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Vie de la recherche – Research news

Dealing with impact. An interdisciplinary, multi-site ethnography of environmental impact assessment in the coastal zone

Camille Mazé^{1,*a}, Jennifer Coston-Guarini², Anatole Danto³, Adrien Lambrechts⁴
and Olivier Ragueneau^{5,a}

¹ Political science, CNRS, UMR7372 CEBC, Villiers-en-Bois, France

² Marine ecology, Université de Bretagne occidentale, UMR6539 LEMAR, Plouzané, France

³ Political science, Université Rennes 1, UMR6051 ARENES, Rennes, France

⁴ Ecology, Biotope, Mèze, France

⁵ Biogeochemistry, CNRS, UMR6539 LEMAR, Plouzané, France

Abstract – The SPA (“Savoir, Pouvoir, Avoir”) project (CNRS, 2017-2019) presented in this article focuses on the ways French society deals with the issue of environmental impact – from the vast question of impact in the context of global change and the issue of the measurement of impact in science, to the specific case of the public policy instrument known as “environmental impact assessment”. Impact is considered as a boundary object at the intersection of several fields of inquiry which captures both the architecture and the dynamics of relationships between “*savoir*” (scientific and lay knowledge), “*pouvoir*” (power and decision) and “*avoir*” (economy/appropriation), that aggregate different interests around the sustainable management of coastal socio-ecological systems. Three sites were selected along a north-south gradient of Long-Term Ecological Research sites: the Bay of Brest and the Iroise Sea, the National Nature Reserve of the French islands in the Southern Ocean and the overseas collectivity of Saint Pierre and Miquelon. The approach of the SPA project is to link concretely social sciences, natural sciences and engineering sciences on these study sites, in an interdisciplinary, multi-site and multi-scale methodology that makes it possible to reveal the conditions for the possible – or impossible – implementation of sustainable management of coastal socio-ecological systems.

Keywords: impact / coastal zone / decision-making process / knowledge / interest

Résumé – Faire face à l’impact. Une ethnographie interdisciplinaire et multi-sites de l’évaluation de l’impact environnemental dans la zone côtière. Le projet SPA (Savoir, Pouvoir, Avoir) (CNRS, 2017-2019) présenté dans cet article se concentre sur la manière dont la société française aborde la question de l’impact environnemental – de son évaluation et sa mesure à son traitement. Le processus réglementaire de l’« étude d’impact environnemental » qui consiste en l’analyse préalable des impacts potentiels prévisibles d’une activité donnée sur l’environnement est donc placé ici au cœur de nos préoccupations dans ce projet qui considère l’impact comme un objet frontière, à l’intersection de plusieurs champs, permettant de saisir l’architecture et la dynamique des relations entre savoir (savoir scientifique et profane), pouvoir (pouvoir et décision) et avoir (économie/appropriation). Pour ce faire, nous proposons de saisir les différents intérêts qui s’agrègent autour de la gestion durable des socio-écosystèmes côtiers. Trois sites ont été choisis selon un gradient nord-sud dans des sites de recherche écologique à long terme : la rade de Brest et la mer d’Iroise, la réserve naturelle nationale des îles françaises de l’océan Austral et la collectivité d’outre-mer de Saint-Pierre-et-Miquelon. L’approche du projet SPA consiste à lier concrètement les sciences sociales, les sciences naturelles et les sciences de

*Corresponding author: camille.maze@cebc.cnrs.fr

^a C. Mazé is also member of the LTSER « Zone Atelier Plaine & Val de Sèvre », Villiers-en-Bois, France ; O. Ragueneau is also member of the LTSER « Zone Atelier Brest Iroise », Plouzané, France

l'ingénieur sur ces sites d'étude, dans une approche interdisciplinaire multi-sites et multi-échelles qui permet de mettre au jour les conditions de possibilité (ou d'impossibilité) de mise en œuvre d'une gestion soutenable des socio-écosystèmes côtiers.

