



Objectives and results

Dissemination meeting, Athens, 4th Dec 2018

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Project number: 11.0661/2016/748064/SUB/ENV.C2

Marine litter: a global issue



NATIONAL
GEOGRAPHIC

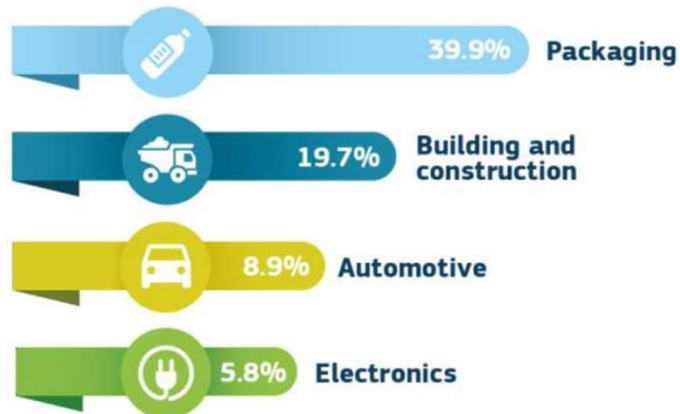
PLANET OR PLASTIC?

*18 billion pounds
of plastic ends up
in the ocean each
year. And that's
just the tip of
the iceberg.*

The annual global production of plastic is ~ 300 million tonnes (2015)

EUROPEAN PLASTICS DEMAND IN 2015

49 million tonnes



EU-28, Norway and Switzerland – Source: Plastics Europe (2016)

Around 25.8 million tonnes of plastic debris are generated in Europe every year...

**500,000 TONNES OF PLASTIC
IN THE OCEANS**

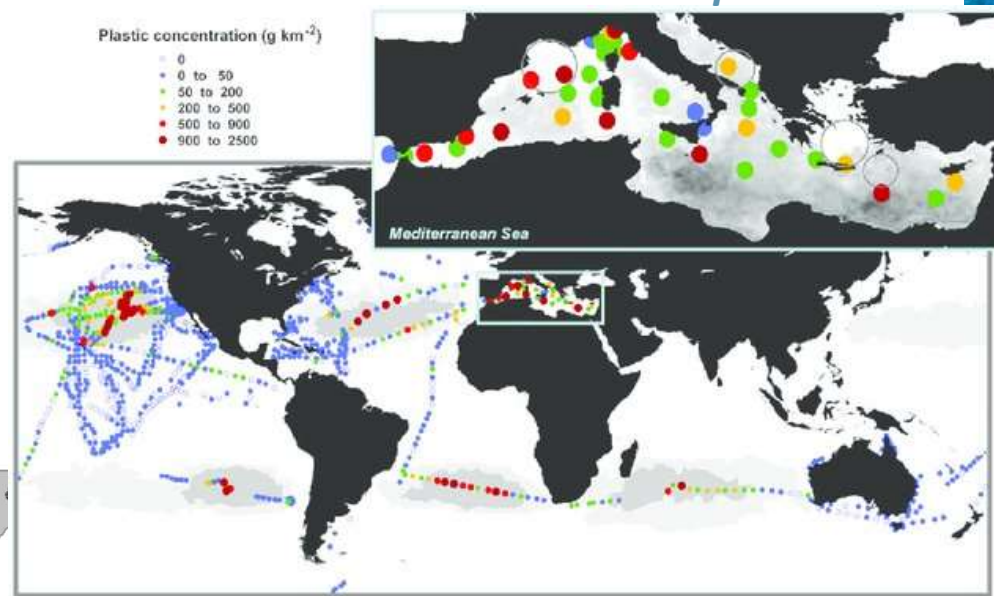


In EU, 150,000 to 500,000 tonnes of plastic waste enter the oceans every year

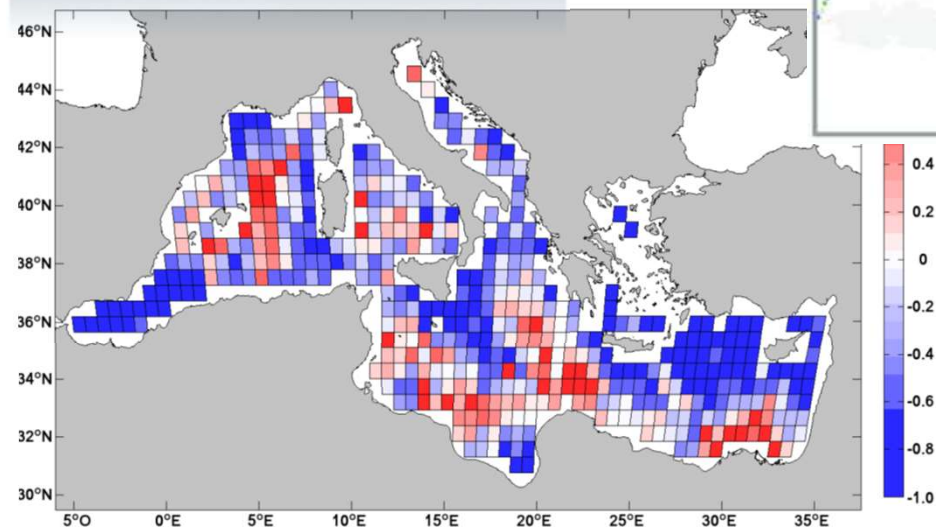
Plastics are now ubiquitous in the marine environment
(beach, sea floor sea, open water...)



Empirical data



Modelling



Cózar A, et al. (2015) PLoS ONE 10(4): e0121762. doi:10.1371/

J. Mansui et al. (2015) Marine Pollution Bulletin 91: 249–257.

Marine plastic pollution: A significant environmental concern for governments, scientists, non-governmental organizations and members of the public worldwide...

NGOs

(5 Gyres Institute, Joint Group of Experts, Ocean Conservancy, ICC, etc.)

- Monitoring of plastic
- Cleaning up coastal areas...
- increase awareness

Governments...

