


**RESTORATION ECOLOGY AND SUSTAINABLE DEVELOPMENT - A SYSTEMIC REVIEW****ECOLOGIA DA RESTAURAÇÃO E DESENVOLVIMENTO SUSTENTÁVEL - UMA REVISÃO SISTÊMICA****ECOLOGÍA DE RESTAURACIÓN Y DESARROLLO SOSTENIBLE: UNA REVISIÓN SISTÉMICA** <https://doi.org/10.56238/sevened2025.034-001>**Equiton Lorengian Grégio<sup>1</sup>, Daniele de Oliveira Lima<sup>2</sup>****ABSTRACT**

The article will be described on the following subject Restoration Ecology and Sustainable Development – A Systemic Review, where I will present the separate concepts of each one to better understand how both are grouped and tools with the same intention and definition, and equal objective. When we refer to restoration ecology according to the Society for Ecological Restoration International Science & Policy Working Group (2004), restoration ecology or restoration ecology is considered an international act, for initiating and accelerating recovery of an ecosystem that relates health, integrity and sustainability. The concept of Sustainable Development, according to ROMEIRO (2012), emerged with the intention of grouping the two sides, the introduced ones and, on the other side, the advocates of zero growth (economy). In this way, the work presented aims to show the challenges of the subject and the main problems faced. The research methods presented in the article were bibliographical research, after concrete data from recent authors, focusing on the chosen subject. We conclude that from the era of wars to the present, the environmental issue has suffered and still suffers a lot from the problems generated by human beings. In this way, it can be seen that with the new studies and the way of acting on issues of ecological psychology and sustainable development that involve the issue of environmental education, triggering new knowledge for people.

**Keywords:** Landscape Ecology. Ecological Restoration. Environment. Environmental Education.

**RESUMO**

O artigo será descrito sobre o seguinte assunto Ecologia da Restauração e Desenvolvimento Sustentável - Uma Revisão Sistêmica, onde apresentarei os conceitos separados de cada um para melhor entender como ambos são agrupados e trabalham mesmo intuito e definição, e objetivo iguais. Quando nos referimos a ecologia da restauração segundo Society for Ecological Restoration International Science & Policy Working Group (2004), restauração ecologia ou ecologia da restauração é considerada um ato internacional, por iniciar e acelerar recuperações de um ecossistema que relaciona a saúde, integridade e sustentabilidade. O conceito de Desenvolvimento Sustentável, segundo ROMEIRO (2012), surgiu com o intuito de agrupar os dois lados, os desenvolvidos e do outro lado os defensores do crescimento zero (economia). Desta forma, o trabalho apresentado tem por objetivo mostrar os desafios do assunto e os principais problemas enfrentados. Os métodos de pesquisa apresentados no

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artigo, foram pesquisas bibliográficas, atrás de dados concretizados de autores recentes, com foco no assunto escolhido. Concluimos que desde era das guerras até o presente, a questão ambiental sofreu e ainda sofre muito com os problemas gerados pelo ser humanos. Desta forma percebe-se que com os novos estudos e formar de atuação nas questões de restauração ecológica e desenvolvimento sustentável que envolvem a questão a educação ambiental, desencadeando novos conhecimentos as pessoas.

