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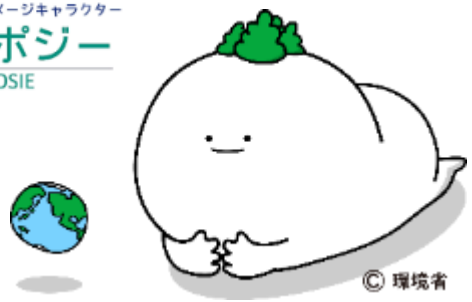

環境省
Ministry of the Environment

Document 3

Value Chain Map of Nature-related Risks and Opportunities by Priority Sectors

Each term is abbreviated in this document.
NP: Nature Positive
NPE: Nature Positive Economy
VC: Value Chain

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VC Map for Food, Agriculture, Forestry and Fisheries–Related Sectors

Food, Agriculture, Forestry and Fisheries-Related Sectors: VC Map of Nature-Related Risks [Summary Version]

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	Upstream	Direct operation	Downstream
Key risks (examples)	■ <u>The yield (≒ sales) of agricultural, forestry and fishery products reduces as ecosystem services (food, raw materials, and genetic resource supply) decline</u> due to the degradation or loss of nature.	■ Competition in raw material procurement intensifies due to decreased upstream raw material supply and increased demand for environmentally friendly raw materials, <u>leading to increased procurement costs.</u>	■ Failing to care for nature damages brand reputation with consumers, shrinking demand for products/services (≈ sales). ■ Strong local opposition led to a suspension of operations, resulting in lower sales.
	■ Nature degradation and loss increase the frequency and severity of localized natural disasters, driving up repair costs for production/manufacturing equipment and infrastructure. <u>Property and casualty insurance premiums charged by insurers also rise.</u> ■ Stricter nature-related policies and regulations increase the cost to comply with legal and tax regulations. ■ Growing demand for the adoption of environmentally friendly technologies, <u>adopting new technologies increases operational costs.</u> ■ Failing to care for nature-related issues erodes reputation with financial institutions and investors, making it harder to access capital.		
	–	■ Insufficient consideration for nature damages brand reputation, increasing the cost of measures to restore its reputation.	

Food, Agriculture, Forestry and Fisheries-related sectors: VC Map of Nature-related Opportunities [Summary Version]

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Key risk: Reduced supply (≈ sales) of agricultural, forestry and fisheries products due to changes in ecosystem services at raw-material production areas

Key risks: Higher procurement costs from raw-material supply shifts, tighter regulations, and reputational decline among financial institutions and investors

Key risk: Reduced product/service demand (≈ sales) due to reputational decline among consumers

	Upstream	Direct operation	Downstream
Key opportunities (examples)	■ Conversion to sustainable production systems and investment in biodiversity conservation and restoration activities improve ecosystem services (supply of food, raw materials, genetic resources, water flow regulation, and water supply, including water purification) and **increase the yield (≒ sales) of agricultural, forestry and fishery products.**	■ Increased raw material yields due to the shift to sustainable production and manufacturing systems, and the substitution of raw materials with local and unused resources, **slowing competition in raw material procurement and reducing procurement costs.**	■ Participation in local environmental conservation activities enhances consumer reputation and increases demand for products/services (≒ sales). ■ Meet growing demand for eco-friendly offerings by using sustainably sourced raw materials in manufacturing (≒ increase in sales).
	■ Acquisition of new revenue streams by developing and providing digital technologies and services such as smart agriculture, forestry and fisheries, and promoting sustainable production and product manufacturing with nature-based solutions (NbS) (≒ increase in sales). ■ Avoid lost opportunities (e.g., suspension of operations and decreased sales due to inability to procure raw materials) by procuring raw materials and manufacturing products using unused local resources. ■ Investments in conserving and restoring biodiversity-critical areas restore ecosystem services (e.g., water flow regulation/purification and soil fertility/nutrient cycling), **lowering water and soil remediation costs (e.g., bioremediation) and strengthening resilience to water scarcity and water price volatility.**		

Food, Agriculture, Forestry and Fisheries: Nature-Related Risks and Opportunities VC Map [Detailed Version] (1/2: Risks)

[Legend for VC positioning]
Up: Upstream
Ops: Direct operations
Down: Downstream
EoL: End of life

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Key risks (e.g.): Physical

Acute risks

- Nature degradation and loss decrease ecosystem services (mitigation of localized natural disasters), increasing the frequency and severity of localized natural disasters.
  - **There will be an increase in the cost of repairing damaged production and manufacturing equipment and infrastructure. If the impact of the disaster is significant, operations will be suspended and sales will decline [Up, Ops, EoL]**
  - Increase in repair and restoration costs for damaged production/manufacturing sites and infrastructures. If the impacts are significant, operations may be suspended, leading to a decline in sales.
- The frequency and severity of localized natural disasters increase, deteriorating ecosystem services (e.g., food, raw materials, and genetic resource supply).
  - **Decrease in yield (≒ sales) of agricultural, forestry and fishery products [Up]**
  - Reduced upstream raw material supply increases procurement costs and, if procurement becomes difficult, can lead to operational suspensions and lower sales [Ops].

Chronic risks

- Worsening soil/water pollution and rising pests/diseases reduce ecosystem services (e.g., food, raw materials/genetic resources, soil fertility/nutrient cycling, pollination).
  - Increase in costs related to technologies and efforts to restore contaminated soil/water quality [Up, Ops]
  - **Decrease in land assets and the yield (≒ sales) of agricultural, forestry and fishery products [Up]**
  - Increase in procurement costs due to a decline in the supply of raw materials from upstream. If raw material procurement becomes difficult, sales will decrease due to the suspension of operations [Ops]
- Increasing pest pressures and the spread of invasive alien species reduce ecosystem services, such as the mitigation of localized natural hazards and erosion control.
  - **Rise in non-life (property and casualty) insurance premiums increases overall costs [Up, Ops].**

Key risks (e.g.): Transition

Policy

- Stricter policies, laws and regulations are implemented to combat nature degradation and loss.
  - **Increase in costs to comply with jurisdictional policies (e.g., incurring costs for relocating production and procurement areas due to the expansion of protected areas) [Up, Ops, EoL]**
  - **Responding to nature-related disclosure obligations: incurring additional costs [Up, Ops, EoL].**

