

Early warning program to manage the introduction and spread of invasive species in the Wadden Sea, a World Heritage protected ecosystem

ICAIS April 24th 2013, A.C. Sneekes



Introduction of IMARES

Institute for Marine Resources & Ecosystem studies

- *To explore the potential of marine nature to improve the quality of life*
- *Scientific support to policies (50%)*
- *Strategic R&D programs (30%)*
- *Contract research (20%)*
 - *Private*
 - *Public*
 - *NGO partners*

The screenshot displays the IMARES website interface. At the top, there is a navigation bar with links for 'About Wageningen UR', 'Career', 'Login', 'Contact', and a language selector set to 'en | English'. Below this is a secondary navigation bar with 'Education & Programmes', 'Research & Results', and 'Expertise & Services'. The main content area features a green header with 'Home', 'Expertise & Services', 'Research Institutes', and 'IMARES'. The 'IMARES' section is titled 'Research institute' and describes its focus on 'strategic and applied marine ecology'. It includes social media icons for Facebook, Twitter, LinkedIn, and YouTube. A featured article titled 'Discards - Unwanted catch' is highlighted, with a 'Read more' link. Below this, a profile for the 'Managing Director dr. MCT (Martin) Scholten' is shown with a 'Contact form' button. The 'Areas of expertise' section at the bottom lists: 'Aquaculture and fisheries', 'Delta technology', 'Marine ecology', 'Maritime technology', 'Water technology & quality', and 'Marine quality'.

Activities of IMARES

Institute for Marine Resources & Ecosystem studies



Arctic - Sustainable Arctic Development

[To realise the potential of opportunities for sustained Sustainable Arctic Development, Wageningen UR is taking the lead to build international...](#)



Atlas of sea fishes of the northern European shelf

The collection of research data by vessel costs a fortune, but the data are poorly used.



BES islands

The special biodiversity of Bonaire, St. Eustatius and Saba (BES islands) is an important basis for tourism.



Benthic Ecosystem Fisheries Impact Study (BENTHIS)

BENTHIS is a pan-European research project to study the impact of bottom trawling on the sea bed and all the animals living on or in the seabed.



Building with Nature - Using ecosystems for coastal protection

Investigating the potential use of biogenic reefs in the lower intertidal zone for consolidation and stabilization of tidal flats in the...



Arctic Biological Indicators

March 25, 2013 - Project - Within this PhD project Arctic Biological Indicators are developed for impact assessments of (new) human activities in the Arctic Region.



Ballast water toxicity experiments

September 3, 2012 - Project - Determine the residual toxicity of ballast water treated with biocides to different marine species in single species tests.



Biodiversity of hard substrates in the Dutch North Sea

September 17, 2012 - Project - As a result of human activity, hard substrate is increasingly present in the North Sea. Examples are wrecks, oil rigs, windmills and coastal defense.



Clean seas

December 31, 2011 - Project - The Maritime Knowledge Centre (MKC) initiated the 'Clean Seas' thematic network, which aims to promote knowledge exchange between industry and...

Early warning program to manage the introduction and spread of invasive species in the Wadden Sea



THE WADDEN SEA WORLD WIDE UNIQUE

With its interconnected complex of mud and sand flats, salt marshes, blomb, dunes, estuaries, gullies and open waters, the Wadden Sea is an area of special natural importance. It supports a huge abundance of various species of flora and fauna. Between 10 and 12 million birds visit the area during their migrations every year.

