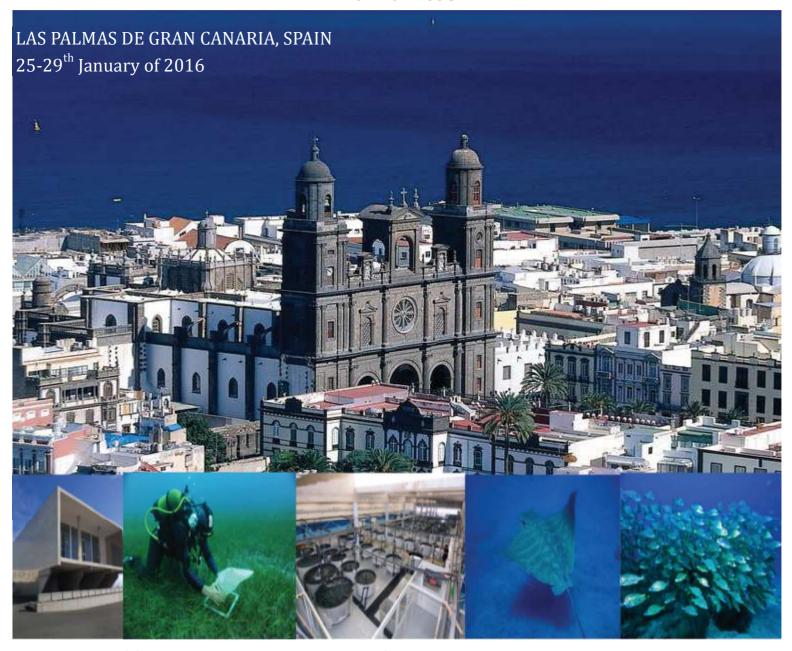
CECOMA 2016

Challenges in the Environmental Management of Coastal and Marine Areas



TOGETHER WE WILL BUILD A BETTER WORLD

ORGANIZED BY ECOAQUA &
UNIVERSITY OF LAS PALMAS DE GRAN CANARIA

IN COLLABORATION WITH IUCN











Table of Contents

PROGRAMME CECOMA 25-291H JANUARY 2016	1
LOCATION:	6
SESSION 1 - INTEGRATED MANAGEMENT OF COASTAL AND MARINE AREAS	7
INCLUDING AQUACULTURE IN THE MANAGEMENT OF COASTAL AND MARINE AREA	
THROUGH THE DEVELOPMENT OF INTEGRATED MULTI-TROPHIC AQUACULTURE	
WHY EXPERIENCE AND KNOWLEDGE MAY CHANGE OUR WAY TO APPROACH THE	
ENVIRONMENTAL CHALLENGES?	9
THE BIODIVERSITY DATABASE OF THE CANARY ISLANDS. ANALYTICAL TOOLS IN	
CONSERVATION.	
MARINE PILOT - MSFD & INSPIRE EXPLORATORY PROJECT	
ALIEN SPECIES IN THE BALTIC SEA: DANGER OR CHANCE?	
REGULATING AND MANAGING MARINE LIVING RESOURCES: FIVE DECADES OF TRIU	
AND FAILURE IN THE EUROPEAN UNION	13
SESSION 2: STRUCTURE AND FUNCTION OF COASTAL & MARINE ECOSYSTEMS	14
THE ROLE OF GLACIATION-RELATED SEA LEVEL OSCILLATIONS IN SHAPING THE	
PRESENT MACARONESIAN ISLAND BIOTAS	15
OPEN OCEAN FISH FARMING: SOME TECHNICAL CONSIDERATIONS FOR A BETTER	
UNDERSTANDING OF ENVIRONMENTAL THREATS AND ADVANTAGES	16
QUANTITATIVE ANALYSIS OF SEAWEEDS ON THE INTERTIDAL ROCKY COASTS OF	
SANTIAGO ISLAND, CAPE VERDE ARCHIPELAGO	17
AN 'ENDEMIC' FISH COMMUNITY ASSOCIATED TO SEAGRASS MEADOWS OFF THE	4.0
CANARY ISLANDS	
SEASONAL AND SPATIAL PATTERNS IN THE MORPHOLOGY AND LIFE STORY OF THE	
