Adaptive Marine Policy
AMP Toolbox

Presentation of the Adaptive Marine Policy Toolbox on the web: example of the marine litter Developed by the EU Perseus

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Adaptive Marine Policy
AMP Toolbox

WHY: Different Directives (e.g. MSFD, CFP) and conventions (e.g. UNEP/MAP´s EcAp, BS SAP) require measures to achieve GES

WHAT: A one-stop repository of principles, methods and resources to elaborate marine policies in the Mediterranean and Black Seas, based on:

- Best available scientific information and knowledge

- Participative approaches, involving stakeholders

- **Capacity to develop adaptive policies,** under uncertain and reactive environment conditions:

- Use of integrated and forward looking analyses

- Cyclical process which enables iterative learning about environmental issues and management consequences through monitoring / assessment

For WHOM: focus on Policy-makers

SCOPE: focus on the national and regional scale

Adaptive Marine Policy
AMP Toolbox

MAIN PAGE

STEPS

1. **SET THE SCENE**
2. **ASSEMBLE THE BASIC POLICY**
3. **MAKE POLICY ROBUST**
4. **IMPLEMENT THE POLICY**
5. **EVALUATE AND ADJUST POLICIES**

KEY ACTIVTIES

14 activities to accomplish each step

RESOURCES

- Knowledge base

- Regional models and assessments

- Tools and methods

- Further readings

(http://www.perseus.net.eu/en/policy cycle/index.html)

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AMP Toolbox

AMP Toolbox > Policy Cycle

Policy Cycle

The policy cycle adopted in the adaptive marine policy (AMP) toolbox is based on the policy-making process suggested by the MSFD. It is transformed into an adaptive and flexible policy-making cycle by incorporating principles and methodologies used in other policy fields. Step-wise, cyclical policy-making methods are widely propagated and used in a variety of different policy fields.

The PERSEUS adaptive policy cycle:
Step 1
Step 2
Step 3
Step 4
Step 5

Problem Identification Tools

PERSEUS Tools

Policy Design Tools

Adaptive Policies: Tools and Strategies

1) Set the scene

2) Assemble the basic policy

5 Steps of Policymaking

5) Evaluate and adjust policies

4) Implement the policy

3) Make policy robust

General Project Management & Monitoring Tools

Policy Strengthening Tools

Demonstration by an example !

About the AMP Toolbox

Policy Cycle

Step 1

AMP Toolbox

AMP Toolbox > Policy Cycle > **Step 1**

Step 1: Set the scene

What is this step about?
This step is about the definition of policy aims by identifying potential problems and issues. To this end, the current situation is defined (through ecological, economic and social analysis, as well as analysis of the existing institutional, political and legal framework in marine affairs) and generic environmental objectives are set (e.g. reaching and/or maintaining the GES). The scope and direction of necessary interventions (i.e. development of policies and measures) is derived from comparing the expected status of marine ecosystems, given the existing conditions (i.e. baseline), with the defined goals (e.g. an environmental state defined as "good" by the MSFD).

In addition, this step aims at determining key sources of knowledge and finding any knowledge gaps, identifying stakeholders and getting an overview of all sorts of useful tools.

Why is this step necessary?
In this step the gaps between the current and desired situations are identified as a starting point to explore first directions for bridging these gaps and for setting objectives. In order to build support from all parties involved, it is of the utmost importance to create a common understanding of the situation as it is and the goals to be achieved and to take opinions of different parties and interest groups into account. This is an indispensable prerequisite for the definition of appropriate strategies and feasible measures in following policy-making steps.

Who should be engaged?
In this step both scientific and non-scientific knowledge are used to recognise and describe the current state (e.g. of the marine ecosystem) as well as to assess human activities, economic uses and social interests relevant to the policy. Accordingly, several actors and parties need to be involved in the process including scientists, local actors and stakeholders. In addition, a technical policy-making team is required to establish the linkages and lead the policy design.

How should this step be carried out?
Both scientific and non-scientific knowledge are needed to identify areas of uncertainty and risk. While evidence-based knowledge and experience-based knowledge are difficult to compare and synthesize, they are also complementary, and therefore enable a diversified perspective on the issues to be addressed. Natural sciences are particularly relevant for information-gathering and determining the current situation in terms of quantitative measurements (e.g. toxicology for the assessment of the level of contaminants in seafood). Social sciences provide methods for engaging with stakeholders (e.g. multi-stakeholder deliberation) and to draw experience-based knowledge into the process. Ultimately, both science and experience are used in adaptive policy making, not as a means to an end (i.e. finding a definitive solution), but as guidance to create a process for managing a complex and constantly changing system (e.g. the marine environment). For these purposes the following list of key activities should be performed:

Key activities (not necessarily a step-by-step process, but a series of actions to be performed before the design and selection of measures begins)

- Involve experts and stakeholders
- Gather information and determine existing conditions
- Develop a mutual understanding and define principles and goals
- Develop Scenarios and perform Risk analysis

What should be the outcome?
The outcome of this step should be a description of the field(s) in which the policy needs to act (i.e. the issue(s) or problem(s) that need to be dealt with in order to achieve the objective(s)), and an indication of the direction it should lead into (i.e. the actual objective(s) of the policy-to-be-developed, as a guidance for possible measures to be chosen and/or designed, and eventually to be implemented in the following steps).

Together these ingredients serve as point of departure for all subsequent steps.