**Palavras-chave:** Ecologia da Paisagem. Restauração Ecológica. Meio Ambiente. Educação Ambiental.

## RESUMEN

Este artículo se centrará en el siguiente tema: Ecología de la Restauración y Desarrollo Sostenible: Una Revisión Sistémica. Presentaré los conceptos de cada uno para comprender mejor cómo se agrupan y cómo trabajan juntos hacia el mismo propósito, definición y objetivo. Al referirse a la ecología de la restauración, según el Grupo de Trabajo Internacional de Ciencia y Política de la Sociedad para la Restauración Ecológica (2004), la ecología de la restauración se considera un acto internacional que inicia y acelera la recuperación de los ecosistemas, vinculando la salud, la integridad y la sostenibilidad. El concepto de Desarrollo Sostenible, según ROMEIRO (2012), surgió para unir a ambos bandos: los desarrollados y los defensores del crecimiento cero (economía). Por lo tanto, el trabajo presentado busca destacar los desafíos del tema y los principales problemas que enfrenta. Los métodos de investigación presentados en el artículo fueron la investigación bibliográfica, buscando datos concretos de autores recientes, centrándose en el tema elegido. Concluimos que, desde la era de las guerras hasta la actualidad, la cuestión ambiental ha sufrido y continúa sufriendo enormemente por los problemas generados por el ser humano. De esta manera, es claro que con nuevos estudios y capacitaciones en los temas de restauración ecológica y desarrollo sustentable que involucren el tema de la educación ambiental, se desencadenen nuevos conocimientos para las personas.

**Palabras clave:** Ecología del Paisaje. Restauración Ecológica. Medio Ambiente. Educación Ambiental.

## 1 INTRODUCTION

The article will be described on the following subject Ecology of Restoration and Sustainable Development - A Systemic Review, where I will present the separate concepts of each one to better understand how both are grouped and work the same intent and definition, and the same goal. The research will be developed through bibliographic studies, with interest in the importance of the problem studied and solutions to it.

The next paragraphs will refer to definitions of the two concepts presented in the subject of the article, which are the ecology of restoration and sustainable development, to better define the concepts and then present them synchronized with the subject of the work: Ecology of Restoration and Sustainable Development - A Systemic Review.

When we refer to the ecology of restoration according to the Society for Ecological Restoration International Science & Policy Working Group (2004), restoration ecology or ecology of restoration is considered an international act, as it initiates and accelerates recoveries of an ecosystem that relates health, integrity and sustainability, that is, to show that due ecosystem is in need of restoration, because it has been degraded, disturbed, transformed or even completely destroyed, with direct or indirect actions under the actions of the human being. He also reports that these actions can even be impacts on the ecosystem in aggravated ways or caused by natural agents, such as fire, floods, storms, in a way that it cannot recover from on its own.

The concept of Sustainable Development, according to ROMEIRO (2012), emerged with the intention of bringing together the two sides, the developed and the defenders of zero growth (economy) on the other side. In this way, the studies were made based on economic growth, as its super high numbers were generating problems for natural resources, that is, a high level of pollution leveraging the health of the population. With this came the emergence of the first United Nations conference, referring to the environment.

The first problem we find is the challenges that occur for processes in environmental crisis, we realize that with all the progress that has emerged in recent years, ecological restoration has received little information, failing to provide important advances to be able to receive parameters of a general model, that is, it should have more access, not just greater possibilities of success of the cases, but rather to obtain monitoring indicators, with the capacity to overcome public policies (BARBOSA, 2019).

In São Paulo, the botanical institute uses a tool for areas that need restoration, the so-called CERAD (Special Coordination for Degraded Areas), which are planting techniques, monitoring in reforestation and projects on ecological restoration were used. All these methods aim to compensate the environment for the damage caused by large enterprises in the state. The objective of this tool is the dissemination of research information that facilitates and better qualifies the restoration processes in São Paulo, CARED, has a list to be followed where it shows the species that are indicated for local forest restoration, decision keys, list of nurseries that produce seedlings of native forest species in the state, List of native tree species. Forming a broad project with more concrete data and easy access to know how to start and maintain projects.

With data from IBGE (2004), it was presented that the largest environmental resource on the planet with a wide biodiversity, areas for agriculture and livestock, numerous hydrographic basins and a rich climatic diversity consolidated in a marine biome and six important terrestrial biomes, all found in the Amazon, Cerrado, Caatinga, Atlantic Forest, among others. It is being increasingly affected by production expansions.

