



## Article

# Using CLA to Participatively Explore the Urban Solid Waste Problem in Uruguay

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## Abstract

*This paper describes the Causal Layered Analysis application process as a participatory approach to address problems generated by urban solid waste in Montevideo (Uruguay). Its results allow us to reflect on the potential of the methodology as an instrument of deliberation and learning, as part of the spaces for collective participation and transformation and specifically as part of the waste problem.*

## Keywords

Complex Problems, Participatory Methodologies, Causal Layered Analysis, Urban Solid Waste, Uruguay

## Introduction

The problems generated by solid waste have grown exponentially since the middle of the twentieth century and have become one of the greatest environmental current concerns (Solíz, 2016). The delimitation and resolution of environmental problems, such as this one, are characterized by their complexity, by the interrelationship between local and global aspects, the multiplicity of potentially affected actors (and therefore diversity of interests, perceptions, knowledge, values and beliefs) and by the need to manage uncertainties and risks (Armitage, Berkes, & Doubleday, 2007). The processes to understand and act upon these problems have been moving towards inter- and transdisciplinary approaches, as well as towards citizen involvement or participation (at the very least in the search of the legitimate construction of public policies, although not particularly based on the search of substantive arguments) (Fiorino, 1991; Lázaro, Trimble, Umpiérrez, Vásquez, & Pereira, 2013).

Causal Layered Analysis seeks to integrate different modes of knowing: empiricist, interpretive, critical and action learning and it is also likely to be useful in developing more effective —deeper, inclusive, longer term— policies (Inayatullah, 2004). As Inayatullah said “As a method, its utility is not predicting the future but in creating transformative spaces for the creation of alternative futures” (Inayatullah, 2004, p.8). This methodology can be applied in participatory processes where it can encourage and contribute with inter and transdisciplinary strategies of policy analysis and solution planning. The main goal of its application in a participatory manner is to explore different ways of analyzing, thinking about and framing an issue, expanding the number and richness of possible scenarios, incorporating varied points of view and modes of knowledge, and integrating the population in the definition of the future (Inayatullah, 2004).

## Participatory Approach to Environmental Problems in Malvín Norte

Malvín Norte is a territory located in the southeast of Montevideo (Uruguay) inhabited more than 27 thousand people (INE, 2011). The population is socioeconomically heterogeneous, irregularly distributed and with varied

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origins and life stories. There are differences in land use and residential typology; some houses are middle class while others are precariously built or share land with other houses. Large uncultivated spaces, precarious settlements and areas with consolidated housing and cooperative complexes stand out (Fraiman & Rossal, 2009; Álvarez, 2014; Alvarado & D'Angelo, 2014). Informal settlements, most of the inhabitants are young, one of the most marginalized age cohorts in the territory (Fraiman & Rossal, 2009).

The School of Science of the Universidad de la República has been located in this area since 1999. In 2016, a group of educators from the neighborhood requested that the School of Science Extension Division address the issues of health, pollution and waste, which were very pressing problems in the territory. This topic has various social, cultural and health implications, and is closely linked to the environmental history of this area, to the sources of employment of many of its inhabitants, and to the fragility and vulnerability in which thousands of people live. Solid waste in particular has been a prominent issue in the neighborhood because there are entire families that, for several generations, have based their main source of income on the sorting and reselling of solid urban waste (Méndez, Gómez, & Iribarne, 2016). In response, the project for Participatory Approach to Environmental Problems was developed in Malvín Norte in 2018<sup>1</sup>.

One of the aspects considered necessary was to strengthen the link between the population of Malvín Norte and the different educational institutions in order to favor the development of collective actions, as well as to favor the integrated work of the different actors that make up this community. The main goal of the project was to contribute to the search for solutions and commitments in order to estimate short-, medium- and long-term measures around the solid urban waste problem, as well as to support the creation of environmental educational plans on that same topic. The proposal revolved around the application of the Causal Layered Analysis theory and method (Inayatullah, 2004, 2009).

