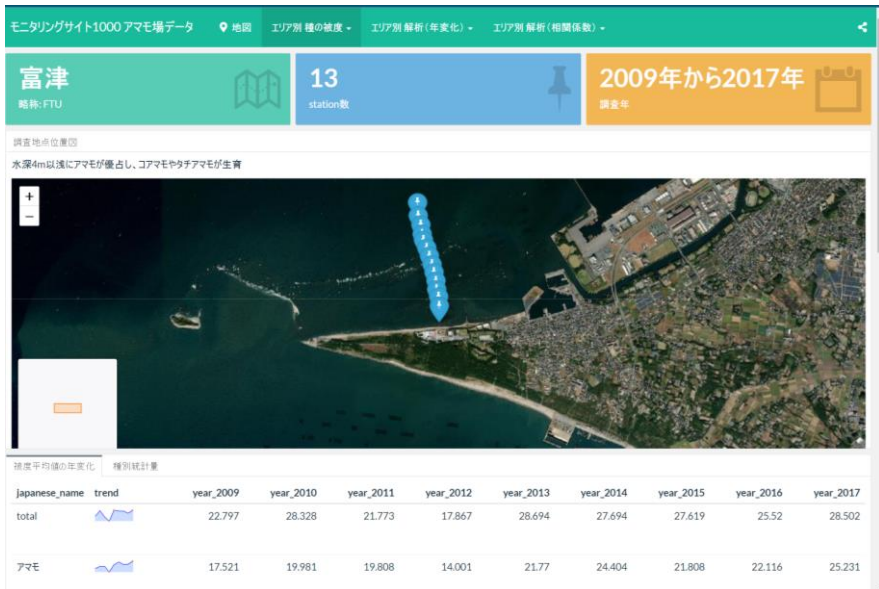
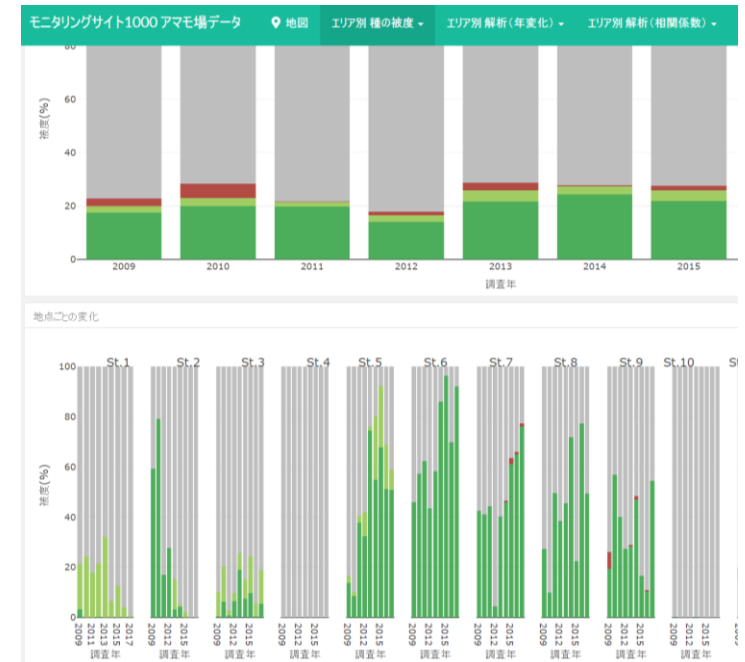


# Essential Ocean Variables(EOVs)/ Essential Biodiversity Variables(EBVs) and Kunming-Montreal Global Biodiversity Framework(KMGBF)/Indicators what we can do from seagrass case in Japan



Take Yamakita  
(JAMSTEC)



