

12<sup>th</sup> AOGEO Symposium  
**AOGEO Task Group 2:  
 Asia Pacific Biodiversity  
 Observation Network  
 (APBON)**

-Achievements, highlights,  
 and next steps of  
 biodiversity observations  
 and community  
 development-

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 (Gifu University, Japan)

**Yayoi Takeuchi**  
 (NIES, Japan)



*For biodiversity conservation  
 & sound decision making*

# APBON

Asia Pacific Biodiversity Observation Network

Our achievements from 2009 to 2019

- 100 sites in 10 countries have been monitored for biodiversity & ecosystems
- 3 APBON books were published
- 23 meetings with participants from 18 countries/areas were held

APBON's monitoring sites

The 22<sup>nd</sup> meeting, Kuala Lumpur, Malaysia, June 2019

Our vision toward 2030

**Biodiversity research and monitoring**

- ✓ Monitoring states and changes of biodiversity
- ✓ Filling gaps in data availability
- ✓ Increasing access to data
- ✓ Improving knowledge on cutting-edge technologies

**Networking observations and users**

- ✓ Coordination of a regional network of biodiversity observation institutions

**Capacity building**

- ✓ Sharing knowledge and skill of biodiversity survey through workshops
- ✓ Training courses for taxonomic capacity building

Our partner

Please visit our website!  
<http://www.esabi.biodic.go.jp/ap-bon/npax.html>

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# History of APBON and Other Network Activities

Year	GEO/GEOSS Symposia	GEO BON	AP BON Meetings	National BONs	CBD COPs	IPBES
2009	3rd GEOSS AP (Kyoto, February)		1st AP BON (July, Japan) 2nd AP BON (December, Japan)	Japan BON (May)		
2010	4th GEOSS AP (a session, Bali, March)	GEO BON Meeting (February, USA)	3rd AP BON (CBD COP10 Preconference, March, Japan)		COP10 (Japan, Side-event)	
2011			4th AP BON (December, Japan)			
2012	5th GEOSS AP (Tokyo, April)	GEO BON Meeting (December, USA)	WCC of IUCN (September, Korea)	Korea BON, Nepal BON, Bangladesh BON	COP11 (India, Side-event)	
2013	6th GEOSS AP (Ahmedabad, February)		5th AP BON (November, ACB, Philippines)	Philippines BON		Plenary-1
2014	7th GEOSS AP (Tokyo, May)	IC and AB (June, Germany)	6th AP BON (October, NIBR Korea)		COP12 (Korea, Side-event)	Plenary-2
2015	8th GEOSS AP (Beijing, September)	IC and AB (June, Germany)		Sino BON, Indonesia BON		Plenary-3
2016	2016-2025 A New GEO Strategy Plan Initiated	All-Hands Meeting (July, Germany)	7th AP BON (ACB, Thailand) 8th AP BON (Taipei, Taiwan)	WCC of IUCN (September, USA)	COP13 (Mexico)	Plenary-4
2017	9th GEOSS AP (Tokyo, January) , 10th GEOSS AP (Hanoi, September)	IC and AB (July, Germany)				Plenary-5
2018	11th GEOSS AP (October, Kyoto)	All-Hands Meeting (July, Beijing)	9th AP BON (Bangkok, February), 10th AP BON (Kuching, July)		COP14 (Egypt)	Plenary-6
2019	12th AOGEO (November, Canberra)		11 <sup>th</sup> AP BON (KL, Malaysia)			Plenary-7
2020					COP15 (China)	Plenary-8



# Kyoto Statement 2018

Kyoto, Japan

October 26<sup>th</sup>, 2018

## **(1) 2030 Agenda for Sustainable Development:**

APBON discussed the need to promote the harmonization of activities that contribute to achieving SDGs (13, 14, 15) by identifying the synergies and trade-offs of ecosystem services and societal requirements. In-situ observations and their emerging knowledge will address these issues by taking consideration of the challenges in balancing our natural systems and societal systems. APBON also identified the importance of long-term monitoring of terrestrial, freshwater, coasts and marine ecosystems to produce the data and knowledge for sound decision making. Tackling the challenges with regard to climate change needs for cross-disciplinary activities including water resources, carbon management, food production, and also with various platforms of Earth Observations (EO).

## **(4) Emerging Case Study for Mekong Region:**

In 2018, AOGEOSS committed each Task Group to focus their knowledge to overcome the specific challenges in the Mekong region.

