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## **INNOVATIVE EXPLOITATION OF ADRIATIC REEFS IN ORDER TO STRENGTHEN BLUE ECONOMY**

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# **FINAL DISSEMINATION EVENT**

**RAVENNA, 23RD – 24TH NOVEMBER 2021**

*Natural and artificial reefs as providers of ecosystem services*  
**Francesca Visintin (eFrame srl) - Massimiliano Pinat (CNR/IRBIM)**

**Analyze the possibilities of enhancement, development and reuse of natural and artificial reefs while preserving the environment**

## 7 PILOT CASES

## ECONOMIC SECTOR IDENTIFICATION

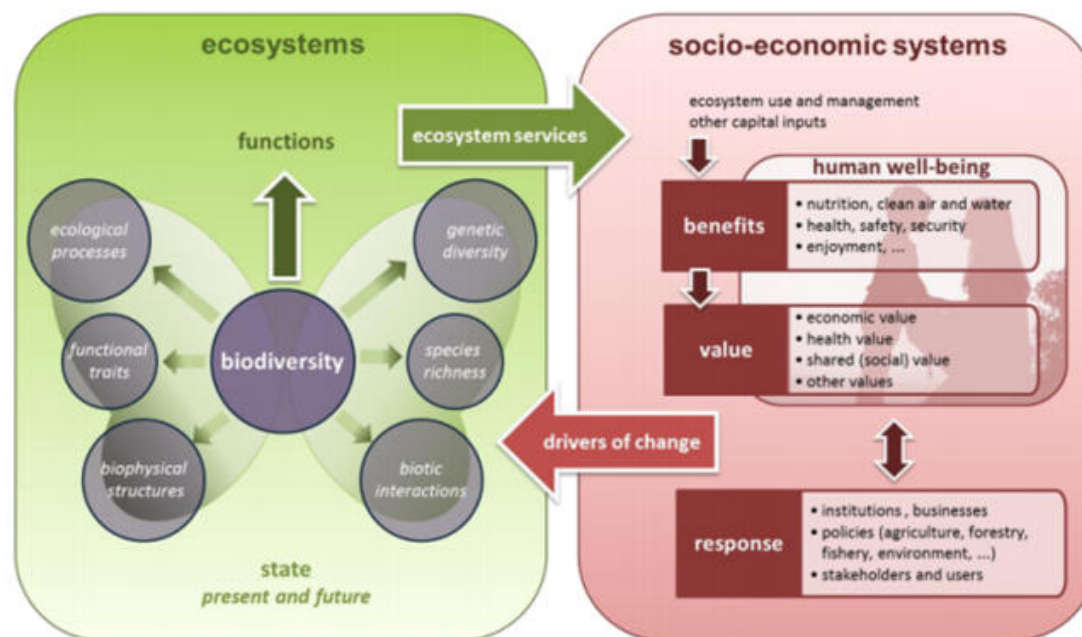
## ECOSYSTEM SERVICES ASSESSMENT



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*“The environment is the service provider that enables human society and the economy to exist and develop (p. 118)”*



Source: Maes J., Teller A., Erhard M., Liqueste C., Braat L., Berry P., Egoh B., Puydarrieux P., Fiorina C., Santos F., Paracchini M.I., Keune H., Wittmer H., Hauck J., Fiala I., Verburg P., Condé S., Schägner J.P., San Miguel J., Estreguil C., Ostermann O., Barredo J.I., Pereira H.M., Stott A., Laporte V., Meiner A., Olah B., Royo Gelabert E., Spyropoulou R., Petersen J.E., Maguire C., Zal N., Achilleos E., Rubin A., Ledoux L., Brown C., Raes C., Jacobs S., Vandewalle M., Connor D., Bidoglio G. (2013), Mapping and Assessment of Ecosystems and their Services. An analytical framework for eco-system assessments under action 5 of the EU biodiversity strategy to 2020. Publications office of the European Union, Luxembourg.

