생물다양성 어젠다와 ESG

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서울대 환경대학원

송영근

Self introduction

- Landscape and ecological planning lab. (https://landscape.snu.ac.kr/)
- Professional field
  - Ecological Planning, Ecological Restoration, Urban Ecosystem, Urban Climate, Habitat, Biodiversity, Landscape Ecology
  - Remote sensing / GIS, Environmental DNA, for conservation science and ecological management

생태, 환경문제란?

- 폐기물, 분리배출, 자원순환 …
- 수질, 대기질, 오염처리 …
- 기후변화, 에너지
- 자연환경, 생태(계), 생물다양성

생태, 환경문제의 특징

- "Wicked"

REVIEW

Ecosystem management as a wicked problem

Ruth DeFries[1]* and Harini Nagendra[2]

Ecosystems are self-regulating systems that provide societies with food, water, timber, and other resources. As demands for resources increase, management decisions are replacing self-regulating properties. Counter to previous technical approaches that applied simple formulas to estimate sustainable yields of single species, current research recognizes the inherent complexity of ecosystems and the inability to foresee all consequences of interventions across different spatial, temporal, and administrative scales. Ecosystem management is thus more realistically seen as a "wicked problem" that has no clear-cut solution. Approaches for addressing such problems include multisector decision-making, institutions that enable management to span across administrative boundaries, adaptive management, markets that incorporate natural capital, and collaborative processes to engage diverse stakeholders and address inequalities. Ecosystem management must avoid two traps: falsely assuming a tame solution and inaction from overwhelming complexity. An incremental approach can help to avoid these traps.

People modify and manage ecosystems to provide food, energy, building materials, and other resources, as well as to filter water, control infectious diseases, decompose wastes, and connect with nature. Ecosystem managers who oversee the provision of these resources and services to society range from government administrators, policy-makers, and industry officials to farmers, fishers, and foragers. They collectively manage many types of ecosystems, including forests, grasslands, lakes, rivers, coastal areas, farms, protected areas, and cities. In this Review, we assess how views toward ecosystem management have changed over time and what approaches can guide ecosystem management in the changing ecological and socioeconomic realities of the 21st century.

U.S. Department of Agriculture Forest Service Chief F. Dale Robertson coined the term "ecosystem management" in 1992, describing an ecological approach to "blend the needs of people and envi-

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PHOTO: STOCKTREK IMAGES/NATIONAL GEOGRAPHIC CREATIVE

Table 2. Approaches to address ecosystem management as a wicked problem.

Approach	Problem to address	Examples of implementation	Obstacles
Multisector decision-making	Services from multifunctional landscapes and seascapes are not factored into decisions about single sectors	National-level spatial planning (*34*); multilevel governance (*35*)	"Stovepiped" administrative structures
Decision-making across administrative boundaries	Ecological processes transcend administrative boundaries	River basin commissions (*40*); large-scale corridor planning (*42*, *43*)	Managers lack incentives and authority to consider other jurisdictions
Adaptive management	Learn-by-doing when outcomes of decisions are uncertain because of complex system dynamics	Ecosystem restoration; fisheries management (*48*)	Inflexible bureaucracies; lack of monitoring
Incorporating natural capital and ecosystem services in markets	Externalities are not included in economic accounting systems	Payments for ecosystem services; certification; inclusive wealth accounting (*50*)	Difficulty in determining value of nonmarketed ecosystem services
Balancing ideologies and political realities of diverse stakeholders	Politics and different expectations of ecosystem management lead to logjams in decision-making	Collaborative planning (*67*)	Differences in ideology and values; political realities

계획이란

- 문제 해결
- 전과정

planning

Also found in: **Thesaurus**, **Medical**, **Legal**, **Acronyms**, **Idioms**, **Encyclopedia**, **Wikipedia**.
Related to planning: **planning commission**, **Project planning**, **Strategic planning**

plan (plăn)

n.

1. An orderly or step-by-step conception or proposal for accomplishing an objective: *a plan for improving math instruction.*
2. A proposed or intended course of action: *had no plans for the evening.*
3. A systematic arrangement of elements or important parts; a configuration or outline: *a seating plan; the plan of a story.*
4. A drawing or diagram made to scale showing the structure or arrangement of something.
5. In perspective rendering, one of several imaginary planes perpendicular to the line of vision between the viewer and the object being depicted.
6. A program or policy stipulating a service or benefit: *a pension plan.*

v. **planned**, **plan·ning**, **plans**

v.tr.

1. To formulate a scheme or program for the accomplishment, enactment, or attainment of: *plan a campaign.*
2. To have as a specific aim or purpose; intend: *They plan to buy a house.*
3. To draw or make a graphic representation of.

v.intr.

To make plans.

[French, alteration (influenced by `plan`, *flat surface*) of `plant`, *ground plan, map*, from `planter`, *to plant*, from Latin `plantāre`, from `planta`, *sole of the foot*; see **plat-** in **Indo-European roots**.]

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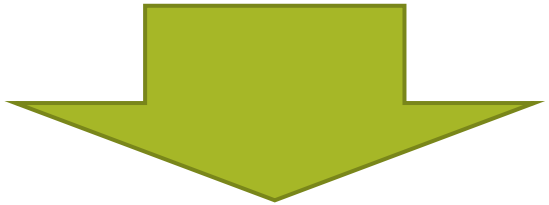
plan′ner *n.*

Synonyms: **plan, blueprint, design, project, scheme, strategy**
These nouns denote a method or program in accordance with which something is to be done or accomplished: *an ambitious plan for achieving energy independence; a blueprint for reorganizing the company; a design for ending the conflict; a project for urban renewal; a grand scheme aimed at ending illiteracy; a strategy for economic recovery.*

- 답이 없는 문제에 대해 / 답이 하나가 아닌 문제에 대해
- 솔루션을 제공하는 사람
- 문제를 풀기위한 전 과정을 제시할 수 있는 사람

생태학이란? (since 1866, 헤켈)

