

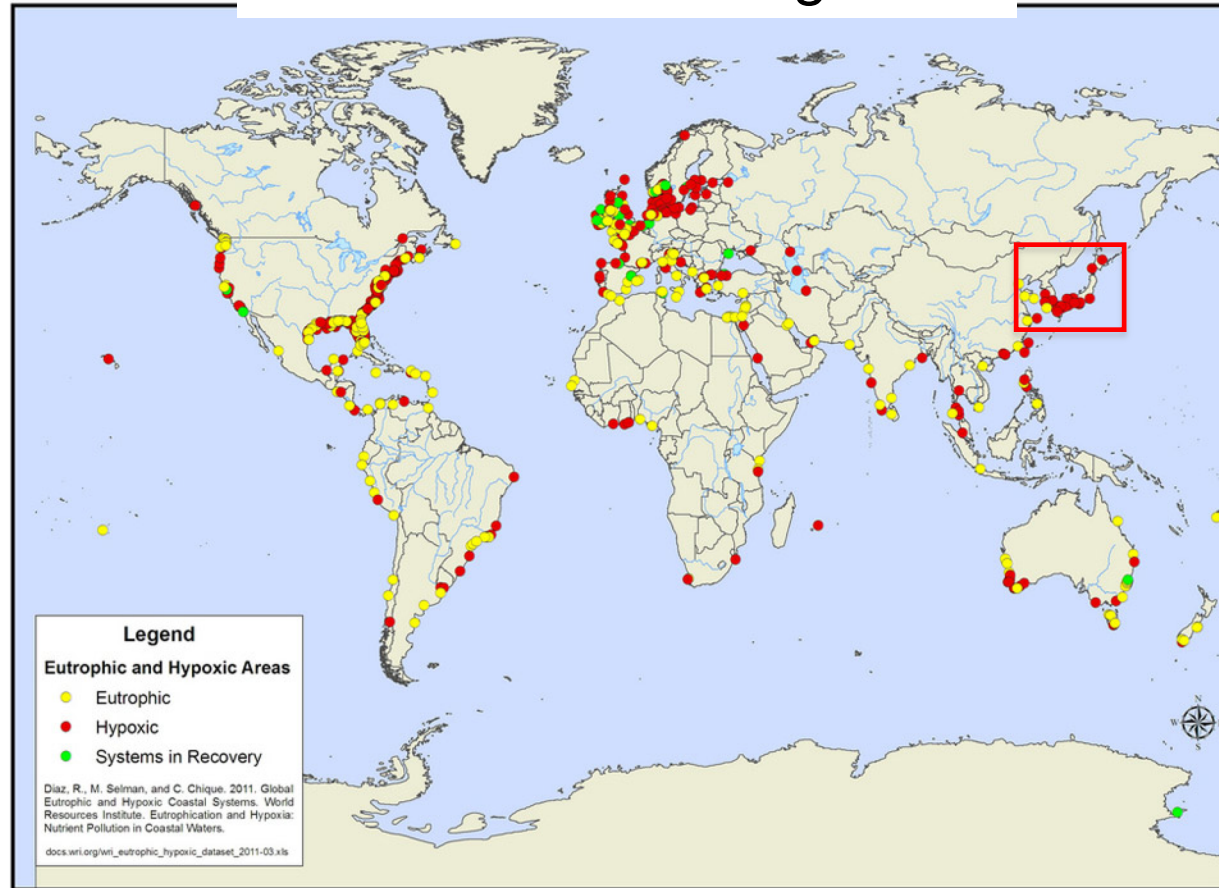
Briefing of the activity on trial application of the screening procedure of the NOWPAP Common Procedure for eutrophication assessment

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NOWPAP CEARAC

October 18, 2017

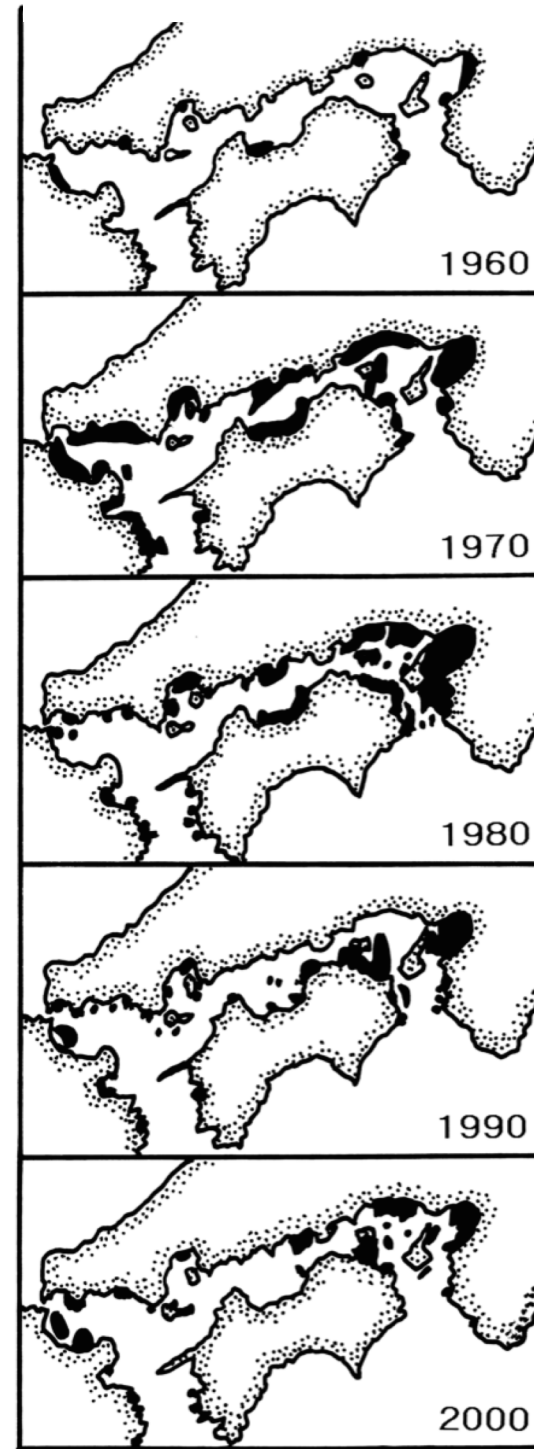
Eutrophication as a threat in the Northwest Pacific