Mots-clés : impact / zone côtière / processus de décision / savoir / intérêts

There is no doubt that several “planetary boundaries” have been crossed (Rockström *et al.*, 2009) in the past century, following our entry into the Anthropocene (Crutzen, 2002). Governments face increasingly constrained choices as they are confronted with complex systemic and regional environmental crises due to the irreversible nature of specific changes in biodiversity and climatic conditions, as well as the many accompanying uncertainties to be taken into account. According to some political anthropologists, decision and public action systems have entered an era of global “politics of survival” (Abélès, 2006), marked by a generalized awareness of the instabilities and threats to the survival of the human species. The longer we delay taking major decisions towards sustainability, the less leeway we leave for future generations to decide their future, producing the so-called “democratic contraction” (Villalba, 2010).

This critical ecological and social situation has led over the past 2-3 decades to major changes in scientific and political arenas. The Millennium Development Goals have been turned into the Sustainable Development Goals in 2015. In the early 2000's, the resilience initiative (Holling, 2001) and the field of sustainability science (Kates, 2011) emerged. In 2012, the Future Earth platform was launched, as a result of a long history of difficult interactions between natural and social and human sciences (Mooney *et al.*, 2013). While the Nation-State was the principal architect of the policy of “convivencia”, new actors are now emerging outside the framework of the Nation-State to implement a principle of “survivalism”. These include supra-national organizations (*e.g.* the European Union, United Nations) as well as local political arenas involving local and regional authorities, NGO's, managers and many other groups of stakeholders, including scientists.

Political spaces are being reconfigured to both tighten and increase nested spatial scales of public action (Lascombes and Le Galès, 2007). The diversification that is now taking place requires an analysis which includes both the local and transnational (europeanization and internationalization) arenas. Contemporary political anthropology is addressing these issues by questioning changes in the political space, especially within the framework of environmental policy interventions (Müller, 2013). Similarly, sustainability science implies that (parts of) science become more solution-oriented, interdisciplinary, participatory and tightly linked to decision-making (Future Earth, 2014). All these changes require further exploration. The ApoliMer research network was founded

in 2014 for precisely that purpose (Mazé *et al.*, 2015a¹), with a major focus on the study of power architecture and dynamics (Weber, 1963; Foucault, 1969) which is crucially absent in resilience studies, especially in their transformational component (Olsson *et al.*, 2014). Political ecology explicitly explores the role of power along the social-ecological nexus, and Ingalls and Stedman (2016) have demonstrated the mutual benefits of a deeper collaboration between resilience and political ecology scholars. Based on this filiation, the ApoliMer research group brings together an interdisciplinary team of researchers in social sciences, natural sciences and engineering sciences to explore the role of power in the governance of marine and coastal social-ecological systems (SES) (Folke, 2006). The aim is to understand the conditions that stimulate, or impede, the transformation of these systems towards sustainability (Ostrom, 1990, 2007; Bousquet *et al.*, 2016). Understanding the factors which enable such change is one of the greatest current challenges for the social sciences (Mazé *et al.*, 2015b, Fontaine and Hassenteufel, 2002). Including social change in SES research has a strong potential to produce new insights, especially through exploration of this knowledge at the intersection between social and environmental dynamics (Cote and Nightingale, 2012).

The origin, objectives and main conceptual hypotheses of ApoliMer have been described elsewhere (Mazé *et al.*, 2015a, 2017; Mazé and Ragueneau, 2017), especially in terms of what the social sciences of politics (SSP) can contribute to the field of sustainability science and why studies need to be undertaken in close connection with the natural and engineering sciences, in particular ecology. In this contribution, we focus on a theoretical cooling-off of the conceptual approach (Hassenteufel, 2008). Hence, we describe a new research project recently funded by the Mission for Interdisciplinarity created by the French National Center for Scientific Research (CNRS): the SPA (Savoir, Pouvoir, Avoir) project (Box 1). This three-year long project (2017-2019) is structured by an original

¹ ApoliMer stands for “Political Anthropology of the sea”. It is now a multidisciplinary thematic network (RTPi) affiliated to the INEE (Ecology and Environment Institute of the French CNRS). Founded in 2014, ApoliMer was first a mixed research structure between the European Institute for Marine Studies (Institut universitaire européen de la mer, IUEM) and the faculty of Human and Social sciences at the University of Brest (UBO).

multi-site and multi-level methodology that aims to integrate perspectives from natural and social scientists at a critical decision-making nexus for all disciplines involved in sustainability science: Environmental Impact Assessment (EIA) policy (Box 2) at the land-sea interface.

