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Article

Sustainability and Economics: The Environmental Valuation Controversy

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Abstract: On sustainable development, a fundamental controversy is a value assigned to environmental goods and services. Economics approaches it from two perspectives: the traditional neoclassical approach (environmental economics) and another, more comprehensive one, where different sciences converge (ecological economics). This work offers a critical review of conventional economic theory associated with sustainable development, also highlights the need to assign values to environmental services for better decision-making, in which individual and social preferences are considered, thereby it would advance towards the central goals of sustainable development: economic efficiency, social justice, and ecological sustainability. This paper's main contribution and novelty are to frame a discussion about the controversy between the various disciplines involved in the commensurability of nature. This link is a necessity of today's world and must be considered an important issue to enhance sustainable development.

Keywords: sustainable development, ecological economics, environmental economics, Green Economics, Sustainable economics.

1. Introduction

One of the greatest challenges facing humanity today is harmonious coexistence with nature. It is impossible to conceive of the human being independent of the resources that the environment provides; its nourishment, and all the material inputs that sustain the production of goods and life itself, are supported by the earth's ecosystems, hence the importance of conserving them. On the other hand, the demands of the population go beyond meeting their basic needs, including improvement in comfort levels and, in some sectors, the accumulation of wealth. This, together with the inadequate administration of natural resources, has caused the alteration of practically all ecosystems and the consequent impact on human well-being. Any attempt to explain this process refers to a review of the origins of development, whose evolution responses have emerged to improve social well-being without deteriorating resources, such as those offered by the sustainable development paradigm.

A study [1] analyzing the effectiveness of environmental programs and regulations requires comparing the costs and benefits of reducing different pollutants or further abatement. To make useful comparisons, the various benefits from reduced pollution must be translated into dollars. Unfortunately, estimating the dollar value of environmental damages is complicated, controversial, and generally uncertain. Often these estimates have been misused. This paper identifies the need for benefit estimates, shows how they are constructed, and demonstrates how they can be used to improve environmental policy analysis. Another study [2] revisits the controversy on the economic valuation of ecosystem services in the light of two aspects that are often neglected in ongoing debates. First, the role of the particular institutional setups in which environmental policy and governance are currently embedded in shaping valuation outcomes. Second, the broader economic and sociopolitical processes that have governed pricing expansion into previously non-marketed areas of the environment. Another book chapter [3] considers the triple bottom line (TBL) concept coined by John Elkington, and now common currency recognizes that corporations add economic value (hopefully) and impact on social and environmental value-added. These concepts correspond to the three pillars of sustainable development, which economists often interpret as economic, social, and environmental capitals. Another research[4] reflects on the extensive literature on environmental sustainability that has been produced over the last two decades and proposes a new approach for environmental policy that goes beyond the cost-benefit analysis that has proved so difficult to implement for non-marginal environmental issues.

As the scale of the global economy continues to grow, demands on ecosystems are increasing, and there is more evidence of an unprecedented global socio-ecological crisis that manifests in diverse but unequivocal ways. Examples of current unsustainable patterns in ecosystem management include the overexploitation of natural resources[5], deterioration of environmental services[6],

climate change[7], and the loss of biodiversity[8]. Given societal priorities for continuous economic growth, difficulties are arising in fulfilling demands for multiple ecosystem services. As highlighted in the Introduction, ecosystem management needs to account for the multiple trade-offs across ecosystem services and scales, among beneficiaries and between periods. Examples that illustrate the unavoidable trade-offs between current patterns of consumption and production and its various ecological impacts are the expansion of oil palm plantations in the tropics[9], international carbon sequestration policies, e.g., REDD+[10] and the expansion of other commodity frontiers in the Global South[11]. The assessment of alternative policy options dealing with social-ecological trade-offs is a complex issue, given that relevant aspects of decision-making cannot be captured from uni-dimensional perspectives[12]. The economics community has devoted significant intellectual effort to develop extended (environmental) cost-benefit analysis hinging on monetary valuations of the environment. The field of valuation is one of the cornerstones of environmental economics and is generally considered the most appropriate framework for determining optimal economic decisions in the realm of ecosystem management[13]. The treadmill of monetary valuation, cost-benefit analysis, and marketing of ecosystem services is attracting increased recognition in environmental governance[14], whereby economic efficiency is placed at the core of ecosystems management[15].

Theoretical developments have been built around this aspiration or ethical principle that takes up some basic economic science postulates. Sustainability is approached fundamentally through two approaches: environmental economics, based on neoclassical economic thought, and ecological economics, which constitutes an eclectic perspective by taking up premises from different sciences such as economics, biology, ecology, and sociology. The first approach is distinguished by its proposal based on property rights and the need to assign prices to all goods and services, including nature and its derivatives, while the heterodox approach (ecological economy) questions extreme commensurability. The objective of this article is to analyze, based on the review of the principles of sustainable development and the associated economic theories, the feasibility of assigning values to the goods and services of ecosystems and thereby contribute elements for the discussion about the controversy between the various disciplines involved in the commensurability of nature.

2. Towards a definition of sustainable development

The development model that has prevailed for more than a century has modified human dependence on nature. This model has resulted in strong pressure on natural resources that is evidenced in environmental degradation, characterized by erosion, desertification, deforestation, loss of biodiversity and soils, as well as by pollution of water, air, and soils, generating various problems social issues such as poverty, malnutrition, unemployment, and violence. The degradation arises since the human being begins to use highly energy-consuming technological processes in agriculture, but it intensifies after the industrial revolution, which leads to a consequent social problem [1]. At that time, the relative abundance of resources and scarcity was no longer limited to land, but capital made it possible for the economy to abstract from the physical world and reduced it only to those objects of utilitarian value for the human being.

Both specialists and society came to conceive a world without physical limits. Economic growth became the primary objective. The essential thing was no longer the satisfaction of human needs but the accumulation of wealth, which generated a dynamic appropriation of natural resources [1]. A productivist economic development model emerged, whose features are still in force, whose fundamental premise is economic growth. According to this paradigm, any problem can be solved with technological advances [2]. Man's relationships with nature are based on an anthropocentric ethic; that is, the human being is the only one with the right to decide what has value, which is established based on the utility that he provides [3]. Towards the sixties of the last century, economic growth was the main objective of the countries; greater development should imply greater well-being. However, even with the growth of economic indicators, social problems and those related to the degradation of natural resources were increasing. It was evident that the existing system promoted economic and social inequality, as well as damage to the resources of the biosphere, endangering their permanence. In the 1970s, various analysts began to insist on the need to propose a new development model. In 1987, the World Commission on Environment and Development proposed the integration of environmental conservation into the objectives of social and economic development under the label of sustainable development through the Brundtland report Our Common Future, which defined it as "one that meets the needs of the present without compromising the ability of future generations to meet their own" [4]. The need to integrate economic, ecological, and social processes into the analysis has required the attention of different disciplines, which has led to different definitions and, although divergences persist in terms of content, many of them focus on ethical and moral development. Some have as a priority to influence well-being; others advocate more for the defense of ecological sustainability. However, and following the foundations of this approach, the majority assume that sustainable development must be balanced in three basic dimensions: social, economic, and ecological or environmental, which would allow fulfilling the ethical and social purpose of the development, and with a more efficient provision and management of resources,

where social planning and the proper use of environmental resources would be applied, in addition, life support systems would be maintained.

