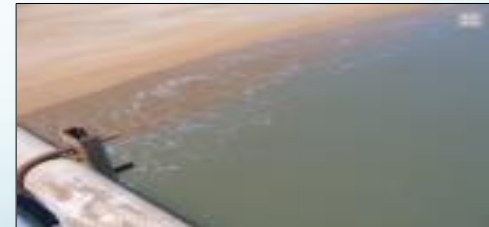




GEO Value

Identifying, communicating and delivering the value of Earth Observations.

Jay Pearlman, Caroline Cusack, Adam
Leadbetter and Francoise Pearlman
October 28 2018



Value of Earth Observation

- Workshop as side event of GEO plenary - Washington DC, October 2017
- Addressed research on methodologies for quantification of impacts of Earth Observation on decisions
- Focused on the use/value of Earth observations by developing value chains in five areas
- Strategy and way forward

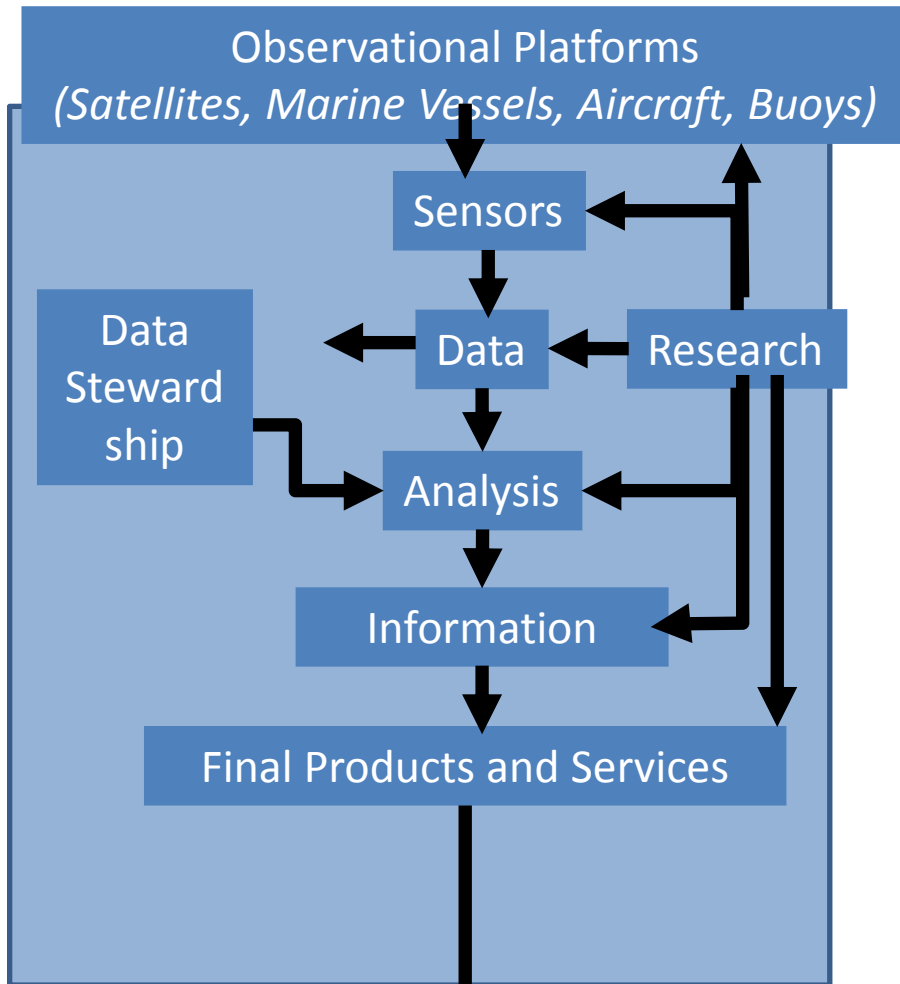


- 1 - Effect of Increasing Temperatures on Human Health
- 2 - Flood Events
- 3 - **Harmful Algal Blooms**
- 4 - Energy and Mineral Supply
- 5 - Effects of Natural Hazards on Transportation Systems



AN EXAMPLE OF VALUE CHAIN (NOAA)

