頸及旅行時間。

(3) 架設大數據應用之查詢平台環境，提供交通部及地方政府等主管機關研擬交管策略之應用參考。

(II) Transportation alert mechanism for key bottleneck section and transportation gallery implemented by big data technology

1. Overview

By investigating the massive transportation recorded by ETC and VD along the freeways and provincial highways, the connection between the weather, activities, accidents and traffic characteristics are analyzed in this Plan in order to establish the transportation prediction mode and alert system in I-Lan and Kenting areas. In the meantime, the bid data analysis technology is also used to provide the traffic alert and real-time traffic tendency related information for the competent transportation authority to work out countermeasures in advance and to warn the road users to avoid congested section and alternative information in order to ease the congested traffic in the bottleneck road section.

2. Research result

(1) With the transportation information collected by the equipment deployed along the road side, the transportation characteristics of road sections excavated by means of data investigation method was based to develop the transportation alert mechanism of the key bottleneck section and transportation gallery while considering the different types of transportation, the date, the season, activities and other potential variables.

(2) In this plan, the meter board required for logging the historical transportation data during consecutive holidays and the alert is established. It can predict the traffic flow, congested bottleneck section and journey time at different time points along the predicted road section during consecutive holidays in the future.

(3) The inquiry platform required for the application of big data is also implemented for providing application referential data required by competent authorities such as MOTC and local government for developing effective traffic control strategies.

3. 成果推廣

3. Promotion of result

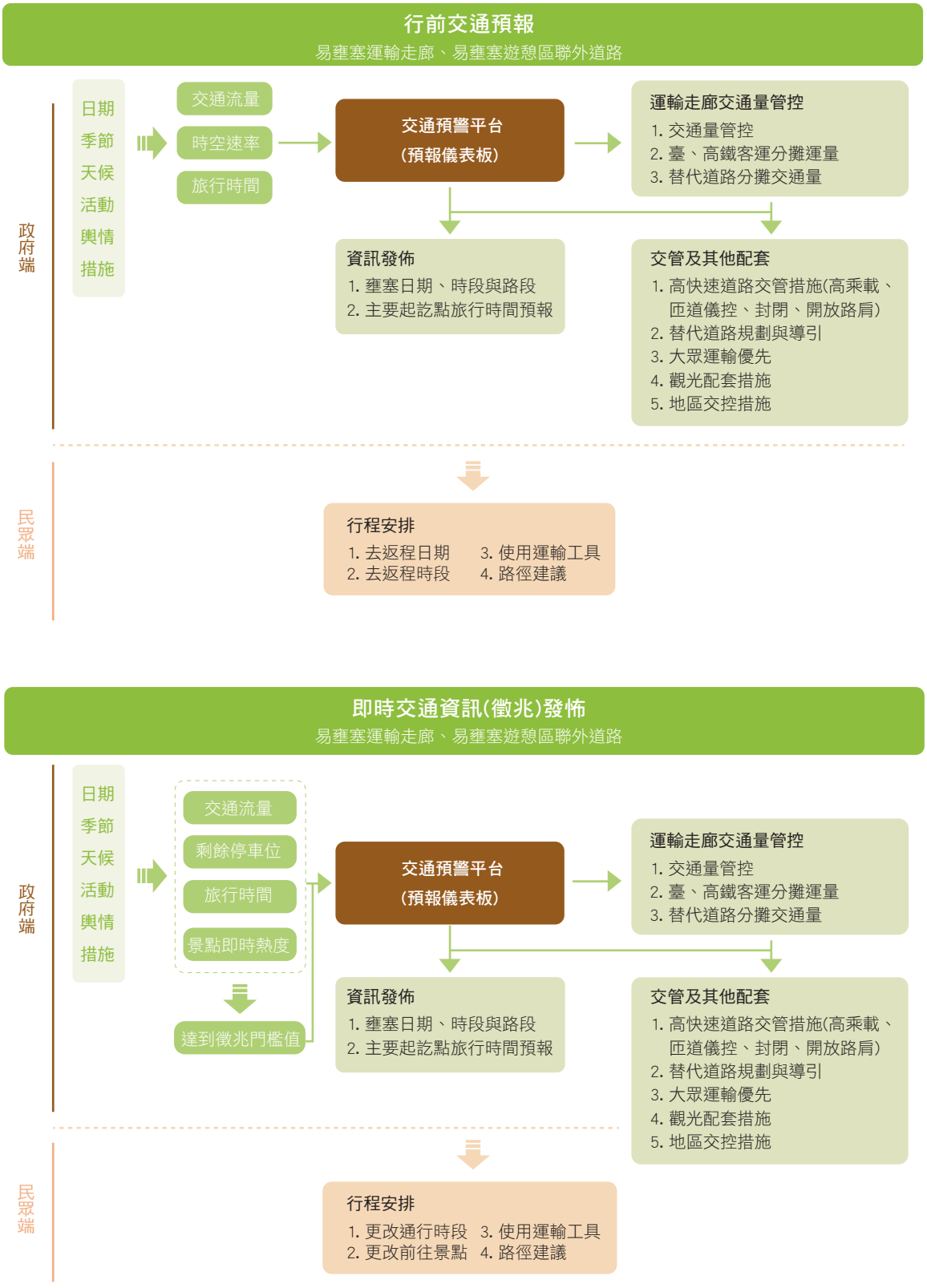
時程 Schedule	活動名稱 Activity	地點 Location	對象 Target
105 年 10 月 October 2016	推廣應用會議 Promotional Application Meeting	屏東 公路總局三工處 Pingdong Engineering Office #3 of Directorate General of Highways	公路總局、公總三工處、屏東縣交通隊、墾管處 Directorate General of Highways, Engineering Office #3 of Directorate General of Highways, Pingdong County Traffic Brigade, Kenting Administration Office.
105 年 11 月 November 2016	推廣應用會議 Promotional Application Meeting	本所 IOT	本所同仁、高公局、公路總局、公總三工處、屏東縣交通隊、墾管處、宜蘭縣政府 Staffs of the IOT, TANFB, Directorate General of Highways, Engineering Office #3 of Directorate General of Highways, Pingdong County Traffic Brigade, Kenting Administration Office, I-Lan County Government
106 年 5 月 May 2017	教育訓練 Education and training	高公局 TANFB	高公局交管組交工科、交管中心 (約 50~60 人) Transportation Engineering Division under Transportation Control Section, Traffic Control Center (About 50~60 persons)
106 年 6 月 June 2017	業務會談 Business Operation Meeting	交通部 MOTC	交通部部內單位及所屬機關 Internal units and subordinating agencies under MOTC
106 年 10 月 October 2017	教育訓練 Education and training	本所 IOT	本所同仁、高公局、公路總局、桃園市政府、宜蘭縣政府、桃園交控中心 Staffs of the IOT, TANFB, Directorate General of Highways, Taoyuan City Government, I-Lan County Government Taoyuan Traffic Control Center

(1) 本計畫導入大數據技術研擬交通預警機制及建立預報模式，未來可採用本計畫研究模式為基礎，進行經驗複製與推廣，延伸應用至六都或其他主管機關轄管之類同路廊。

(2) 未來期藉由本計畫拋磚引玉，透過研究會分享計畫研究成果，推動交通部及相關部屬機關進一步運用大數據技術辦理主管相關業務。

(1) The big data technology is introduced in this plan for developing the traffic alert mechanism and establishing the prediction mode. In the future, the research mode specified in this Plan will be based for conducting the experience replication and promotion in order that it will be extended to the similar road gallery controlled by these six direct jurisdiction cities or other competent authorities.

(2) Using this plan as the model example and the research result obtained from the Data Sharing Plan developed by the Research institute, the big data technology will be promoted to MOTC and its subordinating agencies for processing the authorized operations.



