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Translation and analysis of some documents from Spanish into English and from English into Spanish for a public university's library during the first quarter of 2022

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Abstract

The purpose of this investigation project is to Translation and analysis of some documents from Spanish into English and from English into Spanish for a public university's library. To gather information to achieve the main and specific objectives, a series of instruments were created. This project was conducted under the notion that translation should be part of the publishing process of any document. With the help of mentioned instruments, the researcher should be able to highlight the importance of translation.

The translation of the documents from Spanish to English and from English into Spanish, is a way to reach different audiences that are interested in these topics. The researcher hopes to give access to people who need the information inside the documents, however they are unable because they do not speak the language it is written on. To reach well develop and faithful translation, the researcher will conduct a series of analysis that focus on different aspects of the translation process. During this investigation it is considered the different fields that the documents belong to. The element of the translation process facilities the translation of future projects.

Resumen

El propósito de este proyecto de investigación es la traducción y análisis de algunos documentos del español al inglés y del inglés al español, para ser entregados a la biblioteca de una universidad pública. Para esto se han creado una serie de instrumentos para recolectar información que ayude con la obtención del objetive principal y los objetivos específicos. Este proyecto se condujo con la idea principal de que la traducción debería ser parte del proceso de publicación de todos los proyectos y documentos. Con la ayuda de estos instrumentos, el investigador deberá ser capaz de destacar la importancia de la traducción.

La traducción de algunos de algunos documentos del español al inglés y del inglés al español, es una de las formas de llegar a diversas audiencias que se interesen en estos temas. El investigador espera darle acceso a quienes necesitan la información dentro de estos documentos, que de otra forma no serían capases de obtener, ya que no hablan el idioma en el que fue escrito. Para obtener una traducción fiel y bien desarrollada, el investigador conducirá una serie de analysis, los cuales se concentrarán en diferentes aspectos del proceso de traducción. Durante esta investigación se le prestaron mucha atención a los ámbitos a los cuales estos documentos pertenecen. El analysis de estos elementos de traducción facilita la traducción de futuros proyectos.

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Introductory Framework

Translation has been at the heart of history for centuries, ever since the Mesopotamian era with the translation of the poem "Gilgamesh." Translation has been present in many aspects of society, from communication, business, and even religion to cultural encounters. This discipline provides access to communication and boding among different societies, something that history has witnessed when Buddhist monks translated Indian documents into Chinese to transmit knowledge. Translators have always been silent in their communities that give individuals access to intellectual contributions of knowledge, new ideologies, and ideas. In history, some accredited translators were monks and academic writers that knew the importance of sharing their knowledge with different cultures and communities.

In more modern times, during the industrial era, it was evident the need to make economic and business deals with countries, so translation acquired an acclaimed position among the business worlds. In the industrial era, the internet has revolutionized the spread of knowledge around the world. From this movement, scholars and academics saw the opportunity to expand their studies, with the help of translators, to reach communities that, otherwise, would have not access to a vast part of investigations worldwide. Moving history closer to home, Costa Rica has never been known for its work in translation, as literary works tend to be distributed only nationally due to the lack of its translation. In Costa Rica, the translation academic programs are an ever-growing movement that somehow has stayed in the shadows.

In this country, translation has a very structural platform; however, these talents and services are often offered to outside sources of content, due to the lack of interest or accessibility that Costa Rican authors must expand beyond their borders. Unlike the rest of the continent,

Latin America, and the USA, Costa Rica has not made huge advances when it comes to including translation as an essential part of every piece of literary work. Among the Costa Rican community, there is exist a stigma, as some people consider that if a person can speak or, at the least, understand more than their mother language, then they should be able to have access to more advanced information from other countries. However, people from other countries that perhaps need information or are interested in literary works from our country, may not have the opportunity to be involved in Costa Rica's written artworks. This mindset is very harmful to Costa Rican culture, as these works, that showcase the immense beauty and knowledge of this country, may not reach wider audiences.

In this chapter, the researcher will state the importance of translation among all fields of written works. To showcase its importance, that researcher chose various texts concerning environmental problems all over the world, as well as come documents concerning COVID-19 safety in school. These documents will be translated, so that this value and relevant information reaches more audiences, and most importantly people who will take advantage and work towards a solution. From this process, not only the researcher will enrich her knowledge, but also, at the same, people living in Costa Rica whose first language is English, and those who have access to the public library will benefit from finding these documents in their native language.

1.1 Problem Statement

In this investigation project, the researcher translated some documents from English into Spanish and from Spanish into English for a public library. For this research project, translation procedures and translation methods were used to translate these documents. These procedures and methods were also analyzed thoroughly to assess the translation with care. These analyses are conducted to learn more about the importance of translation in different fields. In addition, every

document must be translated to at least one language before or shortly after being published. Moreover, the main objective of this investigation is to translate important information regarding environmental issues and COVID-19 safety to aid people to access valuable information in their native language.

Even though translation has always been present in history, society has looked over it, not giving it the importance that it holds. “This represents a serious problem because the lack of said assessment has an impact in the professional recognition of translators and interpreters before the law and the public” (Segura & Zúñiga Hernández, n.d.). This neglect towards translation damages the occupation, as not many people would be interested in a field they rarely hear about, so the number of translators is very little, resulting in current translators being overworked. Because of this reason, national and international authors do not see the translation of their documents as a necessary step in their publishing process. Therefore, many of their work never reaches international audiences that may benefit from a variety of studies.

Translation procedures and methods are the center of this investigation, as they would highlight the importance and vitality, they have in the translation process. From this point, it is expected that by investigating the main components of translation and its importance in all fields of life, can be acknowledged. One of the main queries of this investigation is how to demonstrate that translation should have an important position in every document's publishing process. “Translation is necessary for the spread of information, knowledge, and ideas. It is necessary for effective and empathetic communication between different cultures” (The Importance of Translation Studies, 2018). One of the main reasons people do not think translation is important is because they settle for the information that can be accessed easily, instead of expanding their knowledge and culture.

This investigation project, even if overlooked and underrated, is achievable by the analysis of methods and procedures and by the dedication of the researcher. Moreover, this investigation is very attainable, as people from this field fight every day to spread information and the importance of translation. The translation line of work is not very crowded, so workers from the inside tend to encourage people to join in and find the incredible importance that translation holds. This project is born from the lack of information and interest people have about this field. “People also take that for granted, realizing that most will have to confine themselves to their own culture without translation. We’d be very confined and couldn’t get to know other interesting cultures and experiences” (LOGIN, 2020). From this investigation, it is expected that by translating important documents with valuable information, the public will take notice that without their translation, they would have not access to these documents.

1.2 Objectives of the Investigation

1.2.1 General Objective

To analyze translation procedures and translation methods used to translate and analyze some documents from Spanish into English and from English into Spanish for a public university's library during the first quarter of 2022

1.2.2 Specific Objectives

- To translate some documents from Spanish into English and from English into Spanish for a public university library.
- To analyze the translation methods and translation procedures found in both texts.
- To apply translation methods and translation procedures to achieve an accurate translation.

- To create a glossary with the most important terminology found in all the documents.

1.3 Justification of the Study

Currently, society gives translation the importance it should have. Nowadays, there is no trouble when it comes to having access to written works in different languages. As time passes by, translation has been more present in the literature of any kind. However, for a book to be translated, it is required to obtain the rights from the author and the publishing house. All these factors portrait an obstacle when it comes to translation, a problem that may not be present if translation carries the importance and presence it should have. Still, due to the demand for these literary and academic works, translation is on its way to obtaining the place it needs in modern written works.

For this investigation, the researcher saw fit to analyze the translation techniques found in an environmental and covid related project, given the current situation in the world. Due to the factors that affect life on earth every day, these documents have great importance when it comes to keeping the public up to date with the current discussion. As a result of their importance, the need to translate such documents. This process is necessary, so f~~or~~ the people who are interested in these subjects, can obtain information that can give them a broader view of what is going on in the world. Through analyzing the different techniques that can be found in such documents, the translator can make sure that every detail or term is translated perfectly to fit the reader's desires of acquiring knowledge.

When translating the documents chosen for this investigation thesis, the researcher can face certain difficulties when it comes to finding the equivalent to some terms within the environmental jargon. As for the document, *"Construction and Demolition Waste in Romania: The Route from Illegal Dumping to Building Materials"* the translator can find jargon terms from

finance to politics and even wasted management. Taking into consideration the importance these types of documents play in future investigations and environmental projects; the translation techniques must be analyzed carefully. Such translation techniques as modulation, transposition or amplification can provide the target audience with a very in-depth and complete meaning of the original work. When working with documents that have important information small details must be analyzed carefully, as the translator needs to convey not only the idea of the original text but also the meaning behind it, which inspires people in the first place.

1.4 Antecedents

Translation in Costa Rica is one of the aspects of our culture that tends to be forgotten. As explored in Miguel Angel Vega Cernuda's investigation (2008), Costa Rican Literature has reached countries across the ocean, all the way to Spain. However, works like "Su Quijongo" by Max Jimenez tend to be filed in forgotten library slots due to their lack of translation. Such fine documents do not reach broader audiences, because translation is not an essential part of the publishing process. Miguel Angel Vega, in his investigation, proposes the idea that translation not only should be part of Costa Rica's literacy but also that it should be considered part of the citizens' memories, as it holds much cultural value.

Moreover, in his investigation, Miguel Angel Vega explores the idea of how the economic, social, and cultural context of our country has led translation to be put in the background, as the general reading public, of a few decades ago, may not have been interested in overseas literary works. This resulted in a lack of translation awareness, both from international and national counterparts. With a lack of interest in international literary works, translation never became a factor in our society. Due to this, future writers never consider translation as an essential part of their process. Miguel Angel Vega's main objective is to get the current general

reading public to recognize translation as one of the main components in literature, so in that way future writers, generations can expand further.

The significance of regarding translation as an important factor in society is not only reflected in our country. In an international thesis investigation under the name *"The Analysis of Translation Procedures in Subtitles Hachiko Movie"* written by Syarif Hidayatullah, it is proposed the idea of how even in something as simple as a subtitle, translation and its procedures are present and important. Sayrif processes the idea of investigating the translation procedures found in the translation of the subtitles in the movie Hachiko. One of his main objectives was to demonstrate the importance of translation and its procedures to convey the message of the movie and reach broader audiences. One of his main findings of how to convey a full message to the audience is the use of additions and transposition to accommodate the target language structural patterns.

Another investigation thesis under the name *"Analyzing Student's Translation Procedures in Translating Short Story Entitles "The Story of An Hour" By Kate Chopin into Indonesian"* written by Ummi Lathifah, it is explored the idea of translation as the center of international human interaction. As they create this idea, they establish translation as one of the most important aspects of society's education and cultural buildup. One of their main objectives was to demonstrate how translation procedures, even if used in other languages, play an important part to convey the right message at the end. In this case, the investigator, through a series of different translations, managed to determine that modulation was the most used procedure by students, as it deals with accommodating the target language.

As mentioned before, in previous theses and investigation works, it has been established that translation is an essential part of our culture and society, and it should be treated like such. In

Juan Pablo Arias Mora's investigation thesis, *"Trasliteracion, traduccion y deconstruccion: Mas allá de los límites de las lenguas,"* the fact the translation is ~~as~~ an important part not only of culture, but also of sports, is explained and put into context for outsiders. The subject of this investigation is the translated version of the "Taekwondo Textbook" used to spread the knowledge of this sport. Juan Pablo, the author, managed to use transliteration, modulation, and the theory of deconstruction to demonstrate how important are the translation procedures to naturalize these types of informational text. This is one of the most effective ways to expand and experience other cultures to enrich ours, as these types of texts need to be translated and accommodated to each target audience.

To follow the idea that translation should be part of every publishing book process, Ligia María Brenes Jiménez's thesis investigation *"Revising and Editing for Translators, de Brian Mossop: Cambios en una traducción funcional de un texto no literario,"* explores the importance of a translation guide. This investigation goes to show how even the author of a translator's guide thought to translate their work. This investigation shows the importance of reaching Latin American audiences with the principles of translation, to demonstrate the lengths to which literary and non-literary works can reach when they aim to accommodate every audience. This objective was achieved through analyzing the necessary changes to accomplish the functionality of important texts in different cultures and societies.

1.5 Scope

The main objective of this investigation is to translate some documents for a public university library. Such documents are relevant to the current states of the world. The documents deal with environmental issues and COVID-19 safety in schools, two of the most relevant topics in today's media. Because of their importance, the researcher expects that more people, through

the newly gained access to these documents and their information, can acknowledge the importance of translation in national and international published documents. As a result, the researcher expects that the translation of these documents reaches its intended audience, that will appreciate their importance.

The second objective of this investigation is to analyze translation procedures and methods. For this objective, the researcher hopes to find more information about these factors, to develop the translation of these documents. Significantly, the message is transmitted, but it is also expected that, through the translation procedures, all the valuable terms and pieces of jargon get transmitted accurately. As a result, the researcher hopes to find valuable information about translation procedures and methods to be more prepared. The third objective is to apply information obtained from the analysis of the translation procedures and methods to the translation of the aforementioned documents. It is expected that by applying this newly obtained information, the researcher has an easier experience when translating such technical documents.

By putting into practice these procedures and methods, the researcher hopes to attain a very thorough translation of technical terms that can be found in the documents. As a result, the researcher hopes that these important factors provide a pathway to render the best translation. The last objective of this investigation is to create a glossary. For this objective, the researcher hopes to pick valuable and relevant technical terms. It is also expected that the definitions are accurate and clear.

Chapter II

Theoretical Framework

In this chapter, the relevant elements that can be found when translating are discussed and thoroughly analyzed. This investigation project is conducted under several objectives regarding the documents to be translated. Those elements, including translation procedures, translation methods, and glossaries, are expected to provide a cohesive and thorough translation of said documents. The translation procedures and methods were carefully selected to obtain the most from the investigation. The documents selected, deal not only with environmental issues but also with COVID-19 school safety. Due to the relevant topics, it is necessary to render accurate, cohesive, and natural target texts and thus, inform the audience.

2.1 Text Analysis

As a way to introduce the contents of this chapter, the investigator considered it relevant, to begin with, the text analysis. Text analysis allows the translator to form an outline of how the text looks, and how it will look when the translation is done. From this analysis, the translator acquires an idea of what is the main point of the text, which helps the translator to focus on what is the most important. The "Translator analysis of internal and external textual factors contributes to the knowledge of external and internal text factors of the source text and enables the translator to better understand the text itself, its function and aim" (Seresová & Breveníková, 2019). Text analysis is a group of research methods to understand, deconstruct, and analyze a text.

One of the advantages of text analysis is the fact that the translator can recognize future errors that they may encounter. By having the upper hand on the text, the translator can prepare in advance. This is an important aspect of the translation process because the translator will deal with the structures of two languages. By using all the aspects that come with text analysis, the

translator can follow a structural path to ensure that the text will never lose its styles, grammatical structure, function, or semantic purpose. The combination of all that gives, as a result,-a cohesive and thorough translation in both languages.

2.1.1 Text Styles

Text styles are a combination of elements that help to categorize different styles of text. This categorization completely changes how a translator will approach the text. Each text style has characteristics that shape the text, and therefore, it changes the way the audiences see it. As each of the styles has its features, each text that falls into any of these categories needs to be approached accordingly. Even if the ideal situation is that a document only has one style, it can be found a combination of different styles. There are many styles, however, four of these take the spotlight, as they tend to be the most used among writers.

It has to be stated that the style "Gives both the author and his text a voice, allowing works of all genres and topics to be shared and expressed in ways that are memorable, intriguing, and different" (Style, 2016). Whether it is a piece of literature, an academic text, or even poetry, each text has its own or a combination of different styles that make it unique. The main four text styles; persuasive, narrative, expository, and descriptive, allow the translator to be prepared and to know what to expect from the document. Text styles allow the text to have autonomy and to stand on their own, but at the same time, it allows them to be categorized, making it easier for the translator to analyze them.

2.1.2 Stylistic Scales

Stylistic scales are a group of text styles that set the mood for the text. These scales are imperative to the translator, as this allows them to be consistent throughout the whole text. This is

very important, as it results in a cohesive and consistent translation. As for the reader, this type's stylistic scale allows the reader to be immersed in the text, without having a clash of moods and settings. These scales set the scale of formality for the text.

2.1.2.1 Scale of Formality

The audience can comprehend better this scale, which according to Peter Newmark, there are five arrangements of formality: simple, popular, neutral, educated, technical. “An established form or procedure that is required or conventional” (Merriam-Webster Dictionary, 2021). All these arrangements play a role in each language that allows or limits the use of slang or idioms. A neutral and popular scale allows not only the writer, but the reader, to have a more relaxed experience. Since there are not that many technical terms or confusing sentence patterns, that may require a certain level of education. These two scales of formality also allow the translator to have a smooth translation.

A text with a popular or neutral scale presents an easy challenge to the translator, as they do not have to worry about technical terms. On the other hand, an educated or technical text presents a challenge to the translator. Even though these scales are very important to convey the type of information they require, these scales need more attention. The audience may not need to be experts in the topics that these scales typically found themselves but bet they do need a major attention span than the other. As for the translator, these scales require twice the work from them, as it requires investigation, definitions, and a certain level of understanding of the topic. However, these challenges ensure that the translator pays close attention to the text, resulting in a very complete translation.

2.1.2.2 Scale of Generality or Difficulty

This component of the text analysis determines the complexity of the text. According to Newmark (1998), there are five scales of difficulty: simple, general, neutral, educated, technical. The simple scale deals with texts that do not contain jargon and contain everyday modern vocabulary. Neutral, as the name suggests, is a middle ground in text, where the topics and vocabulary it is either too simple or too advanced. The educated scale contains high school and college-level information; and finally, the technical scale is found in instruction and operation manuals.

2.1.2.3 Scale of Emotional Tone

This scale refers not only to the temperament of the text but also to the vocabulary used when written. This scale helps the translator to have a better understanding of the text, as well as how seriously the text takes the topic of the document. According to Newmark (1998), there are three scales of emotional tone: intense, warm, and factual. The intense tone tends to utilize intensifiers in their vocabulary because the writer needs that the message of the text reaches the audience. The warm tone usually deals with more emotional and delicate matters, using a gentle vocabulary to jolt the audience. As for the factual tone, it tends to be a combination of the previous ones, as it intends to convey the message with urgency, but with a more gentle and calm vocabulary.

2.1.3 Text Function

Text function allows the translator to understand the intention of the text, as it also helps the translator to know what kind of target audience the text is intended for. In addition, the translator can know from this element what kind of generality scale or emotional tone is more appropriate to use in the translation process. These text functions are the most important part of

the text, as they set how the message is sent. According to Newmark (1998), there are three kinds of text functions: informative, expressive, and evocative.

2.1.3.1 Informative

This type of text deals with a lot of information, as it represents textbooks, newspapers, scientific documents, technical documents, etc." Informative text offers us facts about reality, physical and chemical phenomena, history, sports, shows or almost any subject" (What are the informative texts? 2019). These types of text tend to present a challenge for both the translator and the reader. They contain a large amount of jargon and sentence structures that the general audience is not used to. These texts require a large amount of research on behalf of the translator, as they need to be knowledgeable on the topics presented.

2.1.3.2 Expressive

The expressive texts contain topics and vocabulary that tend to reflect and resonate emotions. These types of texts not only represent the author's emotions, but they also represent the reader's emotions. According to Newmark (1988), for a translator to translate an expressive text, they must identify which of the three categories they belong to. The three types are divided into imaginative literature, authoritative statements, and autobiography essays. Imaginative literature is one the largest in this category, as it entails genres like poetry, fiction, play, and short stories. Moreover, authoritative statements refer to official or governmental documents. These texts, even if formal and factual, represent the ideals for the near future. They are passionate, meant to inspire people that read or hear them. According to Newmark (1988, p. 39), "these are texts of any nature which derive their authority from high status or the reliability and linguistic competence of their authors." Autobiographies are a special kind of text, as they not only retail

the life of the person but are also written by them. This text tends to resonate a lot with the audiences as they are often familiar with the author of the autobiography.

2.1.3.3 Vocative

A vocative text expresses a message to those who read it. It is also used to persuade or make a call to action to its audiences. These texts often use a very specific vocabulary to convey emotions about certain topics. These emotions can be either positive or negative, depending on the intention of the author. “Notices, instructions, publicity, propaganda, persuasive writing (requests, cases, theses) and possibly popular friction, whose purpose is to sell the book/entertain the reader, as the typical "Vocative text" (Newmark 1988, p. 41). For the translator, the vocative text can present both a challenge and an easy job. It may present a challenge, as the translator can have a hard time when trying to relate to the author’s voice. At the same, as it tends to be more emotional, the translator’s voice may blend into the original text. However, it could also be an easy job, as it does not contain any technical or jargon terms.

2.1.4 Translation Methods

Translation methods are a series of approaches that a translator uses to obtain different results in each translation. Each text conveys a different message given by the author, as a result, each of them carries a particular and unique meaning. For the translator to convey such meaning and intention, it is necessary the use translation methods. Each method allows them to view the text as a whole. This is imperative when the translator is finding the best path to translate the text.

2.1.4.1 Semantic translation

According to Newmark, ‘semantic translation attempts to render, as closely as the semantic and syntactic structures of the second language allow the exact contextual meaning of

the original' (1981, p. 39). Semantic translation attempts to convey the meaning of the text. However, how the translator chooses to convey this meaning should always obey the grammatical rules of the target language. Even though the meaning of the text is the most essential part of the semantic translation, it is also important that it sounds natural and cohesive to the reader. This type of translation manages to guide the readers through experiences they have never had. The semantic translation may present a challenge for the translator, as the meaning of the original text could get lost in the process if the translator did not pay attention. However, this type of translation is the most used, in areas like literature, as the author's ideologies and concepts arrive almost intact to the audiences. Semantics translation manages to give a universal experience. This type of translation defines the job of a translator, as their objective is to deliver the author's voice back to their international audiences. However, as Newmark remarks (1988), "a semantic translation is always inferior to its original since it involves loss of meaning" (p. 42).

2.1.4.2 Communicative translation

Communicative translation, unlike semantic translation, will make any change possible to the text to give the audience context meaning to the text. This type of translation tends to go straight to the point of the original text. This is achieved by not adding any extra information or structure to the target text. As this type of translation does not require the translator to conform to the grammatical structures of the target text, they are freer when it comes to choosing their words. Communicative translation focuses only on producing the same effect in all audiences. A communicative translation tries to convey the core context that the author intended. "Generally, a communicative translation is likely to be smoother, simpler, clearer, more direct, more conventional, conforming to a particular register of language, tending to under translate" (Newmark, 1988, p. 39). Through this journey, the translator manages to give the audience all

the information they need to have the same experience while reading. This type of translation tends to be more reliable and understandable by the audiences, as it does not contain extra information to make it relatable. It contains only the amount of information they need, as a result, the readers do not get confused or lost while reading.

2.2 Translation Procedures

Translation procedures are a series of techniques used by translators to achieve a cohesive and faithful translation. "Translation techniques are methods of linguistic transference of the most relevant parts of the source language text that the translator must use to achieve equivalence." (Delisle, 1999). These procedures allow the translator to analyze the text and make the best decisions to give the audience the best results. These techniques allow the translator to tackle the translation in sections, ensuring a thorough translation. By addressing the translation in smaller parts, rather than the whole as a unit, the translator manages to find minute details, that otherwise would be hard to find. Moreover, translation procedures are a conscious process in which the translator chooses the best factors to solve a translation problem. *"*A potentially conscious procedure for solving a problem faced in translating a text, or any segment of it" (Loescher, 1991). These procedures help the translator to visualize patterns and important factors that may be overlooked with translation methods. In the next segment of this chapter, each translation procedure is explained. In addition, it is going to be detailed, how the translation procedures are used by the translator to achieve an accurate translation.

2.2.1 Transposition

Transposition is a translation procedure in which the translator changes the grammatical structure or category of a word in the target language. This change is conducted when the translation of the source text does not fit into the grammatical structures of the target language.

"Transposition is a procedure by which the translator replaces a part of the speech of the source language for completely different target language speech without losing the message of the source language" (Vázquez Ayora, 1977). By making these changes, the translator only wishes to create a natural text read, and not to change the meaning or context of the original. According to Newmark (1982), there are three types of transposition, the first one being the change from singular to plural. ~~Peter~~ Newmark demonstrates this procedure with the next examples; Furniture = muebles. This change is required in certain contexts, in this case, any piece of furniture always comes in a pair or a bundle; however, the exact translation of the word does not fulfill the whole meaning of the word. The second type is when the translator does not find a correct grammatical structure in the target language, finding themselves obligated to change it. For example, "She has been participating vigorously in…" "Ella ha tomado un parte muy activa." The third type exposes the problem when the translation of the source text is correct, but it does not sound natural in the target text; for example: "He will soon be back", the exact translation would be: "Estará de vuelta pronto;" however, in the target language sounds more natural to say "No tardará en venir."

2.2.2 Modulation

Modulation is the process in which the point of view of a sentence is changed, without losing its meaning. The perception of the text is changed to how it was originally written. However, to the reader, it is the same context and connotation. "A variation through a change of point of view, of perspective and very often of category of thought" (Newmark, 1982 p. 88). This change in perspective needs to be carefully assessed by the translator, as there can be a loss of meaning or even misunderstandings. This technique is very commonly used, as the translation of the source text changes more than one component in a sentence. Modulations can be very subtle, as only one or two-component change in every sentence, for example: "A cop stopped me and

asked to see my papers" these sentences assessed through modulation would be "Un policía me detuvo y me pidió identificación." This modulation is very little, but with a simple change in the semantics of one word, this sentence changed to fit in the target vernacular. However, modulation can make huge or even complete changes to a sentence, for example: "At arm's length" to "Al alcance de las manos." Modulation can be very tricky for translators, as it requires them to have a big understanding of the target language.

2.2.3 Omission

This translation procedure allows the translator to delete or not include certain words or parts of the speech. These words or parts of the speech are taken out of the translated version, as they do not add importance to the target text. These omissions can also be found when in the translated version of the text, certain words may add way too much information, therefore they are taken out. This procedure, unlike the others that have been mentioned, only seeks to provide the reader with smooth and easy reading. It does not seek to change or modify the sentences. Moreover, this procedure allows the translator to play around with the natural sound of the target text. With this example, it can be observed, that even the smallest change, translation can go from being literal to being natural: "I can hear music in the next room" translated to "Oigo música en la otra oficina." A simple omission of a subject can sound natural to the readers. With omission, the translation can take out certain words, pronouns, or even verbs, that while they may have an equivalence in the target language, may not sound correct depending on the context of the text. In addition, some of these aspects may not sound correct to the target audience of the text; therefore, it is better to create a universal experience, for everyone's enjoyment.

2.2.4 Amplification

Amplification is the procedure by which the translator adds extra information that may be lacking from the translated form. Amplification is helpful when there is a lack of equivalence in the target language; therefore, the need for adding information. This procedure also helps when the source's text may be lacking in structure, as the translator can take liberties and add what it is missing. This factor is essential, as the target text needs to be an enhanced version of the source text in this scenario. Amplification, however, should never change or modify the meaning of the original text. In the next example, it is evident that the translator added certain factors to the translated version, as the original text, may not resonate well with the target language. “I wonder about that” translated through amplification to “Me pregunto si eso es verdad.” In this case, amplification replaces “that” from the original text, as it is not very specific and does not give much information. With amplification in the translated text, the translator managed to avoid misunderstandings and confusion for the readers. With this procedure, the translator manages to create a comprehensible text, even when encountering equivalence or grammatical structure problems.

2.2.5 Explicitation

In this process, the translator aims to provide a better explanation of what is implied in the source text. This is achieved by using extra vocabulary, without changing too much from the original text. This procedure is helpful even when the translated version of the original text does not convey the whole meaning of the original. Such a procedure tries to replicate what is implied in the original text. An explanation is useful when there is a lack of vocabulary either in the source or the target language. This procedure only aims to further the context and meaning of the original and not change it completely. In the following example, it is evident that the original text

uses an idiom, that will not translate well in a literal translation, and it does not have an equivalence. However, with explicitation, it is possible to achieve the same meaning and context of the original. “Ten grand attached” translated through explicitation to “Diez billetes de los grandes como recompense.” Explicitation allows the translator to replicate the feeling and context to the target language readers.

2.2.6 Literal Translation

Literal translation is one of the first and easiest processes that a translator is exposed to, as it does not require much change from the original text. “Literal translation is the easiest procedure of translation, it can function whenever the two languages have the same equivalent words or phrases, which is rare, as mostly all languages have differences in lexicon and the grammatical or linguistic style” (Vachon-Spilka 1968). Literal translation only works in a correct way when the sentence to be translated has the same grammatical structure and order in the target language. This presents a particular challenge because when translating into Spanish there is a 20% increment in words, which would not make it a literal translation. This type of translation is usually not the best option, as it does not take into consideration how words work with each other. In the following example, it is shown that while the literal translation of this phrase has an equivalent in the target language, it does not make sense in the target language, “Te estoy tomando el pelo” literary translated to “I’m taking your hair.” On the other hand, the following example shows a literal translation that works, given the grammatical structure of each language. “The boy is in the house” literary translated to “El niño esta en la casa.” Literal translation is often present in a regular translation; however, a translator should never rely only upon this procedure, as it jeopardizes the faithfulness of a translation.

2.2.7 Punctuation changes

Punctuation changes are a factor that tends to be overlooked, as it usually transfers very well from one language to another. “Punctuation marks are integral parts of writing. They do two jobs. One is grammatical, and the other is rhetorical (Kirkman, 2006)” While punctuation marks may not modify a sentence that much, there is enough change for the reader to notice. Even if punctuation marks are used differently in every language, they have the same connotation across almost every language. To have a cohesive and natural translation, there must be an accurate platform for punctuation marks. “Creating a TL appropriate surface structure includes the formal aspects of punctuation, such as different spacing before and after a punctuation mark, and syntactic differences between two languages” (Dana Awad, Ghassan Mourad & Marie-Rose E, 2019). Each rule and use of punctuation marks, even though similar, have their unique characteristics in each language. Punctuation marks are not only grammatical rules of each language, but they also express emotions, suspense, they indicate pauses to create an atmosphere. These marks are an essential part of each language, and even though their correct usage is sometimes overlooked, they carry the syntactic of the text and the translation.

2.2.8 Compensation

Compensation refers to the technique by which the translator recreates certain factors found in the original text that can get lost in translation. This helps the translator to compensate for semantic losses. This technique not only modifies the grammatical structure of the sentence but also adds the linguistics and semantic context of the original text. “It is the replacement of untranslatable elements of the source text with similar elements, that is to compensate for the loss of information and are able to produce the similar effect on the reader of the target text” (Hordiienko, 2011). As mentioned, this technique is important when encountering a target

language that may not need all the components from the target language, but that still needs some other factor to convey a complete idea. In following ~~this~~ ~~next~~ example, it can be identified how even though that word has an equivalent, it does fit within the context. Since the equivalent does not fit into the context, the meaning is lost; therefore, the need for compensation to restore that meaning. “How are you, sir? Translated through compensation to “¿Como se encuentra hoy señor?” Not only there was a need to compensate for the formality of the sentences, but there were punctuation marks, that if left as such, would lose credibility in the target language. Some grammatical elements are difficult or impossible to convey in the target language, which is where compensation plays a big role in achieving a cohesive translation.

2.2.9 Equivalence

Equivalence takes place when a word or a phrase means the same thing in both languages. This is a rare procedure to find, as the translator usually makes a lot of changes to obtain the same meaning as the original. *“*Equivalence-oriented translation as a procedure which 'replicates the same situation as in the original, whilst using completely different wording” (Vinay and Darbelnet, 1995, p. 342). As this extract mentions, equivalence is about finding the exact word that contains the meaning in the target language. This search for the right word does not mean that the words need to be written the same, just that the chosen word holds the same connotation. In the following example, there is evidence of how the translator can achieve the same connotation with completely different wording from the source text. “God bless you!” translated through equivalence to “¡Salud!” The meaning of the original text is lost, even when the translation was reduced to just one word. Equivalence is the art of finding the word, instead of forcing the original text to fit into the target text. This procedure allows the audience to relate more to the reading, as the translator used common words from the native language.

2.2.10 Adaptation

Adaptation takes the initial translation and makes it culturally accurate by modifying the content. When presented with a cultural phrase or an idiom in the source language, the translator must adapt it by using something of the same genre that equals the sentiment of the original. According to Vinay and Darbelnet (2001), "The use of a recognized equivalent between two situations. It is a process of cultural equivalence." As the translator must know the language, it is easier to search through their experiences and knowledge to find the right adaptation. Not only do phrases and idioms need to be adapted, but cultural references also require equivalences to relate to the audiences. The following example, though very simple, is effective, as there is evidence of how a simple adaption can contain so much culture and context. The word "Football" may mean the same across Europe and Latin America; however, for audiences living in the United States, there must be an adaptation to "Soccer." "Adaptation involves judiciously making creative decisions about the new version of the work." (What Is The Difference Between Translation And Adaptation? 2019). While the translator may be free to make creative choices with adaptation, it is important that the meaning and context should never be lost. Nevertheless, some translators stay away from adaptation as some think that by adapting they are changing too much of the original text.

2.2.11 Borrowing

Borrowing is the translation procedure in which the translator takes a term from the original text and transfers it to the target text. This is a simple translation procedure that does not require much change or investigation. However, it does require enough context and knowledge as to when the term should be transferred, as it does not have an equivalence. "Borrowing is one of the most used translation techniques. It is used mainly out of necessity because a certain word

does not exist in the target language" (Grassilli, 2015). As mentioned, a translator only uses borrowing when there is no other option, as they should always search for equivalence to appeal to all audiences. Many words are shared by many languages, as there is no equivalence without exploitation of other translation procedures. A translation should never be more complicated than the original was. These terms have been used for centuries, so much that the word almost seems native to each language. Words like café from French, kindergarten from German to more technical terms like Software and Hardware that fit right into every language. Borrowing does not always mean there is a lack of equivalence in the target language, it also means that the translator chooses to preserve the cultural relevance, that the word gives to the context.

2.2.12 Calque

Unlike borrowing, calque takes a phrase from the source language and translates it word for word in the target language. These phrases have made their way in their target language vernacular, meaning that they have gone through many years of usage. This calque usually does not make sense on its own, as each component does not hold meaning standing side to side. "To borrow a phrase or word from another language whilst translating its components to create a new lexeme in the target language" (What is Calque , 2020). As mentioned, this technique is used to create a new term and to avoid using borrow terms. There are four types of calque, the first one is Structural or Syntactic Calque, this is when there is an error in the phrase; however, it is left like that, and it introduces a new structure to the target language. Typographic Calque is when typographical elements make their way into the target language, like certain punctuation marks. Orthographic Calque is when the writing or spelling of certain words are transferred with not much consideration of the structures of the target language. Paronymous Calque or Loan Word is when there are two words in the same language with similar etymologies; however, they are used

in such different contexts that they now have dissimilar meanings. These types of Calque allow the translator to have a broad list of phrases or words to choose from.

2.2.13 Sentence inversion

This procedure allows the translator to invert certain aspects of the sentences to fit into the speech pattern of the target language. In this procedure, there is not much change when it comes to terms. This procedure deals more with how each factor of the sentence is placed in the text. Sentence inversion makes the translator have a change in their point of view, that way the sentence in the target language sounds more natural according to the context of the text. This procedure is also used when all the factors of the translated version are correct, but the grammatical structure of the target language is slightly different. In the following example, certain factors like nouns and verbs are changed from their original place. This procedure is conducted so that the text sounds natural to the target language reader: "I took my job from my friend" a literal translation would be "Yo tome mi trabajo de mi amigo;" even though each element of the translated version is understandable and works in terms of grammar, it does not sound natural. However, with the use of sentence inversion, the translation would be "Mi amigo me cedió el trabajo." Almost every factor is kept the same way, but they are arranged in a way that sounds natural. This procedure allows the translator to create natural sentences, but still be faithful to the original.

2.3 Glossaries

Such technical terms and jargon are found in the technical text, which is usually targeted to people in those fields. "A glossary is an alphabetical list of specialized or technical words, terms or abbreviations, and their definitions, usually related to a specific discipline or field of knowledge." (Glossaries, 2012). For people outside that field who are interested in the text,

glossaries help them to go through the reading with ease. The role of the translator is to create a glossary to have extra information about certain technical terms. This is useful, as the translator cannot add too much extra information within the translated text. For translators, a glossary allows them to pinpoint terms that they deem relevant and important to the field they are translating. The translators, in their process of creating the glossary, are obligated to investigate the meaning, context, usage of the word. As a result, their investigation process is enhanced as well. *"*A glossary ensures a consistent style and voice, an accurate rendering of the original text, and a level of translation quality that is even throughout" (Acclaro, 2010). As mentioned, by creating a glossary, the translator can continue to use the technical terms with accuracy throughout the whole text. As an extra step, the translator can create their glossary with phrases or patterns that may repeat themselves through the text. To make the most of the glossary, the translator should start extracting terms from the first reading.

Chapter III

Methodological Framework

In the following chapter, the methodology chosen for this investigation is explained, as well as factors like the source material, the methods used to translate the documents, and some techniques used to analyze the texts. This framework is used to gather all the necessary information, and to provide the researcher and future readers with a path into this method of investigation. This part of the investigation explains said the path to further the understanding of the decisions made and study course. Moreover, this chapter guides and justifies the investigation approach chosen by the researcher. "A methodological framework provides structured practical guidance or a tool to guide the user through a process, using stages or a step-by-step approach" (McMeekin et al., 2020). This part of the investigation also analyzes the importance of the instruments used to obtain the expected results from this investigation. In addition, it is going to expand certain terms that the researcher used as a guide to carry out this investigation. This methodological framework improves the consistency and liability of, not only the investigation but the translation of the documents.

3.1 Research Approach

The research approach is the path that the researcher takes to obtain results. *"*A strategic plan of the procedures to be followed during a study to reach valid conclusions, with particular consideration given to participant selection and assignment to conditions, data collection, and data analysis" (APA Dictionary of Psychology, 2014). Even though there are many paths to take, the researcher must focus on the result they hope to achieve the investigation. These results are whether the researcher desires a more statistical or a human approach. In some cases, based on the type of investigation, some researchers may want to have both results. Therefore, the

researcher must follow one of the three research approaches, which are: qualitative, quantitative, and mixed. The qualitative method allows the researcher to have a more personal approach to the investigation. “It involves emerging questions and procedures, data typically collected in the participant’s setting, data analysis inductively building from particulars to general themes, and the researcher making interpretations of the meaning of the data” (Creswell, 2013). As mentioned, those who follow this research approach have a closer relationship with the subject being put under investigation. This is achieved by creating questions and methods that correspond to the subjects’ environments. The results of this question and methods are then analyzed by the investigator, who then gives their interpretation.

Unlike the qualitative, the quantitative approach is straighter forward, and facts based. “Quantitative research involves the process of objectively collecting and analyzing numerical data to describe, predict, or control variables of interest.” (Mcleod, 2008). As mentioned, the quantitative approach bases results and expectations in numbers and sets on data. This approach allows the translator to have a very pragmatical approach to the investigation by anticipating all the variables that may be present throughout. This approach is used to prove the variable or similarities between two subjects. This is achieved by analyzing the way they behave and how they affect the phenomenon being studied.

The last approach involves an amalgamation of the two approaches that have been mentioned before. The mixed approach bases its results on obtaining both quantitative and qualitative data, integrating the two kinds of results to acquire the desired data. “The combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approach alone” (Creswell, 2013). As this suggests, the mixed approach takes both methods and combines them, as certain topics may benefit from a personal approach.

However, the desired result needs to be exactly and statistically corrected to prove a point. This method allows the researcher to be creative and explores the different approaches that the investigation may benefit from. As for this investigation, the researcher considers the qualitative approach for this investigation. This is due to the personal and emotional level the researcher/translator needs to achieve a faithful and cohesive translation. This method allows the researcher to view the documents as individuals. Therefore, each document will have its dispositions, resulting in a personalized translation for each document. This mindset helps the researcher/translator, as each document deals with different subject areas and problems.

3.2 Research Design

The research design is how the researcher obtains the expected results. "It shows the path through which these researchers formulate their problem and objective and present their result from the data obtained during the study period" (Sileyew, 2020). As mentioned, it not only entails what path to take during the investigation but also how the results are presented. In addition, the research design contains the different methods and techniques to achieve the objective of the investigation. These techniques and methods allow the researcher to obtain trustworthy results, with the least margin of doubt in the desired outcome.

Four research designs allow each type of investigation to obtain the best results under the right methods and techniques. The first is the descriptive design, which is focused on describing to the audience the subject of the investigation. "It is a theory-based design method which is created by gathering, analyzing, and presenting collected data." (Research Design, 2018). As mentioned, this design is based on how and why the investigation is being carried out. This design is perfect for researchers who desired to explain and justify why the investigation is important to execute.

The second design is experimental, which deals with the cause and effects of the subject that is being studied. This design demonstrates what affects the investigation and the subject of interest left behind after being investigated. The third design is correlational, which studies the relationship between two variables in the investigation. This design is perfect for the investigation that deals with two variables that would not be able to exist without each other. The fourth and last type of design is Quasi-Experimental, which is the approach a researcher takes when the desired result is to prove the cause and effect of an independent variable and a dependent variable.

For this investigation, the researcher saw fit to utilize the descriptive research design. This decision was taken thanks to the analytic and explanatory nature of this approach, as one of the main objectives of this design is to describe each step, variable, result, and situation that may be encountered during the investigation. This design fits perfectly with the researcher's desire of analyzing the translation procedures that will help to achieve a cohesive and faithful translation. This design also allows the researcher to justify and explain how important it is to translate the documents, as to reach broader audiences. One of the main benefits that this design brings to the investigation is the researcher can explain in detail each method and technique being used in the translation. For the researcher, this design is perfect, as it tends to focus only on the process, and not so much on the outcome. For this investigation, it is imperative to pay close attention to the process that the documents face when translated. Moreover, this design allows the researcher to interact better with the documents, as each step is explained and analyzed. The descriptive design presents the perfect materials to conduct this investigation.

3.3 Information Sources

As a way to develop this investigation, the researcher resorts to liable information sources to find relevant material for the study. The information gathered throughout this investigation must be analyzed closely, as it is of great importance to the analysis of the subject. This information needs to be categorized and analyzed correctly to withdraw the best results. Information sources are the main foundation to develop not only the analysis but also the translation of the documents. These sources can be found in a variety of shapes and mediums. Information sources can be taken from everywhere.

"An Information Source is a source of information for somebody, i.e., anything that provide knowledge to somebody. Information sources may be observations, people speeches, documents, pictures, organizations, etc." (LISBDNETWORK, 2018). In other words, It is how the researcher chooses to utilize it that makes it useful and relevant to the investigation. For this study, in particular, the researcher needs information on environmental issues and covid safety. To obtain the best results, the researcher may need to have access to information sources in the shape of books, encyclopedias, or academic studies. To obtain even better information sources, the researcher may even opt for newspapers and video formats to acquire updated information on these topics. These information sources are categorized into three degrees of importance, that way it is easier to determine which sources need prioritization.

3.3.1 Primary Sources

Primary sources are firsthand evidence that is direct regarding news, a person, or an event. "Primary sources are often empirical studies—research where an experiment was performed, or a direct observation was made." (LibGuides: Primary Source Research and Discovery, 2020). As this extract mentions, they serve as evidence after conducting an experiment or a study. Primary

sources were often created while the subject of study happened. This way, the information for the studies is updated and relevant to the investigation. The primary sources for this investigation are related to the translation procedures and techniques that aid with the translation of the documents. These sources are mostly extracted from books and investigation studies that were carried out by the most influential presence in the translation world. These sources come in the form of textbooks, journals, manuscripts, and even articles. Even though some sources have been published decades ago, the information they provide is still relevant today. However, this investigation also benefits from a more modern interpretation of classic textbooks to give this investigation a fresh study.

3.3.2 Secondary Sources

Secondary sources do not provide new evidence to the investigation, but they analyze and prove the effectiveness of the primary sources. "They are interpretations and evaluations of primary sources. Secondary sources are not evidence, but rather a commentary on and discussion of evidence" (LibGuides, 2020). As this quote mentions, secondary sources only further the primary sources by proving their functionality. They serve to interpret the information and prove the information gathered from the primary sources. These secondary sources are often written after the event that is being studied. For this investigation, the researcher considered that the documents to be translated served the purpose of the secondary sources. The translation of these documents is the interpretation of the information gathered as primary sources. This is because they are the result of the experiment that was carried out. However, these secondary sources also include articles and journals that exhibit the importance and usefulness of said techniques and procedures.

3.3.3 Tertiary Sources

Tertiary sources tend to summarize the information that primary and secondary sources collected. "These sources rarely contain original material and instead typically offer a broad perspective of a topic without any critique or analysis." (Research Guides, 2020). This category of information sources tends to explain and give opinions about the studied subject. These explanations and opinions do not offer any new information, instead, it is the perfect opportunity for the researcher to provide the audiences with their take on the investigation. In these sources, the researcher often sites their primary and secondary sources, as it allows the investigation to have some sort of conclusion based on these sources.

For this investigation, the tertiary sources will be the glossaries that contain terms and extra information extracted from the translation of the documents. These glossaries contain extra information and definitions to aid the translation techniques that were researched through the primary sources. As well as glossaries, the researcher also considered sources in the form of encyclopedias, dictionaries, and indexes to further the explanation and prove the primary and secondary sources. These tertiary sources aid not only the researcher but also the audience with further investigations and explanations of the sources that have already been used in advance. In this investigation, the tertiary sources contain dense and concise information.

3.4 Analysis Categories

In this part of the chapter, the researcher develops the main variables that develop the objectives of the study. These subjects also help in the development of the desired result for each objective. As the name suggests, these categories allow the researcher to develop a deep and insightful investigation about the pillar's subject of this investigation. The three main categories that are analyzed in this study are Translation, translation methods and procedures, text analysis,

and glossaries. In this section, these variables and their importance are explained and researched thoroughly.

3.4.1 Translation

Defined by the main figure in the development of the Centre for Translation Studies, Newmark (1998), it is "rendering the meaning of a text into another language in the way that the author intended the text." As Newmark remarks, translation is the recreation of a text, for people who do not speak the source language of the document. One of the translation's main objectives is to render the message that the original writer intended. The translation is a process from which people obtain meaning and equivalence of a text that is not in their native language. The rendering of meaning is essential, as a translator is expanding the reach of culture and knowledge.