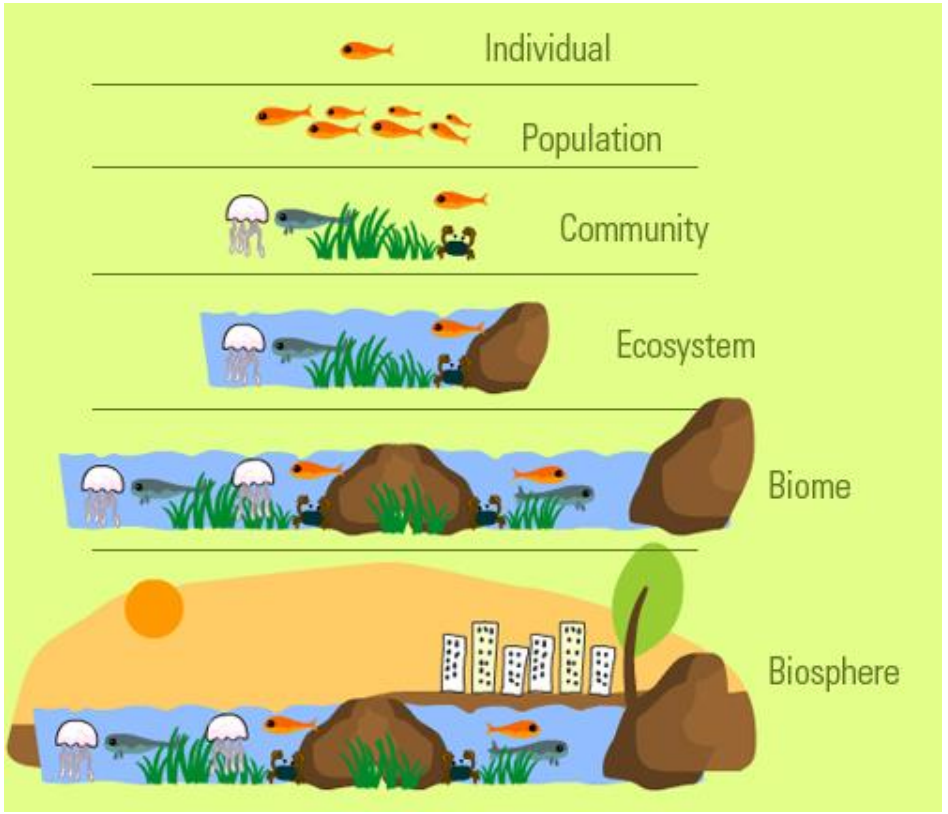
- 대상 : 식물, 동물, …
- 위계 : 개체군, 군집, 생태계, …
- 목적 : 보전, 복원, …



우리에게 중요한 것은 “관계”

생태계란?

- 계층구조
- 계층 간 관계



http://eschooltoday.com/ecosystems/images/Levels-of-Organization-in-an-Ecosystem.jpg

우리에게 중요한 것은 "관계"

생물다양성이란?(Wilson&Peter, 1988)

- = 종다양성 ? NO!
  - 종다양성 뿐만 아니라
  - 종내 유전정보의 다양성, 즉 유전적 다양성 genetic diversity
  - 생물 간 / 생물과 환경 간 관계의 다양성, 즉 생물 군집이나 생태계 다양성
  - 인간의 활동과 자연의 상호작용 결과로써 그 이상의 고차원 시스템의 다양성, 즉 경관(landscape)의 다양성을 포함하는 넓은 개념
  - 유전자 gene / 종 species 혹은 개체군 population / 군집 community 혹은 생태계 ecosystem / 경관 landscape 등 다양한 레벨의
  - 조성적, 구조적, 기능적 계층성을 정리한 개념

우리에게 중요한 것은 "관계"

생태, 환경문제는 공간의 문제

- 국토종합계획, 국가환경종합계획, OO 시 환경보전계획
- IUCN, 보호종, 보호지역
- 국가생물다양성 전략, LBSAP, 야생생물 보호 기본계획
- 습지, 생태하천, 물환경관리
- 환경영향평가
- 탄소중립, 생태복원, etc

자연환경보전 분야

사례

- POST 2020, 30 by 30
- 보호지역 지정 및 확대
- OECMs

KUNMING-MONTREAL GLOBAL BIODIVERSITY FRAMEWORK

2030 Targets

Note from the Secretariat: *Guidance material on each target of the Kunming-Montreal Global Biodiversity Framework is accessible by clicking on the target number below. This material provides an overview of each target by briefly introducing key terms, highlighting some of the implications for national target setting, and providing key points and guiding questions for consideration as part of national target-setting exercises. It also identifies the adopted indicators to monitor progress and resources that could assist with national target setting and implementation. This material should be considered a work in progress, and it will be periodically updated with inputs from Parties and partner organizations in the light of experiences with its use. This information is meant to serve as a resource that Parties and others may wish to consider as they implement the Global Biodiversity Framework. It does not replace or qualify decision 15/4 or 15/5.*

Section H. Global targets for 2030

13. The Kunming-Montreal Global Biodiversity Framework has 23 action-oriented global targets for urgent action over the decade to 2030. The actions set out in each target need to be initiated immediately and completed by 2030. Together, the results will enable achievement towards the outcome-oriented goals for 2050. Actions to reach these targets should be implemented consistently and in harmony with the Convention on Biological Diversity and its Protocols, and other relevant international obligations, taking into account national circumstances, priorities and socioeconomic conditions.

1. Reducing threats to biodiversity

TARGET 1

Ensure that all areas are under participatory, integrated and biodiversity inclusive spatial planning and/or effective management processes addressing land- and sea-use change, to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of indigenous peoples and local communities.

TARGET 2

Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

TARGET 3

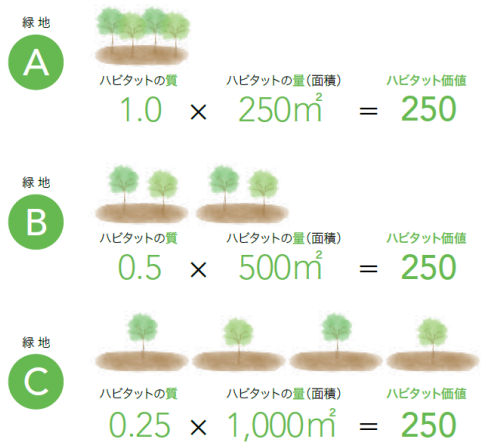
Ensure and enable that by 2030 at least 30 per cent of terrestrial and inland water areas, and of marine and coastal areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories.