BROWN MACROALGAE CYSTOSEIRA ABIES-MARINA (FUCALES, PHAEOPHYCEAE) IN '	
ROCKY INTERTIDAL FROM GRAN CANARIA (EASTERN ATLANTIC): ENVIRONMENTA DRIVERS OF VARIATION	
SESSION 3 - RESPONSIBLE USE OF COASTAL & MARINE RESOURCES	
BUILDING GLOBAL NETWORKS OF MPAS: CHALLENGES, ADVANCES AND OPPORTUN	
	21
THE NEED FOR TECHNICAL AND LEGAL TOOLS TO SUPPORT A COMPETITIVE AND	0.0
SUSTAINABLE ECOTOURISM ASSOCIATED TO MARINE FARMS AT SPAIN	
MODELING THE EFFECTS OF FISHING MANAGEMENT SCENARIOS ON THE GRAN CAN	
MARINE ECOSYSTEMTHE REAL IMPACT OF RECREATIONAL FISHERIES IN CANARY ISLANDS	23 24
FIRST STEPS TOWARDS ENVIRONMENTAL FISHERIES CERTIFICATION CONSIDERIN	
STANDARD OF THE MARINE STEWARDSHIP COUNCIL (MSC): THE CASE OF OPTUNA	
ISLATUNA, ARTISANAL LIVE BAIT TUNA FLEETS (CANARY ISLANDS, SPAIN)	
PREPARATORY ACTION FOR THE IMPLEMENTATION OF THE INTERNATIONAL	23
CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER A	ND
SEDIMENTS (BWM CONVENTION): IDENTIFICATION OF SPECIES IN LAS PALMAS PO	
·	
SESSION 4 - EFFECTS OF GLOBAL CHANGE IN COASTAL AND MARINE ECOSYSTEMS RESPONSES OF NEARSHORE AND COASTAL BIODIVERSITY AND ECOSYSTEMS TO	2 /
CLIMATE CHANGE: COMBINING LONG-TERM OBSERVATIONS, EXPERIMENTS AND	
MODELLINGMODELLING	20
LAND-SEA INTERACTIONS IN A CHANGING SCENARIO: NEW CHALLENGES IN THE	40
ENVIRONMENTAL MANAGEMENT OF SHALLOW MARINE COSTAL AREAS	29
EFFECTS OF OCEAN ACIDIFICATION ON FEEDING RATES OF JUVENILES SEA URCHIN	
PARACENTROTUS LIVIDUS AND DIADEMA AFRICANUM	

