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Participatory Methodologies for Self-Management of Waste: Case Study for the Reduction of Plastics in the Sahrawi Refugee Camps

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Abstract: According to the United Nations, if measures are not taken by 2050, there will be more plastic in the ocean than there are fish. This work addresses this issue by proposing an adaptation of the CLTS, a methodology used in sanitation to promote behavioural changes, to the waste management sector. The methodology is applied in the Sahrawi refugee camps through two phases: a first one in which the specific context is analysed to achieve a real diagnosis of the problem and a second phase in which the CLTS is adapted proposing the use of various participatory techniques in order to reduce the use of plastic bags. The analysis of the information collected in the first phase shows that plastic bags constitute the highest percentage of waste and that the best solution to reduce the consumption of plastic bags is by actively raising awareness among the community through training and talks. This justifies the second phase where a practical guide is provided on how Sahrawi people themselves can become aware of the problem and triggering the desire for change in the community. Thus, the philosophy of the methodology proposed here is that people are capable of self-organising and solving their own problems.

Keywords: Sahrawi refugee camps; sustainable development; plastic reduction; waste management; self-analysis; awareness



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1. Introduction

According to the United Nations (UN) environmental commission, more than a million plastic bags are used every minute. Single-use plastics have a useful life of between twelve and fifteen minutes; however, they can take up to a thousand years to break down into smaller fragments, known as microplastics [1]. The planet is on alert for this situation, because if measures are not taken between now and 2050, then there will be more plastics in the ocean than there are fish; estimates suggest that there are over 150 million tonnes of plastics in the ocean today. In a business-as-usual scenario, the ocean is expected to contain 1 tonne of plastic for every 3 tonnes of fish by 2025, and by 2050, it will contain more plastics than it does fish (by weight) [2]. The UN 2030 Agenda addresses this matter with several of its sustainable development goals (SDGs) and a clear overall goal: to reduce the generation of waste through prevention, reduction, recycling and reuse activities [3]. While none of the 17 SDGs have plastic pollution as a specific target, in July 2017, the United Nations met to discuss the implementation of SDG 14 regarding underwater life and adopted the resolution Our Ocean, Our Future: Call for Action (<https://oceanconference.un.org/callforaction> (accessed on 5 January 2022)) [4]. All countries agreed to “implement long-term and robust strategies to reduce the use of plastics and microplastics, in particular plastic bags and

single-use plastics, including by partnering with stakeholders at relevant levels to address their production, marketing and use.” (p. 4).

Despite the importance and concern for this issue, in the context of international cooperation, other kinds of interventions have predominated over waste management. In the 1980s, an international revolution began to support developing countries in problems related to basic needs, especially those concerning water and sanitation [5]. Nevertheless, regarding sanitation, progress was very modest, mainly due to a lack of political priority [6] as it involved top-down, large-scale and heavily subsidised interventions [7]. For example, thousands of standard latrines were installed in different parts of the world but were never used, or were used for other purposes by the local community [8]. In other words, there was no appropriation by the local community. According to [9], due to these problems, a change in mentality began in the 1990s as technologies more appropriate to local contexts were considered, in addition to—and most importantly—endeavours to promote a change in hygienic behaviour.

In this way, diverse approaches and perspectives on how to generate such behavioural changes emerged, such as PHAST, sanitation clubs or sanitary marketing [10]. Among them, it is worth highlighting the Community-Led Total Sanitation (CLTS). Based on participatory methodologies, the CLTS is an innovative methodology for mobilising communities to completely eliminate open defecation—for example, in fields, forests, bushes, lakes and rivers. According to the UN Children’s Fund (UNICEF (<https://www.unicef.org/> (accessed on 5 January 2022))) [11], one gram of faeces can contain 10 million viruses, one million bacteria and one thousand parasite cysts. Poor sanitation and hygiene practices contribute to over 800,000 deaths from diarrhoea annually, according to the World Health Organization (WHO (<https://www.who.int/en/> (accessed on 5 January 2022))) [12], which is more than the number of people who die from malaria [13]. Communities are facilitated to conduct their own appraisal and analysis of open defecation and take their own action to become open defecation free (ODF) [14]. ODF is a term used in CLTS methodology to describe communities that have shifted to using toilets instead of open defecation. This can happen in a community after CLTS methodology has been implemented. The approach, developed in 1999, expanded rapidly and has already been used in more than fifty countries on all continents. It is based on participatory sessions with the aim of activating the community’s desire for change and promoting self-help. The motto of the Participatory Rural Diagnosis of “they can do it” is followed, based on the idea that once the community becomes aware through the self-analysis of their situation, they will be able to take action. In addition, action is taken by emphasising the collective dimension of the problem, in order for the community to take ownership of the process. They will not enjoy a proper hygienic-sanitary situation until everyone changes their behaviour: what one person does or does not do affects the entire community [14]. In this way, the community is encouraged to take responsibility and be the driver of its own change [15]. There are many studies analysing the impact of CLTS methodology on rural sanitation (see, for example, [16–19]). However, despite the success of this methodology, there are no studies that analyse the possibility of adapting the CLTS methodology to a sector other than sanitation.

Under this new paradigm of self-management and in order to fill this gap, the objective of this research is twofold. First, to adapt this innovative CLTS methodology to a new field, the waste management, but including a new phase of previous analysis of the current situation. This analysis should combine different perspectives in order to have a holistic diagnosis of the situation where the participation of the community becomes a successful key element of the process. The second objective, and as a consequence of the first, is to contribute to the reduction of plastics in the Sahrawi refugee camps in Tindouf (Algeria), thus helping to achieve the SDGs.