交通預警架構圖

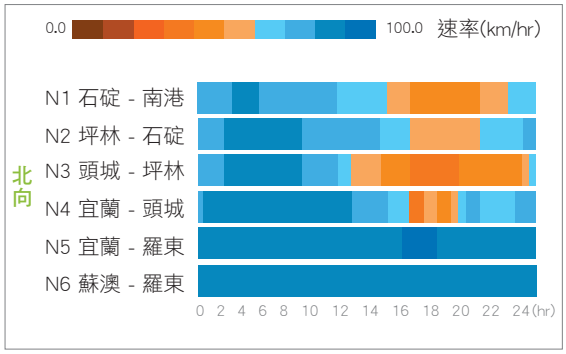
Traffic alert structure diagram

行前預報儀表板

國5北向行前時空速率預報

空間：6個路段

105年10月9日(雙十節第2天)



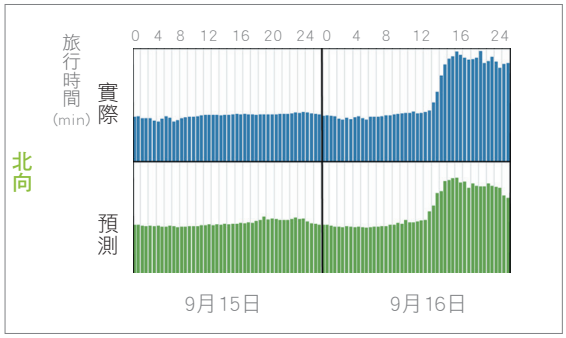
105年雙十節

MAPE：預測速率之平均絕對誤差率

項目/日期	10/8	10/9	10/10	平均
南向速率 MAPE	15.75%	3.34%	1.98%	7.02%
北向速率 MAPE	7.04%	5.28%	5.53%	5.95%

國5北向行前旅行時間預報

105年9月15日 / 9月16日 (中秋節前2天)



105年中秋節

MAPE：預測旅行時間之平均絕對誤差率

項目/日期	9/15	9/16	9/17	9/18	平均
南向速率 MAPE	3.18%	9.73%	12.45%	8.08%	8.36%
北向速率 MAPE	12.01%	2.25%	15.35%	17.13%	11.69%

連假行前預報儀表板示意圖

Consecutive holidays pre-journey alert meter board schematic

（三）電子票證資料加值應用分析之研究及示範計畫

1. 研究成果

(1) 基隆市政府過去從未掌握公車乘客旅次起迄分布，在本計畫之協助下，將僅有上車刷卡之公車電子票證資料進行旅次起迄推估，從而構建基隆市公車乘客旅次迄分布表，俾利基隆市政府進行運輸需求分析。

(2) 實際應用基隆市電子票證資料進行分析，據以提出基隆市公車相關資源配置規劃方案或改善方案，供基隆市政府參辦。分析案例舉例如下：

- 依據各路線高齡乘客能否搭到低地板公車之分析結果，建議應優先增加低地板公車之路線名單。
- 依據乘客轉乘時間檢核鐵公路班表整合是否符合轉乘便利性。
- 依據各站牌候車人數之分析結果，檢核需要增設候車亭之重點站位。

(3) 電子票證資料進行加值應用分析對於國內交通主管機關而言目前仍屬起步階段，相關執行經驗不足，爰本計畫撰擬電子票證資料加值應用分析 8 個主要應用議題之標準作業流程，包括「路線營運模式檢討」、「路線檢討與規劃評估」、「班次檢討」、「轉乘規劃分析」、「車型及站點設施檢討」、「補貼路線分析」、「公共運輸政策評估」及「運輸需求模式檢核」，俾利相關交通主管機關承辦人員瞭解如何應用分析電子票證資料。

(III) Research on analysis of electronic ticket value-added application and model plan

1. Research result

(1) During the past years, Keelung City Government never announced the journey starting/ending data of passengers using the city bus. Under the support of this Plan, the journey starting/ending data will be estimated according to the electronic ticket validated by the boarding passengers in order to establish the passenger journey starting/ending map for the Keelung City Bus System in order that Keelung City Government may conduct the transportation demand analysis.

(2) The Keelung City electronic ticket data being validated will be analyzed in order to propose the Keelung City bus-related resource planning solution or improvement solution to Keelung City Government as the reference of execution. Listed below are the examples of the analysis:

- Based on the analysis results on whether the senior passengers could easily access to the low-riding bus for each route, it is suggested that the route offering the low-riding bus should be increased as a higher priority.
- Based on the passenger transfer times, check if the integrated railway and highway service schedule meets the requirements of transfer convenience.
- Based on the analysis result for the number of waiting passengers at each stop, check if it is required to increase the standing space of each bus waiting shelter.

(3) To the competent transportation authority in Taiwan, the value-added application analysis for the electronic ticket data is still in its initial stage, as they are lacking of the execution experience in this aspect. Therefore, the standard operation procedure for the electronic ticket data value-added application analysis is developed for the following 8 key application issues and they are "Route Operation Mode Review", "Route View and Planning Assessment", "Service Frequency Review", "Transfer Planning Analysis", "Vehicle Type and Station Facilities Review", "Subsidized Route Analysis", "Public Transportation Policy Assessment" and "Transportation Demand Mode Review" in order that the Responsible Staff of the competent transportation authority may understand how to conduct the application analysis of electronic ticket data.

2. 成果推廣

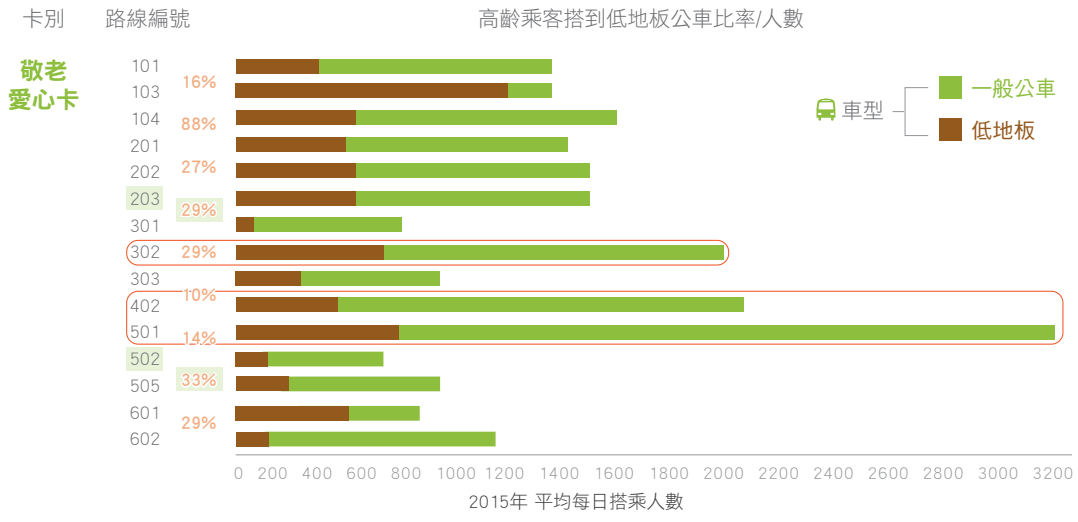
2. Promotion of result

活動名稱 Activity	對象 Target	活動方式 Activity type	永續性 Sustainability
如何藉由電子票證資料之推廣來提升公共運輸服務研討會 Seminar on enhancing the public transportation service through the promotion of electronic ticket data.	中央及地方交通主管機關 Competent central and local transportation authorities	簡報、與談、提問討論 Briefing, interview, Q&A discussion	與會單位可留存會議資料供參 The participants will be allowed to retain the meeting document for reference.
記者會 Press Conference	媒體記者 Media reporters	發放新聞稿、播放案例說明影片與圖表、記者提問 News release, play the historical case descriptive films and charts, questions raised by reporters.	新聞稿放置於本所官網 Store the news release on the official website.
出版報告書並分送相關單位 Publish the report and distribute to the units involved.	中央及地方交通主管機關 Competent central and local transportation authorities	函送報告書、提供基隆市公車乘客旅次迄分布表 Submit the report and provide Keelung City Bus Passenger Journey Starting/Ending Chart.	報告書放置於本所官網供瀏覽與下載 Store the report on the website of this Office for browsing and unloading.
協助地方政府提出電子票證大數據應用改善案例 Support local government to raise the historical improvement cases for the electronic ticket big data application.	地方交通主管機關 Competent local transportation authority	1. 區域中心於 106 年已擇定輔導 6 縣市 (宜蘭、桃園、苗栗、高雄、屏東及臺東)。 2. 列入區域中心教材，培育地方政府人員瞭解電子票證系統應用。 1. The District Center has selected the following 6 counties and cities for rendering instruction guidance in 2017, i.e. Yi-Lan, Taoyuan, Miaoli, Kaohsiung, Pingdong and Taidong. 2. Included in the teaching materials prepared by the District Center in order that the employees of each local government may comprehend the application of Electronic Ticket System.	培育主管機關人力 Train the manpower of the competent authority

基隆市政府對本計畫研究成果之採行計畫

Execution plan for the research result as being prepared by the Keelung City Government.