APBON will provide knowledge about biodiversity and ecosystem services, particularly on the impacts of climate and land use changes and hydropower dam construction. APBON will focus on fresh water biodiversity by intensive field research including direct fish sampling, environmental DNA, and market survey. Existing initiatives on the integration of climate change scenario impacts on the river basin ecosystem will serve as a platform for collaborations and inform effective conservation measures.



# APBON Work Plan update



**Vision** ... *besides our fundamental visions and missions (Supplementary information 1), we focus on promoting interdisciplinary research and problem-solving approaches with filling the knowledge gaps which are identified by the previous assessment (IPBES 2018). We also promote the data accessibility through the networking of the observation networks from local to AP regional scale and deliver our information and knowledge to global platforms such as GEOBON.*

**Needs** ... *We need to contribute to the achievements of SDGs by providing adequate and defensible biodiversity data that help developing policy for conservation and sustainable use of biodiversity*

## Strategy

1. Biodiversity research and monitoring
  - a. Monitoring states and changes of biodiversity
  - b. Filling gaps in data availability
  - c. Increasing access to data
  - d. Improving knowledge on cutting-edge technologies
2. Networking of networks
  - a. Networking of in-situ biodiversity/ecosystem monitoring networks
  - b. Science-policy and science-society networks
3. Capacity building
  - a. Training workshops (students, scientists, users)



## **Major objectives of this APBON session in the 12<sup>th</sup> AOGEO Symposium are to;**

- (1) Engage biodiversity observation communities in the region particularly in the Pacific and Oceanic regions, and Himalayan region
- (2) Identify policy-relevant biodiversity observations and assessments, and
- (3) Seek collaborative opportunities with carbon cycle community and satellite observation mission(s).



# Program of the day



- 09:20 - **Keynote presentations**
- 10:10 - 10:40 *[Group photo & Tea/Coffee break]*
- 10:40 - **Session 1. Engagement of local, national and regional biodiversity observations** (Moderator: Sheila Vergara)  
(speaker changed: Bunthang Touch → Sheila Vergara)
- 12:00 - 13:00 *[Lunch]*
- 13:00 - **Session 2. Recent activities and Highlights of outcomes relevant to science-policy linkage** (Moderator: Eun-Shik Kim)
- 14:10 - 14:30 *[Tea/Coffee break]*
- 14:30 - **Session 3. Designing the future steps: filling observational gaps by multi-disciplinary approach (joint session of TG2 and TG3)** (Moderator: Hiroyuki Muraoka)
- 15:50 - **Session 4. Summary and next steps: data, AOGEO IPS, next plans**  
(Moderator: Yayoi Takeuchi)
- 16:50 - Closing
- 17:30 - *Statement meeting*



# Expected outcomes

## Activities

- Networking
- Science-policy linkage showcase
- Collaborations

## Contributions to IPS

- Mekong River Basin
- Himalayas
- Pacific Islands





### Mapping AOGEO TG Activities with GEO Priorities

Mapping analysis at the 11<sup>th</sup> GEOSS-AP symposium (Kyoto, Oct., 2018)