About the AMP Toolbox

Policy Cycle

Step 1
Set the scene

Step 2
Assemble the basic policy

Step 3
Make policy robust

Step 4
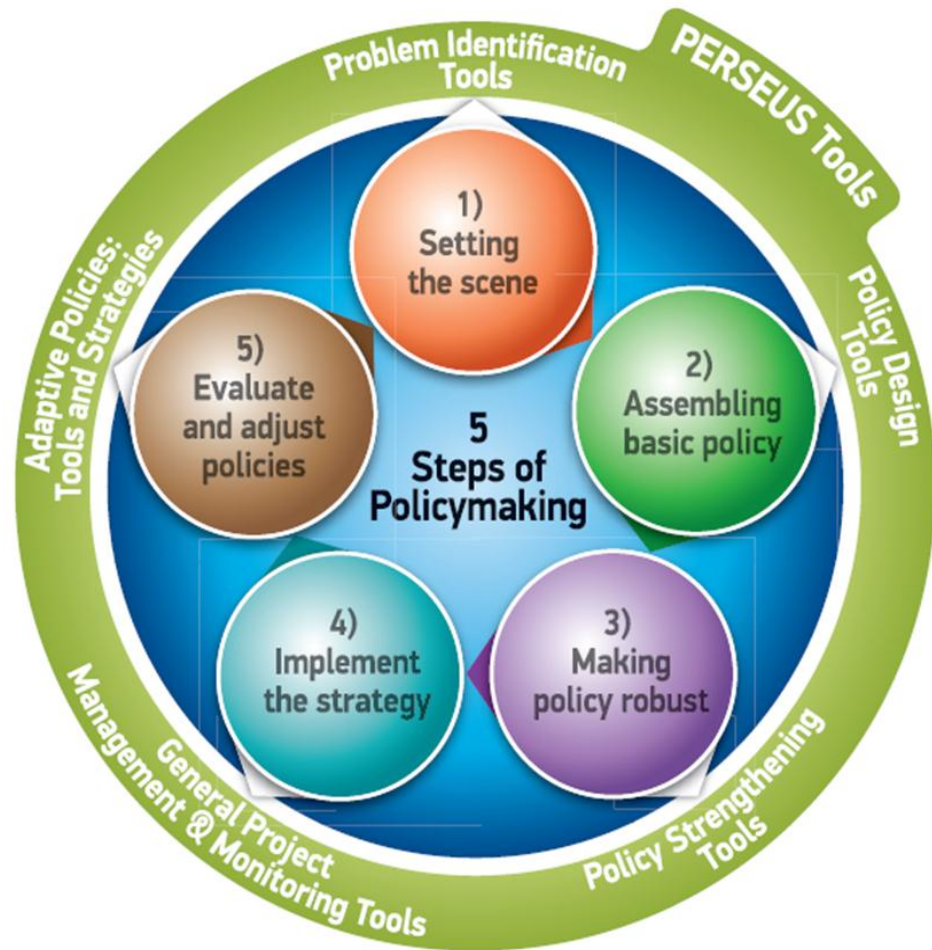Implement the policy

Step 5
Evaluate and adjust policies

Resources

Examples

Feedback

PERSEUS
POLICY-ORIENTED MARINE
ENVIRONMENTAL RESEARCH IN
THE SOUTHERN EUROPEAN SEAS

How can the AMP toolbox support policy-makers?

1. Set the scene;
2. Assembling basic policy;
3. Making policy robust;
4. Implement the strategy;
5. Evaluate and adjust measures.
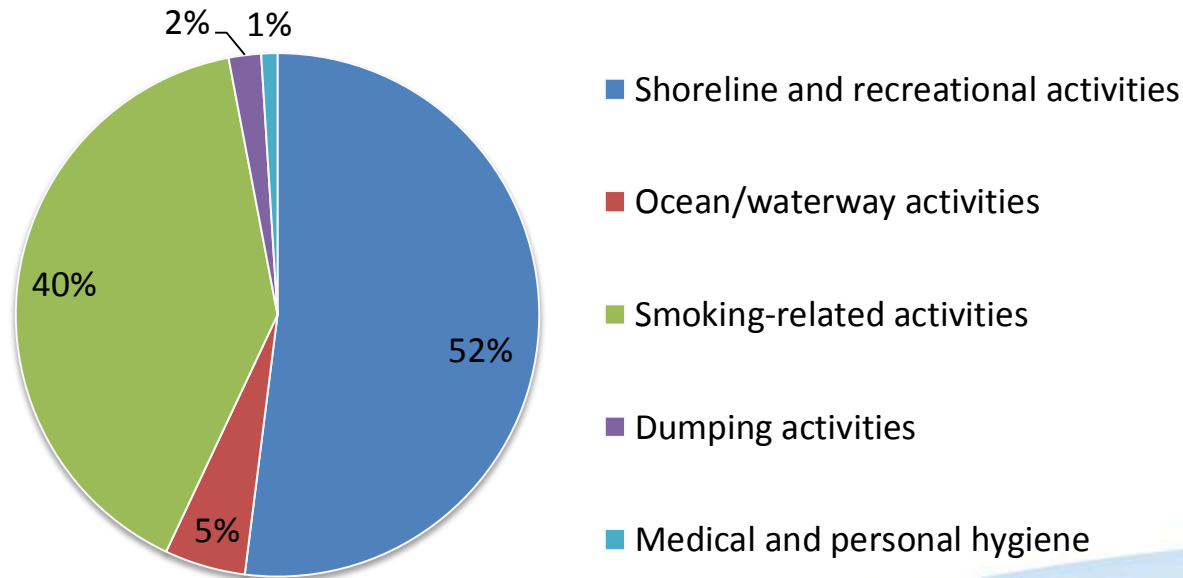
STEP 1:

Set the scene

STEP 1

Gather information and determine existing conditions

<u>Further reading</u>: UNEP, 2009. Marine Litter: A Global Challenge.

Figure: Sources of marine litter from Mediterranean International Coastal Cleanup campaigns (2002-2006)

- ■ Shoreline and recreational activities
- ■ Ocean/waterway activities
- ■ Smoking-related activities
- ■ Dumping activities
- ■ Medical and personal hygiene

<u>Further reading</u>: Pham et al. (2014). Marine Litter Distribution and Density in European Seas from the Shelves to Deep Basins.

