

主辦單位：經濟部工業局
執行單位：台灣綠色生產力基金會

製造業因應氣候變遷策略及配套措施

氣候相關財務揭露

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簡報大綱

- 前言：氣候變遷
 - 環境變遷vs.氣候變遷
 - 氣候變遷的衝擊與因應
- TCFD概觀
 - TCFD趨勢分析
 - TCFD整體架構
- 氣候相關的風險與機會
- 揭露的核心元素與揭露建議
- 情境分析
- 較佳案例：國際與國內
- 情境分析案例

環境變遷

□ 環境變遷

- 全球環境變遷、全球變遷、全球暖化、氣候變遷
- 空間尺度、時間尺度
- 關注層面：健康 → 經濟發展、社會公平、環境保護

□ 環境變遷議題

- 土地資源質損 (Degradation)
自然資源折耗 (Depletion)
- 生物多樣性降低 (Biodiversity)、生物棲息地減少
- 水資源 → 水量減少與水質變差
- 酸雨問題
- 沙漠化與沙塵問題
- 臭氧層破壞
- 全球暖化 → 氣候變遷

沙漠化與沙塵暴

- 1977 UN Conference on Desertification :
沙漠化 (Desertification)，指土地擁有的生物**生產力**減退乃至破壞，最後變成沙漠狀態。
- **UNCCD** United Nations Convention to Combat Desertification 對抗沙漠化公約
 - 1994簽署、1996年生效
- 沙塵暴
 - 係指強風捲起大量地表沙塵，使能見度惡化的沙塵天氣，基本上是乾旱與沙漠化氣候環境的產物，氣象學家上把地面**能見度低於1公里**者稱「沙塵暴」
 - 如何防治？

臭氧層破壞

□ 臭氧層、平流層

- 地球大部分的臭氧都集中在離地面20~30 km處的大氣中→此部分的大氣層稱「平流層」或「臭氧層」

□ 平流層臭氧的功能

- 臭氧可吸收紫外線而分解成氧：臭氧→紫外線的剋星！
- 對流層的臭氧？→空氣污染物

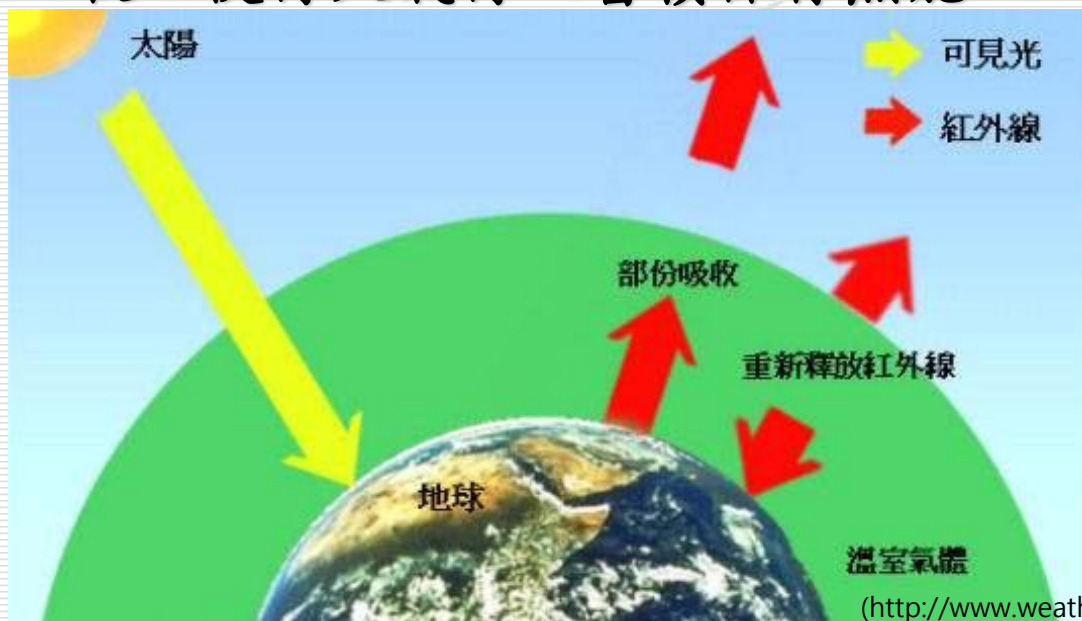
□ 臭氧層破壞→臭氧洞

- 1974年，美國加州大學Sherwood Rowland and Mario Molina 在 Nature 發表論文指出：人造的氟氯碳化物(CFC)會在大氣中不斷累積，在其上升至臭氧層時，將因吸收紫外線而分解釋出氯原子，氯原子最後再與臭氧分反應，致使臭氧層的臭氧濃度降低，一般俗稱臭氧層破洞或臭氧洞。

□ 維也納公約 (1985) → 蒙特婁議定書 (1987)

溫室效應與氣候變遷

- 經地球大氣吸收、地表及大氣反射後，太陽輻射能量僅剩約49%為地表所吸收，地表吸收的能量再以**長波輻射**之紅外線形式釋出，部分被大氣中**溫室氣體**所吸收，使得大氣得以蓄積保存熱能。



地球大氣中若無溫室氣體存在，地球平均大氣溫度據估計應約為**-18°C**，但實際平均溫度**15°C**。

(http://www.weather.gov.hk/climate_change/global_warming_c.htm)

- 過度劇烈之全球暖化造成氣候變遷
 - 氣候變遷減緩與調適
 - 《溫室氣體減量及管理法》、《聯合國氣候變化綱要公約》

氣候變遷的衝擊

- 極端氣候更趨頻繁、颱風降雨強度增加、降雨型態改變、乾旱洪害增加等
- 台灣可能須面對的氣候變遷衝擊：
 - **災害衝擊** - 極端天氣現象發生頻率與強度增加。
 - **水資源** - 降雨型態改變影響水庫蓄水能力，影響水資源供應的穩定性（強降雨易導致崩塌，造成水庫淤積）。
 - **維生管線與關鍵基礎設施** - 災害破壞輸油、輸電、輸水、輸氣或道路、橋梁等設施。
 - **生態系統與農業安全** - 天氣直接影響到農產品的收成，對於林、漁、牧業亦有相當的衝擊。
 - **公共衛生與健康** - 氣溫上升可能使病媒容易散布，而極端天氣引發的供水不穩，則造成公共衛生與醫療體系的負擔。

氣候變遷之因應

□ 溫室氣體減量及管理法立法意旨

- 為因應全球氣候變遷，制定氣候變遷調適策略，降低與管理溫室氣體排放，落實環境正義，善盡共同保護地球環境之責任，並確保國家永續發展...
- 減緩(mitigation)與調適(adaptation)
- 環境正義、永續發展

□ 減緩：指以人為方式減少排放源溫室氣體排放或增加溫室氣體碳匯。

- 碳匯：指將二氧化碳或其他溫室氣體自排放單元或大氣中持續分離後，吸收或儲存之樹木、森林、土壤、海洋、地層、設施或場所。

□ 氣候變遷調適：指人類系統，對實際或預期氣候變遷衝擊或其影響之調整，以緩和因氣候變遷所造成之傷害，或利用其有利之情勢。

- 調適包括預防性及反應性調適、私人和公共調適、自主性與規劃性調適等。

溫室氣體減量、氣候變遷調適

- ❑ 再生能源及能源科技發展。
- ❑ 能源使用效率提昇及能源節約。
- ❑ 工業部門溫室氣體減量。
- ❑ 運輸管理、大眾運輸系統發展及其他運輸部門溫室氣體減量。
- ❑ 低碳能源運具使用。
- ❑ 建築溫室氣體減量管理。
- ❑ 廢棄物回收處理及再利用。
- ❑ 森林資源管理、生物多樣性保育及碳吸收功能強化。
- ❑ 農業溫室氣體減量管理及糧食安全確保。
- ❑ 綠色金融及溫室氣體減量之誘因機制。
- ❑ 溫室氣體總量管制、抵換、拍賣、配售、交易制度之建立及國際合作減量機制之推動。

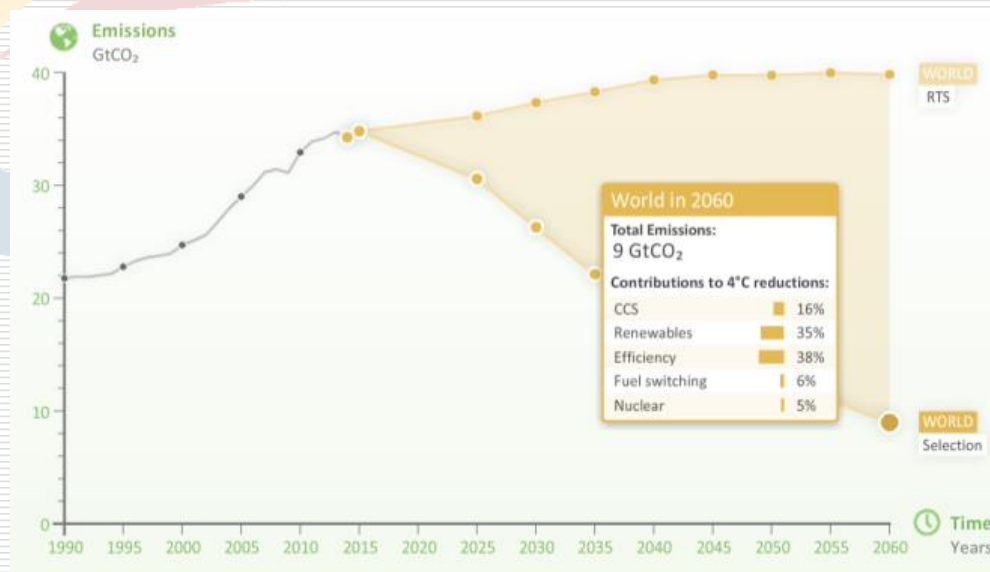
減緩氣候變遷之目標與對策

□ 溫室氣體減量－減緩

- 減緩策略是指藉由減少溫室氣體之產生或將溫室氣體捕捉貯存，以降低其排放至大氣。
- 為維持未來大氣溫度上升控制在 2°C 以下，大氣中二氧化碳濃度不超過450ppm

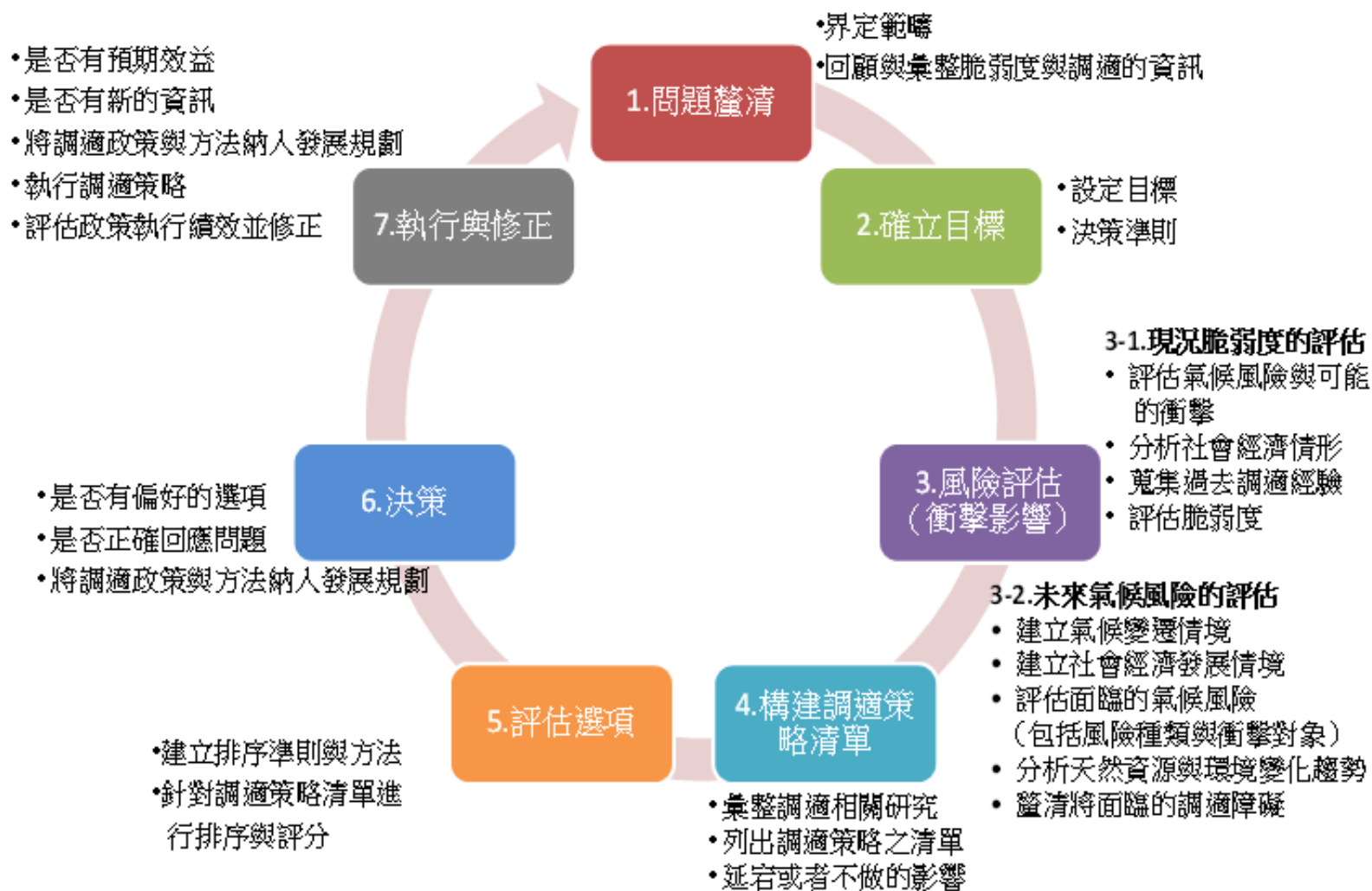
□ 國際能源署提出應發展之關鍵減緩對策包括：

- 能源效率提升
(約38%之GHG減量)
- 再生能源的開發
(約35%之GHG減量)
- 碳捕捉與封存
(約16%之GHG減量)
- 能源轉換(6%)
核能(5%)

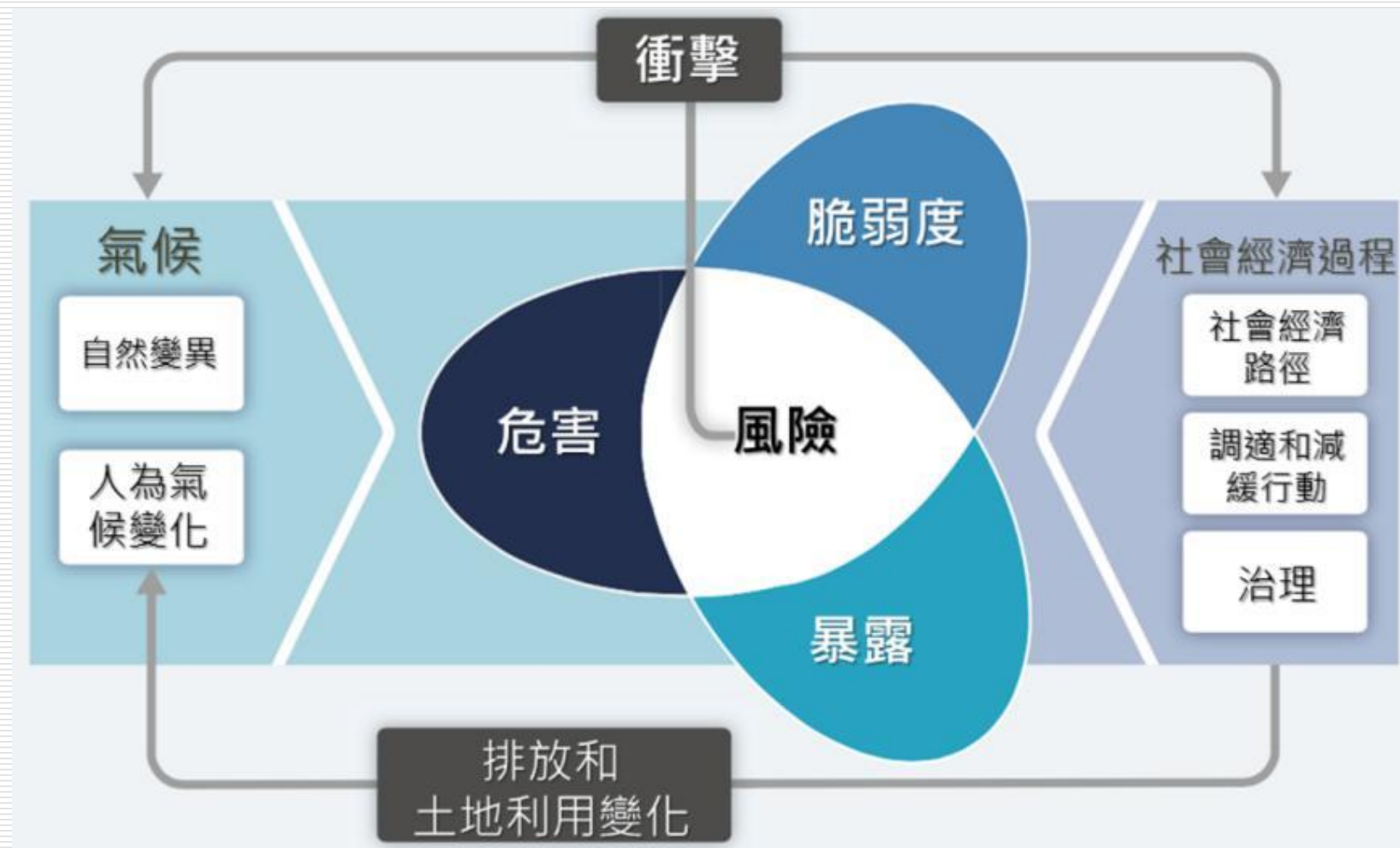


<https://www.iea.org/etp/explore/>

氣候變遷調適管理架構



IPCC-AR5 對於風險、 脆弱度、暴露與危害之核心概念



聯合國氣候變化綱要公約(UNFCCC)

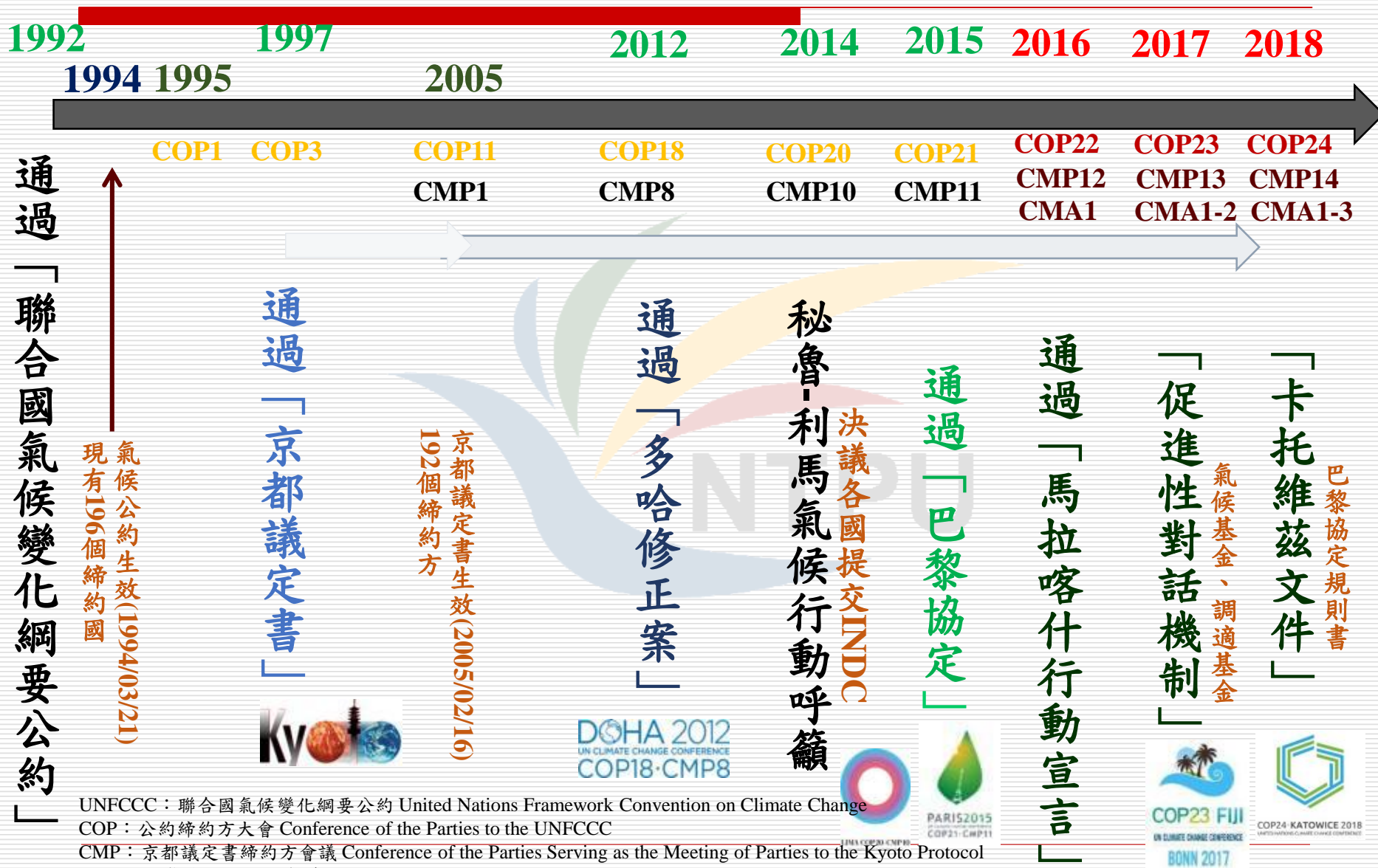
□ UNFCCC沿革：

- 「**聯合國氣候變化綱要公約**」(the United Nations Framework Convention on Climate Change, 簡稱 UNFCCC)，**1992年通過，1994年生效**，計有195個締約方，至今召開**24次**締約國大會。