Adapted from Jeff Atkins

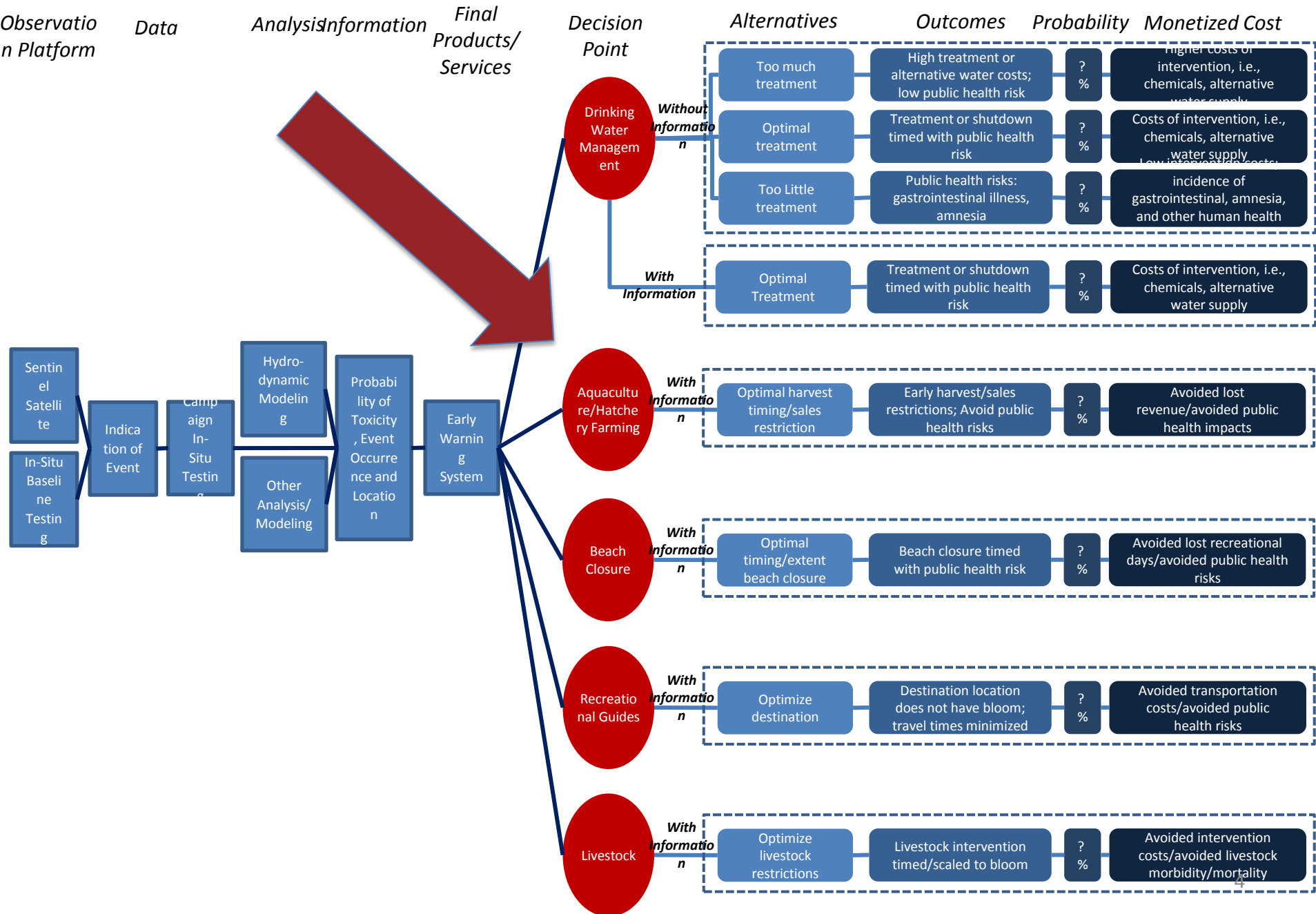


Production: elements involved in the production & sustainability of goods and services

Value chain model: Operational platforms, data collecting sensors; data analyzed producing information; leading to products and services

Consumption: tell the “value story”; identify investments required for products and services; know who uses them, how they use them, and how they benefit from their use

Decision Tree: Toxic Cyanobacteria Blooms



Harmful Algal Blooms - The Issue

High biomass blooms, sometimes referred to colloquially as “red tides” can endanger marine life by:

- clogging the gills of caged fish;
- producing ichthyotoxins, toxic to fish and other marine organisms; and
- suffocating marine life, pelagic and benthic, when blooms subside and bacterial activity and respiration increases dramatically over a short period of time.