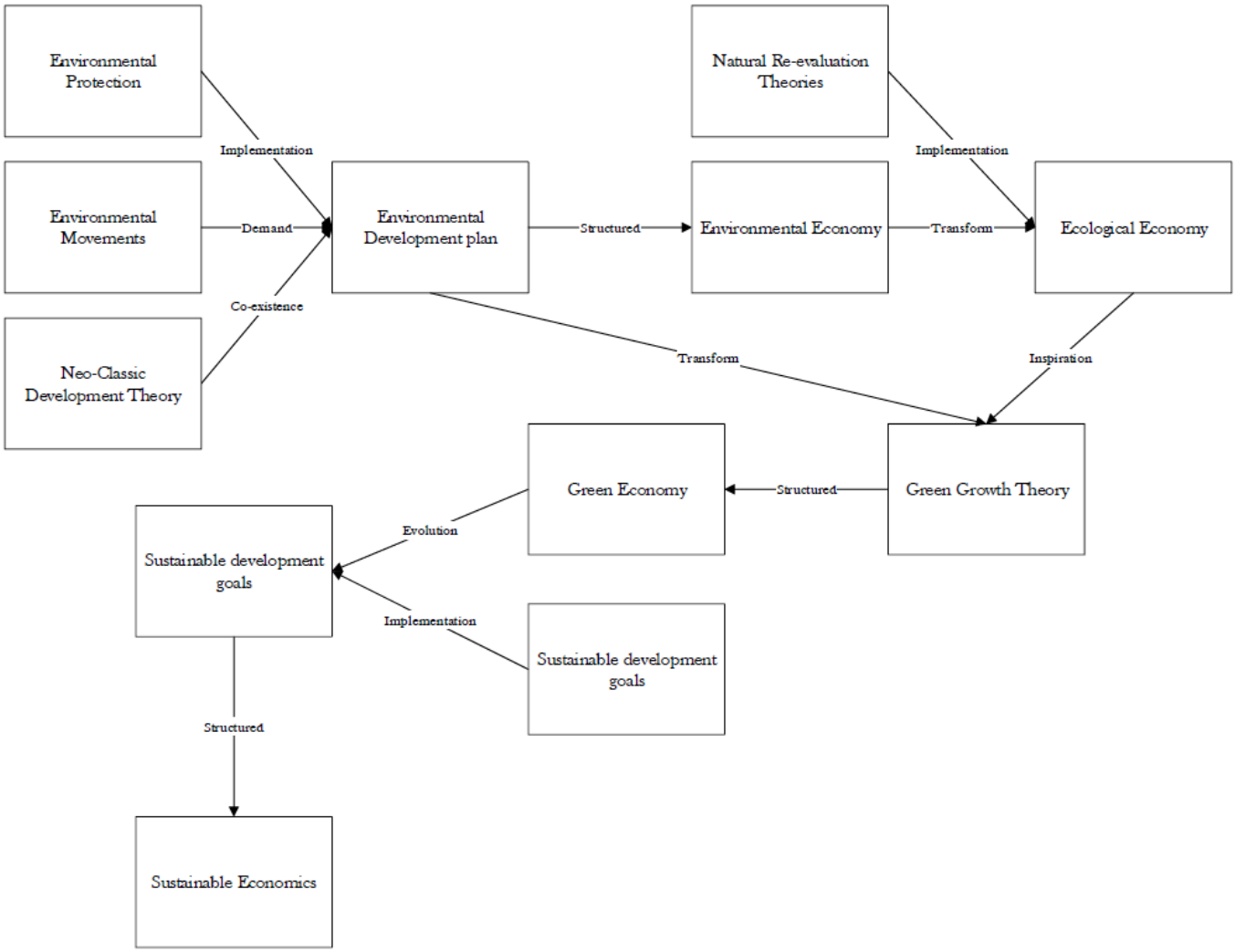

Fig. 1. Evolution of green movements to sustainable economics

The principles of sustainable development are an integrated approach, or with an interdisciplinary vision and solidarity with future generations, it must be equitable and fair; joint participation of the population is required to influence decision-making; The planet's capacity for regeneration and assimilation must also be considered, hence the need to conserve ecosystems. The limits of current development are not found in the technology and the number of existing resources; they have to do with social inequality, the intensity of using natural resources, and the planet's ability to absorb the waste resulting from production and consumption. The sustainable development process as such is based on a healthy economy with social equity and environmental quality; Its objectives must focus on eliminating poverty and maintaining the economy in its optimal ecological size, that is, regulating the rate of use of resources so that it does not exceed its growth or replacement rate. Sustainable development, in this sense, goes beyond being a scientific-technical principle; it is a normative principle that intends that human life can be perpetuated. According to Costanza[1], it is a philosophical, ethical concept that relies on different sciences to explain and achieve its ends; its approaches demand the management of complex systems since solutions to long-term global problems involve many disciplines and connections between them are required.

3. Environmental economics and ecological economics

The different development theories have been based on economic doctrines. Hence it is impossible to separate them from the economic dimension [1]. Sustainable development uses the tools of the economy to become operational, that is, to put into practice the elements that make it possible to achieve this aspiration or ethical principle, which it does through two approaches or approaches: environmental economics and ecological economics. According to some authors, such as Jiménez-Herrero[5], this type of development goes beyond conventional economics and is better adapted to the ecological economics approach. Both approaches are described below, which aim to integrate nature into the economy, although they differ.

3.1. Environmental economics

Towards the end of the fifties and the beginning of the sixties of the last century, in the face of the deterioration of nature attributed to the evolution of the economy, economic science recognized, in the debate on development, that natural resources could constitute a restriction for growth, for which a new relationship between physical resources and the economy was necessary [6]; This is how environmental economics arises, with this new theoretical approach, the nature variable was incorporated into the market without renouncing the objective of economic growth.