MEIRELES (2021), reports the problems that occurred in restoration ecology approaches and SDG 15, which is a study carried out on the anthropogenic impacts generated in the Atlantic Forest. Studies have proven that anthropogenic actions in Brazilian biomes are being seriously intense, as they have large numbers of deforestation, for the expansion of productive areas, such as livestock or agriculture. But, on the other hand, the technologies of science, Brazilian institutions, are leveraging by generating large campaigns and projects to minimize and improve the issues of biomes in the face of agriculture and livestock.

In this way, the work presented aims to show the challenges of the subject and the main problems faced, where studies will be prepared on how these problems can be solved, reaching more concrete conclusions and showing which are the right ways to achieve them.

## 2 MATERIAL AND METHODS

The word Method comes from the Greek word *méthodos*, formed by two words *metá* which means in the middle of "through", between plus *odós*, which means "way". Thus, we can say that Method means along the way, that is, "way of proceeding along a path" (TRUJILLO FERRARI, 1982, p. 19). In science, methods are basic instruments,

where they initiate thoughts in systems, tracing in order to proceed of scientists along their path, thus achieving a goal (TRUJILLO FERRARI, 1982, p.24).

According to CERVO and BERVIN (2001), the meaning reported by both is that method leads to an order that imposed different processes necessary to achieve a desired result or end. In science, the method is understood as a set of processes that present investigation and demonstration of truths.

The research methods presented in the article were bibliographic research, looking for data from recent authors, focusing on the chosen subject, bringing more information about the reality, such as its difficulties and ways to achieve improvement, through data and research.

## 2.1 ENVIRONMENTAL EDUCATION (EE) IN SUSTAINABLE DEVELOPMENT

We know that the origin of Environmental Education (EE) emerged in 1946 by UNESCO, a UN body, which through debates on education issues in general led to the creation of EE, occurring globally and even government mobilization, we cannot forget civil entities. Its formation was post-war, with the objective of providing better social and economic conditions, ensuring peace between the parties.

After the initiative, the biosphere conference emerged, created in 1968 called MAN BIOSPHERE (MaB), with the aim of expanding knowledge and the relationship between humans and the environment. Promoting human practice and values in the implementation of good connections between the population and the environment of the entire planet. The conference was considered an initial milestone for the movements of the means of sustainable development.

In accordance with these principles, the work of EE in environmental issues is inevitable, where it encompasses children, young people and adults. The Stockholm conference states that the parties involved are close to obtaining environmental relations, so that both obtain socioeconomic development.

## 2.2 BELGRADE CHARTER ENVIRONMENTAL ACTIONS

According to the Belgrade Charter, it presents the basic methods of environmental actions, which would be the best to have an optimal relationship between human beings and the other elements of nature. Developing a more environmentally conscious and concerned population

that lives there, taking into account the problems that lead to knowledge, skill, motivation and attitudes in commitment in individual and collective actions for the search for solutions to both problems to improve and prevent the emergence of new ones.

EA's objective according to the Belgrade Charter takes into account the following:

**Table 1**

*Objective of the EA – belgrade charter*

Awareness	Contribute to the individual and group taking into account the awareness and sensitivity towards the environment.
Knowledge	Get comprehension basic upon or middle environment, especially regarding the influences of human activities.
Attitude	Have value acquisition and motivation to enforce participation active in protecting the environment and solving environmental problems.
Skill	To provide conditions for individuals and social groups to acquire the skills necessary for this participation.
Evaluation capacity	Stimulate evaluation of the measures taken in relation to the environment and environmental education programs.
Participation	To help individuals and groups develop their responsibility from urgency with relation to environmental issues.

Source: Authors (2022).

The Belgrade Charter took a very unrealistic view leading to frequent criticism, but it is still considered one of the most important documents for EA regarding the terms of the concepts used, the associated guidelines on sustainable development. It shows that the terms have been ratified by the EA conferences.