Causal Layered Analysis (CLA) is based on the following premise: the way we frame the problems defines the possible solutions and the responsible actors for their transformation (Inayatullah, 2004). This method basically proposes to conduct a vertical analysis of four causal layers for the understanding of a problem, and a horizontal analysis of each layer in search of possible solutions and actors who could or should be involved in them.

The Litany level can be considered the most superficial level at which problems are recorded and commented on (the problems that arise from the area-territory or in the work-labor environment, educational, family or public spheres). It is the most visible or noticeable level of the problems and considers the daily, political or media manifestations of the problem itself. It is the level that is generally handled by the media (typically the headlines), and reflects the public perceptions that are usually generated after direct experience with the problem, or through the information transmitted by the media. The search for solutions, at this level, usually results in short-term outcomes.

The second level, called Systemic Causes (which we call Scientific-Technical Vision), is expressed in technical-academic analysis and provides causal explanations that generally translate into short and sometimes medium-term solutions. The economic, socio-cultural, political, historical and environmental dimensions of the problem are reflected at this level.

The third level, called Discourse/Worldview, deals with the cultural roots and ideologies that may be linked to the problems, and even be the ones that cause them. This third level, which is deeper, attempts to analyze and reflect on the different visions and values that are linked to the issue, as well as the models that we use to understand them or to react accordingly to them. It focuses on the assumptions from which the problems are manifested, that is, the discourse and worldview that legitimize and support them. At this level, the analysis and the search for solutions translate into medium- and long-term solutions since they involve reflection on (and cultural change towards) alternative worldviews. From this level, the need to incorporate the wider array of stakeholders involved and affected by the problem becomes evident; and with them, different ideologies, forms of knowledge and narratives also become evident.

Finally, the fourth level, called Myth or Metaphor, deals with the emotional or archetypal causes that sustain the worldview linked to the problem. These are the deep stories, the collective symbols, the paradoxes or the unconscious dimensions of the problem and are expressed in sayings, proverbs, set phrases or metaphors. At this level, solution analysis translates into the search for alternative symbols that lead to, and are linked with, alternative worldviews. From the analysis of the Worldview and Myths, alternative visions and myths can emerge with which to reconstruct the treatment of the problem and consider different scenarios for the long-term future.

## Methodological Strategy

Applying the CLA methodology, we set out to analyze the different causal levels of the urban solid waste problem in Malvín Norte and in Montevideo in general. At a first stage (during 2018), the project proposal involved the organization of two multi-stakeholder workshops for the collective analysis of the problem. There was also the involvement of undergraduate and graduate students at different stages of the project. The first of these, the Academic CLA (CLAC), focused on the vision and analysis of the academic sector linked in some way, directly or indirectly, to the general issue of waste. Others were summoned based on their disciplinary backgrounds and areas of action that could be linked to the analytical levels of the different causal layers of the CLA (the more philosophical and symbolic layers, for example). Thus, 34 professionals from the most diverse areas of knowledge participated.

We divided the group into different tables with 6 participants on each one of them (we sought to divide the tables having as much diversity of approaches and knowledge as possible on them). One person from each table would become the facilitator and another one the note-taker. Each level was allotted approximately 50 minutes and given some trigger questions to guide the discussion. At the end, a plenary session was held so that each table could share what they considered to be the most interesting aspects of their own process and results.

The second workshop, Territorial CLA (CLAT), focused on the area and was held with local stakeholders involved in one way or another in the issues regarding Malvín Norte. Thirty people participated: people from local organizations and social organizations that are present in the area, waste pickers and waste picker cooperatives, as well as members of local inter-institutional spaces in the areas of education and coexistence.

Unlike what we did on the CLAC, we tried to facilitate the work according to the different causal levels by dividing the day into two blocks: the Problems and their Causes in the morning (dealing with litany and systemic causes) and the Causes and their Roots in the second block (dealing with worldview and myths together). We also worked in Tables of 6 people with the collaboration of a facilitator and note taker on each. As each block finished, and during the break intervals, the note takers handed in their notes. At the end, a final plenary was held, for which some members of the coordinating team integrated the contributions from the tables into a CLA iceberg displaying an overview of the collective work.

