

Article

Small Environmental Actions Need of Problem-Solving Approach: Applying Project Management Tools to Beach Litter Clean-Ups

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Abstract: Clean-ups can be considered real conservation actions since beach litter may impact many ecosystem components. However, although these actions are quite easy to carry out, we think that they need to follow specific criteria and clear planning. Contrariwise, an unplanned clean-up could lead to counter-productive—or even harmful—consequences to the fragile dune ecosystem; e.g., excessive trampling and/or extreme sand removal. Here, we defined a road map for implementing beach clean-ups according to the logic of problem solving and project management, also adding a flow chart. More particularly, we subdivided the clean-up project into different steps as follows: context analysis, input and planning, process, monitoring (outputs and outcomes) and adaptation.

Keywords: beach litter; project management; project cycle; monitoring; adaptation

1. Introduction

Marine and beach litter represents a threat with large economic, aesthetic and ecological impacts [1–5], these last recently reviewed for a large number of biological taxa [6–9], and involving also ecosystems services [10,11]. To cope with the issue of beach litter, several measures have been developed worldwide. Among them, beach clean-ups are simple, concrete actions, often carried out by volunteers and local organizations, which aim to remove the marine litter left along the coastline [12–14]. Clean-ups can be considered real conservation actions since beach litter may impact many ecosystem components (e.g., plants, invertebrates, reptiles and seabirds that can be trapped, poisoned or suffocated) [4,9,15,16]. Besides, these actions can charm and amuse many citizens and technical operators (for example, in LTER—Long Term Ecological Research sites [17,18]), if compared to other activities of nature conservation, planned to respond to more complex threats such as fires, poaching, and invasive species, which require significant amounts of financial resources, professional operators, policies and technology [19]. Even considering their execution ease, clean-ups need to follow specific criteria and clear planning, scheduled by project managers. Contrariwise, an unplanned clean-up could lead to counter-productive—or even harmful—consequences to the fragile dune ecosystem; e.g., excessive trampling and/or extreme sand removal [20].

The aim of this work is to define a useful road map for implementing beach clean-ups according to the logic of problem solving and project management. Contextually, we divided the text into numbered steps, which follow the unfolding of the project’s design, management, and execution [21] (Figure 1).

