# What new technologies are needed to advance the Baltic Sea monitoring and status assessment

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# BONUS SYNTHESIS

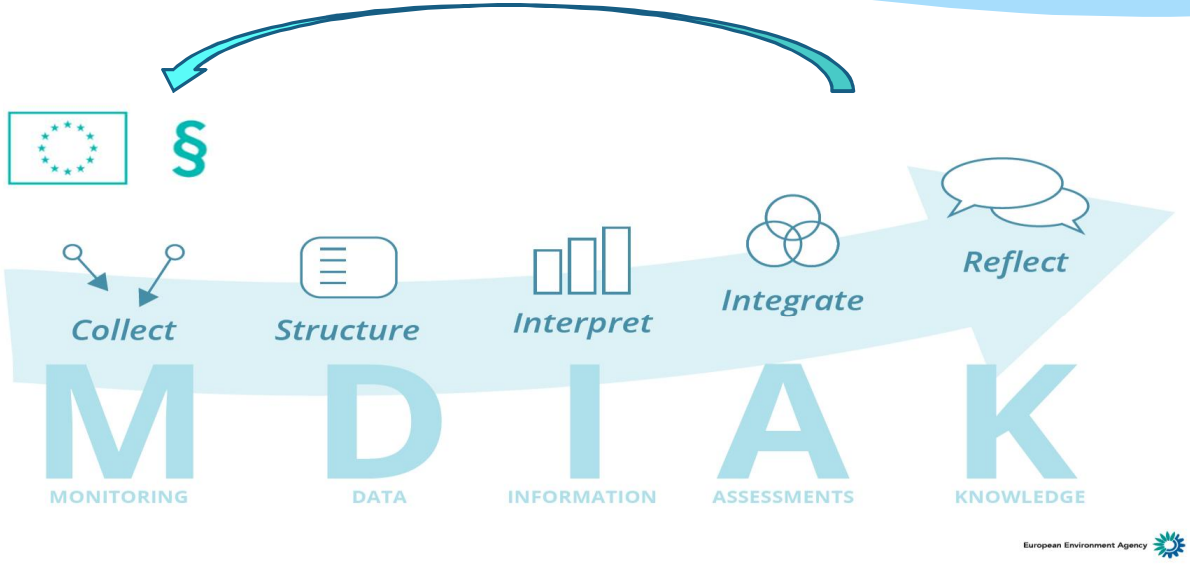
Improve Baltic Sea monitoring

# BONUS FUMARI and SEAM

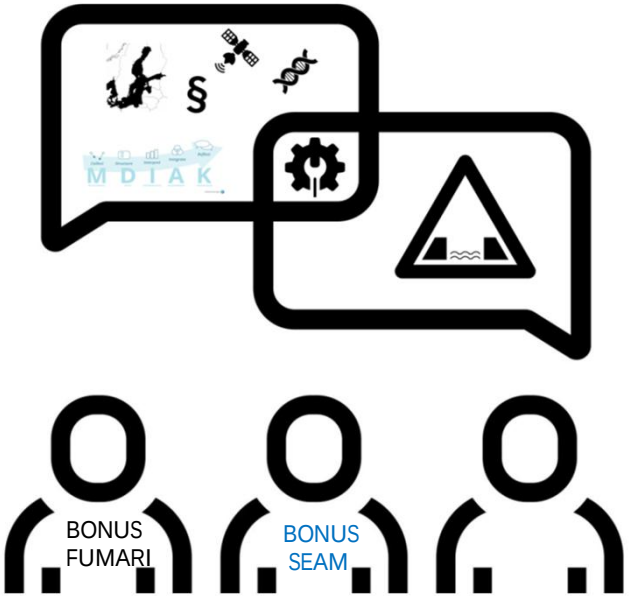
FUMARI = Future Marine Assessment and Monitoring of the Baltic

* FUMARI and SEAM will provide a proposal for a renewed monitoring system of the Baltic Sea marine environment.
* The renewed proposal will outline how Baltic Sea monitoring could be re-organized and supplemented with novel methods to enhance spatial coverage, comparability, sensitivity and cost-effectiveness.