STEP 1

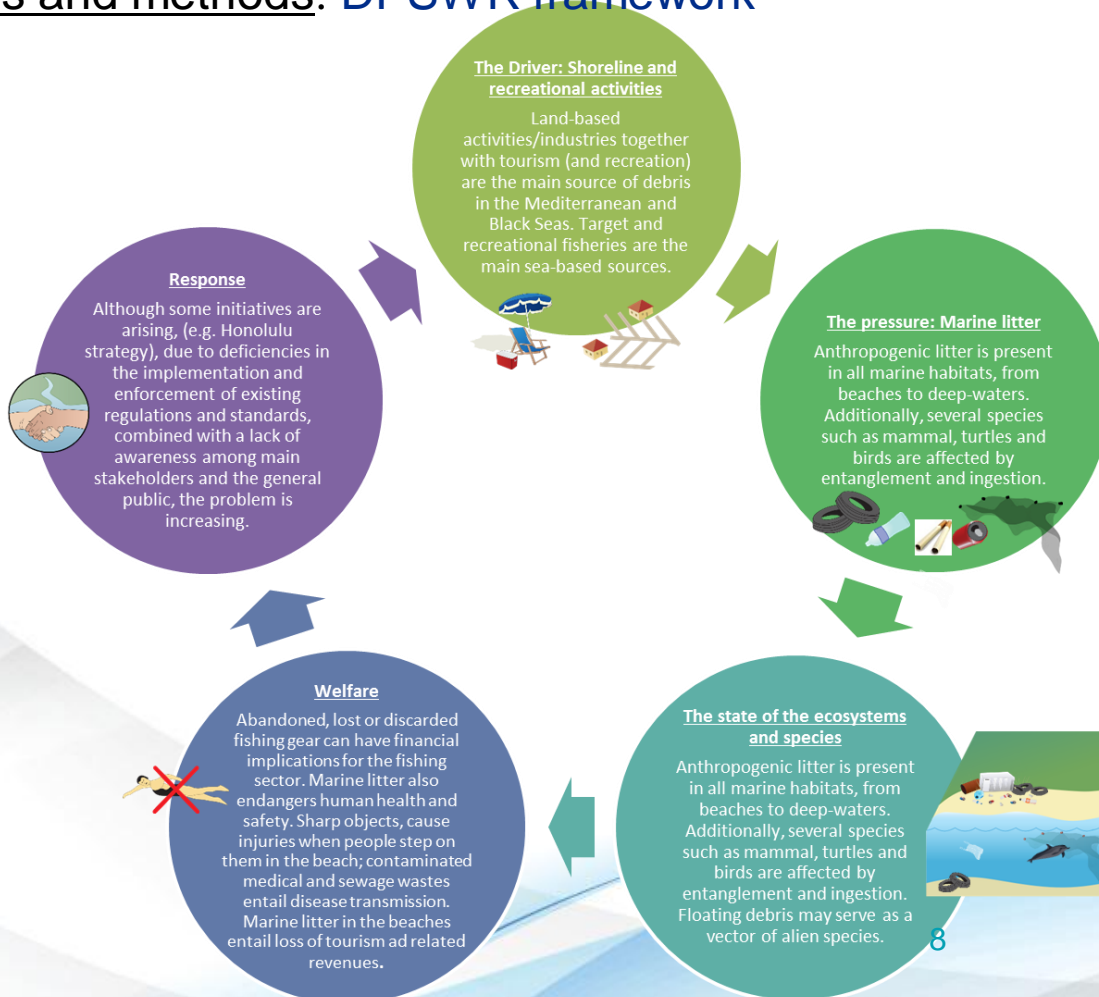# Analyze cause-effect relationships

Tools and methods: DPSWR framework

The Driver: Shoreline and recreational activities

Land-based activities/industries together with tourism (and recreation) are the main source of debris in the Mediterranean and Black Seas. Target and recreational fisheries are the main sea-based sources.

The pressure: Marine litter

Anthropogenic litter is present in all marine habitats, from beaches to deep-waters. Additionally, several species such as mammal, turtles and birds are affected by entanglement and ingestion.

The state of the ecosystems and species

Anthropogenic litter is present in all marine habitats, from beaches to deep-waters. Additionally, several species such as mammal, turtles and birds are affected by entanglement and ingestion. Floating debris may serve as a vector of alien species.

Welfare

Abandoned, lost or discarded fishing gear can have financial implications for the fishing sector. Marine litter also endangers human health and safety. Sharp objects, cause injuries when people step on them in the beach; contaminated medical and sewage wastes entail disease transmission. Marine litter in the beaches entail loss of tourism ad related revenues.

Response

Although some initiatives are arising, (e.g. Honolulu strategy), due to deficiencies in the implementation and enforcement of existing regulations and standards, combined with a lack of awareness among main stakeholders and the general public, the problem is increasing.