사례

- HEP (Habitat Evaluation Procedure)
- IUCN, 야생생물 관련

ハビタット価値＝
ハビタットの質×
ハビタットの量

右図3つの緑地の中で、ハビタットの質が最も高い緑地はAとなります。BはAの1/2、CはAの1/4の質にすぎませんが、量（面積）は逆に、BがAの2倍、CがAの4倍です。このため、ハビタットの価値は3つの緑地で等しくなります。



総ハビタット価値＝
ハビタット価値×（50年平均値）
時間

次に右図の3つのプランのハビタット価値は、いずれも、申請年（0年次）が0点、50年後が250点です。しかし、50年間という時間内での推移は異なり、プラン1は早々に250点に達しているのに対し、プラン2や3のハビタットの回復には時間がかかっています。このため、総ハビタット価値は、プラン1が最も高く、プラン3の3倍となります。

これ以降は事業地間で比較しやすくするために0～100の値となるよう調整した右記の得点を用います。

ハビタット得点＝ハビタット価値÷面積×100
年平均ハビタット得点＝ハビタット得点の50年平均

評価方法 STEP 4

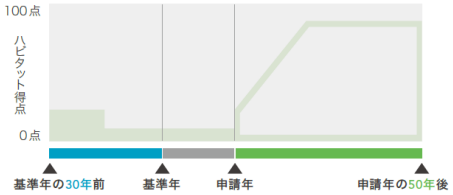
評価値の算出

最終的な評価値、すなわち生物多様性の保全への貢献度は、取り組みにより得られる評価期間分の年平均ハビタット得点から評価基準値(注4)を引き算することで求めます。以下に算出例を説明します。

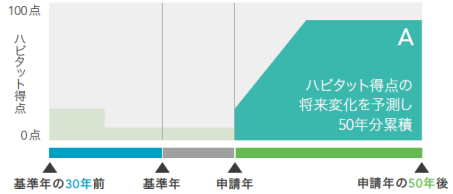
注4）基準年以前30年間の年平均ハビタット得点を求めます。

例　事業所の敷地を自然化する計画

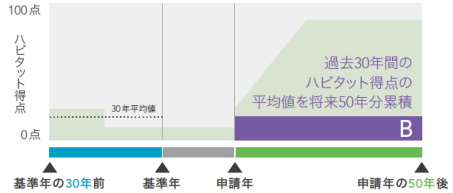
以前の所有者が基準年の15年前に低木の混じる草地を更地にし社屋を建設した敷地です。申請者は、この物件を15年前に購入し、新たに社屋の周りを在来種で緑化する計画を立てています。



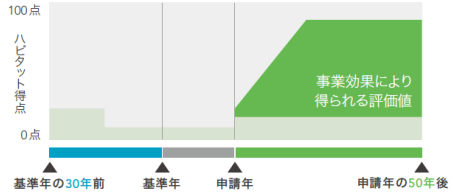
A ÷50＝年平均ハビタット得点



B ÷50＝評価基準値



（A － B）÷50＝ 評価値



즉, 생태, 환경문제는 공간에서 해결

- 열/물/미세먼지/바람 등 복합 기후재해
- 사업효과 사전 분석

"어디에서" "얼마나"

생태계 보전, 왜?

생태계 서비스 (ecosystem service)

- 생태계 서비스의 탄생 배경
- NCP
- 생태복지
- 생태휴식
- …

생태계서비스란 인간이 생태계로부터 얻는 혜택, 생태학의 중요한 주제로 대두
생태계서비스는 생물다양성의 가치를 측정하기 위한 개념도구로 활용

- MA* 제안(2000년 유엔총회, Kofi Annan)
  *MA : Millennium Ecosystem Assessment
- MA 수행
  - 생태계변화가 인류복지에 미치는 영향 평가
  - 인류복지를 위해 생태계를 보존하고 지속 가능한 이용을 증진시키는데 필요한 행동에 대한 과학적 근거 마련
- MA 보고서 완성(2005년)
  - 유엔 주도로 세계 95개국 과학자 1360명의 연구내용에 근거해 작성한 환경보고서
  - 특히, 생태계 서비스에 주목

➡ 생태계가 주는 서비스를 4가지 범주 구분, 24가지 세부서비스 기술
- 15개 서비스가 크게 훼손되고 있음을 경고

생태, 환경에 대한 "계획적" 접근

- 왜 여기에서 (적지, boundary)
- 왜 이것 대신에 (trade off)
- 왜 그 때 (mitigation)
- 왜 이렇게 (기술개발)
- …

Grey vs Green (예시)

- 도시 생물다양성 / 도시 내 생물 서식지의 보전 (개발 대신)

"The battle for life on earth will be won or lost in cities"
Dr. Ahmed Djoglaf (former Executive Secretary CBD)

"Cities are not the problem, they are the solution"
Dr. Jaime Lerner
(Mayor of Curitiba)

Grey vs Green (예시)

- 그린 인프라 vs 그레이 인프라

도시의 입지특성과 특정 생태계 보전에 대한 책임

도시 내 소규모 녹지공간이 가지는 잠재력 (SLOSS)