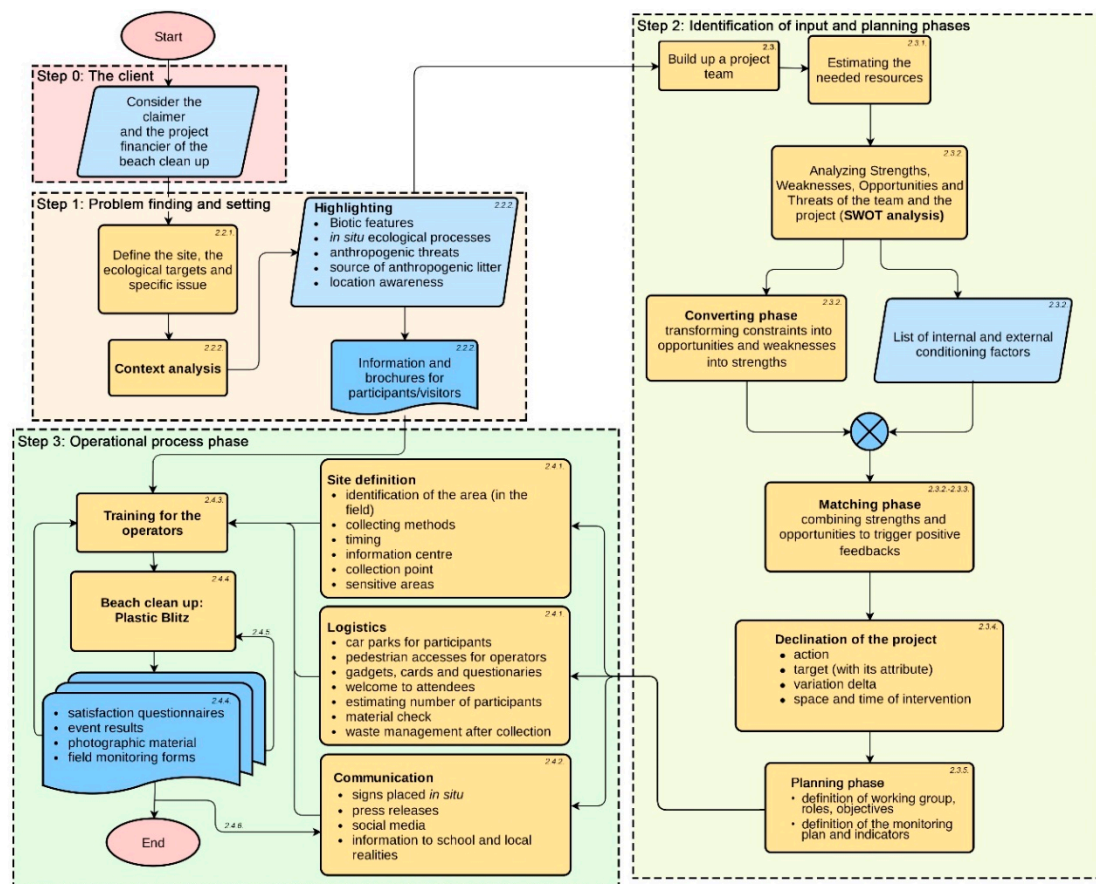


Figure 1. Flow-chart illustrating the main steps of the project cycle applied to clean-up actions (numbers in boxes refer to the sub-paragraph in the text).

2. Project Planning

2.1. The Client (Step 0)

Earlier than the planning onset, we must consider who highlighted the need to remove litter from a beach (claimer) and who is the project financier (i.e., a public agency, a protected area, an environmental Non Governmental Organization (NGO), a research institute). This previous consideration is a crucial aspect that will lead the project in terms of visibility, availability of resources, social and decision-making support, and impact of communication (Figure 1: Step 0).

2.2. Problem Finding and Setting (Step 1)

2.2.1. Find and Set the General Problem

Starting from the general problem (environmental impact of anthropogenic beach litter), the first step would be to define a more specific issue, in a localized coastal site (context/situation analysis). This will allow the identification of threatened ecological targets (e.g., plant and animal species and communities, habitats) and the source of threat to manage (e.g., specific litter types, materials, items). For instance, among all the accumulated beach litter items stranded along a beach during a year, only containers that can act as traps have a negative effect on the sand-dwelling beetle community [22].

2.2.2. Context Analysis

A context analysis foresees several questions that must be addressed. How can we define the site to be managed? Which are its biotic features? Which are the relevant in situ ecological processes

(e.g., weather and sea events, coastal erosion) and what are their dynamics? Which anthropogenic threats occur within the site? Is it possible to highlight a seasonality of beach litter accumulation? Which are the main beach litter types? Which is the main source of anthropogenic litter? An immediate distinction can be made between litter abandoned by beach visitors and debris coming from the sea. In this regard, litter sampling should distinguish waste abandoned by visitors from *sensu stricto* marine litter, stratifying the dataset. A second one concerns the origin of litter (e.g., domestic, industrial, commercial, fishing, agriculture, aquaculture), useful to classify anthropogenic debris based on its original use [23].

As such, from a context analysis perspective, it is deemed appropriate to perform explorative field sampling to gather data on litter amount, type and origin, with different techniques and methods (e.g., [24]); this step will be useful for developing an in situ litter management project.

Near to rivers, urban centers, agricultural or industrial areas and harbors, beach litter accumulation must be a consequence of human exploitation of the site [25]. It can also be useful to summarize the results of this preliminary analysis using flowcharts, to highlight the relationship between different litter types and their root causes [26].

It is then achievable to proceed with data analysis to define the next steps of the project activities.

2.3. Identification of Input and Planning Phases (Step 2)

The collected data will be important for knowing the location, extension, type and temporal dynamics of the beach litter to build a project team that will take care of starting the ordinary (routine) or extraordinary management (one-off) of beach litter.

2.3.1. Resources Needed

Once we have identified the problem and collected the first data, the team has the qualitative and quantitative information to estimate the resources needed for the management to start, in terms of personnel (voluntary and non-voluntary operators, technicians with knowledge, skills and competences), materials (including clothing and personal protective equipment), technology and funding (from sponsors, crowdfunding, public or private Agencies). At this stage, an accounting expert can be useful. Consequently, the team will be more structured. Project lobbying and advocacy activities need a budget covering travel and meeting expenses, formative activities, and formal agreements between public/private bodies and associations consisting of expert botanists, zoologists, ecologists, sociologists, communicators, administrators and technicians, together with volunteer citizens. This project includes organizational, economic, lobbying and advocacy activities, since it needs a budget covering travel and meeting expenses, formative activities, and formal agreements between public/private bodies and associations.

2.3.2. SWOT Analysis

Once the team has been established, and the problem to be addressed and the general objectives have been defined, an analysis of the strengths, weaknesses, opportunities and threats of both the team and the project (SWOT) must be carried out to identify internal and external conditioning factors. In this regard we can plan a number of web-based or face-to-face meetings, providing questionnaires to involve stakeholders and actors so that everyone can contribute to underlining relevant factors in order to arrange them in a list. Knowing in advance the internal and external conditioning factors that may affect the project will facilitate the programming process [27]. Many strengths, weaknesses, opportunities and threats are common to many different realities; others are instead unique to a specific project or working group.