□ UNFCCC基本原則：

- **共同但有區別之責任**：締約方共同承擔但程度不同的責任，「附件一締約方」須優先承擔責任。
- **公平原則**：應將公約中有特別需求或面臨特殊狀況的締約方(特別是開發中國家)，可能承擔之不成比例負擔或反常負擔列入公平考量。
- **防制措施**：締約方應採「**經濟有效**」及「**最低成本**」措施防制氣候變化。
- **經濟發展**：締約方應促進永續性經濟發展，並將經濟發展納入防制氣候變化的關鍵考量因素。

氣候公約(UNFCCC)演進歷程



通過「聯合國氣候變化綱要公約」

通過「京都議定書」

通過「多哈修正案」

通過「巴黎協定」

通過「馬拉喀什行動宣言」

「促進性對話機制」

「卡托維茲文件」

巴黎協定規則書

氣候基金、調適基金

決議各國提交INDC

秘魯、利馬氣候行動呼籲

京都議定書生效(2005/02/16)
192個締約方

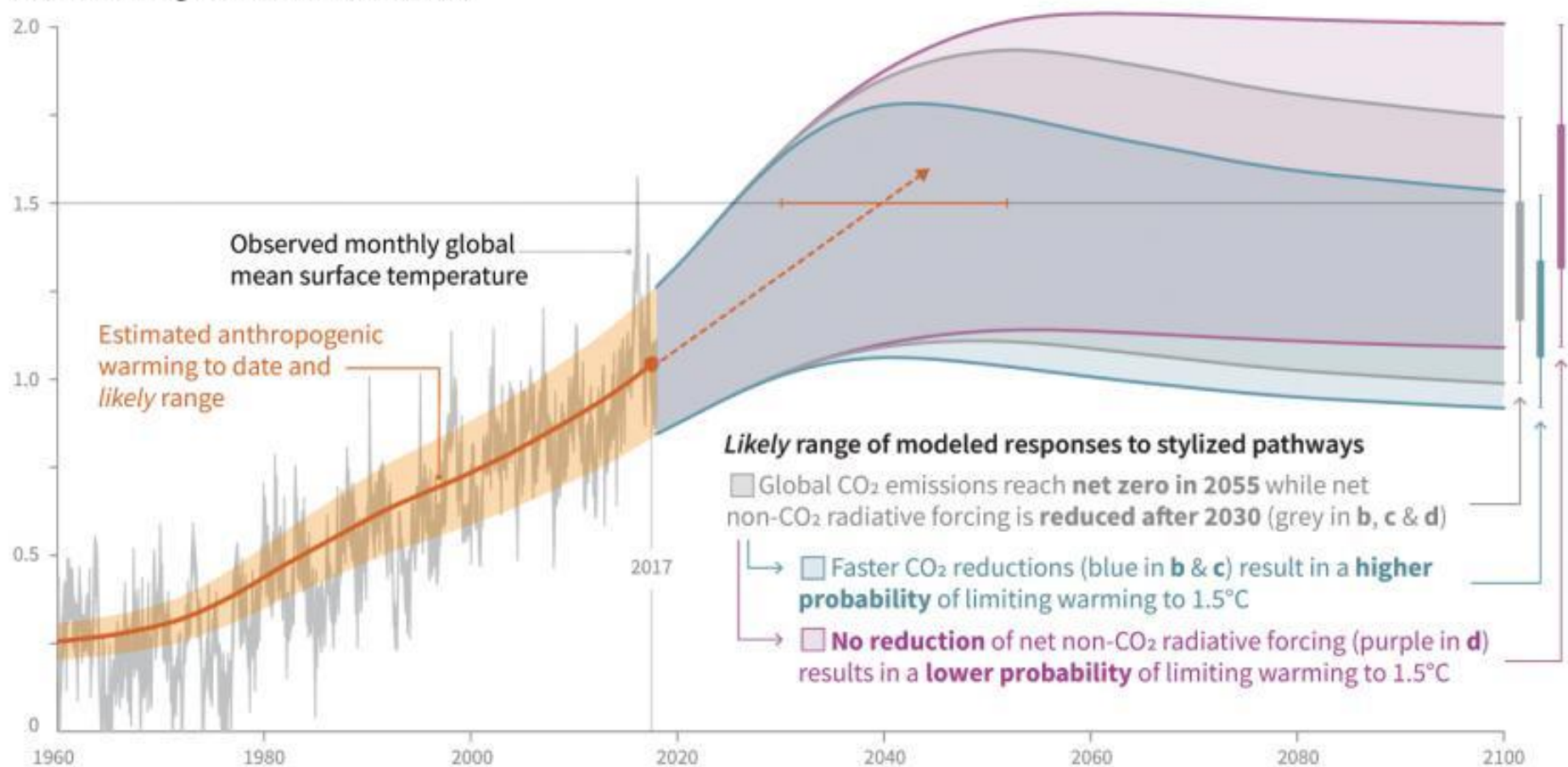
氣候公約生效(1994/03/21)
現有196個締約國

UNFCCC：聯合國氣候變化綱要公約 United Nations Framework Convention on Climate Change
COP：公約締約方大會 Conference of the Parties to the UNFCCC
CMP：京都議定書締約方會議 Conference of the Parties Serving as the Meeting of Parties to the Kyoto Protocol
CMA：巴黎協定締約方會議 Conference of the Parties Serving as the Meeting of Parties to the Paris Agreement
INDC：國家預期自定貢獻 Nationally Intended Determined Contribution

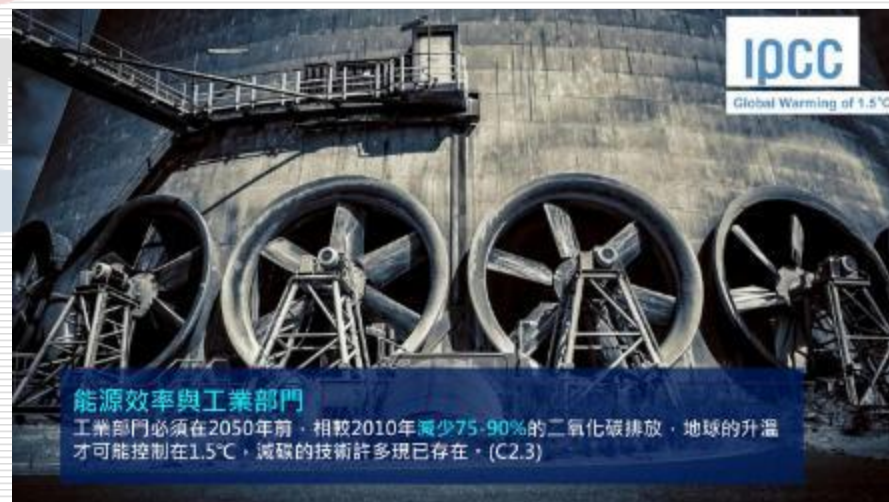
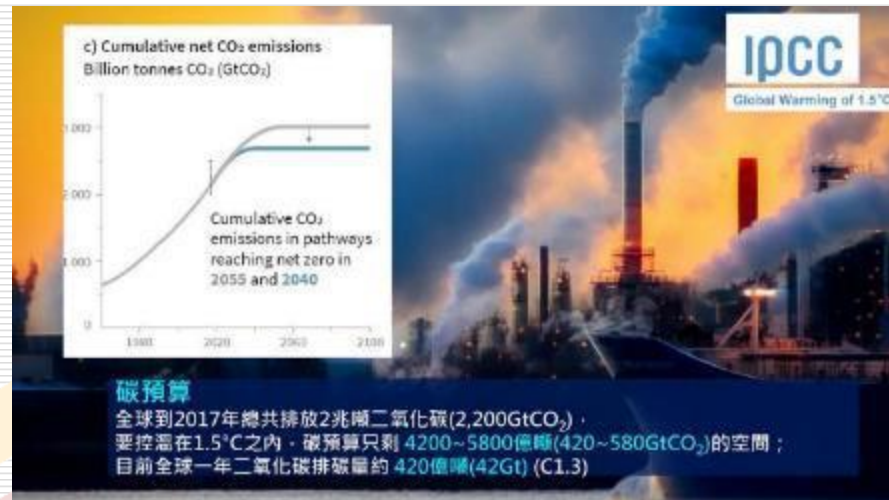
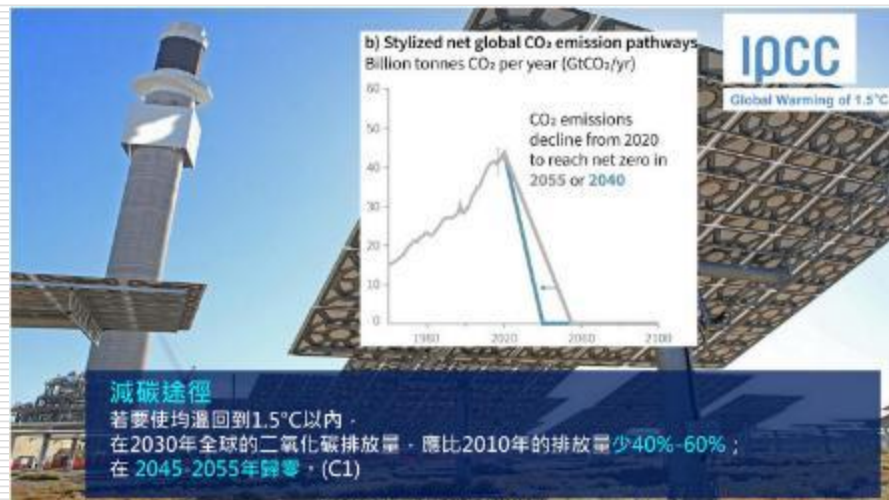
(原始投影片由申永順教授提供，並授權使用及修訂)

關鍵報告: Global Warming of 1.5°C

Global warming relative to 1850-1900 (°C)



呼應暖化 1.5°C 的排放途徑和系統轉變



TCFD簡介

TCFD代表Michael R. Bloomberg致金融穩定委員會主席Carney

“

The Task Force's report establishes recommendations for **disclosing clear, comparable and consistent information about the risks and opportunities presented by climate change**. Their widespread adoption will ensure that the effects of climate change become routinely considered in business and investment decisions. Adoption of these recommendations will also help companies **better demonstrate responsibility and foresight in their consideration of climate issues**. That will lead to smarter, more efficient allocation of capital, and help smooth the transition to a more sustainable, low-carbon economy.

”

本工作小組報告**針對氣候變遷的風險與機會提供一明確、可比較及一致性的資訊揭露建議**，並廣泛採納各方建議以確保氣候變遷影響能被納入商業與投資決策考量。**採納這些建議有助於企業在氣候議題上展現責任心及遠見**，進而更聰明與效率的配置資本，並有助於順利的邁向更永續、低碳經濟的發展。

Michael R. Bloomberg

THREE PROBLEMS: ONE SOLUTION

In the current climate-related disclosure landscape, challenges are faced by:

- **Issuers** who generally have an obligation under existing law to disclose material risks, but lack a coherent framework to do so for climate-related risk,
- **Lenders, insurers, and investors** who need decision-useful climate-related risk information in order to make informed capital allocation and financial decisions, and
- **Regulators** who need to understand risks that may be building in the financial system

The Task Force aims to provide the solution:

a clear, efficient, and voluntary disclosure framework that improves the ease of both producing and using climate-related financial disclosures

投影片直接引用自：

<https://www.fsb-tcfd.org/wp-content/uploads/2016/12/TCFD-Report-Overview-Dec.-2016.pptx>

TCFD簡介

TCFD緣由、目的與歷程



緣由

- ▶ 因應巴黎協議的金融影響，金融穩定委員會(FSB)旗下氣候相關財務揭露工作小組(TCFD)宣布將制定自願性、一致性的氣候相關金融風險揭露工具
- ▶ TCFD成立於2015年12月，成員來自G20國家的各部門



目的

- ▶ 定義主要財務資訊揭露中所必須被揭露的資訊，供企業滿足利害關係人相關訊息需求
- ▶ 了解金融體系暴露在氣候風險的影響
- ▶ 著重與低碳轉型有關之風險與機會



TCFD成立，並提出相關揭露建議

2015/12



發布第二階段建議書及執行手冊

2016/12



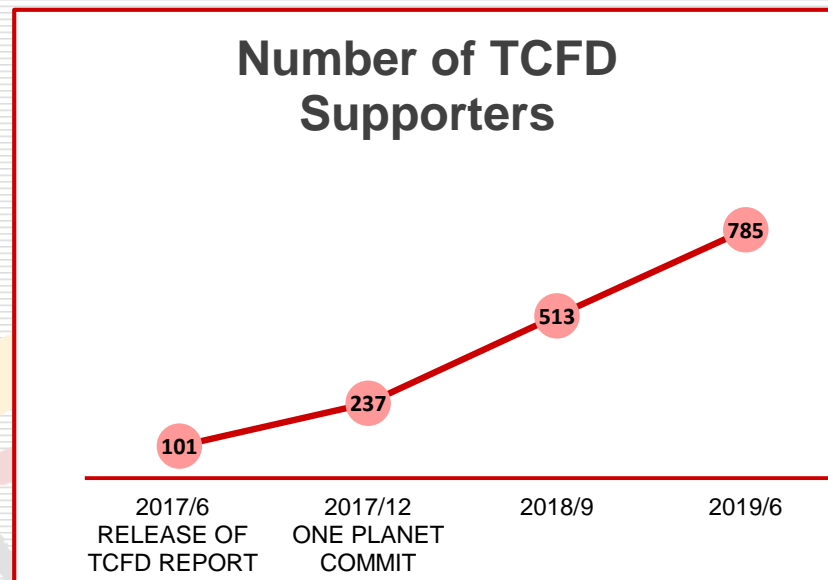
發布終版之建議書、執行手冊及工具書

2017/6

TCFD簡介

2019 Status Report: TCFD 趨勢分析（一）

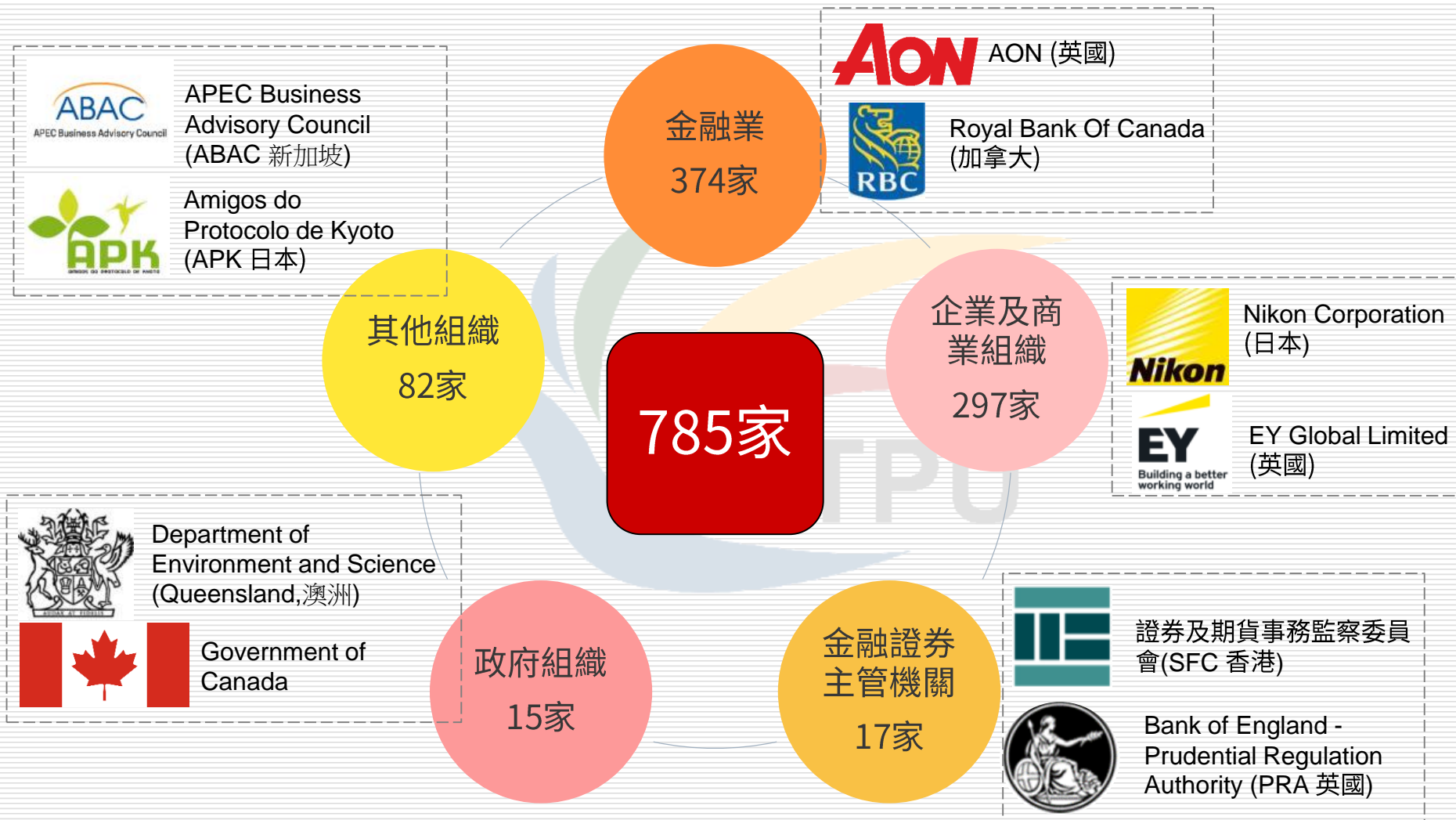
- TCFD支持者已從2018的513個組織，增加到785家，其中有671家為公司，TCFD支持者數量變化如右圖
- 擁有近34兆美元資產管理規模的340名投資者，要求公司需要根據TCFD進行報告
- 36個中央銀行/主管機關鼓勵使用TCFD報告
- 五國政府表示支持TCFD：比利時、加拿大、法國、瑞典、和英國



