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ABSTRACT

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LIST OF ACRONYMS

AQUIPESCA	Program on Fisheries and Aquaculture
BNDE	National Bank for Economical Development
CAPES	Coordination of Improvement of Personnel from Superior Level
CCM	Committee for Marine sciences
CCT	Science and Technology Council
CGEE	Center for Strategic Studies and Management
CNPq	National Council for the Scientific and Technological Development
CIRM	Inter-Ministerial Commission for Marine Resources
CNIO	Independent National Commission on the Oceans
DHN	Navy's Directorate of Hydrography and Navigation
EEZ	Economic Exclusive Zone
EPA	U.S. Environmental Protection Agency
FINEP	Financing Agency for Studies and Projects
FNDCT	National Fund for Scientific and Technological Development
GA	United Nations General Assembly
GDP	Gross Domestic Product
GNI	Gross National Income
GOOS	Global Ocean Observing System
IBAMA	Brazilian Institute of Environment and Renewable Natural Resources
ICP	United Nations Open-ended Informal Consultative Process
INPE	Institute for Space Research
IOC	International Oceanographic Commission
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ISBA	International Seabed Authority
ISI	Institute for Scientific Information
IUCN	International Union for Conservation of Nature
LEPLAC	Survey Plan of the Brazilian Continental Shelf
LME	Large Marine Ecosystems
MCT	Ministry of Science and Technology
MEA	Millennium Ecosystem Assessment
MPA	Marine Protected Areas
NGO	Non-governmental organization
PACTI	Action Plan on Science, Technology and Innovation
PADCT	Program for the Support of the Development of Science and Technology
PBDCT	Basic Plan for Scientific and Technological Development
PMN	National Maritime Policy
PNBOIA	National Buoy Programme

PNRM	National Policy for Sea Resources
PNGC	National Plan for Coastal Management
PPA	Multi-annual Plan – federal budgetary system
PPG- Mar	Executive Committee for the Consolidation and Expansion of Research Groups and Graduate Program in Marine sciences
PROAREA	Program on the Brazilian proposal on mineral resources exploration in international waters
PROARQUIPELAGO	St. Peter and St. Paul Archipelago Program
PROTRINDADE	Trindade Isle Program
PSRM	Sectoral Plans for the Marine Resources
REMAC	National Program for the Recognition of the Brazilian Continental Margin
REMPLAC	Evaluation Program of the Mineral Potential of the Brazilian Legal Continental Shelf
REVIMAR	Evaluation of the Potential Sustainability and Monitoring the Marine Living Resources
REVIZEE	Evaluation Program on the Sustainable Potential of Living Resources of the Exclusive Economic Zone
ROV	Remote Operated Vehicle
S&T	Science and Technology
SBPC	Brazilian Society for the Progress of Science
SCOR	Scientific Committee on Oceanographic Research
SNDCT	National System for Scientific and Technological Development
STF	Supreme Court of Brazil
STJ	Superior Court of Justice
UNCLOS	United Nations Conference on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization

TABLE OF CONTENTS

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Therefore, science has become a very strong political institution. However, the process of producing scientific results is not understood by decision makers and, on the other hand, scientists are very “naïve” when it comes to policy issues and their implementation[6]. There is a growing need to

processes or, individuals or group interests in policy outcomes introducing bias into scientists' work[8].