Market

- Growing environmental consciousness spurs demand for eco-friendly raw materials.
  - Competition for raw material procurement intensifies, increasing procurement costs [Ops]

Technology

- Growing environmental consciousness increases the demand for the introduction of new monitoring and environmentally friendly technologies.
  - Increase in operational costs due to the introduction of new technologies [Up, Ops, EoL]
  - Decline in demand for products/services (≈ sales), if the introduction of new technologies delay [Up, Ops, EoL]

Reputational

- As consumers increasingly prefer environmentally conscious products, the perception that nature is not being given sufficient consideration leads to a decline in evaluations by investors and consumers.
  - **Facing difficulty in fundraising [Up, Ops]**
  - Incurring costs for measures to restore reputation [Ops, Down]
  - **Decline in demand for products/services (≒ sales) [Down]**
  - Decrease in sales due to a strong backlash from the local community, suspending its operation [Down]

Liability

- Stricter policies, laws and regulations are implemented to address nature degradation and loss.
  - **Incurring costs for legal penalties /litigation**
  - **Decline in sales due to penalties and lawsuits leading to suspension of operations [Up, Ops, EoL]**

Food, Agriculture, Forestry and Fisheries: Nature-Related Risks and Opportunities VC Map [Detailed Version] (2/2: Opportunities)

[Legend for VC positioning]
Up: Upstream
Ops: Direct operations
Down: Downstream
EoI: End of life

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Key Opportunities (e.g.): Business performance

Markets

- Emphasize sustainable raw material production based on the concept of Nature-based Solutions (NbS), including the use of low-risk pesticides and unused resources.
  - **Increase in sales** by securing new revenue streams [Up, Ops, EoI]
  - Increase in sales by meeting the growing demand for environmentally friendly products and services [Down]

Capital flow and financing

- Promote finance through sustainable finance (e.g., financing linked to KPIs related to the efficiency of resources deployed in business activities and their impact on nature).
  - **Reduced financing-related costs and increased financing capacity** from improved loan terms [Up, Ops, EoI]

Resource efficiency

- Promote stable procurement of raw materials and manufacturing by utilizing local unused resources (e.g., converting non-standard fruits and vegetables into feed, the effective use of thinning wood).
  - Avoid opportunity loss through stable raw material procurement and product manufacturing/service delivery. [Up, Ops]
  - **Reduction in procurement costs** as competition for raw materials eases. [Ops]

Products and services

- Enhance investment for research and development of digital technologies and services promoting smart agriculture, forestry and fisheries (e.g., precision pesticide application, next-generation integrated pest management, and environmentally responsible aquaculture technologies such as optimized feeding).
- Acquired new revenue streams by developing and providing related technologies/services. (≒ increase in sales) [Up, Ops]

Reputational capital

- Promote environmental conservation initiatives at local level in collaboration with governments, NGOs, and other companies.
  - **Decrease in costs for reputation remediation** due to improved reputation [Up, Ops, EoI]
  - Increase in demand for products and services as consumer affinity for the company/brand grows (≒ increase in sales) [bottom]

Key Opportunities (e.g.): Sustainability performance

Sustainable use of natural resources

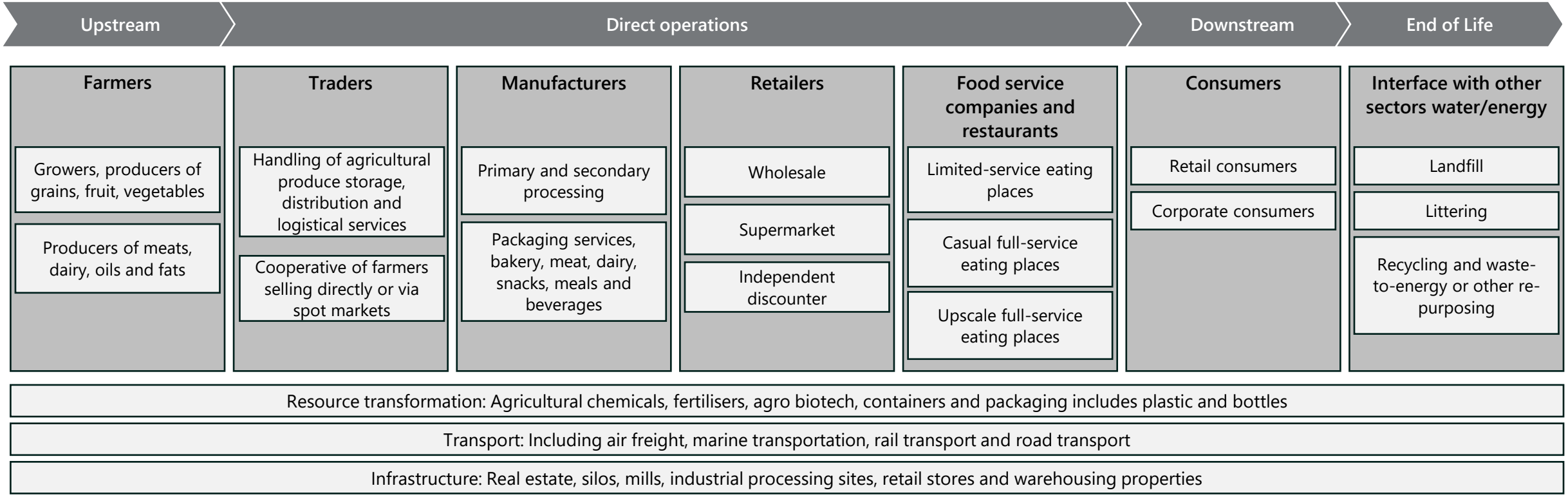
- Promote the production of raw materials through sustainable production systems (e.g., regenerative agriculture; purpose-based forest zoning; aquaculture that avoids reliance on antimicrobials to reduce environmental impacts).
- Ecosystem services (maintenance of soil fertility and nutrient cycling) increase, enhancing the land productivity.
  - Increase in ecosystem services (provision of food, raw materials, and genetic resources), leading to higher yields of agricultural, forestry, and fishery products (≒ increase in sales) [Up]
  - **Decrease in procurement costs** as competition for raw materials eases [Ops]