RELATIONSHIP INTERSPECIFIC AND ENVIRONMENTAL OF Octopus vulgaris AM	
PAGRUS THROUGH CATCHES OF THE GRAN CANARIA FISHING FLEET	31
OVEREXPLOITATION OF THE GALAPAGOS SAILFIN GROUPER: THE NEED FOR	
COMMUNITY BASED COLLABORATIVE EFFORTS TO ESTABLISH MANAGEMENT	
REGULATIONS	
ESSION 5 - ECOSYSTEM CONSERVATION AND AQUACULTURE	
HOLISTIC APPROACHES TO UNDERSTAND THE FUNCTIONING AND RESILIENCE	
COASTAL ECOSYSTEMS: FROM GENES TO ECOSYSTEM SERVICES PROVIDED BY	
MEADOWS	34
DEVELOPMENT OF MARINE AQUACULTURE IN BRAZIL: INSIGHTS ON ENVIRON	
INTERACTIONS	
LARGE SCALE EFFECTS OF AQUACULTURE ESCAPEES ON FISHERIES LANDINGS	
EVIDENCES FROM THE MEDITERRANEAN SEA	
${\tt COMBININGECOLOGYANDAQUACULTUREFOR\it{INSITU}MARINECONSERVATION}$	
INITIATIVES: SEAHORSE IN GRAN CANARIA ISLAND (NE ATLANTIC) - A CASE ST	
A KINETIC ASSAY FOR NITRATE REDUCTASE (NR) IN ULVA RIGIDA	
SEA URCHIN DIADEMA AFRICANUM POPULATIONS AT THE SELVAGENS ISLANDS	
SUSTAINABLE PRODUCTION OF ABALONE HALIOTIS TUBERCULATA COCCINEA	
INTEGRATED MULTI-TROPHIC AQUACULTURE SYSTEMS	
IDH ACTIVITY IN PLANKTONIC ORGANISMS: A NEW PROXY FOR POTENTIAL CO	
PRODUCTION AND RESPIRATORY METABOLISM AT THE BASE OF THE FOOD CH	
SECURING THE FUTURE OF CRITICALLY ENDANGERED ANGEL SHARKS THROU	
THEIR NATURAL RANGE	
POSEIDON PROGRAM: CITIZEN SCIENCE FOR THE STUDY OF MARINE BIODIVER	
THE CANARY ISLANDS	
BEST III AND THE CHALLENGES OF DEFINING COASTAL AND MARINE KEY BIOD	
AREAS IN MACARONESIA	
"BIO-BASED ECOSYSTEMS": AN EUROPEAN CHALLENGE FOR THE 2016-2020 TI	
SUSTAINABLE INNOVATION IN FOOD, FEED AND BIO-BASED INDUSTRIES WITH	
MARINE AND TERRESTRIAL SECTORS. THE CASE OF THE EUROPEAN AQUAPON	
1305	
OSTER SESSION	
P1 - COASTAL SUSTAINABILITY INDICATORS. A PROPOSAL FOR AGRICULTURE	
LIVESTOCK DEVELOPMENT WITHIN THE FRAMEWORK DPSIR (GRAN CANARIA	
P2 - COASTAL SUSTAINABILITY INDICATORS. A PROPOSAL FOR TOURISM AND U	
DEVELOPMENT WITHIN THE FRAMEWORK DPSIR (GRAN CANARIA, SPAIN)	
P3 - FEASIBILITY OF DEVELOPMENT OF AN INDIVIDUAL BEHAVIOUR-BASED M	
FERAL HORSES (Equus Ferus Caballus) IN SABLE ISLAND, NOVA SCOTIA, CANAD	
P4 - ARE ZOOPLANKTON SECONDARY PRODUCTION MODELS ABLE TO PREDICT	
IN THE MARINE MYSID LEPTOMYSIS LINGVURA (G.O. SARS, 1866)?	
P5 - RESPIRATION OF PRIMARY AND SECONDARY PRODUCERS MEASURED BY I	
METHODOLOGIES	
P6 - IMPACT OF INCREASING PCO ₂ ON MARINE POTENTIAL RESPIRATORY ACTI	VITY52
P -7 IMPACT OF RECREATIONAL FISHING ON FISH POPULATIONS DURING THE	
YEARS IN CANARY ISLANDS	
P8 - SHELL ALLOMETRIC DIFERENCES IN BROWN MUSSEL UNDER LONGLINE C	
REGARDING WILD POPULATION (CANARY ISLANDS, SPAIN)	54
P9 - DEFINING, ASSESSING AND VALORISING KEY MARINE HABITATS IN THE MACARONESIAN ARCHIPELAGOS	55
WHELEBRUNG MAIN ART DIFFE AIRLY	ن ر ر.

P1 - COASTAL SUSTAINABILITY INDICATORS. A PROPOSAL FOR AGRICULTURE AND LIVESTOCK DEVELOPMENT WITHIN THE FRAMEWORK DPSIR (GRAN CANARIA, SPAIN).

Pérez-G., Y*¹., Bilbao A¹. González, M²., Cedeño, V²., Suárez, B²., González, G³., Tello, O⁴., González-Gil, S⁴., Jiménez, S³., Santamaría, M.T.G³., Betancort, J⁵. & Pavón N¹