## COMMON INTERNATIONAL CLASSIFICATION OF ECOSYSTEM SERVICES CICES

The CICES provides:

- a taxonomy of ecosystem services related to the Marine coastal water ecosystem moving from Section through to Division, Group and Class

CICES				CASCADE						
Sec.	Div.	Group	Class	1. Structure	2. Function	4. Benefit	5. Value			
PROVISIONING SERVICES	Nutrition	Biomass	Berries and mushrooms	Berry and mushroom habitats (ha)	Average annual production (kg/ha or kg/ha/ha)	Harvest (kg)	Sales, picking income (n, %), health and intrinsic values			
			Game	Game habitats (ha)	Game population (n), wildlife richness	Game bag (kg)	Game bag (€), social and intrinsic values			
			Reindeer	Reindeer pastures (ha)	Reindeer population (n), birth rate (%)	Culled reindeer (kg)	Sales of reindeer employment (n, %), health and intrinsic values			
			Fish and crayfish	State of surface waters (qualitative scale), stream fragmentation	Population dynamics of fish and crayfish	Total catch (kg)	Total catch (€), employment (n, %), health and intrinsic values			
			Crops	Area under crop cultivation (ha)	Nutrient dynamics (kg/ha), fertilizer and pesticide use (kg/ha)	Harvest (kg)	Agricultural income, employment (n, %), health and intrinsic values			
			Reared animals	Number of animals (n), area of pastures (ha)	Nutrient and energy uptake (organic vs. conventional)	Animal products (kg, l)	Agricultural income, employment (n, %), health and intrinsic values			
	Materials	Water	Clean water <sup>1)</sup>	Undisturbed habitats and aquifers (ha)	State of surface water and groundwater (EU classification)	Use of raw water (m <sup>3</sup> )	Value of domestic, process water use (social and intrinsic values)			
			Wood	Managed forests (ha)	Growing stock increment, impact of management (m <sup>3</sup> /ha)	Roundwood removals (m <sup>3</sup> )	Roundwood trade, employment (n, %), health and intrinsic values			
		Biomass	Genetic material	Number of varieties (n), area of gene reserve habitats (ha)	Breeding, genetic variance, evolution	Breeding and discovery potential/benefit	Genetic variance and economic value of organisms (€), intrinsic and health values			
			Bioenergy	Area under bioenergy crops (ha)	Annual growth of biomass (tons/ha/year)	Harvest (m <sup>3</sup> ) energy content (PJ)	Produced energy (€), employment (n, %), health and intrinsic values			
REGULATING AND MAINTENANCE SERVICES										
PROVISIONING SERVICES	Mediation of waste, toxins and other nuisances	Mediation by biota	Mediation of waste and toxins	Suitable ecosystems (ha), soil organisms	Decomposition, mediation or storage of waste by biological processes	Improvement of water and soil quality	Health value, avoided costs of waste management (€), social and intrinsic values			
			Air quality	Urban green infrastructure (ha)	Retention of small particles	Improved air quality	Health values of clean air, avoided medical costs (€), social and intrinsic values			
			Water filtration	Undisturbed habitats and aquifers (ha)	Groundwater production (recharge rate, mm/ha/year)	Groundwater and surface water quality	Value of groundwater and surface water (€), health, social and intrinsic values			
			Nutrient retention	Undisturbed habitats (ha)	Nutrient retention rate	Improved water and soil quality (qualitative scale)	Avoided costs of fertilizer use and water protection measures (€) social, health and intrinsic v.			
			Noise reduction	Vegetation in urban areas (ha)	Acoustic absorption	Reduced noise level	Health values of reduced-noise environment, avoided medical costs (€), social and intrinsic v.			
			Erosion control	Undisturbed soils (ha)	Particle retention rate	Avoided erosion, improved water quality	Avoided costs of fertilizer use (€) high quality surface water (€), intrinsic and health values			
	Mediation of flows	Mass flows	Water retention	Undrained habitats, vegetation type and cover (ha)	Detention time (per habitat type, natural vs. modified)	Flood and flow control (natural levelling of flow)	Avoided costs of flood prevention and avoided			
			CULTURAL SERVICES	Physical and intellectual interactions with biota, ecosystems and landscapes <sup>2m)</sup>	Physical and intellectual interactions	Recreation	Preferred natural areas (ha), accessibility	Natural events, phenology	Experience, participation in recreational activities (n, %)	Avoided medical costs (€), health value, participation in outdoor activities (n), intrinsic value
						Nature tourism	Preferred natural areas (ha), accessibility	Natural events, phenology	Employment (n), recreation, experience	Tourism revenue (€), health value, employment (n), intrinsic value
						Science and education	Areas of particular interest (ha)	Natural events, phenology	Source of knowledge	Social, economic, intrinsic and health value of knowledge and innovations
Nature-related heritage	Cultural heritage in natural landscapes (n)	Natural events, phenology				Cultural continuity	Social, intrinsic, economic and health values of nature-related cultural heritage			
Landscape	Valuable/preferred landscapes (n, ha)	Natural events, phenology	Aesthetic experience			Identity and aesthetics, marketing value of landscape (€) intrinsic and health values				
Intellectual and representative interactions	Arts and popular culture	Emblematic species and landscapes (n)	Natural events, phenology	Aesthetic experience, recreation	Market value (€), identity and aesthetics, intrinsic and health values of cultural representations					

