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TABLE

Making Nature Count:

How should we value nature in our food systems?

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TABLE helps people navigate the evidence, values and visions shaping global debates about the future of sustainable food systems. Both scientific evidence and our personal biases play roles in these crucial conversations: TABLE provides clarity on where, how and why we disagree in order to support inclusive dialogue and drive much-needed action. Originally founded as a collaboration between the University of Oxford, the Swedish University of Agricultural Sciences (SLU) and Wageningen University & Research (WUR), the TABLE network has since expanded to include la Universidad de los Andes (Colombia) and la Universidad Nacional Autónoma de México.

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Introduction

The issues

There is widespread recognition that our natural systems are being degraded at an unprecedented rate, creating substantial risks to humanity. This is potentially the most clear-cut with climate change as global average temperatures rose by almost 1.5˚C on pre-industrial levels in 2023. The picture of the decline of nature is more complex but also considered to be at a crisis point.

Economists have argued for some decades that a key cause of this destruction is that the importance or value of nature and natural systems to humanity is not effectively factored into economic decision-making, either by governments or by businesses and individuals. This claim raises questions about how and by whom this importance or value should be determined and then how it should be factored into such different decision-making processes. For instance, a key driver of **biodiversity** loss is due to habitat destruction, when land is 'cleared' to be converted into agricultural production. How do you compare the value of that land in its natural state to its now productive state? Should that be a matter of scientific judgement, given the complex technical questions involved, or a matter for local or even international communities, who might be affected by the change in use, or just the landowners themselves or involve all parties? Should the outcome be steered through introducing some type of tax or charge or land use regulations or via some other instrument? And who should be deciding upon and implementing such frameworks? These types of questions and how different economic schools of thought seek to answer them in the context of competing demands for our land are the focus of this explainer.

Here, it is important to understand that even if we did have full scientific knowledge of how natural ecosystems support human existence in a technical sense, there would be likely to remain a diversity of ways people might value those natural systems. Some may value nature in terms of its practical benefits to humans, such as providing natural pest control, pollinating fruit trees, as a source of pharmaceutical cures, or reducing run-off that could pollute our rivers and cause flooding. Others may appreciate time in their local park or woodland since they may hold memories and be an important part of their sense of place. Others still may particularly value well-known national parks, while some groups may see some landscapes as having central religious and cultural significance for their identity, irrespective of any more tangible benefits. Those who value nature only for its instrumental benefits may see nature as performing a series of functions that may be interchangeable, whereas people who value their relationship with a particular locality will not. Destruction of specific areas may, for them, be akin to vandalism, as with the destruction of religious icons or works of art, which can rarely be justified by any assessment of 'benefits'. For some, the value of nature goes beyond relational or instrumental worth to humans: to recognise ourselves as part of nature and/or part of multispecies communities means to recognise intrinsic values of nature not associated with direct benefits or relationships to us (Anderson, et al., 2022)). Lastly, some may not value nature at all.

This piece discusses the valuation of nature with particular reference to food systems, which have a major influence on the natural world. Agricultural production is the largest user of land globally and the main driver of habitat destruction and biodiversity loss. The food system is also a major cause of rising global temperatures, accounting for about a third of global greenhouse gas (**GHG**) emissions. As such, any efforts to address the multiple environmental crises we face will need to address impacts arising from the food system – and will need to consider how addressing these crises will in turn affect food production.

To illustrate the practical complexity further, let us consider a scenario of a proposal to clear land for agricultural development by an international company to bring in export revenue, where the land includes areas sacred to some local communities and habitats for threatened species in a region where the inhabitants generally rely on subsistence agriculture with limited access to health and education services. How would the potential benefits such as agricultural employment, and education and health benefits associated with resulting higher incomes, be balanced against the loss of sacred areas and habitat, and indeed the potential pollution from what is likely to be high input monoculture? How would the different perspectives on these questions from governments, investors, local communities and others be represented fairly given their differential power, and who would decide on the outcome?

The main protagonists

Two distinct groups of economists, **environmental economists** and **ecological economists**, have been seeking to address the challenge of factoring the importance of nature into economic decision-making.

