Towards a new Integrated Beach Management System: the Ecosystem-Based Management System for beaches.

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A new Integrated Beach Management System (EBMS-Beaches) that introduces the principles of ecosystem management into these social-ecological environments.

Linking the Theory of Environmental Policy and the Practice of Environmental Management: application to beach management.

Coupling Environmental and Risk Management Systems with the principles of Ecosystem Management

A need of further innovation in beach management frameworks: the case of Spain
Abstract

Massive use of beaches has forced traditional management of these systems to focus on the service offer to users. Consequently, human activity and behavior prevailed over other biological and physical processes and functions. Mirroring this tendency, the use of Performance Awards (Blue Flag) and Environmental/Quality Management Systems (ISO 14001, EMAS, and Q of Quality) were popularized as standards of environmental quality. In parallel to this process, recent international coastal and marine policies have emphasized the need to develop sustainable strategies for implementing the principles of the Ecosystem Approach into management with the overarching goal to maintain ecosystem integrity while enabling the sustainable use of ecosystem goods and services in system under management. As Performance Awards and Environmental/Quality Management Systems do not follow the Ecosystem Approach, an Ecosystem-Based Management System for beaches (EBMS-Beaches) is introduced to overcome this issue. The EBMS-Beaches is intended as a formal standard framework that add new aspects not considered in a classical beach management by the introduction of the principles of the Ecosystem Approach, between them: a) a clear vision-driven process; b) a holistic approach from a geographical perspective; c) pressure analysis and institutional coordination inside clear participatory planning; d) use of risk management techniques in planning; e) the ecosystem service concept as the central piece of the system; f) use of the DPSWR as accountable framework of indicators, g) desired vision based on state indicators and using BQI partial indices; and h) timely participation by local population. The EBMS is structured along three pillars (managerial, informative and participatory pillars) working in an adaptive management way. Based on these three pillars, existing management practices can be standardized into a viable, systematic means of implementing, in an integrated way, the new international policies for beach social-ecological systems. An initial experience of EBMS implementation is a particular beach (S’Abanell beach, Girona-Catalonia, Northwestern Mediterranean) has been initiated and it is presented.
1. - Introduction

The Ecosystem Approach emerged as the dominant paradigm for managing coastal and marine ecosystems (Olsen et al., 2009). New international policies emphasize the need to develop sustainable strategies for implementing the principles of ecosystem management ("Ecosystem Approach" -EA, "Ecosystem-Based Approach" -EBA, "Ecosystem-Based Management" -EBM three concepts considered similar according Farmer et al. (2012) that will be used indistinctly here). This approach offers new opportunities for sustainable use of the sea but requires better understanding of how marine social-ecological systems operate, how they generate goods and services, how well these benefits are captured and sustained, how human degradation of the systems affects human welfare and generates costs, and the complex social relations and value systems underpinning human governance of marine systems. In Europe for example, the achievement of Good Environmental Status (GEnS, following Borja et al., 2010, 2013) and sustainable use of marine ecosystems became primary objectives of the new Environmental Marine Policy of the Union (Marine Strategy Directive-MSFD [2008/56/EU]; Maritime Spatial Planning-MSP [2014/84/EU]). This new policy is aimed towards the achievement of a common vision and a holistic integrated approach using the Ecosystem Approach as its framework of reference. In the Mediterranean region, the "Mediterranean Action Program" (MAP) also has included the Ecosystem Approach as its basic marine strategic framework. While all countries belonging to the European Community supports its marine strategy, the MAP program has been ratified by 22 countries of the Mediterranean beyond their different political and social affinities (Cinnirella et al., 2014). All of this confirms the international support to the principles of the ecosystem approach at the level of policy and send a clear message of how it should be the future management of the coastal and marine environments.

In practice, realities are a little bit different. Different guides and manuals have been developed to facilitate the implementation of these strategies (Shepperd, 2008; Ehler and Douvere, 2009; PISCES, 2012) and several regulatory tools have been proposed (i.e. in Europe, MSFD, MSP and the Mediterranean Protocol of Integrated Coastal Zone Management-ICZM [2009/89/EC]), however, the application of the principles of the ecosystem approach into management and the use of its associated jargon is still confusing, makes its related type of management nebulous rendering it difficult to put into practice, and problems get accentuated by the complex institutional system that manage these environments, with very fragmented responsibilities and extremely reactive (Cormier et al., 2010; Bainbridge et al., 2011; Sardá et al., 2014). All these issues and controversies can be seen in present practices of beach management.
Beaches are social-ecological systems that play a key role in coastal environments. Beaches play multiple functions, being three the most important ones: to act as natural reservoirs, to offer coastal protection, and to provide human recreation. A long list of ecosystem services is provided by these three assigned functions (Sardá, 2013). In the Mediterranean region, as in many other regions of the world, beaches constitute the main asset for the maintenance of the tourism industry and a clear relation between quality, user’s perception and economic valuation is found (Ariza et al., 2012a).

Following such issues most of its public/private management has been developed around its recreational function and other functions observed in beaches have been just seen as a complement of the previous one and, in many cases, managed in a reactive way.