Moreover, translation plays a big role in today's society, as it has been the pillar that has united communities for centuries. "Today's multicultural and multilingual society demands effective, efficient, and empathetic communication between languages and cultures" (The Importance of Translation Studies, 2018). Through history, translation and its many techniques, have shaped culture and societies around the world. Even though it plays a big role in everyday life, it has always been a silent and unknown pillar. By choosing the right techniques, a translator can expand and enrich cultures around the world.

Analyzing these translation aspects is an important part of the process, as it can highlight vital patterns that can be used later. Things like the style of text, different cultural settings, diverse languages, target audiences, as well as grammar and lexical differences create a big platform for the importance of translation. From this big role that translation plays in today's culture, comes the importance of incorporating this factor into every publishing project. Whether

they are old or new, it is important to reach audiences that may not be able to access diverse types of texts. While every culture and country has a fair number of documents that resonate with its people, communities must access written works from the outside to build their knowledge.

3.4.2 Translation Methods and Procedures

This category also holds great importance, as without them the translation process would not be possible. "They establish relationships between specific manifestations of two linguistic systems, one which has already been expressed and is therefore given, and the other which is still potential and adaptable" (Vinay & Darbelnet, 1995). As they state, translation procedures play with the flexibility of both languages. Translation methods and procedures are aspects in translation that are more subjected to each language's grammatical structures. These translation factors allow to transform the original text into a replica of itself but in another language.

3.4.3 Text Analysis

As mentioned in the Theoretical Framework, the text analysis is a factor in translation that allows the translator to obtain as much information from the text as possible. "It is about getting to know deeply the text that is going to be translated with information such as style, function, scale, difficulty, etc." (Newmark,1988). The analysis of the text is one of the first steps to perform when translating. This step is conducted with the sole purpose of creating a platform so that the translator can stand comfortably with all the information they need. Such analysis helps to identify future translation methods and techniques and to approach the source text with ease and knowledge.

3.4.4 Glossaries

As mentioned in the Theoretical Framework, glossaries are an extra step of the translation that allows the translator to give additional information to the audience. A glossary is such a useful tool for the translator, as it allows them to have a record of recurring terms and patterns. Such glossaries let the translator keep a consistent voice throughout the entirety of the translation. Glossaries are an essential part of the translation process.

3.5 Data collection Instruments

The data collection instruments are one of the most important aspects of an investigation project, as they allow the investigator to gather valuable and relevant information. *"*The tools used by researchers to collect data in the research process." (What is Data Collection Instruments, 2022). As mentioned, these instruments are used to collect information, as the investigator searches for reliable information sources. In the case of this investigation project, the researcher made use of these instruments to extract information that would prove to be of value to achieve the main objectives of this project. Through the course of this investigation, these instruments were used as assistance to the translator and as a way to facilitate the gathering of important details.

3.5.1 Color Coding

One of the main instruments used in this investigation project is color-coding. The idea behind this process is to create ~~a~~ visual route that the translator took to achieve the resulting translation. The visual part of this process is represented by different colors to indicate different translation procedures. This process is a useful way for the translator to have a visual understanding of the procedures used to achieve the results. This instrument will be represented in a table chart. The procedures that will be used in this investigation project are the following:

transposition, modulation, omission, amplification, explanation, literal translation, punctuation changes, compensation, equivalence, adaptation, borrowing, and sentence inversion. This instrument will be carried out across 15 paragraphs extracted from the English to Spanish translation and from the Spanish to English translation. These paragraphs will label "Paragraph" followed by the number in which they fall within the list. First will appear the original text followed by the translated version along with the colors assigned to represent the procedures.

Color Coding Table

Translation procedures	**Color assigned**
Transposition	**Yellow**
Modulation	**Green**
Omission	**Light blue**
Amplification	**Pink**
Explicitation	**Blue**
Literal Translation	**Red**
Compensation	**Purple**
Equivalence	**Grey**
Adaptation	**Dark green**

Table 1shows the color coding used to represent the different translation procedures within the translation. Source: The researcher's own creation.

3.5.2 Text Analysis table

The text analysis table that will be used in this investigation project, is meant to analyze, and categorize each of the translated documents, used as the primary sources. This table is meant to be used as a guide, to judge the faithfulness of the translation. This table is made up of five vertical columns and six horizontal lines. The text analysis table will contain on the first horizontal lines the names of each translated document alongside their respective target language

to avoid any confusion. On the first vertical column, we can find the different categories the document can be subjected to.

The first is text style, divided into descriptive, dialogue, discussion, and narrative. Following, there is the scale of formality: Officialese, official, formal, neutral, informal, colloquial, slang, taboo. Next, the scale of generality or difficulty: simple, popular, neutral, educated, technical, opaquely technical. Following is the scale of emotional tone: intense, warm, factual, understanding. As well as text function: esthetic, expressive, informative, metalinguistic, phatic, vocative. To finish, there is the type of translation: semantic, communicative.

Text Analysis Table

Text Analysis	**El covid-19, nuevos énfasis para la educación**	**Formación universitaria y acciones educativas**	**Saberes ambientales en centros educativos**	**Construction and Demolition Waste in Romania**
Text Style				
Scale of Formality				
Scale of Generality				
The scale of Emotional Tone				
Text Function				
Type of Translation				

Table 2 shows the way the texts are analyzed. Source: The researcher's creation.

3.5.3 Glossary

During the translation of the documents, the investigator encountered many technical terms and words that would benefit from further explanation and context. To serve this issue, the investigator created a glossary containing terms and words that require further investigation to achieve an accurate translation. "A glossary is a dictionary of terms specific to a certain subject" (Glossary, 2022). As mentioned, a glossary is a small dictionary that functions only within the project from within the words were extracted. In the case of this investigation project, the terms

in the glossary contain words from four different fields; however, the fields all correlate to each other, creating a cohesive and overall harmonic list of descriptions. Glossaries with the field of translation function to give future translators or proofreaders a concise glossary, that as mentioned before, only functions within the documents from where they were extracted. These types of glossaries help future translators to translate similar documents. These glossaries are also used by companies to give their translators precise terms so that all their documents contain the same terminology. A translator can also be personal, gathering terminology from different fields and documents, for them to create a consistent workflow. For this investigation, the researcher will use two separate glossaries, one for the terms found in the English translation and another for the terms found in the Spanish translation. The layout for these two tables will be four vertical columns. The first column contains the source language. The second column contains the target language terms. The third column is the definition of the word, as a way to provide context and information to understand the documents. The fourth and final column contains the grammatical category of the translated term.

Glossary

Spanish term	**English term**	**Definition**	**Grammatical Category**

Table 3 shows the glossary from the Spanish to English translation. Source: The researcher's creation.

English

English term	Spanish term	Definition	Grammatical Category

Table 4 shows the glossary from the English to Spanish translation. Source: The researcher's creation.

3.6 Collection data process and data analysis

For this investigation project, one of the main objectives was to translate some documents from the source language to the target language. To achieve this objective the investigator selected the documents that prove to be of common interest to serve the public. These documents also contain information and jargon from different but very similar fields, meaning that the investigator could follow one line of thought during the translation of the documents. Taking all of this into consideration, the documents were carefully selected through a revision of their publication date and the relevance they have in today's society. Once the researcher had carefully selected the documents, these were put under the text analysis table, as a way to obtain more information about them.

The text analysis table served as a way for the translator to gather enough information about their composition to create a plan on how to translate them. The information about their structure gave the investigator a better understanding of their content, which allowed the creation of a precise translation route. Once the documents had been carefully selected, analyzed, and translated, the researcher made use of the color codes created specifically for this project. By making use of the instrument "color coding" the investigator could create a visual map of the

translation procedures that were used during the translation of the documents. This instrument provided inside information about the text.

After the cautious translation analysis of the documents, the investigator made use of the previously mentioned glossary, to describe and analyze terms that prove to be difficult during the translation. With the glossary, the investigator was allowed to carry out even deeper research about the topics and the fields involved in the documents. These instruments provided the researcher with more inside information and context of the fields studied for the translation of the documents. The descriptions and grammatical categories of the selected terms also provided future investigators with new concepts about these fields. Taking all of this into consideration, one can notice how all three of the instruments mentioned above, were of great service to the gathering of information through the course of the investigation.

Chapter IV

Translated Documents

This chapter contains the translation of the afore mention documents. The translation from English into Spanish was performed on one document. The Translation from Spanish into English was performed on three different documents. Each translation is labeled with its title and its corresponding language. These translations were executed by the researcher. All the details were carefully examined by the researcher and their tutor. The Spanish translation is also revied by a philologist.

4.1 Translation from English to Spanish

Abstract: The paper performs a critical overview concerning the construction and demolition waste (C&DW) management issues in Romania. Five main stages related to C&DW management are highlighted such as: (i) illegal dumping on public lands; (ii) C&DW collection and disposal in urban landfills; (iii) C&DW treatment and reuse in civil constructions (roads, coating material for landfills).

(iv) regional integrated waste management systems; (v) recycling of building materials (e.g., cement industry and recycled aggregates). The paper reveals the poor monitoring of C&DW flows across Romanian counties and the geographical dimension of this waste stream collected by waste operators. The paper examines the current challenges in Romania, and it reveals the future prospects to provide a reliable transition towards sustainable C&DW management activities. The targeted route: waste fractions can be recycled and/or reused as building materials via integrated waste management systems, which enable a circular economy in urban and rural municipalities.

1. Introducción

Los desechos de construcción y demolición (C&DW) son una de las corrientes de desechos de más rápido crecimiento, debido al proceso de desarrollo económico y urbanización a escala mundial. Los residuos de la construcción presentan una gran cantidad de materiales constructivos que podrían reutilizarse, reciclarse o recuperarse evitando la reducción de los recursos naturales, en términos de materias primas para el sector de la construcción. No obstante, este gran potencial de recuperación y reciclaje se pierde, debido a la falta de instalaciones de recolección de residuos (vertederos) o esquemas de reciclaje deficientes (sistemas basados en vertederos).

Los rellenos sanitarios y vertederos ilegales son las principales opciones de eliminación en todo el mundo, lo que provoca contaminación ambiental, deterioro del paisaje y consumo de la capacidad de los vertederos. La mezcla de C&DW con el desecho sólido municipal (DSM) es un problema real, resultante de la falta de sistemas efectivos y reglas para la segregación de C&DW en muchos países. Alrededor de un tercio (i. e. un billón) del total de desechos en UE provienen de actividades de construcción y demolición, siendo Francia, Alemania y el Reino Unido los principales contribuidores.

Sin embargo, varias definiciones de residuos y sistemas de notificación en la UE imponen precauciones en la comparación geográfica de los flujos de C&DW. El C&DW se genera, principalmente, debido a errores de diseño, adquisiciones y planificación inadecuadas, manejo ineficiente de materiales, residuos de materias primas y cambios inesperados en el diseño de los edificios.

En el sector de la construcción, intervienen muchas partes interesadas (por ejemplo, clientes, subcontratistas, proveedores, operadores de residuos, municipios, etc.) con responsabilidades

complejas, que conducen a varias cadenas de toma de decisiones en los miembros de la UE. La escasa disponibilidad de tierra en áreas urbanas en crecimiento para vertederos o áreas geográficas peculiares (por ejemplo, islas) impone una nueva alternativa para los flujos de C&DW. Rumanía sigue siendo un país basado en vertederos donde el reciclaje y sostenibilidad (2019, 11, 3179; doi: 10.3390 /su11113179 www.mdpi.com/journal/sustainability):

1. Son actividades de recuperación que deben desarrollarse más para cumplir con la normativa de la UE sobre el sector de la gestión de residuos. Este documento tiene como objetivo examinar las actividades de C&DW en Rumanía partiendo del peor de los casos (vertidos ilegales) hacia vías sostenibles dirigidas a esta fracción como material constructivo en el sector de la construcción bajo un sistema circular. El documento revela los desafíos que otros países en transición y en desarrollo de todo el mundo podrían enfrentar, al proporcionar un sistema de gestión de desechos sólidos para esta corriente de desechos.

2. Materiales y métodos

Basado en la reseña literaria, informes ambientales y observaciones de campo, el documento identifica, en el peor de los escenarios, cinco etapas principales de desarrollo; en la etapa I, ilegalmente, se vierte C&DW en los alrededores, sin ningún tratamiento, para convertirlos en materiales de construcción nuevos, con el fin de utilizar fracciones recicladas. Esta hipótesis se considera como el mejor de los escenarios, como se muestra a continuación en la Figura 1. Las comunidades rurales y las áreas urbanas más pequeñas todavía enfrentan problemas de vertidos ilegales, debido a la falta de instalaciones adecuadas para el manejo de desechos, como se señala en la Sección 3.1. Esta situación indeseable se da, específicamente, para la etapa I, donde las

tierras públicas, cunetas, cuerpos de agua y áreas forestales se encuentran frecuentemente expuestas a estas malas prácticas.

Es necesario dotar a todos los municipios urbanos de sistemas de recolección e instalaciones de almacenamiento de C&DW, para enfrentar los problemas de vertidos ilegales en dichas áreas. Esto se logra con el apoyo de las fuerzas policiales, bajo la supervisión de la Guardia Nacional Ambiental, a través de las Comisarías del Condado. Estas acciones básicas se necesitan en la etapa II. La etapa II representa el sistema tradicional de gestión de residuos basado en la eliminación en vertederos, en el cual se pierde el potencial de reciclaje y recuperación de la sección de C&DW. Sin embargo, se espera que las prácticas de vertido abierto disminuyan a través del desarrollo de instalaciones de recolección.

Los vertederos urbanos se están llenando rápidamente, por lo cual se demandan nuevas zonas de eliminación de desechos. Esta práctica apoya una economía lineal, la cual enriquece el agotamiento de los recursos naturales para el sector de la construcción y la gestión de C&DW. Esta práctica se realiza de manera inadecuada, principalmente, en las áreas urbanas más grandes. Los vertederos urbanos que no cumplen con las regulaciones de la UE son reemplazados por vertederos regionales, que servirán tanto a las comunidades urbanas como a las comunidades rurales de los alrededores.

La mejor opción es proporcionar sitios especiales para el desarrollo de C&DW, evitando la contaminación con la sección de desechos municipales o industriales. Por otro lado, estos sitios demandarán más tierra, que podría usarse para otros sectores económicos, por ejemplo, agricultura.

La desviación de C&DW de los vertederos de residuos sólidos urbanos (RSU) es la clave para la etapa III, donde comienza a emerger el sistema circular. Recuperación en el sitio, material de relleno y cimiento de carreteras son las principales alternativas adoptadas por las empresas constructoras y operadores de residuos. Las plantas de trituración alimentan los vertederos de RSU con el material de revestimiento. Esta es una opción de reutilización popular entre los operadores de residuos.

La transición de etapa III a etapa IV implica un enfoque regional de C&DW complementario a la infraestructura de gestión de RSU, el cual debe estar respaldado por una mejor base de datos de estadísticas de desechos y actividades de monitoreo adecuadas. Este es un problema fundamental para Rumanía, a causa de las brechas socioeconómicas entre las grandes ciudades en comparación con las áreas urbanas más pequeñas y las comunidades rurales.

Los nuevos sistemas regionales integrados de gestión de residuos (los cuales abarcan todo condado) deben proporcionar instalaciones básicas para los flujos de C&DW. En cada condado, los sistemas regionales de manejo de desechos deben estar en funcionamiento por los años siguientes, para así proporcionar alternativas confiables de reciclaje y recuperación para el sector de C&DW. En este contexto, la etapa V podría surgir respaldada por un mercado económico confiable. Este es un punto crítico para facilitar el uso de un sistema de economía circular entre el sector de gestión de residuos y la industria, comenzando desde la etapa III hasta la etapa V. La falta de un mecanismo de mercado para ayudar a una mayor recuperación se consideró un problema fundamental en el sector industrial del Reino Unido para facilitar la transición hacia la economía circular.

Las políticas públicas deberían alentar al sector empresarial a desarrollar tecnologías y capacidades de recuperación con el fin de promover redes asociadas para acceder a materiales secundarios. Dicho sistema disminuirá la dependencia del uso de los recursos naturales (por ejemplo, materiales granulados) como materias primas para el sector construcción. Esto redirigirá la atención hacia artículos reciclados en un país como Rumanía con una gran demanda de desarrollo de infraestructura (carreteras, ferrocarriles mejorados, carreteras pavimentadas, servicios públicos, hospitales, viviendas, edificios, etc.). Por lo tanto, se espera que el desarrollo de C&DW aumente en los próximos años y se requiere una gestión de residuos sólida.

Además, esta transición hacia materiales de construcción reciclados reducirá la prevalencia de vertederos y eliminará las prácticas de vertido abierto como una de las opciones principales de vertido en las etapas I-II. Las posibilidades de una trayectoria tan sostenible se examinan más a fondo de acuerdo con cada etapa, con sus correspondientes desafíos y problemas particulares.

El análisis espacial y la cartografía temática se utilizan para revelar, por un lado, las disparidades geográficas en Rumanía acerca de las cantidades recolectadas de C&DW por los operadores de residuos y, por otro lado, para resaltar el proceso de deficiente monitoreo del desarrollo de C&DW en los condados rumanos. Este hecho está respaldado por el análisis comparativo entre las cantidades estimadas de C&DW generadas por la población urbana (calculadas sobre una base per cápita) y aquellas que han sido recolectadas por operadores urbanos.

Además, la relación total entre las cantidades de C&DW y RSU recolectadas por los operadores de desechos se determina para cada provincia utilizando el método de clasificación de rupturas naturales de Jenks, que se usa específicamente para cartografía temática. Este método facilita la determinación de la mejor disposición de valores en diferentes clases, al reducir la diferencia

dentro de las clases y maximizar la diferencia entre estas, destacando las disparidades entre las regiones de un país en un tema o indicador en particular.

Los mapas señalan que estos sectores están poco cubiertos por las estadísticas de residuos, incluso en áreas urbanas. El documento proporciona una perspectiva regional de las actividades de gestión de C&DW en el condado de Neamt, en el cual destacan las brechas entre ciudades, pueblos y las comunidades rurales más grandes. Las cantidades de desechos de construcción se estiman basadas en los criterios de superficie útil dada para cada ciudad y pueblo. Estos se comparan con las cantidades recolectadas por los operadores de desechos (según los datos proporcionados por la Agencia de Protección Ambiental del condado de Neamt). Además, esta sección revela las prácticas de eliminación de desechos no controladas, asociadas con la falta de instalaciones de recolección y tratamiento. Esto se combina con una crisis regional de gobernanza de desechos y un mercado económico carente de materiales reciclados, ya que el condado tiene una única planta de trituración operativa.

Para combatir estas fallas y apoyar la desviación de desechos de vertederos abiertos y vertederos de RSU, se debe desarrollar un sistema circular en cada condado de Rumanía como lo sugieren las etapas III y V. Dichos incentivos y las mejores prácticas actuales se analizan como vías para la sostenibilidad en la gestión de C&DW en Rumanía (ver Sección 3) con el apoyo de literatura revisada por pares.

Además, se consultaron varias fuentes para analizar el estado del arte en las actividades de gestión de C&DW en Rumanía, como los informes ambientales anuales de las agencias locales de protección ambiental (datos para mapas temáticos con respecto a las condados); informes técnicos para infraestructuras específicas de gestión de residuos bajo la supervisión de los

consejos de condado o municipios locales; informes y sitios web de empresas de construcción y reciclaje, operadores de residuos; datos proporcionados por el Instituto Nacional de Estadísticas o la Agencia de Protección Ambiental de la provincia de Neamt (Sección 3.4).

El enfoque regional del sector de gestión de C&DW que involucre tanto a municipios urbanos como rurales debe emerger durante los próximos años para incrementar las tasas de reciclaje y recuperación en un mínimo del 70% del peso total, el cual se obtiene de las actividades de construcción y demolición estipuladas por la Ley No. 211 sobre el régimen de residuos.

2. Actividades de gestión de desechos de construcción y demolición en Rumanía

2.1. Vertido ilegal de C&DW (Etapa I)

A nivel nacional, existe un gran número de situaciones de gestión no conforme para C&DW, la mayoría se conforma de su abandono o almacenamiento incontrolado tanto en suelo interurbano como extraurbano. Estas prácticas se ven favorecidas por la deficiente aplicación de la ley por parte de las autoridades locales y la falta de vertederos para este sector de residuos. La interrupción del vertido ilegal, no conforme con la ley o del vertido no autorizado, fomentará un enfoque proactivo de los generadores de C&DW para encontrar alternativas al vertido. Las empresas constructoras son responsables de transportar el C&DW generado a instalaciones de eliminación seguras de acuerdo con el principio del “contaminador paga” o delegar en un operador de residuos para estos servicios.

A nivel doméstico, el C&DW resultante debe ser transportado por servicios formales de gestión de residuos municipales hacia instalaciones de reciclaje o vertederos urbanos. La cobertura de recolección de residuos aún es incompleta en las ciudades medianas y pequeñas con una menor conexión con las zonas rurales. Este hecho fomenta la eliminación ilegal de residuos de C&DW

como se muestra en la Figura 2. Con frecuencia, los vertederos silvestres contienen una fracción de desechos mixtos como C&DW, desechos municipales y desechos agrícolas, particularmente en áreas rurales. Las observaciones de campo revelan que tanto los municipios urbanos como los rurales están expuestos a problemas de vertidos ilegales de C&DW. Las comunidades periurbanas son más susceptibles a tales prácticas, debido a la expansión de las áreas urbanas.

Además, algunas regiones de Polonia se enfrentan a problemas similares. La recolección y el transporte de residuos de la construcción son costosos y, a menudo, se recogen como residuos mixtos o se depositan en vertederos ilegales. La eliminación incontrolada de residuos sigue siendo una amenaza medioambiental que debe resolverse en Croacia, y en otras regiones europeas existe una cantidad significativa de vertidos ilegales combinada con un mercado heterogéneo de materiales secundarios que puede no reflejarse en las estadísticas oficiales.

El vertido ilegal de C&DW plantea problemas financieros para las autoridades locales rumanas, que deben proporcionar actividades de limpieza de tierras públicas a partir de su presupuesto local. En las zonas rurales, la eliminación ilegal de C&DW era una práctica generalizada, debido a la mala conexión con los servicios confiables de recolección de desechos antes del cierre de los vertederos silvestres rurales durante el 2009-2010. El cierre de tales sitios fue requerido por la Decisión gubernamental No. 345/2005 sobre el vertido de desechos.

Algunos vertederos rurales se cerraron y se cubrieron con C&DW como material de revestimiento. No existen datos sobre la magnitud del problema de los vertidos ilegales a escala nacional, que incluyan tanto áreas urbanas como rurales. Este documento resalta los problemas sobre este tema, al revelar las brechas en los flujos actuales de C&DW y la dimensión geográfica de los datos descubiertos por los operadores de desechos, que podrían usarse (en estudios

posteriores) como un indicador indirecto para las evaluaciones regionales o nacionales de las prácticas de vertidos ilegales.

Los C&DW locales generados a nivel doméstico son recolectados parcialmente por los servicios de manejo de residuos o reutilizados como material de relleno para caminos locales sin pavimentar, basado en presupuestos. La falta de instalaciones de almacenamiento y las largas distancias a las plantas de tratamiento hacen que el transporte sea menos rentable, alentando a las partes interesadas a adoptar prácticas ilegales de eliminación de residuos.

3.2. Recolección y eliminación de C&DW en rellenos sanitarios urbanos (Etapa II)

El C&DW recolectado por los operadores de desechos se elimina con frecuencia en vertederos de desechos municipales o vertederos industriales no peligrosos, lo que mitiga su capacidad inicial de eliminación. La aprobación de esta fracción para eliminarla en vertederos de residuos municipales a menor costo mitiga el desarrollo de las actividades de reciclado y valorización.

Los C&DW generados en el estado de Constanta se eliminan en un vertedero especial ubicado en la ciudad de Ovidiu desde 2008 (capacidad: 310.767 m3, primera fase). Gurau y col. revelan que, en este condado, solamente el 13,56% de C&DW (15.220 t) se recogió en 2008 en comparación con las 122.250 t que se estima generará el plan regional de gestión de residuos de la región sureste. Además, en 2009, 2006, 6 t de 6850 t de C&DW recolectadas en el condado de Constanza se eliminaron en este lugar. La disponibilidad de datos sobre los flujos de C&DW es limitada en Rumanía. Dichos datos son proporcionados, principalmente, por operadores de residuos urbanos basados en estimaciones volumétricas y agregados en el ámbito de condado por los organismos locales de protección del medioambiente (EPA).

Los datos de volumen (basados en la capacidad del camión de residuos) se transforman a toneladas métricas utilizando una densidad específica de 2 t / m3 según lo sugerido por las autoridades medioambientales. Los operadores de residuos están obligados a enviar dichos datos estadísticos de los residuos a las agencias locales de protección del medioambiente. Los datos de C&DW se agregan a nivel de condado (equivalente a las regiones EU NUTS 3), pero son carentes a nivel de las unidades administrativas locales (ciudades y municipios). Los vertederos no conformes no tienen sistemas de pesaje y la mayoría de los datos de estadísticas de residuos se basan en esas estimaciones volumétricas. Por otro lado, no existen regulaciones estrictas que obliguen a las empresas constructoras a proporcionar datos sobre los flujos de C&DW. La mayor parte de los C&DW generados son gestionados por estas empresas.

En este contexto, los datos recopilados por las autoridades medioambientales siguen siendo muy deficientes y subestimados. A nivel mundial, se observa una falta generalizada de datos sobre las prácticas de gestión de residuos, lo que afecta la medición de los resultados de C&DW en varias economías. Los datos sobre los flujos de C&DW requieren especial atención, ya que en esta fracción se elimina tanto legal como ilegalmente y, con frecuencia, no se registra como un flujo de desechos separado o se registra incorrectamente.

La cantidad de C&DW aumentó en 2003-2008, debido al rápido desarrollo del campo de la construcción, seguido de un retroceso causado por la crisis económica, que comenzó en 2009. El sector de la construcción generó el 5,7 % del PIB en 2002 y el 10,5 % en 2008, con un pico de actividad en el 2007, cuando se completaron 45 867 viviendas nuevas (la mayoría de ellas en la ciudad de Bucarest y el condado de Ilfov). Se espera que el sector C&DW aumente en los próximos años, debido a la economía emergente rumana y las serias necesidades de desarrollo en infraestructura.

Las partes interesadas entrevistadas señalaron que la falta de infraestructura para almacenar, tratar y reciclar C&DW es un gran problema en Rumanía. La Figura 3 revela las disparidades regionales entre condados rumanos con respecto a la proporción de C&DW del total de residuos municipales recolectados en 2014 utilizando el método de clasificación de rupturas naturales de Jenks. Los informes ambientales locales proporcionan los datos sobre las cantidades de C&DW recolectadas por los operadores de residuos en cada provincia, luego, la relación de este flujo de residuos al total de residuos sólidos municipales recolectados (por operadores de residuos públicos o privados) se calcula, además, a nivel de condado.

El documento proporciona la primera evaluación de las brechas regionales de los flujos de C&DW en Rumanía utilizando un análisis espacial. Este enfoque revela mejor la magnitud de las estadísticas deficientes relacionadas con las cantidades de C&DW recolectadas por los operadores de residuos. Además, este estudio muestra grandes diferencias entre los C&DW generados en áreas urbanas (calculados sobre una base per cápita) en comparación con los recolectados por los operadores de residuos. Estos hallazgos presentan serios desafíos para evaluar el progreso realizado por Rumanía hasta el momento, teniendo en cuenta las disparidades regionales actuales, así como se muestra en los mapas (Figuras 3-5).

Grandes cantidades de C&DW caracterizan las principales áreas urbanas con una gran demanda para actividades de construcción (edificios residenciales, oficinas) como la ciudad de Bucarest, los condados de Iasi y Cluj, donde la fracción de C&DW tiene más del 13,8 % del total de residuos recolectados en comparación con otros condados (por ejemplo, Dolj, Gorj, Tulcea, Bistrita-Nasaud), donde se encuentra esta fracción apenas se nota (consulte este mapa para ver los nombres de las provincias https://en.wikipedia.org/wiki/Counties_of_Romania). De hecho, la proporción de fracción de C&DW está por debajo del 4% en diecisiete provincias; la mayoría de

ellos ubicados en el centro y la parte sur de Rumanía. Las mismas cantidades vagamente registradas de residuos de construcción y demolición en cuanto a los condados se encuentran en Croacia, especialmente en las zonas menos desarrolladas.

La Figura 3 sugiere que el proceso de monitoreo de los flujos de C&DW es limitado en estas áreas, lo que podría aumentar los riesgos asociados con las prácticas ilegales de eliminación de desechos y la prevalencia de la etapa I. En otros casos, la proporción de C&DW podría ser significativa (entre 6,39 y 13,8%) presentando un sector de la construcción emergente en ocho condados de Rumanía (por ejemplo, Suceava, Bacau, Timis, Satu Mare). El segundo mapa (Figura 4) revela las principales brechas a nivel nacional en lo que respecta al seguimiento adecuado de los flujos de C&DW.

Esta situación se explica por el hecho de que los operadores de residuos son los principales proveedores de datos para los informes ambientales locales. Algunas provincias no reportan ningún dato de C&DW recolectado en 2014, como los condados de Sibiu, Teleorman, Giurgiu o, en otros casos, los datos no están actualizados (antes de 2014). Varios condados informaron pequeñas cantidades de C&DW recolectadas por debajo de las 1000 t, como Botosani, Vaslui, Gorj o Dolj.

La ciudad de Bucarest tiene 1,883 millones de habitantes y es el principal centro industrial y comercial de Rumanía con gran interés en el sector de la construcción. Esto explica una gran cantidad de C&DW recolectada (160.427 t de un total de 793.294 t de residuos sólidos urbanos) por los operadores de residuos urbanos en 2014, como se muestra en la Figura 4.

La provincia de Lasi tiene la mayor cantidad de C&DW recolectado (113.278 t), seguido de Cluj (35.000 t). Por otro lado, el condado de Iasi tiene la proporción más alta de C&DW del total de

RSU recolectados (42,88 %, ver Figura 3) en comparación con la ciudad capital de Bucarest (20,23 %). La Figura 4 señala que los operadores de residuos proporcionan datos insuficientes sobre la magnitud de los flujos de C&DW en los condados rumanos. Su actividad se centra en la recolección del flujo de residuos sólidos urbanos constituidos por residuos domésticos (zonas residenciales) y fracción de residuos similares generada por instituciones, agentes económicos (comercios, oficinas, hoteles, restaurantes, etc.) y el sector industrial. Por lo tanto, las empresas de construcción manejan la mayoría de estos flujos de C&DW sin datos concretos sobre sus prácticas de gestión y eliminación.

Sin embargo, la Figura 4 muestra las diferencias regionales en el total de RSU recolectados, lo que también se espera en el caso del flujo de C&DW, debido a varios factores potenciales como la población, la tasa de urbanización, el nivel socioeconómico, los centros urbanos, el mercado inmobiliario, el desarrollo industrial, etc. En las economías emergentes, la proporción de residuos de la construcción es del 40% del total de residuos municipales, que representan más de 200 millones de toneladas en China.

El documento estima las cantidades de C&DW en áreas urbanas de los condados rumanos, utilizando una tasa de generación de desechos per cápita de 280 kg en un año como sugirieron Musuroaea y otros. Cabe destacar que este valor no incluye los grandes proyectos de infraestructura como nuevas carreteras, rehabilitación de vías férreas y grandes instalaciones industriales.

El tercer mapa (Figura 5) tiene como objetivo revelar el nivel de subestimación de C&DW a nivel nacional y por condado, como resultado de la diferencia entre las cantidades totales de C&DW recolectadas por los operadores de residuos en 2014 (datos proporcionados por informes

ambientales locales) y los generados por áreas urbanas (aplicando la tasa de generación de residuos per cápita mencionada). Los resultados muestran que los operadores de residuos recolectaron 519.723,36 t en 2014 en comparación con las 2.925.333,88 t de C&DW que se estima que se generarán en las áreas urbanas. En otras palabras, el documento destaca que solo el 17,76% del C&DW generado en las zonas urbanas se ha realmente recolectado por los operadores de residuos.

El resto se gestiona, principalmente, a través de empresas constructoras o por individuos que utilizan recuperación en sitio (etapa III), transporte propio a rellenos sanitarios urbanos (etapa II) o prácticas de disposición ilegal en comunidades periurbanas (etapa I). Las áreas urbanas son los principales generadores de C&DW a nivel de condado en comparación con las áreas rurales. Las instalaciones de tratamiento de C&DW se encuentran, principalmente, en áreas urbanas donde operan grandes empresas constructoras.

No existen plantas especiales para el tratamiento de la fracción de C&DW peligrosos estimada en el 4% del flujo total de residuos. Este hecho aumenta los riesgos de contaminación, si dichos materiales no se recolectan y eliminan en instalaciones adecuadas.

La Figura 5 revela un proceso de seguimiento deficiente de los flujos de C&DW a nivel urbano en todo el país. Las construcciones a pequeña escala (edificios residenciales) y las obras públicas (infraestructuras diversas) se aprueban basándose en el permiso de construcción y los propietarios deben asumir la responsabilidad de los C&DW que se generen. Este estudio revela que miles de toneladas de C&DW pueden ser susceptibles a ser vertidas ilegalmente, si no son manejadas de forma adecuada por cada generador (individual o sector empresarial). Ningún condado con una tasa de urbanización más alta (> 65 % de la población total) tiene un monitoreo adecuado de los

flujos de C&DW (Constanta, Brasov, Hunedoara). Además, las áreas urbanas podrían generar cantidades significativas de C&DW incluso en los condados que tienen una proporción de C&DW por debajo del 4 % en el flujo total de desechos, que han sido recolectados por los operadores de desechos en 2014 (ver Figura 5 versus Figura 3).

A pesar de que la ciudad de Bucarest tiene la mayor cantidad de C&DW recolectada, hay 361 930,64 t de C&DW que se descubrieron por informes ambientales, como se muestra en la Figura 5. Esta situación se debe a la falta de una regulación clara sobre cómo se debe gestionar este flujo de residuos y cómo todas las partes interesadas deben informar los datos estadísticos involucrados en el sector de la construcción a las autoridades ambientales. A modo de ejemplo, en la provincia de Valcea, no se informó que se recolectó C&DW durante 2014, pero se estima que se generarán 45 621,52 t en áreas urbanas. Se estima que se generarán grandes cantidades de C&DW en condados sin datos reportados como Sibiu (73 935,96 T).

Los recuentos negativos (círculos azules) están muy extendidos en los condados rumanos, lo que sugiere serias lagunas en las estadísticas de residuos. Existen varios condados donde más de 100.000 t de C&DW generadas no se encuentran en las cantidades recolectadas y comunicadas a las autoridades ambientales como Constanta (114.483,88 t), Timis (105.919,62 t), entre 75.000 y 10.000 t (Dolj, Prahova, Arges, Brasov, Mures).

El condado de Iasi es la única región con un recuento positivo (círculo rojo en el mapa), lo que significa que todos los C&DW que se estima que se generan parecen estar cubiertos por los datos recopilados. Esta situación se explica a través de la gran escala de trabajos en la infraestructura de carreteras (la rehabilitación de líneas férreas) en Lasi, en los años previos, del desarrollo continuo del sector de construcción residencial (casas, villas, cuadras) y oficinas, lo que da lugar a una

gran cantidad de desechos de asfalto procedentes de la excavación; tierra, piedra, grava y una mezcla de desechos C&D.

La mayoría de estos desechos se destinan a los vertederos, pero también se observaron sitios de disposición ilegal en el campo en áreas periféricas. Incluso, en casos favorables, todavía hay flujos de C&DW no contabilizados por las estadísticas oficiales. Esta es la razón por la cual es difícil realizar una estimación cuantitativa confiable de las etapas I-III a nivel local o regional.

Simion et al. proponen como opción de gestión de RCD más adecuada en la ciudad de Iasi (en términos de huella ecológica), un escenario que implica el almacenamiento temporal, la recogida y el transporte en una línea de clasificación y reciclaje combinada con el vertido con tratamiento de lixiviados. Este escenario ya está operando en otras ciudades (p. ej., Piatra Neamt) como parte del sistema integrado de gestión de residuos, que incluye una estación de clasificación, planta de trituración para C&DW y relleno sanitario.

Los vertederos urbanos o los vertederos silvestres (en terrenos públicos o privados) son opciones de eliminación generalizadas para este flujo de desechos. En algunas áreas urbanas, una opción es el almacenamiento de este flujo de desechos en sitios locales temporalmente (sitio de C&DW), servicios de recolección y transporte proporcionados por operadores de desechos o empresas constructoras.

3.3 Tratamiento y reutilización de C&DW en la construcción de obras civiles (Etapa III)

Las principales prácticas que actualmente están comprometidas con la recuperación de C&DW son el paisajismo y el relleno de basureros, mayormente al usar desechos inertes (no peligrosos, como arena, grava, concreto, ladrillos, cerámica, etc.), los cuales usualmente son triturados. A nivel nacional, existen 31 plantas de trituración con una capacidad total estimada de tres millones

de toneladas por año, las cuales se manejan por agentes económicos autorizados. Algunos municipios desarrollaron sus propios servicios de gestión de residuos de la construcción a través de proyectos piloto en Buzau (condado de Buzau), Medias (condado de Sibiu - servicio público), Dej (condado de Cluj - servicio público).

Las plantas de trituración fijas se implementan como parte del sistema integrado de gestión de residuos urbanos (por ejemplo, la ciudad de Piatra Neamt). Sin embargo, hay varios condados sin plantas de trituración, donde el C&DW se elimina en vertederos urbanos o se dispersa a través de vertederos ilegales en áreas periurbanas y rurales (por ejemplo, Arad, Suceava, Satu Mare, Dolj, Teleorman, Tulcea, Hunedoara, Brasov Gorj, Valcea, Ialomita, Calarasi, etc.).

La tasa de reciclaje de C&DW ha aumentado del 28% en 2010 al 59% en 2014, y la tasa de relleno. Estos valores están relacionados con la cantidad total que se genera y se recopila, pero, en realidad, las cantidades de C&DW generadas son mucho mayores que las recopiladas en las estadísticas oficiales, lo que finalmente afecta la confiabilidad de dichos datos. El proceso de monitoreo de este tipo de flujo de desecho presenta un verdadero desafío para la mayoría de los países europeos.

La cobertura de vertederos es otra práctica generalizada para la fracción inerte de C&DW. Estas prácticas también están estipuladas en informes medioambientales. La mayoría de los desechos C&D no peligrosos recogidos se utilizan como material de cubierta para los basureros en el condado de Salaj.

En el condado de Dambovita, se ha presentado una disminución de D&DW (relacionado con el total de desechos recolectados por los operados) de un 9.14% a un 2.37%, la cual se puede asociar con la reutilización de lujo de desechos como material de relleno. De acuerdo con Waste

Framework Directive (Directiva 2008/98/EC), Rumanía se debe preparar para reusar y reciclar material no peligroso de recuperación a un mínimo de 70% en comparación con su peso del 2020. Este objetivo será difícil de lograr sin una legislación específica para la fracción C&DW y la escasa cobertura de las plantas de trituración combinada con la falta de instalaciones de almacenamiento en cada área urbana.

3.4. Actividades de gestión de C&DW en el condado de Neamt: un estudio de caso regional

El condado de Neamt está ubicado en la región noreste de Rumanía, que cubre cinco ciudades y 78 comunas (municipios rurales) con una población total de 470.766 habitantes según el último censo de población de 2011.

3.4.1 Áreas urbanas

Piatra Neamt es la capital del condado y la única zona urbana del condado de Neamt donde funciona una planta de trituración fija. Esta instalación (con una capacidad de 15.000 t / año) está ubicada cerca de la planta de compostaje y el relleno sanitario, evitando costos de transporte suplementarios.

Los residuos triturados, resultantes de la planta, se han utilizado, principalmente, como material de recubrimiento (capa de drenaje) del antiguo vertedero (durante el proceso de rehabilitación) y luego como material de recubrimiento para la primera celda del vertedero sanitario (clausurado en 2010). The average of C&DW processed is 1300 t/yr under 10% of plant capacity (8.6%).

En 2015, se utilizaron alrededor de 3670 t de material de revestimiento para la celda n.º 2 dentro del área del relleno sanitario. Este hecho sugiere que esta planta trituradora podría expandir el área de cobertura geográfica en todo el condado de Neamt. La ciudad de Piatra Neamt tiene dos

centros de recolección separados, ubicados en los distritos de Maratei y Darmanesti, donde la fracción C&DW es recolectada en contenedores especiales (incluidos artículos voluminosos). El individuo o los agentes económicos pueden disponer de sus C&DW en dichos centros o transportarlos al relleno sanitario, que incluye un sitio de almacenamiento temporal para que los desechos sean procesados posteriormente por la planta de trituración. Además, pueden solicitar un contenedor especial al operador de residuos urbanos.

En las ciudades de Polonia, se han puesto en marcha instalaciones similares de recogida selectiva de C&DW. Por otra parte, la cuidad de Zagreb tiene una única planta de tratamiento permanente, mientras que, en otras partes de Croacia, el reciclaje se maneja en plantas de procesamiento movibles.

El vertedero sanitario de la ciudad de Piatra Neamt cuenta con un sistema de pesaje, el cual se encuentra activo desde el 2007. Los datos sobre C&DW son más confiables que en años anteriores o en comparación con otras áreas urbanas, donde los datos se reportan por operadores de residuos basados en estimaciones volumétricas. Los operadores de residuos urbanos recolectaron 72.488,9 t de C&DW durante 2004-2010 en la ciudad de Piatra Neamt, de las cuales, 49.092 t (67,72 %) fueron entre 2007-2010. Este hecho se explica por la contribución de la demolición de antiguos sitios industriales dentro del área administrativa de la ciudad.

Se estima que los desechos de construcción (DW) derivados de nuevos edificios residenciales, en cada nivel urbano, se basan en el total del uso del suelo (UFA); este es el resultado de autorizaciones de construcción que se aplican a comunidades rurales en un estudio previo, por Mihia y Grozazu. Una taza de generación de desechos (WGR) de un 21,38 kl/m2 por superficie

útil neta (Aufa) se utiliza sobre la base del Centro de la Fuerza Aérea del Cuartel General para el Medio Ambiente. Qcw (t) = Aufa (m2) * WGR (kg/m2)/1000 (1).

Este mismo enfoque se desarrolla para la estimación de flujo de C&DW en Tailandia, ya que este país presenta problemas similares en términos de carentes sistemas de reporte, asociados con el flujo de desechos. Estimaciones poco fiables conducen a políticas inadecuadas y prácticas de manejo de desechos poco solidos en países con economías emergentes, como la India. Los países europeos abordan desafíos similares y nuevos enfoques son requeridos para proveer mejores estimaciones de flujo de C&DW en diferentes etapas de construcción o para examinar la tendencia espacial del inventario de material de construcción y potenciales desechos de demolición, incluyendo el análisis de mapas histórico.

En este estudio, los datos sobre el número de edificios privados, edificios nuevos con superficies útiles asociadas, son proporcionados por el Instituto Nacional de Estadística (INS), a través de la base de datos tempo-online. Las cantidades de CW generadas por estos edificios se determinan utilizando la ecuación anterior y, al mismo tiempo, comparando las cantidades de C&DW que se recolectaron por los operadores de residuos. Algunas áreas urbanas reciben servicio de más de un operador de residuos. En el último caso, los datos se agregan a cada nivel de ciudad en función de la información recibida por EPA Neamt de los operadores de residuos urbanos.

La Tabla 1 señala que Piatra Neamt y las ciudades romanas recolectaron las cantidades más significativas de C&DW en el condado de Neamt, lo que supera significativamente los resultantes de las nuevas áreas residenciales.

Tabla 1. Desechos de construcción y demolición (C&DW) recolectados por operadores de desechos urbanos y desechos de construcción (CW) generados por nuevos edificios residenciales durante 2004–2012.

Por otro lado, se informa que se recolectó poco C&DW en Bicaz y Tirgu Neamt y no se recolectó nada en la ciudad de Roznov. En este último caso, esta ciudad no estaba cubierta por un efectivo servicio formal de recolección de residuos antes de 2010. Además, las ciudades de Targu Neamt y Bicaz no reportaron ningún C&DW recolectado durante 2011-2012. Las malas instalaciones de gestión de residuos en estos pueblos favorecieron las prácticas ilegales de eliminación de residuos en los alrededores.

La fracción C&DW es susceptible a tales prácticas, porque casi 3380,57 t de CW no están cubiertas por los registros oficiales en las ciudades de Tirgu Neamt, Bicaz y Roznov. At the county level, the amount of C&DW collected by waste operators decreased from 3688.35 t in 2014 to 1068.64 t in 2015. Este hecho podría sugerir que la mayoría de las empresas constructoras realizan sus actividades sin permisos ambientales y sin entregar informes oficiales sobre los caudales de C&DW. Además, el informe de EPA Neamt señala que las instalaciones de tratamiento de la ciudad de Piatra Neamt (plantas de compostaje y trituración) tienen serios problemas para vender los materiales secundarios (compost y áridos reciclados) durante 2009-2015.

Debido a esta crisis en el mercado económico, se han acumulado grandes cantidades de C&DW tratado en sitios de almacenamiento. La planta de trituración continuó operando en 2014-2015, a pesar del existente inventario; mientras que los materiales reciclables secos procesados por la instalación de clasificación (metales, papel y cartón, plásticos y vidrio) se han vendido a agentes

económicos. Existe una diferencia significativa entre las cantidades de C&DW recolectadas durante 2011-2012 en Piatra Neamt, como 6125,7 t, de las cuales, 3768,1 t son de agentes económicos y tratadas mediante planta de trituración en comparación con la ciudad romana, donde se recolecta todo el C&DW (523,32 t, de las cuales, 496 t son provistas por agentes económicos y fueron eliminadas en el relleno sanitario incumplido).

Hasta ahora, existe un mercado económico pobre relacionado con la fracción C&DW en el condado de Neamt, ya que los agregados naturales son abundantes en todo el condado, debido a la presencia de varios sitios de grava en los prados de los ríos. Además, hay una cantera de piedra caliza en los Cárpatos Orientales (comuna de Bicaz-Chei) y una cantera de margas (comuna de Bicazu-Ardelean) que proporciona las materias primas a la fábrica de cemento (Heidelbergcement) ubicada en la comuna de Tasca, cerca de la ciudad de Bicaz.

Con frecuencia, los agentes económicos del sector de la construcción realizan actividades no autorizadas ambientalmente y, por tanto, no cumplen con los objetivos de reciclaje de residuos de construcción ni cuentan con la documentación necesaria para el transporte de residuos. Esta situación conduce a prácticas descontroladas de eliminación de desechos en terrenos públicos en áreas urbanas y rurales. Por lo que se requiere una mejor aplicación de la ley tanto de los ayuntamientos como de la guardia ambiental local. Dichas prácticas se pueden monitorear aún más combinando datos de campo y herramientas GIS en comparación con las estadísticas oficiales.