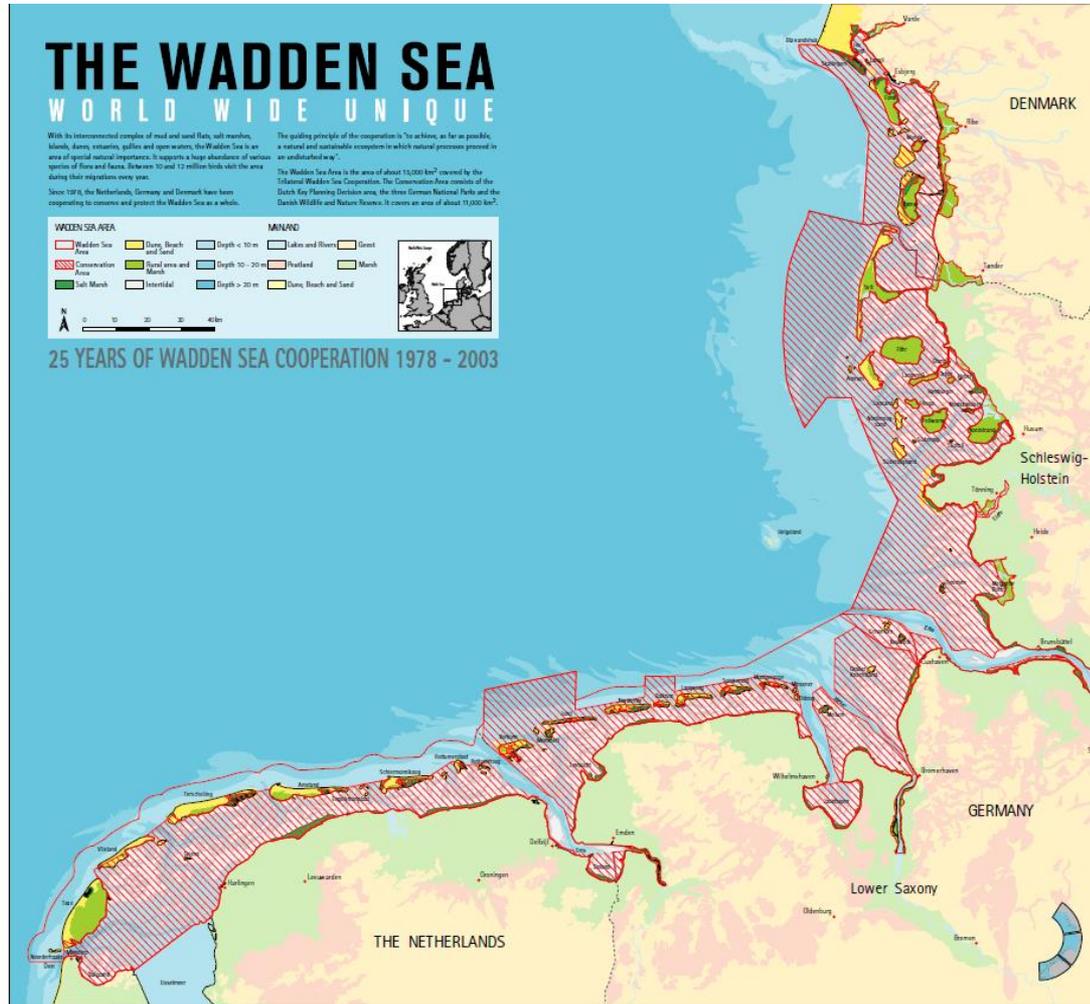
Since 1978, the Netherlands, Germany and Denmark have been cooperating to conserve and protect the Wadden Sea as a whole.

The guiding principle of the cooperation is "to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way".

The Wadden Sea Area is the area of about 15,000 km² covered by the International Wadden Sea Cooperation. The Conservation Area consists of the Dutch Wadden Sea, the three German National Parks and the Danish Wadden Sea and Nature Reserves. It covers an area of about 15,000 km².