During recent decades, in order to bring the best recreational attributes for beach users (clean sand for lying, clean water for bathing and the best services possible), environmental quality standards and environmental management systems have been widely used in beach management. Although it is clear that those frameworks improved the way in which beaches were managed, these schemes are far to applied the principles of the Ecosystem Approach. The introduction of the Ecosystem Approach in beach management arrangements would requires the incorporation in the used framework of a set of principles to ensure the inclusion of essential components such as participation, planning and decision-making, integration, promoting accountability and quality assurance, as well as a new jargon of concepts such as social-ecological systems, ecosystem functions and services,… (CBD, 1998; Balvanera et al., 2001; Cognetti and Maltagliati, 2010; Sardá et al., 2014). To advance into the solution of this deficit, this paper presents the development of a new formal procedure for beach management, intended to be used in practice, the Ecosystem-Based Management System for Beaches (EBMS-Beaches). The Ecosystem-Based Management System was recently developed as a formal standard management system to implement the Ecosystem Approach into the management of public goods (Sardá et al., 2014). It is one of the main outputs of the FP7 KnowSeas project (www.msfd.eu). The EBMS is an adaptive management system that combines the theory of environmental and risk management (Measham and Lockie, 2012) with the principles of ecosystem management (Farmer et al., 2012) and permit its application in a nested way at different spatial scales, whether national, regional, sub-regional or local.

This paper describes the structural and operational components of this new management model (EBMS-Beaches). In its first section, the paper describes the evolution of beach management in Spain, a country that it has always distinguished itself by introducing innovative aspects in the management of beaches. In a second section we describe what the new system incorporates into previous managerial standard systems in order to introduce the EA principles. In the third section,
the EBMS for beaches is described and the applications of several internal tools to the beach of S’Abanell (Blanes-Girona, Spain) are used as examples. Finally, we present some general conclusions that we believe can make the EBMS sufficiently attractive for its use.

2. The development of beach management frameworks in Spain

2.1. From the initial services in beaches to the use of Environmental Managements Systems (EMS).

In Spain, it was not until the end of the First World War when the first transformation of the pre-tourism industry was observed, from low supply activities (spa-resorts) to the initial development of new specific generic types of tourism, which would result in the “sun and sand” tourism model during the second part of the century (a good analysis of this evolution can be found in Garay and Cànoves, 2010). The pre-fordist tourist phenomenon was then initiated and beaches become part of the human landscape like other areas of the territory. At that period, the ecosystem concept was not introduced in public management and only scattered services on beaches were disposed without considering these systems as natural resources of economic interest (Figure-1).

Innovative beach management processes were initiated in Spain during the 1950s and 1960s following the long post war period after the Second World War. A new fordist stage of tourism was born and the preponderance of the “sun and sand tourist model” became a reality. The Spanish Coastal Act of 1969 established the so-called General Zoning Plan for beaches (PGOP) allowing to plan for services and facilities, and the first management guidelines were published for urban environments. During the 1970s Spain developed the "Indicative Plan for the Use of Public Domain" (PIDU) who had a great importance during the 1980s at the beginning of the Spain’s democratic transition (Figure-1). The green environmental movement was born during these decades and a change in the prevailing worldview of our relation with nature recognizing the need for a sustainable use of natural resources was introduced.

The Sustainable Development concept globalized the environmental issues and the mainstreaming of environmental values within all sector and policies during the 1980s. The new Constitution of Spain (1978) promoted the development of a new Coastal Act (22/88) and its Reglament with the main focus in the protection of the coastal public domain. The management of beaches became more important but also more complex due to fragmentation of responsibilities between a bunch of local, regional, autonomic and central governments. Eco-labels emerged in mid 1980s, when the
crisis of mass tourism and the consequent pressure exerted on certain fragile resources as beaches was found. As a consequence of all these changes, concepts as sustainability, continuous quality improvements, impact assessment ... were introduced as references for beach management policies (Fraguell and Martí, 2013) and different Performance Standards such as the Blue Flag (voluntary eco-

- lable award found in 49 world-wide countries) and Environmental Management Systems such as the international European EMAS, the Global ISO 14001 or the Spanish Q of Quality were increasingly used in the management of beaches in Spain (Figure-1) (Ariza et al., 2008). Although Performance Standards and Environmental Management Systems are still widely used they are far of introducing the latest concepts of the internationally environmental policy that was initially developing at that time.

2.2. The need of an Ecosystem-Based Management System in beach management (EBMS-Beaches)

A management system is a systematic framework of policies, procedures and practices used to ensure that an organization can fulfil the tasks required to achieve its objectives. When objectives are related to environmental considerations such is the case of a natural environment like a beach, an Environmental Management System (EMS) is developed. On the other hand, the Ecosystem-Based Management (EBM) has been defined as “an integrated approach to management that considers entire ecosystems, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the
services humans want and need” (COMPASS, 2005). EMS are useful frameworks through which organizations can reduce their environmental impact, improve their environmental performance and provide relevant information to the public and other interested parties. EBM constitute a set of principles and work as a framework for the application of the new international environmental policy. Used in conjunction, a possible evolution of an EMS could be viewed as a useful tool for implementing EBM. Another important aspect to be considered is the need to develop in management a kind of vision to be reached when managing a particular issue. In this case, management should be taken care and deal with all the associated risks that could impede and/or maintain this vision. Risk management systems (RMS) are widely used in different management constructs to deal with that (Cormier et al., 2013). We used all these ideas to develop a new intended standard tool, the Ecosystem-Based Management System-Beaches linking the EMS and RMS tools with the EBM framework for beach environments.

