Climate and Nature Risk Frameworks: TCFD and TNFD for Risk Assessment

Module 4: Green Finance Risk Management, Lesson 2

GREEN FINANCE Consortium

Erasmus+ CBHE Project 101237817

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Lesson 4.2

Climate and Nature Risk Frameworks

TCFD and TNFD for Risk Assessment

Module 4: Green Finance Risk Management

GREEN FINANCE micro-credential

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Outline

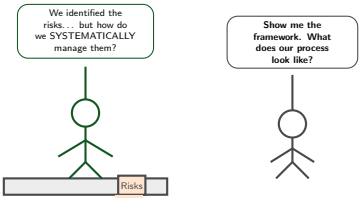
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Why Frameworks? A Risk Manager's Dilemma

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Situation: A risk manager has identified climate and nature risks (Lesson 4.1). Physical risk, transition risk, liability risk: all mapped. The board asks: "How are we *managing* these risks?"
Complication: The risk manager has a taxonomy but no systematic process. Each business line handles climate risk differently. There is no common language.

- Lesson 4.1 gave you the **risk taxonomy**
- Lesson 4.2 gives you the **global framework** for assessing them
- Without frameworks, risk management is ad hoc



TCFD provides the four-pillar structure. TNFD extends it to nature and biodiversity.

Pedagogical arc: "Now that you can classify risks, learn the global frameworks for assessing them."

Learning Objectives

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Participants are able to:

1. **Explain the TCFD four-pillar framework** and why the Risk Management pillar is the operational core
2. **Apply the TNFD LEAP approach** to identify nature-related financial risks
3. **Integrate climate risk into Enterprise Risk Management** (ERM) processes
4. **Score institutional TCFD Risk Management maturity** using a standardized rubric
5. **Compare ASEAN regulatory approaches** to TCFD implementation (Thailand, Singapore, Vietnam)

Prerequisite

Lesson 4.1 (Climate-Related Financial Risks: Taxonomy, Transmission, and Materiality). Familiarity with physical, transition, and liability risk classification.

Why Standardized Frameworks?

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The Problem: Fragmented Disclosure

- Before 2017, climate risk disclosure was **voluntary and inconsistent**
- Each firm chose its own format, scope, and metrics
- Investors could not compare climate risk across portfolios
- Regulators had no standardized supervisory tool

Investor Needs

- Comparable, decision-useful climate risk information
- Forward-looking assessments, not just historical data
- Coverage across governance, strategy, risk processes, and metrics

The Regulatory Push

- 2015: FSB establishes TCFD under Mark Carney
- 2017: TCFD publishes recommendations
- 2021: G7 commits to mandatory TCFD alignment
- 2023: TCFD disbanded, mission transferred to ISSB
- 2024: ISSB S2 adoption in 20+ jurisdictions

Key Insight

The voluntary-to-mandatory transition proves that market forces alone produce uneven adoption. Disclosure without mandate $\neq$ behavioral change.

Source: TCFD (2017). Financial Stability Board.

TCFD Overview: Origin and Global Adoption

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What is TCFD?

The **Task Force on Climate-related Financial Disclosures** was established by the Financial Stability Board (FSB) in 2015, chaired by Michael Bloomberg and Mark Carney. It published its final recommendations in 2017, creating a **four-pillar structure** adopted by regulators worldwide.

Timeline

- **2015:** FSB establishes TCFD
- **2017:** Final recommendations published
- **2020:** NGFS publishes first climate scenarios
- **2020:** UK FCA mandates TCFD for premium-listed firms
- **2022:** BCBS publishes climate risk principles
- **2023:** ISSB S2 published; TCFD disbanded
- **2024:** ISSB S2 adoption begins globally; BOT mandates TCFD

Global Adoption (2024)

- **4,900+** organizations support TCFD
- **100+** jurisdictions reference TCFD
- **20+** countries adopting mandatory ISSB S2
- ASEAN leaders: Singapore (2022), Thailand (2024)

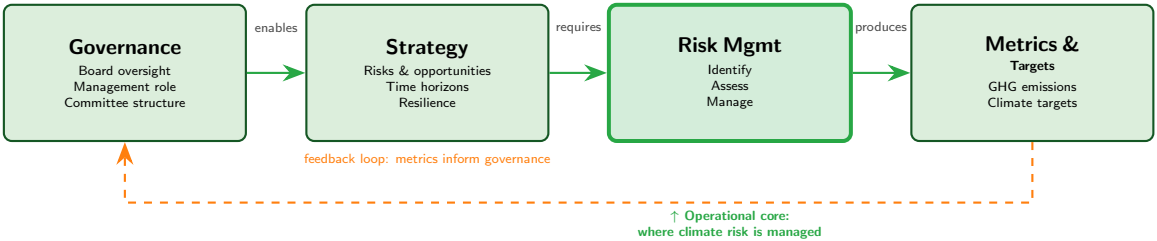
M4/M5 Boundary

TCFD and TNFD serve here as **risk assessment tools** (the Risk Management pillar). Reporting and disclosure aspects belong in **Module 5**.