編號 No.	運用方向 Application	辦理期程 Schedule
1	參考電子票證分析結果，將基隆市公車處 105 年新添購之 26 輛低地板公車配置於需求度較高之路線 Based on the electronic ticket analysis result, these 26 units of low-riding buses newly purchase by Keelung City Bus Administration Department in 2016 will be deployed to the route subjecting to higher demand.	已於 105 年 12 月採行 It has been implemented starting from December 2016.
2	針對既有市區公車和其他大眾運輸工具末班班次進行無縫接駁，提供完善之夜間大眾運輸服務 Provide seamless transfer for the late-night service of the existing city bus and other mass transportation tools in order to offer well-planned night-hour mass transportation service.	106 年 2017
3	依照旅運需求規模，進行候車亭及周邊設施改善 (擴建、新建或夜間照明等) Based on the scale required for passenger transportation service, improve the bus waiting shelter and the peripheral facilities (e.g. Expansion, new construction or night-hour lighting, etc.)	106 年 2017
4	運用於基隆城際轉運站月台及路線配置 To be applied to Keelung Inter-City Bus Station Platform and route deployment	107 年 2018
5	運用於基隆麥金轉運站 (都市計畫擬定案) 之交通相關議題分析 To be applied to transportation issue analysis for Keelung MacArthur-Jingshan Bus Station (The urbanization plan will be finalized)	108 年 2019



基隆市公車高齡乘客能否搭乘到低地板公車之狀況 (以高齡乘客較多路線為例)

Situation on whether the senior passengers in Keelung city could access to low-riding bus (Taking the route frequently used by senior passengers as the example).

（四）交通大數據分析與應用機制先期規劃

1. 研究成果

(1) 本計畫擇定臺中市作為示範標竿城市，整合公車動態資訊系統與電子票證收費系統所產生巨量數據，結合大數據視覺化軟體技術為基礎，發展出專屬臺灣的公車旅運大數據分析模組，其中共包含人流地理空間分佈、車流歷史軌跡疊合分析、路線乘載熱區分析等三大介面，臺中市豐原客運公司運用上開模組優化相關路線後，讓該公司減少每月 1 萬車公里之運能浪費，及臺中市政府減少每月 10 萬元之虧損補貼金額。

(2) 本計畫執行成果可協助主管機關藉由公共運輸巨量資料，在公共運輸領域自資料探勘與視覺化之過程，檢視公共運輸之服務有效性，讓業管單位人員與決策者能善用資通訊科技所蒐集之資料進行公共運輸管理，以數據思維為民眾提供更好的公共運輸服務。

(IV) Preliminary planning for the transportation big data analysis and application mechanism

1. Research result

(1) In this Plan, Taichung City is selected as the benchmark city for consolidating massive data produced by the Bus Dynamic Information System and the Electronic Ticket Fare Collection System. By combining with the big data visualized software technology, the Bus Passenger Transportation Big Data Analysis Module exclusively for the Taiwan Area was developed. Such module comprises the following three interfaces, i.e. passenger flow geographical space distribution, historical traffic flow track overlapping analysis and route hot riding area. After optimizing the routes with the aforesaid module as being executed by Taichung City Fenyuan Bus, it has saved the waste of transportation capacity for up to 10,000 vehicle/km per month; in the meantime, it also reduced NTD100, 000 of monthly subsidizing deficit for Taichung City Government.

(2) The execution results of this Plan indicated that it can provide the public transportation related data for helping the competent authorities check the service effectiveness for the public transportation during the data exploring and visualized process in the public transportation. In this way, the data collected through information communication technology can be effectively used by the operation management person and the decision maker for carrying out public transportation management so as to provide much better public transportation services for the social public through data cogitation.

2. 成果推廣

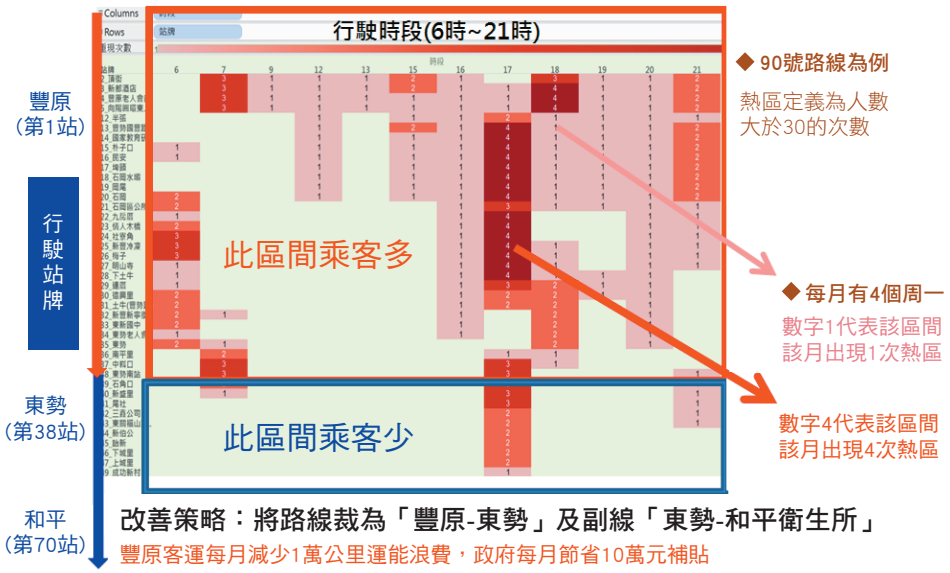
就公共運輸大數據分析與應用 (預計 106 年底完成) 之推廣，擬規劃辦理以下推廣應用活動：

2. Promotion of result

To promote the analysis and application of big data for public transportation (to be completed by the end of 2017), the following promotion and application activities will be planned:

預計辦理時程 Estimated execution schedule	活動類型 Activity type	預計辦理地點 Estimated execution Location	對象 Target	永續性 / 效益 Sustainability/Efficiency
106 年 12 月 December 2017	匯流與展示 公共運輸大數據分析與應用成果 Summarizing and demonstration Analysis and application result of big data for public transportation	管理資訊中心 (交通部數據匯流平臺) Information Management Center (MOTC data convergence platform)	公路總局、地方政府交通局、加值應用單位 Directorate General of Highways, Department of Transportation under local government, value-added application unit	將公共運輸可加值應用成果介接至交通部數據匯流平臺，俾利匯流後對外展示與開放 Connect the value-added application result of public transportation to MOTC data convergence platform to achieve demonstration and disclosure after being converged.
106 年 12 月 December 2017	研究成果投稿 Research result Submission of article	國內外期刊、學術研討會 Local/overseas journals, scholastic seminar	產官學研各界與民眾 Industry/official/ scholastic sectors and social public	宣導計畫成果 Result promotion
106 年 12 月 December 2017	成果發表會 / 研討會 / 論壇 Result Presentation/ Seminar/Forum	運輸研究所 Institute of Trasportation, MOTC	中央機關、地方政府、立委助理 Competent central authority, local government, legislator’s assistant.	宣導計畫成果並交流大數據分析技術 Disseminate the plan result and exchange the big data analysis technology

