UNEP-NOWPAP-CEARAC

The 2nd CEARAC Expert Meeting on Eutrophication Assessment in the NOWPAP Region

Introduction to EcoQO activity and possible eutrophication target

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March 22, 2019, Vladivostok, Russia

Outline of presentation

- Brief introduction to EcoQOs (Ecological Quality Objectives)
- Suggested six EcoQO indicators proposed by NOWPAP (POMRAC)
- EcoQO indicators and SDG14
- Summary of POMRAC WS (March 20, 21)
- Further discussion and the way forward

Introduction to NOWPAP EcoQOs

In 2014, NOWPAP member states have agreed on the following Ecological Quality Objectives (EcoQOs) for the whole NOWPAP region:

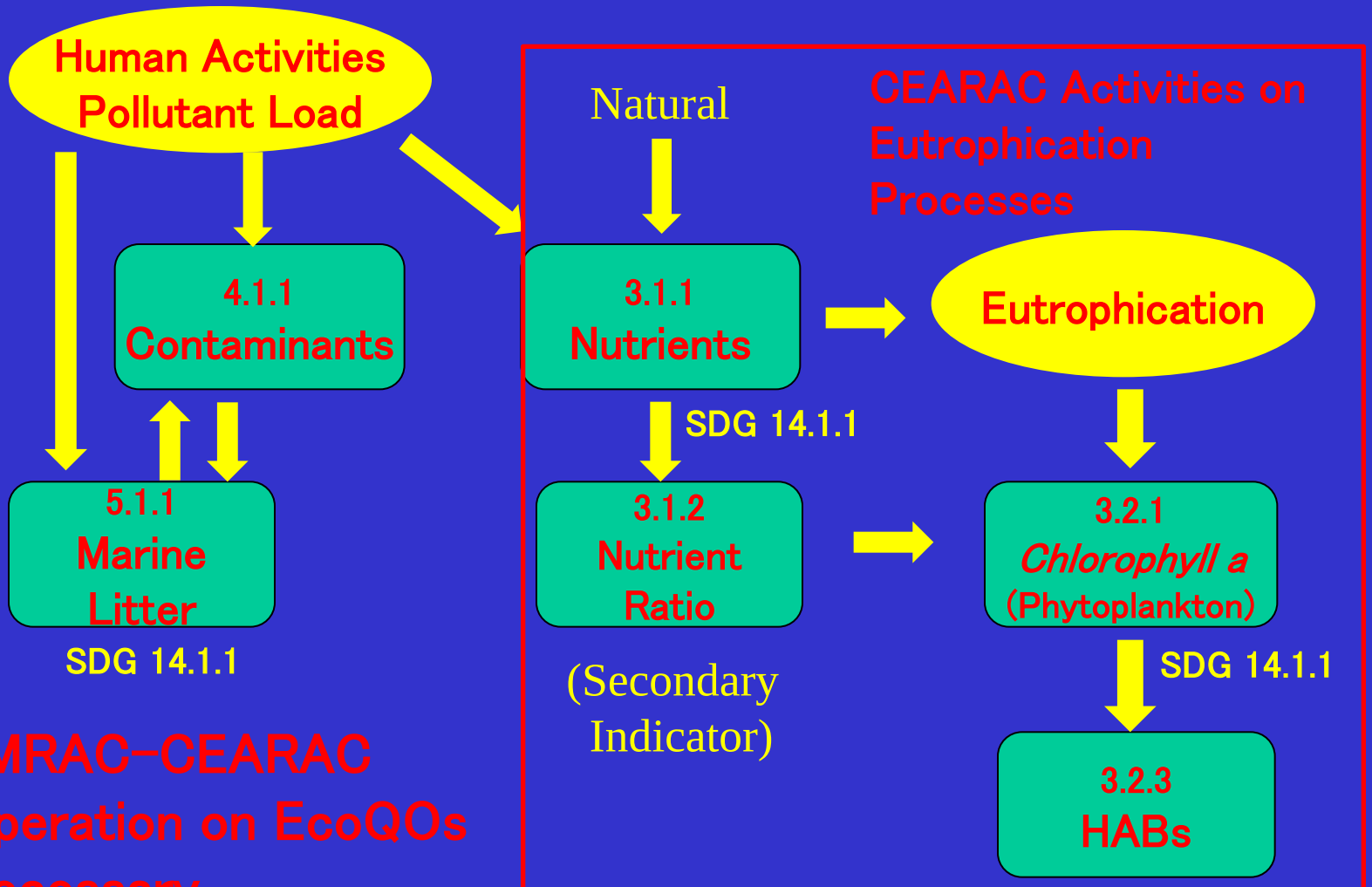
1) Biological and habitat diversity are not changed significantly due to anthropogenic pressure;
2) Alien species are at levels that do not adversely alter the ecosystems;
3) Eutrophication adverse effects (such as loss of biodiversity, ecosystem degradation, harmful algal blooms, and oxygen deficiency in bottom waters) are absent;
4) Contaminants cause no significant impact on coastal and marine ecosystems and human health;
5) Marine litter does not adversely affect coastal and marine environments.