The OMARCOST project, "Strategy for environmental sustainability of cross-border coastal environment" carried out, among other activities, the selection of environmental indicators in the geographical area of the Canary Islands (Spain) and the Coast Region Souss Massa Drâa (Morocco). These indicators are presented as efficient and descriptive tools of phenomena, for it these are optimal for integrated coastal zone management (ICZM), DPSIR framework (Driving force, Pressure, State, Impact and Response) was used as a frame for selecting ICZM-indicators of sustainability on the island of Gran Canaria (Spain). DPSIR is useful in analyzing connections between socioeconomic trends, ecological phenomena and institutional responses in an integrated manner. This paper describes a proposal of indicators for the agriculture and livestock sectors, because both are two very influential driving forces on the coast of the Canary Islands (Gesplan 2012). The selection was based on their suitability, data availability and ease of interpretation, through the use of multi-criteria analysis (Saati, 2008). In short, the main 11 selected indicators were: 1. Annual variation rate of the final agricultural production (and / or gross value added of the branches of agricultural) (driving force), 2. Agricultural area as a percentage of the total littoral area per local government, 3. Number of animals according to the kind of livestock (driving force), 4.Mass of animal excretions according to the kind of livestock (pressure), 5. Packaging and remnants of pesticides in containers (pressure), 6.Percentage of sampling stations in aquifer where nitrate is more than 50 mg/l (state due agriculture), 7. Number of complaints per year by poor state of bathing and recreational areas where agriculture pollutes water (impact), 8. Number of open investigation files because mismanagement of pesticide residues, chemical containers and other hazardous waste; and annual percents finished in penalty (response-surveillance and control-), 9. Number of open investigation files because mismanagement of generated manure on farms, according to the kind of livestock; and annual percents finished in penalty (response-surveillance and control-), 10. Number of farmers/year have received information and training on the proper management of agricultural waste (response about training) and 11. Number of farmers/year and ranchers/year have received information and training on proper application of agrochemicals (farmers) and waste management (ranchers) (response about training). This work has been carried out with the support of the European Union (EU) and cofounded by European Regional Development Fund (ERDF) and POCTEFEX Programme.

Referencies

Gesplan, 2012. Recopilación, análisis y evaluación de información territorial y ambiental. Proyecto LITOMAC, 166pp.

Saati, T. 2008. Decision making with the analytic hierarchy process. *International Journal of Services Sciences*, 1 (1): 83-98.

Keywords: DPSIR, indicators, Integrated Coastal Zone Management (ICZM), multi-criteria analysis.

¹ GMR Canarias S.A.U. c/Los Cactus 68, Polígono Industrial de Arinaga, 35118, Agüimes, Islas Canarias, Spain. *yeraypg@gmrcanarias.com

² Departamento de Análisis Económico Aplicado. Campus de Tafira, Universidad de Las Palmas de Gran Canaria, Las Palmas de Gran Canaria. Spain.

³ Instituto Español de Oceanografía (IEO). Centro Costero de Canarias. Vía Espaldón, Dársena Pesquera PCL 8, 38180. Santa Cruz de Tenerife. Spain.

⁴ Instituto Español de Oceanografía (IEO). Sede Central. Corazón de María 8, 28002. Madrid. Spain.

⁵ Instituto Tecnológico de Canarias (ITC). Dpto. de Agua. Playa de Pozo Izquierdo s/n, 35119, Santa Lucía, Las Palmas, Spain.













COASTAL SUSTAINABILITY INDICATORS. A PROPOSAL FOR AGRICULTURE AND LIVESTOCK DEVELOPMENT WITHIN THE FRAMEWORK DPSIR (GRAN CANARIA, SPAIN).

Pérez-G., Y*1., Bilbao A1. González, M2., Cedeño, V2., Suárez, B2., González-Lorenzo, G3., Tello, O4., González-Gil, S4., Jiménez, S3., Santamaría, M.T.G3., Betancort, J⁵. & Pavón, N¹.

- ¹ GMR Canarias S.A.U. c/Los Cactus 68, Polígono Industrial de Arinaga, 35118, Agüimes, Islas Canarias, Spain. *yeraypg@gmrcanarias.com
 ² Departamento de Análisis Económico Aplicado. Campus de Tafira, Universidad de Las Palmas de Gran Canaria, Las Palmas de Gran Canaria. Spain ³ Instituto Español de Oceanografía (IEO). Centro Costero de Canarias. Via Espaldón, Dársena Pesquera PCL 8, 38180. Santa Cruz de Tenerife. Spai ³ IEO. Sede Central. Corazón de María 8, 28002. Madrid. Spain. ¹ Instituto Tecnológico de Canarias (ITC). Dpto. de Agua. Playa de Pozo Izquierdo s/n, 35119, Santa Lucia, Las Palmas, Spain.
 CECOMA 2016 C

CECOMA 2016 Challenges in the Environmen Management of Coastal and Marine Areas Las Palmas de Gran Canaria, Spain.