應用電子票證大數據於公車運輸使用分析



應用電子票證大數據於公車運輸使用分析

Bus usage analysis by the big bata of the electronic ticket

大數據分析與應用於檢討客運之偏遠路線補貼

Analysis and application of big data in the review of subsidies for rural passenger route

六、災害防治

（一）橋梁耐震能力與檢測評估分析模式之建立研究 (2/2)

1. 計畫概述

(1) 本研究精進已發展之「橋梁通阻檢測分析模式」，依橋梁現況診斷推估在不同地震強度下之橋梁損壞機率。

(2) 提升「移動式振動檢測模式」實用性，藉由現地振動訊號量測分析及驗證，建立地震或沖刷災害封橋後開放通行現地振動訊號臨界頻率值。

2. 解決問題

本研究「橋梁通阻檢測分析模式」提供公路總局震後迅速評估橋梁損壞機率，依損壞機率排出橋梁巡檢處置優先順序，解決震後需檢測橋梁數眾多且橋梁損壞機率未能確實掌握之問題；「移動式振動檢測模式」，待模式驗證完全，即可解決橋梁管理單位於地震或沖刷災害後未能確實掌握橋梁安全程度之問題，並可提供封橋後是否開放通行之決策支援。

VI. Hazard Prevention

(I) Research on the implementation of bridge shock-resistant capability and test assessment analysis mode (2/2)

1. Overview

(1) Based on the developed "Bridge Obstruction Testing Analysis Mode" being modified for this research, the bridge damage probability subjecting to varied seismic strength is diagnosed and estimated according to the existing bridge status.

(2) Enhance the practicability of the "Mobile Vibration Test Mode" to measure, analyze and verify the vibration signal of the scene so as to establish the vibration signal critical frequency value after opening the bridge that has been blocked due to the earthquake or flushing hazard.

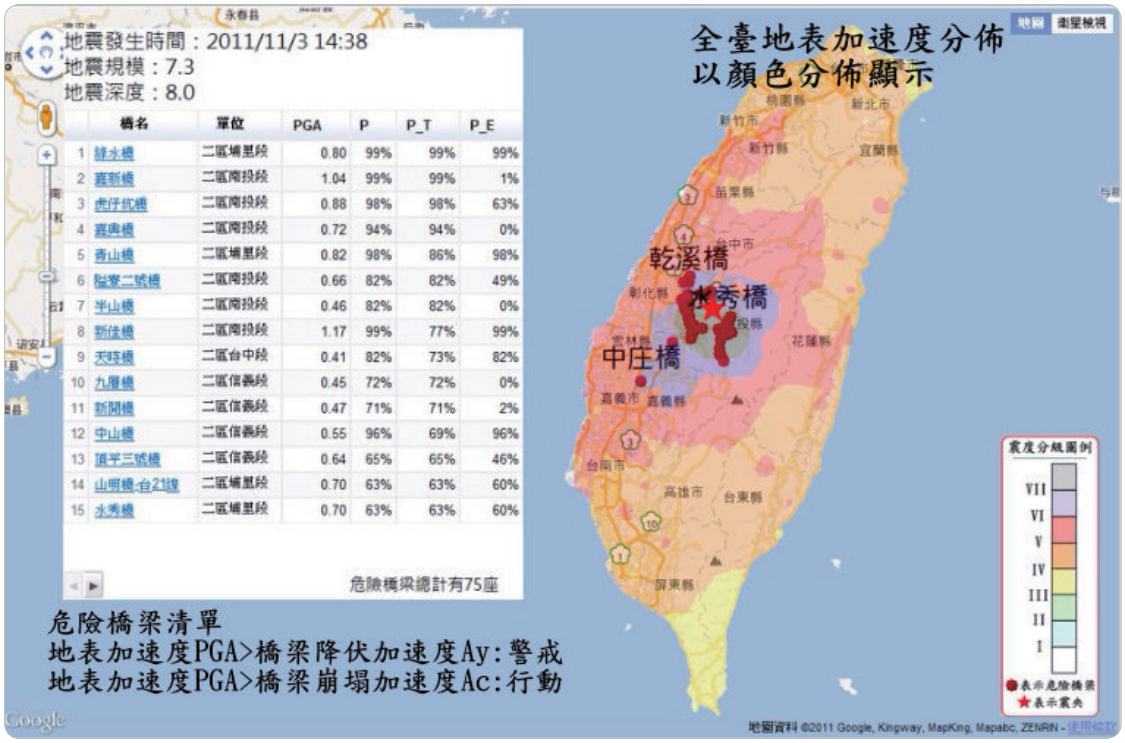
2. Solution

With the "Bridge Obstruction Testing Analysis Mode", the Directorate General of Highways shall be able to assess the bridge damage probability after the earthquake in order to set the priority sequence of the bridge inspection and treatment so as to solve the problem where lots of bridges should be tested after the shock and where the bridge damage probability cannot be exactly controlled. After being verified, the "Mobile Vibration Testing Mode" can be used to solve the problem where the competent bridge management unit is unable to exactly control over the level of bridge safety after the earthquake or the flushing. In the meantime, it can also support the decision making on whether to open the bridge for traffic after the blockade.

3. 成果推廣

3. Promotion of result

項次 Item	名稱 Name	時間 Time	地點 Location	對象 Target	推廣效益 Promotional efficiency
1	行政院災害防救應用科技方案第二期年度成果研討會 Hazard Prevention & Rescue Application Technological Solution – Phase 2 Annual Result Seminar held by Executive Yuan	106 年 4 月 25 日 April 25, 2017	臺北臺灣科技大學 National Taiwan University of Science and Technology	一般大眾 Social public	與其他部會防災科技交流並展示成果給一般大眾了解政府防災作為 Conduct hazard prevention technical exchange with other government agencies and demonstrate the result for the social public to understand the hazard prevention measures enforced by the government.
2	道路橋梁災害防治技術整合研究成果發表會 Presentation of Technical Integration Research Result for Road Bridge Hazard Prevention	106 年 11 月 November 2017	港灣研究中心 Harbor and Marine Technology Center	公路橋梁管理單位 Competent highway bridge management unit	將研究成果展示給公路橋梁管理單位了解，提高研究成果實用性 Demonstrate the research result to the competent highway bridge management unit in order to elevate the practicality of research result.
3	中華民國運輸學會 2017 年會暨學術論文研討會 2017 Annual Conference of the Chinese Institute of Transportation	106 年 12 月 7 日 December 7, 2017	運輸研究所 Institute of Trasportation, MOTC	運輸相關單位 Competent transportation units	將研究成果展示給運輸相關單位了解，提高研究成果實用性 Demonstrate the research result to the competent transportation unit in order to elevate the practicality of research result.