To work with an EBM application, it would be necessary to incorporate into our used framework, the Ecosystem approach principles presented at the UNEP/CBD/COP/4/Inf.9 Conference and referred as the Malawi principles. Table-1 is listing such principles and dictating what these principles bring into the need of modifying present beach management practices.

When they are compared, EMS/RMS frameworks tend to focus more on institutional management issues while EBM schemes are intended to focus more on an ecosystem management perspective. When putting all together preponderance should be given to the welfare mechanisms by which societies can benefit of a sustainable use of a natural resource while maintaining its integrity, both structural and functional. The concept of ecosystem services acquires a preeminent role in the functioning of the EBMS-Beaches. In addition, Elliott et al. (2006) emphasized that in order to develop one of those EBM frameworks, we should have a clear integration among the components of the ecosystems and resource uses and users, we must lead to a sustainable outcome, we should take clear precaution in avoiding deleterious actions and have a clear vision of change by developing and adaptive management approach; all of these aspects were cautiously applied in the EBMS-Beaches.

3.- Towards a new integrated beach management system: the EBMS-Beaches.
3.1.- The Ecosystem-Based Management System (EBMS)

With the final aim to create a comprehensive scientific knowledge base as a practical guidance for the application of the Ecosystem Approach to the sustainable development of Europe’s regional seas, the European project FP7-KnowSeas developed a suite of tools to assist policy makers and regulators with its practical application (legacy of the project can be seen in www.msfd.eu). The Ecosystem-Based Management System (EBMS) (Sardá et al., 2014) was one of these tools. The EBMS is based on a three pillar structure and intended to facilitate the integration of an ecosystem approach to coastal and marine policy development, regardless of the ecosystem or administrative scales.

The managerial pillar is based on classical environmental and risk management systems that incorporate environmental considerations and objectives within a continuous improvement cycle of adaptive management. The managerial pillar is thought to be supported by governance structures that provide oversight and thereby ensure that planning and implementation activities adhere to modern environmental principles. The information pillar ensures that data and scientific advice are based on current knowledge, and the participation pillar brings together institutional coordination, communication and consultation requirements as indicated by the principles of the ecosystem approach (Sardá et al., 2014). Figure-2 (upper left) shows how these pillars work together in a continuous improvement loop-cycle path that is intended to bring a present social-ecological system situation to its desired vision for the future.

The conceptual thinking underpinning the EBMS is the combined use of well-established environmental and risk management systems (EMS-RMS), ISO 14001 (ISO, 2004) and ISO 31000 (ISO 2009a; 2009b; 2009c) with a set of tools that allow to introduce in the framework all aspects needed to encompass the principles of the Ecosystem Approach (Table-1, left column). As EMS/RMS frameworks can be used by whatever organization despite size, sectors or geographical locations, the EBMS is scalable and its structure can be adopted for any program of measures, from regional scale initiatives to local ones, and adapted to the different social-ecological systems under management. The use of the EBMS in beach social-ecological systems allow us to move towards a new integrated beach management system that could fill the gap produced during the last decade regarding the management of public goods. In order to apply the EBMS into EBMS-Beaches, the principles of the Ecosystem Approach were transferred into needs for beach management (Table-2 right column).
3.2. The EBMS-Beaches: application to the S’Abanell beach case study.

The theoretical foundation of this academic work consists of three pillars working together in an adaptive management way with the final aim to reach a desired vision for the beach social-ecological system under management. While the first pillar helps to get an understanding of the management mechanism applied (managerial pillar), the second one provides much value added from an information context (information pillar) establishing all indicators that will be used by the system. The third pillar defines the ways in which participation of stakeholders is regulated in the framework (participatory pillar). By looking all three of them from a theoretical pint of view, it is possible to grasp certain elements that are especially important for achieving project’s objectives. The methodology presented is in validation at S’Abanell beach located in the bay of Blanes (NW Mediterranean Catalan Coast, Spain) (Figure-3). This does not want to say that the entire EBMS framework is in use now but several of the applicable tools have been proven and a good relationship with the managerial institutions in charge of the beach has been obtained which facilitate pilot studies and tool checking.

<FIGURE 3>

S’Abanell beach is the northern landmass emerged zone of the Tordera River delta (Figure-3). During the last four decades, S’Abanell beach have been suffering significant erosive processes due to man-made activities aggravated by periodic episodes of droughts that reduced drastically the sediment supply from the Tordera River. Today, the occasional wetland developed at the mouth of the Tordera river is nowadays put in danger by the retreat of sediment supply by the river. A description of the S’Abanell beach evolution can be found in Lozoya et al. (2011) and Sardá et al. (2013). Historical cartography of this region can be obtained back to the year 1611 (ICC, 2005) indicating abundant information on this area. The general erosive process and retreat has contributed recently to the failure of S’Abanell beach as a supplier of several ecosystem services due to the non-fulfilment of its protective and recreational function. At the mouth of the River, in the southern tip point of the beach, a coastal lagoon is sometimes formed allowing a wetland area which has been awarded under the distinction of Natura 2000 site following European regulation.

