Marine Policy 93 (2018) 128–141

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

# Marine biodiversity offsetting: An analysis of the emergence of an environmental governance system in California

Céline Jacob[a,b,c,*], Sébastien Thorin[a,b], Sylvain Pioch[b]

[a] CREOCEAN, Les Belvédères, Bâtiment B, 128, avenue de Fès, 34080 Montpellier, France
[b] CEFE UMR 5175, CNRS - Université de Montpellier - Université Paul-Valéry Montpellier - EPHE - Université Paul-Valéry Montpellier, Route de Mende 34 199 Montpellier Cedex 5, France
[c] Ifremer, Univ Brest, CNRS, UMR 6308, AMURE, Unité d'Economie Maritime, IUEM, 29280 Plouzané, France

ARTICLE INFO

*Keywords:*
Governance
Biodiversity offset
Marine ecosystems
Actor–Network theory
California

ABSTRACT

Most research studies related to biodiversity offsetting have focused on governance systems already in place in the terrestrial realm – these studies tend to rely on an approach of organizational economics, in particular in relation to mitigation banking schemes. In this study, emerging marine offsetting governance systems has been analyzed using the Actor–Network Theory (ANT) with the aim of highlighting the key elements that enable the emergence of marine offsetting tools. The ANT framework has been applied to four case studies in California using data collected in a field study that consisted of interviewing 30 stakeholders working closely with the issue of marine offsetting. Employing ANT allowed to ascertain the role of commonly studied elements such as impacted ecosystems, sizing methodologies and ecological engineering techniques. Further, it highlighted the key role of other critical factors, such as 'skilled intermediaries', who succeed in overcoming uncertainties generated by the use of new tools and contribute to leading other stakeholders towards the goal: the offset instrument. These mediators call upon effective translation processes to put forward new arguments: a change in spatial and temporal scales and adaptive solutions. The findings point to a line of approach that encourages reconfiguring environmental governance systems that could benefit from feedbacks from Integrated Coastal Zone Management (ICZM) and Marine Spatial Planning (MSP) processes, in order to facilitate the development of marine offset schemes.

## 1. Introduction

To date, most scientific literature examining biodiversity offsetting schemes has focused on systems developed to offset authorized impacts in terrestrial ecosystems. Currently, three types of scheme are mainly used in terrestrial contexts:

- *Permittee-responsible mitigation (PRM)*: The permittee causing the authorized impact implements (itself or through an authorized agent or contractor) offset measures; the permittee retains full responsibility.
- *Mitigation banking*: An operator, which is neither the permittee nor the regulator, undertakes ecological actions in anticipation of future development projects with an ecological impact. This operator then translates these actions into value through the sale of credits to developers that need to compensate for impacts on the same habitats or species in the same defined area as the actions undertaken by the bank.
- *In-lieu fee (ILF) mitigation*: Financial funds are collected from one or several developers causing authorized impacts in order to implement offset measures. These are managed by a public-sector stakeholder or a non-governmental organization (NGO).

Research to date has particularly focused on mitigation banking, which integrates, within an explicit framework, criteria such as equivalence calculation, exchange rules, and legal and financial guarantees [1]. Mitigation banking schemes have benefited from being tested in practice; the first was implemented in the early 1990s in the United States. However, in a marine context, offsetting systems are currently in their very early stages of development (for example, the state of Florida has 3 marine mitigation banks compared to around 90 terrestrial mitigation banks). As of yet, few studies have been dedicated to marine offsetting, so this research topic anticipates a future field.

In this study, rather than investigating governance systems already in place (mainly designed for the terrestrial context), emerging governance systems currently in development were analyzed. With this

* Corresponding author at: Ifremer, Univ Brest, CNRS, UMR 6308, AMURE, Unité d'Economie Maritime, IUEM, 29280, Plouzané, France
*E-mail addresses:* celine.jacob@ifremer.fr (C. Jacob), thorin@creocean.fr (S. Thorin), sylvain.pioch@gmail.com (S. Pioch).

https://doi.org/10.1016/j.marpol.2018.04.007
Received 25 September 2017; Received in revised form 5 April 2018; Accepted 5 April 2018

aim, marine offsetting in California was addressed using the Actor–Network Theory (ANT). Like the neo-institutional economics approaches commonly used to study organizational modes related to mitigation banking [2–4], the sociological framework of ANT stems from the organization theory. The ANT is a sociological approach that was developed in the 1980s by, among others, Callon et al. to deepen the understanding of processes in science production and, in particular, the elaboration of scientific facts in laboratories [55]. For instance, this has been applied to investigate the construction of credibility for new evaluations and assessments (environmental capital, ecological footprinting, and green infrastructure) [8]. This approach is of interest for marine offset as it enables the study of science and technology 'in the making' [5], and marine offsetting is still in its pioneering and innovative phase.

California was chosen as the study area since this state is part of a nation with the largest marine Exclusive Economic Zone in the world (11,350 million km$^2$). California's marine regulations are also some of the most far-reaching. It was one of the coastal states most deeply involved in defining the programs in the Coastal Zone Management Act (1972), a reference text in global policy on coastal zone management. California was the second state to sign this act [6].