Diaz and Rosenberg 2008



Spreading dead zones

Imai and Hori 2006



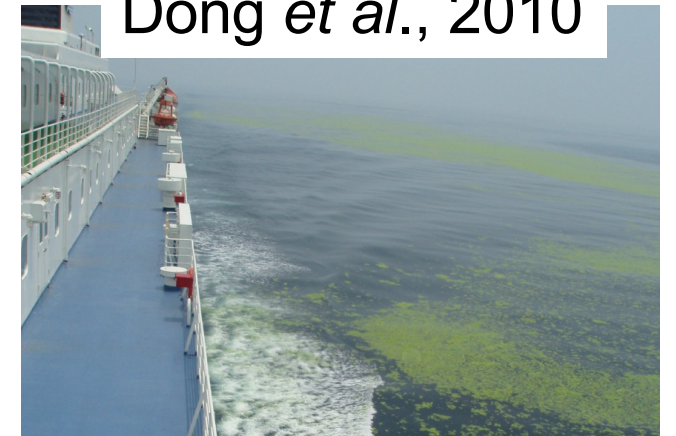
Red tide

Liu *et al.*, 2010



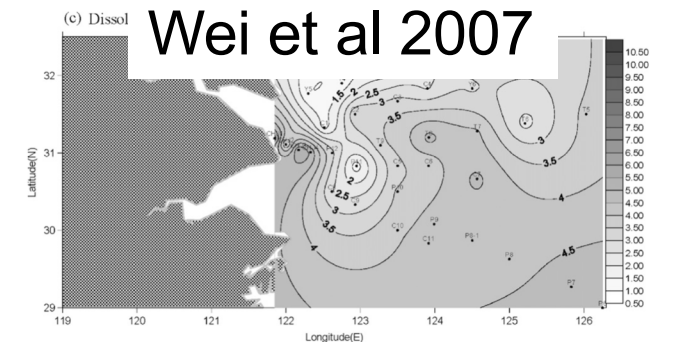
Giant jelly fish

Dong *et al.*, 2010



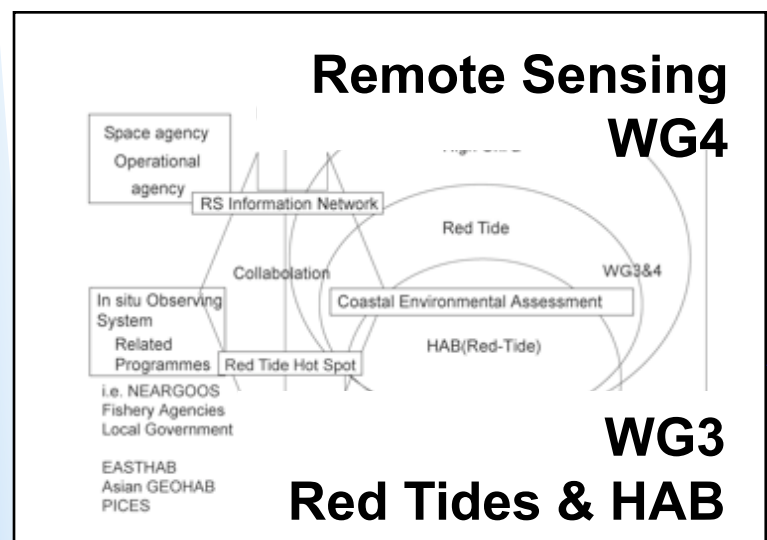
Green tide

Wei *et al* 2007



Hypoxia

1. Background



CEARAC
mid- and long term strategies

2007

UNEP/NOWPAP/CEARAC/FPM 7/Rev2

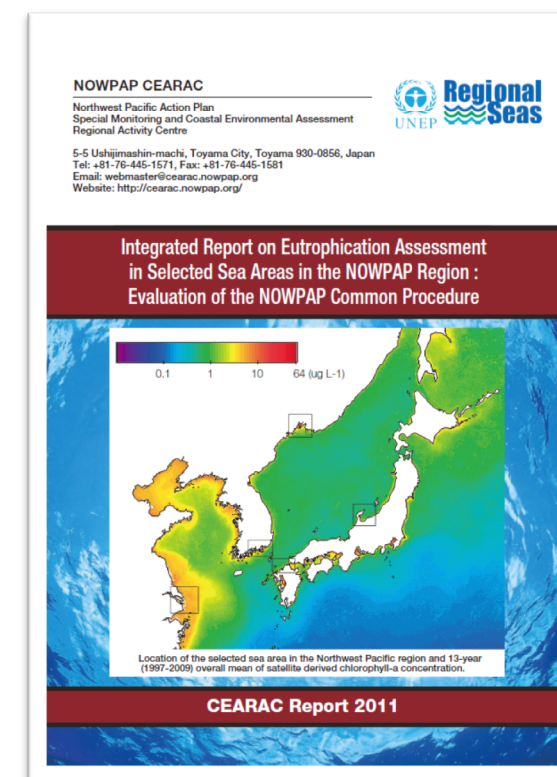
Procedures for assessment of eutrophication status including evaluation of land-based sources of nutrients for the NOWPAP region
(Developed in June 2009)

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Procedures for eutrophication assessment (NOWPAP Common Procedure)