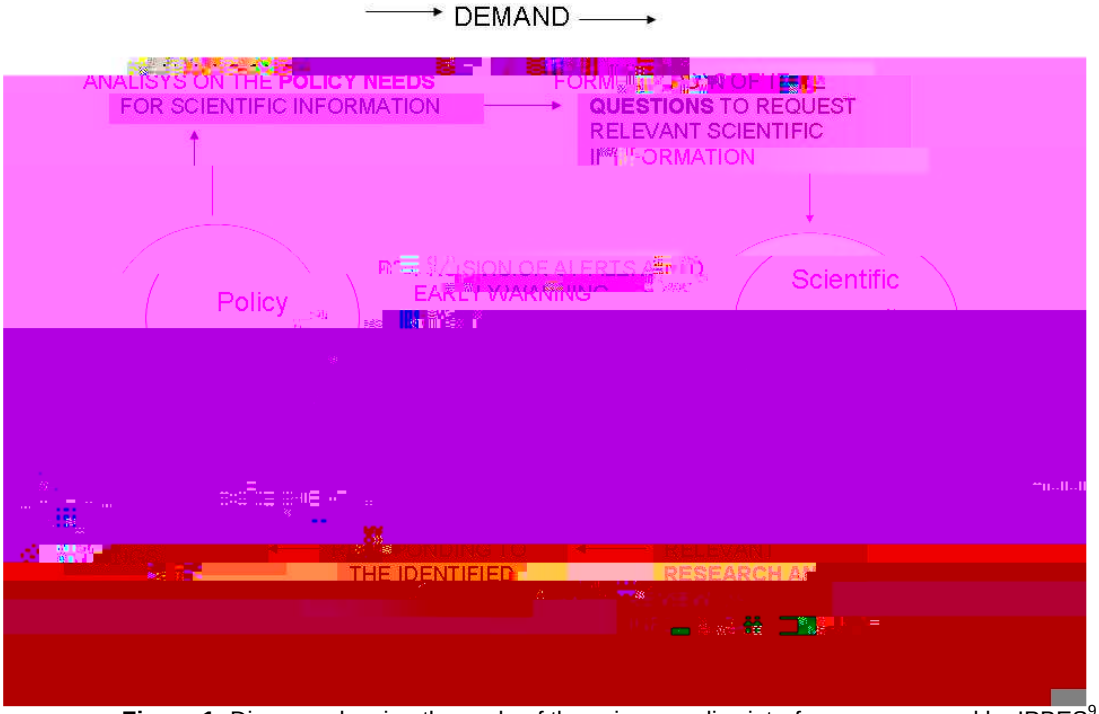

Figure 1: Diagram showing the cycle of the science-policy interface as proposed by IPBES[9].

To advise policy effectively, scientists face the difficult but crucial task of clearly communicating evidence-based information to the public and to policy makers. Frequently, the solutions proposed by scientists are hindered by poor communication as well as being confronted by vested interests. Although certain issues such as environmental warnings are typically discovered by scientists, it is the media that often plays the primary role in promoting public awareness of – and political action regarding – such problems[10].

Indeed, public awareness needs to be considered in this case. Scientists inform managers of the need for new policies and policy officers become

the public will support the adoption of such policies and compliance with them after they have been adopted. The scientific community may be most interested in how the issue relates to scientific theories and find these needs from policy not particularly interesting. Nonetheless, the scientific community must treat these needs as research priorities[11].

Because of the inherent reliability of the realm of Science, it is not uncommon the thought that scientists can provide the ultimate solution for regulations and problem solving. For example, a treaty recently signed between the Kingdom of Norway and the Russian Federation concerning Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean[12] states in its 4th item of its Article 5 the following:

> Any disagreement between the Parties concerning such deposits (hydrocarbon deposits) shall be resolved in accordance with Articles 2-4 of Annex II (Article 5, para. 4, added information .295585(c)-0.o92ie ofc

managers because they were encouraged to keep their messages simple and clear[17].

Decisions need to be made even before conclusive scientific evidence is available and the potential costs of wrong decisions can be huge. The need to establish communication between decision makers and scientists has been in the core of many debates. As a consequence, series of recommendations for improving the science-policy interface are available in the general literature[18]. Their goal is to discover appropriate means for establishing scientific baseline and channeling scientific advice to policymakers and equipping policymakers with tools to assess and manage scientific uncertainty, risk and precaution[19].

Most of the science-policy interface models deal with the fact that scientific results are essentially technical basis on establishing regulations for important matters such as natural resources exploitation, human well being and human impact on the environment[20]. To provide scientific results as input for regulations means being concerned with matters that are basically political or

information about the effects of the ocean on life. Marine research is a key instrument that Governments use to assess the linkages between the natural marine system and the human dependence on these ecosystems and also access marine resources for a better management.

However, it is common sense to simply consider marine science as oceanography which represents a lack of understanding on this field of knowledge. For instance, the United Nations Convention on the Law of the Sea (UNCLOS)[22] and also in the Intergovernmental Oceanographic Commission (IOC)[23] documents there are several references on the use of marine sciences without defining it. Thus, before moving forward, there is a need to define what marine sciences embrace.

Definition of Marine sciences

There is a common sense that marine sciences represent the production of systematic knowledge on the oceans and interrelated areas. This same common sense tends to define it using the universe of oceanography[24] which only embraces physical, geological, chemical and biological oceanography.

Wikipedia[25] used to define Marine sciences as:

e0c 18(u)-2.6.95 [illegible] A multidisciplinary field of study and researc he

Recalling that marine science is important for eradicating poverty, contributing to food security, conserving the world's marine environment and resources, helping to understand, predict and respond to natural events and promoting the sustainable development of the oceans and seas, by improving knowledge, through sustained research efforts and the evaluation of

ocean and contiguous zones and, at the same time, give to the scientists long term planning for funding. By doing so, Brazil could guide its research so as to contribute to the fulfillment of knowledge gaps (such as in the South Atlantic), and also empower a participative forum for discussions towards the sustainable development of the country's marine resources.