## Results

The records of the contributions made by CLAT and CLAC participants allowed us to construct an analysis matrix for each layer, in which the input from both workshops was summarized. Similar comments were grouped together, generating different categories and dimensions of analysis. Tables 1-4 presents a summary of the main diagnostic elements that emerged in both workshops.

Once the results of the CLAC and CLAT workshops were synthesized and categorized, the synthesis was sent to the participants of both workshops and two new workshop instances were proposed to work collectively on their analysis and on concrete proposals for solutions (second stage). The intention of the research team was to use the synthesis as the basis for a more in-depth discussion with the actors involved, as well as to plan courses of action linked to some focal points that could be of interest to the different actors.

This second stage took place during 2019 and its main objective was to share the results with the participants and to advance collectively in their analysis, as well as in the ways or strategies to improve the problems. In order to do this, two new workshops were held where participants from CLAC and CLAT were summoned respectively.

Based on the presentation and discussion of the results of both CLA Workshops, CLAC participants decided to work on the basis of three proposals: waste management at the Universidad de la República; the need to establish connectivity and dialog between the different approaches, projects and actions linked to the topic; and the reflection, in a transversal way, on the multi-causalities, trans-disciplines and multi-scales in order to address the problem. Then, the results analysis workshop was carried out with the territorial actors, defining two central aspects to work on based on a participative mapping to position the possible solutions or actions to be proposed or developed in the area. Participatory mapping is a cartographic creation methodology generated from a collective construction. In addition to generating a product (a map) with great communication potential, it seeks to promote processes of collective reflection and redesign the link between the actors and the area (Ascelrad, 2008; Diez & Escudero, 2012).

**Table 1:** Main aspects that arose from the multicausal layered analysis that involved the participants of both CLA Workshops at Litany level.<sup>2</sup>

	<b>Dirty city</b> (especially because of plastics and bulky waste in Malvín Norte: burnt cars, scrap metal, pruning, furniture, appliances).	In bold, the headlines of what was registered at this level in both CLA workshops are highlighted.
	<b>Contaminated water and soil</b> (health problems in Malvín Norte: intestinal parasite infection, lead poisoning).	The details and insights of each item were mainly provided during that CLAT and they are in relation to the neighborhood situation.
<b>Litany</b>	<b>Existence of irregular dumps</b>	The need for Montevideo Local Government to improve the waste management system was a common element in both CLAs (more frequency in the collection, a change in the container system, to create a collection system that is not confusing, improve information).
	<b>Overflowing waste containers</b>	
	<b>Mismanagement</b>	
	<b>Inappropriate people behavior</b> ("lack of education"; "disposal of recyclables"; "waste pickers leave garbage outside the container"; "garbage is thrown into public spaces").	

**Table 2:** Main aspects that arose from the multicausal layered analysis that involved the participants of both CLA Workshops at Systemic causes level.