Source: TCFD (2023). Final Report. Financial Stability Board.

TCFD Four Pillars: The Architecture of Climate Risk

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Each pillar has specific recommended disclosures, but together they form a coherent system: governance enables strategy, strategy requires risk management, and risk management produces the metrics that complete the loop.

Source: TCFD (2017). Recommendations of the Task Force on Climate-related Financial Disclosures.

Pillar 1: Governance

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Board Oversight

- Board-level responsibility for climate risk assigned to a named committee (e.g., Board Risk Committee)
- Regular review frequency: at least quarterly
- Climate risk explicitly included in board agenda and risk appetite statement
- Board competency: at least one member with climate/sustainability expertise

TCFD Recommended Disclosures

- Board oversight of climate-related risks and opportunities
- Management's role in assessing and managing climate risks

Management's Role

- Chief Risk Officer (CRO) has explicit climate risk mandate
- Dedicated sustainability/climate risk team reports to CRO
- Cross-functional coordination: risk, strategy, operations, finance
- Climate risk KPIs linked to management remuneration

ASEAN Example

DBS Bank (Singapore) established a Board Sustainability Committee in 2020, chaired by an independent director with ESG expertise. The committee reviews climate risk quarterly and has veto power over high-carbon sector lending.

Source: TCFD (2017). Governance recommended disclosures a) and b).

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Risks and Opportunities

- Identify climate risks (physical + transition) across **short** (<5y), **medium** (5 to 15y), and **long-term** (>15y) horizons
- Map climate opportunities: resource efficiency, new markets, resilience
- Assess impact on business model, revenue, expenditure, assets, liabilities

Scenario Analysis

- Test strategy under at least two scenarios (e.g., $\leq$2°C and >3°C)
- Link to NGFS scenarios (covered in Lesson 4.3)
- Assess organizational resilience under each scenario

TCFD Recommended Disclosures

a) Risks and opportunities identified over short, medium, and long term
b) Impact on business, strategy, and financial planning
c) Resilience of strategy under different climate scenarios

ASEAN Example

Krungthai Bank (Thailand) disclosed in 2024 that 18% of its corporate loan book is in climate-sensitive sectors (energy, agriculture, transport), with physical risk concentrated in the Central Plains flood zone. The bank modeled portfolio impact under 1.5°C and 3°C NGFS scenarios.

Source: TCFD (2017). Strategy recommended disclosures a), b), and c).

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The Risk Management pillar contains **three sub-recommendations**, each targeting a distinct stage of the risk management cycle.

Sub-Recommendation	Question	Concrete Activities
A: Identify	How does the organization identify climate-related risks?	Map exposures across geographies; conduct scenario screening; maintain climate risk register
B: Assess	How does the organization assess the size and scope of those risks?	Quantify likelihood and impact; prioritize using scoring methodologies; conduct NGFS stress tests
C: Manage	How does the organization manage climate-related risks?	Set risk appetite thresholds; integrate into credit/investment decisions; monitor effectiveness

Why This Pillar Matters Most for Risk Professionals

Governance and Strategy set direction. Metrics and Targets measure outcomes. But the Risk Management pillar is where **operational processes** live: it determines whether climate risk is identified, assessed, and managed in day-to-day decisions.

Source: TCFD (2017). Risk Management recommended disclosures a), b), and c).

Risk Management: Sub-Recommendation A, Identify

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"Describe the organization's processes for identifying and assessing climate-related risks."

Core Activities

- Map physical and transition risk exposures across business lines and geographies
- Conduct scenario analysis to identify risks under different climate pathways
- Engage with sector-specific TCFD guidance (banking, insurance, energy)
- Establish climate risk registers integrated with existing operational risk registers

Best Practice Indicators

- Climate risks entered in the **enterprise risk register** itself
- Systematic screening applied to **all material portfolios**
- Regular update cycle (at least annual)
- Forward-looking: considers emerging risks, not just current exposures

ASEAN Example

MAS (Singapore) requires banks to demonstrate systematic identification of environmental risks, including climate, as part of their ICAAP submissions (2022 guidelines).