International Convention for the Prevention of Pollution From Ships (MARPOL 73/78)

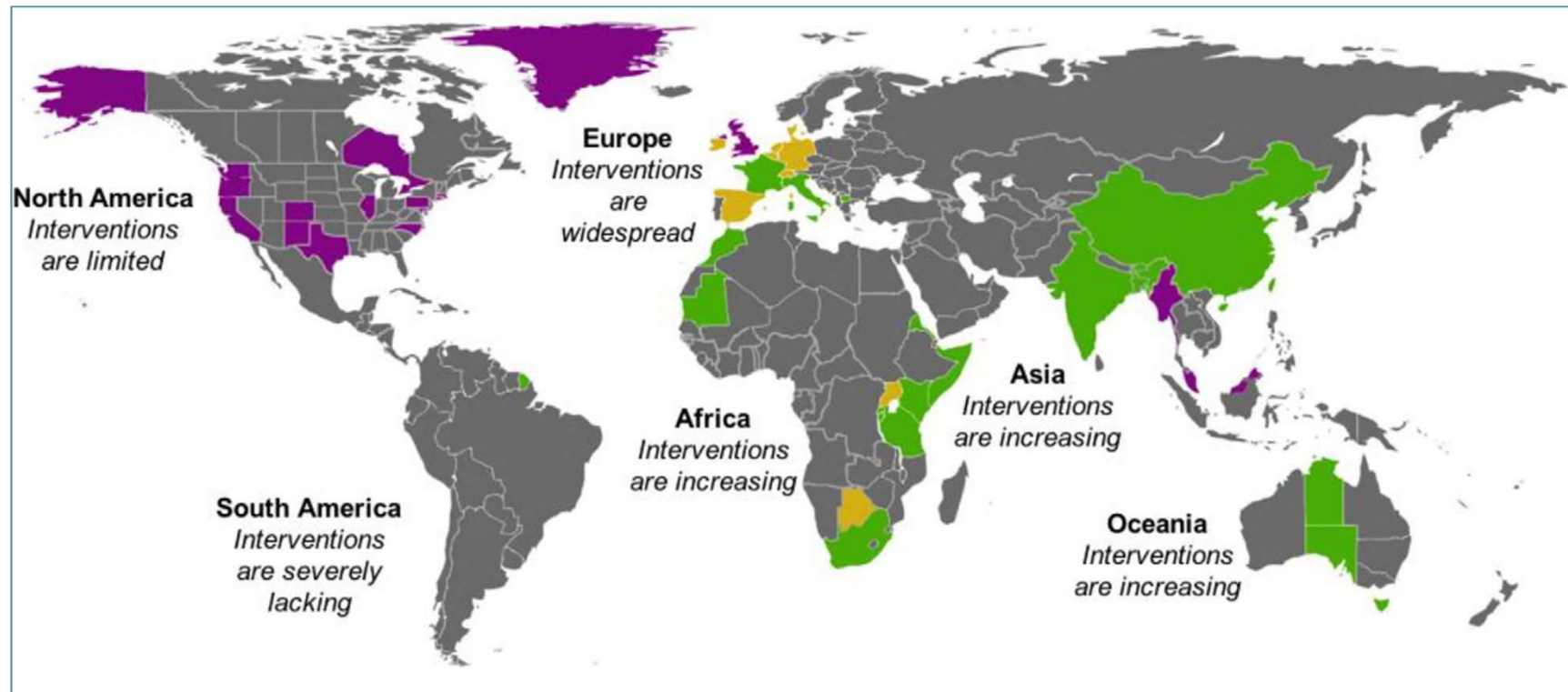
EU strategy for plastics in the circular economy 2030

Marine plastic pollution

The Honolulu Strategy (UNEP and NOAA, 2015)

- Market-based instruments (e.g., levies on new plastic bags) for minimizing waste
- Creates policies, regulations and legislation to reduce marine debris (e.g. imposing bans on plastic bag production)

Example: Plastic bag policies in the world...



Phase out of lightweight plastic bags around the world. Plastic bags banned; Taxes on some plastic bags; partial tax or ban (municipal or regional levels) (adapted from Elekh - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=32400659>).

Marine plastic pollution: a significant environmental concern...

Marine plastic pollution

Pressures- Impacts

Macro plastique (> 5mm)

Micro plastique (< 5mm)

Primary micro-plastics (e.g., microbeads) & secondary micro-plastics, from degraded macro-plastics

Entanglement of species (mortality or reduce performance)

Ingestion (direct mortality or chronic toxicology)

EU strategy for plastics in the circular economy (2030)

The European Union's Marine Strategy Framework Directive (MSFD)

The European Union's Marine Strategy Framework Directive (MSFD)

Good Environmental Status (**GES**) of the EU's marine waters by 2020 (**11 qualitative descriptors**):

→ **Descriptor 10** “Marine litter” = “Properties and quantities of marine litter do not cause harm to the coastal and marine environment”.

- **Primary Criteria** (amount, composition, distribution of macro and micro-litter)
- **Secondary criteria:**
 - **D10C3** of New Commission Decision 2017/848/EU: “*The amount of litter and micro-litter **ingested** by marine animals is at a level that does not adversely affect the **health** of the species concerned*”
 - **D10C4: Other impacts (e.g., Entanglement)**

A SMART approach!!

Specific, measurable, achievable, realistic, time-bound (and ambitious!)

Need of indicators for assessing the efficiency of restauration measures

The Fulmar *Fulmarus glacialis* (OSPAR)

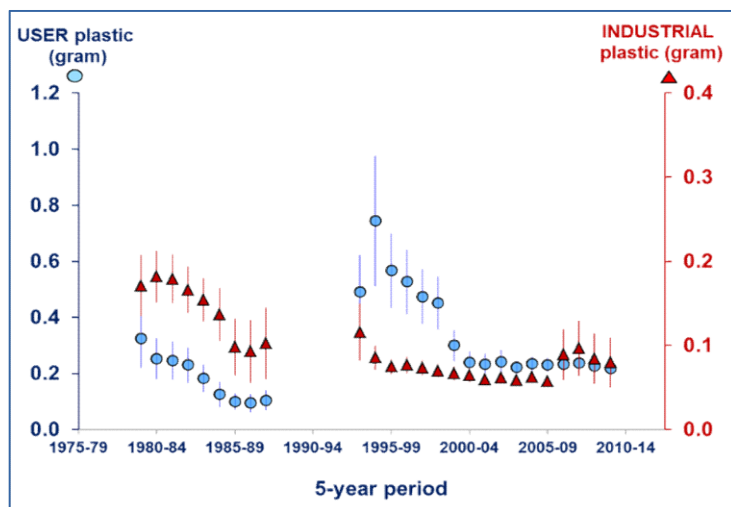


- "Litter ingested by fulmar"
- 2009-2013, the Netherlands:
94% of fulmars
28 fragments/indiv.
 ± 0.3 g