Support for the TCFD has grown to 867 organizations as of September 2019

TCFD簡介

2019 Status Report: TCFD 趨勢分析 (二)



TCFD簡介

2019 Status Report: TCFD 趨勢分析（三）



氣候相關財務訊息揭露從2016年開始逐年增加，但對投資者來說效率仍然不足



企業仍須針對氣候相關議題的潛在財務影響作出更明確的分析，以利投資者做出正確的財務決策



大部分公司在進行揭露時，並沒有針對相關策略的韌性 (Resilience of strategy) 訊息進行揭露



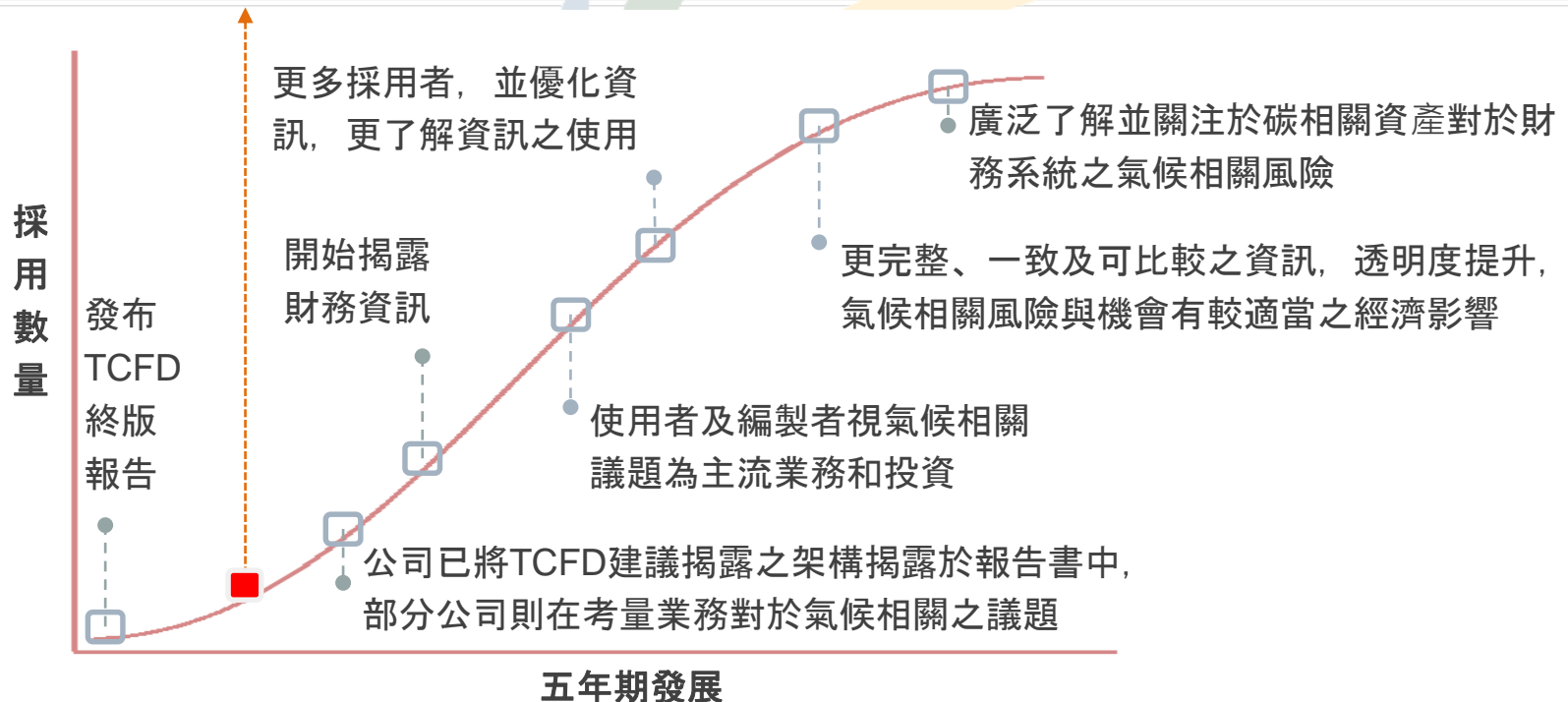
將氣候相關議題納入主流，需要多方職能的人參與，尤其是風險管理和財務職能的參與

TCFD簡介

TCFD現況及未來發展

- ▶ 投資者：超過合計19兆美金之360位投資者要求G20支持TCFD的建議
- ▶ 企業：已有100餘位企業界領袖及其企業做出公開承諾，將支持TCFD的建議。(這些企業的加總市值超過3.5兆美元，其中金融機構所管理的資產規模約為25兆美元)
- ▶ 各國：在G20成員國中有營運據點的台灣的跨國企業而言，應注意各國主管機關的規定，並開始提早擬定因應對策
- ▶ 財務：財務主管(財務長、會計長及會計主管)將需要考慮能源短缺、辨識氣候相關的量化影響並整合至現有的財務揭露
- ▶ 未來發展：氣候變遷保險、避險工具、衍生性金融工具

■ 現況



建議書各章節重點

整體架構說明

A

前言

建議書背景與工作小組職責介紹

D

情境分析和氣候相關議題

情境分析概述，與其建議方法、應用、挑戰及益處資料補充

B

氣候相關風險、機會和財務影響

氣候相關風險與機會類別介紹
氣候相關財務影響實例及類別介紹

E

重要議題與未來進一步工作事項

介紹工作小組考量的重大議題、回饋意見、最終解決辦法及未來工作領域

C

建議和指引

金融和非金融產業部門氣候揭露建議指引與執行建議

F

結論

TCFD簡介

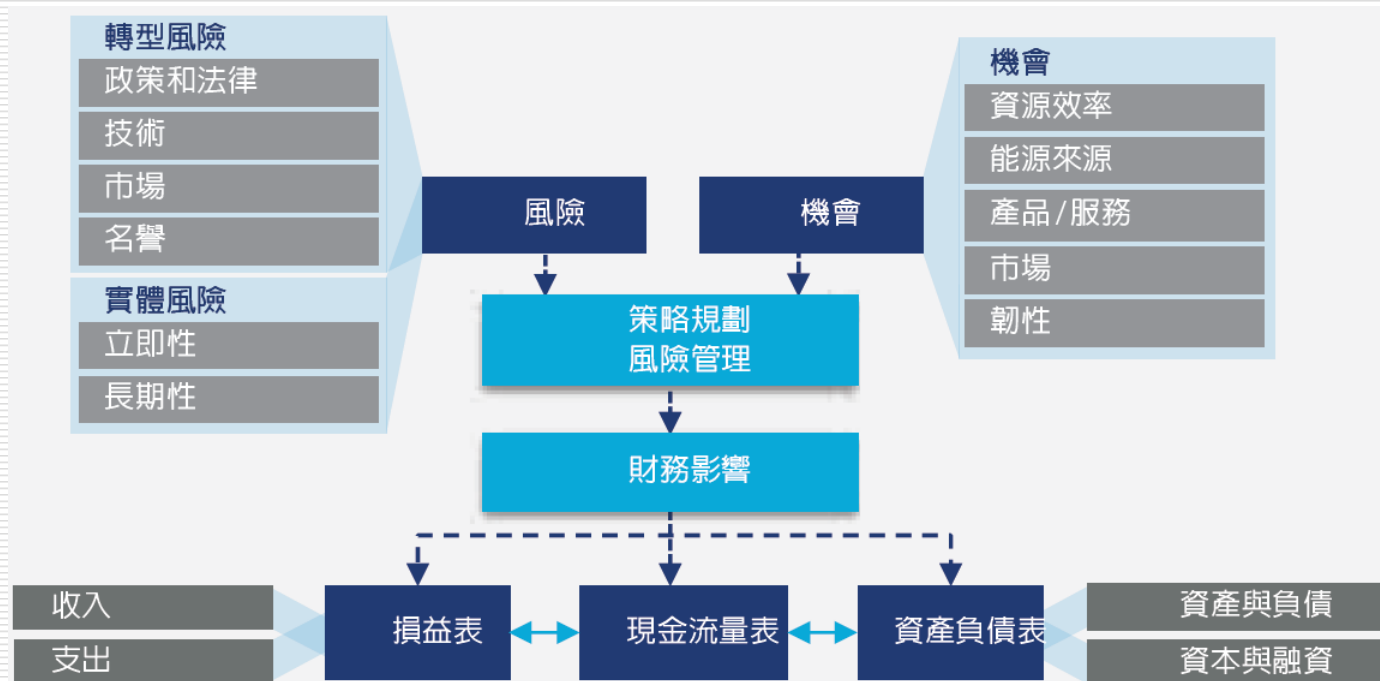
單元B重點

本單元重點: 專注於邁向低碳經濟轉型所涉及的風險與機會

組織的氣候財務影響
受兩大面向驅動

1. 氣候相關風險
及機會

2. 採取的策略與
風險管理決策



氣候相關財務資訊揭露面臨挑戰:

1. 組織對於氣候相關議題瞭解有限
2. 傾向關注近期風險
3. 氣候相關議題財務影響難以量化

應對方式:

TCFD建議書列舉氣候相關風險與財務影響實例, 並詳細介紹與特定產業最具關連性的主要財務影響類別 (收入、支出、資產和負債, 以及資本和融資)

TCFD簡介

單元C重點

本單元重點:所有及特定產業之組織於四大運作核心納入氣候建議揭露指引

 治理	 策略	 風險管理	 指標與目標
<p>治理階層對風險與機會的指導、監督與管理方式</p> <p>建議揭露：</p> <ul style="list-style-type: none">▶ 董事會對氣候變遷相關風險與機會的監督▶ 管理階層評估與管理氣候變遷相關風險與機會的權責	<p>掌握立即與潛在的氣候相關風險與機會，說明對組織業務、策略與財務規劃的衝擊</p> <p>建議揭露：</p> <ul style="list-style-type: none">▶ 鑑別的短、中、長期氣候變遷相關風險與機會▶ 氣候變遷相關風險與機會如何影響組織營運、策略及財務規劃▶ 不同氣候變遷情境下，組織營運、策略及財務規劃之影響	<p>講求方法與流程，揭露組織如何鑑別、評估管理氣候風險的流程</p> <p>建議揭露：</p> <ul style="list-style-type: none">▶ 組織鑑別與評估氣候變遷相關風險的程序▶ 管理氣候變遷相關風險的程序▶ 描述鑑別、評估與管理氣候變遷相關風險的程序如何被整合在組織整體的風險管理架構中	<p>績效的檢視，組織用甚麼樣的指標與目標，來評估和管理氣候相關風險與機會的成果</p> <p>建議揭露：</p> <ul style="list-style-type: none">▶ 揭露訂定策略及風險管理過程中，運用哪些指標評估氣候變遷相關風險與機會▶ 揭露範疇1、2及3溫室氣體排放及相關風險▶ 組織管理氣候變遷相關風險與機會時的目標，以及績效與目標的差異

TCFD簡介

單元D重點

本單元重點:透過情境分析工具瞭解氣候相關風險與機會的策略影響

► 情境分析建議方法

	揭露情境分析的關鍵面向	舉例說明
1	使用情境	溫度升幅控制於2°C或更嚴苛之環境
2	情境分析所輸入的參數、假設及分析選項	各區域、國家、資產所在地、市場內的輸入參數
3	使用情境之時間規劃	短、中、長期里程碑
4	組織策略及財務計劃資訊	策略績效、組織價值鏈、資產配置決策、研發領域，以及組織營運績效和財務狀況

► 情境分析挑戰及益處

情境分析挑戰	情境分析益處
一、氣候相關情境的透明度、資料輸出範圍及支援商業或投資環境的應用工具不一定理想	一、針對未來可能狀況，制定更具靈活性和穩定性的策略規劃
二、資料取得性及詳細程度	二、有助於有效地建構策略議題
三、情境分析潛在商業影響仍在早期階段	三、為投資者提供有效溝通基礎

TCFD簡介

單元E重點

本單元重點:介紹工作小組考量的重要議題及未來進一步工作事項
制定及發布建議時，工作小組的十項重大考量議題:

	十項重大議題	現況與挑戰
1	與其他資訊揭露倡議的關聯性	資訊揭露不一致
2	資訊揭露處和重大性	組織識別資訊重大性的方式以及揭露內容
3	情境分析	組織未能採用科學根據的情境分析
4	資料可取得性、品質以及財務影響	缺乏量化工具、各產業間的差異氣候的不確定性
5	投資相關的溫室氣體排放	報告數據的準確性及完整性不足
6	薪酬	揭露績效指標尚未納入薪酬政策
7	會計考量	並未充分考慮IAS36 資產減損評估
8	短、中、長期時間範圍	時間範圍妨礙組織思考氣候相關風險與機會之影響
9	涵蓋範疇	窄小的涵蓋範疇限縮了對氣候風險的瞭解與評估
10	組織所有權	企業部門權責混亂

TCFD簡介

單元E重點

本單元重點:介紹工作小組考量的重要議題及未來進一步工作事項

工作小組針對兩次徵求公眾意見(500多份回饋)、推廣外部活動、數百次的產業訪談、數次焦點團體訪談、多次網路研討會分析回饋意見，研究並制訂方法和標準。

公眾回饋意見	工作小組分析與建議	未來進一步工作事項	工作內容說明
組織擔憂揭露架構與強制性報導造成行政負擔，不利於能力較弱之組織	工作小組提供一套共同的原則，有助於揭露制度更趨一致	加強與其他資訊揭露倡議機構的關係	鼓勵制定標準的組織積極與其他機構合作，使架構各具一致性
組織肯定情境分析，並要求小組標準化氣候相關情境分析並回饋分析具組織規模比例特性	工作小組為四類非金融組織設定最低標準，以解決比例性問題	情境分析	開發是用於2°C或更嚴苛的轉型情境及相關產出、工具和使用介面
組織建議: 指標應提高比較性和一致性;闡明各指標、風險與機會及財務影響間的連結;簡化指標;對指標提供補充指引	工作小組簡化繁複指標，統一術語，闡明各項指標、氣候相關風險與機會及潛在財務影響間的關係，並鼓勵部門專家研究分析	資料可取得性和品質以及財務影響	氣候相關潛在財務影響研究與分析; 提升資料品質，並制定相關指標; 提升組織對相關風險與機會之瞭解
組織擔心財務資訊揭露與重大性評估與氣候相關風險無直接關係	氣候相關風險屬非可風散風險、影響所有產業部門，許多投資人亦希望對治理/風險管理有所瞭解，故應進行揭露	實例揭露	提供揭露實例，協助編撰者按工作小組建議編制揭露資訊

結論及效益

TCFD建議採納之現行狀況

✓ 企業及商業組織

1. 企業揭露氣候相關資訊不足
2. 儘管揭露的比例增加，但揭露的企業占比仍非常低
3. 企業實際揭露事項逐漸成長中
4. 氣候應揭露事項分散於不同的報告中(財務申報、永續報告書、年度報告等)
5. 揭露比例與公司規模大小相關
6. 揭露內容因地區而有所不同
7. 有關策略之韌性，揭露比例仍非常低

✓ 金融業

考量資產管理人與資產擁有人無法揭露客戶與受益人財務資訊，工作小組**改**
透過聯合國責任投資原則(The Principle for Responsible Investment, 簡稱
PRI) 簽署情況強化金融業氣候相關財務資訊揭露責任