Introduction

The coastal zone is an extremely complex social-ecological system that changes in relation to its environmental, socio-economic, cultural and governance factors (Diedrich et al., 2010). Integrated coastal zone management (ICZM) is a process that seeks to develop an integrated model for sustainable development, that is based on finding points of convergence among these factors (IOC, 2006; cited Diedrich et al., 2010). Indicators are presented as efficient and descriptive tools of anthropogenic and natural phenomena, which are optimal for ICZM (Diedrich et al., 2010). Indicators are defined as quantitative/qualitative statements or measured/observed parameters that can be used to describe existing situations and measure changes or trends over time (IOC, 2006), also in evaluating an isolated phenomenon (diagnosis) or in a monitoring system to evaluate processes and detect changes (Doménech-Quesada y Sarz-Larruga 2010). In ICZM, sustainability scenarios and indicators are no generic, rather they are specific to sites and restricted by political and local realities (Diedrich et al., 2010). In the context of these realities, the analytical framework used for an assessment helps to determine the variety of indicators that are chosen to communicate the outcomes of that assessment (Gabrielsen & Bosch, 2003). For its assessments of the relations between human activities and the environment, Environmental European Agency (EEA) uses the Driving forces-Pressures-State-Impact-Responses (DPSIR) framework (Figure 1; Gabrielsen & Bosch, 2003) and it has been used in this work.

The main goal of this work has been to show a proposal of sustainable indicators for the agriculture and livestock sectors (driving forces) in Gran Canaria. Since both are two important and influential driving forces the Canary Islands coast (Gesplan, 2012) and therefore they should be taken into account in a local ICZM system.













Figure 1. The Driving force, Pressures, State, Impact and Responces (DPSIR) framework scheme.

First, a shortlist of indicators was obtained according to the references, based on the established framework (DPSIR model) and the following four criteria: relevance, data availability, regular updating and ease of interpretation (criteria used by the public bank of environmental indicators of Ministry of Agriculture, Food and the Environment, MAGRAMA). Second, a DELPHI analysis was performed with two specialists in these driving forces, in order to decrease the number of preselected indicators. Third, the final weight of indicators was estimated by an Analytic Hierarchy Process (AHP; Saaty 1980). It was conducted by the two experts considered according to three criteria: relevance, data availability and ease of interpretation

The AHP set 45 indicators initially, divided into DPSIR categories (Table 1). The experts observed the importance granted in parentheses to the criteria of suitability (72.4%), data availability (19.3%) and ease of interpretation (8.3%). In driving force category, it was gave a 7 % to "agriculture and livestock" indicators, a 64 % to "agriculture" and a 28 % to "livestock". In response category, it was gave a 25 % to "survaillance and control" and a 75 % to "Accompanying measures and technical assistance to the sector". The information described above was combined with the comparative of indicators that are part of the AHP, and the resulting normalized weights (0 to 1) are observed in Figure 2. The most relevant indicators are highlighted in Figure 2 and their names appear in bold in the Table 1. This outcome has been delivered from the work agreed among the expert team of OMARCOST project (OMARCOST, 2014). Notwithstanding DPSIR possess some drawbacks, the fact that the method is still in use more than three decades after its creation also attests to its robustness, and it has been concluded that the DPSIR framework is a useful tool that can still be refined (Gari et al., 2015). It links cause-effect relationships among the five categories of the framework (Figure 1) and has been used for analyzing and assessing the social and ecological problems of aquatic systems subject to anthropogenic influence. and it has been used to develop ICZM (Gari et al., 2015). We believe that DPSIR has successfully guided the selection of indicators for the drivers evaluated.

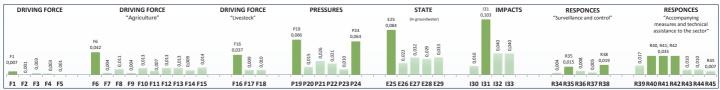


Figure 2. Normalized weights resulting from the Analytic Hierarchy Process (AHP)

Table 1. Names of the 45 indicators used in the Analytic Hierarchy Process (AHP).