Six EcoQO indicators agreed by NOWPAP

In 2016, after carefully considering 24 possible indicators and taking into account SDGs adopted in 2015, experts nominated by NOWPAP member states have agreed that the following six indicators could be used in the whole NOWPAP sea area.

3.1.1 Nutrients concentration in the water column
(possible SDG indicator 14.1.1)
3.1.2 Nutrient ratios (silica, nitrogen and phosphorus)
3.2.1 *Chlorophyll a* concentration in the water column
(possible SDG indicator 14.1.1)
3.2.3 Harmful algal blooms (HABs)
4.1.1 Concentration of contaminants in water,
sediments and organisms
5.1.1 Trends in the amount and composition of litter
washed ashore
(possible SDG indicator 14.1.1)

Outline of inter-linkage among suggested six EcoQO indicators and CEARAC activities



POMRAC-CEARAC cooperation on EcoQOs is necessary

SDGs

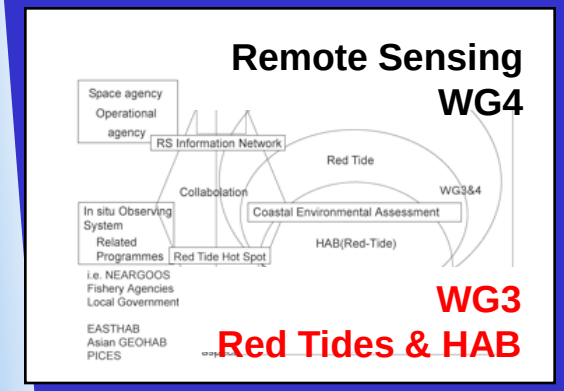
Adopted by all 193 nations of UN in September, 2015

(United Nations Information Centre)

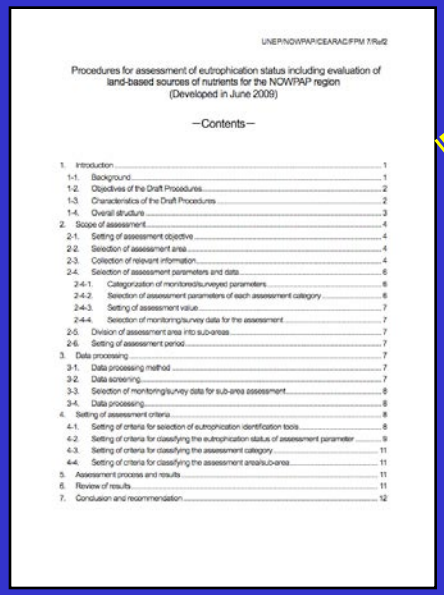
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development (Outline)

1) By 2025, prevent and significantly reduce marine pollution of all kinds, including marine debris and nutrient pollution.
2) By 2020, sustainably manage and protect marine and coastal ecosystems
3) Minimize and address the impacts of ocean acidification
4) By 2020, effectively regulate harvesting and end overfishing, IUU fishing and implement science-based management plans
5) By 2020, conserve at least 10 % of coastal and marine areas (MPA)
6) By 2020, prohibit fisheries subsidies which contribute to overfishing
7) By 2030, increase the economic benefits to small island developing States
8) Increase scientific knowledge and develop research capacity taking into account the IOC Criteria
9) Provide access for small-scale artisanal fishers to marine resources and markets
10) Enhance the conservation and sustainable use of oceans and their resources by implementing international law as UNCLOS