- Harmful Algal Blooms yearly costs to fisheries and shellfisheries at billions of Euros per annum:
- USA \$ 95 million,
- Europe > € 800 million,
- Japan US \$ 1 billion
- In Ireland, phytoplankton biotoxins are ranked as a top issue in terms of industry challenges (PricewaterhouseCoopers, 2006).
- Annual economic loss due to toxic HABs in SW Ireland is ~ € 530,000; cessation of trout farming in SW Ireland in the early 1980s when HABs were frequent.

Use Case for HABs

- Weekly delivery of:
 - HABs & Biotoxin data
 - Regional phytoplankton taxa tables
 - Spatial scale information on SST & phytoplankton blooms
 - Operational forecast numerical hydrodynamic model outputs
 - Synthesised with expert opinion
- As a PDF document, accessible over the WWW



GEO Value

HAB Weekly Product

ESSENTIAL OCEAN VARIABLES & OTHER ESSENTIAL VARIABLES

GOOS Essential Ocean Variables – May 2017
<http://www.goos-ocean.org>

Orange = Concept Green = Mature
Red = Pilot Blue = Other Essential Variable

Ocean Colour Sea Surface Temperature

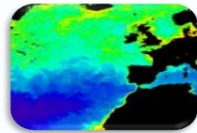
Ocean Surface Stress Sea Surface Height
Sea Surface Temperature Subsurface Temperature
Surface Currents Subsurface Currents
Sea Surface Salinity Subsurface Salinity

Ocean Surface Heat Flux

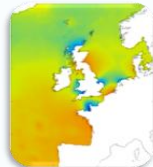
Sea Surface Temperature Subsurface Currents
Surface Currents Subsurface Salinity
Sea Surface Salinity Phytoplankton Biomass & Diversity
Sea Surface Height **Biotoxins / Phycotoxins**
Subsurface Temperature

Note: HAB species (cell counts) are essential to develop products - covered by the "Phytoplankton" EO

DATA INTEGRATOR



Remote sensing

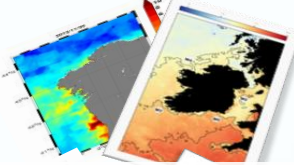


Modelling

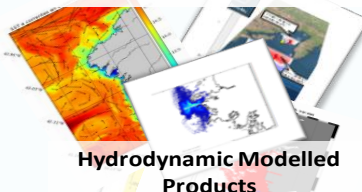


In-situ observations

INTEGRATED DATA PRODUCTS



RS Products



Hydrodynamic Modelled Products



Biotoxin & HAB Products

DECISION SUPPORT



Expert Interpretation

DOWNSTREAM SERVICE HAB BULLETIN



Information: Value Adding Knowledge Chain

USERS

- Scientists

USERS

- Scientists
- Research Community
- Government Institutes
- Food Safety Authorities