Philosophy of the SPA project and focus on EIA

The SPA project team considers both theoretical and practical aspects of the exercise of power in the

Box 1. Participants in the SPA project.

C. Mazé is political scientist, sociological and anthropological training, working in the direction of a political sociology of science, initially within LEMAR (Brest) and now at CEBC (Chizé), to broaden research perspectives beyond the marine environment to include terrestrial regions, and strengthen the contribution of social sciences to the dynamics of the LTSER.

J. Coston-Guarini is a marine ecologist interested in quantitative impact assessment; the participation of J. Coston-Guarini is supported by TBM Environnement and LIA BeBEST.

A. Danto is PhD student in political science with a double background in geography and anthropology; the participation of A. Danto is supported both by the LabexMER and the Chair TMAP (Chaire Territoires et mutations de l'action publique, R. Pasquier, IEP Rennes).

A. Lambrechts is ecological engineer specialized in conducting environmental impact assessment and mitigation hierarchy sequence (Biotope, biodiversity consultancy firm).

O. Ragueneau is biogeochemist working in interdisciplinarity on the road to political sociology of science.

All participants in the SPA project who participated in the writing of this article are members of the international multidisciplinary thematic network ApoliMer (Political Anthropology of the Sea) supported by INEE (CNRS).

Box 2. The EIA process.

It has been nearly half a century since Environmental Impact Assessment (EIA) became part of different national or international legislation as an integral part of their environmental management policy. In the US, it was materialized through the National Environmental Policy Act (NEPA) of 1969. In France, a similar process appeared as early as 1976 within the law on nature protection. One definition of EIA is given by the International Association of Impact Assessment: “[...] the process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of proposed development proposals prior to major decisions being taken and commitments made”. However, there is no universal definition.

The general purpose of EIA is to ensure policy and legislation decisions permitting development are informed by the best possible evidence about the relative importance of the environmental perturbations generated. In addition, actions which mitigate or help avoid or reduce negative effects can be required when potential impacts are judged to be too strong. For government, industry and for society as a whole, the point of EIA is to make it more likely that all interests are considered before a project begins.

Examining the European Union's Impact Assessment process for member states, Jacob (2010) notes that the *ex ante* Impact Assessment (IA) of policies is a powerful tool for integrating concerns of sustainable development as well as other cross-cutting strategies into sectoral policy-making, in theory.

The effectiveness of the EIA process can be questioned, not only regarding decision-making, but also in terms of its substantive benefits to ensuring environmental sustainability.

Despite the absence of a common legal definition, the content of EIA reports are quite similar. And, generally, EIA procedures adopted by most of the world's countries and/or institutions require moving through three phases:

1/ **Consideration of alternatives.** This step evaluates various alternatives and approaches for the proposed action, such as different locations, scales, and designs.

2/ **Screening.** This step answers the question: does the project require an EIA? Environmental legislation or governmental authority usually decides on this question.

3/ **Scoping.** The scoping phase determines the receptors for assessment. The receptor is the object (like a particular biological species or population) or condition that will be impacted.

The formal EIA process begins with the selection of receptors and the description of baseline conditions. This is associated with the determination of the likelihood and magnitude of impacts and their significance relative to the baseline description, and the proposition of mitigation and monitoring measures, if deemed necessary within the specific context of the project. Compensation is also an option when mitigation is not possible and alternatives can be costed and compared. An “environmental management plan” is then developed which identifies actions to be taken under different circumstances.

management of coastal SES, deconstructing marine “governance” with a constructive perspective (Mazé *et al.*, 2017, Shore *et al.*, 2011, Wedel *et al.*, 2005). To do so, the project focuses on the specific case of Environmental Impact Assessment and policy (National Environmental Policy Act, 1969²; Leopold *et al.*, 1971), its weak theoretical development (*e.g.* Lawrence, 1997) and calls to improve its practice (Jacob, 2010; Adelle and Weiland, 2012; Coston-Guarini *et al.*, 2017; Wilson *et al.*, 2017).

