# 編者言

# 從 COP30 看見韌性轉向：全球防減災正在改寫規則

近年來，極端氣候事件的發生頻率與衝擊規模持續擴大，災害風險不再是偶發性的議題，逐步演變為牽動國家治理、經濟發展與社會穩定的長期結構性挑戰。也因此，防減災的政策定位正從過往以災後救援與復原為主的「事後回應」，轉向為必須在發展規劃初期即納入風險評估、資源配置與治理設計的「事前治理」，並成為國際發展治理中不可或缺的關鍵議題。

2025 年於巴西貝倫（Belém）舉行的第 30 屆聯合國氣候變化框架公約締約方會議（COP30），適逢《巴黎協定》（Paris Agreement）通過十週年，國際社會普遍視其為全球氣候行動由目標承諾走向制度化落實的重要轉折點。COP30 通過的「貝倫政治方案」（Belém Political Package），在全球調適目標（Global Goal on Adaptation, GGA）指標制度化、損失與損害因應機制、自然解方（Nature-based Solutions, NbS）及韌性金融等面向提出具體政策方向，顯示氣候調適與防減災已被明確納入全球治理的核心議題，並對發展合作的策略設計與執行模式提出更高要求。

綜觀 COP30 後的國際防減災治理，至少可見數項值得關注的發展趨勢。首先，各國政策逐步由事後回應轉向事前預防與風險管理，強調以科學資料、情境模擬與早期預警系統支撐決策，以降低災害衝擊的不確定性並提升治理韌性。其次，防減災被重新界定為具有長期報酬的公共投資，透過創新金融機制與風險分擔設計，引導私部門資本共同投入韌性基礎建設，以回應災後資金動員不足的結構性問題。第三，國際社會更加重視地方政府與社區層級的參與，並強調制度、技術與人力培力需同步推進，方能確保防減災措施在災前、災中與災後均能持續運作，而非流於短期專案介入。

對長期投入發展合作的國合會而言，上述趨勢不僅反映國際氣候與防災議程的重整，也直接影響援助模式與合作內涵的調整方向。如何結合政策對話、技術協助、金融工具與夥伴國家既有體系，協助其建立可長期維運、可制度化落地的防減災與氣候調適機制，已成為發展合作實務中的重要課題。基於此，本期《國際開發援助現場季刊》以〈從 COP30 看國際推動防減災趨勢：邁向韌性未來的全球行動〉為主題，透過多層次與面向的分析與案例，呈現當前全球防減災治理從政策到實踐的關鍵脈絡。

本期《當季專論》首先刊載國際氣候發展智庫趙恭岳執行長〈從目標設定到體系實踐：COP30 貝倫政治方案對全球氣候調適治理的重構〉，指出「貝倫政治方案」標誌國際氣候治理由承諾走向制度化行動，並以全球調適目標（GGA）與「全球協作」概念，說明全球防減災治

理正逐步建構更具操作性的共同框架。其次，銘傳大學都市設計與永續發展學系邵珮君教授及馬士元副教授合撰的〈2024 年日本能登半島地震對全球災害防救工作推動之啟示〉，則透過日本的防災經驗，檢視防災體系在空間規劃、社區韌性與跨部門協調上的挑戰，提醒防減災治理需因應風險樣態變化而持續調整。國合會投融資處曾薰慧組長及王浩滄高級管理師的〈巨災風險融資與證券化：強化氣候脆弱國家韌性建設的金融創新〉中，介紹巨災債券與韌性債券等創新工具，說明透過風險分層與市場機制，可協助脆弱國家在災後更快速取得資金，並引導私部門投入韌性建設。最後，〈AI 驅動智慧防災外交〉由臺大何昊哲副教授與國合會駐瓜地馬拉技術團李真計畫經理及駐貝里斯技術團段瑞君計畫經理共同發表，以合作計畫為例，呈現 AI 與 IoT 技術如何透過早期預警系統與制度化治理，強化夥伴國家的防災韌性，並展現臺灣防災外交的實務成果。