	<b>Socio-cultural and economic aspects</b> E.g.: Stigmatization and invisibility of the work waste pickers do; problems in the labor market (including the involvement of the whole family in the collection and classification); lack of consideration over the materials that are discarded; lack of sense of belonging to the neighborhood or to the community (in the specific case of Malvín Norte); "as a society we generate large quantities of garbage".	These aspects emerged in both CLAs. At CLAT, the need to revalue waste and dignify the work of the waste pickers arose strongly.
	<b>Policy Approach</b> E.g.: insufficient, discontinuous, contradictory and ineffective public policies; disconnection between the Science, Technology and Innovation (STI) system and policy formulation; lack of coordination between public agencies.	Although contradictions in public policy regarding waste arose in both CLAs, the rest of the elements are part of what was analyzed in the CLAC.
<b>Systemic causes or Scientific and technical level</b>	<b>Management aspects</b> E.g.: Invisibility of the industrial waste problem; fragmented solutions; confusing system; lack of control from the authorities; lack of information or good communication to the population: invisibility of the urban solid waste management chain.	These aspects that have mainly arisen in the CLAC. Unlike the Litany level, at this level, most of the contributions or diagnoses come from the CLAC actors.
	<b>Environmental and health aspects</b> E.g.: Contamination linked to tanneries, leachates, methane gas; evidence of lead poisoning and intestinal parasite infection in Malvín Norte; contamination of the Malvín stream in the neighborhood.	The general aspects were mentioned in the CLAC while the specific information emerged from the CLAT together with the experience of the territorial actors who participated here.
	<b>Educational aspects</b> E.g.: Lack of tools and strategies for environmental education; lack of training in waste management at the Universidad de la República; need to mainstream environmental education.	This aspect emerged in both workshops except for the critical view of the University itself that emerged from CLAC.
	<b>Problem approaches</b> E.g.: Absence of a systemic view; the diversity of actors involved is not reflected; fragmented responsibilities; lack of conceptualization of the problem and its multi-causality; lack of dialog between science and politics.	These aspects were worked with mainly in the CLAC. At CLAT, the need to generate multi-stakeholder meetings and dialogues was mentioned.

**Table 3:** Main aspects that arose from the multicausal layered analysis that involved the participants of both CLA Workshops at Worldview level.

<p><b>The very conceptualization of "waste" as "garbage"</b> and garbage as an inherent element of development</p>	<p>This element was discussed at the CLAC when discussing the development models.</p>
<p><b>Consumerist model</b> E.g.: Cumulative life model; problem of lack of time and immediacy; "waste consumption".</p>	<p>This emerged from both CLA workshops.</p>
<p><b>Emphasis on individual rather than collective or community</b> E.g.: Disconnection between people, neighbors or communities.</p>	<p>This emerged from both workshops. At the CLAC, the need to explore other forms of social links and networks was stressed. In CLAT the need to involve communities in the search for solutions emerged.</p>
<p><b>Plastic as a worldview</b></p>	<p>Plastic as a symbol of degradation rather than prosperity emerged in both workshops. In the CLAC, they worked on linking plastic to immediacy and the world of work.</p>
<p><b>Traditional linear model of development</b> E.g.: Lack of problematization of the idea of development and welfare; linear model of production, distribution and consumption.</p>	<p>Discussing the needs and well-being of people emerged at CLAT. The need to explore other ways of understanding development (and even ways that do not involve talking about Development) emerged at CLAC.</p>
<p><b>Worldview</b></p>	<p><b>Environmental education models</b> E.g.: Predominance of models based on the transmission of knowledge and content; disregarding the creation of what is meant to be "communal" and coexistence; education is neither problematizing nor attentive to ethical and political systemic aspects, nor to problematize consumption habits; dissociation of the emotional dimensions of the problem.</p> <p>This aspect was exclusively mentioned at CLAC.</p> <hr/> <p><b>Linear model of Science, Technology and Innovation</b> E.g.: disciplinary diversity when learning and acting around problems; technological optimism ("we will solve it with more Science and Technology"); emphasis on the treatment of waste and not on its non-production.</p> <p>Topic discussed exclusively at CLAC together with systemic framing alternatives and inter- and transdisciplinary methodologies.</p> <hr/> <p><b>Society-Nature Separation</b> E.g.: Predominance of anthropocentrism; urban development that does not contemplate spaces of contact with nature.</p> <p>This issue was raised at CLAC, although it was mentioned at some tables at CLAT.</p> <hr/> <p><b>Healthcare Hygienist Model</b> E.g.: Fear of alleged health risks from unpacked products.</p> <p>This was discussed at CLAC together with the use of plastic.</p>

**Table 4:** Main aspects that arose from the multicausal layered analysis that involved the participants of both CLA Workshops at Myths level.<sup>3</sup>

