

製造業氣候變遷調適工作坊

分享議題2、情境設定案例分享與實務演練

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日期：110年9月6日

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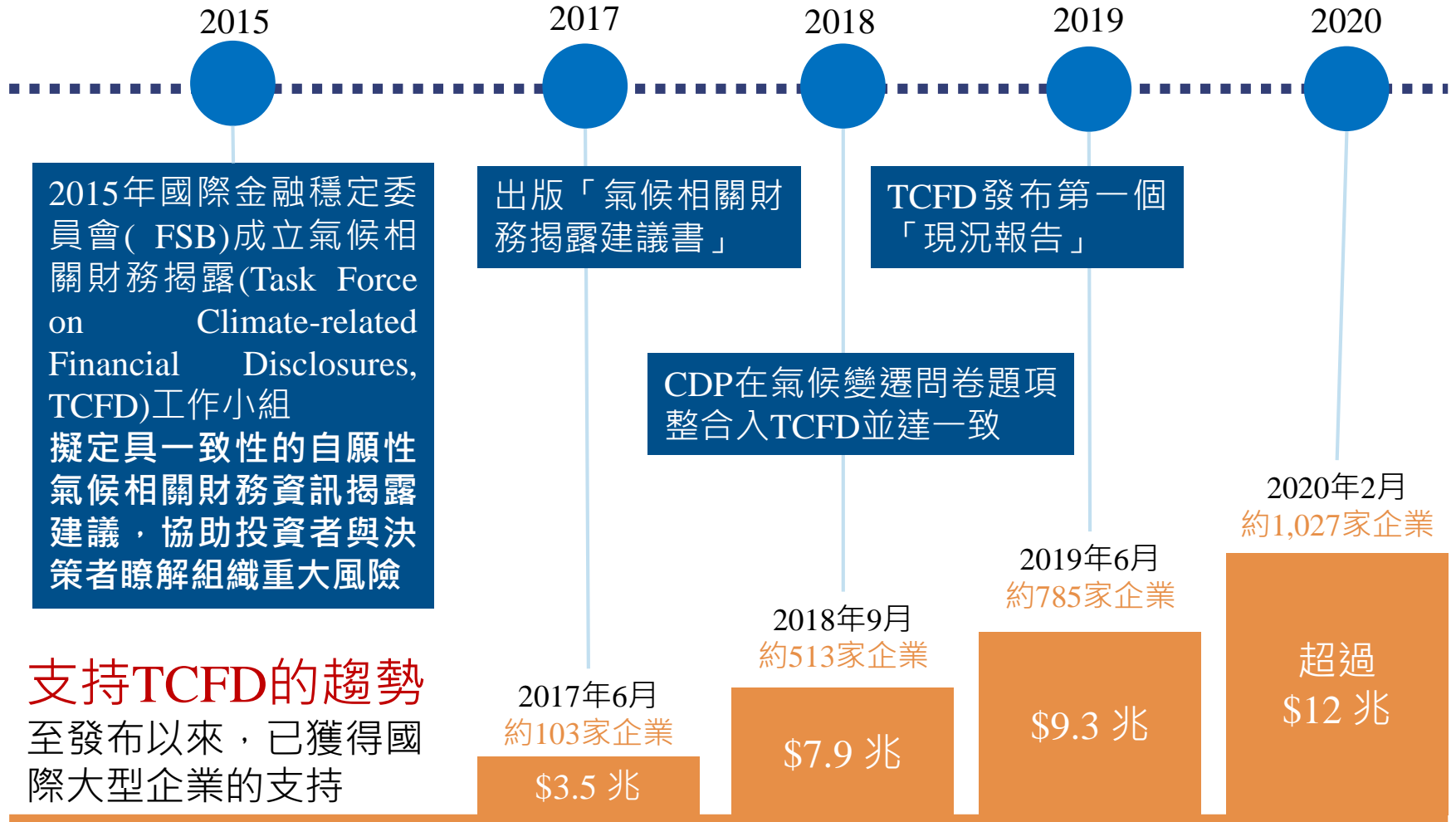
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一、氣候變遷財務揭露建議(TCFD)發展趨勢



支持TCFD的趨勢
至發布以來，已獲得國際大型企業的支持

一、氣候變遷財務揭露建議(TCFD)發展趨勢



CSRD

(企業永續發展報告指令草案)

大公司與上市公司報告須揭露對永續發展的風險與影響，即公司業務對氣候的影響及氣候變遷對其業務的影響

SFDR

(永續金融揭露規則)

銷售永續金融產品時揭露公司層面和金融商品層面的永續資訊

TCFD

揭露環境資訊



企業



提供資金



銀行

揭露公司和金融商品的永續資訊



購買永續金融商品



投資者

一、氣候變遷財務揭露建議(TCFD)發展趨勢

我國永續報告書導入TCFD、SASB時程規劃

TCFD

2021

- 研議TCFD資訊揭露規範

參考TCFD，強化永續報告書揭露，使氣候風險連結至公司治理，以提升企業資訊透明度

2022

- 證交所及櫃買中心將修訂「上市/櫃公司編製與申報企業社會責任報告書作業辦法」

2023

- 上市櫃公司於編製申報2022年永續報告書適用



- 研議應揭露具公司財務重大性及投資人投資決策有用的ESG相關資訊

參考SASB準則，強化揭露具公司財務重大性及投資人投資決策有用的ESG相關資訊，

- 證交所及櫃買中心將修訂「上市/櫃公司編製與申報企業社會責任報告書作業辦法」

- 上市櫃公司於編製申報2022年永續報告書適用

一、氣候變遷財務揭露建議(TCFD)發展趨勢

為什麼TCFD建議這麼重要

投資資訊



可提供明確、可比較及一致性的報告，促使明智的投資決策。同時與CDP一致，有助展現相關指標。

有保障的投資



投資者開始要求組織揭露氣候與可持續營運的相關資訊於營運決策中。

減輕氣候風險



有助於瞭解組織內營運的氣候風險，並減輕其影響。

符合法規



2023年國內資本資超過20億的上市上櫃公司將強制性要求依循TCFD進行揭露。

競爭優勢



TCFD建議已納入全球信用評級機構的評級項目。故具有為組織帶來競爭優勢的潛力。

淨零準備



TCFD建議有助於組織邁向低碳轉型，逐步實現淨零目標。

二、氣候變遷財務揭露建議(TCFD)建議揭露事項

TCFD核心要素之建議揭露事項

治理(Governance)

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

- 描述董事會對氣候相關風險與機會的監督情況
- 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(Strategy)

針對組織業務、策略及財務規劃，揭露實際及潛在與氣候相關的衝擊

建議揭露事項

- 描述所鑑別的短、中、長期氣候相關風險與機會
- 描述在業務、策略和財務規劃上與氣候相關風險與機會的衝擊
- 描述在策略上的韌性，並考慮不同氣候相關情境

二、氣候變遷財務揭露建議(TCFD)建議揭露事項

TCFD核心要素之建議揭露事項

風險管理(Risk Management)

揭露組織如何鑑別、評估及管理氣候相關風險

建議揭露事項

- 描述氣候相關風險的鑑別和評估流程
- 描述氣候相關風險與機會的管理流程
- 描述如何整合於企業風險管理制度中

指標與目標(Metrics & Targets)