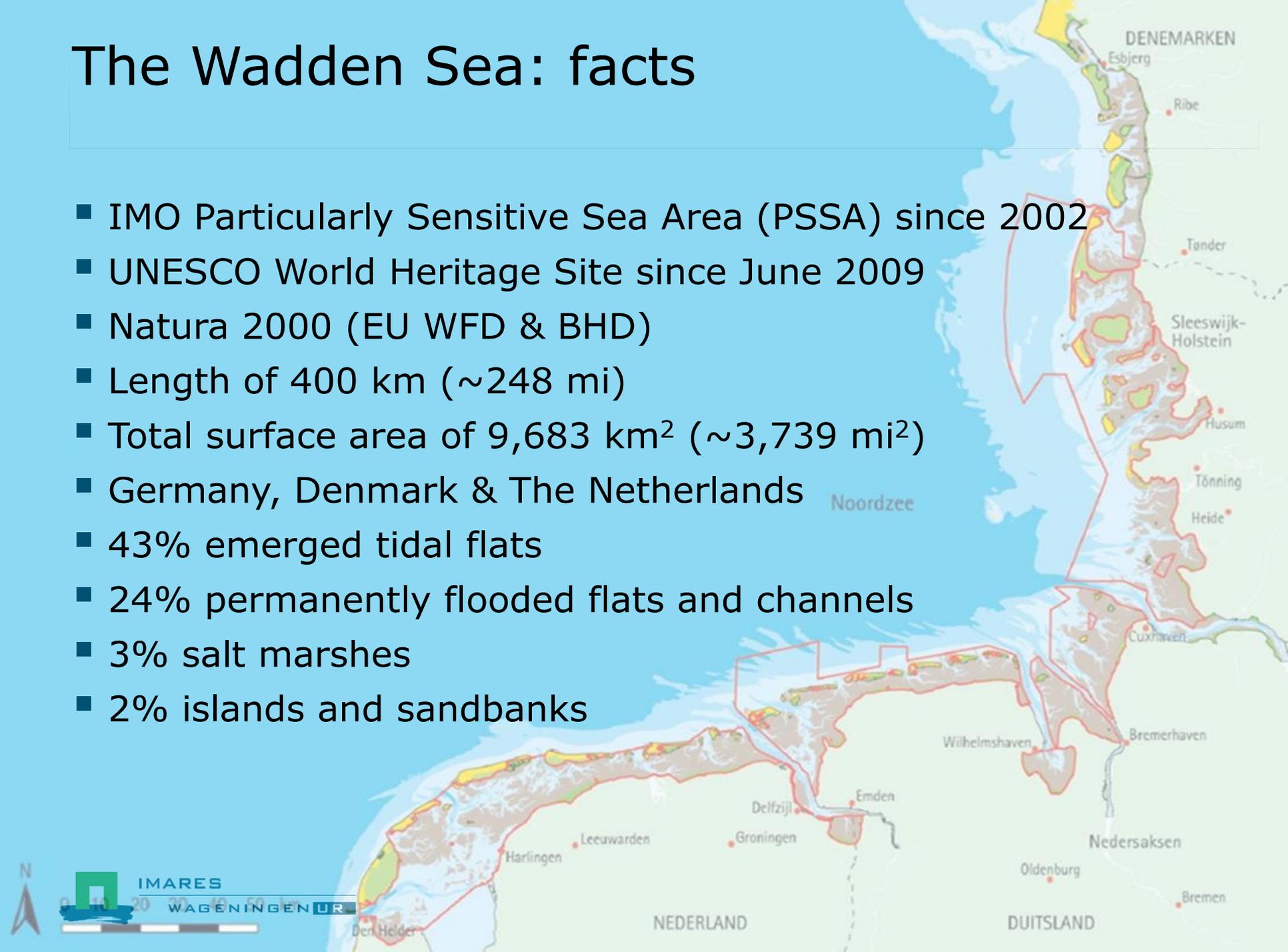


25 YEARS OF WADDEN SEA COOPERATION 1978 - 2003



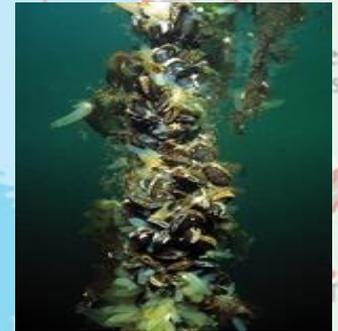
The Wadden Sea: facts

- IMO Particularly Sensitive Sea Area (PSSA) since 2002
- UNESCO World Heritage Site since June 2009
- Natura 2000 (EU WFD & BHD)
- Length of 400 km (~248 mi)
- Total surface area of 9,683 km² (~3,739 mi²)
- Germany, Denmark & The Netherlands