<b>Myths or Metaphors</b>	“Take, use and dispose”	This emerged in both CLAs together with consumerism. At CLAT it emerged as an alternative: "Recycling is resisting"
	"It's someone else's problem"	It emerged from both CLAs together with the lack of encouragement towards what is communal.
	"Residue from the cradle to the grave"	This emerged in CLAT along with its alternative: "residue from the cradle to cradle". These metaphors come from the Model of Circular Economy and were not contextualized in CLAT but they were in CLAC, where specialists in Circular Economy participated (although they did not use them for myths).
	"Clean and separated from the natural world"	It emerged from CLAC when discussing the Society-Nature separation and the Hygienist Model.
	"The more plastic the more prosperous"	They emerged from CLAT together with the use of plastic. At CLAC, the use of hardboiled eggs protected by plastic eggs was proposed as a metaphor.
	"Uruguayan people are dirty"	It was worked at CLAC hand in hand with the discussion over the assumptions about the behavior of our Society.
	"Out of sight..."	It emerged in both workshops while discussing the need to rethink and re-discuss the symbols of what is healthy, good, natural, recyclable and over waste management policies.
	"The waste doesn't s"Belong to everyone"	It arose from the CLAC in consideration of the need for alternative approaches to conceive multiple solutions and alternatives, as well as the arrangement of more human sciences to address these issues.

The first focal point intended to work on the essential short-term actions or solutions corresponding to levels 1 (Litany) and 2 (Scientific-Technical). Considering the results of CLAT, work was done on the following points: 1) Location on a physical map of endemic and recurrent dumps that must be eliminated (the resulting free spaces were dealt with in the following focal point: spaces of transformation). 2) Location on the map of health and environmental risk situations that require integral attention. 3) Location on the map of areas with challenges in relation to waste management (due to lack of infrastructure, for example) that require integral attention, while focal point 2 intended to work on actions and solutions linked to the deepest causal levels, corresponding to levels 3 (Worldview) and 4 (Myth or Metaphor). It was proposed to consider some of the counter-myths that emerged in the CLAT Workshop. For example: to change the "take, use and dispose" for the "to recycle is to resist"; or, in front of "the problem is not mine" use "the problem belongs to everyone". Based on these elements, the following points were raised, emphasizing concrete proposals and actors to be involved in them: 1) Selection and location on the map of spaces to be transformed (and in the process "transforming ourselves": learning, "visualizing the invisible", working collectively to seek deep solutions to the issue of waste). 2) Location on the map of possible areas for composting with organic waste and, together with that, possible community vegetable gardens. 3) Proposals for different activities that can be carried out to support the transformations (talks, workshops with different actors linked to the waste cycle, interventions, among others).

This participatory mapping allowed us to know those spaces that could host proposals linked to priority actions to address the problems and who could or should carry them out. It is understood that these actions will be the ones that make the development of longer-term transformation processes possible. In addition, several proposals were identified that are being currently carried by different public institutions, social and local organizations, and the need for coordination among all of them was highlighted. The participants showed their interest in continuing to work on the transformation of certain areas of the territory with specific proposals to improve coexistence, improve communication and call for the participation and involvement of other groups, as well as to develop proposals for collective learning.

## Discussion

We will focus on the experience and methodology of the CLA to discuss and explore some conclusions, especially those related to the contributions regarding the approaches to complex problems and their potential as a teaching-learning tool, specifically in the topic of waste.

The instances of citizen participation within the framework of debates about problems involving scientific-technical aspects, constitute in themselves valuable and innovative learning processes. Diduck (1999) even considers that this type of learning embedded in processes of citizen participation referred to environmental management can be considered a new model of environmental education understood from a critical point of view. Daniels and Walker (1996) show how the processes of deliberation aimed at making decisions on public affairs imply a social learning insofar as they involve reflection and debate on a certain definition and framing of the problem and the determination of alternatives and possible choices, putting beliefs and values into play. That is, the process (political and participatory) of deliberating and deciding what the problem is, what characteristics of the situation are relevant, what possible resolution strategies exist and what values are at stake inherently involves a process of social learning. The authors identify it as a form of collaborative learning, which goes hand in hand with current pedagogical trends. In this type of learning, the participants take on a more active role, and the "educator" figure is actually a facilitator or guide of a collective co-construction rather than a "teacher".

