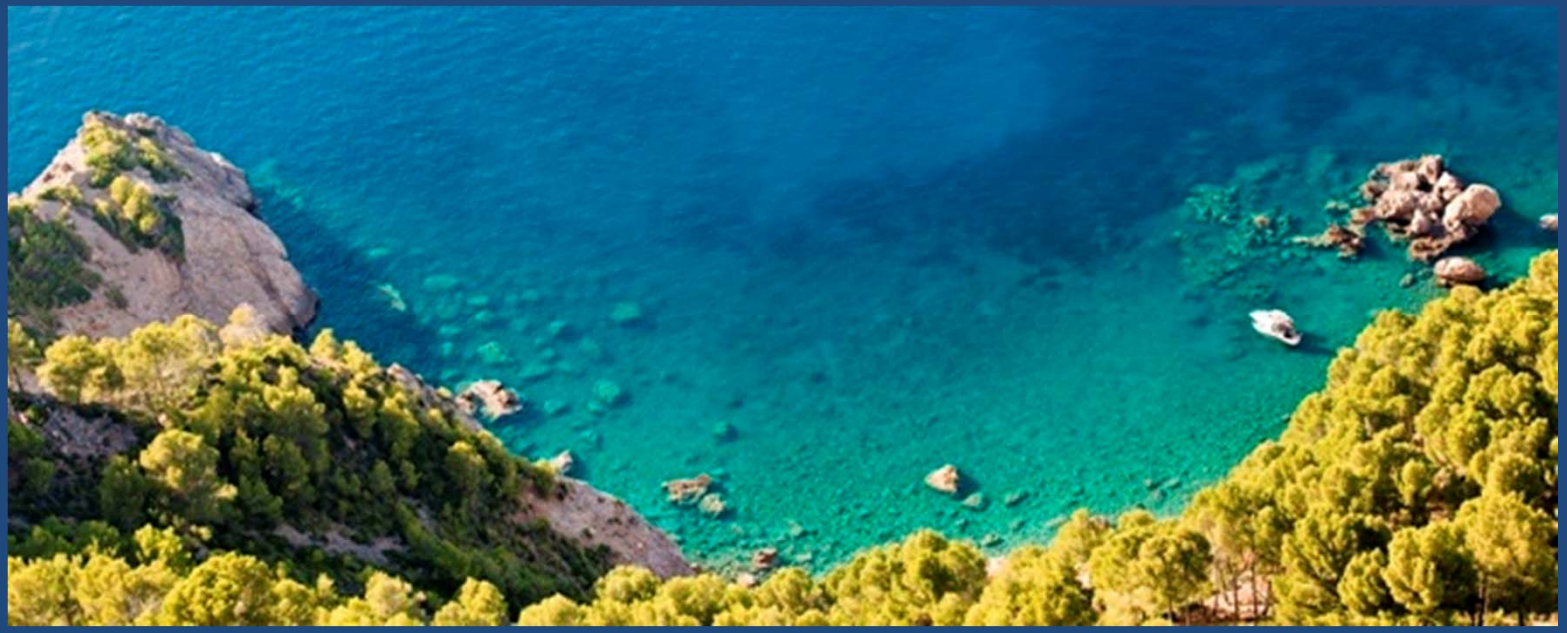
The Design and Implementation of a System of Indicators for Integrated Coastal Zone Management (ICZM) in the Balearic Islands (2006 – ongoing)



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a. Introduction

Balearic ICZM Indicators Project Outline

The objective of the Balearic ICZM Indicators project (2006 – ongoing) is to design and implement a system of indicators to assess and monitor progress towards achieving sustainability in the Balearic Islands.

- Central element of a larger project to implement science-based ICZM in the islands (initiated in 2005 with funding from the Government of the Balearic Islands, I+D+i GIZC Project).
- ICZM is considered to be an appropriate process to support the achievement of sustainability on the islands.

a. Introduction

Definition of ICZM

Cisin-Sain, B and R Knecht. 1998. *Integrated Coastal and Ocean Management: Concepts and Practices*. Island Press.

- A conscious management process that acknowledges the interrelationships among most coastal and ocean uses and the environments they potentially affect.
- A process by which rational decisions are made concerning the conservation and sustainable use of coastal and ocean resources and space.
- Grounded in the concept that the management of coastal and ocean resources and space should be as fully integrated as the interconnected ecosystems making up the coastal and ocean realms.

a. Introduction

Definition of ICZM

Cisin-Sain, B and R Knecht. 1998. *Integrated Coastal and Ocean Management: Concepts and Practices*. Island Press.

- Based on five types of integration: intersectoral, intergovernmental, spatial, science-management, and international.
- Requires participation and coordination among many stakeholders.
- Requires the support of science for decision-making, evaluation, and monitoring.

