United Nations Environment Programme

Northwest Pacific Action Plan (NOWPAP)

Pollution Monitoring Regional Activity Centre (POMRAC)

Regional Workshop on POMRAC activity

"Development of regional NOWPAP EcoQO targets aligned with SDG indicators"

Vladivostok, Russia, 20-21 March 2019

working document

Background

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

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

In 2016, after carefully considering 24 possible indicators and taking into account Sustainable Development Goals (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 to monitor the quality of the marine and coastal environment (along with the EcoQOs mentioned above):

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).

The 22nd NOWPAP Intergovernmental Meeting (IGM) has approved the Programme of Work for 2018-2019 biennium, including the first phase of the POMRAC activity "Development of regional EcoQO targets aligned (where possible) with SDG indicators." Three of six indicators agreed by NOWPAP experts could be aligned in the future with indicators related to the Sustainable Development Goal 14.1: "By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution." The goal of the first phase of this POMRAC activity is ***to analyze the national numerical targets (where they exist) related to NOWPAP EcoQO indicators and suggest (and then discuss) possible regional EcoQO targets aligned to the extent possible with the SDG-14 indicators***. At this stage, only two proxy indicators have been suggested by UNEP and IOC UNESCO for the SDG 14.1: *Chlorophyll a* concentration and the amount of marine debris washed ashore. The second phase of this POMRAC activity will be discussed in September-October 2019 at the next (16th) POMRAC Focal Points Meeting (FPM).

Goal of the workshop

According to the approved POMRAC workplan for the 2018-2019 biennium, the goal of the workshop to be held in March 2019 is to discuss possible regional EcoQO targets. Four of six above mentioned EcoQOs indicators are related to coastal eutrophication. Therefore, while preparing suggestions on the

regional EcoQO targets, relevant achievements of NOWPAP CEARAC in the eutrophication assessment have been used, including reference values presented in several reports (e.g., http://www.cearac-project.org/cearac-project/integrated-report/eut_2013.pdf).

Experience of other Regional Seas programmes (HELCOM, MAP and OSPAR) and some NOWPAP partners (such as YSLME) also has been taken into account, including the following reports (as well as working documents used for preparing those reports):

- Updated State of the Baltic Sea report (2018) available at http://stateofthebalticsea.helcom.fi/;
- Mediterranean 2017 Quality Status Report (available at https://www.medqsr.org/);
- OSPAR Intermediate Assessment 2017 (available at https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/).

While each of NOWPAP member states has well-developed national standards used to monitor and manage marine environmental quality, there are several major problems with setting regional EcoQO targets for the whole NOWPAP sea area. First of all, unlike e.g. the European Union, NOWPAP member states do not have any common legislation which would allow prescribing what standards should be used in any particular country. Some leading Regional Seas programmes, such as HELCOM, MAP and OSPAR, have legally-binding conventions (which were ratified by each participating country), while NOWPAP member states only have adopted Action Plan (i.e. no legally-binding convention).

Second major problem (though similar problems also exist in sea areas covered by HELCOM, MAP, OSPAR and some other similar programmes) is: there are significant differences in geographic and socio-economic conditions in NOWPAP member states and in different areas of NOWPAP sea area. For example, in the northern (sub-arctic) regions of the Russian Far East (part of the NOWPAP sea area), population density could be as low as 1.2 persons per square kilometer and therefore anthropogenic pressure on the marine environment is negligible. At the same time, in coastal provinces of China facing the NOWPAP sea area population density could be as high as 268 persons per square kilometer. Population density in Korea in 2015 was 505 persons per square kilometer. Industry, agriculture and mariculture in coastal areas of China, Japan and Korea are much more developed than in the Russian Far East. At the same time, some coastal regions of China, Japan and Korea within the NOWPAP sea area are sub-tropical (i.e. in sharp contrast with the sub-arctic areas of the Russian Far East).

Different levels of economic development (including industry, agriculture, fisheries and aquaculture) result in different levels of anthropogenic pressure on the marine and coastal environment. River discharge of nutrients and other chemical substances, location of port facilities and offshore installations, density of shipping lanes, as well as coastal geomorphology and hydrography, also affect the marine environmental conditions in NOWPAP member states.