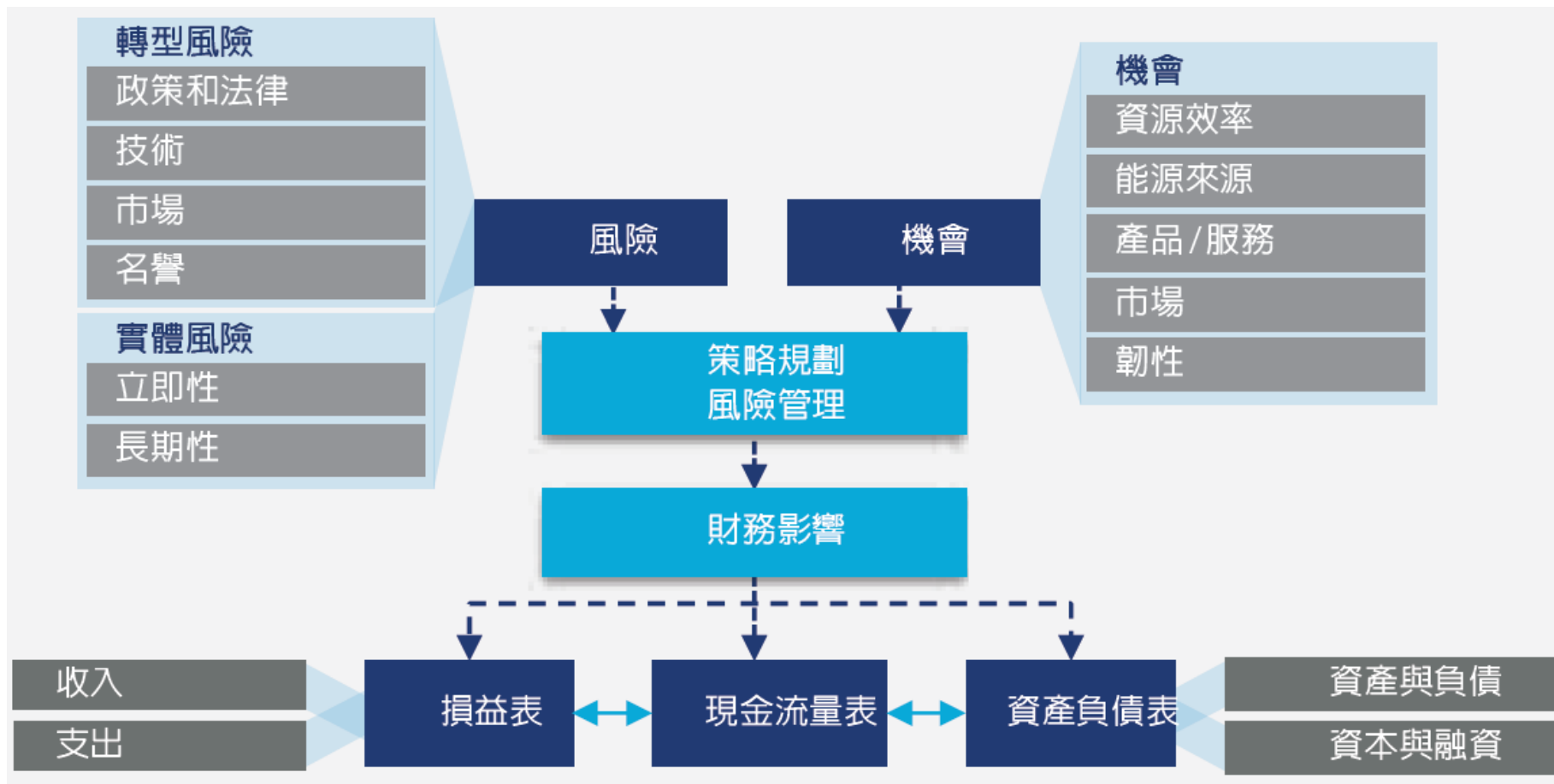
針對重大性的資訊，揭露用於評估和管理氣候相關議題的指標和目標

建議揭露事項

- 揭露範疇1、2、3溫室氣體排放
- 說明絕對減量目標或排放強度減量目標
- 說明基準年與減量目標期程
- 說明評估目標進展之關鍵績效指標

二、氣候變遷財務揭露建議(TCFD)建議揭露事項

TCFD風險與機會



資料來源：TCFD 建議書

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

1

落實治理：

- 將情境分析納入之企業營運計畫或風險管理流程中，並確保內外部利害相關者能夠共同參與

2

評估重大性氣候相關風險

市場	技術
政策	商譽
氣候災害	

3

確立情境

情境應涵蓋轉型風險與實體風險

4

評估對企業營運的影響

- 原物料成本
- 營運成本
- 收益
- 價值鏈
- 業務中斷

5

確立因應方案

- 改變商業模式
- 改變投資組合
- 投資技術

6

文件化及揭露 利益相關者溝通、對外揭露及評估程序文件化

討論

- 你認為未來情境設定是用於風險或機會？
- 你認為要先設定情境，還是先鑑別重大風險？

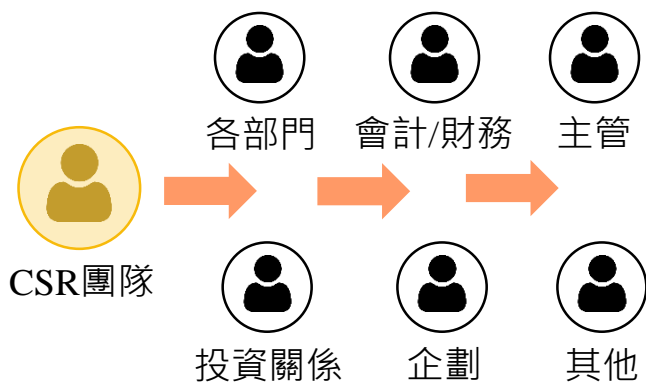


三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

成立一執行團隊，內部參與很重要

執行模式一

由特定部門主導



優勢

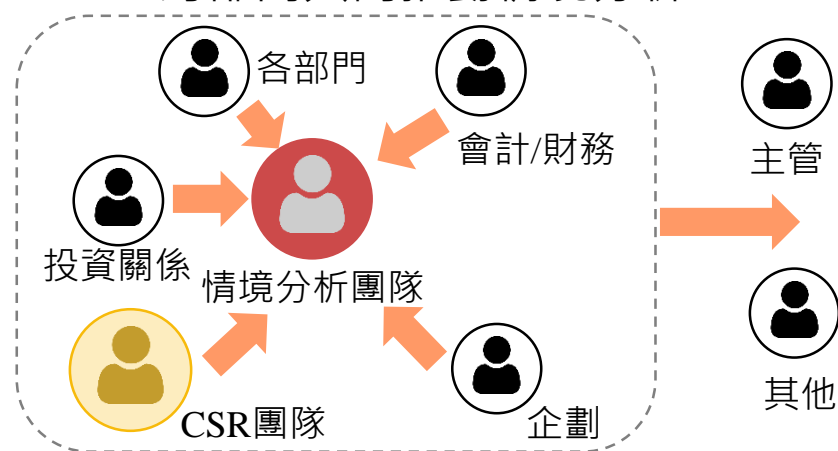
- 較容易推動
- 各部門工作負擔較低

劣勢

- 情境分析所需的內部協調時間較長

執行模式二

跨部門共同推動情境分析



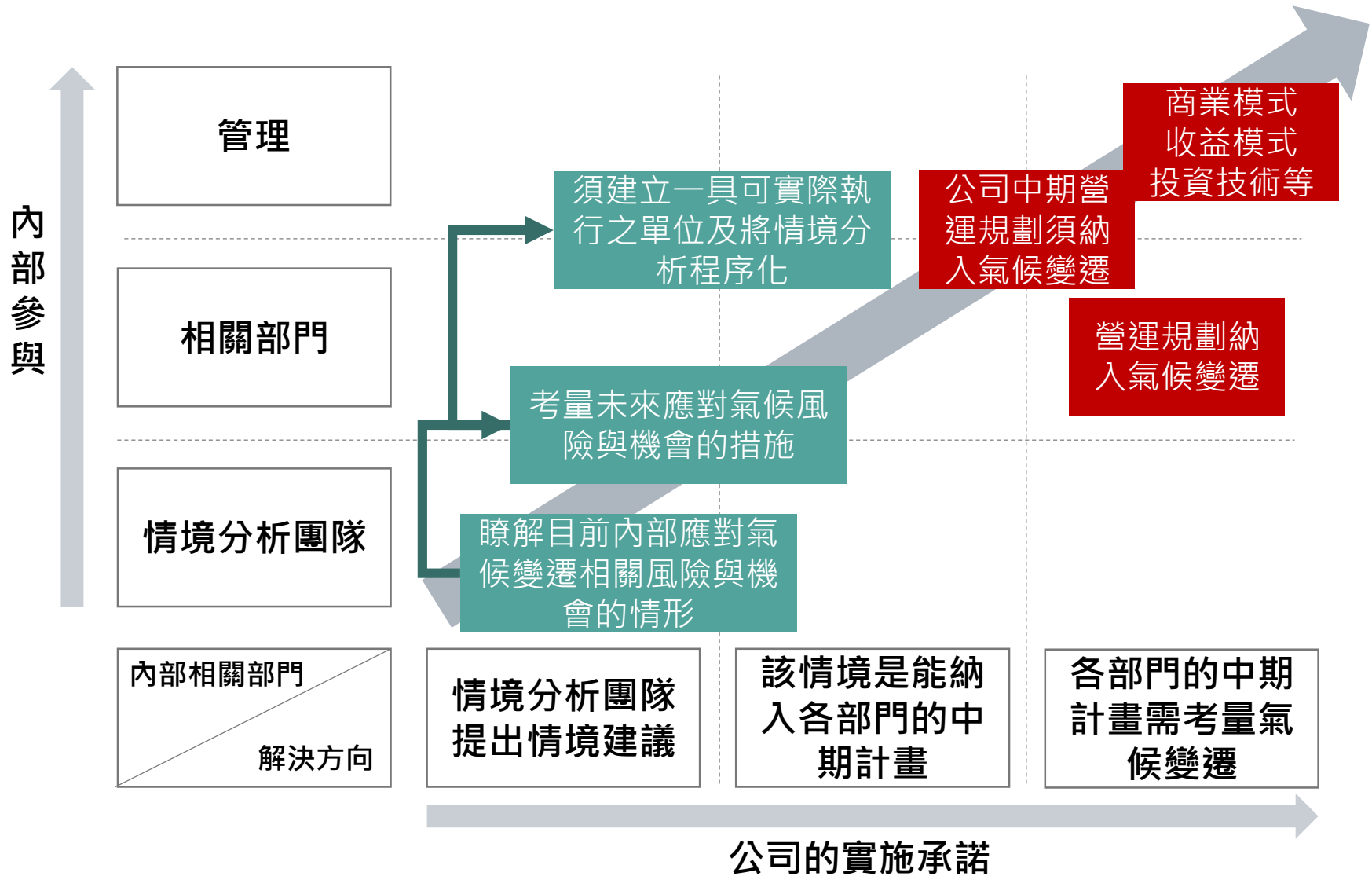
優勢

- 內部協調時間較短
- 直接涉及管理階層提高團隊協調合作

劣勢

- 情境分析時間較長
- 各部門工作負擔較高

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法



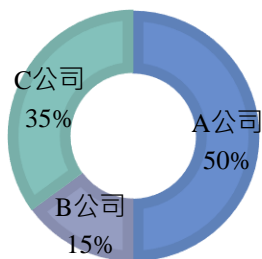
三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

分析範疇界定

可依企業銷售比例、與氣候變遷的關聯度、資料取得的難易度等作為情境分析的範疇

範例1

銷售比例
為分析範疇界定
【銷售比例(%)】



因A公司與C公司銷售比例最高，故設定為分析範疇

範例2

氣候變遷關聯度
為分析範疇界定
【溫室氣體排放量(tCO₂/yr)】



考量A公司與B公司排放量較高，故設定為分析範疇

範例3

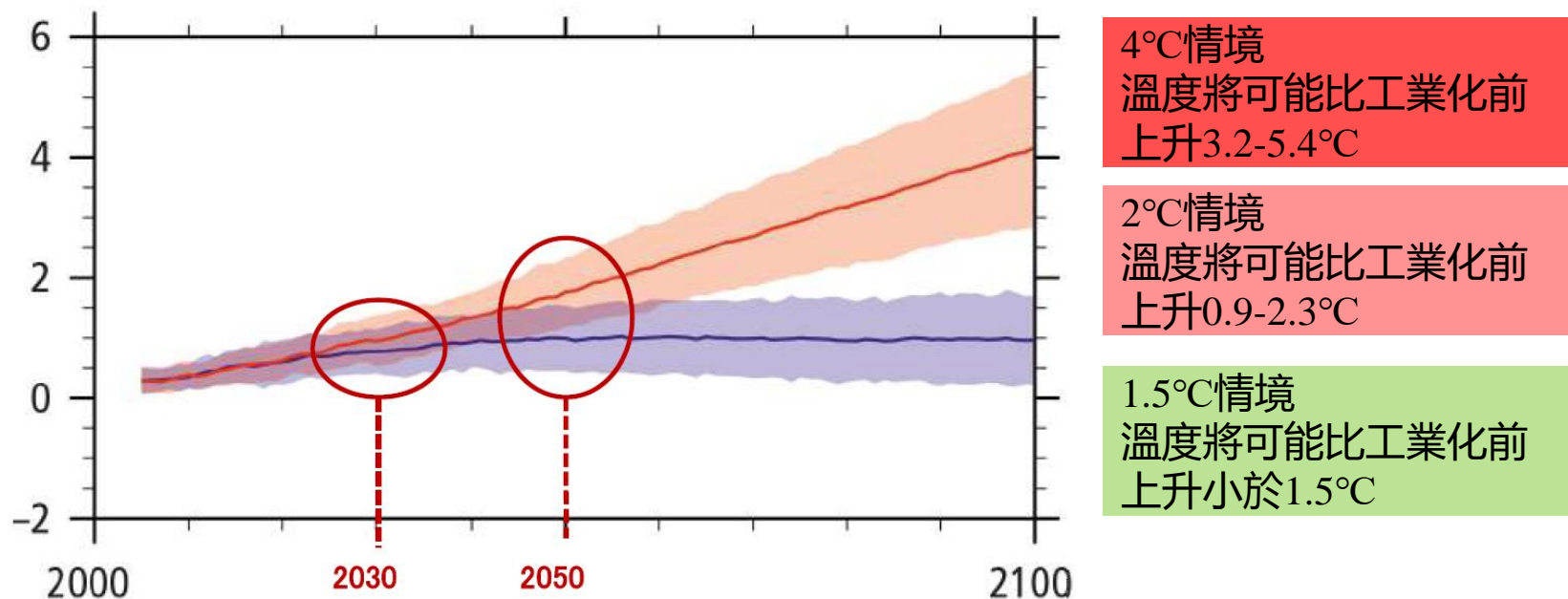
資料可取得難易度
為分析範疇界定
【溫室氣體排放量(tCO₂/yr)】

X區域	具完善的內部資料
Y區域	無資料

海外據點可先從有完善資料的X區域開始

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

選擇情境分析的時間尺度



Source: AR5 SYR Chart SPM.6, IEA, "ETP2017," UNEP, "The Emission Gap Report 2015"

	優勢處	待考量處
2030	<ul style="list-style-type: none">• 相關研究報告或資料較為多• 時間尺度較易於公司進行營運規劃	<ul style="list-style-type: none">• 實體風險對公司營運衝擊較不明顯
2050	<ul style="list-style-type: none">• 實體風險趨於明顯	<ul style="list-style-type: none">• 時間尺度較長，不易公司進行營運規劃

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

- ◆ TCFD建議進行氣候相關風險與機會評估時，應使用氣候情境分析(Climate Scenario Analysis)
- ◆ 氣候情境應以全球升溫低於2°C進行未來情境假設，並以此評估對企業的影響，但若面臨未來情境假設的不確定性，可以假設多種情境進行評估

實體風險(physical risk)

討論未來全球升溫無法控制在2°C以下時，所引發的氣候災害之影響。可使用氣候情境確定所面臨的氣候變遷風險與機會

政府間氣候變化專門委員會(Intergovernmental Panel on Climate Change, IPCC)，依未來溫室氣體排放程度，定義各種氣候變遷情境，用於評估不同的氣候影響。

轉型風險(transition risk)