The main contribution of this research lies in the process of adapting the proposed methodology to a new field and the inclusion of a new phase of analysis and diagnosis. Hence, through the participatory sessions, its aim is for the desire to take action to change their situation to arise in the community, through tools for self-analysis, awareness and

impact. Therefore, these tools are not merely intended to raise awareness, but rather to encourage people to take action themselves. To this end, this article seeks to do more than simply adapt the CLTS methodology; it proposes concrete examples and tools to be used in each phase of the methodology. To the best of our knowledge, there are few articles detailing the dynamics carried out in each phase. These participatory dynamics are precisely the elements that add value to the process, as they can later be extrapolated to other contexts and uses.

The work was carried out in collaboration with *Movimiento por la Paz, El Desarme y la Libertad* (MPDL), a Spanish NGO that has been working on waste management in refugee camps for almost three decades. It is important to understand the current waste management system (WMS) in the camps as it justifies the proposed methodology, which is based on participatory sessions grounded on the adaptation of the CLTS methodology—in this case, in the field of waste management. There is limited information concerning the production and management of solid waste in refugees' camps located in various parts of the world [20]. Regarding Middle Eastern camps, Ref. [21,22] or [23] can be consulted. Ref. [24] studies plastic waste in Rohingya refugee camp (Bangladesh). Recently, Ref. [25] presents a study on waste in camps in Lesbos (Greece), and in the case of refugee camps in Africa, Ref. [26] or [27] can be found.

Currently, the WMS in Sahrawi refugee camps is divided into internal and external collection. On the one hand, internal collection consists of a door-to-door system, in which residents approach the trucks to deposit their waste bags. Subsequently, the waste is transferred to dumps, where it is burned. On the other hand, externally, any waste that the community has dumped directly on the ground is collected. In fact, both controlled and uncontrolled dumping are common waste disposal practices in Africa [28]. For this waste, community clean-up campaigns are organised in which a large part of the community mobilises and contributes to cleaning. Although waste collection services are traditionally provided by public and private sectors in many African countries, community-based organizations in waste collection are equally important in those countries [27] and especially in Sahrawi refugee camps.

Although the WMS is organised to collect waste once a week, the reality is that businesses and families need to remove their rubbish two to three times a week, which means that the volume of waste generated per week is greater than the system's ability to remove it. Consequently, plastic has flooded the camps, generating a multitude of problems, such as the emergence of uncontrolled areas of waste dumping, which have become sources of infection for the health of the community or have led to the loss of domestic animals due to the ingestion of waste, mainly plastics.

In this regard, according to a 2011 study carried out jointly by the National Veterinary Directorate of the Sahrawi Arab Democratic Republic (SADR) and the NGOs Africa 70 and MPDL, more than 40% of the deaths of goats and sheep within the camps are due to waste ingestion. Additionally, in the event that this ingestion does not provoke their death, the decomposition of plastics in the stomach causes certain toxic substances to be released, which are passed on to the people through the food chain, thereby representing a health problem for the Sahrawis [29].

The mass use of plastics, together with the absence of adequate mechanisms for their correct treatment, has led to an accumulation of plastic bags that has become an environmental and public health risk. In the markets, single-use bags are free and not of very good quality, which leads to hundreds of bags being scattered throughout the desert. This has caused a degree of social alarm to begin to arise, owing to the amount of waste dumped without control [30,31].

Currently, MPDL is involved in actions to promote the substitution of single-use plastic bags for cloth bags in markets. Nevertheless, to improve environmental sanitation effectively, the active participation of the community is essential. It is necessary to carry out significant awareness-raising actions to promote conscientious consumption in order to try to reduce the use of plastic and, as far as possible, its reuse. This justifies the proposal

of this work; its specific aim being for the community to achieve collective awareness of these problems, thereby triggering the need to seek solutions to them.

The following section describes the methodology used in the research. Subsequently, the results are presented in the next section, in which the implementation of the methodology in the Sahrawi refugee camps to reduce plastics is analysed. Finally, the main conclusions reached are presented, and the possibilities of replication in other contexts and future lines of research that could give continuity to this work are discussed.

2. Materials and Methods

The research fieldwork was carried out in the Sahrawi refugee camps over four months between February and May 2019. A total of 173,600 Saharawis currently live in the refugee camps, organized in five large population centres called *wilayas* (districts). Each *wilaya* is subdivided into *dairas* (districts), which in turn are divided into *hays* (neighbourhoods), where 75% of the population is considered vulnerable [32].

The methodology followed in this research was divided into two main phases. The first involved an analysis and diagnosis of the current situation regarding waste in the camps. In this first phase, various techniques were employed, such as PEST, SWOT, surveys and a study to characterise the waste in the camps. This allowed a diagnosis to be made of the current waste situation in the camps, based on various perspectives: macro, micro and field analysis. In this phase, it is crucial to collect the perspective and needs of the local community through the use of participatory tools such as workshops, surveys or interviews. Having a real and complete diagnosis of the situation becomes the basis for selecting and designing the techniques used in the second phase and gives the facilitator information to drive the participatory sessions.

In the second phase, an adaptation of participatory methodologies for self-management of waste was developed. In this phase, and after the results of the diagnosis, it was proposed to adapt the CLTS methodology to the field of waste management, thus proposing the use of participatory and self-motivation techniques for this problem and in this context. In turn, this phase had three stages (pre-triggering, triggering and post-triggering), each phase involving various sub-stages and techniques, dynamics and tools. Figure 1 graphically summarises the methodology designed for this work.