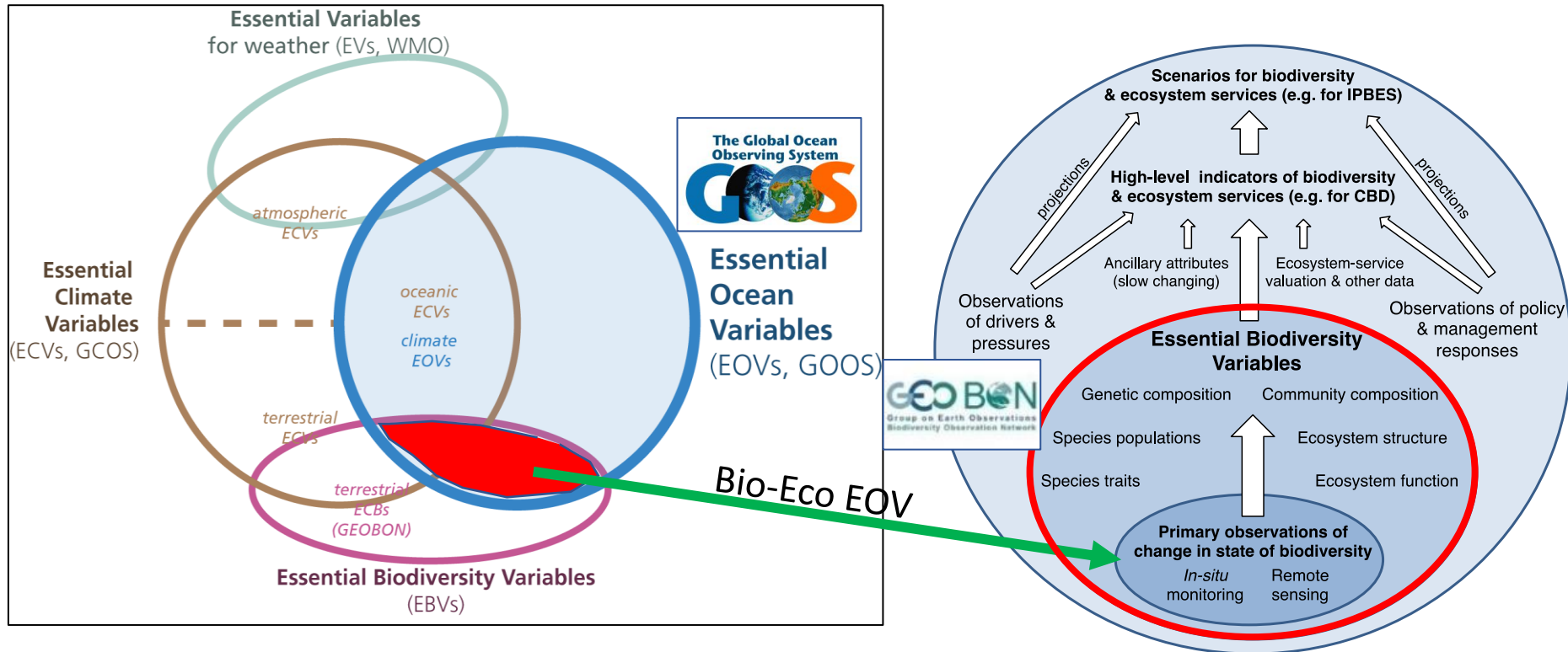
# Marine Biodiversity Observing Network

**MBON**



Physics	Biochemistry	Biology and Ecosystems
<ul style="list-style-type: none"> <li>• <a href="#">Sea state</a></li> <li>• <a href="#">Ocean surface stress</a></li> <li>• <a href="#">Sea ice</a></li> <li>• <a href="#">Sea surface height</a></li> <li>• <a href="#">Sea surface temperature</a></li> <li>• <a href="#">Subsurface temperature</a></li> <li>• <a href="#">Surface currents</a></li> <li>• <a href="#">Subsurface currents</a></li> <li>• <a href="#">Sea surface salinity</a></li> <li>• <a href="#">Subsurface salinity</a></li> <li>• <a href="#">Ocean surface heat flux</a></li> <li>• <a href="#">Ocean bottom pressure</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Oxygen</a></li> <li>• <a href="#">Nutrients</a></li> <li>• <a href="#">Inorganic carbon</a></li> <li>• <a href="#">Transient tracers</a></li> <li>• <a href="#">Particulate matter</a></li> <li>• <a href="#">Nitrous oxide</a></li> <li>• <a href="#">Stable carbon isotopes</a></li> <li>• <a href="#">Dissolved organic carbon</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Phytoplankton biomass and diversity</a></li> <li>• <a href="#">Zooplankton biomass and diversity</a></li> <li>• <a href="#">Fish abundance and distribution</a></li> <li>• <a href="#">Marine turtle abundance and distribution</a></li> <li>• <a href="#">Seabird abundance and distribution</a></li> <li>• <a href="#">Marine mammal abundance and distribution</a></li> <li>• <a href="#">Hard coral cover and composition</a></li> <li>• <a href="#">Seagrass cover and composition</a></li> <li>• <a href="#">Macroalgal canopy cover and composition</a></li> <li>• <a href="#">Mangrove cover and composition</a></li> <li>• Microbe biomass and diversity (*emerging)</li> <li>• Invertebrate abundance and distribution (*emerging)</li> </ul>
<b>Cross-disciplinary (including human impact)</b>		
	<ul style="list-style-type: none"> <li>• <a href="#">Ocean colour</a></li> <li>• <a href="#">Marine debris</a> (*emerging)</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Ocean sound</a></li> </ul>

# Essential Variables



## Essential Ocean Variables (EOVs)

Framework for Ocean Observing (2012)  
<http://www.oceanobs09.net/foo/>

## Essential Biodiversity Variables (EBVs)

GEO BON EBVs  
 Pereira et al. (2013)