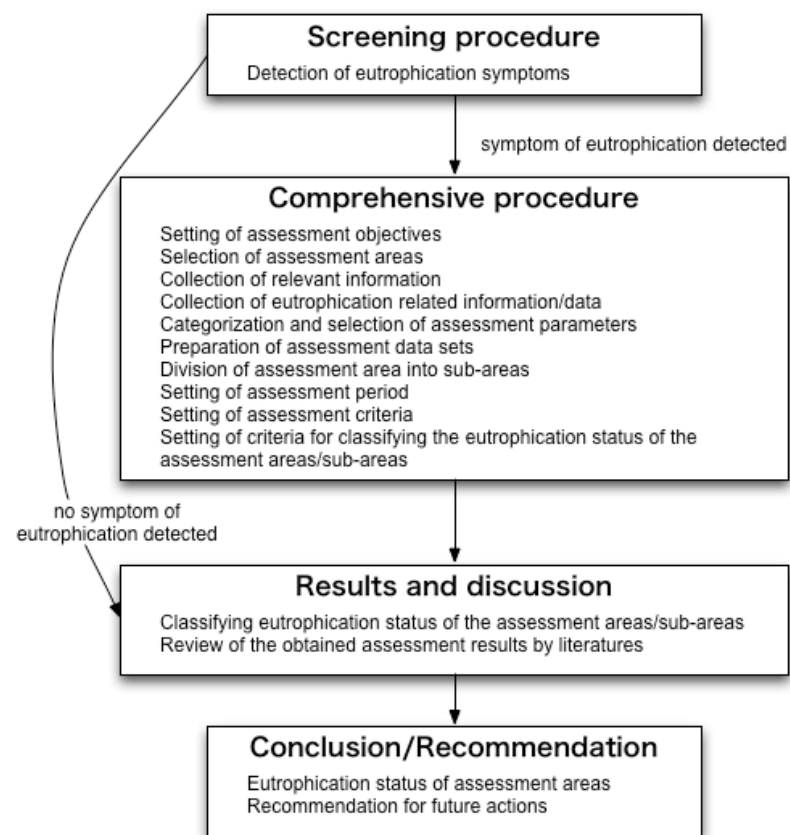
2008-2009



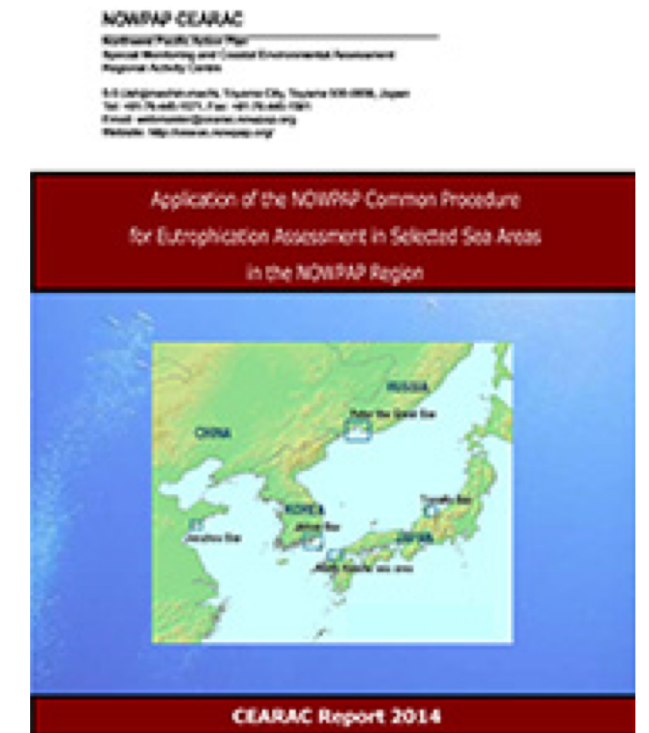
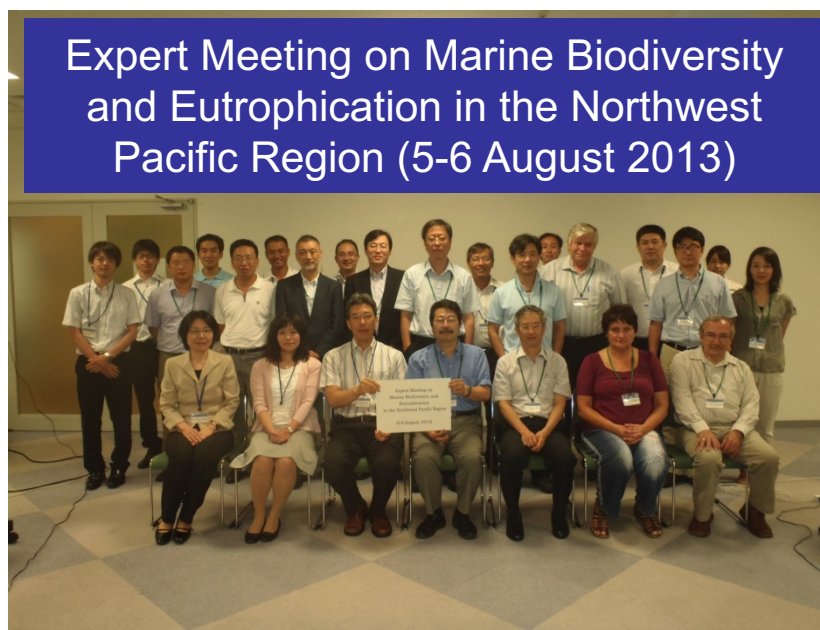
Integrated report of eutrophication assessment

2010-2011

1. Background



Refinement of the NOWPAP Common Procedure



Application of the NOWPAP Common Procedure for eutrophication assessment in selected sea areas in the NOWPAP region