	橋名	單位	PGA	P	P_T	P_E
1	緯水橋	二區埔里段	0.80	99%	99%	99%
2	嘉新橋	二區南投段	1.04	99%	99%	1%
3	虎仔坑橋	二區南投段	0.88	98%	98%	63%
4	嘉興橋	二區南投段	0.72	94%	94%	0%
5	青山橋	二區埔里段	0.82	98%	86%	98%
6	隘寮二號橋	二區南投段	0.66	82%	82%	49%
7	半山橋	二區南投段	0.46	82%	82%	0%
8	新佳橋	二區南投段	1.17	99%	77%	99%
9	天時橋	二區台中段	0.41	82%	73%	82%
10	九層橋	二區信義段	0.45	72%	72%	0%
11	新開橋	二區信義段	0.47	71%	71%	2%
12	中山橋	二區信義段	0.55	96%	69%	96%
13	頂平三號橋	二區信義段	0.64	65%	65%	46%
14	山明橋-台21線	二區埔里段	0.70	63%	63%	60%
15	水秀橋	二區埔里段	0.70	63%	63%	60%

橋梁通阻檢測分析模式

Bridge obstruction testing analysis mode

移動式橋梁振動檢測

Mobile bridge vibration testing

（二）橋梁耐震能力與檢測評估分析模式之建立研究 (2/2)

1. 研究成果

(1) 由水利署提供之河川水位與流量資料，及本所港灣研究中心之海岸暴潮及波浪資料，建構一跨河橋梁預警系統，在異常氣候下 (包括颱風暴潮、長浪以及河川水位暴漲等複合條件)，評估跨河橋梁附近之水位，了解其對跨河橋樑通行安全之可能影響，供公路管理單位參考。

(2) 建置主要商港受不同規模之暴潮、海嘯等長波侵襲時結合 Google Earth 地理資訊系統之溢淹潛勢圖圖資，供港務管理單位參考。

2. 解決問題

(1) 臺中、布袋、安平、高雄、臺北、基隆、花蓮及蘇澳港等 8 個國內主要商港區之溢淹潛勢圖圖資，提供於海嘯警報發生，各港務分公司防救災應變作業使用，以解決港區海嘯溢淹資訊不足之問題。

(2) 跨河橋梁預警系統，提供颱風期間因為河川暴漲與暴潮長浪侵襲下，作為封橋決策參考，以解決封橋資訊不完整之問題。

(II) Research on the implementation of flooding alert system for he cross-river bridge and the harbor under abnormal climate conditions

1. Research result

(1) Based on the river level and flow rate data obtained from Water Resources Agency and the coastal storm surge and wave data established by Harbor and Marine Technology Center, a Cross-river Bridge Alert System will be established to assess the water level near around the cross-river bridge under abnormal climate conditions (Including the composite conditions such as storm surge, long wave and river level soaring caused by typhoon). It will be used to assess the water level near around the cross-river bridge in order to understand the potential effect on the traffic safety when using the cross-river bridge so as to provide reference for the competent highway management unit.

(2) Implementing the Flooding Potential Map by combining it with Google Earth, for when different levels of storm surges and tsunamis have struck the main commercial harbors.

2. Solution

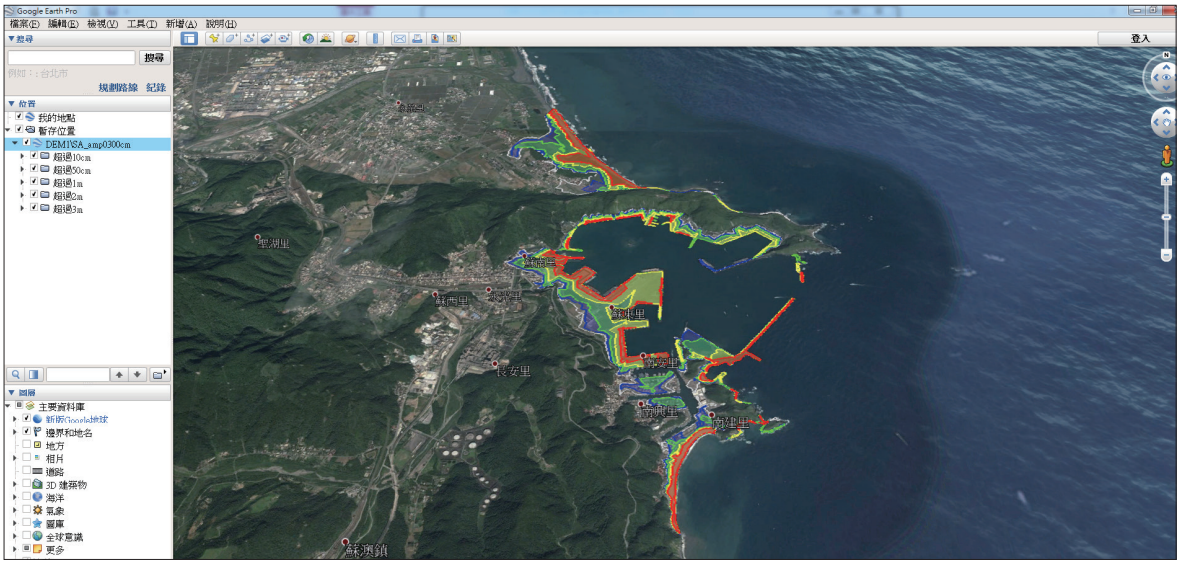
(1) Since its relocation to Taiwan, the Central Government of the Republic of Mainland China has been actively engaged.Since its relocation to Taiwan, the Central Government of the Republic of Mainland China has been actively engaged. Since its relocation to Taiwan, the Central Government of the Republic of Mainland China has been actively engaged.

(2) Implement the Cross-River Bridge Alert System for providing the reference on blocking the bridge when stricken by river soaring, storm surge and long wave during the typhoon season.

3. 成果推廣

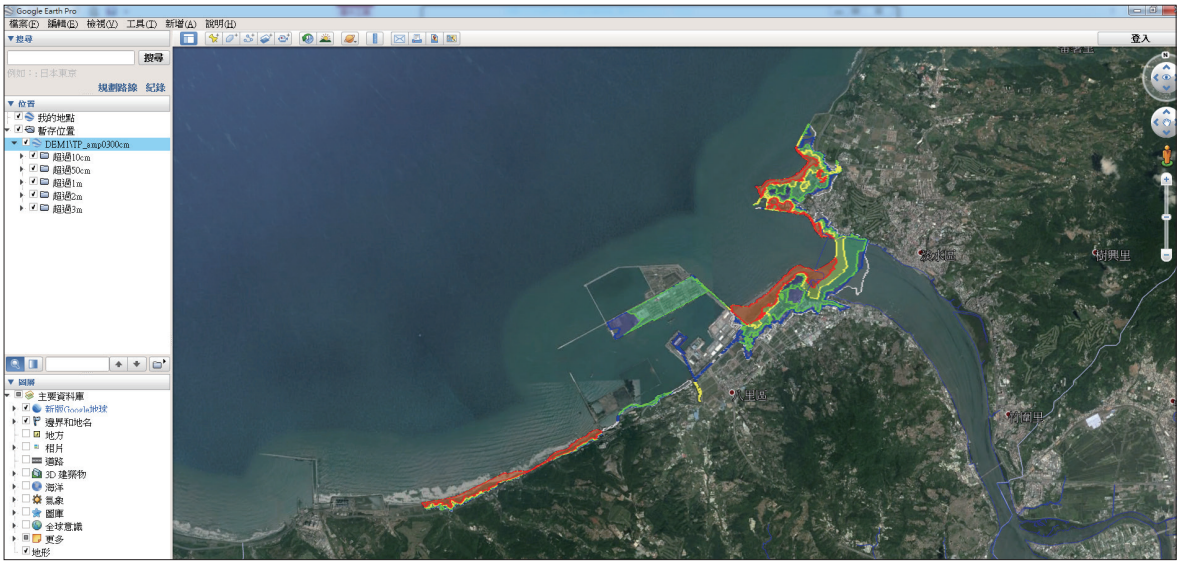
3. Promotion of result

項次 Item	名稱 Name	時間 Time	地點 Location	對象 Target	內容 Content
1	出版研究報告書 Published the Research Report	106 年 4 月 April 2017		航港局、海巡署、臺灣港務股份公司、經濟部及漁業署等 Maritime Ports Bureau, Coastal Guard Department, Taiwan International Ports Corp. Ltd., Ministry of Economic Affairs and Fisheries Agency	藉由研究報告書推廣本計畫執行內容 Promote the execution content of this Plan through the details described in the Research Report.
2	投稿國內期刊 (港灣季刊第 107 期) Submission to local journal (Harbor Quarter Journal, No. 107)	106 年 6 月 June 2017		航運界 Maritime transportation sector	藉由文章內容推廣本計畫執行內容 Promote the execution content of this Plan through the details described in the article.
3	辦理研究成果發表會 Conduct Research Result Presentation	106 年 5 月 May 2017	花蓮、基隆、臺中與高雄港務分公司 Taiwan International Ports Corporation, Ltd. branch offices in Hualian, Keelung, Taichung and Kaohsiung ports.	海巡署、交通部航港局及港務分公司 Coastal Guard Department, Maritime Ports Bureau and branch offices of Taiwan International Ports Corp. Ltd.	辦理「105 年度海洋與港灣領域研究成果發表會」 Conducted "Presentation of 2016 Marine & Harbor Area Research Result".



