編者言

從人類與自然和諧共生中尋求解方

人類文明的發展，自古以來與大自然緊緊相扣，維生方式從狩獵、採集到農業社會，人類與自然一直處在和諧共生的平衡狀態，至 19 世紀工業革命開始蓬勃推進後，人類與自然之間開始出現了扞格，機器的運轉、煤炭石油等能源的大量使用，加速自然資源的耗竭，也增加了二氧化碳氣體的排放，應對世界人口的流動和劇增，森林、農地等土地資源過度開發不僅耗盡環境承載的能力，整個生態系也因過度發展破壞而逐漸失衡，尤其當人類為訴求農作物龐大產量放棄原本與環境共生的自然農法，而改採大規模的商業耕種，慣行農法的確帶來速成的經濟收益，然而，自然生態系統卻因而高度失衡，造成土壤貧瘠、地力耗竭，大地反撲加上氣候變遷的加乘作用下，最終人類也不得不面臨糧食短缺所帶來的危機。

儘管近年來國際社會對於氣候變遷議題日益重視，多次聯合國氣候變遷綱要公約締約方大會上，各國紛紛提出具體目標展現雄心壯志，每次大會後達成的協議宣言，也彷彿讓世人看見氣候變遷肆虐下的一絲曙光。然而，從近年各方的統計數據來看，全球諸多的因應努力，似乎已無從阻止氣候變遷的惡化，例如根據美國國家航空暨太空總署（NASA）分析，2022 年地球平均溫度比 19 世紀末的平均溫度高了約攝氏 1.11 度，與 2015 年並列史上地球平均地表溫度第 5 高。而根據臺灣氣候變遷科學團隊推估，在最嚴峻、且不減少排放溫室氣體的情況下，臺灣的冬天最快在 2060 年以後可能就會完全消失。

為了減緩氣候變遷的衝擊，近幾年國際社會出現了「自然解方」（Natural-based Solutions, NbS）這個名詞，它在 2021 年第 26 屆聯合國氣候變遷大會《格拉斯哥氣候協議》（Glasgow Climate Pact）被視為氣候變遷調適行動的關鍵措施之一，同時也是一種兼顧人類福祉與生物多樣性效益的解決方案，旨在藉由保育、復育以及永續經營自然生態系的同時，有效應對人類社會面的挑戰。然而，國際間對「自然解方」目前尚未有一清楚的定義，使得外界對於企業在運用上，產生了「漂綠」的疑慮。為了討論自然解方的發展趨勢，本期《當季專論》，特以〈自然解方在國際開發援助工作的運用〉為主題，希望向讀者介紹何謂自然解方外，也邀請專家學者就自然解方如何在國際合作工作中運用，以及當國際社會逐步意識到自然資本和生物多樣性在解決氣候變遷問題中的關鍵作用時，臺灣企業如何透過參與對外援助工作，將在自然保育方面的經驗與創意，推廣至海外，並協助企業提升在 ESG 的表現與創造商機。本期內容，亦邀請國合會駐巴紐技術團分享在當地運用自然解方的途徑，以及稻作計畫的推動經驗。

而本期的《焦點企劃》，則以〈將自然解方納入氣候變遷調適的挑戰與對策〉為題，分別採訪國立臺灣大學生態學與演化生物學研究所李玲玲教授及經濟部水利署水利規劃分署張廣智分

署長，邀請他們分別由學術及政府治理的角度，與讀者分享目前「自然解方」在國際上的發展趨勢及運用，以及我國政府在將自然解方納入氣候變遷調適的政策中，所可能面臨的挑戰及因應作為。

在《莊子．齊物論》中有一段話是這樣寫的：「天地與我並生，而萬物與我為一。」短短的幾個字，蘊含了人與自然萬物和諧共生的智慧與哲學，這也意味著 2 千多年前，人類的智慧已隱含著「自然解方」的思維。藉著本期文章，除了讓讀者了解自然解方為什麼能成為解決氣候變遷問題的關鍵舉措外，也希望能引導大家去思考，在人們追求經濟成長、社會發展的同時，如何調和「人」與「自然」間的關係。