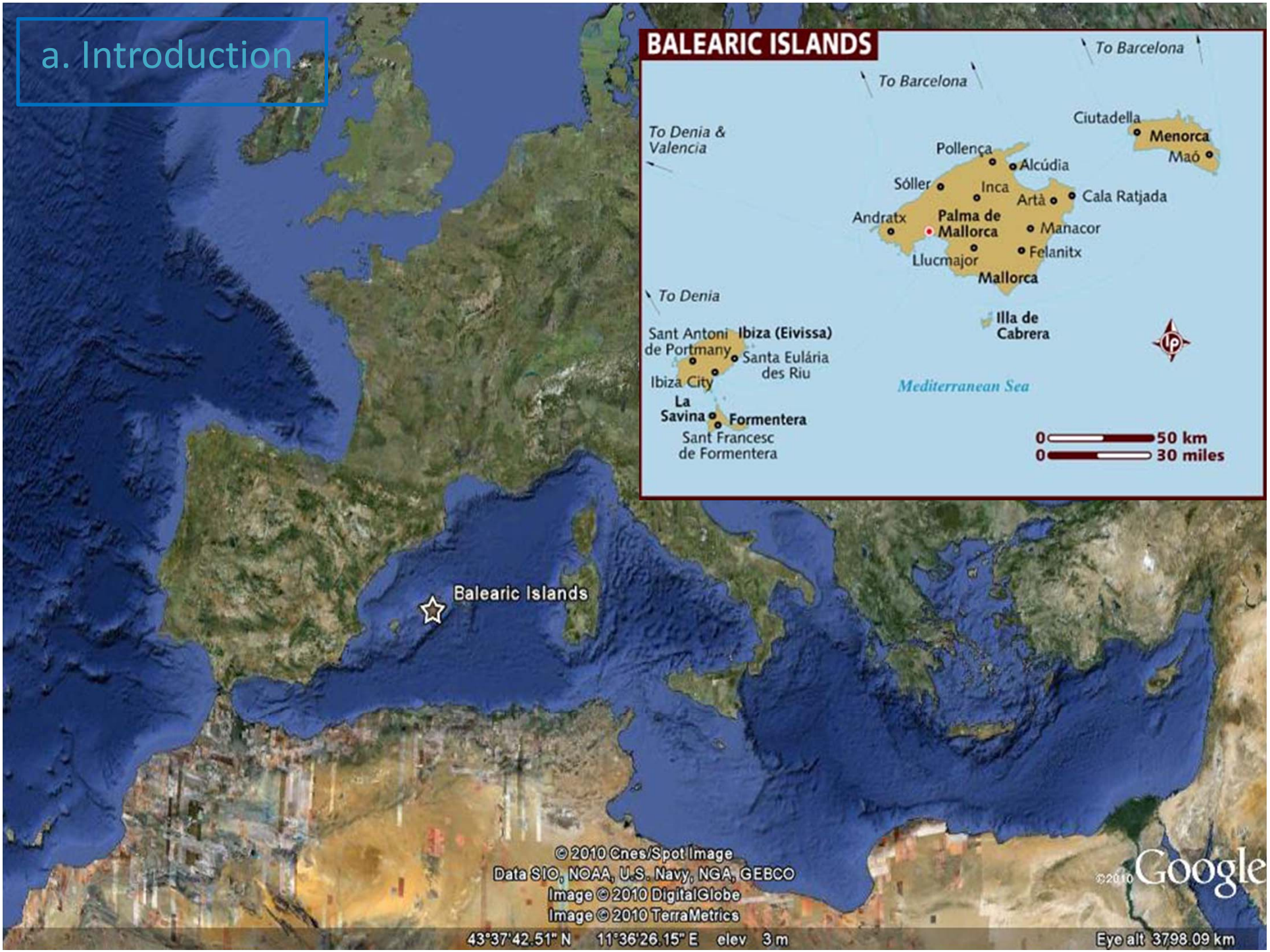
a. Introduction

Definition of an Indicator

Belfiore, S *et al*. 2006. *A Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management*. IOC-UNESCO.

- A measured or observed parameter that provides information about a system.
- Makes certain phenomena perceptible that are not – at least not immediately – detectable. This means that an indicator has a significance extending beyond what is directly obtained from observations.
- Important scientific tools for supporting ICZM and other integrated management processes. They can help decision-makers identify, evaluate, and track progress towards achieving sustainability objectives.

a. Introduction



a. Introduction

The Balearic Islands at a glance

• Area	5,014 km^2
• Length of coastline	1,428 km
• Ratio of coast to land area	285 m/km^2
• Population	1.1m in 2009
– Population density	219 $people/km^2$
• GDP per capita	24 510€ in 2009
• International arrivals	9m in 2009
– Ratio tourists/residents	8
– Tourism model	Sun, sand, sea
– Stage of tourism development	Mature
• Estimated tourism contribution to GDP	
– Direct and indirect (2009)	55%

Various sources

a. Introduction

Major Threats to the Coastal Zone of the Balearic Islands

- Tourism
- Coastal development and habitat destruction
- Pollution
- Coastal erosion
- Pressure on natural resources
- Proliferation of invasive species
- Loss of fisheries resources
- Accidental spills
- Climate change

VULNERABLE INSULAR ENVIRONMENT

MATURE TOURISM DESTINATION (SUN, SAND, AND SEA)

LIMITED, FRAGMENTED ICZM-RELATED GOVERNANCE

a. Introduction

Coastal Transformation in the Balearic Islands

Cala Millor, Mallorca

a. Introduction

Why develop a system of indicators for ICZM in the Balearic Islands?