Among the internal conditioning factors, some examples of a project's strengths include the following:

- availability of economic resources, materials and personnel (as in the case of projects carried out by public agencies);
- number of motivated operators (as in the case of projects carried out by environmental NGOs);
- the presence of competent experts from the environmental and social sectors relating to the topic.

Among internal weaknesses, the following can be mentioned:

- demotivation (for example induced by hierarchical and command-control structures in public Agencies);
- low numbers of operators;
- low skill, capacity and competence of citizens;
- paucity of resources.

Some opportunities can be reported among the external conditioning factors, as follows:

- gaining of experience useful to train operators;
- informing a large audience about the environmental value of dune flora and fauna, and regarding environmental problems such as plastic debris in the seas;
- performing practical activities and carrying out environmental education;
- increasing awareness on the high environmental value of a new site to unaware volunteers;
- making citizens part of responsible and operational activities;
- help in reducing nature-deficit disorder for new generations [28].

The following examples of threats to the project and the team can be mentioned:

- social factors such as opposition, prejudice and contrast raised by citizens, stakeholders, associations, local committees and political groups;
- environmental determinants such as weather and sea events, factors that can restrict access to natural areas, the presence of sensitive components (e.g., psammo-halophilous vegetation and fauna, bird or turtle nests), which could necessitate a modification of the project.

Thus, it can be useful to identify the project constraints, namely those negative external conditioning factors (threats) that can hinder the project and that must be considered immediately so as to manage and overcome them, as follows:

- regulatory constraints (presence of private property, protection constraints on the area that require authorization to access or carry out activities);
- socio-political constraints (opposition from local authorities to the waste management project);
- short- and medium-term environmental constraints, such as weather and sea events, local environmental fragility due to the presence of endangered plant and animal species (e.g., halo-psammophilous plants, charadriid nests);
- sanitary and public safety constraints (presence of toxic materials in situ);
- economic constraints (presence of economic activities in contrast with the project or that identify a threat in it).

Weaknesses and threats must be carefully analyzed and overcome by defining appropriate measures. For instance, requesting authorization in advance or adapting the project area to the boundaries of local properties, limiting actions to public areas (regulatory constraints), communicating the problem, raising the awareness of citizens who are not aware of it, and informing stakeholders and local groups about the start of the project in advance (socio-political and economic constraints). Finally, regarding environmental constraints, these can be overcome by analyzing the local environmental characteristics, avoiding critical areas (if necessary) and providing appropriate information to the involved personnel, in order to limit environmental impact and avoid health-risky

actions. In addition, in terms of meteo-climatic events, it is appropriate to concentrate the actions at optimal times while remaining flexible with respect to possible changes to be made at the last moment (for example, due to extreme weather events). As for hygienic-sanitary constraints, the clean-up can be focused on specific litter categories that must be removed, leaving different kind of waste in place. All cleaning activities must be carried out with proper personal protective equipment and tools, such as gloves, boot and pliers, to ensure hygiene and safety [29].

According to the 'converting phase' of the SWOT analysis [30], the working group should also be able to transform constraints into opportunities and weaknesses into strengths. For instance, the presence of plover (*Charadrius* sp.) nests on the dunes can be considered an environmental constraint which may limit beach cleaning; at the same time, this presence can be a significant opportunity to communicate the value of the dunes and the need to clean them from anthropogenic litter. Thus, the team will be able to change its strategy, concentrating cleaning actions on the dunes in late winter (avoiding the nesting period), while in the spring clean-ups will be carried out far from the nests. In this season, the presence of these birds will be communicated to an audience who will be interested in this added value, and who will therefore be able to intervene in large numbers to clean the beach and, at the same time, check that the nests are not trampled. In this way the ecological constraint is changed into a communication opportunity. Although for conservation reasons the cleaning will be concentrated in non-breeding periods, talk about endangered species will motivate citizens and let them understand that cleaning actions are effective conservation measures for these species; e.g., sand dune-nesting birds that can be trapped by some stranded debris, such as fishing lines and hooks [31].

In the 'matching phase', team members will be able to combine the strengths and opportunities, triggering interesting positive feedbacks. For example, with a suitable budget and motivated staff (strength), in collaboration with a nearby school district (opportunities for training and education), they will be able to develop a multi-objective project. Thereby, effective results could be obtained from the management and conservation point of view (beach cleaning), and from the training and education perspective (by teaching students the value of a working group, and by emphasizing the importance of acquiring practical skills through field activities, e.g., EU projects LIFE16 ESC/IT/000002, EU, 2017 [32]).