GEO Priorities		Cross-Cutting Areas	TG1	TG2	TG3	TG4	TG5	TG6	TG7	TG10	TG11	TG12	
SDGs	1.NO POVERTY		3	3	0	0	3	1	0	1	1	1	
	2.ZERO HUNGER		3	3	0	0	3	1	0	1	1	2	
	3.GOOD HEALTH AND WELL-BEING		1	3	1	1	2	1	0	1	1	1	
	4.QUALITY EDUCATION		1	2	2	2	0	1	0	0	0	1	
	5.GENDER EQUALITY		2	1	0	0	0	1	0	1	1	2	
	6.CLEAN WATER AND SANITATION		3	3	2	1	2	1	1	2	2	3	
	7.AFFORDABLE AND CLEAN ENERGY		2	3	2	0	1	1	1	1	1	1	
	8.DECENT WORK AND ECONOMIC GROUTH		1	2	1	1	2	1	0	1	1	1	
	9.INDUSTRY, INNOVATION AND INFRASTRUCTURE		2	1	1	0	2	1	0	1	1	1	
	10.REDUCED INEQUALITIES		1	2	0	0	2	1	0	1	1	1	
	11.SUSTAINABLE CITIES AND COMMUNITIES		3	3	2	1	0	1	1	1	1	3	
	12.RESPONSIBLE CONSUMPTION AND PRODUCTION		1	3	0	1	0	1	0	1	1	1	
	13.CLIMATE ACTION		3	3	3	3	3	1	2	1	1	3	
	14.LIFE BELOW WATER		2	3	2	3	0	1	0	1	1	1	
	15.LIFE ON LAND		3	3	2	1	3	1	3	1	1	2	
	16.PEACE, JUSTICE AND STRONG INSTITUTIONS		1	1	0	0	0	1	0	0	0	0	1
	17.PARTNERSHIP FOR THE GOALS		3	3	2	2	3	1	2	1	1	3	
Paris Agreement	Adaptation		3	3	2	1	3	1	0	1	1	2	
	Loss & Damage		3	3	1	1	0	1	0	1	1	2	
	Capacity Development/Technology Transfer		3	3	2	2	0	2	2	2	2	3	
	National Reporting/Global Stocktake		0	2	3	2	0	1	1	2	2	1	
	Mitigation		2	3	3	1	0	1	0	1	1	1	
Sendai Framework	Understanding disaster risk		3	3	3	1	0	2	0	2	2	2	
	Strengthening disaster risk governance to manage disaster risk		3	3	0	1	0	2	0	1	1	2	
	Investing in disaster risk reduction for resilience		3	3	0	1	0	1	0	2	2	2	
	Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction		3	3	0	0	0	1	0	2	2	2	
	Data Sharing Infrastructure		3	3	3	3	3	2	2	3	3	3	
	User Engagement and Communication		3	3	2	3	3	2	2	3	3	3	
<b>Total:</b>			<b>64</b>	<b>74</b>	<b>39</b>	<b>32</b>	<b>35</b>	<b>33</b>	<b>17</b>	<b>36</b>	<b>36</b>	<b>51</b>	

\*Scoring: 0=Do nothing, 1=less active, 2=active, 3=very active





# TG report (on Day 3)

Update of mapping analysis at 11<sup>th</sup> APBON workshop (Kuala Lumpur, June 2019)



- Terrestrial WG
- Freshwater WG
- Marine WG

- ✓ Research and monitoring
- ✓ Networking networks
- ✓ Outreach and capacity building



Mapping AOGEOSS Initiative TG Activities with GEO Priorities  
Task Group 2: AP BON(at 11th AP BON meeting)