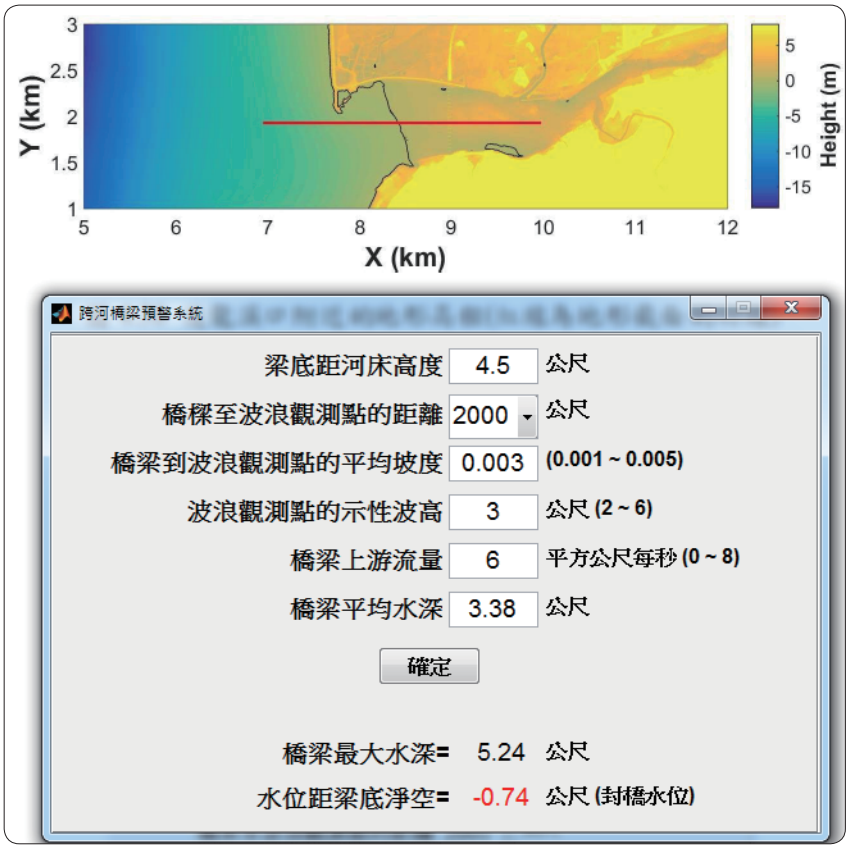
蘇澳港溢淹圖資

Suao Port flooding map



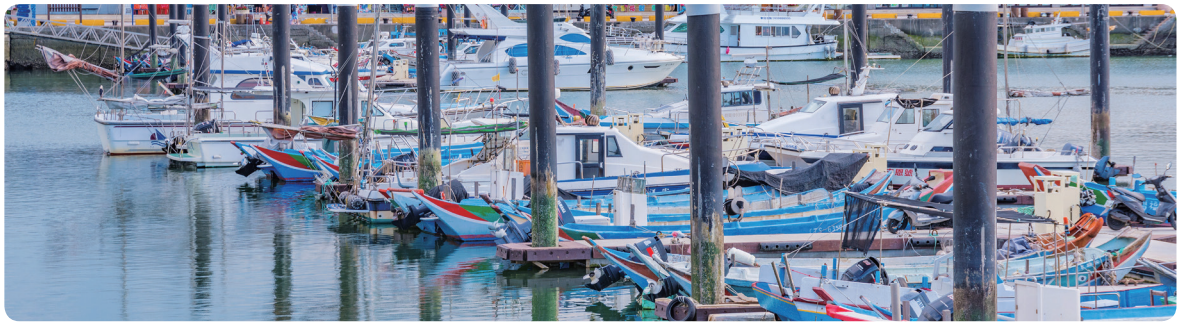
臺北港溢淹潛勢圖

Taipei Port Flooding Potential Map



跨河橋梁預警系統 - 苗栗後龍觀海大橋試算範例

Cross-river bridge alert system – Miaoli Houlung Kuanhai Bridge test-calculation example



（三）建置高雄港區 105 年即時空氣品質推估系統

1. 研究成果

(1) 港區硫氧化物 (SOx) 與氮氧化物 (NOx)…等空氣污染物，佔區域排放之比例頗高，為釐清港務單位應分擔責任，必須予以監測。

(2) 環保署在高雄市區之空氣品質監測站，僅針對一般需求或交通源之項目設置，港區則無設置，港務單位依實務需要，應建置自有之監測系統。

(3) 細懸浮微粒 ($PM_{2.5}$)，環保署已列為管制標的，其影響區域居民健康甚鉅，港區亦應將其列為監測重點。

2. 解決問題

(1) 本計畫利用美國環保署最新公告之 AERMOD 空氣品質擴散模式，結合氣象觀測資料與臺灣海域即時船隻相關資料，已完成高雄港區之即時空氣品質推估系統之建置。

(2) 本系統可依據地面觀測資料，完成建置模式使用氣象資料之前處理作業，建立羅氏法混合層高度設定之機制。

(3) 本系統之推估結果，後續可供港務公司辦理港區空氣品質管制作業參考。

(III) Implemented 2016 real-time air quality estimation system for Kaohsiung harbor

1. Research result

(1) The Sox and NOx air pollution substances spreading over the harbor area account for pretty high percentage in the emission in that area. To clarify, the competent harbor administration unit should share the responsibility in order to monitor the aforesaid pollutants.

(2) The air quality monitoring station established by the EPA in Kaohsiung City is set for the generally required or transportation source items only and it is not installed in the harbor area. Therefore the competent harbor administration unit shall install its own monitoring system according to its needs.

(3) As fine suspension particles (PM2.5), have been listed as the control target by the EPA, it will significantly affect the health of the people living in that area. In addition, these particles are also considered as key monitoring issue by the harbor administration.

2. Solution

(1) With the AERMOD air quality diffusion mode recently announced by America’s EPA, it can be combined with the climate surveillance data and Taiwan Area vessel real-time data for completing the implementation of Kaohsiung Harbor Real-Time Air Quality Estimate System.