According to Riechmann, the biosphere performs three indispensable and irreplaceable functions: an essential source of life and habitat for living species, a storehouse for energy and raw materials, and a waste dump. However, under the prevailing economic paradigm, it is assumed that raw materials from the environment are inexhaustible and waste products irrelevant. This idea encourages that the services provided by the environment do not have a price because there are no specific markets for their exchange [7]. According to this approach, the non-existence of markets in this type of goods and services is explained by the absence of well-defined property rights, as in public goods (the air we breathe or the ozone layer) and common resources. (open forests or unregulated aquifers), both are characterized by non-exclusion; that is, no one can be excluded from their enjoyment. However, they differ because there is no rivalry in consumption since their use does not reduce its availability, while it does in the second [8]. The problem with common resources arises when they are freely accessible, which implies that their use has no cost, but unlike public goods, their depletion or degradation is possible due to rivalry in consumption and lack of regulation availability. The market does not indicate the value of environmental resources, and hence in many cases, they are considered free because their use and enjoyment do not have any monetary cost. When this happens, the cost of appropriation of a good or degradation of service is paid by society; that is, they become hidden subsidies that prevent us from perceiving the importance of conserving resources. The economic system considers this situation an externality because it occurs when one person's activity affects the welfare without the latter charging a price for it if it is negative or positive [6]. Environmental economics proposes to convert these negative externalities on a scale that is comparable to the elements of the economic system; For this; it proposes the use of some techniques that allow assigning a price to environmental goods and services, which will be useful when designing specific instruments such as taxes, subsidies; or, for its direct integration at a price. In this way, these negative externalities would be internalized, and environmental degradation activities or actions would be discouraged. Environmental assessment is the tool that allows such an assignment.

Environmental economics has been known as the neoclassical economics of natural resources and environmental pollution, and it is considered an extension of conventional economics [9]. According to some authors, such as Aguilera-Klink and Alcántara [10], this approach does not constitute a critique of the current economic system but rather represents a specialization within neoclassical economics. According to Azqueta, it is not about environmental economics trying to make the market define the quality of the environment with which society wishes to live but to use the logic of the market to discover its value and where it would like to go. Society in terms of environmental quality

3.2. Ecological economy

Ecological economics emerges as a critique of the approaches of environmental economics, and it casts doubt on the part of the instruments of conventional economics on which it is based, given the evidence of its failure. It aims to delve into those social and ecological aspects that conventional economics has not considered by integrating economic and ecological processes based on efficiency and equity criteria [11]. The ecological economy was born properly as a branch of the economy in the eighties of the last century when theoretical divergences arose in environmental economics regarding the role of the substitutability and monetarization of natural resources [1,12]. The first contributions stem from the critique of neoclassical theory made more than a hundred years ago by Sergei Podolinksy, Patrick Geddes, and Fredrick Soddy, who tried to incorporate energy flow analysis into economic studies; later, Nicolas Georgescu-Roegen proposed his work The entropy law and the economic process which, despite criticism, constituted the basis of the paradigm shift. This work indicates that the degradation of energy, through the phenomenon of entropy, is irreversible, a postulate that becomes the main theoretical foundation of this approach [13]. From this perspective, the economy

depends on the presence of ecosystems for its existence. Hence the survival of physical and biological processes has priority over profitability, regardless of people's perception; Its purpose is to study all the objects that make up the biosphere and natural resources, which do not necessarily provide any utility to human societies: the value of environmental resources is intrinsic to them.

Ecological economics focuses on the physical nature of resources and their link to interrelated systems; it takes into account the scarcity and the renewability of the same to the harmfulness and the possible recycling of waste generated; It has the purpose of guiding the institutional framework and generating solution proposals [14]. Given the complexity of the dynamic interrelationships between the economic system and the physical and social systems, this approach seeks to study problems in a transdisciplinary way to construct responses to environmental and social problems. From the convergence of different disciplines, various contributions to economic theory have been developed that lead to sustaining that ecological economics proposes, rather than modifications to the predominant economic system, a conceptual reconstruction of the economy [15]. Ecological economics is considered as the current paradigm and as the science of sustainability management [16]; This part of the premise that the global ecosystem (the earth) is finite and has limited capacities for assimilation and regeneration focuses on the interaction of economic, social and environmental systems within the framework of equity, distribution, ethics, and culture. If the economy is considered a subsystem within the global ecosystem, open to the exchange of energy, matter, and information, then it is assumed that it is subject to the laws of nature. Thus, ecological economics is based on three basic biophysical principles: The first law of thermodynamics states that matter and energy are neither created nor destroyed; they only transform; that is, they remain constant in a closed system (like the earth). This implies that when extracting resources or using energy, they must return in some way, at some point, and in the same proportion; therefore, the production and consumption processes will always be accompanied by the generation of waste [17].

The second law of thermodynamics, or entropy, states that matter and energy continually degrade in one direction, from usable to unusable or from available to unavailable. Therefore, an increase in entropy equates to a decrease in available energy. Every time a process is carried out, a certain amount of energy is dissipated, irretrievable, and therefore will not be available to carry out any future work. Thus, what gives value to matter or energy is its availability to be used. The main sources of energy on our planet are fossil hydrocarbons that, when used, lose the possibility of being reused, which implies their imminent depletion [18].

The third principle refers to the impossibility of extracting more resources than nature can regenerate and generating more waste than nature can assimilate. In this way, the global system is limited by the laws of thermodynamics; the world is finite, which implies the irreversible depletion of resources and the services they provide. That is why the degree to which economic activity must operate will be defined by scale, that is, by the capacity of ecosystems to support it. One of the elements that differentiate environmental economics from ecological ones is precisely scaled. Ecological economics emphasizes the production times of nature, in contrast to the production times of the economic system. The destruction of nature is expressed in the difference between economic time and biological time, controlled by nature's rhythm (regeneration of resources and absorption of waste). If the goods and services of nature are introduced to the market, this difference will be altered, which will result in a high rate of deterioration, where economic time triumphs over ecological time [19]; For this reason, some authors, within this same approach, disapprove of the use of monetary valuation. Authors such as Ehrlich and Ehrlich have considered that the main ecological problem is overpopulation, a position that has been highly criticized by those who argue that assuming this would indicate that natural resources are insufficient to satisfy the population; This criticism would be meaningless in the face of the real fact that, even in the case of abundant resources, their indiscriminate use would end up using them up[20]. The real problem then lies in consumption because although human needs are finite and should be similar for any human being, societies have modified them according to their historical-cultural condition. However, for some authors, the decrease in consumption would imply the decrease of the economy and, therefore, the system's collapse [21]. Costanza proposes exploring models where central economic, ecological, social, and political planning. The problem of substitute goods is not solved by finding new lifestyles but by reconfiguring these, particularly those who obtain higher incomes. ; Likewise, it would also be necessary to consider sustainability as essential for subsistence[21].

In this way, ecological economics can be considered a critique of conventional economics since it incorporates a new way of visualizing and assuming the relationships between physical and social systems; Furthermore, its transdisciplinary nature allows us to understand the interrelationships of complex systems and visualizes nature as an ordered set of ecosystems that need to be widely known to guide management. It is based on physical knowledge of the biosphere to support monetary valuation and decision-making by economic agents. Its foundations are equity, ethics, and justice, values that it takes up to understand sustainability and proposes to measure it through biophysical indicators as a complement to monetary ones. It incorporates those aspects hidden by the price system in the analysis, implying undervaluing environmental resources and processes and their repercussions.