While EIA is intended as a major instrument to inform decision-makers, the decision-making process associated with them needs examining (Neßhöver *et al.*, 2015) because it crystallizes power relationships regarding SES sustainability. EIA policy is a thorny issue, with bundles of relationships at the science/policy interface, including economics. As such, it represents a unique opportunity for comparative analysis, because systems and practices of EIA policy differ considerably between nations (Lee, 1983).

The more general topic of environmental impacts is also a starting point from which to highlight changing relationships between human societies and nature. The notion of “impact” encapsulates explicitly the point-of-view of a particular group on its environment. Experimenting with the diversity of approaches that have arisen from specific historical and environmental contexts is an important part for identifying possible sets of solutions. Our research will thus develop a longitudinal analysis of impact assessment policies through case studies of coastal regions, examining how communities have shaped the processes and outcomes of existing assessment processes.

During the SPA project, we will investigate the governance of coastal social-ecological system by assessing and comparing the whole process of EIA undertaken at the 3 sites, all of them being – in theory – framed by the same French legal process and laws. Each stage of the EIA process will be analyzed: stakeholder involvement in the preparatory phases, role of the local authority for the screening phase, content of the outcomes and deliverables, required degree for mitigation measures, etc. For example, under French jurisdiction developers are liable for the measurable outcomes that are defined as conditions for their permits. There are also options for suing for environmental damages when non-compliance with permit conditions is found. We will then examine how government/local authorities handle such liabilities, which options they must ensure for compliance, or whether they rely on pressure from other stakeholders. We shall also compare the monitoring and any auditing of the actual EIA process. For example, are there instances where stakeholders empower third parties to conduct independent audits and/or monitoring with the intent to challenge project developers in different arenas?

² National Environmental Policy Act of 1969, Pub. L. 91-290, 42 U.S.C. § 4321, January 1, 1970.

Theoretical cooling off: the field sites of the SPA project

The coastal zone

The coastal zone, at the land-sea interface, is particularly well-suited for such an exercise. On the one hand, it is a highly complex, dynamic component of the earth system, with high biological production, biodiversity, playing a major role in all biogeochemical cycles and providing important ecosystem services and functions. At the same time, it is also subject to the combined effects of several aspects of global change, including climate change, eutrophication, proliferation of invasive species linked to aquaculture and increasing transportation around the world, pollutions of all kinds from land and ocean, overfishing and increasing anthropisation (Cloern *et al.*, 2015). Science-based management practices of coastal zones have been called a failed experiment (Christie, 2011). Integrated Coastal Management (ICM), which has been influenced by the changes in the political arena described earlier, is being studied as a governance framework (Bremer and Glavovic, 2013). Despite some success stories with these new forms of government of the coastal zone, and “many years of intervention of scientists, governments, local communities and other actors, the health of coastal ecosystems continues to decline” (Benham and Daniell, 2016). These areas are therefore particularly well-suited to exploring social, political and scientific processes touching EIA policy.

Three ethnographic case studies

Specifically, we are studying and comparing examples from a set of French sites (Fig. 1): the Iroise Sea and Bay of Brest (metropolitan territory), Saint Pierre and Miquelon (the only French territory in North America, near Newfoundland) and the Kerguelen Islands (part of the French Southern and Antarctic Lands), where the challenge of sustainability and tensions around equity and power balance are in evidence (Watts, 2000; Walley, 2004; Dahou, 2018). The SPA project aims to identify the times, places, institutions, instruments and actors of public action to clarify “governance” as a category and understand who in fact governs, when it may seem that nobody, or indeed everybody, does (Favre, 2003).