本期《焦點企劃》以〈全球防災新視野：跨國經驗、科研創新與產業實踐〉為題，進一步回應後 COP30 時期國際防減災治理面臨的核心命題：在全球氣候承諾與資金動能趨於保守的現實條件下，各國如何透過制度設計、科技創新與跨部門合作，實質提升面對極端氣候的韌性能力。透過分別訪問瓜地馬拉防災委員會（Coordinadora Nacional para la Reducción de Desastres, CONRED）克魯斯執行秘書長（Dr. Claudinne Ogaldes Cruz）、臺灣國家災害防救科技中心陳宏宇主任，以及長期參與國際防災合作的民間企業代表優聖系統有限公司楊育誠副總經理，從治理需求、科研實作到產業落地三個層次，呈現防減災如何從國際政策論述轉化為可運作、可延續的行動體系。

整體而言，本期內容凸顯全球防減災行動正逐步朝向「制度化、金融化與科技化」的趨勢發展。期盼透過本期專題的整理及分享，能為讀者提供理解國際防減災治理脈動的參考框架，並為推動更具韌性的發展合作行動帶來實務啟發。

## 當期論文摘要

### 從目標設定到體系實踐：COP30 貝倫政治套案對全球氣候調適治理的重構

（趙恭岳，國際氣候發展智庫執行長、國立中央大學地科前瞻中心助理研究員）

第 30 屆聯合國氣候變化框架公約締約方會議（UNFCCC COP30）於巴西貝倫舉行，此次會議不僅象徵《巴黎協定》十週年，也標誌全球氣候治理進入從目標設定走向全面實施的關鍵轉折。面對全球溫升逼近 1.5° C 門檻、極端氣候頻率與強度持續攀升，會議通過「貝倫政治套案」（Belém Political Package），在氣候調適、損失與損害、自然為本解方（NbS）及韌性金融領域提出具體制度與技術路徑。研究發現，透過「貝倫政治套案」的通過，國際氣候建制正經歷從「規範設定」向「實質執行」的轉向。具體而言，全球調適目標（GGA）59 項指標的制度化，標誌著調適行動可測量性（measurability）的確立；而「全球協作」（Global Mutirão）概念的引入，則反映了多邊主義在應對碎片化治理危機時的論述重構。

## 2024 年日本能登半島地震對全球災害防救工作推動之啟示

（邵珮君，銘傳大學都市設計與永續發展學系教授；馬士元，銘傳大學都市設計與永續發展學系副教授）

日本在 2024 年能登半島地震後因複合型災害而導致災區重建延宕，本研究透過三次現地調查與二手資料的蒐集，分析能登半島在地震前的社會經濟情況，並掌握 2024 年能登半島地震的受災情況、災後應變等課題。藉此瞭解能登半島災區與國土韌性地區計畫推動的落差導致建物與維生管線耐震不足、其他地方政府跨區支援災區長期化不易的困難與偏鄉高齡化與階段性避難生活困境等課題。透過研究發現：能登半島地震災後對於交通、避難所生活基準、志工協助內容修法、結合境況模擬之地區災害防救計畫修訂、防災廳設立等災害防救業務精進的經驗，對於台灣日後在避難生活人權重視、志工服務修法、國土韌性基本計畫研擬、以境況模擬為基礎之地區災害防救計畫修訂及防災專責機構設立上具有重要參考價值，同時也能讓全球在災害防救業務結合數位科技推動上以及建構提升自助共助與公助之整體災防系統亦能有所啟示與影響。

## 巨災風險融資與證券化：強化氣候脆弱國家韌性建設的金融創新

（曾薰慧，財團法人國際合作發展基金會投融資處組長；王浩滄，財團法人國際合作發展基金會投融資處高級管理師）

氣候變遷衝擊全球，對開發中國家及小型島嶼開發中國家（SIDS）更是構成巨大威脅，常導致基礎設施嚴重破壞，造成不成比例的鉅額災損。該等國家的財政體質通常也較為脆弱，災害發生後，需要能立即取得緊急性資金，進行災難救援與復原。

為能有效進行氣候及自然災害的風險管理，首先應進行風險分層，倘為發生頻率高但災害規模小、可自行承受的損失可風險自留，而低頻率但高嚴重性、無法自行承受的巨災風險，則應設法移轉。國際上已有巨災債券（Cat bonds）等發展成熟的創新金融工具可將保險公司的巨災風險移轉至資本市場。