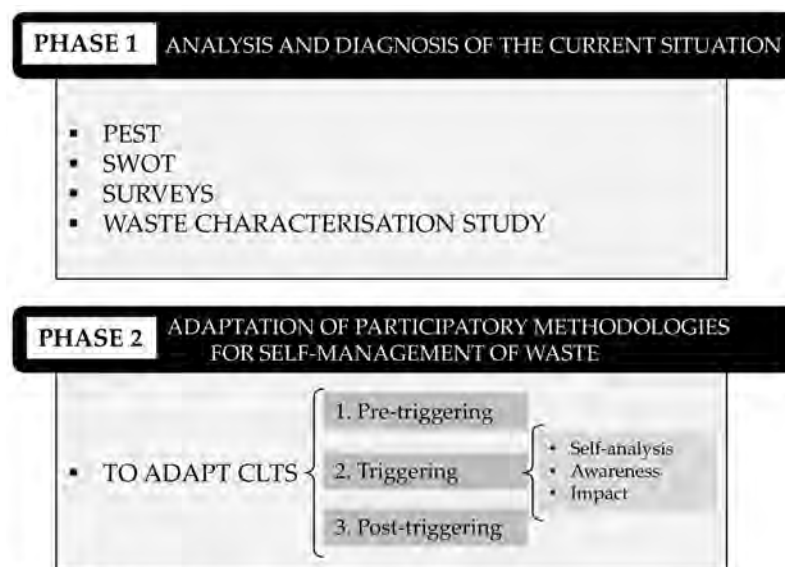


Figure 1. Schematic diagram of the methodology.

Next, the different techniques used to collect the information are explained. In the first phase of the methodology (analysis and diagnosis of the current situation), the PEST tool was used to analyse the characteristics of the camps. This is a tool for analysing the

political, economic, social and technological environment that allows the proposal to be contextualised. Furthermore, the SWOT technique was used to study strengths, weaknesses, opportunities and threats. Finally, the analysis was complemented with statistical data on the state of plastics in the camps, through various surveys with the community and a study to characterise the waste in the markets.

To this end, two types of survey were designed. Six people per *wilaya* answered the first question, 30 surveys in total, allowing the collection of quantitative information on the amount and type of waste generated per family in a week. Based on the profile of the people being surveyed, the survey was designed as a grid with the days of the week and the following items: Tetra Briks, plastic bottles, metal (cans), nappies, plastic bags, clothing, single-use plastic (plates and cups), glass or others. In the survey, respondents had to indicate the number of waste articles of each type that they generated each day. In the second survey, the information was structured around two blocks. On the one hand, they were asked about the current waste situation, what they perceive as the biggest problem of uncontrolled waste generation, and what they generate the most in their own waste. In the second block, information was collected on the measures that the community believes are most useful to reduce waste generation, and the means and people that they believe are most suitable to raise awareness among the populace. This survey had a greater number of responses, since 30 questions were distributed per *wilaya* (150 surveys in total).

Parallel to the surveys, a waste characterisation study was carried out in the markets. For the study, the markets of Rabuni (as it is the administrative centre and frequent transit point for shopping) and Ausserd (due to its proximity to Tindouf and the few productive activities) *wilayas* were selected. The study was carried out by the staff of the waste collection system in collaboration with MPDL. This consisted of choosing six bags at random, weighing the full contents, and weighing them according to the composition of their contents. In Figure 2, the personnel are observed separating the contents of the bags and weighing the entire bags.



Figure 2. WMS staff conducting the waste categorisation study. Source: [own elaboration].

The second phase of the methodology (adaptation of participatory methodologies for self-management) consisted in adapting the CLTS to waste management. The three methodological steps on which the CLTS is based are the following [14]: pre-triggering, triggering and post-triggering. Pre-triggering consists of a series of field visits to select a community, as well as to determine the right place, day and time for the triggering session. Since the process does not try to impose upon the communities, and each one responds differently, the most favourable community has to be chosen to carry out the process. The triggering phase is based on the generation of a collective sense of shame and disgust in the members of the community through participatory workshops in which, with the help of the facilitators, the community is helped to analyse their situation with the objective of triggering the desire to take action to change it [5]. The facilitator's goal is simply to help community members see for themselves what the problem is, but at no point should they explain their situation or stress the need for change. It is then the community's responsibility to decide how to tackle the problem and take action [14]. Finally, post-triggering consists of revisiting the community on a pre-established date and with a defined purpose. It is important to identify people with natural leadership and encourage them to take charge

of ensuring that action plans are followed and behaviours are maintained. The role of the facilitating team (an NGO for example) is relegated to the background, supporting the leaders, giving them a voice in the meetings, encouraging them, etc. Post-triggering comes to an end when a change in behaviour and, consequently, a change in the environment can be seen in the community.

In order to carry out the study, various methodological limitations were faced, due to the characteristics and circumstances of the camps. The first of these was the language barrier, since the official language of the camps is Hassaniya Arabic, a variant of Magrebi Arabic; despite the fact that there are many Sahrawis who speak Spanish, either because they have lived through the colonial era or because they have studied in Cuba or Spain, it was necessary to have a translator to obtain information.

Another highly influential aspect when carrying out this study was the strict security measures, which were intensified as a result of the kidnapping of three aid workers in 2011. Expatriate aid workers have a curfew to enter Protocol (the place where they must lodge). In addition, they are forbidden to drive or take any means of transport and they are only authorised to travel in the organisation's car with the Saharawi driver. All of this makes the task of travelling to the *wilayas* difficult, which is why it was not possible to conduct the survey in all of them.

It is also worth noting the difficulty in finding reliable quantitative data, since, due to the situation in the refugee camps, the Sahrawis are not used to collecting information, and the few studies that are carried out are usually not published (it being necessary to consult the physical files of the different organisations).

To overcome these methodological limitations, MPDL assisted by providing information and documentation, as well as access to translators in order to conduct the work. In addition, it is a recognised NGO in the camps, which inspires confidence in the Sahrawis when it comes to surveying them and gathering information.