討論未來為控制全球升溫不超過2°C或1.5°C，相關低碳或零碳規範。可使用法規、政策等途徑進行轉型風險與機會的評估

國際能源署(The International Energy Agency, IEA)，以政策途徑考量所有國家對減少溫室氣體的承諾，進行能源需求與結構、技術、溫室氣體排放量等情境分析。

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

面臨低碳經濟與極端氣候的影響
將根據全球暖化程度而有所不同

1.5°C

為避免重大氣候災害影響，全球升溫須低於2°C，且必須朝向淨零經濟與適當的調適作為。

2°C

IPCC明確指出升溫超過2°C將會造成更嚴重的災難性的氣候影響，尤其對中低收入國家，影響更為明顯。必須有更多的調適作為，與朝向低碳經濟。

4°C

將引發劇烈的氣候災害而影響全球。必須有更多的積極性的調適手段與作為。

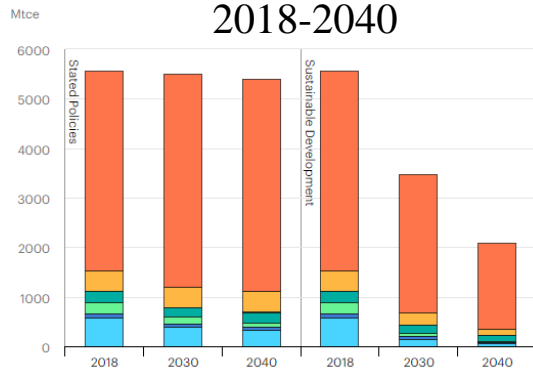
三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

<p>情境 來源</p>	<p>IEA WEO (World Energy Outlook)</p>	<p>SSP(Shared Socioeconomic Pathways)</p>	<p>PRI IPR(Inevitable Policy Response)</p>
	<p>有提出<u>中長期能源</u>市場的預測(定量/定性)</p>	<p>基於<u>社會經濟情境</u>(如人口、人類發展、經濟、生活型態、政策與機構等因素)，提出五大情境</p>	<p>提出可能在<u>短期</u>內會有的<u>氣候相關政策</u></p>
		<p>SSP1 SSP2 SSP3 SSP4 SSP5</p>	
<p>RCP 8.5 (4°C)</p>	<p>CPS(Current Policies)</p>	<p>— — — — ✓</p>	<p>—</p>
<p>RCP 6.0 (below4°C)</p>	<p>STEPS(Stated Polices) DRS(Delayed Recovery)</p>	<p>✓ ✓ ✓ ✓ ✓</p>	<p>FPS(Forecast Policy Scenario)</p>
<p>RCP 4.5</p>	<p>—</p>	<p>✓ ✓ ✓ ✓ ✓</p>	<p>—</p>
<p>RCP 3.4</p>	<p>—</p>	<p>✓ ✓ ✓ ✓ ✓</p>	<p>—</p>
<p>RCP 2.6 (2°C)</p>	<p>SDS(Sustainable Development)</p>	<p>✓ ✓ ✓ — ✓</p>	<p>—</p>
<p>RCP 1.9 (1.5°C)</p>	<p>NZE 2050(Net Zero Emissions by 2050)</p>	<p>✓ — — — —</p>	<p>—</p>

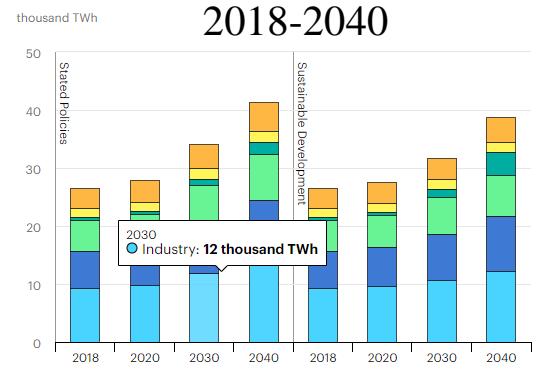
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IEA WEO(World Energy Outlook)

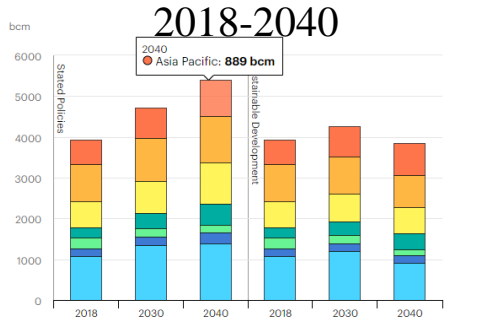
Coal production by region and scenario



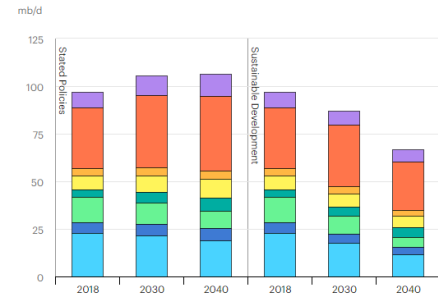
Electricity demand by sector and scenario



Gas production by region and scenario



Oil demand by region and scenario



● North America ● Central and South America ● Europe ● Africa ● Middle East
● Eurasia ● Asia Pacific

● Industry ● Residential ● Services ● Transport ● Other final uses ● Power services*

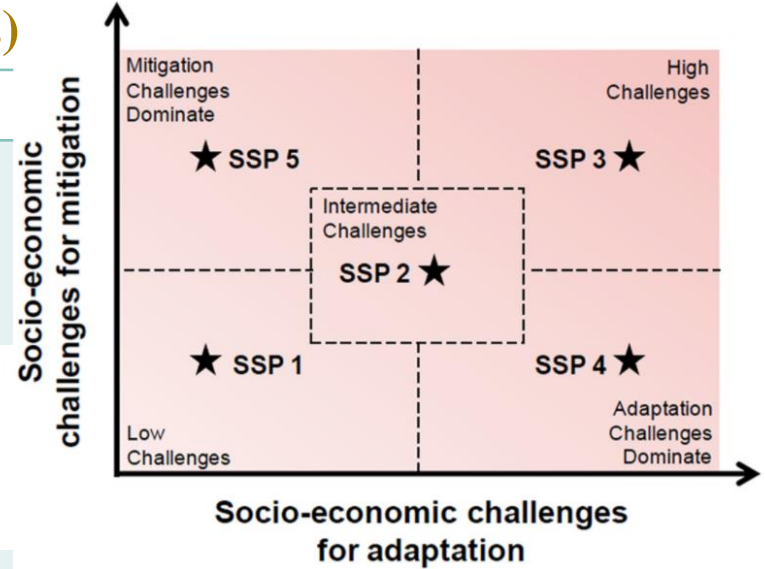
● North America ● Central and South America ● Europe ● Africa ● Middle East
● Eurasia ● Asia Pacific

● North America ● Central and South America ● Europe ● Africa ● Middle East
● Eurasia ● Asia Pacific ● International bunkers

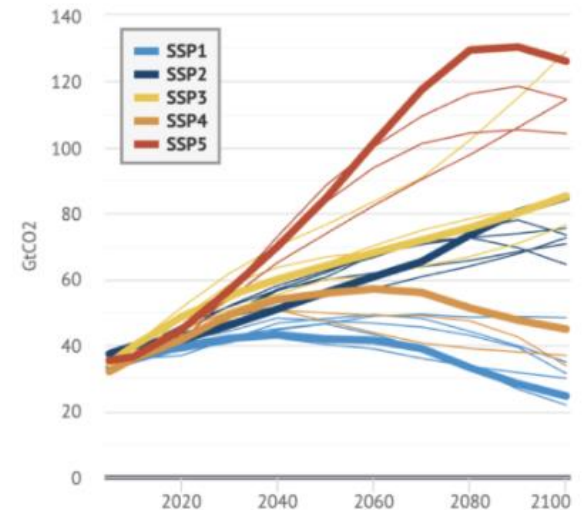
三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

SSP(Shared Socioeconomic Pathways)

情境	情境說明
SSP1	永續發展路徑(減緩和調適的低度挑戰) 全球朝向永續發展的道路。從重視經濟成長轉變為更加重視人類福祉，並以低物質、低能源及資源的消費需求為導向。
SSP2	中間路線路徑(減緩和調適的中度挑戰) 各國發展和收入成長不均，全球雖有往永續發展努力，但仍緩慢。整體對資源和能源的使用需求呈下降趨勢，但不願意使用非化石燃料。
SSP3	區域分化路徑(減緩和調適的高度挑戰) 各國較關注自身的能源、糧食等安全問題，且對於環境議題較不重視及科技發展慢。使用化石燃料區域的排碳與能源密集度高。
SSP4	不平等路徑(減緩挑戰低，調適挑戰高) 各國發展不均且差異大，對於經濟、教育程度、技術等皆較低的國家，其社會凝聚力低。促使全球投資不一，有些投資高碳排項目(如化石燃料)，有些則傾自低碳能源。
SSP5	高碳發展路徑(減緩挑戰高，調適挑戰低) 全球為推動經濟與社會發展，持續開採化石燃料資源和能源密集型的生活方式。