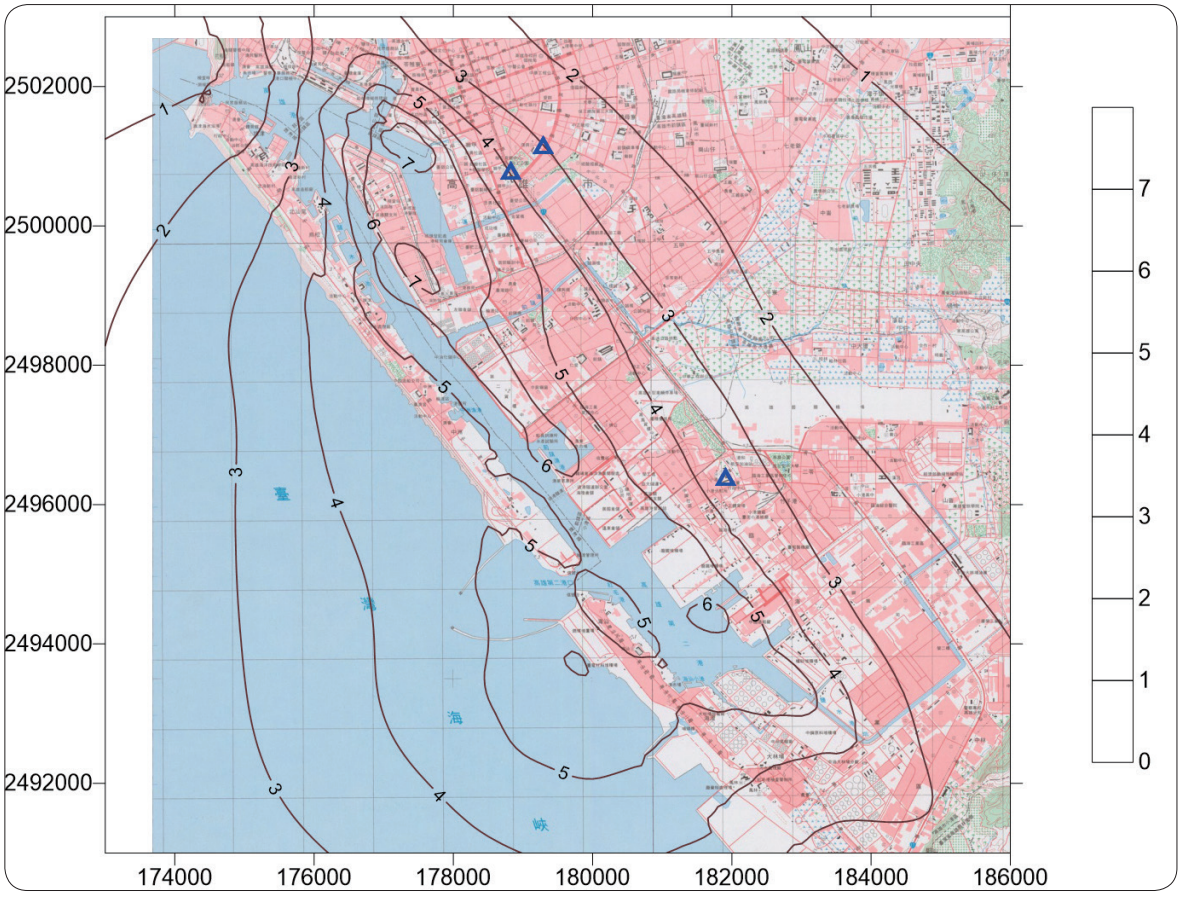
(2) Based on the terrestrial surveillance data, the pre-job processing work of climate data used for the mode can be implemented to establish the mechanism required or setting the height of Roche mixed layer.

(3) The estimate result of this system can be used as the reference for Taiwan International Ports Corp. Ltd. to execute the harbor area air quality control.

3. 成果推廣

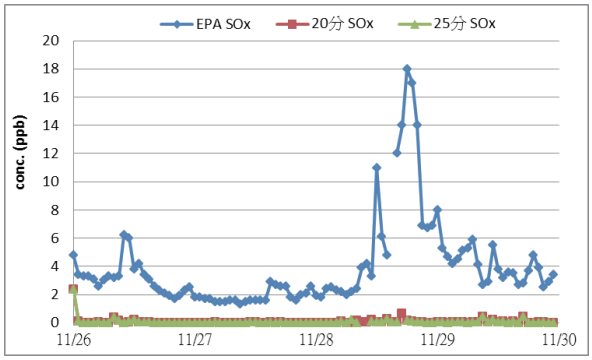
3. Promotion of result

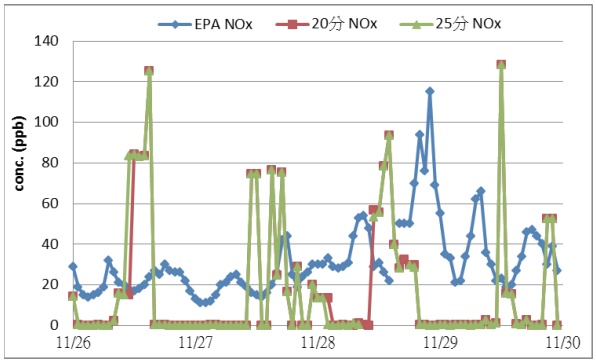
編號 Item	工作項目 Name	時間 Time	地點 Location	對象 Target
1	105 年第 1 次教育訓練 (模式介紹及地形資料處理介紹) 1st Session Education & Training in 2016 (Introduction of mode and terrestrial data processing)	105 年 9 月 September 2016	臺中 Taichung	港務公司、縣市政府、環保署、顧問公司 Taiwan International Ports Corporation, Ltd. competent county/ city government, EPA, consultant.
2	105 年第 2 次教育訓練 (氣象資料處理介紹與系統模擬測試) 2nd Session Education & Training in 2016 (introduction of climate data processing and system simulation test)	105 年 10 月 October 2016	臺南 Tainan	
3	105 年第 3 次教育訓練 (系統應用與使用手冊說明) 3rd Session Education & Training in 2016 (explaining of System Application & Manual)	105 年 11 月 November 2016	臺中 Taichung	
4	配合本所 106 年相關計畫，辦理教育訓練與成果推廣 Conduct the education and training as well as result promotion according to the plan developed by the IOT in 2017.	106 年 10 月 October 2017	臺中 Taichung	

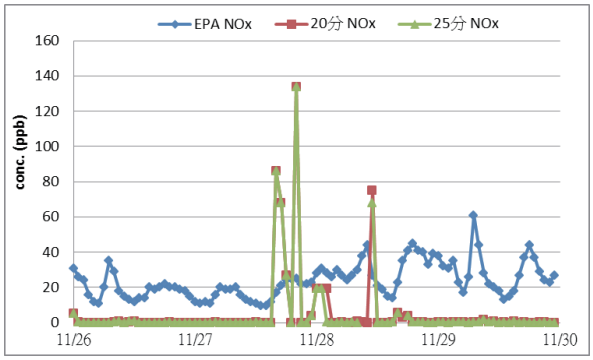


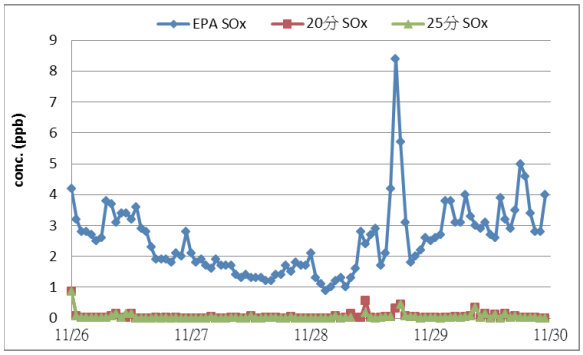
船舶排放 NOx 年最大增量濃度分布圖 (單位：ppb)

Max. yearly ship-emitted NOx increment concentration distribution diagram (unit: ppb)









系統推估結果與環保署測站之比較 (以高雄市前金與前鎮測站之 NOx、SOx 為例)

Comparison between the result estimated by the system and the data of EPA (Taking the NOx, Sox obtained from Chienjing and Chiencheng surveillance stations deployed in Kaohsiung City for example)

05

教育訓練

Education and Training

教育訓練

Education and Training

以下簡述本所 105 年度辦理完成之各項教育訓練課程。

The following briefly describes all education and training courses of the Institute in 2016.