USERS

- Scientists
- Environmental Protection Agencies

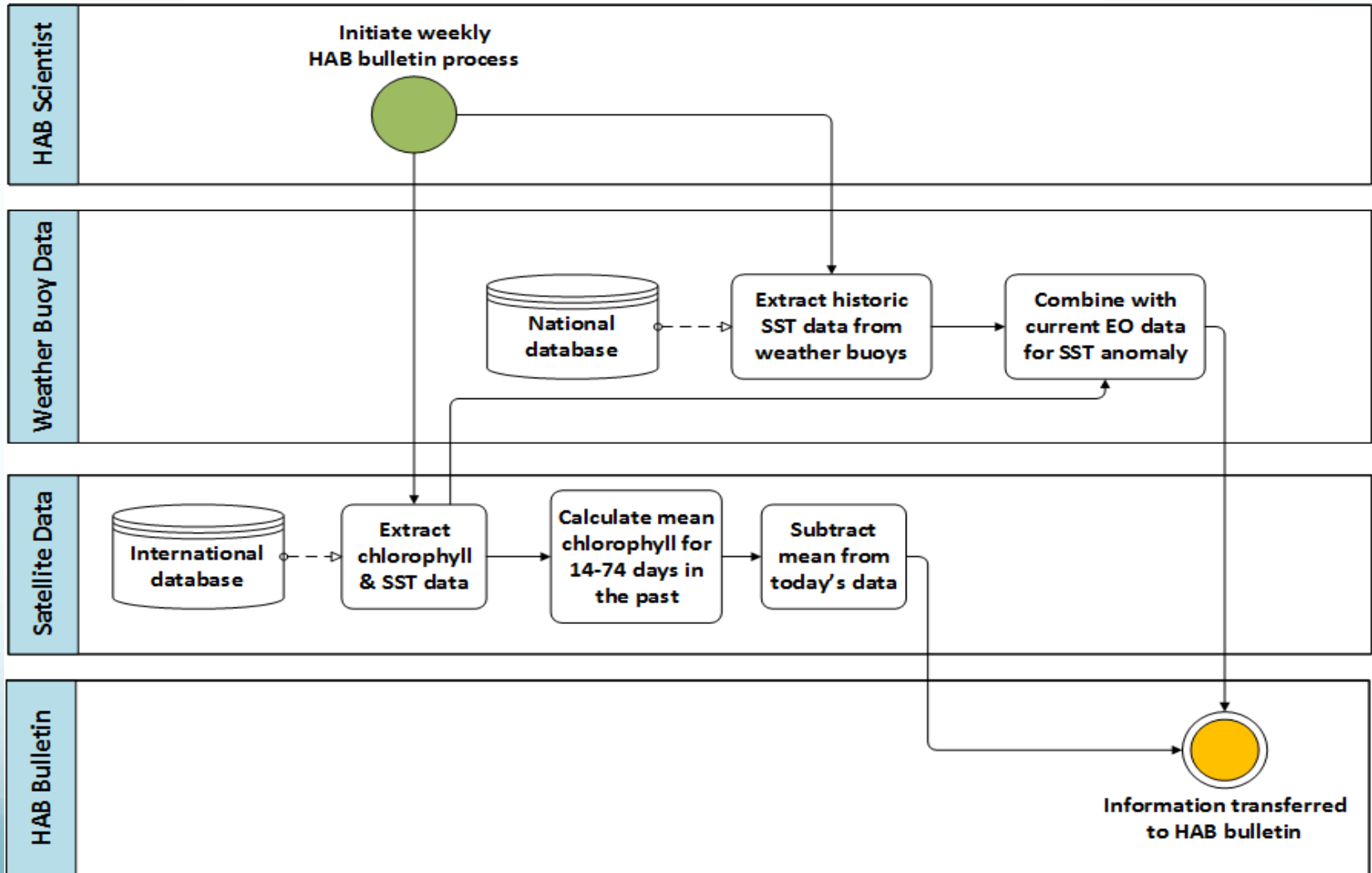
USERS

- Shellfish and Fish Farmers
- Harvesters and Seafood Processing companies
- Wild Pickers/Recreational Gatherers
- Sea Fisheries Authorities
- Food Safety Authorities

USERS OF DERIVED VALUE INFORMATION PRODUCTS

- Local Councils
- General Public
- Fishermen
- Coast Guard

Data Processing



Phytoplankton

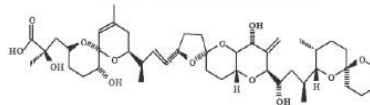
(a)

Dinoflagellates Genus:
Dinophysis
LOW biomass blooms*



Dinophysis acuminata

Biotoxins: Okadaic Acid,
DTX-1 DTX-2, esters



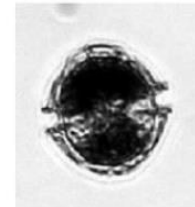
DSP

Diarrhetic Shellfish Poisoning

EU Regulatory Limit: 0.16 µg/g tissue

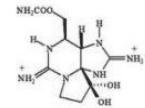
(b)