Key point: The **first step** is to **acknowledge that there is a problem** – i.e., that there is marine litter, that this causes problems and that the negative impacts of marine litter are of sufficient importance to merit further analysis
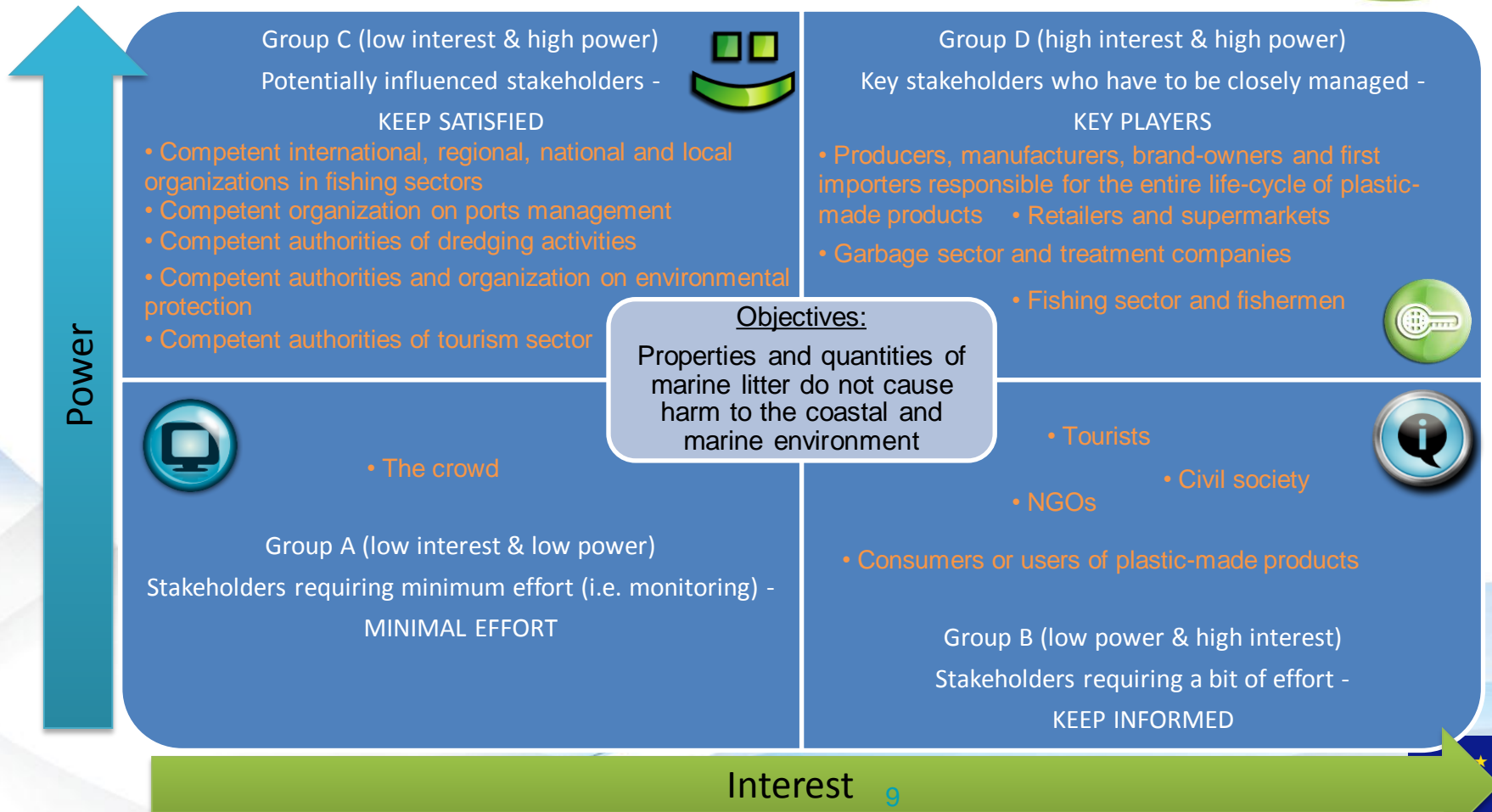
STEP 1

Involve experts and stakeholders

Tools and methods: Stakeholder analysis

Power →

Group C (low interest & high power)

Potentially influenced stakeholders -

KEY SATISFIED

• Competent international, regional, national and local organizations in fishing sectors
• Competent organization on ports management
• Competent authorities of dredging activities
• Competent authorities and organization on environmental protection
• Competent authorities of tourism sector

Group D (high interest & high power)

Key stakeholders who have to be closely managed -

KEY PLAYERS

• Producers, manufacturers, brand-owners and first importers responsible for the entire life-cycle of plastic-made products   • Retailers and supermarkets
• Garbage sector and treatment companies
• Fishing sector and fishermen

Objectives:
Properties and quantities of marine litter do not cause harm to the coastal and marine environment

• The crowd

Group A (low interest & low power)

Stakeholders requiring minimum effort (i.e. monitoring) -

MINIMAL EFFORT

• Tourists
• Civil society
• NGOs
• Consumers or users of plastic-made products

Group B (low power & high interest)

Stakeholders requiring a bit of effort -

KEEP INFORMED

Interest → 9

STEP 1

Develop a mutual understanding and define principles

Framework consisting in three goals and associated strategies: A. Land based sources; B. Sea based sources; C. accumulated marine debris on coastal and marine ecosystems

i.e. Goal A: Reduced amount and impact of land-based sources of marine debris introduced into the sea
Strategy A1. Conduct education and outreach on marine debris impacts and the need for improved solid waste management
Strategy A2. Employ market-based instruments to support solid waste management, in particular waste minimization
Strategy A3. Employ infrastructure and implement best practices for improving stormwater management and reducing discharge of solid waste into waterways
Strategy A4. Develop, strengthen, and enact legislation and policies to support solid waste minimization and management
Strategy A5. Improve the regulatory framework regarding stormwater, sewage systems, and debris in tributary waterways
Strategy A6. Build capacity to monitor and enforce compliance with regulations and permit conditions regarding litter, dumping, solid waste management, stormwater, and surface runoff
Strategy A7. Conduct regular cleanup efforts on coastal lands, in watersheds, and in waterways — especially at hot spots of marine debris accumulation

Key point: Before the possible solutions are listed, it is helpful to develop a clear set of objectives that the policy needs to address. Initiatives for new actions will need to build on both an **understanding of the proble**m as well as the **benefits of addressing the problem**.

Also, list the framework and infrastructure elements that will be needed to make the new policies work.

STEP 1

Involve experts and stakeholders

<u>Knowledge Base</u>: Institutional inventory

INTERGOVERNMENTAL ORGANIZATIONS

- ✓ Black Sea Commission (BSC)
- ✓ Mediterranean Action Plan Coordinating Unit
- ✓ United Nations Environnement Programme (UNEP)
- ✓ International Maritime Organization (IMO)
- ✓ World Health Organization (WHO)
- ✓ Food and Agriculture Organization of the United Nations (FAO)
- ✓ Intergovernmental Oceanographic Commission (IOC)
- ✓ Mediterranean Science Commission (CIESM)
- ✓ Joint group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)
- ✓ European Commission (EC)

Key point: The process will be more effective and simpler when there is **clear institutional authority for action and enforcement**

STEP 1

Involve experts and stakeholders

Knowledge Base: Legal inventory

Key point: To identify additional legal and administrative obligations, with the **aim of defining consistent objectives and strategies**.

INTERNATIONAL

- ✓ Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention)
- ✓ Convention for the Prevention of Pollution from Ships (MARPOL) (London protocol)
- ✓ Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention)
- ✓ Convention on Biological Diversity (CBD)
- ✓ UNEP Global Marine Litter United Nations General Assembly resolutions on Oceans and the Law of the Sea
- ✓ United Nations General Assembly resolutions on sustainable fisheries
- ✓ Fifth International Marine Debris Conference (5IMDC) and Honolulu strategy
- ✓ Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) (and the Global Partnership on Marine Litter (GPML)
- ✓ International Conference on Prevention and Management of Marine Litter in European Seas
- ✓ Marine Strategy Framework Directive

STEP 1

Involve experts and stakeholders

 Knowledge Base: Legal inventory

Key point: To identify additional legal and administrative obligations, with the **aim of defining consistent objectives and strategies**.