Due to these major problems, it is suggested that during the first phase of this POMRAC activity, each NOWPAP member state choses a “designated area” where monitoring data for several years are available (e.g. Masan Bay in Korea or Amursky Bay in Russia). Again, the reference values suggested for selected sea by the CEARAC experts on eutrophication assessment will be taken into account. Then nominated national experts agree on EcoQO targets (for those six indicators agreed upon) for each

designated area using common and coordinated approach while taking into account national legislation, data availability, experience from other regions, etc.

Then, during 2020-2021 and later on (during the second phase of this activity), nominated national experts will try to ”test” the agreed EcoQO targets by observing actual monitoring data in their designated areas in comparison with the agreed targets. By doing so, experts will observe if agreed EcoQO targets are indeed feasible and easily applicable in their countries. In 2022-2023, nominated experts will discuss the EcoQO targets agreed upon earlier together with recent national monitoring data within the designated areas and consider if any changes in EcoQO targets are needed. At that time, SDG 14.1 indicators might be further developed by UNEP and IOC UNESCO and NOWPAP EcoQO targets might be further aligned with those indicators.

On the following pages, possible EcoQO targets are suggested for discussion. Special attention should be given to those targets which could be aligned with the SDG 14.1 indicators (nutrients, *Chlorophyll a*, and marine litter). Numerical values in the tables should be considered only as EXAMPLES to be discussed and probably corrected by experts at the workshop. In some cases, more than one option is suggested for discussion. Text shown in red color also requires careful consideration. Examples from NOWPAP CEARAC report (http://www.cearac-project.org/cearac-project/integrated-report/eut_2013.pdf) as well as from HELCOM, MAP, OSPAR and YSLME are shown below for easy reference.

Suggested target for the NOWPAP EcoQO indicator 3.1.1:
Nutrients concentration in the water column

Suggestion: 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):

Designated area	**Suggested target (mg/L)**
Jiaozhou bay, China (second level)	DIN – 0.3 DIP – 0.03
Hakata bay, Japan (class II)	TN – 0.3 TP – 0.03
Masan bay, Korea (???)	DIN - ??? DIP - ???
Amursky bay, Russia (mesotrophic waters)	DIN – 0.34 (autumn) - 0.47 (winter) DIP – 0.05 (autumn) – 0.07 (winter)

Table Ошибка! Текст указанного стиля в документе отсутствует..**1 from CEARAC 2013 report: Reference values used in Jiaozhou Bay in China**

Categories	Assessment parameters	Reference value	Reference
I	TN concentration	0.6 mg/L (42.9 μM)	Japan Fishery type 2
	TP concentration	0.05 mg/L (1.61 μM)	Japan Fishery type 2
	DIN concentration	0.3 mg/L (21.4 μM)	NSQS Class II
	DIP concentration	0.03 mg/L (0.97 μM)	NSQS Class II
	DIN/DIP ratio	16	Redfield ratio
Ⅱ	Maximum of chlorophyll-*a*	20 μg/L	Bricker et al., 2003
	Mean of chlorophyll-*a*	5 μg/L	Yao et al., 2007; Xia et al., 2012
	Red tide events (diatom species)	1 event/3 years	CEARAC Report 2011
	Red tide events (flagellate species)	1 event/3 years	CEARAC Report 2011
Ⅲ	DO at bottom layer	2 mg/L	Bricker et al., 2003
	COD	3 mg/L	NSQS Class II
	Fish kill incidents	1 event/3 years	CEARAC Report 2011
IV	Red tide events (*Noctiluca* sp. and *Mesodinium* sp.)	3 event/3 years	CEARAC Report 2011
	Shell fish poisoning incidents	1 event/3 years	CEARAC Report 2011

Table Ошибка! Текст указанного стиля в документе отсутствует.**.2 from CEARAC 2013 report: Reference values used in the North Kyushu sea area, Japan**