The application of the CLA in instances of participative problem solving makes this type of learning possible. The reflective processes that occur in the implementation of this collective analysis are a form of collaborative learning that contributes to the development of new ways of constructing critical views about the complexity of problems and can be replicated taking into account the diversity of actors and their areas of work, experiences and activity.

If the problem generated by waste is expressed differently at each level, so are the different models, strategies or approaches used to understand it. What environmental education strategy could be adopted in Malvín Norte in relation to the problem of solid waste? At the Litany level this dimension was expressed as the need to have more and better information in order to, among other things, know how to classify and recycle. At this level it is generally assumed that the problem is that people "lack information or knowledge" and that this (despite the way it is transmitted or shared) will help to solve the problem (in this case the problem of "lack of education").

At the Scientific-Technical level, the educational aspect emerged from the following elements: "providing more technical information"; "linking causes and consequences of problems", "involving educators and not only publicists", "generating effective information and visualization campaigns of actors, processes and territories that include waste pickers", "carrying out specific courses and training by sector", and "educating the consumer". The need to work with alternative ways of "understanding reality" (including the emotional dimension and art) also arose. At this level, participants explained the need for information to be based on technical knowledge and within the framework of a specific discipline or area such as environmental education. Hence, at this level, environmental education emerges as a specific discipline that should play a main role and be transversal in every training process. It must be aimed to know the causes of the problems and mobilize other human experiences such as the expressive and sensitive one. Thus, at this level, art and other extra-scientific disciplines contribute from their own acceptance of technical knowledge and their "evaluation of reality".

At the Worldview level, the challenges were different. If the problem is consumerism as a model, the solutions are to propose alternative visions or to problematize the model and how urban life is set ("there is waste because we consume badly") and to incorporate them into teaching strategies. If the problem is that we use plastic to "isolate" ourselves from the rest of nature and avoid contact with contaminating agents<sup>3</sup>, the solution is to problematize its use and propose alternatives, as well as to answer questions such as: Do we need plastic? How do we move towards a model in which we do not need so much plastic? Is its use linked to immediacy and the use of time? Or is it linked to the separation of nature and the hygienist model? If the problem, at this level, refers to the model, tools and formats, as well as the aims of education (reductionist, non-questioning nor critical, transmitter of contents, non-participatory, unidirectional) and specifically of environmental education, the solution is to question these models, to problematize education and to propose alternative models such as problem-based teaching, in projects or in collaborative learning spaces.

As for the Myth or Metaphor level, and from what emerges in the workshops, the following considerations can be made. If the myth (always thinking about the cultural-educational dimension) is "we Uruguayans are dirty", the

solution at the symbolic level is to analyze what it is to be dirty (is it to not value common spaces?), and to think of alternative myths that, from the symbolic point of view, help us transform the narratives about ourselves.

It was proposed as a myth that "recycling is dirty", and as an alternative the myth "to recycle is to resist", which can refer to resisting the consumerist model (it is worth noting that this alternative myth was widely supported and celebrated at CLAT). If the myth is "it's not my problem" and the alternative is "waste is a problem of and for everyone", we should visualize the scales and responsibilities of the system as a whole.

In levels 3 and 4 (Worldview and Myth or Metaphor), art and the emotional and symbolic dimension were appealed to, not only as a mere companion and tool for transmitting technical knowledge, but also as an essential approach for understanding the problem and for "questioning and imagining ourselves in alternative ways".