✓ NGO

面對使用氣候相關情境分析的挑戰，NGO可發展企業相關數據與支援工具，協助企業使用情境分析，取得氣候相關風險以及發展具有氣候韌性的策略

Source: TCFD 2019 Status Report

結論及效益

採行工作小組建議的優點

促進董事及高層對氣候議題之參與²

- ▶ 董事會應該更關注氣候變遷風險、對投資人揭露更多資訊，提升透明度

有助於瞭解所曝露的氣候相關風險⁴

- ▶ 協助產品和服務策略，掌握氣候風險，發展新商業模式或創新產品
- ▶ 重新審視企業能/資源的使用效率

1 提高靈活度以適應不斷改變的氣候情況

- ▶ 加強企業氣候治理韌性能力建置

3 通過情境分析議題的「未來性」

- ▶ 連結國際倡議，確保低碳經濟轉型進程
- ▶ 務實且以科學方法規劃溫室氣體減量，履行企業公民責任

5 具決策/前瞻性的財務資訊揭露設計

- ▶ 健全企業財務規劃，以因應能源轉型及低碳經濟發展，例如：再生能源與傳統能源價格變動

結論及效益

發展與實施路徑

各類型組織發展出符合建議的編制揭露建議

已根據其他架構揭露的組織

- ▶ 直接依據工作小組架構揭露
- ▶ 年度財務申報依原有流程進行揭露

經驗較少的組織

- ▶ 考慮揭露目前的治理、策略和風險管理相關議題
- ▶ 初步資訊揭露使投資人能瞭解組織潛在財務影響

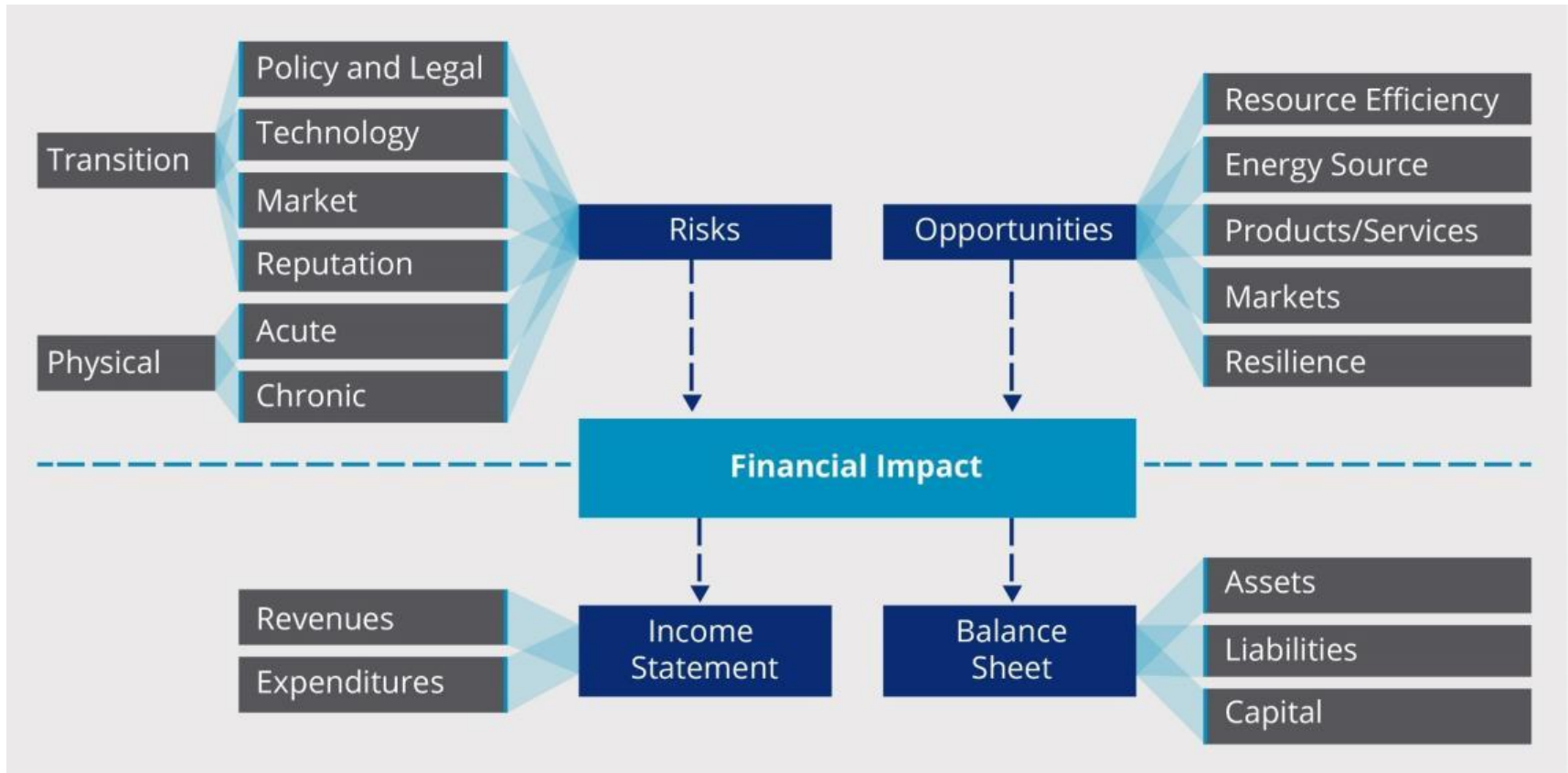
按照國家要求架構揭露的組織

- ▶ 組織應在其他報告書中揭露內容
- ▶ 報告應廣泛發行或至少每年發布一次
- ▶ 內部控制流程與財報中的內部控制流程大致相同

廣泛採用建議，
有助於決策、風險與機會價值能準確定義，
進而促成資本有效分配。

EVALUATING FINANCIAL IMPACT

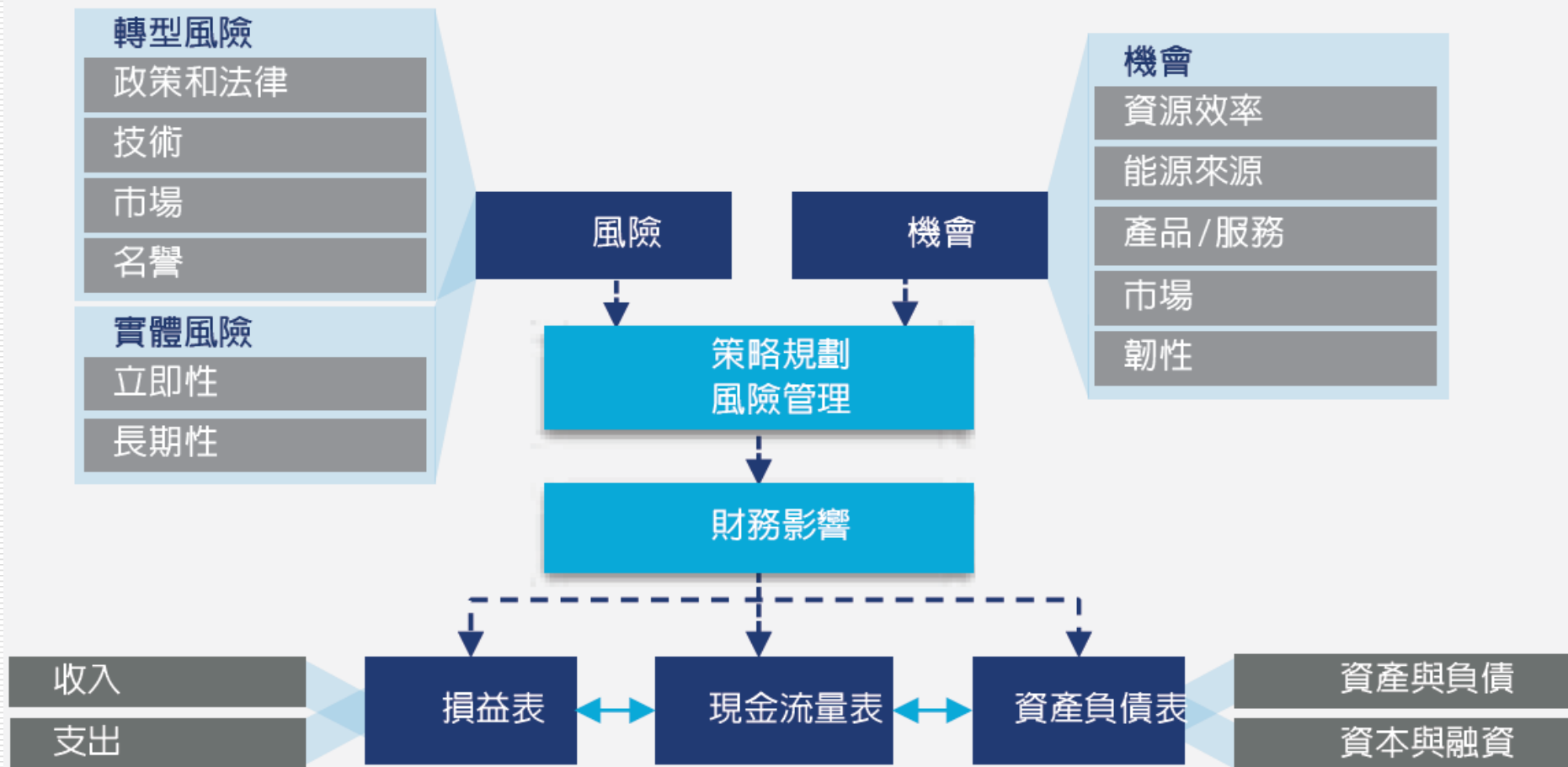
Climate-related risks and opportunities can impact organizations' financial performance.



投影片直接引用自：

<https://www.fsb-tcfd.org/wp-content/uploads/2016/12/TCFD-Report-Overview-Dec.-2016.pptx>

氣候相關風險、機會和財務影響



TCFD氣候相關財務揭露建議(安永-繁體中文版)

2019/10/02發表

CLIMATE-RELATED RISKS AND OPPORTUNITIES

Type	Climate-Related Risks	Type	Climate-Related Opportunities
Transition Risks	Policy and Legal	Resource Efficiency	<ul style="list-style-type: none"> – Use of more efficient modes of transport – More efficient production and distribution processes – Use of recycling – More efficient buildings – Reduced water usage and consumption
	<ul style="list-style-type: none"> – Increased pricing of GHG emissions – Enhanced emissions-reporting obligations – Mandates on and regulation of existing products and services – Exposure to litigation 		
	Technology	Energy Source	<ul style="list-style-type: none"> – Lower-emission sources of energy – Supportive policy incentives – Emergence of new technologies – Participating in carbon market – Energy security and shift towards decentralization
	<ul style="list-style-type: none"> – Substitution of existing products and services with lower emissions options – Unsuccessful investment in new technologies – Upfront costs to transition to lower emissions technology 		
	Markets	Products and Services	<ul style="list-style-type: none"> – Develop and/or expand low emission goods and services – Climate adaptation and insurance risk solutions – R&D and innovation – Diversify business activities – Shifting consumer preferences
Physical Risks	<ul style="list-style-type: none"> – Changing customer behavior – Uncertainty in market signals – Increased cost of raw materials 		
	Reputation	Markets	<ul style="list-style-type: none"> – New markets – Public-sector incentives – Community needs and initiatives – Development banks
	<ul style="list-style-type: none"> – Shift in consumer preferences – Stigmatization of sector – Increased stakeholder concern or negative stakeholder feedback 		
	Acute	Resilience	<ul style="list-style-type: none"> – Participate in renewable energy programs and adopt energy-efficiency measures – Resource substitutes/diversification – New assets and locations needing insurance coverage
	<ul style="list-style-type: none"> – Increased severity of extreme weather events such as cyclones and floods 		
	Chronic		
	<ul style="list-style-type: none"> – Changes in precipitation patterns and extreme weather variability – Rising mean temperatures – Rising sea levels 		

投影片直接引用自：

<https://www.fsb-tcfd.org/wp-content/uploads/2016/12/TCFD-Report-Overview-Dec.-2016.pptx>

氣候相關的風險與機會

類型	氣候相關風險 ³²	潛在財務影響
轉型風險	政策和法規	
	<ul style="list-style-type: none"> 提高溫室氣體排放定價 強化排放量報導義務 現有產品和服務的要求及監管 面臨訴訟風險 	<ul style="list-style-type: none"> 增加營運成本（如合規成本和保費增加） 政策變化導致現有資產沖銷和提前報廢 因罰款和判決導致的成本增加和/或產品和服務需求降低
	技術	
	<ul style="list-style-type: none"> 以低碳商品替代現有產品和服務 對新技術的投資失敗 低碳技術轉型的成本 	<ul style="list-style-type: none"> 現有資產沖銷和提前報廢 產品和服務需求量下降 新型和替代型技術研發支出 技術開發的資本投資 採用/建置新型實務運作和流程的成本
	市場	
	<ul style="list-style-type: none"> 客戶行為變化 市場訊息不確定 原物料成本上漲 	<ul style="list-style-type: none"> 消費者偏好改變導致商品和服務需求量下降 投入成本（如能源、水）和產出需求（如廢棄物處理）變化導致生產成本提高 突然其來的能源成本改變 收入組合和來源變化 資產重新定價（如石化燃料儲備、土地評價、證券評價）
	名譽	
	<ul style="list-style-type: none"> 消費者偏好轉變 產業污名化 利害關係人的關注與負面回饋日益增加 	<ul style="list-style-type: none"> 商品/服務需求量下降 產能下降（如停產、規劃同意書延期、供應鏈中斷） 影響勞動力管理和規劃（如員工的招募和留任） 可用資本減少
實體風險	立即性	<ul style="list-style-type: none"> 產能下降或中斷（如停產、運輸困難、供應鏈中斷） 影響勞動力管理和規劃（如衛生、安全、缺勤） 現有資產沖銷和提前報廢（如「高風險」地區的財產和資產損害）
	長期性	<ul style="list-style-type: none"> 營運成本提高（如水力發電站水量不足或核能及火力發電廠冷卻水不足） 基礎建設成本升高（如設施毀損） 銷量/產出降低導致收入下降 保費提高以及位處「高風險」地區的資產難以投保

類型	氣候相關機會 ³³	潛在財務影響
資源效率	<ul style="list-style-type: none"> 採用更高效率的運輸方式 使用更高效率的生產和配銷流程 回收再利用 轉用更高效率的建築物 減少用水量和耗水量 	<ul style="list-style-type: none"> 降低營運成本（如透過提升效率和降低成本） 提高產能，增加收入 提高固定資產價值（如高效能建築物） 有利於勞動力管理和規劃（如改善衛生和安全、員工滿意度），降低成本
能源來源	<ul style="list-style-type: none"> 使用低碳能源 採用獎勵性政策 使用新技術 參與碳交易市場 轉變至非集中式能源 	<ul style="list-style-type: none"> 降低營運成本（如透過使用成本最低的減碳措施） 降低暴露於未來化石燃料價格上升的風險中 降低溫室氣體排放風險，因此降低對碳交易價格變化的敏感度 投資低碳技術的回報 資本增加（如更多投資人看好低碳製造商） 名譽提高且商品/服務需求量上升
產品和服務	<ul style="list-style-type: none"> 開發和/或增加低碳商品和服務 開發氣候調適和保險風險解決方案 開發新產品和服務的研發與創新 業務活動多元化 消費者偏好轉變 	<ul style="list-style-type: none"> 透過低碳產品和服務的需求提高收入 透過新的解決方案滿足氣候調適的需求以提高收入（如保險風險轉移產品和服務） 改善競爭地位以反映消費者偏好的轉變，提高收入
市場	<ul style="list-style-type: none"> 進入新市場 善用公共部門獎勵辦法 獲得需要投保的新資產和地區 	<ul style="list-style-type: none"> 進入新型和新興市場（如與政府、開發銀行合作），提高收入 提高金融資產的多元化（如綠色債券和基礎設施）
韌性	<ul style="list-style-type: none"> 參與可再生能源項目並採用節能措施 能源替代/多元化 	<ul style="list-style-type: none"> 透過韌性規劃提高市場估值（如基礎設施、土地、建築物） 提高供應鏈可靠性和不同條件下的營運能力 透過確保韌性的新產品和新服務來增加收入

類型	氣候相關風險 ³²	潛在財務影響
轉型風險	政策和法規	
	<ul style="list-style-type: none"> — 提高溫室氣體排放定價 — 強化排放量報導義務 — 現有產品和服務的要求及監管 — 面臨訴訟風險 	<ul style="list-style-type: none"> — 增加營運成本（如合規成本和保費增加） — 政策變化導致現有資產沖銷和提前報廢 — 因罰款和判決導致的成本增加和/或產品和服務需求降低
	技術	<ul style="list-style-type: none"> — 以低碳商品替代現有產品和服務 — 對新技術的投資失敗 — 低碳技術轉型的成本 — 現有資產沖銷和提前報廢 — 產品和服務需求量下降 — 新型和替代型技術研發支出 — 技術開發的資本投資 — 採用/建置新型實務運作和流程的成本
	市場	<ul style="list-style-type: none"> — 客戶行為變化 — 市場訊息不確定 — 原物料成本上漲 — 消費者偏好改變導致商品和服務需求量下降 — 投入成本（如能源、水）和產出需求（如廢棄物處理）變化導致生產成本提高 — 突然其來的能源成本改變 — 收入組合和來源變化 — 資產重新定價（如石化燃料儲備、土地評價、證券評價）

類型	氣候相關風險 ³²	潛在財務影響
	名譽 <ul style="list-style-type: none"> — 消費者偏好轉變 — 產業污名化 — 利害關係人的關注與負面回饋日益增加 	<ul style="list-style-type: none"> — 商品/服務需求量下降 — 產能下降(如停產、規劃同意書延期、供應鏈中斷) — 影響勞動力管理和規劃(如員工的招募和留任) — 可用資本減少
實體風險	立即性 <ul style="list-style-type: none"> — 颱風、洪水等極端天氣事件嚴重程度提高 	<ul style="list-style-type: none"> — 產能下降或中斷(如停產、運輸困難、供應鏈中斷) — 影響勞動力管理和規劃(如衛生、安全、缺勤) — 現有資產沖銷和提前報廢(如「高風險」地區的財產和資產損害)
	長期性 <ul style="list-style-type: none"> — 降雨(水)模式變化和氣候模式的極端變化 — 平均氣溫上升 — 海平面上升 	<ul style="list-style-type: none"> — 營運成本提高(如水力發電站水量不足或核能及火力發電廠冷卻水不足) — 基礎建設成本升高(如設施毀損) — 銷量/產出降低導致收入下降 — 保費提高以及位處「高風險」地區的資產難以投保

類型	氣候相關機會 ³³	潛在財務影響
資源效率	<ul style="list-style-type: none"> 採用更高效率的運輸方式 使用更高效率的生產和配銷流程 回收再利用 轉用更高效率的建築物 減少用水量和耗水量 	<ul style="list-style-type: none"> 降低營運成本(如透過提升效率和降低成本) 提高產能，增加收入 提高固定資產價值(如高效能建築物) 有利於勞動力管理和規劃(如改善衛生和安全、員工滿意度)，降低成本
能源來源	<ul style="list-style-type: none"> 使用低碳能源 採用獎勵性政策 使用新技術 參與碳交易市場 轉變至非集中式能源 	<ul style="list-style-type: none"> 降低營運成本(如透過使用成本最低的減碳措施) 降低暴露在未來化石燃料價格上升的風險中 降低溫室氣體排放風險，因此降低對碳交易價格變化的敏感度 投資低碳技術的回報 資本增加(如更多投資人看好低碳製造商) 名譽提高且商品/服務需求量上升
產品和服務	<ul style="list-style-type: none"> 開發和/或增加低碳商品和服務 開發氣候調適和保險風險解決方案 開發新產品和服務的研發與創新 業務活動多元化 消費者偏好轉變 	<ul style="list-style-type: none"> 透過低碳產品和服務的需求提高收入 透過新的解決方案滿足氣候調適的需求以提高收入(如保險風險轉移產品和服務) 改善競爭地位以反映消費者偏好的轉變，提高收入
市場	<ul style="list-style-type: none"> 進入新市場 善用公共部門獎勵辦法 獲得需要投保的新資產和地區 	<ul style="list-style-type: none"> 進入新型和新興市場(如與政府、開發銀行合作)，提高收入 提高金融資產的多元化(如綠色債券和基礎設施)
韌性	<ul style="list-style-type: none"> 參與可再生能源項目並採用節能措施 能源替代/多元化 	<ul style="list-style-type: none"> 透過韌性規劃提高市場估值(如基礎設施、土地、建築物) 提高供應鏈可靠性和不同條件下的營運能力 透過確保韌性的新產品和新服務來增加收入

DISCLOSURE RECOMMENDATIONS

The Task Force developed **four widely-adoptable recommendations** on climate-related financial disclosures that are applicable to organizations across sectors and jurisdictions.

The recommendations are structured around four thematic areas that represent core elements of how organizations operate:



Governance

The organization's governance around climate-related risks and opportunities

Strategy

The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning

Risk Management

The processes used by the organization to identify, assess, and manage climate-related risks

Metrics and Targets

The metrics and targets used to assess and manage relevant climate-related risks and opportunities

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<https://www.fsb-tcfd.org/wp-content/uploads/2016/12/TCFD-Report-Overview-Dec.-2016.pptx>

氣候相關財務資訊揭露的核心元素

工作小組透過組織營運核心的四項元素建立報告架構，即治理、策略、風險管理，以及指標和目標

Figure 2

氣候相關財務資訊揭露的核心要素



治理

該組織針對氣候相關風險與機會的治理

策略

氣候相關風險與機會對於組織的業務、策略和財務規劃的實際和潛在衝擊

風險管理

組織鑑別、評估和管理氣候相關風險的流程

指標和目標

用以評估和管理與氣候相關風險與機會的指標和目標

DISCLOSURE RECOMMENDATIONS *(CONTINUED)*

The four recommendations are supported by specific **recommended disclosures** organizations can include in financial filings to provide decision-useful information about their climate-related risks and opportunities.

Governance	Strategy	Risk Management	Metrics and Targets
Disclose the organization's governance around climate-related risks and opportunities.	Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	Disclose how the organization identifies, assesses, and manages climate-related risks.	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities.
Recommended Disclosures	Recommended Disclosures	Recommended Disclosures	Recommended Disclosures
a) Describe the board's oversight of climate-related risks and opportunities.	a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	a) Describe the organization's processes for identifying and assessing climate-related risks.	a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.
b) Describe management's role in assessing and managing climate-related risks and opportunities.	b) Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	b) Describe the organization's processes for managing climate-related risks.	b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.
	c) Describe the potential impact of different scenarios, including a 2° c scenario, on the organization's businesses, strategy, and financial planning.	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.

投影片直接引用自：

<https://www.fsb-tcfd.org/wp-content/uploads/2016/12/TCFD-Report-Overview-Dec.-2016.pptx>

資訊揭露的建議

治理

揭露組織與氣候相關風險與機會的治理情況

建議揭露事項

a) 描述董事會對氣候相關風險與機會的監督情況。

b) 描述管理階層在評估和管理氣候相關風險與機會的角色。

策略

針對組織業務、策略和財務規劃，揭露實際及潛在與氣候相關的衝擊

建議揭露事項

a) 描述組織所鑑別的短、中、長期氣候相關風險與機會。

b) 描述組織在業務、策略和財務規劃上與氣候相關風險與機會的衝擊。

c) 描述組織在策略上的韌性，並考慮不同氣候相關情境（包括2°C或更嚴苛的情境）。

風險管理

揭露組織如何鑑別、評估和管理氣候相關風險

建議揭露事項

a) 描述組織在氣候相關風險的鑑別和評估流程。

b) 描述組織在氣候相關風險的管理流程。

c) 描述氣候相關風險的鑑別、評估和管理流程如何整合在組織的整體風險管理制度。

指標和目標

針對重大性的資訊，揭露用於評估和管理氣候相關議題的指標和目標

建議揭露事項

a) 揭露組織依循策略和風險管理流程進行評估氣候相關風險與機會所使用的指標。

b) 揭露範疇1、範疇2和範疇3（如適用）溫室氣體排放和相關風險。

c) 描述組織在管理氣候相關風險與機會所使用的目標，以及落實該目標的表現。

DISCLOSURE GUIDANCE FOR ALL SECTORS

The Task Force developed **guidance** to assist organizations in implementing the recommended disclosures. The guidance builds on the recommendations and the recommended disclosures.



投影片直接引用自：

<https://www.fsb-tcfd.org/wp-content/uploads/2016/12/TCFD-Report-Overview-Dec.-2016.pptx>

建議和指引

建議

建議

與治理、策略、風險管理以及指標和目標相關的四項廣為採用的建議

建議揭露事項

組織須將建議揭露事項納入於財務申報，以提供有助於決策的資訊

所有產業的通用指引

提供組織在建議揭露事項的脈絡與建議

特定產業的補充指引

強調特定產業考量重點，以及提供該產業潛在氣候相關財務影響的全貌
補充指引提供金融產業和最可能受氣候變遷影響的非金融產業

所有產業通用的
指引

特定產業的補充
指引

建議揭露事項

SCENARIO ANALYSIS

Scenario analysis is an important and useful tool for understanding the **strategic implications of climate-related risks and opportunities**.

The Task Force recommends that organizations describe the potential impact of different scenarios, including a 2° c scenario, on their businesses, strategy, and financial planning.

- 1 Scenario analysis can help organizations consider issues, like climate change, that have the following characteristics:
 - Possible outcomes that are highly uncertain (e.g., the physical response of the climate and ecosystems to higher levels of GHG emissions in the atmosphere)
 - Outcomes that will play out over the medium to longer term (e.g., timing, distribution, and mechanisms of the transition to a lower-carbon economy)
 - Potential disruptive effects that, due to uncertainty and complexity, are substantial
- 2 Scenario analysis can enhance organizations' strategic conversations about the future by considering, in a more structured manner, what may unfold that is different from business-as-usual. Importantly, it broadens decision makers' thinking across a range of plausible scenarios, including scenarios where climate-related impacts can be significant.
- 3 Scenario analysis can help organizations frame and assess the potential range of plausible business, strategic, and financial impacts from climate change and the associated management actions that may need to be considered in strategic and financial plans. This can lead to more robust strategies under a wider range of uncertain future conditions.
- 4 Scenario analysis can help organizations identify indicators to monitor the external environment and better recognize when the environment is moving toward a different scenario state (or to a different stage along a scenario path). This allows organizations the opportunity to reassess and adjust their strategies and financial plans accordingly.
- 5 Scenario analysis can assist investors in understanding the robustness of organizations' strategies and financial plans and in comparing risks and opportunities across organizations.