3.2.1. Visioning phase (establishing the context)

The first task to be accomplished is the establishment of the foundation for the EBMS-Beaches. Defining the social-ecological system under management (unit of analysis, in this case the beach of S’Abanell) will identify the targeted geographical area. After having delimited the unit, an initial
assessment report should be drafted to develop a common understanding of the system. The
assessment allows us to compile and synthesize all the relevant information for this particular unit
that becomes necessary for its correct management. The assessment also lets us know about the
pressuring factors on the system and the related stakeholders to be considered. The objective of the
report is to comprehensively describe the major features of the unit that must be used sustainably,
the human activities which must be managed within it and the major interactions among the unit
features and the human activities observed there. The report is intended to provide managers with a
better understanding of the social-ecological actions and relationships in the selected unit as well as
to inform the public and other stakeholders about the “status quo” of the system and the pressures
it is receiving. The visioning phase constitutes the starting procedure to implement the information
and participatory pillars to build interest, expand participation and create settings for actors to come
are part of its work. As a final task, the visioning phase should develop the desired vision to be
reached and a set of overarching goals with a potential measuring mechanism. These overarching
goals must be presented as indicators of “State” following classical Driver-Pressure-State-Welfare-
Response (DPSWR) accounting framework (Cooper, 2013).

In the case of S’Abanell beach, we have a large amount of information in form of scientific papers
and grey literature (doctoral thesis, environmental impact assessment reports, nourishment
technical studies...). The analysis of this information constitutes the initial assessment report
obtained for the beach (a tool demanded by the EBMS, Sardá et al., 2014). Based on all this
information and expert judgment criteria we develop our desired vision for this beach to be: a) to
recover a width of, at least, 30m all over its length within a stable beach profile in order to ensure
that the beach can develop its protective and recreational functions, and b) to maintain the natural
integrity of the wetland found in the mouth of the River to allow the accomplishment of its
preserved natural function.

3.2.2. Managerial pillar

The managerial pillar was developed with the same structure of an EMS ISO 14011-type. It followed
the five main elements of the Deming cycle loop: policy baseline, planning preparedness,
implementation and operation, checking and corrective actions, and management review (Deming,
1986). These elements were then adapted to work with the principles of the Ecosystem Approach
following Table-1. Presently used EMS tools applied to beaches can be easily modified and adapted
to the changes required by and ecosystem-based approach by modifying some of the required
clauses as a consequence of having introduced the ecosystem-based management jargon, notably
clause A.3.2. (Social-ecological key aspects), A.3.4 (Risk management programs), and A.6. (Management review). Table-2 listed the different clauses observed in this pillar through the above commented steps (a much detailed explanation can be found in Sardá et al. (2014) and www.msfd.eu.

**<TABLE 2>**

The selection of the key social-ecological aspects in the planning phase will be carried out using risk management techniques (Figure-4). A Risk Management framework using the ISO 31000:2009 Risk Management Standard is used for this job. The work to be done is related with the identification of those aspects (human activities and behavior, natural hazards,) pressuring the littoral unit under management. After risk identification and environmental risk profile will be done providing the most up-to-date knowledge of the risks and its environmental effects, causes and consequences. The assessment will inform the decision-making process preparing a risk evaluation of management strategies to eliminate, reduce or mitigate risks including the costs and benefits of the implementation and evaluating options for feasibility and effectiveness. Once this is done, the risk management plan is developed (goals, targets and objectives) and it will be implemented by a series of actions that will be included in the risk management program. The further implementation and operation phase, as well as the checking and corrective measure phase will not change too much from what it is normally seen in an ISO 14001 application besides the fact that new jargon is introduced and new monitoring requirements highlighted.

**<FIGURE 4>**

The management of environmental issues is usually linked to chains of cause and effect. These cause and effect issues are the ones that can put us in danger of not reaching and/or not maintaining the desired state. In order to practicing these previous ideas, a proposed methodology was developed using S’Abanell beach as example (Lozoya et al., 2011). The methodology used the risk management framework (ISO 31000) in which coastal hazards and beach ecosystem services were jointly considered. The definition of the risk profile and the assessment of identified risks was done by building the beach Pathway of Effect, where links between coastal hazards with ecosystem services were identified following a DPSWR approach (Cooper, 2013); the second phase (risk evaluation) including risk valuation and hazard prioritization followed previous work. Figure-2 shows the scheme of this tool in the planning phase of the managerial pillar. In its application to S’Abanell beach (Lozoya et al., 2011) River floods and storm-induced floods were the riskiest hazards and the disturbance regulation ecosystem service the most affected one. When these events are related to
the present states of beach social-ecological components, beach width becomes the most acute problem that should be prioritized in S’Abanell beach.

The DPSWR accounting framework for analysis is used (Cooper, 2013). In this accountability, aspects are analytically structured along pressures, which are caused by one or multiple drivers resulting in changes in the state of the social-ecological system components. These changes may lead to welfare changes in the societal use of ecosystem goods and services and it require some type of response. These responses are the ones that will be translated into the management program designed to eliminate, mitigate or compensate pressures related to drivers of human activities, and to control drivers coming from natural events and/or hazards, both of them with the purpose of avoiding potential environmental negative effects.

The final management review is an essential part in the continual improvement of the management system. As an adaptive management tool, the EBMS needs periodic reviews to analyze the distance with its desired vision and to incorporate new scientifically and technical knowledge, and sometimes even to re-analyze our own vision. The final review of a loop cycle will be connected with the planning phase of the next cycle establishing the main context in which the next risk identification and prioritization of programs should be carried out.