GEO Priorities	Terrestrial		Freshwater		Marine		
	Score	Keywords	Score	Keywords	Score	Keywords	
1.NO POVERTY	1	eco-tourism, local indigenous people, job opportunity, community forestry	2	aquatic resources, eco-tourism, hydropower	2	Food provision, job opportunity, eco-tourism,	
2.ZERO HUNGER	1	pollinating service, local indigenous people, job opportunity, community forestry	3	aquatic resources, drinking water	2	Food provision, job opportunity, Sustainable use of natural resources	
3.GOOD HEALTH AND WELL-BEING	2	allergy, avian flu, nipah virus, phenology, traditional medicine, clean air, clean water, cooling temperature	3	drinking water, daily life water	2	Higher Food quality, happier life due to cultural ecosystem services,	
4.QUALITY EDUCATION	2	capacity building, citizen science, zoo and botanical garden, biosphere reserve, long-term data and knowledge for good education and researchers	1	environmental education	1	Outreach and awareness of surrounding nature	
5.GENDER EQUALITY	1	opportunity to produce goods from natural resources	0	N/A	2	Equal job opportunities and in nature related activities	
6.CLEAN WATER AND SANITATION	2	water purification, water regulation	3	drinking water, daily life water	1	Regulating Ecosystem Service/functions	
7.AFFORDABLE AND CLEAN ENERGY	1	clean energy, hydropower, bio fuels -- assessment environmental impacts	2	hydropower, micro-hydropower	1	Biofuels (algae)	
8.DECENT WORK AND ECONOMIC GROWTH	1	sustainable growth - green growth - decoupling economic growth and environmental degradation, environmental accounting	1	sustainable economic growth	1	Community-based management, Strengthening EIA processes; Eco-tourism	
9.INDUSTRY, INNOVATION AND INFRASTRUCTURE	1	bio-cosmetic, drug development, bio prospecting, green infrastructure, e-DNA, agro-forestry, biodiversity monitoring using cutting-edge technologies	0	N/A	0	Bio-prospecting; Mainstreaming biodiversity	
10.REDUCED INEQUALITIES	2	Nagoya protocol ABS, capacity building	1	Nagoya protocol (ABS)	1	Gender equality in research (e.g., women, children assessment on gleaming activities), Focus on marginalized sectors, broad-scale analysis (wider geographic researches)	
11.SUSTAINABLE CITIES AND COMMUNITIES	2	parks - education, gathering people, protection of biodiversity, MAB project, smart city, green city	1	protection of biodiversity	2	Biodiversity conservation, Recycling programs, Adaptive management options, Sustainable development	
12.RESPONSIBLE CONSUMPTION AND PRODUCTION	2	biodiversity trade and footprint, fair-trade certificate, reducing plastics	2	biodiversity trade and footprint, fair-trade certificate	1	Reduce wastage, Green energy, green solutions, effective production process, sustainable food systems	
13.CLIMATE ACTION	3	restoration, carbon sequestration, cooling temperature, monitoring biodiversity	2	reduce CO2 by hydro/microhydro-power	2	Adaptation, Mitigation, Climate smart agriculture	
14.LIFE BELOW WATER	3	long-term monitoring of species loss, environmental change, species trends, ecosystem fragmentation, phenology, reducing plastics	3	freshwater/land-water ecosystem	3	Biodiversity, Ecosystem services, Ecosystem functions, Conservation, Food provisioning	
15.LIFE ON LAND	3	long-term monitoring of species loss, environmental change, species trends, ecosystem fragmentation, phenology	2	freshwater/land-water ecosystem	1	Disaster Risk Reduction, Ridge to Reef / Hilltops to Oceans, Water quality, Coastal Integrity Vulnerability assessment	
16.PEACE, JUSTICE AND STRONG INSTITUTIONS	1	trans-boundary governance of natural resources, adaptive management	2	transboundary governance of natural resources, especially transboundary rivers	1	United Nations Convention on the Law of the Sea; Responsible coastal governance, Equitable use of resources	
17.PARTNERSHIP FOR THE GOALS	3	networking science, society and policy	2	networking science, society and policy	3	Regional collaboration multilateral transboundary arrangements	
Adaptation	3	Ecosystem-based adaption, protected area, eco-DRR	2	Ecosystem-based adaption, protected area, eco-DRR	2	co-management; risk management	
Loss & Damage	3	in-situ long-term monitoring of biodiversity and services, prediction of the changes	2	in-situ long-term monitoring of biodiversity and services, prediction of the changes	2	vulnerable countries; recovery planning	
Capacity Development/Technology Transfer	3	networking research collaborations and deliver the knowledge & information	2	networking research collaborations and deliver the knowledge & information	2	South-south cooperation; training needs assessment	
National Reporting/Global Stocktake	2	Carbon accounting -- biomass, soil carbon, blue carbon	1	Carbon accounting	2	Biodiversity trends; Drivers of biodiversity loss; Species distribution	
Mitigation	3	REDD+, restoration, ex-situ conservation but limited, preference for in-situ conservation	2	reduce CO2 by hydro/microhydro-power, restoration, ex-situ conservation	1	Blue Carbon Accounting/Offsets; Restoration of Ecological Habitats; Coastal restoration and conservation	
Understanding disaster risk	3	phenology monitoring for early warning of wild fire and drought			2	Tsunami, Early warning system, capacity building	
Strengthening disaster risk governance to manage disaster risk	2	MAB, adaptive governance restoration after the disaster, social capital, social memory			2	Early warning system, capacity building	
Investing in disaster risk reduction for resilience	1	eco-DRR		3	Floods/drought and their measures, Eco-DRR, Green infrastructure	2	Early warning system, capacity building, outreach and education
Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction	1	green infrastructure			2	Early warning system, capacity building, outreach and education	
Cross-Cutting Areas	Score	Keywords	Score	Keywords	Score	Keywords	
Data Sharing Infrastructure	3	GBIF, ABCDnet, Data papers and Data repository, ILTER-DEMS, Data ONE, Asian CHM, Phenological Eyes Network, Mybis, GEOSS Portal, Biodiversity Center's portal site	3	GBIF, Data papers and Data repository	3		
Data Engagement and Communication	3	GEO BON, Regional BONs, National BONs, ILTER	2	GEO BON, Regional BONs, National BONs	3		
<b>Total</b>	<b>58</b>		<b>47</b>		<b>49</b>		

\*Scoring: 0=Do nothing, 1=less active, 2=active, 3=very active

**TG report (today 17:30)**



# Input to AOGEO Statement 2019

*Short text (up to 4 lines) to be sent to AOGEO CB.*

(draft by AOGEO CB)

## **Contribute to 2030 Agenda for Sustainable Development:**

... APBON emphasizes the need to promote the harmonization of activities that contribute to achieving SDGs (13, 14, 15) by identifying the synergies and trade-offs of ecosystem services and societal requirements. ...