## COMMON INTERNATIONAL CLASSIFICATION OF ECOSYSTEM SERVICES CICES

The CICES provides:

- a list of indicators in order to assess the benefit provided by the ecosystem to the human society
  - Capacity indicator:  
capacity of the natural resources to provide the ecosystem service flow  
(e.g., in case of the “wildlife and their outputs ecosystem service”, fish abundance)
  - Flow indicator:  
flow of good and services from the ecosystem to the human society  
(e.g. yearly fish catches)
  - Benefit indicator:  
economic value of the flow  
(e.g. market value of the fish catches)



## ECOSYSTEM SERVICES AND ASSESSMENT INDICATORS

### WILDLIFE AND THEIR PRODUCTS

**- Capacity indicator:**

- Legal framework
- Fish abundance in the reef

**- Flow indicator:**

- Number of professional fishermen in the reef.
- Number of fishing days in the reef.
- Fish and shellfish landed (t/a) from the reef

**- Benefit indicator:**

- Market value of the fish and shellfish landed

### EXPERIENTIAL AND PHYSICAL USE

**- Capacity indicator:**

- Presence and list of iconic species in the reef

**Flow indicator:**

- Tourism flow
- Number of facilities

**- Benefit indicator:**

- Cost of the recreational activity
- Employment rate (economic operator)
- Revenue (economic operator)

### SCIENTIFIC ECOSYSTEM SERVICE

**- Capacity indicator:**

- Scientific facilities (laboratory)

**- Flow indicator:**

- Number of research projects on the reef.
- Number of publications about the reef

**- Benefit indicator:**

- Projects budget.
- Employment rate

### EDUCATIONAL ECOSYSTEM SERVICE

**- Capacity indicator:**

- Educational facilities (laboratory)

**- Flow indicator:**

- Number of educational activities in the reef

**- Benefit indicator:**

- Cost of educational activities.
- Employment rate (economic operator)
- Revenue (economic operator)

## DATA COLLECTION: SURVEY

### Questionnaires:

- Economic operators: professional fishing, aquaculture (shellfish harvesting), diving, boat excursions
- Project partners (capacity, flow and benefit indicators)