2.3.3. The Search for Solutions and the Role of Creativity

Local beach contexts are different from one another. Even though general guidelines that define waste managing exist, specific solutions can (and must) be found for each context.

The search for design solutions requires local knowledge, technical and scientific competence, and overall, creative approaches. As well as experts, even local stakeholders can contribute to finding new solutions to local problems, with their knowledge of the history, characteristics and social aspects of the site. Besides, even non-expert citizens can suggest solutions.

Solutions can be found during brainstorming, also using digital networks, and by means of different techniques, which encourage creativity and the use of lateral thinking [33].

Whatever technique is chosen, when the discussion between the participants in the group on the possible actions to be taken starts, the rule of 'suspension of judgment' applies [34]. Every proposal, even if apparently paradoxical, unorthodox, extreme, or anomalous with respect to the context, must be considered, since it could stimulate associations of ideas and thus be developed until it becomes feasible. The 'six thinking hats' technique, the 'provocations' technique, the '6-3-5-Osborn practice' and many others are all useful for developing new ideas [33].

For example, during a litter management activity, which involved plastic waste removal, it emerged that cotton buds were the most frequent litter item. The most obvious solution would have been to differentiate them in landfills. During a recent brainstorming with a group of students (Roma Tre University, Ecosystems Management course), many ideas emerged to transform this waste from a problem to an opportunity inside a protected coastal area (the Torre Flavia wetland, Central Italy) where they faced the actual conservation issue. Then, they were asked the following question: 'How can

we transform cotton buds from a problem to an opportunity?’ Each student could provide from 1 to n solutions in a defined time (1 h), following the Osborn’s brainstorming technique and ‘lateral thinking’ [33]. The ideas were transcribed on a data sheet and then discussed collectively to select them progressively. In a short time, 75 solution ideas emerged, which were categorized into the six categories of artistic, commercial, management, educational, communication and fruition (C. Battisti, unpublished data). For example, artistic and commercial ideas implied the use of litter as raw material to create pieces of art using different techniques (e.g., fishing nets with woven cotton buds to address the problem of the marine litter, plastics representing the protected area made with various techniques and materials, including cotton buds, etc.). Many items made with cotton swabs can be marketed to address the problem (rugs, tapestries, bracelets, toys) in order to obtain solutions for the protected area.

Cotton buds can also be collected and used for the purpose of facilitating the use of the protected area. For instance, collected cotton buds can be reused for panels, signal arrows, waste collection baskets, walkways, bird feeders and other small structures within the protected area. A ‘suggestion box’ at the entrance to the park can be lined with cotton buds. Even recreational–educational activities may include the use of these polymers; some students have proposed the creation of an Adventure Park for children dedicated to marine litter with a treasure hunt for cotton buds, or natural objects (e.g., shells and balls of fibrous material from *Posidonia* sp. foliage) can be hidden in containers containing thousands of cotton buds. Again, among the ideas emerged the possibility of creating totems to be placed at the park entrance. Even a ‘Marine Litter’ Museum can contain cotton buds of different colors and degradation level, exhibited in display cases and collected in containers, perhaps dividing the types by shape, size, color, chemical composition, origin, impacted organisms, deposition environments, hazard for man, etc. Cotton buds have been proposed as the park’s ‘currency’; their collection allows one to claim an ‘exit ticket’ from park authorities, which allow one to collect rewards of different value, such as a bookmark (e.g., 10 cotton buds), a sticker ($n = 20$), a poster ($n = 30$) or a book ($n = 50$). Operational management tools can also be made using these plastics, such as metric rods graduated with cotton swabs as the reference unit, arithmetic rulers, or bollards (for troublesome animals such as pigeons). To obtain information on the relative operational effectiveness of these ideas, each of them was then assigned a score regarding the following criteria: advantage of the idea, testability through pilot projects and operational feasibility. Possible risks (attributing a negative score from -1 (‘little risk’) to -2 (‘very risky’)) were also considered.

The selection led to assigning the highest total value to the artistic and object-exhibition ideas, and to some ludic-didactic ideas dedicated to primary and secondary school students visiting the protected area.

Creativity can also be used to raise awareness and involve children and teenagers through games. The ideas that emerged during the brainstorming between operators and volunteers included the following:

- ‘The message in the bottle’: one or more ‘message’ is hidden among the various beach litter items. Then the children actively seek them, collecting and removing anthropogenic litter at the same time;
- ‘The beach litter national park’: the idea is to allow progressive waste accumulation in a specific beach area. The area will be defined, delimited and used during ‘Educational visits’ to communicate the conservation issue. This idea emerged using the ‘provocation’ technique [33];
- ‘Umbrella Clean-up’: during bathing season, the beach users could undertake waste removal in the area around their beach umbrella (within 1–2 m radius from their stopping point). It is an excellent pastime. An ‘exit ticket’ can also be provided as above described for those who bring the collected material to an information center (or a bathing establishment).
- ‘The beach-litter shop’: local operators and volunteers (but also students and association members) can provide for the collection of many different types of waste, that will be crammed (once sanitized) into containers, and also divided by shape, size, color, composition, state of degradation, etc.