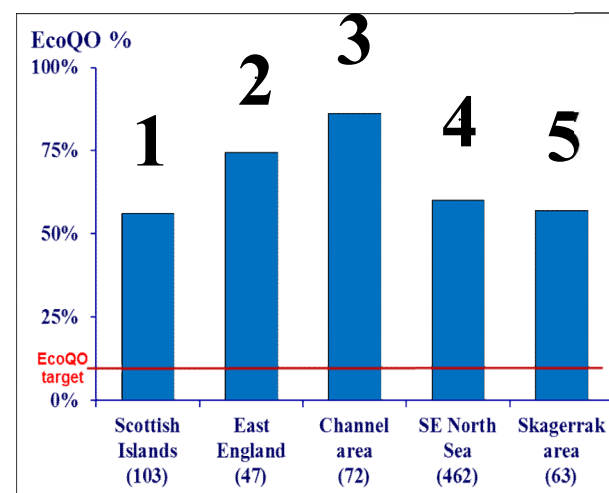


EcoQO: There should be less than 10 % of fulmars with more than 0.1 g of plastic in the stomach

The indicator should reflect the local pollution



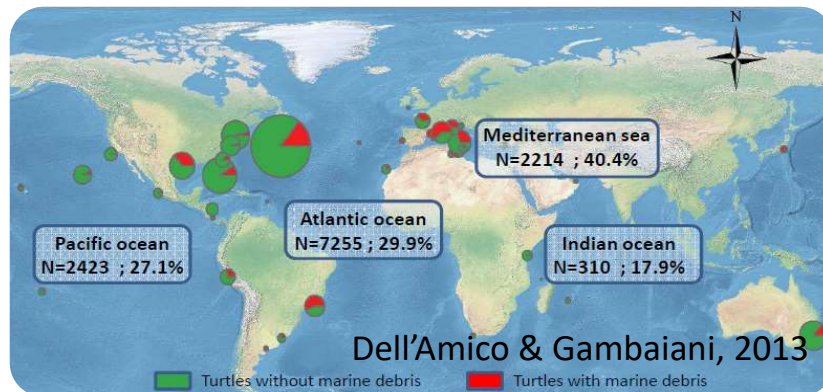
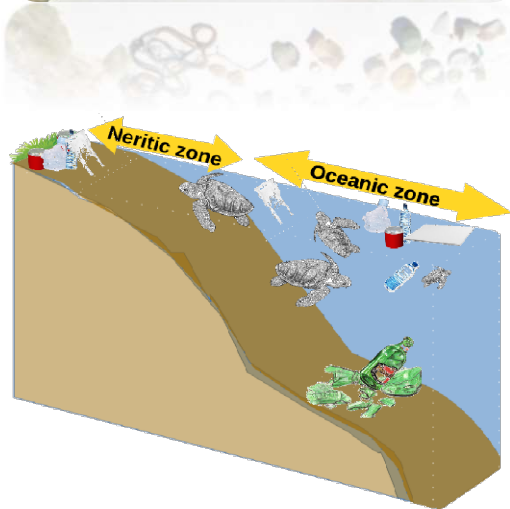
↓ over time with restoration measures



Region
Correlation ingested debris and local pollution



Establishing relevant indicators at the MSFD scale



- Easy to use
- Large distribution (→ harmonized RSCs)
- Propensity to be impacted by debris (e.g. ingestion, entanglement) relative to environmental pollution
- Scientific rigour: Should show significant variations relative to restoration efforts



INDICIT: Indicator Impact Turtle

Implementing indicators of marine litter impact on biota

In brief...

➤ February 2017-January 2019



➤ Support the implementation of EU's MSFD Descriptor 10
"Marine Litter"

+ Barcelona and OSPAR Regional Sea Conventions

⇒ Impact indicators

- Implementation of indicators of marine litter on sea turtles and biota
- Harmonizing approaches
- Developing a set of standardized tools for the monitoring of impacts



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INDICIT: Indicator Impact Turtle

Implementing indicators of marine litter impact on biota



1. "Litter ingested by sea turtle" (micro and macro)

⇒ pilot studies, GES baseline, criteria, implementation



2. "Entanglement with debris by marine biota"

⇒ Feasibility studies



3. "Micro-debris ingested by sea turtles and fish"