## **Contribute to Paris climate agreement within the UNFCCC:**

<...>



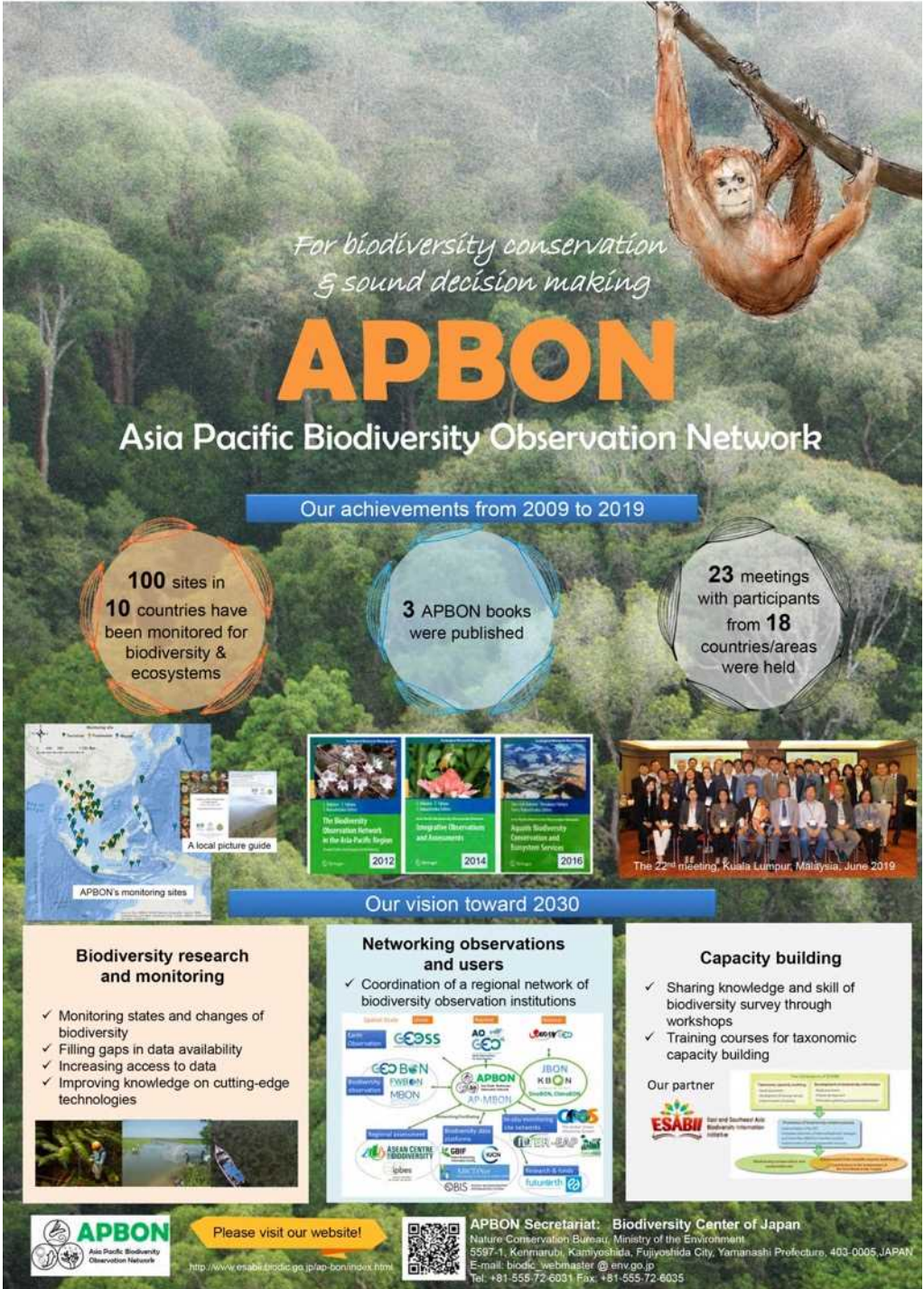


## Participation:

- **##** attendee from **##** countries (Australia, China, Indonesia, Japan, Korea, Malaysia, Nepal, Thailand, Philippines)
- GEO BON