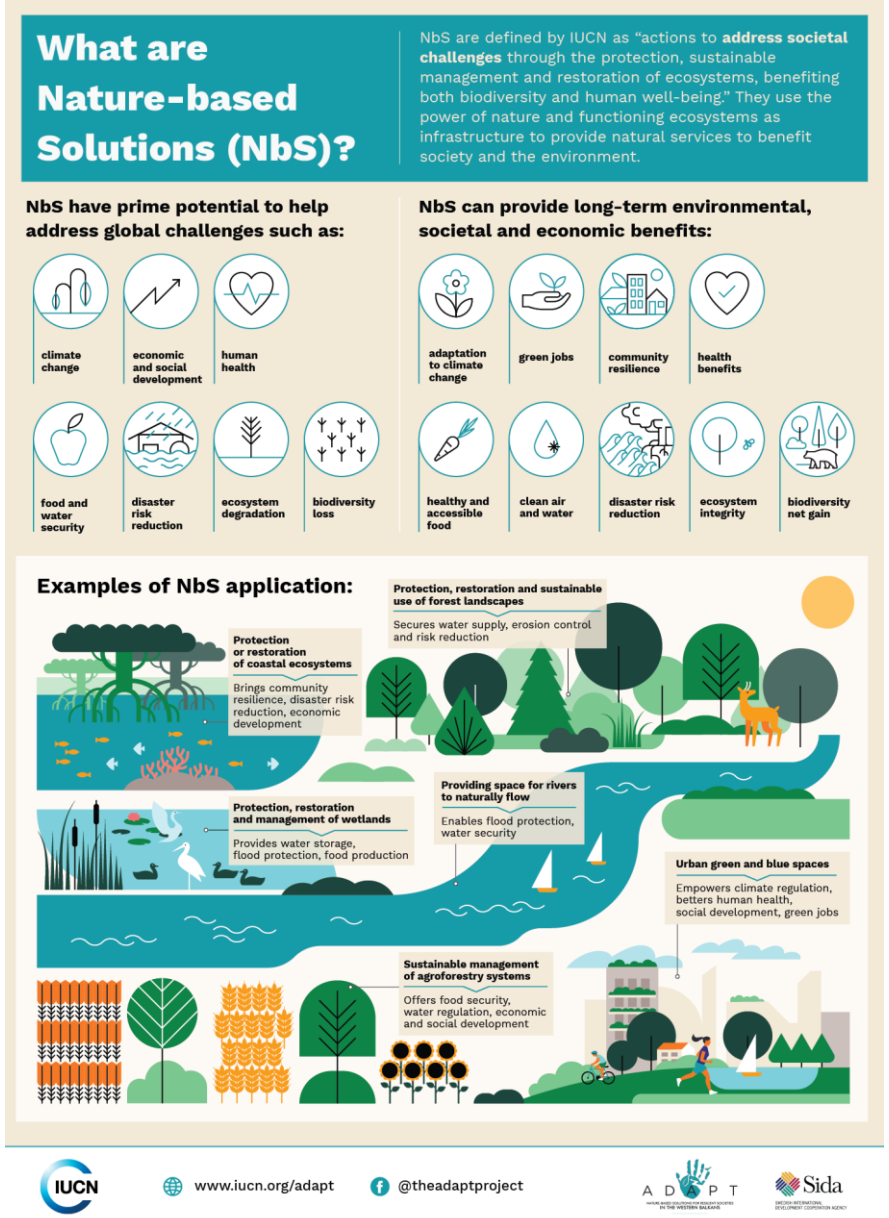
생활밀착형 자연만이 제공해 줄 수 있는 생태계 서비스

생태발자국(ecological footprint), 그린인프라

치수, 토사재해방지, 생물다양성 보전, 수원 보호, 지하수 함양, 수질정화, 이산화탄소 고정, 도시기후 완화, 재생가능에너지, 자원순환, 그린스트릿, 해충억제, 화분매개자 보전, 관광자원, 역사문화, 경관향상, 환경교육, 휴양, 생태복지, 힐링, 지역커뮤니티... 등

앞으로는 도시 내 조성공간의

생태기반 지속가능한 디자인(sustainable design) 필요



Grey vs Green (예시)

- Mitigation / Conservation (banking, 부담금..)
- 개발과 보전의 공존

Green vs Green (예시)

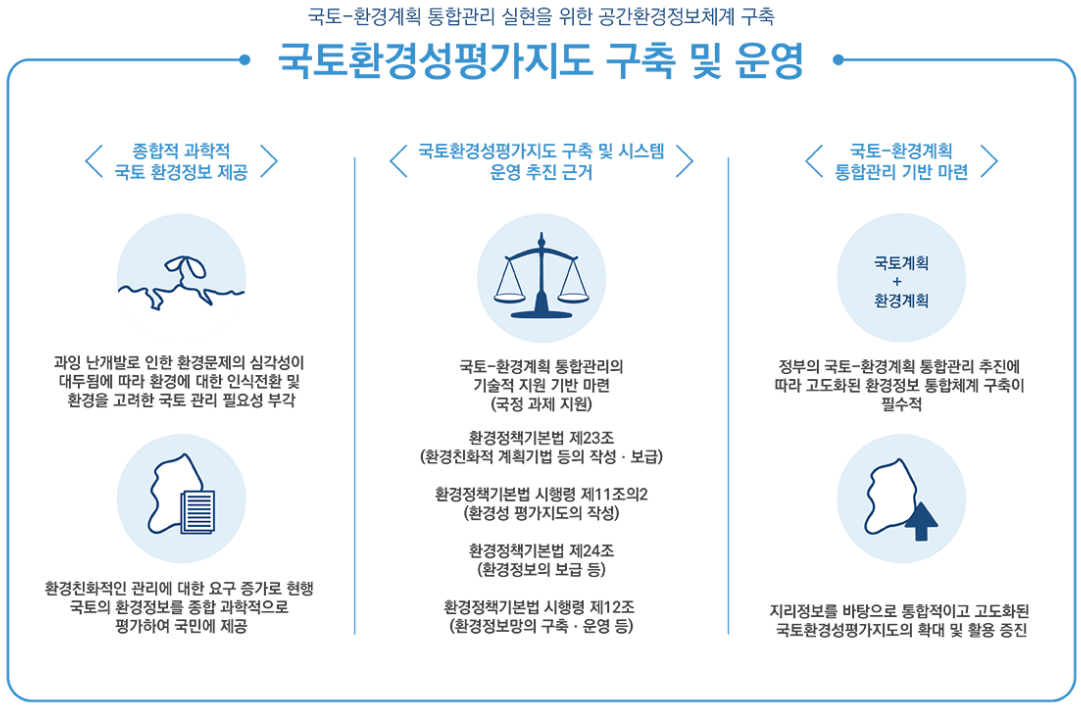
- 탄소중립
- SDGs
- Energy landscape
- …

Trade off & Synergies (예시)

- 흑백논리가 아니라 → 어디에서 어떻게 공존시킬 것인가

의사결정 지원 (예시)

- 도시생태현황지도
- 기타 지도 도구들



[표 2-1] 도시생태현황지도 작성에 대한 최종 성과품 목록

최종목표	성과품 목록		비고
도시생태현황지도	비오톱유형도		최종 비오톱 GIS파일에 포함****
	비오톱평가도		
	기본주제도	토지피복현황도	
		토지이용현황도	
		지형주제도	
		식생도**	
		식물상주제도	식물상GIS파일****
		동물상주제도	야생동물GIS파일****
	기초자료*	토지피복지도	대상지역에 해당하는 부분만 추출한 속성자료
		지형분석도***	
		영상자료	
		지적도	
		임상도	
		생태 · 자연도	
		전국자연환경조사 자료	
		그 외 기타자료	

* : 비오톱평가도 및 기본주제도 작성을 위해 활용된 모든 기초자료를 의미하여, 최종 비오톱 GIS파일 포함 유무에 관계없이 대상지역에 해당하는 속성자료로 구성된 지도(SHP, Raster 등)파일이나 문서(Excel, 한글 등)파일을 제출해야 함

** : 비오톱유형 현장조사에서 수집된 현존식생에 대한 주제도 임

*** : 지형분석도는 수치지형도를 활용하여 해당지역에 대한 표고, 경사, 향을 분석한 결과자료로서 Raster 형식으로 제출함

**** : '성과품 제출 양식'에서 상세 설명함

생태, 자연환경 보전의 목표는

- 온전성 (integrity) → 맛있는 케이크
- 연계성 (connectivity) → 관계, 시공간적 맥락
- 회복탄력성 (resilience) → 교란과 재생, 기후변화

환경 생태 문제 해결을 위한 방향

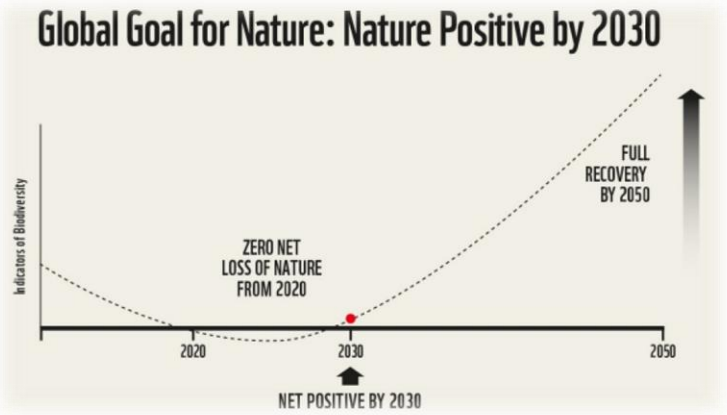
- 효율성과 지속성
- MRV (monitoring, reporting and validation)
- Conservation & Restoration

IT, BT, ET 융합으로 극복!