為協助開發中國家運用巨災債券之機制，世界銀行善用其多邊機構之身分，集合多國風險組成風險分擔池，協助主權政府以更有利的條件發行巨災債券，讓開發中國家的政府在遭遇大型災難時能迅速取得流動性資金。最著名案例為墨西哥 MultiCat 債券，此機制已成為該國災害風險融資策略的重要一環。

國際間正進一步在發展能引導私部門資本投入氣候韌性基礎建設的創新金融機制。保險連結貸款（ILLP）或韌性債券（Resilience Bond）等新興工具的核心皆是設法將「韌性紅利」貨幣化，以補貼韌性建設之前期建設成本。未來此機制倘能發展成熟，將有助我國以及國際夥伴以更有效率方式在中低收入脆弱國家推動韌性基礎建設計畫。

## AI 驅動智慧防災外交—國合會攜手臺大土木團隊協助貝里斯、瓜地馬拉政府建置早期預警系統的技術驗證與治理實踐

（何昊哲，國立臺灣大學土木工程系副教授；李真，財團法人國際合作發展基金會駐瓜地馬拉技術團計畫經理；段瑞君，財團法人國際合作發展基金會駐貝里斯技術團計畫經理）

面對極端氣候導致的災害風險上升，建立具前瞻性的早期預警系統已成為全球防災治理的重要課題。財團法人國際合作發展基金會（國合會）攜手國立臺灣大學團隊，在貝里斯與瓜地馬拉推動以人工智慧（AI）與物聯網（IoT）技術為核心的智慧防災合作計畫。

透過布建監測站網絡、開發 AI 水文模型及建置「軟體即服務」（SaaS）雲端預警平臺，計畫成功提升兩國防災決策的即時性與準確性，並協助政府建立制度化、可持續的災害治理機制。同時，計畫亦著重於技術人員培訓與社區動員，強化中央至地方的整體防災能量。成果顯示，導入早期預警系統後，社區撤離效率提升，顯著減少災害損失。本篇計畫案例不僅為臺灣科技防災外交的典範，也展現 AI 技術於開發中國家強化災害韌性的實際應用潛力。

# 《Editor's Note》From COP30 to a Resilience Turn: How Global Disaster Risk Reduction Is Rewriting the Rules

In recent years, extreme climate events have intensified, both in frequency and scale. Disaster risk is no longer an occasional concern; it has evolved into a long-term structural challenge that affects national governance, economic development, and social stability. As a result, disaster risk reduction (DRR) policies are undergoing a fundamental shift—from a traditional focus on post-disaster response and recovery to a model of ex-ante governance, in which risk assessment, resource allocation, and policy design are integrated at the earliest stages of development planning. DRR has thus become an indispensable pillar of international development governance.

The 30th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP30), held in Belém, Brazil, in 2025, coincided with the tenth anniversary of the Paris Agreement and was widely regarded as a critical turning point in global climate action—from aspirational commitments to institutionalized implementation. The adoption of the Belém Political Package at COP30 set out concrete policy directions in areas including the institutionalization of indicators under the Global Goal on Adaptation (GGA), mechanisms for addressing loss and damage, Nature-based Solutions (NbS), and resilience finance. These outcomes underscore that climate adaptation and disaster risk reduction have been firmly positioned at the core of global governance, while higher demands have also been placed on the strategic design and implementation of development cooperation.

A review of international DRR governance in the post-COP30 era reveals several notable trends. First, national policies are increasingly shifting from post-disaster response toward prevention and risk management, emphasizing the use of scientific data, scenario modeling, and early warning systems to support decision-making, reduce uncertainty, and enhance governance resilience. Second, DRR is being redefined as a form of public investment with long-term returns. Through innovative financial mechanisms and risk-sharing arrangements, private-sector capital is being mobilized to co-invest in resilient infrastructure, addressing the structural inadequacies of post-disaster financing. Third, greater emphasis is being placed on the participation of local governments and communities, alongside the simultaneous advancement of institutional, technical,

and human capacity-building, to ensure that DRR measures remain operational before, during, and after disasters rather than becoming short-term project-based interventions.