These materials will be a resource for anyone who wants to use them (for example, schools and artists to create works).

- The ‘waste hunt’ (with teams organized by color or type of waste).

2.3.4. Specific Project Objectives

Once the specific problems and possible solutions have been defined, a project objective can be structured in the local context.

In nature conservation, a correctly defined project objective must include the action, the target and its attribute (i.e., its variable), the variation delta (e.g., the percentage of litter removed), a time of realization and a site of intervention [35].

Even if apparently complex, this structure enables the identification of well-defined actions and the definition of the subject of the ante–post monitoring activities, useful to letting everyone understand the actual efficacy of the project (it is said, in the language of project management, that the project was successful or not [36]).

Goals can be focused on anthropogenic litter or environmental targets. Examples of objectives correctly focused include the following: ‘Removal (action) of at least 50% (variation delta) of the weight (target attribute) of polystyrene (target) from the left bank of the Crati River (space) by December 2021 (time)’, or ‘Removal of 90% of the length of fishing lines abandoned along the Fregene beach (Central Italy; from the mouth of the Arrone river to 200 m to the north) by March 2022’.

An example of an objective focused on environmental targets is the ‘50% reduction (action) (delta) in the individual abundance (attribute) of insects (target) trapped in plastic containers on the Capo Rizzuto beach (Southern Italy; 500 m south of the tip) by April 2020’.

The definition of an objective thus outlined automates the search for indicators as well as the need to start a before/after monitoring of activities, so as to verify that the objective has actually been achieved.

The declination of objectives in this way can be a useful exercise for the following understanding what results you want to achieve (e.g., which variation delta of a specific variable), and focusing on specific litter (or environmental) targets. This approach provides a feeling of seriousness—through the declination of these objectives, we are aware that they will be monitored to verify that the results have been achieved. This approach can make the project communicable and politically legitimate.

Actually, if the objectives are declined in this way, it is also necessary to prepare a monitoring plan, identifying indicators, methods and sampling protocols and starting an appropriate analysis of the data, both before the project (Before phase) and after it (After phase), to verify that the identified objective has been achieved (see the ‘before and after control impact’ (BACI) approach to monitoring in [37]). In this regard, a technician able to handle monitoring programs is needed within the team in order to select indicators, define field methods and perform data analysis [38].

We report the following example of a BACI monitoring approach applicable to the management of beach anthropogenic litter. The declined objective is defined as the ‘removal of at least 50% of the plastic containers for food use from the beach sector in loc. X (5 hectares extension) by May Y’; an indicator (plastic containers for food use) and a variable (the absolute number, which can be transformed into density) are identified. Analogously to plant sampling designs (e.g., [39]), a representative number of plots is prepared; for instance, five fixed squared spots (of 10 m size) per hectare, repeated in time (e.g., one visit/week), randomly located and georeferenced with a GPS. Before the removal activity (Before phase), sampling is started in the plots quantifying the number of containers. The removal project starts. Subsequently, the sampling is repeated in the same plots. To be successful, the project must have achieved the objective; that is, it must have removed at least 50% of the containers (the quantification was carried out on a sample basis in the plots, assuming that they are representative of the total area. This assumes that they have been placed in a random and not opportunistic way) [40]. In order to apply a protocol in conformity with the BACI, similar samplings should be made in a control area, where the collection has not been carried out, and using the same plot size and number. This is

because it is necessary to establish whether the reduction observed in the plastic containers is actually due to the removal activity (in this case we would have a higher number of these in the control area), and not rather to external factors (for example, a storm that took away the containers; in this case we would have a low number of containers also in the control area).

2.3.5. Planning Phase. Definition of Actions, Time Schedule

Once the objectives have been defined, the actions to be taken are defined, each characterized by an implementation time and resources to be used. Although each local project can be characterized by specific actions in relation to the characteristics of the context and the problem to be faced, there are actions that can be considered general and common to all projects of this type. This, however, is an approach that must be adapted from time to time, modifying it to specific contexts.