생물다양성/자연회복 아젠다와 기업활동

ESG의 E 이행방향 관점에서

2020 세계경제포럼, the future of nature and business



GBF의 관점에서

- 생물다양성에서 자연 회복(nature positive)으로 개념/용어 문턱 낮춤
- 2030 mission: To take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery for …
- 1) 공간계획 2) 생태복원 3) 보호지역 등 실제 대상지, 공간 중심으로 즉각 이행 강조

TNFD 관점에서

- 기업활동의 자연관련 '목표(targets)'를 설정하고 해당 목표에 대한 진행률과 성과를 측정하는 것이 요구됨
- 구체적으로는, 어떻게 목표를 설정하는가, 자연관련 의존 – 영향 – 리스크 – 기회 및 성과 관리 시 그 목표는 무엇인가, 이 목표가 기후 목표와 상충되는 점은 없으며 어떤 시너지를 내는가, 이 모든 진행상황을 어떻게 측정할 것인가 등을 설명해야 함

생물다양성/자연회복 아젠다와 기업활동

기업활동과 자연과의 관계

생태계 서비스

Value chain

- 원재료 조달
- 자연자원 이용
- 운송
- 생산, 가공
- 제품 서비스 판매 이용
- 연구개발
- 토지이용 개발
- 소유지 관리
- 자원순환, 폐기물
- 투자, 융자
- 사회공헌