- There is a need – negative impacts, threat to sustainability.
- There is a demand – civil society (partnership) and government (funding).
- ICZM is a logical framework for achieving sustainability in a small island, mature *sun, sand and sea* destination.
- Definition of site specific sustainability objectives and associated indicators is an important foundation for the ICZM process (GESAMP, IOC, S. Olsen, etc.).

a. Introduction

The Partners of the Balearic ICZM Indicators Project

Mediterranean Institute of Advanced Studies/SOCIB (since 2009)

- ICZM-related scientific community in the Balearic Islands .
- Spanish National Research Council/University of the Balearic Islands, RDI regional government.

Economic and Social Council (CES) of the Balearic Islands

- Organization of *participatory democracy* (Jentoft 2009).
- Employees' organizations, trade unions, representatives of public interests.
- Legal competence to represent the opinions and the needs of civil society and relate them to government (*Dictamen*).
- In Europe, they exist at regional, national and EU levels.

a. Introduction

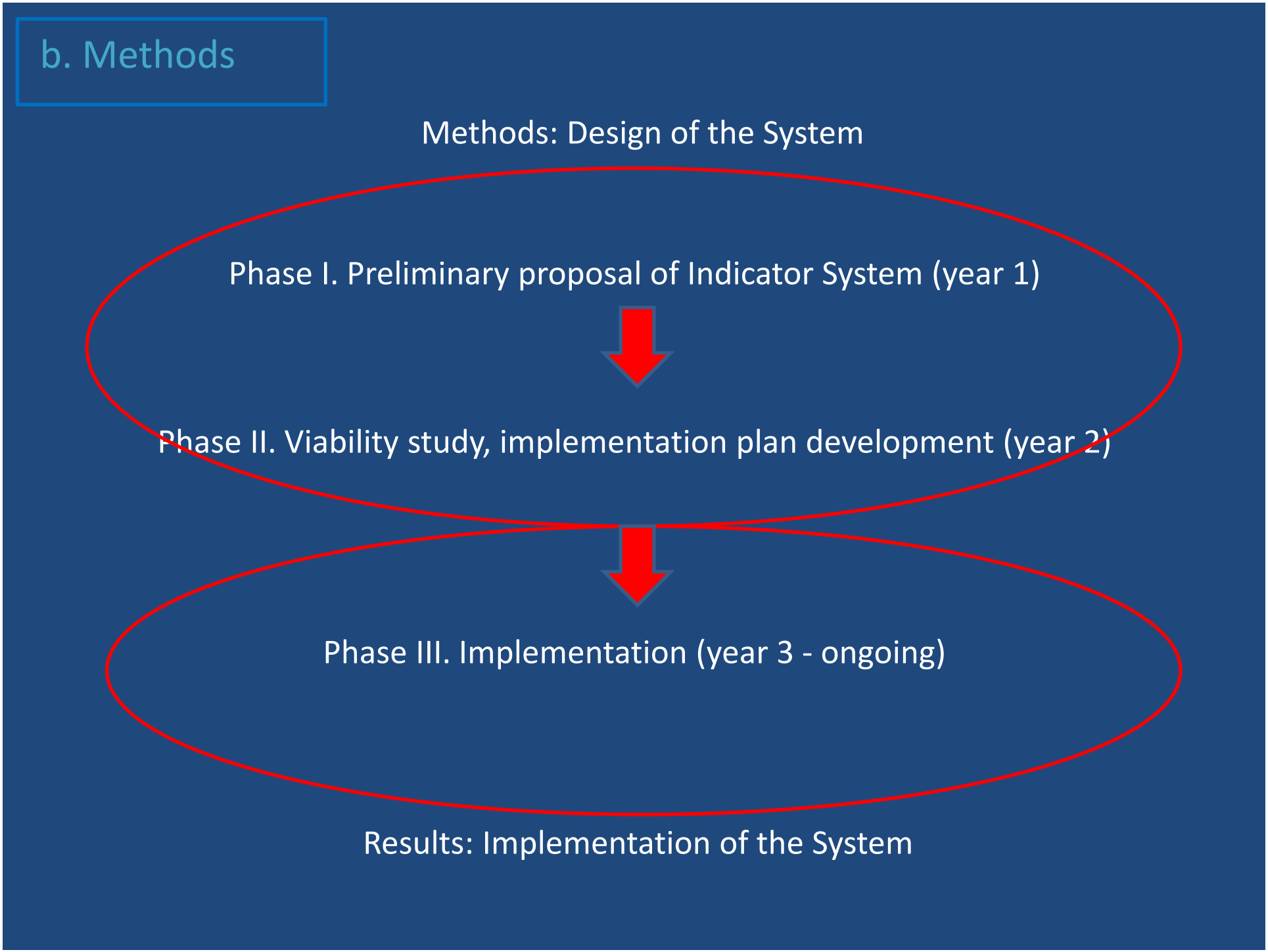
The Partnership

- Both partners have equal influence over the decision-making process and the terms of agreement are defined at the start of the project and not subject to unilateral change (Arnstein *Ladder of Citizen Participation* 1969).
- Strategic as opposed to all-inclusive.
- Other entities consulted but not formally included in the partnership.

b. Methods: Design of the System

"What we measure affects what we do. If we have the wrong measures, we will strive for the wrong things" (Joseph Stiglitz 2010, *Progressive Thinking*, Nature Editorial).