Below is a road map for the preparatory steps:

- Definition of working group, roles, objectives. When defining the actions, this is the first to be included, even if it is assumed that once the planning phase has been reached, the specific problem has been identified, the group must have already been formed, and the objectives have already been declined. It may be appropriate to take some time to better define the group (for example, not excluding stakeholders, technicians or administrators who can be a resource in the continuation of the project). The key roles in the field project are the coordinator and the operators (the latter possibly being managers of generic volunteers). These will be joined by the staff who will take care of the logistics, relations with politicians, public administrators, local associations and sponsors, and those responsible for communicating and documenting the actions (e.g., photographers during the events), as well as any monitoring technicians (biologists, naturalists, sampling and analysis experts);
- Definition of the monitoring plan and indicators. It may be appropriate to spend some time thinking about which indicators, methods and protocols to implement. A good monitoring plan will allow you to obtain important quantitative data to be communicated to the public, administrators and politicians through tables and diagrams, so as to underline the seriousness of and commitment to the work, and the effectiveness of the project. These data could be important for both scientific and management purposes, and for citizen science [19].

2.4. Operational Process Phase

2.4.1. Definition of the Project Site, Sensitive Sub-Areas and Logistics

The site must be identified and delimited on cartography and in the field. The limits of the project area can be defined through appropriate field trips (see what has been said about environmental, regulatory, social, political, economic constraints), together with specific methods to apply and timing (also with simulations and pilot actions). For instance, charadriid birds (plovers, *Charadrius* sp.) or sea turtle nests must be highlighted, and the departure and arrival points and waste collection area have to be defined, together with the areas where other materials for education or artistic activities are to be preserved.

It is important to establish car parking and pedestrian access for operators. It would be better if the starting point (check-in station) is unique and located in an information center, in order to facilitate certain operative activities, such as informing and welcoming attendees, and the providing of utensils, cards and questionnaires. It would be appropriate if this point matched the collection point at the end of the day, where the team members will accumulate the bags with collected litter, quantify the material, acquire cards and questionnaires, and place gazebos that will be filled with the materials to be delivered to the volunteers. It is important to record the number of attendees and the quantity of material collected (the numbers and weights of litter items are the key data to be communicated, useful for verifying the effectiveness of the project).

It is appropriate to identify, as soon as possible, the sensitive areas inside the site that must be excluded from the project; for example, it may be necessary to place pegs with ropes to fence the most delicate areas (with halo-psammophilic vegetation, particularly rare plants or nests of charadriid birds or sea turtles), thus promoting the reduction of trampling and the impacts on biodiversity. This aspect must be kept in careful consideration to prevent the cleaning of the beaches turning into a further impact on the ecosystems [41]. However, in sensitive sub-areas, ad hoc protocols can be provided, carried out by operators adequately trained and aware of the vulnerability of these sites.

It is advisable to have information on the number of participants in advance in order to prepare the necessary materials and better organize cleaning events. The possibility of having a number of certificates, plastic-free tools and food products (for refreshments) lower than the number of participants must never occur. It is necessary to know if there will be voluntary operators from other countries, in order to prepare the information material in other languages.

Besides this, in this phase all the needed materials have to be checked and eventually purchased (e.g., vehicles, equipment, personal protective equipment, hygienic and sanitary material, and eventually gazebos and furnishings). It may be necessary to have the following [42,43]:

- an off-road vehicle or a towed vehicle (e.g., towable trolley);
- clothing (uniforms) and ‘siblings’ to be worn to make operators recognizable (or even badges, T-shirts, hats, pins or other gadgets to be delivered to participants so that they are recognizable as ‘clean-up operators’);
- personal protective equipment (gloves, pick-up pliers, bags, also of different colors if a differentiated collection for materials is prepared);
- questionnaires on the expectations and satisfaction of the participants to prepare in advance, information material on the area, naturalist field guides (dune plants, birds, insects), certificates of recognition for participation in the event, etc.;
- in the absence of a location at the beach, it may be necessary to have a gazebo and furnishings;
- it may be useful to have tools to collect participants if present in large numbers and scattered over large areas (flags, whistles, speakers, to be used wisely to avoid impact on nature);
- it is important to have a source of drinking water, and for personal hygiene, toilets (also mobile) and first aid equipment should be provided;
- it may be useful to contact sponsors to provide drinks and food to participants (preferring local products and avoiding plastic containers and packaging).

It is important to contact the municipality, and the municipalized companies responsible for the collection and landfilling of anthropogenic beach litter, immediately after the event. Area recyclers for aluminum, glass and plastic bottles can also be contacted. It may be important to arrange a separate collection of materials (especially plastic, glass, rubber, iron), using different bags or identifying teams to focus on specific litter types (plastics, etc.).