## Meeting objectives:

1. Engagement of biodiversity observation communities in the region particularly in the Pacific and Oceanic regions, Himalayan region
2. Identifying policy-relevant biodiversity observations and assessments, and
3. Seeking collaborative opportunities with carbon cycle community and satellite observation mission(s)



*For biodiversity conservation & sound decision making*

# APBON

Asia Pacific Biodiversity Observation Network

**Our achievements from 2009 to 2019**

- 100 sites in 10 countries have been monitored for biodiversity & ecosystems
- 3 APBON books were published
- 23 meetings with participants from 18 countries/areas were held

**Our vision toward 2030**

**Biodiversity research and monitoring**

- ✓ Monitoring states and changes of biodiversity
- ✓ Filling gaps in data availability
- ✓ Increasing access to data
- ✓ Improving knowledge on cutting-edge technologies


**Networking observations and users**

- ✓ Coordination of a regional network of biodiversity observation institutions

**Capacity building**

- ✓ Sharing knowledge and skill of biodiversity survey through workshops
- ✓ Training courses for taxonomic capacity building

Our partner



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# APBON session



## Keynotes

- AP-MBON and related marine observations
- Biodiversity and ecosystem observations in Australia

## Session 1: Engagement of local, national and regional biodiversity observations

- Indonesia
- Nepal
- ASEAN

## Session 2: Recent activities and Highlights of outcomes relevant to science-policy linkage

- GEO BON
- Freshwater
- Marine

## Session 3: Designing the future steps: filling observational gaps by multi-disciplinary approach (joint session of TG2 and TG3)

- In-situ field research and drone measurements on forest structure
- Satellite observations on forest biomass and carbon budget
- Lessons from IPBES Global Assessment and implications to carbon observations

## Session 4: Summary and next steps

- Standard biodiversity data
- Collaborations with AOGEO IPS





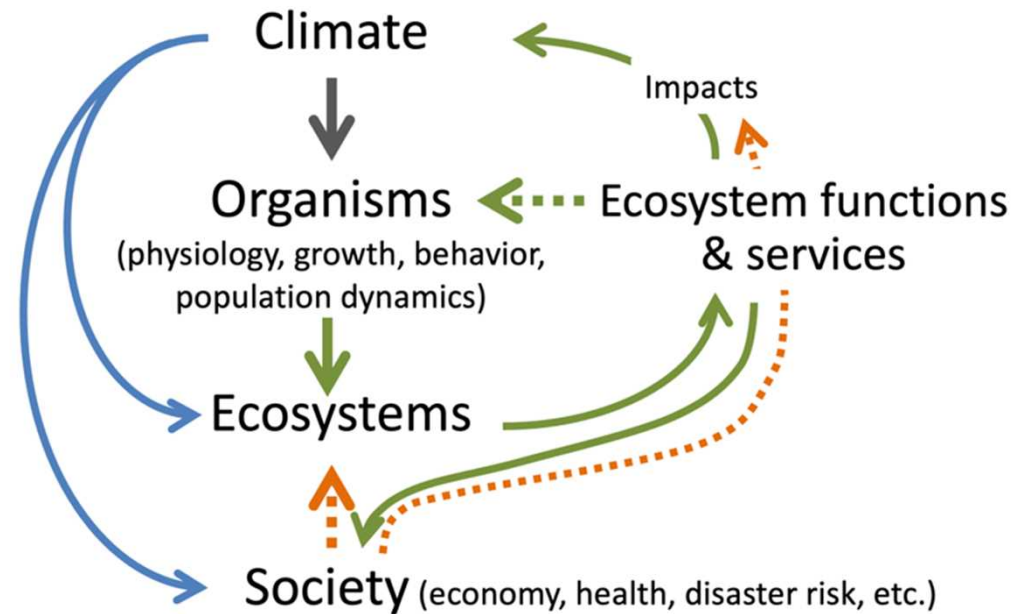
# Contribution to IPS



- Mekong River Basin
- Himalayas
- Pacific Islands



# Joint session of TG2 and TG3



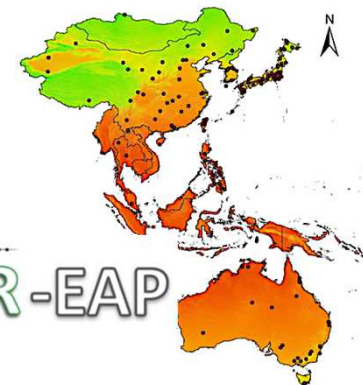
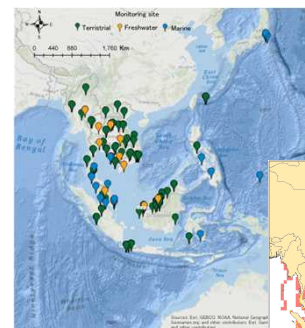
## Sharing research sites of networks