投影片直接引用自：

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情境分析

情境分析是在面對不確定條件下，針對一定範圍內、未來可能發生的情況，鑑別及評估相關潛在影響之程序。

- 1 情境分析可以協助組織考量系列特性的議題，如氣候變遷：
 - － 高度不確定下可能發生的結果（例如氣候及生態系統因應大氣中溫室氣體排放量提高，所產生的物理反應）
 - － 中長期才顯現的結果（例如進行低碳經濟轉型的時機、分布情況和機制）
 - － 因不確定性及複雜性，而產生潛在的破壞性影響
- 2 情境分析使組織以更有結構性且有別於往常的運行模式，加強組織對於未來的策略性對話。重要的是，情境分析將決策者的思維擴展到可能發生的情境下，包括氣候衝擊帶來的顯著影響。
- 3 情境分析可以協助組織，建構及評估氣候變遷對業務、策略及財務上潛在衝擊的範圍，以及在財務規劃中可能需要考量的相關管理行動，這使得組織在眾多不確定性的未來條件下，導引出更為穩健的策略。
- 4 情境分析可協助組織鑑別出可控管外部環境的指標，更有助於識別出環境朝向不同情境前進（或為情境分析的不同階段）。組織得以有機會重新評估和調整相對應的策略及財務規劃。⁴⁴
- 5 情境分析可協助投資人瞭解組織策略及財務規劃的穩定性，並比較不同組織之間的風險與機會。

EXAMPLES OF AREAS FOR FURTHER WORK

The Task Force also identified certain areas where further work can contribute to the evolution of climate-related financial disclosures.

Relationship to Other Reporting Initiatives	Encourage standard setting organizations and others to actively work toward greater alignment of frameworks and to support adoption
Data Quality and Financial Impact	Undertake further research and analysis to better measure and understand how climate-related issues translate into potential financial impacts
Reporting GHG Emissions Associated with Investments	<ul style="list-style-type: none">– Develop methodologies for allocating emissions in asset classes beyond equities, including non-corporate bonds, property/real estate, infrastructure, private equity, and alternative assets– Improve data quality, increase understanding of climate-related risks and opportunities, and enhance risk measurement methodologies broadly
Scenario Analysis	<ul style="list-style-type: none">– Further develop applicable 2°C (or lower) transition scenarios and supporting outputs and tools/user interfaces– Develop broadly accepted methodologies, datasets and tools for scenario-based evaluation of physical risk by organizations– Make datasets and tools publicly available and provide commonly available platforms for scenario analysis

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未來進一步作業事項

碳揭露專案（CDP）、氣候揭露標準委員會（CDSB）、全球永續性報告協會（GRI）、國際整合性報導委員會（IIRC）和永續會計準則委員會（SASB）編製的架構，以及工作小組建議的資訊揭露。

與其他資訊揭露倡議的關係	鼓勵制定標準的組織積極與其他機構合作，使各種架構更具一致性並得以被採用
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情境分析	進一步開發適用 2°C 或更嚴苛的轉型情境，以及配套措施、工具和使用介面 為了讓組織能以情境為基礎進行實體風險評估，因而開發能被廣泛接受的方法學、資料集及工具 發展通用的資料集及工具，並提供通用的情境分析平台
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資料可取得性、品質以及財務影響	進一步研究及分析，深入瞭解並衡量氣候相關議題如何演變為金融產業和非金融產業的潛在財務影響因素 改善資料品質，並進一步制定金融產業標準指標，包括更詳細界定碳資產，並制定能顧及範圍更廣泛的氣候相關風險與機會指標 提升組織對氣候相關風險與機會的瞭解
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資訊揭露實例 ⁴⁹	提供資訊揭露相關實例，協助編撰者按照工作小組的建議編製揭露資訊
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TCFD Supporters from Taiwan

Name	Location	Region	Sector	Industry	Date
ASE Technology Holding Co., Ltd	Taiwan	Asia	Information Technology	Semiconductors & Semiconductor	Nov-18
ASUSTeK COMPUTER INC.	Taiwan	Asia	Information Technology	Technology Hardware, Storage & Peripherals	Dec-18
Cathay Financial Holdings	Taiwan	Asia	Financial	Insurance	Jun-18
China Airlines	Taiwan	Asia	Industrials	Airlines - Transportation	Sep-18
China Development Financial	Taiwan	Asia	Financial	Diversified Financial Services	Dec-18
Chunghwa Telecom	Taiwan	Asia	Communications	Diversified Telecommunication	Oct-18
Cozeta Energy Service Corp.	Taiwan	Asia	Industrials	Energy Service	Apr-18
Delta Electronics Inc.	Taiwan	Asia	Information Technology	Electronic Equipment, Instruments	Feb-18
E.SUN Financial Holding	Taiwan	Asia	Financial	Banking	Dec-17
Fubon Financial Holdings	Taiwan	Asia	Financial	Insurance	Sep-19
LITE-ON	Taiwan	Asia	Information Technology	Technology Hardware, Storage & Peripherals	Sep-18
Nan Shan Life Insurance	Taiwan	Asia	Financial	Insurance	Sep-18
Shin Kong Financial Holdings	Taiwan	Asia	Financial	Banking	Sep-18
Taishin Financial Holdings	Taiwan	Asia	Financial	Banking	Jan-19
Taiwan Cement	Taiwan	Asia	Industrial	Construction Materials	Aug-19
Taiwan Semiconductor Manufacturing Company, Ltd. (TSMC)	Taiwan	Asia	Information Technology	Semiconductor & Semiconductors	Jun-19

Supporting the TCFD Recommendations

FAQ: Supporting the TCFD Recommendations

1. Who is currently supporting the TCFD?

As of June 2019, over 800 companies, financial institutions, regulatory bodies and government entities have expressed their support for the TCFD. This includes over 375 financial firms responsible for assets of \$118 trillion. Located in over 45 countries on six continents supporters span a variety of industries from the financial and non- financial sector such as asset management, banking, chemicals, energy, insurance, metals & mining, oil & gas and transportation among others. Other organizations include trade associations, central banks, regulators and national governments.

2. How can you support the TCFD and its recommendations?

Companies can express their support for the TCFD recommendations by having their name added to our list of supporters on the TCFD website: <https://www.fsb-tcdf.org/supporters-landing/>

In addition to being added to the list companies can provide a quote for our [quotes section](#), they can publish their own statement of support, press release or conduct additional communications activities to express their support.

3. What type of organizations can support the TCFD recommendations?

Organizations with public debt or equity and asset managers and owners – the preparers and users of financial disclosures – are particularly encouraged to support and implement the recommendations. Other supporters can range from industry associations, to central banks, governments, regulators and others.

4. What are the benefits/implications of supporting the TCFD recommendations?

The TCFD recommendations are voluntary in nature and have been devised by the private sector – "*by the market, for the market.*" Therefore, we rely on industry support to drive adoption and implementation of the recommendations. Companies expressing their support for the TCFD recommendations join a cohort of leading companies that take action against climate change and are thoughtful to consider how climate change will impact their businesses. Publicly declaring their support is a natural next step for companies that are already looking into climate-related disclosure.

Public support provides companies with the opportunity to communicate with their investors, clients and employees alike how they are thinking of and tackling the implications of climate change.

Supporting the TCFD Recommendations

5. Does supporting the TCFD recommendations imply implementing them?

Supporting the TCFD recommendations does not mean that companies have to implement them straight away. However, as a supporter we do expect a willingness to consider the implementation of climate-related disclosure eventually. The TCFD realizes that climate-related disclosure is a journey for many companies that will evolve over time as organizations, investors, and others contribute to the quality and consistency of the information disclosed. Therefore, the sooner companies start to implement the recommendations the more they contribute to standardizing this kind of disclosure in mainstream financial reporting.

6. What are the benefits of implementing the TCFD recommendations?

The TCFD recommendations have been drafted with the following benefits in mind:

- easier or better access to capital by increasing investors' and lenders' confidence that the company's climate-related risks are appropriately assessed and managed
- more effectively meeting existing disclosure requirements to report material information in financial filings
- increased awareness and understanding of climate-related risks and opportunities within the company resulting in better risk management and more informed strategic planning
- proactively addressing investors' demand for climate-related information in a framework that investors are increasingly asking for, which could ultimately reduce the number of climate-related information requests received

7. Where can I find tools to help implement the recommendations?

In May 2018 the TCFD launched the TCFD Knowledge Hub in collaboration with the Climate Disclosure Standards Board (CDSB). Available at tcfdhub.org the TCFD Knowledge Hub is the first online platform housing relevant insights, tools and resources to help organizations implement the TCFD recommendations. The portal houses over 400 resources with over 80 of them covering governance, 236 strategy, 152 risk management and 125 metrics & targets – aligned with the four overarching TCFD recommendations. Contributors range from non-profit organizations to intergovernmental institutions, academics, industry associations, consultants and corporates. Additional resources are added on a continuous basis.

8. What are the next steps after my company has expressed its support?

As an immediate step your company name will be added to the growing numbers of supporters on our TCFD website. In the longer time the TCFD seeks to continue engaging with supporting companies that are working on implementing the recommendations. Companies will have the opportunity to participate in "preparer forums" that allow companies to address implementation issues and improve their disclosure in line with the TCFD

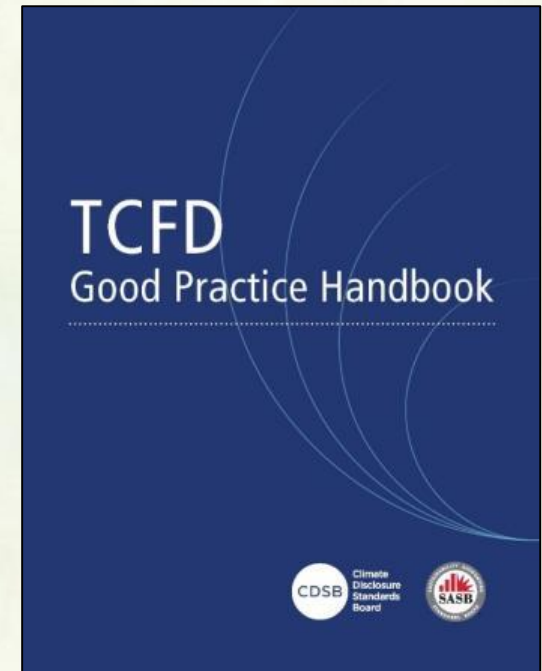
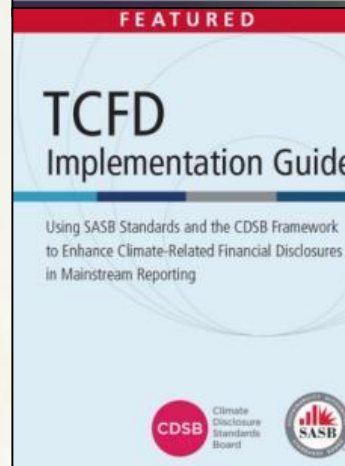
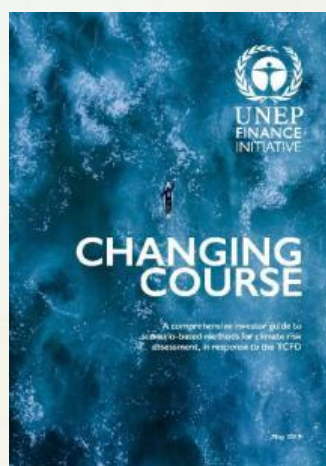
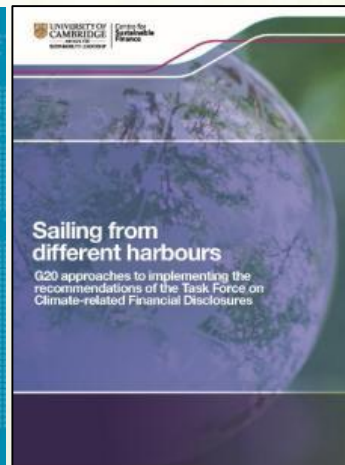
TCFD氣候相關財務揭露建議 繁體中文版發表會



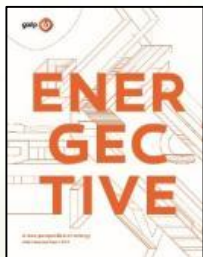
Photo: Greenbiz

台灣永續能源研究基金會/台灣企業永續研訓中心
王彬墀 副秘書長

Resources Available



Galp “Energetive – a new perspective on energy” Integrated Report 2018



In this extract, Portuguese oil and gas company, Galp identifies the full suite of actors and bodies engaged in overseeing and managing climate-related risks and opportunities.

The disclosure provides details of the respective remit of the specialised committees, as well as the Board, Executive Committee and other business units.

Organisation

Board of Directors Definition, monitoring and supervision of the strategy drivers
Executive Committee Approval, development and implementation of the strategy objectives
Corporate Centre Business Units Support the senior management in strategy development and the implementation of the defined strategy

1.強化董事會監督 2.增強管理的角色與功能

Analyse the energy and climate context and challenges , ensuring the alignment of the Company's strategy with best practices ; Monitoring, reporting and analysis of energy and climate indicators and requirements

Identification and monitoring of the main risks and opportunities for the Company ; Monitor and provide recommendations on mitigation plans to manage the identified risks.

Support the Executive Committee in promoting the principles that sustain Galp's EQS culture ; Monitor the EQS performance (objectives and strategic alignment) and the EQS initiatives in the organisation.

Develop and propose changes to the remuneration policy aligned with the Company's strategy targets.

Specialised committees

Sustainability Committee
Risk Management Committee
Risk Management Committee
Remuneration Committee

Commonwealth of Australia

“Becoming a simpler, better bank” Annual Report 2018

1. 考量短中長期氣候相關的風險與機會
2. 考量氣候相關的風險與機會在商業、策略及財務規劃的衝擊
3. 發展調適策略和情境分析



The Commonwealth Bank of Australia, an Australian multinational bank, discloses the potential financial opportunities it sees in the low-carbon transition, In terms of sustainable finance, global environmental markets, and products and services.

In the 2017 financial year, the company also quantified these opportunities by creating a low-carbon target for 2025, against which it measured progress in the 2018 financial year. This is a further example of how strategy and metrics and targets TCFD disclosures may be interconnected, with the latter shedding light on the effectiveness of the former.

Low carbon transition opportunities

There are significant opportunities presented by the transition to a low carbon economy.

Global environmental markets

We are aiming to be a market leader in environmental markets, supporting our clients' transition to a net zero emissions economy. We target clients globally who have a strategy in place to support their transition. We support this transition by providing tailored financing and risk management environmental market solutions to meet client requirements. This includes facilitating liquidity across global environmental markets.

 **\$15bn**
2025 low carbon target

2025	\$15bn
2018	\$7.3bn

Sustainable finance

This financial year our lending exposure to the renewable energy sector grew to \$3.7 billion, reflecting our expertise in this market.

For the year ended June 2018, Commonwealth Bank ranked number one for Mandated Lead Arranger financing roles of renewables projection Australia and ranked 18th globally.

We have also set up a Sustainable Finance Committee to focus on identifying other low carbon opportunities, such as climate bonds. This year we led more than \$2 billion of green or sustainability notes.

We continue to support business investment in energy efficiency improvements through our \$300 million partnership with the Clean Energy Finance Corporation on the Energy Efficient Equipment Finance program.

In the 2017 financial year we set ourselves a Low Carbon Target of \$15 billion by 2025. Our progress to date shows our exposure to low carbon projects as at 30 June 2018 is \$7.3 billion. Eligible projects include renewable energy, 6-star rated commercial green buildings, energy efficiency and low carbon transport. We have aligned our Low Carbon Target eligible projects with the green project categories identified in the Green Loan principles.

Source: TCFD-Good Practice Handbook

Commonwealth of Australia

“ Becoming a simpler, better bank ”
Annual Report 2018

Physical Transition



Flooding



Extreme heat and drought



Storms



Bushfires



Sea level rise



Market



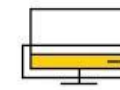
Regulatory



Legal



Reputation



Technology

Insurance

Expected insurance premium cost impacts over time

Building insurance policies

Potential impacts on insurance claims and affordability of insurance

Consider business and customer implications and emerging insurance product needs
Explore approaches to risk mitigation
Consider customer awareness and engagement options

Retail lending

Expected impacts on damage and loss over time

Home loan portfolio

Potential damage to properties (at an aggregated level) due to perils Home loan portfolio exposure concentration s

Develop management
Approach of current and future portfolio in high risk areas
Consider customer awareness and engagement options

Wealth

Transition risk impacts on domestic economy at a sectoral level

FirstChoice Australian Share Fund

Change to sector value add contribution
Exposure of fund to growth and contraction sectors

Consider asset allocations
Consider further scenario analysis for global portfolios

Business lending

Transition risk impacts on domestic economy at a sectoral level

Business lending portfolio debt exposure

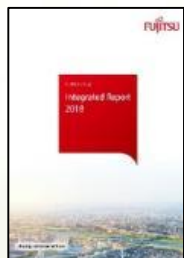
Economic growth and contraction by sector
Sector heat maps
Exposure of portfolio to growth and contraction sectors

Update ESG risk assessment tool
Explore and develop low carbon product sand services
Client engagement and capacity building

Fujitsu Group

Integrated Report 2018

1. 界定風險評估及鑑別程序
2. 妥善擬定管理風險程序
3. 整合至企業風險管理



Fujitsu, a Japanese multinational IT equipment and services company, broadly illustrates its risk management process through a diagram. The excerpt notes the roles of the Risk Management & Compliance Committee and risk management compliance officers and explains the Committee's role in reporting significant risks to the Board and other business functions. Climate change, in the context of a physical risk, is listed as a principal risk. The different risks, including climate change, are considered proportionately in a summary table.

Risk Management Process



Fujitsu Group Integrated Report 2018

Business Risks and Other Risks of the Fujitsu Group

The Fujitsu Group identifies, analyzes, and assesses risks inherent in business activities and takes steps to avoid or mitigate the effects of these risks. In addition, we have established processes for responding to materialized risks.

Principal Risks

1. Economic and Financial Market Trends	<ul style="list-style-type: none"> • Risk associated with changes in the economic trends of mainstay markets • Risk associated with fluctuations in exchange rates and interest rates and changes in trends in capital markets
2. Customers	<ul style="list-style-type: none"> • Risk associated with changes in ICT investment trends among customers • Risk associated with the inability to continue trust-based, transactional, or contractual relationships with customers
3. Competitors and the Industry	<ul style="list-style-type: none"> • Risk associated with loss of competitiveness due to changes in market or competitive conditions • Risk associated with a decrease in competitive advantages with respect to R&D
4. Investment Decisions and Business Restructuring	<ul style="list-style-type: none"> • Risk that investments in R&D or necessary measures in such areas as capital expenditure, business acquisitions, and business restructuring are unable to generate adequate returns
5. Suppliers, Alliances, etc.	<ul style="list-style-type: none"> • Risk associated with tight component supply due to natural disasters or other unpredicted events • Risk associated with impediments resulting from the procurement of inferior quality products • Risk associated with the inability to continue cooperative relationships with respect to partnerships, alliances, or licensing and risk associated with the inability to gain from such cooperation
6. Public Regulations, Public Policy, and Tax Matters	<ul style="list-style-type: none"> • Risk associated with increased adaptive costs and business opportunity losses arising from the strengthening of, or changes in, statutory regulations or government policies in countries where the Group has businesses
7. Natural Disasters and Unforeseen Incidents	<ul style="list-style-type: none"> • Risk associated with the inability to continue businesses due to natural disasters or accidents, including earthquakes, typhoons, and water damage, or the spread of infectious diseases (including the increased frequency or effect of the above-mentioned due to climate change) • Risk associated with the effect on businesses of conflicts, terrorism, demonstrations, strikes, or political instability in the countries or regions where the Group has business

BASF

BASF Report 2018

1. 制定適當指標
2. 揭露碳排(範疇一、二及三)與相關風險
3. 訂定適切目標



BASF, a German chemicals company, describes two sets of targets that it has set. First, it describes targets it established for 2020 with a baseline in 2002. Its first set target is a normalised greenhouse gas reduction target, measured as CO₂ emissions per ton of sales product, for which it set a 40% reduction target

BASF also notes that it has set a new goal from 2019 onward to achieve CO₂-neutral growth and specifies that this target will apply from 2019 through to 2030.