2.4.2. Communication of the Start of the Project

The project (in particular, operational events) has to be communicated to the public through various approaches, for example signs placed in situ at beach resorts, in car parking areas or along the paths, press releases and information via social media or local radio, information to schools and local authorities, etc. This communication, carried out before the operational actions, has the function of communicating the environmental problem, the proposed solutions and, in this regard, the dates of the events locally prepared. It will be different from post-event communication, which will be carried out subsequently to communicate the results of the project.

In communication, it is important to remind everyone that it is appropriate to maintain a strong consistency with the theme of the day. If the objective is to mitigate the problem of beach anthropogenic litter, with implications for the reduction of consumption, particular attention must be paid to the

message that ‘beach cleaning starts at home’ (tools and equipment should respect the environmental sustainability principle, using refillable bottles, reusable gloves, car sharing, etc.; example in [42]).

2.4.3. Preparation of a Day Dedicated to Training Operators

This action can be dedicated only to a limited number of technical operators or extended to a large audience of participants. The language and timing will obviously be different. The contents of the meeting will concern the problems of sea litter, the impacts, the possible answers to be implemented at international, regional and local levels, and, so as to introduce the topic of the local management of beach anthropogenic litter, the collection techniques with operational information, i.e., what, how and where to collect (e.g., litter not to be collected because of its dangerous or natural origin, and therefore to be left on site), where and how to give, how to behave if trapped or beached animals are found, what clothing to wear, what to bring (water, sunscreen, sunglasses and insect repellent in the case of sensitive individuals), and who to contact if injured or beached animals are found or if there are other emergencies (e.g., health). In addition, topics such as the quantification of data and observation, monitoring and communication will be discussed in the short meeting. As mentioned, it is important to communicate which materials to collect and which not. In particular, all finds belonging to natural debris must be left on the site, including plants, algae, remains of *Posidonia oceanica*, tree branches and trunks, animals and their remains (e.g., shells), including excrements and eggs, and rocky, clayey and sandy material, since all these elements represent important resources and structural components for the conservation of biocoenosis and the dune ecosystem. All remaining objects of anthropogenic origin can instead be collected and removed. Finally, attention must be paid to dangerous materials, such as drugs, chemical compounds, medical equipment (e.g., syringes), as well as too-heavy or -bulky objects whose management should be left to qualified personnel.

During the meeting it is important to communicate to the operators the protocol to be followed in the case of health emergencies (providing first aid kits and telephone numbers to contact), and to advise volunteers to drink plenty of water and use sunscreen (during late spring and summer). It is always useful to ask if any of the participants has medical training or knows the basics of first aid; in this case they can be assigned a role of referent for health emergencies. In addition, it is necessary to explain what must be done in the case of beach-stranded, trapped or injured large animals, including beached marine vertebrates, such as cetaceans and sea turtles (e.g., providing contacts details of the Port Authority). Even though decomposition often occurs, carcasses can be useful for scientific purposes (for example, to trace the causes of death, and to carry out biometric or parasitological analyses; [44]). Sustainability issues (reuse, reduce, recycle) may be part of the discussion during the meeting.

2.4.4. Clean-Ups (or ‘Plastic Blitz’): The Operational Days

The number, duration and frequency of days dedicated to the collection of beach litter will be defined according to the objectives. Given the large heterogeneity of roles and activities, the operational days will be planned by a personnel organization chart.

During a typical ‘clean-up day’, the following actions must be carried out:

- preparation, at the information point, of logistics materials, collection devices, cards, certificates and tools;
- signaling of the parking area, with the bins and containers for recycling, and of the properly serviced toilets;
- welcome with a ‘thank you’ message (motivating), with communication of ‘why we are here’ (global and local issues), and registration of operators (the number of operators is an indicator of project output);
- distribution of materials and short briefing, which conveys the collection instructions to the voluntary operators. If, in addition to collecting the waste, operators also fill in the field monitoring survey after a short training course carried out by professional researchers, it will be possible to

underline the importance of data collection, providing information on how to record the times, types, quantities and positioning of beach litter. Remember to collect the forms at the end of the collection, once completed. During this phase, if a preparatory meeting has not previously been held, it is necessary to communicate information on what to collect and what not to collect, as well as where (delimitation of the project area), how and in what way (e.g., wear gloves, separate the materials in special bags if different types are collected) to remove waste. In this regard, operators could be provided with more bags, if a differentiation of the waste or stops with different operators at longitudinal bands parallel to the coastline are envisaged (e.g., ‘shoreline’ group, ‘internal’ group). Each group can have a coordinator. Other useful and not obvious information (which should be reiterated several times) is reported in Table 1.

- communication of useful numbers in case of emergency and the names of the coordinators (of the roles and responsibilities of each), of times and itinerary (starting point and arrival point), and of refreshment points, toilets and other information (e.g., where to find other bags).

Table 1. Useful and not obvious information for operators during the operational clean-up days.