Ecosystem protection, restoration and regeneration

- Invest in initiatives aimed at conserving and restoring biodiversity-important areas.
  - Increase in ecosystem services (provision of food, raw materials, and genetic resources; and water supply including flow regulation and purification) leading to higher yields of agricultural, forestry, and fishery products (≒ increase in sales) [Up]
  - Increase in ecosystem services (water supply including water flow regulation and water purification) enhancing the resilience to water scarcity and price volatility [Up, Ops, EoI]
  - Increase in ecosystem services (water supply including water flow regulation and water purification, maintenance of soil fertility and nutrient cycling) resulting in reduction of costs to remediate water quality and soil pollution (e.g., bioremediation) [Up, Ops, EoI]

(Reference) VC Diagram in Food, Agriculture, Forestry and Fisheries-Related Sectors

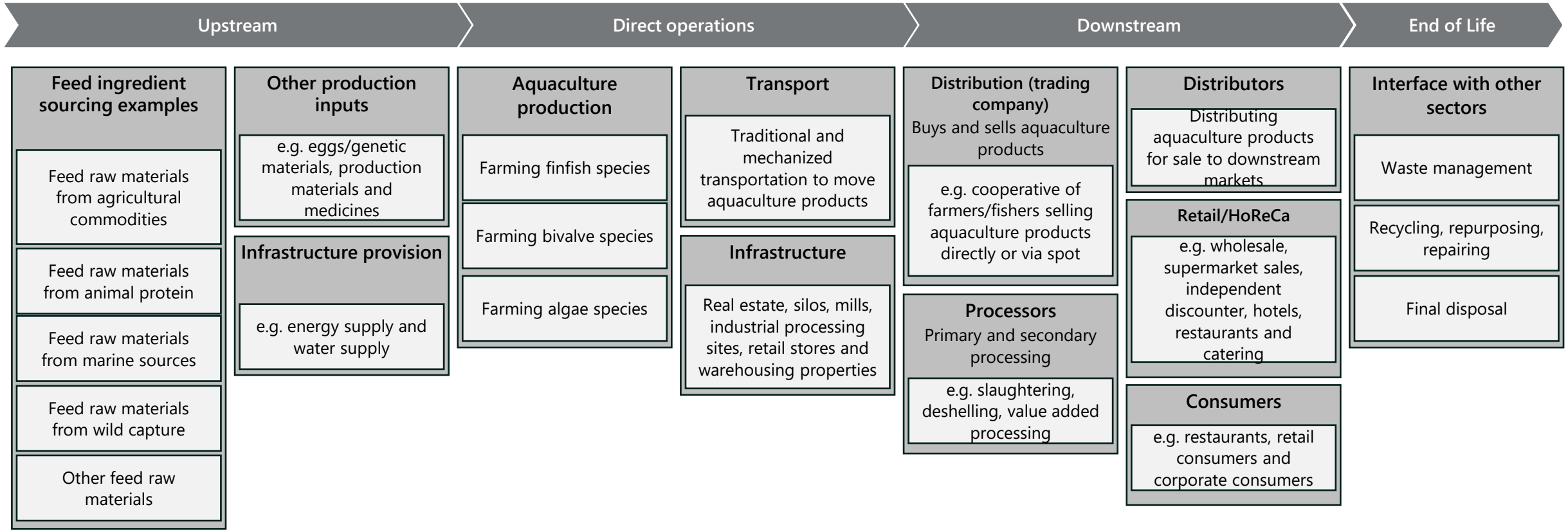
- TNFD's Additional Sector Guidance – Food and Agriculture organizes the food and agriculture sector's VC as follows.
- In assessing food, agriculture, forestry and fisheries-related sectors, major risks and opportunities are structured by VC in line with this framework.



Sources：TNFD「Additional sector guidance - Food and agriculture」

(Reference) VC Diagram in Aquaculture-Related Sectors

- TNFD's Additional Sector Guidance – Aquaculture organizes the aquaculture sector's VC as follows.
- As noted on the previous page, analysis of food and agriculture–related fields follows the VC set out in TNFD's Food and Agriculture guidance. However, readers focused on aquaculture are advised to consult the VC below as appropriate (For example, "distribution" may be positioned under direct operations in some frameworks and under downstream in others).



Sources：TNFD「Additional sector guidance - Aquaculture」

VC Map for Manufacturing-Related Sectors

Manufacturing-Related Sectors: VC Map of Nature-Related Risks [Summary Version]

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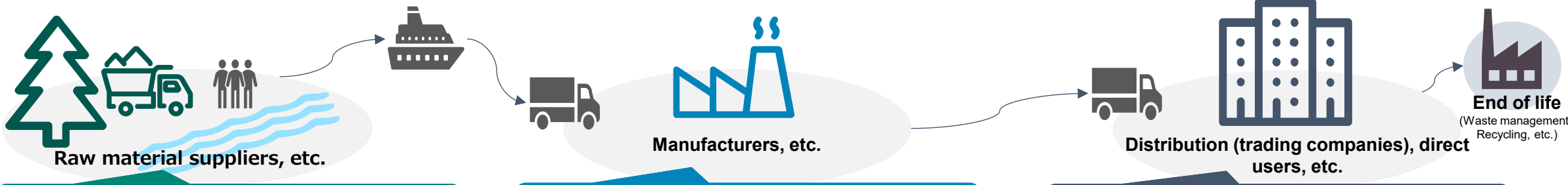

Key risk: Reduced raw material supply (≈ sales) due to changes in ecosystem services around raw material production areas

Key risk: Declined sales due to diminished product competitiveness/ Increased procurement costs due to changes in the supply of raw materials

Key risk: Increased response costs from product use and environmental incidents, and reputational damage among customers, investors, and other stakeholders

	Upstream	Direct operation	downstream
Key risks (examples)	■ The frequency and damage of local disasters increase due to natural degradation or loss, **and the costs of repairing production/manufacturing equipments and infrastructure rise.** In addition, costs increase due to due to premium hikes in non-life (property and casualty) insurance. ■ **Stricter nature-related policies and regulations increase the cost** to comply with legal and tax regulations. ■ Damage to pharmaceutical and chemical storage facilities and the leakage of hazardous substances impacts on the surrounding ecosystem, **resulting in rising response costs for restoration. It also incurs costs for responding to legal penalties or lawsuits.** ■ Negative reports about serious environmental accidents and other factors lead to a decline in brand reputation, diminishing demand for products and services (≒ sales) and facing difficulties in raising funds. In addition, costs of measures to restore its reputation increases.		
	■ **The yield (≒ sales) of raw materials reduces** as the frequency and severity of localized natural disasters increases due to the degradation or loss of nature and the ecosystem services (food, raw materials, and genetic resource supply) decline, resulting from the influx of pharmaceuticals and chemical substances into rivers and lakes.	■ Competition in raw material procurement intensifies due to decreased upstream raw material supply and increased demand for environmentally friendly raw materials, **leading to increased procurement costs.** ■ Delays in the introduction of environmentally friendly technologies and manufacturing systems, **leading to diminish product competitiveness and a decline in sales.** ■ Due to excessive pumping of groundwater, etc., water supply and demand across the entire manufacturing process becomes strained, resulting in increased operating costs, changes in production lines, and reduced manufacturing capacity.	■ Routine laundering of synthetic and blended –fiber garments increases microplastics in waterways and oceans, incurring and increasing mitigation and collection costs.