當期論文摘要

自然解方在國際開發援助工作的運用

（邱祈榮，臺灣大學森林環境暨資源學系副教授；國際氣候發展智庫理事長）

依據世界經濟論壇（The World Economic Forum）發布的《2024 年全球風險報告》（Global Risk Report 2024）指出：人類面臨的短期及長期的風險，主要來自於自然的崩解以及氣候變遷影響衝擊。因此，如何應對人類世的 3 個核心挑戰：減緩和適應氣候變遷、保護生物多樣性，成為確保人類社會永續生存的關鍵。在這種背景下，人類社會思考如何能夠同時解決 3 大核心挑戰的時刻，自然聚焦基於自然的解決方案或稱自然解方（Nature-based Solutions, NbS）。國際上自然解方於開發中國家的推動方式大多數是由已開發國家提供資金與技術，與當地的非營利組織共同合作推動。因此本文希望藉由檢視自然解方於開發中國家的推動現況，探究自然解方如何結合國際開發援助工作，強化國際開發援助與氣候變遷的減緩與調適行動與生物多樣性保育關聯，進而提出未來透過國際開發援助工作結合自然解方的推動路徑。

以自然解方推動氣候變遷調適行動之國際合作趨勢與啟示

（施友元，國立臺灣師範大學永續管理與環境教育研究所助理教授）

2021 年第 26 屆聯合國氣候變遷大會《格拉斯哥氣候協議》（Glasgow Climate Pact）提出「自然解方」（Natural-based Solutions, NbS）為氣候變遷調適行動的關鍵措施之一，可確保社會福祉與環境保障。2023 年第 5 屆聯合國環境大會（Fifth session of the United Nations Environment Assembly, UNEA-5）定義 NbS，並已達成推動共識，自然生態系服務可提供解決方案，提升國家整體因應氣候變遷調適之韌性，因應各種社會挑戰，近年各國逐漸以自然解方推動氣候變遷調適行動，同時落實國際合作運用已成為國際趨勢。

為因應氣候變遷與國際發展趨勢，我國在 2023 年起推動國家氣候變遷調適行動已納入 NbS 概念，本文歸納歐盟、英國、日本、美國與東協國家之作法，並解析我國以自然解方推動氣候變遷調適行動之機會與挑戰，期望透過各國做法與策略，對我國未來以自然解方推動氣候變遷調適行動，拓展國際合作提供啟示。基於我國在水利與農業領域具有特色優勢，且長期與東南

亞國家已建立國際合作鏈結，建議未來可參考先進國家作法，以自然解方推動氣候變遷調適行動之國際合作，推廣至東南亞國家，以深化國際開發援助之運用。

自然解決方案與自然相關財務揭露：臺灣企業參與對外援助的新契機

（楊文琪，政治大學外交學系副教授；國際事務學院澳洲研究中心主任）

1992 年在巴西里約熱內盧舉行的地球高峰會上制定了 3 個重要的國際公約，分別是《聯合國氣候變遷綱要公約》、《生物多樣性公約》和《聯合國防治沙漠化公約》。這 3 個重要的環境公約都是為了因應人類生存所面臨最重大的挑戰，並且共同推動永續發展。然而，30 年過去了，氣候變遷與生物多樣性喪失等環境議題日益嚴峻，企業也面臨著日益加劇的自然相關風險。

近年來，國際社會提出了許多與自然保護相關的概念與框架，其中「基於自然的解決方案」（Nature-based Solutions, NbS）以及「自然相關財務揭露」（Taskforce on Nature-related Financial Disclosures, TNFD）兩個重要概念為企業提供了新的思維框架，可促進企業因應環境挑戰，並創造永續發展價值。