Environmental economics as a discipline originated in the 1960s, first in the US and then in Europe as a sub-discipline of **neo-classical economics**. Neo-classical economics has increasingly dominated the economics discipline since the end of the 19th century and is now so prevalent that those belonging to this tradition and the wider public tend to refer to it just as economics. This tradition views markets as generally the best economic mechanism for maximising welfare for humans, largely due to the perceived efficiency of well-functioning markets where property rights are well-defined, transaction costs are low and information is shared. Following this theory, environmental economists consider their job to be to make markets work better by incorporating environmental values into them, as they are often not priced by markets; this is sometimes referred to as 'getting the prices (in markets) right' or fixing market failures where environmental costs have been excluded (these excluded costs are often referred to as externalities). This does not exclude the potential for other non-environmental externalities, but environmental economists tend to focus largely on the environmental ones.

Ecological economists formed as an international interdisciplinary group involving economists and ecologists at an international academic conference in 1987; but the group's formation can trace its intellectual roots back to social energetics studies in the 1800s (Martinez-Alier, 1990), and to concerns about the limits to growth and the study of the flows of energy and materials in the economy (Spash, 1999). Ecological economics was initially more of a movement rather than a discipline, because it lacked a unified methodology as developed by environmental economists. However, it has now developed into a well-defined discipline (Spash, 2024).

As with neo-classical economics, environmental economists tend to dominate teaching in university economics departments, although courses are generally only an option at the undergraduate level within mainstream economic courses. Applied economics for and within Government administrations also generally follows an environmental economic approach. A typical example of this is a 2024 report by the Green Growth Knowledge Partnership, led by the Global Green Growth Institute, OECD, UNEP, UNIDO and the World Bank Group, which argues that investment of $7.4 trillion in natural capital in 40 countries could deliver $152 trillion of benefits, based on values estimated using environmental economic methodology (GGKP, 2024).

Those who identify as ecological economists tend to sit within multi-disciplinary university centres outside economics departments. Given that they do not subscribe to neo-classical economic theory, they are often not recognised as economists by those in the economics department. While the ecological economics critique of environmental economics is a key focus for ecological economists, environmental economists in academia, consultancies and government generally do not engage with it or their broader thinking. One reason is that environmental economics is theoretically self-contained and complete so they do not see a requirement for ecological economics. Another is that environmental economist techniques are now widely embedded in governmental administrative requirements for cost-benefit assessments to inform policy decisions. Environmental economists are part of a mainstream policy consensus focused on achieving green growth in line with ecomodernism, while ecological economists argue that growth is at odds with achieving sustainability (Daly, 1973), (Daly, 1992), (Georgescu-Roegen, 1971) (this complex debate is covered in the TABLE explainer **What is ecomodernism?**).

For the purposes of this explainer and to clearly compare the two main perspectives, ecological economists will be taken to refer to those who take a distinctly different approach to economics, drawing on schools outside neoclassical economics, such as **feminist**, **Marxist socialist**, **critical institutionalist**, and **post-Keynesian** (Spash, 2024). In contrast with neo-classical economics, which views markets as tending towards beneficial equilibria, these traditions view markets as complex adaptive systems shaped by social and political institutions that promote cost and risk-shifting onto society and the environment.

The approach that environmental economists take to incorporating values of nature into economic decision-making involves investigating objectively, as far as possible, what value people ascribe to nature, stating this value in monetary units, which can then be factored into economic decisions. The prevalent methodology used involves surveys requesting respondents to represent their values in monetary units using questions such as 'how much would you be willing to pay to preserve a woodland?'. Once these values have been estimated from these surveys, they can inform the assessment of the costs and benefits of Government decisions. They can also be used to inform the design of **economic instruments** such as taxes and subsidies, e.g. grants for the creation and/or preservation of woodland and/or **nature markets** so that the economic values of nature factor into actual prices in markets. Nature markets involve converting benefits from nature, which are normally free, into services that can be bought and sold. So, for instance, a government might create a market for the biodiversity benefits of woodlands, which has happened in the UK.

On the other hand, ecological economists approach the challenge of factoring nature's values into economic decisions as an inherently discursive, interactive and political process rather than a process of 'objective' discovery or estimation. The challenge for them is multifaceted; it includes how one builds an understanding of the value of nature in the first place, how to allow the expression of values held that are potentially incommensurable, how to create fair political and policy processes so that the range of values of nature are effectively integrated into democratic decision making. They would tend to favour methodologies such as citizen assemblies involving dialogue between a diverse, representative group of participants and evidence from experts to develop common views on policy questions. Strategies for change are then likely to involve wider system change rather than only changes to prices in markets. So, for instance, they would see a transition from conventional to '**regenerative agriculture**' (however that is defined – see TABLE's explainer **What is regenerative agriculture?**) as requiring a long-term change strategy, potentially including support for new products, processing and markets, changes to agricultural training, new standards for public procurement and so on.