CEARAC activities on eutrophication at the first stage



CEARAC mid- and long term strategies 2007



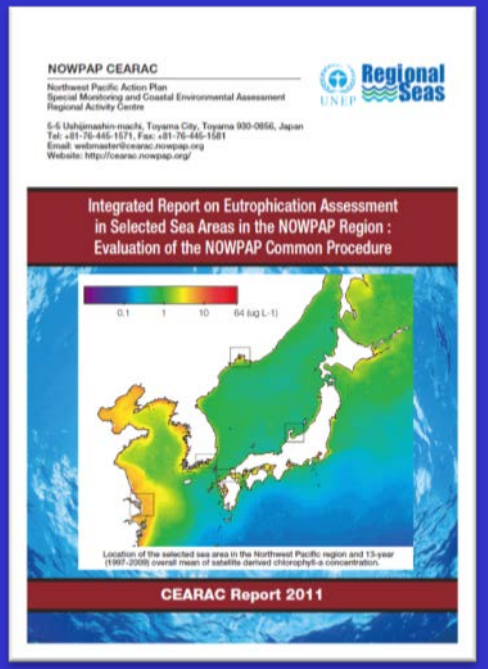
UNEP/NOWPAP/CEARAC/FPM 7/Rev2

Procedures for assessment of eutrophication status including evaluation of land-based sources of nutrients for the NOWPAP region
(Developed in June 2009)

—Contents—

Procedures for eutrophication assessment (NOWPAP Common Procedure)

2008-2009



Integrated report of eutrophication assessment

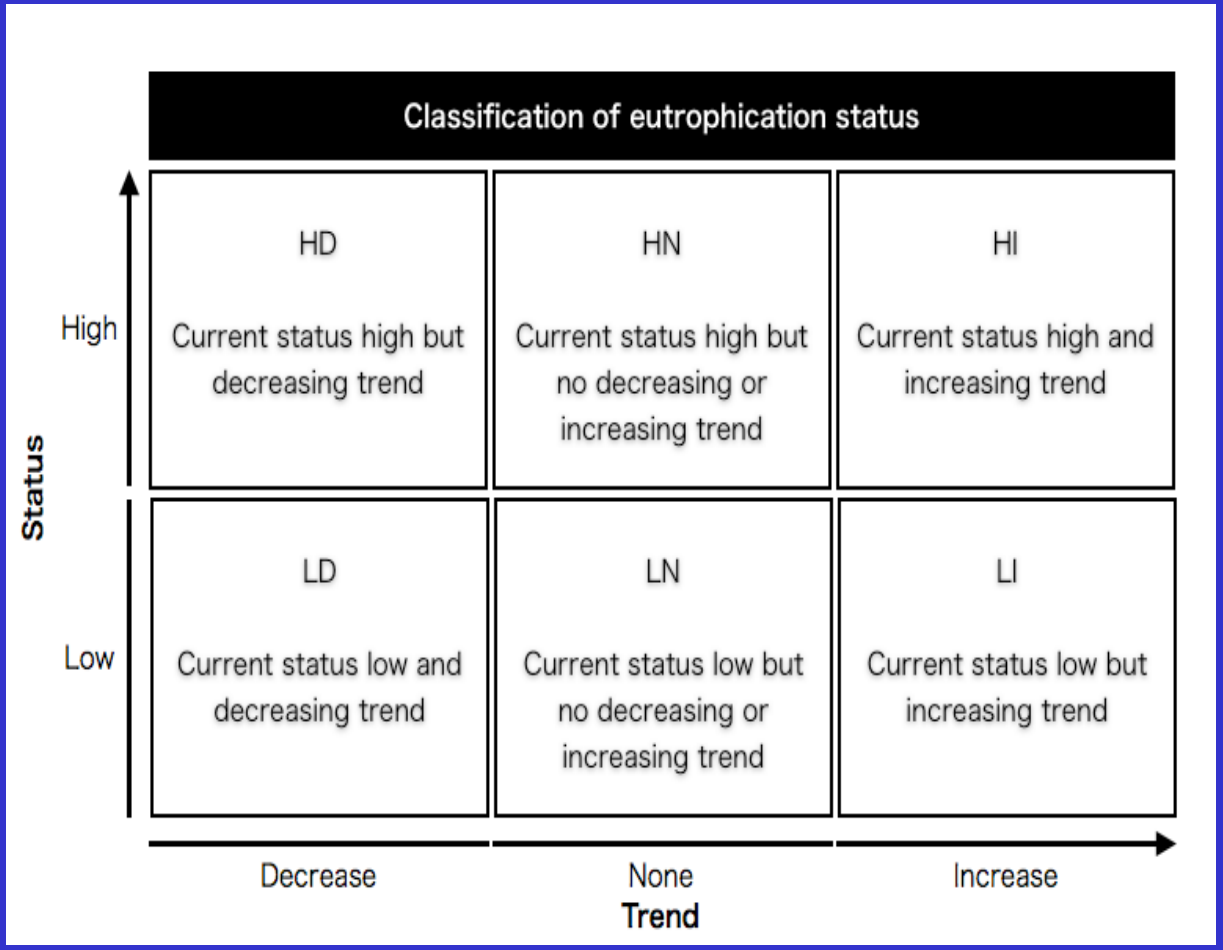
2010-2011

NOWPAP CEARAC FPM and Expert Meeting on assessment of eutrophication and marine biodiversity in 2010