자연(생물다양성, 생태계) 에 대한 의존, 영향 저감

자연(생물다양성, 생태계) 보전, 리스크/기회

- 전 과정이 리스크이자 동시에 선제적 대응 (네이쳐 포지티브 경제로의 이행) 으로 이익 창출

생물다양성/자연회복 아젠다와 기업활동

자연관련 리스크의 예시

- 의존 / 영향
- 정책 규제
- 기업 이미지, 사회적 평판
- 시장, 제품
- 재무
- 구성원, 협력업체

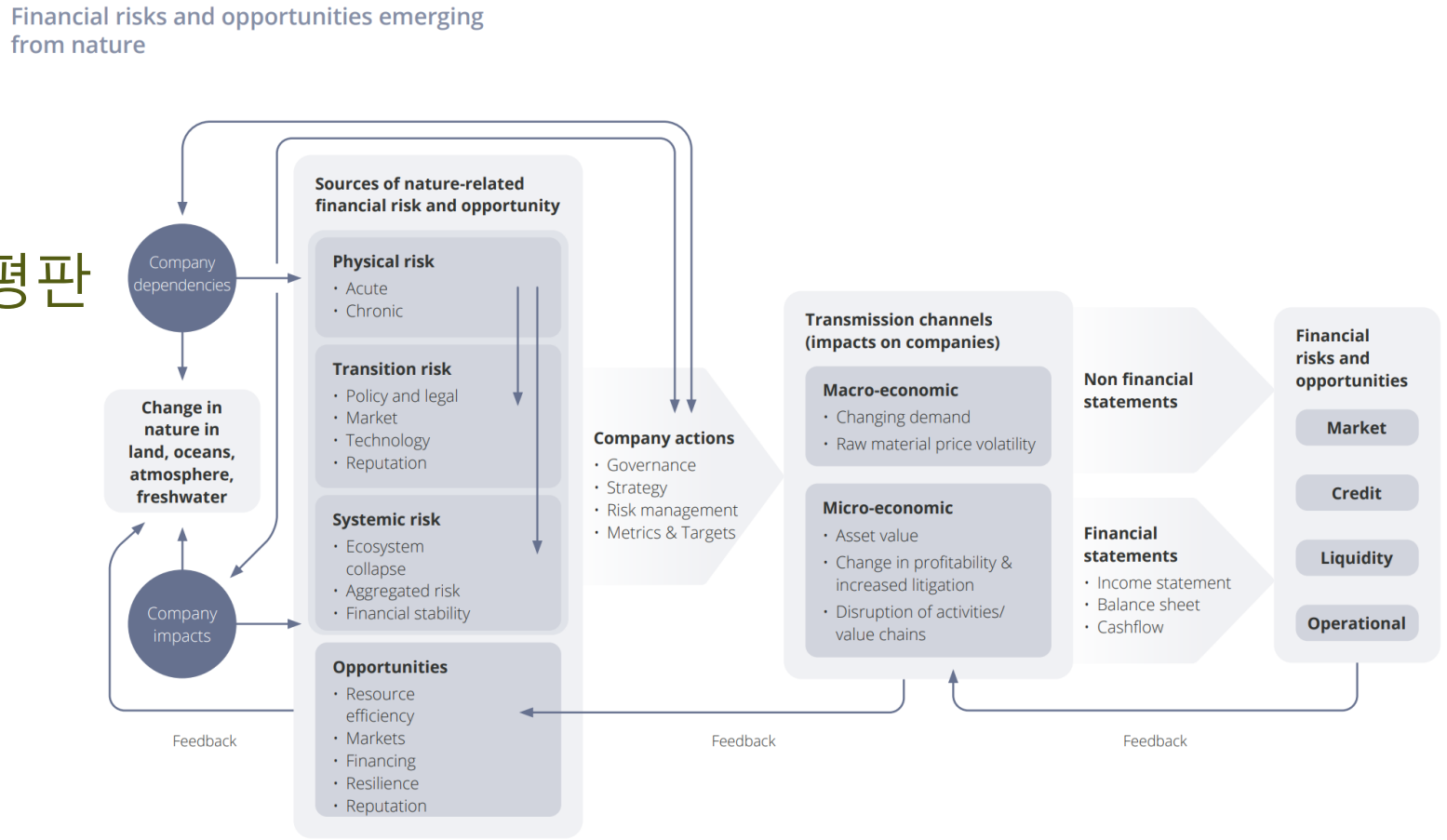


Figure 17: Financial risks and opportunities emerging from nature

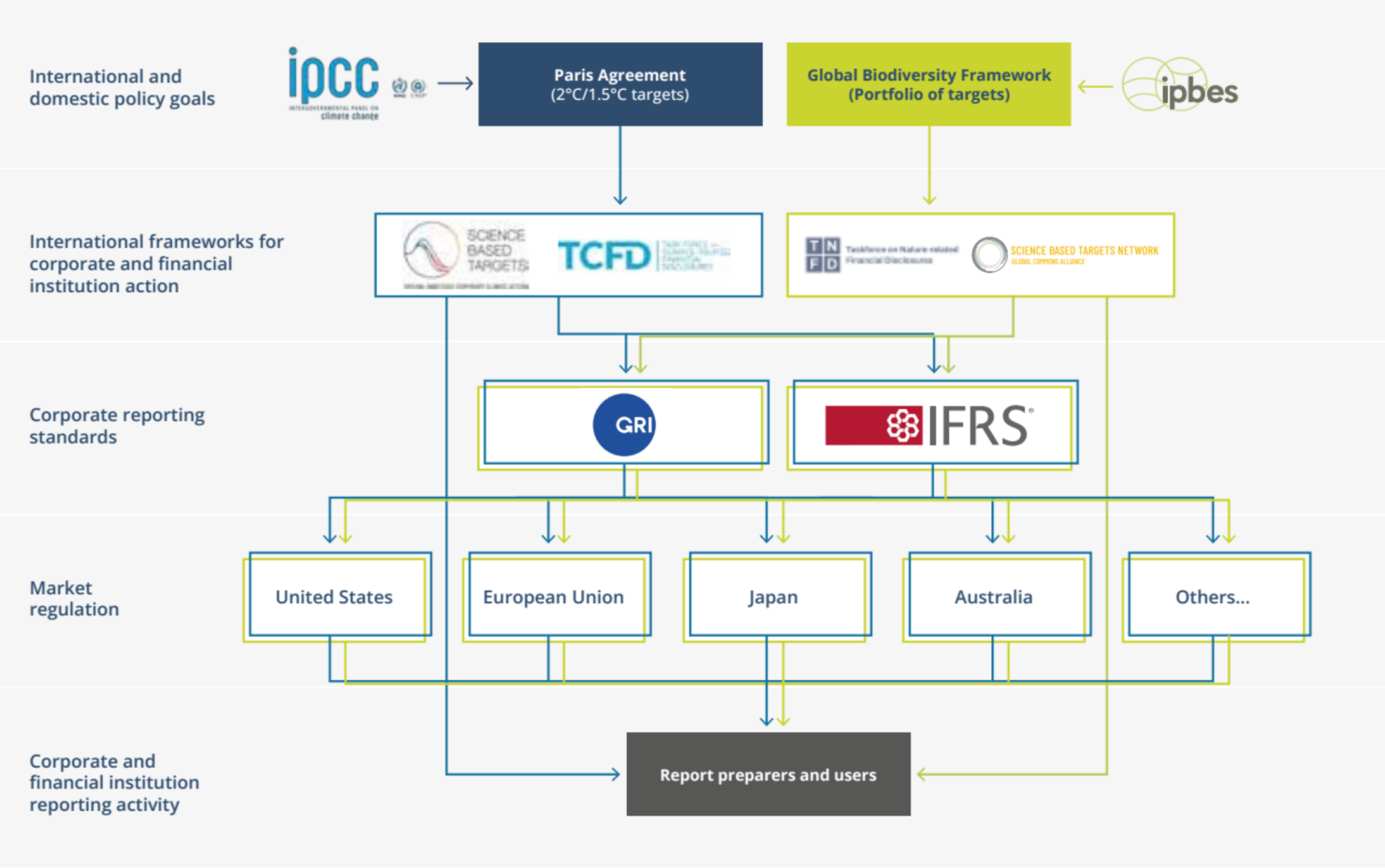
TNFD 이해하기

- GBF 에 기반, TCFD (2017)의 프레임 차용, 패키지화 (Nature-Climate tool) 목표
- 원칙, 목적, LEAP 접근
- 19 core knowledge partner organizations for financial and natural materiality