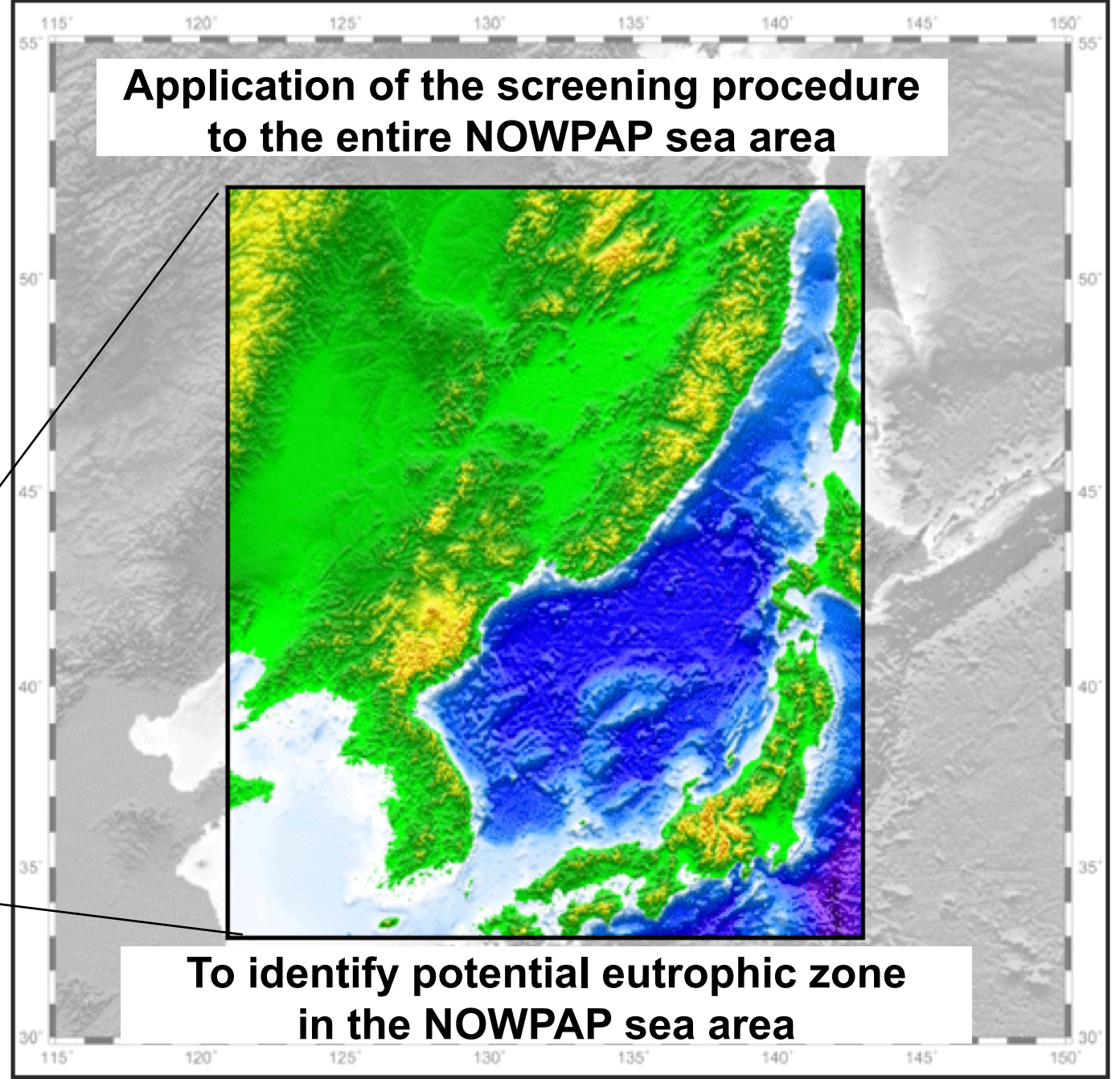
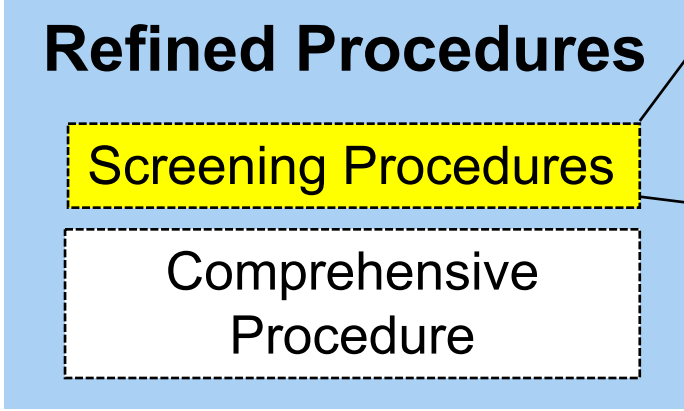
2012

2013.....

2014

1. Background

NOWPAP-CEARAC
Northwest Pacific Action Plan
Regional Monitoring and Coastal Environmental Assessment
Regional Activity Centre
6-8-1 Sakaguchihama, Toyama City, Toyama 920-0898, Japan
Tel: +81-76-441-1071, Fax: +81-76-441-1061
E-mail: nowpap@cearac.org
Website: <http://www.nowpap.org>



2012-2013

2014-2015

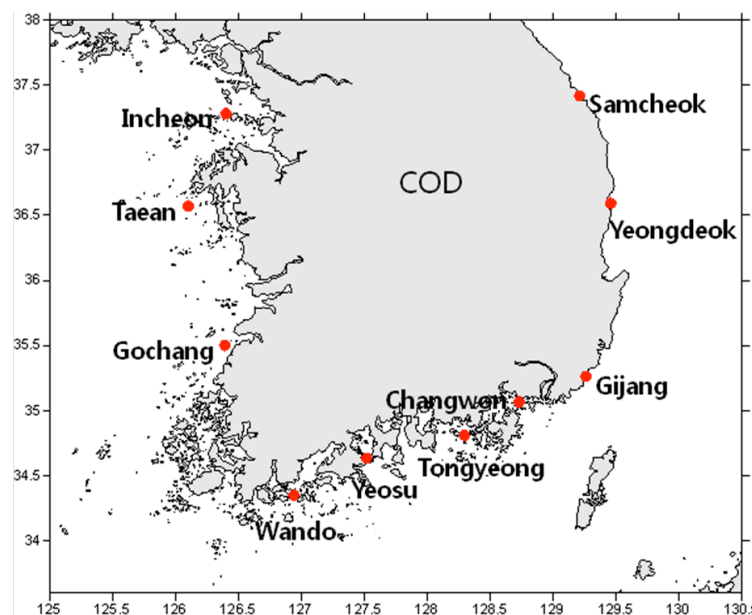
2. Objective

- To encourage autonomous use of the NOWPAP Common Procedure by the member states by applying the Screening Procedure of the refined NOWPAP Common Procedure to the entire NOWPAP sea area in order to identify potential eutrophic zones as well as to verify the suitability of the Screening Procedure