High

Status

Low

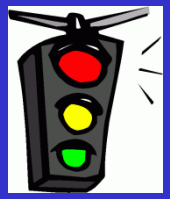


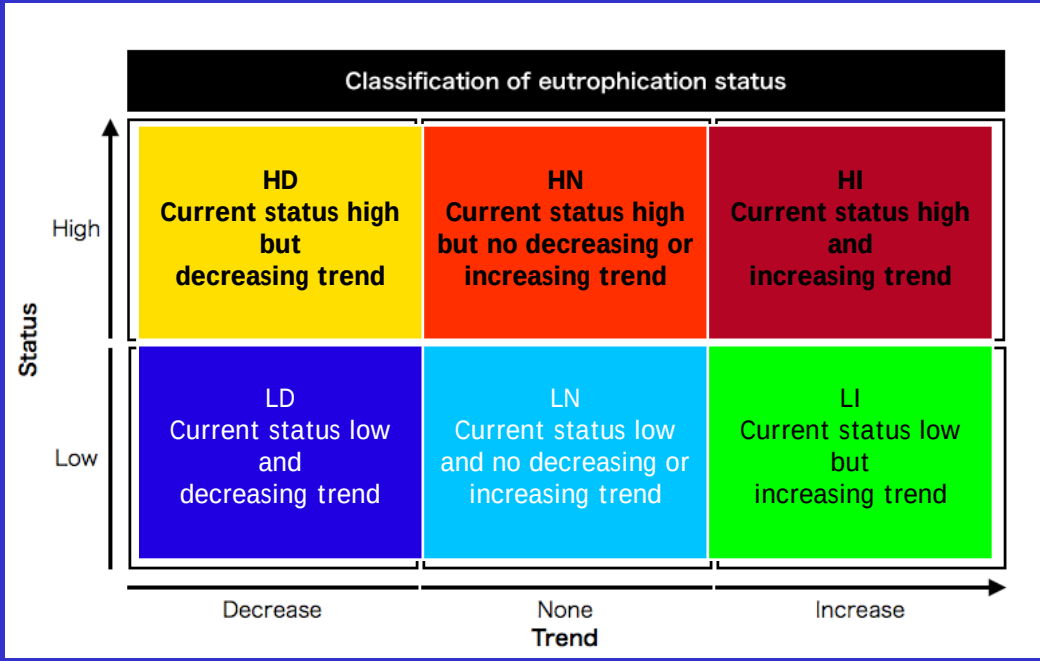
Decrease Trend Increase

Basic ideas of CEARAC for six classified categories of eutrophication based on "status" and "trend" of parameters. This evaluation was applied to nutrients, *Chl. a* and DO.

NOWPAP Common Procedure for eutrophication assessment (2009):

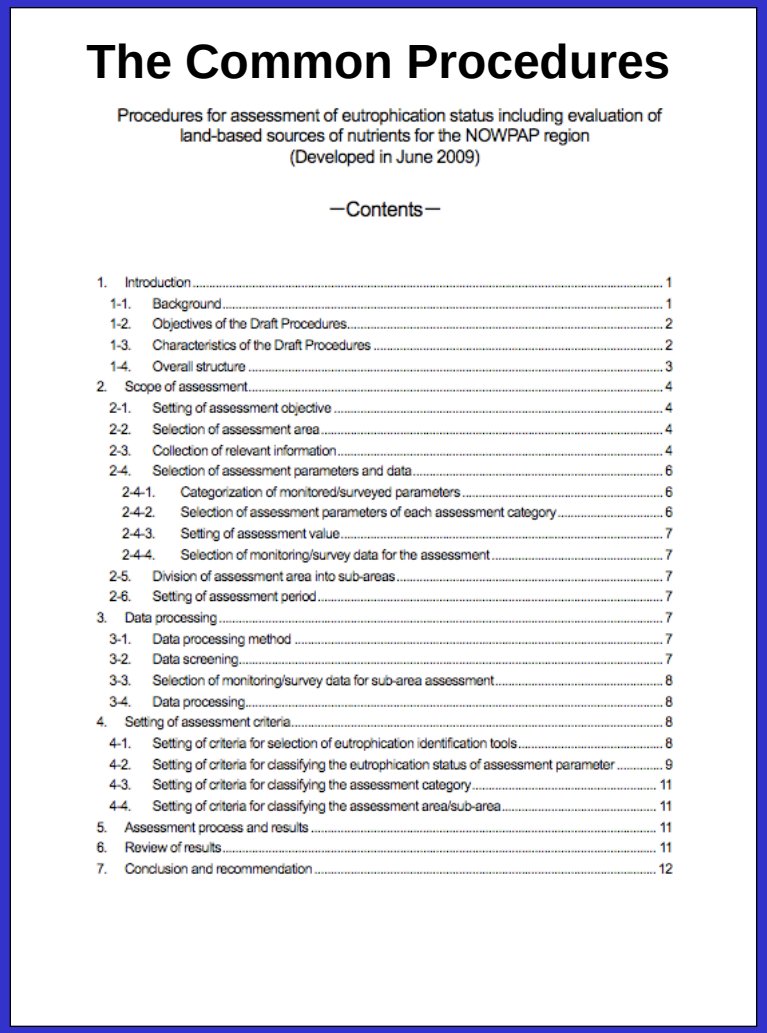
Initiatives to address or mitigate eutrophication