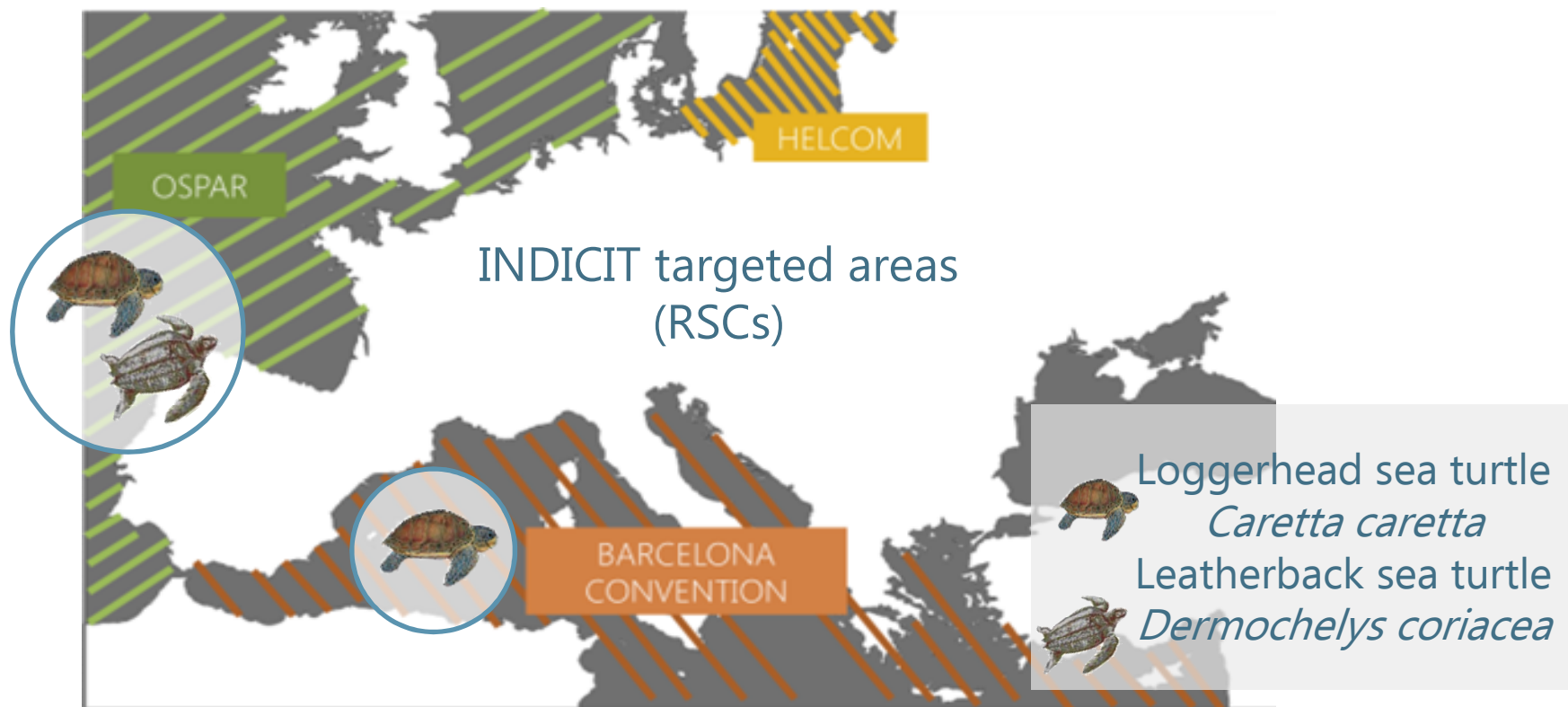
⇒ Feasibility studies



INDICIT: Indicator Impact Turtle

Implementing indicators of marine litter impact on biota

1. "Litter ingested by sea turtle"




INDICIT consortium



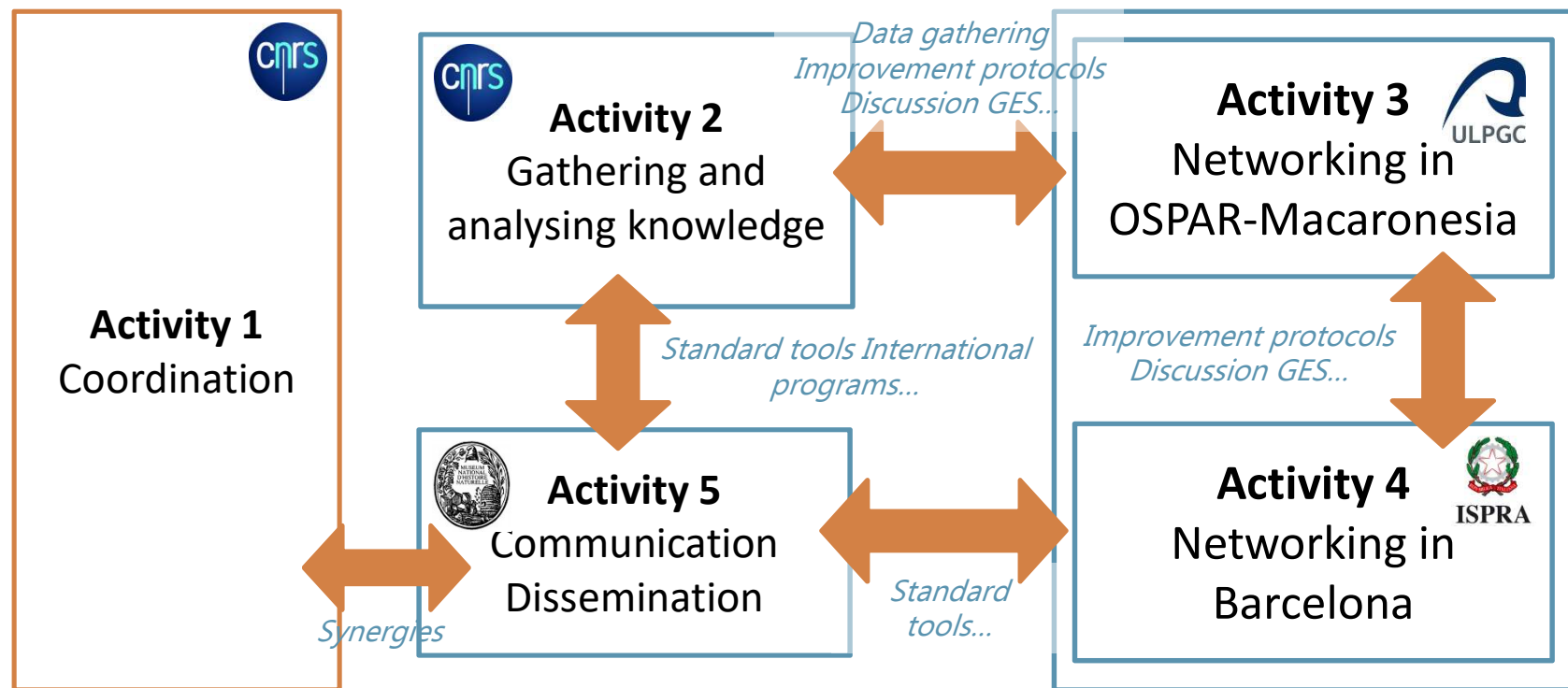
10 partner institutions



Strategy and structure

- 
- Networking
 - Collection of standard data
 - Analysis of raw data to provide GES and criteria
 - Disseminating standard tools to wider community

5 Work packages



Activity 1 "Management and coordination"

Objective: Ensuring proper implementation and management of project

- Technical coordination of the project
- Administrative, legal and financial management of the project