Ecosystem models

Satellite remote sensing

In-situ field survey

Sensor networks



ILTER-EAP

# Future steps



- APBON Work Plan 2030 to be published
- Biodiversity and ecosystem service monitoring
  - Terrestrial
  - Freshwater
  - Marine
- Networking of scientists, institutions, countries, obs. networks
- Capacity building
- APBON workshop



Mapping AOGEOSS Initiative TG Activities with GEO Priorities  
Task Group 2: AP BON(at 11th AP BON meeting)



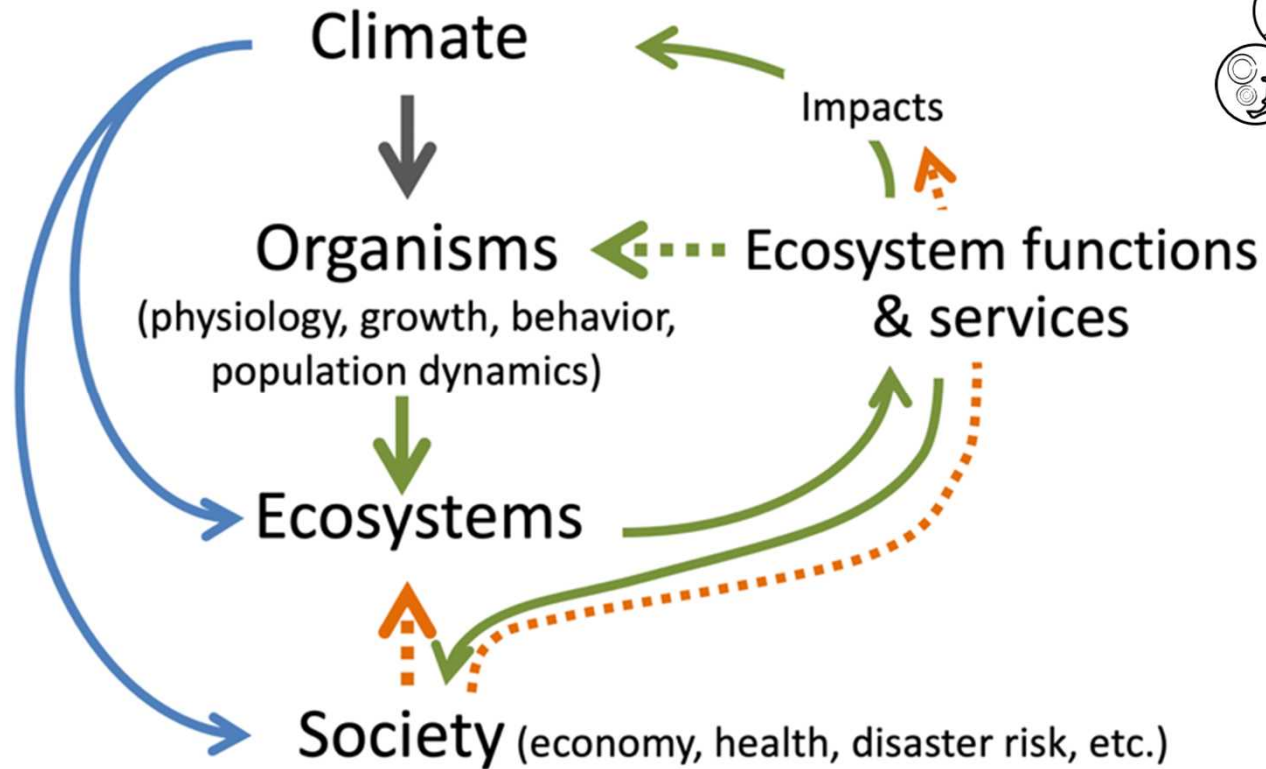
# Update of mapping on there GEO engagement priority areas