Classification based on the Common Procedures (NOWPAP CEARAC, 2009)

Reddish: high level of eutrophication
Bluish: less eutrophic



The Common Procedures

Procedures for assessment of eutrophication status including evaluation of land-based sources of nutrients for the NOWPAP region
(Developed in June 2009)

—Contents—

Selected sea areas in NOWPAP countries for case studies in 2010–2011 biennium

Common parameters and examples of assessment results in selected areas

Nation	Selected area	Sub-area	Eutrophicaion assessment results of common parameters					
			DIN conc.	DIP conc.	DIN/DIP ratio	Max. Chl-*a*	Mean Chl-*a*	DO
China	Changjiang/Yangtze River estuary and adjacent sea	-	HI	LI	HN	HN	LI	LN
Japan	Northwest Kyushu sea area	A: Hakata Bay	HI	LN	HI	HD	HD	LN
		B: Dokai Bay and Kanmon Strait	-	-	-	HN	HN	LN
		C: Intermediate area	LN	LD	HN*	LN	LN	LN
		D: Offshore area	-	-	-	N	N	HN
	Toyama Bay	A: Coastal area	LN	LN	HN*	LN	LN	LN
		B: Intermediate area	LN	LN	HN*	LN	LN	LN
		C: Offshore area	LN	LN	HN*	LN	LN	LI
Korea	Jinhae Bay	A: Jinhae Bay	LD	LD	LD	-	HD	LD
		B: Masan-Haengum Bay	LD	LD	LD	-	HD	LD
Russia	Peter the Great Bay	A: Amursky Bay	HI	HI	-	-	LI	HD
		B: Ussuriisky Bay	LN	LN	-	LN	LN	LN
		C: Southern part of the Peter the Great Bay	LN	LN	-	HN	LN	LN

*Parameter identification of the winter DIN/DIP ratio was not used for category identification, because winter DIN concentration and winter DIP concentration were lower than reference concentrations.

Parameters:

DIN, DIP
DIN/DIP ratio
Max Chl.a
Mean Chl.a
DO

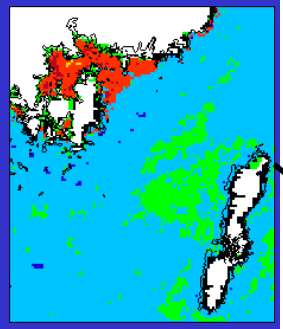
Reference values used in each selected area by CEARAC: not uniform (e.g.: DIN and Chl-a)