Manufacturing-Related Sectors: VC Map of Nature-Related Opportunities [Summary Version]

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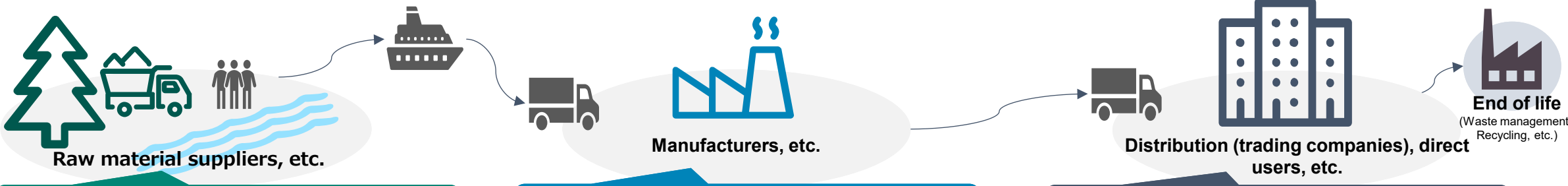

Key risk: Reduced raw material supply (≈ sales) due to changes in ecosystem services around raw material production areas

Key risk: Declined sales due to diminished product competitiveness/ Increased procurement costs due to changes in the supply of raw materials

Key risk: Increased response costs from product use and environmental incidents, and reputational damage among customers, investors, and other stakeholders

	Upstream	Direct operation	downstream
Key opportunities (examples)	■ Improvement in lending terms and conditions through sustainable finance, **lowering financing-related costs and increasing capital raised.** ■ Enhanced reputation through promoting local environmental conservation initiatives, resulting in increased sales, improved attraction and retention of skilled talent, and **reduced recruitment and retention costs.** ■ Investments in efforts to conserve and restore biodiversity-critical areas increase ecosystem services (water supply including water flow regulation and water purification, maintenance of soil fertility and nutrient cycling) and reduce water and soil pollution remediation costs (e.g., bioremediation, etc.). It also improves resilience to water scarcity and price fluctuations.		
	■ Entering new markets **by introducing environmentally friendly raw material production technologies (e.g., environmentally friendly pesticides and precision agriculture) to gain new revenue streams (≒ increase in sales).**	■ By promoting the use of recycled and next-generation materials, and the introduction of environmentally friendly technologies and manufacturing systems, productivity improves and **manufacturing costs are reduced**. In addition, **waste-disposal-related costs are reduced** due to reduced waste. ■ Leveraging biotechnology methods such as synthetic biology and metabolic engineering to enhances competitive advantage increase sales.	■ Respond to the increase in demand for environmentally friendly products and services by promoting the introduction of environmentally friendly technologies and manufacturing systems (≒ increase in sales).

Manufacturing-Related Sectors: Nature-Related Risks and opportunities VC Map [Detailed version] (1/2: Risk)

[Legend for VC positioning]
Up: Upstream
Ops: Direct operations
Down: Downstream
EoI: End of life

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Key risks (e.g.): Physical

Acute risks

- Ecosystem services (mitigation of local disasters) decrease due to natural degradation or loss, increasing the frequency and severity of localized natural disasters.
  - **Increase in costs to repair disaster-damaged production/manufacturing equipment and infrastructure; if the impact is severe, operations may be suspended, resulting in reduced sales [Up, Ops, Down, EoI]**
  - **Increase in costs for restoring surrounding ecosystems** due to hazardous substances leaking from damaged pharmaceutical and chemical storage facilities where adequate measures (e.g., investments to strengthen disaster resilience) are insufficient [Ops]
- Drought reduces ecosystem services (supply of raw materials, genetic resources, and medicinal resources)
  - **Decline in raw material yield (≒ sales) [Up]**
  - Increase in procurement costs due to limited raw material supply from upstream; if raw material procurement faces difficulty, operations may be suspended, resulting in reduced sales [Ops]

Chronic risks

- Pharmaceuticals and chemical substances flow into rivers, lakes, etc., influencing ecosystems through bioaccumulation and other processes, leading to a decrease in ecosystem services (supply of raw materials, genetic resources, medicinal resources, regulation of water flow, and water supply including water purification).
  - **Decrease in raw material yields (≒ sales) [Up]**
  - Increase in procurement costs due to reduction of raw material supply from upstream. If raw material procurement faces difficulty, operation may be suspended, resulting in reduced sales [Ops]
- Excessive pumping of groundwater reduces ecosystem services (water supply including water flow regulation and water purification), tightening the supply and demand of water throughout the manufacturing process.
  - **Increase in operating costs due to changes in production lines, and decrease in manufacturing capacity [Ops]**
- Routine laundering of synthetic and blended–fiber garments increases microplastics in waterways and oceans.
  - **Increase in costs to respond for emission reduction/recovery [Down]**
  - Decrease in sales as confronting a strong backlash from the local community or facing legal restrictions, suspending its operation [Down]

Key risks (e.g.): Transition

Policy

- Stricter regulations are implemented to prevent degradation or loss of nature (such as the leakage of pharmaceuticals and chemical substances into the environment).
  - **Increase in costs for regulatory compliance** (e.g., stricter rules and procedures required in line with the REACH Regulation, Stockholm Convention, etc.) [Up, Ops, Down, EoI]
  - **Increase in costs to respond to nature-related information disclosure obligations [Up, Ops, Down, EoI]**

Market

- Increasing stakeholder pressure to shift to environmentally responsible manufacturing processes (e.g., introduction of synthesis methods with less environmental impact (biocatharsis, etc.) and biodegradable packaging).
  - **Increase in response costs and decline in productivity [Up, Ops, Down]**