3.3. Contrasts and concordances between both approaches

While environmental economics builds valuation only on objects that provide well-being to society or are useful to it, ecological economics extends the analysis to the rest of economic objects that cannot be translated into monetary units and complements valuation with the physical measurement of resources in cases where monetary values are not valid. According to authors who adhere to the ecological economy paradigm, such as Naredo and Martínez-Alier and Roca-Jusmet, environmental economics incorporates the transformation of the natural environment as a problem of allocation of scarce resources and encourages their monetarization. This contrasts with the postulate of the second law of thermodynamics, which states that all material transformation is irreversible and gives rise to physical waste and dissipated energy generation[22, 23]. In addition, they consider that the monetary valuation of externalities is applicable only in the case of reversible phenomena (such as water pollution, which can be cleaned). Still, the value assignment does not proceed in the case of irreversible ones (such as the extraction and depletion of a resource) or where energy processing or dissipation was involved.

Other criticisms from the ecological economy point out that the environmental economy assumes that nature is constituted only by natural capital, thus leaving aside the complex functions arising from the interrelation of that capital with energy flows to which no value can be assigned to them. A central criticism is that this does not prevent deterioration even when the assigned monetary values are very high. On the other hand, the greatest difference between approaches is the scale measurement when assigning values, since, through this, importance is given to the assimilation and regeneration capacity of the evaluated system. The ecological economy proposes to take as a reference a sustainable scale; that is, it does not erode the environmental carrying capacity over time[24].

Environmental economics has considered incorporating the natural environment as a problem of resource allocation. However, it does not contemplate the physical-chemical laws of nature. As noted, the second law of thermodynamics establishes the irreversible degradation of matter and energy that gives rise to physical waste and dissipated energy. This implies that ultimately, it is a problem of equity and degradation and loss of energy resources. In this framework, the waste generation should be less than the assimilation capacity of the ecosystems and the extraction less than its sustainable or renewable yield, which is hardly the case today. On the other hand, environmental economics implies changes induced by incorporating environmental aspects into decision- making, a top-down strategy. In contrast, ecological economics entails modifications from society, which implies a strategy from the bottom up [25].

According to the ecological economy paradigm, technology must be harmonized with sustainable development, and advances in this field are necessary for the generation of clean technologies aimed at increasing the productivity of resources; that is, to generate a greater volume per unit of resource, as well as to venture into the design of products and processes that facilitate recycling [26]. In contrast, environmental economics considers that resources do not have to be limited, since once they become scarce, technological innovations aimed at satisfying human needs will take place [27]. This approach assumes perfect substitutability between natural and produced capital and requires sustainable growth that considers the non-reduction of per capita consumption through the optimal use of resources and technology [28]. One of the most marked differences between the two approaches has to do with territoriality. In the ecological economy, the data obtained for assigning values must be linked to a reference territory. Hence, the use of cartographic tools such as geographic information systems is essential. In the conventional approach, focused on rationality, a dimensionless world is conceived that evolves regardless of specific territorial references and considers figures the most appropriate working instruments. Despite the differences between approaches, it is important to admit that their common objective is to know and understand the human-economy-environment interaction, which leads the economy towards sustainability [29]

4. Discussion

4.1 The valuation

The value is defined, in general, as the degree of utility or aptitude of the things to satisfy the needs or to provide well-being or delight. Human beings give value to different elements based on our conception of the valued object's needs. If we consider that the environment provides a wide range of values that positively affect well-being, we can say that it acquires value for society [2]. According to environmental economics, these values, given their utilitarian nature, can be integrated into the economic system. However, beyond their use, the true value of ecosystems lies in their ability to fulfill important ecological and environmental functions that, even when they do not have a utilitarian value, are fundamental for life and provide essential goods and services to satisfy the needs of the ecosystem. Human needs and their development; this capacity has been diminished by the intervention of the human being himself. Although the renewable character allows ecosystems to re-establish themselves, the population's needs have exceeded the time required to make it possible, so the quality and quantity of the services they provide have decreased to such

a degree that in some cases, their alteration is irreversible. Environmental valuation emerges as a tool of environmental economics that considers it useful to value the services provided by ecosystems and their impact in monetary terms. That is, an attempt is made to assign quantitative values to the goods and services provided by environmental resources, regardless of whether or not there are market prices that allow doing so, to generate indicators that account for the importance of these resources for society [30]. According to the main authors of this paradigm, the fact that services are intangible and problems are evaluated in physical terms does not mean that it is impossible to do so in monetary terms. Those who maintain the convenience of using this tool, although they consider that some elements of the environment are invaluable, affirm that by not valuing them, they would fall into the error of assuming that their value is zero, and thus they would be excluded from decision-making. Hence the need to estimate the values to have elements that allow comparing environmental factors with social and economic ones, even when there is a risk of assigning values lower than the real ones.

4.2. Monetary valuation and commensurability

Valuation is the process of estimating and expressing a value for a particular stock or object; in the environment, this process focuses on allocating monetary value to goods and services of an ecosystem. It is a controversial tool since there are various questions about the allocation of a price to nature; The difficulty or impossibility of measuring its intrinsic value is argued and the inability to assign values to future social costs due to the uncertainty of the processes. However, according to the environmental economics approach, monetary valuation constitutes an indispensable instrument to advance towards the balance between economy and environment. For the ecological economy, on the other hand, it is necessary to move from market values to a type of these that reflect the intrinsic value of nature, based on its very existence and on the environmental services it provides; in this way, the short-term vision would be overcome to transcend future generations.

Despite the differences in the appraisals of these approaches regarding the value, it is clear that they are used in both, although with a different vision [31]. Authors such as Castro e Silva and Teixeira suggest that social change concerning the environment strongly links values[32]. It is possible to find a large number of indices to measure various aspects of sustainability [33-35]; however, according to Gasparatos and Scolobig, when using composite indicators, it is not It is possible to make a specific assessment of the role of human beings, as is the case with biophysical or economic indicators, since notions of value are lost during the normalization and aggregation of the elements that make them up[36]. In recent years, market-based instruments have been adopted at the regional level to assess the condition of regions. However, valuation remains a great challenge; A wide knowledge gap persists about biophysical and ecohydrological relationships that should serve as the basis for reliable modeling. Identifying the ecosystem services provided by a region and assessing their contribution to human well-being is a daunting task [37]. However, progress is being made in the design of instruments that consider spatiality and integrate the available economic and biophysical information and thus allow the generation of reliable values to estimate the integral value of territories or regions. This assessment not only makes it possible to incorporate such values into the economic system but also provides additional information to assess how they vary across space and how, through them, it is possible to influence the design of policies that promote the recovery and increase of the capacities of environmental services and, consequently, a favorable impact on social well-being [38, 39].