3.4.2 Zonas rurales

Por lo general, no se prestan servicios especiales de recolección de residuos dedicados a C&DW. Los desechos generados a nivel doméstico se eliminan ilegalmente en los alrededores o la

fracción inerte se reutiliza como material base para nuevas construcciones, rellenando caminos locales sin pavimentar. Con frecuencia, la fracción de madera se recupera como combustible sólido y los metales se recolectan para venderlos a empresas de reciclaje. Algunos municipios rurales no están totalmente cubiertos por los servicios de recolección de residuos y las prácticas ilegales de eliminación de residuos, incluida la fracción C&DW, todavía se detectan en las zonas rurales. Algunos de los artículos de C&DW se eliminan en bolsas resistentes o contenedores de residuos para que los operadores de residuos los recojan y sean transportados a vertederos urbanos.

Sin embargo, hay un operador de residuos que atiende exclusivamente a los municipios rurales (por ejemplo, las comunas de Savinesti, Pipirig, Faurei, Ruginoasa). Este operador recolectó 188 t de C&DW en 2011 (de agentes económicos) y 288 t en 2012 (población); estos escombros se desechan en el vertedero de la ciudad romana de acuerdo con los datos de EPA Neamt. Las comunidades rurales están expuestas a la eliminación ilegal de C&DW realizada por empresas constructoras. Las observaciones de campo revelaron estas malas prácticas en los bordes de las carreteras locales, pastizales, llanuras aluviales y riberas de los ríos, como se muestra en la Figura 6.

Figura 6. Varios vertederos de C&DW en la llanura aluvial de Moldavia (aldea de Pildesti, julio de 2014).

Mihai y Grozavu estimaron que los edificios rurales generaron 31 393 t de desechos de construcción a nivel de condado (durante 2002-2010), de los cuales, 4897,3 t son reciclables, 9417,9 t son ladrillos y tejas, y 2197 t son de hormigón. Los valores oscilan entre 1000 y 2000 t en las localidades periurbanas con el mayor interés en edificios residenciales o pensiones

turísticas a menos de 100 t en las regiones más pobres del condado. Estos desechos se eliminan en vertederos abiertos o se reutilizan y recuperan a nivel doméstico.

Las comunidades rurales enfrentan cambios similares hoy en día, debido a la falta de instalaciones adecuadas de recolección y almacenamiento asociadas con el sector de la construcción. Por lo tanto, la etapa I todavía se mantiene activa en las regiones rurales de la provincia de Neamt. Además, el vertedero sanitario regional ubicado en la comuna de Girov (que debería cubrir la mayoría de los municipios urbanos y rurales del condado) se abrió más tarde (desde agosto de 2015), debido a los prolongados retrasos causados por un proceso de licitación para la gestión de este sitio.

Por lo tanto, los sitios de almacenamiento temporal (básicamente, vertederos) reemplazan los viejos vertederos que no cumplen con las normas (clausurados en julio de 2012) como la opción principal de eliminación de desechos recolectados (incluida la fracción C&DW como fracción separada de desechos o desechos mezclados residuales) en Tirgu Neamt, Roman, Bicaz, así como ciudades de Roznov y comunas circundantes.

Estos sitios temporales deben cerrarse y todos los desechos acumulados para ser transportados al relleno sanitario de Girow, pero esto implica otros costos para los operadores de desechos y los municipios. Por otro lado, las empresas constructoras y los operadores de residuos locales tratan de evitar las tarifas de los rellenos sanitarios buscando alternativas más económicas para la eliminación de residuos. El vertido ilegal de C&DW todavía ocurre dentro del área de estudio, debido a esta crisis de gobernanza de residuos. Se necesitan más investigaciones para revelar la magnitud de las amenazas ambientales asociadas con la falta de actividades de gestión de C&DW, incluidas otras regiones rurales de Rumanía.

4. Caminos para la sostenibilidad en la gestión de residuos de construcción y demolición en Rumanía

4.1. Desarrollo de centros de reciclaje y recuperación en áreas urbanas (Fase IV)

Las pautas generales sobre los problemas de C&DW se publican a nivel de la UE utilizando un enfoque de pensamiento de ciclo de vida. En Rumanía, se publicó en 2011, una guía de mejores prácticas en la gestión de RCD como parte de un proyecto de gestión integrada de residuos en la Región Centro (NUTS 2), entre las autoridades regionales y locales de Noruega y Rumanía. A lo largo de este proyecto, Medias City ha implementado un centro de reciclaje y recuperación dedicado a la fracción C&DW. Los individuos o agentes económicos pueden requerir un contenedor especial para la fracción C&DW. El operador de residuos transporta el contenedor a la instalación de reciclaje y recuperación o los C&DW generados son llevados por cada generador.

Los C&DW se clasifican mediante un proceso mecánico que da como resultado nuevos materiales para su reutilización en el sector de la construcción. En 2016, esta instalación recogió y procesó 4278,5 t de RCD y recibió 394 pedidos de servicios de recolección de residuos. Para tener un permiso de construcción, los individuos o agentes económicos deben informar las cantidades de C&DW resultantes y estipular cómo manejan estos escombros. Este podría ser un aspecto clave para prevenir el vertido ilegal de C&DW alrededor de las áreas periurbanas. Las autoridades locales podrían implementar dichos centros de reciclaje y recuperación a través de proyectos propios correlacionados con las necesidades locales sin más intervenciones gubernamentales.

El proyecto de Life LIFE10 ENV/RO/000727 “Recuperación de residuos de construcción y demolición en el condado de Buzău/VAL-C&D” proporciona una importante área de investigación piloto relacionada con las actividades de gestión de C&DW en el condado de Buzau. Existe una estación piloto para el tratamiento mecánico (trituración) y, en su caso, la clasificación gravimétrica de los RCD que tiene una capacidad máxima de tratamiento de 40.000 t/año, respectivamente, 20 t/hora (http://www.domeniiprestserv.ro/despre-noi.html). Las operaciones principales que se realizan en la planta de reciclaje:

- Los C&DW se examinan en el sistema de pesaje para registrar las fracciones de residuos, que se aceptan para la planta de trituración.
- Los desechos se eliminan en un área de almacenamiento temporal.
- Los reciclables serán clasificados (madera, papel y cartón, metales, vidrio, plásticos, tejas, etc.).
- Corte de vigas y otros grandes elementos de hormigón armado.
- Trituración primaria con trituradora de mandíbulas.
- Separación magnética de los metales.
- La trituración secundaria de la púa.
- Selección manual de madera, plástico, papel y cables.
- Tamizaje por fracciones de tamaño de partícula.
- Clasificación granulométrica (0/10 mm, 10/30 mm,> 30 mm).
- Eliminación de partículas diminutas por filtración, lavado.

El proyecto es una asociación público-privada que tiene como objetivo promover una gestión sólida de la fracción C&DW. Para fomentar las operaciones de reciclaje y recuperación, esta instalación cobra una tarifa (50 RON, 1 EUR = 4,7 RON) por el uso del sistema de pesaje, no por tonelada de C&DW eliminada. En 2015, esta instalación procesó 1200 t de RCD y se vendieron todos los materiales de construcción resultantes; mientras que, en 2016, se procesaron 1500 t de RCD, de las cuales se vendieron 280 (galería de fotos http://www.domeniiprestserv.ro/galerie-foto.html).

En diciembre de 2010, se inauguró una planta de trituración de hormigón que tiene como objetivo tratar el C&DW generado y recogido en el área metropolitana de la ciudad de Oradea (condado de Bihor). De esta forma, la planta de trituración de hormigón ECO BIHOR SRL ofrece varias opciones en cuanto a los servicios de tratamiento de RC&DW (https://ecobihor.ro/beton.htm):

(i) Reciclaje como proveedor de servicios; el cliente se queda con el producto terminado (hormigón triturado, hierro); (ii) reciclaje parcial donde el cliente guarda el hierro por separado después de ser triturado y el concreto triturado es preservado por ECO BIHOR; (iii) tratamiento de residuos de demolición donde se conserva el producto terminado por ECO BIHOR (hormigón triturado, hierro).

Estos ejemplos mencionados anteriormente señalan los primeros pasos de un enfoque sostenible de C&DW en Rumanía que debe desarrollarse más en cada una de estas áreas urbanas.

4.2. Ampliación de las actividades de coprocesamiento de residuos en la industria del cemento (etapa V)

Las fracciones de residuos se utilizan en la industria del cemento en el proceso de coincineración como sustituto de los combustibles fósiles y el reciclaje de materiales como sustituto de la

materia prima en la producción de cemento. Hay siete fábricas de cemento en Rumanía autorizadas para el proceso de coincineración que utilizan diversos flujos de residuos: residuos municipales clasificados, neumáticos usados, combustibles derivados rechazados (RDF), aceites, residuos industriales peligrosos y no peligrosos, etc.

Estas fábricas de cemento ubicadas en Deva, Bicaz, Fieni (Heidelberg Cement Romania), Alesd, Campulung (Holcim Romania), Medgidia y Hoghiz (CRH Cement Romania) han integrado el proceso de fabricación del clínker. Para la obtención del cemento compuesto, el clínker es sustituido parcialmente por otros compuestos minerales con características químicas similares a los materiales naturales (calizas) o residuales como C&DW o materiales secundarios (escoria granulada de alto horno, cenizas volantes). El coprocesamiento de residuos es ampliamente aplicado por la industria cementera a nivel mundial y reconocido a nivel europeo como una de las mejores prácticas de uso eficiente de los recursos. La industria del cemento y el hormigón de Rumanía puede conducir a esta transición al ampliar las instalaciones de coprocesamiento de residuos. Por ejemplo, Holcim Rumanía afirma invertir 3 millones de euros en la expansión de sus instalaciones de coprocesamiento en sus plantas de cemento en Alesd y Câmpulung. La cantidad de residuos industriales y municipales coprocesados en la industria del cemento de Rumanía durante 2004-2014 es de 2 millones de toneladas, lo que equivale a los residuos municipales que se generan en un año en 24 ciudades con más de 250,000 habitantes.

El aspecto clave es aumentar el papel de la fracción inerte de C&DW como material sustituto en la producción de cemento. Los experimentos revelan que los materiales con residuos industriales como las cenizas volantes ultrafinas se recomiendan para ser utilizados como losas prefabricadas para el pavimento. El hormigón de cemento de CDW también es adecuado para la construcción de pavimentos. Las pruebas de laboratorio mostraron que los agregados reciclados tenían

características de rendimiento similares con la grava triturada que las virutas utilizadas en la construcción de pavimentos rígidos.

La producción de cemento y los áridos reciclados son vías importantes para el reciclaje y la recuperación de C&DW en Rumanía, estas prácticas deberán ser mejor desarrolladas. Los desechos y subproductos de otras industrias reemplazan entre el 20% y el 30% de las materias primas naturales tradicionales utilizadas por la industria del cemento y ahorran más de 2 millones de toneladas de recursos naturales al año.

4.3 Desarrollo del sector de áridos reciclados (Etapa V)

La tasa de valorización de los áridos reciclados resultante del tratamiento mecánico de C&DW a través de plantas de trituración sigue siendo insignificante en Rumanía. Los costes de este tipo de prácticas son demasiado elevados en comparación con los áridos naturales y, a su vez, existen pocas plantas de trituración a nivel nacional. Rumanía es muy rica en áridos minerales y no se crean incentivos para preferir áridos reciclados y más caros.

Anualmente, un aproximado de 25-30 millones de metros cúbicos de áridos naturales de origen sedimentario (arenas y gravas) se extraen por excavación, ya sea de los lechos de los ríos o de las terrazas de los prados. Cada ciudad debería ser atendida por una planta de trituración fija o móvil con el fin de recuperar el C&DW generado y evitar prácticas ilegales o legales en vertederos. Estos planes podrían incorporarse al sistema regional de gestión de residuos que debe cubrir las áreas urbanas y rurales del condado.

La fracción inerte de C&DW es favorable para la producción de áridos de 0/30 mm, según lo respalda un análisis LCA desde las perspectivas ambiental y económica. Un análisis de LCA sugiere que la compra de áridos reciclados resultantes del tratamiento de RDC es rentable, solo si

la planta de tratamiento está situada dentro de un área de 30 km. Las largas distancias entre los centros de gestión integrada de residuos de las áreas urbanas más pequeñas y las comunidades rurales fomentarán las instalaciones ilegales de eliminación de residuos y aumentarán la prevalencia de áridos naturales en el sector de la construcción.

Las plantas de trituración móviles combinadas con instalaciones de almacenamiento locales podrían ser una solución para tales asentamientos. Al final de su vida útil, el hormigón se puede reciclar como un árido reciclado o en otras aplicaciones, como la base de la carretera. El mercado de áridos reciclados deberá mejorar en Rumanía teniendo en cuenta el crecimiento económico sostenible a largo plazo. Un estudio sugiere que el precio de los áridos reciclados debe mantenerse al menos un 20% más bajo que el de los áridos naturales, lo que en la actualidad no toma en cuenta los áridos producidos a partir de residuos.

Rumanía tiene acceso a áridos naturales baratos y esta iniciativa es difícil de implementar. Los costes de eliminación de residuos y la diferencia en el precio de los áridos naturales y reciclados podrían ser factores clave para el éxito de las prácticas de reciclado de C&DW entre los nuevos Estados Miembros de la UE. Los experimentos realizados muestran que reemplazar el 25% de los materiales naturales con áridos reciclados no tiene un significativo efecto adverso en el desempeño del concreto estructural.

Otro análisis de ACV concluye que los áridos reciclados deben considerarse un recurso complementario y no una alternativa completa al uso de áridos naturales, teniendo en cuenta la gran demanda actual en el sector de la construcción rumano. A nivel europeo, las principales barreras derivan de la comercialización de tales áridos reciclados, el mercado de materiales

vírgenes o su logística y no del lado de la tecnología de reciclaje, en particular para los residuos de hormigón y cerámica.

Guignot y otros proponen un nuevo esquema de reciclaje para la fracción RCD utilizando una tecnología de fragmentación eléctrica. Esta tecnología reintrodujo los desechos de hormigón en el circuito para producir hormigón nuevo para edificios y suministrar parte de la alimentación cruda de un horno de clínker. Además de la conservación de los recursos naturales y la reducción de las áreas de relleno sanitario, la implementación de áridos reciclados en el concreto premezclado también fomentará una mayor investigación y desarrollo de la construcción sustentable. Se debe promover el mismo enfoque en Rumanía para acelerar la transición de una economía lineal a una circular evitando el agotamiento de los recursos naturales.

4.4 Enfoque regional del sistema sostenible de gestión de residuos de construcción y demolición (Etapa III-V)

Un desafío crucial es integrar las actividades de gestión de C&DW a nivel de provincia, incluidos los municipios urbanos y rurales. Un estudio de viabilidad sobre la implementación de un sistema integrado de gestión de RCD en el condado de Hunedoara sugiere las siguientes propuestas:

- Nueve áreas especiales de almacenamiento para C&DW ubicadas en áreas urbanas (Brad, Petrosani, Calan, Orastie, Petrila, Lupeni, Uricani, Aninoasa), un almacenamiento central cerca del sistema municipal integrado de gestión de residuos será ubicado en Bircea Mare, donde una instalación móvil de trituración (20 t / h) estará en operación, esta instalación podría transportarse a las áreas de almacenamiento urbanas anteriores, si se solicita.
- Sitios de almacenamiento especiales para localidades rurales con áreas recomendadas de aproximadamente 20 m × 20 m deberán ser clausuradas.

- Varios contenedores especiales (capacidad-7 m ³) en zona urbana y uno en cada comuna.
- Un contenedor (1,1 mc) ubicado en cada pueblo junto a los contenedores de basura municipales.

El C&DW generado en áreas rurales se transporta al área de almacenamiento urbano más cercana como se enumeró anteriormente. El mismo estudio establece que los materiales inertes se recuperarán en la construcción de carreteras, las fracciones seleccionadas (metales, vidrio, plástico, madera) se enviarán a empresas recicladoras y los rechazos de D&DW se utilizarán en rellenos sanitarios o como cubierta de material inerte para rellenos sanitarios de Bârcea Mare.

El uso de diferentes tipos de materiales C&DW (áridos de hormigón reciclado, ladrillos triturados, pavimento asfáltico recuperado) en las capas base y subbase de las carreteras ha demostrado ser una excelente alternativa a los áridos naturales, sin una gran pérdida de rendimiento de la infraestructura.

Un tema clave es poder hacer la transición de la etapa de construcción civil (relleno, base de la carretera, material de cobertura, cimientos) a la reutilización de dichos materiales en edificios a través de agregados reciclados cualitativos a precios. Un enfoque holístico de las actividades de gestión de residuos de C&D es imperativo para los responsables de la toma de decisiones regionales y locales. Yeheysis y otros proponen un índice de sostenibilidad integrado basado en LCA de residuos de construcción que considera indicadores ambientales, económicos y sociales.

La actividad de gestión de residuos es una actividad compleja, que involucra dimensiones técnicas, medioambientales, económicas, sociales, de gobernanza y políticas a diversas escalas geográficas (local, regional, nacional, UE). En primer lugar, la ley debe establecer un seguimiento adecuado de los flujos de C&DW para tener una base de datos confiable (que

involucre a los operadores de residuos y las empresas de construcción). Los permisos de construcción deben incluir la obligación de que las personas o empresas informen las cantidades de C&DW generadas y estipulen cómo se debe gestionar adecuadamente este flujo de residuos.

Estas acciones deben estar respaldadas por la aplicación de la ley adecuada de las autoridades ambientales y locales. El futuro aumento de las tarifas de los vertederos desalentará la eliminación de dicha fracción en vertederos urbanos o regionales y alentará a las partes interesadas a prestar más atención a las actividades de reciclaje y recuperación.

Las prácticas actuales de gestión de residuos se basan en la recuperación local de esta fracción (relleno, carreteras, cimientos) o la eliminación en vertederos urbanos o esparcidos por terrenos públicos o privados como vertederos silvestres. La implementación de sistemas regionales integrados de gestión de residuos municipales debería mitigar los problemas planteados por actividades inadecuadas relacionadas con la fracción C&DW.

Sin embargo, las implementaciones de dichos proyectos se retrasan regularmente debido a la burocracia, las apelaciones de licitaciones, los desafíos políticos, los problemas de gobernanza y los tribunales. Dichos retrasos, combinados con el cierre de rellenos sanitarios que no cumplen con las normas, conducen a prácticas de vertido ilegales o vertederos temporales, debido a la falta de sitios alternativos de disposición sanitaria. Además, el reciclaje, instalaciones de tratamiento, recogida de residuos y los esquemas de transporte se ven afectados, incluyendo los atribuidos a los flujos de C&DW.

La eliminación ilegal de C&DW sigue siendo una práctica generalizada debido a la falta de una legislación coherente, la aplicación deficiente de las autoridades locales a este respecto, y las instalaciones de almacenamiento y tratamiento insuficientes. Las actuales plantas de trituración,

que con frecuencia sirven principalmente a un área urbana, deberían ampliar su cobertura hacia los municipios rurales circundantes. Las prácticas de recuperación y reciclaje en el sitio que utilizan una instalación de trituración móvil podrían ser una solución óptima para las empresas de construcción.

Las instalaciones móviles de tratamiento parecen ser la mejor opción para resolver los problemas de gestión de residuos de construcción y demolición en Croacia. Los estudios de caso de Irlanda revelan la necesidad de acuerdos contractuales de colaboración cooperativa para facilitar la participación temprana de las partes interesadas del proyecto y establecer objetivos de rendimiento de residuos para el constructor principal y los subcontratistas.

En Australia, las estrategias para mejorar la reutilización de los desechos de la construcción incluyen educación y capacitación en el campo en todo el sector; mejor comunicación entre los actores que se ocupan de la reutilización de materiales de desecho; incentivos legislativos y financieros más efectivos; mejores instalaciones de gestión de residuos dentro y fuera del sitio y responsabilidad extendida del productor.

Estas son estrategias generales con cobertura mundial en cuanto a la mejora de la recuperación en el sitio. La implementación efectiva de la clasificación de residuos de la construcción requiere una amplia gama de factores que involucran a los seres humanos, la gestión, la tecnología, el medioambiente y los recursos. Además, una estimación fiable de los costes asociados a los flujos de residuos ayudará a los responsables de la toma de decisiones a mejorar la estrategia adecuada que pueda mitigar la generación de RCD.

El relleno, las cubiertas de los vertederos, la base de las carreteras y los edificios son las principales rutas de desviación de desechos de los vertederos y vertederos municipales. En áreas

rurales, se observan prácticas de recuperación local (cimientos de edificios, material de relleno, caminos sin pavimentar), pero sin instalaciones básicas de manejo de residuos de C&DW. Las instalaciones móviles de trituración podrían ser una opción confiable para áreas urbanas más pequeñas y comunidades rurales circundantes.

El documento señala los desafíos de las actividades de gestión de residuos de C&D en Rumanía en el contexto de instalaciones deficientes de gestión de residuos dedicadas a esta fracción de residuos. El documento identifica cinco etapas de C&DW en la ruta sostenible comenzando con el peor de los casos (etapa I), como el vertido ilegal en los alrededores (que aún prevalece en las comunidades rurales) hacia materiales de construcción que utilizan elementos reciclados (por ejemplo, áridos reciclados) bajo un enfoque de economía circular (etapa V). El documento destaca la dimensión geográfica de los flujos de C&DW en los condados rumanos y grandes cantidades de C&DW, que no están cubiertos por las estadísticas de desechos como se muestra en los mapas temáticos.

5. Se perfilan varias vías para la sostenibilidad en la gestión de los RCD en Rumanía a través de las siguientes opciones: desarrollo de plantas de trituración en cada zona urbana, plantas móviles de trituración para empresas de construcción (recuperación in situ) o destinadas a pequeñas ciudades y comunidades rurales; áreas de almacenamiento especiales y contenedores para RCD.

Conclusiones

Actividades de recolección y eliminación, la expansión de las actividades de procesamiento de residuos en la industria del cemento rumana, el desarrollo del sector de áridos reciclados respaldado por un mercado económico confiable; estas actividades son necesarias para desarrollar

un sistema de economía circular de flujos de C&DW, centrándose en las interacciones entre las etapas III, IV y V.

Otros países de todo el mundo deberían examinar estas etapas en transición y en desarrollo, los cuales enfrentan condiciones similares en términos de infraestructura deficiente para la gestión de C&DW.

El documento revela algunas prácticas prometedoras en áreas urbanas (proyectos piloto) y analiza las perspectivas futuras en el apoyo a las actividades de reutilización, recuperación y reciclaje de C&DW como materiales de construcción en un enfoque de economía circular. Para lograr esta transición, los municipios urbanos y rurales deben ser parte de un sistema de gestión integrado de C&DW.

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4.2 Translation from Spanish to English

Curricular environmentalization. COVID-19, new emphasis for education

The contemporary environmental crisis, since its origins, has followed a growing process in terms of its pace, magnitude, level, and depth (Tommasino et al., 2001). It has gone from merely ecological concerns to concerns about the impact on all spheres of human and non-human life. Its growing depth has caused it to reposition itself in the social fabric and occupy one of the main

axes to understand and outline the new contours of the world and the development of both present and future generations worldwide.

We can understand the genesis of the environmental crisis in the framework of multiple imbalances in the articulation between society and nature. Morín and Kern (1993) bring light to the global economic imbalance, the demographic imbalance, and the development crisis, to which is added the environmental imbalance. Due to the above, Toledo (1996) and Alba (1991) point out that we are experiencing a societal crisis, a crisis of civilization or generalized social crisis. This crisis shows the collapse of economic, political, cultural, ethical, educational, ideological, social, environmental structures, and previous social configurations. This evidences a process of change towards other paths, other structures, and other social practices that are still in formation. However, the configuration process of the new societies takes place in a framework of greater precariousness and, for countries like ours —of the third world—, the new conditions are more adverse.

From the environmental field, solution perspectives, development models, environmental and sustainability guidelines have been outlined to revert and overcome the profound deterioration of nature that occurs at national and global levels. In this great company, higher education is seen as one of the social institutions of importance in the current world configuration, so its deep link with environmental causes is imperative.

Higher education is, with greater emphasis, a strategic sector for the development of societies. In the context of the so-called "Knowledge society," knowledge and the institution linked to it, reconfirm the singularity and importance of higher education institutions.

Although HEIs are historical institutions, they seek to respond to their time, space, environment, and social demands, which has currently made them highly complex institutions that have great significance for in the present and for the future. They are institutions where knowledge is transmitted and, in a good part of them, knowledge is created and certified. HEIs extend beyond their borders. Their work does not end within themselves. Through their graduates, their educational and research work, their professors, and their researchers, they extend to society and reach their meaning and their concretion for their indulgence. For this reason, several researchers have established the role of HEIs as an object of strategic importance for the sustainability of societies, in the hope that they will contribute to the objectives of environmental change.

We are referring to the crisis that developed from the Industrial Revolution, but which has intensified since the end of the Second World War, in which the relationship between human beings and nature had not been present in the environmental history of the world, by disrupting its dynamic balance. The environmental field has been called the set of actors, programs, and policies that from the government, educational or social sector address the environmental issue, each from their own spaces, but linked through debates, controversies, and agreements. HEIs, particularly universities, emerged in the eleventh century in Europe with a history of cathedral schools. In Mexico, they appear in the sixteenth century in the colonial era.

However, higher education must be rethought and reconceptualized, since it is heir to anthropocentric and mechanistic visions that have contributed to the contemporary environmental crisis. The vision of the relations between society and nature, particularly the symbolic ways of approaching the natural world, has been decisive in generating the critical environmental situation. The mechanistic vision of the world that was established three centuries ago has contributed to this.

Mechanism completely permeated the way of life of Western society and, therefore, of higher education. This brought two consequences: materialism, thinking that only the material, the objective, exists; and determinism, from the idea that everything has a physical cause, including consciousness. The mechanistic vision implies the fragmentation of knowledge and, with it, the division of reality into disciplines or fields of knowledge. This vision has been central to interpreting and intervening in reality, since the biosphere has been fragmented and unstructured, which is contrary to an approach that wanted to be structuring and integrating. Modern science that subscribes this vision has been one of the most powerful instruments for the management and transformation of the natural environment. The university, through its central tasks, particularly the training of professionals, has been the bearer of these atomized visions.

However, the environmental crisis has generated new knowledge and wisdom, which are separated from the mechanistic paradigm, through conceptual strategies oriented towards the construction of a new social and epistemological rationality, guided by principles of democracy, ecological sustainability, cultural diversity, and social equality. By breaking with the paradigm of the reduction of knowledge to its parts, with determinism, the concealment of chance and the application of mechanistic logic to the problems of nature and the social, complex thought emerges that seeks to distinguish and recognize the singular and the concrete, without separating and without atomizing, in a dialogical game among order, disorder, organization, context, and uncertainty, without taking as truth that particular organization of a determined set. From this new perspective, work is being done to build desirable development scenarios that overcome serious environmental problems and prevent others.

The curricular environmentalization framed in the above considerations has been, since the 70s, proposed to generate changes in higher education that lead to transformations of HEIs, so that they can support the transformation of society towards perspectives of sustainability.

The effects of the new coronavirus in our societies, particularly in Mexico, with more than 1,301,249 infected and 117,949 deaths as of December 19, 2020 (Noticieros Televisa, 2020), have shown us the harshness of thirty years of the neoliberal era, where the corruption of the ruling elites devastated the patrimony and wealth of the people, leaving the health, educational, productive systems, etc., in the greatest precariousness. For this reason, the reconstruction of hospitals and health services to deal with the growing infections has been a titanic task. In the same way, the economic recomposition of the country will be a task like no other.

The human species uses several ways to adapt to nature: technical tools, social organization, and production systems. With this, it has developed symbolic forms of interpretation of the natural world, with which it values and intervenes in nature. However, this health crisis has led to a greater awareness among various groups in society, who have indicated that the tasks of curricular environmentalization must include with greater determination the analysis and teaching of the generation and impact of this type of virus in the quality of life of society. The appearance of the virus is associated with unsustainable consumption styles and high population growth, among others.

Young people undergoing training in HEIs, future professionals, can reorient their ways of life and consumption. They can influence their community to achieve changes towards healthy lifestyles that do not alter nature so profoundly, and thus reduce the danger of the appearance of new viruses.

Curricular environmentalization

In the context of environmental crisis, professional practice and, therefore, HEIs, in their eagerness to contribute to national development through the training of professionals, have avoided foreseeing the alteration of ecosystems and are largely responsible for environmental problems, due to the content and values they transmit, which affects the quality of life of human beings, other species, economic activities, and development. In the research that we have been carrying out (Bravo, 2013), we identified that curricular environmentalization proposes professional training with a vision of prevention, to overcome the logic of destroying, to build and to remediate, as it is proposed in some environmental careers.

Curricular environmentalization aims to promote the inclusion of prevention and, even more, the inclusion of prospective training for professionals in training and interdisciplinary work, to build desirable development scenarios. This implies the redesign of the curriculum, from the study of professions and their occupational fields, and the definition of environmentalism professional profiles, study plans (curricula), and learning units, among other aspects. Thus, the curricular environmentalization and the necessary research that this task entails, must consider that social practices, particularly professional practices and educational processes that are at the base of production-consumption processes, are part of the causes of the environmental crisis.

On the other hand, the principles of the sustainability proposals synthesize the causes and focus attention to reverse trends and promote the construction of a viable development for a sustainable future. We can summarize these principles as follows:

- Nature, the dynamics of the Earth, has led to the availability of livelihoods, for example, non-organic minerals and hydrocarbons, but the pace of production and consumption activities is outpacing the replacement rates of these non-renewable resources.
- overexploitation of the goods offered by ecosystems is exceeding their renewal rates; further aggravated by the destruction of the ecosystems that sustain life.
- Excessive waste and the destruction of ecosystems make it impossible to reincorporate the former into biogeochemical cycles.

The different alterations interact in the dynamics of the biosphere, which produces global problems such as climate change. Added to this, is the unequal distribution of the products of development and the unequal relations among rich and poor countries and among groups within countries. This makes necessary the redistribution of the goods of development and equity among human beings now and future generations.

For curricular environmentalization, a review of existing curricula in terms of their objectives and contents is required, to develop understanding and transdisciplinary inclusion of social, economic, and environmental sustainability. However, this would imply generating new didactic ways of approaching knowledge. To this end, teaching, learning, and evaluation methods are recommended in lifelong learning, which includes skills for creative and critical thinking, for oral and written communication, for collaboration and cooperation, for conflict management, decision-making, problem-solving, and planning experiences, with the use of ICT. The practice of citizenship, centrally understood as educating people to promote sustainable consumption and production, is also recommended (Unesco, 2005).

Different conceptions

In the debate on curricular environmentalization, initially, in the 1970s, the denomination of incorporation of the environmental dimension, was proposed. The denominations of curricular environmentalization and curricular sustainability are more recent. These denominations come from the different moments in which the field of environmental education has been shaped and has acquired different meanings. When the term environmental dimension was used, the environmental dimension was absent: it alluded to aspects not considered at the various levels of social life, in development planning, in the creation of institutions, in the hard bodies of scientific disciplines, in public policies, and, of course, in education, among others. For Sunkel (1981), the inclusion of the environmental dimension means recognizing that the process of economic growth is conditioned by the biophysical, local, national, and global environment, because it affects economic growth in various ways and is substantially affected by it, more and more, as the development process progresses.

The environmental dimension of development refers to the set of values, attitudes, and motivations that govern the relationship between society and nature and how these relationships are translated into the production systems and appropriation of productive resources, as well as the individual and collective management of natural resources, the ecological balance, and the preservation and quality of life.

These relationships, systems, and managements are of vital importance for both society and for nature, because life on the planet and the perpetuity of the human species, and all other living species depend on rationality and responsibility with which the following unavoidable dialectical confrontation is understood and managed: on the one hand, the vital and inescapable need of societies to settle, subsist, coexist, progress, and project themselves historically, at the expense of nature and its immense resources and potentialities; and, on the other, the fragility and

vulnerability of that nature and its ecological flows and cycles, as well as the unquestionable finite of all its resources. The necessity to conserve and develop nature and its ecological balance is a sine qua non condition for organic life, survival, and development of all human and non-human society on the planet we inhabit.

The introduction of the environmental perspective questions a series of beliefs derived from the ideology of economic growth that has prevailed in recent decades, such as that of infinite growth, inexhaustibility, and self-care of nature, among others. In the 1990s, at the meeting of the United Nations Conference on Environment and Development, known as Rio 92, the environmental dimension was renamed as a central reference point. Officially, the term sustainable development was adopted, which was accepted as the socially shared utopia.

With this denomination, it was intended to reach an integrated vision of the environment with ecological, social, political, economic, ethical, and cultural aspects. As a result, the notion of curricular environmentalization was adopted. This marked an important difference, since this denomination was due to the idea of overcoming the notion of the environmental dimension, which supposed that it only referred to one part of the problem: the ecological part. The inclusion of sustainable development criteria in study plans was established as a goal.

Environmentalization was conceived as a continuous process of cultural production aimed at training professionals committed to the permanent search for the best possible relationships between society and nature, which attends to the values of justice, solidarity, and equity and applies universally recognized ethical principles and respect for diversity.

In this way, the curricular environmentalization seeks to contribute to the training of future graduates to prevent possible negative environmental impacts derived from their professional

practice, and, moreover, that they participate through said practice in the construction of the desirable development scenarios.

This implies a comprehensive training that begins with the mastery of the profession, its role in society, and in the social projects in which it is inserted, its possible environmental impacts, and the development of values that are reflected in the attitudes of people (ACESNetwork, 2002). The most recent notion, curricular sustainability, is part of education for sustainable development. It corresponds to a new vision of the world, where each one has the possibility and the commitment, through education, to establish new life models, behaviors, and values to create a better future.

It is conceived as the final professional qualification and the comprehensive training of the graduate, which must constitute the basis on which contributions are founded and proposed that guarantee and promote the introduction of sustainable development in the curriculum.

It points out that today's professionals must have several capacities, among which are:

- Understand how their professional activity interacts with society and the environment, locally and globally, to identify possible challenges, risks, and impacts.
- Understand the contribution of their work in different cultural, social, and political contexts and how these affect their work and the environmental quality of their surroundings
- Work in multidisciplinary teams, to provide solutions to the demands imposed for the socio-environmental problems derived from sustainable lifestyles, including proposals for professional alternatives that contribute to sustainable development
- Apply a holistic and systemic approach to the resolution of socio-environmental problems

- Go beyond the tradition of breaking reality down into unconnected parts
- Actively participate in the discussion, definition, design, implementation, and evaluation of policies and actions, both in the public and private spheres, to help redirect society towards more sustainable development
- Apply professional knowledge in accordance with ethical principles and universal ethical values and principles, and
- Collect the perception, demands, and proposals of citizens to allow them to have a voice in the development of their community.

Based on the above, it is envisioned that education, in this perspective, should:

- Have an integrated approach to knowledge, attitudes, skills, and values in teaching
- Promote work in multidisciplinary teams
- Stimulate creativity and critical thinking
- Encourage reflection and self-learning
- Reinforce systematic thinking and a holistic approach
- Train participatory and proactive people who can make responsible decisions
- Become aware of the challenges posed by globalization
- Promote respect for diversity and a culture of peace. (CRUE, 2005)

CORONAVIRUS (COVID-19)

Given the appearance of the new coronavirus worldwide —and future viruses that are announced (Carabias, 2020)—, curricular environmentalization acquires new perspectives and urgent attention. Current and new generations must learn to cultivate relevant consumption and become aware of prevention. Therefore, these topics must be present in the higher education curriculum and/or in the extracurricular training of students and teachers, and, in general, in the educational community of each institution.

It has been pointed out that this virus has divided our history in two —before and after it—, so now we will have to live differently in the long term (ECLAC, 2020). Consequently, curricular environmentalization needs to face this phenomenon and promote greater training on the situation, without neglecting the panorama of the environmental crisis that we are experiencing (ECLAC, 2020).

In the face of the COVID-19 pandemic, we ask ourselves several questions:

- Is the coronavirus crisis a sign of a capitalist crisis or is it a sign of a crisis of civilization?
- Has life in cities alienated us from nature itself?
- Have we stopped co-evolving with nature?
- Is this the reason for the high levels of human health problems?

For his part, Leff (2020) wonders:

- What is a virus?
- How is it that, being part of the evolution of life, it becomes a deadly agent that attacks and destroys life?

- What is its role in the evolution of life?
- What agency—of nature itself or human intervention—activates its spread and its pathogenic effects?

The truth is that there is a lack of knowledge to answer these and other questions, so we must promote awareness of prevention and promote research on these aspects based on what is known.

Interaction and change

Society, culture, ecosystems, the Earth, the solar system, and the universe are the product of the interaction and change of its components. The origin of life and its evolution, from the first cells to birds and mammals, are stories of interaction and change, of integration at different levels of complexity, and the emergence of new properties at each level of aggregation. The origin and biological evolution of the Homo sapiens, its sociocultural evolution, and its environmental impacts are also the product of interaction and change. Interaction, change, integration at different levels of complexity, and the emergence of properties are common features of natural and social phenomena. However, natural change processes have occurred on a geological timescale.

Man, with all his modern characteristics, has existed for 40,000 years, but the impact of the human being on nature has been of greater magnitude in the last 300 years. Thus, while the changes of natural phenomena occur on geological time scales, the changes caused by human beings are of great magnitude and occur over periods of hundreds or dozens of years. Therefore, human beings and their actions are considered a force for change of a great magnitude that can cause their own extinction as a species.

Historically, society has appropriated nature and modified nature. The natural environment has been a determining source in the worldview and identity of cultures. That is, human beings have co-evolved with nature since our appearance on Earth. However, due to the technological power and the exponential growth of the human species, we have exploited nature beyond the physical limits that had been valued so as not to cause greater imbalances. Both the consumption and the use of energy and the resources that are used, have led to climate change and negative effects on ecological systems. Carbon dioxide — CO2— in the atmosphere has increased sharply. Today, we have 414 parts per million, against 280 parts before the Industrial Revolution (Brito & Stafford, 2012).

For several years, there has been great concern about the negative impacts on the Earth, since these are of great magnitude. The urgency of reducing the emission of greenhouse gases to curb climate change, which already causes the suffering of many human beings and other species on the planet, has been demanded; a climate change can also accelerate the arrival of diseases like the one we are suffering. Due to climate change, viruses and bacteria are now in areas where they did not exist before.

The loss of biodiversity is another worrying global environmental problem. This is related to the change in land use for food production, which has led to defaunation, which is shocking due to the loss of jungles and forests. Everything is involved in a system that is already unsustainable, where, in addition to ecological damage, we have damage to human health. We live on a finite planet, and we cannot pretend to modify the laws of nature at our will to adjust them to our concepts of economic or financial development. On the contrary, we should modify our development according to the laws of nature.

Imbalance of nature If we continue to put pressure on natural ecosystems with an exacerbated consumption of resources and territory, we can foster sources of contagion. We may lose the ability to withstand the onslaught of extreme weather events. We will ultimately lose our resilience as a society.

The protective function of biodiversity is being affected, which, thanks to effects such as the dilution of the viral load and the damping of contagion, is an immense and effective barrier to zoonoses, such as the coronavirus. SARS-CoV-2 has long co-evolved with the bat so that when healthy, the viral load is minimal (Valladares, 2020; Toledo, 2020). In states of stress, such as when persecuted, hunted, handled, and consumed, the animal's immune system is depressed, and the viral load skyrockets.

Something similar happens to other hosts such as the pangolin, which is illegally hunted and trafficked in many regions of Asia and Africa, where their meat is demanded as food and its keratin scales, like our fingernails, are used in traditional oriental medicines. These are the most hunted and trafficked wild mammals in the world. In such a situation, with the immunocompromised host reaching a high viral load, the virus becomes more dangerous to humans. If we add to this that human societies have also experienced environmental problems for many years and that we have lived with high rates of air pollution in cities, such as those in northern Italy, Madrid or Mexico City, with serious consequences for health, especially in vulnerable populations, it could be said that this is related to a higher incidence of cardiorespiratory diseases such as COVID-19.

A healthy nature, with functional ecosystems rich in species, protects us in a very broad way against infections by pathogens. Nature, in general, protects us from desert dust and helps reduce

air pollution, two vehicles that spread viruses and accentuate respiratory symptoms in patients affected by COVID-19. What is indisputable is that it is our habits and behaviors that endanger us, because behind this pandemic is the destruction of nature that we have caused. The vast majority of environmentalists agree that agricultural production practices, within the framework of neoliberalism, have unleashed the attack of this virus, and, if it continues like this, many more could follow, still unknown and lethal (Zibechi, 2020).

Agricultural Production

It has been identified that one of the structural causes of this pathogen, the coronavirus, and others has been the food production process and the profitability of multinational companies in times of neoliberalism (Altieri & Nichols, 2020). The industrial model of agriculture has made viruses increasingly harmful. However, this has not been investigated, since, before the appearance of a new pathogen, what they do is look for the new cure or vaccine, from which great profits are obtained.

However, the situation is broader and more worrying. Savage neoliberalism has led to the grabbing of land, the last primary forests, and the agricultural exploitation of small owners worldwide. This has led to deforestation and the emergence of new diseases. The razing of the land has led to the release of pathogens that were previously locked up, which migrate to local livestock and human communities.

In Mexico, free trade devastated the countryside, ruined small and medium-sized farmers, and forced millions of small farmers to migrate to the United States or the northwest of the country. And not only that, but it also profoundly disrupted the diet of the popular classes by causing what

is now coming to light with COVID-19, other serious epidemics: obesity, malnutrition, and diabetes, which increases the mortality of Mexicans infected by the coronavirus.

Ebola, Zika, other coronaviruses, the resurgence of yellow fever, a variety of avian influenzas, and African swine fever are among many of the pathogens moving out of the more remote hinterlands into peri-urban circuits, regional capitals, and finally to the global travel network. There are no pathogens free from the influence of capital. Even the most remote regions are affected, albeit from afar. With global approaches, in a few hours or weeks, the Ebola virus can arrive from the Congo to Miami bathers, who die from it.

For some years, it has been calculated that nature could be a great economic investment, so that today the planet Earth, to a large extent, is a great industrial agricultural factory, both in terms of biomass and land use. Agribusiness aims to corner the food market. The neoliberal project is designed to help companies from the most developed industrialized countries steal land and resources from weaker countries. As a result, many of these new pathogens, previously linked to forest ecosystems that have developed over long periods, are being released and threaten the entire world.

Capitalist needs, replacing natural ecology, organize agriculture, and provide the exact means by which a pathogen can develop the most virulent and infectious phenotypes. A better system could not be designed to generate deadly diseases, but they do not care if people die. The agribusiness field is oriented to use the benefits of viruses regardless of the human mortality it generates, as long as their profits are not affected. The expansion of farm animal genetic monocultures removes any immunological barriers that may be available to slow or stop transmission. Large size and high population densities facilitate higher transmission rates. These crowded conditions

depress the immune response of the animals. The high yield of animals, as an inseparable part of any industrial production, provides viruses with a constant supply of new animal hosts, which promotes their virulence.

Highly industrialized food production depends on practices that endanger all of humanity and, in this case, may contribute to triggering a new deadly pandemic, thanks to the increased consumption of dangerous preservatives that cause many diseases, which also generate pandemics such as obesity that we now suffer in Mexico.

Tasks for curricular environmentalization

There are several tasks that this experience leaves us, which are not over yet, and we do not know when it will end. Perhaps the virus is part of our future life, as the health sector has suggested. If the causes of the appearance of this disease can be found in rapid urbanization, changes in agricultural systems, changes in ecosystems, and greater globalization of the trafficking of animals and their products, it is necessary to fundamentally change our social practices, consumption, relationship with nature, which has already been mentioned for several years. This could be one of nature's last warnings. Universities in these subjects have a broad panorama of action, training, and education in a culture of sustainability, which implies reorienting rational consumption, adapting agricultural production, strengthening, and applying environmental regulations to inhibit the trafficking and consumption of wildlife animals, especially in the face of the sixth extinction, which is underway.

The limit of the capacity of the Earth's ecosystem cannot continue to expand. Population growth is one of the important challenges that humanity must change. The orientation of the universities in their community should promote rational population growth. The culprit, more broadly, is a

social system, a civilization, in which a minority of less than 1% of the population equally exploits both the work of nature and the work of human beings. Social and environmental inequality is at the heart of many current problems. Universities have the mission of reducing social inequality, so they must seek new, effective ways to balance the lives of populations.

The transition from a market economy to a social and solidarity economy has been proposed; from large companies and corporations to family businesses and cooperatives, end of the monopolies, from gigantic banks to collective savings banks; from fossil energy to renewable energies; from industrial agri-food systems to agroecological systems; from centralized and vertical organizations to decentralized and horizontal organizations, networks; from a representative democracy to participatory democracy. However, above all, it has been proposed to build from the local —communities, municipalities, micro-regions— a citizen or social power capable of confronting and controlling the suicidal actions of capital. In short, ecopolitics from, with, and for life. The search for the common good in the mechanisms of social development is an urgent task in which universities can strongly show their support.

We should demand that food systems be socialized in such a way that these dangerous pathogens cannot thrive. To achieve this will require, first and foremost, agro-ecological practices that protect the environment and the farmers who grow the food. In the bigger picture, we need to heal the metabolic rift that separates our ecology from our economy. In an interrelated world such as the current one, the potential for the rapid emergence and spread of emerging and re-emerging infectious diseases, has increased. This risk stems from several factors, such as the appearance of new pathogens, the ease of movement of people and food, the increase in microorganisms resistant to certain drugs, advances in the field of biotechnology, and the acquisition of pathogens by terrorist groups.

The consequences of the spread of an infectious disease can become catastrophic, not only affecting the health and economy of the population, but also the world economy and the stability of the country where they occur, as we are experiencing. The pandemic shows us crudely how sensitive we are to a natural environment that does not work well. The current situation should serve as a test to rethink a great crisis that is waiting for us, that does not stop and that is even more complex to manage and tackle than the coronavirus pandemic: that of climate change and the loss of biodiversity.

The conservation of health through food and sustainable consumption are key points that should be included, without delay, in educational processes and in the curricular environmentalization. What we must do is outline a new, more balanced relationship with nature that is sustainable over time. It is necessary to deeply question the social and economic framework in which we operate. Throughout this time, health care for the sick has worked, but under heroic conditions. We have to ensure that, from now on, it works in bearable conditions, without bordering on collapse. Environmental hygiene safety should be a task in which universities contribute not only with the training of the health sector personnel, but also with the generation of medicines and care and self-care technologies, technologies necessary for health procurement.