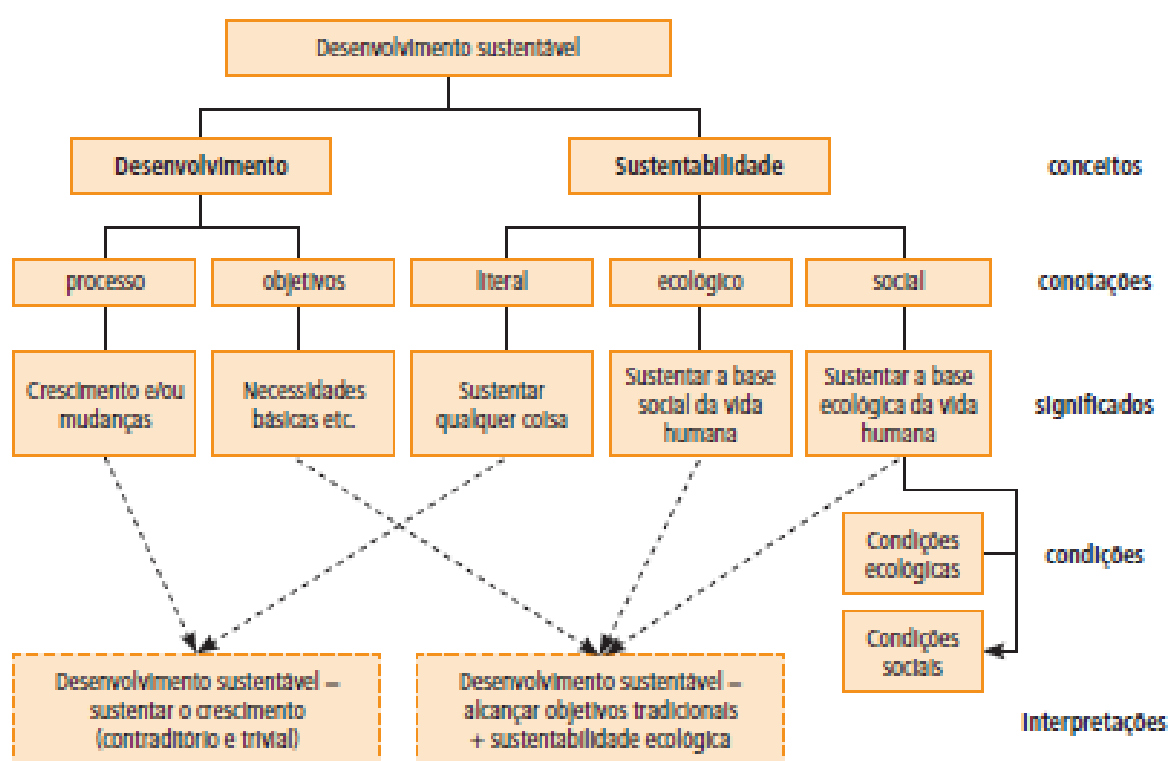
## 2.3 EDUCATION IN SUSTAINABLE DEVELOPMENT

We know that poverty is considered one of the factors of environmental degradation, according to (WORLD BANK, 1992, p.67), shows important opinions about decision-makers, expresses this opinion several times, for example, states that low-income families, in order to meet their short-term needs, harm natural capital, that is, they deforest more than they can replace. In this way, leading to having a fallacious thought, mind you, these families are increasingly trying to defend themselves that lead them to act in such a way because they see that it is the best option to choose. However,

it should be noted that the main cause of degradation is associated with the excessive consumption of affluent segments of society.

Ten years later, the World Summit on Sustainable Development (WSSD, 2002 – RJ - JOHANNESBURG), better known as Rio+10, was held. It aims to take into account five specific issues, they are: water and sanitation, energy, health, agriculture, biodiversity and ecosystem management. But of course, other issues were also considered, such as poverty, globalization and the problems of Africa. In the end, an implementation plan was drawn up consisting of 153 recommendations for the fulfillment of Agenda 21, and the principles found in the Rio+10 declaration on Environment and Sustainable Development (SD).