3.2.3. Information pillar

An essential requisite for correct environmental management is the compilation and analysis of exhaustive environmental information. The information pillar must provide the managerial pillar with user-friendly tools to facilitate the flow of information into the decision making process. In the EBMS, the information pillar is structured into an Information Factory with two main support tools: a Spatial Data Infrastructure (SDI) following standard procedures, and a platform of indicators accessible to be used in the system at any time.

Coastal and marine SDI are no longer a novelty, they are well reported in existing literature and are acknowledged to be a key element in improving the management of these areas (Drapeau, 2008; Cinnirella et al., 2011). S’Abanell beach is the shoreline unit under management but it is being influenced by processes occurring at a much wider territorial area. A cartographical representation of the boundary delimitations of all this area is advisable to understand major events than can occur in the zone of management (Balaguer et al., 2008).
Concerning the platform of indicators, for clarity the EBMS employs the DPSWR social-ecological accounting framework to organize the information on aspects that are relevant to represent the interactions between them (Cooper, 2013). This accounting framework is utilized by the risk management tools used in the planning phase of the management pillar and it is also used in the initial assessment and at the revision phase of each management cycle. In the case of beach environments, “State” indicators of the different identified beach functions and sub-functions were compiled to form a composite index based on function analysis called the Beach Quality Index-BQI (Ariza et al., 2010). The BQI (Figure-5) includes thirteen partial indices divided into the three main functions of the beach (recreational, natural and protective functions) that gave place to three sub-indices too. Each partial index provides a quality of value of its represented state. All values (index, sub-indices and partial indices) scores from 0 (worst situation) to 1 (best situation). These indicators of state will also drive the implementation of the risk management program through the implementation and operation and the checking and corrective measure phases.

State indicators are the ones that will be used to measure the distance to the desired vision. The thirteen partial indices computed in the BQI can serve as a Balance Scorecard for the management of the beach system. An assessment of these values was performed in S’Abanell beach during summer 2005 and 2006 (Ariza et al., 2010). Obtained values gave a global score of 0.67; the analysis of the different partial indices assessed told us that we were not having the desired vision for the beach. From 2007 to 2009, three nourishment processes were carried out in S’Abanell beach (180.000 m³ in November 2007; 144.000 m³ in May 2008; and 250.000 m³ summer of 2009, Sardá et al., 2013). Besides these nourishment processes the geomorphological condition of the beach only has improved slightly; the protective partial index that gave a value of 0,31 in summer 2006 was computed as 0,33 in February 2014 (beach width at that time can be seen by transects in Figure-3).

3.2.4. Participatory pillar

The third pillar of the EBMS is aimed to facilitate societal participation, an element required in the Ecosystem Approach. Participation means active involvement of the actors (people influencing and affected by management actions). In order to implement a well-structured functioning of the EBMS-Beaches, it is necessary to work with an effective governance structure and to identify and involve its main actors. In addition, the Ecosystem Approach requires the adoption of a holistic attitude from a geographic perspective, beach environments cannot be isolated from the watershed and marine environment that are forming them which yield to institutional complexities and fragmented
responsibilities derived from its management. The effective governance structure will require significant cooperation amongst governments; civil society and private interests in the need of a collective action, and this participatory pillar should facilitate this work in order to overcome the barriers imposed by administrative procedures.

The participatory pillar of the EBMS accomplished three main tasks: a) facilitation of stakeholder identification, b) allowing effective participation and conflict resolution, and c) enhancing capacitation. Tools are available for the identification of stakeholders (e.g. Sanó 2009, Bainbridge et al. 2011), and initiatives to generate informed networks of stakeholders are beginning to emerge. The visioning phase (initial assessment) of the EBMS-beaches identifies these actors and this list should be maintained through the revision steps.

Participation should require institutional coordination of all national, regional and local authorities competent in the littoral unit managed as well as society involvement. The EBMS-Beaches implementation can be hampered by the complexity and potential conflicting jurisdictional policy objectives of the various arms and levels of government. In this case a lack of coordination can imply governance failures and can create conflicts between these different administrative institutions and between these institutions and civil society. In the case of S’Abanell beach different offices have different responsibilities and the complexity is amplified by the land-based interactions located in the Tordera catchment area and its urban environment as well as several policy objectives that may not align with the beach integrity. The Blanes municipality manage all services associated to the beach, the Regional Government (Autonomous Community of Catalonia) has two different “Consellerias” (Community Ministries) involved. The Ministry of Territory and Sustainability has the Coastal Service Unit managing licensing of beach activities and the Water Catalan Agency (a private/public institution) deals with the management of the Tordera watershed and it is responsible of managing in Catalonia the Water Framework Directive. On the other hand, the Catalan Ministry of Agriculture, Livestock, Fisheries, Food and Natural Environment have the responsibility to manage the Natura 2000 site of the mouth of the Tordera River. Finally the Central Government of Spain (Ministry of Agriculture, Food and Environment) through its Coastal General Directorate manage the Public Marine Domain regulated by the Spanish Coastal Act and it is in charge of the Marine Framework Strategy Directive. The tremendous amount of complexity involved in this structure without any supra-municipal beach office and without any clear managerial leadership is the main obstacle for a correct implementation of the EBMS-Beaches today, however, the use of the EBMS-Beaches framework could introduce a common language and a common set of procedures facilitating dialogue, coordination, and capacity building between the different offices involved.
Public engagement in coastal management was highlighted as an essential component of ICZM activities (Ernoul, 2010; Lozoya et al., 2011; Areizaga et al., 2012). Public participation is encouraged but practicing of this engagement is rare. The introduction of the Ecosystem Approach in beach management obliges to accommodate and prioritize needed public services but also to take care about the different social-ecological activities and events that are observed in the beach. At that level, the participation of users and agents with economic interest in the system need to be guaranteed. To assess beach user’s motivations, expectations and priorities, a survey based questionnaire is recommended to be used during the bathing season in the EBMS-Beaches. An example about this questionnaire can be found in Lozoya et al., 2014 for S’Abanell beach. Concerning agents with economic interest, innovative schemes for linking public and private efforts to protect social-ecological systems by ensuring the provision of ecosystem services are becoming more and more used today involving “payment for ecosystem services” schemes (Wendland et al., 2009; Farley and Costanza, 2010; Farley et al., 2010) or just raising tables for discussion.

