**Data collection and monitoring manual**

Monitoring scheme for touristic coastal amenities, namely Recreational Diving and Touristic Glass Bottom Boats following Ecosystem Based and Integrated Coastal Zone Management on the Jordanian coast of the Gulf of Aqaba.

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| Sector/ TOPIC: Marine Coastal Activities  **Components:**  [Socio Economic Sectors (Id=175)] -> [Tourist Amenities (Id=91)] -> [Other touristic activities (Id=96)] | | |
| TITLE: Monitoring scheme for touristic coastal amenities, namely Recreational Diving and Touristic Glass Bottom Boats following Ecosystem Based and Integrated Coastal Zone Management on the Jordanian coast of the Gulf of Aqaba. | | |
| tARGET AREA  All the gulf of Aqaba interested by the glass boats’ activity. | | |
| frequency  Calibrated on season’s pick. It is important to understand when the operators have time to be committed and inform their costumers and when, because the season’s pick, their time is reduced. A mitigation risk strategy, during the season pick, could be providing them of materials to which they can refer customers. | | |
| **MONITORING RATIONALE (System Component)** | | To define the term Citizen Science, Davis et al (2023) reported the definition in the Oxford English Dictionary: “scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions”.  Previous project highlighted that “on-line educational and training resources are a must to ensure the cost-effectiveness of the citizen science initiatives. Any of such materials must take into consideration overcoming language barriers”.  Factors to be consider increasing the chance of successful:  “For tourism operators to partake in citizen science initiatives, they have to perceive a clear benefit to their involvement. Whether it is a reputational gain, improving their customer experience or helping to safeguard their “playground”, the case for participation should be built into citizen science initiatives and made clear from the outset”.  Citizen engagement and science introduction seminars: in Citizen science, volunteers are all taught the same protocols so that their data will be consistent, reliable, and trustworthy.  The owners of the boats will not only be better knowledgeable about the resources and impacts along their tours, but they will be available to proper introduce the concepts of citizen science and engagement to the public too.  In long term: if we recommend involving the tourists, in the future, it is important to consider all the challenges described by Green (2021). The tourists become more involved, potentially involving them in recording birds (contributing to eBird and ISP), marine mammals or/and turtles’ observations (contributing to iNaturalist or GBIF and ISP).  FIRST PHASE: training  SECOND PHASE: application of the protocols |
| **MONITORING GOAL** | | 1. Quantify visitation frequency of touristic boats in terms of numbers of boats, crew, sites visited and trip lengths on the Jordanian sector of the Gulf of Aqaba. 2. Map the distribution of touristic boats customers in terms of guest numbers, onboarding point and visitation site, biographic info, experience and adherence to environmental directives. 3. Provide daily information on the environmental conditions at visitation sites through glass bottom boats operators observations and note taking. 4. Provide detailed descriptions on visitation sites attractions, facilities accessibility and environmental conditions including incidental anthropogenic impacts and incidents encountered by the boats. 5. Provide historical records on the above if available. |
| **LABORATORY ANALYSIS NEEDS** | | - |
| **Data Analysis and interpretation protocols** | | All the protocols will be collected and entered by the ISP responsible (JREDS). |
| DSS System Diagram & INDICATORS | | |