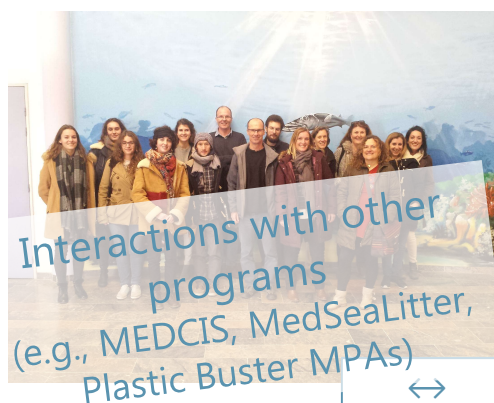
Financial reports
Budget management

Beneficiary	Own contribution (100% max)	EC Contribution (100% max)	Total	Comments
CONCEPT	79 305,00 €	222 777,00 €	302 082,00 €	25,33%
UNEP	42 616,00 €	66 382,00 €	108 998,00 €	8,13%
SFPA	38 158,00 €	221 893,00 €	259 051,00 €	1,41%
ONE-BOAC	77 059,00 €	61 940,00 €	138 999,00 €	6,91%
ICMVR	70 823,00 €	14 730,00 €	85 553,00 €	7,88%
UNEP	24 000,00 €	89 213,00 €	113 213,00 €	8,62%
EUROCC	58 580,00 €	221 893,00 €	280 473,00 €	2,77%
INCYD/WWF	21 403,00 €	12 823,00 €	34 226,00 €	6,79%
PAU-CHAMH	10 000,00 €	49 487,00 €	59 487,00 €	3,16%
INTECH	9 094,00 €	28 973,00 €	38 067,00 €	3,73%
TOTAL	328 144,00 €	999 953,00 €	1 328 097,00 €	100,00%



Internal communication

Task	Start Date	End Date	Status
Final report	2016-12-15	2016-12-15	Completed
Administrative tasks	2016-12-15	2016-12-15	Completed
Internal communication	2016-12-15	2016-12-15	Completed
External communication	2016-12-15	2016-12-15	Completed



↔
Activity 5



Activity 2 "Acquiring and using scientific knowledge to develop the indicators of litter impact at the (sub)regional and the whole MSFD spatial scale"

Objective: Filling the gaps of knowledge

→ Defining GES and criteria for Indicator "Litter ingested by sea turtles"

→ Evaluating relevance of 2 new impact indicators:

- "Entanglement with debris by marine biota"
- "Micro-debris ingestion by sea turtles and fish"

- Literature review on biological constraints influencing criteria
- Pilot studies
- Improvement and standardization of monitoring
- Establishment common databases
- Evaluation of GES and indicator criteria at whole area



"Litter ingested by sea turtles"



"Entanglement with debris by marine biota"



"Micro-debris ingestion by sea turtles and fish"



Activity 3

Activity 4

→ Networking and training to the standard collection of litter ingested by sea turtles

Objective: Applying specific actions for implementation of Indicator 1 “Litter ingested by sea turtles”

→ Activity 3: focus on **ATLANTIC OCEAN** (OSPAR RSC AND MACARONESIA)

→ Activity 4: focus on **MEDITERRANEAN BASIN** (BARCELONA RSC)

- Identification of local stakeholders
- Training on established standard protocols
- Sharing collected data in common databases
- Validating and implementing calculated GES and indicators' criteria at the RSC scale

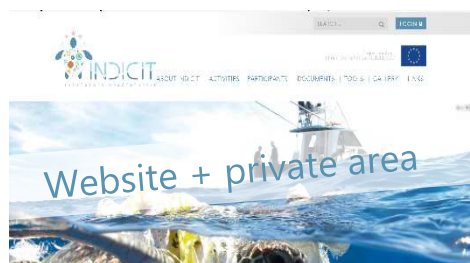


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Activity 5 "Communication and dissemination"

Objective: Communicating about the project and outcomes

- by providing technical tools within or outside INDICIT "area"
- by communicating towards a general audience



INDICIT progress



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INDICIT current results

Feasibility and pilot studies



<https://indicit-europa.eu/indicit-documents/>



Indicator Litter ingested by sea turtles

- State-of-art indicator's constraints
- Existing network
- Descriptive analyses from previous non standard data



Entanglement of marine biota in litter

- State-of-art + questionnaire
- Identification of relevant taxa / species
- Identification of indicator's constraints
- Existing networks and monitoring means



Micro-debris ingestion by fish and sea turtles

- State-of-art
- Identification relevant fish species
- Identification of relevant methods considering field and lab contamination



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INDICIT current results

Feasibility studies: Entanglement of marine fauna in debris



<https://indicit-europa.eu/indicit-documents/>



Picard Nature

26 Megafauna species in study area +
invertebrates

Main conclusions

- Identification of data producers/ sampling platforms, useful for MSFD TSG ML
- Need standardized methodology
- Need time + funds to involve identified networks



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INDICIT current results

Feasibility studies: Micro-plastic ingestion in fish and sea turtles



<https://indicit-europa.eu/indicit-documents/>



159 fish species + sea turtles

Main conclusions

- Identification of sampling technics
- Identification of target fish species
 - Would allow target other areas (e.g., HELCOM)
 - Would allow target debris <<1mm
- Proposition methodologies (sea turtles)
 - Already existing and trained network
 - Debris 1-5 mm
- Need standard protocol and data



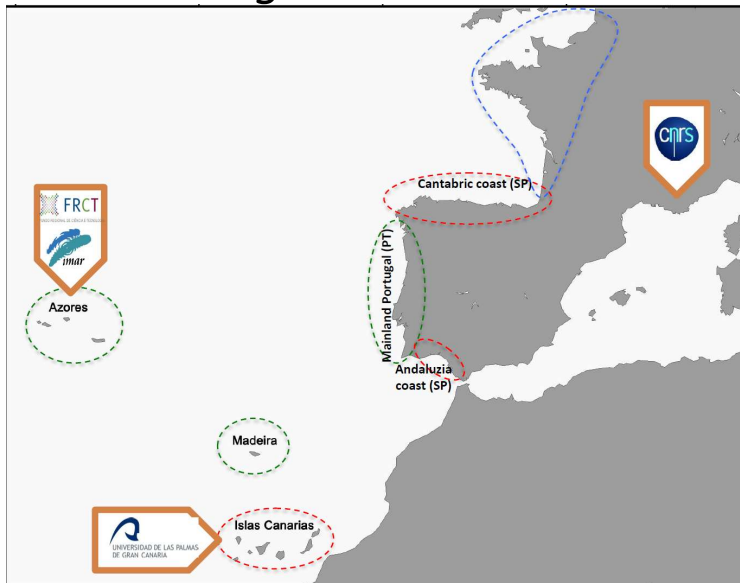
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INDICIT current results

