臺北市政府環境保護局

淨零碳排短中長期行動策略再探討

期末報告定稿

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懿心國際有限公司
YI SHIN INTERNATIONAL COMPANY

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摘要

臺北市政府環境保護局
計畫成果報告摘要

計畫名稱：淨零碳排短中長期行動策略再探討

計畫案號：114s039

計畫執行單位：懿心國際有限公司

計畫主持人：吳宜樺

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摘　要

一、研究目的

本計畫旨在回應全球淨零排放治理，由政策承諾邁入跨部門深度減碳與風險治理的新階段，系統性盤點國際淨零排放趨勢、主要政策工具及部門別減碳路徑，並透過國內外政策與城市案例分析，作為臺北市精進短、中、長期淨零碳排行動策略與治理架構之決策參考依據。

二、研究過程

本研究首先彙整《巴黎協定》架構下各國淨零治理發展趨勢，並進行能源、住商、運輸、製造、農業及環境等六大部門之國際減碳政策比較分析；其次蒐整歐洲、亞洲、美洲及大洋洲共 30 個國家與城市之淨零案例，檢視其制度設計、技術應用與自然為本解方（NbS）之整合模式。在國內層級，盤點我國中央淨零治理架構、六大部門減碳策略及六都執行成果差異，並分析臺北市溫室氣體排放結構與第二期減量執行方案推動成效。進一步引入國際淨零治理工具，評估其於城市層級之適用性，並以 TCFD 氣候風險治理架構為核心，透過 Delphi 專家問卷與權重分析，辨識並排序臺北市在氣候風險情境下之淨零行動優先順序。

三、重要發現

研究結果顯示，國際城市推動淨零轉型普遍仰賴高度再生能源滲透、建築深

度翻修、運具電動化、循環經濟、廢棄物零排放及氣候韌性農業等策略，並透過制度化政策工具與跨部門治理加速轉型進程。臺北市排放結構則高度集中於住商部門（約 76%）與運輸部門（約 19%），近年排放量雖較 2005 年下降約 19.39%，惟電力排放係數變動與建築老舊化，仍為進一步減量之主要限制。第二期溫室氣體減量執行方案中，11 項量化指標已有 9 項達成，顯示政策具一定成效，但再生能源購置/建置量與公共運輸運量仍面臨推動挑戰。

四、主要建議

本計畫建議臺北市將氣候風險資訊納入預算編列、公共投資審查、跨局處管考及資訊揭露機制等過程，以強化淨零策略所需之風險評估基礎。在行動策略上，依專家共識與權重分析結果，聚焦於「降溫城市、綠運轉型、韌性治理、淨零新生活」四大面向：短期優先於高風險區域推動都市降溫與調適行動，強化跨局處資料整合與韌性治理；中期將氣候情境納入基礎設施與法規制度設計；對轉型風險較高之減碳措施採取試行與示範方式循序推動；中長期則透過碳存摺、建築能效揭露及金融工具連結，引導市民與企業參與淨零轉型。重點摘要如下：

(一) 優先推動高風險區域的降溫與調適行動

專家共識顯示，「通風廊道與都市綠化」及「降溫設施示範」具最高優先性。建議優先於高溫熱區導入遮蔭、綠化與被動式降溫設計，並建立高溫與健康、用電等關聯資料，作為後續政策決策與投資評估基礎。

(二) 強化跨局處整合，提升城市韌性治理能力

「整合智慧防災」被評為短期應優先推動行動，透過即時監測、資料整合與跨部門通報機制，降低極端氣候事件造成的災損與長期財政風險。

(三) 將氣候風險正式納入法規與制度設計

建議將「基礎設施適應氣候情境」納入相關法規與技術規範，使氣候風險不再僅是政策宣示，而成為公共工程與建設投資的正式評估條件。

(四) 循序推動轉型風險較高之減碳措施

對於「電動車普及」、「超低排放區」、「焚化廠轉型 CCUS」等轉型風險較高的策略，建議採取試行、示範與配套先行的方式降低社會衝擊，逐步累積制度與市場成熟度。

(五) 建立以市民為核心的淨零新生活制度工具

以能力建構之教育宣導措施，普及各年齡層為短中期推動主軸。「碳存摺 2.0」與「建築能效揭露」等行動，被視為中長期重要策略。透過資訊透明、誘因設計與金融工具連結，引導市民與企業參與減碳行動，並將氣候風險轉化為綠色經濟與社會效益。

五、政策意涵

本研究顯示，臺北市推動淨零碳排已進入需結合氣候風險治理、制度化工具與跨部門整合的關鍵階段。未來淨零政策不僅是單點減碳措施的推進，更涉及公共投資、財政風險與治理模式的轉型。透過持續沿用並深化 TCFD 架構精神，臺北市可將氣候風險轉化為政策決策與資源配置的重要依據，提升城市長期淨零轉型與韌性治理的整體效能。

1. Research Objectives

This project aims to respond to the global transition of net-zero governance from policy commitments toward cross-sector deep decarbonization and climate risk–based governance. By systematically reviewing international net-zero emission trends, major policy instruments, and sectoral decarbonization pathways, this study seeks to provide a robust analytical basis for refining Taipei City's short-, medium-, and long-term net-zero action strategies and governance framework.