NbS 是運用自然和生態系統來解決社會與環境挑戰的方法，可涵蓋森林保育、濕地修復、綠色基礎設施等多元方案。TNFD 則是由全球企業、金融機構、政府與非營利組織等共同倡議成立之工作小組，旨在建立一套企業揭露自然相關風險與機會之框架。

本文首先將簡要介紹 NbS 和 TNFD 的發展，接著分析臺灣企業導入 NbS 與 TNFD 之現況，並探討這些概念是否能增加企業投入對外援助工作的誘因。

與自然同行的生態農業—以國合會駐巴布亞紐幾內亞技術團稻種增產計畫為例

（劉宏澤，國合會駐巴布亞紐幾內亞技師；吳東鴻，農業部農業試驗所作物組副研究員）

穩定國家發展與產業競爭力必定優先考量糧食供應與民生需求，而農糧生產對地貌景觀及生態圈擴張等均會產生長期且不易逆轉的影響，開發中國家面臨劇烈天氣與全球貿易競爭更顯無力應付衝擊；以巴布亞紐幾內亞 Morobe 省陸稻產業為例，區域農業面臨氣候變遷壓力與栽培技術不佳，又農民經濟脆弱而無力負擔化肥與農機服務，導致稻作產能每況愈下，亟欲尋求協助。有鑑於地球生命的福祉皆源於自然資源，且科學證據顯示人類必須與自然生態圈共存才能永續維持良好生活品質，因此國合會駐巴布亞紐幾內亞技術團透過以自然為本的解決方案，分析稻農所處環境尺度挑戰，提出建立生態農耕策略，引入生態鏈防治、建構生物多樣性環境及循環利用農業廢棄物等措施，提升農民應對氣候變遷與生存韌性。歷經 3 年的能力建構，稻農耕作面積從低於 9 公頃擴增至 57 公頃、白米總產量自 3.2 公噸成長至 46.2 公噸及受益農民達 500 名，部落除了自足亦有餘力出售白米，為社區經濟發展提供助力，以及陸稻生產調適環境衝擊迎來曙光，提供一項農業永續生產案例供國際農業援助借鏡。

Seeking Solutions from the Harmonious Coexistence of Humanity and Nature

The development of human civilization has been closely intertwined with nature since the time immemorial beginning. Humanity and nature have maintained a harmonious balance as we moved from hunting and gathering to agricultural societies. However, conflicts between humans and nature have occurred since the Industrial Revolution began flourishing in the 19th century. The operation of machines and the extensive use of energy sources such as coal and oil have accelerated the depletion of natural resources and increased carbon dioxide emissions. In response to the redistribution and explosive growth of the world's population, the overdevelopment of lands such as forests and farmland has exhausted the environmental carrying capacity and gradually disrupted the entire ecosystem. It is particularly evident when humans abandon traditional, natural farming methods that coexist with the environment in pursuit of massive crop yields by adopting large-scale commercial farming. While commercial farming practices have brought rapid economic benefits, the natural ecosystem has become severely imbalanced, resulting in barren soil and depleted land productivity. Consequently, with the backlash from nature and the compounding effects of climate change, humanity ultimately will face a food shortage crisis.

The international community has increasingly emphasized climate change issues in recent years. Countries have frequently proposed specific goals to demonstrate their ambitions at various conferences of the Parties to the UN Framework Convention on Climate Change. Each agreement and declaration reached after these conferences offers a glimmer of hope amidst the onslaught of climate change. However, statistical data from recent years suggests that many global efforts to address climate change appear to have failed to prevent deterioration. For instance, according to an analysis by NASA, the average global temperature in 2022 was approximately 1.11 ℃ higher than the average temperature at the end of the 19th century, ranking the fifth highest recorded surface temperature, tied with 2015. Moreover, Taiwan's climate change science team's estimates indicate that under the most severe conditions, without reducing greenhouse gas emissions, Taiwan's winters could completely disappear as early as 2060.