3. Main tasks

- 3.1.1 Collection and analysis of COD (or TOC) Trend

Country	Years	Stations
China	2005 - 2012	7
Japan	1970s - 2013	333
Korea	1998 - 2013	10
Russia	2010-2014	2



Locations of COD sampling stations in China, Korea and Japan

3. Main tasks

- 3.1.2 Collection of data and mapping of occurrences of red tides and hypoxia

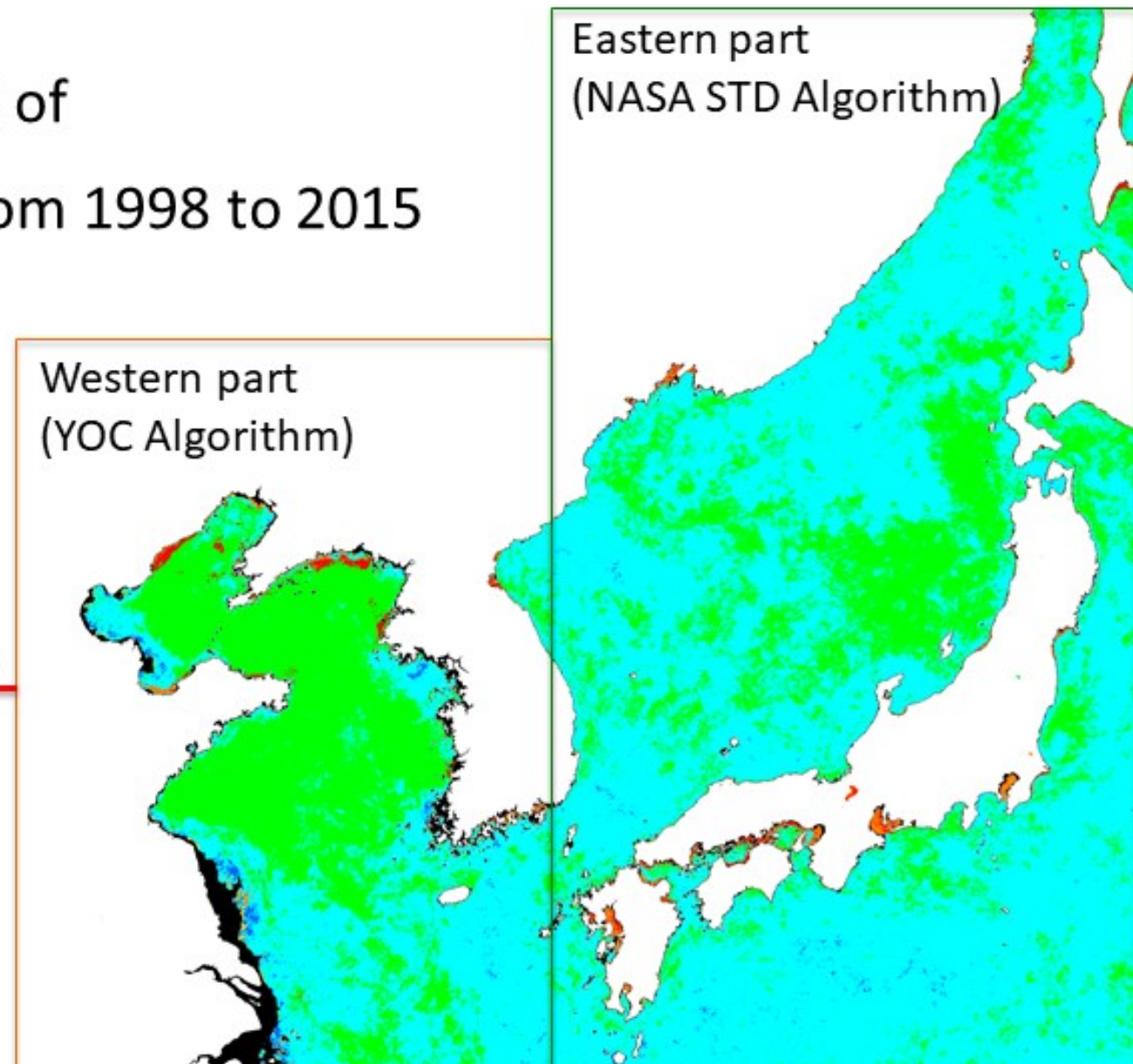
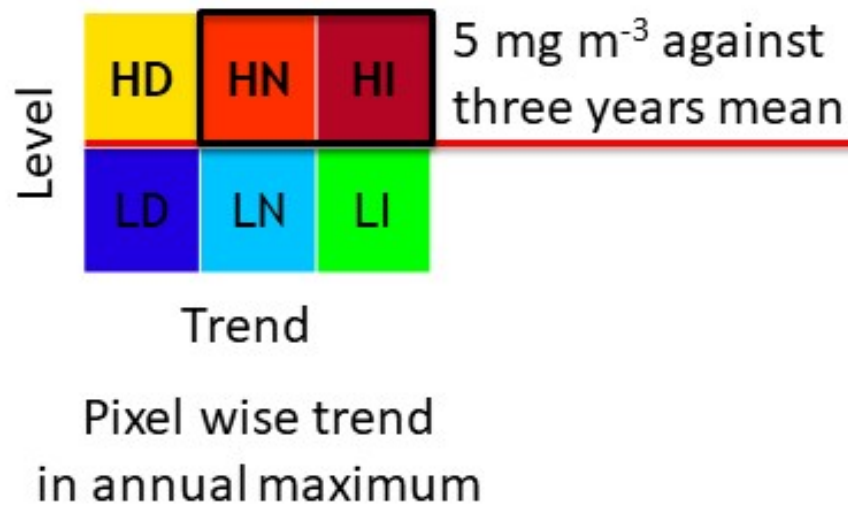
Number of redtide events and fish kills

Country	Number of red tide events	Number of hypoxia events
China	41	4
Japan	453	1345
Korea	99	33
Russia	8	7