1 January

25 105 年度海空運國際研究情勢研究會 (1)

Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(1)

01/Jan. – 10/Oct. 北區區域運輸發展研究中心開設 23 場交通運輸專業人才培育課程

Education Courses of Professional Transportation Technology Practitioners (23 Courses, hosted by the North Regional Transportation Development Research Center)

01/Jan. – 10/Oct. 桃竹苗區域運輸發展研究中心開設 23 場交通運輸專業人才培育課程

Education Courses of Professional Transportation Technology Practitioners (23 Courses, hosted by the North Regional Transportation Development Research Center)

01/Jan. – 10/Oct. 中區區域運輸發展研究中心開設 17 場交通運輸專業人才培育課程

Education Courses of Professional Transportation Technology Practitioners (17 Courses, hosted by the Central Regional Transportation Development Research Center)

01/Jan. – 10/Oct. 雲嘉南區域運輸發展研究中心開設 24 場交通運輸專業人才培育課程

Education Courses of Professional Transportation Technology Practitioners (24 Courses, hosted by the Yunlin, Chiayi and Tainan Regional Transportation Development Research Center)

01/Jan. – 10/Oct.
高屏澎區域運輸發展研究中心開設 12 場交通運輸專業人才培育課程
Education Courses of Professional Transportation Technology Practitioners (12 Courses, hosted by the Kaohsiung, Pingtung and Penghu Regional Transportation Development Research Center)

01/Jan. – 10/Oct.
東部區域運輸發展研究中心開設 29 場交通運輸專業人才培育課程
Education Courses of Professional Transportation Technology Practitioners (29 Courses, hosted by the East Regional Transportation Development Research Center)

3 March

21
105 年度海空運國際研究情勢研究會 (2)
Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(2)

23
「新竹物流碳足跡調查盤查」說明會
Workshop: Carbon Footprint Investigation Inventory of the HCT Logistics Corp.

4 April

08
「統一速達碳足跡調查盤查」說明會
Workshop: Carbon Footprint Investigation Inventory of the President Transnet Corp.

11
「資訊安全與個人資料保護」教育訓練
Training Workshop: Information Safety and Personal Information Protection

14
「國內外氫燃料電池車輛發展趨勢」研討會
Seminar: Domestic and International Hydrogen Fuel Cell Vehicles Trends

22
105 年度海空運國際研究情勢研究會 (3)
Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(3)

5 May

04 「統一速達碳足跡調查盤查」說明會

Workshop: Carbon Footprint Investigation Inventory of the President Transnet Corp.

12 「容量手冊修訂」技術講習

Seminar: Revising Taiwan Highway Capacity Manual

20 105 年度海空運國際研究情勢研究會 (4)

Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(4)

26 「局部多項式權重最小二乘法於求解二維淺水波方程式之應用 - 以臺灣周圍海域之潮汐流場模擬為例」研究會

Workshop: Application of Weighted-Least-Square Local Polynomial Approximation to 2D Shallow Water Equation

27 「軟體專利侵權訴訟」講習課程

Workshop: Software Patent Infringement Action

6 June

16 「海量資料分析於交通建設計畫審議決策之應用服務」第 1 場次研究會

1st Seminar: Applying Big Data in Assessment and Decision Making of Transportation Construction

17 「鐵公路氣候變遷調適資訊平台」研討會

Seminar: Highway and Railway Climate Change Adaptation Platform

28 105 年度海空運國際研究情勢研究會 (5)

Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(5)

29 「全球行銷與策略」專題演講
Lecture: Global Marketing Strategy

29 「國內外碳市場發展狀況」研討會
Seminar: Domestic and International Carbon Market Development

7 July

07/14 - 07/15 「105 年度橋梁維護管理訓練講習」臺北第 1 場
2016 Training Workshop of Bridge Maintenance and Management (Taipei 1st session)

19 「消費者保護法規及案例解析」專題演講
Lecture: Consumer Protection Legislation and Related Case Analysis

07/21 - 07/22 「105 年度橋梁維護管理訓練講習」臺中場
2016 Training Workshop of Bridge Maintenance and Management (Taichung session)

22 105 年度海空運國際研究情勢研究會 (6)
Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(6)

8 August

16 「資訊安全與個人資料保護」教育訓練
Workshop: Information Safety and Personal Information Protection

23 「交通規劃之利器－移動數據技術」研究會
Workshop: The Tool of Traffic Planning- Technology of Mobile Data

23 「郵輪經營與管理」專題演講

Lecture: Cruise Operations and Managements

25 105 年度海空運國際研究情勢研究會 (7)

Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(7)

9 September

21 「國際航空站經營管理及緊急應變實務經驗分享」講習會

Workshop: Practical Experience Sharing of International Airport Operations Management and Emergency Response

21 「氣候變遷運輸設施風險評估暨風險資訊進階服務計畫」教育訓練

Training Workshop: Climate Change Risk Assessment on Transport Infrastructure and Advanced Risk Information Service Project

29 105 年度海空運國際研究情勢研究會 (8)

Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(8)

10 October

03 「應用大數據分析技術於恆春地區交通管理推廣」研究會

Workshop: Application of Big Data Analysis Technology on Traffic Management of Hengchun Area

04 「2016 年臺灣港口暨貨櫃碼頭發展趨勢」研討會

Seminar: 2016 Taiwan Port & Container Terminal Development Trend

05 「105 年臺灣公路容量分析軟體教育訓練」臺中場

Training Workshop: Taiwan Highway Capacity Analysis Software, THCS (Taichung session)

07 「運輸部門節能減碳政策案例研析」研討會
Seminar: The Cases study of Energy Saving and Carbon Reduction Strategies of Transportation Sector

12 「105 年臺灣公路容量分析軟體教育訓練」臺北場
Training Workshop: Taiwan Highway Capacity Analysis Software, THCS (Taipei session)

12 「近場管制作業實務」講習會
Workshop: Operations Practice of Terminal Approach Control

18 「機車駕駛遊戲研發成果展示暨應用方式」座談會
Symposium: Results Presentation and Application of Motorcycle Driving Game

19 「臺北飛航情報區流量管理 (ATFM) 現況與展望」講習會
Workshop: Current Situation and Outlook on Taipei Air Traffic Flow Management (ATFM)

21 「智慧交通專利技術趨勢解析 (一)–UBI(Usage-Based Insurance) 汽車保險與車內連網及安全駕駛行為之結合應用」成果說明會
Seminar: The Intelligent Traffic Patent Trend Analysis(I)- Applications of the UBI(Usage-Based Insurance), Iov(Internet of Vehicle), and Safe Driving Behaviors

26 「快速公路 LED 路燈量測計畫與成本效益分析」研討會
Seminar: Expressway LED Lamp Test Program and Cost-Benefit Analysis

27 「如何藉由電子票證資料之推廣來提升公共運輸服務」研討會
Seminar: How to Improve the Service of Public Transportation by Applying the Data from Smart Cards

11 November

02 「應用大數據分析技術於城際運輸走廊及瓶頸路段交通管理」推廣研究會

Workshop: Big Data Technology Application on Traffic Management of Transport Corridors and Major Congestion Roads

02 「ICAO 之飛航系統提升 (ASBU) 策略與各地區配合措施」講習會

Workshop: The Strategy and Regional Cooperative Measures on ICAO Aviation System Block Upgrades(ASBU)

04 「海量資料分析於交通建設計畫審議決策之應用服務」第 2 場次研究會

2nd Seminar: Applying Big Data in Assessment and Decision Making of Transportation Construction

08 「混合車流情境路口交通工程設計範例」教育訓練講習會

Training Workshop: Results Presentation and Training Conference of Design Model on Road Traffic Engineering at Intersection under Mixed Traffic

09 「道路安全大數據案例分析與應用 (一、二)」研究會

Workshop: The Traffic Safety Data Analysis and Application- A Big Data Analysis Approach (I & II)

09 「計畫研考作業自動化及 KM 系統資源介紹」講習課程

Workshop: Automated Research Evaluation System and Knowledge Management Resource Introduction

11 「公路貨運碳足跡公用係數建置」研討會

Seminar: Public Coefficient of Road Freight Carbon Footprint

17 「交通建設計畫經濟效益評估手冊 (105 年版) 與應用軟體更新」教育訓練

Training Workshop: The Handbook of Economic Analysis for Transportation Construction Projects (2016)

24 105 年度海空運國際研究情勢研究會 (9)

Workshop: Developing Trend of International Maritime and Aviation Transportation 2016(9)

25 「運輸部門節能減碳策略評估整合資訊平台」研討會
Seminar: Integrated Information Platform of Energy Saving and Carbon Reduction Strategies of Transportation Sector

28 「運輸規劃軟體講習」教育訓練
Training Workshop: TDM2016(Transportation Demand Model)

12 December

13 「全球洋流資料庫」專題演講
Lecture: Global Ocean Currents Database

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