Technology

- Failure to transition from traditional manufacturing methods with high environmental impact to safer, more sustainable products manufacturing.
  - Diminish the product competitiveness and decline in sales [Ops]
  - **Loss of potential business opportunities; if the business is removed from the market, operations may be suspended, resulting in reduced sales [Ops]**

Reputational

- Reputational decline due to negative media coverage related to natural resource use or accountability for major environmental incidents.
  - **Difficulty in raising funds [Up, Ops, Down, EoI]**
  - Increase in costs required for measures to restore reputation [Up, Ops, Down, EoI]
  - **Decline in demand for products/services (≒ sales) [Up, Ops, Down, EoI]**
  - Decrease in sales as confronting a strong backlash from the local community, suspending its operation [Down]

Liability

- Adverse impacts on ecosystems arising from business activities or omissions (failure to take necessary actions), and the occurrence of environmental incidents.
  - **Incurring legal penalties/litigation costs. Decrease in sales depending on the details of penalties or lawsuits, potentially leading to the suspension of operations[Up, Ops, Down, EoI]**

Manufacturing-Related Sectors: Nature-Related Risks and Opportunities VC Map [Detailed Version] (2/2: Opportunities)

[Legend for VC positioning]
Up: Upstream
Ops: Direct operations
Down: Downstream
EoI: End of life

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Key Opportunities (e.g.): Business performance

Market

- Introduce environmentally friendly raw material production technologies (e.g., environmentally friendly pesticides and precision agriculture) to enter new markets.
  - **Increase in sales by securing new revenue streams** [Up]

Capital flows and financing

- Raising funds through sustainable finance (e.g., financing linked to KPIs related to the efficiency of resources deployed in business activities and the impact on nature, etc.)
  - **Reduce in financing-related costs and increase in capital raised** with improvement of lending terms and conditions [Up, Ops, Down, EoI]

Resource efficiency

- Promoting the use of recycled materials and the reuse of existing products, the adoption of next-generation materials, and the introduction of environmentally responsible technologies and manufacturing systems.
  - **Reduce in manufacturing costs** as productivity advanced [Ops]
  - **Decrease in waste disposal-related costs** through waste reduction [Ops]
  - **Reduce in environmental impact by avoiding the risk of fines/penalties** [Ops]

Products and services

- Achieve innovation in environmentally conscious product design by leveraging biotechnology approaches (e.g., synthetic biology and metabolic engineering) in the manufacture of pharmaceuticals and chemicals.
  - **Increase in sales** through the manufacture and provision of products with strong competitive advantage [Ops]
  - **Reduction in procurement costs** by manufacturing with affordable raw materials [Ops]
  - Meeting growing demand for sustainable products and services (≒ Increase in sales) [Down]

Reputational capitals

- Promoting environmental conservation initiatives at local level in collaboration with governments, NGOs, and other companies.
  - **Reduces the costs to restore reputation and management** with improved reputation [Up, Ops, Down, EoI]
  - **Increase in sales and capital raised** with enhanced reputation among customers, investors, local communities [Up, Ops, Down, EoI]
  - **Reduce recruitment and retention costs** by improving acquisition and retention rate of skilled talent with strong brand reputation [Up, Ops, Down, EoI]

Key Opportunities (e.): Sustainability performance

Sustainable use of natural resources

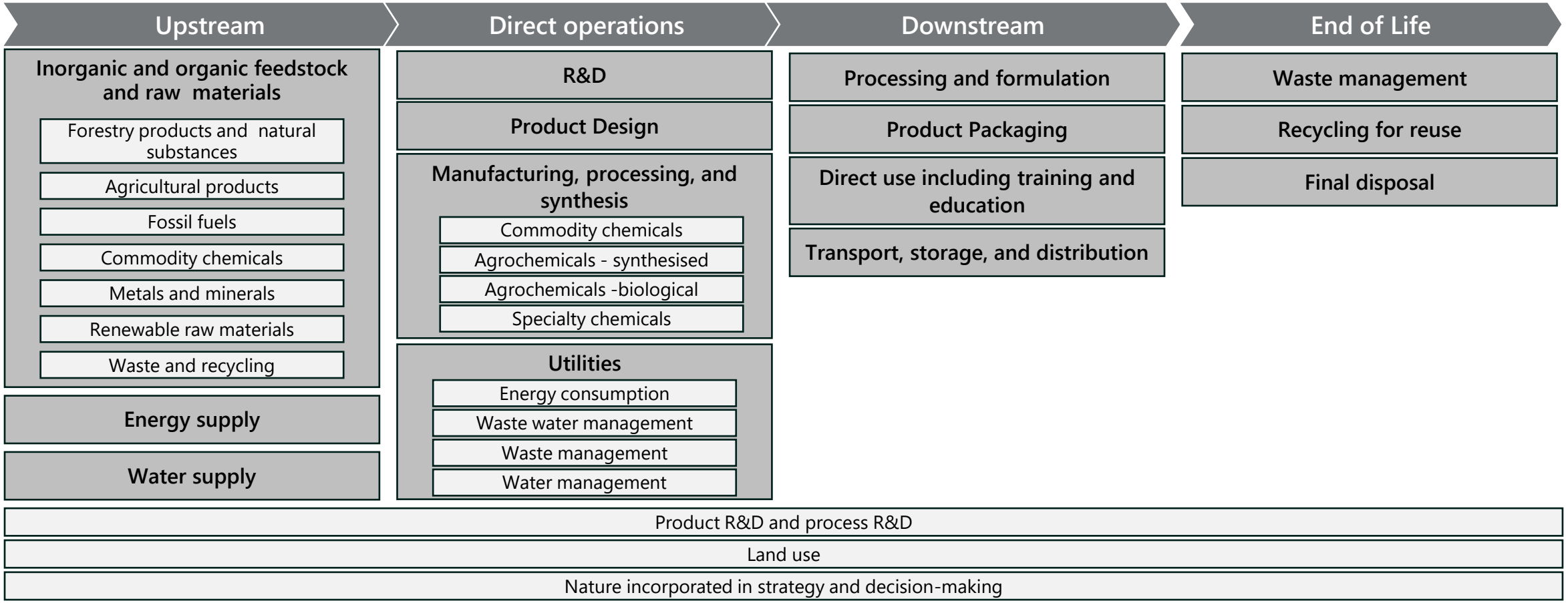
- A certification system ensures that bio-derived raw materials are produced sustainably and clarifies the impact at the raw material procurement stage.
  - **Increase in sales and capital raised** by ensuring credibility and reputation for caring for the natural environment and for having a positive impact [Up]
  - **Decrease in financing-related costs,** alongside an increase in capital raised, as achieving sustainability-related targets improves lending terms through sustainable finance [Up]