The non-economist actors

To date, environmental economists have been the most influential of the two groups in policy making: there are common requirements within governments' decision-making processes to include valuation of the environment to inform cost-benefit assessments of policies, programmes and projects, and more recently, there has been increasing interest within governments in creating so-called nature markets. For instance, the promotion of a 'nature positive economy' at the United Nations Convention on Biological Diversity's 15th Conference of the Parties in Montreal, Canada in 2022 focussed on the potential to develop markets in biodiversity offsets or credits created from the regeneration of ecosystems (Spring & Jessop, 2022).

Part of this success has been down to **environmental pragmatists** who have increasingly supported the economic valuation of the environment, as one part of their approach to influencing environmental policy, based on the claim that politicians will, as a result, be more likely to prioritise protecting the environment and funding conservation activities (Spash, 2013). For instance, David Attenborough, the internationally high-profile veteran environmentalist, wrote the foreword to the UK government-commissioned Dasgupta Review, which took an environmental economics approach to valuing nature, concluding:

> *Economics is a discipline that shapes decisions of the utmost consequence, and so matters to us all. The Dasgupta Review at last puts biodiversity at its core and provides the compass that we urgently need. In doing so, it shows us how, by bringing economics and ecology together, we can help save the natural world at what may be the last minute – and in doing so, save ourselves." (Dasgupta, 2021)*

There are also now coalitions of international NGOs, national and international governmental organisations, and businesses that deploy environmental economics to promote nature markets as an approach to regenerating ecosystems (Melanidis & Hagerman, 2022).

This broad international policy consensus is, however, contested by a coalition of local grassroots, indigenous and justice-oriented groups, which are referred to in this explainer as **environmental justice groups**. Similar to ecological economists, this coalition tends to focus on the need for systemic changes to environmental governance, driven by considerations of justice and redress, as well as environmental outcomes. They see a market-based approach to environmental regeneration as a dangerous distraction, likely to be co-opted, largely by corporations, to 'continue what is seen as the unsustainable, unjust status quo' (Melanidis & Hagerman, 2022).

Trash floats in the ocean next to several tropical fish. Image by Naja Bertolt Jensen via Unsplash.

In summary, therefore, there are the following main perspectives in the debates about nature and economics:

- Environmental economists, trained in neo-classical economics, who use techniques to discover, as far as it is practical, the 'true' value people ascribe to nature in terms of monetary units in order to address market failures by internalising these values into markets. They use economic instruments, such as taxes, subsidies and nature markets.

- Environmental pragmatists who argue that the monetary values for nature created by environmental economic analysis can increase the pressure on politicians to promote better protection of the environment. So there interest is primarily in getting better protection of the environment that estimating 'true' values.

- Ecological economists who, drawing on **heterodox economics** and natural science, are highly critical of environmental economics. They believe that valuing the environment properly in economic systems should be a deliberative, participatory and inclusive process, to design economic system change strategies to create sustainable and equitable economies.

- Environmental justice groups who argue that the promotion of nature markets is at best a distraction from real action, and at worst a mechanism for ongoing environmental exploitation (for instance see **EJOLT**).

There are, of course, some fuzzy and shifting boundaries between these groups (see Figure 1), particularly the pragmatists, who might draw on a range of perspectives, but they provide a useful tool for exploring some of the key differences in thinking among them. The aim of this explainer is to better understand what the consequences of applying these approaches might be for food system change. It focuses on each of the two major areas of debate – valuing nature and creating nature markets – and then discusses the implications for food systems.