According to Haro-Martínez and Taddei-Bringas, the use of Geographic Information Systems (GIS) to identify and quantify environmental services acquires increasing recognition for its spatial or territorial identification scope for the estimation of reliable values and the efficient use of resources. Hence it has become a reference base for adopting Payment for Environmental Services (PES) schemes[40]. PES schemes are the voluntary transaction of environmental services between a provider and their user, which allows the former to be compensated for the guarantee of the service in exchange for a general economic remuneration [41]; they constitute the first practical approach to the integration of the economic system with the social and environmental one. These schemes have come into force in recent years due to their potential to change harmful behavior to the environment and their benefits to rural livelihoods [11]. Currently, the valuation of environmental services occupies a central place in the political and academic agendas of biodiversity conservation due to its usefulness in decision-making [42]. Even when the approaches of environmental economics and ecological economics coincide in need to use this instrument, there are discrepancies regarding its design and application; for the first, it represents a scheme to improve the efficiency of natural resource management, while for the second, it constitutes the opportunity to reconcile decisions on natural resource management with social interests.

Due to the similarities between both perspectives, it is noted that adequate implementation of the PES scheme is possible were linked to profitability, inter and intragenerational equity is considered [43]. This would lead to meeting the expectations of both approaches in terms of improving the management of resources to ensure the provision of environmental services and thus have an impact on increasing the quality of life and reducing poverty, especially in rural areas. According to Naredo, environmental management can proceed in two ways: one, from monetary valuation, by applying the analytical approach of conventional economics based on monetary prices, costs, and benefits; and the other, adopting the analytical approaches of the different disciplines

involved in environmental problems to management[9]. The author argues that both perspectives must complement each other so that the utility and well-being of the economic system adapt to ecological requirements and incorporates the difficulties represented by the interaction with the rest of the systems with which it is related. This implies that the economic system relies on others that provide it with adequate information and allow the problem to be dimensioned to affect the physical universe it is immersed in.

In this way, the object of study would be extended to other systems, and the systems that are most appropriate to the context would be used, thus moving from the universe of monetary value to one where physical reality is included, with new predictive models and technological options, and with new processes of social negotiation, where the discussion focuses not only on the market but on institutions and information. As can be seen, the above does not imply a renunciation of monetary valuation. Rather, it alludes to integrating the economic system to its biophysical and territorial environment, giving rise to a new analysis structure. This new approach called ecointegrator leads to a conceptual restructuring of the economy by upsetting its instruments, methods, and principles [9]. On the other hand, there is no standard measurement method evaluating externalities to be considered arbitrary. Hence it cannot serve as a basis for the design of environmental policies. However, it is not possible that such policies are based solely on ecological rationality since to decide, it is necessary to compare costs and benefits, which makes the assignment of values indispensable.

The complexity that surrounds the interrelationships of the various systems involved has led to the consideration and use of the multicriteria decision theory [42], which proposes to evaluate all those criteria necessary for decision-making, these can be of various kinds: assessment, monetary, weightings of the different factors involved, consensus. The possible solutions are organized in a matrix, and a practical judgment based on the capacity for perception and knowledge is used to make the final decision.

As can be seen, under this logic, there is no single solution to the problem; rather, it depends on the relative weight or importance given to each criterion [44-48]; This allows us to maintain that for an informed and adequate decision-making aimed at solving complex problems, it is necessary to develop solid instruments, useful for the evaluation of the different elements involved and their interrelationships. The most accepted and used method is the multicriteria approach, which implies the individual evaluation of each element. To be valid must be based on reliable information; monetary valuation is one of the tools that can provide this information. In short, making sustainable development operational requires the convergence of the proposals of both approaches. Both the tools proposed by ecological economics and those of environmental economics should be complemented to obtain better and more information regarding decision-making consistent with the principles of sustainable development: equity, justice, efficiency in the use of resources, and that it corresponds with the natural load capacity of the system being evaluated[49].

4.3. Sustainability in the allocation of monetary values

According to Naredo, the object of study of ecological economics is sustainability without necessarily having to resort to a single type of value expressed in numbers. Valuing the environment is useful, although not necessary; This approach does not renounce some economic objects' valuation but rather limits it. Thus, some of these objects have monetary values , and others may be expressed in physical units. It is necessary to consider some basic problems that green economics addresses, from which the valuation must be made. According to this approach, the basic challenges are sustainable scale, fair distribution, and efficient allocation. The first refers to the fact that the scale or magnitude of human activities must be ecologically sustainable; it refers to the natural capacities of the ecosystem to regenerate inputs and absorb waste on a sustainable basis. The second is related to the distribution of resources and just property rights, both of the present generation and between this and future generations, as well as between humans and other species; here, the mechanisms can be taxes, social security payments, or payment schemes for environmental services, among others. The third and last one suggests allocating resources between final uses of the product (includes market resources such as purchased goods and non-market such as environmental services) according to individual preferences determined by the individual's ability to pay. Even when allocation and distribution are treated by conventional economics, the scale has been practically excluded, so it is necessary to consider both allocation and distribution around ecological sustainability [44–46].

The preceding is relevant in the valuation framework from the ecological economy since this approach opposes the internalization of external costs through market prices because this implies undesired effects on income distribution. Transferring externalities to society through the market entails social injustice since distribution through the market, in principle, is not fair. This approach, therefore, considers that distribution and allocation should be kept separate, in such a way that for the former to be fair, a transfer policy is necessary (property, taxes, collection for social security, payment of environmental services, etc.) that should be agreed based on social benefit. On the other hand, the prices determined by supply and demand would be the base mechanism to carry out an efficient allocation. Thus, if the distribution is based on monetary values, social injustice is incurred by transferring the costs of using resources in the productive processes to society; However, if these values are used for the allocation of resources, those who would pay for these externalities would be the owners of the means of production. Thus, distribution and scale must be

supported by social consensus. The decision elements can be diverse (biophysical, social, and economic indicators); Among these, weights of monetary or numerical values can be considered for decision-making. Once these two problems are solved, market mechanisms can be used to allocate resources efficiently. These three elements should be treated in an interrelated way as this will allow compliance with the principles of sustainable development.

In summary, to make the green economy approach operational and then meet the goals of sustainable development, it is essential to take into account three factors: sustainable scale, fair distribution, and efficient allocation of resources; These would have to be considered in an integrated manner and the following order: first, set the ecological limits of the sustainable scale, which could be achieved through the creation of policies that ensure that the growth of the economy remains within those limits; second, to establish an equitable and just distribution through policy instruments, which allows reducing the degree of inequality; and third, use market mechanisms to carry out the allocation [47].

4.4. The values of sustainability

According to what was suggested by Costanza[1], the valuation of ecosystem services based on efficiency, justice, and sustainability should be based on three types of values:

1) The "E" value, based on efficiency, is based on individual preferences that are assumed to be fixed. It is assumed that these preferences exist, and their value is determined by the willingness to pay for the good or service given; Under this consideration, the best estimate of what people want to pay would be what they pay in the real market. In cases where there is no market price, such as in environmental services, this can be estimated from information obtained with questionnaires where individuals answer how much they are willing to pay for the good or service in question.
2) The value "F" (fair or just in English) is based on justice, where the subjects express their preferences as members of the community, not as individuals. There should be consensus on the values that would be fair for all community members and other species, both in the present and future. Scientific information about the future consequences of assigning such values is incorporated into consensus-building discussions.
3) The "S" value, based on sustainability. It would require an evaluation of the contribution to the ecological sustainability of the resource in question; This value is linked to the physical, chemical, and biological role within the long-term functioning of the global system, so it is necessary to have scientific information about the functioning of the global system and to build a consensus in this regard. The individual expresses his preferences as if they were representative of the entire system (individual, community, and other preferences) instead of expressing current individual preferences.