For the Taiwan International Cooperation and Development Fund (TaiwanICDF), which has long been engaged in development cooperation, these trends not only reflect the realignment of international climate and disaster risk agendas but also directly shape the evolution of aid modalities and partnership frameworks. A key challenge lies in integrating policy dialogue, technical assistance, financial instruments, and partner countries' existing systems to help establish disaster risk reduction and climate adaptation mechanisms that are sustainable, institutionalized, and capable of long-term operation. Against this backdrop, the theme of this issue is **"International Trends in Advancing Disaster Risk Reduction from COP30: Global Action Toward a Resilient Future."** Through multi-level analyses and case studies, this issue maps the critical pathways through which global DRR governance is moving from policy formulation to practical implementation.

This issue opens with **"From Target Setting to Systemic Implementation: How the COP30 Belém Political Package Reshapes Global Climate Adaptation Governance,"** by Kung-Yueh Chao, Executive Director of the International Climate Development Institute. The article argues that the Belém Political Package marks a decisive shift in international climate governance—from pledges to institutionalized action—and illustrates how the Global Goal on Adaptation (GGA) and the concept of "Global Mutirão" are contributing to the construction of a more operational and coordinated global framework for disaster risk reduction.

Next, **"Lessons from the 2024 Noto Peninsula Earthquake for Advancing Global Disaster Risk Reduction,"** co-authored by Professor Pei-Chun Shao and Associate Professor Shih-Yuan Ma of Ming Chuan University, examines Japan's disaster management experience. The article analyzes challenges related to spatial planning, community resilience, and cross-sector coordination, highlighting the need for DRR governance to continuously adapt to evolving risk profiles.

In **"Catastrophe Risk Financing and Securitization: Financial Innovation for Strengthening Resilience in Climate-Vulnerable Countries,"** Hsun-Hui Tseng, a section chief, and Hao-Tsang Wang, senior manager in the TaiwanICDF's Investment and Financing Department, introduce innovative instruments such as catastrophe bonds and resilience bonds. The article explains how risk layering and market-based mechanisms can enable vulnerable countries to access post-disaster financing more rapidly while channeling private capital into resilience-building efforts.

The final article, **"AI-Driven Smart Disaster Prevention Diplomacy,"** co-authored by

Associate Professor Hao-Che Ho of National Taiwan University and TaiwanICDF technical mission project managers Chen Li (Guatemala) and Jui-Chun Tuan (Belize), discusses joint projects that demonstrate how AI and IoT technologies enhance disaster resilience through early warning systems and institutionalized governance. These cases illustrate the practical outcomes of Taiwan's disaster prevention diplomacy.

The special report, titled **"New Global Perspectives on Disaster Risk Reduction: Cross-National Experience, Scientific Innovation, and Industry Practice,"** further addresses a core question facing DRR governance in the post-COP30 era: amid increasingly conservative global climate commitments and financing dynamics, how can countries effectively strengthen resilience to extreme climate events through institutional design, technological innovation, and cross-sector collaboration? Interviews with Dr. Claudinne Ogaldes Cruz, an executive secretary in Guatemala's National Coordinator for Disaster Reduction (CONRED); Hung-Yu Chen, director of Taiwan's National Science and Technology Center for Disaster Reduction; and a senior executive from a private-sector company deeply engaged in international DRR cooperation, provide perspectives spanning governance needs, scientific application, and industrial implementation. Together, they demonstrate how disaster risk reduction can be translated from international policy discourse into operational and sustainable action systems.

Overall, this issue highlights a clear global trajectory in disaster risk reduction—toward greater institutionalization, financialization, and technologization. It is our hope that the analyses and insights presented herein will offer readers a useful framework for understanding the evolving landscape of international DRR governance and provide practical inspiration for advancing more resilient development cooperation initiatives.