Ecosystem protection, restoration and regeneration

- Invest in efforts aiming at the conservation and restoration of biodiversity-critical areas.
  - **Enhance resilience to water scarcity and price fluctuations** through increasing ecosystem services (water supply including water flow regulation and water purification) [Up, Ops, Down, EoI]
  - **Reduce reduce water quality and soil pollution remediation costs** (e.g., bioremediation, etc.) with improved ecosystem services (water supply including water flow regulation and water purification, maintenance of soil fertility and nutrient cycling) [Up, Ops, Down, EoI]
  - **Increase in the yields** (≒ sales) of raw materials as ecosystem services (supply of raw materials, genetic resources, and medicinal resources) increase [Up]

(Reference) VC Diagram in Manufacturing-Related Sectors

- TNFD's Additional Sector Guidance – Chemicals organizes the chemical sector's VC as follows.
- In assessing manufacturing-related sectors, major risks and opportunities are structured by VC in line with this framework.



Sources：TNFD「Additional sector guidance - Chemicals」

VC Map for Construction and Infrastructure-Related Sectors

Construction and Infrastructure-Related Sectors: : VC Map of Nature-Related Risks [Summary Version]

Key risk: Escalated contamination remediation costs in extraction and manufacturing operations, and heightened difficulty and expense in expanding developable land

Key risk: Declined real estate value due to contamination and insufficient green space, and increased costs stemming from urban heat island effects

Key risk: Reduced property values due to building lifecycle maintenance and decommissioning obligations, and revenue losses arising from inadequate pollution management

	Upstream	Direct operation	downstream
	■ The frequency and damage of local disasters increase due to the degradation or loss of nature, and <u>the costs of repairing production/manufacturing equipments and infrastructure rise</u>. In addition, costs increase due to premium hikes in non-life (property and casualty) insurance. ■ Due to occurrence/increase of pests and diseases on the site, the deterioration of ground stability leads to increased costs for pest control and for maintaining a safe and attractive environment, <u>resulting in declines of real estate value for tenants</u> (≒ decrease in sales). ■ Failing to care for nature damages brand reputation with consumers, diminishing demand for products and services and facing difficulties in raising funds.		
Key risks (examples)	■ Stricter regulations on site selection and architectural design, <u>increasing the cost of land development for new business sites and monitoring costs related to impacts on the natural environment.</u> ■ Tightening stakeholder requirements may necessitate additional habitat compensation/offsetting measures, resulting in incremental compliance and mitigation costs.		■ Building maintenance activities (e.g., excessive use of pesticides, frequent mowing) and demolition reduce ecosystem services (providing habitat and growth environments, conservation of natural landscapes, places and opportunities for recreation and tourism, etc.), and <u>reduce cultural and real estate value for local people</u> (≒ decrease in sales) ■ Failure to implement adequate pollution management may lead to the loss of opportunities to secure demolition contracts, thereby reducing revenue.
	■ Due to water and soil pollution occurs in the mining and production processes of minerals and oil, remediation costs increase. ■ Reducing the amount of land available for resource extraction increases the difficulty and cost of expanding existing quarries and applying for new ones.	■ Competition in raw material procurement intensifies due to decreased upstream raw material supply and increased demand for environmentally friendly raw materials, leading to increased procurement costs. ■ Pollution and the lack of green space reduce real estate values as the contract rates and purchase intentions of tenants and prospective buyers weaken.(≒ decrease in sales) ■ Cooling costs increase due to heat island effects in urban areas.	

Construction and Infrastructure-Related Sectors: : VC Map of Nature-Related Risks [Summary Version]

Raw material suppliers, etc.

Key risk: Escalated contamination remediation costs in extraction and manufacturing operations, and heightened difficulty and expense in expanding developable land

Construction and real estate agents, etc.

Key risk: Declined real estate value due to contamination and insufficient green space, and increased costs stemming from urban heat island effects

Tenants, waste management companies, etc.

Key risk: Reduced property values due to building lifecycle maintenance and decommissioning obligations, and revenue losses arising from inadequate pollution management

	Upstream	Direct operation	downstream
Key opportunities (examples)	■ **increase ins sales through** the adoption of environmentally friendly technologies, developing blue and green infrastructure, and advancing nature-positive development and construction, in response to the growing demand for environmentally friendly products and services. ■ Improvement in lending terms and conditions through sustainable finance, **lowering financing-related costs and increasing capital raised.** ■ Enhancing ecosystem services(local disaster mitigation and climate regulation) and monetizing the value provided as services to gain new revenue streams (≒ increase in sales). ■ Developing a transparent biodiversity management plan and promoting circular economy initiatives enhances reputation among customers, investors and the communities, **avoiding additional costs to restore brand reputation.**		
	■ Applying phytoremediation and phytostabilization (and related techniques) may **reduce remediation costs for water and soil contamination.**	■ Implementing on-site greening and green infrastructure **create property values, increasing revenue.** ■ By introducing measures to strengthen the ecosystem network (ecological network) at the design stage, real estate value and reputation among customers, investors, and the community improve, leading to increased sales and capital raised.	■ Implementing micro-irrigation (drip irrigation) in the planting area **reduces irrigation and labor costs.** ■ The development of blue and green infrastructure improve ecosystem services (mitigation of local disasters) and reduce disaster risk, thereby reducing non-life insurance costs.