# Biology and Ecosystem Essential Ocean Variables (EOVs)

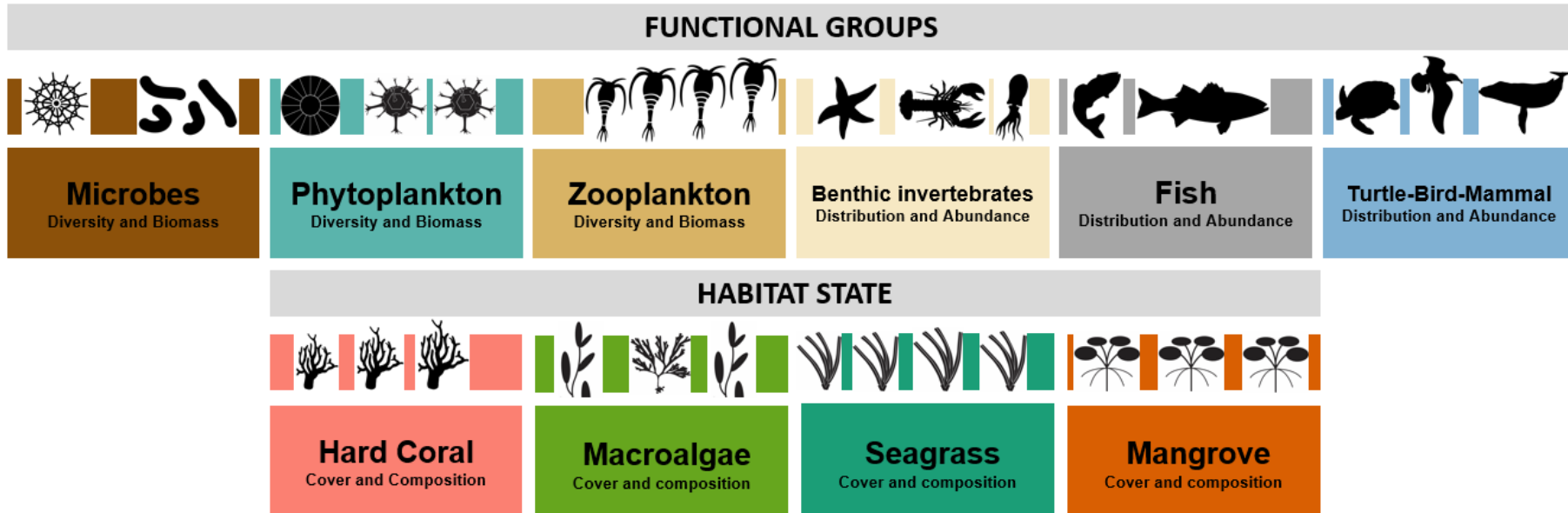






Table 1 EOV Information (definitions of terms in glossary)	
<b>Name of EOV</b>	Seagrass cover and composition
<b>Sub-Variables</b>	Shoot density/cover Canopy height Seagrass diversity (species) Areal extent of seagrass meadows Photosynthetic efficiency (measured with PAM)
<b>Derived products</b>	Primary and secondary production Global and regional seagrass distribution Contributions to blue" carbon storage Essential fish habitat extent Seagrass habitat fragmentation
<b>Supporting Variables</b>	Water clarity / turbidity Temperature Salinity Epiphytic algae and fouling load
<b>Complementary variables</b>	Seagrass biomass Seagrass disease prevalence Algal abundance/biomass Epifaunal abundance Fish abundance and species composition Invertebrate abundance and species composition Inorganic macronutrients (nitrate, ammonium, phosphate)

EOV class	EOV Bio names	In Japan
Plankton 	Phytoplankton diversity	Water quality assessment?
	Phytoplankton abundance	Satellite
	Zooplankton abundance	--
	Zooplankton diversity	j-OBIS
Mobile animals 	Fish abundance	Catch
	Fish distribution	eDNA/visual census on coral
	Large animals abundance	Track /sound data?
	Large animals distribution	Track /sound data?
	Benthic Invert. Abundance	(Field Obs.)
Habitat 	Benthic Invert. Diversity	Field Obs.
	Coral cover	Field Obs.
	Coral composition	Field Obs.

	EOV Bio names	In Japan
Habitat 	Seagrass cover	Satellite /Field Obs.
	composition	Field Obs.
	Macroalgal cover	(Satellite)
	composition	/Field Obs.
	Mangrove cover	JAXA
	Mangrove composition	Field Obs.
Others	Microbe biomass	-
	Microbe Composition	- (eDNA)
*Not in EOVs	Deepsea invertebrates cover/abundance	Field Obs.
	Deepsea invertebrates diversity	Field Obs.
	Deepsea fish cover/abundance	-
	Deepsea fish diversity	eDNA

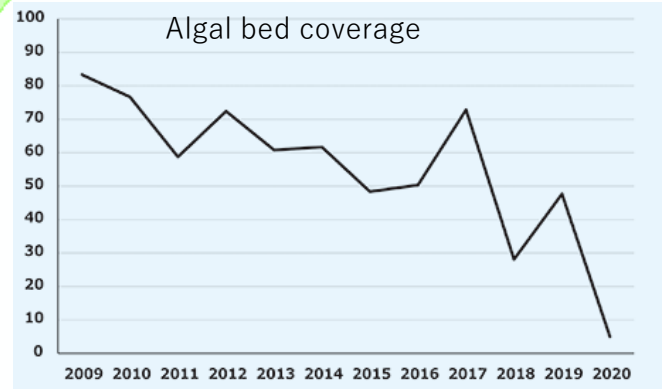
# Monitoring 1000 of Japan by MoE



Monitor the distribution or presence of species at the same location annually for 15 years.