With what has been analyzed so far, it can be assumed that the value of services based on economic efficiency implies less difficulty for decision-making; however, the preferences of all community members would not necessarily be reflected in it, so the value is based on justice would be more appropriate. However, despite the benefits of the F value, the role of the life support system is excluded, that is, the environment where the relationships between the social and the economic take place. The sustainable value tries to interrelate in the long term the physical aspects with the social and economic ones through knowledge, considering the preferences of the system as a whole, which would ensure sustainability in the long term, since the aforementioned basic goals would be met: scale sustainable, fair distribution and efficient allocation[48,49].

5. Conclusions

More than a science or technique, sustainable development is an ethical-philosophical-normative principle that perpetuates human life. Hence, this paradigm does not incorporate the conditions to become operational, so it requires reliance on various disciplines such as economics, from which two approaches emerge: environmental economics and ecological economics. The first seeks to integrate the elements of sustainable development through the traditional reasoning of neoclassical economics, while the second, recognizing contributions from the former, transcends it and proposes a conceptual restructuring. The ecological economy paradigm bases its proposals on values such as efficiency, equity, justice, and the capacity to regenerate and assimilate the global ecosystem in a sustainable way. The theoretical review carried out allows us to sustain, with Jiménez-Herrero, the existence of greater compatibility of the ecological economy with sustainable development goals; however, it is evident that this approach also uses the tools of environmental economics a complement to its own. Thus, ecological economics endorses the proposal to operationalize sustainable development by estimating sustainable value based on the system's preferences (individual, community, and other beings' preferences). The use of sustainable value would imply its integration into the decision-making system and would ensure long-term sustainability. The sustainable value can include the values of efficiency (E) and justice (F), which would be used as instruments to base the social decision (consensus), both in distribution, understood as the use of instruments by the state to promote equity, as in a scale, understood as the carrying capacity, assimilation, and recovery of the planet.

On the other hand, maximizing efficiency in allocating resources would be based on market mechanisms. Thus, putting into practice or making sustainable development operational implies considering three types of values, one from the tools and principles of environmental economics (E) and two from ecological economics (F and S); These values would make it possible to generate criteria that in turn would base decisions to define a sustainable scale, a fair distribution and an efficient allocation of resources. Thus, it is possible to argue that progress can be made towards sustainable development by implementing the instruments proposed by both streams. The values calculated in monetary figures and those produced by logical reasoning, scientific information, and those derived from social consensus constitute essential and complementary elements for comprehensive decision-making. In this sense, it is proposed to transcend the false dilemma between the positions that disqualify the tools of one or the other of both approaches analyzed. Much of the existing empirical valuation works could be framed indistinctly in environmental economics or ecological economics. When reviewing them, it is noted that most remain in the generation of the E value, thus limiting themselves to a vision circumscribed to the traditional economic perspective. This limitation can be solved by obtaining the S and F values by constructing models that integrate them into sustainable development goals: sustainable scale, efficient allocation, and fair distribution. This integration will make it possible for the development of values not to be limited to the generation of a monetary value or weightings by regions, but rather to form analytical models to support decision-making, based on scientific information and social consensus, so that it is possible to have more adequate tools to advance on the path of sustainable development.

As a recommendation for future studies following cases can be mentioned: Future studies could analyze rural sustainability in more depth since this literature is essential for economic development in poor regions. Future studies could use other techniques, such as main path analysis, to compare findings. Future research could investigate (in-depth) other papers as a literature review.

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References

1. Matthews, H. Scott, and Lester B. Lave. Applications of environmental valuation for determining externality costs. *Environmental Science & Technology* **2000**, *34*(8), 1390-1395.
2. Gómez-Baggethun, E. and Ruiz-Pérez, M. Economic valuation and the commodification of ecosystem services. *Progress in Physical Geography* **2011**, *35*(5), 613-628.
3. Richardson, J. Accounting for Sustainability: Measuring quantities or enhancing qualities?. In The Triple Bottom Line **2013** (pp. 56-66). Routledge.
4. Ekins, P. Environmental sustainability: From environmental valuation to the sustainability gap. *Progress in Physical Geography* **2011**, *35*(5), 629-651.
5. Pauly, D., Christensen, V., Guénette, S., Pitcher, T.J., Sumaila, U.R., Walters, C.J., Watson, R. and Zeller, D. Towards sustainability in world fisheries. *Nature* **2002**, *418*(6898), 689-695.
6. Křeček, J. and Pažourková, E. Education strategy supporting environmental services of mountain forest catchments. In *Environmental Sustainability Education for a Changing World* 2021 (pp. 97-105). Springer, Cham.
7. Caney, S. Climate change. In *The Routledge handbook of global ethics* 2015 (pp. 384-398). Routledge.
8. Worm, B., Barbier, E.B., Beaumont, N., Duffy, J.E., Folke, C., Halpern, B.S., Jackson, J.B., Lotze, H.K., Micheli, F., Palumbi, S.R., Sala, E. Impacts of biodiversity loss on ocean ecosystem services. *science*. **2006**, *314*(5800), 787-90.
9. Koh, L.P., Wilcove, D.S. Is oil palm agriculture really destroying tropical biodiversity. *Conservation letters* **2008**, *1*(2), 60-4.
10. Angelsen, A., Brockhaus, M., Sunderlin, W.D., Verchot, L.V. editors. Analysing REDD+: Challenges and choices. Cifor; 2012.
11. Muradian, R., Walter, M., Martinez-Alier, J. Hegemonic transitions and global shifts in social metabolism: Implications for resource-rich countries. Introduction to the special section. *Global environmental change* **2012**, *22*(3), 559-67.
12. Lu, N., Liu, L., Yu, D., Fu, B. Navigating trade-offs in the social-ecological systems. *Current Opinion in Environmental Sustainability*. **2021**, *48*, 77-84.
13. Robertson, M.M. The nature that capital can see: science, state, and market in the commodification of ecosystem services. *Environment and Planning D: society and space.* **2006**, *24*(3), 367-87.
14. Barnaud, C., Corbera, E., Muradian, R., Salliou, N., Sirami, C., Vialatte, A., Choisis, J.P., Dendoncker, N., Mathevet, R., Moreau, C., Reyes-García, V. Ecosystem services, social interdependencies, and collective action. *Ecology and Society*. **2018**, *23*(1).
15. Wegner, G., Pascual, U. Cost-benefit analysis in the context of ecosystem services for human well-being: A multidisciplinary critique. *Global Environmental Change*. **2011**, *21*(2), 492-504.