Source: TCFD (2017). Risk Management: Recommended Disclosure a).

Risk Management: Sub-Recommendations B & C, Assess and Manage

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B: Assess

"Describe the organization's processes for identifying and assessing climate-related risks."

- Quantify potential size and scope of identified risks
- Evaluate likelihood and impact across time horizons
- Prioritize climate risks relative to other risks using consistent scoring
- Conduct stress testing under multiple NGFS scenarios

Assessment Output

- Climate risk heatmaps by sector and geography
- Scenario-adjusted PD/LGD estimates
- Concentration risk reports for carbon-intensive exposures

C: Manage

"Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management."

- Implement risk mitigation strategies (hedging, diversification, engagement)
- Set risk appetite thresholds for climate exposures
- Integrate climate into credit approval, investment, and underwriting
- Monitor and report on risk management effectiveness

ASEAN Example

Bangkok Bank integrated climate risk into its ERM in 2023. Agricultural loans in flood-prone provinces now include a climate vulnerability score in the standard credit approval checklist.

Source: TCFD (2017). Risk Management: Recommended Disclosures b) and c).

Pillar 4: Metrics and Targets

[FOUNDATION]

Core Metrics

- **GHG Emissions:** Scope 1 (direct), Scope 2 (purchased energy), Scope 3 (value chain, especially financed emissions for banks)
- **Transition risk metrics:** carbon intensity (tCO_2/$M revenue), portfolio WACI
- **Physical risk metrics:** assets in high-risk zones, climate VaR
- **Opportunity metrics:** green revenue share, green bond issuance

Targets

- Emission reduction targets aligned to Paris Agreement
- Net-zero commitments with interim milestones
- Sector-specific decarbonization pathways
- Portfolio alignment targets (e.g., implied temperature rise)

TCFD Recommended Disclosures

a) Metrics used to assess climate risks and opportunities
b) Scope 1, 2, and (if appropriate) 3 GHG emissions
c) Targets and performance against targets

Connection to Lesson 4.4

Detailed carbon metrics (PCAF, WACI, financed emissions) and Climate VaR are covered in Lesson 4.4.

Source: TCFD (2017). Metrics & Targets recommended disclosures a), b), and c).

TCFD Four Pillars: Summary Comparison

[FOUNDATION]

Pillar	Core Question	Key Outputs	Responsible
Governance	Who is responsible for climate risk?	Board mandate, committee structure, management roles	Board, CRO
Strategy	How does climate affect our business?	Scenario analysis, resilience assessment, time-horizon mapping	C-suite, Strategy team
Risk Management	How do we identify, assess, and manage climate risks?	Risk register, stress tests, risk appetite thresholds, credit integration	Risk function
Metrics & Targets	How do we measure and track progress?	GHG emissions, WACI, climate VaR, net-zero targets	Finance, Sustainability

Coherence Principle

The four pillars are not independent disclosures: they are a **system**. Governance without risk management is performative. Risk management without metrics is unverifiable. Metrics without governance lack accountability.

Source: TCFD (2017). Recommendations of the Task Force on Climate-related Financial Disclosures.

TCFD Implementation: From Recommendations to Operations

[INTERMEDIATE]

Phase	Activities	Timeline	Output
1	Gap analysis: map existing risk processes against TCFD recommendations	Months 1 to 3	Gap assessment report
2	Governance setup: establish board oversight, assign CRO responsibilities	Months 3 to 6	Updated risk governance charter
3	Risk identification: conduct initial climate risk screening across portfolios	Months 6 to 12	Climate risk register
4	Scenario analysis: run NGFS scenarios through credit and market risk models	Months 12 to 18	Scenario analysis results
5	Integration: embed climate risk into BAU credit, investment, and reporting processes	Months 18 to 24	Integrated ERM framework

ASEAN Example: DBS Bank

DBS Bank (Singapore) completed TCFD implementation over 24 months (2020 to 2022), moving from initial gap analysis to full integration of climate risk into credit approval processes. The bank now includes carbon intensity thresholds in sector-specific lending policies for power generation, palm oil, and shipping.

Source: TCFD (2021). Implementing the Recommendations of the TCFD.