3. Results and Discussion

This section presents the results of the research, which have been divided into three sections. The first section shows the results of the analysis and diagnosis phase, which will help to understand the current situation of waste management in the camps and the need to propose participatory methodologies to achieve self-management of waste. The second section addresses the proposal to adapt the CLTS methodology to the Saharawi context so that people themselves are aware of the problem of plastics and take measures to avoid it. The third section discusses the results of the research.

3.1. Diagnosis of the Current Situation Regarding Waste Management in the Camps

In this first phase, a series of tools were incorporated in order to analyse the current problem of waste management in the camps through the combination of various techniques that provide a complete vision of the problem. The PEST analysis highlights, on the political side, the particular context of the camp: that of a refugee community for more than four decades. Despite all these years, people still consider the camps temporary and hope to return to their own lands someday. Their uprooting means that there is no sense of needing to care for it as if it were their own land. Another feature that affects planning is the lack of environmental legislation that prohibits the use of plastic bags or introduces a fee for their use.

From the economic perspective, the community depends entirely on humanitarian aid, although there are economic inequalities between the Sahrawis who survive exclusively on foreign aid and those who also receive some other income, for owning small businesses or for receiving remittances from relatives living abroad. Another aspect that influences is the Algerian dinar (the official currency in the camps) and the fluctuations in its exchange rate. Finally, the dependence on Algeria for trade or industry is another variable that must be taken into account, since being settled on land they do not own, the Sahrawis cannot collect

taxes for their development, or establish industrial activities on “Algerian soil” without prior authorisation.

From the social aspect, the Sahrawis are part of a traditional Arab and Muslim society and the first language is Hassaniya Arabic. They are also part of a very family-oriented society, where family nuclei do not only consist of parents and children but extend further, with an average of seven people living in each tent. In recent years, there has been an increase in population and there are social inequalities between those who have studied abroad in countries such as Cuba or Spain and those who have only lived in the camps. There are also great gender inequalities, with women being in charge of the daily tasks in the *jaimas*, and of taking care of the children, thus having very little access to jobs, while men occupy almost all the institutional positions. In addition, the extreme geographic and weather conditions mean the Sahrawis are a largely sedentary society, as at certain times of the year, such as Ramadan or in summer, it is very difficult to work.

In terms of technology, in recent decades, electricity has arrived and roads have been built. However, there are still *wilayas* without electricity, such as Laayoune, and the others suffer power cuts very frequently. Today, social networks have proliferated greatly among the Sahrawis, which has allowed an increase in communication, as well as access to information from abroad.

Having analysed the PEST environment, the main strengths, weaknesses, opportunities and threats in the camps were assessed with regard to the implementation of a proposal by MPDL to reduce plastics. Figure 3 summarises the SWOT carried out.

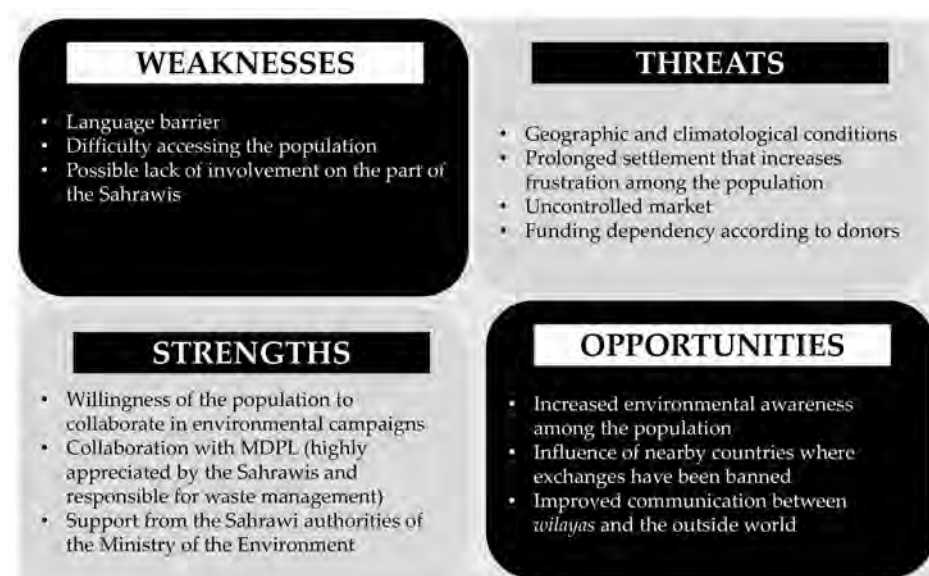


Figure 3. SWOT matrix.

Analysing the matrix, the difficulties of acting in the Sahrawi refugee camps are revealed. However, among the Sahrawi community, an environmental awareness is beginning to be created, which together with the positive image MPDL enjoys in the camps, provides confidence in the ability to carry out a fruitful campaign. Furthermore, by working closely with the organisation’s local staff, weaknesses can be more easily addressed, in terms of both language and access to the community.

Third, the results of the surveys carried out provide information regarding the amount and type of waste that is generated over a week in a family in the camps. Figure 4 shows that most of the waste generated is made up of plastics and, above all, plastic bags. Thus, 29% of a family’s weekly rubbish is in the form of plastic bags. It should be noted that the results are not percentages of weight or volume, but rather number of items (a single plastic bag counts the same as a single bottle or can).