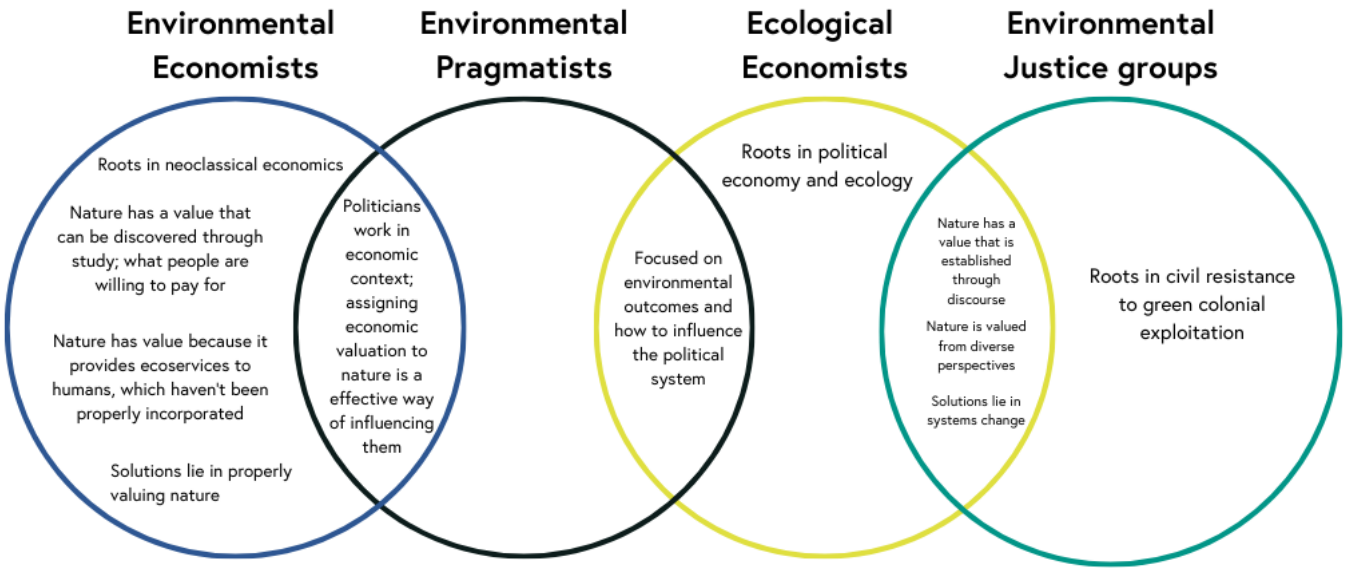

Figure 1: A Venn Diagram describing the ideological relationships between environmental economists, environmental pragmatists, ecological economists, and environmental justice groups.

Valuing nature

The environmental economic approach to valuing nature

Since the founding of environmental economics in the 1960s, a key focus of effort has been on developing techniques for valuing the environment so that it can be properly factored into policy decision-making. Environmental economists argue that if the services we receive from the environment, known as **ecosystem services**, are assigned values in monetary units, decision-makers will better recognise that this value exists. Making the valuation process explicit will also aid transparency and democratic decision-making (Pearce, Markandya, & Barbier 1989). Ecosystem services are generally divided into four types:

- Provisioning services such as food, raw materials, genetic resources and energy;
- Regulating services such as purification of air and water, carbon sequestration, waste decomposition and detoxification, biological pest and disease control, pollination and flood regulation;
- Cultural services including those that are spiritual and historical, recreational, educational and therapeutic;
- Supporting services, such as soil formation and water and nutrient cycling, underpin the first three services but do not directly benefit humans.
- Although these services can be separately classified, clearly a particular geographical area can provide them simultaneously, and they can all be interlinked. So, woodland along a river can provide all four types of services, from providing food, timber and firewood to regulating pollution into rivers and reducing flood risks to providing recreation, education and mental well-being.

In neo-classical economic theory, markets are a key mechanism for revealing the value of goods and services at a particular moment via prices. Prices emerge through the market interplay between buyers demanding goods and sellers supplying them. So, for example, beef has a higher price than potatoes in Europe, reflecting both the buyers' preferences (they prefer beef over potatoes) and the costs of supply, which are higher for beef than potatoes. In the absence of markets to generate these values for ecosystem services which – except for provisioning services – are not generally bought and sold on markets, environmental economists have developed two main techniques for estimating them:

- **Examining markets** where the emergent prices imply a value for elements of the environment. For instance, environmental economists analyse the prices of houses to determine the premium paid for houses with good views of and easier access to quality landscapes, as compared with similar ones without such views or easy access. This premium then is used to estimate the value of viewing and accessing quality landscapes.
- **Creating artificial or hypothetical markets** to estimate what prices would emerge if markets for environmental goods and services existed. This generally involves surveying people to ask them to state their individual maximum willingness to pay for or accept compensation for a marginal loss due to a particular environmental change. For instance, residents could be asked about their maximum willingness to pay for a small area of farmland to be converted into woodland that would be publicly available for recreational access.