Construction and Infrastructure-Related Sectors: Nature-Related Risks and Opportunities [Detailed version] (1/2: Risk)

[Legend for VC positioning]
Up: Upstream
Ops: Direct operations
Down: Downstream

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Key risks (e.g.): Physical

Acute risks

- The degradation or loss of nature degrades ecosystem services (such as local disaster risk reduction), increasing the frequency and severity of local disasters.
  - **Increase in the costs of repairing damaged production/manufacturing equipment and infrastructure**; if the impact of the disaster is significant, operations may be suspended, resulting in reduced sales [Up, Ops, Down]
  - Increase in procurement costs due to a decrease in the supply of raw materials from upstream; if raw material procurement faces difficulty, operations may be suspended, resulting in reduced sales [Ops]
- Extraction and production processes for minerals, oil, etc. may lead to the degradation of water quality and soil pollution (e.g., oil spills into upstream water bodies).
  - **Increase in water and soil pollution remediation costs [Up]**

Chronic risks

- Excessive land development reduces ecosystem services (biological control, suppression of soil erosion), and pests and diseases occur or increase on the site, weakening the ground conditions.
  - **Increase in pest control costs and maintenance costs to maintain a safe and sustain environment attractive [Up, Ops, Down]**
  - **Decrease in real estate value for tenants and prospective buyers** (= decrease in sales) [Up, Ops, Down]
- Reducing ecosystem services (water purification, provision of habitat and growth environment) due to land development and other factors.
  - **Decline in real estate values** (≒ decrease in sales) as pollution and a lack of green space occur, reducing numbers of contracts and purchase intentions of tenants and prospective buyers
  - **Increase in direct costs** of response to improve ecosystem services and asset value
- Land development and other factors reduce ecosystem services (air quality and other urban environmental quality adjustments), increasing the risk of heat island effects and rising temperatures in urban areas.
  - **Increase in cooling costs and decrease in sales as operations may be suspended due to rising rate of heat stroke incidents (depending on the severity of the heat island phenomenon) [Ops]**

Key risks (e.g.): transition

Policy

- Stricter regulations (for site selection and architectural design) to prevent the degradation or loss of nature.
  - Increase in costs of land development for new business sites [Up, Ops]
  - **Increase in costs of responding to nature-related information disclosure obligations [Up, Ops, Down]**
- Reducing land availability for resource extraction as more areas are designated as protected areas and conservation areas.
  - **Decline in sales** if resource extraction is limited [Up]
  - Increase in procurement costs due to reduction in the supply of raw materials from upstream; if raw material procurement faces difficulty, **operations may be suspended resulting in reduced sales** [Ops]

Market

- Increasing demand for sustainability-certified resources among consumers.
  - **Increase in costs** for switching to certified products [Up]
  - **Increase in procurement costs** as competition in raw material procurement intensifies [Ops]
- Tightening stakeholder requirements necessitate additional habitat compensation/offsetting measures.
  - Required for additional costs to response the changes

Technology

- As interest in ecosystem conservation grows, attention shifts from the demolition of buildings to restoration and renovation.
  - **Decline in demand** for new construction and demolition-related businesses (≒ decrease in sales) [Ops, Down]
  - **Increase in costs for transition from a traditional business model to a sustainable business model** [Ops, Down]

Reputational

- Failing to manage the spread of invasive alien species, pollution control, etc., influencing the surrounding ecosystem.
  - Increase in costs to acquire new business land [Up, Ops, Down]
  - **Difficulty in acquiring real estate tenants and buyers and raising capital (≒ decrease in sales) [Up, Ops, Down]**
  - Strong local opposition led to a suspension of operations, resulting in lower sales [Up, Ops, Down]

Liability

- Bringing invasive alien species into the country by international maritime transport and contract vessels.
- As soil contamination-related regulations become stricter, soil contamination occurs.
  - **Increase in legal penalties/litigation costs; operations may be suspended depending on the details of the penalty or lawsuit (≒ decrease in sales) [Up, Down]**

Construction and Infrastructure-Related Sectors: Nature-Related Risks and Opportunities VC Map [Detailed Version] (2/2: Opportunities)

[Legend for VC positioning]
Up: Upstream
Ops: Direct operations
Down: Downstream

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Key Opportunities (e.g.): Business performance

Market

- Promote the introduction of environmentally friendly technologies, the development of blue and green infrastructure, and advance nature-positive development and construction.
  - **Increase in sales** by meeting the increasing demand for environmentally friendly products and services [Up, Ops, Down]
  - **Increase in sales** by securing new revenue streams [Up, Ops, Down]

Capital flows and financing

- Raise funds through sustainable finance (e.g., financing linked to KPIs related to the efficiency of resources deployed in business activities and the impacts on nature, etc.)
  - **Reduce financing-related costs and increase capital raised** with improved lending terms and conditions [Up, Ops, Down]

Resource efficiency

- Efficient use of construction materials.
  - **Decrease in construction costs [Ops]**
- Introduce micro-irrigation (drip irrigation) in the planting areas.
  - **Decrease in irrigation and labor costs [Down]**

Products and services

- Enhance ecosystem services (local disaster mitigation, climate regulation) of owned or managed natural resources, monetize the value of their provision.
  - **Increase in sales by securing new revenue streams** [Up, Ops, Down]
- Implement natural climate solutions for climate change adaptation increase ecosystem services (water supply, including water flow regulation and water purification, and local disaster mitigation).
  - **Minimize/avoid the risk of damage to equipment and infrastructure** due to water shortages with improved resilience to local disasters [Up, Ops]

Reputational capital

- Realize highly transparent biodiversity management plans to promote circular economy-related initiatives.
  - **Decrease in costs to restore brand reputation [Up, Ops, Down]**
  - **Increase in sales and capital raised** by improving reputation among customers, investors, and local communities [Up, Ops, Down]