-  Seagrass
-  Shore birds
-  Tidal flat
-  Rocky shore
-  Algal bed

Impact of herbivore fish are very severe

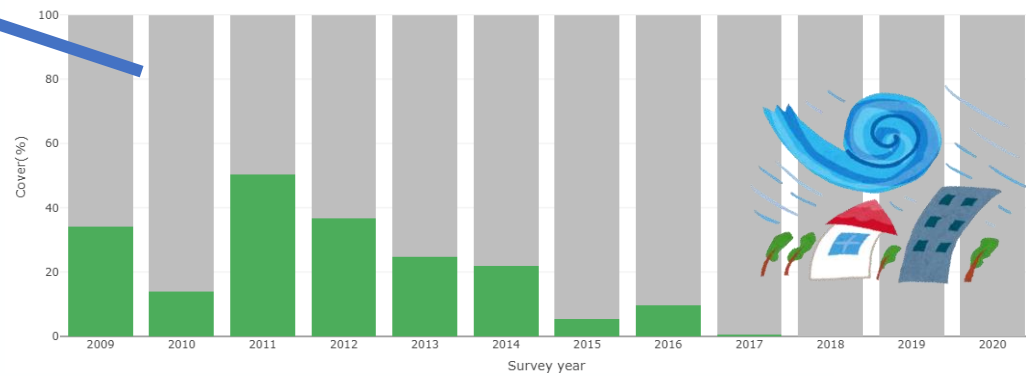
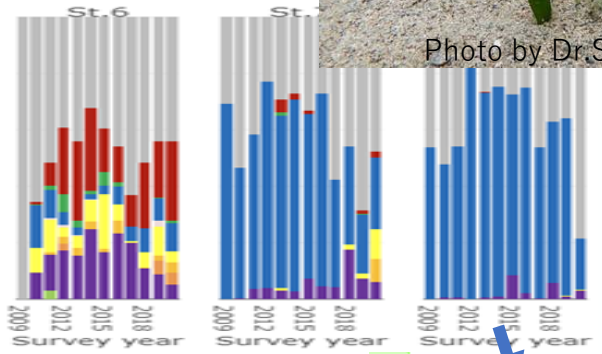


Impact of sea turtles are getting severe



Disappearance of whole bay populations at the southern limit was observed.

-  bare ground
-  *Cymodocea rotundata*
-  *Cymodocea serrulata*
-  *Enhalus acoroides*
-  *Halodule pinifolia*
-  *Halodule uninervis*
-  *Halophila ovalis*
-  *Syringodium isoetifolium*
-  *Thalassia hemprichii*
-  *Zostera japonica*









































EBV class	EBV names	In Japan
Genetic composition	<b>Genetic diversity</b> (richness and heterozygosity)	
	<b>Genetic differentiation</b> (number of genetic units and genetic distance)	
	<b>Effective population size</b>	
	<b>Inbreeding</b>	?
Species populations	<b>Species distributions</b>	
	<b>Species abundances</b>	
Species traits	<b>Morphology</b>	GA P
	<b>Physiology</b>	Poor
	<b>Phenology</b>	Poor
	<b>Movement</b>	
	<b>Reproduction</b>	

EBV class	EBV names	In Japan
Community composition	<b>Community abundance</b>	
	<b>Taxonomic/phylogenetic diversity</b>	
	<b>Trait diversity</b>	Poor GA P
	<b>Interaction diversity</b>	Poor
Ecosystem functioning	<b>Primary productivity</b>	
	<b>Ecosystem phenology</b>	?
	<b>Ecosystem disturbances</b>	Varies GA P
Ecosystem structure	<b>Live cover fraction</b>	?
	<b>Ecosystem distribution</b>	GA P
	<b>Ecosystem Vertical Profile</b>	Poor

\*Types of Ecosystems: :Coral, :Mangrove, :Saltmarsh, :Seagrass, :Algae, :Rocky shore, :Tidal flat, :Offshore & Water column