Sector-Specific Implementation: Banks, Insurers, Asset Managers

[INTERMEDIATE]

Banks

- Credit risk: climate-adjusted PD/LGD models
- Portfolio-level financed emissions (PCAF)
- Sector concentration risk for carbon-intensive industries
- Climate stress testing (supervisor-mandated)

Insurers

- Underwriting risk: physical climate exposure in property/casualty
- Asset-side: transition risk in investment portfolios
- Nat-cat modeling integration with climate scenarios
- Protection gap analysis for climate events

Asset Managers

- Portfolio alignment metrics (implied temperature rise)
- Engagement strategies for high-carbon holdings
- Climate risk integration into security selection
- Product-level climate disclosures (fund level)

Sector Supplements

TCFD published sector-specific supplemental guidance for financial institutions, energy, transport, materials, and agriculture. These translate the four pillars into industry-specific metrics and processes.

Source: TCFD (2021). Implementing the Recommendations, Annex: Supplemental Guidance for the Financial Sector.

Enterprise Risk Management Integration

[FOUNDATION]

Climate risk should be **embedded into existing ERM**, not managed as a separate silo.

Integration Principles

- **Same risk appetite framework:** Climate risk tolerance expressed within the overall risk appetite statement
- **Same risk register:** Climate risks added alongside credit, market, operational, and liquidity risks
- **Same committee structure:** Board Risk Committee and CRO have explicit climate mandates
- **Same escalation processes:** Climate risk breaches trigger standard remediation workflows

Practical Example

A bank embedding climate into ERM adds **"physical flood risk to mortgage portfolio"** as a line item in its credit risk register:

- Scored using the same likelihood-impact matrix
- Reviewed by the same credit risk committee
- Subject to the same risk appetite limits
- The climate element is new; the infrastructure is existing

ASEAN Example

Bangkok Bank added climate-related risk factors to its credit risk assessment for corporate lending in 2023. Agricultural loans in flood-prone provinces now include a climate vulnerability score.

Source: BCBS (2022). Principles for the Effective Management and Supervision of Climate-Related Financial Risks.

From Climate to Nature: The Biodiversity Gap

[FOUNDATION]

Why Nature Matters for Finance

- $44 trillion of global GDP, **more than half**, is moderately or highly dependent on nature (WEF, 2020)
- Climate risk frameworks (TCFD) address only **one dimension** of environmental risk
- Biodiversity loss, ecosystem degradation, and natural resource depletion create distinct financial risks
- Nature risks are **location-specific** (unlike carbon, which is globally fungible)

Nature-Finance Transmission Channels

- **Deforestation:** loss of carbon sinks, regulatory risk (EU Deforestation Regulation)
- **Water stress:** operational costs, credit defaults in agriculture, energy, mining
- **Pollinator loss:** 75% of food crops rely on animal pollination: threatens agricultural lending
- **Soil degradation:** reduced yields, eroded land collateral values
- **Marine decline:** coral bleaching, overfishing threaten fisheries and coastal tourism

ASEAN Relevance

Southeast Asia contains 4 of the world's 36 biodiversity hotspots. Banks with concentrated exposure to palm oil, rubber, and timber face compounding nature-related financial risks.

Source: WEF (2020). Nature Risk Rising. World Economic Forum.

TNFD Overview: Extending TCFD to Nature

[FOUNDATION]

What is TNFD?
The **Taskforce on Nature-related Financial Disclosures** published its v1.0 recommendations in September 2023, extending the TCFD framework to encompass nature-related risks.

Key Features

- Builds on TCFD's four-pillar structure (Governance, Strategy, Risk Management, Metrics & Targets)
- Adds the **LEAP approach**: a nature-specific risk assessment process
- Addresses **dependency risks** (reliance on ecosystem services) and **impact risks** (consequences of harming nature)
- Uses spatial/geospatial analysis (unlike TCFD, which is largely non-spatial)

Nature Risk Categories

- **Dependency risk:** reliance on ecosystem services that may be degraded (e.g., water purification, pollination, flood regulation)
- **Impact risk:** regulatory, reputational, and legal consequences of the firm's own impact on nature (e.g., deforestation, pollution)