# FUMARI: MDIAK

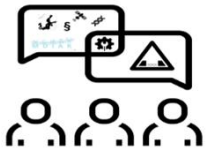


# Stakeholder involvement & cooperation



# Identify gaps: WP1

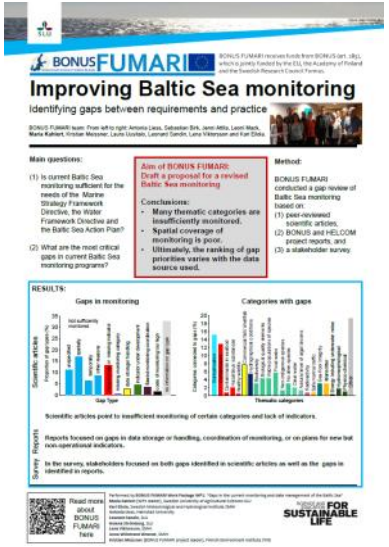




# Identify gaps: WP 1

Gaps in relation to legislation

- Stakeholder analysis
- Scientific literature review (>1000)
- Review of Reports



# Identify gaps: WP 1 Stakeholders

- Better/new indicators
- Spatial coverage
- Indicators not operational yet
- Biodiversity
- Molecular monitoring
- Benthic habitats
- Marine litter
- Climate change
- Dumped munition

- Poor integration between scientists, stakeholders and monitoring programs
- Too little coordinated national monitoring
- Insufficicient harmonization of monitoring

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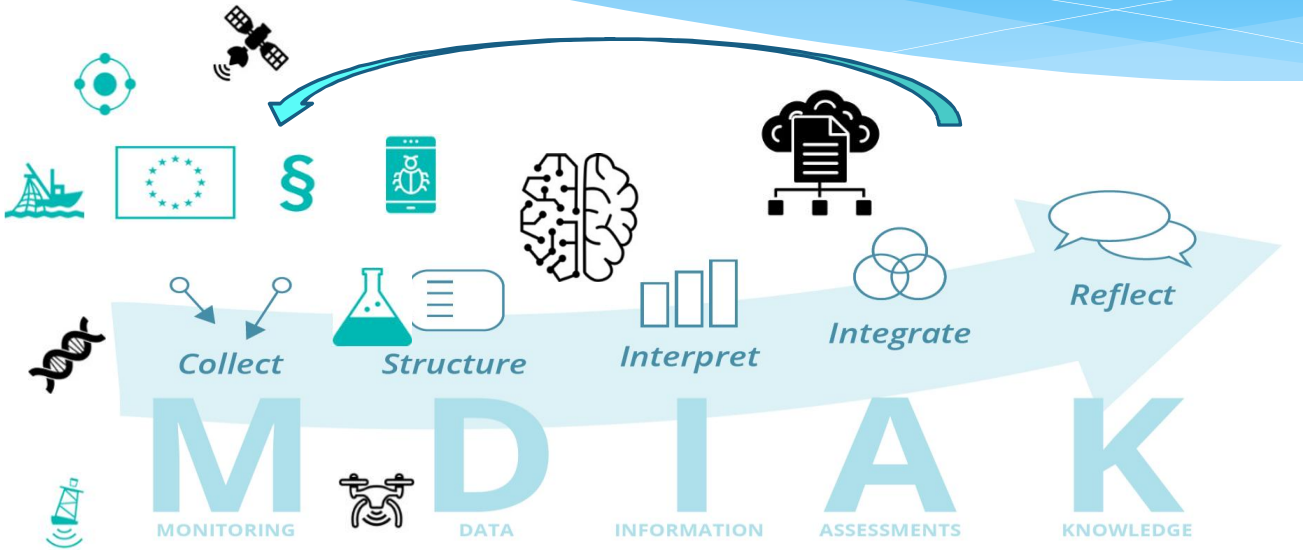
# Identify novel methods: WP2

* Identify, collect data on and rate novel sampling and analysis methods:
  * Stakeholders
  * Project members
  * External researchers
  * Scientific and project reports

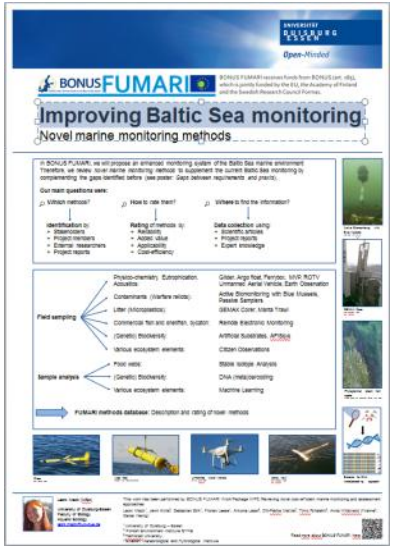
→ Online database available in September 2019!