- 43% emerged tidal flats
- 24% permanently flooded flats and channels
- 3% salt marshes
- 2% islands and sandbanks



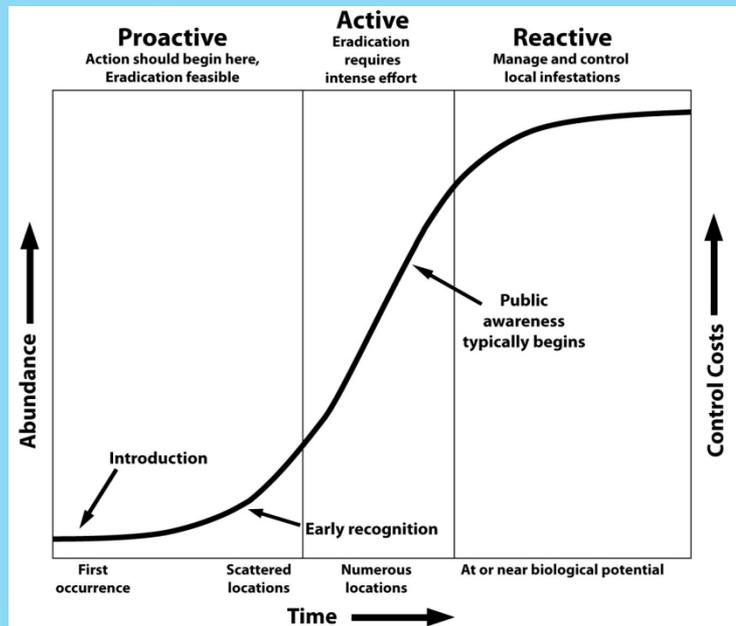
The Wadden Sea: economic activities

- Harbour development and shipping
- Fisheries
- Agriculture/mariculture
- Recreation & tourism
- Wind farming
- Offshore oil & gas exploration
- Adjacent to North Sea area