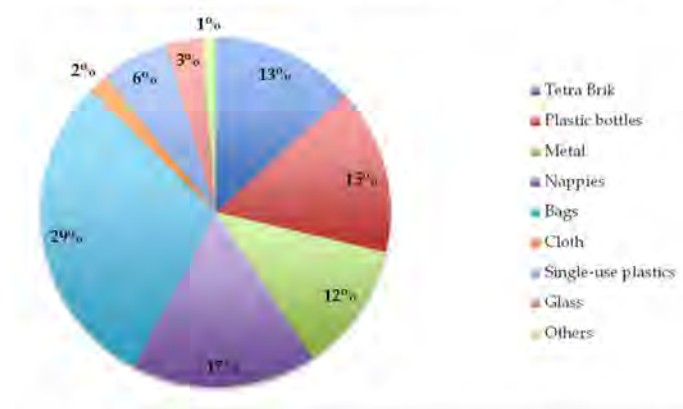


Figure 4. Typology of waste generated by a family during a week.

Another interesting piece of information gathered from the survey concerns the current situation of waste and the measures that the community think are most useful to reduce waste generation. The results (Figure 5) reveal how 46% of those surveyed believe that the cause of the large amount of rubbish is a lack of awareness among the community, and that the most useful measure to solve the problem of waste is by reducing consumption (41%), followed by recycling (30%) and reusing (29%).



Figure 5. Causes of waste generation and possible measures to adopt mentioned by the community, according to the results of the survey.

Regarding awareness (Figure 6), we find that the means that they believe are most effective in reaching the community are the media and the training sessions or talks in the *dairas*, with 22% and 23%, respectively.



Figure 6. The most effective means of raising awareness in the community, according to the results of the survey.

However, regarding who should be responsible for spreading the message (Figure 7), there are more diverse responses, from specific personnel with 23%, to the entire community in general or women in charge of the *dairas*, receiving 21% and 20%, respectively.

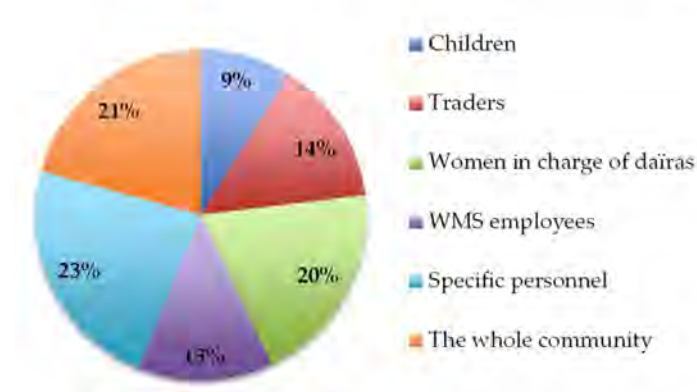


Figure 7. The people who should be in charge of raising awareness in the community, according to the results of the survey.

Parallel to the surveys, a waste characterisation study was carried out in the markets. Table 1 shows how plastic represents the highest percentage by weight of all the waste found in the bags collected in the markets.

Table 1. Waste characterisation in the markets (by %).

Plastic	Paper	Wood	Cloth	Metal	Organic	Glass	Batteries	Other
55.6	15	0.2	1.6	3.1	4	5.7	0.2	21.8

In addition, another favourable aspect is the willingness of people to change their behaviour (Figure 8), since 42% of the community commented that they would use cloth bags, and only 4% would not be willing to change their daily life of using plastics.

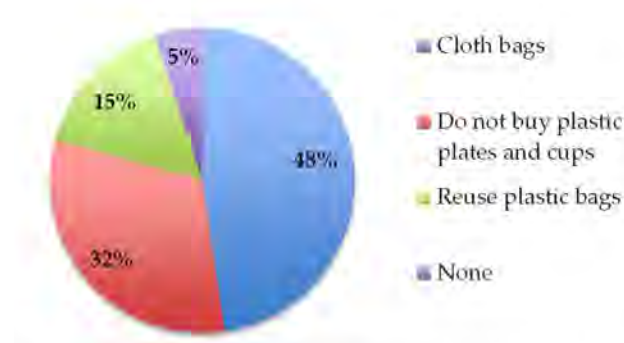


Figure 8. Measures that community would be willing to take, based on the results of the survey.

3.2. Proposal to Reduce Plastics in Camps through Participatory Methodologies

After having analysed the situation with different tools, it is observed that the plastic waste constitutes the highest percentage. Furthermore, the results of the surveys carried out reveal that, according to the community, (i) the most useful measure to reduce plastic waste is by reducing consumption and (ii) the most effective communication strategies will be talks in the *dairas* and training sessions.

Therefore, the proposal to reduce the number of plastic bags scattered throughout the desert requires a deeper awareness of the problem at both environmental and sanitary levels. A methodology such as the CLTS needs to be adapted to instil in the Sahrawi

community an attitude of responsibility and care for the environment that encourages them to take consensual measures for themselves.

As has been stated, the designed methodology is based on the three steps of the CLTS [9]: pre-triggering, triggering and post-triggering. The proposal for each of the steps is shown below.

3.2.1. Pre-Triggering

This step consists of a series of field visits to select a community. For demographic reasons and accessibility to the community, the Boujdour *wilaya* was chosen to implement the methodology. The Boujdour *wilaya* is the closest to Rabuni (the *wilaya* where the workers of the organisations are housed and where their offices are located). The target audience for the campaign is the adult women of Boujdour. The reason why the age range over eighteen was chosen is because it constitutes the group that buys in the markets and therefore the group that uses plastic bags. Specifically, the actions are aimed at a specific group of adult women from Boujdour, made up of ten people from each day, including those responsible for the *dairas* and neighbourhood of the WMS, and those in charge of raising awareness.

Boujdour is made up of three *dairas*, which at the same time are subdivided into four neighbourhoods. Thus, the first group to which the methodology will be directed consists of 30 women, of whom three will be responsible for a *daira*, twelve for the neighbourhood and two for raising awareness. Later, they, with the support of the organisation, will be in charge of carrying out the campaign with the rest of the segment, thus creating a snowball effect, being able to access more people. The proposed methodology, if satisfactory, could be replicated in the rest of the *wilayas*, with Boujdour acting as a pilot project.