Environmental economists might also analyse the costs of artificially replacing the lost environmental services due to environmental degradation, in so far as that is practical. For instance, if the loss of biodiversity reduces the effectiveness of natural pest management, farmers might be required to increase their spending on pesticides.

Work to establish the value of different environmental improvements or losses can be costly and time-consuming, so when new policy decisions need to be assessed in terms of their environmental benefits, environmental economists will often seek to repurpose existing studies where the environmental benefits or losses can be argued to be comparable. So there might be a study done in a particular place and time seeking to establish the value of environmental losses from growing a particular crop per hectare based on a standard high-input monoculture. If, later, in a different context, a decision required an assessment of the environmental losses of growing this same crop as compared to converting the land into woodland, the results of the previous study might be used, rather than a whole new study undertaken.

Databases of valuation studies have been created for policy analysts to draw on, such as the **Ecosystems Services Valuation Database**, which includes studies from around the world. However, such benefit transfer can be highly questionable, as resource constraints can drive assumptions on comparability that are very difficult to justify (Spash & Vatn, 2006).

For example, a recent report aimed at advising governments on the benefits of investing in natural capital to meet Sustainable Development Goals took exactly this approach, drawing on 'unit values associated with the benefits of closing the natural capital gap… sought from the literature, where possible reflecting any variation of values between countries' (GGKP, 2024). With this approach, the report estimated the benefits in 40 countries of addressing climate change, preventing nearly 4.5 million premature deaths, protecting over 28 million hectares of important ecosystems, restoring over 250 million hectares of degraded agricultural land and saving more than 18 billion tons of natural resources as $152 trillion compared to estimated costs of $7.4 trillion.

Environmental valuation, cost-benefit analysis and discounting

Environmental values are used in social **cost-benefit analyses** to inform policy decisions. This involves assessing, as far as possible, all the costs and benefits of different policy options to achieve policy outcomes. Consider a situation where a government wants to reduce meat consumption and increase uptake of alternative proteins. Several policy options could be proposed, such as banning meat advertising, taxing meat products and/or subsidising the production of alternative proteins. A social cost-benefit analysis would estimate the social costs of putting each option into place and the environmental and perhaps social benefits arising from the resulting reductions in livestock numbers, such as reductions in agricultural land use or lower greenhouse gas emissions, or (potentially) reduced diet-related hospital admissions. Each of these environmental changes would have their benefits estimated, as far as this is practical, based on economic valuation so that the social costs and benefits can be compared and used to inform policy. Those environmental impacts that cannot practically be valued would be indicated in physical quantities, e.g., the number of species protected – this may even be done qualitatively if quantitative data do not exist. However, environmental economists see these as a less effective means of informing a policy decision because they cannot be included directly in a monetary cost-benefit analysis.

Cost-benefit analysis generally requires the addition of a time dimension, since the costs and benefits of different decisions are likely to arise at different times. The costs are often upfront, while the benefits arise in the future. So, for instance, the costs of changing land management and use, such as re-naturalising flood plains with meanders and wetlands, will be upfront, while the environmental benefits will arise over time as vegetation grows, species return, and carbon is sequestered.

Environmental economists, in line with neo-classical economic theory, generally consider that in this cost-benefit calculus, future benefits need to be reduced – or 'discounted'. **Discounting** is a process of reducing future costs and benefits so they can be compared with current costs on a like-for-like basis. This is based on the belief that people generally prefer current benefits over waiting for future ones and on the assumption that in coming years people will be richer due to ongoing economic growth. Spending a given amount now therefore, constitutes a greater sacrifice than it would in the future (Pearce, Markandya, & Barbier, 1989).

What the right discount should be is a topic of substantial debate amongst environmental economists, particularly since the mathematical nature of discounting means that future benefits, particularly in the long-term to future generations, can quickly shrink, such that their significance in the cost-benefit calculus of current decision-making is minimal. So the costs of establishing hedges or planting woodlands are largely upfront, while their benefits in terms of biodiversity, carbon sequestration and so forth will only be seen after a few years. Hence, the values of these benefits in future years will be discounted when included in a cost-benefit analysis. If the discount rate applied is high, it may be impossible to justify planting the hedges and forests in the first place because the discounted benefits would be too low. The choice of discount rate is therefore subject to much debate, one argument being that the benefits to future generations are marginalised in the decision-making process, while the assumption that they will be richer is difficult to justify given climate change. Environmental economists can offer a range of values based on different discount rates. Then it is up to policy decision-makers to choose which discount to use and to justify what can be a controversial assumption however policy makers may be loath use this approach as it requires quite technical understanding of the ethical choices implied by the discount rates.