The Executive branch of the Government, headed by the President, is accountable for effectively managing the country's resources and deciding on best practices that will lead the country towards sustainable development for the well being of the people. Advising the President and also heading the national

Brazilian Navy and MCT in order to use the vessel for scientific purposes. Many research projects were successfully implemented, including in the fields of marine biotechnology, climate change and ocean euthrophization. Other effective initiatives that were put into action are the improvement of observational systems (buoys), the participation of scientists in international *fora* as delegates, and many others.

Although marine research has improved in the last decades, there are still many gaps to be filled, including enhancing capacity building, funding and most of all, acquiring more research vessels. Only 14 research vessels are available in the 65 universities and research centers involved in marine sciences[39]. This numerical limitation is one of the main bottlenecks to meet the minimum of 120 hours of boarding activities that are mandatory for student's training in Oceanography. Thus, this limited number of research vessels made marine scientists dependent on Navy ships to develop research.

The Brazilian Navy holds a Directorate of Hydrography and Navigation - DHN that owns and maintains ships and smaller vessels to perform surveys for navigation and mapping purposes. Marine scientists have built a partnership with the Navy, in which MCT acts as a mediator, to use such vessels as research platforms to address scientific endeavors that are important for the country's needs. Among this research there is the evaluation of the continental shelf and the assessment of fish stocks and mineral resources. Although the relationship between scientists and the Navy is well managed, there is still a need to provide science with proper instruments and guidelines to develop research in marine systems.

Despite of the lack of proper support by the available legislation, and also due to the increased public and Government awareness on the need for better marine science, there is a political will to enhance the Brazilian Marine sciences to respond to its role as an adviser to produce better public policies. In fact, Marine sciences as it stands now in Brazil is able to provide better ways of dealing with crucial matters in the country's governance such as poverty, food security and renewable sources of energy inasmuch as helping the country to

[39] MCT. Technical note on the status quo of Marine Sciences in Brazil. Internal document.

better manage its waters through environmental approaches to management and further research on the mitigation of impacts from natural events.

Moreover, the calls for an ecosystem approach to resource assessment and management are seldom accompanied by a practical strategy, particularly one with a payment plan for the approach in developing countries[40]. Thus, Brazil needs to properly manage its natural marine resources with the help of scientists who need to be supported by proper legislation. It is the current

waters and the use of the scientific results to produce public goods. The focus is on both CIRM and MCT as the organizations responsible for marine sciences.

METHODOLOGY

Understanding how decision making takes place in Brazil requires some knowledge on how the country is organized, especially in relation to the production of science and technology. This section aims to describe briefly on how Brazil is organized and where Marine sciences stand in this context.

Brazil is a Presidential and Federal Republic with a landmass of about 8.5 million km^2, which represents approximately 47% of South America[42] (Figure 2). Moreover, it is the world's tenth largest economy by nominal GDP[43] and the ninth largest by purchasing power parity[44]. Brazil has a coastline of 8,698 km along which most of its 192 million habitants reside[45]. Because of the current political stability, major economic reforms have been accomplished and inflation has been suppressed. Social programs have been established to enhance public services such as health and education. However, there are still many challenges to overcome, especially in relation to poverty, hunger and basic goods such as sanitization and water.

[42] Central Intelligence Agency. 2008. Accessed on June 8th, 2010 at https://www.cia.gov/library/publications/the-world-factbook/geos/br.html
[43] World Bank. 2008. World Development Indicators database. Accessed on June 8th, 2010 at

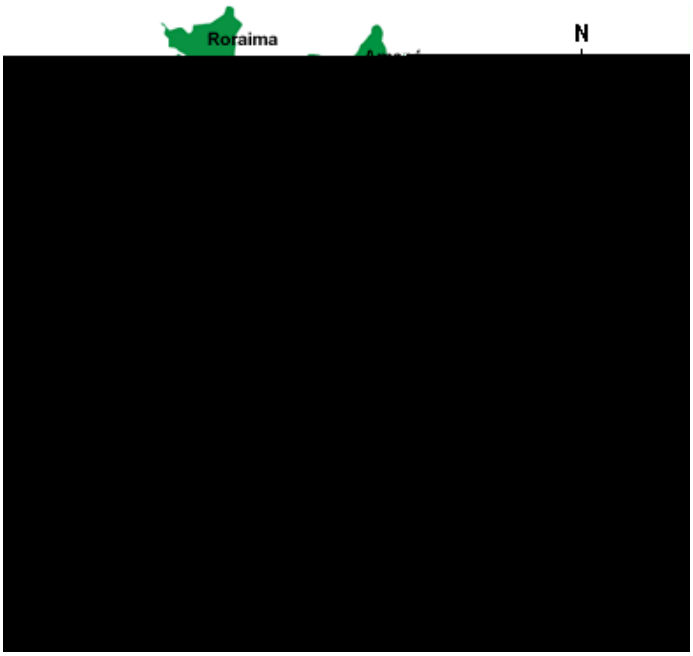

FIGURE 2: Political map of Brazil's Federative Republic showing the five geographical regions and the states therein[46].