PPs	PPs name	Case Study	Professional fishing	Aquaculture	Diving center	Boat excursions	Total
LP	Ravenna Munic.	Paguro Wreck	5 (2) [3]	2 (0) [2]	2 (2) [0]	1 (0) [1+1]	31 (5)
PP1	Arpa ER		10 (0) [3]	10 (0) [0]	1 (1) [0]	0 (n.a.)	
PP2	Zadra Nova	Plić Lagnjići	1 (0) [0]	0 (n.a.)	4 (2) [1+2]	2 (2) [0]	8 (5)
PP3	Sunce		0 (n.a.)	0 (n.a.)	1 (1) [0]	0 (n.a.)	
PP4	University Zadar		0 (n.a.)	0 (n.a.)	0 (n.a.)	0 (n.a.)	
PP5	CNR IRBIM	P.to Recanati-P.to Potenza Picena	4 (3) [0]	1 (1) [0]	1 (1) [0]	0 (n.a.)	6 (5)
PP6	Arpa Puglia	Torre Guaceto MPA	5 (5) [0]	0 (n.a.)	15 (12) [1+2]	0 (n.a.)	20 (17)
PP7	OGS	Trezza San Pietro e Bradelli	5 (3) [2]	0 (n.a.)	9 (5) [3+3]	0 (n.a.)	14 (8)
PP9	IRB	Plić Seget	0 (n.a.)	0 (n.a.)	1 (1) [0]	0 (n.a.)	1 (1)
PP10	University Rieka	Plićina Konjsko	0 (n.a.)	0 (n.a.)	2 (2) [0]	0 (n.a.)	2 (2)
<b>Total</b>			<b>30 (13) [8]</b>	<b>13 (1) [2]</b>	<b>36 (27) [5+7]</b>	<b>3 (2) [1+1]</b>	<b>82 (43, 52%) [24, 29%]</b>

Legenda: () = economic operators who are carrying out their activity in the reef; [] = interested to carry out

## STRENGTHS

Natural capital and ecosystem services. Reefs preserve high-value natural capital. Natural capital provides important ecosystem services for humans and Blue economy sectors, such as:

- “Wildlife and their products” ecosystem service, which provides food for the humans and economic development opportunities for local communities.
- “Experiential and physical use-recreation” ecosystem service, which provides the opportunity to directly experience the animal and plant worlds, marine landscapes in different environmental settings and that translates into economic opportunities for ecotourism and tourism.
- “Education” ecosystem service, which provides opportunities for environmental education, including marine science programs for the public, formal and informal learning and nature-based, cognitive tourism.
- “Scientific” ecosystem service, which provides researchers and academics with open-air laboratories where they can carry out research and monitoring activities and in which they can also include citizens through citizen science paths.

## WEAKNESSES

Legislative framework. The lack of a legislative framework even at local level does not facilitate the adoption of management plans, except when the site is part of a protected area or a Natura 2000 site.

Uneconomic exploitation. The distance of these areas from the mainland and marine conditions make their economic exploitation uneconomic.

## OPPORTUNITIES

Regulatory framework. Regulatory framework should include measures promoting activities with low or no environmental impact, especially those relaxing environmental pressure on natural reefs.

Pushing Blue economy sectors. Stakeholders are carrying out activities in the reef (43% of the fishermen, 8% of the shellfish harvesting economic operators, 75% of the diving centers, 67% of boat rentals). Among those who do not yet carry out but will carry out activities in the reef the percentage is variable (27% of the fishermen, 15% of the shellfish harvesting, 33% of the diving center, 67% of boat rentals).

Nature-based solutions. Although the use of artificial reefs for fish stocking remains their main purpose, several other purposes can be promoted and regulated with particular regard to those that can be developed as nature-based solutions such as protection of coastal nursery grounds against illegal trawling and protection of seagrass beds

## THREATS

Lack of legal framework. Existing legal framework does not include natural reefs nor recognizes the importance the natural reefs deserve as natural habitats.

Uncontrolled forms of exploitation. Existing legal framework (international, European national and local ) does not include artificial reefs in a way that covers the entire spectrum of possible uses. This can lead to uncontrolled forms of exploitation.



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