Key Opportunities (e.g.): Sustainability performance

Sustainable use of tural capital

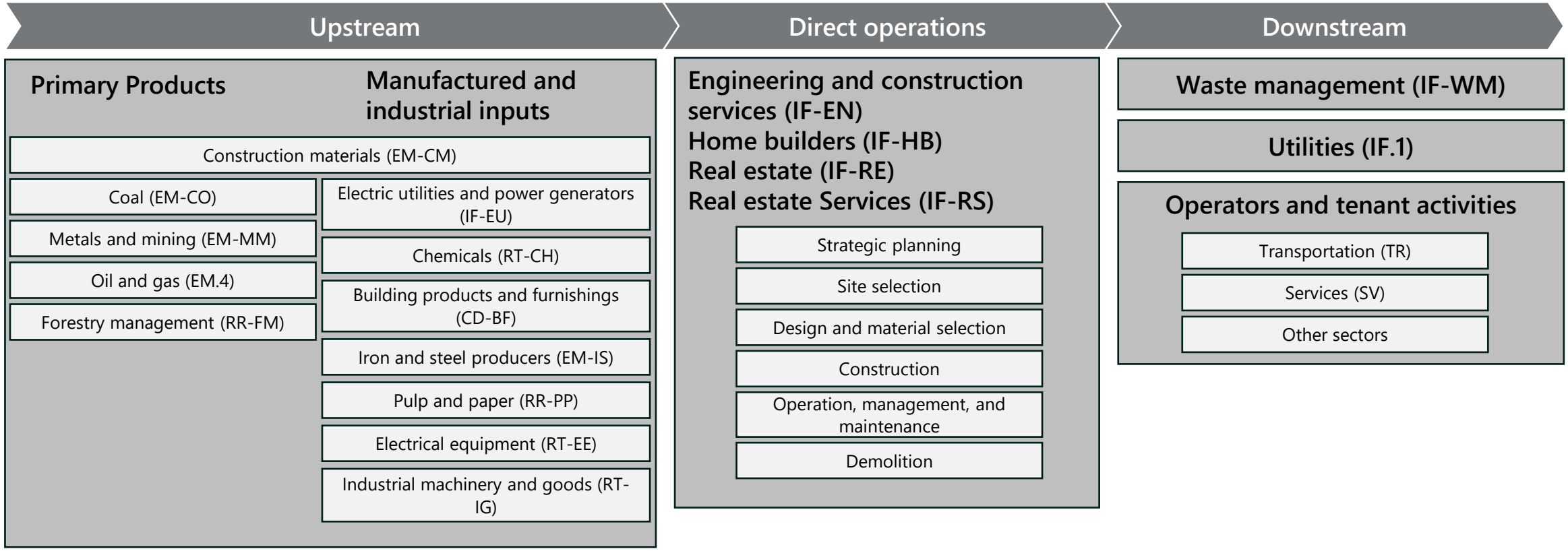
- Avoidance of using raw materials influencing biodiversity during mining and processing (e.g., application of LCA (Life Cycle Assessment)).
- Minimizing the land use footprint of new construction and promoting mixed land use.
  - **Increase in sales and capital raised** with solid trust in caring for the natural environment and in having a positive impact [Ops]
  - **Increase in capital raised** by achieving sustainability-related targets through sustainable financing, and **reduce in financing-related costs** with improved financing conditions [Ops]

Protecting, restoring and regenerating ecosystems.

- Phytoremediation (a technology that uses plants to purify soil) and phytostabilization (a method in which plants reduce the mobility of heavy metals in the soil and suppress their diffusion into the external environment and groundwater) are applied.
  - **Reduce additional costs for improving water quality and soil remediation and improvement in real estate values and the reputation from customers, investors, and local communities, resulting in increased sales [Up]**
- Implementation of measures to strengthen the ecosystem network (ecological network) at the design stage (e.g., wildlife overpasses (eco-bridges), underpasses (eco-ducts, etc.), canopy bridges).
  - **Increase in sales** and capital raised by enhancing ecosystem services (providing habitat, preserving natural landscapes) to secure real estate value and reputation from customers, investors, and local communities [Ops]

(Reference) VC Diagram in the Field of Construction and Infrastructure

- TNFD's Additional Sector Guidance – - Engineering, construction and real estate organizes the construction and infrastructure sector's VC as follows.
- In assessing construction and infrastructure-related sectors, major risks and opportunities are structured by VC in line with this framework.



Sources：TNFD「Additional sector guidance - Engineering, construction and real estate」

Reference: Classification of Nature-Related Risks and Opportunities

(Reference) Nature-Related Risk Categories

Major categories	Middle Category	Subcategories	Overview
Risks	Physical Risks	Acute risk	Occurrence of short term, specific events that change the state of nature. For example, oil spills, forest fires or pests affecting a harvest.
		Chronic risk	Gradual changes to the state of nature. For example, pollution stemming from pesticide use or climate change.
	Transition Risks	Policy	Changes in the policy context due to new (or enforcement of existing) policies to create positive impacts on nature or mitigate negative impacts on nature.
		Market	Changing dynamics in overall markets, including changes in consumer preferences, which arise from changing physical, regulatory, technological and reputational conditions and stakeholder dynamics. For example, the market value of a company is affected by assets that have decreased in value because there is insufficient freshwater for the production process, or the value of the business' production process is reduced by the emergence of new technologies that require less water to operate.
		Technology	Substitution of products or services with a reduced impact on nature and/or reduced dependency on nature. For example, the replacement of plastics with biodegradable containers.
		Reputation	Changes in perception concerning an organization's actual or perceived nature impacts, including at the local, economic and societal level. This can result from direct company impacts, industry impacts and/or impacts of activities upstream and/or downstream in a value chain.
		Liability	Liability risks that arise directly or indirectly from legal claims. As laws, regulations and case law related to an organization's preparedness for nature action evolves, the incident or probability of contingent liabilities arising from an organization may increase.

Data source: TNFD "Recommendations of the Task Force on Nature-related Financial Disclosures"

(Reference) Nature-Related Opportunity Categories

Major categories	Middle Category	Subcategories	Overview
Opportunities	Business performance	Markets	Changing dynamics in overall markets, such as access to new markets or locations, that arise from other opportunity categories as a result of changing conditions, including consumer demand, consumer and investor sentiment and stakeholder dynamics
		Capital Flows and Financing	Access to capital markets, improved financing terms or financial products connected to positive nature impacts or the mitigation of negative impacts.
		Resource Efficiency	Actions an organization can take within its own operations or value chain to avoid or reduce impacts and dependencies on nature (for example, by using fewer natural resources), while achieving co-benefits such as improved operational efficiency or reduced costs (for example, micro-irrigation, which maximizes plant health, reduces water use and reduces costs).
		Products & Services	Value proposition related to the creation or delivery of products and services that protect, manage or restore nature, including technological innovations.
		Reputational Capital	Changes in perception concerning a company's actual or perceived nature impacts, including the consequent impacts on society and engagement of stakeholders.
	Sustainability Performance	Sustainable use of natural resources	Substitution of natural resources by recycled, regenerative, renewable and /or ethically responsibly sourced organic inputs.
		Ecosystem protection, restoration and regeneration	Activities that support the protection, regeneration or restoration of habitats and ecosystems, including areas both within and outside the organization's direct control.

Data source: TNFD "Recommendations of the Task Force on Nature-related Financial Disclosures"