This article studies the relations between the elements of the socio-ecological system to help identifying the different strategies developed by the stakeholders and the key enabling processes for the implementation of marine offset schemes. In Section 2, the theoretical framework is detailed. The stakeholders who were interviewed, the documents that were reviewed, and the items related to the ANT concepts around which the analysis is organized are outlined in Section 3. Section 4 displays the four case studies encountered in California and the information needed for the ANT application. For each case study, the different elements of ANT explaining the emergence of marine offsetting schemes are discussed in Section 5. Section 6 describes how the reconfiguration of environmental governance constitutes a crucial element in the design of marine offsetting schemes.

## 2. Theoretical framework

Generally, the creation of knowledge (or innovation) is presented as linear, transferred from the originator to the receiver. In contrast, Callon, Latour and Akrich proposed the Actor–Network Theory, which argues that information is received not only according to its internal merits ('the facts') but also according to the receivers' strategies and aims for using it [55]. ANT thus emphasizes the importance of translating information in a way that is pertinent to receivers' concerns in order to recruit them into actions. This process takes place in a network of stakeholders.

Organizational dynamism relies on this capacity to translate information. Thus, it is essential to establish what ANT terms an 'obligatory passage point', shared by a network of stakeholders [5,7], through which other stakeholders must pass in order to reach their goal. ANT does not create a division between words and things or between human and non-human elements: all participate in a collective action and are referred to as 'actants'.

When analyzing the emergence of new tools or 'knowledge' according to ANT, their qualities are considered as just one element in a more complex picture; it is equally crucial to understand 'how knowledge claims become incorporated into the actions, values, and projects of others' [8]. The role of external, social, and economic factors is decisive in stabilizing connections between knowledge and action. As mentioned by Cowell and Lennon [8], entrenching the use of a methodology depends on 'a complex and sometimes precarious assemblage of knowledge content, metaphor, policy resources, and institutional setting'. This assemblage can affect the limits of the relevance of what are effectively social abstractions (i.e. evaluations) as bearers of values; key stakeholders normally have to agree on these limits [9]. A new methodology or tool, also called a 'politico-technical artefact' [10], must 'combine irresistible forms of knowledge with political legitimacy' in order to make it less subject to negotiation [11].

Thus, in ANT it is crucial to identify the 'positive modalities' (consolidating) and 'negative modalities' (contesting) in a new tool or 'knowledge'. The former are related to arguments that move the debate away from the contestable conditions in which knowledge was produced so that they can be used to underlie actions. The latter consist of arguments that focus on the conditions in which knowledge was produced, questioning the methods, data or assumptions. In addition to these key elements within ANT, Cowell and Lennon [8] highlight the important role of 'skilled intermediaries' or 'policy entrepreneurs'. These intermediaries have the ability to forge links between key stakeholders and are able to explain the potential value of the tool to others and address any negative modalities. These facilitators are crucial, as the adoption of a tool must 'driv[e] forward particular conceptions of sustainability across a range of governmental sectors, each with their own forms of knowledge and expertise, normative criteria, and policy territories' [12 *In*: 10].

In ANT, ecosystems are 'actants' in the same way as stakeholders. Indeed, as mentioned by [13], 'a theme that runs through geographical analysis of environmental governance […] is how the biophysical properties of natural resources and ecological systems impinge on and shape the organizational and institutional systems through which they are governed'. Thus, governance schemes are fundamentally linked to particular ecosystems, and this relationship affects the way that governments seek to manage economic development in their territories [14]. Indeed, different levels of uncertainty prevail in different ecological systems (in terms of scientific knowledge, restoration techniques and methodologies used to assess offset needs). As demonstrated by Jacob et al. [15], an ecological impact assessment relies strongly on the studied ecosystem and ecological restoration techniques also vary greatly according to the ecosystem. So a thorough analysis requires taking into account all the different elements of an ecological system, including the various aspects of human entities and their articulations.

## 3. Materials and methods

An experimental approach based on interviews with various stakeholders involved in marine offsetting in California was used to study the different governance systems implemented in this field and the resulting offsetting instruments. The field study was conducted over a month and a half in 2015 between San Diego and San Francisco in the state of California in the United States. 30 stakeholders were interviewed working in the field of marine offsetting in face-to-face, semi-structured interviews. These 30 persons were selected either because of their past experience with one of the case studies or because of their strong expertise in Californian mitigation. The interviews were carried out with public-sector stakeholders (6 representatives from federal agencies and 9 representatives from state agencies), private stakeholders (3 environmental consultants and 5 private developers) and scientists (7 researchers). The scientists played a role in the monitoring of one or several case studies, either during impact assessment or restoration processes.

Key documents for examination of the case studies were identified thanks to the interviews, providing technical elements necessary to inform the ANT framework. The interviews enabled to get a narrative around each example, but also to understand the position of each stakeholder and the stakes of the different agencies that do not appear in the reports. The four case studies analyzed here were the result of cross-referencing data gathered during the enquiries. They represent the examples most quoted by the interviewees. This choice was also determined by the availability of information that allowed the selected analytical framework (ANT) to be applied correctly.

The stakeholders and their roles in marine offsetting are briefly described in Appendix A. Each agency or organization is considered as a human 'actant' whose objectives were those described by their