The second target relates to the coverage of BASF's primary energy demand through certified energy management systems, for which it set a 90% coverage target. For both of these targets, BASF reports its progress to date as well as in the most recent reporting year.

Global goals and measures

We aim to reduce our greenhouse gas emissions per metric ton of sales product by 40% by 2020, compared with baseline 2002

(BASF operations excluding the discontinued oil and gas business). In absolute terms, our emissions declined slightly in 2018 compared with the previous year. We reduced greenhouse gas emissions per metric ton of sales product by 34.2% compared with baseline 2002 (2017: reduction of 35.5%). Since 1990, we have been able to lower our overall greenhouse gas emissions from BASF operations (excluding the oil and gas business) by 49.2% and even reduce specific emissions by 74.2%.

We will pursue a new goal from 2019 onward: CO₂-neutral growth until 2030. We will maintain greenhouse gas emissions per metric ton of sales product as an additional reporting indicator. By 2020, we want to have introduced certified energy management systems (DIN EN ISO 50001) at all relevant production sites.¹ Taken together, this represents 90% of BASF's primary energy demand

BASF

BASF Report 2018

BASF Group's greenhouse gas emissions according to the Greenhouse Gas Protocol¹Million metric tons of CO₂ equivalentsBASF operations including the discontinued oil and gas business²

	2002	2017	2018
Scope 1 ³			
CO ₂ (carbon dioxide) ⁴	14.634	16.813	16.956
N ₂ O (nitrous oxide)	6.407	0.747	0.740
CH ₄ (methane)	0.244	0.048	0.064
HFC (hydrofluorocarbons)	0.061	0.081	0.091
Scope 2 ⁵			
CO ₂ ⁴	5.243	3.796	3.361
Total	26.589	21.485	21.212
Sale of energy to third parties (Scope 1) ⁶			
CO ₂ ⁴	0.347	1.086	0.567
Total	26.936	22.571	21.779

BASF reports its Scope 1 and Scope 2 emissions. For its Scope 1 emissions, BASF breaks out its emissions by constituent, including carbon dioxide, nitrous oxide, methane and hydrofluorocarbons. BASF includes data from its most recent reporting year, as well as from the previous year, and finally its performance in 2002, which was the base year for its 2020 targets.

Total

Registration Document 2018



Total provides three years of trailing data, enabling investors to analyse trends in Total's performance.

Indicators related to climate change

		2018	2017	2016	2015
SCOPE 1 Direct greenhouse-gas emissions (operated scope)	Mt CO ₂ e	40	38	41	42
Breakdown by segment					
Exploration & Production	Mt CO ₂ e	18	17	19	19
Gas, Renewables & Power	Mt CO ₂ e	2	0	0	-
Refining & Chemicals	Mt CO ₂ e	21	21	22	22
Marketing & Services	Mt CO ₂ e	< 1	< 1	< 1	< 1
SCOPE 1 Direct greenhouse-gas emissions based on the Group's equity interest	Mt CO ₂ e	54	50	51	50
SCOPE 2 Indirect emissions attributable to energy consumption by sites	Mt CO ₂ e	4	4	4	4
GHG emissions (Scopes 1 & 2) on operated oil & gas facilities	Mt CO ₂ e	42	41	45	46
Net primary energy consumption (operated scope)	TWh	143 ^(a)	142	150	153
Group energy efficiency indicator	Base 100 in 2010	88.4	85.7	91.0	90.8
Daily volume of all flared gas (Exploration & Production operated scope) (including safety flaring, routine flaring and non-routine flaring)	Mm ³ /d	6.5	5.4	7.1	7.2
Of which routine flaring	Mm ³ /d	1.1	1.0	1.7 ^(b)	2.3 ^(c)

Total reports both its Scope 1 and Scope 2 greenhouse gas emissions. For its Scope 1 emissions, Total reports such emissions on two different bases – Total's operated scope as well as on an equity interest basis. Providing both of these bases helps investors to understand the nature of Total's Scope 1 emissions in terms of its level of operational control of such emissions.

Total further breaks down its emissions by its operating segments, including its exploration and production operations, gas, renewables and power, downstream operations, and marketing and services.

Prudential Plc “We do life” Annual Report 2018



Emissions source (tCO ₂ e)		2018	2017	% Change
Scope 1	Occupied estate ¹	9,191	10,494	-12%
	Investment properties	7,711	7,703	0%
Scope 2 – Location-based	Occupied estate ¹	56,554	61,154	-8%
	Investment properties	15,281	18,751	-19%
Scope 2 – Market-based (supplier and residual mix)	Occupied estate ¹	52,127	55,484	-6%
	Investment properties ¹	5,459	7,237	-25%
Scope 3	Group ¹	22,545	15,306	+47%
Scope 1 and Scope 2*	Occupied estate	61,318	65,979	-7%
	Investment estate	13,170	14,940	-12%
Total Scope 1 and 2*	Group	74,488	80,919	-8%
Total Scope 1, 2 and 3*	Group	97,032	96,225	+1%

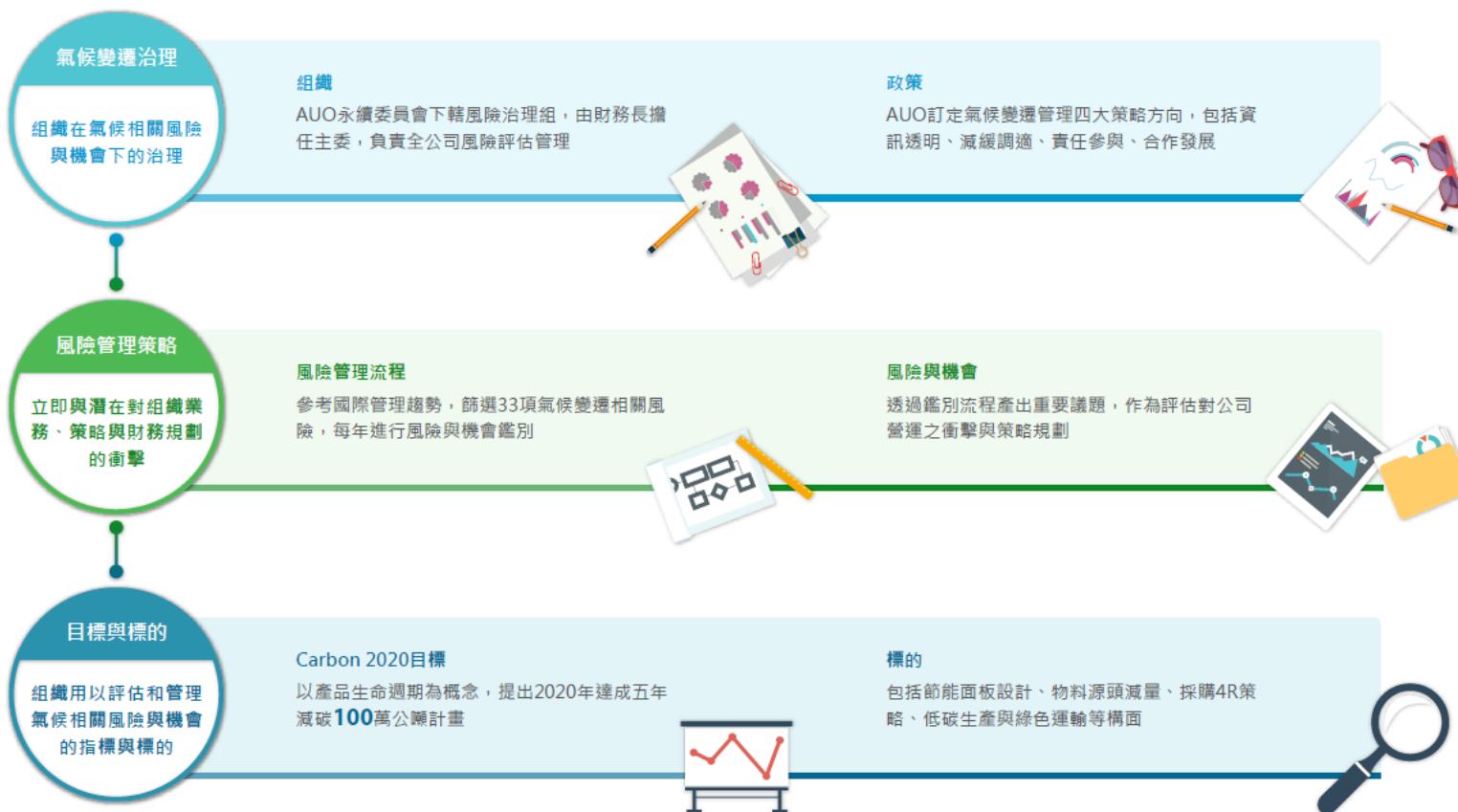
Carbon intensity*		2018	2017	% Change
kg CO ₂ e per m ² – Scope 1 and 2 only	Group ¹	24	29	-17%
kg CO ₂ e per employee – Scope 1 and 2 only	Group ¹	3.1	3.2	-3%
kg CO ₂ e per m ² – Scope 1, 2 and 3	Group ¹	32	34	-8%

In its data table, Prudential reports its Scope 1, 2 and 3 emissions and breaks down such emissions by both its occupied estate as well as its investment estates. Prudential's previously discussed focus on its Scope 2 emissions are supported by the relatively high degree to which such emissions contribute to its overall emissions. Prudential also reports several normalised metrics, using factors to establish efficiency ratios that can enhance comparability across companies to the extent such ratios are generally accepted.

TCFD揭露案例：AUO友達光電

氣候變遷因應

氣候變遷為全球性的議題，在符合維持地球升溫不超過2°C的目標過程中，影響企業產能擴充及市場機會層面，隱含之機會與風險，是企業須提前因應準備的挑戰。友達光電參考CDSB氣候變遷報告架構（Climate Change Reporting Framework）與TCFD氣候相關財務揭露的建議與實施指引（Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures），作為公司整體報告與管理之依據。



AUO氣候變遷治理

4-1-1 政策

友達光電透過公司永續委員會運作，依循聯合國SDG永續發展目標積極採減緩與調適措施，因應氣候變遷於永續發展的具體挑戰。

本公司擬定氣候變遷管理策略，作為風險與機會評估及溫室氣體減量與碳資產管理的基礎。

資訊透明 Transparency

因應國際標準，積極參與國際碳資訊揭露，提高資訊準確度與透明度。



減緩調適 Action

致力於開發綠色產品，進行能源效率管理，並促進水資源再生與有效利用。



責任參與 Responsibility

參與政策研訂，支持政府與國際氣候變遷減緩倡議。



合作發展 Cooperation

檢視價值鏈與供應鏈之風險與機會，與利害相關者合作發展低碳經濟。



氣候變遷
管理策略

4-1-2 挑戰與機會

考量在氣候變遷方面之國際協議與法規規範、氣候系統實質衝擊程度、以及其他社會面影響之原則，並依據CDP納入TCFD^{註1}定義之風險與機會各類別、58項風險與機會項目，進行可能性及風險衝擊程度指標進行矩陣量化；2017年主要風險項目為國際協議、總量管制與排放交易、再生能源、極端氣候、降雨改變、消費者行為以及企業商譽等7項重要議題；2017年主要機會項目則為水資源使用、政策獎勵、低碳產品/服務、開拓資金來源、參與再生能源，以及尋找新商機等6項重要議題^{註2}。

AUO氣候相關風險機會與財務衝擊圖(依循TCFD架構)

轉型風險

- 政策與法規
 - 國際協議
 - 總量管制與排放交易
- 技術
 - 再生能源
- 市場
 - 消費者行為
- 商譽
 - 企業商譽

物理風險

- 立即性
 - 降雨改變
- 長期性
 - 極端氣候

資源效率

- 水資源使用
- 新能源
 - 參與再生能源

韌性

- 開拓資金來源
- 產品/服務
 - 低碳產品/服務
- 市場
 - 政策獎勵
 - 尋找新商機



風險

策略規劃與
風險管理



機會

財務衝擊

AUO氣候變遷重大性議題分析

風險面

鑑別風險	面向	項目	利害關係人	挑戰與機會	管理方針
轉型風險	政策與法規	國際協議	• 友達光電	全球各國的減碳承諾與政策，將促進低碳生產與綠色產品發展，亦將增加減量責任與風險	<ul style="list-style-type: none"> 持續透過Carbon 2020目標之減碳管理 設定SBT目標承諾 持續透過ISO 50001系統運作及投資節能方案達成年節電率1.5%之目標
	政策與法規	總量管制與排放交易	• 友達光電	台灣環保署計畫二年內開始推行，友達光電大部分的製造廠區將面臨總量排放限制，將增加營運成本	<ul style="list-style-type: none"> 參與產業公、協會等組織與政府政策議和 採取內部碳價進行節能方案與減量額度之碳權管理 溫室氣體盤查管理
轉型風險	技術	再生能源	• 友達光電 • 客戶	國際上再生能源需求提升，政策與綠色供應鏈要求應設置或使用再生能源	<ul style="list-style-type: none"> 投資太陽能事業單位 在全台灣8座廠房屋頂建置太陽能電廠(2017年已達成目標)參與再生能源憑證市場
物理風險	立即	降雨改變	• 友達光電	降雨型態改變導致缺水期間增加，影響產能用水調配	<ul style="list-style-type: none"> 持續透過Water 2020目標之水資源管理 對外宣告新建廠房採用綠建築設計概念 建置製程用水全回收技術
物理風險	長期	極端氣候	• 供應鏈	風災、水患與乾旱的發生機率與嚴重度的增加，建置供應鏈對於氣候變遷的減緩與調適能力	<ul style="list-style-type: none"> 建立供應鏈風險鑑別與BCP管理 進行年度供應商風險鑑別 建置供應商風險地圖
轉型風險	市場	消費者行為	• 友達光電 • 客戶	客戶對於環境商品要求，不只符合當地與國際法規，利害關係人期待企業超越法規需求提升環境保護績效	<ul style="list-style-type: none"> 持續低耗能面板研發 發展高效能之太陽能板 建置產品環境足跡管理
轉型風險	商譽	企業商譽	• 投資人	ESG投資興起，投資者會依照公司非財務績效選擇投資標的	<ul style="list-style-type: none"> 成立CSR永續委員會管理CSR績效 參與DJSI、CDP、MSCI、FTSE等國際評比檢視與提升管理作為，並分享經驗給外部產業團體

AUO氣候變遷重大性議題分析

機會面

鑑別面向	項目	利害關係人	挑戰與機會	管理方針
資源效率	水資源使用	<ul style="list-style-type: none"> 友達光電 客戶 NGO 	降低水資源依賴程度的製造轉型，應對永續環境願景。	<ul style="list-style-type: none"> 製程用水零排技術達成100%全回收 創建水資源教育館進行環境教育推廣 成立宇沛永續新事業處，開展水資源循環經濟產品與服務 參與政府政策制定水資源回收議題
市場	政策獎勵	<ul style="list-style-type: none"> 友達光電 客戶 	由於氣候變化和全球變暖的影響，政府通過各項激勵措施促進替代能源，以盡量減少傳統能源的需求，減少能源生產過程中的二氧化碳排放。	<ul style="list-style-type: none"> 參與綠色能源政策獎勵計畫，增加太陽能事業發展機會。 擴大新興國家的再生能源投資
市場	尋找新商機	<ul style="list-style-type: none"> 友達光電 	因應各國政府國家減量目標與能源政策，開創新興商機。	多方合作發展新的商業模式。
產品/服務	低碳產品或服務	<ul style="list-style-type: none"> 友達光電 客戶 	優先掌握市場脈動，確保供給穩定，讓國內外客戶需求得以滿足，提升客戶對於永續發展的產品或服務滿意度	<ul style="list-style-type: none"> 建立供貨合約機制 產品或服務差異化加值 加強價值鏈合作關係
韌性	開拓資金來源	<ul style="list-style-type: none"> 友達光電 銀行 股東 	友達的投資人遵循綠色金融與赤道原則，投資ESG與太陽能相關事業。	<ul style="list-style-type: none"> 建立CSR委員會並積極提升ESG相關作為 提升氣候變遷與碳管理揭露透明度，未來使投資人更願意借貸給友達進行更多綠色投資案
新能源	參與再生能源	<ul style="list-style-type: none"> 友達光電 	投資太陽能事業，促進綠電買賣市場。	提供建置全方位太陽能電廠的整合能力。

AUO氣候變遷管理策略



AUO 氣候相關風險機會與財務衝擊圖



TCFD揭露案例：中華開發金控

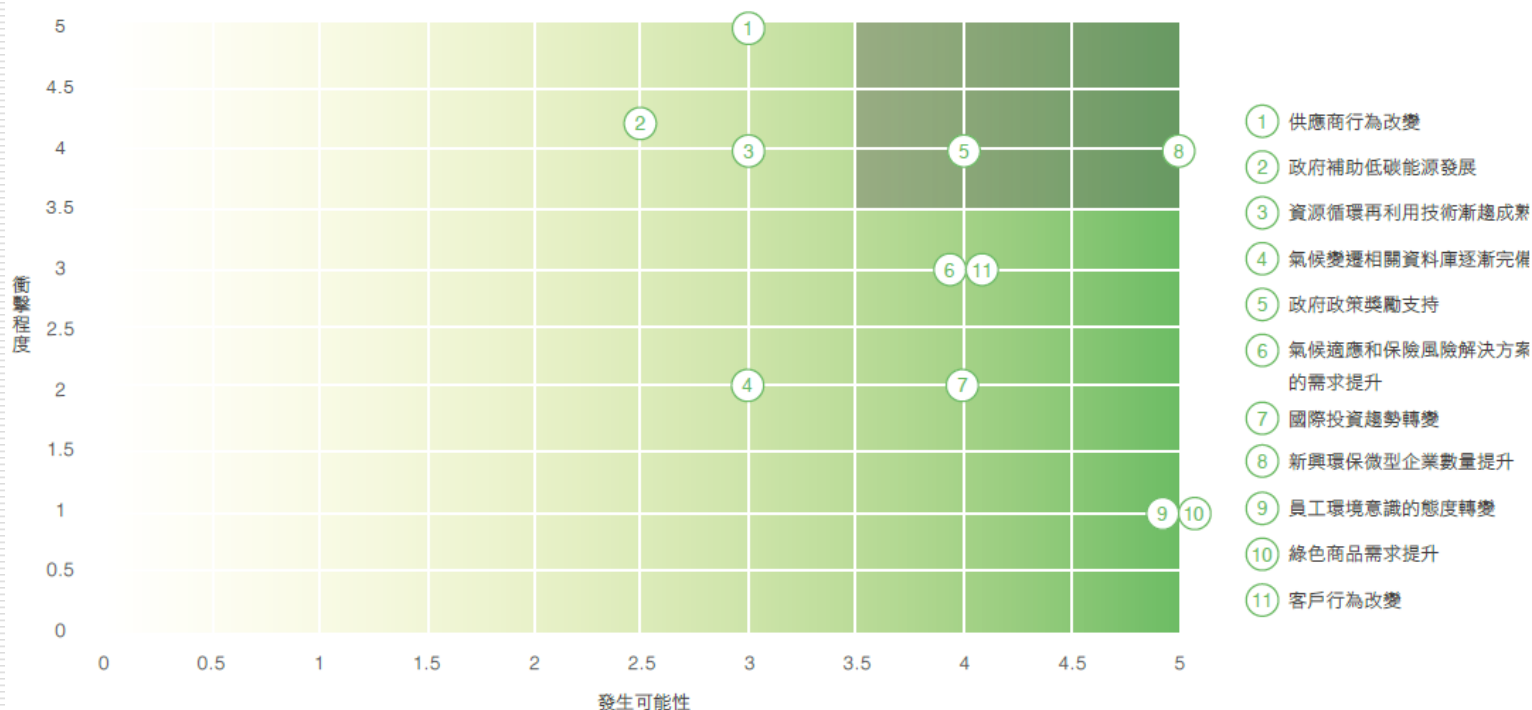
- 針對氣候議題可能之風險與機會...基於「發生可能性」和「造成之影響」兩維度，將...氣候風險與氣候機會進行排序，更進一步透過情境分析，模擬評估該風險與機會對公司之衝擊及財務影響，並研擬短中長期因應的行動方案。
- 考量聯合國氣候變遷小組(IPCC)最新特別報告《Global Warming of 1.5°C》，開發金控評估攝氏1.5度C情境(1.5DS)及外部環境變化(包括政治、經濟、社會、科技)，進一步評估風險與機會影響開發金控自身營運與投資的程度，以研擬可能的應對行動方案。針對負面衝擊的風險，開發金控以「移轉、規避、保留與控制」四項風險管理原則，考量行動方案及訂定相對應之管理辦法...
- 董事會在監督氣候相關風險與機會的角色
 - 負責督導本公司建立適當之氣候變遷風險管理架構與管理文化
 - ...
- 管理階層在評估與管理相關議題的作用
 - 風險管理委員會由總經理擔任主席；委員則由各子公司經營階層擔任
 - ...