Dinoflagellates Genus:
Alexandrium
LOW biomass blooms*



Alexandrium cf. minutum

Biotoxins: Saxitoxin Grp 30+



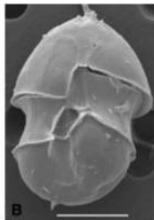
PSP

Paralytic Shellfish Poisoning

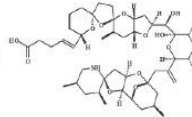
EU Regulatory Limit: 0.80 µg/g tissue

(c)

Dinoflagellates
Genus: ***Azadinium***
LOW biomass blooms



Biotoxins: Azaspiracid, 30+
analogues



AZP

Azaspiracid Shellfish Poisoning

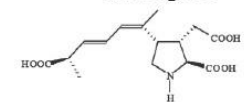
EU Regulatory Limit: 0.16 µg/g tissue

(d)

Diatoms
Genus: ***Pseudo-nitzschia***
HIGH biomass blooms



Biotoxins: Domoic acid +
analogues



ASP

Amnesic Shellfish Poisoning

EU Regulatory Limit: 20 µg/g tissue

Ireland: Predictions

ASP event: Low - steady
AZP event: **High and fluctuating**
DSP event: Low - steady
PSP event: Low to very low (site specific)

NMP Current closures			
ASP	AZP	DSP	PSP
0	0	0	0

ASP: No change from last week , steady seasonal trend with no immediate issues indicated – Very slow seasonal increase in cell levels continues with marginally fluctuating weekly levels. No significant toxic species/toxin currently present .

AZP: Continued **Highest caution level** is still advised with this difficult species. Current seasonal impact may rise during onshore water transport conditions in any area. This is the main historical occurrence period, suitable environmental conditions continue to prevail and the toxin is currently present and possibly increasing . Issues with this toxin can occur suddenly and acutely .

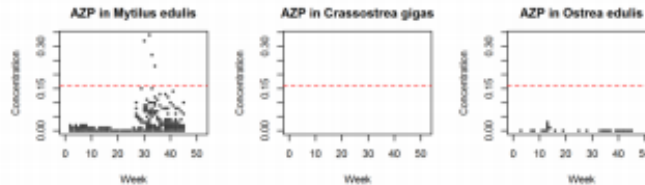
DSP: Similar to last week - *Low, except in SW, caution level in sites currently affected*- Steady pattern similar to last week - Low toxicity issues in general, but there is still the possibility of short term peaks at this seasonal transitional period. Cell levels continuing to decrease would be the expected trend with toxicity issue sites being dependant on sufficient levels of non toxic phytoplankton.

PSP: Stable seasonal pattern of very low cell levels and low likelihood of issues establishing .Current environmental conditions and patterns are not indicated to be favourable for bloom issues .

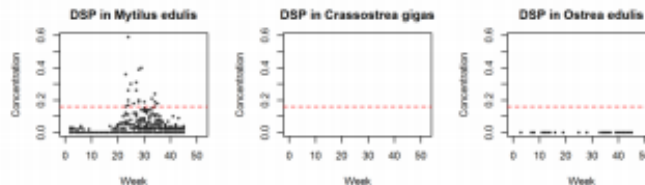
Blooms: **No current significant issues recorded with any of the historically occurring problematic species.** Any unusual water discoloration should be noted and regional labs contacted if concerned /regarding possible need for additional sampling. All feedback is welcome at Joe.Silke@Marine.ie .