The Bay of Brest: an unsustainable trajectory

The case of the Bay of Brest (located in NW France, Fig. 1) concerns the combination of excessive nitrogen inputs from agricultural practices, increasing water temperatures and proliferation of invasive species that have had profound impacts on the marine environment. In the recent past, with accelerated development and establishment of a productivist agricultural model, these

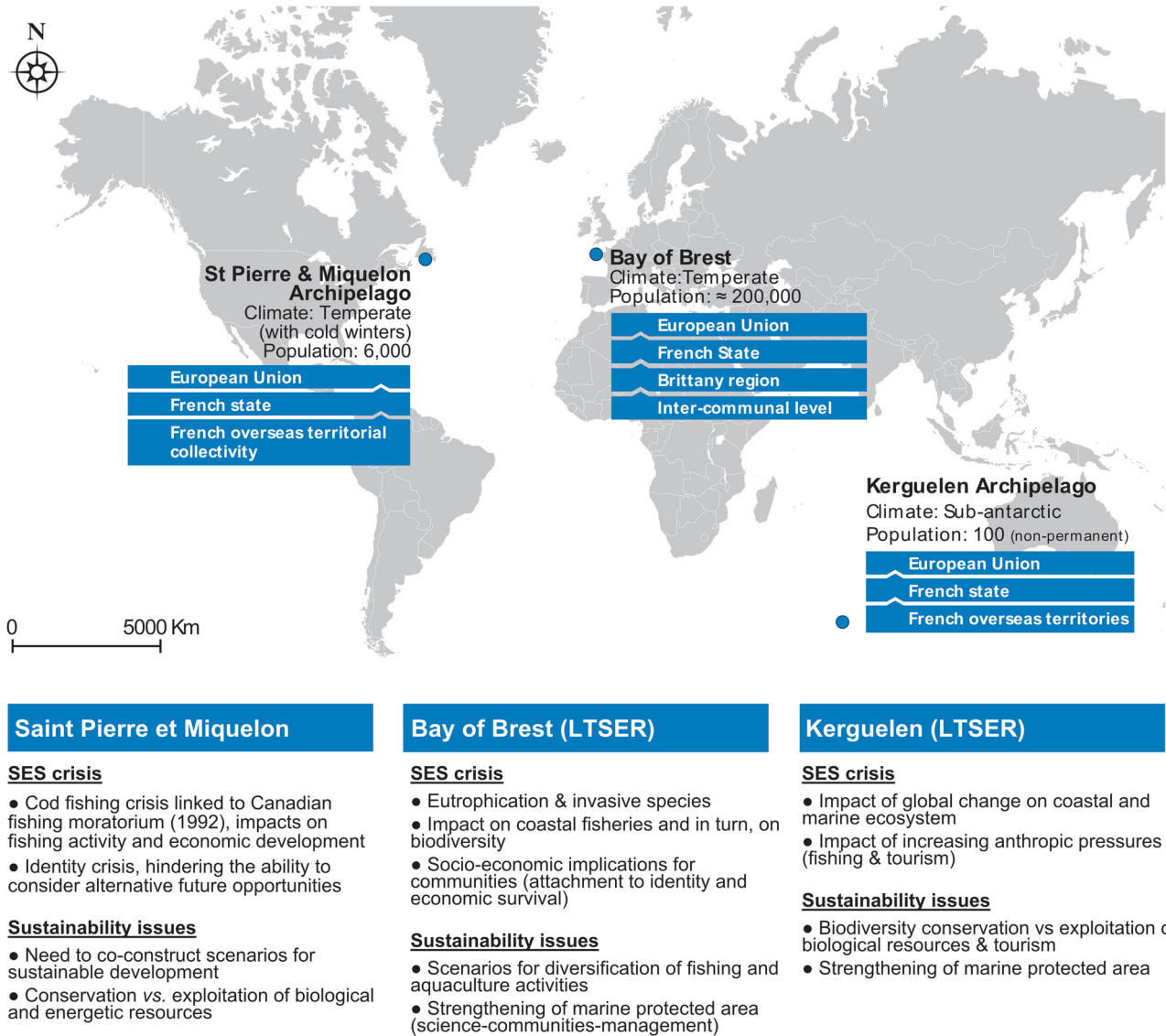


Fig. 1. The study sites of the SPA project and their main sustainability issues. The bands indicate the different decision levels. Source: the authors.

changes have led to drastic modifications in nutrient ratios reaching the bay. This has had a considerable effect on coastal food webs, especially through the development of green algae in the adjacent Iroise Sea and of harmful algal blooms in the Bay of Brest.