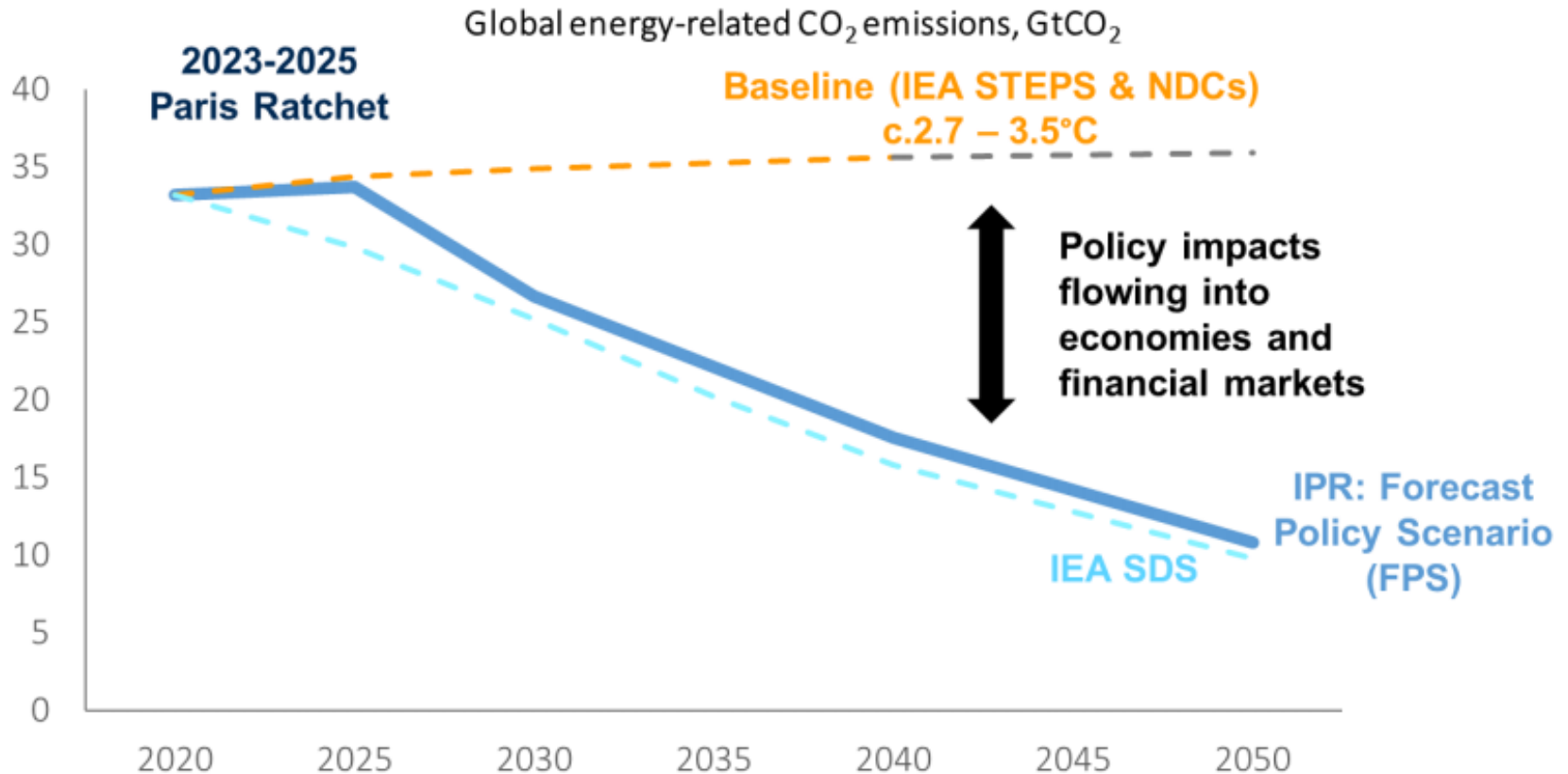
CO2 emissions for SSP baselines



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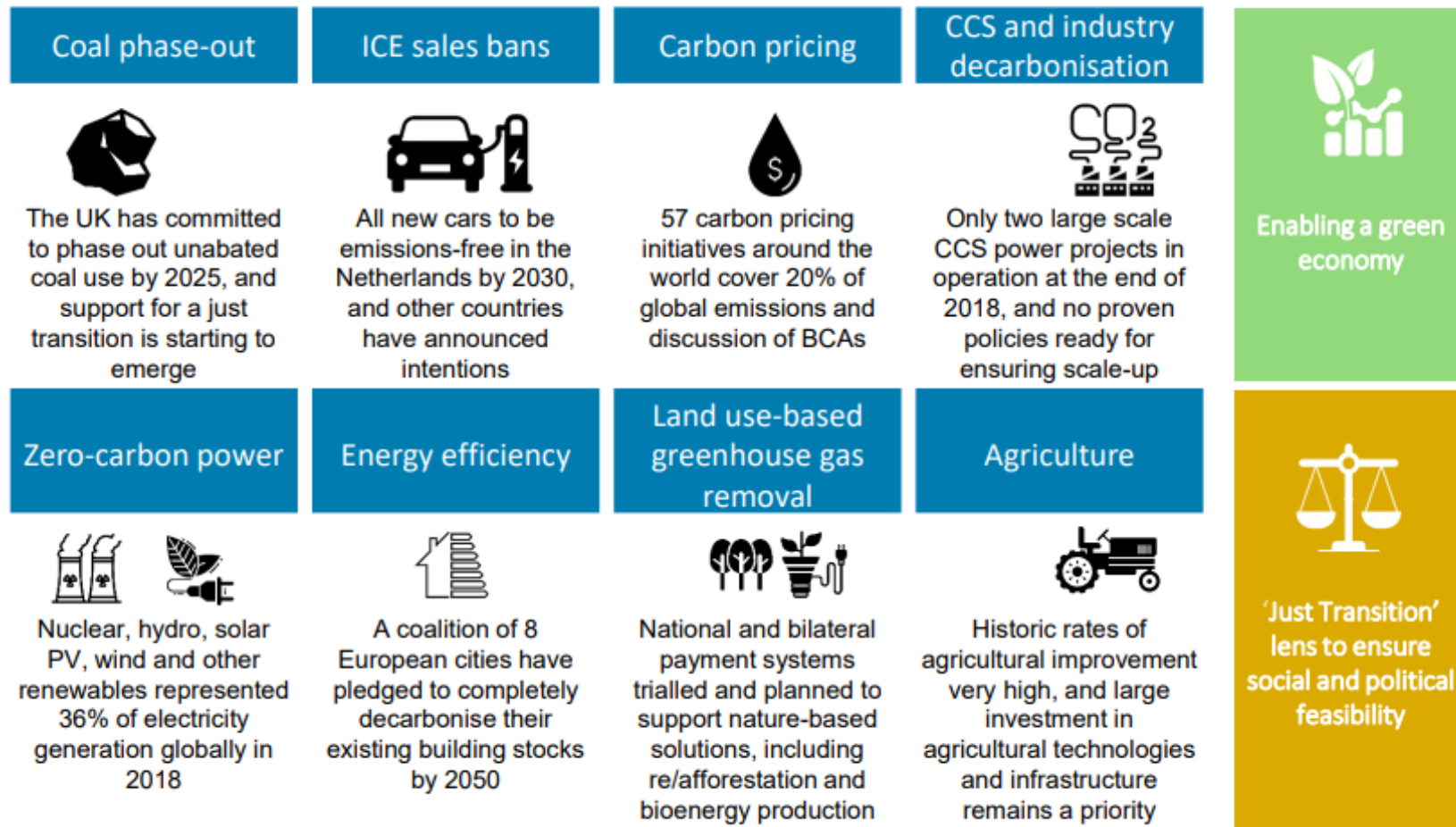
IPR(Inevitable Policy Response)

- IPR(Inevitable Policy Response) 預測主要在展示投資者投資組合中的潛在風險，與氣候情景不同，是根據可能的政策和技術發展，而不是依據全球升溫的溫度。
- 可替代 IEA 作為商業規劃情境，供投資者、企業和監管機構使用



三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

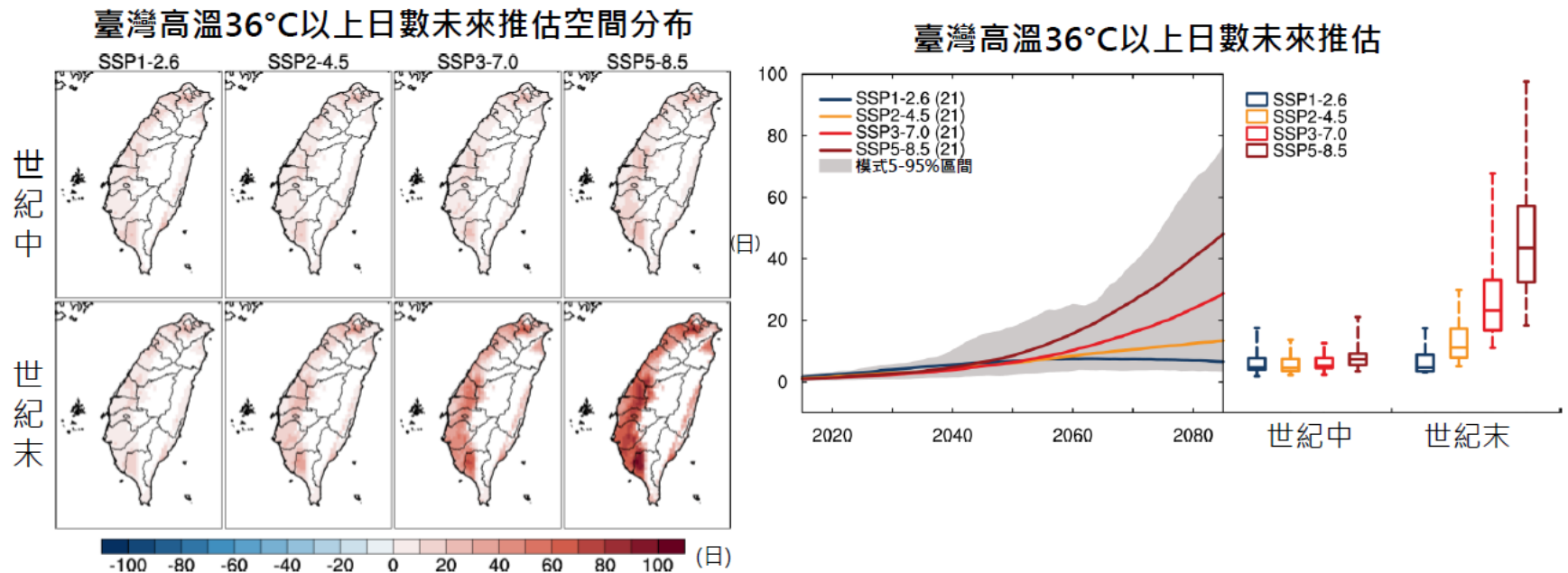
- 各國政府因應氣候變遷最有可能的政策，包括禁止煤炭；核容量和生物能源作物的增加；提升能源效率和重新/植樹造林；更廣泛地使用碳定價，並增加對綠色經濟項目的低成本資金供應。



三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

臺灣年高溫36°C以上日數

- ▶ 未來極端高溫事件中，各地高溫36°C以上日數增加。最劣情境 (SSP5-8.5)下，21世紀中、末，增加幅度約8.5日、48.1日，其中，以都市地區增加較其他地區顯著；理想減緩情境(SSP1-2.6)下，增加幅度約6.8日、6.6日。

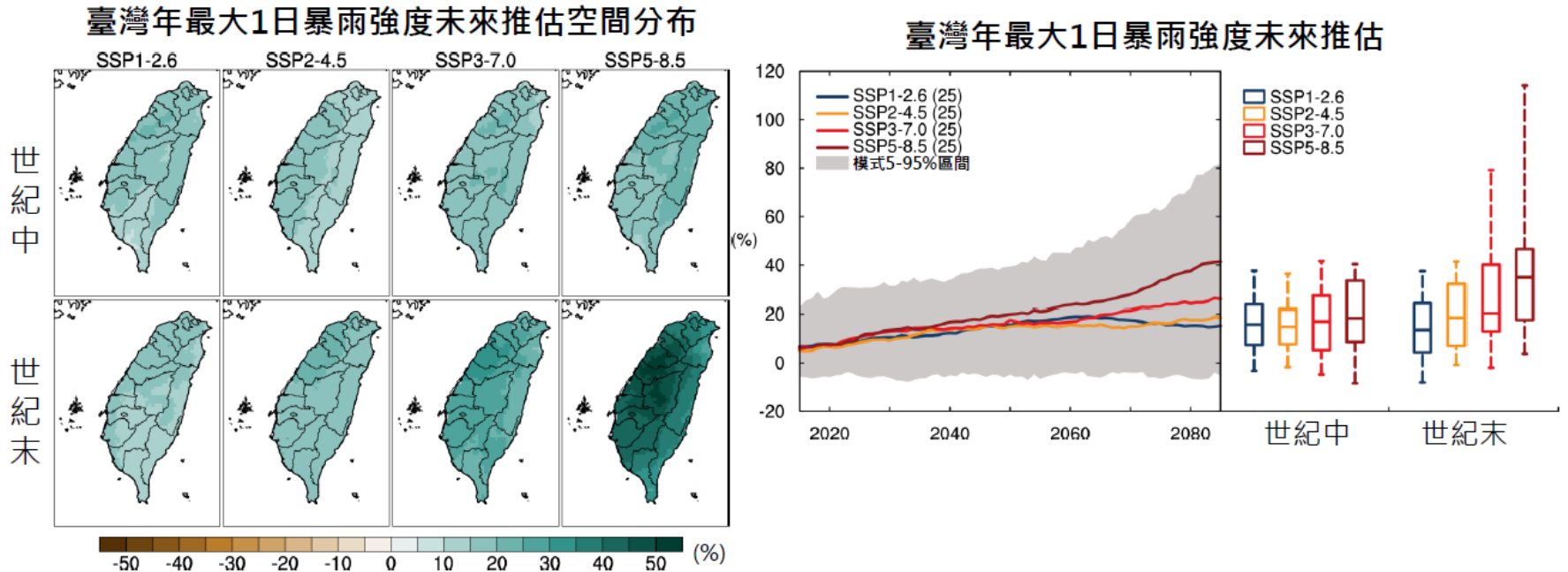


資料來源：引用至2021年台達氣候沙龍之 IPCC AR6報告之氣候科學重點發現-臺灣版(中研院 許晃雄 研究員)