We must learn that what is important is to plan, substantially expand, and quickly deploy the weapons of public health, in addition to orienting them towards the suppression of infections and not only their mitigation, now and in the future; in short, be prepared in case a new wave of infections arrives. In the medium term, the reform of our National Health System with technical solvency and political wisdom cannot be postponed. Our health professionals deserve more than applause and a salary increase. The country's universities must participate in these great tasks that the experience of the COVID-19 pandemic has left us, we are not only referring to students in the

health sector, but the university. Since the problem is global, its solution must be of the same level.

4.2.1 Second Translation from Spanish to English

UNIVERSITY TRAINING AND EDUCATIONAL ACTIONS TO UNDERSTAND THE "COSTA RICA VERDE". AN EDUCATIONAL PROPOSAL FROM THE HISTORICAL DISCIPLINE

Educating, unequivocally, suggests a process of development of intellectual capacities, knowledge, skills, values, beliefs, and habits acquired by human beings from birth to death, through countless techniques, objectives, and places of sociability. Therefore, when we try to configure the term environmental education, we point to those contemporary and historically constituted actions through formal and informal education, individual and group perceptions, and the daily relationship with the environment. Postulates, in large part, suggested by various environmental reports of the United Nations Organization.

Theoretical consideration that Leff reinterpreted in the 1990s, with the meaning of environmental knowledge, to express his reflections on the social construction of the current world, where biophysical and biological processes converge and precipitate, as well as and the historical significance of human invention. Times of hybridization of the world where technology, the debt with nature, the miscegenation of cultures, the redefinition of identities, and socioeconomic problems, are reflected in the diverse environmental knowledge which stimulate the emergence of new values and rationalities about our existence. A worldview of knowledge, which tends to transcend to the extent that it shakes the dominant educational paradigms, the globalizing and unitary visions of education, to develop a critical and transforming vision among popular

knowledge, multicausal approaches, interdisciplinary dialogue and the historical process differentiated in spatial and temporal scales (Leff, 1998).

Significantly important proposal for our company, whose objective is focused on the analysis of the historical development of environmental education in Costa Rica and the materialization of new training proposals of the Environmental History of Costa Rica course (Historia Ambiental de Costa Rica), centered on the understanding of environmental problems in the long term, to enrich the traditional historiographical explanations of a political and socioeconomic nature, underlining the value of environmental dynamics as engines of change and highlighting the importance of history for the understanding of current ecological problems, without neglecting the dissemination of knowledge and the recognition of the theoretical-methodological tools of environmental history and other related disciplines.

This proposal arises, given the new educational-environmental requirements of our time in terms of the training and development of skills of future generations of professionals in history, the teaching of social and civic studies, and other academic units of the college community. Theoretical-practical gear developed by the Observatorio de Historia Agroecológica y Ambiental (OHAA) (Observatory of Agroecological and Environmental History) de la Escuela de Historia (School of History)□ a research team that from the disciplinary, interdisciplinary, and multidisciplinary perspective□ has proposed the elective course of Historia Ambiental de Costa Rica (Environmental History of Costa Rica), to generate a genuine space for discussion and teacher training, to understand the contemporary ecological crisis and its particularly felt glimpses in the Costa Rican level.

The archaic pretensions of educating for conservation A review of the origins of environmental education in Costa Rica Spinning the finest lines of the development of education in Costa Rica, we realize that since the end of the 19th century, indirectly and with the support of European scientists such as Pittier, Tonduz, and Biolley, early recognition of our botanical, zoological and anthropological resources had been promoted, a situation that was reflected in the foundation of the Museo Nacional (National Museum) in 1887 and the Instituto Físico- Geográfico (Physical-Geographical Institute). Years later, in 1926, the foundation of the Escuela Nacional de Agricultura (National School of Agriculture), with merely productivist objectives, also tended to elucidate some current environmental problems (Guier, 2000).

With a productive diversification project in development, the Costa Rican State, since 1949, generated a conservationist discourse and an incipient education project under the pseudonym "Semana de Los Recursos Naturales" (Environmental Education Week), to promote sustained production and try to alleviate the problems that have been dragging on for decades, due to the deforestation of the forest, soil erosion, excessive grazing, and the extermination of wildlife. Thus, with the aim of awakening and spreading environmental awareness among the Costa Rican population, in September, amid the independence celebrations, it was sought to establish certain links between the Costa Rican identity and natural resources, through the national symbols such as the tree, the bird, and the national flower. At that time, the state definition of natural resources included only water, soil, forest, grass, and other biological components, not always well specified.

Thus, a paternalistic-protective image of the State was extolled over nature, which would generate a "supposed" rational use, leading to the optimal exploitation of resources with the motto: "El Futuro de Costa Rica está en sus mano" (The future of Costa Rica is in your hands),

under the protection of the Ministerio de Agricultura e Industrias (Ministry of Agriculture and Industries) and the Servicio Técnico Interamericano de Cooperación Agrícola (STICA) (Inter-American Technical Service for Agricultural Cooperation), which they offered support to any person dedicated to agriculture who wished to conserve the environment (El Agrario Nacional, October 20, 1951, p. 1).

Parallel to this environmental education strategy, agricultural groups were encouraged to experiment and put into practice the new technological innovations, which years later would be considered as typical of the "Revolución Verde" (Green Revolution), since the discourse, meaning, and value of resource conservation were based on the access and protection of future raw material to be used in production systems. As is evident, these types of educational principles were aimed at both the national productive sector and the student sector, so that this new ideal would transcend future generations.

According to the written press of the time, this festivity remained in force at least until a good part of the 1950s, with different emphases or central themes. For example, in 1951, emphasis was placed on the problem of soil erosion and how it could be conserved through the application of simple practices and the preservation of the soil of the forest that in turn protected the soil, the water, the wild animals, the wood, the wild fruits, and firewood, to maintain "…the common heritage of the Costa Ricans…" (Órgano de los Clubes 4-S, 1951, p. 1). The discourse of the rationalization of natural resources prevailed among government projects, as expressed by Claudio Volio, in the inaugural speech by the Ministro de Agricultura.

Barely a year ago, the idea of dedicating a week to the Conservation of Resources, promoted by my Ministry, ceased to be a concern and became a dynamic and fruitful reality. Not only have all

the organizations that, in one way or another, are linked to our agriculture, but also those that, like the industrial, commercial, and cultural ones, understand and appreciate its enormous importance, have contributed in ae effective and encouraging was. Everyone has the power to enjoy the benefits provided by the increasingly efficient exploitation of our resources, coupled with their rational conservation, to be always able to dispose of an abundant common fund… of production and exchange. (Órgano de los Clubes 4-S, 1951, p. 1)

In subsequent years, the conservationist discourse exalted the importance of tree plantations for forestry exploitation, for which they specified cultivation techniques in special threshing floors beds and nurseries. All this accumulation of knowledge tried to promote an alternative forestry sector, to generate immediate profits and to bring revenues to the agricultural exploitation (Repertorio Agrícola, 8 de junio de 1950, 1950, p. 6).

Within this context, however, forest plantations were only an incipient and even timid experimental practice, since most of the timber was extracted from the forest with the logic of clearing, which translated into new strips of fertile land for agricultural use and obtaining capital; meanwhile, the protection of species of flora and fauna only remained on paper, because in practice they did not materialize. Despite the above, in 1957 the Semana de la Conservación de Los Recursos Naturales (Natural Resources Conservation Week) focused on disseminating the new "conservation" initiatives among schools and encouraged the taking of a weapons census (Asamblea Legislativa de Costa Rica, 1959, p. 95).

Meanwhile, in the Costa Rican administrative area, a process began to incorporate officials within the Comité del Departamento Forestal y de la Administración de la Vida Silvestre (Committee of the Forestry Department and Wildlife Administration), Comité Protector de la

Fauna Silvestre (Wildlife Protection Committee), the Departamento Forestal y la Administración de la Vida Silvestre (Forestry Department and Wildlife Administration), el Ministerio de Economía y Hacienda and the Federación Nacional de Tiro y Caza (Ministry of Economy and Finance and the National Federation of Shooting and Hunting) or other similar associations, which until then had functioned under the tutelage of the Ministry of Agriculture and Industry. There is not the slightest doubt that all these types of changes were made in the administrative part of the Central Plateau and, therefore, the rural areas were awaiting effective concretions. Efforts there are generally reflected in the Wildlife Conservation Law 1956 and 1961 and the Water Law of 1959.

Clearly, between 1950 and 1970, these environmental education initiatives were issued from a paternalistic worldview, in which a dynamic of protection was at work, delineated with specific laws, for the protection of vital resources of agricultural exploitation, such as water, forest, and some species of fauna valued for hunting. The latter, because more than initiating a new order in the productive system, the fifties and sixties became an experimental model permeated by old customs and new elements in the productive sector, establishing ideal areas of rationalization, protection, and conservation of the available resources, all with a view to their future exploitation.

With an evident anthropocentric vision, where the human being was the entity of control over the available natural resources. Thus, an essential part of the provisions of the law was transmitted to the population through two mechanisms: the press and the national educational system. These generated mythical perceptions about the "inexhaustibity" of natural resources.

Ironically, despite the consecutive efforts of the 1950s, towards the 1970s, amid the consolidation of the Green Revolution, the same ironic State, continued to bet on the Natural Resources Week, aimed at raising awareness among the population about the problems and the anthropization of space historically caused by the hand of the human being (La Nación, May 12, 1976.). Consequently, in that context, it would start to create new conceptions of environmental education as a consequence of the Stockholm Conference and the Intergovernmental Conference on Environmental Education in Tbilisi, Soviet Union (USSR) in 1977, which together raised the need to put into operation an action plan that included informative, educational, social, and cultural aspects within formal and non-formal environmental education, developed in the United States through educational policies, to generate awareness of individual and collective responsibility for the protection and improvement of the environment in all its dimensions (Naciones Unidas, 1977, p. 152-157).

For this reason, it is not surprising that in the 1980s pioneering university proposals began to mature, focusing on the understanding of the biotic, physical, socioeconomic, and cultural components associated with the environmental problems of the time. In the case of our institution, mention has always been made of the pioneering efforts developed by the School of Environmental Sciences (Pizarro Méndez, October 8, 2015, interview with Eduardo Mora). As expected, the concession of environmental education would evolve; thus, seven years later in 1987, at the International Congress of the USSR, this was defined as that possibility of making the population aware of the environmental problems of that time and the near future. In this way, those productivity concessions of the Developmental State were left behind.

According to Quesada, these and other proposals influenced the granting of a Estrategia Nacional para Conservación y Desarrollo Sostenible (ECODES) (National Strategy for Conservation and

Sustainable Development) and the Plan Maestro de Educación Ambiental para Costa Rica (Environmental Education Master Plan for Costa Rica), two programs that became pioneering articulations of formal Costa Rican environmental education. Based on these efforts, in 1988 the first Plan Maestro para la Creación de una Comisión Nacional de Educación Ambiental (CONEA) (Master Plan for the Creation of a National Commission for Environmental Education) was established by executive decree, to develop coordination mechanisms among different organizations and institutions. The insufficient educational response gave way to the creation of the Subcomisión Universidad y Medio Ambiente (SUMA) (University and Environment Subcommission), which would later become the Comisión Interuniversitaria de Educación Ambiental (Inter-University Commission for Environmental Education), attached to CONARE (Guier, 1989).

Not satisfied with this, in the following years, the basic objectives were defined and the lines of action under the protection of the conceptions of the ecological economy catapulted from the famous Rio Conference of 1992. Since then, environmental resignations became global issues, associated with economic, social, and political conditions, seen from interdisciplinary approaches, with the presumption of developing environmental attitudes and sensitivities, and deep explanations for a better understanding of environmental problems. Associated with this, in 1998 the Sistema Nacional y Conservación (SINAC) (National System and Conservation) and the National Ministry of Environment and Energy (MINAE) proposed the Estrategia Nacional de Educación y Extensión Ambiental (National Strategy for Environmental Education and Extension), to centralize the efforts that were scattered.

In addition, with Agenda 21 and the launch of the National Action Plan for Environmental Education for Sustainable Development by the United Nations Educational, Scientific and

Cultural Organization (UNESCO) in 1995, environmental education has been rethought as the possibility of materializing values, abilities, and critical capacities of citizens, to recover a local, national and global environmental sense from educational centers, as part of the curricular plan, which, up to a certain level, incorporates the environmental dimension.

However, within the sphere of formal education, there is still a widespread fear of the educational shortcomings of the teaching staff, in terms of a responsible reading of the now popular environmental component, despite the advances made by public universities and the Ministry of Public Education (MEP). Given the need to develop an education with systemic approaches, which allows the resolution of socio-environmental problems identified in the Costa Rican reality, we developed the teaching practice of the Historia Ambiental de Costa Rica (Environmental History of Costa Rica).

With the legacy of previous situations and, above all, with Costa Rica's recent incursion into environmental history and, specifically, the Observatorio de Historia Agroecológica y Ambiental (OHAA) (Observatory of Agroecological and Environmental History) of the School of Historia de la Universidad Nacional (UNA) (School of History of the Universidad Nacional), the potentialities have been revealed not only in the research field, but also in the ability to formulate proposals in the educational field, above all, by obtaining pleasant forms of community and academic dialogue from applied history, whose the main objective for many years has been focused on the interpretation of historical environmental problems of great significance for Costa Rican communities, private and state institutions. Thus, combining research with teaching, with the active participation of the Observatory from 2013 to 2015, the course on Environmental History of Costa Rica was taught to students of the bachelor’s degree in History, Teaching of

Social Studies, and Civic Education due to its nature as an elective course, to numerous students from the university community domestic and foreign.

This is because, for many years, environmental history, far from generating a historiographical hyper-specialization in our country has given rise to successful interpretations of the relationship between human beings and the environment reflected in the field of production and knowledge, and very rarely in educational practices. However, when trying to generate prospective proposals to minimize the impact of environmental degradation and the risk of ecological collapse, topics of daily discussion, little is said about the resilient measures that we must address from education, addressed to different age groups of the community. How to make a difference, without a doubt, was the premise of OHAA, for this reason, from its genesis, it was planned to start from the Costa Rican environmental problems, which day after day and of which, many are also consciously and unconsciously examine by the same student groups.

Therefore, starting from a general review of the origins of environmental history in Europe, the United States, and Latin America, the course tried to contextualize the historical development of Costa Rican society, within the framework of its main agro-ecological problems, associated with political and socioeconomic conditions. This, without forgetting the close relationship with classical agrarian history, the closest social history, the ecological economy, the renewed trends of the contemporary agroecological paradigm, and the approaches and distances between environmental history and other specializations of the social sciences of economics, geography, anthropology and sociology, and the natural sciences.

All of the above, associated with the historical (re)construction of the concept of sustainability and sustainable development, which has given way to epistemological interpretations of

agroecology, which today has become a great tool for making renewed readings of the Costa Rican rural territory. This, regardless of the lens with which it is viewed, expresses tonalities of an economy with abundant environmental debts, tuned to a growing social marginality and different public health problems, ironically developed in the "Costa Rica sin ingredientes artificiales" (Costa Rica without artificial ingredients) or the very same “Costa Rica Verde” (Green Costa Rica).

For the above, four techniques were essential to achieve our goal. First, the reading of renowned specialists in environmental history. Secondly, we counted on the participation of seminarians members of the OHAA who, being specialists in various topics (environmental problems of indigenous territories in contemporary times; fronts of agricultural colonization and its environmental impacts; the coffee cultivation system, impacts and changes in the landscape; forest fires in Costa Rica; natural and anthropogenic disasters linked to a culture of risk, and socio-environmental conflicts as a result of the water imbalance of climate change), managed to explain from the strangeness of the same situations, the historical roots, and their subsequent consequences in Costa Rican society.

The fore-mentioned seminars did not limit the presence of experts from other disciplines and geographical areas, in on topics related to the course program, since the renowned Costa Rican marine biologist, Master Lilliana Piedra was even present and a video conference held with Dr. Aceneth Perrafán, from the University of Cali, Colombia. The purpose of both activities was to visualize similarities and differences when interpreting the environmental field between different disciplines and Latin American geographic spaces.

Special mention deserves the development of reflective tours coordinated between the teaching of the course and the OHAA projects registered in the Sistema de Información Académica (SIA) (Academic Information System) that are progressing in the Caño Negro Lagoon System, the Santa Rosa National Park, the cantons of Upala, and La Cruz, to develop much of the practical content of the course, in association with the research experience of the academic staff. In this sense, during the development period, three themes were convergent and recurrent: the development of Costa Rican conservation policies focused this time on the Santa Rosa National Park and Caño Negro Wildlife Refuge, agricultural colonization in the cross-border area of Upala and La Cruz and its long-term environmental impacts. Three years of tours, which gave the student body the basic elements of how truly complex national, foreign, cross-border, and environmental identities are built in Costa Rica, are reflected in the tour reports.

It is important to mention that within the methodology, practical observation guides were used, prepared by the academic staff in charge of each project, a technique that was triangulated with the elaboration of reflective essays, taking, analysis and criticality of photographs and development of interviews developed in the places

With the experiences developed in the classroom and the fieldwork and based on the transversal axes of the course program -energy, water, air, human health, soils, gender, and ethnic diversity- the student body proposed and developed research. Although, it is true that with the first experiences raised the possibility of defining, designing, developing, and implementing a proposal for educational actions (AE), known as that possibility that the information collected, and the investigations had different uses and meanings among their interlocutors, then a large part of the execution of the projects was focused on the approach of applied history, for only having an educational cycle to develop the said proposal. This situation did not limit the

realization of projects in their practical component, since it was always sought that the student groups develop some dialogue with community groups.

For this, applied history, defined as that possibility of investigating current socio-environmental problems that the country faces, whose historical roots make it possible to have not only a better reading of the current concrete reality, but also the development of a multicaulisin perspective of the past and a better perspective for the near future. These case studies were sustained by the intention of disseminating their knowledge among social actors, often thirsty for a historical reading of the process of the enthronization of their environment (Picado, 2015).

After three intense years, in the work team has the good taste of having had numerous students from our academic unit and outside the faculty, and above all, having devised a methodology that would yield fruitful reflections among students, since several times they expressed the contributions were obtained by their professional preparation because its academic unit did not have a course in the environmental area or because in their future professional development they would have to face some environmental component that they had ignored until that moment. Therefore, understanding the historical roots of environmental problems and their political components, economic, and social from environmental history, made the course a seminal space of experiences that we hope will be etched in their lasting memory.

Conclusions

In the 21st century, the media, public management, and education have become spaces for the reproduction of global environmental aggravations. Despite this, the majority of Costa Ricans, far from understanding the context of global warming, the various positions of the ecological economics, and the conflicts over changes, access, and distribution of natural resources at the

local and global levels, have joined a recurrence of “ecological” discourses, maximized by the new “sustainable” proposals at the level of public policies, whose most monumental levels had been set for the year 2021, when Costa Rica would be the first country, internationally speaking, to be “Carbon Neutral.” For insiders and outsiders, it seems clear that the above has been a construct developed in the long term, of course, under the protection of different policies of "conservation and environmental protection."

Therefore, promoting among students the analysis of the historical development of Costa Rican society through the understanding of long-term environmental problems has been, without a doubt, an extraordinary experience for the OHAA; an effort inherited from other educational approaches developed by Costa Rican institutions, indirectly and indirectly since the end of the 19th century and until the 20th century, which is now heading towards an understanding of the environmental knowledge of the same groups of students and by entire communities, overwhelmed by the environmental problems that are palpable in everyday life. For this reason, it is valid to refute the inaccurate postulates that haunted us with postmodernism, whose essence was focused on the end of history, since with the binomial research and teaching, that old conjecture of "inexhaustible" resources is eliminated.

4.2.2 Third Translation from Spanish to English

FROM THEORY TO PRACTICE TRIAL PLAN FOR THE INCORPORATION OF ENVIRONMENTAL KNOWLEDGE IN AN EDUCATIONAL INSTITUTION

Starting from the theoretical conception of environmental knowledge, described as all that "Social system of knowledge and practices with an ethical sense, aimed at sustainable development, which expresses its empathic relationship with other manifestations of life" (López,

et al., 2004), the research team tried to describe an education in which knowledge and concrete actions are produced and reflected in a better human-environment relationship.

The theoretical notion also worked on multiple world spheres and was especially promoted by Enrique Leff, who since the end of the 1990s has published a series of manuscripts on environmental education, under the pseudonym of Environmental Knowledge. He tries to conceive, from new ethics and epistemology based on the fusion of knowledge, projection of values and internationalization of knowledge, the environmental complexity, whose apprehension can only be incorporated through the unawareness of previously known knowledge of the environment, the questioning about the ecological conditions reflecting unsustainability that, according to him, block the path towards a more democratic and fairer society. Thus, the construction and communication of knowledge constitute the maker of a critical analysis of the strategies of power and the effects of domination, generated by the status quo, through the forms of detention, appropriation, and transmissions of prevailing knowledge in society (Leff, 2002).

Seeking that conception of environment that reflects the reality of the student population, the research team investigated the particular perceptions about life, its environment, and the perception of the environment of each person, which in the end reflect the different beliefs, access to information, and conception of life present in a diverse and complex society. Thus, with a definition of environmental knowledge that went beyond diagnosis, and that in its path it generated new knowledge, in which general and scientific knowledge were mixed, this project began with the aim of seeking a real change in the relationship of people with other manifestations of life.

When this project began, there were two clear and well-defined aspects: the first and most concrete was the real need for an educational center to investigate and appropriate an environmental education strategy; and the other, a little more general, but very important, was the not inconsiderable succession of knowledge developed at an international level, for just over 40 years. These aspects, without a doubt, are still valid in modern times and are clearly shown as a starting point, to implement an educational intervention strategy more relevant to the target groups.

As is well known, environmental education gained popularity in the 1970s, when the environmental decline began to be considered a social problem. In fact, in 1972, when the United Nations Organization held the "Human Environment" conference in Stockholm, environmental problems began to be analyzed from a social and cultural perspective; and among its many recommendations, a necessary international education program regarding the environment was highlighted, including formal education -from preschool to higher levels- and non-formal education, with planned contents, made up of interdisciplinary perspectives and visions.

In 1976, the United Nations Educational, Scientific and Cultural Organization (UNESCO) proposed, at the Nairobi International Conference, the creation of the International Environmental Education Program, led by that organization and the United Nations Environment Program (UNEP). This led to that in 1977, the First Intergovernmental Conference on Environmental Education was held in Tbilisi, in of the former Soviet Union (USSR) -organized by UNESCO with the cooperation of UNEP- where the key elements for the construction of integrated methods according to the needs of each region were pointed out, as well as the components of environmental education for the formation of all people and societies.

This conference set the standard for environmental education at an international level, as it proposed, for the first time, environmental education to develop awareness, acquisition of knowledge, modified behaviors, achieved attitudes, and promote active participation with actions of change. According to UNESCO (1977), at that time, its objectives were expressed as follows:

1. Help social groups and individuals to become aware of the global environment and help them become aware of these issues

2. Help social groups and individuals to acquire a diversity of experiences and a fundamental understanding of the environment and related problems

3. Help social groups and individuals to understand a series of values, as well as to feel interested and concerned for the environment, by motivating them in such a way that they can actively participate in the improvement and protection of the environment

4. Help social groups and individuals to acquire the necessary skills to determine and solve environmental problems

5. Provide social groups and individuals with the opportunity to actively participate in tasks that aim to solve environmental problems. Thus, the efforts continued, until in the '80s and '90s, these important events occurred, which marked the course of environmental education. For example, in 1981 the Environmental Training Network for Latin America was created, under the sponsorship of UNEP, to promote training alternatives in the region.

In this context, the First Seminar on University and Environment in Latin America and the Caribbean was held in 1985 in Bogotá, organized by the National University of Colombia, ICFES, UNESCO, and UNEP. Two important documents resulted from this event: the ten theses

on the environment in Latin America and the Bogota letter on University and Environment, which is still valid today due to its relevant contributions to environmental education and development (Trellez and Wilches, 1999).

Other world events that mark the course for the approach to environmental issues and, therefore, for environmental education, was the curricular nature of environmental education at the international level, discussed in 1987 in Moscow, understanding this as a process in which individuals and communities became aware of their environment, to act, and solve present and future problems.

By 1992, the European Economic Community, through its Program of Policy and Action for the environment and sustainable development, Action 21, proposed that all those aspects regarding the environment, including both in the natural sciences and human and social sciences, prepared for practical life, should be incorporated into school programs at different levels. This proposal was unanimously accepted at the Rio 92 Conference, whose development axes were awareness, training, and education related to the environment.

Precisely, the 1992 Rio Conference marked a new course in the approach regarding environmental issues, since the Earth Charter became an inspiring document and ethical guide that has become a universal declaration that, although it is not binding for the United States is a call to conscience, which calls for the promotion of values.

Within this context, during the first decade of the present 21st century, the Instituto de Estudios Sociales en Población (IDESPO-UNA) (Institute of Social Studies in Population) considered the need to generate projects that would contain the possibility of contributing to the systematization of theories, methods, knowledge, and practices as a contribution to the understanding of the

environmental issue in Costa Rican society, taking environmental education as the focal point of work to be developed. Thus, under the protection of the Environmental Knowledge Project (Saber Ambiental project), actions are implemented with the following objectives:

1. Gather and systematize knowledge and practices related to environmental issues that facilitate awareness processes for an adequate quality of life
2. Manage initiatives that facilitate the understanding of environmental issues from a holistic view
3. Link theories and methods with popular practices to achieve a comprehensive approach to environmental issues

These objectives have allowed the execution of educational actions in communal spaces and formal education to implement the following strategic lines:

- Construction of critical thinking
- Interdisciplinary and environmental knowledge
- The exchange and revaluation of knowledge
- The creative role of communities in participatory environmental management

Today, there is no doubt that for decades, in many countries, environmental education has been conceived from the myopic accession of environmental protection and as a process for the conservation only of natural resources, without advancing in the incorporation of historical, cultural, economic, and social components, as part of the environmental studies and environmental education.

In this sense, our approach conceived environmental education from the formation of nature preservation habits, to environmental understanding as an ethical issue, where behavior promotes the development of collective processes that create responsibility training, transforming people into moderate consumers and creating an environmental awareness where the human being feels immersed in Nature, just as another species within the bunch; therefore, this intrinsically depends on the relationship established with it to survive. That is why, it is important to arise values such as solidarity and respect, where environmental education becomes the vehicle to promote a genuine relationship between the environment and its fellows.

Environmental knowledge as a methodological strategy of environmental education

Once immersed in the project, the methodological strategy was proposed based on the characteristics of the educational institution and its different levels of the organization, namely:

- Academic Committee and Management of the Educational Center
- Board of Directors.
- Teaching staff and administrative staff
- Projection of actions to parents and community

In the first instance, a leadership group was defined for the process in the making, a team that also served as a link with the IDESPO work team and the entity in charge of monitoring and following up on the actions carried out. This group was composed of the Director's Office, a representative of the Academic Committee, and the Board of Directors of the Educational Institution, all of whom individually, had designated, in turn, a target population of work.

Chapter V

Data Analysis

This chapter will present the result of the analysis performed on the documents under the names: *Residuos de construcción y demolición en Rumanía: El camino del vertido ilegal a materiales de construcción* translated from English to Spanish, as well as *Curricular environmentalization. COVID-19, new emphasis for education; University Training and Educational Actions to Understand The Costa Rica Verde, An Educational Proposal from The Historical Discipline;* and *From Theory to Practice Trail Plan for The Incorporation of Environmental Knowledge in An Educational Institution* translated from Spanish to English. These documents allow the researcher to further develop the three specific objectives ~~in~~ established in Chapter I. All three of the data collection instruments helped the researcher before, during, and after the translation of the documents, as they provided important aspects like getting to know the details of the documents to provide a better inside and thus, achieve a faithful translation. During the translations, it was important to obtain~~ed~~ detailed results of the translation procedures used to achieve the final translation of the documents. Moreover, after achieving the translation, it was important to extract essential terms that will benefit future translators, who may encounter the same or similar documents in the field. All the information gathered in this chapter will benefit future researchers and translators that may delve in the fields mentioned though the investigation.

5.1 Analysis and Interpretation of the Results

As mentioned in Chapter III, the data collection instruments were used to gather essential information, such as: a text analysis table was created by gathering important factors that aided in the recollection of valuable details from the documents. The table was created in a way that

contained all the information gathered from the documents in place, to have precise information. The second instrument was a ~~being~~ color coding, which helped the researcher to represent each translation procedure used in the translation of said documents. The final instrument was a glossary that will aid future translators and researchers if they come across a field that correlates or falls within the same area. Following there can be found the data collection instruments used to develop the three main objective of this investigation.

5.1.1 Text Analysis

One of the most important steps in the routine of a translation is to read the original text before starting the process. By doing this, the translator can extract information that is not visible; therefore, creating a plan to achieve a faithful translation. However, gathering so much information can be challenging to remember all aspects of the text. Consequently, a text analysis table can aid translators to create a visual map of all the information they have gathered while reading. The aspects to be considered in the following table helped the translator to choose the best method to translate different documents. The following chart contains the results drawn from the four translated documents.

Text Analysis Table

Text Analysis	El covid-19, nuevos énfasis para la educación	Formación universitaria y acciones educativas	Saberes ambientales en centros educativos	Construction and Demolition Waste in Romania
Text Style	Descriptive	Descriptive	Descriptive	Descriptive
Scale of Formality	Formal	Neutral	Neutral	Official
Scale of Generality	Educated	Neutral	Neutral	Technical/Educated
Scale of Emotional Tone	Factual	Warm/Factual	Warm/Factual	Intense/Factual
Text Function	Informative	Informative/Vocative	Informative/Vocative	Informative/Vocative
Type of Translation	Semantic	Semantic	Semantic	Semantic

Table 5 shows the way the texts are analyzed. Source: The researcher's own creation.

The first aspect to be considered in this text analysis table is the style of text. As the researcher read the documents, it was obvious from the start that each of them contained many important details, whether small or significant that helped to develop the intention of the text. By acknowledging this, the texts were categorized as descriptive, as each of them describe in detail the situation, time, jargon of their specific field. Each text retail in detail the journey and the purpose of its information to provide the reader with a clear and vivid image. The translated text

from English into Spanish narrates in detail the pollution and contamination of waste sites, with the intention of providing the Rumanian government with enough information for them to act upon it. Aspects as field-based terms, mappings of the contaminated areas, environmental laws, and such, require an immense amount of detail to stay faithful to the original text. The researcher, ~~by~~ acknowledging that this specific document contains large amounts of detail, got better prepared by researching for the correct term in the target language instead of going in blind.

The text translated from English into Spanish, even though a much different field, contains large number of details, too. These documents were written as documented evidence for some field experiments for workshops and schools. This kind of document needs a great amount of attention, due to the real-life events presented in them. This means that no details should be changed or modified, as they could change the results of the experiments. Such description and attention to detail requires a great amount of time. Therefore, by creating a text analysis table, the researcher realized that these texts needed a bigger amount of time to describe and find the right words.

The second aspect to consider was the scale of formality to put into perspective the kind of environment these documents were written in. The first document explains how higher education institutions are agents of change, when it comes to curricular greening, as well as being one the biggest problems when it comes to sustainability and environmental protection. These documents present real-life events, as they serve as evidence higher powers. The nature of this documents gives this document a formal scale, as it needs to be reviewed by experts on the topic as to make decisions. The second document recounts the experiences of professors in charge of a workshop to train college students in environmental protection. This document was solely written to carry evidence on the experience. It is meant to be read by future students and professors

involved in this workshop; therefore, it falls into a neutral scale. The third document recounts the experiences of a similar workshop in different educational institutions, so it gains a neutral scale, too. The fourth and final document reprises the contamination of construction and demolition waste in Rumania. This document was written by governmental institutions as to give the government concise information on the matter. Due to the nature of this document~~s~~, it falls into the official scale, as it requires to be read by governmental figures.

The following aspect in the text analysis table is the scale of generality. The first document, as mentioned, is intended to be read by a higher power; therefore, it needs a certain level and expertise in this field to be understood. The second and third document~~s~~ fall into the neutral scale, as anyone who is interested in these types of workshops can read and immerse themselves to what it is about and to expect from them. The fourth and final document is technical and educated. This document was written by university professors who are experts on this field; not to mention that the people who read this document need to be immersed in the topic and be expects in order to act.

The fourth aspect ~~to~~ considered is the scale of emotional tone. While all the documents are unique and were written with different purposes, they were all a mixture of factual and warm. The reason for these results is that while they were all factual and fast to get to point and intention, they were not harsh, as they are meant to call to action. In correlation to this last aspect, the fifth one is the text function. The researcher considered that all four documents were a mixture of informative and vocative. These documents were meant to inform and educate, but also as a way to bring light into important matters. They are vocative as they invite anyone who reads them to take part into their initiatives. The final and sixth aspect to considered in table is the type of translation. The researcher found that because of the nature of each document, it was

imperative to run a semantic translation. This with desire of keeping the original intention intact, as they serve to a greater good.

5.1.2 Color Coding

In every translation, the procedures to obtain said translation are one of the most important aspects. Following this idea, the researcher used nine translation procedures to render a natural, accurate, and cohesive translation, but most importantly to represent in a visual map of ~~way~~ the structure of the translation. This like syntax, style, grammatical, and orthographic changes often do not get recognized when reading the translation of a text, even though they are part of the structure of every translation. As a way to create a visual representation of this important aspect, the researcher used a color coding as a method to obtain the expected results. This instrument will help the viewer to identify aspect that often get lost or forgotten when translating.

The color coding brough out interesting aspects of the translation, as both languages hold a higher percentage of a translation procedures. For example, the translation from English into Spanish had a big number of transpositions of various types, this resulting from the different grammatical structures of ~~in~~ each language. There was also a fair amount of amplification, as English sometimes is vague Spanish tends to describe everything in detail. In some paragraphs the dominant procedure was modulation, as every factor needed to be arranged differently to create a natural and smooth reading for native speakers.

On the other hand, the translation from English into Spanish threw very different result. Literal translation was the dominant procedure, through the entire translation, since the three translated documents were very formal and serious in tone. The documents were not written in an

everyday structure; therefore, the need to leave almost everything in its place. Transposition was the second most used procedure as when translating due to the need to follow the language's pattern. In a similar note, in the Spanish translation pronouns played a big role, as sometime there was not a need for them in the translated version; therefore, they ended up as omissions.

Bellow, it can be found the color chart the researcher used to identify each translation procedure, as well as the translated paragraph and their respective original counterpart.

Color Coding Table

Translation procedures	**Color assigned**
Transposition	**Yellow**
Modulation	**Green**
Omission	**Light blue**
Amplification	**Pink**
Explicitation	**Blue**
Literal Translation	**Red**
Compensation	**Purple**
Equivalence	**Grey**
Adaptation	**Dark green**

Table 6 shows the color coding used to represent the different translation procedures within the translation. Source: The researcher's own creation.

5.1.2.1 Residuos de construcción y demolición en Rumanía: El camino del vertido ilegal a materiales de construcción

Paragraph 1

However, Figure 4 shows regional differences in total MSW collected which is also expected in case of C&DW stream due to several potential factors such as population, urbanization rate,

socioeconomic status, urban centers, real estate market, industrial development, etc. In emerging economies, the share of construction waste is 40% of total municipal waste, which account over 200 million tons in China. The paper estimates the amounts of C&DW in urban areas of the Romanian counties using a per-capita waste generation rate of 280 kg per-capita yr^{-1} as suggested by Musuroaea et al. It should be noted that this value does not include the major infrastructure projects such as new roads, railway rehabilitation, and large industrial facilities.

Sin embargo, la figura 4 muestra las diferencias regionales en el total de RSU recolectados, lo que también se espera en el caso del flujo de C&DW debido a varios factores potenciales como la población, la tasa de urbanización, el nivel socioeconómico, los centros urbanos, el mercado inmobiliario, el desarrollo industrial, etc. En las economías emergentes, la porción de residuos de la construcción es del 40% del total de residuos municipales, que representan más de 200 millones de toneladas en China. El documento estima las cantidades de C&DW en áreas urbanas de los condados rumanos, utilizando una tasa de generación de desechos per cápita de 280 kg en el plazo de un año como sugiriero Musuroaea y otros. Cabe destacar que este valor no incluye los grandes proyectos de infraestructura como nuevas carreteras, rehabilitación de vías férreas y grandes instalaciones industriales.

Paragraph 2

Despite the fact, Bucharest city has the largest amount of C&DW collected, there are 361,930.64 t of C&DW uncovered by environmental reports as shown in Figure 5. This situation is due to the lack of clear regulation on how this waste stream should be managed and how all stakeholders should report the statistical data involved in the construction sector towards environmental authorities. As an example, in Valcea County, no C&DW is reported to be collected during 2014,

but 45,621.52 t are estimated to be generated in urban areas. Large amounts of C&DW are estimated to be generated in counties without data reported such as Sibiu (73,935.96 t).

A pesar de que la ciudad de Bucarest tiene la mayor cantidad de C&DW recolectada, hay 361 930,64 T de C&DW que se descubrieron por informes ambientales como se muestra en la figura 5. Esta situación se debe a la falta de una regulación clara sobre cómo se debe gestionar este flujo de residuos y cómo todas las partes interesadas deben informar los datos estadísticos involucrados en el sector de la construcción a las autoridades ambientales. A modo de ejemplo, en el condado de Valcea, no se informó que se recolectó C&DW durante 2014, pero se estima que se generarán 45 621,52 T en áreas urbanas. Se estima que se generarán grandes cantidades de C&DW en condados sin datos reportados como Sibiu (73 935,96 T).

Paragraph 3

The maps point out that this fraction is poorly covered by waste statistics even across urban areas. The paper provides a regional insight of C&DW management activities in Neamt county, highlighting the gaps between larger cities, towns and rural communities. Amounts of construction waste are estimated based on usable floor area criteria for each city and town and compared to those collected by waste operators (based on data provided by the Environmental Protection Agency of Neamt County).

Los mapas señalan que estos sectores están mal documentados, esto se dedujo gracias a las estadísticas de residuos, incluso en áreas urbanas. El documento proporciona una perspectiva regional de las actividades de gestión de C&DW en la provincia de Neamt, el cual, se destacan las brechas entre ciudades, pueblos y las comunidades rurales más grandes. Las cantidades de desechos de construcción se estiman basadas en los criterios de superficie útil dados para cada ciudad y pueblo. Estas se comparan con las cantidades recolectadas por los operadores de

desechos (según los datos proporcionados por la Agencia de Protección Ambiental de la provincia de Neamt).

Paragraph 4

To combat such failures and to support the waste diversion from open dumps and MSW landfills, a circular system must be further developed in each county of Romania as suggested by stages III–V. Such incentives and current best practices are analyzed as pathways for sustainability in C&DW management in Romania (see Section 3) supported by peer-reviewed literature. Also, various sources were consulted to analyze the state of art in C&DW management activities in Romania such as the annual environmental reports of local environmental protection agencies (e.g., data for thematic maps at county level); technical reports for specific waste management infrastructures under the supervision of County Councils or local municipalities; reports and websites of construction and recycling companies, waste operators; data provided by National Institute of Statistics or Environmental Protection Agency of Neamt county (Section 3.4).

Para combatir estas fallas y apoyar la desviación de desechos de vertederos abiertos y vertederos de RSU, se debe desarrollar un sistema circular en cada condado de Rumania como lo sugieren las etapas III y V. Dichos incentivos y las mejores prácticas actuales se analizan como vías para la sostenibilidad en la gestión de C&DW en Rumania (ver Sección 3) con el apoyo de literatura revisada por diferentes pares. Además, se consultaron varias fuentes para analizar el estado del arte en las actividades de gestión de C&DW en Rumania, como los informes ambientales anuales de las agencias locales de protección ambiental (datos para mapas temáticos con respecto a los condados); informes técnicos para infraestructuras específicas de gestión de residuos bajo la supervisión de los consejos de condado o municipios locales; informes y sitios web de empresas

de construcción y reciclaje, operadores de residuos; datos proporcionados por el National Institute of Statistics or Environmental Protection Agency of Neamt county (Sección 3.4).

Paragraph 5

At the national level, there is a large number of non-compliant management situations for C&DW, the majority consisting of their abandonment and/or uncontrolled storage on both intra- and extra-urban land. Such practices are favored by the poor law enforcement of local authorities and the lack of landfills for this waste fraction. Discontinuation of illegal, non-compliant, dumping or unauthorized landfilling will encourage a proactive approach of C&DW generators in finding alternatives to landfilling. Construction companies are responsible to transport the C&DW generated to safe disposal facilities according to the "polluter pays" principle or delegating a waste operator for such services.

A nivel nacional, existe un gran número de situaciones de gestión no conforme para C&DW, la mayoría se conforma de su abandono y/o almacenamiento incontrolado tanto en suelo interurbano como extraurbano. Estas prácticas se ven favorecidas por la deficiente aplicación de la ley por parte de las autoridades locales y la falta de vertederos para este sector de residuos. La interrupción del vertido ilegal, no conforme con la ley, de los vertidos o del vertido no autorizado fomentará un enfoque proactivo de los generadores de C&DW para encontrar alternativas al vertido. Las empresas constructoras son responsables de transportar el C&DW generado a instalaciones de eliminación seguras de acuerdo con el principio del "contaminador paga" o delegar en un operador de residuos para estos servicios.

Paragraph 6

At the household level, the C&DW result should be transported by formal municipal waste management services towards recycling facilities or urban landfill sites. Waste collection coverage is still incomplete across middle and smaller cities with a poorer connection towards rural areas. This fact encourages the illegal waste disposal of C&DW as shown in Figure 2. Frequently, wild dumps contain mixed waste fractions as C&DW, municipal waste, and agricultural waste, particularly in rural areas. Field observations reveal that both urban and rural municipalities are exposed to illegal dumping issues of C&DW.

A nivel doméstico, el C&DW resultante debe ser transportado por servicios formales de gestión de residuos municipales hacia instalaciones de reciclaje o vertederos urbanos. La cobertura de recolección de residuos aún es incompleta en las ciudades medianas y pequeñas con una menor conexión con las zonas rurales. Este hecho fomenta la eliminación ilegal de residuos de C&DW como se muestra en la Figura 2. Con frecuencia, los vertederos silvestres contienen una fracción de desechos mixtos como C&DW, desechos municipales y desechos agrícolas, particularmente en áreas rurales. Las observaciones de campo revelan que tanto los municipios urbanos como los rurales están expuestos a problemas de vertidos ilegales de C&DW.

Paragraph 7

Also, regions of Poland are facing similar issues. Construction waste collection and transport is costly, and it is often collected as mixed waste or is deposited in illegal dumping sites. Uncontrolled waste disposal is still an environmental threat to be solved in Croatia and in other European regions, there is a significant amount of illegal dumping combined with a heterogeneous market for secondary materials that may not be reflected in official statistics. The

illegal dumping of C&DW poses financial issues for Romanian local authorities, which must provide cleaning activities of public lands from their local budget

Además, algunas regiones de Polonia se enfrentan a problemas similares. La recolección y el transporte de residuos de construcción es costosa y, a menudo, se recogen como residuos mixtos o se depositan en vertederos ilegales. La eliminación incontrolada de residuos sigue siendo una amenaza medioambiental que debe resolverse en Croacia, y en otras regiones europeas existe una cantidad significativa de vertidos ilegales combinada con un mercado heterogéneo de materiales secundarios que puede no reflejarse en las estadísticas oficiales. El vertido ilegal de C&DW plantea problemas financieros para las autoridades locales rumanas, que deben proporcionar actividades de limpieza de tierras públicas a partir de su presupuesto local.

Paragraph 8

In rural areas, illegal disposal of C&DW was a widespread practice due to the poor connection to reliable waste collection services prior to the closure of rural wild dumps during 2009–2010. The closure of such sites was required by Government Decision No. 345/2005 regarding the landfill of waste. Some rural dumpsites were closed and covered with C&DW as a coating material. There are no data about the magnitude of illegal dumping issue at the national scale, which include both urban and rural areas. This paper draws attention to this issue by revealing the gaps in current C&DW flows.

En las zonas rurales, la eliminación ilegal de C&DW era una práctica generalizada debido a la mala conexión con los servicios confiables de recolección de desechos antes del cierre de los vertederos silvestres rurales durante el 2009-2010. El cierre de tales sitios fue requerido por la Decisión gubernamental No. 345/2005 sobre el vertido de desechos. Algunos vertederos rurales

se cerraron y se cubrieron con C&DW como material de revestimiento. No existen datos sobre la magnitud del problema de los vertidos ilegales a escala nacional, que incluyan tanto áreas urbanas como rurales. Este documento resalta los problemas sobre este tema al revelar las brechas en los flujos actuales de C&DW.

Paragraph 9

The geographical dimension of uncovered data by waste operators could be used (in further studies) as a proxy indicator for regional or national assessments of illegal dumping practices. Local C&DW generated at the household level are partially collected by waste management services or reused as filling material for local unpaved roads, household bases. The lack of storage facilities and long distances to treatment plants makes the transport to be less cost-effective encouraging the stakeholders to adopt illegal waste disposal practices.

La dimensión geográfica de los datos descubiertos por los operadores de desechos, que podrían usarse (en estudios posteriores) como un indicador indirecto para las evaluaciones regionales o nacionales de las prácticas de vertidos ilegales. Los C&DW locales generados a nivel doméstico son recolectados parcialmente por los servicios de manejo de residuos o reutilizados como material de relleno para caminos locales sin pavimentar, basado en presupuestos. La falta de instalaciones de almacenamiento y las largas distancias a las plantas de tratamiento hacen que el transporte sea menos rentable, alentando a las partes interesadas a adoptar prácticas ilegales de eliminación de residuos.

Paragraph 10

C&DW collected by waste operators is frequently disposed of in municipal waste landfills or non-hazardous industrial landfills, which mitigate their initial disposal capacity. The acceptance

of this fraction to be disposed of in municipal waste landfills at lower costs mitigates the development of recycling and recovery activities. C&DW generated from Constanta County have been disposed of in a special landfill site located in Ovidiu town since 2008 (capacity-310.767 m3, first phase). Gurau et al. reveal that, in this county, only 13.56% of C&DW (15,220 t) was collected in 2008 compared to 122.250 t estimated to be generated by the regional waste management plan of the South-East region.