Environmental valuation and Natural Capital Accounts

More recently, the attention of environmental economists has moved from using values to inform a social cost-benefit assessment of individual changes within the environment to creating natural capital accounts of the environment. Effectively their attention has moved from assessing flows of benefits from nature, known as **ecosystem services**, to the 'stocks' of nature. A stock is a collection of environmental features such as forests, grasslands and rivers. **Natural capital** is the term used by environmental economists to describe such stocks in terms of environmental features and natural resources that are regarded as having an economic value for humans. Such stocks can be assessed at any geographical scale, from the individual farm to the whole world. Natural capital accounts seek to establish the total economic value in monetary terms of such **environmental assets**, as they are also often referred to by environmental economists. This can provide a basis for assessing whether their economic value is increasing or decreasing over time due, for instance, to pollution, deforestation, or encroachment by commercial activities. These natural capital accounts are intended to provide Governments and other stakeholders with a strategic overview of the state and value of natural assets, rather than to inform specific policy decisions (Department for Environment, Food & Rural Affairs, 2023). The motivation is to provide an indicator comparable to GDP, the standard measurement of economic activity, and to give an overall sense of direction regarding whether economies at local, regional or national levels are degrading or improving their environmental assets (Bateman & Mace, 2020).

There has been an ongoing debate amongst environmental economists as to the importance of having natural capital vs human-made capital for economies to be sustainable, whether a certain quality and quantity of natural assets is needed for sustainability and the extent to which natural capital can be substituted for with other types of non-natural capital. So, for instance, can we replace natural pest management with artificial pesticides or natural soil fertility with fertilisers? The **weak sustainability** requirement is the belief that we can generally replace natural with human-made capital and so only need to maintain overall capital for economies to be sustainable. This assumes that we could replace most or all our natural capital with human-made substitutes; we could, for example, replace all soil as a food-growing medium with hydroponic systems. Proponents, among environmental economists, of the **strong sustainability** requirement argue that many of the services we receive from ecosystems, such as the regulation of our climate, provision of clean water and air, soil as a growing medium and much more, cannot be replaced with human-made capital and so are critical to our survival. Some environmental economists (Brand, 2009) have sought to determine what level of natural capital is critical and cannot be replaced, but establishing this is extremely challenging given the complexity of ecosystems.

These accounts are considered by many environmental economists to offer an important additional tool to social cost-benefit analysis. This is because natural capital accounts provide an overall picture of trends in the value of our environment – i.e. in our stock of environmental assets. In contrast, the process of internalising ecosystem values, i.e. the values of flows, into markets, is likely to be somewhat piecemeal depending on which issues are prioritised for policy attention. As a result, they cannot be guaranteed to add up to an overall environmental improvement, while these accounts are designed to provide the overall picture. However, producing these accounts is challenging due to the complexity of the relationship between different ecosystem assets and economic benefits, and they will always have their limits, which will need to be understood and compensated for (Bateman & Mace, 2020).

The critique of environmental valuation

Ecological economists have led the criticism of the environmental economic approach to valuing nature, both on technical and ethical grounds. This criticism has developed in parallel with the development of valuation techniques by environmental economists.

The key technical critiques of environmental economic valuation methodologies are argued to be as follows (Victor, 2020):

- Using monetary valuation of ecosystem services conflates **economic values** with market prices. Although both are measured in monetary units, they measure different things. Economic valuation, when based on surveys, may provide an estimate of what people are willing to pay for a good or service, while market prices reflect buyers' and sellers' willingness to trade at a particular price. Many buyers may well pay less in a real-life market situation for a good or service than they might say they would be willing to pay in a survey. So, a cost-benefit analysis that uses both values based on willingness to pay and market prices, which are likely to be the measure for costs, is using monetary values that are not equivalent measures. For instance, the market price of a hectare of land reflects current trading conditions such as the cost and availability of planning permissions, local development possibilities, the outlook on agricultural prices and more; the willingness to pay for ecosystem services is not directly related to any market involving trading. As ecosystem services are not traded in a market, it is inherently impossible to estimate a market price. Market prices don't reflect economic values – just a price people are willing to trade at.