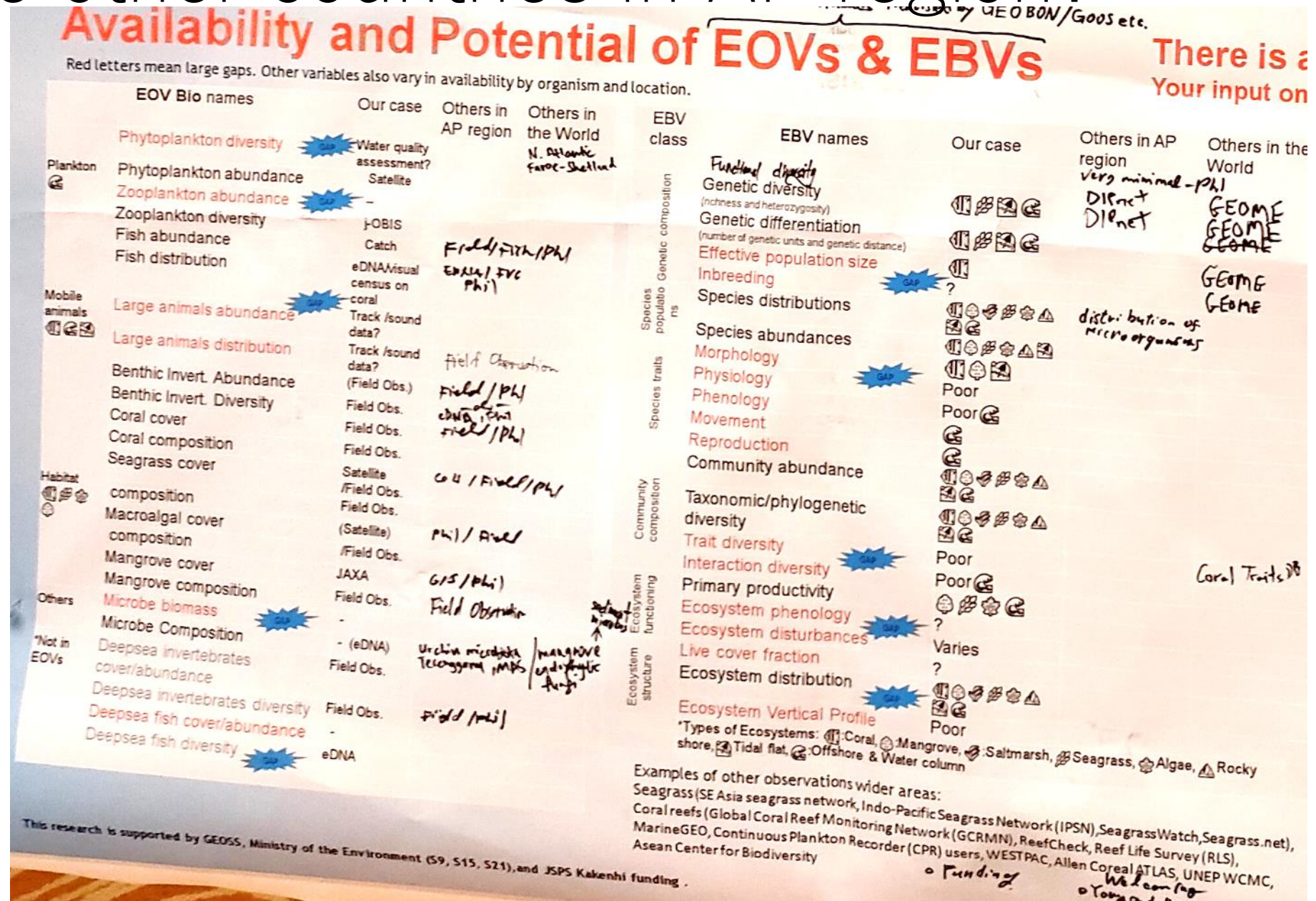
# Comparison

EOV class	EOV Bio names	In Japan
Plankton 	Phytoplankton diversity	Water quality assessment?
	Phytoplankton abundance	Satellite
	Zooplankton abundance	--
	Zooplankton diversity	j-OBIS
Mobile animals   	Fish abundance	Catch
	Fish distribution	eDNA/visual census on coral
	Large animals abundance	Track /sound data?
	Large animals distribution	Track /sound data?
Habitat   	Benthic Invert. Abundance	(Field Obs.)
	Benthic Invert. Diversity	Field Obs.
	Coral cover	Field Obs.
	Coral composition	Field Obs.

EBV class	EBV names	In Japan
Genetic composition	Genetic diversity (richness and heterozygosity)	   
	Genetic differentiation (number of genetic units and genetic distance)	   
	Effective population size	
	Inbreeding	?
Species populations	Species distributions	       
	Species abundances	     
Species traits	Morphology	  
	Physiology	Poor
	Phenology	Poor 
	Movement	
	Reproduction	

# How is the other countries in AP region?

- Workshops at the WCMB (World Conference of Marine Diversity )in Penang, Jul. 2023





# The Kunming-Montreal Global Biodiversity Framework

## Goal A

Ecosystems maintained, enhanced, or restored, extinctions are halted, extinction rate reduced tenfold and genetic diversity is maintained

## Goal B

Biodiversity is sustainably used and its contributions to people are maintained, enhanced or restored

## Goal C

Benefits from the use of genetic resources are shared and sustainably increased

## Goal D

The biodiversity funding gap of 700 billion USD is closed by ensuring adequate means of implementation are available.

<https://unfccc.int/sites/default/files/resource/CBD%20GGA6%20Monitoring%20and%20reporting%20under%20the%20Kunming-Montreal%20%E2%80%8BGBF%202023.06.04.pdf>

# The Kunming-Montreal Global Biodiversity Framework

## I. Reducing threats to biodiversity

1. Spatial planning and effective management
2. Ecosystems & restoration
3. Protected areas & OECMs
4. Threatened species
5. Sustainable use
6. Invasive alien species
7. Pollution
8. Climate change

## II. Meeting people's needs through sustainable use & benefit-sharing

9. Wild species
10. Agriculture, aquaculture, fisheries and forestry
11. Nature's contributions to people
12. Urban areas
13. Access and benefitsharing

## III. Tools and solutions for implementation and mainstreaming

14. Sectoral planning
15. Private sector
16. Sustainable consumption
17. Biosafety
18. Negative incentives
19. Financial resources
20. Capacity-building and development
21. Data & knowledge
22. Participation
23. Gender equality

<https://unfccc.int/sites/default/files/resource/CBD%20GGA6%20Monitoring%20and%20reporting%20under%20the%20Kunming-Montreal%20%E2%80%8BGBF%202023.06.04.pdf>

# monitoring framework

- Adopted in decision 15/5 and composed of:
  - i. Headline indicators
  - ii. Binary (yes/no) responses in national reports
  - iii. Component indicators
  - iv. Complementary indicators
- Parties will use the headline indicators in their national reports, supported by the others.