Finally, the participatory pillar should enhance manager and societal capacitation. Raising a web portal where people can find enough information systems under management is appreciated. The EBMS standard tool has today one of this tools in operation, a visit can be done at www.msfd.eu

4.- Discussion.

Massive use of beaches has forced traditional management of these systems to focus on the service offer to users. Consequently, human activity and behavior prevailed over other biological and physical processes and functions that are normally managed in a reactive way. Mirroring this tendency, the use of Performance Awards and Environmental Management Systems (EMS) were popularized as standards of environmental quality. Although EMS has proven to be a good tool for improving beach management processes, its promotional benefits are hardly visible in the eyes of typical mass tourism and for this reason many coastal managers preferred to combine both type of certifications (performance awards and EMS) as complementary (Fraguell and Martí, 2013). However, these standard tools do not reflect the new principles of the environmental policy recognized in the international coastal and marine regulation. The change towards the requested ecosystem management approach constitutes a social challenge today; it is not seen in practice and should involve not only local managers and formal stakeholders, but also the civil society (Ariza et al., 2012b). The application of the EBMS for beach social-ecological systems is aimed to facilitate such integration.
The EBMS is aimed to be a standard adaptive management methodology to assist coastal and marine environments by introducing a common set of tools and procedures and a common language that can be useful for facilitating knowledge transfer and capacity building when applied to beaches. The EBMS-Beaches is aimed to fill the gap between the present theory of environmental policy and present beach management practices. The EBMS for beaches is scalable, can be hierarchically introduced at different spatial scales and this could facilitate the institutional coordination needed to solve the problem of policy fragmentation and differentiated responsibilities (Cormier et al., 2010). The EBMS-Beaches can be considered as a quality assurance tool by itself being used in a vision-driven process of continuous improvement which makes it necessary to reach a societal consensus for the desired future conditions of the beach environment under management. Although we are just introducing the idea, the EBMS-Beaches potentially could also work (as other standards do) with the possibility to allow certification if promoting circumstances become important.

Although the implementation of Environmental Management Systems enhanced the achievement of sustainable outcomes in the management of beaches, this enhancement was mainly focused in the environmental quality for its recreational function. The use of the EBMS-Beaches will allow us to manage together, in an integrated way, the different functions of the beach environment and the ecosystem services they provide. The EBMS add new aspects not considered in a classical EMS framework: a) beach management is part of a clear vision-driven process; b) beach management adopts a holistic approach from a geographical perspective; c) it requires pressure analysis and institutional coordination inside clear participatory planning; d) planning is obtained through the use of risk management techniques; e) the concept of ecosystem service is a central piece of the system; f) beach management use the DPSWR as its analytical accountability framework of indicators, g) good final state is based on “state” indicators using BQI partial indices (Ariza et al., 2010); and h) it ensures timely participation by local population. Although the EBMS-Beaches can be seen as an evolvement of previous EMS systems, there are enough aspects that make this new system different. The structure of the EBMS and all related jargon was uploaded into a web platform tool (www.msfd.eu) to facilitate training and capacitation, something similar for beaches would be of great help.

The use of management systems and certifications ensures that importance is given to the territorial presence of beaches. It is sad to see how geographical areas as beaches what are considered essential economic assets are not properly managed. By the understanding of the role of stakeholders in capturing the benefits obtained from ecosystem good and services of beaches, we can discuss better arguments for the recognition of possible additional governance costs of the new
adaptive management system supporting the EBMS-Beaches tool, including transaction costs, the
cost of monitoring and dynamic economic effects. It is clear that beaches play a key role in the
maintenance of the Tourism Industry in Spain, an essential sector for the economic welfare of the
country as the present economic crisis has shown (Sardá and Fluvià, 1999; Sardá, 2001). Yepes
(2004) described how the 0,001% of the Spanish surface (beaches that holds the “sun and beach”
tourism model), are indirectly responsible of more than 10% of the Spanish Gross Domestic Product.
Consequently, in Spain beaches should be considered to be one of the country’s major assets. The
recreational service of the Lloret de Mar central beach (1.3 km; 5.6 ha, located 5 km north of the
S’Abanell beach) was assessed using the Travel Cost Methodology (TCM) as a valuation technique
(Ariza et al., 2012a). We obtained an annual value of 73.8 million Euros for this beach just as its
direct use. At that time, 19% of this money (13.4 million Euros) went into taxes received by the
different administrations involved. The results also show the important gap between investments
made by coastal managers (less than 1 million Euros for all municipal beaches of this town during
the analyzed year) and users’ economic valuation (73.8 million Euros year as a direct use). With all
these data, the value per meter square of the central beach of Lloret de Mar was computed as 1320
Euros and its annual value per ha on 13.2 million Euros. We do not have the same values for
S’Abanell beach, however, even if we assume that we can talk about half of the value per meter
square (Lloret de Mar is one of the most popular beaches in Catalonia while S’Abanell is a normal
one), the amount of money entering into the public finances as a consequence to have the beach is
enormous when compared on the money spent on it. Ignorance of these numbers put in risk even
the presence of beaches in the future in a constant tendency of accelerated erosion process, and
today, no accountability is obtained by any management process.