The Bay of Brest is a coastal ecosystem subject to different aspects of global change, *i.e.* eutrophication, arrival and proliferation of alien species (Cloern *et al.*, 2015). It is considered a relatively well-studied ecosystem, but major environmental problems persist, in particular the increasing magnitude and frequency of harmful algal blooms (Chapelle *et al.*, 2015). These toxic phytoplankton blooms are recurrent in the bay, preventing the harvest of the Great scallop (*Pecten maximus*) and compelling the commercial shellfishing community to switch stocks, leading to bottom dredging on maerl beds,

in spite of the many scientific alerts and the existing protection of this habitat (Grall and Hall-Spencer, 2003). This situation is currently creating controversy, tensions and blockages that are not yet resolved despite strong and long-term interactions between scientists, fishermen and decision makers/managers (Ragueneau *et al.*, 2018).

The SPA project investigates the issue of the impact of dredging on the maerl beds and on their biodiversity, exploring the decision-making process and in particular the production of knowledge, its circulation among various stakeholders and its use, or non-use, in the decision-making process. The challenge is to understand what hinders the change of fishing practices towards a lower impact exploitation of the bay, guaranteeing protection of biodiversity and the maintenance of a fishery-based economic and social activity. The question that arises today

for the social sciences (Callon, 1986) is to bring to light the actors, the factors and the interests which cause this, that despite the scientific alerts and available knowledge on the status of the maerl beds (we are not in the case of decision-making with any uncertainty), there has been no measure of protection and limitation of fishing activity within the Natura 2000 area affected. The role of the State and of the European Union in relation to the local fishing community (40 boats) in the management of territories and resources will be analysed in at different scales.

The National Nature Reserve of the French Southern Territories: a hotspot for biodiversity conservation combined with exploitation

Created in 2006, the National Nature Reserve of the French Southern Territories (Fig. 1) has been extended recently to most of the French Exclusive Economic Zone (over 600,000 km² of ocean surface) following the French commitments to the 2015 “COP 21” meeting in Paris. This reserve is thus the world’s sixth largest Marine Protected Area (MPA). It is the result of scientific commitments made to the Reserve Management and Scientific Committees that are placed under the authority of the French Southern Territories.

The Reserve’s objective is to reconcile the need to preserve biodiversity in the French Southern Territories and the exploitation of natural resources (mostly fishing, e.g. patagonian toothfish), scientific activities and tourism. These territories are uninhabited and human activities are mainly associated with scientific research projects. The Reserve Management Plan distinguishes between classic (fisheries activities allowed) and enhanced MPA zones (resource exploitation is not allowed and exceptional permits are required for scientists and tourists to access the zone).

The SPA project will focus on the toothfish fishing (“white gold”) and the problem of depredation because of interaction with killer and sperm whales, birds mortality and marine control of legal and illegal fishing. After more than two centuries of natural resource exploitation (whale and seal hunting, fisheries, sheep and salmon farming attempts), terrestrial and coastal areas of the Kerguelen Islands are devoted to scientific activities that guarantee French sovereignty with regards to the international maritime rules. The relatively low anthropogenic impacts on the Kerguelen coastal environment make it a strategic site to assess impacts of on-going environmental changes on marine habitats in sub-Antarctic regions.

The contemporary Saint Pierre and Miquelon Archipelago: rush on the sea cucumber

The Archipelago of Saint-Pierre-et-Miquelon is located in the Northwest Atlantic about 25 km off the southern coast of Newfoundland (Fig. 1). It is the most important geographical link between France and North

America and is maintained by the French State for geopolitical and economic reasons. Throughout its history, the archipelago has been characterized by its economic and cultural dependence on cod fishing, shipping and fuelling services. However, since the cod moratorium (2 July 1992, Canadian Federal Ministry of Fisheries and Oceans), the end of the earlier economic and social model has undermined the identity of the territory.

In a recent report (February 2016), the French Court of Auditors analysed the state of fishing in the waters of the Saint Pierre and Miquelon Archipelago (Cour des comptes, 2016). The report concludes that the socio-economic sector of fisheries is far from realizing its potential for all targeted species. This is the case for benthic stocks of invertebrate species, including *Placopecten magellanicus*, *Cancer irroratus*, *Chionecetes opili*, *Homarus americanus*, *Buccinum undatum*, *Cucumaria frondosa*, but which to date only represent ca. 10% of the economic activity of the archipelago’s fisheries. However, the existence of these stocks is gaining in notoriety on the international market.