REGIONAL

- ✓ Convention on the Protection of the Mediterranean against Pollution (Barcelona Convention) and its Protocols

- ✓ Mediterranean Action Plan (MAP)

- ✓ MED POL Program

- ✓ MAP initiative on the Ecosystem Approach (EcAp)

- ✓ Regional Plan on Marine Litter Management in the Mediterranean

STEP 2:

Assemble the basic policy

Key point: Policy-makers look at the **full range of possible solutions and develop a list of options**.

Identify measures

Knowledge base: Database Measures Inventory
Search query: Impact-Marine Litter

Activities	Pressure	Response
Ballast uptake and dumping area closures	Other physical disturbance	Clean Shipping Index_4
Bathing Zones	Other physical disturbance	Big beach clean project
Bathing Zones	Contamination by hazardous substances	Israel's Clean Coast Index
Bathing Zones	Other physical disturbance	UN's World Tourism Organization's Global Code of Ethics for Tourism
Bathing Zones	Other physical disturbance	DestiNet
Bathing Zones	Other physical disturbance	Blue Flag Scheme organised by the Federation of Environmental Education in Europe
Bathing Zones	Other physical disturbance	Beachwatch project
Bathing Zones	Other physical disturbance	Coastwatch - Tchildren and volunteers who collect and investigate the litter washed onto the shore
Bathing Zones	Other physical disturbance	Monaco's Operation Plage Propre
Canoeing, kayaking	Other physical disturbance	Romania's Ecotourism Certification System
Commercial Shipping	Systematic and/or intentional release of substances	MARPOL 73/78 Convention on the Prevention of Pollution from Ships
Commercial Shipping	Other physical disturbance	MARPOL- Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form
Commercial Shipping	Other physical disturbance	MARPOL - Annex V Prevention of Pollution by Garbage from Ships
Commercial Shipping	Other physical disturbance	Hellenic Marine Environment Association (HELMEPA)
Commercial Shipping	Other physical disturbance	'No-special-fee' system in all Baltic Sea ports_3
Commercial Shipping	Other physical disturbance	Commercial and recreational fishing fees. Ship berthing fees Port reception fees
Commercial Shipping	Other physical disturbance	Financial and technical support for the installation of waste management systems on board of ships
Commercial Shipping	Other physical disturbance	Installation of Port Reception Facilities_3
Commercial Shipping	Other physical disturbance	Certification system for ports and marinas « Harbour Environmental Management» certification_2
Commercial Shipping	Other physical disturbance	Clean Shipping Index_2
Fisheries in general	Biological disturbance	Common Fisheries Policy (CFP)_3
Fisheries in general	Other physical disturbance	Fishing for Litter (FFL)
Fisheries in general	Biological disturbance	Awareness programs to mitigate ALDFG (abandoned, lost or otherwise discarded fishing gear) impacts
Fisheries in general	Other physical disturbance	Mitigation measures to reduce ALDFG e.g. innovative materials (
Fisheries in general	Other physical disturbance	Curative measures, e.g. clean up projects to mitigate "ghost fishing"
Fisheries in general	Other physical disturbance	Fishing for litter programme; Incentives to fishermen for reporting on and the removal of debris.
Fisheries in general	Other physical disturbance	Preventative measures to reduce ALDFG
Marine cruising	Other physical disturbance	Friend of the Environment label (Croatian Ministry of Tourism together with the Ministry of Environmental Protection)
Marine cruising	Other physical disturbance	Tourist charges (in general): 1) Tourist taxes 2) Car park fees 3) Waterfront business charges
Offshore Oil/Gas Platforms	Other physical disturbance	Removal of OBM pile cutters
Offshore Oil/Gas Platforms	Other physical disturbance	Removal of surface large concrete pipelines
Ports & Harbour Service Area	Systematic and/or intentional release of substances	Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues.

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STEP 2

Identify measures

Further readings: Ten Brink et al. (2009). Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter.

Table: Marine litter categories and tools to combat marine litter (Modified from Ten Brink et al., 2009)

Economic Instruments	Lad-based sources				Ocean-based sources				
	Plastic	Other solid waste	Medical	Sewage related debris	Plastic	Other solid waste	Sewage related debris	Nets and boxes	Fishing debris
Plastic bag tax					X				
Charging schemes for waste services	X	X	X						
Landfill tax	X	X	X						
Deposit for drink containers	X	X			X	X			
Port reception fee					X	X	X		
Incentives to fishermen for reporting and retrieval/removal of debris					X	X			X
Award-based incentives for coastal villages with Integrated Waste Management	X	X							
Damaged/abandoned fishing gear buy-back								X	
Tourist taxes, car parking fees, waterfront business charges and other sources of revenue to earmark for beach cleaning	X	X							
Fine for illegal disposal of litter/fly tipping/pet waste fouling	X	X							
Ship garbage record books					X	X	X		
Fines register					X	X	X		

STEP 2

Prioritize/assess new measures

Tools and Methods: BCA Toolkit

Purpose
The BCA tool kit is used to quantify and compare the costs and benefits of proposed measures and projects to address natural hazards

Usage: Medium-high
Cost: Moderate-high
Capacity: Moderate-high
Background requirements: Moderate-high
Participation: Low-moderate
Time range: Medium-high
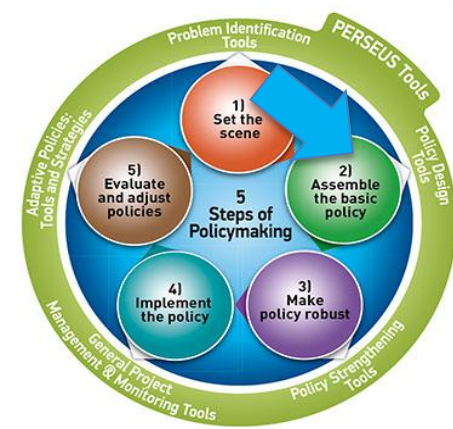
Knowledge base:
Database Marine valuation

Visitors' perceptions on the management of an important nesting site for loggerhead sea turtle (*Caretta caretta* L.): The case of Rethymno coastal area in Greece

Nikoleta Jones[a], Kalliopi Panagiotidou[a, b, 1], Ioannis Spilanis[c, 2], Konstantinos I. Evangelinos[a], Panayiotis G. Dimitrakopoulos[b, 1]

Sample Value Estimates:

➢ 1.13 euro: WTP for daily accommodation tax for environmental management

➢ 1.59 euro: WTP for entrance fee

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STEP 2

Prioritize/assess new measures

Further readings: Ten Brink et al. (2009). Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter.