Categories	Assessment parameters	Reference value	Reference
Ⅰ	Riverine input of TN	None	None
	Riverine input of TP	None	None
	Input from direct discharge of TN	None	None
	Input from direct discharge of TP	None	None
	TN concentration	0.3 mg/L	Environmental quality standards for water pollution, Type II
		0.6 mg/L	Environmental quality standards for water pollution, Type III
		1.0 mg/L	Environmental quality standards for water pollution, Type IV
	TP concentration	0.03 mg/L	Environmental quality standards for water pollution, Type II
		0.05 mg/L	Environmental quality standards for water pollution, Type III
		0.09 mg/L	Environmental quality standards for water pollution, Type IV
	Winter DIN concentration	0.170 mg/L	Correspond to 'Environmental quality standards for water pollution, Type II'
		0.338 mg/L	Correspond to 'Environmental quality standards for water pollution, Type III'
		0.562 mg/L	Correspond to 'Environmental quality standards for water pollution, Type IV'
	Winter DIP concentration	0.010 mg/L	Correspond to 'Environmental quality standards for water pollution, Type II'
		0.017 mg/L	Correspond to 'Environmental quality standards for water pollution, Type III'
		0.029 mg/L	Correspond to 'Environmental quality standards for water pollution, Type IV'
	Winter DIN/DIP ratio	16	Redfield ratio
Ⅱ	Annual maximum of chlorophyll-*a*	20 μg/L	Bricker et al., 2003
	Annual mean of chlorophyll-*a*	5 μg/L	Bricker et al., 2003
	Red tide events (diatom species)	1 event/3 year	None
	Red tide events (flagellate species)	1 event/3 year	None
Ⅲ	DO at bottom layer	4.3 mg/L	Fisheries water quality standard
		3.6 mg/L	Yanagi, 1989
	Fish kill incidents	1 event/3 year	None
	COD	3.0 mg/L	Environmental quality standards for water pollution, Type B
	Transparency	None	None
Ⅳ	Red tide events (*Noctiluca* sp.)	3 event/3 years	None
	Shell fish poisoning incidents	1 event/3 year	None

Table Ошибка! Текст указанного стиля в документе отсутствует.**.3 from CEARAC 2013 report: Reference values used in Toyama Bay in Japan**

Categories	Assessment parameters	Reference value	Reference
Ⅰ	Riverine input of TN	None	None
	Riverine input of TP	None	None
	Input from direct discharge of TN	None	None
	Input from direct discharge of TP	None	None
	TN concentration	0.3 mg/L	Environmental quality standards for water pollution, Type II
	TP concentration	0.03 mg/L	Environmental quality standards for water pollution, Type II
	Winter DIN concentration	0.144 mg/L	Set based on the relationship between TN and DIN
	Winter DIP concentration	0.017 mg/L	Set based on the relationship between TP and DIP
	Winter DIN/DIP ratio	16	Redfield ratio
Ⅱ	Annual maximum of chlorophyll-*a*	20 μg/L	Bricker et al., 2003
	Annual mean of chlorophyll-*a*	5 μg/L	Bricker et al., 2003
	Red tide events (diatom species)	1 event/year	None
	Red tide events (flagellate species)	1 event/year	None
Ⅲ	Annual minimum DO	6.0 mg/L	Fisheries water quality standard
	Fish kill incidents	1 event/year	None
	COD	3.0 mg/L	Environmental water quality standard Type B
Ⅳ	Red tide events (*Noctiluca* sp.)	3 event/3 years	None
	Shell fish poisoning incidents	1 event/year	None

Table Ошибка! Текст указанного стиля в документе отсутствует.**.4 from CEARAC 2013 report: Reference values used in Jinhae Bay in Korea**

Categories	Assessment parameters	Reference value	Reference
Ⅰ	Riverine input of TN	20 mg/L	Chang et al., 2012
	Riverine input of TP	2 mg/L	Chang et al., 2012
	TN concentration	0.4 mg/L	Background value in Gijang area
	TP concentration	0.04 mg/L	Background value in Gijang area
	Winter DIN concentration	0.2 mg/L	Background value in Gijang area
	Winter DIP concentration	0.02 mg/L	Background value in Gijang area
	Winter DIN/DIP ratio	16	Redfield ratio
Ⅱ	Annual maximum of chlorophyll-*a*	15 μg/L	Background value in Gijang area
	Annual mean of chlorophyll-*a*	4 μg/L	Background value in Gijang area
	Red tide events (diatom species)	1 event/3 years	CEARAC Report 2011
	Red tide events (flagellate species)	1 event/3 years	CEARAC Report 2011
Ⅲ	DO at bottom layer	4 mg/L	OSPAR, 2005
	Fish kill incidents	1 event/3 years	CEARAC Report 2011
	COD	1.5 mg/L	Background value in Gijang area
Ⅳ	Red tide events (*Noctiluca* sp. and *Mesodinium* sp.)	3 event/3 years	CEARAC Report 2011
	Shell fish poisoning incidents	1 event/3 years	CEARAC Report 2011