# Identify novel methods: WP2



# Identify novel methods: WP2

| | | |
|---|---|---|
| **Field sampling** | Physico-chemistry, Eutrophication, Acoustics: | Glider, Argo float, Ferrybox, MVP, ROTV Unmanned Aerial Vehicle, Earth Observation |
| | Contaminants (Warfare relicts): | Active Biomonitoring with Blue Mussels, Passive Samplers |
| | Litter (Microplastics): | GEMAX Corer, Manta Trawl |
| | Commercial fish and shellfish, bycatch: | Remote Electronic Monitoring |
| | (Genetic) Biodiversity: | Artificial Substrates, AFISsys |
| | Various ecosystem elements: | Citizen Observations |
| **Sample analysis** | Food webs: | Stable Isotope Analysis |
| | (Genetic) Biodiversity: | DNA (meta)barcoding |
| | Various ecosystem elements: | Machine Learning |



# Renewed plan: WP3

* Based on WP1 and WP2
* cooperate with BONUS SEAM
* combine traditional and novel approaches and technologies
* provide a cost efficiency estimate of the proposed system

# Assessing the cost-efficiency of novel marine monitoring methods

New methods are often claimed to be “cost-efficient” without any real assessment of the associated costs

- What methods have been used to evaluate the cost effectiveness of marine ecosystem monitoring methods? (publications from year 2000→)

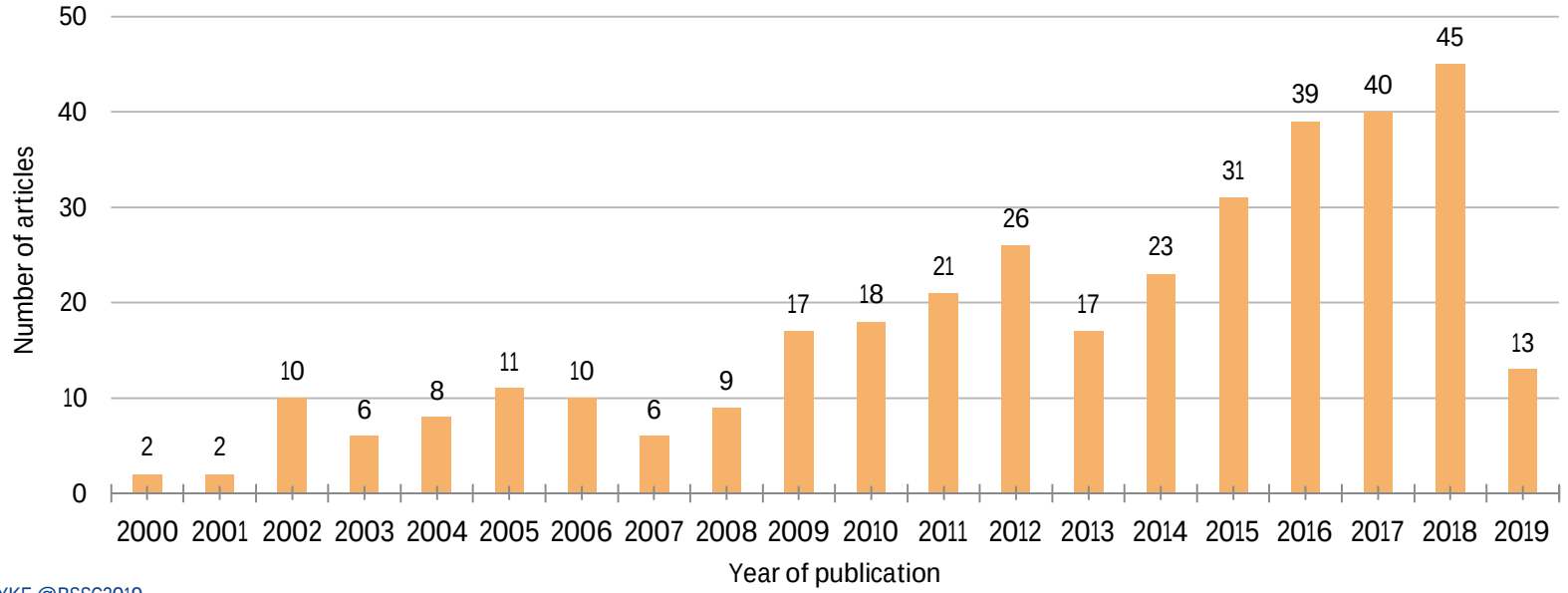
# Literature screening

A search of Scopus and Web of Science yielded 1684 articles (March 21st 2019).