F1. Annual variation rate of the final agricultural production (and / or gross value added of the branch

or the linal agnorulary production (and or of gross value acced or F.2. Annual variation rate of the agnicultural exports F.3. Number of jobs in the agriculture and livestock sectors F.4. Agricultural Work Units (AWU) employed in agriculture F.5. Number of self-sufficient in the agriculture and livestock sect DRIVINE FORCE "Agriculture" TORIVINE FORCE "Agriculture" froultural area as a percentage of the total fittoral area per local gr

F7. Abandoned agriculture land area as a percentage of the total area per municipality

F8. Percentage of greenhouse cultivated area of the total surface per municip F9. Percentage of greenhouse area dedicates to hydroponic and aeroponic cu

F10. The use of irrigation in agricultura (in cubic hectometers) in a year

F11. Cubic hectometers of water a year extracted from wells and treated with some method of de-

nsumption of chemical fertilizers per hectare and yea F13. Apparent consumption of pesticides per hectare and year

F14. Organic farming area as a percentage of usable agricultural area (UAA)

F15. Percentage of agriculture area whose owners claim to use organic fertilizers mainly

F16. Number of animals according to the kind of its

F17. Number of farms according to the kind of livestock F18. Percentage of fully legalised farms from the territorial and environmental point of view

PRESSURES

P19. Mass of animal excretions according to the kind of livestock

P20. Mass of non-biodegradable solid waste originated from agricultural and livestock P21. Mass of biodegradable waste from agriculture consumption of antibiotics, hormones or other medicines in livestock

P23. Landscape units negatively affected by agriculture and livestock activities

P24. Packaging and remnants of pesticides in containers

STATE - (In groundwater)
S25. Percentage of sampling stations in aquifer where nitrate is more than 50 mg //

S26. Chloride concentration in coastal groundwater S27. Concentration in by-products from pesticides used in agriculture and livestock

S28. Concentration in antibiotics, hormones or other medicines in coastal groundwater

I31. Number of complaints per year by poor state of bathing and recre

132. The value lost by the reduction of the economic functions of the groundwater, because its pollution (salinization, nutries

133. Percentege of water extracted from the groundwater that produce a added cost by desalinating it

R34. Percentege of inspectioned installations that present a correct register (aparently) in the farm notebook ("cuaderno de campo") er of open investigation files because mismanagement of pesticide residues, chemical containers and other hazardous waste; and annual pr

finished in penalty (response-surveillance and control-) R36. Number of open investigation files because mismanagement of non - biodegradable and non-hazardous waste from agricultural sources: percentage of

R37. Number of open investigation files because mismanagement of biodegradable waste from agricultural sources; percentage of penalised cases ent of generated manure on farms, according to the kind of livestock; and annual percents f penalty (response-surveillance and co

R39. Percentage< of the consumed water in agriculture from treated water by tertiary treatment

R40. Number of farmers/year that have received information and training about proper management of agricultu

ear that have received information and training about the on the proper application of a R42. Number of farmers beneficiaries by information and training on proper management of livestock waste

nefited by information and training on food and animal health that receive some form of treatment to fix and reduce exposure to soil eros R43. Number of stock breeders be e of the abandoned agricultural land that red

R45. Percentage of landscape units (indicator P23) subject to a rehabilitation program, and funding for it

ré 6 F. Navinés. 2010. Balancing science and society through establishing indicators for integrated coastal zone management in the Balearic Islands. Marine Policy 34: 772–781.
s, JL. y F. J. Sanz-Larruga. 2010. Guía para la implementación de un sistema de gestión integrada de zonas costeras. Observatorio del Litoral de la Universidad de A Coruña. Ne

ielsen, P. & P. Bosch, 2003. Environmental Indicators: Typology and Use in Reporting. European Environment Agency. 20 pp.
S.R., A. Newton & J.D. Icely. 2016. A review of the application and evolution of the DPSIR framework with an empashis on coastal social-ecological sys

Recopilación, análisis y evaluación de información territorial y ambiental. Proyecto LITOMAC, 166 jovernmental Oceanographic Commission of UNESCO). A handbook for measuring the progress r., 2. Paris, UNESCO, 2008.



Acknowledgments

The OMARCOST project (www.omarcost.org), "Strategy for environmental sustainability of cross-border coastal environment" was carried out with the support of the European Union (EU) and cofounded by European Regional Development and Spain-External Borders Cross-Border Cooperation Operational Programme (POCTEFEX).