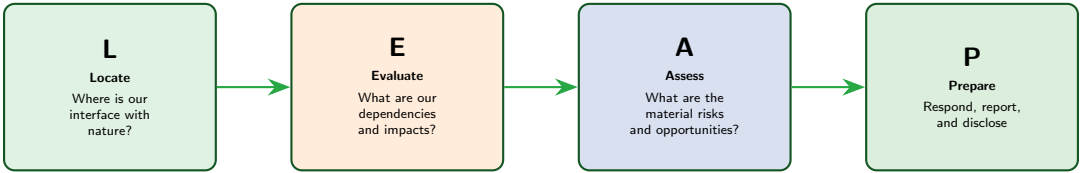
Ecosystem Services at Risk

- Provisioning (food, water, raw materials)
- Regulating (climate, flood, disease control)
- Cultural (recreation, tourism, heritage)
- Supporting (nutrient cycling, soil formation)

Source: TNFD (2023). Recommendations of the Taskforce on Nature-related Financial Disclosures, v1.0.

The TNFD LEAP Approach

[FOUNDATION]



LEAP is an **iterative** process: institutions refine their assessments as data quality and methodological capability improve.

Source: TNFD (2023). The TNFD Nature-related Risk and Opportunity Management and Disclosure Framework, v1.0.

LEAP: Locate and Evaluate

[FOUNDATION]

L, Locate: Interface with Nature
Where are our activities, assets, and value chains located? What ecosystems do they interact with?

- Map business operations against biodiversity-sensitive areas
- Use geospatial tools: **IBAT** (Integrated Biodiversity Assessment Tool), **ENCORE**
- Identify proximity to Key Biodiversity Areas (KBAs), protected areas, deforestation frontiers
- Spatial resolution matters: a forest in Borneo $\neq$ a forest in Scandinavia

E, Evaluate: Dependencies and Impacts
What ecosystem services do we depend on? What impacts do we have on nature?

- **Dependencies:** water purification, pollination, flood regulation, soil fertility
- **Impacts:** deforestation, pollution, habitat fragmentation, water extraction
- Distinguish between **direct operations** and **value chain** dependencies
- Use ENCORE database to map sector: ecosystem service linkages

ASEAN Example

A palm oil lender in Malaysia applying LEAP would: (L) map plantation locations against deforestation frontiers in Borneo; (E) evaluate dependencies on pollination and water regulation.

Source: TNFD (2023). LEAP Approach, Phases L and E.

LEAP: Assess and Prepare

[INTERMEDIATE]

A, Assess: Risks and Opportunities
What are the material nature-related financial risks? How do they interact with climate risk?

- Translate dependencies and impacts into **financial risk** (credit, market, operational, reputational)
- Assess magnitude and likelihood of financial losses
- Apply **double materiality**: both financial materiality (how nature affects the firm) and impact materiality (how the firm affects nature)
- Integrate with existing climate risk assessments from TCFD

P, Prepare: Respond and Report [PhD]
What strategies will the organization adopt? How will it report?

- Develop nature-positive strategies and transition plans
- Set science-based targets for nature (SBTn)
- Prepare TNFD-aligned disclosures
- Engage with portfolio companies on nature risk

ASEAN Example (continued)

The Malaysian palm oil lender: (A) assesses financial risks from EU Deforestation Regulation penalties and reputational damage; (P) prepares transition plans and TNFD-aligned disclosures for affected loan portfolios.

Source: TNFD (2023). LEAP Approach, Phases A and P.

TCFD vs TNFD: Systematic Comparison

[FOUNDATION]

Dimension	TCFD (Climate)	TNFD (Nature)
Established	2015 (FSB); recommendations 2017	2021; recommendations 2023 (v1.0)
Scope	Climate-related financial risks	Nature-related financial risks (biodiversity, ecosystems, natural capital)
Structure	Four pillars: Governance, Strategy, Risk Management, Metrics & Targets	Same four pillars + LEAP approach
Risk assessment	Scenario-based (NGFS pathways)	Spatial/location-based (LEAP + geospatial tools)
Key metric	tCO_2e (globally fungible)	No single metric (MSA, BII, STAR; location-specific)
Data maturity	High (GHG protocols established)	Low (spatial data gaps, metric fragmentation)
Regulatory status	Mandatory in 20+ jurisdictions (via ISSB S2)	Voluntary; early adoption phase
ASEAN adoption	Singapore (2022), Thailand (2024)	Singapore (biodiversity guidance 2024); others emerging

Key Takeaway

TCFD and TNFD are **complementary**, not competing. Climate and nature risks interact: deforestation accelerates climate change, while climate change accelerates biodiversity loss. Integrated assessment is the ultimate goal.