3.2.2. Triggering

This phase consists of activating the desire of women to take action in relation to reducing plastics. It is based on the generation of a collective sense of shame and disgust in the members of the community, as it confronts the raw facts about the uncontrolled waste dumping, specifically of plastics, and its negative impacts on the community as a whole.

The purpose of the facilitator is simply to help community members see for themselves that the accumulation of waste in the environment has unpleasant consequences.

To reach the moment of triggering, various tools will be used. The selection and design of the dynamics of this phase are crucial to the success of the methodology, and it is at this point where the information collected in the first phase becomes essential. Having a complete and real knowledge of the situation allows the facilitator to select the best tools for the triggering of the participants. Tools used are explained below and should be implemented as a workshop.

Self-Analysis

The objective for the first part of the workshop is for the participants to realise what their situation is like, what their mode of consumption is and what they do with the waste they generate. For this purpose, the dynamics shown in Figure 9 will be used.



Figure 9. Dynamics for self-analysis.

The first dynamic consists of a dialogue that, moderated by the facilitator through questions, serves to make them self-aware of the situation and the problems. Table 2 shows the type of questions that can be asked in this phase.

Table 2. Questions for self-knowledge of the situation.

How many times a week do you go shopping?
What do you usually buy when you go to the market?
What do you do with the waste and rubbish?
Have you ever seen animals feeding on waste?
If you have livestock, is their pen located somewhere close to uncontrolled waste dumping?
Do any of you normally burn the rubbish you throw away?
Have you ever been present when waste is being burned? What have you observed or felt when you near it?

The second dynamic (routine) serves to visualise the amount of waste that is used throughout a day, and is shown below (adapted from [33]):

Participants must write their daily routine, on a card provided for this purpose, highlighting the waste that is generated and indicating, as far as possible, its typology. The facilitator can start by giving an example:

*I get up at 8 in the morning and go to the kitchen to prepare my breakfast and that of my children, I take **two plastic cups** and fill them with **a carton of milk**, and then I take out **a plastic pack of cookies** for each child. After breakfast, we go to the bathroom to comb our hair, using **a wooden comb** and brushing our teeth with **a plastic toothbrush**. I take my children to school, and on the way back to my tent, I go through the marsas to do some shopping. I buy tomatoes that I put in **a plastic bag**, apples, for which I use **another plastic bag**, **a package of rice that also comes in plastic**, and **a glass bottle of juice**. Then I put everything in **another plastic bag**. Back in the tent, I sweep the ground with **a wooden broom** and prepare rice with chicken to eat in **a metal pot** and serve it on **ceramic plates**.*

*In the afternoon, my family comes to have tea. I traditionally prepare the tea, for which I need **a metal teapot and tray**, tea that comes in **a cardboard box**, **a plastic sugar packet**, and **a large plastic bottle of water**. In the evening ...*

Once they have finished, this information is shared aloud and a discussion ensues about what type of waste they generate the most. Next, it is proposed that they rewrite their routine trying to change the residues that they believe are unnecessary, or that can be avoided, always being realistic and taking into account the situation and the means available to them. The facilitator has to emphasise that there is no problem if someone feels that their routine does not require any changes. The results are shared again, and new ideas are discussed.

Due to the circumstances in the camps, it is very likely that most of the waste they generate in their daily lives does not have substitute products or other ways of acquiring them (in bulk). However, many may conclude that, to reduce the amount of waste generated, plastic bags can be dispensed with, using other objects such as backpacks, glass jars and cloth bags; or that the plastic bags can even be reused.

The last dynamic consists of showing them a photo of any point of accumulation of waste in the camps; participants have to describe what they see using two or three colours. Once the final colours have been agreed upon, they are written on the board and participants are asked which items they associate with each colour. Again, it is likely that blue will be among the colours that they identify as it is the typical colour of the plastic bags used in the camps. When writing the list of items associated with each colour, it is possible that for the other colours they will identify several items, while for blue they will most likely only associate it with plastic bags. This again highlights the sheer magnitude of waste that would be saved just by stopping using plastic bags. However, this is a conclusion that the people have to reach themselves. The facilitator can try to guide people through questions such as “What do you think about the fact that the other colours are associated with many items, while blue is only associated with plastic bags?” or “What do you think about the list that we see on the board? Can you draw any conclusions?”

Awareness

Once the participants understand and have reflected on their mode of consumption and waste management, the next step will be to try to make them aware of the health and environmental dangers that this entails. This step, if it works well, will result in activation, with the desire to take action beginning to arise. To this end, we shall use the two tools shown in Figure 10.

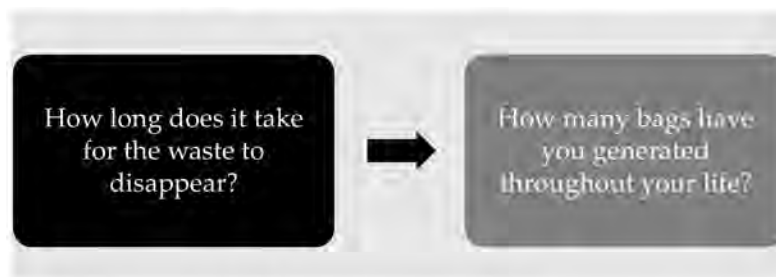


Figure 10. Dynamics in the awareness-raising phase.

The first part refers to the self-analysis procedure in which participants defined which waste they generated the most. It consists of asking them if they know how long it takes for these residues to disappear. The facilitator can indicate an approximate calculation of the waste generated if the routine given as an example in the analysis phase had been carried out, for example, on three days a week throughout his whole life.