<https://unfccc.int/sites/default/files/resource/CBD%20GGA6%20Monitoring%20and%20reporting%20under%20the%20Kunming-Montreal%E2%80%8BGBF%202023.06.04.pdf>

# Headline indicators

Indicator name	Availability
A.1 Red List of Ecosystems*	Available
A.2 Extent of natural ecosystems*	In devel.
A.3 Red List Index	Available
A.4 The proportion of populations within species with an effective population size > 500*	Available
B.1 Services provided by ecosystems*	In devel.
C.1 Indicator on monetary benefits received*	In devel.
C.2 Indicator on non-monetary benefits*	In devel.
D.1 International public funding, including official development assistance (ODA) for conservation and sustainable use of biodiversity and ecosystems	Available
D.2 Domestic public funding on conservation and sustainable use of biodiversity and ecosystems*	In devel.
D.3 Private funding (domestic and international) on conservation and sustainable use of biodiversity and ecosystems*	In devel.
1. A.1 Red List of Ecosystems*	Available
1. A.2 Extent of natural ecosystems*	In devel.
1.1 Percent of land and seas covered by biodiversity-inclusive spatial plans*	In devel.
2.2 Area under restoration*	In devel.
3.1 Coverage of protected areas and OECMS	Available

A.3 Red List index	Available
A.4 The proportion of populations within species with a genetically effective population size > 500*	In devel.
5.1 Proportion of fish stocks within biologically sustainable levels	Available
6.1 Rate of invasive alien species establishment*	Data pending
7.1 Index of coastal eutrophication potential	Available
7.2 Pesticide environment concentration*	In devel.
8.In devel.*	In devel.
9.1 Benefits from the sustainable use of wild species*	In devel.
9.2 Percentage of the population in traditional employment*	Data pending
10.1 Proportion of agricultural area under productive and sustainable agriculture	Available
10.2 Progress towards sustainable forest management	Available
11.1 Services provided by ecosystems*	In devel.
12.1 Average share of the built-up area of cities that is green/blue space for public use for all	Available
C.1 Indicator on monetary benefits received*	In devel.
C.2 Indicator on non-monetary benefits*	In devel.
13. In devel.*	In devel.

C.1 Indicator on monetary benefits received*	In devel.
C.2 Indicator on non-monetary benefits*	In devel.
14. In devel.*	In devel.
15.1 Number of companies reporting on disclosures of risks, dependencies and impacts on biodiversity*	In devel.
16. In devel.*	In devel.
17. In devel.*	In devel.
18.1 Positive incentives in place to promote biodiversity conservation and sustainable use	Available
18.2 Value of subsidies and other incentives harmful to biodiversity, that have been eliminated, phased out or reformed*	Data pending
19.D.1 International public funding, including official development assistance (ODA) for conservation and sustainable use of biodiversity and ecosystems	Available
D.2 Domestic public funding on conservation and sustainable use of biodiversity and ecosystems*	In devel.
D.3 Private funding (domestic and international) on conservation and sustainable use of biodiversity and ecosystems*	In devel.
20. In devel.*	In devel.
21.1 Indicator on biodiversity information for monitoring the global biodiversity framework*	In devel.
22. In devel.*	In devel.
23. In devel.*	In devel.



# Component indicators

Goal A	Ecosystem Intactness Index	Target 1	Priority retention of intact / wilderness areas
Goal A	Ecosystem Integrity Index	Target 2	Extent of natural ecosystems by type
Goal A	Species habitat Index	Target 2	Maintenance and restoration of connectivity of natural ecosystems
Goal A	Biodiversity Habitat Index	Target 3	Protected area coverage of key biodiversity areas
Goal A	Protected Connected (Protconn) index	Target 3	Protected Area Management Effectiveness (PAME)
Goal A	Protected Area Connectedness Index (PARC-Connectedness)	Target 3	Protconn
Goal A	Evolutionarily Distinct and Globally Endangered (EDGE)	Target 3	Protected Area Connectedness Index (PARC-Connectedness)
Goal A	Living Planet Index	Target 3	Red List of Ecosystems
Goal A	Change in the extent of water-related ecosystems over time	Target 3	Connectivity Indicator (in development)
Goal B	Red List Index (for utilized species)	Target 3	The number of protected areas that have completed a site-level assessment of governance and equity (SAGE)
Goal B	Living Planet Index (for used species)	Target 3	Species Protection Index
Goal C	None adopted	Target 4	Living Planet Index
Goal D	None adopted	Target 4	Number of plant and animal genetic resources secured in medium or long-term conservation facilities
		Target 4	Trends in effective and sustainable management of human-wildlife conflict and coexistence