In general, the solutions that appeared are related to forms of collaborative work, debate and collective construction. These solutions coincide with those proposed by Gordillo and Osorio (2003) of "teaching to participate" or to get involved in the analysis and transformation of reality. In short, the longer-term challenge can be posed in relation to new forms of involvement and learning with others, either through collaborative learning strategies, incorporating other dimensions of learning (symbolic, emotional, psychological), working in local contexts (nearby), building urban spaces of coexistence. In these spaces of collective learning (whether stimulated or fostered by formal or non-formal education, or through projects and proposals of multiple origin), the disciplines -and their associated practices- are reconfigured since the key becomes the integration and exchange of knowledge and not the specific contents. The world of education would thus move from teaching to learning and, consequently, from content to practice, as J. Dewey (1938) proposed.

One of the suggestions of the analysis related to environmental education (and looking at the long term) is that it cannot be limited to working on concrete strategies of, for example, recycling or reuse, nor to just sensitizing or raising awareness about the importance of caring for the environment (perhaps useful in the short term). Many of the points in the analysis are based on the relevance of considering what our own responsibility is as consumers, or how we organize ourselves, what kind of notions of "development" and "progress" we handle, what kind of consumption patterns we have, how we use time and for what, among other aspects. In other words, environmental education, which we sometimes associate only with education linked to environmental care, should be linked to more philosophical, political or social exercises of reflection and problematization. In this sense, and continuing with the focus of the analysis in layers that facilitates the connection between different dimensions, environmental education should not be conceived "isolated" from other spheres of education, which reinforces the idea of inter and transdisciplinarity.

It is also interesting to point out the potential of the CLA methodology as a way of promoting the construction of a critical view of a common problem and the collective proposal of alternative solutions. Integral, inter- and transdisciplinary approaches present the difficulty of dialog and collective construction between "different" people, as well as integrating different forms of knowledge (based on experience, science and technology and more theoretical-philosophical reflection on underlying worldviews). The application of a methodology such as this can be useful since one of its goals is to integrate these different forms of understanding and analysis of reality. In this sense, and starting from the contact between the humanistic and the scientific-technological culture as one of the objectives of STS education, it can be said that CLA encourages it.

In summary, the CLA, as a tool for a collective approach to a complex problem, allowed the expansion of spaces for analysis and the redefinition of ideas about the future and present legacies, based on the construction of knowledge anchored in the territory and the community. Likewise, it allowed a deeper and more comprehensive approach to the different dimensions that support and are interwoven in this complex problem.

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## Notes

- 1- An interdisciplinary team made up of teachers and researchers from the Schools of Sciences, Social Sciences and Chemistry (Universidad de la República) as well as social educators from the Youth and Adults Education Center number 6 (National Public Education Administration-Central Directing Council [ANEP-CODICEN]) was developed. The project was financed by the Sectoral Commission for Extension and Activities within the Universidad de la República and was developed within the framework of the Eco-health Project in Uruguay, financed by the Interdisciplinary Space of the Universidad de la República.
- 2- The terminology used by the participants was kept; they used the terms "waste", "garbage" or "rubbish" interchangeably to name that which is no longer used, has no value or ends up in a landfill.
- 3- The terminology used by the participants was kept; they used the terms "waste", "garbage" or "rubbish" interchangeably to name that which is no longer used, has no value or ends up in a landfill.
- 4- A CLAC participant puts as a possible cause of this problem the hygienist model of public health that emerged in the 17th-19th century, based on the "miasma" paradigm, which held that the health-disease processes of human populations were determined by water, air and soil contamination. This paradigm led to various practices aimed at limiting contact between bodies and the environment, in order to prevent miasmas from entering bodies. Steps 7&8 of the model are out of scope of this research ... the well-connected distribution grid of the future of electricity, based on distributed and small-scale production at the place of consumption, provides a platform for increasing the choices for customers/consumers. A super grid with centralized, inclusive, and large-scale governance will not be relevant. In the future energy grid, energy consumers are energy producers (prosumers) and we will face "a large numbers of self-governing consumers without the reliance (or with minimum reliance) on the network" or "many small self-regulating mini-grids". At the same time, they are integrated into a complex energy system.

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