The Wadden Sea: bioinvasions

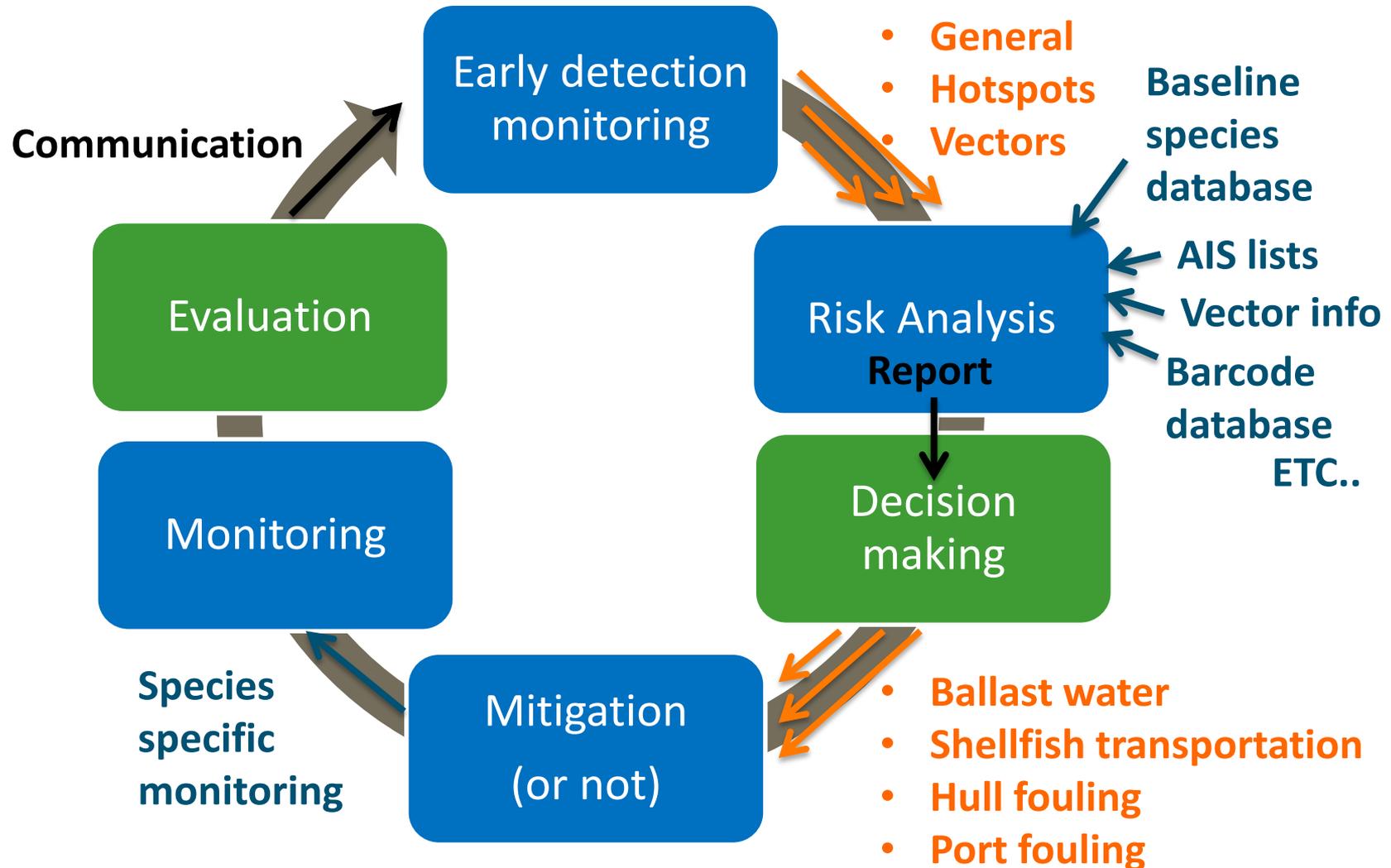
- Not a good combination, but we cannot exclude all economic activities.
- Therefore, development of trilateral program to manage the introduction and spread of invasive species in the Wadden Sea