Example: $3 \text{ plastic bags/day} \times 3 \text{ days a week} \times 52 \text{ weeks a year} \times 22 \text{ years of life} = 10,296$

The facilitator emphasises several times the number of waste plastic bags that he has generated throughout his life:

I have contributed to 10,296 more plastic bags in the desert! And worst of all is that when I am gone (unfortunately I do not think I will live more than 100 years) those bags will still be there, my children and probably even my grandchildren will see them.

It is intended that, at this stage of the workshop, activation will begin to emerge among some participants. Nevertheless, the workshop continues, with the second tool. To prevent people from getting lost with the magnitude of the numbers, and to be able to show the above in a more visual way, the facilitator proposes a dynamic.

With the help of a calculator provided, participants have to calculate how many bags they generate in three months. Once calculated, they go to the table to pick up a packet of chickpeas. Back in their place, each person has to put in front of him a pile with as many chickpeas as waste plastic bags they have generated in three months.

The facilitator also participates:

$3 \text{ bags} \times 3 \text{ days a week} \times 12 \text{ weeks} = 108 \text{ chickpeas}$

Once all the people have finished, it is emphasised that it corresponds to only three months, and that they should imagine how big the pile would be if it were multiplied by four and, later, multiplied again by their age, and remembering that it is not about chickpeas, but that each one represents a plastic bag, and that these will persist for at least 150 years from now.

By the time the dynamic involving chickpeas has finished, many participants must already be aware of what their mode of consumption is doing to the environment. However, for many Sahrawis, environmental problems do not form part of their concerns (bearing in mind that they have many other problems of greater relevance) and that, in addition, it is very difficult to make people aware of taking care of their environment, and keeping it clean, if they are living in a territory that is not their own.

Impact

To raise awareness that a plastic-free environment is not only better for the environment but also for their health, the following, more shocking, dynamic is proposed.

When it is lunchtime, they are offered a plate of goat meat with rice and, showing them the plate, they are asked who wants to eat. Undoubtedly, everyone says yes. Once the dishes have been distributed, the facilitator once again highlights the questions of animals ingesting plastic and says that they are now eating those animals.

To make it more visual, Figure 11 shows one of the images from the study on toxic substances in the food of sheep and goat origin raised in the Sahrawi refugee camps [11].



Figure 11. Presence of toxic substances in sheep and goats [29].

It is likely that they will once again identify the blue colour of the plastic bags in the images, and that at this point the feelings of disgust towards the food in front of them will begin to emerge and they will stop eating.

The facilitator emphasises that, even though it is not visibly apparent in their daily lives, this is the reality. If they do not have good environmental management and spread waste uncontrollably across the desert, their livestock will feed on it, and then it can reach them through the food chain.

This dynamic is based on the assumption that no human beings can sit idly by once they have learnt that they are eating plastic. This is where the triggering phase ends, leaving the Sahrawis reflecting and discussing how they can change their situation. At this point, ideas and action plans begin to emerge on how to proceed, as throughout the entire phase, the facilitator remains detached, adopting a listening attitude, since the people themselves have to decide how they are going to act. During these conversations, natural leaders begin to emerge.

3.2.3. Post-Triggering

This phase is very important, as community dynamics can change rapidly and go in different directions. External encouragement and sensitive support can be crucial, to maintain motivation at all times. Triggering without follow-up is bad practice and should be avoided by planning ahead, and also by involving and linking with an organisation and/or people who can follow-up [9].

For post-triggering, the community is visited again on a date that has been pre-established with them and with a defined purpose. It is important to identify natural leaders and encourage them to take it upon themselves to ensure action plans are followed and behaviours are maintained.

At this stage, facilitators have a nonintrusive support role and have to be aware of what is happening—timely interventions can make a big difference. The bottom-up approach is followed, based on community empowerment. Facilitators should never intervene in any way that creates dependency; their goal has to be to withdraw as soon as possible.

Facilitators have to be sensitive in encouraging and supporting the participants; they should not have to take care of them. Furthermore, they must not interfere in any way that could undermine their ownership and energy; the process belongs to the Sahrawis, not the facilitators.

The facilitators also have to be on the alert for positive developments, and encourage official visits that show interest and appreciation for what they are doing. These could be from the Ministry of Water and Environment, the *uali* of the *wilaya*, to television and radio media. This encourages people and reinforces their actions.

Frequently, the support of religious leaders is very effective and powerful in accelerating local collective action. Locating mosques helps the community to see the conditions and environments of places of worship and to understand that their religious leaders are also exposed to contamination.

Finally, video documentation of Sahrawis committing to change made in the early stages can be very effective in persuading others later on.

Post-triggering ends when a change in behaviour and consequently a change in the environment can be seen in the community, the reduction of plastic bags being perceptibly visible. In the CLTS, this phase ends with the proclamation and celebration that the community is “free of open-air defecation”. However, a *wilaya* in the camps proclaiming to be free of plastic bags would be very difficult to achieve due to all the limitations that have been explained throughout the research.

However, with the change in behaviour and the reduction of plastic bags, recognition could be given for the community’s effort, increasing the sense of pride and creating interest from the neighbouring *wilayas*.

3.3. Discussion

Having carried out the various analyses of Phase 1, a better picture was revealed of the very particular situation in which this proposal is contextualised and the limitations that are involved, since it is located in a refugee camp that has been waiting for more than four decades for a self-determination referendum to be held

It was also observed that plastic waste constitutes the highest percentage in all the analyses carried out, both at the family level and in markets. In addition, it can be stressed that both the purpose of reducing the use of plastic bags as well as the community participation approach, which is described in this proposal, are well structured and justified since, on the one hand, the community is aware that the main problem is that of lack of awareness among the community and that the best solution is to reduce consumption; on the other hand, the training sessions and talks in the *dairas* are among the means most positively valued by the community in order to raise awareness about the danger of plastics.