Networking in OSPAR-Macaronesia

- Creation of a new network in the Atlantic area
- Numerous training sessions
- Improve standard protocol
- Discuss the GES scenarios

A large area covered



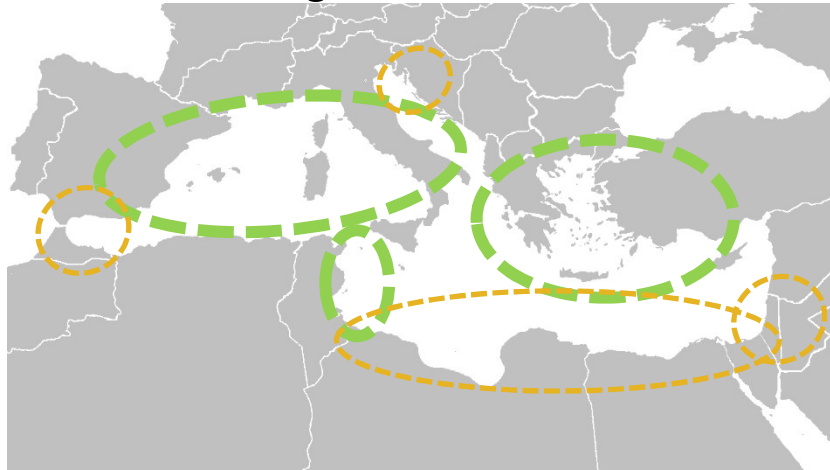
- Several other contacts: Collection of conditions for involvement

- **30 stakeholders involved/contacted**
 - 5 rescue centres
 - 11 stranding networks
 - 5 both activities
 - 3 Research centres
 - 5 Regional authorities
- Sharing in common database

INDICIT current results

Networking in UNEP/MAP EcAp process (Barcelona convention)

A large area covered



Several other contacts: Collection of conditions for involvement

- **29 stakeholders involved/contacted**
 - 9 rescue centres
 - 8 stranding networks
 - 1 both activities
 - 7 Research centres
 - 4 Regional authorities
- Sharing in common DB

- Numerous training sessions
- Improve standard protocol
- Discuss the GES scenarios



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INDICIT current results

Co-building of a standard protocol



Basic data (→ Litter ingested sea turtles)

- Debris >1mm
- Classification and quantification



Optional data (→ Adjust indicator's constraints; collect data on other impacts)

- Litter description
- Biometry, health status, injuries, digestive capacity
- Entanglement
- Micro-debris (1-5 mm) ingestion



2 approaches

- From dead individuals (necropsies)
- From alive individuals (feces)



<https://indicit-europa.eu/protocols/>

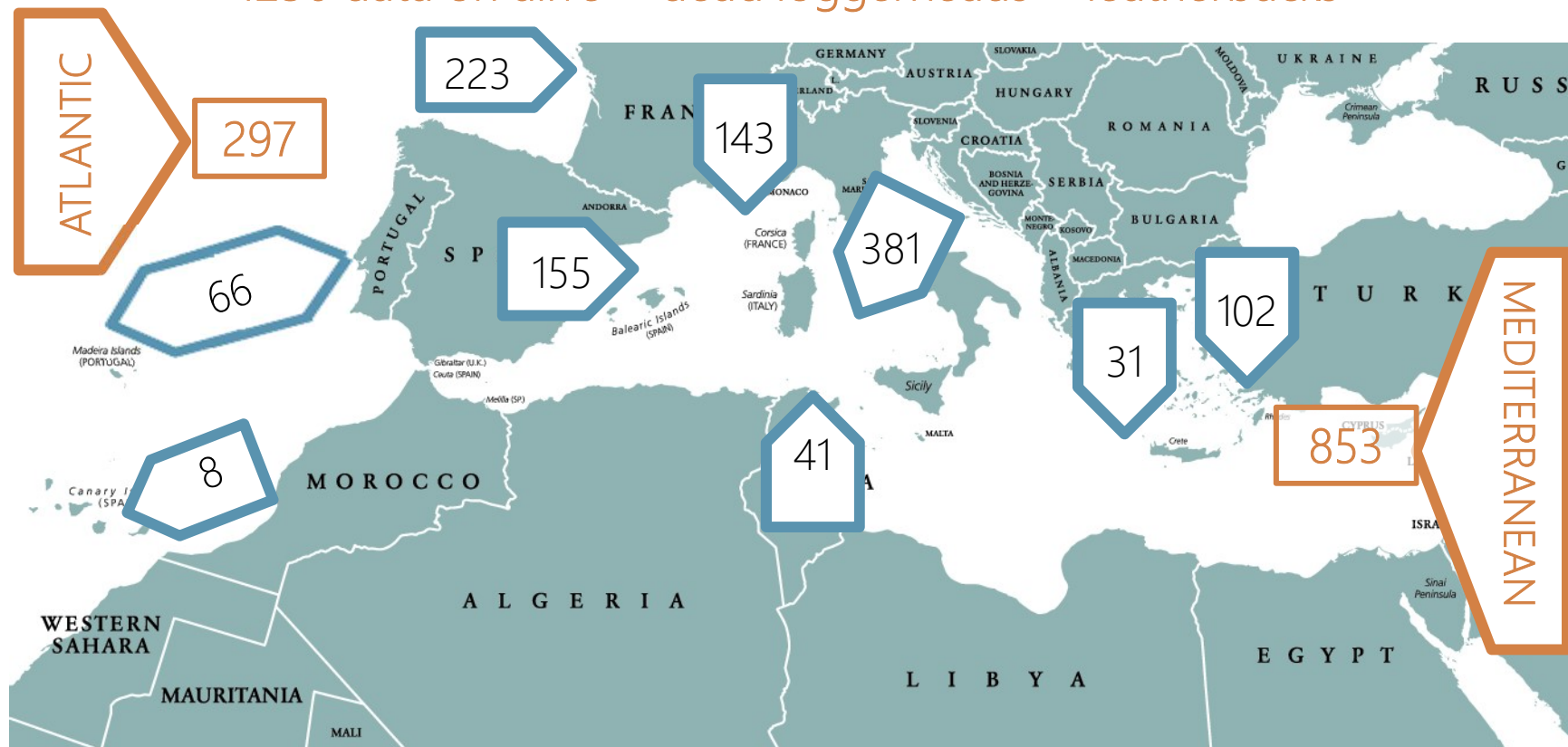


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INDICIT current results

A large standard dataset

1256 data on alive + dead loggerheads + leatherbacks



Number of sampled loggerheads (Nov. 2018)