Table Ошибка! Текст указанного стиля в документе отсутствует.**.5 from CEARAC 2013 report: Reference values used in Peter the Great Bay in Russia**

Categories	Assessment parameters	Reference value	Reference
Ⅰ	Riverine input of DIN	none	none
	Riverine input of DIP	none	none
	DIN concentration	33.4 μM (0.47 mg/L)	Winter
		24.3 μM (0.34 mg/L)	Spring, Autumn
		18.3 μM (0.26 mg/L)	Summer
	DIP concentration	2.1 μM (0.065 mg/L)	Winter
		1.5 μM (0.046 mg/L)	Spring, Autumn
		1.1 μM (0.034 mg/L)	Summer
	DSi concentration	35.5 μM (0.997 mg/L)	Winter
		25.8 μM (0.725 mg/L)	Spring, Autumn
		19.4 μM (0.545 mg/L)	Summer
	DIN/DIP ratio	none	none
Ⅱ	Annual mean of chlorophyll-*a*	8 μg/L	OECD, 1982
	Annual maximum of chlorophyll-*a*	8 μg/L	OECD, 1982
Ⅲ	Annual mean of DO at bottom layer	none	none
	Annual minimum of DO at bottom layer	76 μM (2.4 mg/L)	Diaz, 2001
		89 μM (2ml/L)	Breitburg et al., 2009
Ⅳ	Fish kill incidents	none	none
	Benthic fauna and flora	none	none

Box 1. Examples from MAP and HELCOM (Nutrients concentration)

Proposed MAP targets:

- Reference nutrients concentrations according to the local hydrological, chemical and morphological characteristics of the un-impacted marine region.
- Decreasing trend of nutrients concentrations in water column of human impacted areas, statistically defined.
- Reduction of nutrients emissions from land based sources

HELCOM total phosphorus threshold values for some sea areas ("assessment units") agreed by experts (not all assessment units are shown here):

HELCOM ID	Assessment unit (open sea)	Threshold value [µmol/L]
SEA-001	Kattegat	0.64
SEA-002	Great Belt	0.95
SEA-003	The Sound	0.68
SEA-008	Gdansk Basin	0.60
SEA-010	Western Gotland Basin	0.45
SEA-011	Gulf of Riga	0.70
SEA-012	Northern Baltic Proper	0.38
SEA-013	Gulf of Finland	0.55
SEA-014	Åland Sea	0.28
SEA-015	Bothnian Sea	0.24
SEA-016	The Quark	0.24
SEA-017	Bothnian Bay	0.18

Suggested target for the NOWPAP EcoQO indicator 3.1.2:
Nutrient ratios (silica, nitrogen and phosphorus)

Suggestion: 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).

Note: nutrient ratios are not used in HELCOM and OSPAP assessments; in MAP, nutrient ratios are considered only as sub-indicator, without numerical targets.

Suggested target for the NOWPAP EcoQO indicator 3.2.1:

***Chlorophyll a* concentration in the water column**

Suggestion 1: Maximum and mean *Chlorophyll a* concentrations during the growing season?/or annual mean remain below a justified area-specific % deviation from background not exceeding 50% (similar to OSPAR approach).

Suggestion 2: Mean *Chlorophyll a* concentrations during the growing season?/or annual mean? do not exceed the following limits (Similar to HELCOM approach):

Designated area	Suggested target (µg/L)	Remarks
Jiaozhou bay, China	5	CEARAC, 2013 after Xia et al., 2012
Hakata bay, Japan	5	CEARAC, 2013 after Bricker et al., 2003
Masan bay, Korea	???	???
Amursky bay, Russia	8	CEARAC, 2013 after OECD, 1982

Box 3. Example from HELCOM (*Chlorophyll a*)

***Chlorophyll a* threshold values for some sea areas ("assessment units") agreed by experts:**

HELCOM ID	Assessment unit (open sea)	Threshold value (µg/L)
SEA-001	Kattegat	1.5
SEA-002	Great Belt	1.7
SEA-003	The Sound	1.2
SEA-004	Kiel Bay	2.0
SEA-005	Bay of Mecklenburg	1.8
SEA-006	Arkona Basin	1.8
SEA-007	Bornholm Basin	1.8
SEA-008	Gulf of Gdansk	2.2
SEA-009	Eastern Gotland Basin	1.9
SEA-010	Western Gotland Basin	1.2
SEA-011	Gulf of Riga	2.7
SEA-012	Northern Baltic Proper	1.7
SEA-013	Gulf of Finland	2
SEA-014	Åland Sea	1.5
SEA-015	Bothnian Sea	1.5
SEA-016	The Quark	2
SEA-017	Bothnian Bay	2

Suggested target for the NOWPAP EcoQO indicator 3.2.3:
Harmful Algal Blooms (HABs)

Suggestion: 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.