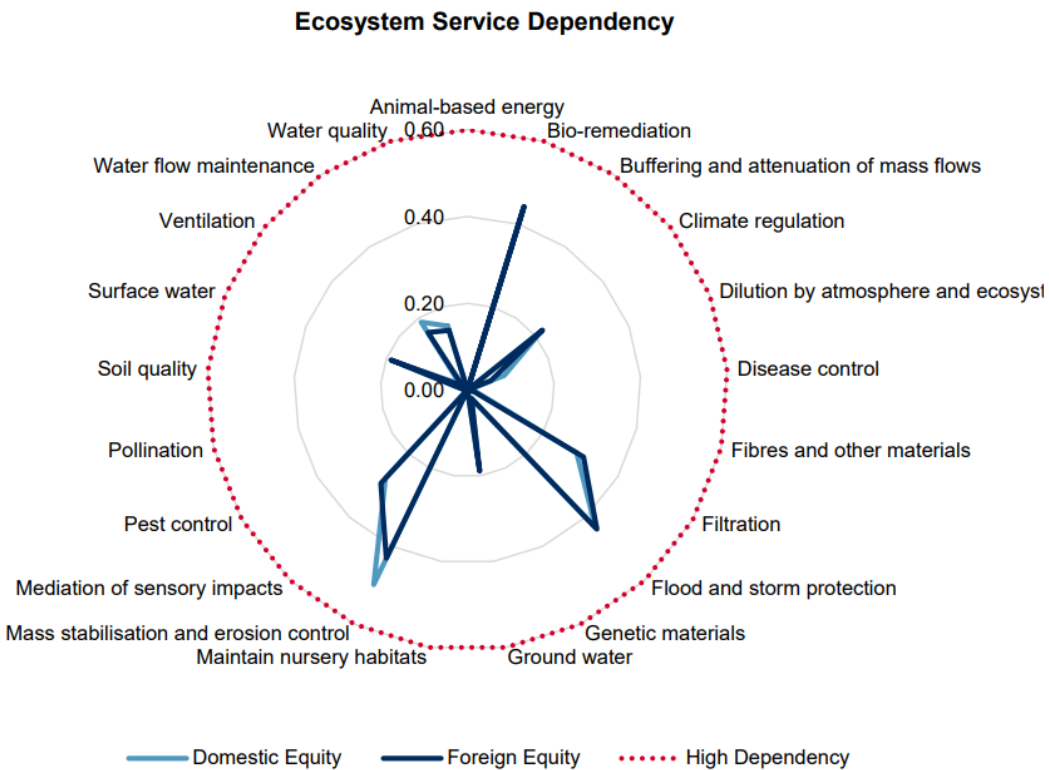
Target 4	Green Status of Species Index	Target 9	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)	Target 13	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 4	Conservation status of species listed in the CITES Appendices has stabilized or improved	Target 9	Red List Index (species used for food and medicine)	Target 14	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 5	Red List Index for used species	Target 9	Living Planet Index (for used species)	Target 15	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 5	Living Planet Index for used species	Target 10	Area of forest under sustainable management: total forest management certification by Forest Stewardship Council and Programme for the Endorsement of Forest Certification	Target 16	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 5	Sustainable use of Wild Species	Target 10	Average income of small-scale food producers, by sex and indigenous status	Target 16	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 6	Rate of invasive species impact and rate of impact	Target 11	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	Target 18	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 6	Rate of invasive alien species spread	Target 11	Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)	Target 19	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 6	Number of invasive alien species introduction events	Target 11	Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities	Target 20	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 7	Fertilizer use	Target 11	Proportion of bodies of water with good ambient water quality	Target 21	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 7	Proportion of domestic and industrial wastewater flow safely treated	Target 11	Level of water stress	Target 21	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 7	Floating plastic debris density [by micro and macro plastics]	Target 12	Recreation and cultural ecosystem services provided	Target 22	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 7	Red List Index (impact of pollution)	more		Target 23	Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 8	Total climate regulation services provided by ecosystems by ecosystem type (System of Environmental Economic Accounts)				Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 8	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030 which include biodiversity				Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 8	National greenhouse inventories from land use and land use change				Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)
Target 8	Bioclimatic Ecosystem Resilience Index (BERI)				Number of people using wild resources for energy, food or culture (including firewood collection, hunting and fishing, gathering, medicinal use, craft making, etc.)