2. Research Process

The study first examines global net-zero governance trends under the framework of the Paris Agreement, followed by a comparative analysis of decarbonization policies across six major sectors: energy, buildings, transport, manufacturing, agriculture, and the environment. A total of 30 international net-zero cases from Europe, Asia, the Americas, and Oceania were compiled to assess integrated approaches combining institutional design, technological deployment, and nature-based solutions (NbS).

At the domestic level, Taiwan's central net-zero governance structure, sectoral mitigation strategies, and implementation performance across the six special municipalities were reviewed, alongside an analysis of Taipei City's greenhouse gas emission profile and progress under its second-phase mitigation program.

Furthermore, international net-zero governance tools were assessed for their applicability at the city level. The study adopts the TCFD climate risk governance framework as its core analytical approach and applies Delphi expert surveys and weighted analysis to identify and prioritize net-zero action strategies under Taipei City's climate risk context.

3. Key Findings

The results indicate that leading international cities rely on a combination of high renewable energy penetration, deep building retrofits, transport electrification, circular economy practices, zero-waste strategies, and climate-resilient agriculture to advance net-zero transitions, supported by institutionalized policy tools and cross-sector governance mechanisms.

Taipei City's emissions are highly concentrated in the buildings sector (approximately 76%) and the transport sector (approximately 19%). Although total emissions have declined by about 19.39% compared to 2005 levels, further reductions are constrained by fluctuations in the electricity emission factor and the aging building stock. Review of the second-phase greenhouse gas reduction program shows that 9 out of 11 quantitative indicators have been achieved, while renewable energy procurement and public transport ridership remain key implementation challenges.

4. Key Recommendations

This study recommends that Taipei City formally integrate climate risk information into budget formulation, public investment appraisal, cross-departmental performance management, and information disclosure mechanisms, thereby strengthening the analytical foundation for net-zero policymaking. Based on expert consensus and weighted prioritization, four strategic pillars are proposed: Cooling the City, Green Mobility Transition, Resilient Governance, and Net-Zero Lifestyles.

In the short term, priority should be given to cooling and adaptation actions in high-risk areas and to strengthening cross-departmental data integration and resilience governance. In the medium term, climate scenario considerations should be embedded into infrastructure planning, regulations, and technical standards. For mitigation

measures with higher transition risks, a phased approach emphasizing pilot projects and demonstrations is recommended. In the medium to long term, institutional tools such as carbon accounts, building energy performance disclosure, and linkages with financial instruments should be used to encourage public and corporate participation in the net-zero transition.

Overall, the strategy focuses on four key pillars: Cooling the City, Green Mobility Transition, Resilient Governance, and Net-Zero Lifestyles, as summarized below:

(1) Prioritize Cooling and Adaptation Actions in High-Risk Areas

Expert consensus identifies "Ventilation Corridors and Urban Greening" and "Cooling Facility Demonstrations" as top priorities. It is recommended to prioritize the implementation of shading, greening, and passive cooling designs within high-temperature hotspots. Furthermore, establishing datasets that correlate extreme heat with public health and electricity consumption is essential to provide a foundation for future policy decisions and investment evaluations.

(2) Strengthen Inter-Departmental Integration to Enhance Urban Resilience Governance

"Integrated Smart Disaster Prevention" has been rated as a high-priority short-term action. By utilizing real-time monitoring, data integration, and cross-departmental notification mechanisms, the city can mitigate damage caused by extreme weather events and reduce long-term fiscal risks.

(3) Formally Incorporate Climate Risk into Regulations and Institutional Frameworks

It is advised to integrate "Infrastructure Adaptation to Climate Scenarios" into relevant laws and technical specifications. This ensures that climate risk moves beyond policy rhetoric and becomes a formal evaluation criterion for public works and infrastructure investment.

(4) Progressively Implement Carbon Reduction Measures with Higher Transition Risks

For strategies involving higher transition risks—such as the "Widespread Adoption of EVs," "Ultra-Low Emission Zones (ULEZ)," and "Transforming Incineration Plants with CCUS"—a phased approach is recommended. By utilizing pilot programs, demonstrations, and supporting measures, the city can minimize social impact while gradually building institutional and market maturity.

(5) Establish Citizen-Centric Institutional Tools for a Net-Zero Lifestyle

The short-to-medium-term focus should be on capacity-building and educational outreach across all age groups. Initiatives such as "Carbon Pass 2.0" and "Building Energy Efficiency Disclosure" are regarded as vital long-term strategies. Through information transparency, incentive structures, and links to financial tools, the city can guide citizens and businesses toward decarbonization, transforming climate risks into green economic opportunities and social benefits.

5. Policy Implications

The findings indicate that Taipei City has entered a critical phase in its net-zero transition, where climate risk governance, institutionalized policy tools, and cross-departmental integration are essential. Net-zero policy should no longer be viewed solely as a collection of individual mitigation measures, but as a governance transformation encompassing public investment, fiscal risk management, and long-term resilience. By continuing to apply and deepen the principles of the TCFD framework, Taipei City can more effectively translate climate risks into actionable policy inputs, thereby enhancing the overall effectiveness of its long-term net-zero and resilience governance.