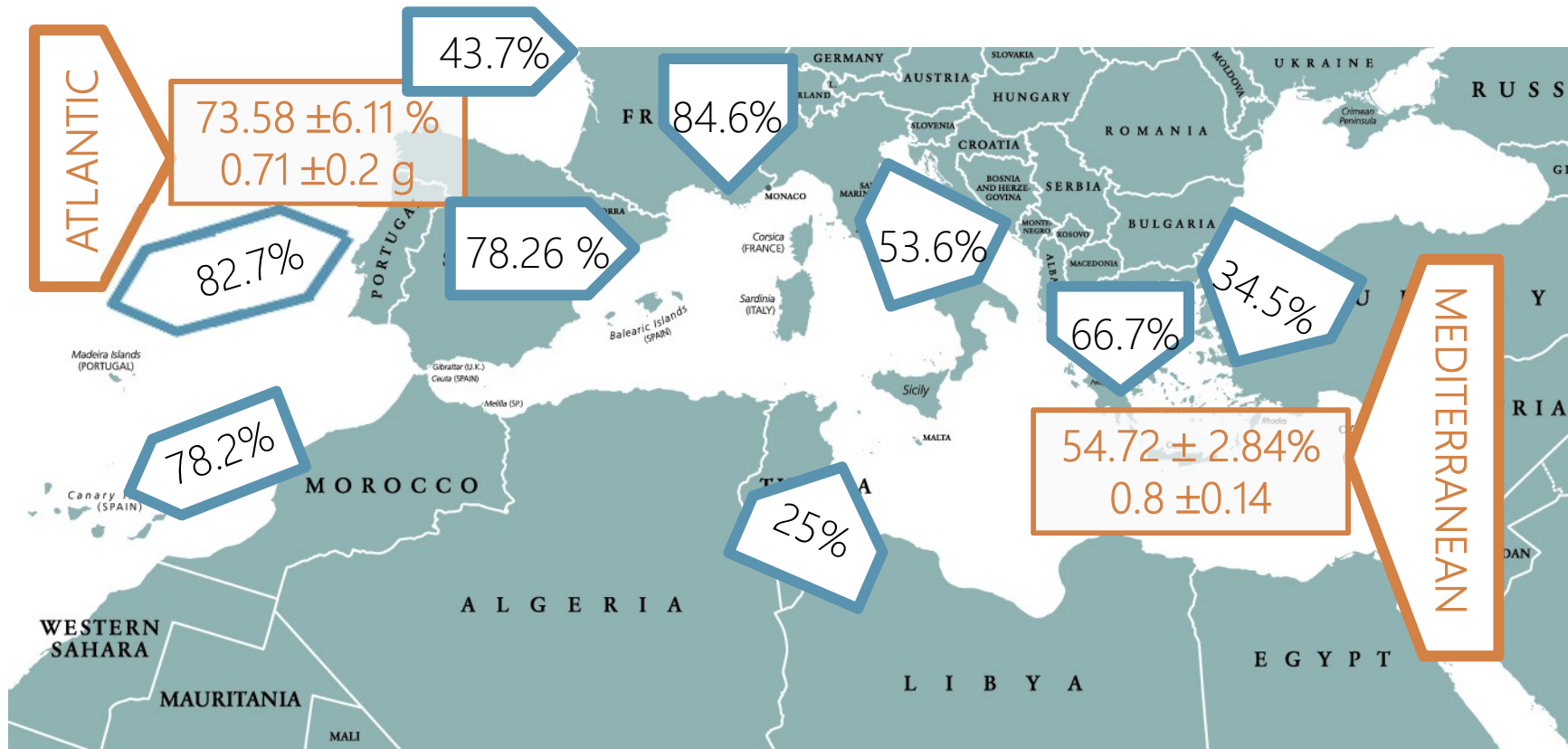


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INDICIT current results

A high occurrence of debris ingestion in Caretta

From **necropsies**: **57.5 (± 2.27)%**; **0.79 (± 0.47) g** (data > 2013)



Occurrence of plastics ingestion (%) and quantity of ingested plastics (g) in necropsied loggerheads (Nov. 2018, to be updated)



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INDICIT current results

Mostly plastics with a high diversity of current single-use items



Bags, cups, lollipops, packaging, fragments... (Nov. 2018)

INDICIT current results

Awareness

- News (site + Facebook)
- Documentary (in progress)
- Press articles
- Pedagogical materials, e.g. “Turtle story” scenario, in several languages
- INDICIT Challenge for World Ocean Day and World Sea Turtle Day (June 18)



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INDICIT current results

Synergies with other programs

- Interaction and collaboration with other experts/programs (MISTIC SEAS, MARCET...) → **Proposals for harmonized approaches** (e.g., common protocols, GES unit, risky areas, data banking...)



- Developed by Ifremer in 2015 for French dataset for MSFD Descriptor 10 "Marine Litter" and being adapted for D10C3/4 based on INDICIT protocol

The screenshot shows the INDICIT software interface. At the top, there's a section for 'Informations on the discovery site' with fields for Program, Station, Date, Survey time, Part, and Comments. Below this is a table with columns for Program, Station, Date, Survey time, Part, and Comments. The table contains two rows of data. Below the table, there's a section for 'Selections on the animal's body conditions' with a table for 'List of sampling operation to create'. This table has columns for Species, Conservation status, Main, By-Catch, Discovery, Probable cause of, Entanglement, Litter causing, Health, Affected, Fat, and Part of the. The table contains several rows of data, including 'Caretta caretta', 'Dermochelys', 'Chelonia mydas', and 'Other'.