b. Methods

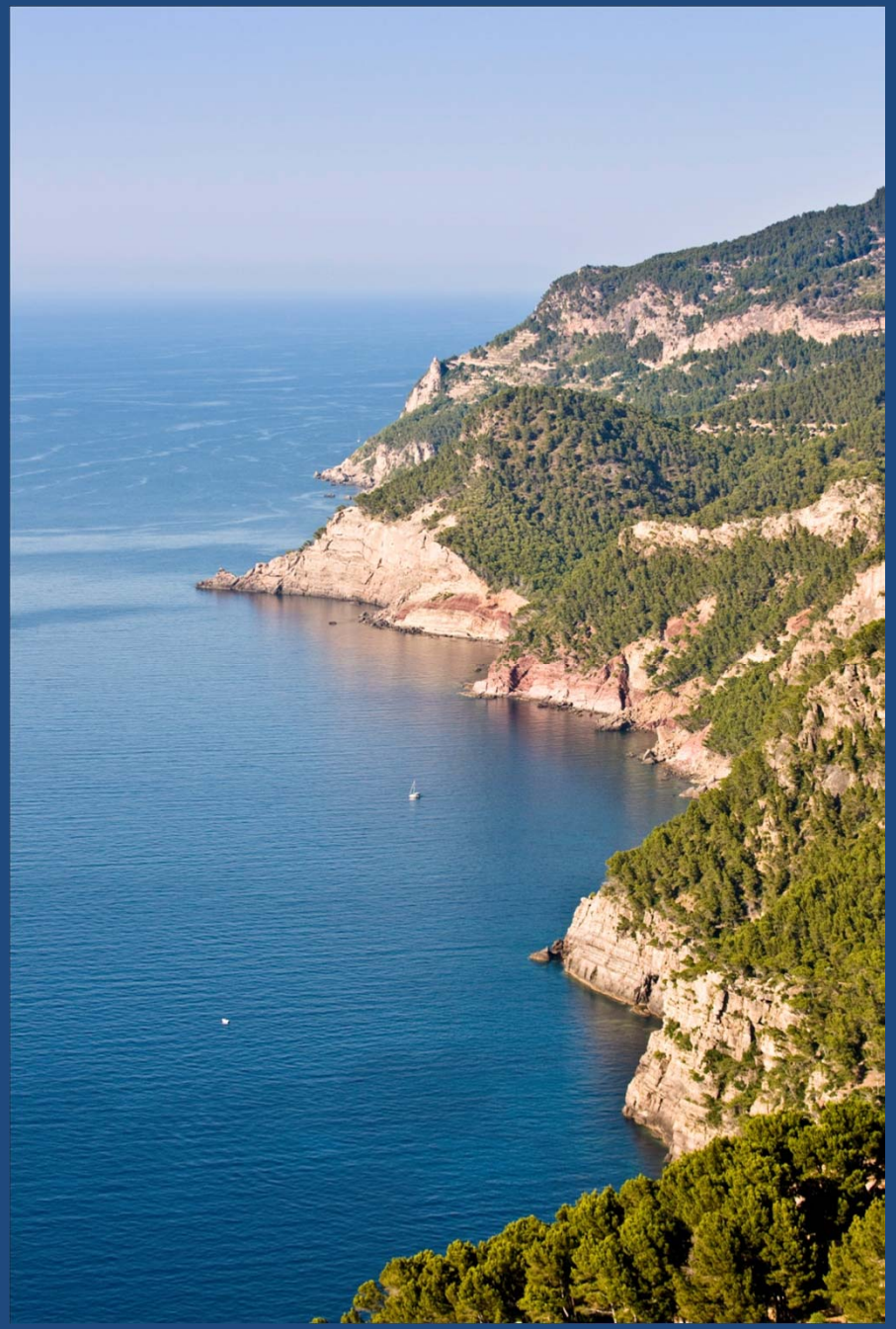

Methods: Design of the System
Phase I. Preliminary proposal of Indicator System (year 1)
Phase II. Viability study, implementation plan development (year 2)
Phase III. Implementation (year 3 - ongoing)
Results: Implementation of the System

b. Methods

Phase I: Preliminary Proposal of Indicator System

1. Formal establishment and definition of the partnership
2. Establishment of locally specific sustainability objectives (governance, socio-economic-cultural, environmental)
3. Literature review
4. Preliminary selection of indicator "suite"

56 indicators



b. Methods

Phase II: Viability study, implementation plan development

1. Viability study (based on Basque country methodology)

- ✓ Availability of data
- ✓ Availability of data at necessary spatial scale(s)
- ✓ Availability of data at necessary temporal scale(s)
- ✓ Definition of methodology
- ✓ Cost of implementation
- ✓ Time-responsive
- ✓ Related to sustainability objectives

High viability ≥ 19; medium viability 16 – 18; low viability ≤ 15

b. Methods

Phase II: Viability study, implementation plan development

1. Viability study (based on Basque country methodology)

2. Assignment of level of "importance" of the indicators (high, medium, low, *eliminate*) for evaluating/monitoring sustainability in the islands.

   - ✓ Initial ranking of importance was proposed by scientific group.
   - ✓ Delphi Study with working commissions of the CES (n = 13)

b. Methods

Phase II: Viability study, implementation plan development

1. Viability study (based on Basque country methodology)

2. Assignment of level of “importance” of the indicators (high, medium, low, *eliminate*) for evaluating/monitoring sustainability in the islands.