**Figure 1**  
*Sustainable Development*



Source: Lélé (1991).

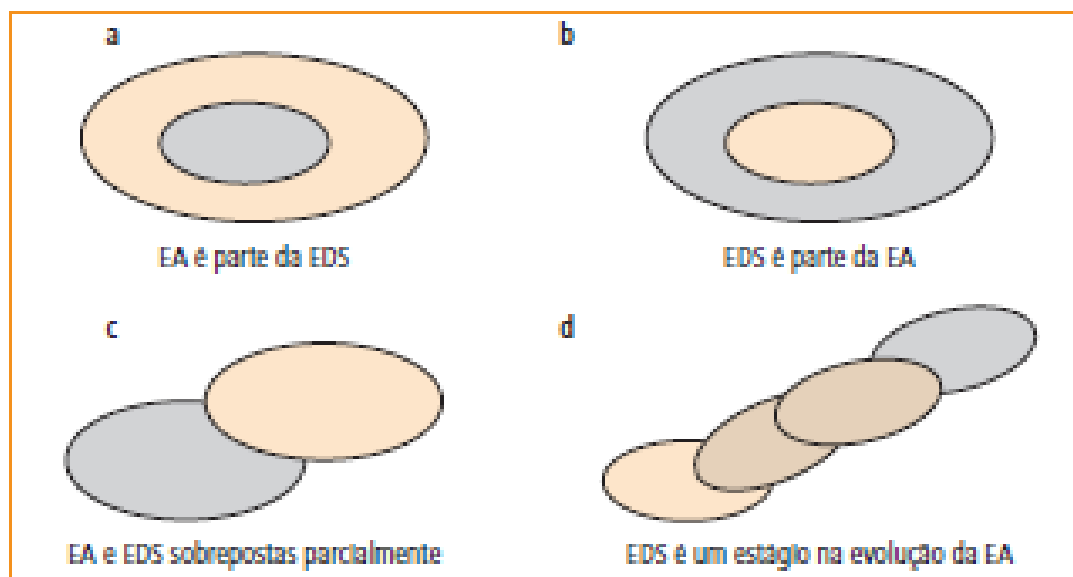
In 2003, the United Nations General Assembly (UNGA) adopted these recommendations, where it recognizes that education is irreplaceable for the SD, proclaiming the UNUEDS (United Nations Decade of Education for Sustainable Development), designated to UNESCO to be responsible for its promotions. The goal of Decênio is that from 2005 to 2014 is the deadline to provide learning to all. DNUEDS,

mentions that the planetary dimension project aims to meet all the basic needs existing in the present, that is, without harming future generations.

Among these documents and others, Education for Sustainable Development (ESD) proposed the complementary reformulation of education on a global scale, so that there would be a alignment with the objectives of the UN conferences triggered in Stockholm (1972), related to the environment and development. The ESD presents four perspectives in relation to EE, figure 2.