> Key point: The various **options need to be assessed against a range of criteria**. The importance of selecting these criteria is fundamental to the final success of an instrument, and care should be taken to get this right.
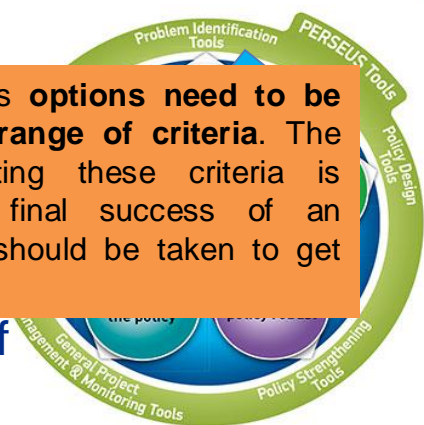
Table:10 criteria to select policy options (Modified from Ten Brink et al., 2009)

Instrument	Type of Economic Instrument	1 Addresses important objectives (e.g. legal)	2 Potential to offer significant environmental benefits	3 Raises useful revenues	4 Potential to be fair and equitable	5 Avoids unacceptable social impacts	6 Consistent with other important economic objectives	7 Likely to be cost-effective	8 Lead to efficient pricing	9 Understandable and credible to Stakeholders and public	10 Feasible (capacity to design, implement and enforce)	Index
Plastic bag tax	Tax	5	5	5	5	4	5	5	5	5	4	48
Landfill tax	Tax	5	3	5	5	1	5	4	5	4	3	40
Deposit for drink containers	Deposit refund	5	4	1	5	3	5	5	5	5	4	42
Port reception fee (general fee, no special fee for waste)	Fee	4	4	4	5	5	5	4	4	4	5	44
Incentives for fishermen (for reporting and removal)	Subside	4	4	1	4	5	4	5	3	5	5	40
Award-based incentives for coastal villages with Integrated Waste Management systems	Award	4	4	1					3	5	5	39
Waste fishing gear buy-back	Incentive	5	5	1					3	5	5	42
Tourist taxes, car park fees, waterfront business charges and other sources of revenue to earmark for beach cleaning	Tax, fee	5	4	5					5	5	5	48

Legend:
5 Completely agree
4 Agree
3 Neutral
2 Disagree
1 Strongly disagree

STEP 3:

Make policy robust

STEP 3

Forward looking analysis: assess policy success

Regional models: Scenarios to be modelled

Key point: To make the policy robust it is necessary to **identify key factors that affect policy performance**; and define the scenarios to **study the way these factors might evolve in the future**.
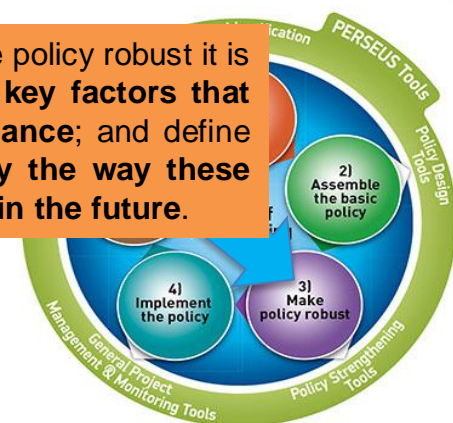
Table: Direction of change for drivers or activities particularly related to marine litter for the five PERSEUS scenarios for the Mediterranean and Black Seas (2030)

| SECTOR		Business as Usual	Convergence with proactive environmental management	Convergence with reactive environmental management	Heterogeneity with proactive environmental management	Heterogeneity with reactive environmental management
MEDITERRANEAN SEA						
Tourism	Mass tourism demand	0/+	-	++	0/+	+
	Luxury tourism	0/+	+	++	0/+	-
	Local/cultural tourism	0/+	++	++	+	-
	Eco-tourism	0	++	--	+	0
Coastal Development/ Urbanization	Population	++	+	++	+	++
	Expansion of settlements	+	0/-			++
Fisheries/ aquaculture	Fisheries production	0/-	++			--
	Aquaculture production	+	+			+
Maritime transport/ports	Expansion of port areas	0/+	+			0/+
	Increase of transports	0/+	++			0/-
BLACK SEA						
Tourism	Mass tourism demand	0/+	+			-
	Luxury tourism	0	++			--
	Local/cultural tourism	0/+	++	++	+	-
	Eco-tourism	0/+	++	0/+	+	0
Coastal Development/ Urbanization	Population	+	+	++	+	0/+
	Expansion of settlements	+	0/+	++	0/+	+
Fisheries/ aquaculture	Fisheries production	0	+	0/+	0/-	-
	Aquaculture production	+	+	++	0/+	+
Maritime transport/ports	Expansion of port areas	0/+	++	0/-	0	0/+
	Increase of transports	++	++	0/-	0/-	0/+

Legend:
0 same as present state
+ more than present state
++ much more than present state
- less than the present state
-- much more than present state

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STEP 3

Forward looking analysis: assess policy success

Regional models: End to end models
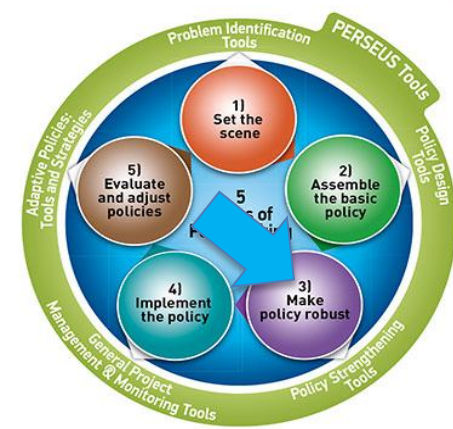
Key Point: Scenarios can be turned into methods that can be as informal as a verbal description of system dynamics, or as detailed as the models developed by the PERSEUS Project.