3. Ranking of indicators based on (1) viability study and (2) level of “importance”

b. Methods

Phase II: Viability study, implementation plan development

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3. Ranking of indicators based on (1) viability study and (2) level of “importance”

4. Development of “incremental” implementation plan

c. Results: Implementation of the System

c. Results

- The Delphi Study results showed that, of the 56 indicators that were assessed (Phase I), opinions of science team and CES coincided in 45 cases and there were small differences in opinion in 11 cases (2 eliminated).

Table 1. The relationship between the importance and viability rankings

Category	Number of Indicators	High Importance	Medium Importance	Low Importance
High Viability	20	17	3	0
Medium Viability	14	10	3	1
Low Viability	20	9	9	2

- The final result was a system of 54 indicators and an implementation plan.

Indicators	Category (original no.)	Viability	Importance
1 Area of land and sea protected by statutory designatio	Governance 3	20 – High	High
2 Unemployment	Socio-economics 15	20 – High	High
3 Occupation of tourism accommodation supply	Socio-economics 19	21 – High	High
4 Evolution of tourism demand	Socio-economics 20	21 – High	High
5 Consumption of water	Socio-economics 28	20 – High	High
6 Consumption of electricity	Socio-economics 29	21 – High	High
7 Fishing	Socio-economics 30	20 – High	High
8 Density of resident population	Socio-economics 31	21 – High	High
9 Seasonality of population	Socio-economics 34	20 – High	High
10 Immigration	Socio-economics 35	20 – High	High
11 Construction of homes	Socio-economics 36	21 – High	High
12 Water treatment	Socio-economics 37	19 – High	High
13 Number of moorings.	Socio-economics 40	19 – High	High
14 Existence and use of roads and social infrastructures	Socio-economics 41	19 – High	High
15 Quality of beaches	Environment 52	20 – High	High
16 Quality of tourism accommodation supply	Socio-economics 23	20 – High	High
17 Cost of tourism accommodation supply	Socio-economics 24	19 – High	High

Antich se compromete a aprobar una norma para proteger la zona costera

A. MATEOS

El president del Govern, Francesc Antich, se comprometió ayer a aprobar una norma legal para proteger de los impactos humanos negativos la mayor área posible de la zona costera de Balears. El Jefe del Ejecutivo realizó este anuncio durante la presentación del dictamen 5/2007 del Consell Econòmic i Social (CES) sobre la gestión integrada de la zona costera de Balears que contempla 54 indicadores, dirigidos a mejorar la sostenibilidad de la costa de las Islas. Además, aceptó la propuesta realizada por el presidente del Consell de Menorca, Marc Pore

IMPACTO

El informe aconseja al Govern que minimice los impactos negativos de la urbanización y el desarrollo en la costa

cer una zona piloto para implantar los citados indicadores.

En concreto, los indicadores están divididos en tres categorías: gobernanza, socioeconómicos y medioambientales. Los primeros permitirán evaluar cuatro aspectos claves de un sistema integrado de gestión (implantación e integración). Por su parte, los socioeconómicos son 42 indicadores que representan las fuerzas conductoras humanas más importantes que afectan al medio ambiente marino y al litoral de Balears. Por último, los medioambientales son cuatro indicadores que se desglosan en diferentes medidas. Por citar algunos ejemplos, el dictamen recomienda al Govern que mantenga una economía en el litoral que sea «saludable, sostenible y productiva», y que «minimice los impactos negativos de la urbanización y el desarrollo en la costa».

El conseller d'Economia, «determinar cuál es el impacto de nuestro modelo de crecimiento económico y hacia dónde tenemos que ir».

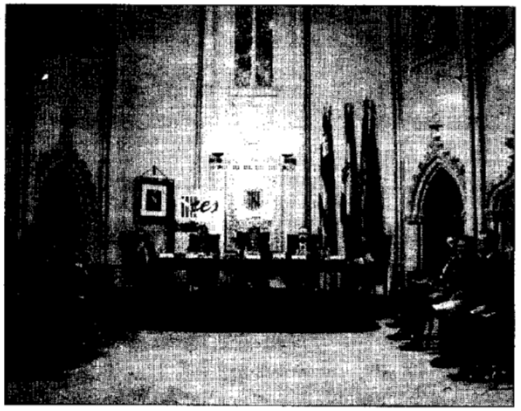


Imagen de la presentación de la publicación. Foto: JAUME MOREY.

participado el CES, la Direcció General de Recerca, Desenvolupament Tecnològic i Innovació y el Institut Mediterrani d'Estu-

ral del Instituto Español de Oceanografía, Enric Tortosa Martorell. En su opinión, el libro que se presentó ayer se trata de «un ejemplo excelente de la sociedad del conocimiento. Es un caso de conocimiento real que se ha plasmado en Balears». Además, animó al Govern a invertir en I+D+I, a pesar de la crisis.