- The valuation process involves methodological choices which can have significant impacts on the resulting value estimates and are often determined simply by pragmatic considerations, such as the availability of data and/or valuation estimates that can be transferred from other studies, rather than on the basis of any scientific justification. For instance, values based on willingness to pay are likely to be lower, as they are potentially affected by respondents' budgets, than those based on willingness to accept compensation for loss, where no such budget constraint exists. Behavioural economics has also generally found that people value potential losses higher than potential gains. In practice the former methodology tends to be used to avoid responses that no payment would be an adequate compensation, which cannot be used in summing values.

- Economic valuation is particularly flawed when applied at a macro or system change level, such as in strategic policy decisions and natural capital accounts, because environmental economic theory, a subset of microeconomic theory, is only theoretically valid in the context of small or marginal change. This is because microeconomic theory is based on the analysis of small or marginal changes in supply and demand, while all other potential elements affecting price are kept constant. So microeconomics can reasonably analyse changes in the demand for and supply of an agricultural commodity from day to day, but it cannot analyse, for instance, the costs and benefits arising from a change from monocultural, industrial production to agroecological farming since such a change would be likely to involve changes to too many variables. Furthermore, any results from surveys are likely to be unreliable because respondents cannot reasonably be expected to understand the implications of complex, interacting systems level environmental changes, which are likely to give rise to tipping points in ecosystem functioning. For example, consider how one might respond to being asked how much you would pay to protect the rainforest in the Amazon basin, the loss of which could fundamentally change our climate systems and, hence, our social, political and economic systems in ways that are fundamentally uncertain and likely existentially catastrophic.

Beyond these flaws in economic methodology, many ecological economists would also argue that the methodology is fundamentally unscientific as it ignores the evidence of plural and incommensurable values which cannot be validly 'added up' (O'Neill, 2017).

Ecological economists are, though, not primarily concerned with the methodological weaknesses in economic valuation of the environment; unlike environmental economists, they do not see valuation as a primarily scientific issue. Rather, they consider that monetary valuation approaches reinforce the very values that drive the destruction of the environment on which we depend and undermine values that could constrain such destruction. Furthermore, they argue that discounting values undermines the rights of future generations, turning fundamental ethically questions into technical challenges, while assuming that ecological crises are always going to be marginal to ongoing economic growth.

For a start, the economic valuation methodology frames environmental choices as similar to other consumption decisions, a matter of how much to pay for an environmental benefit, as compared to say, a new car. This frame emphasises our individual material interests – rather than those of a citizen considering the wider interests of society and future generations or of a person who engages in a more spiritual sense with the natural world. The methodology does recognise that people have a range of reasons for valuing the environment, some of which may be altruistic, but still asks us to approach its value in the same way we might approach the decision to buy a new outfit or a holiday. So the question of whether to promote organic agriculture is reduced to an individual's willingness to pay

more for organic food rather than framed a public debate about the merits of transforming agricultural systems for society and future generations.

Secondly, for businesses, the environment is treated as a business opportunity rather than in terms of their responsibility to their community and wider society. So farming is viewed as a commercial undertaking rather than as an act of stewardship of land for the benefit of current and future generations. This framing reinforces the environment as something to be exploited for business gain, and such exploitation ecological economists consider to be a key driver of environmental destruction.

Thirdly, the economic valuation framing, i.e., that the environment only has an economic value reinforces governments' tendency to see the environment as another source of economic growth. For example, they may seek to grow their green finance and environmental business sectors, which ecological economists argue will further increase environmental pressures as they drive increasing economic activity.

Finally, economic valuation reinforces power differentials. Unlike in democracy, richer people have a bigger economic 'vote', while the views and needs of less powerful communities, particularly in the Global South, carry less weight. Thus, cost-benefit approaches can be used to justify exporting environmental impacts to the Global South, such as mining minerals to drive conversion to renewable energies or taking control of land to regenerate biodiversity and sequester carbon to offset environmental impacts generated by people in the Global North.