Type of model/component	Link
Hydrodynamic models	
– **ROMS** **Regional Ocean Model System** – **POM** **Princeton Ocean Model** – **NEMO** **Nucleus for European Modelling of the Ocean** – **POLCOMS** **Proudman Oceanographic Laboratory Coastal Ocean Modelling System**	- http://iod.ucsd.edu/~falk/roms_class/shchepetkin04.pdf. - http://web.stevens.edu/ses/ceoe/fileadmin/ceoe/pdf/alan_publications/AFB032.pdf. - http://www.nemo-ocean.eu/About-NEMO/Reference-manuals. - http://cobs.pol.ac.uk/modl/metfcst/POLCOMS_DOCUMENTATION/node4.html.
Lower Trophic Level models	
– **BFM** **Biogeochemical Fluxes Model** – **NPZD** **Nitrogen, Phytoplankton, Zooplankton, Detritus** – **ERSEM** **European Regional Seas Ecosystem Model**	- http://bfm-community.eu/publications/bfmV5manual_r1.0_201303.pdf. - http://ic.ucsc.edu/~kudela/OS130/Readings/Franks,2002.pdf. - http://www.sciencedirect.com/science/article/pii/0077757995900470.
Higher Trophic Level models	
– **EwE** **Ecopath with Ecosim** – **OSMOSE** **Object-oriented Simulator of Marine biOdiverSity Exploitation** – **ICHTHYOP** **A Lagrangian tool for modelling ichthyoplankton dynamics**	- http://www.seaaroundus.org/journal/christensenwalters2004a.pdf. - http://www.sciencedirect.com/science/article/pii/S0990744001011068. - http://www.brest.ird.fr/personnel/ppenven/publications/lett_ems2008.pdf.

STEP 3

Key Point: Monitoring new policies is critical, and should be built into the process. Monitoring may include ongoing surveys that reveal the status of the problem.

Design and implement a monitoring plan

Further readings: European Commission (2010). Commission Decision on criteria and methodological standards on good environmental status of marine waters.

10.1. Characteristics of litter in the marine and coastal environment

10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source.

10.1.2 Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea- floor, including analysis of its composition, spatial distribution and, where possible, source.

10.1.3 Trends in the amount, distribution and, where possible, composition of micro-particles (in particular micro- plastics).

10.2. Impacts of litter on marine life

10.2.1 Trends in the amount and composition of litter ingested by marine animals (e.g. stomach analysis).

Further readings: - Galgani et al. (2010). MSFD Task Group 10 Report Marine litter. - UNEP(DEPI)/MED WG.401/3 (2014). Draft Monitoring and Assessment Methodological Guidance

STEP 3

Design and implement a monitoring plan

Further readings: Galgani et al., 2013. Marine litter within the European MSFD.
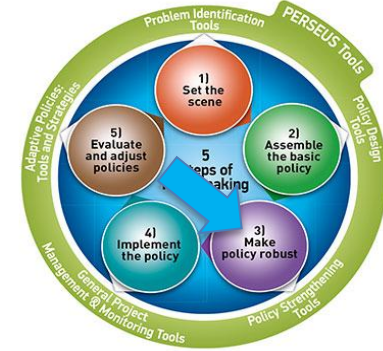
Table: Summary of approaches for assessing Good Environmental Status with regards to marine litter (Galgani et al., 2013)

Compartment	Approaches	Positive aspects	Poorly covered and negative aspects
Coastline	Counts of the amount of litter items on known stretches of coast.	Allows for assessment of composition, amounts, sources, trends, social harm (aesthetic, Economic).	Very small items and micro-particles in sediments are not quantified. Not all coasts are accessible or appropriate.
Sea surface.	Ship observers.	Precise evaluation at local scale.	Depending on weather. Not at large scale, small debris not considered, strong temporal variation
Sea surface and water column	Trawling and water filtration.	Precise evaluation at local scale, consider smaller debris.	Costs, strong temporal variation.
Sea surface	Aerial counts of the number of litter items floating on the sea surface along transects.	Assessment of densities of litter on water surface over large areas possible; correlation with shipping or fisheries activities.	Smaller items not covered. Only counts of items from TetraPak size upwards are possible.
Sea floor shallow	Visual survey with divers.	All substrate types, replicability, feasible to account for detectability.	Depth limitation (<40 m).
Sea floor, deep sea	Litter Trawling.	Replicability, possible standardization.	Only where trawling is possible.
Sea floor, deep sea litter	Submersibles and remote operated vehicles.	All sites accessible.	Only small areas, costs.
Entanglement rates of marine organisms	Entanglement rates in birds found on the coastline.	Can be carried out as part of existing surveys.	Standard protocol would need to be developed and implemented.
OSPAR Fulmar Plastic Ecological Quality Objective (EcoQO)	Mass of plastic in stomachs of beached seabirds (Fulmars).	Operational and tested in North sea. Applicable everywhere in most of OSPAR area.	Focuses on surface litter in offshore habitats; not yet operational in all EU regions: need further developing.
Ingestion by other marine organisms.	Abundance of plastic by mass	Potentially similar to Fulmar EcoQO approach.	Need to be developed and tested.
Micro-plastic on shorelines	Extraction of fragments from sediment samples and subsequent identification using FT_IR spectroscopy.	Positive identification of specific polymers.	Analysis is time-consuming and is unlikely to detect all of the micro-particles. This is especially true for very small fragments (<100 mm).
Micro-plastic at sea surface	Manta trawl (330 mm) and subsequent identification using FT_IR spectroscopy.	Positive identification of specific polymers.	Analysis is time-consuming and is unable to detect all of the micro-particles
Socio-economic	Assessment of direct costs through survey-based methods.	Provides indication of economic burden on marine and coastal sectors.	Does not capture full impact of degradation of ecosystem goods and services due to marine litter.