3. Main tasks

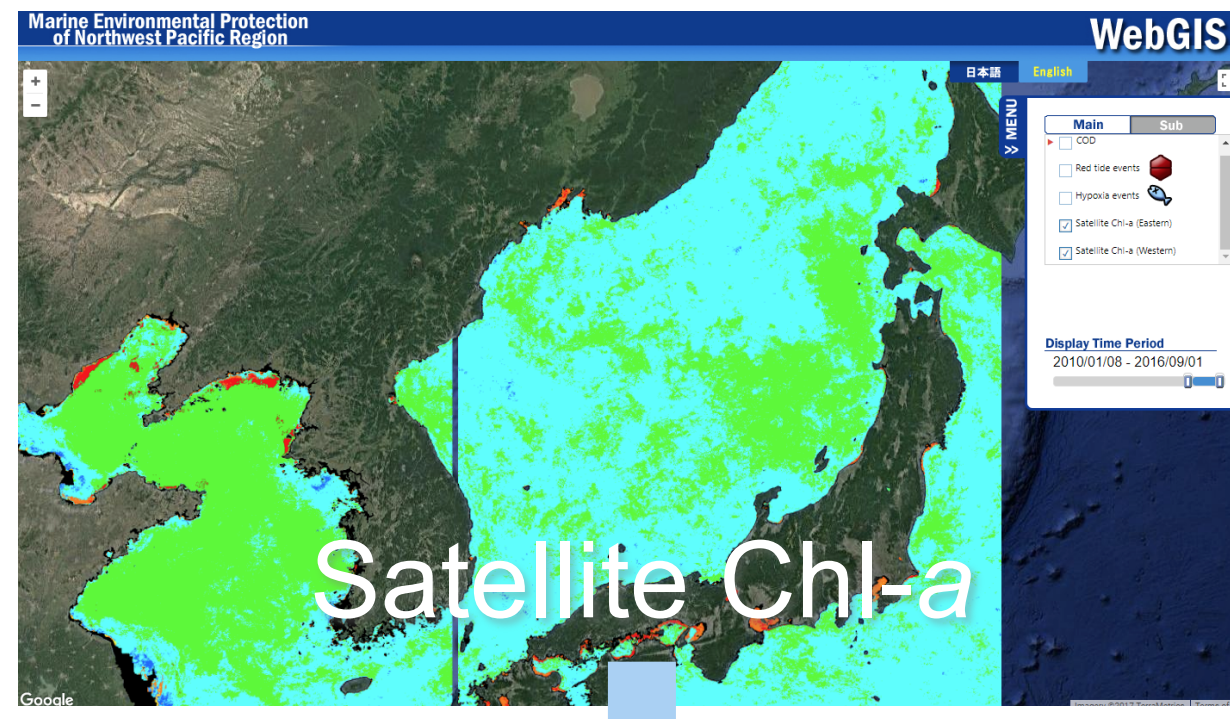
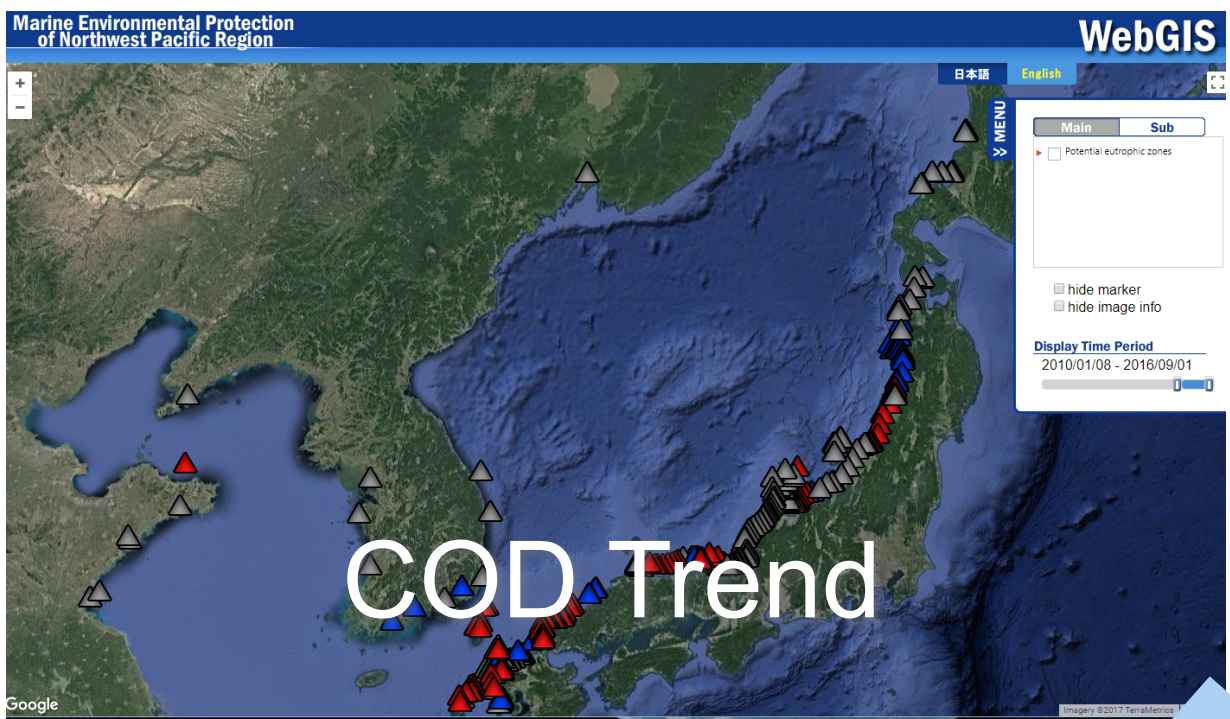
- 3.1.3 Development of satellite map of chlorophyll-a concentration

Based on level and trend of
Satellite derived Chl-*a* from 1998 to 2015



A satellite map to preliminary assessment of eutrophication was developed base on a long term consistent data set