El C&DW recolectado por los operadores de desechos se elimina con frecuencia en vertederos de desechos municipales o vertederos industriales no peligrosos, lo que mitiga su capacidad inicial de eliminación. La aprobación de esta fracción para su eliminación en vertederos de residuos municipales a menor costo mitiga el desarrollo de las actividades de reciclado y valorización. Los C&DW generados en el condado de Constanta se eliminan en un vertedero especial ubicado en la ciudad de Ovidiu desde 2008 (capacidad: 310.767 m3, primera fase). Gurau et al. revelan que, en este condado, solamente el 13,56% de C&DW (15.220 t) se recogió en 2008 en comparación con las 122.250 t que se estima generará el plan regional de gestión de residuos de la región sureste.

Paragraph 11

Furthermore, in 2009, 2006.6 t of 6850 t C&DW collected in Constanta County was disposed of at this site. The availability of data concerning the C&DW flows is limited in Romania. Such data are provided mainly by urban waste operators based on volumetric estimations and aggregated at the county level by the local environmental protection agencies (EPA). The volume data (based on waste truck capacity) are transformed in metric tons using a specific density of 2 t/m3 as suggested by environmental authorities.

Además, en 2009, 2006,6 t de 6850 t de C&DW recolectadas en el condado de Constanza se eliminaron en este lugar. La disponibilidad de datos sobre los flujos de C&DW es limitada en Rumania. Dichos datos son proporcionados principalmente por operadores de residuos urbanos basados en estimaciones volumétricas y agregados en el ámbito de condado por los organismos locales de protección del medio ambiente (EPA Los datos de volumen (basados en la capacidad del camión de residuos) se transforman a toneladas métricas utilizando una densidad específica de 2 t / m3 según lo sugerido por las autoridades del medio ambiente.

Paragraph 12

The waste operators are obliged to send such waste statistics data to local environmental protection agencies. The C&DW data is aggregated at the county level (equivalent to EU NUTS 3 regions) but lacking at local administrative unit levels (cities and communes). Noncompliant landfills have no weighing systems and most of waste statistics data rely on such volumetric estimations. On the other hand, there are no strict regulations to oblige construction companies to provide data about the C&DW flows.

Los operadores de residuos están obligados a enviar dichos datos estadísticos de los residuos a las agencias locales de protección del medio ambiente. Los datos de C&DW se agregan a nivel de condado (equivalente a las regiones EU NUTS 3), pero son carentes a nivel de las unidades administrativas locales (ciudades y municipios). Los vertederos no conformes no tienen sistemas de pesaje y la mayoría de los datos de estadísticas de residuos se basan en esas estimaciones volumétricas. Por otro lado, no existen regulaciones estrictas que obliguen a las empresas constructoras a proporcionar datos sobre los flujos de C&DW.

Paragraph 13

The quantity of C&DW increased in 2003–2008 due to the fast development of the construction field followed by a regress caused by the economic crisis, which started in 2009. Construction sector generated 5.7% of GDP in 2002, and 10.5% in 2008, with a peak of activity in 2007 when 45,867 new habitations were completed (most of them in Bucharest city and Ilfov county). C&DW sector is expected to increase in the following years due to the Romanian emerging economy and serious needs for infrastructure development.

La cantidad de C&DW aumentó en 2003-2008 debido al rápido desarrollo del campo de la construcción, seguido de un retroceso causado por la crisis económica, que comenzó en 2009. El sector de la construcción generó el 5,7 % del PIB en 2002 y el 10,5 % en 2008, con un pico de actividad en el 2007 cuando se completaron 45 867 viviendas nuevas (la mayoría de ellas en la ciudad de Bucarest y el condado de Ilfov). Se espera que el sector C&DW aumente en los próximos años debido a la economía emergente rumana y las serias necesidades de desarrollo en infraestructura.

Paragraph 14

The interviewed stakeholders pointed out that the lack of infrastructure to store, treat, and recycle C&DW is a huge problem in Romania. Figure 3 reveals the regional disparities across Romanian counties regarding the ratio of C&DW of total municipal waste collected in 2014 using the Jenks natural breaks classification method. Local environmental reports provide the data concerning C&DW amounts collected by waste operators in each county, then, the ratio of this waste stream of total municipal solid waste collected (by public or private waste operators) is further calculated at county level.

Las partes interesadas entrevistadas señalaron que la falta de infraestructura para almacenar, tratar y reciclar C&DW es un gran problema en Rumanía. La Figura 3 revela las disparidades regionales entre condados rumanos con respecto a la proporción de C&DW del total de residuos municipales recolectados en 2014 utilizando el método de clasificación de rupturas naturales de Jenks. Los informes ambientales locales proporcionan los datos sobre las cantidades de C&DW recolectadas por los operadores de residuos en cada condado, luego, la relación de este flujo de residuos al total de residuos sólidos municipales recolectados (por operadores de residuos públicos o privados) se calcula además a nivel de condado.

Paragraph 15

The results show that waste operators collected 519,723.36 t in 2014 compared to the 2,925,333.88 t of C&DW estimated to be generated across urban areas. In other words, the paper points out that only 17.76% of C&DW generated in urban areas is actually collected by waste operators. The rest is mainly managed by construction companies or by individuals using on-site recovery (stage III), own transportation to urban landfills (stage II) or illegal disposal practices in periurban communities (stage I).

Los resultados muestran que los operadores de residuos recolectaron 519.723,36 T en 2014 en comparación con las 2.925.333,88 T de C&DW que se estima que se generarán en las áreas urbanas. En otras palabras, el documento destaca que solo el 17,76 % del C&DW generado en las zonas urbanas es realmente recolectado por los operadores de residuos. El resto se gestiona principalmente a través de empresas constructoras o por individuos que utilizan recuperación en el sitio (etapa III), transporte propio a rellenos sanitarios urbanos (etapa II) o prácticas de disposición ilegal en comunidades periurbanas, afueras de la zona urbana (etapa I).

5.1.2.2 Curricular environmentalization. COVID-19, new emphasis for education

Paragraph 1

La crisis ambiental contemporánea1, desde sus orígenes, ha seguido un proceso creciente en cuanto a su ritmo, magnitud, nivel y profundidad (Tommasino et al., 2001). Ha transitado por preocupaciones meramente ecológicas hasta inquietudes por la afectación en todas las esferas de la vida humana y no humana. Su creciente profundidad ha hecho que se reposicione en el entramado social y ocupe uno de los principales ejes para comprender y perfilar los nuevos contornos del mundo y del desarrollo tanto de las presentes como de las futuras generaciones a nivel mundial. Podemos comprender la génesis de la crisis ambiental en el entramado de múltiples desajustes de la articulación entre la sociedad con la naturaleza.

The contemporary environmental crisis, since its origins, has followed a growing process in terms of its pace, magnitude, level, and depth (Tommasino et al., 2001). It has gone from merely ecological concerns to concerns about the impact on all spheres of human and non-human life. Its growing depth has caused it to reposition itself in the social fabric and occupy one of the main axes to understand and outline the new contours of the world and the development of both present and future generations worldwide. We can understand the genesis of the environmental crisis in the framework of multiple imbalances in the articulation between society and nature.

Paragraph 2

Morín y Kern (1993) señalan el desajuste económico mundial, el desajuste demográfico y la crisis del desarrollo, a lo que se suma el desajuste ambiental. Por lo anterior, Toledo (1996) y Alba (1991) señalan que vivimos una crisis societal, de civilización o crisis social generalizada. Dicha crisis muestra el derrumbe de estructuras económicas, políticas, culturales, éticas,

educativas, ideológicas, sociales, ambientales y de configuraciones sociales anteriores. Esto evidencia un proceso de cambio hacia otros derroteros, hacia otras estructuras y otras prácticas sociales que aún se encuentran en formación. Sin embargo, el proceso de configuración de las nuevas sociedades se da en un marco de mayor precariedad.

Morín and Kern (1993) bring light to the global economic imbalance, the demographic imbalance, and the development crisis, to which is added the environmental imbalance. Due to the above, Toledo (1996) and Alba (1991) point out that we are experiencing a societal crisis, a crisis of civilization or generalized social crisis. This crisis shows the collapse of economic, political, cultural, ethical, educational, ideological, social, environmental structures, and previous social configurations. This evidences a process of change towards other paths, other structures, and other social practices that are still in formation. However, the configuration process of the new societies takes place in a framework of greater precariousness.

Paragraph 3

Desde el campo ambiental se han perfilado perspectivas de solución, modelos de desarrollo, orientaciones ambientales y de sustentabilidad, a fin de revertir y superar el profundo deterioro de la naturaleza que se presenta a nivel nacional y mundial. En esta gran empresa se ve la educación superior como una de las instituciones sociales de trascendencia en la actual configuración mundial, por lo que su vinculación profunda con las causas ambientales es imperativa. La educación superior es, con mayor énfasis, un sector estratégico para el desarrollo de las sociedades. En el contexto de la llamada sociedad de conocimiento, el saber y las instituciones ligadas a él reconfirman la singularidad e importancia de las instituciones de educación superior.

From the environmental field, solution perspectives, development models, environmental and sustainability guidelines have been outlined to revert and overcome the profound deterioration of nature that occurs at national and global levels. In this great company, higher education is seen as one of the social institutions of importance in the current world configuration, so its deep link with environmental causes is imperative. Higher education is, with greater emphasis, a strategic sector for the development of societies. In the context of the so-called "Knowledge society," knowledge and the institution linked to it, reconfirm the singularity and importance of higher education institutions.

Paragraph 4

Si bien las IES son instituciones históricas, a su vez pretenden responder a su tiempo, espacio, entorno y exigencias sociales, lo que en la actualidad las ha convertido en instituciones de gran complejidad que tienen una gran trascendencia en el presente y para el futuro. Son instituciones en donde se transmite y, en una buena parte de ellas, se crea el saber y se certifica. Las IES se extienden más allá de sus fronteras. Su labor no termina en sí mismas. A través de sus egresados, de su trabajo educativo e investigativo, de sus profesores y de sus investigadores, se extienden a la sociedad y alcanzan su sentido y su concreción ante ellas mismas. Por ello, varios investigadores han señalado el papel de las IES.

Although HEIs are historical institutions, they seek to respond to their time, space, environment, and social demands, which has currently made them highly complex institutions that have great significance for the present and for the future. They are institutions where knowledge is transmitted and, in a good part of them, is created and certified. HEIs extend beyond their borders. Their work does not end within themselves. Through their graduates, their educational

and research work, their professors, and their researchers, they extend to society and reach their meaning and their concretion for their indulgence. For this reason, several researchers have established the role of the HEIs.

Paragraph 5

Sin embargo, la educación superior tiene que repensarse y reconceptualizarse, ya que es heredera de visiones antropocéntricas y mecanicistas que han contribuido a la crisis ambiental contemporánea. La visión de las relaciones entre la sociedad y la naturaleza. Particularmente las formas simbólicas de acercamiento al mundo natural, ha sido determinante para generar la crítica situación ambiental. En ello ha contribuido básicamente la visión mecanicista del mundo que se constituyó desde hace tres siglos. El mecanicismo impregnó por completo la forma de vida de la sociedad occidental y, por ende, de la educación superior. Esto trajo dos consecuencias: el materialismo, al pensar que solo existe lo material, lo objetivo, y el determinismo, desde la idea de que todo tiene una causa física, incluso la conciencia.

However, higher education must be rethought and reconceptualized since it is heir to anthropocentric and mechanistic visions that have contributed to the contemporary environmental crisis. The vision of the relations between society and nature, particularly the symbolic ways of approaching the natural world, has been decisive in generating the critical environmental situation. The mechanistic vision of the world that was established three centuries ago has contributed to this. Mechanism completely permeated the way of life of Western society and, therefore, of higher education. This brought two consequences: materialism, thinking that only the material, the objective, exists; and determinism, from the idea that everything has a physical cause, including consciousness.

Paragraph 6

La visión mecanicista implica la fragmentación del conocimiento y, con ello, la parcelación de la realidad en disciplinas o campos del saber. Esta visión ha sido central para interpretar e intervenir la realidad, ya que la biosfera ha sido fragmentada y desestructurada, lo cual es contrario a un enfoque que quería ser estructurante e integrador. La ciencia moderna que suscribe esta visión ha sido uno de los instrumentos más poderosos para el manejo y transformación del medio natural. La universidad, a través de sus tareas centrales, particularmente de la formación de profesionales, ha sido portadora de estas visiones atomizadas. Sin embargo, la crisis ambiental ha generado nuevos conocimientos y saberes.

The mechanistic vision implies the fragmentation of knowledge and, with it, the division of reality into disciplines or fields of knowledge. This vision has been central to interpreting and intervening, since the biosphere has been fragmented and unstructured, which is contrary to an approach that wanted to be structuring and integrating. Modern science that subscribes this vision has been one of the most powerful instruments for the management and transformation of the natural environment. The university, through its central tasks, particularly the training of professionals, has been the bearer of these atomized visions. However, the environmental crisis has generated new knowledge and wisdom.

Paragraph 7

Al romper con el paradigma de la reducción del conocimiento a las partes que lo componen, con el determinismo, la ocultación del azar y la aplicación de la lógica mecanicista a los problemas de la naturaleza y lo social, surge el pensamiento complejo que busca distinguir y reconocer lo singular y lo concreto, sin desunir y sin atomizar, en un juego dialógico entre orden, desorden,

organización, contexto e incertidumbre, sin dar como verdad esa particular organización de un conjunto determinado. Desde esta nueva perspectiva se está trabajando para construir escenarios deseables de desarrollo que superen los graves problemas ambientales y prevengan otros. La ambientalización curricular enmarcada en las anteriores consideraciones.

By breaking with the paradigm of the reduction of knowledge to its parts, with determinism, the concealment of chance and the application of mechanistic logic to the problems of nature and the social, a complex thought that emerges seeks to distinguish and recognize the singular and the concrete, without separating and without atomizing, in a dialogical game among order, disorder, organization, context, and uncertainty, without taking as truth that particular organization of a determined set. From this new perspective, work is being done to build desirable development scenarios that overcome serious environmental problems and prevent others. The curricular environmentalization framed in the above considerations.

Paragraph 8

Los efectos del nuevo coronavirus en nuestras sociedades, particularmente en México, con más de 1 301 249 contagiados y 117 949 decesos al 19 de diciembre de 2020 (Noticieros Televisa, 2020), nos han mostrado la crudeza de treinta años de la era neoliberal, en donde la corrupción de las élites gobernantes arrasó con el patrimonio y la riqueza del pueblo, dejando los sistemas de salud, educativos, productivos, etc., en la mayor precariedad. Por ello, ha sido una tarea titánica la reconstrucción de los hospitales y servicios de salud para atender los crecientes contagios. De la misma manera, la recomposición económica del país será una tarea sin igual.

The effects of the new coronavirus in our societies, particularly in Mexico, with more than 1,301,249 infected and 117,949 deaths as of December 19, 2020 (Noticieros Televisa, 2020),

have shown us the harshness of thirty years of the neoliberal era, where the corruption of the ruling elites devastated the patrimony and wealth of the people, leaving the health, education, productive systems, etc., in the greatest precariousness. For this reason, the reconstruction of hospitals and health services to deal with the growing infections has been a titanic task. In the same way, the economic recomposition of the country will be a task like no other.

Paragraph 9

Sin embargo, esta crisis sanitaria ha propiciado una mayor conciencia de varios grupos de la sociedad, que han señalado que las tareas de la ambientalización curricular deben incluir con mayor determinación el análisis y la enseñanza de la generación y afectación de este tipo de virus en la calidad de vida de la sociedad. La aparición del virus se asocia a los estilos de consumo insustentable y al alto crecimiento de la población, entre otros. Los jóvenes en proceso de formación en las IES —los futuros profesionales— pueden reorientar sus formas de vida y de consumo. Pueden influir en su comunidad a fin de lograr cambios hacia estilos de vida saludables que no alteren tan profundamente la naturaleza.

However, this health crisis has led to a greater awareness among various groups in society, who have indicated that the tasks of curricular environmentalization must include with greater determination the analysis and teaching of the generation and impact of this type of virus in the quality of life of society. The appearance of the virus is associated with unsustainable consumption styles and high population growth, among others. Young people undergoing training in HEIs, future professionals, can reorient their ways of life and consumption. They can influence their community to achieve changes towards healthy lifestyles that do not alter nature so profoundly.

Paragraph 10

En el contexto de crisis ambiental, el ejercicio profesional y, por lo tanto, las IES —en su afán de contribuir al desarrollo nacional mediante la formación de profesionales— han soslayado la previsión de la alteración de los ecosistemas y son en gran parte responsables de la problemática ambiental, debido a los contenidos y valores que trasmiten, lo que afecta la calidad de vida de los seres humanos, de las otras especies, de las actividades económicas y del desarrollo. En la investigación que hemos venido realizando (Bravo, 2013), identificamos que la ambientalización curricular plantea la formación profesional con una visión de prevención, para superar la lógica de destruir, para construir y para remediar, como se plantea en algunas carreras ambientales.

In the context of environmental crisis, professional practice and, therefore, HEIs, in their eagerness to contribute to national development through the training of professionals, have avoided foreseeing the alteration of ecosystems and are largely responsible for environmental problems, due to the content and values they transmit, which affects the quality of life of human beings, other species, economic activities, and development. In the research that we have been carrying out (Bravo, 2013), we identified that curricular environmentalization proposes professional training with a vision of prevention, to overcome the logic of destroying, to build and to remediate, as it is proposed in some environmental careers.

Paragraph 11

La ambientalización curricular pretende promover la inclusión de la prevención y, aún más, la inclusión de una formación prospectiva para los profesionales en formación y el trabajo interdisciplinario, con el propósito de construir escenarios deseables de desarrollo. Ello implica el rediseño curricular, desde el estudio de las profesiones y sus campos ocupacionales y la

definición de los perfiles profesionales ambientalizados, de los planes de estudio y de las unidades de aprendizaje, entre otros aspectos. Así, la ambientalización curricular y las investigaciones necesarias que conlleva esta tarea deberán considerar que las prácticas sociales en particular las prácticas profesionales y los procesos educativos que están en la base de los procesos de producción-consumo forman parte de las causas de la crisis ambiental.

Curricular environmentalization aims to promote the inclusion of prevention and, even more, the inclusion of prospective training for professionals in training and interdisciplinary work, to build desirable development scenarios. This implies the redesign of the curriculum, from the study of professions and their occupational fields, and the definition of environmentalism professional profiles, study plans (curricula), and learning units, among other aspects. Thus, the curricular environmentalization and the necessary research that this task entails, must consider that social practices, particularly professional practices, and educational processes that are at the base of production-consumption processes, are part of the causes of the environmental crisis.

5.1.2.3 UNIVERSITY TRAINING AND EDUCATIONAL ACTIONS To UNDERSTAND THE "COSTA RICA VERDE". AN EDUCATIONAL PROPOSAL FROM THE HISTORICAL DISCIPLINE

Paragraph 12

Educar, inequívocamente, sugiere un proceso de desarrollo de capacidades intelectuales, conocimientos, habilidades, valores, creencia y hábitos adquiridos por los seres humanos desde su nacimiento hasta su deceso, mediante infinidad de técnicas, objetivos y espacios de sociabilidad. Por ello, cuando tratamos de configurar el término de educación ambiental apuntamos hacia aquellas acciones contemporáneas e históricamente constituidas mediante la

educación formal e informal, las percepciones individuales y grupales, y la relación cotidiana con el medio ambiente. Postulados, en gran parte, sugeridos por diversos dictámenes ambientales de la Organización de Naciones Unidas. (ONU). Consideración teórica que Leff reinterpretó en la década de 1990, con la acepción de saberes ambientales, para expresar sus reflexiones sobre la construcción social del mundo actual

Educating, unequivocally, suggests a process of development of intellectual capacities, knowledge skills, values, beliefs, and habits acquired by human beings from birth to death, through countless techniques, objectives, and places of sociability. Therefore, when we try to configure the term "environmental education", we point to those contemporary and historically constituted actions through formal and informal education, individual and group perceptions, and the daily relationship with the environment. Postulates, in large part, suggested by various environmental reports of the United Nations Organization. Theoretical consideration that Leff reinterpreted in the 1990s, with the meaning of environmental knowledge, to express his reflections on the social construction of the current world.

Paragraph 13

Donde convergen y precipitan los procesos biofísicos, biológicos y la trascendencia histórica de la invención humana. Tiempos de hibridación del mundo donde la tecnología, la deuda con la naturaleza, el mestizaje de culturas, la resignificación de identidades y los problemas socioeconómicos se ven reflejados en los diversos saberes ambientales, que estimulan a la emersión de nuevos valores y racionalidades sobre nuestra existencia. Una cosmovisión del saber, que tiende a trascender en la medida que sacude los paradigmas educativos dominantes las visiones globalizantes y unitarias de la educación, para desarrollar una visión crítica y

transformadora entre los saberes populares, los enfoques multicausales, el diálogo interdisciplinario y el proceso histórico diferenciado en escalas espaciales y temporales (Leff, 1998).

Where biophysical and biological processes converge and precipitate, as well as the historical significance of human invention. Times of hybridization of the world where technology, the debt with nature, the miscegenation of cultures, the redefinition of identities, and socioeconomic problems, are reflected in the diverse environmental knowledge which stimulate the emergence of new values and rationalities about our existence. A worldview of knowledge, which tends to transcend to the extent that it shakes the dominant educational paradigms the globalizing and unitary visions of education, to develop a transforming vision among popular knowledge, multicausal approaches, interdisciplinary dialogue and the historical process differentiated in spatial and temporal scales (Leff, 1998).

Paragraph 14

Propuesta significativamente importante para nuestra empresa, cuyo objetivo se centra en el análisis del desarrollo histórico de la educación ambiental en Costa Rica y la materialización de nuevas propuestas formativas del curso Historia Ambiental de Costa Rica, centralizado en la compresión de los problemas ambientales en el largo plazo, con el fin de enriquecer las explicaciones historiográficas tradicionales de tipo político y socioeconómico, subrayando el valor de las dinámicas ambientales como motores de cambio y destacando la importancia de la historia para el entendimiento de los problemas ecológicos presentes, sin descuidar la divulgación del conocimiento y el reconocimiento del utillaje teórico-metodológico de la historia ambiental y otras disciplinas a fines.

Significantly important proposal for our company, whose objective is focused on the analysis of the historical development of environmental education in Costa Rica and the materialization of new training proposals of the Environmental History of Costa Rica course (Historia Ambiental de Costa Rica), centered on the understanding of environmental problems in the long term, to enrich the traditional historiographical explanations of political and socioeconomic nature, underlining the value of environmental dynamics as engines of change and highlighting the importance of history for the understanding of current ecological problems, without neglecting the dissemination of knowledge and the recognition of the theoretical-methodological tools of environmental history and other related disciplines.

Paragraph 15

Con un proyecto de diversificación productiva a cuestas, el Estado costarricense, desde 1949, generó un discurso conservacionista y un incipiente proyecto de educación ambiental, bajo el seudónimo “Semana de los Recursos Naturales”, para impulsar una producción sostenida y tratar de paliar los problemas que se arrastraban desde décadas anteriores, a causa de la tala del bosque, la erosión del suelo, el pastoreo excesivo y el exterminio de la fauna silvestre. Así, con el afán de despertar y divulgar una conciencia ambiental entre la población costarricense, en el mes de setiembre, en medio de las celebraciones de la independencia, se buscó establecer ciertos nexos entre la identidad costarricense y los recursos naturales, a través de los símbolos patrios.

With a productive diversification project in development, the Costa Rican State, since 1949, generated a conservationist discourse and an incipient environmental education project under the pseudonym "Semana de Los Recursos Naturales" (Environmental Education Week), to promote sustained production and try to alleviate the problems that have been dragging on for decades,

due to the deforestation of the forest, soil erosion, excessive grazing, and the extermination of wildlife. Thus, with the aim of awakening and spreading environmental awareness among the Costa Rican population, in September, amid the independence celebrations, it was sought to establish certain links between the Costa Rican identity and natural resources.

5.1.3 Glossary

A glossary, as mentioned in previous chapters, is one the most important aspects of a translation, whether a glossary is used at the beginning of a translation or is created when the documents are translated. These types of instruments help future translators to maintain the same vocabulary during the translation, creating consistency. For this investigation, the researcher created a glossary that contained not only the definition, but also the grammatical category of each word. During the extraction of the terms, the researcher noticed that many terms, both technical and not, were present many times throughout the text. These types of terms were the ones chosen for the glossary, as they helped to maintain consistency.

5.1.3.1 Glossary from English to Spanish

English term	**Spanish term**	**Definition**	**Grammatical Category**
Construction and demolition wastes (C&DW)	Desechos de construcción y demolición (C&DW por sus siglas en ingles)	Construction and demolition (C&D) waste is generated from the construction, renovation, repair, and demolition of houses, large building structures.	Noun and adjective

Dumping	Vertederos	A place for throwing away large amounts of garbage	Noun
Municipal solid waste (MSW)	Desecho solido municipal (DSM)	Trash or garbage—consists of everyday items we use and then throw away, such as product packaging, grass clippings, furniture, clothing, bottles	Noun and adjective
Sustainable	Sostenibles	Capable of being continued with a minimal long-term effect on the environment.	Adjective
Development	Desarrollo	The act of developing or the state of being developed.	Noun
Communities	Comunidades	A group of people forming a smaller social unit within a larger one, and sharing common interests, work, identity, location.	Noun
Waste	Residuos	To use, consume, spend, or expend thoughtlessly or carelessly.	Noun
Crushing plants	Plantas de trituración	One-stop crushing installation, which can be used for rock crushing, garbage crushing, building materials crushing, and other similar materials.	Noun and verb
Coating material	Paterial de recubrimiento	A layer of material is deposited onto a substrate to enhance the surface properties for corrosion and wear protection.	Noun and adjective

Circular economy system	Sistema de economía circular	A systemic approach to economic development designed to benefit businesses, society, and the environment.	Noun and adjective
Open dumping	Vertido abierto	A land disposal site at which solid wastes are disposed of in a manner that does not protect the environment, are susceptible to open burning, and are exposed to the elements.	Noun and adjective
Counties	Condados	A political and administrative division of a state, providing certain local governmental services.	Noun
Operators	Operadores	Someone who controls a machine, or the manager or owner of a business.	Noun
Fraction	Sectores	Representative equal parts of a whole or a collection.	Noun
Disposal practices	Prácticas de eliminación	The collection, processing, and recycling or deposition of the waste materials of human society.	Noun and verb
Periurban	Periurbanas	Immediately adjoining an urban area; between the suburbs and the countryside.	Adjective
Storage	Almacenamiento	A place for storing items or such items.	Adjective
Volumetric	Volumétricas	Of or relating to measurement by volume.	Adjective

Stream	Flujo	A stream of things is a large number of them occurring one after another.	Noun
Spatial analysis	Análisis espacial	The geographical analysis seeks to explain patterns of human behavior and its spatial expression.	Noun and Adjective
Per-capita	Per cápita	Per unit of the population; per person.	Adjective
Hazardous	peligrosos	A substance, natural or man-made, which is intrinsically dangerous or otherwise poses a safety hazard.	Noun and Adjective
Regulation	Regulación	A rule, ordinance, or law by which conduct is regulated.	Noun
Inert	Inertes	slow or having no action or power to move.	Adjective

Table 7 Glossary from Spanish to English. Source: Researcher's own creation. All terms were extracted from https://www.yourdictionary.com/ (Dictionary definitions you can understand - YourDictionary, 2022)

5.1.3.2 Glossary from Spanish to English

Spanish term	**English term**	**Definition**	**Grammatical Category**
Conocimientos	Knowledge	The body of facts, principles, etc. is acquired through human experience and thought.	Noun

Educación ambiental	Environmental education	The teaching of the natural environment's functionality so that human beings can adapt to them without causing harm.	Noun and adjective
Identidad	Identity	The awareness that an individual or group has of being a distinct, persisting entity.	Noun
Materia prima	Raw material	The material is still in its natural or original state, before processing or manufacture.	Noun and adjective
Desgaste	Soil erosion	Soil erosion is a gradual process of movement and transport of the upper layer of soil (topsoil) by different agents	Noun
Conservacionista	Conservationist	One that practices or advocates conservation, especially of natural resources.	Noun or adjective
Sector forestal	Forestry sector	A sector of the economy in which an aggregate of establishments is engaged in the management of an extensive area of woodland.	Noun and adjective
Agropecuaria	Agricultural	Of or pertaining to agriculture, connected with, or engaged in, tillage.	Noun
Educación superior	Higher education	Education beyond the secondary level, especially education at the college or university level.	Noun and adjective

Sustentabilidad	Sustainability	Sustainability is the ability to be upheld, or the quality of being aware and protective of the natural resources and environment during economic and population growth	Noun
Reconceptualizarse	Reconceptualized	To conceptualize afresh; to develop a replacement concept of something.	Verb
Mecanicismo	Mechanism	A system of parts that operate or interact like those of a machine.	Noun
Ambientalización curricular	curricular greening	Ensuring that students are capable of taking on the 21st-century challenges of global warming and climate change	Noun and adjective
Sobreexplotación	Overexploitation	Excessive and damaging exploitation.	Noun
Biosfera	Biosphere	The part of the earth and its atmosphere in which living organisms exist or that is capable of supporting life.	Noun
Redistribución	Redistribution	An economic theory or policy that advocates reducing inequalities in the distribution of wealth.	Noun
Dimensión ambiental	Environmental dimension	With the fragility of ecological and biophysical systems, and their different functions, under a	Noun and adjective

		hazardous condition, to suffer damage and deterioration.	
Noción teórica	Theoretical notion	Lacking practical application or actual existence.	Noun and adjective
Insustentabilidad	Unsustainability	The state or condition of being unsustainable.	Noun
Saber ambiental	Environmental knowledge	Environmental knowledge is the number of information individuals has concerning environmental issues and their ability to understand and evaluate their impact on society and the environment.	Noun and adjective
Estrategia metodológica	Methodological strategy	The mechanism used by the teacher to be applied in class is to obtain a specific goal.	Noun and adjective
Finca	Finca	A rural property, especially a large farm or ranch	Noun
Población meta	Target population	An informal term is used mostly in epidemiology. It's generally defined to mean a group or set of elements that you want to know more information about.	Noun and adjective
Lombricario	Vermicompost	To make compost by providing organic waste as a food source to earthworms and then collecting their excrement.	Noun

Didácticas	Didactic	Used or intended for teaching or instruction.	Adjective

Table 8 Glossary from Spanish to English. Source: Researcher's own creation. All terms were extracted from https://www.yourdictionary.com/ (Dictionary definitions you can understand - YourDictionary, 2022)

Chapter V

Conclusions and Recommendations

This chapter contains the conclusion and recommendations obtained from the translation and analysis of *Curricular environmentalization. COVID-19, new emphasis for education; University Training and Educational Actions to Understand The Costa Rica Verde. An Educational Proposal from The Historical Discipline; From Theory to Practice Trail Plan for The Incorporation of Environmental Knowledge in an Educational Institution*, and *Residuos de construcción y demolición en Rumanía: El camino del vertido ilegal a materiales de construcción.* In this chapter, the researcher explains in detail the results for each of the specific objectives and will give some recommendation to future researcher that may be involved in similar topics and fields.

6.1 Purpose of the Conclusion

The purpose of conclusion is to dissect the chosen documents to understand the translation process and its importance on a deeper level. This part of the investigation provides the reader with the final thoughts of the researcher after interacting with the translated documents and the data collection instruments for eight months. This provides a concise summary of the

investigation, as well as some final thoughts on the experience. It allows the researcher to restate the exiting ideas at the beginning of the investigation, after having acquired new information from the documents. Finally, it allows the researcher to have a place to put the information acquired during the investigation in one place for easier access.

6.2 Conclusions

From the beginning ~~begging~~, it was mentioned the importance that translation holds in our society. After translating the documents, the researcher measures the importance of the topics covered by the translated texts, as the information they hold has to do with real-life, as for we try to fight climate change and improve the state of our environment. These documents, as they belong to a public university library, are going to reach a different and broader audience. Therefore, one of the main objectives of this project is fulfilled, since which to make people will be aware of its importance in society.

One of the most important aspects of this investigation was to analyze in detail the documents. This was achieved though the use of the data collection instruments, served its own purpose in the extraction of important information from these translations. Such instruments helped the translator to achieve a cohesive, natural, and accurate translation. Their usage aided the translator in the positive interaction with the text, as they sometimes could be difficult to follow due to the amount of information and inside knowledge that was required when reading.

6.2.1 To translate some documents from Spanish into English and from English into Spanish for a public university library

The translation of the four documents was an extensive project, as they contained many details they were of great importance in the overall sense. Such details required extreme

concentration and a large amount of time to read through every detail. As mentioned in previous chapters, the first step when initiating a translation is a reading to look for difficulties during the process. By following this step, the researcher was able to find common threads among all four documents that would eventually help to maintain a steady stream of thought. The documents even though different, shared similarities when it came to topics and fields. While some documents were more formal and official, all of them shared similarities in the way they were written. Because of this common feature, all documents were translated with ease, jumping from one document to other as if they were one. However, this does not mean, that details were overlooked, as the researcher decided to carry out a thorough investigation in order to understand completely the topics and the complicated terms. Consequently, the translation of important terms phrases did not give the translator much trouble. However, one thing that proved to be difficult was time management, as it required many hours of reading. Nonetheless, the documents did not present any difficulty, and the quality of the translation was not compromised.

6.2.2 To apply translation methods and translation procedures to achieve an accurate translation.

The reason behind this objective was to obtain a faithful translation using the color coding and the text analysis table. The results that the researcher was able to obtain were the expected ones, as the translation maintained the emotional tone. This part of the investigation took many weeks, as every detail needed to be found and analyzed to obtain results. However, that amount of concentration allowed the researcher to become familiar with documents, knowing their ins and outs. This was achieved through multiple readings of the documents, each time focusing on finding different aspects. When applying the text analysis table to the text, the researcher could gather the profile all the four texts in question. This part was essential, as it gave a clear path to

the translator when choosing the correct translation method. In the case of these documents, they translated using semantic translation to maintain the original intention and heart of the text. On the other hand, the translation procedures allowed the researcher to dissect the final form of the translation and see if the translation achieved the main goal. In this case, the researcher was satisfied with the final translation, as all these instruments helped to achieve the desired feel and emotion.

6.2.3 To analyze the translation methods and translation procedures found in both texts.

For this objective, translation methods and procedures needed to be used to fully analyze every aspect of the translation. For this, the translator used two of the data collection instruments, that is the color coding and the text analysis table. The text analysis table gave the researcher results regarding the translation methods and how to achieve a faithful, natural, and accurate and translation. With the help of this instrument the investigator was able to find the emotional tone, showing that the documents were inviting, almost a call to action to whoever wanted to read them ~~texts~~. In addition, the style of the texts, as mentioned before, the documents were very descriptive and flooded with important details.

On the other hand, the translation procedures were extracted using the color-coding instrument. This instrument helped the translator to identify common threads among the documents, for example, that the Spanish translation had transpositions while the English translation was filled with literary translation. These interesting factors resulted from the specific structure of each language. Such unique details helped the researcher to look for mistakes after the translation process, as every paragraph needed to be looked at closely. By doing this, the researcher was aware that the style of translation chosen was the correct, as it was achieved a

semantic translation. As mentioned before, while the documents were descriptive, each of them called people to do something about a specific problem. Therefore, the necessity of maintaining the emotional tone of the documents.

6.2.4 To create a glossary with the most important terminology found in all the documents

As mentioned, many times during the investigation, a glossary is fundamental in the translation of any document, as it not only important for the translator, but for future translators of similar documents. In this case, the researcher created a glossary for the translation in Spanish and one for the translation in English. This glossary contained not only the most important terms in the documents, but ~~it~~ also contained the ones that were repeated the most throughout the text. This was important, as it helped the researcher to be consistent, and not use different words for the same terms. Moreover, by creating this glossary, the researcher had to investigate and go to different sources of information to find the one that contained all needed information in one place. This with the whole purpose of being consistent with the terms. By doing so, the investigator became familiar with the new terms, their meaning, and use. This instrument~~s~~ also helped with the development of the color coding, as it contained the grammatical category of each text. Overall, the creation and application of this instruments helped in all aspects of the investigation.

6.3 Restatement of the Research Question

"What is the result of analyzing translation procedures and translation methods used to translate and analyze some documents from Spanish into English and from English into Spanish?" This question was proposed in the first chapter of this investigation, before the translation of the documents. The purpose was to analyze the translation procedures and methods

to obtain an insight into the documents. By using the steps and different techniques mentioned in previous chapters, the researcher was able to accomplish the main objective, as the researcher was able to analyze and apply these methods and procedures to maintain their original intention and emotional tone, and thus, allow different communities to reach this kind of information. Furthermore, in a deeper and extensive level, the application of the three data collection instruments, allowed the researcher to access pocket information. These pockets of information are sometimes overlooked as they are not visible. However, through their finding and analysis, the researcher could use this information in her advantage to achieve the desire translation. The analysis of these factors was one of the most important aspects of this investigation, as they were the ones that established the foundation for the path of the translation.

6.5 Recommendations

These recommendations are intended for future translators and researchers that may want to embark a similar investigation project. These pieces of advice are a result of an eight-month project. Considering this, one most important piece of advice is to take the time to read. Reading is one of the steps that require uninterrupted attention; therefore, setting a side two or three hours to read and investigate about the documents and the history of translation is crucial. This step allows future researchers to think like an expert in the field, as well as creating critical and well researched opinions.

While this type of investigation does not allow much of the researcher's passion into its chapter, one way coming around this, is by choosing documents that mean and represent something. Reading and investigating about a topic that you find interesting allows you to be more invested, which in crucial when translating the documents. The translation side of this investigation is one the heaviest parts; therefore, by translating something of interest, you learn

something new in the process. A passion project will always yield betters results as it allows the investigator to fully submerge in all aspects. In addition, it means that you are giving future translators the permission to write about something they are passionate about.

The last recommendation is to take time for each step. This type of investigation requires a lot of attention to detail, so time and patience are needed. One single detail when reading the documents could give the translation an entirely different connotation. Patience is key when working with the data collection instruments, as they can be frustrating. However, by setting a timer and working in small pockets, this project should not present any problem. Being familiar with your translation capacity is key to not overwhelmed oneself. Translation is a very heavy job, which is way is important to find your pace to ensure that no mistakes fly by.

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Annexes

sustainability

MDPI

Article

Construction and Demolition Waste in Romania: The Route from Illegal Dumping to Building Materials

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Abstract: The paper performs a critical overview concerning the construction and demolition waste

(C&DW) management issues in Romania. Five main stages related to C&DW management are highlighted such as: (i) illegal dumping on public lands; (ii) C&DW collection and disposal in urban landfills; (iii) C&DW treatment and reuse in civil constructions (roads, coating material for landfills); (iv) regional integrated waste management systems; (v) recycling of building materials (e.g., cement industry and recycled aggregates). The paper reveals the poor monitoring of C&DW flows across Romanian counties and the geographical dimension of this waste stream collected by waste operators. The paper examines the current challenges in Romania and it reveals the future prospects to provide a reliable transition towards sustainable C&DW management activities. The targeted route: waste fractions can be recycled and/or

reused as building materials via integrated waste management systems, which enable a circular economy in urban and rural municipalities.

Keywords: construction and demolition waste (C&DW); waste management; recycling; recovery; sustainability; circular economy; illegal dumping

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1. Introduction

Construction and demolition wastes (C&DW) are one of the fastest-growing waste streams due to the economic development and urbanization process at a global scale. Construction waste presents a huge amount of building materials which could be reused, recycled, or recovered avoiding natural resource depletion in terms of raw materials for the construction sector [1]. This great recovery and recycling potential is lost via the lack of waste collection facilities (wild dumps) or poor recycling schemes (landfill based systems). Illegal dumping and landfills are the main disposal options across the world, causing environmental pollution, deterioration of the landscape, and consumption of landfill capacity. Mixing of C&DW with municipal solid waste (MSW) is a real issue because of the non-existence of effective systems and rules for segregation of C&DW in many countries [2]. Around one third (i.e., 1 billion t) of total EU wastes come from construction and demolition activities where France, Germany, and the UK are the main contributors [3].

However, various waste definitions and reporting systems across the EU impose cautions in geographical comparison of C&DW flows. C&DW is mainly generated due to design errors, improper procurement, and planning, inefficient material handling, residues of raw materials and unexpected changes in building design [4]. There are many stakeholders (e.g., customers,

subcontractors, suppliers, waste operators, municipalities, etc.) involved in the construction sector with complex responsibilities, which lead to various decision-making chains across EU Members [5]. The poor availability of land in growing urban areas for landfill sites or peculiar geographical areas (e.g., Islands) impose new alternative for C&DW flows. Romania is still a landfill-based country where recycling and

recovery activities must be further developed in order to comply with the EU regulations on the waste management sector. This paper aims to examine the C&DW activities in Romania starting from the worse case option (illegal dumping) towards sustainable pathways targeting this fraction as a building material in the construction sector under a circular system. The paper reveals the challenges,

which other transition and developing countries across the world could face in providing a sound waste management system for this waste stream.

2. Materials and Methods

Based on the literature review, environmental reports, and field observations; the paper identifies main five development stages from the worst-case scenario (stage I) where C&DW is illegally dumped on surroundings without any treatment towards new building materials using recycled fractions as a best-case scenario as shown in Figure 1. Rural communities and smaller urban areas are still facing illegal dumping issues due to the lack of proper waste management facilities as pointed out in Section 3.1. This undesirable situation is specifically for stage I, where public lands, roadsides, water bodies, and forest areas are frequently exposed to such bad practices.

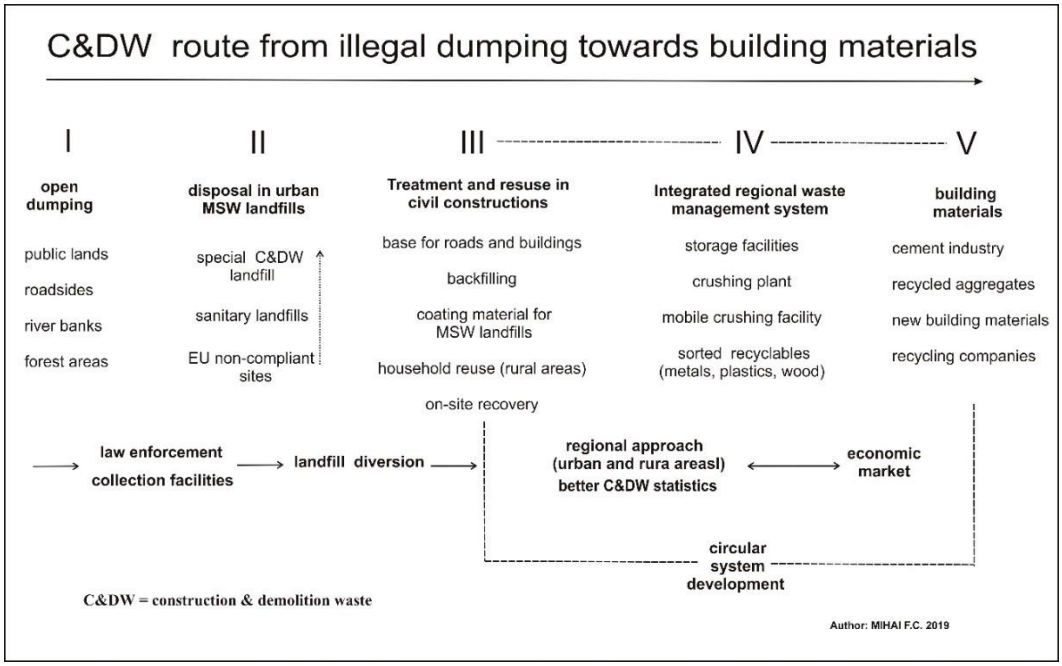

Figure 1. Development stages for a sustainable route of construction and demolition waste (C&DW) management in Romania.

C&DW collection schemes and storage facilities must be provided for all urban municipalities to combat illegal dumping issues in such areas supported by law enforcement under the supervision of the National Environmental Guard through County Commissariats. These basic actions are required for stage II.

Stage II represents the traditional waste management system based on landfill disposal where recycling and recovery potential of C&DW fraction is lost, but open dumping practices are expected to decrease through the development of collection facilities. Urban landfills are rapidly filling up demanding new land areas for waste disposal sites. This practice supports a linear economy, which feeds natural resources depletion for the construction sector and C&DW management is improperly performed, mainly in larger urban areas. Noncompliant urban landfills (with EU regulations) are replaced by regional sanitary landfills, which will serve both urban and surrounding rural communities. The best option is to provide special sites for C&DW stream avoiding contamination with municipal or industrial waste fractions. On the other hand,

such sites will demand more land, which could be used for other economic sectors (e.g., agriculture).

C&DW diversion from municipal solid waste (MSW) landfills is the key issue to stage III, where the circular system starts to emerge. On-site recovery, backfilling, based for roads, these are the main alternatives adopted by construction companies and waste operators. Crushing plants feeds the MSW landfills with the coating material. This is a widespread reuse option among waste operators. The transition from stage III to stage IV implies a regional approach of C&DW complementary to MSW management infrastructure, which must be supported by better waste statistic database and proper monitoring activities. This is a key challenge for Romania due to the socioeconomic gaps between large cities compared to smaller urban areas and rural communities. The new regional integrated

waste management systems (which cover an entire county) must provide basic facilities for C&DW flows. Regional waste management systems must be operational in the following years, in each county, to provide reliable recycling and recovery alternatives for C&DW fraction. In this context, stage V could emerge supported by a reliable economic market. This is a critical point to enable a circular economy system between the waste management sector and industry starting from stage III towards stage V. The lack of market mechanism to aid a greater recovery was found as a critical challenge in UK industry sector to enable the transition towards circular economy [6]. Public policies should encourage the business sector to develop recovery technologies and capabilities and to promote partner networks to access secondary materials [7].

Such system will decrease the dependence on natural resources (e.g., aggregates) as raw materials for construction sector towards recycled items in a country like Romania with a great

demand for infrastructure development (highways, improved railways, paved roads, public utilities, hospitals, residential buildings, etc.). Thus, C&DW stream is expected to increase in the following years and sound waste management is required. Furthermore, this transition towards recycled building materials

will reduce the prevalence of landfills and eliminating the open dumping practices as one of the primary disposal options in the stages I–II. The prospects of such a sustainable path are further examined according to each stage with particular challenges and issues.

Spatial analysis and thematic cartography are used to reveal, on the one hand, the geographical disparities in Romania about the collected amounts of C&DW by waste operators and on the other hand, to highlight the poor monitoring process of C&DW flows across Romanian counties.