POLITICS

After a long period of a military dictatorship (1964-1985), Brazil became a

and to a lesser degree State Governors), who have a more narrowly defined agenda for their respective constituencies. However

TABLE 1: Brazil in Numbers. Source: The World Bank*.

Brazil in Numbers (*)	2008
Population, total (millions)	192.0
Population growth (annual %)	1
Surface area (sq. km) (thousands)	8514.88
Life expectancy at birth, total (years)	72
Mortality rate, infant (per 1,000 live births)	18

this new regime as an opportunity to develop[65]. Research groups that usually worked apart were now being coordinated by the fede

that are related to the ongoing programs and activities that Brazil carries out in its waters. This includes a series of research programs on the exploration of marine resources. These research programs are all conducted with the support of CIRM's members. MCT is an important adviser in those programs and also the provider of a reliable system of peer-reviewed selection of projects as well as a well established system for these projects' implementation and evaluation.

brings an appendix in which all main issues and their related goals are set as

TABLE 3: THE NATIONAL MARITIME GOALS AS SET BY THE PMN

The PMN - National Maritime Policy Goals
Development of a national maritime culture.
Rationality and profitability of maritime activities.
National technological independence, in the area of maritime activities.
Research, rational exploitation of living resources. especially for food production. and non-living resources in the seas, the seabed, the ocean floor and the subsoil thereof, navigable rivers, lagoons and lakes, where significant commercial activities in terms of the maritime power are performed.
Production, in the country, of ships, boats, equipment and specific material, relating to the development of maritime activities and with the defense of the maritime interests of the Country.
Improvement of the country's port infrastructure, waterways and naval repairs.
Optimization of internal and external waterway transport.
Environmental protection in areas where maritime activities take place.
Training, evaluation and rational use of the human resources required for maritime activities.
The privatization of maritime activities where State management does not constitute a strategic or national security imperative.
Obtaining the benefits derived from the participation in international instruments pertaining to maritime activities.
Security of maritime activities and the safeguarding of national interests relating to the sea.
Positive image of the country abroad in support of Brazilian diplomatic action.
Guarantee the existence of effective naval power of compatible dimensions with the other components of maritime power.

MCT'S OBLIGATIONS UNDER THE PMN

Encourage research and development of new maritime propulsion technologies, including nuclear technology, and;

Encourage the establishment or the development of research entities on maritime activities.

As a participant, MCT was designated in the following actions:

In the ‘*International Relations*

laws and policies (such as the PMN), the over-arching Federal Constitution and the international instruments to which Brazil is a party[80].

Its basic principles are:

1. the compliance with political and strategic guidelines issued by the Office of the President of the Republic;
2. the harmonization with other national policies and the multi-annual plan[81];
3. the prioritization of programs and activities in accordance with the multi-annual plan and others that can contribute to the furthering of national interests and the sustainable development of the country;
4. the decentralized and participative implementation of this policy in order to provide incentives to the Federation's partners, states, local authorities and society;

development and diffusion of new technologies for Fisheries (leader: Ministry of Fisheries and Aquaculture);

review which has clearly been successful in screening out good science from bad in the research context[84]. Therefore, the wider adoption of peer review by regulators will assure them access to better science. In fact, delegating a sensitive issue to an advisory body remains one of the most politically acceptable options for regulatory agencies, even when the underlying motive is to transfer a fundamentally political problem to the seemingly objective arena of science.

Advisory bodies have an important role in the science policy interface. Jasanoff (1990) clarifies two different approaches to this matter: the technocratic model and the democratic model. The technocratic model holds a need for more and better science into decisions, expanding the role of the expert community in decision-making. Proposals for accomplishing this objective include the separation of scientific and political decision-making, in part by conferring more authority on scientific advisory bodies. The democratic model holds that the primary problem is the failure of the regulatory agencies to incorporate a full enough range of values into their decision-making. Therefore, this view stresses the need to incorporate more than narrowly technical viewpoints, that is, to adopt open decisionmaking procedures, advance publication of decision-making guidelines and judicial review. As a result, the author proposes a negotiation among both science and policy considering the experts as political actors and as the public as well:

> Advisory bodies rarely restrict their deliberations to purely technical issues. In fact, experts themselves seem at times aware that what they do is not science in any ordinary sense, but a hybrid activity that combines elements of scientific evidence and reasoning with large doses of social and political judgment. Advisers are free to serve in widely divergent professional capacities: as technical consultants, as educators, as peer reviewers, as policy advocat( )-512.467(i)1.87(n)-43032