STEP 3

Design and implement a monitoring plan

Further readings: Honolulu Strategy

Table: Indicators to evaluate the effectiveness of the management strategies (Honolulu Strategy).

| DECREASING LAND-BASED SOURCES OF MARINE DEBRIS |
| --- |
| **What is the level of awareness of specific groups with BMPs, laws and regulations, and marine debris impacts?** |
| - Number of stakeholders briefed by affiliation (for example, industry, government, public) |
| - Pre- and post-outreach tests for knowledge and intent |
| - Percentage of specific groups adopting BMPs (for example, waste haulers, packaging industry, institutions, environmental and health agencies) |
| - Recycling rates pre- and post-outreach |
| **Are infrastructure and use of BMPs sufficient?** |
| - Number of informal dumping sites |
| - Number of receptacles per quantity of beach, park, or street user |
| - Rate of escape of pre-production pellets into waterways |
| - Tonnage of solid waste recovered from waterways |
| **What is the capacity to monitor and enforce compliance with regulations and permit conditions?** |
| - Number/types of permits or regulations in place to prevent land-based debris |
| - Number of enforcement and compliance officers |
| - Number of violations |
| - Number of repeat violations |
| - Number of violations as a percentage of total permits |
| **How effective are regulatory measures?** |
| - Number of waterways exceeding allowed trash load |
| - Number of violations |
| |
| **How effective are litter and solid waste cleanup efforts at preventing marine debris?** |
| - Frequency of clean-up activities by location |
| - Accumulation rate of trash by location |
| - Number of volunteers; number of hours |
| - Tonnage of solid waste recovered from coastal lands, watersheds, and tributary waterways |
| - Tonnage of solid waste recovered at booms and debris traps with and without watershed cleanups |
| - Number of removal actions necessary to maintain a set level of cleanliness |

STEP 4:

Implement the policy

STEP 4

Draw up an implementation plan

Further readings: Gantt charts → to organize actions along a timeline
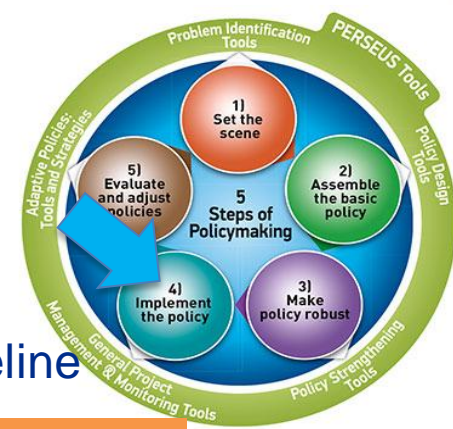
Key point: Planning the implementation process and the actions necessary for putting the policy into practice is highly important to **ensure enforcement and commitment from all actors.**

Table: Implementation plan to manage Marine litter, including activities and corresponding time spans

Task name	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Designate and Formalize Roles and Responsibilities	■										
Designate stakeholder to take into account	■										
Develop an initial assessment of the state of the problem	■	■									
Identify drivers and consequences of actual state	■	■									
Review environmental legislation and other requirements	■	■									
Gain management approval and define the scope of the policy			■								
Define and prioritize measures			■								
Assess policy success looking for future uncertainties					■						
Identify and Develop Operational Controls / Emergency Plans						■					
Implement the planned policy							■	■	■		
Implement monitoring strategy							■	■	■		
Document and record monitoring results			26							■	
Take corrective actions										■	

STEP 5:

Evaluate and adjust policies

STEP 5
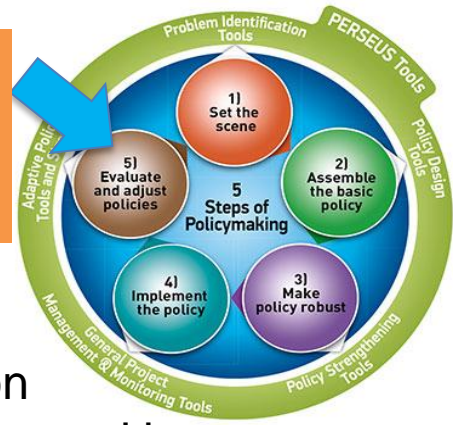
<u>Evaluate on-going policy:</u> Using participation tools.

- ✓ Data recorded with monitoring plan → knowledge accumulation about the sources, transport, fluxes and impacts of marine litter; and increase confidence of the models or the future scenarios.
- ✓ Apart for this technical learning, the plan should also facilitate cyclical assessment and revision of the targets, as well as the rest of the elements of the policy.

Institutional or social learning loop

Assess problem → Design

Adjust

Technical learning loop

Evaluate → Implement → Monitor
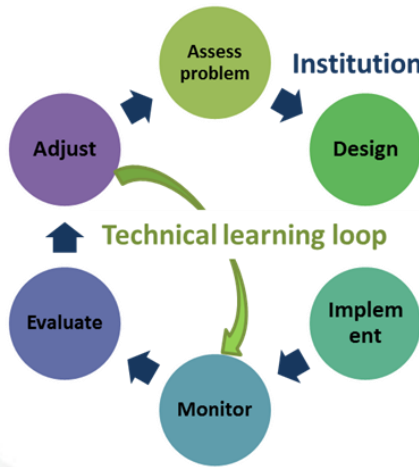
Double loop

Institutional or social loop: learning about resource problem and decision architecture

Technical loop: learning about ecosystem structure and functions

Through periodic review of the "architecture" of decision-making and engaging stakeholders.

Through an iterative sequence of decision-making, monitoring, and assessment.

<u>Adjust the policy to new uprising issues</u>

These adjustments or corrective actions can be performed following briefly the processes described in Steps 2,3 and 4; or the whole cycle for fundamental changes.

- Visit and test the toolbox on line !

http://www.perseus-net.eu/en/about_the_apf_toolbox/index.html

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THANK YOU FOR YOUR ATTENTION!