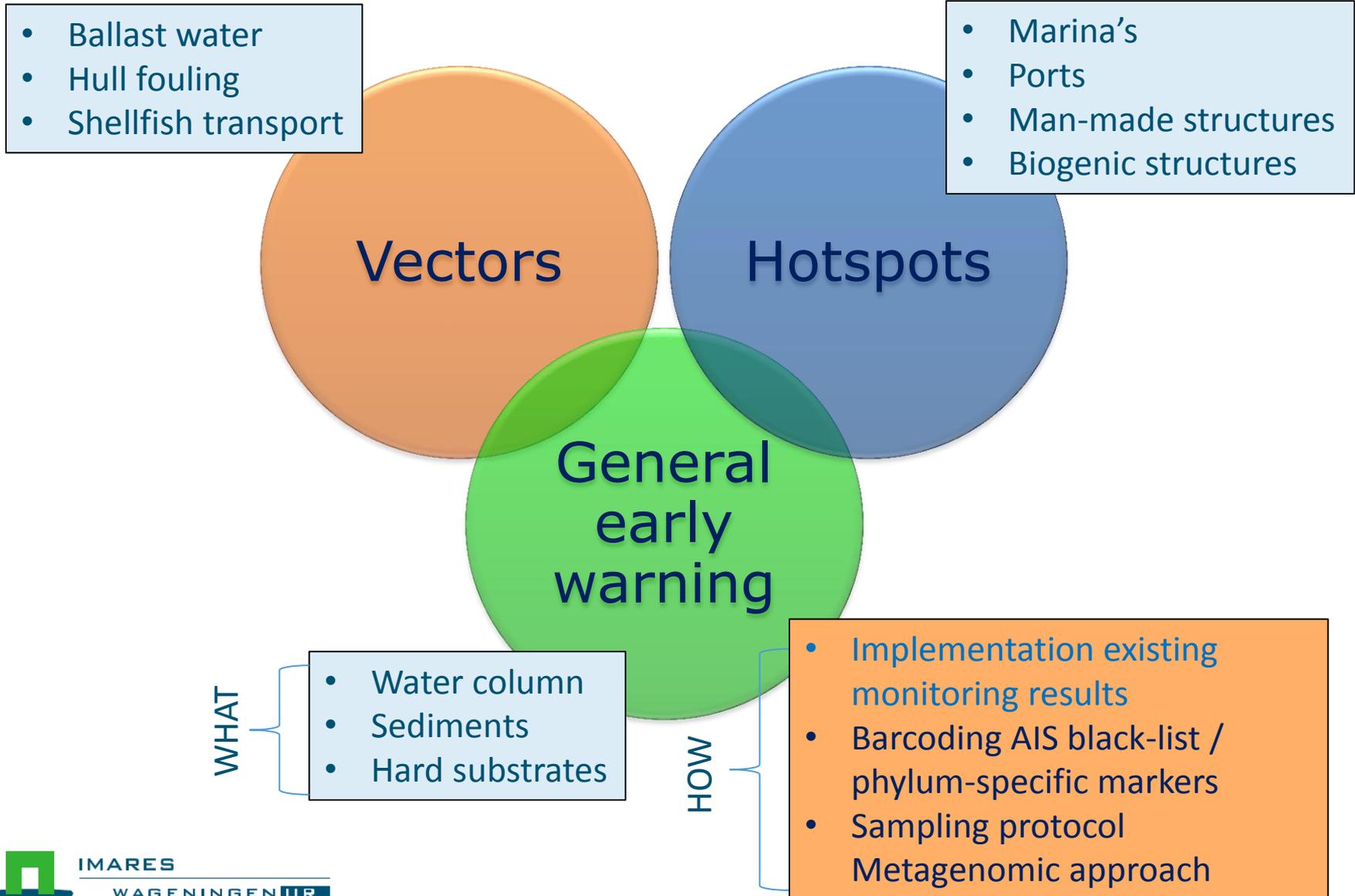
Phases of Invasive Species Invasion and Control