16. Davidson, N.C. How much wetland has the world lost? Long-term and recent trends in global wetland area. *Mar. Freshw. Res*. **2014**, *65*, 934– 941.
17. Jaramillo, U.; Cortés-Duque, J.; y Flórez, C. *Colombia Anfibia, un País de Humedales*; Instituto de Investigación de Recursos Biológicos Alexander von Humboldt: Bogotá, D.C., Colombia, 2015; Volume I.
18. Patiño, J.E. Análisis espacial cuantitativo de la transformación de humedales continentales en Colombia. *Biota Colomb*. **2016**, *17*, 86–105.
19. Rodríguez, J.P.; Senhadji-Navarro, K.; Ruiz Ochoa, M.A. Estado ecológico de algunos humedales colombianos en los últimos 15 años: Una evaluación prospectiva. *Colomb. For*. **2017**, *20*, 181–191.
20. Johnson, W.C.; Werner, B.; Guntenspergen, G.R.; Voldseth, R.A.; Millett, B.; Naugle, D.E.; Tulbure, M.; Carrol, R.W.; Tracy, J.; Olawsky, C. Prairie wetland complexes as landscape functional units in a changing climate. *BioScience* **2010**, *60*, 128–140.
21. Weller, M.W. Issues and approaches in assessing cumulative impacts on waterbird habitat in wetlands. *Environ. Manag*. **1998**, *12*, 695–701.
22. Jones, M. Strategic environmental assessment for wetlands: Resilience thinking. In *The Wetland Book: I: Structure and Function, Management, and Methods*; Finlayson, C., Everard, M., Irvine, K., McInnes, R., Middleton, B., Van Dam, A., Davidson, N., Eds.; Springer: Dordrecht: Switzerland, 2018; pp. 2105–2115.
23. Parrott, L.; Quinn, N. A complex systems approach for multiobjective water quality regulation on managed wetland landscapes. *Ecosphere* **2016**, *7*, 1–17.
24. Grima, N.; Singh, S.J. How the end of armed conflicts influence forest cover and subsequently ecosystem services provision? An analysis of four case studies in biodiversity hotspots. *Land Use Policy* **2019**, *81*, 267–275.
25. Vilardy, S.; Cadena-Marín, A.; Cortés-Duque, J.; Vásquez, C. El prisma del bienestar humano. In *Colombia Anfibia, un País de Humedales*; Jaramillo, U., Cortés-Duque, J., Flórez, C., Eds.; Instituto de Investigación de Recursos Biológicos Alexander von Humboldt: Bogotá, D.C., Colombia, 2016; Volume II, pp. 42–43.
26. Rincón-Ruiz, A.; Echeverry, M.; Piñeros, A.M.; Tapia, C.H.; David, A.; Arias, P.; Zuluaga, P.A. *Valoración Integral de la Biodiversidad y los Servicios Ecosistémicos: Aspectos Conceptuales y Metodológicos*; Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH): Bogotá, D.C., Colombia, 2014.
27. Cárdenas, J.C.; Castañeda, J.L.; Castillo, D.; Laverde, C.; Pereira, M.F.; Rodríguez, L.Á. *Métodos Complementarios para la Valoración de la Biodiversidad: Una Aproximación Interdisciplinar*; Instituto de Investigaciones de Recursos Biológicos Alexander von Humboldt y Universidad de los Andes, Ed.; Instituto de Investigación de Recursos Biológicos Alexander von Humboldt: Bogotá, D.C., Colombia, 2013.
28. Martín-López, B.; González, J.A.; Vilardy, S. *Guía Docente: Ciencias de la Sostenibilidad*; Universidad del Magdalena, Instituto Humboldt, Universidad Autónoma de Madrid: Bogotá, D.C., Colombia, 2012.
29. Cuartas-Calle, C.A.; Álvarez, E.; Cogollo, A. Ecología de Humedales del Magdalena Medio: El Caso del Complejo de Ciénagas de Cachimbero, Caño Negro, La Chiquita y El Encanto en Cimitarra; Fundación Jardín Botánico de Medellín Joaquín Antonio Uribe, Ed.; Interconexión eléctrica S.A. E.S.P.—ISA: Santander, Colombia, 2015.
30. Flórez-Ayala, C.; Estupiñán-Suárez, L.M.; Rojas, S.; Aponte, C.; Quiñones, M.; Acevedo, Ó.; Villardi, S.; Jaramillo, Ú. Identificación espacial de los sistemas de humedales continentales de Colombia. *Biota Colomb*. **2016**, *17*, 44–62.
31. IPBES. Available online: https://www.ipbes.net/es (accessed on 17 March 2021).
32. Díaz, S.; Demissew, S.; Carabias, J.; Joly, C.; Lonsdale, M.; Ash, N.; Larigauderie, A.; Adhikai, J.R.; Arico, S.; Bàldi, A.; et al. The IPBES Conceptual Framework—connecting nature and people. Curr. Opin. Environ. *Sustain*. **2015**, *14*, 1–16.
33. MEA: Millennium ecosystem assessment. Ecosystems and Human Well-Being; Island Press: Washington, DC, USA, 2005; pp. 1–64.
34. Russi, D.; Ten Brink, P.; Farmer, A.; Badura, T.; Coates, D.; Förster, J.; Kumar, R.; Davidson, N. The Economics of Ecosystems and Biodiversity for Water and Wetlands. Lond. *UK IEEP Ramsar Secr*. **2013**, *78*, 1–118.
35. Perevochtchikova, M.; De La Mora-De La Mora, G.; Hernandez, J.A.H.; Marín, W.; Flores, A.L.; Bueno, A.R.; Rojo, I. Systematic review of integrated studies on functional and thematic ecosystem services in Latin America. *Ecosyst. Serv*. **2019**, *36*, 1992–2017.
36. de Groot, R.S.; Wilson, M.A.; Boumans, R.M. A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecol. Econ*. **2002**, *41*, 393–408.
37. Farber, S.C.; Costanza, R.; Wilson, M.A. Economic and ecological concepts for valuing ecosystem services. *Ecol. Econ.* **2002**, *41*, 375–392.
38. Balmford, A.; Bruner, A.; Cooper, P.; Costanza, R.; Farber, S.; Green, RE; Jenkins, M.; Jefferiss, P.; Jessamy, V.; Madden, J.; et al. Economic Reasons for Conserving Wild Nature. *Science* **2002**, *297*, 950–953.
39. Hackbart, V.C.; de Lima, G.T.; dos Santos, R.F. Theory and practice of water ecosystem services valuation: Where are we going? *Ecosyst. Serv*. **2017**, *23*, 218–227.
40. Christie, M.; Fazey, I.; Cooper, R.; Hyde, T.; Kenter, J.O. An evaluation of monetary and non-monetary techniques for assessing the importance of biodiversity and ecosystem services to people in countries with developing economies. *Ecol. Econ*. **2012**, *83*, 67–78.
41. Barbier, E.B.; Acreman, M.C.; Knowler, D. Economic Valuation of Wetlands: A Guide for Policy Makers and Planners; Ramsar Convention Bureau: Gland, Switzerland, 1997.