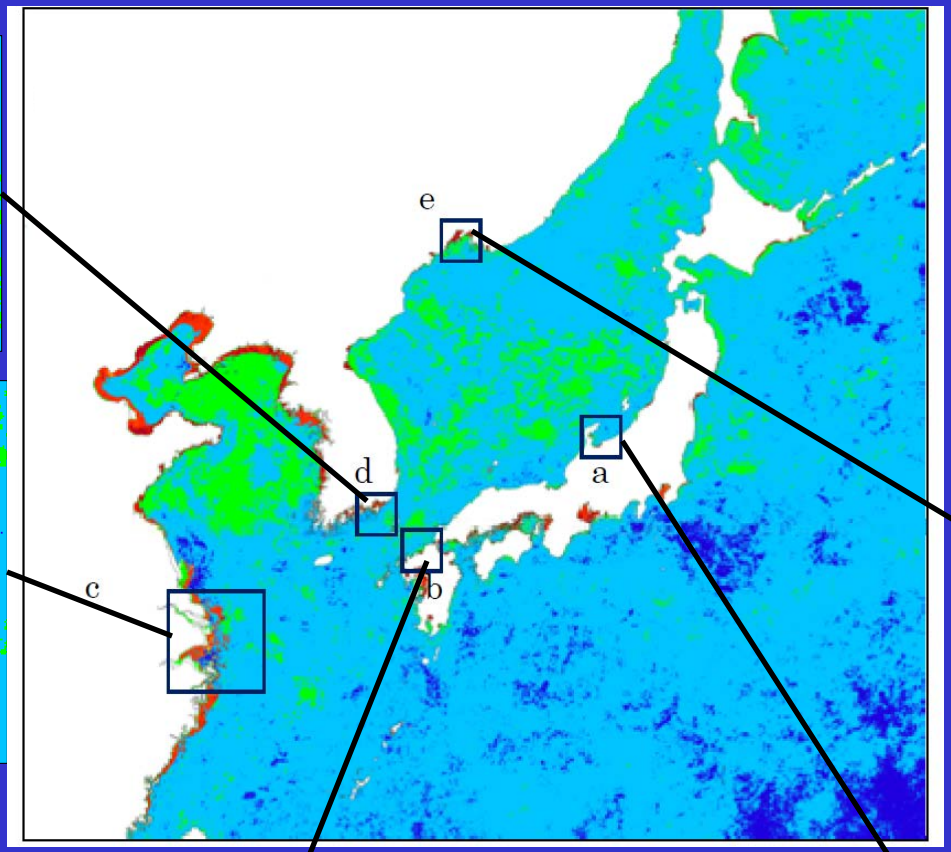
Selected sea areas	Reference value for DIN	Reference
Changjiang River estuary and its adjacent sea area	28.6 μM	NSQS (1997)
Northwest Kyushu sea area	12.1, 24.1, 40.1 μM	Environmental standard
Toyama Bay	10.3 μM	
Jinhae Bay	6.4 μM	Background value in Gijang coast
Peter the Great Bay	18.3, 24,3, 33.4 μM	Redfield *et al.* (1963)

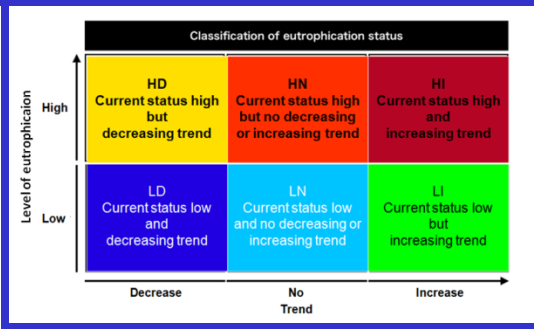
Selected sea areas	Reference value for annual Chl-a	Reference
Changjiang River estuary and its adjacent sea area	5 μg/L	Bricker *et al.* (2003)
Northwest Kyushu sea area	5 μg/L	Bricker *et al.* (2003)
Toyama Bay	5 μg/L	Bricker *et al.* (2003)
Jinhae Bay	2.4 μg/L	Gijang coast
Peter the Great Bay	8 μg/L	OECD(1982)

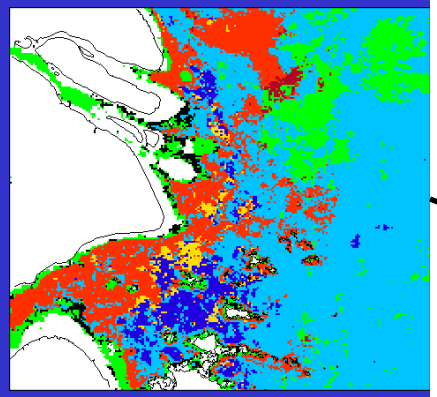
Example of eutrophication assessment by satellite derived Chl-*a* at the first stage

Jinhae Bay

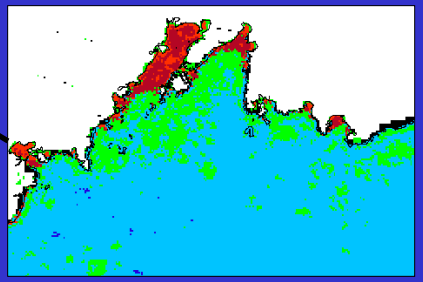




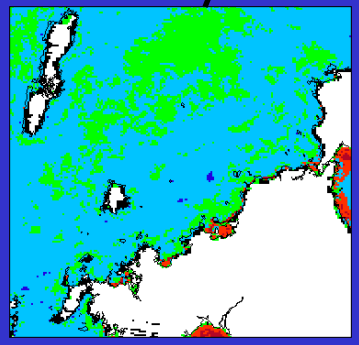




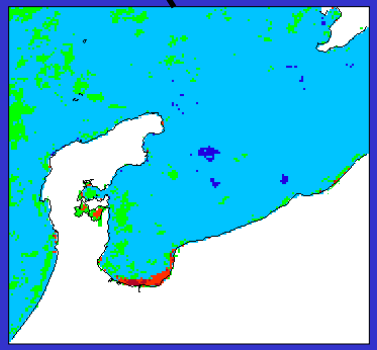
Changjiang River estuary and its adjacent sea area