| **DIAGRAM ELEMENT:** [Other touristic activities (Id=96)]   |  |  |  | | --- | --- | --- | | **Indicator** | **Information and data** | **Description** | | Number bottom boats |  | 98 glass bottom boats, belonging to one association | | Number of crew members |  |  | | Site visited |  |  | | Trip length |  |  | | Guest number for each trip |  |  | | Onboarding point |  |  | | Biographic info, experience and adherence to environmental directives | (to be modified in the ISP) |  |   **DIAGRAM ELEMENT:** [Sea water (Id=1)]   |  |  |  |  | | --- | --- | --- | --- | | **Name** | **Description** | **Update Frequency** | **Data Source** | | Sea Water Physical Parameters | Data are in °C coming from 6 different monitoring programs in the Gulf of Aqaba in different locations. Temperature, Salinity, Density, Transparency | Weekly | ASEZA Monitoring Programs | | Bio Geo Chemical Parameters | Nitrate  Nitrite  Ammonium  Phosphate  Silicate  Chl A  pH  Alkalinity  DO | Monthly | ASEZA Monitoring Programs | | Total Hydrocarbon | Anthropogenic source | Monthly | ASEZA Monitoring Programs | | Suspended matter | Includes living and non-living components |  |  | | Environmental incidental impacts | From fishermen and glass boat protocols |  |  | | Incidents encountered | From fishermen and glass boat protocol |  |  | | Environmental conditions at visitation sites | From fishermen and glass boat protocol |  |  | | | |
| Data Collection Procedure | | |
| Staff | Trainers from JREDS to prepare the boat owners (first phase)  Owners of the glass boats willing to participate to the monitoring protocol | |
| Equipment | GPS  Camera  Data logger to record abiotic variables (such as water temperature, salinity, pH, oxygen) | |
| Protocol | "For both citizen science and the SDGs to be truly transformative, the voices of all stakeholders— especially local communities and diverse publics—need to be fairly integrated into every step of the research and decision-making processes: from question and method development to data collection and analysis, to application and dissemination of results for on-the-ground impacts. " (Lorenz and Lepenies 2023).  **Monitoring goal a):** updating the maps of Wissam Yahia Al-Hayek (2016), in particular the routes of the glass boats (date; time start and end; starting GPS point; track recorded with the GPS; ending GPS point; possible stopover and reason/s; and so on).  **Monitoring goal b):**  **Monitoring goal c):** If the target is recording impacts, disturbance, evident pollution, so the methodology applied should include a protocol that record this kind of information (such as oil spill, solid waste, algae bloom, corals affected by bleaching, and so on). If the target includes collecting abiotic variables, the boat owners should be trained and provided of data loggers. An option to take, properly store (=with clear details about author, date, position), and archive photos should be planned as well.  **Monitoring goal d):**  **Monitoring goal e):** DATA COLLECTION SHEET. The historical records can be recorded and entered in the ISP in the first phase, as part of the training demonstration. The ISP responsible and the trainers of the boat owners must take in consideration the PhD work of Wissam Yahia Al-Hayek about the same topic.  The owners will be interviewed to understand what kind of questions the tourists usually ask about the coral reef, and, with them, we can prepare sheets and/or material and/or seminars to provide the boats' owners a better preparation. We would reach two targets in this way: 1) improve the environmental awareness (owners and tourists); 2) integration of the "local communities" voices in "research and decision-making processes".    **General comments;**   * The monitoring outcomes should be published online. * All the materials / outcomes need to be translated in a broad range of relevant languages, to guarantee to support successful and long-term engagement of both operators and their customers. | |
| Quotations |  | |
| References:  Davis L.S., Zhu L. and Finkler W. 2023. Citizen Science: Is It Good Science? Sustainability, 15, 4577. <https://doi.org/10.3390/su15054577>  H2020 SOPHIE Consortium (2020) “Pilot Tourism & Citizen Science Programme on Oceans and Human Health: Report on Results & Recommendations”. H2020 SOPHIE Project. Madrid, Spain. DOI 10.5281/zenodo.3859389  Lorenz L. and Lepenies R. 2023. Contributions of Citizen Science to the Sustainable Development Goals: Is Transformative “Global” Citizen Science Possible?  <https://theoryandpractice.citizenscienceassociation.org/articles/10.5334/cstp.595>  Wissam Yahia Al-Hayek 2016. Assessing Integrated Coastal Zone Management (ICZM) Status in Aqaba: A Participatory Geographic Information System (PGIS) Approach. PhD Thesis. University of York: 305 pp. | | |