開發金氣候變遷風險

風險類別	高風險因子	風險描述	衝擊	現有措施	執行成效	未來可採行方案	方案所需資源	財務影響力 (新臺幣/元)
政策及法律	碳排揭露要求增加	<ul style="list-style-type: none"> 因投資對象的法規遵循成本增加，壓縮獲利 客戶裁罰紀錄不斷，減少融資意願 企業成本提升，影響上市櫃時程，進而造成市場IPO/SPO家數減少 	營收	<ul style="list-style-type: none"> 執行追蹤計畫，拜訪被投資戶，了解其最新動態 	<ul style="list-style-type: none"> 透過每季「被投資戶最新營運狀況報告」掌握公司營運狀況 	<ul style="list-style-type: none"> 執行追蹤計畫，拜訪被投資戶，了解其最新動態 積極拜訪潛在企業 	<ul style="list-style-type: none"> 每季由投資案之帳戶管理員對投資案做檢視，並撰寫「被投資戶最新營運狀況報告」 每月進行業務會議追蹤 	16 萬
市場	市場訊號不確定性	<ul style="list-style-type: none"> 客戶資產殘值大幅波動，減少融資意願 產業研究預測之不確定性提升，需投入更多人力追蹤法令、科技對產業的影響，使營運成本增加 增加徵信作業成本、產業調查成本、資產重新鑑估成本及重大風險通報作業頻率 	投入成本 營收 營運成本	<ul style="list-style-type: none"> 徵授信報告 鑑價辦法 隨時關注市場變化及交流市場資訊 判定制度及流程、產業調查 	<ul style="list-style-type: none"> 授信案件年度續約、每半年覆審 配合公司完成年度氣候變遷影響之國家、產業報告 年度檢視與更新徵授信制度與產業調查 	<ul style="list-style-type: none"> 增加徵授信人員 隨時關注市場變化，研擬因應措施 	<ul style="list-style-type: none"> 預估新增案量每年 150 件 增加徵授信人員 13 人、催收員增加 1 人 	1,610 萬
聲譽	利害關係人疑慮增加或負面回饋	<ul style="list-style-type: none"> 影響公司聲譽 	投入成本	<ul style="list-style-type: none"> 與媒體維持良好及頻繁的互動，建立透明誠信的公司形象 	<ul style="list-style-type: none"> 每年舉辦 4 次法說會，並舉行多次國內外路演，因此外資持股比例持續成長 與媒體維持良好互動，增加媒體露出，以提高企業透明度 	<ul style="list-style-type: none"> 每月 IR/PR 工作月報 訂閱 IPREO 資料庫，追蹤法人動向 訂閱新聞資料庫，檢視媒體報導，迅速採取因應措施 	<ul style="list-style-type: none"> IPREO 資料庫，可以更即時掌握法人動向 加強媒體溝通 每日剪報，確定公司高層獲得即時媒體報導，並擬定因應策略 	200 萬
財務影響力合計								18,260,000

開發金氣候變遷機會

機會類別	高機會因子	機會描述	該機會對開發金控的意義	影響發生所在面向	財務影響力 (新臺幣/元)
能源來源	新科技的採用	新興環保微型企業數量提升 資本可取得性的增加	綠能產業、循環經濟、替代能源等新興微型 產業將使授信、融資等需求提升	提升營收	綠色投 / 融資約 10 億
市場	政府政策獎勵支持	公部門獎勵措施	市場綠債發行量增加、相關承銷案增加	提升營收	綠色承銷收入約 100 萬
產品與服務	綠色 / 低碳產品需求增加	投資人對投資低碳商品的興趣 提高	投資於低碳科技的收益增加	提升營收	1.5 億
財務影響力合計					1,151,000,000

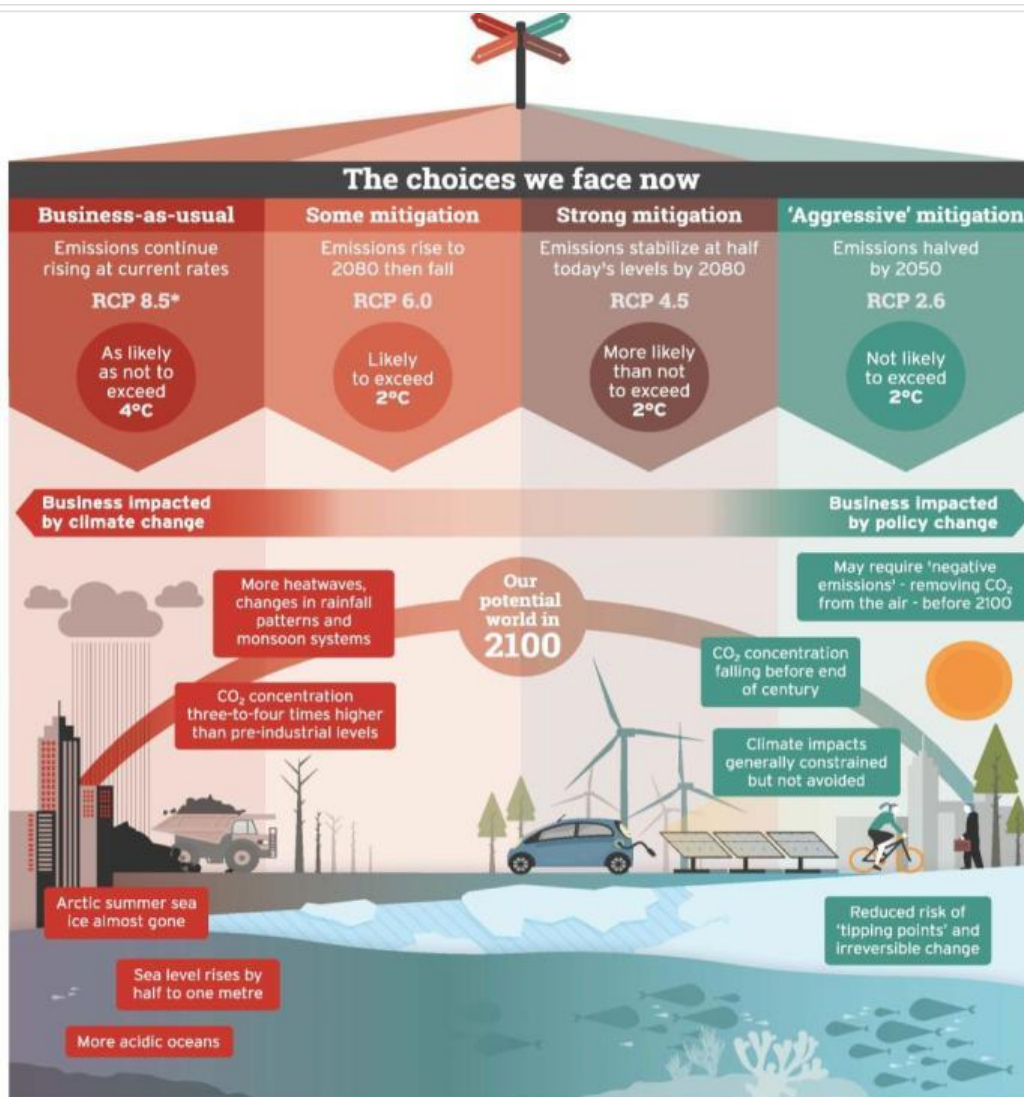


TCFD情境分析

IPCC RCP情境

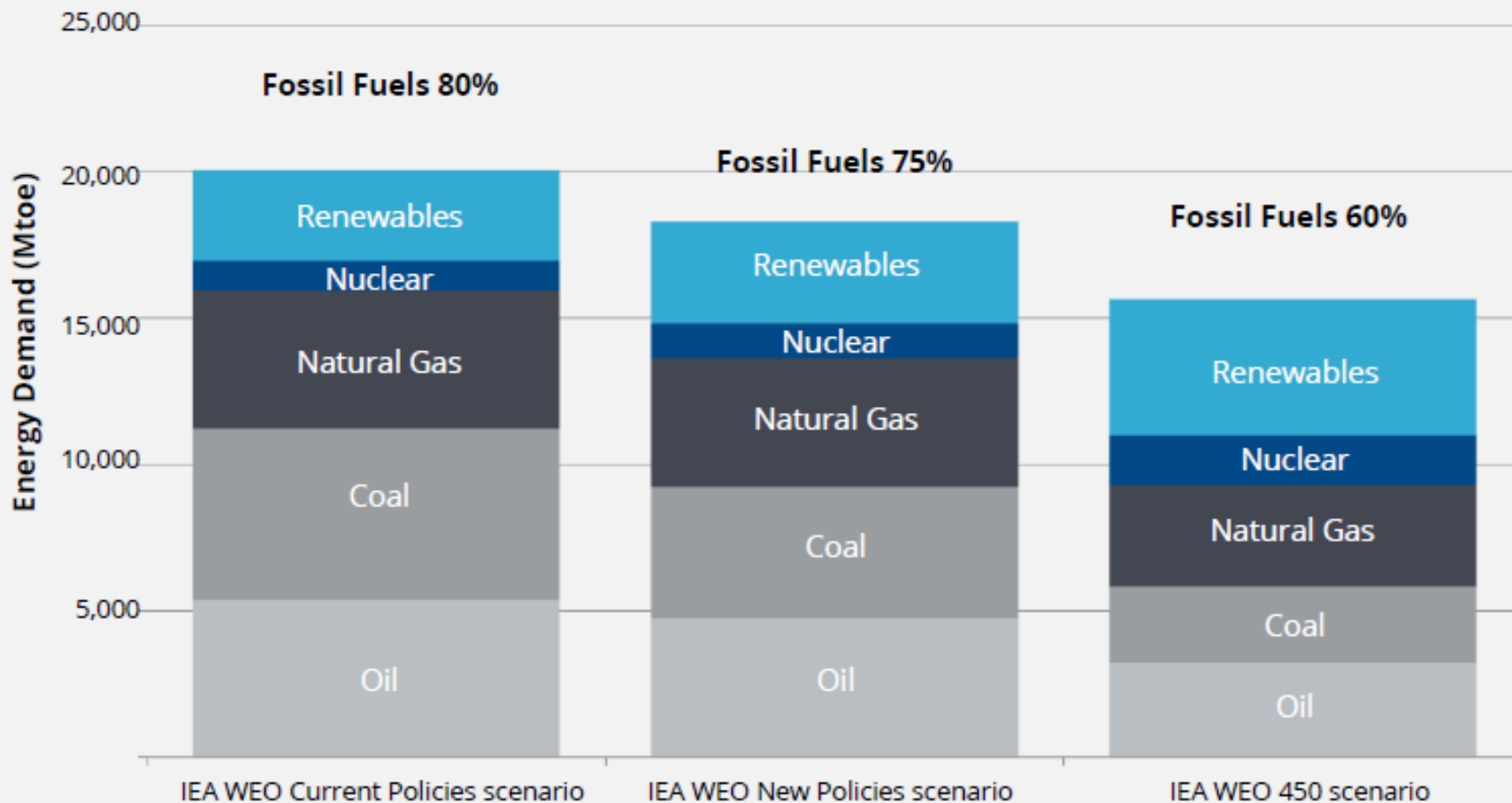
- ❑ RCP 8.5
溫升4°C以內
- ❑ RCP 6.0
溫升可能達2°C
- ❑ RCP 4.5
有機會不超過2°C
- ❑ RCP 2.6
溫升不超過2°C

我們要面對
怎樣的未來



國際能源總署轉型情境

IEA World Energy Outlook (WEO) Scenarios to 2040



氣候相關之風險與機會情境分析程序

1

Ensure governance is in place: Integrate scenario analysis into strategic planning and/or enterprise risk management processes. Assign oversight to relevant board committees/sub-committees. Identify which internal (and external) stakeholders to involve and how.

2

Assess materiality of climate-related risks

Market and Technology Shifts	Reputation
Policy and Legal	Physical Risks

What are the current and anticipated organizational exposures to climate-related risks and opportunities? Do these have the potential to be material in the future? Are organizational stakeholders concerned?

3

Identify and define range of scenarios

Scenarios inclusive of a range of transition and physical risks relevant to the organization

What scenarios (and narratives) are appropriate, given the exposures? Consider input parameters, assumptions, and analytical choices. What reference scenario(s) should be used?

4

Evaluate business impacts

Impact on:

- Input costs
- Operating costs
- Revenues
- Supply chain
- Business interruption
- Timing

Evaluate the potential effects on the organization's strategic and financial position under each of the defined scenarios. Identify key sensitivities.

5

Identify potential responses

Responses might include

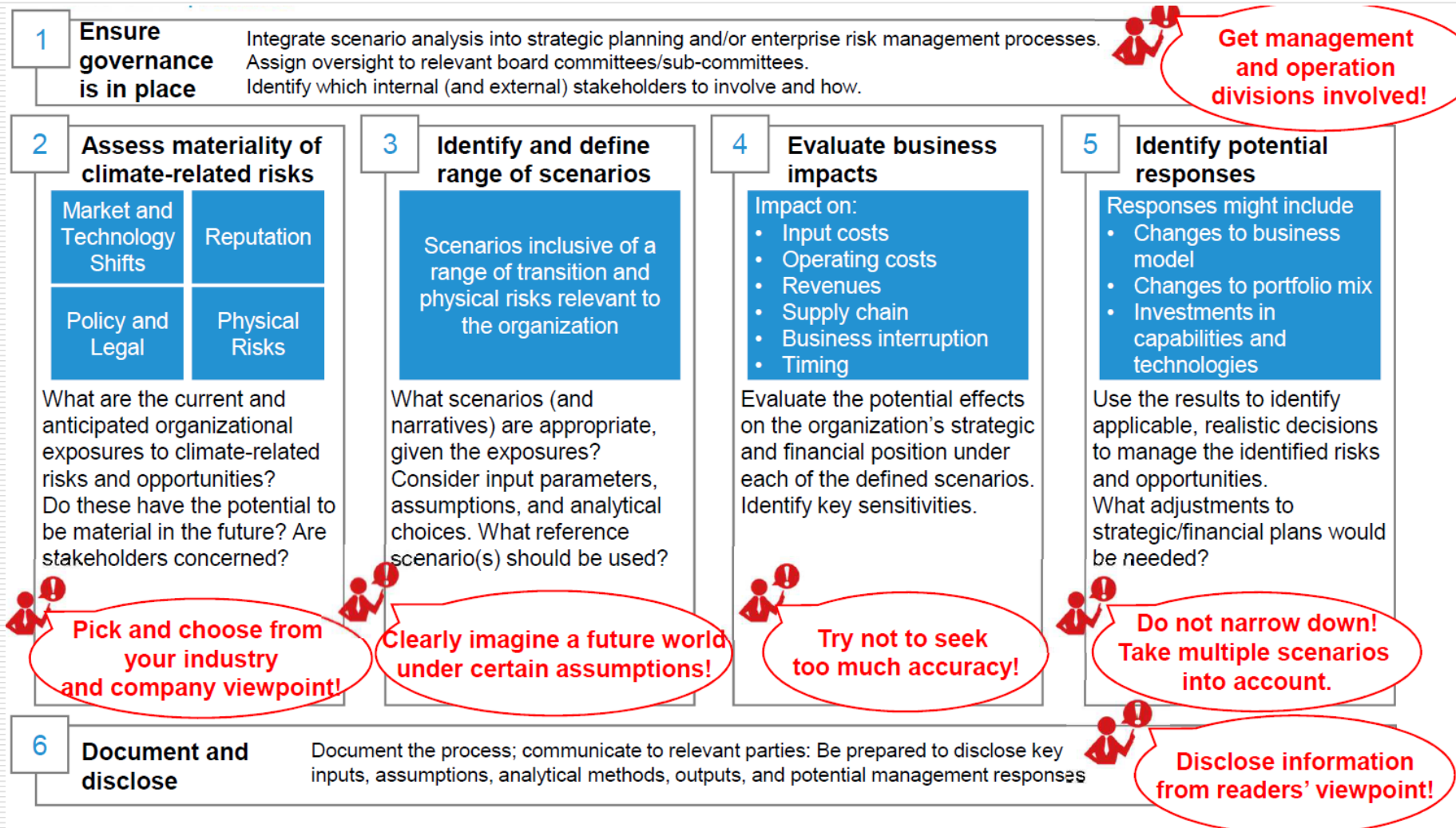
- Changes to business model
- Changes to portfolio mix
- Investments in capabilities and technologies

Use the results to identify applicable, realistic decisions to manage the identified risks and opportunities. What adjustments to strategic/financial plans would be needed?

6

Document and disclose: Document the process; communicate to relevant parties; be prepared to disclose key inputs, assumptions, analytical methods, outputs, and potential management responses.

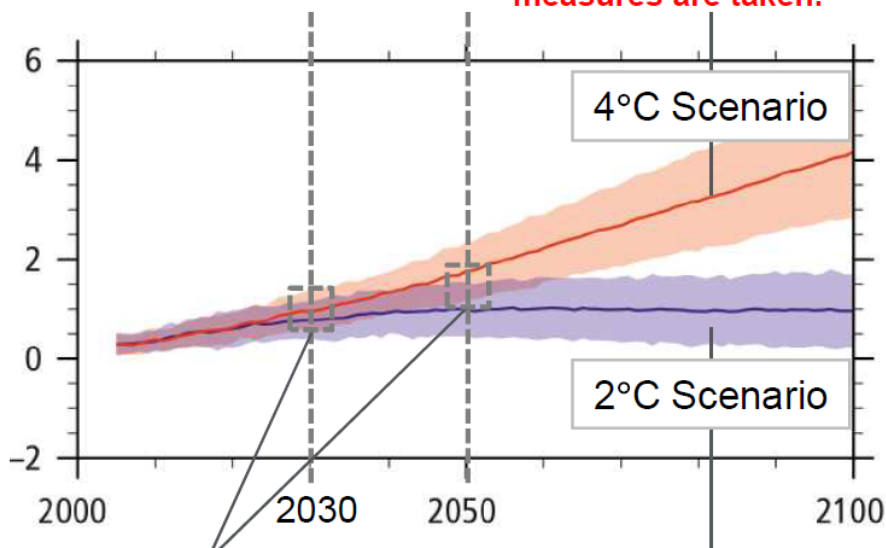
日本環境省建議之情境分析程序



日本環境省建議之氣候情境

[Forecast of global average surface temperature]
(difference from the 1986-2005 average)

The temperature will rise 2.6-4.8°C above pre-industrial levels, unless more rigorous measures are taken.



The 2°C and 4°C scenarios describe similar temperature changes by 2030. They describe considerably different futures 30 years ahead.

The temperature will rise 0.3-1.7°C above pre-industrial levels, if strict measures are taken.

4°C Scenario

An example of TCFD 4°C scenario

Transition Scenario (IEA)

- IEA WEO New Policies Scenario (4°C)

Physical Scenario (IPCC)

- RCP8.5 Scenario (2.6-4.8°C)
- ✓ States “business as usual”.

2°C Scenario

An example of TCFD 2°C scenario

Transition Scenario (IEA)

- IEA ETP 2DS Scenario
- IEA WEO 450 Scenario

Physical Scenario (IPCC)

- RCP2.6 Scenario (0.3-1.7°C)

Other scenarios

Other TCFD scenarios

Transition Scenario (IEA)

- IEA WEO current policy scenario (6°C)
- ✓ States “business as usual”.