42. Admiraal, J.F.; Wossink, A.; de Groot, W.T.; de Snoo, G.R. More than total economic value: How to combine economic valuation of biodiversity with ecological resilience. *Ecol. Econ*. **2013**, *89*, 115–122.
43. Gibbons, D. C. The economic value of water. RFF Press, 2013.
44. Flórez-Ayala, C.; Estupiñán-Suárez, L.M.; Rojas, S.; Aponte, C.; Quiñones, M.; Acevedo, Ó.; Jaramillo, Ú. El entramado anfibio. In *Colombia Anfibia, un País de Humedales*; Jaramillo, U., Cortés, J., Flórez, C., Eds.; Instituto de Investigación de Recursos Biológicos Alexander von Humboldt: Bogotá, D.C., Colombia, 2015; Volume I, pp. 54–115.
45. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH). Aves de la Expedición en el Municipio de Cimitarra, Santander—Proyecto Santander BIO; IAvH: Bogotá, D.C., Colombia, 2019.
46. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH). Peces de Agua Dulce del Municipio de Cimitarra, Santander—Proyecto Santander BIO; IAvH: Bogotá, D.C., Colombia, 2018.
47. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH). Anfibios y Reptiles del Municipio de Cimitarra, Santander—Proyecto Santander BIO; IAvH: Bogotá, D.C., Colombia, 2018.
48. Nhuan, M.T.; Ninh, N.H.; Huy, L.Q.; Sam, D.D.; Ha, T.H.; Thanh, N.C.; Du, N.Q. Vietnam Wetland Component Report: Economic Valuation of Demonstration Wetland Sites in Vietnam; United Nations Environmental Programme, Global Environment Facility and UNEP/GEF: Hanoi, Vietnam, 2003; Available online: https://www.iucn.org/sites/dev/files/import/downloads/06_vietnam_economic_valuation_of_wetland_sites.pdf (accessed on 17 March 2021).
49. Pearce, D.; Moran D. The economic value of biodiversity. Routledge; 2013.
50. Patton, M.Q. *Qualitative Evaluation and Research Methods*, 2nd ed.; SAGE Publications, Inc.: Thousand Oaks, CA, USA, 1990.
51. Fundación Humedales, ASOPEZCHUCURI y ASOPESBOCAR. Acuerdos de Pesca Comunitarios Entre las Comunidades de Pescadores de San Rafael de Chucuri y Bocas de Carare. Hacia la Conservación del Bagre Rayado Pseudoplatystoma Magdaleniatum, Como Iniciativa Piloto en un Sector del Magdalena Medio (Barbacoas-Carare); Proyecto vida silvestre Magdalena medio: Magdalena Medio, Colombia; Fundación Humedales: Ubate, Colombia, 2016.
52. WCS, Fundación Humedales, ASOPEZCHUCURI y ASOPESBOCAR. Propuesta de Zonas de Reserva Para el Bagre Rayado en el Área de influencia de San Rafael de Chucuríy Bocas de Carare, Magdalena Medio Para Evaluación y Decisión de la Autoridad Nacional De Acuicultura y Pesca-AUNAP-Hacia la Conservación del Bagre Rayado Pseudoplatystomamagdaleniatum, Como Iniciativa Piloto en un Sector del Magdalena Medio (Barbacoas-Carare); Proyecto Vida Silvestre Magdalena Medio: Magdalena Medio, Colombia, 2017.
53. Moreno, H.M.; Quevedo, J.; Villa, J. Aunar Esfuerzos Para Estimar la Capacidad de Captura/Emisión de Carbono de los Humedales en la Cuenca Baja del Río Claro-Cocorná Sur (Campos Teca, Nare y Cocorná) y en la Cuenca Baja del Río Cimitarra (Campos de Casabe, Yondó); Informe final- Convenio 1412-129; CORANTIOQUIA y Universidad Nacional de Colombia: Bogotá, D.C., Colombia, 2016; p. 82.
54. Chaikumbung, M.; Doucouliagos, H.; Scarborough, H. The economic value of wetlands in developing countries: A meta-regression analysis. *Ecol. Econ*. **2016**, *124*, 164–174.
55. Costanza, R.; d'Arge, R.; De Groot, R.; Farber, S.; Grasso, M.; Hannon, B.; Raskin, R.G. The value of the world's ecosystem services and natural capital. *Nature* **1997**, *387*, 253–260.
56. Zarandian, A.; Baral, H.; Stork, N.E.; Ling, M.A.; Yavari, A.R.; Jafari, H.R.; Amirnejad, H. Modeling of ecosystem services inform s spatial planning in lands adjacent to the Sarvelat and Javaherdasht protected area in northern Iran. *Land Use Policy* **2017**, *61*, 487–500.
57. Correa Restrepo, F. Tasa de descuento ambiental Gamma: Una aplicación para Colombia. *Lect. De Econ*. **2008**, *69*, 143–162.
58. Wattage, P.; Mardle, S. Total economic value of wetland conservation in SriLanka identifying use and non-use values. *Wetl. Ecol. Manag.* **2008**, *16*, 359–369.
59. Márquez, G. De la abundancia a la escasez: La transformación de ecosistemas en Colombia. In Naturaleza en disputa; Universidad Nacional de Colombia, Ed.; Universidad Nacional de Colombia: Bogotá, D.C., Colombia, 2001; Available online: http://www.idea.unal.edu.co/publica/docs/abund_escasez.pdf (accessed on 17 March 2021).
60. Garzón, N.V.; Gutiérrez, J.C. Deterioro de Humedales en el Magdalena Medio: Un Llamado Para su Conservación; Fundación Alma –Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Ed.; Instituto de Investigación de Recursos Biológicos Alexander von Humboldt: Bogotá, D.C., Colombia, 2013; Available online: http://www.humboldt.org.co/es/i2d/item/406-deterioro-de-humedales-en-el- magdalena-medio-un-llamado-para-su-conservacion (accessed on 17 March 2021).
61. Garratt, M.P. ; Breeze, T.D. ; Jenner, N. ; Polce, C. ; Biesmeijer, J.C., Potts, S.G. Avoiding a bad apple: Insect pollination enhances fruit quality and economic value. *Agriculture, ecosystems & environment*. **2014**, *184*, pp.34-40.
62. FEDEGAN. Statistics. Available online: https://www.fedegan.org.co/estadisticas/precios (accessed on 17 March 2021).
63. SendeCO2 Spanish market platform-Certified Emission Reductions (CER). Available online: https://www.sendeco2.com/es/precios-co2 (accessed on 17 March 2021).

64. Pemberton, C.A.; Mader-Charles, K. Ecotourism as a means of conserving wetlands. J. Agric. *Appl. Econ.* **2005**, 37, 463–474.