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

臺灣年最大1日暴雨強度

- ▶ 臺灣年最大1日暴雨強度有增加趨勢。最劣情境 (SSP5-8.5)下，21世紀中、末平均年最大1日暴雨強度增加幅度約為20%、41.3%。理想減緩情境(SSP1-2.6)下，21世紀中、末平均年最大1日暴雨強度增加幅度約為15.7%、15.3%



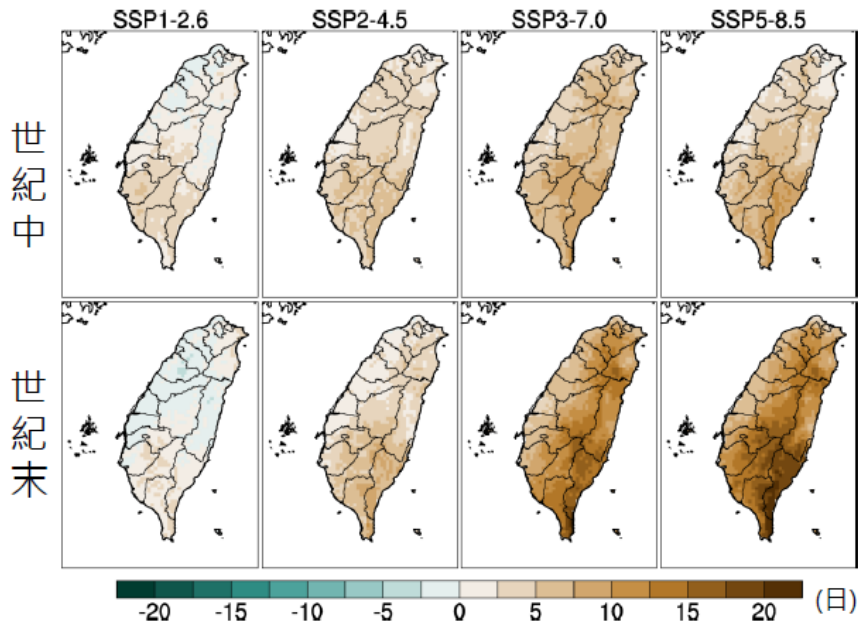
資料來源：引用至2021年台達氣候沙龍之 IPCC AR6報告之氣候科學重點發現-臺灣版(中研院 許晃雄 研究員)

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法

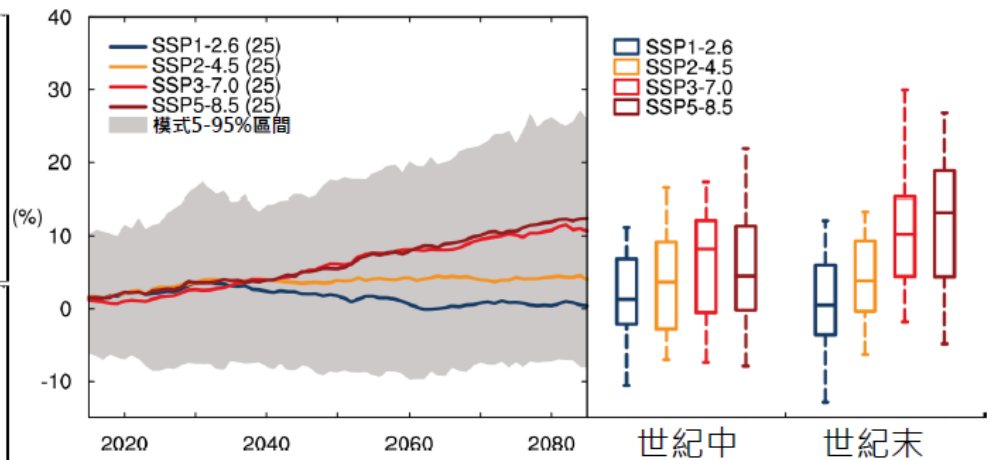
臺灣年最大連續不降雨日數

- 年最大連續不降雨日數各地有增加的趨勢，最劣情境 (SSP5-8.5)下，21世紀中、末平均增加幅度約為5.5%、12.4%；理想減緩情境 (SSP1-2.6)下，21世紀中、末減少幅度約為1.8%、0.4%。

臺灣年最大連續不降雨日數未來推估空間分布



臺灣年最大連續不降雨日數未來推估



資料來源：引用至2021年台達氣候沙龍之 IPCC AR6報告之氣候科學重點發現-臺灣版(中研院 許晃雄 研究員)

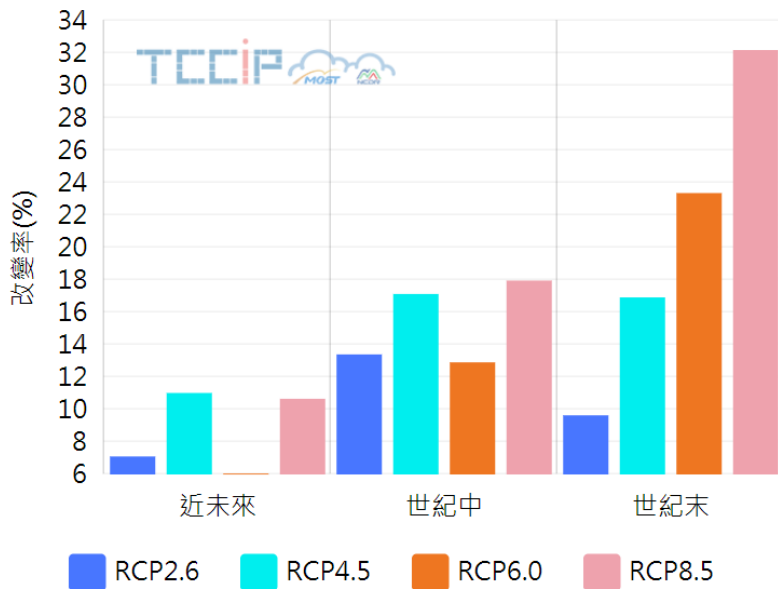
三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法



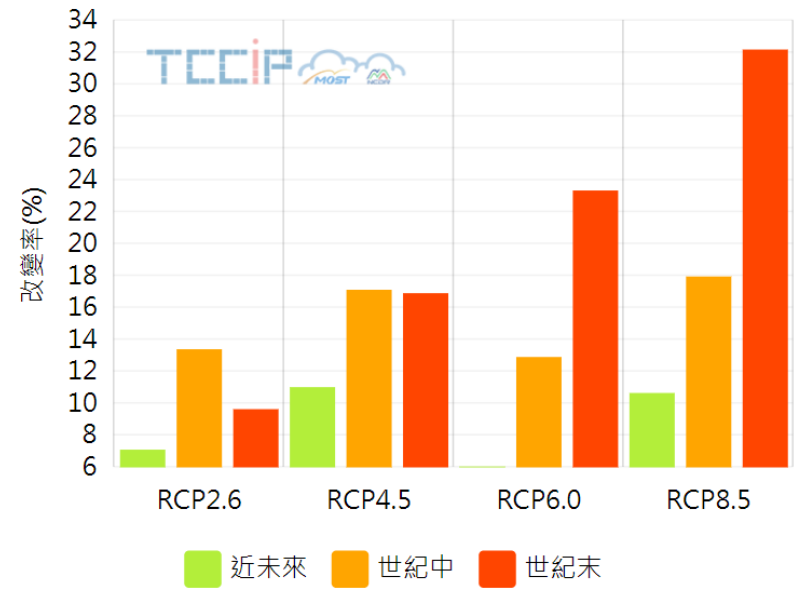
臺灣氣候變遷關鍵指標-哪裡找

雨量 ▾ 01. 年最大日降雨量之平均改變率 ▾ 縣市 ▾ 臺北市 ▾

臺北市 年最大日降雨量之平均改變率 基期：179 公厘



臺北市 年最大日降雨量之平均改變率 基期：179.00 公厘



年最大日降雨量之平均改變率：一年中最大的日降雨之雨量值，故在氣候模式或觀測資料網格裡，每個網格點上每一年都會有一最大日降雨強度，其單位為公厘 (mm)。

三、氣候變遷財務揭露建議(TCFD)之情境分析概念與作法



國家災害防救科技中心
National Science and Technology Center
for Disaster Reduction

災害潛勢地圖網站





分享

請分享您的公司在情境設定的執行方式

實務討論與分享

誰參與

重大議題如何擇定



情境選擇與關鍵參數

溫度與時間尺度

情境分析案例

情境與時間尺度選擇

四、氣候變遷財務揭露建議(TCFD)之情境案例

Mitsubishi Corporation 三菱商事(日本)

- ✓ 採用IEA WEO、IEA WTP研究報告推估數值
- ✓ 採用多種情境

	Awareness of the business environment under the NPS/RTS* ¹ Scenario	Awareness of the business environment under the 2°C (2DS/SDS)* ² Scenario
Demand Outlook		
	<p>The trajectory forecast from the present to <u>2040-2050</u> for the global supply and demand related to the selected <u>businesses under the NPS/RTS scenario</u> in publications such as the <u>IEA's World Energy Outlook and Energy Technology Perspectives</u> is expressed in seven levels (significant decrease, decrease, slight decrease, flat, slight increase, increase, significant increase).</p>	<p>The trajectory forecast from the present to <u>2040-2050</u> for the global supply and demand related to the selected businesses under the <u>2°C scenario</u> in publications such as the <u>IEA's World Energy Outlook and Energy Technology Perspectives</u> is expressed in seven levels (significant decrease, decrease, slight decrease, flat, slight increase, increase, significant increase).</p>
Awareness of the Business Environment	Introduction of the general awareness of the business environment as expressed in the NPS/RTS* ¹ , etc. (BAU scenario)	Introduction of the general awareness of the business environment as expressed in the 2°C Scenario (2DS/SDS), etc.

Policies and Initiatives Based on the Awareness of the Business Environment

Analysis of the impact to MC's business based on the awareness of the business environment detailed in both scenarios above, and related policies and initiatives.

*1 NPS/RTS Scenario

One of the primary scenarios of the World Energy Outlook 2017 and Energy Technology Perspectives 2017 published by the IEA (International Energy Agency). It is a scenario based on each country's reduction targets and climate change mitigation measures post-2020 as pledged in the Paris Agreement.

*2 2DS/SDS Scenario

One of the primary scenarios of Energy Technology Perspectives 2017 published by the IEA (International Energy Agency), which assumes that greenhouse gas emissions will be limited to keep long-term temperature increases below 2°C. Additionally, one of the primary scenarios of the World Energy Outlook 2017 that takes into account the stable supply of energy while responding to climate change.

四、氣候變遷財務揭露建議(TCFD)之情境案例

Mitsubishi Corporation 三菱商事(日本)

採用IEA WEO、IEA WTP研究報告推估數值

Natural Gas

	Awareness of the business environment under the NPS/RTS* ¹ Scenario	Awareness of the business environment under the 2°C (2DS/SDS)* ² Scenario
Demand Outlook		
Awareness of the Business Environment	<p>Demand for natural gas is expected to increase (average annual growth of <u>1.6% between 2016-2040</u>), especially in China, developing countries in Asia and the Middle East, mainly as fuel for power generation to support the increasing electricity demand that will surpass the deployment of renewable energy, as chemical feedstock and as transportation fuel, among other uses. It is recognized that LNG demand will grow due to its high transportability (LNG is expected to reach 15% of the total natural gas demand by 2040, an increase from 10% in 2016).</p>	<p>Global gas demand is projected to increase by 20% by 2030 compared to 2016 levels, maintaining the same levels of demand thereafter. By region, gas demand in Asia-Pacific will increase significantly through 2040, primarily in China and India. On the other hand, in North America and Europe, gas demand is expected to increase up to 2025 and then decrease thereafter. By industry, demand for gas in power generation will gradually decline, but demand for alternatives to coal in industries such as steel and cement is expected to increase, and if natural gas distribution networks are established in developing countries, usage of gas in urban area buildings will likely increase as well.</p>

Policies and Initiatives Based on the Awareness of the Business Environment

MC assumes as a base case that coal will be replaced as a fuel source by a combination of natural gas and renewable energy. In addition to strengthening the foundation of its existing businesses and steadily launching projects that are currently under construction, MC aims to expand its LNG business by participating in new, competitive projects, strengthening its sales capabilities and developing new markets. Under the 2°C Scenario, global demand for natural gas is projected to be flat from 2030. However, by launching new projects to meet demand increases and by carefully selecting highly cost-competitive projects, MC expects to maintain a competitive advantage in the natural gas business. Under this scenario, MC will continue to proactively develop new markets in Asia to capture the huge increase in energy demand anticipated in that region. In addition, MC will continue to monitor international policy developments such as the introduction of carbon taxes, which could be a factor that affects profits under the 2°C Scenario. MC will also stay up to date on technological trends in the steel and cement industries that could drive increases in demand for coal alternatives, and will promote marketing activities and business innovation accordingly. Furthermore, also paying attention to technological developments around CCUS that will increase the viability of the 2°C Scenario, MC will actively promote initiatives to increase resilience to climate risks and capture opportunities.