- Possibility to **hide data** entered
- Possibility to be **used at larger scale** (I.E. UNEP MAP RAP / MEDPOL Database)
- Possibility to impose a **Moratorium on the dataset**



INDICIT current results



Synergies with other programs

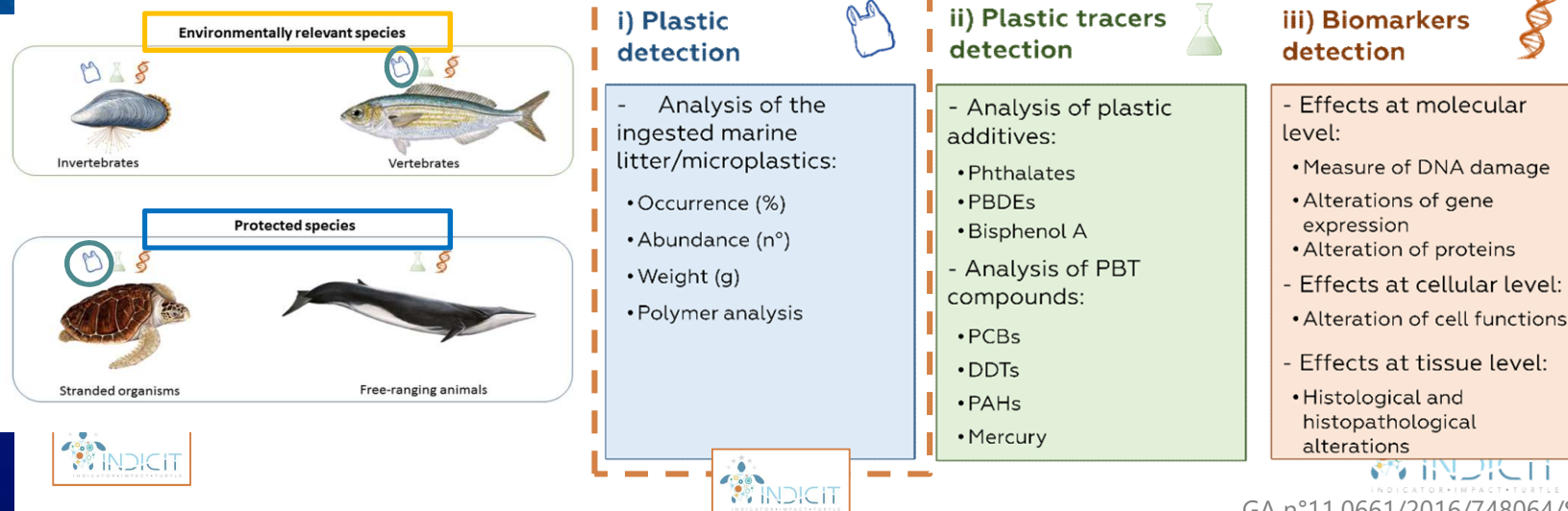
The simultaneous investigation in bioindicator species of:

A) analysis of **gastro-intestinal content** to evaluate the **marine litter** ingested by the organisms;

B) analysis of **plastic additives** and PBT compounds used as plastic tracers;

C) analysis of the effects **by biomarkers responses** at different level of biological organization

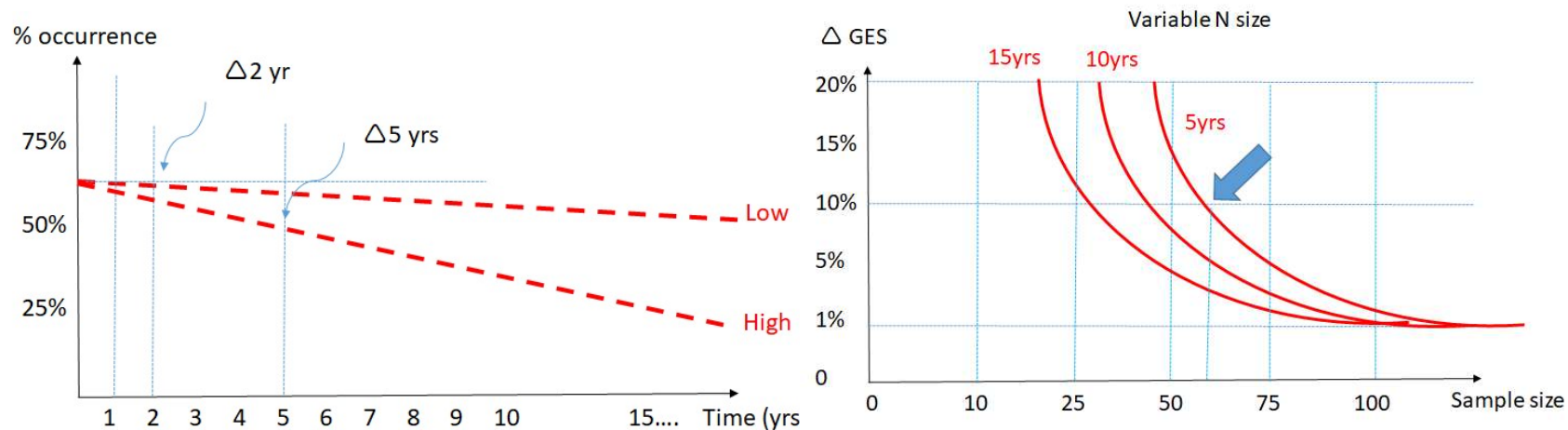
to allow a **more complete assessment of the real impact** related to plastic debris ingestion by marine organisms.



INDICIT perspectives

Evaluating GES

- What timing to detect a significant (ambitious) trend?
- How many samples (individuals) to detect a significant trend?



Ex: A **10%** decrease is significantly detected with a sampling every **5 years** with **N = 60 samples**

INDICIT perspectives

Assessment of GES and criteria

- **Examples GES scenarios**
 - *"There should be less than X% of loggerheads having more than Y g or more of plastics in the digestive tract in a sample of min 50 loggerheads from each area (RSC)"*
 - 48.76% have more than 0.88 g (average from data in Nov. 18)
 - *"There should be less than X% of loggerheads with more plastics than food remains"*
 - Among indiv. with ingested debris: 73.42% (average from data in Nov. 18)
 - Other scenarios considering body condition being evaluated
- Consideration of acquired knowledge on the factors influencing litter ingestion → Biological constraints



Thank you