3.2 Mapping potential eutrophic zones in the NOWPAP region

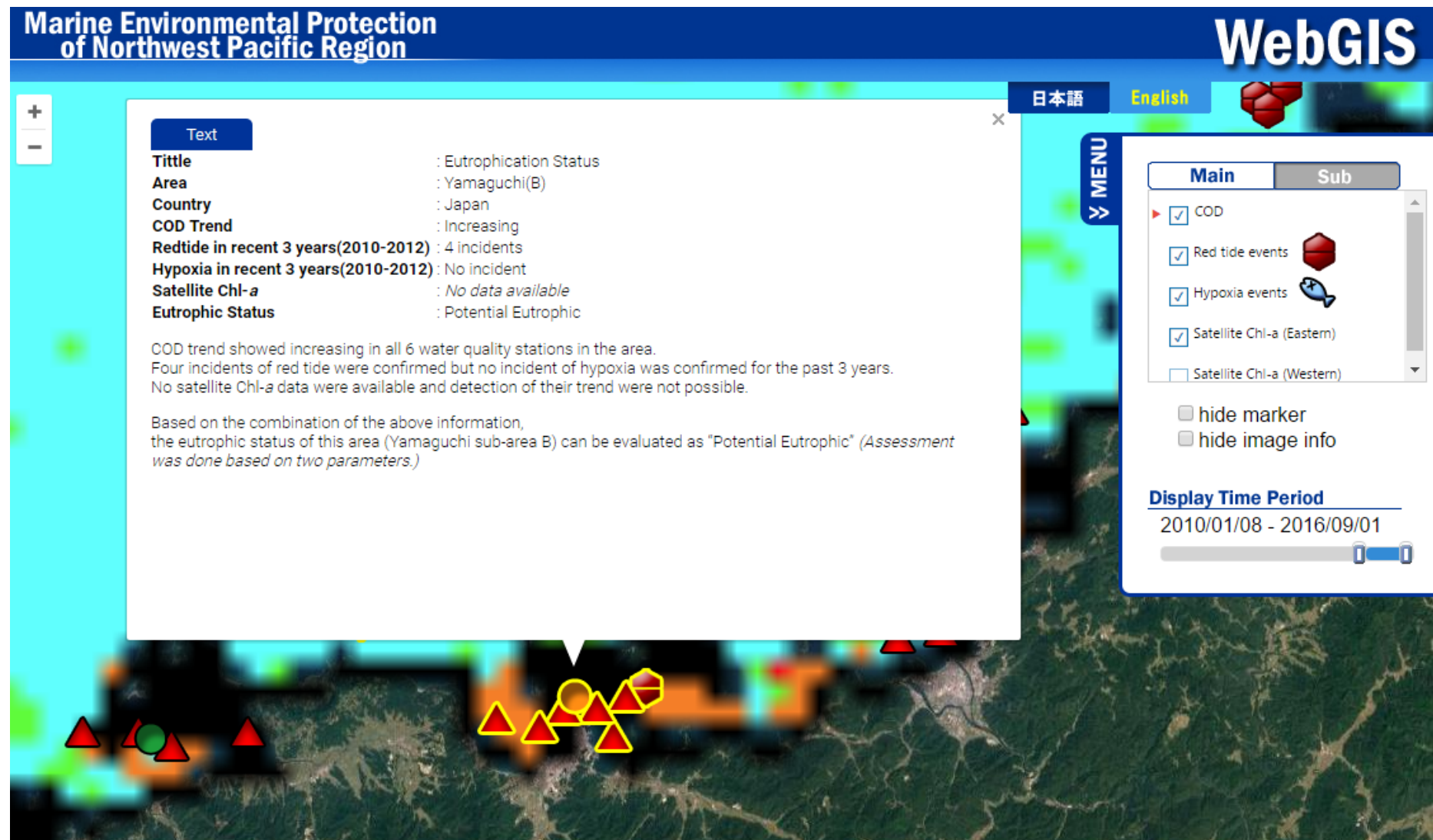


4. Achievements until 2017

- Potential eutrophic zones in the NOWPAP region were identified and visualized on a map.
- A web GIS map was constructed on the Marine Environmental Watch Project