Physical Scenario (IPCC)

- RCP4.5 Scenario (1.1-2.6°C)
- RCP6.0 Scenario (1.4-3.1°C)

情境分析案例：伊藤忠商事株式会社

STEP 2 “Assess materiality of climate-related risks”

STEP 2 3 4 5

Climate-change risks and opportunities for the power generation segment

Risk item	Business impact (examples of considerations)	
Carbon pricing/emission rights trading	<ul style="list-style-type: none"> Introduction of carbon pricing and emission rights trading will <u>increase the cost of thermal power generation.</u> (It is highly likely that the cost will not be able to be passed on in the sales price.) <u>Competitive advantages for renewable energy will increase.</u> 	Large
Carbon dioxide emission targets/policies of countries	<ul style="list-style-type: none"> Strict regulations will <u>require the company to consider selling assets or making additional capital investment.</u> 	Large
Change in energy mix	<ul style="list-style-type: none"> Electricity from particular resources will <u>become unsaleable, opportunity loss</u> will occur, or <u>sales will decrease.</u> The Company will <u>have to consider selling assets, or making capital investment in alternative energy resources.</u> 	Large
Spread of recycling and energy-saving technologies (CCS, storage batteries, resource-saving design, etc.)	<ul style="list-style-type: none"> If carbon capture and storage (CCS) is made mandatory for thermal power generation, <u>extra costs will be incurred.</u> A drastic shift to renewable energy will <u>require huge investment in storage batteries and grid systems.</u> If a new, low-cost and high-efficiency renewable or energy-saving technology emerges, the <u>demand for thermal power generation will decrease.</u> 	Large
Renewable energy prices (FIT price)	<ul style="list-style-type: none"> <u>Sales prices of new renewable energy projects will decline.</u> <u>Competitive advantages for renewable energy will increase.</u> 	Large
Changes in the reputations among investors	<ul style="list-style-type: none"> Divestment will accelerate, and continuation of the thermal power generation business will <u>increase fund-raising costs.</u> 	Large

Introduction of carbon pricing will lead to a rise in power generation costs and changes in energy mix, which will have great financial impacts.

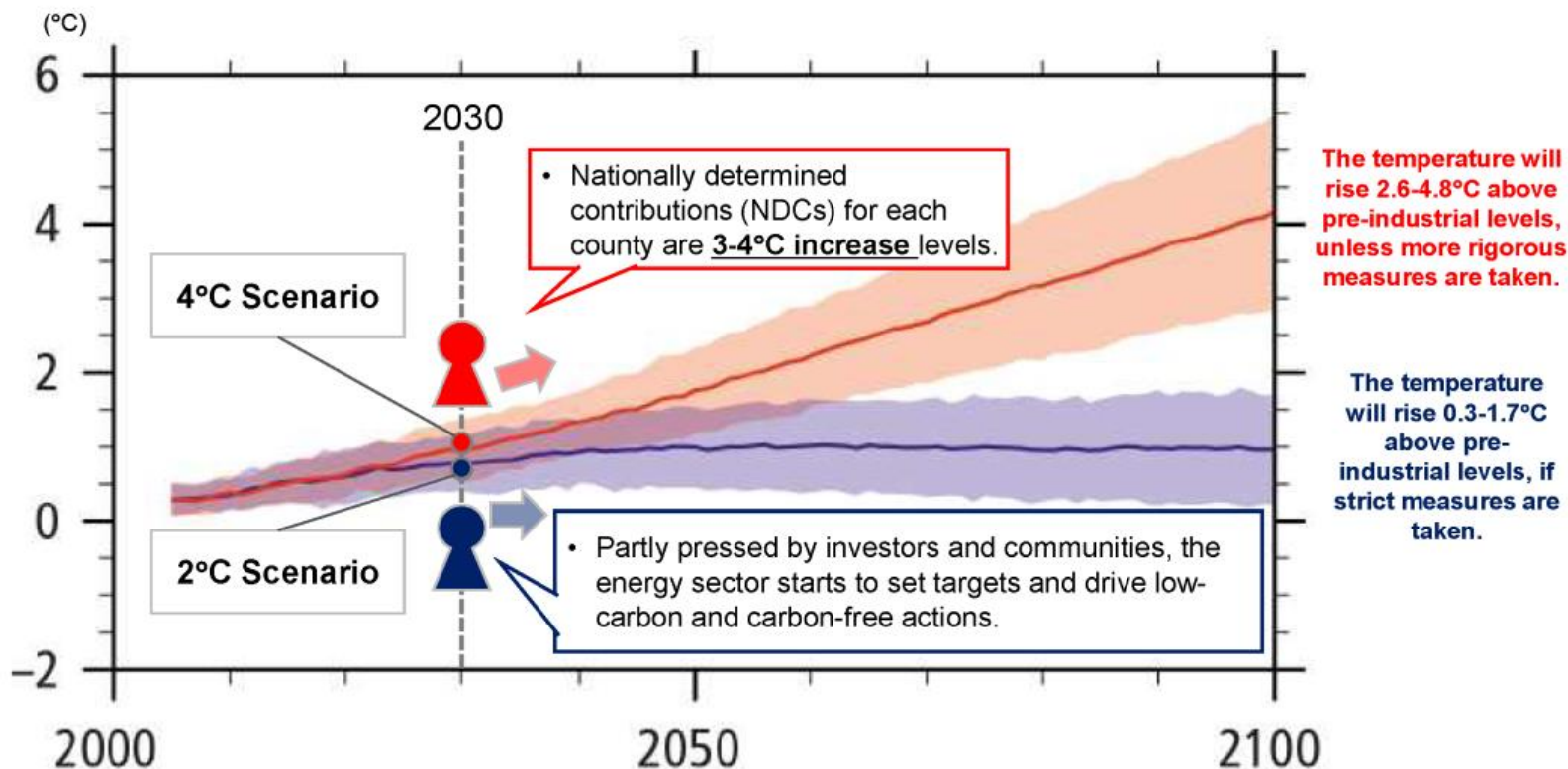
情境分析案例：伊藤忠商事株式会社

STEP 3 “Identify and define range of scenarios”

Consider society in 2040 with two scenarios of climate change that are highly uncertain.

STEP 2 3 4 5 Scenario 4°C 2°C

[Forecast of global average surface temperature (difference from the 1986-2005 average)]



Sources: Figure SPM.6 in the Synthesis Report (SYR) of the IPCC Fifth Assessment Report (AR5); International Energy Agency (IEA), "ETP 2017"; UNEP, "the Emission Gap Report 2015"; and website of the Ministry of Foreign Affairs

情境分析案例：伊藤忠商事株式会社

STEP 3 “Identify and define range of scenarios”

IEA's and Other Assumptions based on Scientific Grounds

STEP 2 3 4 5 Scenario 4°C 2°C

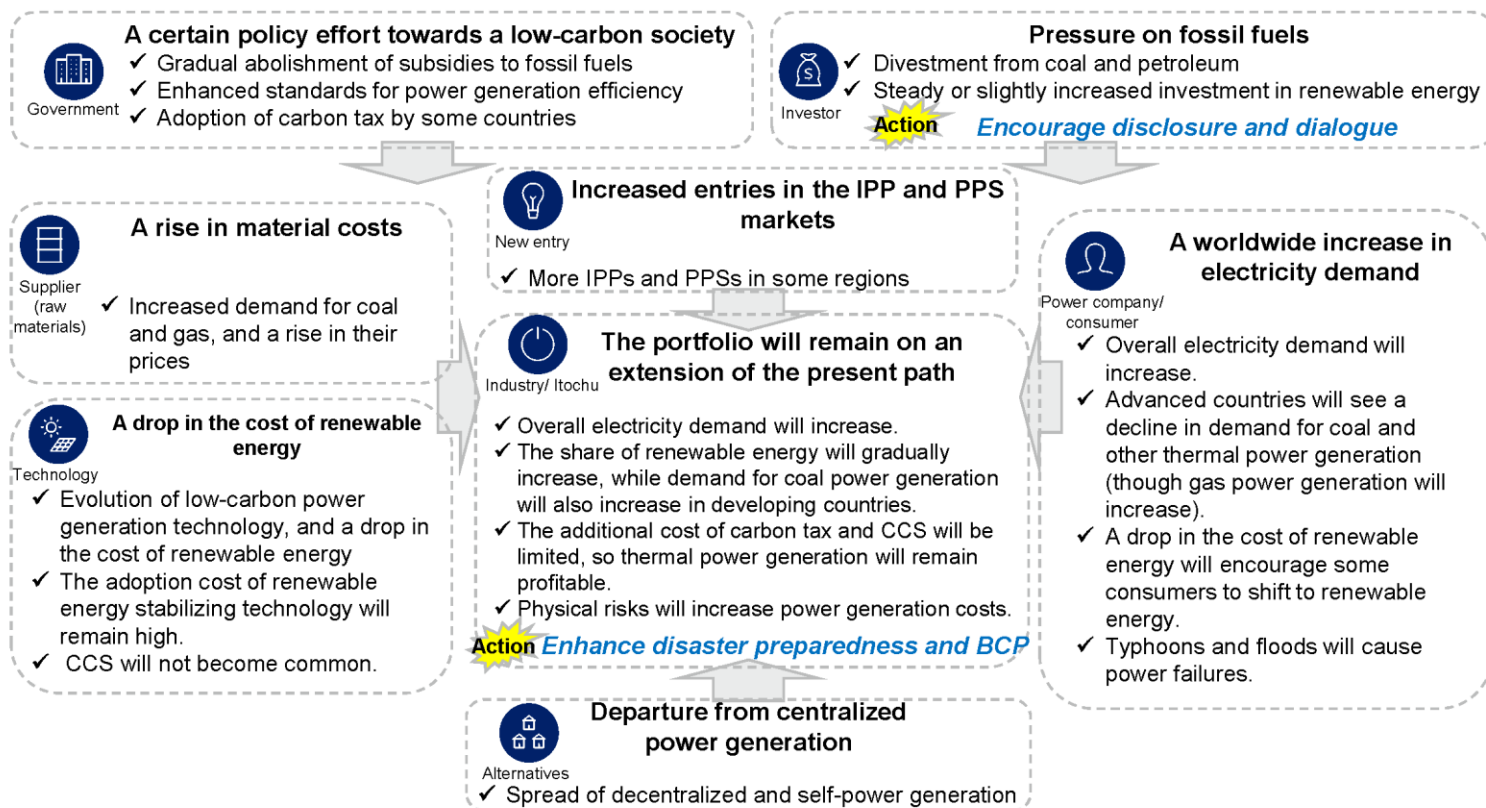
		Present (2014)	2040		Sources
			World 40 years ahead in the 4°C scenario	World 40 years ahead in the 2°C scenario	
Carbon pricing/ emission rights trading	Carbon pricing/ emission rights trading	N/A	N/A	\$140/t (US)	• IEA WEO2016 (450 scenario)
Carbon emissions targets/ policies*	Fossil fuel prices	Coal: \$78/t Gas: \$4.4/Mbtu (US)	Coal: \$108/t Gas: \$7.5/Mbtu (US)	Coal: \$77/t Gas: \$5.9/Mbtu (US)	• IEA ETP 2016 (4DS, 2DS)
	Renewable energy prices (FIT price) (US)**	N/A	PV utility scale: 7.2-8.8 yen/kWh Onshore wind power: 6.2-7.7 yen/kWh	PV utility scale: 6.6-7.1 yen/kWh Onshore wind power: 6.2-7.7 yen/kWh	• IEA WEO2016 (NPS, 450 scenario)
Changes in energy mix	Energy output by source (US)	Coal thermal: 1,713 TWh (40%) Gas thermal: 1,161 TWh (27%) Renewable: 570 TWh (13%)	Coal thermal: 1,016 TWh (21%) Gas thermal: 1,480 TWh (30%) Renewable: 1,488 TWh (30%)	Coal thermal: 153 TWh (3%) Gas thermal: 959 TWh (20%) Renewable: 2,560 TWh (54%)	• IEA WEO2016 (NPS, 450 scenario)
Spread of renewable and energy-saving technologies	Penetration rate of CCS	N/A	N/A	Coal thermal with CCS: 64% Gas thermal with CCS: 18%	• IEA ETP 2016 (2DS)

情境分析案例：伊藤忠商事株式会社

STEP 3 “Identify and define range of scenarios”

STEP 2 3 4 5 Scenario 4°C 2°C

In the 4°C scenario, the world will see an increased share of renewable energy, while the Company will continue following the present path towards further expansion



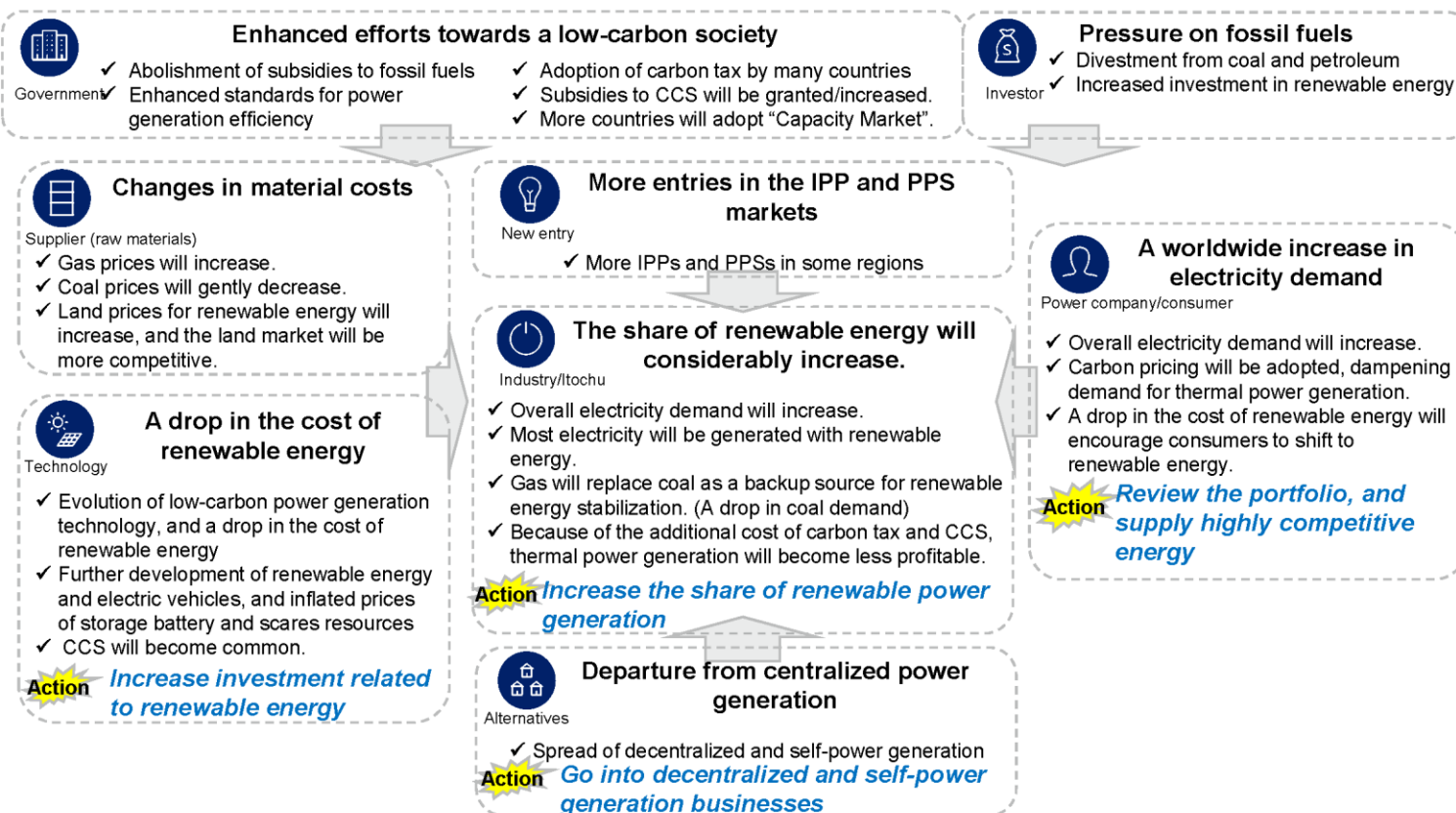
While keeping the portfolio on an extension of the present path, enhance the business continuity plan (BCP) to respond to physical risks
Encourage active disclosure and dialogue to secure reputation

情境分析案例：伊藤忠商事株式会社

STEP 3 “Identify and define range of scenarios”

STEP 2 3 4 5 Scenario 4°C 2°C

In the 2°C scenario, the world will reduce the use of thermal power generation, and substantially increase the share of renewable energy



While constructing a business portfolio focusing on renewable energy in line with the world trend of departure from carbon, pursue new electricity business opportunities

情境分析案例：伊藤忠商事株式会社

STEP 4 “Evaluate business impacts”

STEP 2 3 4 5 Scenario 4°C 2°C

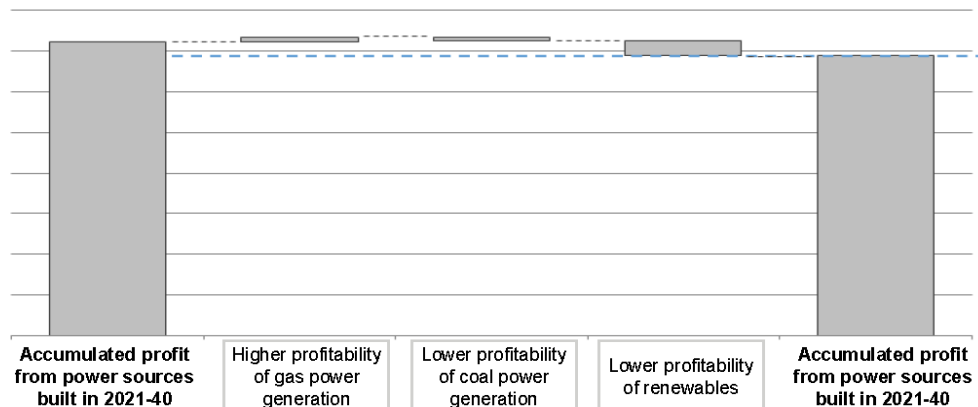
Under both the 2°C and 4°C scenarios, the Company will maintain at least the current level of income

4°C Scenario

(Image)

There are possibilities that:

- Gas power generation will be more profitable.
- Coal power generation will be less profitable.
- Renewables will also be less profitable.
- Accumulated income will drop.

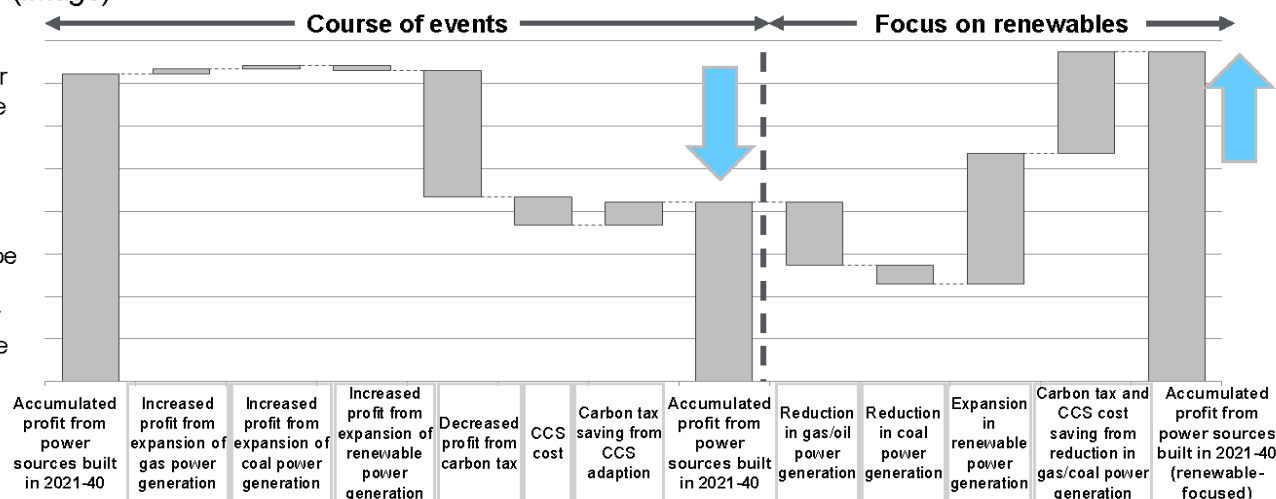


2°C Scenario

(100% carbon tax)

(Image)

- Power generation other than renewables will be subject to carbon tax, which will result in a substantial drop in profitability.
- But the Company will be able to maintain or increase profitability by building new renewable plants.



日本環境省情境分析指引|其他案例

- ②株式会社商船三井
- ③日本航空株式会社
- ④三菱自動車工業株式会社
- ⑤住友林業株式会社
- ⑥東急不動産ホールディングス株式会社

TCFDを活用した経営戦略立案のススメ

～気候関連リスク・機会を織り込むシナリオ分析実践ガイド～



環境省地球温暖化対策課

2019年3月

Thank you!



Q&A

NTPU