The theoretical work done in S’Abanell about the main risks at the beach yielded the present width
of the beach as the most notable state indicator to focus management activities. This is something
that present management systems are not able to detect in a formalized way. The EBMS-Beaches, as
it is integrated, has the potential to prioritize the most important aspects going on in the beach and
it obliges coastal managers to know it and to deal with that. In this sense, it would be appreciated if
Administrative offices could lead a program of advice and support to enhance the use of
environmental certification of beaches for integrated management and sustainability of the coast
that could be based in the new environmental policy where the EBMS-Beaches could play a major
role.
504  5.- Conclusion.

505  The new European coastal and marine policy, as well as the Mediterranean Action Plan, uses the
506  Ecosystem Approach as its framework of reference, a management concept that focuses on the
507  relationship between human society and the ecosystems that supports it. It is necessary to bring this
508  approach into practice and fill the gap between theory and practice. In order to bridge this gap we
509  have described the EBMS (Sardá et al., 2014) as a new management standard system. This
510  management scheme it is easily applicable for beaches. Due to the large economic importance that
511  beaches have for the economy of different countries on its relationship with Tourism activities, we
512  believe that we need the most rapid transition possible into this type of new management standards
513  that can facilitate the correct management of social-ecological systems today.

514

515  5.- Acknowledgements.

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518  KnowSeas+ project (201530E018). We thanks the Secretariat of the 3rd International Conference on
519  ICZM for allow us to present the paper at the Conference.

520

521  6.- References.


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Figure legends

**Figure 1.**- Timeline development of the used tools in Spain for beach management issues in relation to major changes in the global environmental thinking.

**Figure 2.**- General structure of the Ecosystem-Based Management System and its managerial pillar, showing the developed tool (left) used in the planning phase to deal with the beach social-ecological key aspects. (Adapted from Sardá et al., 2014 and Lozoya et al., 2011).

**Figure 3.**- Location map of S’Abanell beach. The bottom-right picture is showing the width of the beach (in meters) in different transects on February 7th 2014.

**Figure 4.**- The managerial pillar of the EBMS and its proposed methodology to deal with the prioritizations of the key social-ecological key aspects. (Adapted from Sardá et al., 2014 and Lozoya et al., 2011).

**Figure 5.**- Panel of indicators associated with the Beach Quality Index (BQI).
TABLE-1.- Relationship between the Ecosystem Approach principles developed by the Convention of Biological diversity and its application for beach management frameworks.

<table>
<thead>
<tr>
<th>CBD Ecosystem Approach principles</th>
<th>Beach management needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The objectives of management of land, water and living resources are a matter of societal change</td>
<td>Use participatory planning: appropriate management schemes should ensure timely participation in a transparent decision-making process by local populations. Adopt a holistic way from a geographic perspective: beach environments cannot be isolated from the watershed and marine environment that is forming them.</td>
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<tr>
<td>2) Management should be descentralized to the lowest appropriate level</td>
<td>Effective governance structure should be developed to guide implementation</td>
</tr>
<tr>
<td>3) Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems</td>
<td>Social-ecological dynamics and functioning of the beach should take care about the interdependency between the land and the marine/freshwater parts forming a single entity. All elements relating to the hydrological, geomorphological, climatic, ecological, socio-economic and cultural systems should be taken into account in an integrated matter, not exceeding carrying capacity and preventing negative effects of natural disasters and development.</td>
</tr>
<tr>
<td>4) Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context</td>
<td>Accommodate and prioritize public services needed, but also taking care about the multiplicity of social-ecological activities/events that are observed on beaches.</td>
</tr>
<tr>
<td>5) Conservation of ecosystem structure and functioning, to maintain ecosystem services, should be a priority target of the Ecosystem Approach</td>
<td>The concept of ecosystem services should be central in the management of beaches following the new environmental policy.</td>
</tr>
<tr>
<td>6) Ecosystems must be managed within the limits of their functioning</td>
<td>Beach management should work taking care of natural processes and adopting a long-term perspective. Damage to the beach environment shall be prevented and, where it occurs, appropriate restoration shall be effected.</td>
</tr>
<tr>
<td>7) The Ecosystem approach should be undertaken at the appropriate spatial and temporal scales</td>
<td>Beach management frameworks should be taken into consideration when plans and programs for urban development or sectorial policies evolve. Development of these policies can have an effect on the beach environment and this need to be analyzed.</td>
</tr>
<tr>
<td>8) Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term</td>
<td>Beach management should be part of a vision-driven process. The final idea is to align this management with the obtention of a sustainable development for the zone around the beach.</td>
</tr>
<tr>
<td>9) Management must recognize that change is inevitable</td>
<td>Adaptive management should be implemented to recognize change.</td>
</tr>
<tr>
<td>10) The Ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity</td>
<td>Depending of the particular case and specificities of the beach under management, natural functions of the beach should allocate the presence and use of biological diversity.</td>
</tr>
<tr>
<td>11) The Ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices</td>
<td>An information system should be developed to guide decision-making and monitoring in the management process.</td>
</tr>
<tr>
<td>12) The Ecosystem approach should involve all relevant sectors of society and scientific disciplines</td>
<td>Institutional coordination of the various administrative services and regional and local authorities competent in coastal zone should be required. Appropriate effective governance structure needed.</td>
</tr>
</tbody>
</table>
TABLE-2.- The different phases and clauses of the managerial pillar in the EBMS-Beaches.