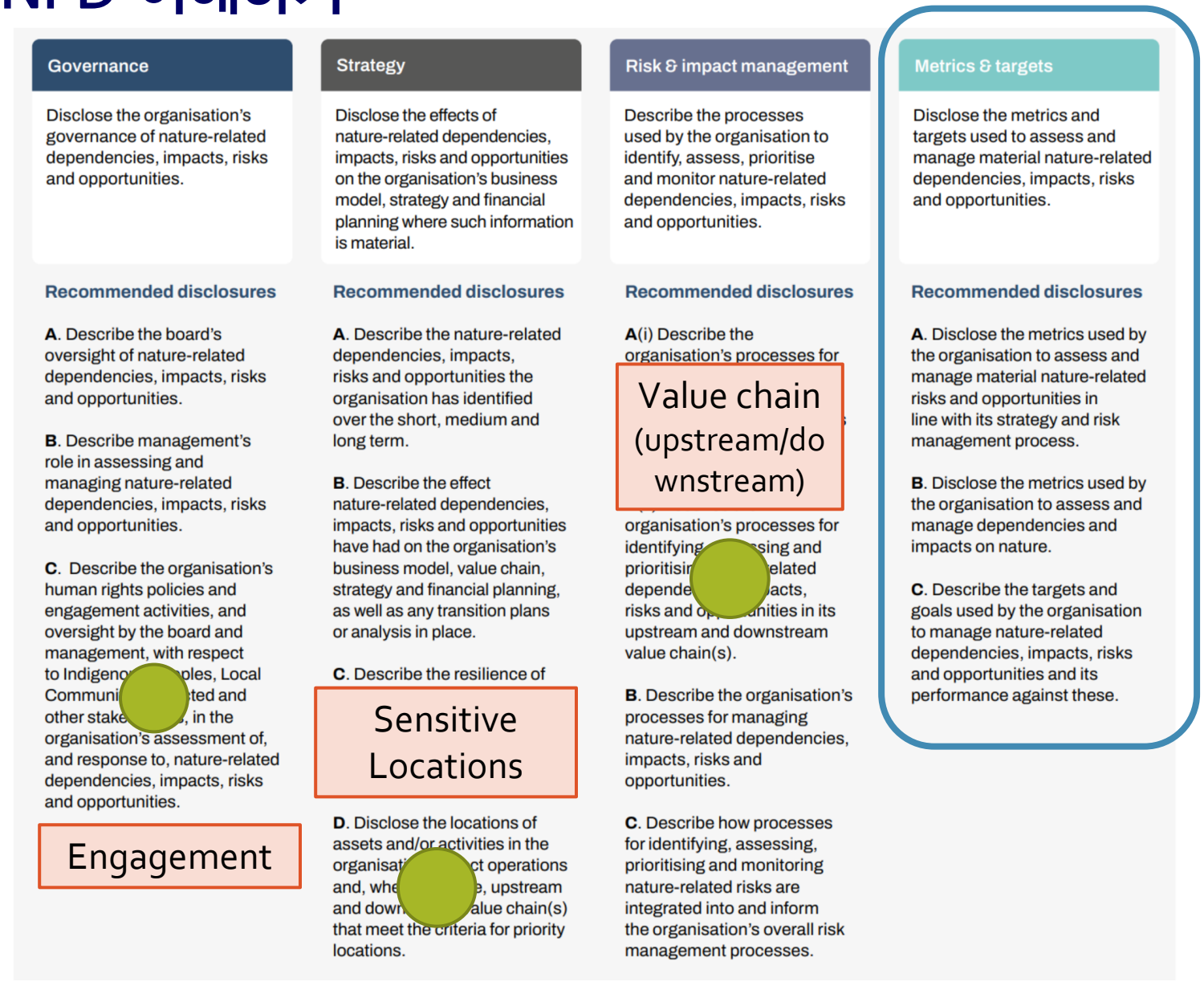
TNFD 이해하기

- 표준 개발까지 자발적 수용 > 권장에서 표준화로 > 규제로 단계적 이행
- TCFD 스케줄에 맞춰 빠르게 추진

Figure 6: Where TNFD fits in the emerging reporting architecture



TNFD 이해하기

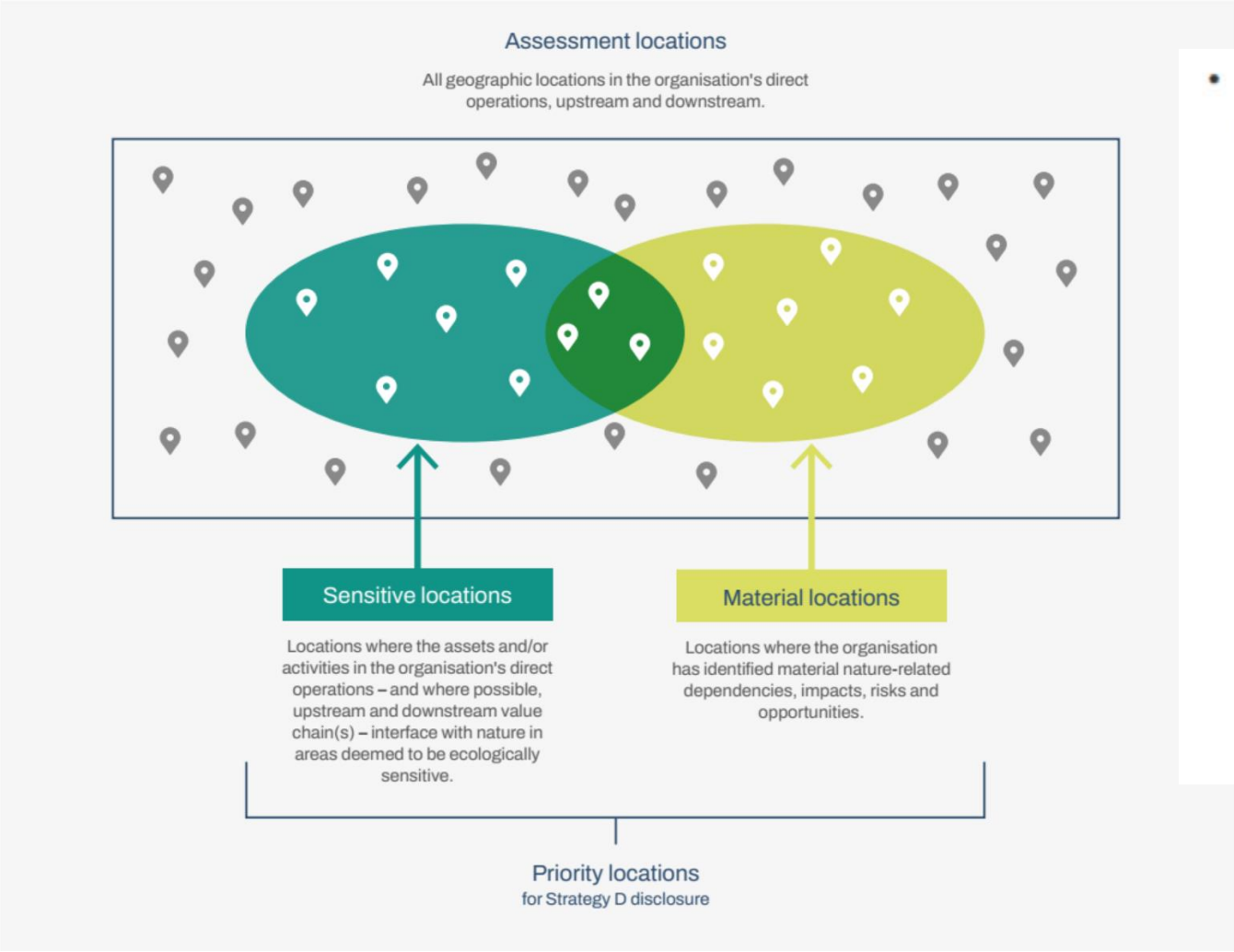


Goal to provide quantitative data that are:

- Science-based
- Practical to collect at reasonable cost
- Decision-useful
- Able to support cross-sector and sector-specific comparison
- Assurable on an annual reporting basis
- Aligned to global and national policy goals and targets