Sostenibilidad

Por su parte, el presidente de Segittur, David Bustamante, aseguró que con el dictamen «se demuestra que la sociedad tiene una clara voluntad de actuar en favor de la sostenibilidad». Además, destacó que se trata de «un trabajo de vital importancia en un momento de proceso de cambio como en el que nos encontramos». De este modo, ma-

Presentado el dictamen del CES para una gestión integrada y sostenible de la zona costera

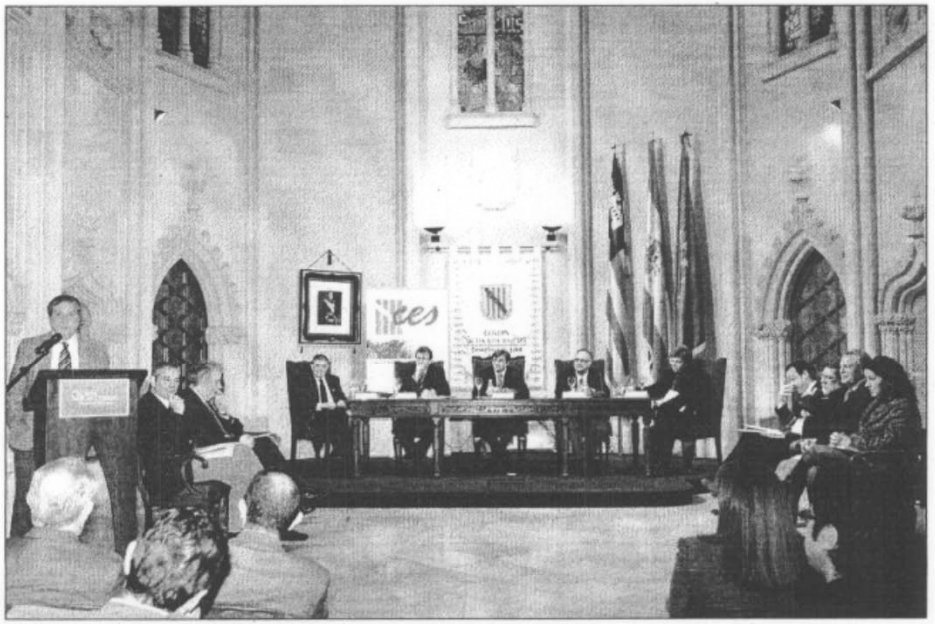
I.O. *Palma.*

Una gestión integrada y sostenible de la zona costera basada en conocimientos científicos y consensuada con los agentes sociales. Es el objetivo del dictamen presentado ayer por el Consejo Económico y Social (CES) que ha contado, en su parte investigadora y científica, con la labor del Instituto Mediterráneo de Estudios Avanzados (IMEDEA).

Hasta 54 indicadores de gobernanza, socioeconómicos y mediambientales son los que tiene en cuenta este estudio, "una herramienta fundamental para calibrar el impacto de nuestro modelo de crecimiento y ver hacia dónde vamos", sostuvo el conseller de Economía, Carles Manera.

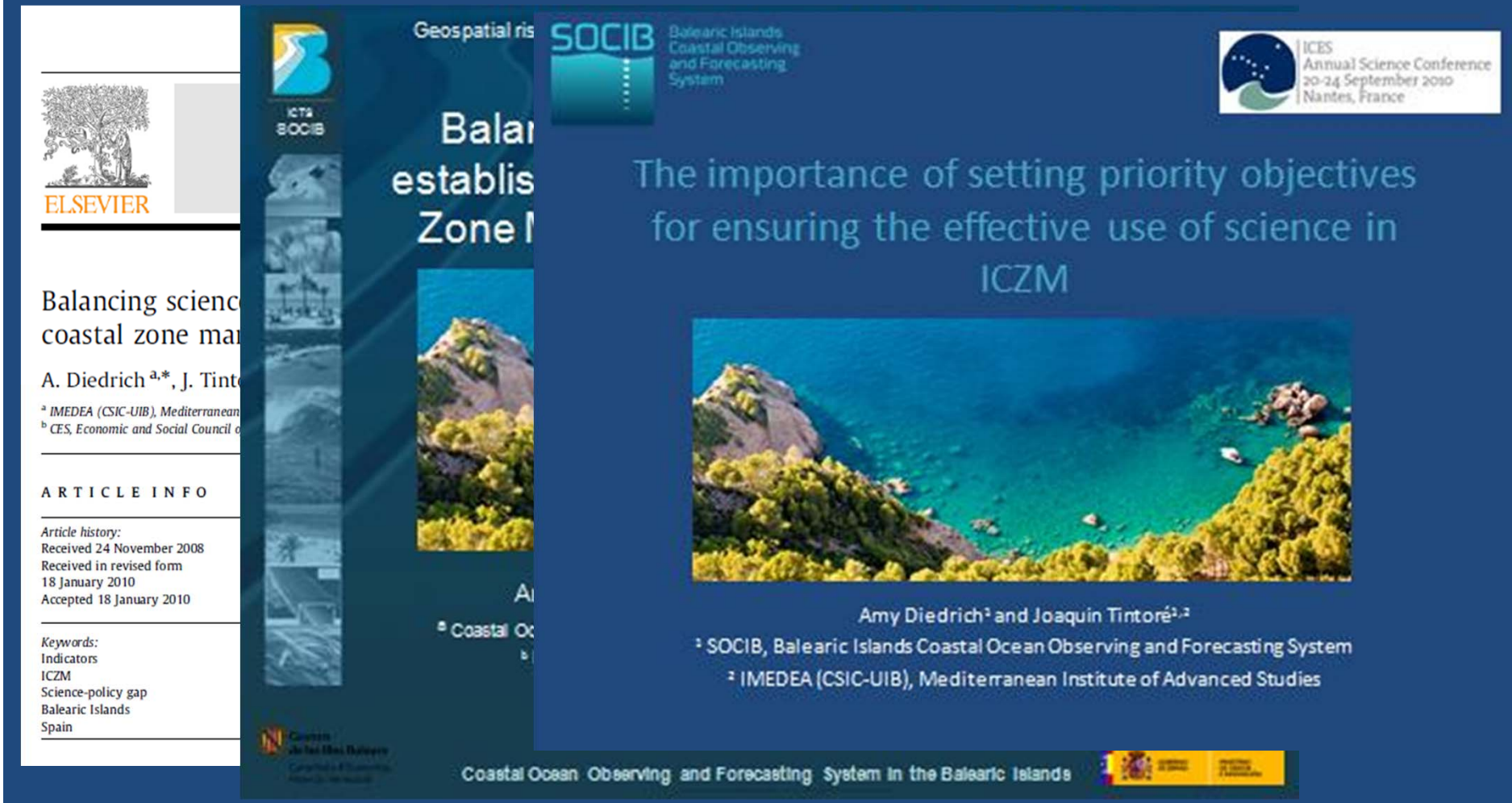
Javier Bustamante, de la secretaria de Estado de Turismo, indicó que el estudio presentado ayer es clave para afrontar la renovación en el sector turístico incidiendo en que la sostenibilidad y la adaptación al cambio climático devienen como dos aspectos claves para el futuro de esta actividad económica.