This fact is supported by the comparative analysis between the estimated amounts of C&DW generated by the urban population (calculated on per capita basis) compared to those collected by urban operators. Also, the ratio of C&DW of total MSW collected by waste operators is determined for each county using the Jenks natural breaks classification method, which is specifically used for thematic cartography. This method enables the determination of the best arrangement of values into different classes by reducing the variance within classes and maximizes the variance between classes, highlighting the disparities between regions of a country on a particular theme or indicator [8].

The maps point out that this fraction is poorly covered by waste statistics even across urban areas. The paper provides a regional insight of C&DW management activities in Neamt county, highlighting the gaps between larger cities, towns and rural communities. Amounts of construction waste are estimated based on usable floor area criteria for each city and town and compared to those collected by

waste operators (based on data provided by the Environmental Protection Agency of Neamt County). Furthermore, this section reveals the uncontrolled waste disposal practices associated with the lack of collection and treatment facilities combined with a regional waste governance crisis and a poor economic market of recycled items resulted from the sole operational crushing plant in the county.

To combat such failures and to support the waste diversion from open dumps and MSW landfills, a circular system must be further developed in each county of Romania as suggested by stages III–V. Such incentives and current best practices are analyzed as pathways for sustainability in C&DW management in Romania (see Section 3) supported by peer-reviewed literature.

Also, various sources were consulted to analyze the state of art in C&DW management activities in Romania such as the annual environmental reports of local environmental protection agencies (e.g., data for thematic maps at county level); technical reports for specific waste management infrastructures under the supervision of County Councils or local municipalities; reports and websites of construction and recycling companies, waste operators; data provided by National Institute of Statistics or Environmental Protection Agency of Neamt county (Section 3.4).

The regional approach of the C&DW management sector involving both urban and rural municipalities must emerge in the following years to increase recycling and recovery rates at minimum 70% of total weight derived from construction and demolition activities stipulated by the Law No. 211 on waste regime [9].

3. Construction and Demolition Waste Management Activities in Romania

3.1. Illegal Dumping of C&DW (Stage I)

At the national level, there is a large number of non-compliant management situations for C&DW, the majority consisting of their abandonment and/or uncontrolled storage on both intra- and extra-urban land [10]. Such practices are favored by the poor law enforcement of local authorities and the lack of landfills for this waste fraction [11]. Discontinuation of illegal, non-compliant, dumping or unauthorized landfilling will encourage a proactive approach of C&DW generators in finding alternatives to landfilling [12]. Construction companies are responsible to transport the C&DW generated to safe disposal facilities according to the "polluter pays" principle or to delegate a waste operator for such services.

At the household level, the C&DW resulted should be transported by formal municipal waste management services towards recycling facilities or urban landfill sites. Waste collection coverage is still incomplete across middle and smaller cities with a poorer connection towards rural areas. This fact encourages the illegal waste disposal of C&DW as shown in Figure 2. Frequently, wild dumps contain mixed waste fraction as C&DW, municipal waste, and agricultural waste, particularly in rural areas. Field observations reveal that both urban and rural municipalities are exposed to illegal dumping issues of C&DW. Periurban communities are most susceptible to such practices due to the expansion of urban areas.

Figure 2. Illegal dumping of C&DW in Hemeius commune, Bacau county (July 2014).

Also, regions of Poland are facing similar issues. Construction waste collection and transport is costly and it is often collected as mixed waste or is deposited in illegal dumping sites [13]. Uncontrolled waste disposal is still an environmental threat to be solved in Croatia [14] and in other European regions, there is a significant amount of illegal dumping combined with a heterogeneous market for secondary materials that may not be reflected in official statistics [5].

The illegal dumping of C&DW poses financial issues for Romanian local authorities, which must provide cleaning activities of public lands from their local budget [15]. In rural areas, illegal disposal of C&DW was a widespread practice due to the poor connection to reliable waste collection services prior to the closure of rural wild dumps during 2009–2010. The closure of such sites was required by Government Decision No. 345/2005 regarding the landfill of waste. Some rural dumpsites were closed and covered with C&DW as a coating material. There are no data about the magnitude of illegal dumping issue at the national scale, which include both urban and rural areas. This paper draws attention to this issue by revealing the gaps in current C&DW flows and the geographical dimension of uncovered data by waste operators, which could be used

(in further studies) as a proxy indicator for regional or national assessments of illegal dumping practices.

Local C&DW generated at the household level are partially collected by waste management services or reused as filing material for local unpaved roads, household base.

The lack of storage facilities and long distances to treatment plants makes the transport to be less cost-effective encouraging the stakeholders to adopt illegal waste disposal practices.

3.2. C&DW Collection and Disposal in Urban Landfills (Stage II)

C&DW collected by waste operators is frequently disposed of in municipal waste landfills or non-hazardous industrial landfills, which mitigate their initial disposal capacity. The acceptance of this fraction to be disposed of in municipal waste landfills at lower costs mitigates the development of recycling and recovery activities [11].

C&DW generated from Constanta County have been disposed of in a special landfill site located in Ovidiu town since 2008 (capacity-310.767 m^3, first phase). Gurau et al. [16] reveal that, in this county, only 13.56% of C&DW (15,220 t) was collected in 2008 compared to 122.250 t estimated to be generated by the regional waste management plan of the South-East region. Furthermore, in 2009, 2006.6 t of 6850 t C&DW collected in Constanta county was disposed of at this site. The availability of data concerning the C&DW flows is limited in Romania. Such data are provided mainly by urban waste operators based on volumetric estimations and aggregated at the county level by the local environmental protection agencies (EPA). The volume data (based on waste truck capacity) are transformed in metric tons using a specific density of 2 t/m^3 as suggested by environmental authorities. The waste operators are obliged to send such waste statistics data to local environmental protection agencies.

The C&DW data is aggregated at the county level (equivalent to EU NUTS 3 regions), but lacking at local administrative unit levels (cities and communes). Noncompliant landfills have no weighing systems and most of waste statistics data rely on such volumetric estimations. On the other hand, there are no strict regulations to oblige construction companies to provide data about the C&DW flows. Most of the C&DW generated are managed by such companies. In this context, data gathered by environmental authorities are still very poor and highly underestimated [12]. A general lack of data on waste management practices is seen at the global level, which affects the measurement of C&DW performances across various economies [17]. Data about C&DW flows requires special attention because this fraction is disposed both legally and illegally and frequently is not recorded as a separate

waste stream, or is recorded incorrectly [18].

The quantity of C&DW increased in 2003–2008 due to the fast development of the construction field followed by a regress caused by the economic crisis, which started in 2009 [19]. Construction sector generated 5.7% of GDP in 2002, and 10.5% in 2008, with a peak of activity in 2007 when 45,867 new habitations were completed (most of them in Bucharest city and Ilfov county) [20].

C&DW sector is expected to increase in the following years due to the Romanian emerging economy and serious needs for infrastructure development.

The interviewed stakeholders pointed out that the lack of infrastructure to store, treat, and recycle C&DW is a huge problem in Romania [12]. Figure 3 reveals the regional disparities across Romanian counties regarding the ratio of C&DW of total municipal waste collected in 2014 using the

Jenks natural breaks classification method. Local environmental reports provide the data concerning C&DW amounts collected by waste operators in each county, then, the ratio of this waste stream of total municipal solid waste collected (by public or private waste operators) is further calculated at county level.

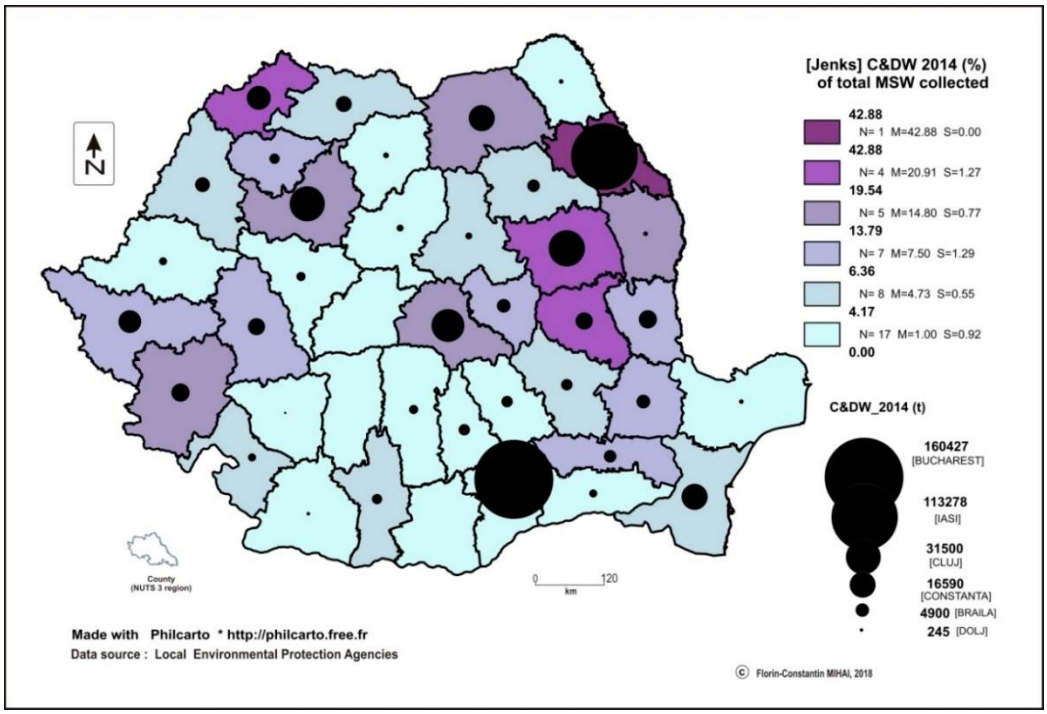

Figure3. TheratioofC&DWcollectedbywasteoperatorsfromtotalmunicipalsolidwaste(MSW)(2014).

The paper provides the first assessment of regional gaps of C&DW flows in Romania using spatial analysis. This approach better reveals the magnitude of poor statistics related to the amounts of C&DW collected by waste operators. Furthermore, this study shows major differences between the C&DW generated in urban areas (calculated on a per capita basis) compared to those collected by waste operators These findings suggest serious challenges to evaluate the progress made by Romania so far taking into account the current regional disparities as shown by the maps (Figures 3–5).

Large amounts of C&DW characterize the major urban areas with a strong demand for construction activities (residential buildings, offices) such as Bucharest city, Iasi and Cluj counties where C&DW fraction has over 13.8% of total waste collected compared to other counties (e.g., Dolj, Gorj, Tulcea, Bistrita-Nasaud) where this fraction is barely noted (please check this map for the names of counties https://en.wikipedia.org/wiki/Counties_of_Romania). In fact, the ratio of C&DW fraction is below 4% in seventeen counties, most of them located in the center and southern part of Romania. The same poor registered quantities of C&D waste at the county level are found in Croatia, particularly in less developed areas [14].

Figure 3 suggests that monitoring process of C&DW flows is limited in these areas which could increase the risks associated to illegal waste disposal practices and the prevalence of stage I. In other cases, the share of C&DW could be significant (between 6.39–13.8%) outlining an emerging construction sector in eight counties of Romania (e.g., Suceava, Bacau, Timis, Satu Mare).

The second map (Figure 4) reveals the major gaps at the national level concerning the proper monitoring of C&DW flows.

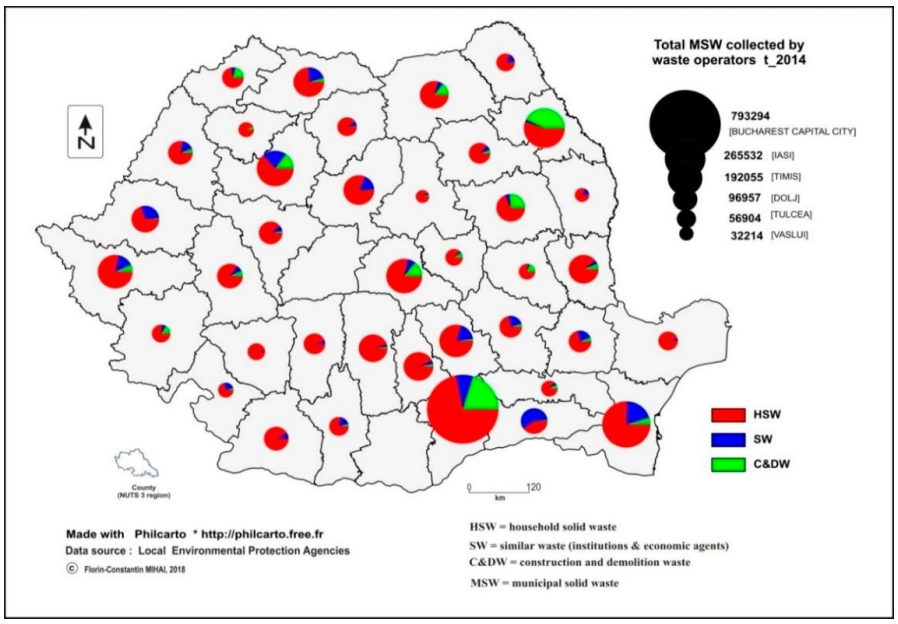

Figure 4. Amounts of household, similar and C&DW collected by waste operators in 2014 (t).

This situation is explained by the fact that waste operators are the main data providers for local environmental reports. There are counties, which do not report any data of C&DW collected in 2014 such as Sibiu, Teleorman, Giurgiu counties, or in other cases, the data are not updated (before 2014). Several counties reported small amounts of C&DW collected under 1000 t such as Botosani, Vaslui, Gorj, or Dolj. Bucharest city has 1.883 million inhabitants and it is the main industrial and commercial center of Romania with great interest in the construction sector. This explains a large amount of C&DW collected (160,427 t of total 793,294 t municipal solid waste) by urban waste operators in 2014 as shown in Figure 4.
Iasi County has the largest amount of C&DW collected (113,278 t), followed by Cluj (35,000 t)

On the other hand, Iasi County has the highest ratio of C&DW from total MSW collected

(42.88%, see Figure 3) compared to Bucharest capital city (20.23%).

Figure 4 points out the fact that waste operators provide insufficient data concerning the

magnitude of C&DW flows across Romanian counties. Their activity focuses on collecting

municipal solid waste stream consisting in household waste (residential areas) and similar waste

fraction generated by institutions, economic agents (shops, offices, hotels, restaurants, etc.) and

industrial sector. Thus, construction companies handle most of these C&DW flows without

concrete data about their management and disposal practices.

However, Figure 4 shows regional differences in total MSW collected which is also expected in case of C&DW stream due to several potential factors such as population, urbanization rate, socioeconomic status, urban centers, real estate market, industrial development, etc.

In emerging economies, the share of construction waste is 40% of total municipal waste, which account over 200 million tons in China [21].

The paper estimates the amounts of C&DW in urban areas of the Romanian counties using a per-capita waste generation rate of 280 kg per-capita yr^{-1} as suggested by Musuroaea et al. [10]. It should be noted that this value does not include the major infrastructure projects such as new roads, railway rehabilitation, and large industrial facilities.

The third map (Figure 5) aims to reveal the underestimation level of C&DW at national and county level resulted as the difference between the total amounts of C&DW collected by waste operators in 2014 (data provided by local environmental reports) and those generated by urban areas (applying the mentioned per-capita waste generation rate).

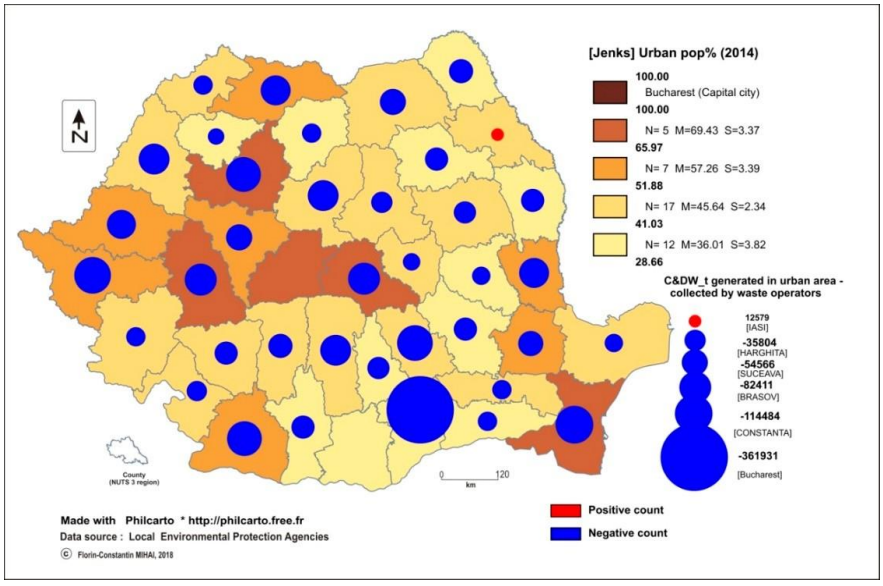

Figure 5. Comparative analysis between CDW generated in urban areas (per-capita basis) and those collected via waste operators (2014).

The results show that waste operators collected 519,723.36 t in 2014 compared to 2,925,333.88 t of C&DW estimated to be generated across urban areas. In other words, the paper points out that only 17.76% of C&DW generated in urban areas is actually collected by waste operators. The rest is mainly managed by construction companies or by individuals using on-site recovery (stage III), own transportation to urban landfills (stage II) or illegal disposal practices in periurban communities (stage I). Urban areas are the main generators of C&DW at the county level in comparison to rural areas. The treatment facilities of C&DW are mainly in urban areas where large construction companies operate.

There are no special plants for the treatment of hazardous C&DW fraction estimated at 4% of the total waste stream [6]. This fact increases the pollution risks if such materials are not collected and disposed of in proper facilities.

Figure 5 reveals a poor monitoring process of C&DW flows at the urban level across the country. Small-scale constructions (residential buildings) and public works (various infrastructures) are approved based on the building permit and the owners should take the responsibility for C&DW generated. This study reveals that thousands of tons of C&DW may be susceptible to illegal dumping if not properly managed by each generator (individual or business sector). Neither county with a higher urbanization rate (>65% of the total population) have proper monitoring of C&DW flows (Constanta, Brasov, Hunedoara). Furthermore, urban areas could generate significant amounts of C&DW even in counties, which have a ratio of C&DW below 4% in the total waste stream, collected by waste operators in 2014 (see Figure 5 vs. Figure 3).

Despite the fact, Bucharest city has the largest amount of C&DW collected, there are 361,930.64 t of C&DW uncovered by environmental reports as shown in Figure 5.

This situation is due to the lack of clear regulation on how this waste stream should be managed and how all stakeholders should report the statistical data involved in the construction sector towards environmental authorities.
As an example, in Valcea County, no C&DW is reported to be collected during 2014, but 45,621.52 t are estimated to be generated in urban areas. Large amounts of C&DW are estimated to be generated in counties without data reported such as Sibiu (73,935.96 t). The negative counts (blue circles) are widespread across Romanian counties suggesting serious gaps in the waste statistics. There are several counties where over 100,000 t of C&DW generated are not found in the amounts collected and reported to environmental authorities such as Constanta (114,483.88 t), Timis (105,919.62 t), between 75,000–10,000 t (Dolj, Prahova, Arges, Brasov, Mures).

Iasi county is the sole region with a positive count (red circle on the map) which means that all C&DW estimated to be generated seems to be covered by those collected. This situation is explained by the large-scale works in the road infrastructure (e.g., the rehabilitation of tram lines) in Iasi in previous years, the continuous development of the residential construction sector (houses, villas, blocks) and offices, resulting in large quantities of asphalt waste from the excavation: soil, stones, gravel, mixtures of C&D waste [22]. Most of such wastes are destined to the landfill site, but also illegal disposal sites

were observed in the field across peripheral areas. Even in this favorable case, there are still C&DW flows unaccounted by official statistics. This is the reason why a reliable quantitative estimation of stages I-III is difficult to proceed at local or regional levels.

Simion et al. [18] propose as the most appropriate C&DW management option in Iasi city (in terms of ecological footprint) a scenario which implies temporary storage, collection, and transport than a line of sorting and recycling combined with landfill with leachate treatment. This scenario is already operating in other cities (e.g., Piatra Neamt) as part of the integrated waste

management system, which includes a sorting station, crushing plant for C&DW, and sanitary landfill. Urban landfill sites or wild dumps (on public or private lands) are widespread disposal options for this waste stream. In some urban areas, an alternative option is the storage of this waste stream in local temporary sites (C&DW site), collection and transport services provided by waste operators or construction companies.

3.3. C&DW Treatment and Reuse in Civil Construction (Stage III)

The main practices currently engaged in the recovery of C&DW are backfilling or landscaping, mainly using inert waste (non-hazardous, such as sand, gravel, concrete, bricks, tiles, etc.) that is usually crushed [12]. At the national level, there are 31 crushing plants with a total capacity estimated at 3 million tons per year managed by authorized economic agents [11]. Some municipalities developed their own construction waste management services through pilot projects in Buzau (Buzau county), Medias (Sibiu county–public utility), Dej (Cluj county–public utility).

Fixed crushing plants are implemented as part of the integrated urban waste management system (e.g., Piatra Neamt city). However, there are several counties without any crushing plants where C&DW is disposed of in urban landfills or scattered via illegal dumping sites across periurban and rural areas (e.g., Arad, Suceava, Satu Mare, Dolj, Teleorman, Tulcea, Hunedoara, Brasov Gorj, Valcea, Ialomita, Calarasi, etc.). The recycling rate of C&DW has increased from 28% in 2010 to 59% in 2014, and the filling rate ranging between 11–14% [11].

These values are related to the total amount generated and collected, but in reality, the amounts of C&DW generated are much larger than those collected in official statistics which ultimately affect the reliability of such data. The monitoring process of this waste stream is quite challenging for most of the European countries [5].

Landfill cover is another widespread practice for the inert fraction of C&DW. Such practices are also stipulated in environmental reports. Most of non-hazardous C&DW collected is used as backfilling and landfill cover material in Salaj County [23].

In Dambovita County, a decreased trend of the C&DW ratio is observed (related to total waste collected by operators), from 9.14% in 2009 to 2.37% in 2014 associated with to the reuse of this waste stream as filling material [24].

According to the Waste Framework Directive (Directive 2008/98/EC) Romania must prepare for re-use, recycling and material recovery of non-hazardous C&DW to a minimum of 70% by weight in 2020 [25]. This target will difficult to achieve without specific legislation for C&DW fraction and poor coverage of crushing plants combined with a lack of storage facilities in each urban area.

3.4. C&DW Management Activities in Neamt County—A Regional Case Study

Neamt County is located in the North-East Region of Romania, which covers five cities and 78 communes (rural municipalities) with a total population of 470,766 inhabitants according to the latest population census in 2011

3.4.1. Urban Areas

Piatra Neamt is the county capital city and the sole urban area within Neamt County where a fixed crushing plant is operating [26]. This facility (capacity of 15,000 t/yr) is located in the proximity of composting plant and sanitary landfill avoiding supplemental transportation costs. Crushed waste, resulting from the plant, has been primarily used as the coating material (drainage layer) of the old landfill (during the rehabilitation process) then as a covering material for the first cell of the sanitary landfill (closed in 2010). The average of C&DW processed is 1300 t/yr under 10% of plant capacity (8.6%) [27]. In 2015, about 3670 t of coating material was used for cell No. 2 within the sanitary landfill area. This fact suggests that this crushing plant could expand the geographical coverage area across the Neamt County. Piatra Neamt city has two

separate collection centers located in Maratei and Darmanesti districts where C&DW fraction is collected in special containers (included bulky items).

The individual or economic agents can dispose of their C&DW to such centers or transport them to the sanitary landfill facility, which includes a temporary storage site for such wastes to be further processed by the crushing plant. Also, they can order a special container from the urban waste operator. Similar separate collection facilities for C&DW are initiated in Poland cities [28]. On the other hand, Zagreb city has the sole stationary treatment facility; while in the other parts of Croatia recycling is carried out in mobile processing plants [14].

The sanitary landfill site of Piatra Neamt city has a weighing system, which is operational since 2007. The data about C&DW are more reliable than in previous years or in comparison with other urban areas where data are reported by waste operators based on volumetric estimations. Urban waste operators collected 72,488.9 t of C&DW during 2004–2010 in the Piatra Neamt city, of which 49,092 t (67.72%) between 2007–2010. This fact is explained by the contribution of old industrial sites demolitions within the administrative area of the city.

The construction wastes (CW) derived from the new residential buildings are estimated at each urban level based on the total usable floor areas (UFA) resulted from building authorizations as applied to rural communities in a previous study by Mihai and Grozavu [29]. A waste generation rate

(WGR) of 21.38 kg/m^2 per net usable floor areas (A_{ufa}) is used based on the HQ Air Force Center for Environmental Excellence recommendation [30].

$$Q_{cw}\,(t) = A_{ufa}\,(m^2) * WGR\ (kg/m^2)/1000 \quad (1)$$

The same approach is performed to estimate the C&DW flows in Thailand, because this country is facing similar issues in terms of poor reporting system associated with this waste stream [31]. Unreliable estimates lead to inadequate policies and unsound waste management practices in emerging economies like India [32]. European countries deal with same challenges and new approaches are required to provide better estimations of C&DW flows in different construction stages [33] or to examine the spatial trend of building material stock and potential demolition wastes including the analysis of historical maps [34].

In this study, data concerning the number of private buildings, new buildings with associated usable floor areas are provided by the National Institute of Statistics (INS) via tempo-online database [35] The amounts of CW generated by these buildings are determined using the above equation and compared to the amounts of C&DW collected by waste operators. Some urban areas are served more than one waste operator. In the latter case, data are aggregated at each city level based on information received by EPA Neamt from urban waste operators.

Table 1 points out that Piatra Neamt and Roman cities collected the most significant amounts of C&DW in Neamt county which significantly exceeds those resulting from new residential areas.

Table 1. Construction and demolition wastes (C&DW) collected by urban waste operators and construction wastes (CW) generated from new residential buildings during 2004–2012.

Urban Areas	Pop. 2011 (Census)	Private Buildings 2012 (Nr)	New Buildings (2004–2012)	Usable Floor Areas (sq.m)	CW Generated (t)	C&DW Collected (t)
Piatra-Neamt	85,055	42,919	858	159,660	3413.53	78,614.6
Roman	50,713	25,774	576	87,569	1872.23	6486.06
Bicaz	6543	3417	279	31,349	670.24	100
Roznov	8593	3546	401	51,763	1106.69	0
Targu Neamt	18,695	7732	496	85,156	1820.64	117

Source of data: INS Tempo-online (private buildings, new buildings, UFA), EPA Neamt (C&DW collected) and own calculations (CW).

On the other hand, poor C&DW is reported to be collected in Bicaz and Tirgu Neamt and none in Roznov town. In the latter case, this town was not covered by an effective formal waste collection service prior to 2010. Furthermore, Targu Neamt and Bicaz towns no reported any

C&DW collected during 2011–2012. Poor waste management facilities in these towns favored illegal waste disposal practices on the surroundings. C&DW fraction is susceptible to such practices because almost 3380.57 t of CW are not covered by official records in Tirgu Neamt, Bicaz, and Roznov towns. At the county level, the amount of C&DW collected by waste operators decreased from 3688.35 t in 2014 to 1068.64 t in 2015 [36].

This fact could suggest that most of the construction companies perform their activities without environmental permits and without providing official reports regarding C&DW flows. Furthermore, the EPA Neamt report [36] points out that treatment facilities of the Piatra Neamt city (composting and crushing plants) have serious issues in selling the secondary materials (compost and recycled aggregates) during 2009–2015.

Because of this economic market crisis, large amounts of treated C&DW have been accumulated on storage sites. The crushing plant continued to operate in 2014–2015 despite existing stocks while, the dry recyclables processed by the sorting facility (metals, paper & cardboard, plastics, and glass) have been sold to economic agents. There is a significant difference between the amounts of C&DW collected during 2011–2012 in Piatra Neamt such as 6125.7 t (of which 3768.1 t from economic agents) and treated via crushing plant compared to Roman city where all of C&DW collected (523.32 t of which 496 t provided by economic agents) were disposed in the noncompliant landfill. There is a poor economic market related to C&DW fraction in Neamt County so far because the natural aggregates are abundant across the county through the presence of several gravel sites on river meadows. Additionally, there is a limestone quarry in the Eastern Carpathians (Bicaz-Chei commune) and a marl quarry (Bicazu-Ardelean commune) that provides the raw materials to the cement factory (Heidelbergcement) located in Tasca commune, near to Bicaz city. Frequently, the economic agents of the construction sector run activities that are not environmentally authorized and therefore, do not comply with construction waste recycling targets or have the necessary documents for the transport of wastes [36]. This situation leads to

uncontrolled waste disposal practices on public lands across urban and rural areas. Better law enforcement is required from both local councils and local environmental guard. Such practices can be further monitoring combining field data and GIS tools [37] in comparison with official statistics.

3.4.2. Rural Areas

No special waste collection services dedicated to C&DW are generally provided. The wastes generated at the household level are either illegally disposed on the surroundings or inert fraction is reused as a base material for new buildings, backfilling local unpaved roads.

Frequently, the wood fraction is recovered as solid fuel, and metals are collected to be sold to recycling companies. Some rural municipalities are not fully covered by waste collection services and the illegal waste disposal practices, including C&DW fraction, is still detected across rural areas [38]. Some of C&DW items are disposed of in sturdy bags or residual containers to be collected by waste operators and transported to urban landfills.

However, there is a waste operator that serves rural municipalities exclusively (e.g., Savinesti, Pipirig, Faurei, Ruginoasa communes). This operator collected 188 t of C&DW in 2011 (from economic agents) and 288 t in 2012 (population); this debris being disposed of to the Roman city landfill site according to EPA Neamt data.

Rural communities are exposed to illegal disposal of C&DW performed by construction companies. Field observations revealed such bad practices on local roadsides, pastures, floodplains and river banks as shown in Figure 6.

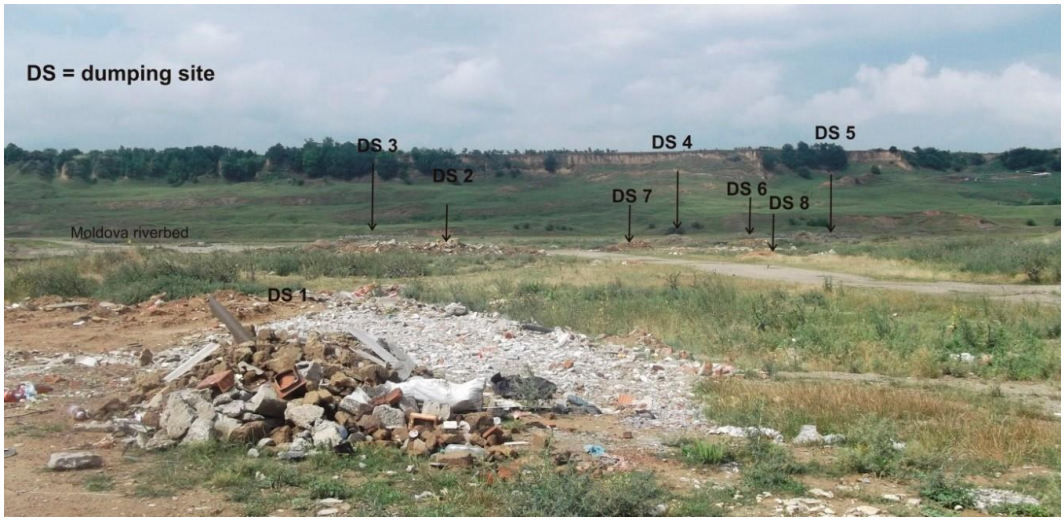

Figure 6. Several C&DW dumping sites on Moldova floodplain (Pildesti village, July 2014).

Mihai and Grozavu [29] estimated that 31,393 t of construction waste has been generated by rural buildings at the county level (during 2002–2010) of which 4897.3 t recyclables, 9417.9 t bricks, and tiles, and 2197 t concrete. The values are raging between 1000–2000 t in periurban localities with the highest interest in residential buildings or touristic pensions to lower than 100 t in the poorest regions of the county. These wastes either are disposed of in open dumps or reuse and recovered at the household level

Rural communities face similar changes nowadays due to the lack of proper collection and storage facilities associated with the construction sector. Thus, the stage I still prevails in rural regions of Neamt County. Furthermore, the regional sanitary landfill site located in Girov commune (which should cover most of the urban and rural municipalities across the county) has been opened later (since August 2015) due to the prolonged delays caused by a tender process regarding the management of this site.

Thus, temporary storage sites (basically dumpsites) replace the old noncompliant landfills (closed on July 2012) as the primary waste disposal option of wastes collected (including C&DW fraction as a separate waste fraction or residual mixed waste) in Tirgu Neamt, Roman, Bicaz, and Roznov cities and surrounding communes.

These temporary sites should be closed and all the wastes accumulated to be transported to the Girow sanitary landfill, but this implies other costs for waste operators and municipalities. On the other hand, construction companies and local waste operators try to avoid the sanitary landfill fees looking for cheaper waste disposal alternatives.

Illegal dumping of C&DW still occurs within the study area due to this waste governance crisis. Further investigations are needed to reveal the magnitude of environmental threats associated with the lack of C&DW management activities including other rural regions of Romania.

4. Pathways for Sustainability in C&D Waste Management in Romania

4.1. Development of Recycling and Recovery Centers in Urban Areas (Stage IV)

General guidelines about C&DW issues are released at EU level using a life-cycle thinking approach [3]. In Romania, a guideline of best practices in the management of C&DW has released in 2011 as part an integrated waste management project in Center Region (NUTS 2) between regional and localNorwegianandRomanianauthorities[39]. Throughoutthisproject, Mediascityhasimplementeda recycling and recovery center dedicated to C&DW fraction. Individuals or economic agents may require a special container for C&DW fraction. The waste operator transports the container to the recycling and recovery facility or the C&DW generated are brought by each generator. The C&DW are sorted via a mechanical process resulting in new materials for reuse in the construction sector. In 2016, this facility collected and processed 4278.5 t of C&DW and it received 394 orders for waste collection services [40]. To have a building permit, the individuals or economic agents have to report the resulted C&DW quantities and to stipulate how they manage this debris. This could be a key aspect in preventing the illegal dumping of C&DW around the periurban areas. Local public authorities could implement such recycling and recovery centers through own projects correlated with the local needs without any further governmental interventions. The Life project LIFE10 ENV/RO/000727 “Recovery of construction and demolition waste in Buzău county/VAL-C & D”, provides a critical pilot

research area related to C&DW management activities at Buzau county level [10]. There is a pilot station for mechanical treatment (crushing) and, where appropriate, gravimetric sorting of C&DW which has a maximum treatment capacity of 40,000 t/year, respectively 20 t/hour (http://www.domeniiprestserv.ro/despre-noi.html). The main operations performed at the recycling facility [41]:

- The C&DW are screened at the weighing system in order to record the waste fractions, which are accepted for crushing plant.
- The wastes are disposed into a temporary storage area;
- The recyclables are sorted (wood, paper, and cardboard, metals, glass, plastics, tiles, etc.);
- Cutting beams and other large reinforced concrete elements;
- Primary crushing with the jaw crusher;
- Magnetic separation of metals;
- The pick secondary crushing;
- Manual selection of wood, plastic, paper, and cables;
- Sieving by particle size fractions;
- Granulometric classification (0/10 mm, 10/30 mm, >30 mm);
- Removal of the tiny particles by filtration, washing;

The project is a public-private partnership that aims to promote sound management of C&DW fraction. In order to encourage the recycling and recovery operations, this facility charges a fee (50 RON, 1 EUR = 4.7 RON) for the use of weighing system not per ton of C&DW disposed of.

In 2015, this facility processed 1200 t of C&DW and all resulted building materials were sold while in 2016, 1500 t C&DW were processed of which 280 were sold (photo gallery http://www.domeniiprestserv.ro/galerie-foto.html) [41].

A concrete crushing plant has been inaugurated in December 2010 which aims to treat the C&DW generated and collected from the metropolitan area of Oradea city (Bihor County). Thus, the concrete crushing plant ECO BIHOR SRL offer several options regarding the C&DW treatment services (https://ecobihor.ro/beton.htm) [42]; (i) Recycling as a service provider; the

customer keeps the finished product (crushed concrete, iron); (ii) partial recycling where the customer keeps the iron separately after crushing and the crushed concrete is preserved by ECO BIHOR; (iii) treatment of demolition waste where the finished product is preserved by ECO BIHOR (crushed concrete, iron).

These examples mentioned above points out the first steps of a sustainable approach of C&DW in Romania which must be further developed in each urban area.

4.2. Extension of Waste Co-Processing Activities in Cement Industry (Stage V)

Waste fractions are used in the cement industry in the co-incineration process as a substitute for fossil fuels and material recycling as a substitute for raw material in cement production. There are seven cement factories in Romania authorized to co-incineration process which use various waste streams: sorted municipal waste, used tires, refused-derived fuels (RDF), oils, hazardous and non-hazardous industrial wastes, etc. These cement factories located in Deva, Bicaz, Fieni (Heidelberg Cement Romania), Alesd, Campulung (Holcim Romania), Medgidia, Hoghiz (CRH Cement Romania) have integrated the clinker manufacturing process. In order to obtain the composite cement, the clinker is partially substituted by other mineral compounds with similar chemical characteristics as natural materials (limestone) or residual such as C&DW or secondary materials (granulated blast furnace slag, fly ash). Co-processing waste is widely applied by the cement industry worldwide and recognized at European level as one of the best practices of efficient use of resources [43]. Cement and concrete industry from Romania may lead to this transition by expanding co-processing waste facilities. As an example, Holcim Romania claims to invest 3 million Euro in expanding its co-processing facilities in its cement plants in Ales¸d and Câmpulung [44].

The amount of industrial and municipal waste co-processed in the cement industry from Romania during 2004–2014 is 2 million tons, which is equivalent of municipal waste generated in a year by 24 cities with over 250.000 inhabitants [43].

The key aspect is to increase the role of inert C&DW fraction as a material substitute in cement production. The experiments reveal that the materials with industrial waste such as ultrafine fly ash are recommended to be used as prefabricated slabs for the pavement [44]. Cement concrete of CDW is also suitable for pavement construction. Laboratory tests showed that recycled aggregates had similar performance characteristics with crushed gravel as chippings used in rigid pavement construction [45].

Cement production and recycled aggregates are important routes for recycling and recovery of C&DW in Romania, which must be further developed. Waste and byproducts of other industries replace 20–30% of traditional natural raw materials used by the cement industry and save over 2 million tons of natural resources annually [46].

4.3. Development of Recycled Aggregates Sector (Stage V)

The valorization rate of recycled aggregates resulted from the mechanical treatment of C&DW via crushing plants is still insignificant in Romania.

The costs of such practices are too high in comparison with natural aggregates and there are still few crushing plants at the national level [11]. Romania is very rich in mineral aggregates, and no incentives are created to prefer recycled and more expensive aggregates [12]. Annually, approximately 25–30 million cubic meters of natural aggregates of sedimentary origin (sands and gravel) are extracted by excavation either from the river beds or from the terraces of the meadows [47]. Each city should be served by a fixed or mobile crushing plant in order to recover the C&DW generated and avoiding illegal or legal landfill practices. These plans may be

incorporated under the regional waste management system that should cover both urban and rural areas of the county.

The inert fraction of C&DW is favorable for the production of aggregate 0/30 mm as supported by an LCA analysis from both environmental and economic perspectives [48]. An LCA analysis suggests that the purchase of recycled aggregates resulting from C&DW treatment is cost-effective only if the treatment plant is situated within a 30 km area [47]. Long distances between integrated waste management centers from smaller urban areas and rural communities will encourage illegal waste disposal facilities and increase the prevalence of natural aggregates in the construction sector. Mobile crushing plants combined with local storage facilities could be a solution to such settlements. At the end of its life, concrete can be recycled either back concrete as a recycled aggregate or into other applications such as road base [43].

The market for recycled aggregates should be improved in Romania taking into consideration sustainable economic growth in the long term. A study suggests that the price of recycled aggregates has to be kept at least 20% lower than natural aggregates which at present disregards the aggregates produced from waste [49]. Romania has access to cheap natural aggregates and such initiative is difficult to implement. Waste disposal costs and the difference in the price of recycled and natural aggregates could play as key factors to the success of C&DW recycling practices among the new EU Member States [14].

Experiments conducted shows that replacing 25% of natural materials with recycled aggregates has no significant adverse effect on structural concrete performance [50].

AnotherLCAanalysisconcludesthatrecycledaggregatesshouldbeconsideredasacomplementary resource and not a full alternative to the use of natural aggregates taking into account the current

large demands in the Romanian construction sector [47]. At European level, the main barriers derive from commercialization of such recycled aggregates, the market of virgin materials or their logistics and not from recycling technology side, particularly for concrete and ceramic wastes [5] Guignot et al. [51] propose a new recycling scheme for C&DW fraction using an electrical fragmentation technology. This technology reintroduced the concrete wastes in the loop to produce new concrete for buildings and supply part of the raw feed of a clinker kiln.

Besides the conservation of natural resources and reduced landfill areas, the implementation of recycled aggregates in ready-mix concrete will also encourage further research and development of sustainable construction [52]. The same approach must be promoted in Romania to accelerate the transition from a linear towards a circular economy avoiding natural resource depletion.

4.4. Regional Approach of Sustainable C&D Waste Management System (Stage III–V)

A crucial challenge is to integrate the C&DW management activities at the county level, including urban and rural municipalities. A feasibility study regarding the implementation of an integrated C&DW management system in Hunedoara County suggests the following proposals [53]:

- Nine special storage areas for C&DW located in urban areas (Brad, Petrosani, Calan, Orastie, Petrila, Lupeni, Uricani, Aninoasa)
- central storage near the municipal integrated waste management system located in Bircea Mare where a mobile crushing facility (20 t/h) is operational with the mention that this facility could be transported to above urban storage areas if requested
- Special storage sites for rural localities with recommended areas about 20 m × 20 m, which must be enclosed
- Several special containers (capacity-7 m^3) in urban areas and one in each commune
- One container (1.1 mc) located in each village beside municipal waste bins

C&DW generated from rural areas are transported to the nearest urban storage area listed above. The same study stipulates that the inert materials will be recovered on road construction, sorted fractions (metals, glass, plastic, wood) will be sent to recycling companies, and C&DW refusals will be used in fillings or as inert material cover for sanitary landfill of Bârcea Mare [53]. The use of different types of C&DW materials (recycled concrete aggregates, crushed bricks, reclaimed asphalt pavement) in the base and subbase layers of roadways has been proven to be an excellent alternative to natural aggregates without a great loss of infrastructure performance [54].

A key issue is to be able to make the transition from civil construction stage (backfilling, road base, cover material, foundations) to reuse of such materials into buildings via qualitative recycled aggregates at affordable prices.

A holistic approach to C&D waste management activities is imperative for regional and local decision-makers. Yeheysis et al. [4] propose a construction waste LCA-based integrated sustainability index considering environmental, economic and social indicators.

Waste management activity is a complex activity, which involves technical, environmental, economic, social, governance and policy dimensions at various geographical scales (local, regional, national, EU).

First of all, law must establish proper monitoring of C&DW flows in order to have a reliable database (involving waste operators and construction companies). Building permits must include the obligation for individuals or companies to report the amounts of C&DW generated and to stipulate how this waste stream should be properly managed. These actions must be supported by proper law enforcement of environmental and local authorities. The future increase of landfill

fees will discourage the dispose of such fraction in urban or regional landfills and will encourage stakeholders to pay more attention to recycling and recovery activities.

Current waste management practices rely on the local recovery of this fraction (backfilling, roads, foundations) or disposal in urban landfills or scattered across public or private lands as wild dumps. The implementation of regional integrated municipal waste management systems should mitigate the issues raised by improper activities related to C&DW fraction. These major projects are financed by through European funds (2007–2013; 2014–2020) and supervised by county councils. However, the implementations of such projects are regularly behind the schedule due to bureaucracy, tender appeals, political challenges, governance issues, and court cases. Such delays, combined with the closure of non-compliant landfills, lead to illegal dumping practices or temporary dumpsites due to the lack of alternative sanitary disposal sites [38]. Also, recycling, treatment facilities, waste collection and transportation schemes are affected, including those attributed to C&DW flows. Illegal disposal of C&DW is still a widespread practice due to the lack of coherent legislation, poor enforcement of local authorities in this regard, insufficient storage and treatment facilities. The current crushing plants,

which frequently serve mainly one urban area, should expand their coverage towards surrounding rural municipalities. On-site recovery and recycling practices using a mobile crushing facility could be an optimal solution for construction companies. Mobile treatment facilities seem to be the best option for solving the C&D waste management issues in Croatia [14]. Case studies from Ireland reveal the need for co-operative collaborative contractual arrangements to facilitate early involvement of project stakeholders and setting waste performance targets for the main constructor and subcontractors [55]. In Australia, the strategies for improving reuse of construction waste include sector-wide education and training in the field, better communication between actors which deals with waste materials reuse; more effective legislative and financial incentives; better on and off-site waste management facilities and Extended Producer Responsibility [56].

These are general strategies with worldwide coverage concerning on-site recovery improvement. Effective implementation of construction waste sorting requires a wide range of factors involving human beings, management, technology, environment and resources [57]. Furthermore, a reliable estimation of costs associated with waste flows will help decision-makers to enhance the appropriate strategy that can mitigate the C&DW generation [58].

The backfilling, landfill covers, the base for roads and buildings are the main waste diversion routes from wild dumps and municipal landfill sites. In rural areas, local recovery practices are observed (buildings foundations, filling material, unpaved roads), but without basic C&DW waste management facilities. Mobile crushing facilities could be a reliable option for smaller urban areas and surrounding rural communities.

5. Conclusions

The paper points out the challenges of C&D waste management activities in Romania in the context of poor waste management facilities dedicated to this waste fraction. The paper identifies five stages of C&DW on the sustainable route starting with a worst-case scenario (stage I) such as illegal dumping on surroundings (which still prevails across rural communities) towards building materials using recycled items (e.g., recycled aggregates) under a circular economy approach (stage V). The paper highlights the geographical dimension of C&DW flows across Romanian counties and huge amounts of C&DW, which are not covered by waste statistics as shown by the thematic maps.

Several routes for sustainability in C&DW management in Romania are outlined via the following options: development of crushing plants in each urban area, mobile crushing plants for construction companies (on site recovery) or destined for small cities and rural communities;

special storage areas and containers for C&DW collection and disposal activities, the expansion of co-waste processing activities in Romanian cement industry, the development of recycled aggregates sector supported by a reliable economic market. These activities are necessary to develop a circular economy system of C&DW flows, focusing on interactions between III, IV, and V stages. These stages should be examined for other transition and developing countries across the globe, which are facing similar conditions in terms of poor infrastructure for C&DW management. The paper reveals some promising practices in urban areas (pilot projects) and analyzes the future prospects in supporting the reuse, recovery, and recycling activities of C&DW as building materials in a circular economy approach. To achieve such a transition, urban and rural municipalities must be part of an integrated C&DW management system.