GEO Priorities	Score	Terrestrial		Freshwater		Marine	
		Score	Keywords	Score	Keywords	Score	Keywords
1.NO POVERTY	1	1	eco-tourism, local indigenous people, job opportunity, community forestry	2	aquatic resources, eco-tourism, hydropower	2	Food provision, job opportunity, eco-tourism,
2.ZERO HUNGER	1	1	pollinating service, local indigenous people, job opportunity, community forestry	3	aquatic resources, drinking water	2	Food provision, job opportunity, Sustainable use of natural resources
3.GOOD HEALTH AND WELL-BEING	2	2	allergy, avian flu, nipah virus, phenology, traditional medicine, clean air, clean water, cooling temperature	3	drinking water, daily life water	2	higher Food quality, happier life due to cultural ecosystem services,
4.QUALITY EDUCATION	2	2	capacity building, citizen science, zoo and botanical garden, biosphere reserve, long-term data and knowledge for good education and researchers	1	environmental education	1	Outreach and awareness of surrounding nature
5.GENDER EQUALITY	1	1	opportunity to produce goods from natural resources	0	N/A	2	Equal job opportunities and in nature related activities
6.CLEAN WATER AND SANITATION	2	2	water purification, water regulation	3	drinking water, daily life water	1	Regulating Ecosystem Service/Functions
7.AFFORDABLE AND CLEAN ENERGY	1	1	clean energy, hydropower, bio fuels -- assessment environmental impacts	2	hydropower, (algae)		
8.DECENT WORK AND ECONOMIC GROWTH	1	1	sustainable growth - green growth - decoupling economic growth from degradation,				
9.INDUSTRY, INNOVATION AND INFRASTRUCTURE	1	1	bio-composites, prospecting, IP forestry, biodiversity to ecotourism				
10.REDUCED INEQUALITIES	2	2	Nagoya protocol				
11.SUSTAINABLE CITIES AND COMMUNITIES	2	2	arks, education of biodiversity, city				
12.RESPONSIBLE CONSUMPTION AND PRODUCTION	2	2	biodiversity trade certificate, red				
13.CLIMATE ACTION	3	3	restoration, carbon temperature, m				
14.LIFE BELOW WATER	3	3	long-term monitoring environmental fragmentation,				
15.LIFE ON LAND	3	3	long-term monitoring environmental fragmentation,				
16.PEACE, JUSTICE AND STRONG INSTITUTIONS	1	1	trans-boundary governance of natural resources, adaptive management	2	transboundary governance of natural resources, especially transboundary rivers	1	United Nations Convention on the Law of the Sea, Responsible coastal governance, Equitable use of
17.PARTNERSHIP FOR THE GOALS	3	3	networking sci				
Adaptation	3	3	Ecosystem-based DRR	2	Ecosystem-based adaption, protected area, eco-DRR	2	co-management; risk management
Loss & Damage	3	3	In-situ long-term services, predic	2	in-situ long-term monitoring of biodiversity and services, prediction of the changes	2	vulnerable countries; recovery planning
Capacity Development/Technology Transfer	3	3	networking re the knowledge	2	networking research collaborations and deliver the knowledge & information	2	South-south cooperation; training needs assessment
National Reporting/Global Stocktake	2	2	Carbon account carbon	1	Carbon accounting	2	Biodiversity trends; Drivers of biodiversity loss; Species distribution
Mitigation	3	3	REDD+, restora limited, prefer	2	reduce CO2 by hydro/microhydro-power, restoration, ex-situ conservation but limited, preference for in-situ conservation	1	Blue Carbon Accounting/Offsets; Restoration of Ecological Habitats;Coastal restoration and conservation
Understanding disaster risk	3	3	phenology mon fire and drought				
Strengthening disaster risk governance to manage disaster risk	2	2	MAB, adaptive disaster, social				
Investing in disaster risk reduction for resilience	1	1	eco-DRR				
Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction	1	1	green infrastr				
Cross-Cutting Areas	Score						
Data Sharing Infrastructure	3	3	GBIF, ABCD repository, ILD, Phenological Biodiversity Center's portal site				
User Engagement and Communication	3	3	GEO BON, Regional BONs, National BON, ILTER	2	GEO BON, Regional BONs, National BONs	3	
<b>Total</b>	<b>58</b>			<b>47</b>		<b>49</b>	

\*Scoring: 0=Do nothing, 1=less active, 2=active, 3=very active







### Sharing research sites of networks

**Ecosystem models**

**Satellite remote sensing**

**In-situ field survey**

**Sensor networks**