Source: TCFD (2017); TNFD (2023). Comparative analysis by authors.

Nature-Related Risk: Dependency vs Impact

[INTERMEDIATE]

Dependency Risk
Financial risk arising from the organization's **reliance on ecosystem services** that may be degraded or lost.

- Water-dependent industries face cost increases when watersheds degrade
- Agricultural lenders depend on pollination and soil fertility
- Coastal real estate depends on reef and mangrove protection
- Energy sector depends on water for cooling

Ecosystem Services Classification

- **Provisioning:** food, water, timber, raw materials
- **Regulating:** climate regulation, flood control, water purification, pollination
- **Cultural:** recreation, tourism, heritage

Impact Risk
Financial risk arising from **regulatory, reputational, and legal consequences** of the organization's own negative impact on nature.

- EU Deforestation Regulation imposes penalties on deforestation-linked supply chains
- Civil society campaigns against nature-damaging financing
- Litigation risk from biodiversity harm
- Stranded assets from ecosystem collapse

Double Materiality for Nature

Financial materiality: How does nature loss affect the firm?
Impact materiality: How does the firm affect nature?
EU CSRD requires assessment of **both** directions.

Source: Colas, J., et al. (2023). Nature-related financial risks: a conceptual framework. NGFS.

[INTERMEDIATE]

TCFD Scoring Rubric

Score institutional maturity on 4 dimensions (0 to 3 scale):

	0	1	2	3
Identify	Absent	Ad hoc	Systematic	Comprehensive
Assess	None	Qualitative	Some quant.	Full scenarios
Manage	None	Generic	Sector-specific	Embedded
Integrate	Siloed	Separate	Committee	Full ERM

$$\text{Score}_{\text{total}} = \sum_{d=1}^{4} s_d \in [0, 12]$$

Classification: 0 to 3 Absent, 4 to 6 Basic, 7 to 9 Developing, 10 to 12 Advanced

Climate-Adjusted Capital (Conceptual)

$$K_{\text{climate}} = K_{\text{base}} \times \left(1 + \alpha_{\text{climate}} \cdot E_{\text{climate}}\right)$$

where:

- K_{base} = standard Basel capital requirement
- α_{climate} = climate sensitivity factor (regulatory parameter)
- E_{climate} = proportion of portfolio in climate-sensitive sectors

Nature Dependency Metrics

- Mean Species Abundance (MSA)
- Biodiversity Intactness Index (BII)
- STAR (Species Threat Abatement and Restoration)
- No single metric equivalent to tCO_2e

Source: BCBS (2022); TNFD (2023). Scoring rubric adapted from TCFD Risk Management sub-recommendations.

Worked Example: Thai Bank TCFD Scoring

[INTERMEDIATE]

Apply the TCFD Risk Management scoring rubric to a hypothetical Thai commercial bank.

Dimension	Score	Evidence
Identification	2/3	Systematic screening with climate risk register; covers corporate and retail lending; annual update cycle
Assessment	1/3	Qualitative assessment only; limited NGFS scenario analysis; no quantitative stress testing yet
Management	2/3	Sector-specific lending policies for power, agriculture; some credit integration; no portfolio steering
Integration	1/3	Climate risk reported separately from main ERM; not yet in risk appetite statement

$$\text{Score}_{\text{total}} = 2 + 1 + 2 + 1 = 6/12 \quad \Rightarrow \quad \textbf{Basic}$$

Priority Actions

1. Implement NGFS scenario analysis (moves Assessment from 1 to 2 to 3)
2. Include climate risk in the board risk appetite statement (moves Integration from 1 to 2 to 3)

Source: Hypothetical example for pedagogical purposes. Based on BOT (2023) TCFD Guidelines.

Basel III/IV and Climate Risk Integration

[INTERMEDIATE]

The BCBS published **Principles for the Effective Management and Supervision of Climate-Related Financial Risks** (2022): principles 1 to 12 address how banks should manage those risks, 13 to 18 how prudential supervisors should review them. That document does not itself map climate risk onto the three Basel pillars; the mapping below is Module 4's own.