# Summaries

## From Target Setting to Systemic Implementation: Reconstructing Global Climate Adaptation Governance through the COP30 Belém Political Package

（Kung-Yueh Chao, Executive Director, International Climate Development Institute; Assistant Researcher, Advanced Earth Science Center, National Central University）

The 30th Conference of the Parties to the UNFCCC (COP30), held in Belém, Brazil, marked both the tenth anniversary of the Paris Agreement and a pivotal transition in global climate governance—from goal-setting to comprehensive implementation. As global warming approaches the 1.5°C threshold and the frequency and intensity of extreme climate events

continue to rise, COP30 adopted the Belém Political Package, which outlines concrete institutional and technical pathways in climate adaptation, loss and damage, nature-based solutions (NbS), and resilience finance. This study finds that the adoption of the package signifies a shift in the international climate regime from normative frameworks to operational execution. Specifically, the institutionalization of 59 indicators under the Global Goal on Adaptation (GGA) establishes the measurability of adaptation actions, while the introduction of the concept of "Global Mutirão" reflects a rearticulation of multilateralism in response to fragmented global governance.

## Lessons from the 2024 Noto Peninsula Earthquake for Advancing Global Disaster Risk Reduction

（Pei-Chun Shao, Professor; Shih-Yuan Ma, Associate Professor, Department of Urban Design and Sustainable Development, Ming Chuan University）

Following the 2024 Noto Peninsula earthquake, Japan faced prolonged recovery due to compounded disasters. Based on three field investigations and secondary data analysis, this study examines pre-disaster socioeconomic conditions, damage impacts, and post-disaster response challenges in the Noto Peninsula. The findings reveal gaps between disaster-affected areas and national land resilience planning, including insufficient seismic resistance of buildings and lifeline infrastructure, difficulties in sustaining cross-regional local government support, and challenges associated with aging populations and prolonged phased evacuation in rural areas. Post-disaster reforms in transportation, shelter standards, volunteer service legislation, scenario-based disaster planning, and the establishment of a disaster management agency offer valuable lessons for Taiwan and the international community, particularly in integrating digital technologies and strengthening comprehensive disaster management systems that enhance self-help, mutual aid, and public assistance.

## Catastrophe Risk Financing and Securitization: Financial Innovation for Strengthening Resilience in Climate-Vulnerable Countries

(Hsun-Hui Tseng, Section Chief; Hao-Tsang Wang, Senior Manager, TaiwanICDF)

Climate change poses severe threats worldwide, particularly to developing countries and small island developing states (SIDS), where disasters often cause disproportionate damage to infrastructure and massive economic losses. These countries typically face fiscal constraints and require rapid access to emergency funding for response and recovery. Effective climate and disaster risk management begins with risk layering: frequent, low-impact losses can be retained, while

low-frequency, high-severity catastrophe risks should be transferred. Mature financial instruments such as catastrophe bonds enable insurers to transfer such risks to capital markets. Leveraging its multilateral role, the World Bank has facilitated pooled risk-sharing mechanisms that help sovereign governments issue catastrophe bonds on more favorable terms, enabling rapid liquidity access following major disasters. Mexico's MultiCat Program is a prominent example. Emerging tools such as insurance-linked loans and resilience bonds aim to monetize the resilience dividend to offset upfront investment costs. As these mechanisms mature, they hold significant potential for Taiwan and its partners to promote resilient infrastructure in vulnerable low- and middle-income countries more efficiently.

## AI-Driven Smart Disaster Prevention Diplomacy: Technical Validation and Governance Practice of Early Warning Systems in Belize and Guatemala

（Hao-Che Ho, associate professor, Department of Civil Engineering, National Taiwan University; Chen Li, project manager, Taiwan Technical Mission in Guatemala; Jui-Chun Tuan, project manager, Taiwan Technical Mission in Belize）

As extreme climate events intensify disaster risks, the development of forward-looking early warning systems has become a critical priority in global disaster governance. The TaiwanICDF, in collaboration with National Taiwan University, has jointly implemented smart disaster prevention projects in Belize and Guatemala that employ the use of artificial intelligence (AI) and internet of things (IoT) technologies. Through the deployment of monitoring networks, AI-based hydrological models, and software-as-a-service (SaaS) cloud-based warning platforms, the projects have significantly improved the timeliness and accuracy of disaster-related decision-making while helping governments establish institutionalized and sustainable governance mechanisms. Emphasis on technical training and community mobilization has further strengthened disaster preparedness from the central to local levels. Results show improved evacuation efficiency and substantial reductions in disaster losses, demonstrating both the practical potential of AI-driven resilience building in developing countries and a model for Taiwan's disaster prevention diplomacy.