**Figure 2**

*Perspectives on the relationship between EE and ESD*

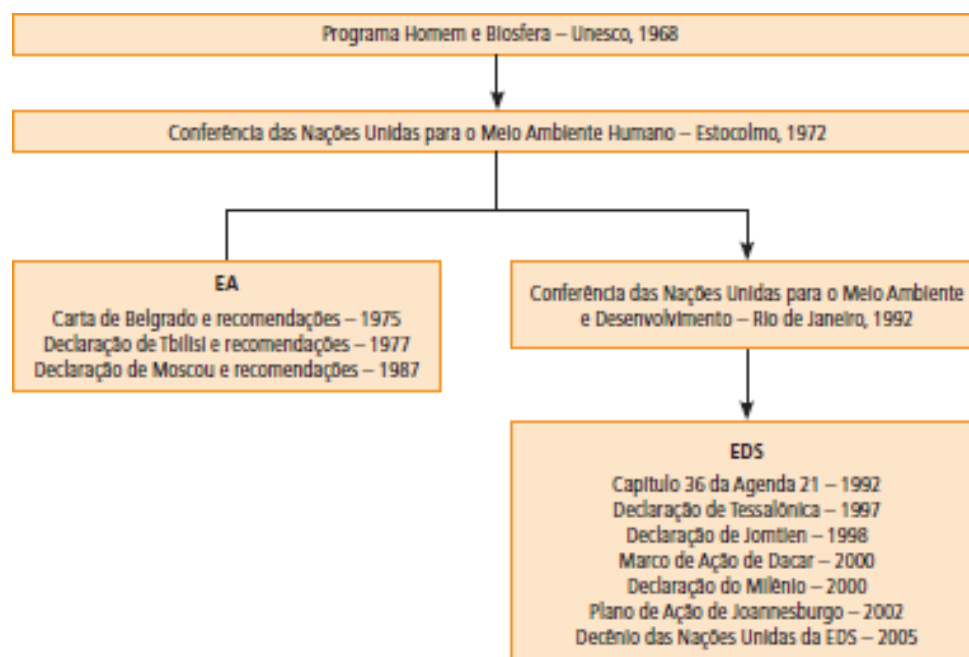


Source: Hasselink, Kempen and Wals (2000, p. 12).



**Figure 3**

*Trajectory of EA and ESD*



Source: José Carlos Barbieri (2011).

## 2.4 RESTORATION ECOLOGY

Ecology Restoration emerged with the intention of an activity that initiates or accelerates the recovery of a damaged ecosystem, whether its health, integrity and sustainability. Ecosystems have needed restoration consequently because of some degradation, disturbance, transformation or because they have been entirely degraded directly or indirectly by humans. Some of these cases can also sometimes be caused by natural agents, such as fire, floods, storms and even volcano eruptions, causing the ecosystem to be unable to reverse the situation.

**Figure 4**

*Ecological restoration*



Source: SER 2004.

According to SER (2004), it explains:

Some ecosystems, particularly in developing countries, are still managed by traditional, culturally sustainable practices. There is a reciprocity in these cultural ecosystems between cultural activities and ecological processes, so that human actions reinforce the health of ecosystems and sustainability. Many cultural ecosystems have suffered from population growth and external pressures of various kinds and are in need of restoration.

With these definitions, SER International (2004) presents nine attributes to determine whether a restoration has been complete. These attributes show the appropriate path for the development of the ecosystem to achieve its goal. Some of these can be measurable while others are evaluated indirectly by research. Below is the list and its explanations.

1° The ecosystem that has been restored has a set of species characteristics that it obtains as a reference to restructure a community.

- 2° The restored ecosystem is formed by native species on the largest possible scale of the site. Because when cultural ecosystems are cited, exotic, ruderal species can be allowed, as long as they are not invasive or segetal. Ruderal are plant species that colonize areas that have been disturbed.
  - 3° Groups in general that assume the continuous development or stabilization of the restored ecosystem are represented by groups with the potential to colonize by natural means.
  - 4° The environment of this restored ecosystem may be able to sustain some reproductive populations, for their stability or development along the trajectories.
  - 5° This ecosystem visibly functions in a normal way for an ecological stage in development with no signs of dysfunction.
  - 6° A restored ecosystem is integrated by a broad landscape or ecological matrix, where interaction occurs through biotic and abiotic exchanges and flows.
- Threats that occur to the landscape or the health or even the integrity of the restored ecosystem are eliminated or even reduced as much as possible.
- 8° The restored ecosystem is resilient for the purpose of withstanding normal and periodic stressful events in the environment, serving to maintain the integrity of the ecosystem.
  - 9° It is self-sustaining for the restored ecosystem to the same degree so that the ecosystem has the capacity and potential to persist the existing environmental conditions. As its aspects, biodiversity, structure and functioning, there may be changes according to the normal development of the ecosystem. In this way like any intact ecosystem, the compositions of the species and other attributes of the ecosystem.