To mitigate the impact of climate change, the term "Nature-based Solutions (NbS)" has emerged in the international community in recent years. At COP26 in 2021, the Glasgow Climate

Pact recognized these solutions as one of the key measures for climate change adaptation. The solutions balance human well-being with biodiversity benefits, effectively addressing societal challenges by conserving, restoring, and sustaining natural ecosystems. However, no clear definition of “Nature-based Solutions” exists internationally, leading to concerns about “greenwashing” when enterprises utilize the concept. This issue focuses on the topic “The Application of Nature-based Solutions in International Development Aid” with the hope of introducing readers to what nature-based solutions are, discussing the development trends of nature-based solutions, inviting experts and scholars to discuss how they can be applied in international cooperation, and how Taiwanese enterprises can leverage their experience and creativity in conservation through participation in foreign aid work when the international community gradually recognizes the crucial role of natural capital and biodiversity in addressing climate change issues. Furthermore, this issue includes insights from the Taiwan Technical Mission in Papua New Guinea on the local pathways for applying nature-based solutions and their experiences promoting rice cultivation projects.

In the special report, we feature the article “Incorporating Nature-based Solutions into Climate Change Adaptation: Challenges and Strategies,” which includes interviews with Professor Ling-ling Lee from the Institute of Ecology and Evolutionary Biology of National Taiwan University and Kuang-Chih Chang, Director of Water Resources Planning Institute, Water Resources Agency, Ministry of Economic Affairs. They share insights from academic and governmental perspectives on the current development trends and applications of “Nature-based Solutions” and the challenges and responses the Taiwanese government may face when incorporating these solutions into climate change adaptation policies.

A passage from “ Zhuangzi: The Adjustment of Controversies” states: “Heaven, Earth, and I were produced together, and all things and I are one.” These few words encapsulate the wisdom and philosophy of the harmonious coexistence of humanity and nature and suggest that over 2,000 years ago, “Nature-based Solutions” were already part of human wisdom. Through this article, we hope to enable readers to understand why nature-based solutions can become a key measure to address climate change and encourage everyone to reflect on reconciling the relationship between “humans” and “nature” while pursuing economic growth and social development.

Summaries

The Application of Nature-based Solutions in International Development Aid

(Chyi-Rong Chiou, Associate Professor, School of Forestry and Resource Conservation, National Taiwan University; President, International Climate Development Institute)

According to the Global Risk Report 2024 published by the World Economic Forum, the primary short- and long-term risks humanity faces stem from the degradation of nature and the impact of climate change. Thus, addressing the three core challenges of the Anthropocene—mitigating and adapting to climate change and protecting biodiversity—has become critical to ensuring the sustainable survival of human society. In this context, society has turned to Nature-based Solutions (NbS) to address these challenges simultaneously. In developing countries, NbS initiatives are often funded and supported by developed countries in collaboration with local non-profit organizations. This article aims to review the current promotion of NbS in developing countries and explore how NbS can be integrated into international development aid. It seeks to strengthen the connection between development aid, climate change mitigation and adaptation, and biodiversity conservation while proposing future pathways for incorporating NbS into international development aid efforts.

International Cooperation Trends and Insights in Promoting Climate Change Adaptation through Nature-based Solutions

(Yu-Yuan SHIH, Assistant Professor, Graduate Institute of Sustainability Management and Environmental Education, National Taiwan Normal University)

The Glasgow Climate Pact from COP 26 in 2021 identified Nature-based Solutions (NbS) as a key measure for climate change adaptation, ensuring social well-being and environmental protection. In 2023, during the Fifth Session of the United Nations Environment Assembly (UNEA-5), NbS was defined, and a consensus was reached on its promotion. It was recognized that ecosystem services can offer solutions that enhance national resilience to climate change and address various societal challenges. In recent years, countries have increasingly adopted NbS to drive climate adaptation actions, with international cooperation becoming a global trend.