TNFD 이해하기

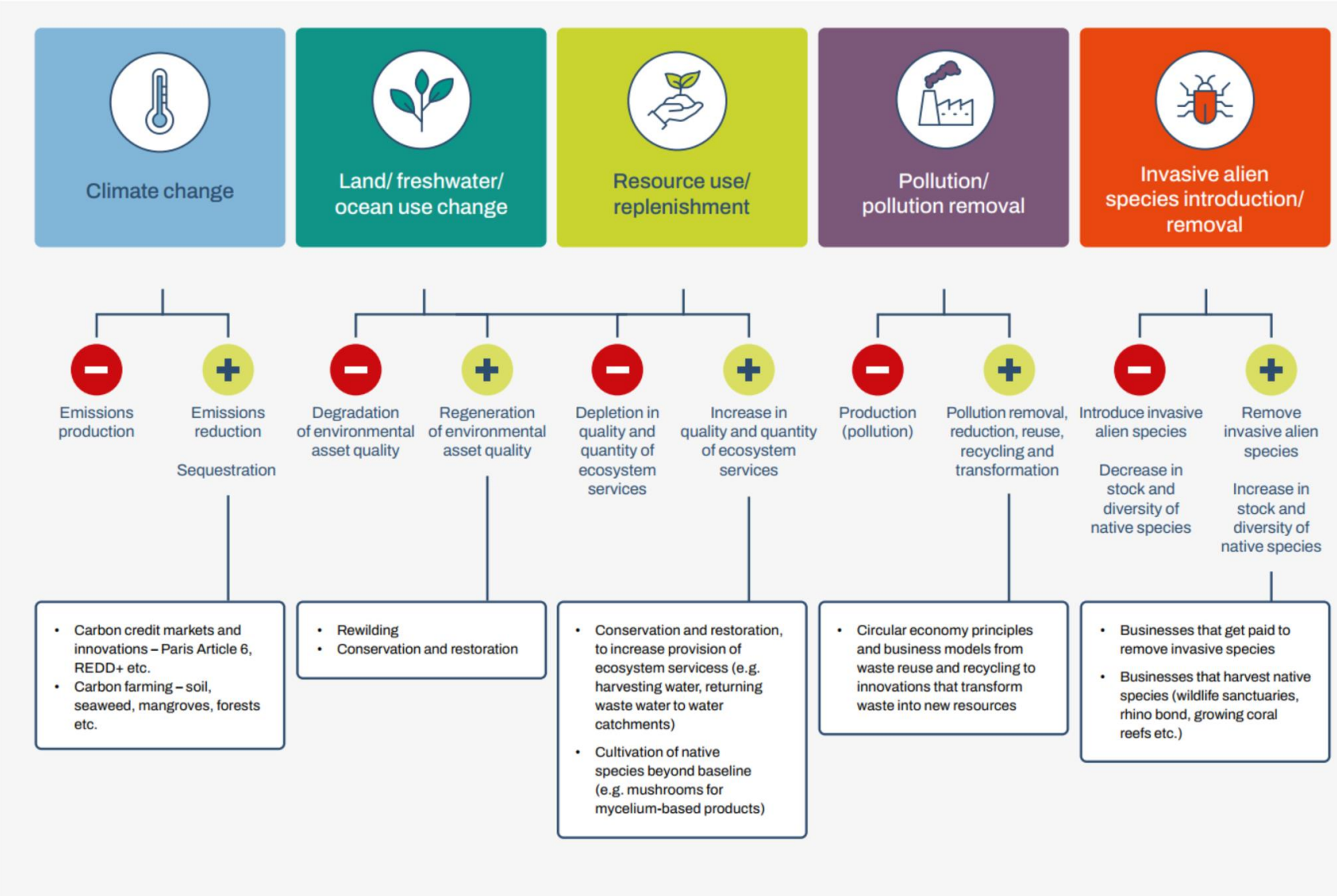
Figure 21: Assessment of priority locations – sensitive and material locations



- **Sensitive locations:** Locations where the assets and/or activities in its direct operations – and, where possible, upstream and downstream value chain(s) – interface with nature in:
  - Areas important for biodiversity; and/or
  - Areas of high ecosystem integrity; and/or
  - Areas of rapid decline in ecosystem integrity; and/or
  - Areas of high physical water risks; and/or
  - Areas of importance for ecosystem service provision, including benefits to Indigenous Peoples, Local Communities and stakeholders.

TNFD 이해하기

Figure 23: Drivers of nature change – reflecting both negative and positive impacts



- Distinction between mitigating negative impacts… and contributing to positive impacts on nature
- Separate reporting of negatives and positives (no net reporting)

- Recognize new products and business models and contributions to nature positive outcomes

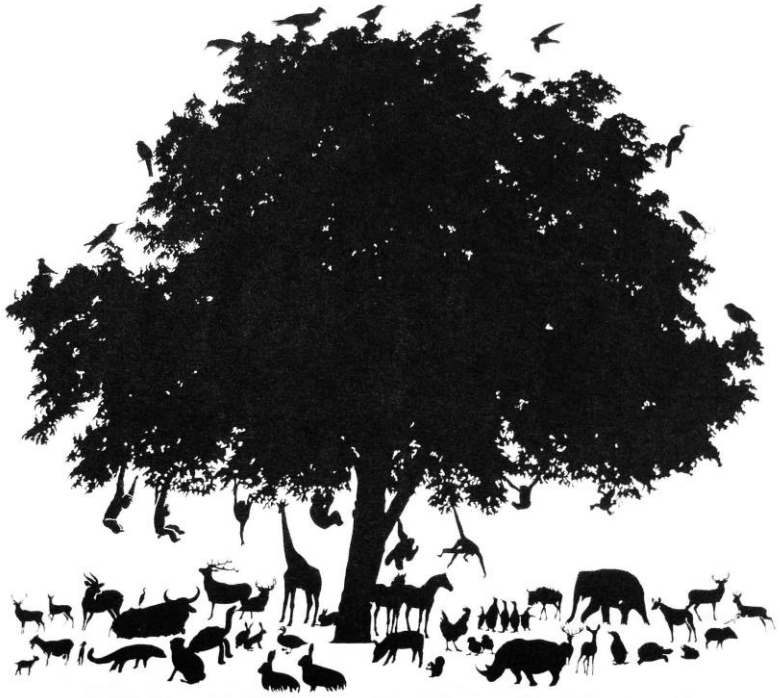
TNFD 이해하기

Metric	
Financial exposure to a **defined set of sectors** considered to have material nature-related dependencies and impacts	**For banks:** Absolute amount or percentage of lending volume.
	For asset owners and managers: Absolute amount or percentage of invested or owned assets.
	For insurers: Absolute amount or percentage of net premiums written or total sums insured.
Financial exposure to companies with **activities in sensitive locations**	**For banks:** Absolute amount or percentage of lending volume.
	For asset owners and managers: Absolute amount or percentage of invested or owned assets.
	For insurers: Absolute amount or percentage of net premiums written or total sums insured.

Highlights

- 2 core global metrics for financial institutions, recognising data dependency issues and to provide a place to start
- Expectation FIs will report on the 5 core global risk and opportunity metrics
- Expectation FIs will report on the other D&I metrics over time as data is available from investees, clients and customers

Thank you for listening!



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