Therefore, the proposal to reduce the use of plastic bags, and consequently, the number of bags scattered throughout the desert, involves increasing awareness about the danger of plastics and the problems they cause if they are scattered uncontrollably or burned. Bearing this objective in mind, this paper proposes the implementation of participatory methodologies to encourage the community to take measures for itself.

In this sense, the results of this study show that it is possible to adapt a participatory methodology typical of the water and sanitation sector, the CLTS, to a different area such as waste management. The steps to follow are practically the same; only the dynamics to be implemented with the community are different. Therefore, it is necessary to have a good understanding of the CLTS approach before adapting it to another sector in order to extract the maximum performance from the methodology. Moreover, it is crucial to have a good understanding of the real situation and needs of the community. For this reason, it is required to analyse from different perspectives the context that allows to design properly the dynamics with the community. On the other hand, a certain skill of the facilitating team is also required to propose, from experience, dynamics that are understandable for the community and generate the expected triggering.

4. Conclusions

This article presents a case study in which it is proposed to adapt participatory methodologies to the problem of waste management in a very specific context, as is the case of the Sahrawi refugee camps. To this end, a methodology is designed and proposed that consists of two major phases: a first one in which the specific context is analysed in order to achieve a real diagnosis of the problem and to know which ways are most appropriate to face the problem itself, and a second phase in which the CLTS methodology is adapted to the problem of waste management in refugee camps. In the latter, the three stages defined by the CLTS methodology are followed, proposing the use of various participatory techniques that lead the Saharawi people themselves to become aware of the problem and triggering the desire for change in the community, with the community taking ownership of the process and becoming the drivers of change and the search for a solution to the problem.

As a result of this study, the importance of the first phase of the methodology is concluded, since it is important to contextualise the problem in order to subsequently adapt participatory methodologies. Knowing the real context is the basis of the subsequent design and justifies the selection of the techniques and tools used. To this end, in this work, an analysis of the situation was carried out from various perspectives: micro, macro and field-work, which provides a more complete vision of the problem and a better understanding of it, as well as the limitations that exist. Specifically, the PEST analysis, the SWOT technique and two surveys were used. The first was used to collect quantitative information about the amount and type of waste (30 surveys in total) and the second to collect information about the perception of the Sahrawi community on the current waste problem and what means and measures would be most efficient to solve it (150 surveys); finally, a study of the characterisation of residues in the markets was performed.

Having analysed the information collected in the first phase of analysis and diagnosis, it was concluded that plastic waste, especially plastic bags, does indeed constitute the highest percentage of waste and that the community is aware of this fact. In addition, the results of the surveys show that the respondents believe that the main issue is the lack of awareness of the problem and that the best solution is to reduce the consumption of plastic bags by actively raising awareness among the community through training and talks in the *daïras*.

All of this justifies the adaptation proposed in this work of participatory methodologies for self-management of waste, specifically, of the CLTS methodology, since this is based on the idea that society itself must acquire an attitude of responsibility incentivising people to take action.

In this regard, the different participatory techniques and tools that are proposed to be used in each stage of the process (pre-triggering, triggering and post-triggering) are detailed in the case study. In the pre-triggering step, the community of the case study was selected. Due to demographics and accessibility reasons, the Boujdour *wilaya* was chosen, where 30 women participated. The triggering step consists of activating the desire of women to reduce plastic waste. This step combines different tools and dynamics. More concretely, for the self-analysis, three dynamics were used (see Figure 9): questions and dialogue for self-knowledge of the situation, a routine of generated waste and waste colour definition. For awareness, step two tools are proposed (see Figure 10): the first one consists of asking participants which type of waste they generate most and if they know how long it takes to disappear, and the second one consists of asking them to calculate how many bags they use in their lives. Finally, for the impact step, the facilitator offers a plate of goat meat and then shows images where participants can identify the blue colour of the plastic bags in the meat. In the post-triggering step, the community is visited again on a pre-established date. Facilitators should encourage and support participants in their actions. It is proposed that official visits (for example, the Ministry of Water and Environment, the *uuli* of the *wilaya*, media or religious leaders) are conducted that show interest and appreciation for what they are doing.

Thus, a methodology is presented that, even though it cannot be directly extrapolated to work in another context, since it is necessary to make a detailed analysis of the real situation of the specific problem (phase one of the proposed methodology), does provide a practical guide on how the CLTS methodology can be adapted to contexts other than purely sanitary ones. The success of this methodology resides on the selection of tools and dynamics that can effectively impact on the community. Then, the information obtained with a detailed and systematic analysis facilitates the adaptation of the CLTS methodology to new sectors. In this way, in addition to the proposal being adaptable to other contexts and problems, it contributes to the achievement of the SDGs defined by the UN through a practical guide that includes both the methodological design (definition of phases and stages and their sequencing) and the proposal of different techniques and tools in each of them that can be extrapolated and applicable in other contexts.

As future lines of research that can give continuity to this work, it would be interesting, on the one hand, to implement the methodology proposed here in the camps and carry out an a posteriori evaluation. This would make it possible to refine the methodology and make an initial analysis of its effectiveness. It cannot be overlooked that various methodological limitations appeared during this study: language barrier, strict protocols for security reasons and difficulties to find reliable quantitative data. For these reasons, a posterior assessment would provide insightful information to validate the suggested methodology and assess the achievements of the proposed objectives. On the other hand, the methodology could be adapted to contexts other than waste management, obviously after having carried out an initial diagnosis of the context. In effect, the philosophy of the methodology proposed here is that people are capable of self-organising and solving their own problems. This poses a challenge to the practice of international cooperation, which sometimes still errs towards trying to solve people's problems.

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