四、氣候變遷財務揭露建議(TCFD)之情境案例



AES發電有限公司(美國)

依不同的升溫情境闡述實體風險或轉型風險的可能發生情形

AES scenario convention

Transition risk
(IEA WEO 2017 scenarios)

Physical risk
(IPCC AR5 scenarios)

Implications for business

Indications of what the world would look like in 2040

2 - 4°C Scenario

Stated Policies Scenario (STEPS) | 2.7°C
RCP 6.0 | 2.0 - 3.7°C

Increased physical risk

- Global carbon emissions levels remain mostly stable through 2040
- Carbon prices continue or are enacted in select countries, such as Europe
- Fossil fuel generation drops from 63% to 45% of the world's electricity generation from 2019 to 2040
- Renewable power grows from 27% to 47% of global generation by 2040
- Electric vehicle share of global car and light truck fleet rises from 2% to 18% by 2040
- On a trajectory for sea level rise of 0.32-0.63m, more heat waves and changes in rainfall patterns by 2100

1.5 - 2°C Scenario

Sustainable Development Scenario (SDS) | 1.5 - 2°C
RCP 2.6 | 0.9 - 2.3°C

Increased transition risk

- Global carbon emissions levels fall 56% through 2040 and continue to fall until they hit net zero in 2070
- Carbon prices reach \$125/tonne for emerging economies and \$140/tonne for advanced economies by 2040
- Fossil fuel generation falls to 17% of total global generation by 2040
- Renewable power nearly triples to 72% of global generation by 2040
- Electric vehicle share of global car and light truck fleet rises from 2% to 41% by 2040
- Mitigates the worst climate change impacts by 2100, but varied regional changes still expected

四、氣候變遷財務揭露建議(TCFD)之情境案例



AES發電有限公司(美國)

2 - 4°C Scenario

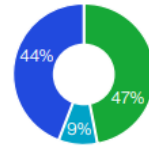
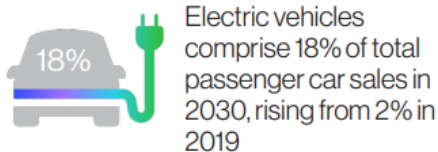
Aligns IEA's steps and IPCC's RCP 6.0



Carbon emissions peak in 2019 but generally return to 2019 levels by 2040



Carbon prices are implemented in select countries



Global power generation mix 2040:
 → **Renewables:** 47%
 → **Nuclear:** 9%
 → **Fossil fuels:** 44%

The world is on a 2100 trajectory toward:

- Stabilizing the amount of CO₂ in the atmosphere at twice those of pre-industrial levels
- 2.0-3.7°C increase in average global temperatures from pre-industrial levels
- Sea level rise of 0.32-0.63 meters
- More frequent and longer heat waves, more unusually hot and fewer unusually cold days, increased severity but decreased frequency of hurricanes and regional trends will vary widely

1.5 - 2°C Scenario

The 1.5 - 2°C Scenario requires global emissions to peak as soon as possible and rapidly fall by 70% by 2050, until they hit net zero by 2070. The scenario defines how the global energy sector needs to change by 2040 to both limit temperature increases to 2°C and also achieve the UN's related policy goals around energy access and air pollution. Under this scenario, the world has a near even chance of staying within the 2°C temperature increase¹, thereby mitigating extreme impacts of climate change and the associated physical risk.

As described earlier in this section, this is a standardized scenario for purposes of the stress test. The [AES vision](#) of 2050 provides more information about how we are thinking beyond these scenarios to enhance our strategic thinking and positioning.

1.5 - 2°C Scenario

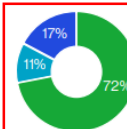
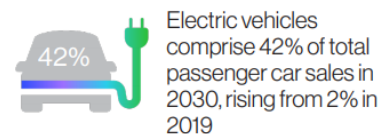
Aligns IEA's SDS and IPCC's RCP 2.6



Carbon emissions peak in 2019 and **decrease by 56%** through 2040



Carbon price schemes are established in all advanced economies, and emerging countries implement moderately less aggressive cap and trade schemes




Global power generation mix 2040:
 → **Renewables:** 72%
 → **Nuclear:** 11%
 → **Fossil Fuels:** 17%

The world is on a 2100 trajectory toward:

- Stabilizing the amount of CO₂ in the atmosphere at less than twice those of pre-industrial levels
- 0.3-1.7°C increase in average global temperatures from pre-industrial levels
- Sea level rise of 0.26-0.55 meters
- Generally mitigating the worst climate change impacts, but it is projected that there will be more frequent and longer heat waves and regional trends will vary widely

四、氣候變遷財務揭露建議(TCFD)之情境案例

 麒麟啤酒株式會社(日本)

Group Scenario 1 : 2°C scenario, SSP1, sustainable development

Group Scenario 3 : 4°C scenario, SSP3, unwanted world

Agricultural products		Kirin Group Scenario3: 4°C, unwanted world, 2050			
		United States	Asia	Europe/Africa	Oceania
Barley			West Asia Yield▲/+ South Korea Yield+	Finland Spring wheat yield▲ Mediterranean coast (West) yield▲, (East) yield+ France Winter barley and spring barley: Both yields▲	Western Australia Yield▲▲
Hops				Czech Republic Yield▲	
Black tea			Sri Lanka Yields down in lowlands Little impact of temperature rise in highlands India (Assam region) For each 1° C temperature rise above average temperature of 28° C, yields down 3.8% India (Darjeeling region) Yield▲▲~▲▲▲(Sources from tea industry, not academic papers)	Kenya Rise in altitude of suitable cultivation land Major contraction of suitable cultivating land in Nandhi region and western Kenya Kenyan mountain regions will remain suitable for cultivation Malawi Chitipa district: Suitable land▲▲▲ Nkhata Bay district: Suitable land▲▲▲ Mulanje district: Suitable land+++ Thyolo district: Suitable land++	
Wine grapes	United States (California) Suitable land: ▲▲▲ Northwestern United States Suitable land: +++ Chile Suitable land: ▲▲	Japan (Hokkaido) Expansion of suitable land Enable cultivation of Pinot Noir Japan (Central Honshu) Suitable land expanded on the one hand, but high-temperature damage also caused	Northern Europe Suitable land: +++ Mediterranean coast Suitable land: ▲▲▲ Spain Production volumes▲to▲▲ Western Cape, South Africa Suitable land: ▲▲▲	New Zealand Suitable land: +++ Southern coastal regions of Australia Suitable land: ▲▲▲ Outside southern coastal regions of Australia Suitable land: ▲▲	
Coffee beans	Brazil Suitable land for Arabica: ▲▲▲ Suitable land for Robusta: ▲▲▲	Southeast Asia Suitable land for Arabica: ▲▲▲ Suitable land for Robusta: ▲▲▲	East Africa Suitable land for Arabica: ▲▲ Suitable land for Robusta: ▲▲		
Corn	Southwestern United States Yield ▲▲ United States (Iowa in mid-West) Yield ▲~▲▲ Brazil, Argentine Yield ▲~▲▲	China Yield ▲▲			

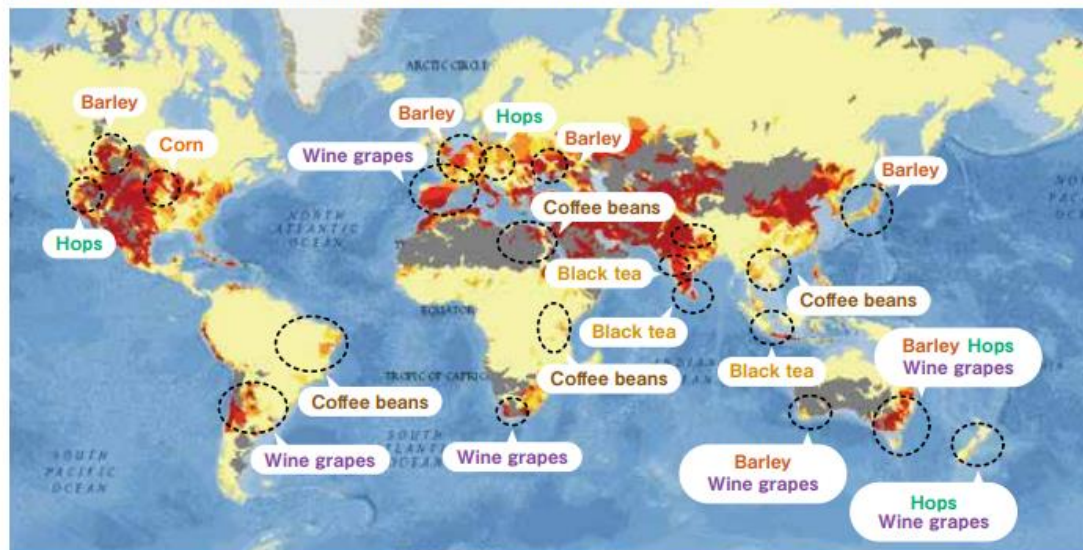
Legend: Negative/positive impact of less than 10% ▲/+ From 10% to less than 50% ▲▲/+ 50% or more ▲▲▲/+++

四、氣候變遷財務揭露建議(TCFD)之情境案例



麒麟啤酒株式會社(日本)

Water stress in major agricultural production regions (2040, equivalent to Kirin Group Scenario 3)



source : World Resources Institute

Assessment of impact of carbon pricing

In event of inaction on medium-term
GHG emission reduction target of 30% by 2030

Kirin Group Scenario1:2°C, sustainable development
Kirin Group Scenario1:4°C, unwanted world

	Kirin Group Scenario 3		Kirin Group Scenario 1	
	2025	2040	2025	2040
Estimate cost of impact (unit: 1,000 USD)	10,944	14,448	51,268	80,374
Estimate cost of impact (unit: 1 million JPY)	1,215	1,604	5,691	8,921

In event of achievement of medium-term GHG emission reduction target of 30% by 2030

	Kirin Group Scenario 3		Kirin Group Scenario 1	
	2025	2040	2025	2040
Estimate cost of impact (unit: 1,000 USD)	8,956	6,905	41,958	38,411
Estimate cost of impact (unit: 1 million JPY)	994	766	4,657	4,264

資料來源：Kirin Group Environmental Report 2020

四、氣候變遷財務揭露建議(TCFD)之情境案例



朝日啤酒(日本)

情境設定
設定2050年IPCC RCP2.6 (2°C)
RCP8.5 (4°C) 情景和 IEA 情景

主要原料(玉米、咖啡)

- 咖啡和玉米是主要採用的農產品原料，佔2050年的採購成本的增加幅度。
- 根據日本和海外農產品原料採購量等因子，推算2050年玉米成本可能增加 19.7 億日元，咖啡成本可能增加約 26.6 億日元。

Yield Forecasts for Each Scenario as of 2050 (Compared with Current Yields)