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Ambientalización curricular. El covid-19, nuevos énfasis para la educación

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Curricular environmentalization. Covid-19, new emphases for education

Resumen

La ambientalización curricular ha sido promovida desde el campo de la educación ambiental para la formación ambiental —con criterios de sustentabilidad— de las futuras generaciones que desarrollarán las prácticas profesionales para las que han sido formados. Las instituciones de educación superior se consideran agentes de cambio social que aportan soluciones a problemas sociales críticos y forman a los futuros profesionales. Sin embargo, juegan un papel paradójico, porque, en buena medida, han contribuido a la generación de los problemas ambientales y de insostenibilidad. Se ha propuesto examinar críticamente el tipo de formación profesional que ha sido promovida desde las universidades, a fin de refrendar su compromiso con el cuidado y el mantenimiento de las propiedades ecosistémicas de la naturaleza. En el presente trabajo, se hace un recuento sintético de las orientaciones de la ambientalización curricular antes de la pandemia del covid-19. Se desarrollan algunas aproximaciones sobre la aparición del coronavirus en la vida de los seres humanos. Debido a ello, las orientaciones que ahora está adquiriendo el trabajo de la ambientalización curricular presentan nuevos énfasis en la problemática ambiental para los espacios educativos.

Palabras clave: ambientalización curricular, currículum ambientalizado, coronavirus, educación ambiental, educación superior, crisis ambiental

Abstract

Curricular environmentalization has been promoted from the field of environmental education for environmental training—with criteria to ensure the sustainability—of future generations that will carry out the professional practices for which they have been trained. Higher education institutions are considered agents of social change, providing solutions to critical social problems and training future professionals. However, they play a paradoxical role because, to a large extent, they have contributed to the emergence of environmental problems and unsustainability. It has been proposed to critically assess the type of professional training that has been promoted by the universities, in order to corroborate their commitment to the care and maintain the ecosystem properties of nature. In this article, we provide a summary of the directions of curriculum environmentalization before the Covid-19 pandemic. Some views on the appearance of the coronavirus in the life of human beings are discussed. Because of that, the directions now being followed in the context of curriculum environmentalization feature new emphases on environmental problems for educational spaces.

Keywords: curriculum environmentalization, environmentalized curriculum, coronavirus, environmental education, higher education, environmental crisis

Ambientalização curricular. A Covid-19, novas ênfases para a educação

Resumo

A ambientalização curricular foi promovida a partir do campo da educação ambiental para a formação ambiental — com critérios de sustentabilidade — das gerações futuras que desenvolverão as práticas profissionais para as quais foram capacitadas. As instituições de ensino superior são vistas como agentes de mudança social, fornecendo soluções para problemas sociais críticos e formando futuros profissionais. No entanto, eles desempenham um papel paradoxal, pois, em grande medida, têm contribuído para a geração de problemas ambientais e insustentabilidade. Tem sido proposto examinar criticamente o tipo de formação profissional promovida nas universidades, a fim de corroborar seu compromisso com o cuidado e a conservação das propriedades ecossistêmicas da natureza. Neste artigo, é feito um relatório sintético das orientações da ambientalização curricular antes da pandemia da Covid-19. São desenvolvidas algumas aproximações sobre o aparecimento do coronavírus na vida dos seres humanos. Por causa disso, as orientações que o trabalho de ambientalização curricular está adquirindo apresentam agora novas ênfases da problemática ambiental para os espaços educacionais.

Palavras-chave: ambientalização do currículo, currículo ambientalizado, coronavírus, educação ambiental, educação superior, crise ambiental

La crisis ambiental contemporánea[1], desde sus orígenes, ha seguido un proceso creciente en cuanto a su ritmo, magnitud, nivel y profundidad (Tommasino *et al*., 2001). Ha transitado por preocupaciones meramente ecológicas hasta inquietudes por la afectación en todas las esferas de la vida humana y no humana. Su creciente

[1] Nos referimos a la crisis que se desarrolló a partir de la Revolución industrial, pero que se ha recrudecido desde las postrimerías de la Segunda Guerra Mundial, en la que la relación de los seres humanos con la naturaleza no se había presentado en la historia ambiental del mundo, al trastocar los equilibrios dinámicos de esta.

profundidad ha hecho que se reposicione en el entramado social y ocupe uno de los principales ejes para comprender y perfilar los nuevos contornos del mundo y del desarrollo tanto de las presentes como de las futuras generaciones a nivel mundial.

Podemos comprender la génesis de la crisis ambiental en el entramado de múltiples desajustes de la articulación entre la sociedad con la naturaleza. Morín y Kern (1993) señalan el desajuste económico mundial, el desajuste demográfico y la crisis del desarrollo, a lo que se suma el desajuste ambiental. Por lo anterior, Toledo (1996) y Alba (1991) señalan que vivimos una crisis societal, de civilización o crisis social generalizada. Dicha crisis muestra el derrumbe de estructuras económicas, políticas, culturales, éticas, educativas, ideológicas, sociales, ambientales y de configuraciones sociales anteriores. Esto evidencia un proceso de cambio hacia otros derroteros, hacia otras estructuras y otras prácticas sociales que aún se encuentran en formación. Sin embargo, el proceso de configuración de las nuevas sociedades se da en un marco de mayor precariedad y, para países como el nuestro —del tercer mundo—, las nuevas condiciones nos son más adversas.

Desde el campo ambiental[2] se han perfilado perspectivas de solución, modelos de desarrollo, orientaciones ambientales y de sustentabilidad, a fin de revertir y superar el profundo deterioro de la naturaleza que se presenta a nivel nacional y mundial. En esta gran empresa se ve la educación superior como una de las

[2] Se ha denominado campo ambiental al conjunto de actores, programas y políticas que desde el sector gubernamental, educativo o social atienden la cuestión ambiental, cada uno desde sus propios espacios, pero vinculados a través de debates, polémicas y acuerdos.

instituciones sociales de trascendencia en la actual configuración mundial, por lo que su vinculación profunda con las causas ambientales es imperativa.

La educación superior es, con mayor énfasis, un sector estratégico para el desarrollo de las sociedades. En el contexto de la llamada *sociedad de conocimiento*, el saber y las instituciones ligadas a él reconfirman la singularidad e importancia de las instituciones de educación superior [IES]. Si bien las IES son instituciones históricas[3], a su vez pretenden responder a su tiempo, espacio, entorno y exigencias sociales, lo que en la actualidad las ha convertido en instituciones de gran complejidad que tienen una gran trascendencia en el presente y para el futuro.

Son instituciones en donde se transmite y, en una buena parte de ellas, se crea el saber y se certifica. Las IES se extienden más allá de sus fronteras. Su labor no termina en sí mismas. A través de sus egresados, de su trabajo educativo e investigativo, de sus profesores y de sus investigadores, se extienden a la sociedad y alcanzan su sentido y su concreción ante ellas mismas. Por ello, varios investigadores han señalado el papel de las IES como de importancia estratégica para la sustentabilidad de las sociedades, con la esperanza de que contribuyan con los objetivos de cambio ambiental.

Sin embargo, la educación superior tiene que repensarse y reconceptualizarse, ya que es heredera de visiones antropocéntricas y mecanicistas que han contribuido a la crisis ambiental contemporánea. La visión de las relaciones entre la sociedad y la naturaleza[4] —particularmente las formas simbólicas de acercamiento al mundo

[3] Las IES, particularmente las universidades, surgieron en el siglo XI en Europa con antecedentes de las escuelas catedrales. En México aparecen en el siglo XVI en la época colonial.

[4] La especie humana usa varias formas para adaptarse a la naturaleza: las herramientas técnicas, la organización social y los sistemas productivos. Con ello, ha desarrollado formas simbólicas de interpretación del mundo natural con las que valora e interviene a la naturaleza.

natural— ha sido determinante para generar la crítica situación ambiental. En ello ha contribuido básicamente la visión mecanicista del mundo que se constituyó desde hace tres siglos.

El mecanicismo impregnó por completo la forma de vida de la sociedad occidental y, por ende, de la educación superior. Esto trajo dos consecuencias: el materialismo —al pensar que solo existe lo material, lo objetivo— y el determinismo —desde la idea de que todo tiene una causa física, incluso la conciencia—. La visión mecanicista implica la fragmentación del conocimiento y, con ello, la parcelación de la realidad en disciplinas o campos del saber. Esta visión ha sido central para interpretar e intervenir la realidad, ya que la biosfera ha sido fragmentada y desestructurada, lo cual es contrario a un enfoque que quería ser estructurante e integrador. La ciencia moderna que suscribe esta visión ha sido uno de los instrumentos más poderosos para el manejo y transformación del medio natural. La universidad, a través de sus tareas centrales, particularmente de la formación de profesionales, ha sido portadora de estas visiones atomizadas.

Sin embargo, la crisis ambiental ha generado nuevos conocimientos y saberes, que se separan del paradigma mecanicista, a través de estrategias conceptuales orientadas hacia la construcción de una nueva racionalidad social y epistemológica, guiada por principios de democracia, sustentabilidad ecológica, diversidad cultural y equidad social. Al romper con el paradigma de la reducción del conocimiento a las partes que lo componen, con el determinismo, la ocultación del azar y la aplicación de la lógica mecanicista a los problemas de la naturaleza y lo social, surge el pensamiento complejo que busca distinguir y reconocer lo singular y lo concreto, sin desunir y sin atomizar, en un juego dialógico entre orden, desorden, organización, contexto e incertidumbre, sin dar como verdad esa

particular organización de un conjunto determinado. Desde esta nueva perspectiva se está trabajando para construir escenarios deseables de desarrollo que superen los graves problemas ambientales y prevengan otros.

La ambientalización curricular enmarcada en las anteriores consideraciones, desde los años 70, se ha propuesto generar cambios en la educación superior que lleven a transformaciones de las IES para que estén en condiciones de apoyar la transformación de la sociedad hacia perspectivas de sustentabilidad.

Los efectos del nuevo coronavirus en nuestras sociedades, particularmente en México — con más de 1 301 249 contagiados y 117 949 decesos al 19 de diciembre de 2020 (Noticieros Televisa, 2020)—, nos han mostrado la crudeza de treinta años de la era neoliberal, en donde la corrupción de las élites gobernantes arrasó con el patrimonio y la riqueza del pueblo, dejando los sistemas de salud, educativos, productivos, etc., en la mayor precariedad. Por ello, ha sido una tarea titánica la reconstrucción de los hospitales y servicios de salud para atender los crecientes contagios. De la misma manera, la recomposición económica del país será una tarea sin igual.

Sin embargo, esta crisis sanitaria ha propiciado una mayor conciencia de varios grupos de la sociedad, que han señalado que las tareas de la ambientalización curricular deben incluir con mayor determinación el análisis y la enseñanza de la generación y afectación de este tipo de virus en la calidad de vida de la sociedad. La aparición del virus se asocia a los estilos de consumo insustentable y al alto crecimiento de la población, entre otros.

Los jóvenes en proceso de formación en las IES —los futuros profesionales— pueden reorientar sus formas de vida y de consumo. Pueden influir en su

comunidad a fin de lograr cambios hacia estilos de vida saludables que no alteren tan profundamente la naturaleza, y así disminuir el peligro de la aparición de nuevos virus.

La ambientalización curricular

En el contexto de crisis ambiental, el ejercicio profesional y, por lo tanto, las IES —en su afán de contribuir al desarrollo nacional mediante la formación de profesionales— han soslayado la previsión de la alteración de los ecosistemas y son en gran parte responsables de la problemática ambiental, debido a los contenidos y valores que trasmiten, lo que afecta la calidad de vida de los seres humanos, de las otras especies, de las actividades económicas y del desarrollo.

En la investigación que hemos venido realizando (Bravo, 2013), identificamos que la ambientalización curricular plantea la formación profesional con una visión de prevención, para superar la lógica de destruir, para construir y para remediar, como se plantea en algunas carreras ambientales.

La ambientalización curricular pretende promover la inclusión de la prevención y, aún más, la inclusión de una formación prospectiva para los profesionales en formación y el trabajo interdisciplinario, con el propósito de construir escenarios deseables de desarrollo. Ello implica el rediseño curricular —desde el estudio de las profesiones y sus campos ocupacionales— y la definición de los perfiles profesionales ambientalizados, de los planes de estudio y de las unidades de aprendizaje, entre otros aspectos.

Así, la ambientalización curricular y las investigaciones necesarias que conlleva esta tarea deberán considerar que las prácticas sociales —en particular las prácticas profesionales y los procesos educativos que están en la base de los

procesos de producción-consumo— forman parte de las causas de la crisis ambiental.

Por otro lado, los principios de las propuestas de sustentabilidad sintetizan las causas y focos de atención para revertir tendencias y promover la construcción de un desarrollo viable para el futuro sostenible. Podemos sintetizar estos principios de la siguiente manera:

- La naturaleza —la dinámica de la Tierra— ha propiciado la disponibilidad de medios de subsistencia, por ejemplo, los minerales no orgánicos y los hidrocarburos, pero el ritmo de las actividades de producción y consumo están rebasando las tasas de sustitución de estos recursos no renovables.
- La sobreexplotación de los bienes que ofrecen los ecosistemas está rebasando sus tasas de renovación; agravada, además, por la destrucción de los ecosistemas que sostienen la vida.
- El exceso de residuos y la destrucción de los ecosistemas imposibilitan la reincorporación de los primeros a los ciclos biogeoquímicos.

Las diferentes alteraciones interactúan en la dinámica de la biosfera, lo que produce problemas globales como el cambio climático. A ello, se agregan la distribución desigual de los productos del desarrollo y las relaciones de inequidad entre países ricos y pobres y entre grupos al interior de los países. Esto hace necesaria la redistribución de los bienes del desarrollo y la equidad entre los seres humanos de ahora y de las futuras generaciones.

Para la ambientalización curricular, se requiere una revisión de los planes de estudio existentes en términos de sus objetivos y contenidos, para desarrollar la comprensión y la inclusión transdisciplinaria de la sostenibilidad social, económica y ambiental. No obstante, esto implicaría generar nuevas formas didácticas de aproximación al conocimiento. Para ello, se recomiendan métodos de enseñanza, de aprendizaje y de evaluación en la formación permanente, que incluyan habilidades para el pensamiento creativo y crítico, para comunicación

oral y escrita, para la colaboración y la cooperación, para la gestión de conflictos, la toma de decisiones, la resolución de problemas y las experiencias de planificación, con el uso de las TIC. También se recomienda la práctica de la ciudadanía, entendida centralmente como educar a la gente para promover el consumo y producción sostenibles (Unesco, 2005).

Diferentes concepciones

En el debate sobre la ambientalización curricular, de manera inicial, en la década de los 70, se planteó la denominación de *incorporación de la dimensión ambiental*. Las denominaciones de *ambientalización curricular* y *sostenibilidad curricular* son más recientes. Estas denominaciones proceden de los distintos momentos en que se ha conformado el campo de la educación ambiental y han adquirido diferentes significados.

Cuando se utilizó el término *dimensión ambiental*, lo ambiental estaba ausente: aludía a los aspectos no tomados en cuenta en los diversos planos de la vida social, en la planeación del desarrollo, en la creación de instituciones, en los cuerpos duros de las disciplinas científicas, en las políticas públicas y, por supuesto, en la educación, entre otros. Para Sunkel (1981), la inclusión de la dimensión ambiental significa reconocer que el proceso de crecimiento económico está condicionado por el medio biofísico, local, nacional y global, porque afecta de diversas maneras el crecimiento económico y sustancialmente es afectado por él, cada vez más, mientras avanza el proceso de desarrollo.

La *dimensión ambiental del desarrollo* se refiere al conjunto de valores, actitudes y motivaciones que rigen las relaciones entre la sociedad y la naturaleza y las formas como dichas relaciones se traducen en los sistemas de producción y

apropiación de los recursos productivos, así como en el manejo individual y colectivo de los recursos naturales, el equilibrio ecológico y la preservación y calidad de la vida. Estas relaciones, estos sistemas y estos manejos son de importancia vital tanto para la sociedad como para la naturaleza, debido a que la vida sobre el planeta y la perpetuidad de la especie humana y de todas las demás especies vivientes dependen de la racionalidad y de la responsabilidad con las cuales se entienda y se maneje la siguiente insoslayable confrontación dialéctica: por una parte, la necesidad vital e ineludible de las sociedades de asentarse, subsistir, convivir, progresar y proyectarse históricamente, a expensas de la naturaleza y sus inmensos recursos y potencialidades; y, por otra, la fragilidad y vulnerabilidad de esa naturaleza y sus flujos y ciclos ecológicos, así como la incuestionable finitud de todos sus recursos. La necesidad vital de conservar y de desarrollar la naturaleza y su equilibrio ecológico es una condición *sine qua non* de la vida orgánica, de la supervivencia y del desarrollo de toda la sociedad humana y no humana en el planeta que habitamos

La introducción de la perspectiva ambiental cuestiona una serie de creencias derivadas de la ideología del crecimiento económico que ha prevalecido en los últimos decenios, como es la del crecimiento infinito, la inagotabilidad y el autocuidado de la naturaleza, entre otras.

En la década de 1990, en la reunión de la Conferencia de las Naciones Unidas sobre el Medio Ambiente y el Desarrollo —conocida como Río 92—, se cambió la denominación de la *dimensión ambiental* como referente central. De manera oficial, se adoptó la denominación de *desarrollo sustentable*, que se acogió como la utopía socialmente compartida. Con dicha denominación, se pretendió llegar a una visión integrada del ambiente con los aspectos ecológicos, sociales, políticos,

económicos, éticos y culturales. Derivado de ello, se adoptó la noción de *ambientalización curricular*. Esto marcó una diferencia importante, ya que dicha denominación obedecía a la idea de superar la noción de *dimensión ambiental*, la cual suponía que solo hacía referencia a una parte de la problemática: la parte ecológica. Se estableció como meta la inclusión de criterios del desarrollo sustentable en los planes de estudio.

La ambientalización se concibió como un proceso continuo de producción cultural tendiente a la formación de profesionales comprometidos con la búsqueda permanente de las mejores relaciones posibles entre la sociedad y la naturaleza, el cual atiende a los valores de la justicia, la solidaridad y la equidad, y aplica los principios éticos universalmente reconocidos y el respeto a las diversidades.

De esta manera, la ambientalización curricular busca contribuir a la formación de los futuros egresados, con el fin de prevenir los posibles impactos ambientales negativos derivados de su práctica profesional y, más aún, de que participen a través de dicha práctica en la construcción de los escenarios deseables del desarrollo. Ello implica una formación integral que inicia con el dominio de la profesión, el papel de esta en la sociedad y en los proyectos de sociedad en los cuales se inserta, sus posibles impactos ambientales y con el desarrollo de valores que se reflejan en las actitudes de las personas (Red ACES, 2002).

La noción más reciente —*sostenibilidad curricular*— se enmarca en la educación para el desarrollo sostenible. Corresponde a una nueva visión del mundo, donde cada uno tiene la posibilidad y el compromiso, mediante la educación, de establecer nuevos modelos de vida, conductas y valores para crear un futuro mejor.

Se concibe como la cualificación profesional final y la formación integral del titulado, las cuales han de constituir la base sobre la que se fundamenten y se propongan aportaciones que garanticen e impulsen la introducción del *desarrollo sostenible* en el currículum.

Señala que los profesionales de hoy deben tener varias capacidades, entre las que están:

• comprender cómo su actividad profesional interactúa con la sociedad y el medio ambiente, local y globalmente, para identificar posibles desafíos, riesgos e impactos; • entender la contribución de su trabajo en diferentes contextos culturales, sociales y políticos y cómo estos afectan al mismo y a la calidad ambiental de su entorno; • trabajar en equipos multidisciplinares, para dar solución a las demandas impuestas por los problemas socioambientales derivados de los estilos de vida sostenibles, al incluir propuestas de alternativas profesionales que contribuyan al desarrollo sostenible; • aplicar un enfoque holístico y sistémico a la resolución de problemas socioambientales;
• ir más allá de la tradición de descomponer la realidad en partes inconexas;
• participar activamente en la discusión, la definición, diseño, implementación y evaluación de políticas y acciones, tanto en el ámbito público como en el privado, para ayudar a redirigir la sociedad hacia un desarrollo más sostenible;
• aplicar los conocimientos profesionales de acuerdo con principios deontológicos y valores y principios éticos universales; y
• recoger la percepción, las demandas y las propuestas de los ciudadanos para permitir que tengan voz en el desarrollo de su comunidad.
Con base en lo anterior, se vislumbra que la educación, en esta perspectiva, debe:

• tener un enfoque integrado sobre los conocimientos, las actitudes, las habilidades y los valores en la enseñanza;
• promover el trabajo en equipos multidisciplinares;
• estimular la creatividad y el pensamiento crítico;
• fomentar la reflexión y el autoaprendizaje;
• reforzar el pensamiento sistémico y un enfoque holístico;
• formar personas participativas y proactivas que sean capaces de tomar decisiones responsables;
• adquirir conciencia de los desafíos que plantea la globalización; y
• promover el respeto a la diversidad y la cultura de la paz. (CRUE, 2005)

Coronavirus: covid-19

Ante la aparición del nuevo coronavirus a nivel mundial —y de los futuros virus que se anuncian (Carabias, 2020)—, la ambientalización curricular adquiere nuevas perspectivas y una urgente atención. Es de suma importancia que las actuales y las nuevas generaciones aprendan a cultivar un consumo pertinente y a adquirir una conciencia de la prevención. Por ello, estos temas deben estar presentes en el currículum de la educación superior y/o en la formación extracurricular de los estudiantes y maestros, y, en general, en la comunidad educativa de cada institución.

Se ha señalado que este virus ha dividido nuestra historia en dos —antes y después de él—, por lo que ahora tendremos que vivir de manera diferente en un largo plazo (Cepal, 2020). En consecuencia, la ambientalización curricular necesita ubicarse ante este fenómeno y propiciar una mayor formación sobre la situación, sin desatender el panorama de la crisis ambiental que vivimos (Cepal, 2020).

Ante la pandemia del covid-19, nos hacemos varias preguntas:

- ¿La crisis por el coronavirus es un signo de crisis capitalista o es un signo de una crisis de civilización?
- ¿La vida en las ciudades nos ha alejado de la propia naturaleza?
- ¿Hemos dejado de coevolucionar con ella?
- ¿Por ello las altas afectaciones a la salud humana?

Por su parte Leff (2020) se pregunta:

- ¿Qué es un virus?
- ¿Cómo es que, siendo parte de la evolución de la vida, se convierte en un agente mortífero que ataca y destruye la vida? • ¿Cuál es su función en la evolución de la vida?
- ¿Qué agencia —de la propia naturaleza o de la intervención humana— activa su diseminación y sus efectos patógenos?

Lo cierto es que hay desconocimiento para responder estas y otras preguntas, por lo que debemos propiciar una conciencia de la prevención y promover la investigación en estos aspectos a partir de lo que se conoce.

Interacción y cambio

La sociedad, la cultura, los ecosistemas, la Tierra, el sistema solar y el universo son producto de la interacción y el cambio de sus componentes. El origen de la vida y su evolución —desde las primeras células hasta las aves y los mamíferos— son historias de interacción y cambio, de integración en diferentes niveles de complejidad y de la emergencia de propiedades nuevas en cada nivel de agregación.

El origen y la evolución biológica del *homo sapiens*, su evolución sociocultural y sus impactos ambientales son también producto de la interacción y el cambio. La interacción, el cambio, la integración en diferentes niveles de complejidad y la emergencia de propiedades son rasgos comunes de los fenómenos naturales y sociales. No obstante, los procesos de cambio naturales se han producido en escala de tiempo geológico.

El hombre, con todas sus características modernas, existe desde hace 40 000 años, pero el impacto del ser humano en la naturaleza ha sido de mayor magnitud en los últimos 300 años. Así, mientras que los cambios de los fenómenos naturales se producen en escalas de tiempo geológico, los cambios provocados por los seres humanos son de gran magnitud y se producen en lapsos de cientos o decenas de años. Por ello, los seres humanos y sus acciones se consideran una fuerza de cambio de gran magnitud que puede causar su propia extinción como especie.

Históricamente, la sociedad se ha apropiado de la naturaleza y la modifica. El medio natural ha sido fuente determinante en la cosmovisión e identidad de las culturas. Es decir, los seres humanos hemos coevolucionado con la naturaleza desde nuestra aparición en la Tierra.

Sin embargo, a causa del poderío tecnológico y del crecimiento exponencial de la especie humana, hemos explotado la naturaleza más allá de los límites físicos que se habían valorado para no causar mayores desequilibrios. Tanto el consumo como el uso de la energía y de los recursos que se utilizan han propiciado el cambio climático y efectos negativos en los sistemas ecológicos. Se ha incrementado de manera intensa el dióxido de carbono —CO_2— en la atmósfera. Hoy tenemos 414 partes por millón, contra las 280 partes de antes de la Revolución industrial (Brito & Stafford, 2012).

Desde hace varios años, hay una gran preocupación por los impactos negativos sobre la Tierra, ya que estos están siendo de gran magnitud. Se ha demandado la urgencia de reducir la emisión de los gases de efecto invernadero para frenar un cambio climático, que ya causa el sufrimiento de muchos seres humanos y de otras especies en el planeta; un cambio climático que también puede acelerar la llegada de enfermedades como la que estamos sufriendo. Por el cambio climático, virus y bacterias ahora están en zonas donde antes no existían.

La pérdida de biodiversidad es otro de los problemas globales ambientales preocupantes. Esta se relaciona con el cambio de uso del suelo para la producción alimentaria, que ha propiciado la defaunación, la cual es impactante a causa de la pérdida de selvas y bosques. Todo está involucrado en un sistema que ya es insostenible, donde, además del daño ecológico, tenemos daños a la salud humana.

Vivimos en un planeta finito y no podemos pretender modificar las leyes de la naturaleza a nuestro antojo para ajustarlas a nuestras concepciones de desarrollo económico o financiero. Al contrario, deberíamos modificar nuestro desarrollo según las leyes de la naturaleza.

Desequilibrio de la naturaleza

Si seguimos presionando los ecosistemas naturales con un consumo exacerbado de recursos y de territorio, podemos propiciar focos de contagio. Podemos perder la capacidad de resistir el embate de eventos climáticos extremos. Perderemos, en definitiva, nuestra capacidad de resiliencia como sociedad.

Se está afectando la función protectora de la biodiversidad que, gracias a efectos como la dilución de la carga vírica y la amortiguación del contagio, es una inmensa y eficaz barrera para las zoonosis, como lo es el coronavirus.

El SARS-CoV-2 ha coevolucionado largo tiempo con el murciélago de forma que cuando está sano, la carga vírica es mínima (Valladares, 2020; Toledo, 2020). En estados de estrés, como cuando se le persigue, se caza, se manipula y se consume, el sistema inmune del animal se deprime y la carga vírica se dispara.

Les ocurre algo similar a los demás hospedadores como el pangolín, objeto de caza y de tráfico ilegal en muchas regiones de Asia y de África, donde demandan su carne como alimento y sus escamas de queratina —como nuestras uñas— para usarlas en medicinas tradicionales orientales. Estos son los mamíferos silvestres más cazados y traficados del mundo. En tal situación, con el hospedador inmunodeprimido que alcanza una alta carga vírica, el virus resulta más peligroso para el ser humano.

> Si a ello le agregamos que las sociedades humanas también hemos experimentado los problemas ambientales por muchos años y que hemos vivido con elevadas tasas de contaminación atmosférica en ciudades, como las del norte de Italia, Madrid o Ciudad de México —con graves consecuencias para la salud, especialmente en poblaciones vulnerables—, se podría decir que esto tiene relación con una mayor incidencia de enfermedades cardiorrespiratorias como el covid-19.
>
> Una naturaleza sana, con ecosistemas funcionales y ricos en especies, nos protege de una manera muy amplia ante infecciones por patógenos. La naturaleza, en general, nos protege del polvo del desierto y ayuda a reducir la contaminación atmosférica, dos vehículos que propagan virus y que acentúan los síntomas respiratorios en los pacientes afectados por el covid-19.

Lo que resulta indiscutible es que son nuestros hábitos y comportamientos los que nos ponen en peligro, porque detrás de esta pandemia está la destrucción de la naturaleza que hemos propiciado.

> La gran mayoría de ambientalistas coincide en que han sido las prácticas de producción agropecuarias, en el marco del neoliberalismo, lo que ha desatado el ataque de este virus, y, de seguir así, podrían seguir muchos más, aún desconocidos y letales (Zibechi, 2020).

La producción agropecuaria

> Se ha identificado que una de las causas estructurales de este patógeno —el coronavirus— y de otros más ha sido el proceso de producción de alimentos y la rentabilidad de las empresas multinacionales en tiempo del neoliberalismo (Altieri & Nichols, 2020). El modelo industrial de la agricultura ha generado que los virus sean cada vez más nocivos. Sin embargo, esto no se ha investigado, ya que, ante la

aparición de un nuevo patógeno, lo que hacen es buscar la nueva cura o vacuna, de donde se obtienen grandes ganancias.

Pero la situación es más amplia y preocupante. El neoliberalismo salvaje ha encabezado el acaparamiento de las tierras, de los últimos bosques primarios, y las explotaciones agrarias a los pequeños propietarios a nivel mundial. Con ello se ha producido la deforestación y la aparición de nuevas enfermedades. El arrasamiento de las tierras ha propiciado la liberación de los patógenos que antes estaban encerrados, los cuales migran a la ganadería local y a las comunidades humanas.

En México, el libre comercio devastó el campo, arruinó a pequeños y medianos agricultores y obligó a millones de pequeños campesinos a migrar a los Estados Unidos o al noroeste del país. Y no solo eso, trastocó profundamente la dieta de las clases populares al provocar lo que ahora sale a relucir con el covid-19, otras graves epidemias: la de obesidad, la de desnutrición y la de diabetes, lo que aumenta la mortalidad de los mexicanos contagiados por el coronavirus.

El ébola, el zika, otros coronavirus, la reaparición de la fiebre amarilla, una variedad de gripes aviares y la peste porcina africana se encuentran entre muchos de los patógenos que salen de las zonas más remotas del interior hacia los circuitos periurbanos, las capitales regionales y, finalmente, hacia la red mundial de viajes. No hay patógenos libres de la influencia del capital. Incluso las regiones más remotas se ven afectadas, aunque sea desde la lejanía. Con los acercamientos mundiales, en pocas horas o semanas, puede llegar del Congo el virus del ébola a los bañistas de Miami, que fallecen a causa de este.

Desde hace algunos años, se calculó que la naturaleza podría ser una gran inversión económica, por lo que hoy el planeta Tierra, en gran parte, es una gran

fábrica agrícola industrial, tanto en términos de biomasa como de uso de la tierra. La agroindustria tiene como objetivo acaparar el mercado de alimentos. El proyecto neoliberal está diseñado para ayudar a las empresas de los países industrializados más desarrollados a robar tierras y recursos de los países más débiles. Como resultado, muchos de estos nuevos patógenos, previamente ligados a ecosistemas forestales que se habían desarrollado durante largos periodos de tiempo, están siendo liberados y amenazan al mundo entero.

Las necesidades capitalistas, en sustitución de la ecología natural, organizan la agricultura y proporcionan los medios exactos por los que un patógeno puede desarrollar los fenotipos más virulentos e infecciosos. No se podría diseñar un mejor sistema para generar enfermedades mortales, pero a ellos no les importa que la gente muera.

La agroindustria está orientada a utilizar los beneficios de los virus sin importar la mortalidad humana que genera, siempre y cuando sus ganancias no se vean afectadas. La expansión de los monocultivos genéticos de animales de granja elimina cualquier barrera inmunológica que pueda estar disponible para ralentizar o frenar la transmisión. Las grandes dimensiones y las altas densidades de población facilitan mayores tasas de transmisión. Estas condiciones de hacinamiento deprimen la respuesta inmunológica de los animales. El alto rendimiento de los animales, como parte indisoluble de cualquier producción industrial, proporciona a los virus un suministro constante de nuevos animales huéspedes, lo que promueve su virulencia.

La producción de alimentos altamente industrializada depende de prácticas que ponen en peligro a toda la humanidad y, en este caso, es posible que contribuya a

desencadenar una nueva pandemia mortal, gracias al incremento del consumo de conservantes peligrosos causantes de muchas enfermedades, que además generan pandemias como la obesidad que ahora padecemos en México.

Tareas para la ambientalización curricular

Varias son las tareas que nos deja esta experiencia, la cual aún no termina y no sabemos cuándo vaya a finalizar. Tal vez el virus sea parte de nuestra vida futura, como lo ha sugerido el sector salud.

Si las causas de la aparición de esta enfermedad se pueden encontrar en la rápida urbanización, en los cambios en los sistemas agropecuarios, en cambios en los ecosistemas y en una mayor globalización del tráfico de animales y de sus productos, es necesario cambiar de fondo nuestras prácticas sociales, nuestro consumo, nuestra relación con la naturaleza, lo cual ya se ha mencionado desde hace varios años. Este podría ser uno de los últimos avisos de la naturaleza.

Las universidades en estos temas tienen un amplio panorama de acción, formación y educación en una cultura de sustentabilidad, que implica reorientar el consumo racional, adecuar la producción agropecuaria, fortalecer y aplicar la normatividad ambiental para inhibir el tráfico y consumo de animales de vida silvestre, más aún ante la sexta extinción, que está en marcha.

El límite de la capacidad del ecosistema de la Tierra no puede seguir ampliándose. El crecimiento de la población es uno de los importantes retos que debe modificar la humanidad. La orientación de las universidades en su comunidad debe promover un crecimiento poblacional racional.

El responsable, de manera más amplia, es un sistema social, una civilización, en la que una minoría de menos del 1% de la población explota por igual tanto el trabajo de la naturaleza como el trabajo de los seres humanos. La desigualdad social y ambiental está en el centro de muchos problemas actuales. Las universidades tienen como misión disminuir la desigualdad social, por lo que deberán buscar nuevas formas eficaces para equilibrar la vida de las poblaciones.

Se ha propuesto el paso de una economía de mercado a una economía social y solidaria; de grandes empresas y corporaciones a empresas familiares y cooperativas —fin de los monopolios—, de gigantescos bancos a cajas colectivas de ahorro; de energía fósil a energías renovables; de sistemas agroalimentarios industriales a sistemas agroecológicos; de organizaciones centralistas y verticales a organizaciones descentralizadas y horizontales —redes—; de una democracia representativa a una democracia participativa. Pero, sobre todo, se ha propuesto construir desde lo local —comunidades, municipios, microrregiones— un poder ciudadano o social capaz de enfrentar y controlar las acciones suicidas del capital. En suma, una ecopolítica desde, con y para la vida. La búsqueda del bien común en los mecanismos de desarrollo social es una tarea inaplazable en que las universidades pueden apoyar fuertemente.

Deberíamos exigir que los sistemas alimentarios se socialicen, de tal manera que estos patógenos peligrosos no puedan desarrollarse. Para lograr esto, se requerirán, en primer lugar, prácticas agroecológicas que protejan el medio ambiente y a los agricultores que cultivan los alimentos. En el panorama general, necesitamos curar la grieta metabólica que separa nuestra ecología de nuestra economía.

En un mundo interrelacionado como el actual se ha incrementado la posibilidad de que aparezcan y se expandan rápidamente enfermedades infecciosas emergentes y reemergentes. Este riesgo tiene su origen en varios factores, como la aparición de nuevos patógenos, la facilidad de circulación de personas y alimentos, el aumento de microorganismos resistentes a determinados medicamentos, los avances en el ámbito de la biotecnología y la adquisición de agentes patógenos por parte de grupos terroristas.

Las consecuencias de la expansión de una enfermedad infecciosa pueden llegar a ser catastróficas, no solo al afectar la salud y economía de la población, sino también la economía mundial y la estabilidad del país en donde se producen, como lo estamos observando.

La pandemia nos muestra con crudeza cuán sensibles somos a un medio natural que no funcione bien. La situación actual debería servir de ensayo para repensar una gran crisis que nos está esperando, que no cesa y que es aún más compleja de gestionar y atajar que la pandemia del coronavirus: la del cambio climático y la de la pérdida de la biodiversidad.

La conservación de la salud a través de la alimentación y el consumo sustentable son puntos neurálgicos que deberán incluirse, ya sin demora, en los procesos educativos y en la ambientalización curricular. Lo que tenemos que hacer es perfilar una nueva relación más equilibrada con la naturaleza y sostenible en el tiempo. Es necesario cuestionar profundamente el marco social y económico en el que nos movemos.

En todo este tiempo, la asistencia sanitaria a los enfermos ha funcionado, pero en condiciones heroicas. Tenemos que lograr que, a partir de ahora, funcione en

condiciones soportables, sin bordear el colapso. La seguridad higiénica ambiental deberá ser una tarea en la que las universidades aporten no solo con la formación de personal del sector de la salud, sino con la generación de medicinas y tecnologías de cuidado y autocuidado, tecnologías necesarias para la procuración de la salud.

Debemos aprender que lo realmente importante es planificar, ampliar sustancialmente y desplegar rápido las armas de la salud pública, además de orientarlas a la supresión de los contagios y no solo a su mitigación, ahora y en el futuro; en suma, estar preparados por si llega una nueva ola de contagios.

En el mediano plazo, parece inaplazable la reforma de nuestro Sistema Nacional de Salud con solvencia técnica y sabiduría política. Nuestros profesionales de la salud se merecen algo más que aplausos y una subida de sueldo.

Las universidades del país deben ser partícipes de estas grandes tareas que nos ha dejado la experiencia de la pandemia del covid-19 —no solo nos referimos a los estudiantes del sector salud, sino a la universidad en su conjunto—. Ya que el problema es global, así debe buscarse su solución.

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FORMACIÓN UNIVERSITARIA Y ACCIONES EDUCATIVAS PARA COMPRENDER LA "COSTA RICA VERDE". UNA PROPUESTA EDUCATIVA DESDE LA DISCIPLINA HISTÓRICA

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Resumen: El artículo detalla la experiencia docente desarrollada en el curso optativo de Historia Ambiental de Costa Rica, impartido por la Escuela de Historia para la formación ambiental del estudiantado universitario, entre el 2013 y el 2015, como corolario de maduración del Observatorio de Historia Agroecológica Ambiental (OHAA). Para ello, se precisa un renovado enfoque de la educación ambiental que tome en cuenta lejanas concepciones educativas y los nuevos postulados de la práctica docente en Costa Rica. Para explicar tales procesos, se emplean fuentes diversas y se describen, a grandes rasgos, las técnicas desarrollas en el curso. En tal sentido, desde la experiencia investigativa histórica y la práctica docente, este artículo subraya la trascendencia de nuevas formas de enseñar.

Palabras clave: Historia ambiental, historia aplicada, educación ambiental, docencia, Costa Rica.

Abstract: This article describes the teaching experience developed in the Environment History of Costa Rica course; an optional course given at the School of History for the environmental training of university students, between 2013 and 2015, as a maturity corollary of the Monitoring committee of Environmental Agroecological History. For this, it is needed a renewed point of view of the environmental education, taking into account old educative conceptions and new postulates of the Costa Rica teaching practice. To explain these processes, different sources were used, and the techniques implemented during the course are described in a 52 general way. In this regard, under the historical investigative research experience, this article underlines the transcendence of new teaching ways.

Keywords: environmental history, history applied, environmental education, teaching profession, Costa Rica.

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Introducción

> Educar, inequívocamente, sugiere un proceso de desarrollo de capacidades intelectuales, conocimientos, habilidades, valores, creencia y hábitos adquiridos por los seres humanos desde su nacimiento hasta su deceso, mediante infinidad de técnicas, objetivos y espacios de sociabilidad. Por ello, cuando tratamos de configurar el término de *educación ambiental* apuntamos hacia aquellas acciones contemporáneas e históricamente constituidas mediante la educación formal e informal, las percepciones individuales y grupales, y la relación cotidiana con el medio ambiente. Postulados, en gran parte, sugeridos por diversos dictámenes ambientales de la Organización de Naciones Unidas

(ONU), como consecuencia de la presión ejercida por los movimientos ambientalistas de la década de 1960 y 1970 y los más recientes.

> Consideración teórica que Leff reinterpretó en la década de 1990, con la acepción de *saberes ambientales*, para expresar sus reflexiones sobre la construcción social del mundo actual, donde convergen y precipitan los procesos biofísicos, biológicos y la trascendencia histórica de la invención humana. Tiempos de hibridación del mundo donde la tecnología, la deuda con la naturaleza, el mestizaje de culturas, la resignificación de identidades y los problemas socioeconómicos se ven reflejados en los diversos *saberes ambientales*, que estimulan a la emersión de nuevos valores y racionalidades sobre nuestra existencia. Una cosmovisión del saber, que tiende a trascender

en la medida que sacude los paradigmas educativos dominantes, las visiones globalizantes y unitarias de la educación, para desarrollar una visión crítica y transformadora entre los saberes populares, los enfoques multicausales, el diálogo interdisciplinario y el proceso histórico diferenciado en escalas espaciales y temporales (Leff, 1998).

Propuesta significativamente importante para nuestra empresa, cuyo objetivo se

3 centra en el análisis del desarrollo histórico de la educación ambiental en Costa Rica y la materialización de nuevas propuestas formativas del curso Historia Ambiental de Costa Rica, centralizado en la compresión de los problemas ambientales en el largo plazo, con el fin de enriquecer las explicaciones historiográficas tradicionales de tipo político y socioeconómico, subrayando el valor de las dinámicas ambientales como motores de cambio y destacando la importancia de la historia para el entendimiento de los problemas ecológicos presentes, sin descuidar la divulgación del conocimiento y el reconocimiento del utillaje teórico-metodológico de la historia ambiental y otras disciplinas a fines.

Esta propuesta surge, ante los nuevos requerimientos educativos–ambientales- de nuestro tiempo en cuanto a la formación y desarrollo de destrezas de las futuras generaciones de profesionales en historia, la docencia de estudios sociales y las cívicas, y demás unidades académicas de la comunidad universitaria. Engranaje teórico-práctico desarrollado por el Observatorio de Historia Agroecológica y Ambiental (OHAA) de la Escuela de Historia un equipo de investigación que desde la perspectiva disciplinaria, interdisciplinaria y multidisciplinaria ha propuesto el curso optativo de Historia Ambienta

de Costa Rica, con el ánimo de generar un genuino espacio de discusión y formación docente, con el fin de entender la crisis ecológica contemporánea y sus atisbos particularmente sentidos en el plano costarricense.

Las arcaicas pretensiones de educar para conservar: Un repaso por los orígenes de la educación ambiental en Costa Rica

> Hilando las líneas más finas del desarrollo de la educación en Costa Rica, nos damos cuenta de que desde finales del siglo XIX, de forma indirecta y con el amparo de científicos europeos como Pittier, Tonduz y Biolley se había propiciado un temprano reconocimiento de nuestros recursos botánicos, zoológicos y antropológicos, situación que se vio reflejada en la fundación del Museo Nacional en 1887 y el Instituto FísicoGeográfico. Años más tarde, en 1926, la fundación de la Escuela Nacional de Agricultura, con objetivos meramente productivistas, tendió también a dilucidar algunas problemas ambientales vigentes (Guier, 2000).

> Con un proyecto de diversificación productiva a cuestas, el Estado costarricense, desde 1949, generó un discurso conservacionista y un incipiente proyecto de educación

> ambiental, bajo el seudónimo “Semana de los Recursos Naturales”, para impulsar una producción sostenida y tratar de paliar los problemas que se arrastraban desde décadas anteriores, a causa de la tala del bosque, la erosión del suelo, el pastoreo excesivo y el exterminio de la fauna silvestre.

> Así, con el afán de despertar y divulgar una conciencia ambiental entre la población costarricense, en el mes de setiembre, en medio de las celebraciones

de la independencia, se buscó establecer ciertos nexos entre la identidad costarricense y los recursos naturales, a través de los símbolos patrios como el árbol, el ave y la flor nacional. Para ese tiempo, la definición estatal de recursos naturales comprendía únicamente el agua, el suelo, el bosque, el pasto y otros componentes biológicos, no siempre bien esclarecidos. Así, se ensalzaba una imagen paternalista-proteccionista del Estado sobre la naturaleza, que generaría un

"supuesto" uso racional, conducente a la óptima explotación de los recursos con el lema:
"El futuro de Costa Rica está en sus manos", bajo el amparo del Ministerio de Agricultura e
Industrias y el Servicio Técnico Interamericano de Cooperación Agrícola (STICA), que ofrecían apoyo a cualquier persona dedicada a la agricultura deseosa de conservar el ambiente (El Agrario Nacional, 20 de octubre de 1951, p. 1).

Paralelamente a esta estrategia de "educación ambiental", se incentivó a los grupos agricultores para que experimentaran y pusieran en práctica las nuevas innovaciones tecnológicas, que años más tarde, serían consideradas como propias de la "Revolución Verde", puesto que el discurso, el sentido y el valor de la conservación de los recurso se fundamentaba en el acceso y protección de la futura materia prima utilizable en los sistemas productivos. Como es patente, este tipo de principios educacionales estaban dirigidos tanto al sector productivo nacional, como al estudiantil, con el fin de que este nuevo ideal trascendiera a las futuras generaciones.

Según la prensa escrita de la época, esta festividad se mantuvo vigente por lo menos hasta buena parte de la década del cincuenta, con diferentes énfasis o temáticas centrales. Por ejemplo, en 1951 se enfatizó en la problemática del

desgaste del suelo y cómo este podía ser conservado mediante la aplicación de prácticas sencillas y la preservación del

bosque que a su vez resguardaba el suelo, el agua, los animales silvestres, la madera, los

5 frutos silvestres y la leña, para así mantener "…el patrimonio común de los _____ costarricenses…" (Órgano de los Clubes 4-S, 1951, p. 1). Evidentemente, el discurso de la racionalización de los recursos naturales prevalecía entre los proyectos de gobierno, tal como lo plasmó Claudio Volio, en el discurso inaugural a cargo del Ministro de Agricultura.