Basel Pillar	Climate Integration	Examples
Pillar 1: Minimum Capital	Climate-adjusted risk weights; scenario-based capital add-ons	IRB models incorporate climate-adjusted PD/LGD; concentration charges for fossil fuel exposure
Pillar 2: Supervisory Review (ICAAP)	Climate stress testing; governance assessment	Supervisor-mandated NGFS scenario analysis; Pillar 2 surcharges for inadequate climate risk management
Pillar 3: Market Discipline	Standardized climate disclosures aligned with TCFD/ISSB S2	GHG emissions, climate VaR, transition plan targets; qualitative governance disclosures

Connection to Lesson 4.5

Detailed climate stress testing methodology (top-down and bottom-up approaches, ECB/BOE exercises) is covered in Lesson 4.5.

Source: BCBS (2022). Principles for the Effective Management and Supervision of Climate-Related Financial Risks.

Case Study: Bank of Thailand, From 2011 Floods to TCFD Mandate

[FOUNDATION]

The 2011 Floods as Catalyst
Thailand's 2011 floods caused **$46.5 billion in economic damage**: one of the costliest natural disasters in history.

- 800+ factories in 7 industrial estates inundated
- Global supply chain disruption (hard drives, automotive, electronics)
- NPL ratio in affected areas: 3.2% $\rightarrow$ 8.7%
- Insurance losses exceeded $15 billion
- GDP contracted 9% in Q4 2011
- BOT implemented emergency liquidity facilities

This disaster demonstrated that climate events are not externalities: they are core financial risks.

BOT's Response: Phased TCFD Mandate

Phase	Requirements
Phase 1 (2024)	D-SIBs: full TCFD four-pillar disclosure; climate stress testing; risk appetite integration
Phase 2 (2025)	All commercial banks: TCFD disclosure (phased); risk identification; initial scenario analysis
Phase 3 (2026+)	Specialized financial institutions: proportionate TCFD requirements

Key Design Choice

BOT chose a **phased approach**: largest banks first, proportionate requirements. This builds institutional capacity progressively and avoids overwhelming smaller institutions.

Source: Bank of Thailand (2023). Sustainable Finance Framework and TCFD Guidelines.

ASEAN Regulatory Comparison: Thailand, Singapore, Vietnam

[FOUNDATION]

Dimension	BOT (Thailand)	MAS (Singapore)	SBV (Vietnam)
Mandate type	Mandatory (phased)	Mandatory (2022)	Voluntary (emerging)
Scope	All banks (phased by size)	All banks, insurers, asset managers	Large state-owned commercial banks
Scenario analysis	Required (NGFS-aligned)	Required (industry stress test 2022)	Not yet required
Nature/TNFD	Under consideration	Biodiversity guidance published 2024	Not yet addressed
Key driver	2011 flood experience	Financial center competitiveness	World Bank technical assistance

Discussion Questions

- Why did Thailand choose a phased approach vs. Singapore's uniform mandate?
- What factors explain Vietnam's slower regulatory pace despite comparable climate exposure?
- If the 2011 floods occurred today, how would TCFD-aligned practices have changed the financial sector's response?

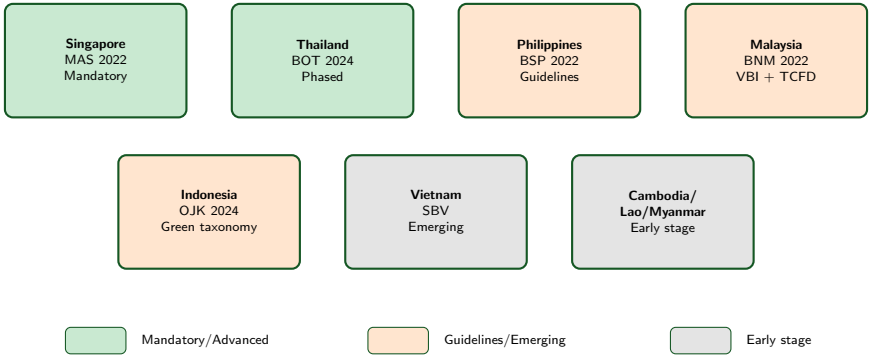
Philippine Context

BSP (Bangko Sentral ng Pilipinas) published Sustainable Finance Framework (2020) and Environmental Risk Management Guidelines (2022), requiring TCFD-aligned climate risk assessment for universal and commercial banks.

Source: BOT (2023); MAS (2022); BSP (2022). Comparative analysis by authors.

ASEAN TCFD Adoption Landscape

[INTERMEDIATE]



Key observation: ASEAN TCFD adoption correlates with financial center development and climate disaster experience, not solely with climate vulnerability. Vietnam and Myanmar face severe physical climate risks but have the least developed frameworks.

Source: NGFS (2022); national central bank publications. Authors' compilation.

