Supplementary Material

# Supplementary Methods

These supplementary methods are based on the proposals of Câmara et al. (2020, 2021), Nelson et al. (2015, 2018), and Nelson and Grubesic (2018) for composing the indicator presented methodology of this study.

# Data selection in mapping

The 68 MPAs locations analyzed were assembled into 37 digital maps using My Maps. Each map had an area of 25 km in length, having as a central point the georeferences of the oil spills that were made online available by Ibama (2020). However, 15 locations summarized in 4 maps, where no oil residues were spotted, were considered in the mapping, since the impact of the disaster was felt indirectly in the neighboring regions. In these locations (Table 1), we used the closest georeferenced spills and, consequently, had areas larger than 25 km.

**Table 1 –** Mapped locations where no oil stains was spotted

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Map n°**  | **State** | **Municipality** | **Locality** | **Mapped Area Limit** |
| Map 1 | Bahia | Salinas da Margarida | Conceição de Salinas | 52 km |
| Cairu de Salinas  |
| Salinas da Margarida |
| Map 2 | Salvador | Ilha de Maré: Bananeiras | 51 km |
| Ilha de Maré: Candeias |
| Ilha de Maré: Maracanã |
| Ilha de Maré: Martelo |
| Ilha de Maré: Passé |
| Ilha de Maré: Ponta Grossa |
| Ilha de Maré: Porto dos Cavalos |
| Ilha de Maré: Praia Grande |
| Map 3 | Madre de Deus | Suape  | 59.3 km |
| Map 4 | Rio Grande do Norte | Macau | Diogo Lopes | 118 km |
| Barreiras  |
| Sertãozinho |

## Criteria for dividing activities by exposure level

The division of the mapped establishments, according to the level of exposure to oil slicks, had as parameter the classification of Blue Economy activities adopted by Carvalho (2018) and agreed upon by Câmara et al. (2021). These activities (Table 2) were grouped into economic sectors, following the national classification of economic activities (NCEA).

**Table 2 –** Classification of the establishments identified in the digital mapping, according to sector and exposure level.

|  |  |  |
| --- | --- | --- |
| **Level of Exposure** | **Sectors** | **Economic Activity** |
| High Exposure | Food | Restaurants |
| Bars |
| Snack Bars |
| Beach huts |
| Markets and fish trade |
| Ice cream parlor |
| Barbecue restaurant  |
| Sweetshop |
| Coffee shop |
| Bakeries |
| Accommodation | Hotel |
| Inn |
| Resort |
| Hostel |
| Beach House |
| Ranch |
| Apartment |
| Chalet |
| Tourism and leisure | Tourist spots  |
| Places for sports and orchestration or musical activity |
| Parks, campsites and clubs |
| Buggy rides |
| Tourist sites |
| Museum or theater |
| General services of high exposure | Real Estate Activity |
| Travel and tourism |
| Water transport, sea terminal or port customs |
| Stores of high exposure | Aquaculture |
| Handicraft or embroidery |
| Food industry |
| Low Exposure | Automotive services | Tire or welding shop |
| Car wash |
| Workshop and auto parts (car and motorcycle parts) |
| Esthetic services | Beauty salon and manicure |
| Tanning salon |
| SPA, beauty or hair removal clinic |
| Gym and/or yoga |
| Barber shop |
| Tattoo parlor |
| General services of low exposure | Gas stations |
| Educational institutions (including universities) |
| NGO, foundation, association or council |
| Fishermen's association |
| Health center, hospital, emergency care units, clinic or dentist |
| Advertising studio or agency |
| Financial, legal, insurance or business activity |
| Events, nightclubs, catering or other entertainment activities |
| Post office, registry office, forum or newspaper  |
| Engineering services  |
| Technical support or internet |
| Security  |
| Driving school |
| Bank or lottery |
| Laundry |
| Telecommunication |
| Parking |
| Power, mining or water treatment stations |
| Police station, police command, army or air force |
| Toilet rentals, cleaning services or garbage collection |
| Transportation or logistics services |
| Government or union headquarters or department |
| Stores of low exposure | Fashion, cosmetics, jewelry or shoe stores |
| Children's stores |
| Furniture, household goods, or appliances |
| Electronics, musical instrument, or game stores |
| Technology company |
| Stationery, printing, book, or party supply stores |
| Bicycle and quad bike stores |
| PET stores |
| Flower, garden and lawn supply stores |
| Gas distributor |
| Beverage, ice, liquor or tobacco vendor |
| Pool or beach entertainment items |
| Construction materials, parts and hardware or blasting |
| Pharmacy or supplement store |
| Surf store, fishing or hunting supplies |
| Optics  |
| Concessionaires, boat and motorboat stores |
| Religious articles store |
| Variety |
| - | Religious institutions |

# Focus Group

Focus group sessions were held, aiming to increase the in-depth evaluation based on the specificities of each location in MPAs, consulting experts and marine scientists with knowledge of the field reality in these Brazilian regions. In all, four online focus group sessions were held, three synchronously and one asynchronously. These are text-based, while those allow a real-time conversation, and both can be used in a complementary way in order to give greater flexibility of time and make use of facilitating tools such as discussion boards or online forums (Lijadi & Schalkwyk, 2015). It should be noted that the synchronous sessions were conducted on Google Meet and the asynchronous one on Google Drive. In total, the synchronous sessions had 16 participants and an average of 1 hour of duration each, recording all issues discussed by two moderators and making them available in Google Drive.