Marc Pons, presidente del Consell de Menorca, emplazó al Govern en nombre de todas las instituciones insulares a desarrollar un plan regional de desarrollo sostenible en Balears y el president Antich, por último, se congratuló de contar con esta herramienta de sostenibilidad basada en el conocimiento científico y se comprometió a aplicar estos indicadores.



Un momento de la presentación del informe del CES para la gestión integrada de la costa. Foto: B. Ramón.

c. Results



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coastal zone ma

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SOCIB Balearic Islands Coastal Observing and Forecasting System

ICES Annual Science Conference 20-24 September 2010 Nantes, France

The importance of setting priority objectives for ensuring the effective use of science in ICZM

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Coastal Ocean Observing and Forecasting System in the Balearic Islands

Process used to inform Canadian Government indicator development

c. Results

Implementation activities

2. A pilot study initiated on the island of Menorca in 2010 to implement 17 priority indicators.

- ✓ Collaboration with the Balearic Statistics Institute (local government), Socio-environmental Observatory of Menorca (Insular Council)
- ✓ Verification of data sources and quality
- ✓ Data catalogue
- ✓ Technical worksheets
- ✓ Linkages with other initiatives
- ✓ Initial analyses and fact sheets

c. Results

Implementation activities

3. Development of a proposal for supporting legislation to define the necessary governance structure for implementing the system of indicators (initiated August 2010).

- ✓ Based on Doménech et al. 2010. Guide for the Implementation of a System of Integrated Coastal Zone Management in Spain. Coastal Observatory of La Coruña.
- ✓ Collaboration with Ministry of Environment, Local Agenda 21 Team

c. Results

Implementation activities

4. Build in the perspective and participation of additional stakeholders on the Islands.

- Study on *Limits to Growth in the Coastal Zone* carried out in collaboration with the Chamber of Commerce of Mallorca (2007-2009)
  - ✓ Mail out survey about perceptions of sustainability and priority objectives sent to 900+ businesses in Mallorca.
  - ✓ Co-publication of an integrated management process for implementing sustainable development in Mallorca.
  - ✓ Development of a methodology for establishing optimal use limits of beaches and recreational boats in bays.

d. Next Steps

d. Next Steps

Science

- Links among indicators (DPSIR, systems thinking)
- Improve decision-making framework (e.g. apply risk analysis, DFO Canada)
- Fine tune for different islands
- Marine Spatial Planning
- Establish key methodologies – seasonality, “floating” population, second residencies
- Need more data!

Participation

- Build in more stakeholder perspectives and participatory activities

Governance

- Get legislation approved
- Coordination, systemization, and quality control of data
- Decision-making based on indicators and monitoring

e. Conclusions and Reflections

e. Conclusions

... towards a future research a

- Total protection of ecosystems th
areas is becoming a decreasingly
towards balancing multiple huma
ecological systems).

- This movement is reflected in em
that seek to combine scientific re
and policy development, focusing
dimensions.

- The science that is needed to sup
interdisciplinary, use-inspired, an
science.

PNAS PNAS PNAS PNAS

EDITORIAL

Sustainability Science: A room of its own

Sustainability science has emerged over the last two decades as a vibrant field of research and innovation. Today, the field has developed a core research agenda, an increasing flow of results, and a growing number of universities committed to teaching its methods and findings. Like "agricultural science" and "health science," sustainability science is a field defined by the problems it addresses rather than by the disciplines it employs.

tions between nature and society toward more sustainable trajectories? How can science and technology be more effectively harnessed to address sustainability goals?

From its core focus on advancing understanding of coupled human–environment systems, sustainability science has reached out with focused problem-solving efforts targeted to urgent human needs. As most recently delineated by the World Summit on Sustainable Development,

Beyond basic vs applied research: Science in Stoke's Quadrants

Research inspired by... / Considerations of use?	No	Yes
Quest for fundamental understanding? No		Applied research (Edison)
Quest for fundamental understanding? Yes	Basic research (Bohr)	*Use-inspired basic research (Pasteur)*

Fig. 1. Research characterized by the motivations

"How can science and technology be more effectively harnessed to address sustainability goals?"