Managing invasions in the Wadden Sea

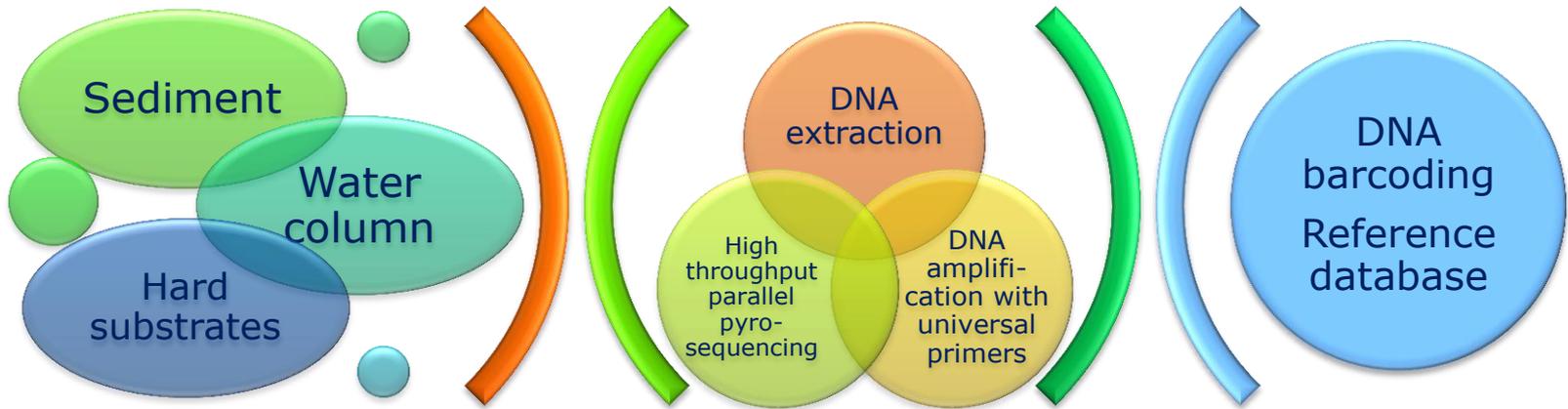


Early detection monitoring



Early detection: DNA metabarcoding as tool

DNA metabarcoding: automated identification of multiple species in an environmental sample based on short DNA sequence