Peter the Great Bay



Northwest Kyushu sea area



Toyama Bay

Outline of Regional Workshop on POMRAC activity “Development of regional NOWPAP EcoQO targets aligned with SDG indicators” held in Vladivostok, Russia, 20-21 March 2019

*Presentation of Dr. Shulkin on the POMRAC activity “Development of regional NOWPAP EcoQO targets aligned with SDG indicators”

*Presentation of expert from the People’s Republic of China (Dr. Lan)
from Japan (Prof. Matsuda)
from the Republic of Korea (Dr. Ryu)
from the Russia (Dr. Zuenko)

*Presentations from the regional partners related to the EcoQOs, indicators and targets” by Dr. Lobanov of WESTPAC

*Presentation of Dr. Tkalin on possible regional EcoQO targets

*Discussion on suggested regional targets and designated areas, taking into account experience of other Regional Seas Programmes

Outlined summary of POMRAC WS held in March, 2019

During the WS, national inputs were presented by member states and then active discussion was made on the suggested targets related to six EcoQO indicators agreed upon earlier (below).

3.1.1 Nutrients concentration in the water column
(possible SDG indicator 14.1.1)
3.1.2 Nutrient ratios (silica, nitrogen and phosphorus)
3.2.1 *Chlorophyll a* concentration in the water column
(possible SDG indicator 14.1.1)
3.2.3 Harmful algal blooms (HABs)
4.1.1 Concentration of contaminants in water,
sediments and organisms
5.1.1 Trends in the amount and composition of litter
washed ashore
(possible SDG indicator 14.1.1)

Outline of responses to POMRAC EcoQO indicators

Indicator		China	Japan	Korea	Russia	Remarks
Nutrients		P	P	P	P	positive
Nutrient ratio		(P)	(N)	(P)	(P)	
Chl. a I & II		(P)	P*	P	(P)	positive *CEARAC
HABs		P	N	N	N	negative
Contaminants	I	P	P	P	P	positive
	II	P	N	(P)	P	
Marine Litter	I	P	N	P	P	positive
	II	(N)	N	(P)	(P)	

P: positive or almost positive, N: negative or almost negative
(P): positive with some exceptions, (N): negative with some exceptions

Outlined summary of POMRAC WS held in March, 2019

Suggested designated area where preliminary EcoQO targets could be tested during the second phase of POMRAC activity on EcoQOs:

Outline of suggested designated area
China – Jiaozhou bay
Japan – Toyama bay and/or Hakata bay
Korea – Masan bay and coastal Ulsan *
Russia – Amursky bay

Target for the POMRAC EcoQO indicator 3.1.1:

Original proposal

Nutrients concentration in the water column

During the last 5 years, average autumn/winter concentrations on major nutrients in surface waters within the designated area do not exceed the following limits (mg/L).

Revised on March 21, 2019 at the WS

Nutrients concentration in the water column

Nutrient concentrations in the water column within designated area do not exceed baseline values* or existing national standards.

Target for the POMRAC EcoQO indicator 3.1.2:

Original proposal

Nutrient ratios (silica, nitrogen and phosphorus)
Major nutrient ratios (N/P, Si/N and Si/P) within the designated areas do not deviate significantly from their baseline values (observed previously in the same designated areas).

Decision on March 21, 2019 at the WS

National expert agreed that nutrient ratios could not be used as as EcoQO indicator (related to eutrophication) in the NOWPAP sea area.

Original proposal cancelled

Target for the POMRAC EcoQO indicator 3.2.1:

Chlorophyll a **concentration in the water column**

Suggestion I: Maximum and mean *Chlorophyll a* concentrations during the growing season?/or annual mean remain below a justified area–spesific % deviation from background not exceeding 50% (similar to OSPAR approach).

Suggestion II: Mean *Chlorophyll a* concentrations during the growing season?/or annual mean? do not exceed the following limits (similar to HELCOM approach).