Leave the natural material on the sand ground (wood, shells, algae, living organisms or parts of them)
Do not touch materials of dubious origin or dangerous (call, if necessary, an operator)
Do not step on the vegetation
Be careful (and do not step on) possible Charadriidae (<i>Charadrius alexandrinus</i> and <i>C. dubius</i>) or sea turtle (<i>Caretta caretta</i>) nests
Shake the collected material before inserting it in the bag, to avoid excessive sand removal [20]
Check for the presence of trapped organisms (insects, molluscs or reptiles) in the collected containers: if alive, free them; if dead, call an operator for the conservation of the carcasses/remains, being careful to observe the norms for health

Before leaving check that everyone has gloves, bags (including spares) and cards. At the end of the event the team members will:

- collect the satisfaction questionnaires and field forms;
- quantify and weigh the anthropogenic litter following the standardized procedures;
- congratulate the site coordinators and volunteers for the work done;
- provide water for washing and sanitation products;
- deliver certificates, tools and refreshments (bookmarks, stickers, pins, water bottle with logo, hat, manual, park guide, etc.);
- communicate the event’s results;
- greet everyone—group photos with the collected material;
- take care of the final stages of children’s events, such as award ceremony and funniest and strangest objects collected during the ‘treasure hunt’ game;
- collect photographic material together with finds worthy of being conserved in order to create a portfolio of images and a technical report for public administrators and expand the collection of the Marine Litter Museum. This material will also be useful to communicate the clean-up efficacy via traditional media and social media;
- communicate schedule of future events, if any.

2.4.5. Post-Work Monitoring

If a BACI (before and after control impact) monitoring protocol has been adopted, it is necessary to start sampling the beach litter immediately after the event to make sure that environmental or anthropogenic constraint not does affect the project area. This should be carried out both in the project

area (defined as the impact area) and in a control area, similar in characteristics to the project area. The sampling will be focused on the indicators selected previously (e.g., specific types of beach litter). This monitoring will allow one to verify the effectiveness of the project and the actual achievement of the objective [45,46].

However, periodical (e.g., seasonal or after extreme meteo-marine events) monitoring should be carried out to obtain patterns of litter deposition useful to defining further clean-up projects (i.e., litter removal) [16,18].

2.4.6. Communication of the Results and Documentation

Collect copies of any newspaper articles, photos, posts, videos, or other sources of information or newsletters concerning the event, and communicate them to the institutions (municipalities, region). In the communication phase, the results of the clean-up are important both as outputs (number of operators intervened) and as outcomes (numbers and weights of materials removed). Furthermore, if the project is part of larger-scale projects (e.g., with organizations such as Ocean Conservancy and others) [47], the data obtained locally must be entered in a larger-scale database.

2.4.7. Final Briefing and Adaptation (Adaptive Management)

A further group meeting, after the clean-up, would be useful to analyze the acquired documentation, as well as errors, weaknesses and unfavorable circumstances that occurred during the project ('what did not go as planned') so as to improve future projects, starting from the experience gained.

2.4.8. Side Events and Thematic Clean-Ups

If children are present, side events can be proposed as games alone or by team ('the strangest or funniest object collected'; 'teams divided by types of collected objects', etc.). It must be remembered that the involvement of children is very important, to communicate the problem to them, and to make them responsible and active citizens. Finally, the clean-up event can be included in a program of events promoted by local authorities, also with wider purposes (tourism, social, educational), for example in the summer planning of seaside resorts. Days dedicated to the collection and quantification (monitoring) of specific categories of beach anthropogenic litter can be programmed. In this case, the event can be important in determining a particular category of litter, as well as to communicating social behaviors to avoid (cigarette filters left on the ground or the lines and hooks abandoned by the fishermen) or the origins and characteristics of special materials (for example, the expanded polystyrene which, as it is lighter, is transported by the wind once beached, and accumulates behind the dunes). At the same time, you can find effective slogans for the day; for example, in the case of cigarette filters, the slogan can be 'This beach is not an ashtray'.

3. Conclusions

Project management issues applied to beach clean-ups stimulate collective research on causes, effects and solutions ('Which organisms are impacted by different litter types? How do we remove it in our specific context?'), and promote system-level thinking and creativity, both necessary ingredients in all project phases of conservation projects [48,49]. The achievement of results, even within a few hours, makes people feel satisfied with having achieved 'smart' goals ('I did something to change the world for the better'). In this regard, there is a great debate around 'citizen science' in conservation [50]—using clean-up actions as true conservation project actions could transition society toward the birth of so called 'citizen management' [51]. In this sense, beach clean-up projects allow us to obtain not only ecological outcomes, but also positive feedbacks at the civic (social) level [19].

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