Note: Number of HABs occurrence is not considered in HELCOM, MAP and OSPAR assessments.

Suggested target for the NOWPAP EcoQO indicator 4.1.1:
Concentration of the contaminants in water, organisms and sediments ???

Suggestion 1: During the last 5 years, the average concentrations in surface waters within the designated area do not exceed the following limits:

Designated area	Suggested target (µg/L)	Remarks
Jiaozhou bay, China (second level)	Cd – 5 Cu – 10 Pb – 5 Hg – 0.2 Ni – 10 Zn – 50 DDTs – 0.1 HCHs - 2	
Hakata bay, Japan (human health-related)	Cd – 3 Cu – --- Pb – 10 Hg – 0.5 Ni – ??? Zn – ??? DDTs – ??? HCHs - ???	
Masan bay, Korea (chronic toxicity)	Cd – 2.2 Cu – 1.2 Pb – 1.6 Hg – 1.0 Ni – 1.8 Zn – 11 DDTs – ??? HCHs - ???	
Amursky bay, Russia (waters for fisheries)	Cd – 5 Cu – 1 Pb – 6 Hg – 0.01 Ni – 10 Zn – 10 DDTs – 0.01 HCHs – 0.01	

Suggestion 2: During the last 5 years, the average concentrations in marine organisms (consumed by humans) within the designated area do not exceed the following limits:

Designated area	Suggested target (mg/kg)	Remarks
Jiaozhou bay, China (marine organisms)	As – 5.0 Cd – 0.2 Cu – 25 Pb – 2.0 Hg – 0.1 Ni – ??? Zn – 50 DDTs – 0.10 HCHs – 0.15	
Hakata bay, Japan (human health-related)	As – ??? Cd – ??? Cu – ??? Pb – ??? Hg – ??? Ni – ??? Zn – ??? DDTs – ??? HCHs -???	
Masan bay, Korea (chronic toxicity)	As – ??? Cd – ??? Cu – ??? Pb – ??? Hg – ??? Ni – ??? Zn – ??? DDTs – ??? HCHs -???	
Amursky bay, Russia (mollusks and other invertebrates)	As – 5 Cd – 2.0 Cu – 30 Pb – 10 Hg – 0.2 Zn – 200	

Box 5. Examples from OSPAR and YSLME (Concentration of contaminants)

OSPAR targets: Hg, Cd, Pb, PCB, PAHs, Organotin, PBDE and HCB concentrations in sediments and biota agreed by experts for different OSPAR sub-regions

YSLME SAP targets on contaminants:
Target 4: Meeting international requirements on contaminants
Target 5: Reduction of total loading of nutrients from 2006 levels
Target 7: Reduce contaminants, particularly in bathing beaches and other marine recreational waters, to nationally acceptable levels

Some relevant YSLME SAP activities:

- Review of policies and regulations in China and RO Korea dealing with pollution control and assess compliance with UNCLOS, the Future We Want, multi-lateral environmental agreements and programs ratified by both countries, and prioritize legal and regulatory reforms in both countries
- Establish regional pollution monitoring guideline, environmental quality standards and network based on any existing ones: harmonize regional methodology and update regional monitoring guideline including for emerging contaminants
- Support to apply modeling and calculate nutrient loading in hot spots/ critical habitats

Suggested target for the NOWPAP EcoQO indicator 5.1.1:
Trends in the amount and composition of litter washed ashore

Suggestion 1: 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 2: During the last 5 years, the amount of marine animals found dead due to entanglement/ingestion of marine litter is decreasing (statistically defined).

Box 6. Examples from MAP and YSLME

MAP targets on marine litter:

- Decreasing trend in the number of/amount of marine litter (items) deposited on the coast
- Trends in the amount of litter in the water column (including microplastics) and on the seafloor

YSLME SAP target on marine litter:
Target 6: Reduced standing stock of marine litter from current level

Relevant YSLME SAP activities:

- Support to develop regulatory measures for marine litter monitoring
- Develop and test monitoring system, and conduct a regional baseline survey of marine litter in collaboration with other relevant organizations