Revised on March 21, 2019 at the WS

Chlorophyll a **concentration in the water column**

Chlorophyll a **concentrations within designated areas do not exceed the baseline values*.**

Target for the POMRAC EcoQO indicator 3.2.3:

Original proposal

Harmful algal blooms (HABs)

During the last 5 years, average annual number of HABs registered within the designated areas is decreasing (statistically defined) comparing with previous 5–year period.

Decision on March 21, 2019 at the WS

National expert agreed that HAB frequency could not be used as an EcoQO indicator (related to eutrophication) in the NOWPAP sea area.

Original proposal cancelled

Target for the POMRAC EcoQO indicator 4.1.1

Concentration of contaminants in water, sediments and organisms

Suggestion I: During the last 5 years, the average concentrations in surface water within the designated area do not exceed the following limits.

Suggestion II: During the last 5 years, the average concentrations in marine organisms (consumed by humans) within the designated area do not exceed the following limits.

Decision on March 21, 2019 at the WS
(Suggestion I revised and Suggestion II cancelled)

Concentration of contaminants in water and sediments

During the last 5 years, contaminant concentrations in water and surface sediments within the designated area do not exceed the existing national standards. (with *)

Target for the POMRAC EcoQO indicator 5.1.1

Trends in the amount and composition of litter washed ashore (possible SDG indicator 14.1.1)

Suggestion I: During the last 5 years, there is a decreasing trend (statistically defined) in the amount of marine litter washed ashore (items per square meter), floating on sea surface (items per square kilometer), and deposited on sea floor within the major fishing areas (items per square meter).

Suggestion II: During the last 5 years, the amount of marine animals found dead due to entanglement/ingestion of marine litter is decreasing (statistically defined).

Decision on March 21, 2019 at the WS
(Suggestion I revised and Suggestion II cancelled)

Trends in the amount and composition of litter washed ashore

During the last 5 years, there is a decreasing trend (statistically significant) in the amount of marine litter washed ashore.

The Project of Harmonization of Marine Microplastics Monitoring Methodologies, conducted by MoEJ

Background

(to this project experts from 4 NOPAP countries join)

- Marine litter including microplastic is globally urgent matter. Measures against marine litter and microplastics need to be considered and taken, based upon scientific knowledge.
- Understanding their actual condition is important, however…
- Comparing and synthesizing measured data of microplastic abundance obtained by various researchers are currently difficult due to the diversified monitoring methods taken.

- 'G7 Action Plan to Combat Marine Litter' was agreed in G7 Elmau Summit in 2015.
- Communique adopted at G7 Toyama Environment Ministers' meeting in 2016 committed to implement five priority measures in accordance with national circumstances, including **actions towards standardizing and harmonizing monitoring methodologies for microplastics**.
- Expert workshop held in Germany in 2015 following-up G7 Elmau Summit agreed that **Japan would lead the field of standardization and harmonization**.

'The Project of Harmonization of Microplastics Monitoring Methodologies' in the Ocean has been conducted by MoEJ since FY2016.

The Project of Harmonization of Marine Microplastics Monitoring Methodologies, conducted by MoEJ

Goals

- Focus on net sampling and sample analysis methods
  - For developing distribution map of microplastics on sea surface
- Identify technical parameters to be harmonized
  - Considering minimum requirements and specific needs

ex. Sampling-net towing condition (duration, area etc.), type of sampling net (mesh size, shape), identification of polymer-type (PE, PP, PS, PET), etc.

Recommendation on Marine Microplastics Monitoring.

Steps

FY2016
- Initial draft of recommendation of microplastic monitoring by international expert group

FY2017
- Revising the draft focusing analyzing method with a participation of laboratories in 10 countries analyzing standardized samples.

FY2018
- Revising the draft focusing of field sampling on sea surface based on the comparison experiment of different sampling methods
- Compiling draft guidelines for marine microplastic monitoring

Inputs to GESAMP, UNEP, and WESTPAC (IOC-UNESCO)

Further discussion and the way forward:

- How can POMRAC make use of valuable experiences of eutrophication assessment developed by CEARAC in the progress of EcoQO indicators, in particular of nutrient concentration, *Chlorophyll a* and HABs?
- What lesson can POMRAC learn from CEARAC case study of eutrophication assessment conducted in designated sea areas including monitoring, data processing and evaluation?
- New international "Marine Microplastics Monitoring Methodologies" project to which experts from 4 NOWPAP countries are participating and "A manual on Ocean Statistics" (UN Environment) should be taking into account.

Acknowledgments:

The author would like to thank Dr. Genki Terauchi of NPEC (CEARAC) for providing valuable figures and information.

Thank you very much for your attention!