SPA focuses on the specific case of the new fishery plan for *Cucumaria frondosa*, a sea cucumber, which is intended to boost the economic activity of the archipelago. This is a very popular species on the Asian market and despite the poor knowledge on the state of the stock and the potential negative impact of dredging, this plan is currently being promoted by decision-makers. This raises questions regarding the way fishing authorization decisions are taken, or how the extension of quotas is determined.

The lack of information on the status of marine populations, and particularly benthic ones, in this territory pose a risk to the future of these populations and any economic activities that depend on them. While, at the same time, the particularity of the hydro-climatic conditions along the archipelago’s coasts offer a rare opportunity to test, *in situ*, ecological theories on biological responses of marine organisms under rapidly fluctuating conditions. These two circumstances, motivated the launch of a combined oceanographic and biological diversity survey in 2017 to fill the knowledge gap on the ecological systems in this territory. SPA is thus using this scientific work to observe and analyse how researchers, engineers and local stakeholders understand and move forward with the newly produced body of scientific information.

Methodological approach

These three sites have been selected because: (i) they are all subject to tensions between conservation and exploitation, leading to well-identified public problems (e.g. water quality, aquaculture installations, tourism, oil and gas exploration, MPA management); (ii) they refer to different situations in terms of socio-economic,

political and environmental development policy (role of the State, of NGO and agencies, political representation of communities); (iii) they display diverse strategies for managing SES being deployed by interested parties; and (iv) their communities have different symbolic modes of interaction with nature and have dissimilar environmental management values and practices at the knowledge/policy/economy interface.

Context does indeed matter. Each of these areas face strong social-ecological challenges in terms of sustainability due to different aspects of threats to their ecosystems, as well as the socio-economic stakes linked to the exploitation of resources, and a strong attachment to a particular cultural identity. These territories, all maritime peripheral regions, are inhabited by communities with strong identities. These identities, inherited from long traditions of minority and/or community settlements (as invoked by the occupants themselves) are largely oriented towards the sea and the uses of coastal and offshore environments, and are also sources of a particular relationship with the State. The French territories, geographically distant from the national decision-making centers, possess unique legal, administrative and political peculiarities in the French public landscape. These include survival of certain customary laws and the non-application of some European Union directives. Their political status as regions, territories and “*outré-mer*” collectivities (roughly translated by “*overseas*” lands) in French administrative structures has a complex history originating from an earlier colonial context. The French administration evolved a unique terminology that attempts to categorize some of the diversity of the individual histories involved. Currently, the “*collectivités d’outré-mer*”, while considered as a fully integral part of the French Republic, maintain diverse statuses with respect to France and the EU. In comparison the “*départements et régions d’outré-mer*” implement the same European directives as the French Republic. The only example of a “*territoire d’outré-mer*” are the French Southern and Antarctic Lands (*Terres australes et antarctiques françaises*) where the Kerguelen Archipelago is situated.

SPA applies a multi-site approach in terms of the presence of the French State in Western Europe, North America and in the Indian Ocean. All these sites are subject to French legislation on EIA. In 1976, two member States, France and Ireland, made statutory provisions for EIA, although the coverage of each system is very different. In France, the Nature Protection Act (1976³) provides that prior to starting significant public or private works requiring public authorization, an impact assessment (IA) study must be done. Subsequent application decrees have detailed the

coverage, content, provision for public participation, and other aspects of the IA study. In 1978 alone, over 4,000 impact studies were completed. Even though the principle of impact assessment is introduced as a need to describe “*measures to eliminate, reduce and, where possible, compensate for the harmful effects on the environment*”, the obligation to offset impacts has been generally ignored until French law was brought into conformity with the European Directive 92/43/EEC of 21 May 1992 (known as the *Habitats Directive*⁴) post-2007. The conditions for when an impact study should be required were described in 2009⁵, but have since been modified. Hence, the record of environmental impact assessments is relatively short on the majority of study sites within SPA.