Ralph Cicerone, in their respective roles as outgoing and incoming presidents of the National Academy of Sciences, proposed that the maturing field of sustainability science might be ready for a "room of its own" in PNAS. After a committee study and extended discussion, the PNAS Editorial Board approved a new section on Sustainability

erty alleviation. Likewise, sustainability science is being applied to devise practical protections for the earth's key life-support systems. Special attention in recent years has been given to mitigating pressures on the global climate, conserving ecosystem services, and protecting biodiversity. Finally, and most ambitiously, sustainability science research is seeking to support the

The resulting field of sustainability science has been expanding at an accelerated pace and in multiple directions, as can be tracked through its (appropriately) virtual "Forum on Science and Innovation for Sustainable Development" (http://sustainabilityscience.org). The forum monitors an increasing number of major conferences, including the

"…. defined by the problems it addresses rather than by the disciplines it employs."

pursued from bases as diverse as geography and geochemistry, ecology and economics, or physics and political science. Increasingly, however, a core sustainability science research program has begun to take shape that transcends the concerns of its foundational disciplines and focuses instead on understanding the complex dynamics that arise from interactions between human and environmental systems. Central questions (2) include the following. How can those dynamic interactions be better incorporated into emerging models and conceptualizations that integrate the Earth system, social development, and sustainability? How are long-term trends in environment and development reshaping nature–society interactions? What factors determine the limits of resilience and sources of vulnerability for such interactive systems? What systems of incentive structures can most effectively improve social capacity to guide interac-

solving, so has it remained closely linked with curiosity-driven research across a range of disciplines. Efforts to provide useful knowledge for solving the very practical but highly complex problems sketched above has often required fundamental advances in our conceptualization and understanding of coupled human–environment systems. This has meant that scientists seeking to promote a sustainability transition have needed to tap into, and indeed engage in, cutting-edge research in areas ranging from complex systems theory to cultural and political ecology.

Sustainability science is thus most usefully thought of as neither "basic" nor "applied" research. Rather, it is an enterprise centered on the "use-inspired basic research" that the late Donald Stokes characterized as "Pasteur's Quadrant" of the modern science and technology enterprise (see Fig. 1) (3). The field reaches out beyond this core,

ability scientists. Above all, however, the forum documents a growing flow of research results, published across an immense variety of journals and disciplines.

The National Academies and Sustainability Science

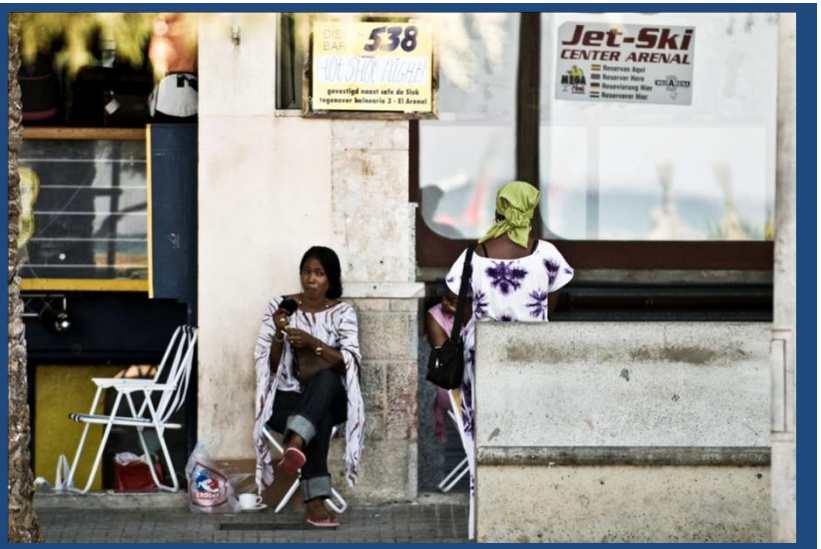
For two different reasons, PNAS recently responded to this growing supply of sustainability science by giving the field a "room of its own" among the journal's more established sections. First, as the NAS presidents emphasized when they suggested the PNAS initiative, the Academy has been a leader for more than a decade in efforts to harness science and technology in the service of sustainable development. Building on long-standing strengths across the Academies and National Research Council, the NAS initi-

e. Conclusions

Conclusions and reflections ...

- Bridging the science-policy gap is arguably the biggest current challenge to achieving sustainability (Lubchenco and Sutley, 2010, *Science).*
- Reflected in a movement towards developing scientific tools and methods to support decision-making, facilitate the integration of different types of data, and adapt the global concept of sustainability to the local reality (*there is no panacea for achieving sustainability of social-ecological systems*, E. Ostrom).
- In many cases we do not need to *reinvent the wheel*, we already have a lot of scientific information and tools we need to achieve sustainability … it is just not being used effectively.

e. Conclusions



Conclusions and reflections ...

- Science for sustainability can be complicated and costly to implement – incremental, priority-based approaches can be used to overcome inaction – *work with what you have.*
- We need to accept (and be clear about) the limitations of science in "solving" sustainability problems.
- Social science research methods (qualitative and quantitative) are well equipped to support the process of understanding the local context, stakeholder perceptions and priorities, hence guiding sustainability related research across disciplines …

Moltes Gràcies