Sampling in the field



DNA Analysis

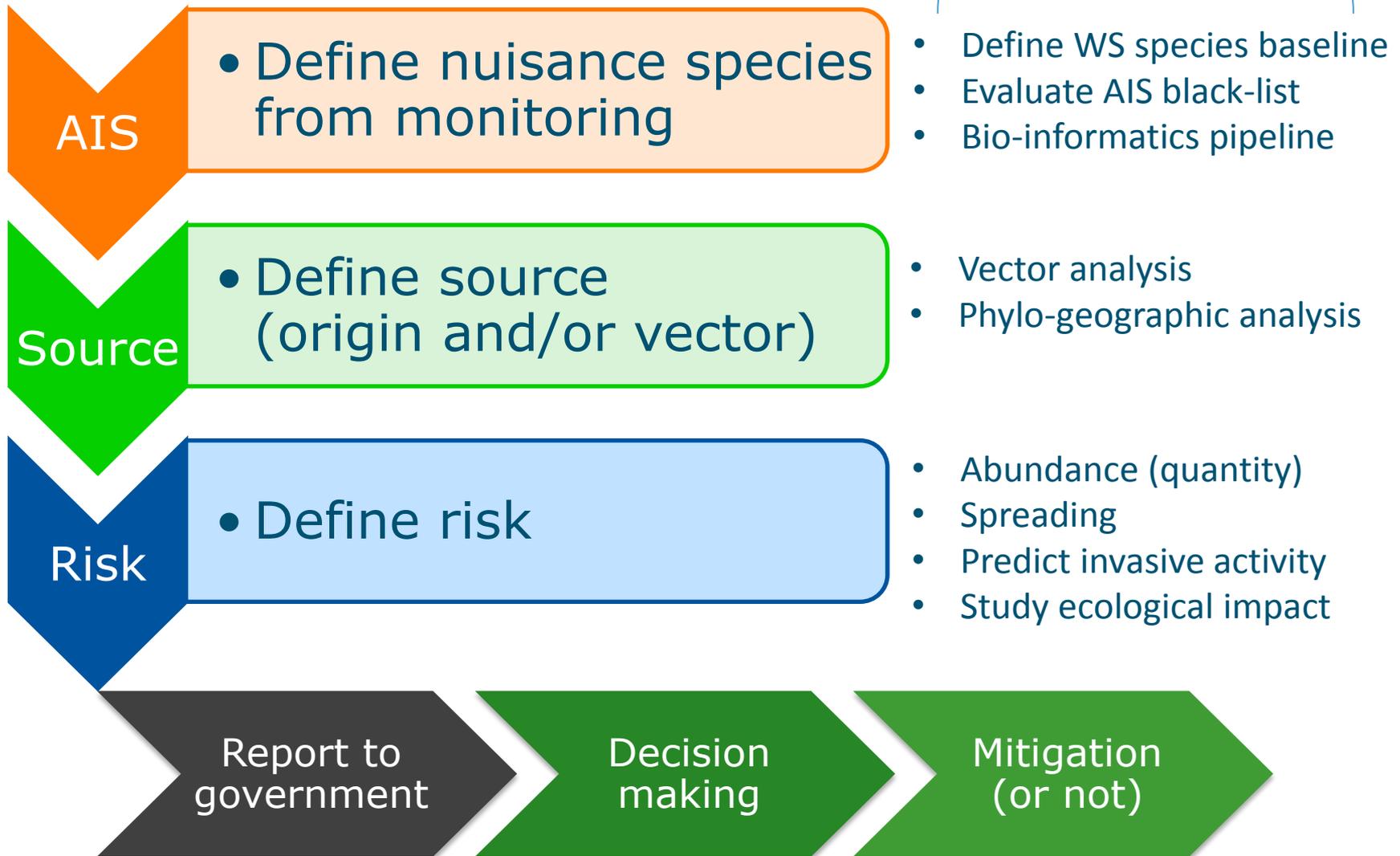


Species identification



Risk Analysis

HOW



Mitigation of vectors

Ballast water



Demonstrate effectiveness of BW treatment and define risk of sub-vectors

Hull fouling



Evaluate importance of vector and define risk of sub-vectors

Promote voluntary guidelines IMO

Shellfish



Demonstrate effectiveness of Shellfish Import Monitoring Protocol

Demonstrate effectiveness of freshwater flushing and select indicator species

Latent invaders: does treatment really work?

Mitigation of hotspots

Stop input

- Block the vector
- Is a species established?
- Value of green antifouling?

Early eradication

- Is early eradication effective?
- Which method?
- How early is early?

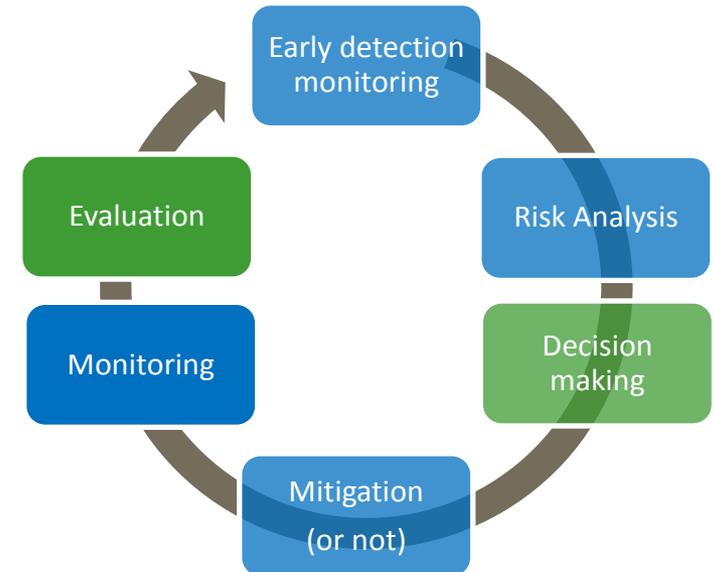
Communication

- Awareness
- Acceptability



Monitoring & Evaluation

- Species specific monitoring
 - Habitat directed
 - Vector and/or hotspot
- Evaluation
 - Decision to mitigate (or not)
 - Result of mitigation
- Communication to government



Involved parties (so far)

- Governments
- NGO's
- Universities
- Research Institutes
- Consultancies
- Industry



Thank you for your attention

Questions?

Many thanks to:
N.H.B.M. Kaag
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