TCFD Effectiveness: The Awareness-Action Gap

[PhD]

Krueger, Sautner & Starks (2020)
Review of Financial Studies, 33(3), 1067 to 1111.
Survey of 439 institutional investors globally:

- **43%** engaged portfolio firms on climate via discussions with management
- Climate risks rank **fifth of six** investment risks, yet are still seen as financially material; **25%** hedge against climate risk
- The awareness-action gap is largest for **physical risks** (hardest to quantify)
- Investors with **longer time horizons** (pension funds, SWFs) more likely to act
- Regulatory pressure is the **strongest motivator**

Implications for TCFD

- Disclosure alone may be **insufficient** to change behavior
- Mandatory disclosure + supervisory expectations + capital requirements needed
- Directly influenced the TCFD → ISSB S2 transition

Research Question

Has the awareness-action gap narrowed since mandatory TCFD-aligned disclosure in the UK (2022), Japan (2023), and Australia (2024)? What is the gap for ASEAN institutional investors specifically?

Source: Krueger, P., Sautner, Z., & Starks, L.T. (2020). The Importance of Climate Risks for Institutional Investors. RFS.

TNFD Data Challenges

[PhD]

Three Core Challenges

1. **Spatial Resolution**
   - Nature risks are highly location-specific
   - Unlike carbon (globally fungible), biodiversity value varies by site
   - High-resolution geospatial data often unavailable for ASEAN supply chains
2. **Biodiversity Metrics**
   - No single metric comparable to tCO_2e
   - Competing: MSA, BII, STAR, species richness
   - Each has different strengths and limitations
3. **Dependency Mapping**
   - Quantifying financial dependence on ecosystem services requires understanding complex ecological-economic linkages
   - ENCORE/IBAT provide qualitative but not quantitative precision

Emerging Solutions

- **Satellite monitoring:** Global Forest Watch, Planet Labs: near-real-time deforestation alerts
- **eDNA sampling:** rapid biodiversity assessment from environmental DNA
- **TNFD Data Catalogue:** aims to standardize available datasets

Research Question

What minimum spatial resolution and temporal frequency of biodiversity data would be sufficient for ASEAN financial institutions to conduct meaningful nature-related risk assessments? What are the costs of achieving this data quality?

Comparison with TCFD Data

TCFD benefited from 20+ years of GHG Protocol development. TNFD starts from a much lower data baseline: comparable to TCFD circa 2005.

Source: Colas et al. (2023). Nature-related financial risks: a conceptual framework. NGFS.

Summary and Key Takeaways

[FOUNDATION]

What You Learned

1. **TCFD** provides a four-pillar structure (Governance, Strategy, Risk Management, Metrics & Targets) adopted by regulators worldwide
2. The **Risk Management pillar** is the operational core: Identify, Assess, Manage
3. Climate risk must be **integrated into ERM**: same appetite, register, committee, escalation
4. **TNFD** extends TCFD to nature using the LEAP approach (Locate, Evaluate, Assess, Prepare)
5. ASEAN adoption varies: Singapore and Thailand lead; Vietnam emerging

Connection to Other Lessons

- ← **L4.1:** Risk taxonomy (physical, transition, liability) that TCFD/TNFD frameworks organize
- → **L4.3:** Scenario analysis, the TCFD Strategy pillar requirement implemented with NGFS pathways
- → **L4.4:** Carbon metrics, the TCFD Metrics & Targets pillar (PCAF, WACI, Climate VaR)
- → **L4.5:** Climate stress testing, the Basel Pillar 2 integration with TCFD
- → **M5:** TCFD/TNFD as reporting frameworks (disclosure and communication)

One Sentence

TCFD and TNFD provide the global architecture for assessing climate and nature risks; the challenge is turning frameworks into operational risk management.

Next: Lesson 4.3, Scenario Analysis and Climate Modeling: NGFS Pathways to IAMs.

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Use of generative AI

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- idea generation and brainstorming on module structure and worked examples;
- language editing of author-specified content;
- literature classification and organisation of the reading list;
- coding assistance for the chart, data-processing, and document-build scripts;
- interactive literature searching using AI-enhanced search tools.

The authors specified and reviewed the content of this module. Every cited source was checked against the original publication, and every figure states its provenance on its own face, distinguishing sourced values from derived values and from illustrative teaching assumptions. The authors remain fully responsible for the originality, accuracy, integrity, references, and conclusions of the material.

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