In response to climate change and international developments, Taiwan has integrated the NbS concept into its national climate adaptation actions starting in 2023. This article summarizes the approaches of the European Union, the United Kingdom, Japan, the United States, and ASEAN countries while analyzing Taiwan's opportunities and challenges in promoting climate change

adaptation through NbS. By examining the practices and strategies of other countries, this paper aims to offer insights for Taiwan in expanding international cooperation on climate adaptation through NbS. Given Taiwan's strengths in water resource management and agriculture, along with its long-standing international collaborations with Southeast Asian countries, it is suggested that Taiwan could draw on the practices of advanced nations to promote NbS-based international cooperation on climate adaptation, particularly by extending its efforts to Southeast Asia, thus deepening the application of international development aid.

Nature-based Solutions and Nature-related Financial Disclosures: New Opportunities for Taiwanese Businesses in International Aid

(Wen-Chi Yang, Associate Professor, Department of Diplomacy, National Chengchi University; Director, Australian Studies Centre, College of International Affairs)

In 1992, the Earth Summit held in Rio de Janeiro, Brazil, led to the establishment of three major international conventions: the United Nations Framework Convention on Climate Change, the Convention on Biological Diversity, and the United Nations Convention to Combat Desertification. These pivotal environmental treaties were designed to address the most pressing challenges to human survival and promote sustainable development. However, 30 years later, environmental issues such as climate change and biodiversity loss have become more severe, and businesses now face increasing nature-related risks.

In recent years, the international community has introduced several nature conservation concepts and frameworks, among which two stand out for offering new strategic frameworks to businesses: Nature-based Solutions (NbS) and the Taskforce on Nature-related Financial Disclosures (TNFD). These frameworks can help companies address environmental challenges while creating sustainable value.

NbS uses nature and ecosystems to address social and environmental challenges and can encompass diverse initiatives such as forest conservation, wetland restoration, and green infrastructure. TNFD, on the other hand, is a task force initiated by global businesses, financial institutions, governments, and non-profit organizations to create a framework for companies to disclose nature-related risks and opportunities.

This article first provides a brief overview of the development of NbS and TNFD, followed by an analysis of the current status of Taiwanese companies adopting these concepts. Finally, it explores whether these frameworks can incentivize businesses to increase their involvement in international aid projects.

Ecological Agriculture in Harmony with Nature: A Case Study of the TaiwanICDF Rice Seeds Production Project in Papua New Guinea

(Hung-Tse Liu, Specialist of the Taiwan Technical Mission in Papua New Guinea;
Dong-Hong Wu, Associate Research Fellow, Taiwan Agricultural Research Institute,
Ministry of Agriculture)

Ensuring stable national development and industrial competitiveness must prioritize food supply and the needs of the people. However, agricultural production has long-term, often irreversible impacts on landscapes and ecosystems. Developing countries are particularly vulnerable in the face of extreme weather conditions and global trade competition. Taking the upland rice industry in Morobe Province, Papua New Guinea, as an example, the region's agriculture is under pressure from climate change and poor cultivation techniques. Additionally, the economic fragility of farmers, who cannot afford fertilizers or agricultural machinery, has led to declining rice production capacity and the urgent need for assistance.

Recognizing that the well-being of all life on Earth depends on natural resources and scientific evidence that humans must coexist with natural ecosystems to sustain a good quality of life, the Taiwan Technical Mission in Papua New Guinea employed nature-based solutions. The mission analyzed the environmental challenges faced by rice farmers. It proposed an ecological farming strategy, introducing measures such as natural pest control, creating a biodiverse environment, and recycling agricultural waste. These efforts aim to enhance farmers' resilience to climate change and improve their livelihoods.

After three years of capacity building, the rice farming area expanded from less than 9 hectares to 57 hectares, and white rice production increased from 3.2 metric tons to 46.2 metric tons, benefiting 500 farmers. Beyond self-sufficiency, the community now has surplus rice to sell, contributing to local economic development and offering hope for the rice industry's adaptation to environmental challenges. This case provides a model of sustainable agriculture for international agricultural aid.