National Monitoring Programme

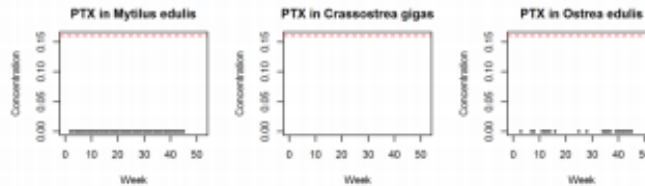
AZP



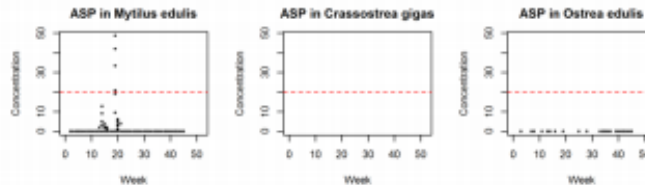
DSP



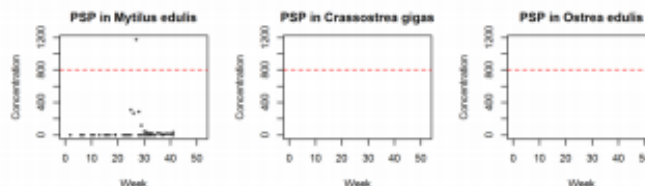
PTX



ASP



PSP



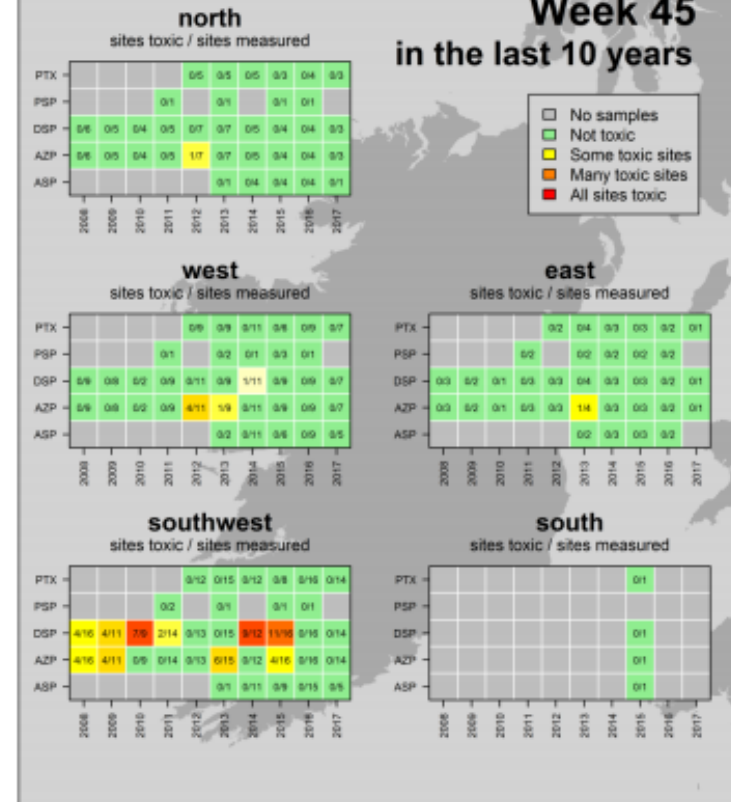
Levels from week 1 to present week. Regulatory limit - - - - -



HISTORIC TRENDS



Week 45 in the last 10 years



ASP events: mid-March to early May

AZP events: April to December

DSP events: May to December

PSP events: June to mid-July and end September; only in Cork Harbour

- Enabling decision support for:
 - Scientists
 - Research Community
 - Government Institutes
 - Food Safety Authorities
 - Environmental Protection Agencies
 - Shellfish and fish farmers
 - Shellfish and fish producers
 - Harvesters and Seafood processing companies
 - Wild pickers
 - Sea fisheries authorities
 - Food safety authorities



The Ocean Value Chain



Best practices are necessary in each single step of the Chain

- For Observations:

- to allow a faster operationalization of mature observing technologies
- to sustain an incremental development approach of Platforms/sensors guided by documented scientific past knowledge

- For generic services:

- To allow forecast intercomparison, future multi-model ensemble methodologies
- To increase the intermediate user uptake

- For customized services:

- To widen market potential
- To allow a fair competition giving means to show compliance to

Dissemination



Earth Science Information Partners ([ESIP](#)) presents the webinar:

Does it matter? The Socioeconomic Value of Earth Science Data, Information, and applications

Date: June 5, 2018
Time: 12:30 PM - 1:30 PM ET
Location: Go To Meeting; <https://global.gotomeeting.com/join/809085733> (see below for details)



Reference Material

GEO Value

- GeoValue.org
- LinkedIn.com GEOValue Community Group
- <https://www.crcpress.com/GEOValue-The-Socioeconomic-Value-of-Geospatial-Information/Kruse-Crompvoets-Pearlman/p/book/9781498774512>