A.1.- General Structure
A.2.- Vision
A.3.- Planning phase
  A.3.1.- National and International requirements.- The competent authority shall establish and maintain a procedure to identify all National and International requirements under which the area/region under management has obligations.
  A.3.2.- Social-Ecological key aspects.- The competent authority shall establish and maintain a procedure to identify aspects (human activities, events or hazards) that may have an influence on achieving the vision for the site under management.
  A.3.3.- Risk Management Plan.- The competent authority shall establish and maintain the documented Plan, with its objectives and targets. The Plan is the latest document based on the risk assessment approach.
  A.3.4.- Risk Management Programs.- The competent authority shall establish and maintain a series of risk management programmes and procedures intended for each management period upon which audits and reviews would be carried out.
A.4.- Implementation and Operation phase
  A.4.1.- Structure and responsibilities.- Roles, responsibilities and authorities shall be defined, documented and communicated in order to facilitate effective management.
  A.4.2.- Capacity building.- The competent authority shall identify training needs.
  A.4.3.- Communication.- A risk management communication plan should be implemented. Internal risk management communication and reporting processes as well as external communication plans must be established.
  A.4.4.- EBMS Documentation.- The competent authority should maintain the programmes needed to achieve its objectives and targets.
  A.4.5.- EBMS Operational Control.- The competent authority shall identify those operations and activities associated with the identified social-ecological key aspects in line with its policy, objectives and targets.
  A.4.6.- Vulnerable assessment and response.- The competent authority shall establish and maintain procedures to identify potential for and respond to accidents and emergencies, as well as for preventing and mitigating the environmental impacts that may be associated with them.
A.5.- Checking and Corrective measures phase
  A.5.1.- Monitoring.- The competent authority shall establish and maintain documented procedures to monitor and measure on a regular basis, the key social-ecological aspects that have a significant impact on the environment.
  A.5.2.- Unplanned events and conflict resolution capacity.- The competent authority shall establish an alert system to detect inappropriate functioning in the system and/or unexpected environmental hazards/activities.
  A.5.3.- EBMS records.- The competent authority shall establish and maintain procedures for the identification, maintenance and disposition of social-ecological key records used in the system as well as the evaluation of the indicators selected for the desired vision.
  A.5.4.- EBMS audits.- The competent authority shall establish and maintain a program and procedures for periodic system audits to be carried out.
A.6.- Review phase
Figure 1

DOMINANT "SOCIAL" PARADIGM

Up to the mid 20th century, a worldview of "limitless resources", poor ecosystem understanding and forward planning.

NEW ENVIRONMENTAL PARADIGM

Change in prevailing statistics and a recognition of the need for sustainable resource use and integrated thinking (1960s).

DOMINANT "SUSTAINABILITY" PARADIGM

Globalization of environmental issues and mainstreaming of environmental values within all sectors and policies.

"SOCIAL-ECOLOGICAL" PARADIGM

A worldview recognizing the mutual inter-association between human society and ecological processes that are necessary for the survival of both.

1900's

1960's

1950's

2000's

2010's

BATHING WATER DIRECTIVE (1977)

First Beach Services

Spanish Coastal Act (1969)

PIDU

Bathing Water Directive (1977)

Blue Flag

New Spanish Coastal Act (1988)

ISO 14001

EMAS

EMAS II (Services)

Environmental Management Approach (80's - 90's)

Ecosystem-Based Management Approach (CBD, 2000)

Bruntland report (1987)

Rio Conference (1992)

Johannesburg Conference (2002)

Millennium Ecosystem Assessment (2003)
Figure 5

<table>
<thead>
<tr>
<th>BQI Index</th>
<th>Sub-indices</th>
<th>Partial indices</th>
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<tr>
<td></td>
<td><strong>RFI</strong></td>
<td>(α) Microbiological Quality</td>
</tr>
<tr>
<td></td>
<td>(Recreational function)</td>
<td>(IC) Crowding</td>
</tr>
<tr>
<td></td>
<td><strong>NFI</strong></td>
<td>(IEQ) Environmental Quality</td>
</tr>
<tr>
<td></td>
<td>(Natural function)</td>
<td>(ISerF) Services and Facilities</td>
</tr>
<tr>
<td></td>
<td><strong>PFI</strong></td>
<td>(lact) Activities</td>
</tr>
<tr>
<td></td>
<td>(Protective function)</td>
<td>(IAcPar) Access and Parking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Icomf) Comfortability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(IS) Surrounding Area Quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(IBS) Beach safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(IN) Natural Conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(IWSP) Water-Sand Pollution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(IPQ) Physical Quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(IPP) Protection index</td>
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