Main Ingredients of Beer

Item	Country of Production	2°C Scenario	4°C Scenario
Barley	Canada (Spring)	+1%	+2%
	France (Spring)	-10%	-18%
	France (Winter)	-5%	-10%
	Eastern Region of Germany (Winter)	+8%	+19%
Hops	Australia	-7%	-13%
	Czech Republic (Spring)	+18%	+7%
Hops	Czech Republic (Yield)	-5%	-7%
	Czech Republic (Quality)	-13%	-25%

Main Raw Materials of Soft Drinks and Alcohol Beverages Other Than Beer

Item	Country of Production	2°C Scenario	4°C Scenario
Sugar	Australia	+1%	+2%
	Brazil	+3%	+12%
	India	0%	-3%
	Japan	+2%	+21%
Raw Milk	Thailand	-26%	-45%
	Australia	-9%	-19%
	United States	-6%	-11%
	Japan	-2%	-3%
Coffee	New Zealand	-2%	-2%
	Brazil	-8%	-23%
	Colombia	-4%	-15%
	Guatemala	-11%	-17%
Coffee	Tanzania	-2%	-9%
	Ethiopia	-8%	-25%
	Vietnam	-9%	-24%
	Indonesia	-10%	-30%

Common Ingredients of Alcohol Beverages and Soft Drinks

Item	Country of Production	2°C Scenario	4°C Scenario
Corn	United States	-12%	-24%
	Brazil	-3%	-9%
	Argentina	-9%	-16%
	China	0%	-10%
	Ukraine	-17%	-26%
	Australia	-13%	-27%

Quantitative risks of yield reduction

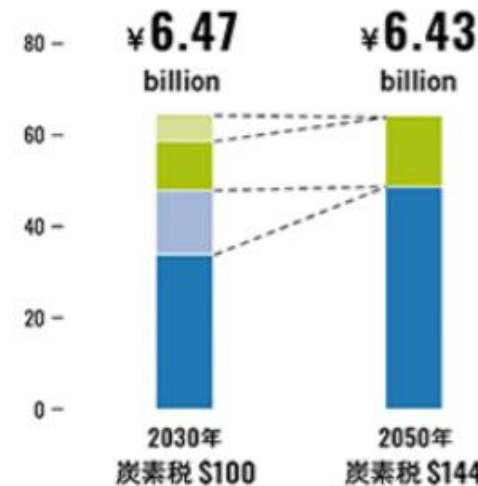
¥1.97 billion (Corn)
 ¥2.66 billion (Coffee)

- 氣候變遷顯然對公司產生重大影響
- 生產所使用的重要農產品產量下降
 - 碳稅所產生的製造成本增加
 - 農場和生產據點的缺水和洪水風險增加

課徵碳稅

Impact on Production Costs

(¥ billion)



■ Alcohol Beverages Business (Scope 1)
■ Alcohol Beverages Business (Scope 2)
■ Soft Drinks Business (Scope 1)
■ Soft Drinks Business (Scope 2)

- 假設碳稅在2030年為100美元/噸：營運成本增加 64.7 億日元
- 2050年為144美元/噸：營運成本增加 64.3 億日元。
- *預計於2050年實現電力CO₂零排放的目標，故無因碳稅而增加的營運成本

註：根據 IEA World Energy Outlook 中的預測估算碳稅金額

四、氣候變遷財務揭露建議(TCFD)之情境案例



丸井集團(日本)

	End of 21st Century	Scenario Employed
<p>High physical risks High impact on the environment</p> <p style="text-align: center;">↑</p> <p>High transition risks High impact from regulations</p>	<p>4°C Scenario Average global temperature 4°C above pre-industrial levels</p>	<p>RCP8.5, IPCC (High warming scenario) IPCC scenario based on maximum greenhouse gas emissions</p>
	<p>2°C Scenario Average global temperature 2°C above pre-industrial levels as consented to under Paris Agreement</p>	<p>RCP2.6, IPCC (Low stability scenario) IPCC scenario based on target of keeping warming below 2°C above pre-industrial levels Sustainable Development Scenario, IEA Sustainable IEA scenario based on the Paris Agreement</p>
	<p>1.5°C Scenario Average global temperature below 1.5°C above pre-industrial levels</p>	<p>SR1.5, IPCC IPCC Special Report on Global Warming of 1.5°C</p>

四、氣候變遷財務揭露建議(TCFD)之情境案例



丸井集團(日本)

	Changes in society	Risks faced by MARUI GROUP	Description of risks	Financial impacts
Physical risks	Flood damage due to typhoons, torrential rains, etc. *1	Suspension of store operations	Impact on rent revenues, etc., due to business suspension	Approx. ¥1.9 billion
			Building damages due to flooding (recovery of power supply facilities, etc.)	Approx. ¥3.0 billion
		Suspension of system centers	Groupwide suspension of business activities due to downed systems	Response completed *2
Transition risks	Increase in demand for renewable energy	Rise in renewable energy prices	Increase in energy costs due to renewable energy procurement	Approx. ¥0.8 billion (Annual)
	Tightening of government's environmental regulations	Introduction of carbon taxes	Tax increase due to carbon taxes	Approx. ¥2.2 billion (Annual)

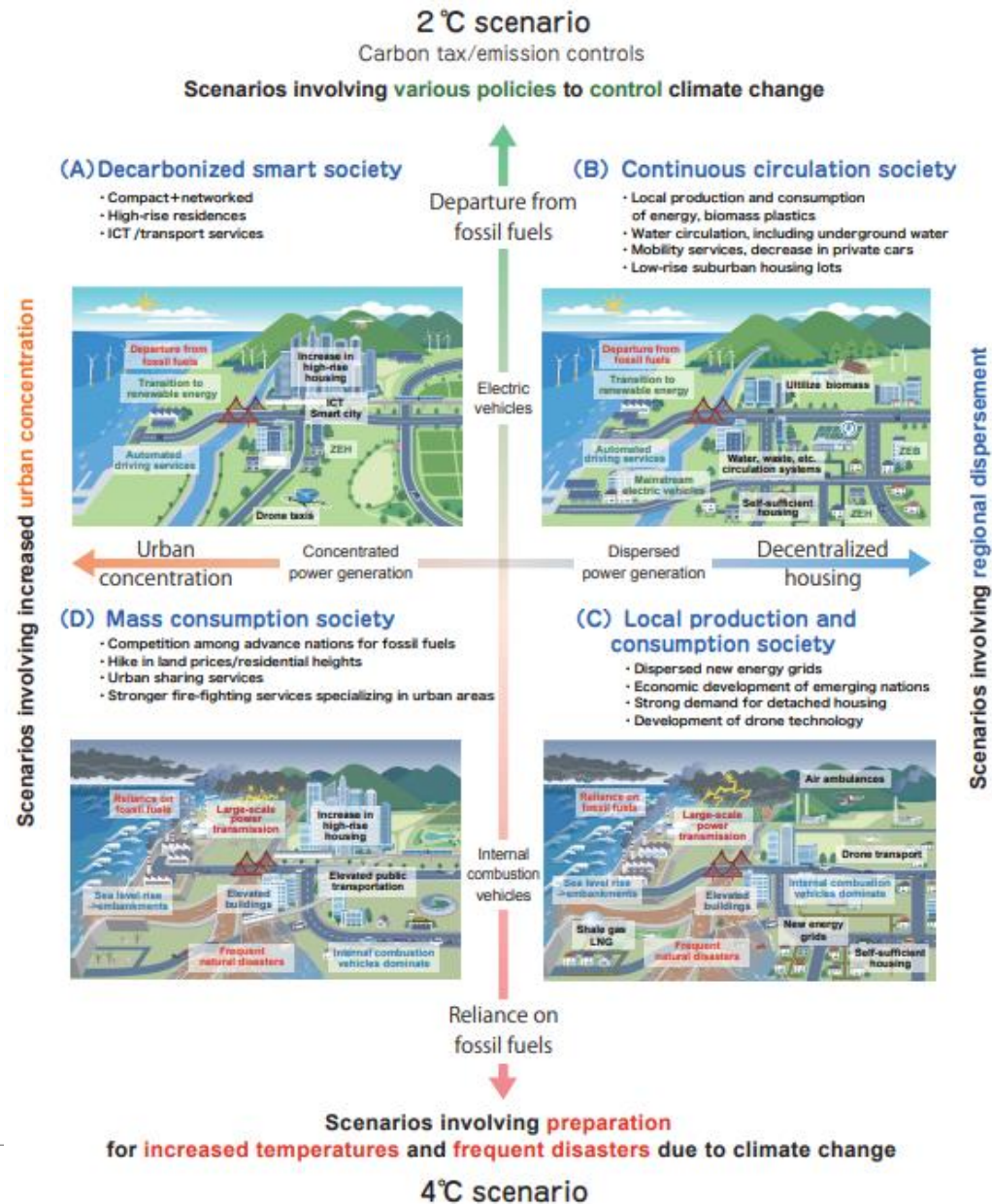
四、氣候變遷財務揭露建議(TCFD)之情境案例



積水化學工業株式會社(日本)

- ✓ 考量住宅、先進的基礎設施、創新交通、生命科學及能源領域等因素。
- ✓ 考量未來的不確定性，故僅專注於可能會發生的情境，如零排放汽車 (ZEV) 將可能成為主流
- ✓ 在 2°C 與 4°C 氣候情境，基礎設施、城市發展、人口分布等都將影響到情境的設定

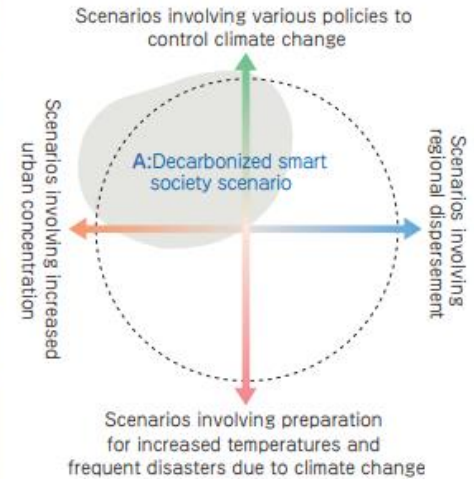
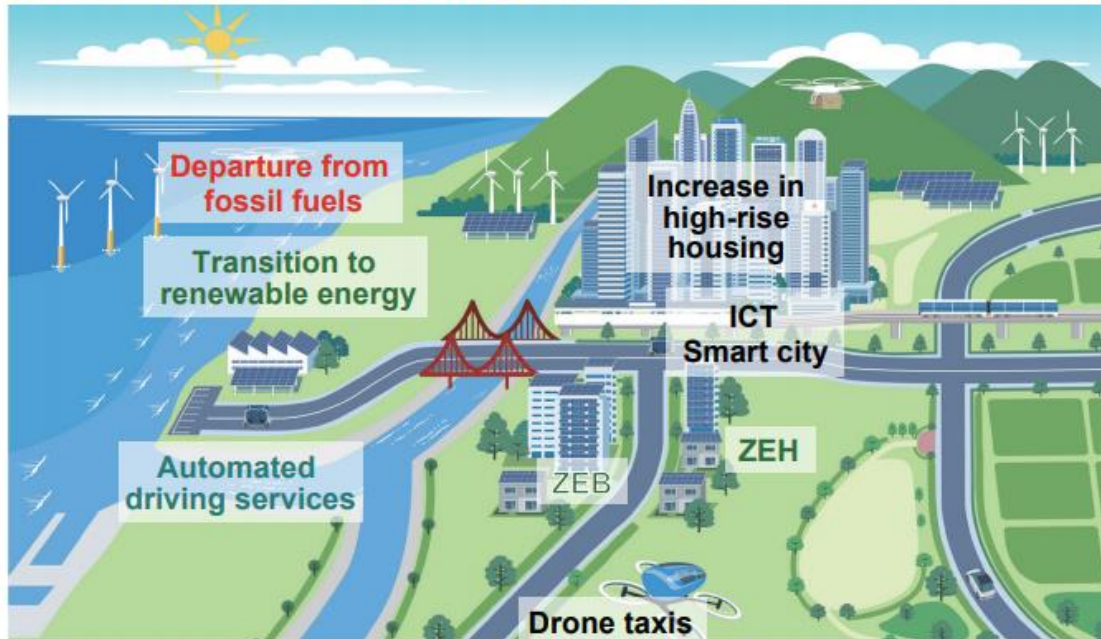
資料來源：Sekisui Chemical, Information Disclosures based upon the TCFD Statement of Support 2020