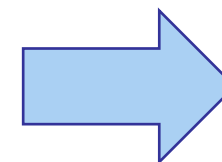
**For general
discussion**

Problems of the developed map



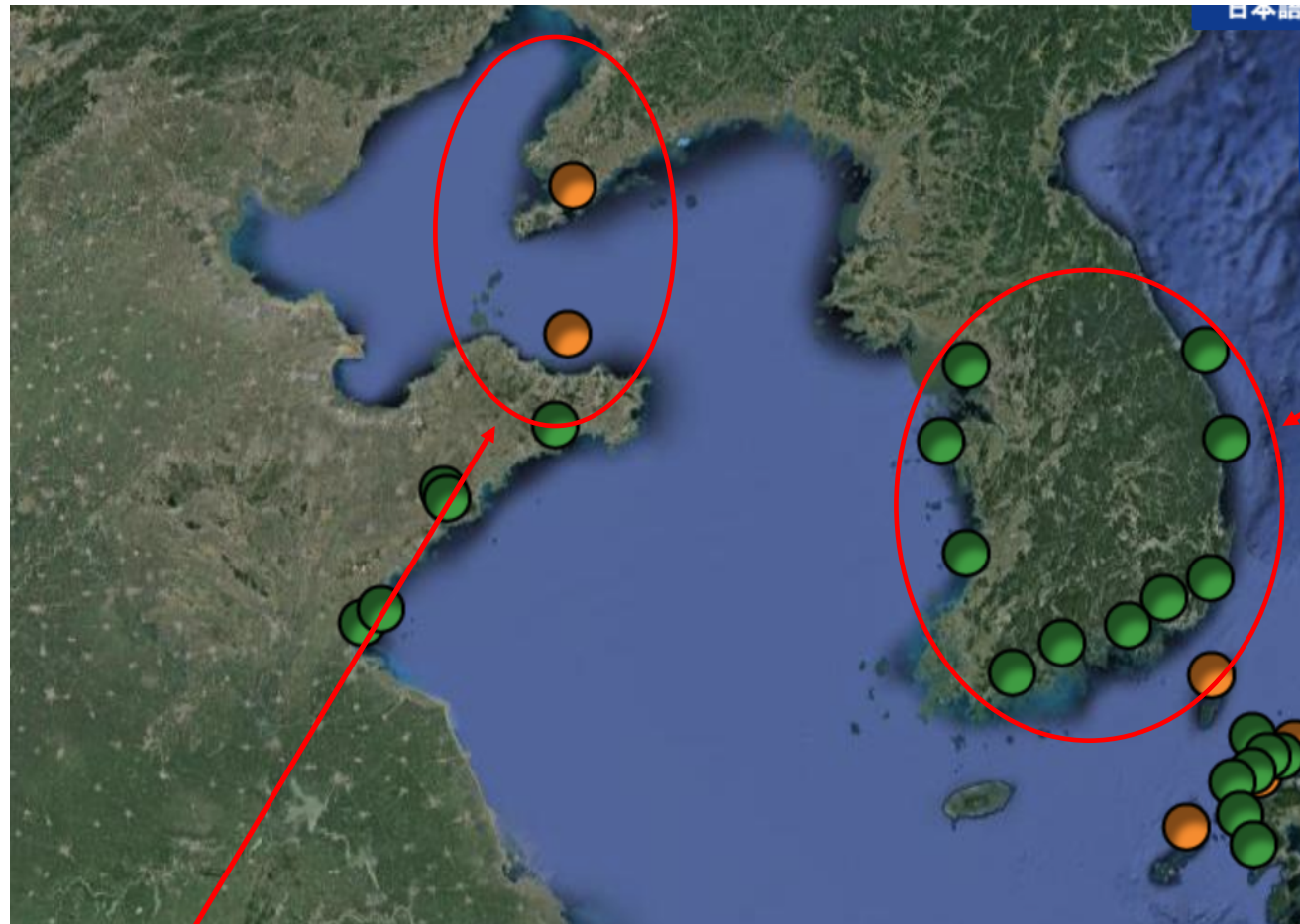
Case #1

- Increasing COD trend
- 4 incidents of red tide in recent three years
- **No satellite derived Chl-a information available**



Potentially Eutrophic?

Problems of the developed map

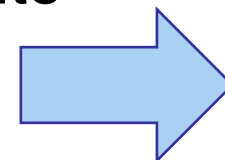


Case #3 in Korean coastal areas

Non eutrophic?

Case #2 in Dalian Bay and Sishili Bay in China

- 8 red tide incidents and high increasing satellite Chl-*a* in Dalian Bay
- Increasing COD and 4 red tide incidents in Sishili Bay



Potentially Eutrophic?

Suggestion for improvement

Tighten the criteria may be necessary?

COD	Red tide and Hypoxia		Satellite Chl-a	Current result	Refined result
1	1	1	1	Eutrophic	Eutrophic
1	1	0	1	Eutrophic	Eutrophic
1	0	1	1	Eutrophic	Eutrophic
1	0	0	1	Potentially Eutrophic	Potentially Eutrophic
1	1	1	0	Potentially Eutrophic	<i>Eutrophic</i>
1	1	0	0	Potentially Eutrophic	Potentially Eutrophic
1	0	1	0	Potentially Eutrophic	Potentially Eutrophic
1	0	0	0	Non Eutrophic	Non Eutrophic
1	1	1	n/a	<i>Potentially Eutrophic</i>	<i>Eutrophic</i>
1	1	0	n/a	<i>Potentially Eutrophic</i>	<i>Eutrophic</i>
1	0	1	n/a	<i>Potentially Eutrophic</i>	<i>Eutrophic</i>
1	0	0	n/a	<i>Non Eutrophic</i>	<i>Non Eutrophic</i>
0	1	1	n/a	<i>Non Eutrophic</i>	<i>Non Eutrophic</i>
0	1	0	n/a	<i>Non Eutrophic</i>	<i>Non Eutrophic</i>
0	0	1	n/a	<i>Non Eutrophic</i>	<i>Non Eutrophic</i>
0	0	0	n/a	<i>Non Eutrophic</i>	<i>Non Eutrophic</i>
0	1	1	1	Potentially Eutrophic	Potentially eutrophic
0	1	0	1	Potentially Eutrophic	Potentially eutrophic
0	0	1	1	Potentially Eutrophic	Potentially eutrophic
0	0	0	1	Potentially Eutrophic	Potentially eutrophic
0	1	1	0	Non Eutrophic	Non Eutrophic
0	1	0	0	Non Eutrophic	Non Eutrophic
0	0	1	0	Non Eutrophic	Non Eutrophic
0	0	0	0	Non Eutrophic	Non Eutrophic





1. Increasing COD, more than 1 event of red tide or hypoxia, and HN or HI of satellite Chl-a
 0. Decreasing COD or No trend, no red tide or hypoxia event, and HN or HI satellite Chl-a, or
 n/a. No satellite Chl-a dat/

Refinement of the NOWPAP Common Procedure

- Revising criteria to determine potential eutrophic zones?
- Revising parameters in the screening procedure
 - ◆ COD Trend
 - ◆ Frequency of red tide and hypoxia events
 - ◆ Level and trend of satellite Chl-*a*

Assessment criteria to detect potential eutrophic zones

Four categories of the assessment results of the eutrophication status
Defined by the screening procedure of the NOWPAP Common Procedure

	Eutrophic area All parameters among COD, frequencies of red tides and hypoxia events and satellite chlorophyll- <i>a</i> indicate symptoms of eutrophication.
	Potential eutrophic area More than two parameters among COD, frequencies of red tides and hypoxia events and satellite chlorophyll- <i>a</i> indicate symptoms of eutrophication.
	<u>Non eutrophic area</u> Only one parameter among COD, frequencies of red tides and hypoxia events or satellite chlorophyll- <i>a</i> indicates symptoms of eutrophication. Or, neither of these parameters indicates symptoms of eutrophication.
	Improved area COD or frequencies of red tide and hypoxia events indicate the eutrophic status has improved.

Next steps to consider

- How do we compare/collaborate with national monitoring and assessment programs?
- How often should we carry our regular assessment of eutrophication in NOWPAP
- Should we update satellite derived chl-*a* map on annual basis?