The Bay of Brest and the Kerguelen Archipelago are also members of the French Long-Term Social-Ecological Research Network (LTSER) which is a formally defined network of field research sites organized by the scientific community and national institutions (Haase *et al.*, 2018). These field sites “*are dedicated to documenting, analysing, and understanding ecological processes and patterns operating over long time scales and broad spatial scales*” (Redman *et al.*, 2004). They have been described as “*sentinels*” for global change and are identified, through their membership in the network, as privileged locations for research investment. The French LTSER network is also intended as a “*setting for data stewardship, characterized and challenged by a long-term science perspective coupled with an open data sharing policy for primary research data in a highly distributed environment of interdisciplinary collaboration*” (Karasti *et al.*, 2006). LTSER members are thus privileged interlocutors with the diverse organizations concerned with problems of environmental quality, management and conservation. The overseas collectivity of Saint-Pierre-et-Miquelon has recently been designated a site of global ecological interest by the CNRS, although it is not currently an LTSER site.

This multi-site approach will enable us to better understand how societies organize themselves in this context of rapid change in a wide variety of situations from the point of view of political anthropology. This includes reflections on relationships in colonial and postcolonial contexts, the links between overseas territories, indigenous communities, the distant metropolis, and decision-making level (UN, Europe, State, territorial collectivities...). This integrative exploration, which places social sciences at the

³ Loi n° 76-629 du 10 juillet 1976 relative à la protection de la nature, *Journal officiel de la République française*, 13 juillet 1976.

⁴ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, *Official Journal of the European Communities*, L 206, 22 July 1992, 7-50.

⁵ Article 8 de la Loi organique n° 2009-403 du 15 avril 2009 relative à l’application des articles 34-1, 39 et 44 de la Constitution, *Journal officiel de la République française*, 16 avril 2009, 6528.

heart of the process, will be conducted by political sociologists and maritime anthropologists specializing in fishing communities, and by natural scientists including ecological and biogeochemical researchers within academia and the ecological engineering sciences, through consultancies specializing in the regulatory framework and impact assessment studies. Furthermore, the political analysis implemented is based on an unprecedented link between qualitative methods (ethnography) and quantitative methods (system modelling, sociological network analyses) allowing a richly detailed, interpretative exploration (“thick” description; Geertz, 1973) of the decision processes and networks, while integrating the exploration of models, scenarios, data and indicators taken into account in the decision-making process of SES management.

Relevance and importance of the chosen comparative approach: a multi-site, multi-level, comparative and crossover analysis

The social science of politics, that calls on ethnographic methods at multiple levels as well as at the interface and in the intimacy of social worlds, are all relevant to this type of work (Herzfeld, 1997; Becker, 2002). The SPA team will work with a multi-site approach (Marcus, 1995), considering manifold levels and scales of interactions. The different study sites will be included in a crossover comparative perspective. Such a decentering, comparative perspective is an essential component of SPA’s approach, as suggested by several authors concerning environmental policy integration (Jordan and Lenschow, 2010) or the Science / Policy interface (Pohl, 2008). There is indeed a real analytical challenge hidden behind the question of interlacing different spheres and governance levels (Jordan and Lenschow, 2010).

Vertically, for each site, teams will explore multi-level negotiation arenas, where decision-making processes concerning the regulation and legislation around EIA policy occur. Thus, it proposes an analysis of the key factors of success or failure of the transposition of global principles to local sites. Such a comparative study is an essential component of the SPA approach.

Conclusion

The field-based approaches developed by the ApoliMer research group, particularly within the SPA project presented in this article, make it possible to open the black box of decision-making processes relating to the sustainable –or unsustainable– management of marine and coastal socio-ecosystems, by coupling social sciences, natural sciences and engineering sciences to investigate in the field questions about the measurement

and/or mitigation of impact. This approach makes it possible to renew our understanding of the notion of impact in the context of the Anthropocene. In doing so, our purpose, which puts decision-making and power studies back into studies on the governance of social-ecological systems, allows us to question *in situ* and in action, the capacity of a society to transform its ways of thinking and doing to move towards sustainability. It thus illustrates perfectly how power imbalances need to be questioned in the field of social-ecological systems studies and the sciences of sustainability.

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