四、氣候變遷財務揭露建議(TCFD)之情境案例

Scenario (A)

Decarbonized smart society scenario (2°C x centralized scenario)



Opportunities

- Increased demand for smart infrastructure, remote control systems, etc.
- > Advanced technology utilization and expand services for infrastructure
- Increased demand for power generation/storage products
- > Higher performance of electronic/energy related products

Risks

- Decreased car sales due to transition to mobility services
- > Decreased sales of housing and mobility related products
- Transition to renewable energy
- > Increase in energy procurement costs
- Decreased demand for low-rise housing
- > Decreased sales of housing related products

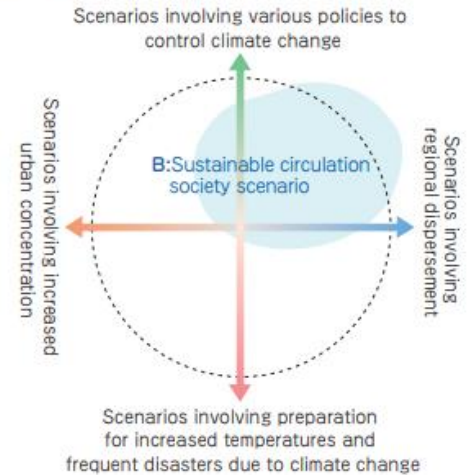
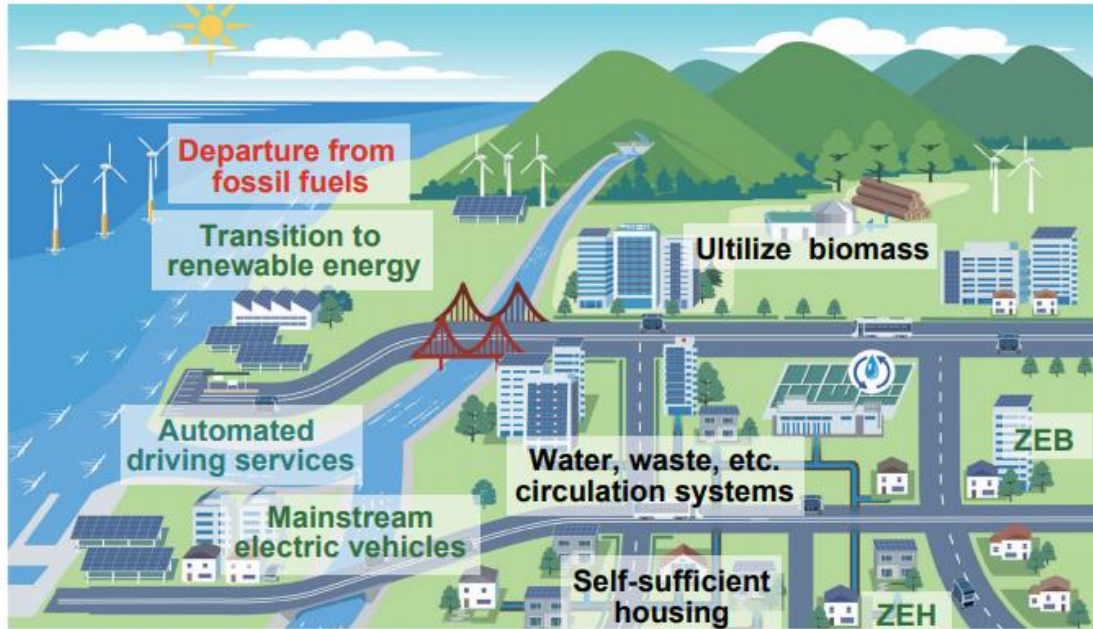
SEKISUI response

- [Production activities] Begin converting to renewable energy (introduction of megasolar (USA), SMART HEIM Denki)
- [Housing business] Standardize ZEH specs
- [Energy] Begin storage battery business
- [IT] Material development to promote improvement of ICT (heat dissipating materials, materials for LED and OLED)

四、氣候變遷財務揭露建議(TCFD)之情境案例

Scenario (B)

Sustainable circulation society scenario (2°C x dispersed scenario)"



Opportunities

- Localized power generation
- >Increased demand for power generation, storage and related technologies
- Expanded circulation of resources such as electric power, water, carbon, etc.
- >Increased demand for circulation infrastructure
- Increased demand for housing with ZEH specs

Risks

- Decreased car sales due to transition to mobility services
- >Decreased sales of housing and mobility related products
- Transition to renewable energy
- >Increase in energy procurement costs
- Decreased reputation among customers and investors due to failure to decarbonize

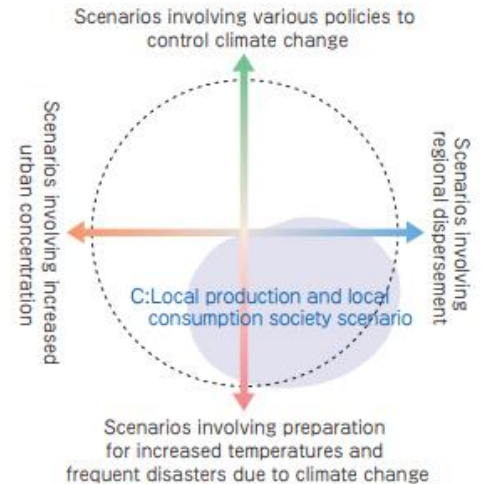
SEKISUI response

- [Production activities] Begin converting to renewable energy (introduction of megasolar (USA), SMART HEIM Denki)
- [Housing business] Standardize ZEH specs
- [Energy] Promote the spread of energy self-sufficient housing (PV, storage batteries)
- Also contribute to local energy production and consumption through TEMS
- [Vehicles] Provide high performance materials with new functions, that support the functionalization of vehicles and aircrafts.
- (S-LEC wedge-shaped HUD interlayers, KYDEX sheets, CFTRP)
- Establish technologies for CCU systems (BR)

四、氣候變遷財務揭露建議(TCFD)之情境案例

Scenario (C)

Local production and local consumption society scenario (4°C x dispersed scenario)"



Opportunities

- Promoting resilient infrastructure and autonomous driving infrastructures
 -> Increased sales of highly durable infrastructure materials and construction services
- Creation of market of new energy grids
 -> Needs for control systems and energy infrastructure technologies

Risks

- Increased raw material and energy costs due to disaster-resilient supply chain, logistics, and energy security measures
- Increased factory relocation costs in locations vulnerable to natural disasters
- Increased human cost due to increase in diseases caused by global warming
- Extensive damages due to fragmentation of infrastructure in the area

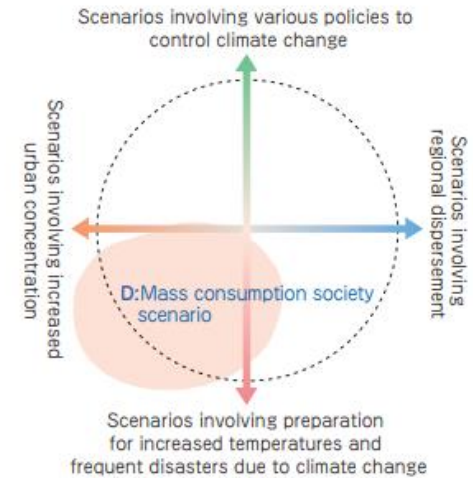
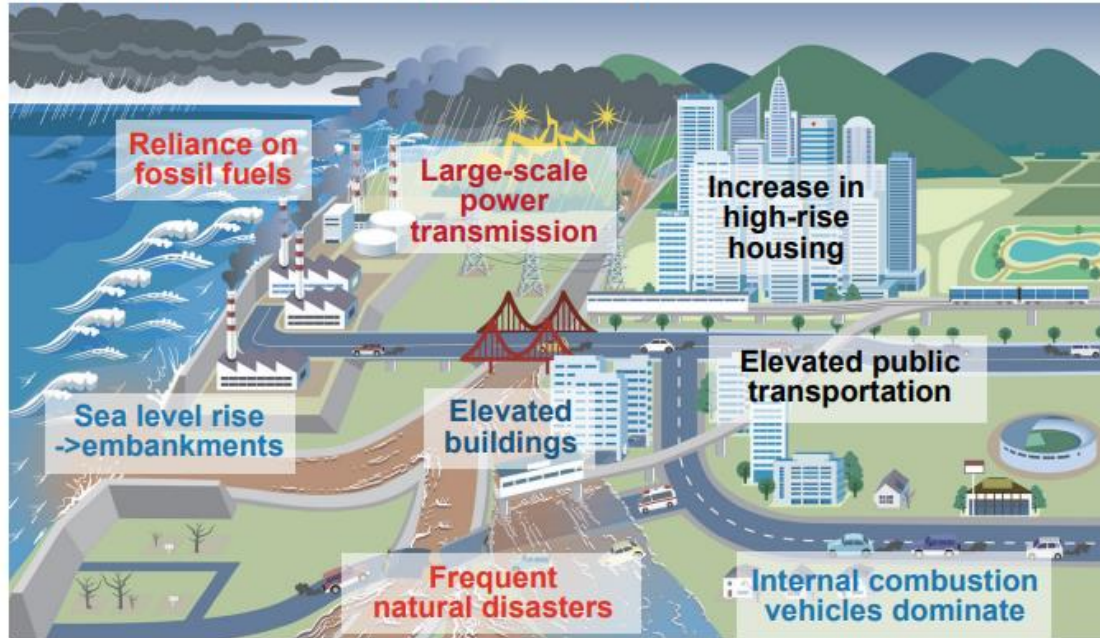
SEKISUI response

- At the level of managers of operating companies and business establishments, grasp risks in each area and organization, formulate BCP, and study risk reduction measures.
- [Water infrastructure] Expand businesses that contribute to more resilient water infrastructure (Renewal: SPR method, New construction: Collaboration with Vietnamese companies)
- [Transportation infrastructure] Improve durability of transportation infrastructure ("Utsuku Sheet", "InfraGuard")
- Strengthen contract manufacturing system for pharmaceutical products
- Explore HEMS and other TEMS technology for building smart grids (SMART HEIM Denki)
- Develop urban planning businesses (expand services)

四、氣候變遷財務揭露建議(TCFD)之情境案例

Scenario (D)

Mass consumption society scenario (4°C x centralized scenario)



Opportunities

- Promoting resilient infrastructure and autonomous driving infrastructures
- >Increased sales of highly durable infrastructure materials and construction services
- Increased needs for energy-related products for large-scale power generation
- >Increased sales of products related to stabilizing systems and improving efficiency of power generation

Risks

- Increased raw material and energy costs due to disaster-resilient supply chain, logistics, and energy security measures
- Increased factory relocation costs in locations vulnerable to natural disasters
- Increased human cost due to increase in diseases caused by global warming
- [Housing] Decreased demand for low-rise housing
- >Decreased sales of housing related products

SEKISUI response

- At the level of managers of operating companies and business establishments, grasp risks in each area and organization, formulate BCP, and study risk reduction measures.
- [Water infrastructure] Expand businesses that contribute to more resilient water infrastructure (Renewal:SPR method, New construction:Collaboration with Vietnamese companies)
- [Transportation infrastructure] Improve durability of transportation infrastructure ("Utsuku Sheet", "InfraGuard")
- Strengthen contract manufacturing system for pharmaceutical products
- Contribute to more stable power transmission by burying grids underground ("CC-Box")

有任何問題歡迎一起討論與學習

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Thanks
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