313 articles included

- a marine ecosystem monitoring method and
- a cost-efficiency assessment.

# Cost- efficiency assessments are increasing

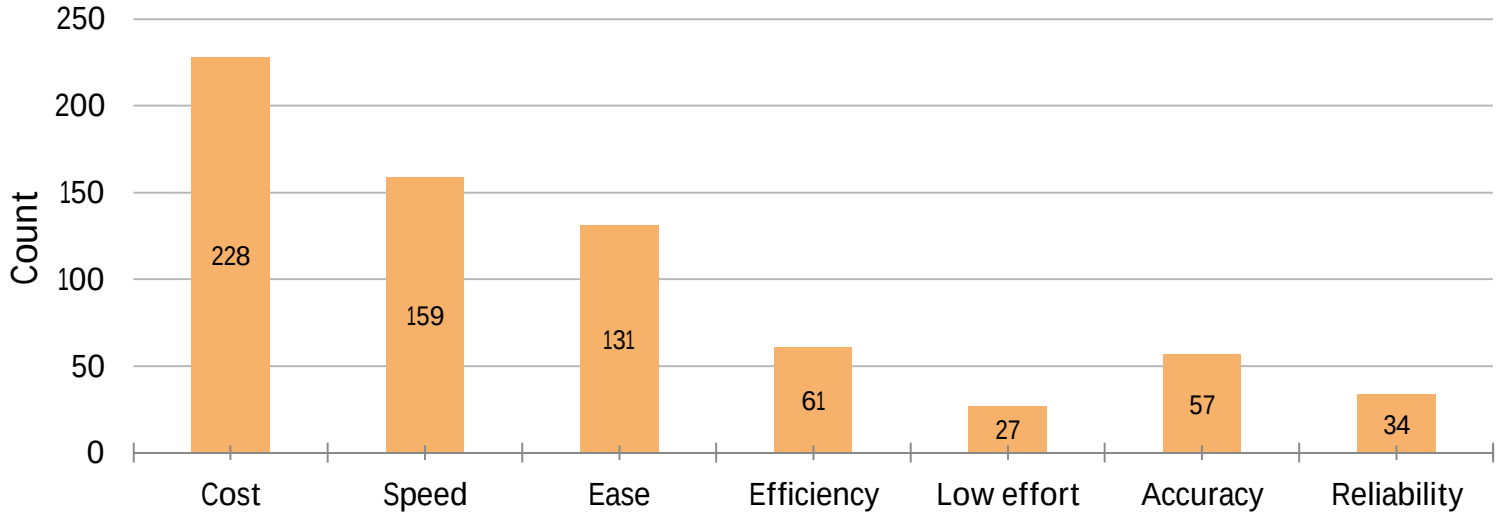


# Cost-efficiency assessment methods

Five distinct cost-efficiency assessment methods were observed:

- Cost-benefit analysis /ratio
- Comparative study based on an experiment
- Comparative study based on a literature review
- Comparisons with other methods based on literature
- Comparisons with other methods based on authors´ experience/intuition

# Reasons for cost efficiency



# Some conclusions for cost-efficiency

* Cost-efficiency and necessity of novel monitoring methods should be evaluated in terms of overall monitoring needs/aims
* A thorough cost-efficiency assessment is often lacking
* More comparable, objective and precise criteria need to be applied in future cost efficiency assessments of novel methods

# Some conclusions for novel methods

* A number of promising methods have been identifed (e.g. molecular methods for biodiversity and nonindigenous species monitoring)
* Implementation of novel methods in Baltic Sea monitoring will require international cooperation and standardization

# There is more to come !
# Follow BONUS FUMARI:

Thank you!