> Hace apenas un año que, propiciada por el Ministerio a mi cargo la idea de dedicar una semana a la Conservación de los Recursos dejó de ser una inquietud para convertirse en realidad dinámica y fecunda. A ello han contribuido en forma eficaz y alentadora no solamente todos los organismos que de una u otra forma, están ligados a nuestra agricultura, sino aquellos que como los industriales, los comerciales y los culturales, comprenden y aprecian en justo valor la enorme importancia. Todos tienen el poder de gozar de los beneficios que brinda la cada vez más eficiente explotación de nuestros recursos, aparejada con su racional conservación, para poder en todo tiempo, disponer de un fondo común abundante… de producción y de intercambio. (Órgano de los Clubes 4-S, 1951, p. 1)

En los años sucesivos, el discurso conservacionista exaltó la importancia de las plantaciones de árboles para el aprovechamiento forestal, para lo cual, especificaban las técnicas de cultivo en eras y viveros especiales. Todo este

cúmulo de conocimiento trataba de propiciar un sector forestal alternativo, para generar ganancias inmediatas y aparejar réditos en la explotación agrícola (Repertorio Agrícola, 8 de junio de 1950, p. 6).

Dentro de ese contexto, sin embargo, las plantaciones forestales solo eran una incipiente y hasta tímida práctica experimental, pues en realidad la mayoría de la madera se extraía del bosque con la lógica de desmonte, que se traducía en nuevas franjas de tierra fértil para el uso agropecuario y la obtención de capitales; mientras tanto, la protección de especies de flora y fauna, solo quedaron plasmadas en el papel, pues en la práctica no se llegaron a concretar. A pesar de lo anterior, en 1957 la *Semana de la Conservación de los Recursos Naturales* se concentró en difundir las nuevas iniciativas de "conservación" entre las escuelas e incentivó el levantamiento de un censo de armas (Asamblea Legislativa de 56

Costa Rica, 1959, p. 95).

Mientras tanto, en la parte administrativa costarricense se inició un proceso de incorporación de funcionarios dentro del Comité del Departamento Forestal y de la Administración de la Vida Silvestre, el Comité Protector de la Fauna Silvestre, el Departamento Forestal y la Administración de la Vida Silvestre, el Ministerio de Economía y Hacienda y la Federación Nacional de Tiro y Caza u otras asociaciones similares, que hasta ese momento funcionaban con la tutela del Ministerio de Agricultura e Industrias. No cabe la menor duda de que todo este tipo de cambios se realizaban en la parte administrativa de la Meseta Central y, por tanto, las zonas rurales quedaron a la espera de

concreciones efectivas. Esfuerzos que en general se vieron reflejados en la Ley de conservación de fauna silvestre 1956 y 1961 y la Ley de aguas de 1959.

Claramente entre 1950 y 1970, estas iniciativas de educación ambiental se emitieron desde una cosmovisión paternalista, en la que funcionaba una dinámica de protección delineadas con leyes específicas, para la protección de los recursos vitales de la explotación agropecuaria, como el agua, el bosque y algunas especies de fauna cotizadas por la caza.

Esto último, porque más que iniciar un nuevo orden en el sistema productivo, las décadas del cincuenta y sesenta se convirtieron en un modelo experimental permeado por viejas usanzas y nuevos elementos en el sector productivo, estableciendo rubros ideales de racionalización, resguardo y conservación de los recursos disponibles, todo con miras hacia su explotación futura. Con una evidente visión antropocéntrica, donde el ser humano era el ente de control sobre los recursos naturales disponibles. Así, parte esencial de las disposiciones de la ley fueron trasmitidas la población por medio de dos mecanismos: la prensa y el sistema educativo nacional. Estas generaron percepciones míticas sobre la

"inagotabilidad" de los recursos naturales.

Irónicamente, a pesar los consecutivos esfuerzos de la década de 1950, hacia 1970, en medio de la consolidación de la Revolución Verde, el mismo e irónico Estado, seguía apostando por la Semana de los Recursos Naturales, destinada a sensibilizar a la población sobre las problemáticas y la antropización del espacio provocada históricamente por la mano del ser humano (La Nación, 12 de mayo de 1976.). Así en ese contexto, empezaría a

arribar nuevas concepciones de la educación ambiental como consecuencia de la

7 Conferencia de Estocolmo y la Conferencia Intergubernamental sobre educación ambiental en Tbilisi, de la Unión Soviética (URSS) de 1977, que juntas plantearon la necesidad de poner en funcionamiento un plan de acción que incluyera aspectos informativos, educativos, sociales y culturales dentro de la educación ambiental formal y no formal, desarrollada en los Estados mediante las políticas educativas, para generar conciencia de la responsabilidad individual y colectiva sobre la protección y el mejoramiento del ambiente en todas su dimensiones (Naciones Unidas, 1977, p. 152-157).

Por ello no es extraño que en la década de 1980 se empezaran a madurar pioneras propuestas universitarias, centralizas en la comprensión de los componentes bióticos, físicos, socioeconómica y culturales asociados a las problemáticas ambientales de la época. Para el caso de nuestra institución, siempre se ha hecho mención de los pioneros esfuerzos desarrollados de la Escuela de Ciencias Ambientales (Pizarro Méndez, 8 de octubre de 2015, entrevista a Eduardo Mora).

Como era de esperarse, la concesión de la educación ambiental evolucionaría; por ello, siete años más tarde 1987, en el Congreso Internacional de la URSS, esta fue definida como aquella posibilidad de concientizar a la población de las problemáticas ambientales de aquel tiempo y del futuro cercano. De tal manera, atrás quedaban aquellas concesiones productivistas del Estado Desarrollista.

Según Quesada, estas y otras propuestas influyeron para la concesión de una

Estrategia Nacional para Conservación y Desarrollo Sostenible (ECODES) y el Plan Maestro de Educación Ambiental para Costa Rica, dos programas que se constituyeron en articulaciones pioneras de la educación ambiental formal costarricense. A partir de estos esfuerzos, en 1988 se estableció vía decreto ejecutivo, el primer Plan Maestro para la Creación de una Comisión Nacional de Educación Ambiental (CONEA), con el fin de desarrollar mecanismos de coordinación entre diferentes organizaciones e instituciones. La insuficiente respuesta educativa dio paso a la creación de la Subcomisión Universidad y Medio Ambiente (SUMA), que luego se transformaría en la Comisión Interuniversitaria de Educación Ambiental, adscrita a CONARE (Guier, 1989).

No conformes con esto, en los próximos años se definieron los objetivos básicos y las líneas de acción bajo el amparo de las concepciones de la economía ecológica, catapultadas de la famosa Conferencia de Río de 1992. A partir de entonces, las dimisiones 58 ambientales se tornaron en temáticas globales, asociadas a las condiciones económicas, sociales y políticas, vistas desde enfoques interdisciplinarios, con la presunción de desarrollar actitudes y sensibilidades ambientales, y explicaciones profundas para un mejor entendimiento de los problemas ambientales. Asociado a esto, en 1998 el Sistema Nacional y Conservación (SINAC) y el Ministerio Nacional de Ambiente y Energía (MINAE) plantearon la Estrategia Nacional de Educación y Extensión Ambiental, para centralizar los esfuerzos que se encontraban dispersos.

Auxiliarmente, con la Agenda 21 y el lanzamiento del Plan de Acción Nacional de Educación Ambiental para el Desarrollo Sostenible por parte de la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (UNESCO) en 1995, se ha repensado la educación ambiental como aquella posibilidad de materializar valores, habilidades y capacidades críticas de la ciudadanía, para recobrar un sentido ambiental local, nacional y global desde los centros

educativos, como parte del plan curricular, el cual, hasta un cierto nivel, incorpora la dimensión ambiental. Sin embargo, dentro de la esfera de la educación formal, todavía existe un temor generalizado por las falencias educativas del personal docente, en cuanto a una lectura responsable del ahora popular componente ambiental, a pesar de los avances desarrollados por las universidades públicas y el Ministerio de Educación Pública (MEP). Ante la necesidad de desarrollar una educación con enfoques sistémicos, que permita la resolución de problemas socioambientales identificados en la realidad costarricense, desarrollamos la práctica docente del curso Historia Ambiental de Costa Rica.

Educando desde las problemáticas ambientales: Un acercamiento a las particularidades del curso Educación Ambiental de Costa Rica

Con la herencia de las situaciones anteriores y, sobre todo, con la reciente incursión de Costa Rica en la historia ambiental y, específicamente, del Observatorio de Historia Agroecológica y Ambiental (OHAA) de la Escuela de Historia de la Universidad Nacional (UNA), se han puesto de manifiesto las potencialidades no solo en el ámbito investigativo, sino también en la capacidad de formular propuestas en el educativo, sobre todo, al obtener gratas formas de interlocución comunitaria y académica desde la historia aplicada, cuyo 59

objetivo principal por años se ha centrado en la interpretación de problemáticas ambientales históricas de gran significación para las comunidades, instituciones privadas y estatales costarricenses. Así, conjugando la investigación con la

docencia, con la participación activa del Observatorio desde el año 2013 y hasta el 2015, se impartió el curso de Historia Ambiental de Costa Rica a estudiantes del Bachillerato en Historia, la Enseñanza de los Estudios Sociales y la Educación Cívica y, por su naturaleza de curso optativo, a gran cantidad de estudiantes de la comunidad universitaria nacionales y del extranjero.

Tabla 1 Control de asistencia del curso Historia Ambiental de Costa Rica

Fecha/Ciclo lectivo	Estudiantes matriculados	Estudiantes aprobados	Estudiantes a examen extraordinario	Estudiantes que reprobados	Estudiantes que abandonaron/retiraron el curso
II ciclo, 2013*	33	25	0	2	6
II ciclo, 2014*	41	28	0	5	8
I ciclo, 2015**	40	30	0	3	10
Curso de verano (IFSA)***	2	2	0	0	0
Total	116	85	0	10	24

Notas: * Curso optativo impartido a estudiantes de los bachilleratos en Historia y en Estudios Sociales y Educación Cívica. ** Curso optativo impartido a toda la comunidad universitaria con 37 estudiantes de otras unidades académicas. *** Bajo la modalidad de curso de verano y con ciertas adecuaciones, el curso se concretó desde el 28 de mayo al 18 de junio de 2015. **Fuente:** Elaboración propia.

Lo anterior, porque durante muchos años atrás, la historia ambiental, lejos de generar una hiperespecialización historiográfica en nuestro país, ha suscitado acertadas 60 interpretaciones de la relación ser humano y ambiente, reflejadas en el campo de la producción y del conocimiento, y muy pocas veces en las prácticas educativas. Sin embargo, al tratar de generar propuestas prospectivas para minimizar el impacto de la degradación ambiental y el riesgo de colapsos ecológicos, temas de diaria discusión, poco se dice de las medidas resilientes que debemos abordar desde la educación, direccionada a diferentes grupos etarios de la ciudadanía.

Cómo hacer la diferencia, sin duda fue la premisa en OHAA, por ello, desde su génesis, se planeó partir de las problemáticas ambientales costarricenses, que día tras día palpamos y de las cuales, muchas son también lametadas de forma consciente e inconsciente por los mismos grupos estudiantiles.

Por ello, partiendo de un repaso general de los orígenes de la historia ambiental en Europa, Estados Unidos y América Latina, en el curso, se trató de contextualizar el desarrollo histórico de la sociedad costarricense, en el marco de sus principales problemas agroecológicos, asociados a los condicionantes políticos y socioeconómicos. Eso, sin olvidar la estrecha relación con la historia agraria clásica, la historia social más cercana, la economía ecológica, las renovadas tendencias del paradigma agroecológico contemporáneo y los acercamientos y las distancias entre la historia ambiental y otras especializaciones de las ciencias sociales la economía, la geografía, la antropología y la sociología y las ciencias naturales.

Todo lo anterior, asociado a la (re)construcción histórica del concepto sustentabilidad y desarrollo sostenible, que ha dado paso a las interpretaciones epistemológicas de la agroecología, que hoy por hoy se ha convertido en una gran herramienta para hacer renovadas lecturas del territorio rural costarricense. Este, indistintamente de la lente con la que se lo mire, nos expresa tonalidades de una economía con abundantes deudas ambientales, sintonizadas a una creciente marginalidad social y distintos problemas de la salud pública, irónicamente desarrollados en la “Costa Rica sin ingredientes artificiales” o la misma “Costa Rica verde”.

Para lo anteriormente planteado, cuatro técnicas fueron fundamentales para conseguir nuestro cometido. En primer lugar, la lectura de especialistas de gran renombre de la historia ambiental. Mientras, en un segundo plano, se contaba con la participación de

seminaristas integrantes del OHAA quienes, al ser especialistas en variadas temáticas

1 (problemáticas ambientales de los territorios indígenas en tiempos contemporáneos; frentes de colonización agrícola y sus impactos ambientales; el sistema de cultivo del café, impactos y cambios en el paisaje; los incendios forestales en Costa Rica; los desastres naturales y antrogénicos ligados a una cultura de riesgo, y los conflictos socioambientales a raíz del desbalance hídrico del cambio climático), lograron explicar desde la extrañas de las mismas situaciones, las raíces históricas y sus posteriores consecuencias en la sociedad costarricense.

Los reiterados seminarios no limitaron la presencia de personas expertas de otras disciplinas y espacios geográficos, en temáticas atinentes al programa del curso, puesto que incluso se contó con la presencia de la reconocida bióloga marina costarricense máster Lilliana Piedra y se desarrolló una video conferencia con el doctor Aceneth Perrafán, de la Universidad de Cali, Colombia. Ambas actividades con el fin de visualizar similitudes y diferencias a la hora de interpretar el ramo ambiental entre distintas disciplinas y espacios geográficos latinoamericanos.

Mención aparte merece el desarrollo de giras reflexivas coordinadas entre la docencia del curso y los proyectos del OHAA inscritos en el Sistema de Información Académica (SIA) que se progresan en el Sistema Lagunar de Caño Negro, El Parque Nacional Santa Rosa, los cantones de Upala y La Cruz, con el

fin de desarrollar gran parte de los contenidos prácticos del curso, en asocio con la experiencia investigativa del personal académico. En ese sentido, durante el período de desarrollo de los cursos, tres temáticas fueron convergentes y recurrentes: el desarrollo de políticas de conservación costarricense centralizado en esta oportunidad en el Parque Nacional Santa Rosa y Refugio de Vida Silvestre Caño Negro, la colonización agrícola en la zona transfronteriza de Upala y La Cruz y sus impactos ambientales en el largo plazo. Tres años de giras, que dieron al estudiantado los elementos básicos de cómo en Costa Rica se construyen identidades nacionales, extranjeras, transfronterizas y ambientales realmente complejas, reflejadas en los informes de gira.[6]

Figura 1 Explicación histórica de Margarita Torres sobre los frentes de colonización agrícola en la zona Norte (II ciclo, 2014)

[6] Es importante mencionar que dentro de la metodología se usaron guías prácticas de observación elaboradas por el personal académico al frente de cada proyecto, técnica que fue triangulada con la elaboración de ensayos reflexivos, toma, análisis y criticidad de fotografías y desarrollo de entrevistas desarrolladas en los sitios visitados.

Fuente: Colección personal de los estudiantes: Roberto Álvarez, Erick Arroyo, Gabriela 63 Monge y Viviana Lara.

Figura 2 Observaciones realizadas por estudiantes en Puerto Soley, La Cruz, Guanacaste (I ciclo 2015)

Fuente: Colección personal de Margarita Torres Hernández.

Tabla 2 Giras realizadas en el curso de Historia Ambiental de Costa Rica (2013-2015)

Sitios	Proyectos asociados al programa	Profesionales a cargo	Fecha/Ciclo

Refugio Nacional Vida Silvestre Caño Negro	Cabalgando con el gaspar.	Maximiliano López y Roberto Granados	II ciclo, 2013
Refugio Nacional de Vida Silvestre Caños Negro/Yolillal de Upala*	Cabalgando con el gaspar. Colonización y producción agropecuaria en la zona fronteriza norte de Costa Rica: 1900-1973 (Estudio de caso Upala). Fase 1.	Maximiliano López y Roberto Granados Gertrud Peters y Margarita Torres	II ciclo, 2014
Parque Nacional Santa Rosa/La Cruz*	El bosque seco en llamas. Colonización y producción agropecuaria en la zona fronteriza norte de Costa Rica: 1900-1973. (Estudio de caso La Cruz). Fase 2.	Wilson Picado y Carlos Cruz Margarita Torres y Yanina Pizarro	I ciclo, 2015

Notas: * Estas giras contaron con la colaboración de dos programas de investigación, aspecto que fue muy enriquecedor para el estudiantado.
Fuente: Elaboración propia.

Con las experiencias desarrolladas en el aula y el trabajo de campo, y partiendo de los ejes trasversales del programa del curso -la energía, el agua, el aire, la salud humana, los suelos, el género y la diversidad de etnias- el estudiantado planteó y desarrolló investigaciones. Sin bien es cierto, con las primeras experiencias se planteó la posibilidad de definir, diseñar, desarrollar e implementar una propuesta de acciones educativas (AE) entendidas como aquella posibilidad en la que la información recopilada y las investigaciones tuvieran diferentes usos y sentidos entre sus interlocutores, luego se centró gran parte de la ejecución de los proyectos en el enfoque de la historia aplicada, por tan solo poseer un ciclo educativo para desarrollar dicha propuesta. Esta situación no limitó la concreción de proyectos en su componente práctico, pues se buscó en todo momento, que los grupos estudiantiles desarrollaran alguna interlocución con grupos comunitarios. Por ello, la historia aplicada, definida como aquella posibilidad de investigar problemáticas socioambientales actuales que el país enfrenta, cuyas raíces históricas posibilitan tener no solo una mejor

lectura de la realidad actual concreta, sino que también el desarrollo de una perspectiva multicausística del pasado y una mejor prospectiva de cara al futuro cercano. Estos estudios de caso se sustentaron por la pretensión de difundir su conocimiento entre los actores sociales, muchas veces con sed de una lectura histórica del proceso de antropización de su entorno (Picado, 2015).

Después de tres años intensos, en el equipo de trabajo nos queda el sabor de boca de haber contado con una gran cantidad de estudiantes de nuestra unidad académica y fuera de la facultad, y sobre todo, haber ideado una metodología que rindiera fructíferas reflexiones entre estudiantes, puesto que varias veces manifestaron los aportes que estaban obteniendo para su preparación profesional debido a que su unidad académica no contaba con curso en el área ambiental o porque en su futuro desarrollo profesional tendrían que enfrentarse a algún componente de tipo ambiental que habían ignorado hasta ese momento. Por tanto,

entender las raíces históricas de las problemáticas ambientales y sus componentes políticos,

5 económicos y sociales desde la historia ambiental, hizo del curso un seminal espacio de experiencias que esperamos queden grabadas en su memoria perdurable.

Conclusiones

En pleno siglo XXI, los medios de comunicación, la gestión pública y la educación se han convertido en espacios de reproducción de los agravantes ambientales globales. A pesar de ello, la mayoría de costarricenses, lejos de entender el contexto del calentamiento global, las diversas posturas de la economía ecológica y los conflictos por los cambios, accesos y distribución de

los recursos naturales a nivel local y mundial, se ha sumado a una reincidencia de discursos “ecológicos”, maximizados por las nuevas propuestas “sustentables” a nivel de políticas públicas, cuyos niveles más monumentales se habían fijado para el año 2021, cuando Costa Rica sería el primer país, internacionalmente hablando, en ser “Carbono Neutral”. Para individuos propios y extraños, parece claro que lo anterior ha sido un constructo desarrollado en el largo plazo, claro está, bajo el amparo de diferentes políticas de “conservación y protección ambiental”.

Por ello, promover entre el estudiantado el análisis del desarrollo histórico de la sociedad costarricense mediante la comprensión de los problemas ambientales en el largo plazo ha sido, sin duda, una experiencia extraordinaria para el OHAA; un esfuerzo heredero de otros enfoques educativos desarrollados por la institucionalidad costarricense de forma indirecta e indirecta desde finales del siglo XIX y hasta el siglo XX, que ahora se enfila hacia un entendimiento de los *saberes ambientales* de los mismos grupos de estudiantes y por comunidades enteras, abrumadas por las problemáticas ambientales que se palpan en la cotidianidad. Por ello, es válido refutar los inexactos postulados que nos rondaron con el posmodernismo, cuya esencia se centraba en el fin de la historia, pues queda claro que con el binomio investigación y docencia, se elimina aquella vieja conjetura de recursos

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DE LA TEORÍA A LA PRÁCTICA:
PLAN PILOTO PARA LA INCORPORACIÓN DE SABERES AMBIENTALES EN UN CENTRO EDUCATIVO

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Resumen: Este artículo recoge la experiencia adquirida de la implementación de un plan piloto de educación ambiental en un centro educativo semiprivado. La estrategia de trabajo atinente a la materia ambiental trató de permear diferentes esferas de acción, a saber, la administrativa, la académica-formativa y la de proyección comunitaria. Por ello, se desarrollaron lecciones desde el nivel preescolar hasta bachillerato diversificado, con una estrategia metodológica que cubrió todos los niveles de enseñanza y, a la vez, se permeó la política institucional, su quehacer administrativo, junto con el involucramiento de la junta de padres de familia y su proyección a nivel comunal.

Palabras clave: Educación ambiental, programas de educación, medio ambiente, saber ambiental, ética ambiental, acción comunitaria.

Abstract: This article collects the lessons learned from a pilot plan of an environmental education in a semiprivate educational center. The working strategy about the environmental matter tried to approach different areas of action, e.g., administrative and academic field, as well as the community projection. Therefore, from kindergarten to high school levels, training courses were developed under a methodological strategy covering all the school stages. At the same time, the institutional policy, its administrative work, along with the involvement of the parents committee and their community projection were permeated.

Keywords: environmental education, educational programmers, environment, environmental awareness, environmental ethics, community action.

Introducción

Los resultados que se presentan a continuación son producto de la experiencia desarrollada en el Proyecto *Saber ambiental: De la teoría a la práctica*, ejecutado del

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año 2002 al 2004, por un equipo de investigación del Instituto de Estudios Sociales en Población (IDESPO-UNA) en el Centro Educativo Universidad Nacional (CEUNA). El trabajo se sustentó en la necesidad de desarrollar una metodología piloto para incorporar la variable ambiental en los diferentes espacios de trabajo de la educación básica, con el fin de mostrar aprendizajes y bagajes que podrán ser utilizados en distintas instituciones educativas.

Partiendo de la concepción teórica de *saber ambiental*, descrita como todo aquel "Sistema social de conocimientos y prácticas con sentido ético, tendente al desarrollo sustentable, que expresa su relación empática con otras manifestaciones de vida" (López, *et al.*, 2004), el equipo investigador trató de describir una educación en la que se produzcan saberes y acciones concretas reflejadas en una mejor relación ser humano-ambiente.

La noción teórica, también trabajada en múltiples esferas mundiales y especialmente impulsada por Enrique Leff, quien desde finales de la década de 1990 ha publicado una serie de manuscritos sobre la educación ambiental, con el seudónimo de *Saber Ambiental*; trata de concebir, desde una nueva ética y epistemología -basadas en la fusión de conocimientos, proyección de valores e internacionalización de saberes-, la complejidad ambiental, cuya aprensión solo puede ser incorporada mediante la desaprensión de los conocimientos antes consabidos del ambiente, el cuestionamiento sobre las condiciones ecológicas reflejas de la insustentabilidad que, según él, bloquean el camino hacia una sociedad más democrática y más justa. Así, la construcción y la comunicación de saberes se constituye en hacedora de un análisis crítico de las estrategias de poder y los efectos de

9 dominación, generados por el *statu quo*, a través de las formas de detención, apropiación y transmisión de conocimientos prevalecientes en la sociedad (Leff, 2002).

Buscando esa concepción de ambiente que refleje la realidad de la población estudiantil, el equipo de investigación indagó las particulares perceptivas sobre la vida, su entorno y la percepción del ambiente de cada persona; que en el fondo reflejan las distintas creencias, acceso a la información y concepción de vida presentes en una sociedad diversa y compleja. Así, con una definición de *saber ambiental* que iba más allá del diagnóstico, y que a su paso generaba un conocimiento nuevo, en la que se mesclaban los conocimientos populares con los científicos, se inició el proyecto con el fin de buscar un cambio real en la relación de las personas con otras manifestaciones de vida.

Cuando se empezó el trabajo, se tenían dos aspectos claros y bien definidos: la primera y más concreta, era la necesidad real de un centro educativo por indagar y apropiarse de una estrategia de educación ambiental; y la otra, un poco más general, pero muy importante, era la nada despreciable sucesión de conocimientos desarrollados a nivel internacional, desde hacía poco más de 40 años. Estos aspectos, sin duda, siguen vigentes en estos tiempos y se muestran claramente como un punto de partida, para implementar una estrategia de intervención educativa más atinente a los grupos meta.

Como es bien sabido, la educación ambiental adquirió un mayor auge a partir de los años 70, cuando la degradación ambiental comenzó a considerarse como un problema social. De hecho, en 1972 cuando la Organización de Naciones Unidas llevó a cabo en Estocolmo la conferencia “Medio Ambiente Humano”, se empezó a analizar la problemática ambiental desde lo social y cultural; y entre sus tantas recomendaciones se destacó un necesario programa internacional de educación sobre el medio ambiente, incluyendo la educación formal -desde los niveles preescolares hasta los superiores- y

la no formal, con contenidos planificados, constituidos por perspectivas y visiones interdisciplinarias.

Para 1976, la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (UNESCO) propuso, en la Conferencia Internacional de Nairobi, la creación del Programa Internacional de Educación Ambiental, liderado por esa organización y el Programa de Naciones Unidas para el Medio Ambiente (PNUMA). Esto llevó a que en

0 1977, se realizara la Primera Conferencia Intergubernamental sobre Educación Ambiental en Tbilisi, de la antigua Unión Soviética (URSS) -organizada por la UNESCO con la cooperación del PNUMA- donde se señalaron los elementos claves para la construcción de métodos integrados acordes con las necesidades de cada región, así como los componentes de una educación ambiental para la formación de todas las personas y las sociedades.

Esta conferencia marcó la pauta a nivel internacional para la educación ambiental, ya que planteó, por primera vez, una educación ambiental para desarrollar conciencia, adquirir conocimientos, modificar comportamientos, conseguir actitudes y promover la participación activa con acciones de cambio. Según la UNESCO (1977) para ese entonces, así se expresaron sus objetivos:

1. Ayudar a los grupos sociales y a los individuos a adquirir una conciencia del medio ambiente global y ayudarles a sensibilizarse por esas cuestiones.
2. Ayudar a los grupos sociales y a los individuos a adquirir una diversidad de experiencias y una comprensión fundamental del medio y de los problemas anexos.
3. Ayudar a los grupos sociales y a los individuos a compenetrarse con una serie de valores, y a sentir interés y preocupación por el medio ambiente motivándoles de tal modo que puedan participar activamente en la mejora y la protección del medio ambiente.

4. Ayudar a los grupos sociales y a los individuos a adquirir las aptitudes necesarias para determinar y resolver los problemas ambientales.
5. Proporcionar a los grupos sociales y a los individuos la posibilidad de participar activamente en las tareas que tienen por objeto resolver los problemas ambientales.

Así, los esfuerzos prosiguieron, hasta que en las décadas de los ochenta y noventa, acontecieron hechos de importancia, que marcaron el rumbo de la educación ambiental. Por ejemplo, en 1981 se dio la creación de la Red de Formación Ambiental para Latinoamérica, con el auspicio del PNUMA, para propiciar alternativas de formación en la región.

En este contexto se llevó a cabo en 1985 el Primer Seminario sobre Universidad y Medio Ambiente en América Latina y el Caribe, organizado en Bogotá, por la Universidad Nacional de Colombia, el ICFES, LA UNESCO y PNUMA. Resultaron de este evento dos importantes documentos: las diez tesis sobre el medio ambiente en América Latina y la [41] Carta de Bogotá sobre Universidad y Medio Ambiente, que aún hoy sigue vigente por sus relevantes aportes sobre la educación ambiental y el desarrollo (Trellez y Wilches, 1999).

Otros eventos mundiales que marcan el rumbo del abordaje de la temática ambiental y, por tanto, de la educación ambiental, fue el carácter curricular de esta misma a nivel internacional, discutido en 1987 en Moscú, entendiendo esta como un proceso en el cual los individuos y las colectividades se hacían conscientes de su entorno, para actuar y resolver los problemas presentes y futuros.

Para 1992, la Comunidad Económica Europea, a través de su Programa de Política y Acción para el ambiente y desarrollo sostenible, Acción 21, propuso que todos aquellos aspectos relativos al ambiente, incluidos tanto en las ciencias naturales como en las humanas y sociales, que preparaban para la vida práctica debían ser incorporados a los

programas escolares en sus diferentes niveles. Esta propuesta fue aceptada unánimemente en la Conferencia de Río 92, cuyos ejes de desarrollo fueron la sensibilización, la formación y la educación relativas al ambiente.

Precisamente, la Conferencia de Río de 1992 marcó un nuevo rumbo en el abordaje de la temática ambiental, pues la *Carta de la Tierra* pasó a ser un documento inspirador y guía ética que se ha convertido en una declaración universal que -aunque no es vinculante para los Estados- es un llamado a la conciencia, que echa mano a la promoción de los valores.

En este contexto, durante la primera década del presente siglo XXI, se planteó, en el Instituto de Estudios Sociales en Población (IDESPO-UNA), la necesidad de generar proyectos que llevaran consigo la posibilidad de contribuir a la sistematización de teorías, métodos, saberes y prácticas como aporte a la comprensión del tema ambiental en la sociedad costarricense, tomando la educación ambiental como el eje de trabajo a desarrollar.

Así, con el amparo del proyecto *Saber Ambiental* se implementan acciones con los siguientes objetivos:

1. Recopilar y sistematizar saberes y prácticas relativos a temas ambientales que permitan facilitar procesos de concientización para una adecuada calidad de vida.

2 2. Gestionar iniciativas que faciliten la comprensión de temas ambientales desde una visión holística

3. Vincular teorías y métodos con las prácticas populares para lograr un enfoque integral del tema ambiental.

Estos objetivos han permitido ejecutar acciones educativas en espacios comunales y de educación formal con el fin de implementar las siguientes líneas estratégicas:

- Construcción de un pensamiento crítico.
- La interdisciplinariedad y saberes ambientales.
- El intercambio y la revalorización de los saberes.
- El protagonismo creativo de las comunidades en la gestión ambiental participativa.

Hoy por hoy, no cabe duda de que durante décadas, en muchos países, se ha concebido la educación ambiental desde la miope accesión de protección ambiental y como proceso para la conservación solamente de los recursos naturales, sin avanzar en la incorporación d los componentes históricos, culturales, económicos y sociales, como parte de los estudios ambientales y de la educación ambiental en particular.

En ese sentido, nuestro abordaje concibió la educación ambiental desde la formación de hábitos de preservación de la Naturaleza, hasta la comprensión ambiental como una cuestión ética, donde el comportamiento promueve el desarrollo de procesos colectivos hacedores de una formación para la responsabilidad, transformando a las personas en consumidoras moderadas y creando una conciencia ambiental en donde el ser humano se sienta inmerso en la Naturaleza, como una especie más y, por tanto, intrínsecamente depende de la relación que establezca con ella para sobrevivir. Por eso es importante despertar valores como la solidaridad y el respeto, donde la educación ambiental se convierta en el vehículo para promover una genuina relación entre el ambiente y sus semejantes.

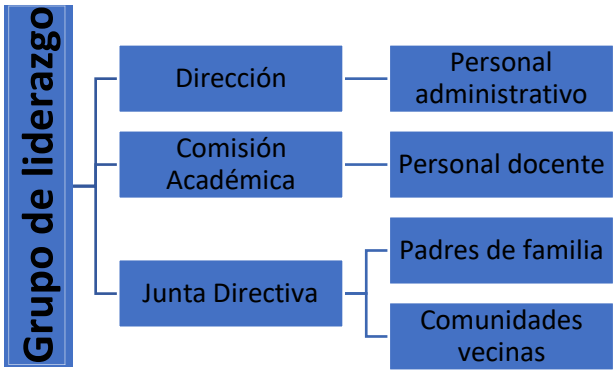
El *saber ambiental* como estrategia metodológica de la educación ambiental

Una vez inmersos en el proyecto, se planteó la estrategia metodológica a partir de las características particulares del centro educativo y sus distintos niveles de organización, a saber:

- Comisión académica y dirección del centro educativo. 43
- Junta Directiva.
- Personal docente y planilla administrativa.
- Proyección de acciones a padres y comunidad.

En primera instancia, se definió un grupo de liderazgo del proceso en ciernes, equipo que fungió también como enlace con el equipo de trabajo del IDESPO y ente encargado de efectuar el monitoreo y seguimiento de las acciones desarrolladas. Ese grupo estaba compuesto por la Dirección, un representante de la Comisión Académica y de la Junta Directiva del Centro Educativo, instancias que, de una forma individual y particular, tenían designada, a su vez, una población meta de trabajo -ver figura 1-.

Figura 1 Instancias involucradas y población de atención



Fuente: Elaboración propia.

El papel de dicha comisión era esencial para generar una atmósfera de coordinación y apoyo entre las diferentes instancias de la institución y crear un referente para todo el personal académico y administrativo involucrado; de tal manera que las consultas, 44 sugerencias o comentarios podían ser canalizados desde cualquier miembro de las poblaciones de atención

hasta el grupo de liderazgo y, a su vez, este grupo compartía lo acontecido con miembros del equipo investigador del IDESPO.

Las reuniones de coordinación entre el grupo de liderazgo y el equipo investigador servían como espacios de discusión y construcción de la metodología a emplear, así como fuente de retroalimentación para redireccionar acciones o incorporar unas temáticas a abordar. La finalidad última era que este grupo líder continuara posterior a la conclusión del proyecto conjunto con el equipo investigador del IDESPO-UNA.

Igualmente, las reuniones servían para analizar los diferentes espacios pertenecientes a la institución, los jardines, las aulas, los pasillos, el comedor, el bus viejo, la bodega y un pequeño bosque propiedad de la sociedad dueña del centro educativo, al cual se le denominaba *la finca*. Estos espacios eran analizados en las reuniones como posibles lugares para desarrollar proyectos de diferentes temas ambientales.

Contrayendo el *saber ambiental*: La ejecución de la primera etapa del proyecto

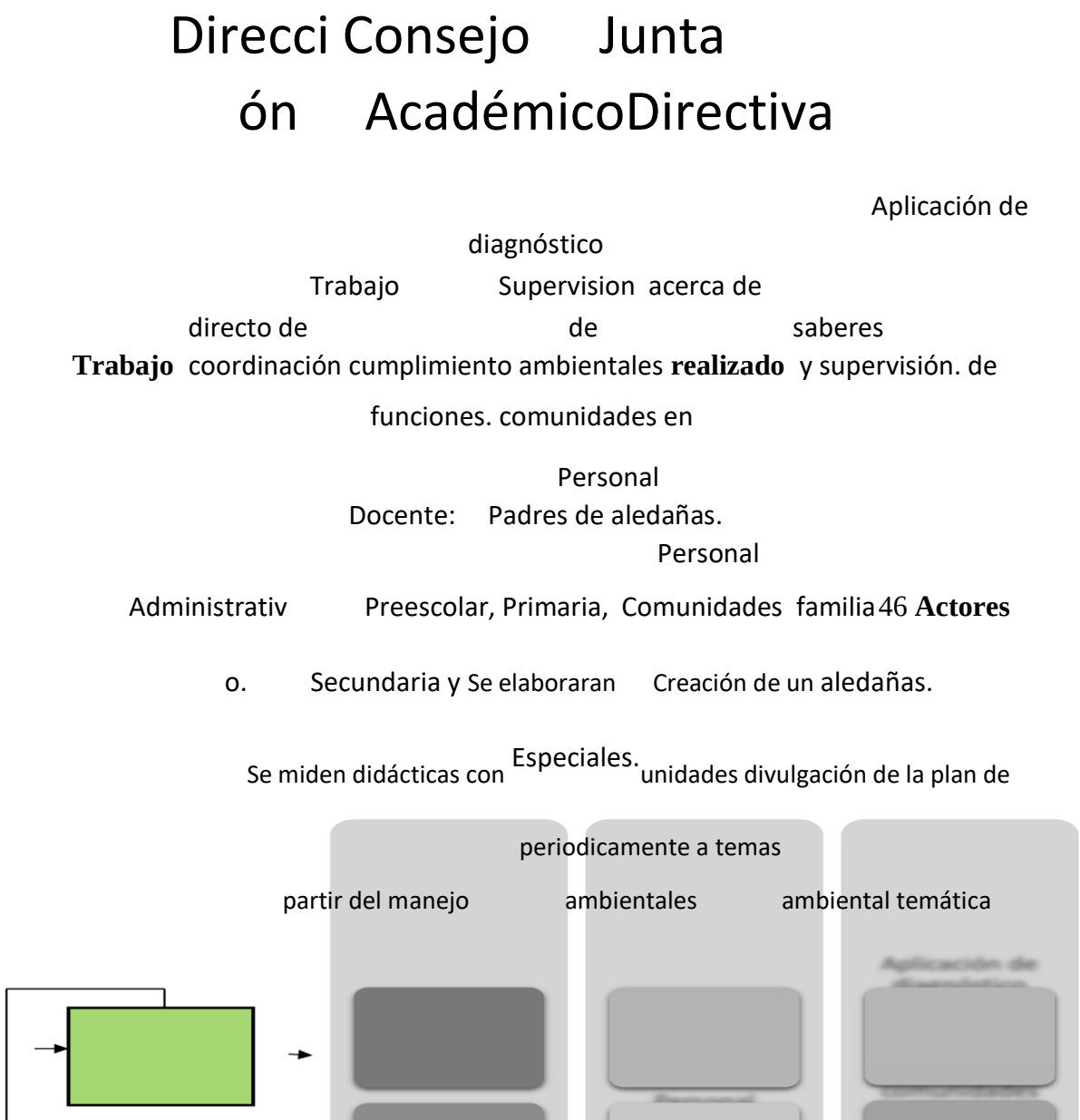
En la primera etapa, se desarrollaron una serie de reuniones con la directora del centro educativo, e igualmente, con miembros de la Comisión Académica y de la Junta Directiva, para lograr definir e identificar las necesidades y las metas que se querían alcanzar.

De esa manera, se determinó, como necesidad prioritaria, contar con un equipo de larga permanencia en la institución, que potenciara el liderazgo en gestión ambiental institucional y facilitación académica. En ese sentido, se propuso en primera instancia, efectuar un diagnóstico, donde se establecieron dos momentos diferentes de actividades. Para un primer momento, se propuso elaborar e implementar un cuestionario dirigido al personal del centro educativo de forma generalizada, en el cual se pretendían captar los conocimientos previos en

temas ambientales, sus expectativas y necesidades de capacitación, así como su identificación con la institución en la que laboraban. [45]

Posteriormente, con los resultados procesados, se efectuó un taller de validación de datos y de priorización de necesidades del personal. Estas actividades fueron el insumo necesario para establecer el plan de trabajo con cada población identificada. Así, se establecieron los productos que se esperaba alcanzar, como se puede observar en la figura 2.

Figura 2 Estrategia de trabajo según población identificada y productos esperados



de conceptos y cambios en las adaptadas a las materias que comunidades dirigido a las

Logros acciones cotidianas imparten, el éxito aledañas y **obtenidos** dentro del centro se mide a traves ejecutado por educativo . del conocimiento los padres de adquirido por el familia. estudiantado.

Fuente:
Elaboración propia.

De esa manera, se establecieron prioridades de trabajo, mientras el grupo de liderazgo inició un proceso de capacitación en temas generales de ambiente, planeamiento estratégico, liderazgo y comunicación, por el lapso de un año. Los objetivos que este grupo se planteó fueron los siguientes:

Objetivo general:

- Diseñar una estrategia que permita ubicar el centro educativo en una posición de liderazgo ambiental en el ámbito educativo.

Objetivos específicos:

- Desarrollar acciones de capacitación entre las autoridades del centro educativo en áreas de liderazgo, comunicación y administración de proyectos.
- Servir de enlace entre el centro educativo e instituciones públicas y privadas nacionales e internacionales para establecer acciones académicas en la finca.
- Promover la formulación de propuestas de investigación-acción, para presentarlas ante organismos nacionales e internacionales.

Con la precisión de las metas, luego se hicieron presentes las capacitaciones desarrolladas cada quince días, en la que los diferentes grupos incorporaban actividades que se debían cumplir.

En esta etapa cada sector miembro del grupo de liderazgo debió iniciar el desarrollo de actividades con el siguiente nivel de población involucrada. Como se pudo observar en la figura 2, esta metodología estuvo diseñada con el efecto cascada, donde se inició trabajando con una población meta y esta decanta su conocimiento con otra población, para lograr, así, resultados por etapas hasta llegar a una tercera población.

De esa forma, en esta fase de trabajo, la Dirección en conjunto con el equipo investigador inició una serie de talleres y actividades de capacitación con el personal administrativo, para que este comprendiera que el centro educativo buscaba abordar en todos los aspectos el tema ambiental. Para lograr los objetivos, se trabajó con profundidad acciones cotidianas del personal y su manifestación en el centro educativo.

Así, se establecieron espacios en el comedor para disponer de los residuos sólidos producto de las comidas que se preparan en ese sitio. De igual forma, se fortaleció la creación de un centro de acopio para la disposición de residuos valorizables, junto con la planificación de una estrategia para mantener el lombricario para la generación de abono orgánico, la huerta escolar y un plan de manejo de la finca -propiedad de la Junta Directiva- con la ayuda de estudiantes de la Escuela de Ciencias Geográficas de la Universidad Nacional, en la elaboración de un plan de manejo de la finca, supervisado por un profesor de la carrera de Geografía. Aquí los académicos involucrados

generaban las propuestas para la mejora o el establecimiento de cada proyecto propuesto.

En cuanto a la Comisión Académica se trabajó en un programa de capacitación en temas ambientales, empezando con el tema de cultura ambiental, el cual, contó con la participación de personeros del programa *Carta de la Tierra* para profundizar en el tema de valores, ética ambiental y acciones cotidianas.

Posteriormente, el equipo del IDESPO trabajó en talleres de temas específicos que ligaran las acciones cotidianas con elementos del ambiente, a saber: usos del agua, la energía, el aire, el suelo y el manejo general de residuos. Además, se complementó la capacitación en temas de confección de unidades didácticas, con la meta de que cada docente escogiera un tema que se adaptara a su área de conocimiento y nivel de enseñanza, y elaborara una guía didáctica para ser puesta en práctica con el estudiantado. Dicha unidad

8 debía contener alguna actividad extracurricular para que el contenido fuera trabajado con el núcleo familiar por cada estudiante y así impactar también en sus hogares.
En relación con este trabajo, dicho sea de paso, se hizo necesaria una efectiva supervisión de parte del Comité Académico y el equipo del IDESPO hacia el personal docente, para trabajar en la formulación y propuesta de unidades didácticas, y según el tema tratado, se ligó con las actividades del sector administrativo y del sector de proyección comunitaria. Es importante mencionar que el abordaje con el personal docente se realizó en forma separada, con la siguiente división: docentes de primaria, docentes de secundaria y docentes de materias especiales.

El tercer bloque de trabajo se dirigió inicialmente por medio de sesiones de grupo con los miembros de la Junta Directiva. A partir de ahí, se elaboró un plan de trabajo que

contempló sesiones de divulgación del proyecto, a todos los padres y madres de familia del alumnado del centro educativo, mediante reuniones convocadas en cada nivel de enseñanza.

Paralelamente, se elaboró -en forma conjunta con el equipo investigador- un cuestionario que fue aplicado a la población de las comunidades aledañas, para tener una línea base en cuanto a conocimientos y acciones cotidianas en temas ambientales.

Con los resultados del nuevo diagnóstico, se trabajó con el grupo de liderazgo elaborando un plan de trabajo que contemplara un programa de divulgación interno y externo al centro educativo. A nivel interno, se proyectó una serie de acciones dirigidas a los padres de familia, al personal de la institución y al estudiantado, con el objetivo de divulgar las actividades temáticas de cada nivel. Para ello, se estableció un viernes al mes para compartir, en reuniones del centro educativo, los productos del estudiantado, atinentes a la recolección de residuos valorizables, o bien, celebrar alguna actividad ambiental resaltante de los valores contemplados en la *Carta de la Tierra*. A nivel externo se planificaron actividades de proyección a los hogares del alumnado y a las comunidades aledañas.

De esa forma, cada población se mantuvo interconectada mediante reportes a los entes de monitoreo y control. Incluso, se establecieron planes futuros para que se proyectara una selección de personal docente a contratar -dada su alta movilidad - con [49] criterios de selección y un proceso de inducción al nuevo personal, en la filosofía y valores ambientales del centro educativo. Y, con el propósito de monitorear todo en el personal involucrado en este plan piloto de incorporación de la variable ambiental a un centro educativo, se dio un seguimiento mensual de parte del grupo de liderazgo y una sesión anual para contemplar ajustes no planificados que surgen en la práctica cotidiana.

Conclusiones

Incorporar el tema ambiental como eje transversal en un centro educativo se sustentó en la búsqueda de estrategias para insidir en un cambio de cultura ambiental, partiendo de las acciones cotidianas, donde la protección del ambiente debe ser una responsabilidad individual, familiar, comunitaria, de la sociedad y del Estado. Por tanto, a través de nuestro proyecto, no vimos en la necesidad de fomentar una conciencia ambiental, en donde el ser humano se conciba como parte de la *naturaleza*, mediante la meditación crítica de las consecuencias de nuestras acciones y nuestros estilos de vida contemporáneos e insustentables, y reflexionar sobre los problemas que nos aquejan a escala local, nacional y mundial.

De esta forma, pretendimos generar conciencia al crear espectativas de bienestar en la sociedad actual, sobre la redundante preferencia de las generaciones futuras, pues las personas que hoy por hoy habitamos el planeta necesitamos de la naturaleza para realizar el potencial máximo, tomando conciencia de que no somos dueños de nuestro entorno, sino que solo podemos vernos como personas administradoras.

En este sentido, la ética ambiental no puede reducirse a fórmulas de comportamiento individual, sino que tiene que convertirse en una normativa del comportamiento social y político, donde prevalezca una ética del bien común, asentada en el sentimiento y en la creencia de un código de deberes.

Como bien tratamos de reflejar en el manuscrito, el trabajo realizado en el centro educativo permitió propiciar, entre las partes interesadas, el desarrollo de una visión común acerca de la organización, del trabajo, del cambio y de lo que significa colaborar para buscar formas armoniosas de convivencia. Se llegó a mantener oportuna y adecuadamente informadas a las

personas acerca de los cambios en el entorno, que inciden en las interrelaciones como respuesta y propuestas resilientes, que conlleven la profundización constante de una nueva conciencia ambiental. Lo anterior, mediante el establecimiento de canales de comunicación entre organizaciones y personas, que permitan sentar las bases para la creación de una sociedad más justa y responsable, en su convienvia con el ambiente.