# Complementary indicators

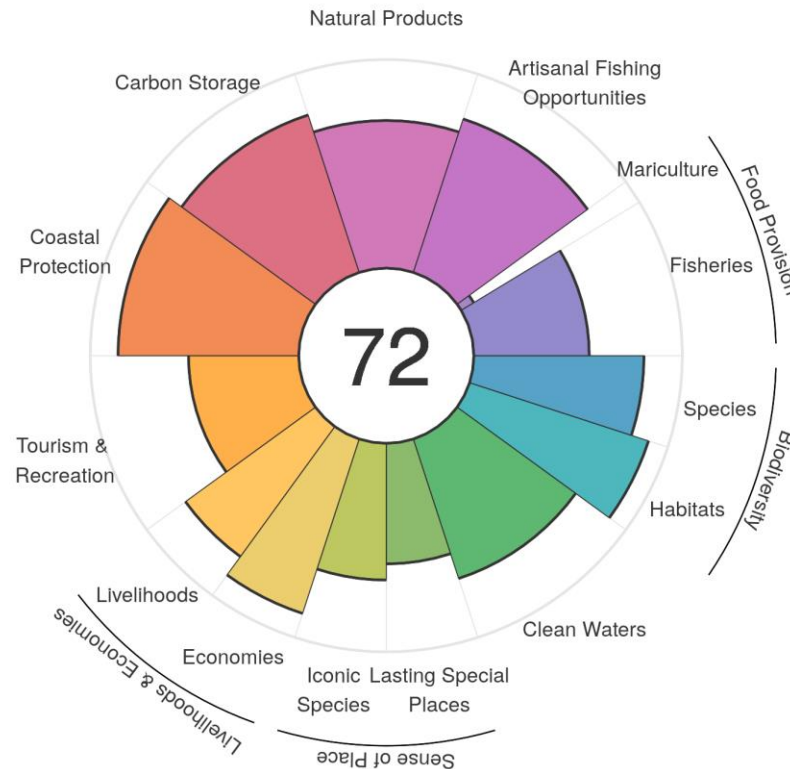
Goal A	Forest area as a proportion of total land area	Goal A	Wetland Extent Trends Index	Goal A	Changes in plankton biomass and abundance	Target 1	Number of countries using natural capital accounts in planning processes
Goal A	Forest distribution	Goal A	Change in the extent of inland water ecosystems over time	Goal A	Fish abundance and biomass	Target 1	Percentage of spatial plans utilizing information on key biodiversity areas
Goal A	Tree cover loss	Goal A	Forest Fragmentation Index	Goal A	Genetic scorecard for wild species		Habitat patches located within marine protected areas or integrated coastal zone management (ICZM)
Goal A	Grassland and savannah extent	Goal A	Forest Landscape Integrity Index	Goal A	Species richness/Changes in local terrestrial diversity (PREDICTS)	Target 1	Other spatial management plans (not captured as ICZM or marine spatial planning in 14.2.1)
Goal A	Mountain Green Cover Index	Goal A	Biomass of selected natural ecosystems	Goal A	Marine species richness	Target 1	Number of countries using ocean accounts in planning processes
Goal A	Peatland extent and condition	Goal A	Biodiversity Habitat Index	Goal A	Comprehensiveness of conservation of socioeconomically as well as culturally valuable species.	Target 1	Proportion of transboundary basin area with an operational arrangement for water cooperation
Goal A	Permafrost thickness, depth and extent	Goal A	Global Vegetation Health Products	Goal A	Number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities	Target 1	Percent of total land area that is under cultivation
Goal A	Continuous Global Mangrove Forest Cover	Goal A	Bioclimatic Ecosystem Resilience Index (BERI)	Goal A	Proportion of local breeds classified as being at risk extinction	Target 1	Extent of natural ecosystems by type
Goal A	Trends in mangrove forest fragmentation	Goal A	Relative Magnitude of Fragmentation (RMF)	Goal A	Red List Index (wild relatives of domesticated animals)		Number of countries implementing national legislation, policies or other measures regarding FPIC related to conservation would work here for IPs (not necessarily LCs), if spatial planning was substituted for conservation.
Goal A	Trends in mangrove extent	Goal A	Ecosystem Intactness Index	Goal A	CMS Connectivity Indicator	Target 1	Ecosystem Integrity Index
Goal A	Live coral cover	Goal A	Biodiversity Intactness Index	Goal A	Species Status Index		
Goal A	Hard coral cover and composition	Goal A	Biodiversity Intactness Index	Goal A	Intact Wilderness		
Goal A	<b>Global coral reef extent</b>	Goal A	Ocean Health Index	Goal A	Expected Loss of Phylogenetic diversity		
Goal A	<b>Global Seagrass Extent (Seagrass Cover and composition)</b>	Goal A	Extent of physical damage indicator to predominant seafloor habitats physical damage	Goal A	Proportion of populations maintained within species		
Goal A	Global saltmarsh extent	Goal A	River Fragmentation Index	Goal A	Free flowing rivers		
Goal A	<b>Macroalgal Canopy Cover and Composition</b>	Goal A	Percentage of threatened species that are improving in status according to the Red List	Goal A			
Goal A	Cover of key benthic groups	Goal A	Number of threatened species by species group	Goal A			
Goal A	Fleshy algae cover	Goal A	Wild bird index	Goal A			
		Goal A	Mean Species Abundance (MSA)				
		Goal A	Species Protection Index				

# Other projects

- TNFD



- Ocean Health Index (Ecosystem service and livelihood)



- A lot more...

- INVEST SoIVES
- InFOREST
- ARIES
- MIMES
- SAORE-S
- EPM
- EcoAIM
- ENCORE

[https://www.gpif.go.jp/en/investment/GPIF\\_ESGReport\\_FY2022\\_E\\_report04.pdf](https://www.gpif.go.jp/en/investment/GPIF_ESGReport_FY2022_E_report04.pdf)

[https://www.gpif.go.jp/esg-stw/GPIF\\_ESGReport\\_FY2022\\_J\\_report04.pdf](https://www.gpif.go.jp/esg-stw/GPIF_ESGReport_FY2022_J_report04.pdf)

So,

How to connect our works into these?

- Ideas and questions

- Does anyone applied for the IPBES Monitoring assess member from APBON?(Jan.6)
- Writing review paper can be cited by national / IPBES assessments.
- Listing up contents of existing NBSAPs / National assessment  
(Do we read detail of AHTAG report first, so far only summary? )  
[Ad Hoc Technical Expert Group on Indicators  
https://www.cbd.int/conferences/indicators-ahteg](https://www.cbd.int/conferences/indicators-ahteg)
- Bottom up ways, questionnaires and workshops?
- More project to compile data?
- Metadata database? Or expansion of OBIS/GBIF?
- What will we do about Foot print / Trading information
- Species itself is not clearly known in marine case.  
How we can identify red list species?
- Contribution to UN Decade restoration / ocean also important!
- anything else?

We might need good case study / tools to do.?

Analysis workshops for reviewing indicators?