In this case, we can observe that a restored ecosystem serves to obtain natural capital, where they generate an increase in these goods and services, or even propose habitats for rare species, which need protection from a set of several selected species. They can also include offers of aesthetic services or social activities, such as strengthening the community itself.

### 3 RESULTS AND DISCUSSION

The objective of the article presented was to show the challenges of the subject and the main problems faced, showing the ways that were used to solve the problems, reaching more concrete conclusions and showing the right ways to achieve them. To better express the ideas of the subject of the work, research was carried out on aspects of the Historical

Aspects of movements around the world regarding the environmental problems faced at the time and today. Bringing the real importance of environmental education applied to the chosen subjects and how it helped to change historical landmarks.

For the emergence of sustainable development, the application of EE to the population was some expressly important, because according to WOLD BANK, poverty is one of the factors that most help pollution, deforestation "destruction of the most precious good, the environment", that is, we realize that through this idea the reality of many people is terrifying, because we observe and draw conclusions that sometimes it is the only way for them to get a little income to bring food to their table, or we can report that people of greater power use them not to be involved in the case.

This issue and others are often due to lack of knowledge about the environmental area, due to this lack of learning they lead to large losses of ha (hectares) of areas destroyed, devastated and even lost to endless wars. But we were able to notice that due to the broad aim of UNESCO (UN), after war and all other destructions, they created EA (Environmental Education), focused on SD (Sustainable Development), which was something so well planned and applied that governments and civilians carried it out, achieving the long-awaited improvement and expansion of knowledge for many.

With these initiatives and the emergence of conferences, it provided the human being with the value and practices of implementing this valuable knowledge, being able to present the great connections that the population can have with the environment without affecting it, motivating to have a complete planet, together with EA and DS. In this way, it determines that everyone can develop their economic activities while involving environmental and socioeconomic relationships in their daily lives.

Now when we analyze the idea of Belgrade, where it presents the most basic methods on environmental actions, it shows how easy and effective the practices are. Because it is with these methods in practice that we can develop a population that is more aware and concerned about the resources that are available. With these methods we can report that people become responsible for their actions even before acting, because they have realized the problems that can be generated by such attitudes and that many times may not be reversed, that is, they learn that the knowledge they receive is a set of commitments, both individual and collective.

As everything is connected, we cannot leave aside the issues of ecological restoration, because with all these methods and knowledge that the proper authors pass on to people, they are already aware of the ecology of restoration, as SER already reports that this



The subject is an activity that can be done together with a society, it does not only need to be done by people trained in the area, because this is something that together they can enjoy new knowledge as well as bring to researchers the reason for that ecosystem to reach the proper bridge, and what were the reasons to lead to the consequences found.

Finishing the analysis of all these authors, we can define that they all pass on a little knowledge, and that they are eternally remembering, because everything that is done has a consequence, and the environment often ends up being affected by greed or even greater interests, leading to the total loss of it. With this we understand the great importance that the population has in intervening in these actions, to prolong the life of that ecosystem, and at the same time enjoy it with their acquaintances.

#### 4 CONCLUSION

We conclude that from the era of wars to the present, the environmental issue has suffered and still suffers a lot from the problems generated by human beings. Problems that often cannot be reversed to return to their natural state. But it is clear that with the performance of environmental education, deforestation, pollution, fires, and several others, can be minimized, not solved as a whole. In this way, it is perceived that with the new studies and training of action in the issues of ecological restoration and sustainable development that involve the issue of environmental education, triggering new knowledge to people, from their childhood to become adults. Making a population more aware of the issues of caring for the environment, a care that is not only about knowing everything about: waste separation, recycling, not deforesting, not affecting natural habitats, restoring weakened ecosystems, but also being able to make the little they know available to others, forming a barrier and thus strengthening care for the environment. Because every act always generates a consequence and because of these mistakes we need to change, to become a better world.

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