In the first session, the objective, the steps of the research method, and the study areas covered were presented and discussed with the group. Subsequently, in the second session, participants were asked open-ended questions about the main issues related to the dependence of local economic activities and traditional communities on coastal and marine resources. It is emphasized that it appropriated concepts such as from Hossain et al. (2020), Selig et al. (2019), and Cinner and Pomeroy (2012), which highlight a more social-ecological approach to marine-coastal dependence, indicating that it is a diverse and heterogeneous system, so they depend on diverse livelihoods or resources, whether in the political, social, economic, environmental, and cultural spheres. Therefore, this session asked about the sectors essentiality like tourism, real estate, and food for the local economy, the diversification of the source of income in the traditional communities of people of the sea, as well as the dedication of these people to fishing, the governmental support to these communities, the balance of power between them, and the participation of these people in policies of local interest. After the group's considerations, the items of the questionnaire were prepared, based on a metric scale logic, according to the precepts of Allport and Hartman (1925) and Likert (1932), in an attempt to develop a measurement instrument capable of allowing a comparison between the groups of mapped UC localities.

In the third session, the questionnaire items developed were given to these experts to select the most useful ones for the final evaluation of the questionnaire. In this session, the experts proposed more topics, which could compose the questionnaire, specifically focused on the policies developed during the oil spill disaster. It is worth noting that this group of scientists participating in the focus group were also the target audience, since they had field experience in the communities. Therefore, collecting opinions with this audience allowed the statements to use the respondents' vocabulary and textual style (Likert, 1932). Finally, in the fourth session, asynchronously, the questionnaire was again given to the group through Google Drive for a final follow-up of the items. Furthermore, the final questionnaire (Table 3) had a five-point Likert scale and received a total of 68 answers, referring to the evaluation of 20 specialists.

As for the profile of the experts who evaluated the marine-coastal dependence questionnaires, 75% were men and 25% women, where 85% had a Ph.D. or post-doctoral degree, and the rest (15%) of masters students. The majority (60%) had a degree in Natural Sciences, followed by Human Sciences, specifically in the field of Geography (30%).

**Table 3** – Measurement items of the applied questionnaire and respective topics addressed

|  |  |
| --- | --- |
| **Theme** | **Item** |
| Collaboration Network: Initial Actions | Municipal government participation in beach cleanup |
| State government participation in beach cleanup |
| Community participation in beach cleaning |
| Voluntary participation of non-governmental institutions in beach cleanup |
| Effectiveness of containment booms built to contain oil |
| Monitoring of the oil by state government entities to predict the advance of the oil (e.g. monitoring based on the movement of ocean currents to predict the arrival of oil on beaches) - such as the use of the SAO chart |
| Monitoring of the oil by municipal government entities to predict the advance of oil (e.g. monitoring based on the movement of sea currents to predict the arrival of oil on beaches) - such as the use of the SAO chart |
| Distribution of personal protection kits (e.g. coveralls, goggles, mask, gloves and boots) by governmental entities to volunteers in beach cleanup |
| Collaboration Network: Later Actions | Follow up by the municipal government on the health status of the population that has had direct or indirect contact with the oil |
| Follow-up by the state government of the state of health of the population that had direct or indirect contact with the oil |
| Disclosure by the state government entities of the volume of residues collected from the beaches |
| Disclosure by the municipal governmental entities of the volume of residues collected from the beaches |
| Current monitoring by state government entities regarding species and areas affected by the oil |
| Current monitoring by municipal government entities regarding species and areas affected by the oil |
| Dedication to Fishing | Level of dedication of fishermen to alternative activities that are not related to fishing |
| The degree of dependence of fishermen on financial benefits received from the government |
| The participation of fishing activity in the family income composition |
| Developing Tourism in the Region | Typical hotel establishments in the region have, in their majority, a small infrastructure and a home style |
| There is a noticeable movement in the community in favor of the conservation of the natural and cultural heritage of the region (such as the existence of community councils, etc.) |
| How is the tourist flow (presence of tourists) in the region during the year? |
| The level of importance of the tourist flow (presence of tourists) for the region |
| Environment | Possibility of self-recovery of the environment in the short term |
| Possibility of self-recovery of the environment in the long term |
| Predicted time for the environment to recover in the short term, without human intervention |
| Predicted recovery time for the environment in the long term, without human intervention |
| Typically have turtles, manatees, or other fragile species in areas affected by the oil spill |

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