Environmental pragmatists and environmental valuation

Environmental pragmatists see economic valuation as the current best hope of increasing the environment's visibility in policy decision-making, given the influence of environmental economists. They might argue this is more effective than seeking to change the system since the time available to act on the environmental crisis is running out. They may also be more likely to take an ecomodernist approach to addressing our environmental problems, maintaining that that it is possible to address environmental issues within our current economic system with the aid of technical change (see the TABLE explainer **What is ecomodernism?**). Environmental pragmatists, by their nature, are more interested in environmental outcomes, and are less likely to be wedded to a particular ideology.

Ecological economics approach to values and valuation

For ecological economists, values are not facts that can be 'discovered' by individuals through scientific investigation and translated into monetary values with techniques used by environmental economists. They consider values to be social rather than individual phenomena related to our collective needs as humans. They are complex and multiple in nature and potentially in conflict or at least incommensurate (like apples and rain forests), reflecting different and changing identities, histories, cultures, world views and more. So, for instance, some farmers might emphasise the value of producing as much food as possible, and other farmers the value arising from stewarding the landscape in ways that are in keeping with multi-generational practices. Ecological economists feel that this type of clash of views and values should be addressed through dialogue involving all relevant stakeholders, during which the different groups can better understand each other's perspectives and, as far as possible, find common ground around practical actions.

As a result, decision-making is viewed as a discursive and dynamic process of negotiation between different values and understandings to find common ground, rather than a technical, scientific process aimed at discovering and estimating the different values individuals hold to inform a cost-benefit assessment of policy options. One example of such a process might be a citizen's assembly where participants are chosen to be as representative as possible of the wider community and who hear evidence from a range of experts as input to their proposals.

In these processes, ecological economists consider a fair process or **procedural justice** crucial to ensure that the values of all groups are heard and that the rules of decision-making prevent one set of values from dominating over others (Arias-Arévalo et al., 2023). As a result, they argue for open, accessible and transparent decision-making and governance processes that ensure different incommensurate values are factored into decision-making (IPBES, 2022) and power imbalances are countered (Arias-Arévalo et al., 2023). So for instance, it might be claimed that the protests by farmers in Europe against EC agricultural policy change in 2023 suggest that such farmers do not feel their views have been heard or adequately factored into these decisions.

Environmental justice groups and environmental valuation

These groups will likely have similar views as ecological economists, particularly on procedural justice, which may be based on lived experience. Many of the activists in these groups may feel that citizens' views in the Global South, particularly Indigenous groups whose environmental value systems may be very different from those of many in the Global North, are often assigned a low value (Victor, 2020).

Furthermore, those who advocate for the environment in the Global South are particularly aware of the violence perpetrated against those who seek to defend the environment from agricultural, fossil fuel and mining interests. In 2022, someone died every other day while seeking to defend the environment; others may go unrecorded. Others still, while not murdered for their stance, are subject to other forms of criminalisation, harassment and digital attacks to silence them (Global Witness, 2023). This culture of violence and intimidation provides the context in which they hear claims from the Global North that their views will be heard and respected.

Summary

In summary, environmental economists consider economic valuation to be founded on a largely scientific, objective assessment of the values of nature held by individuals and believe that factoring these values into policy decision-making through cost-benefit assessments will improve the quality of the decisions made. Environmental pragmatists argue that valuing nature in economic terms will improve environmental outcomes because decision-makers will give environmental considerations greater weight. Ecological economists view the conversion of values into monetary units as a political act that reinforces the very values which they argue drive environmental destruction. They argue that eliciting values should be seen as a political and social process to inform policy development that reflects multiple, often incommensurate values rather than technical quantification or monetisation of values. Environmental justice groups' views would be broadly in line with ecological economists, seeking for their views to be heard and values respected.

Creating markets for nature

The broad environmental economics approach

For environmental economists, valuing nature economically and using those values in cost-benefit appraisal and natural capital accounts are only the first steps. For these values to affect actual market decisions, they need to be converted from theoretical values into changes in actual prices. That is, they need to be internalised into markets. This internalisation can be divided into broadly two approaches, to be decided on based more on practical than theoretical considerations (Pearce, Markandya, & Barbier, 1989):

- Governments can introduce taxes, charges, levies or subsidies linked to quantities of pollution emitted or resources including ecosystem services used; and
- Governments and potentially others can create markets in which environmental or resource units are traded so their price reflects their value.

In the first case, the price of environmental damage is incorporated into markets, but the environmental impact is uncertain as it depends on the decisions made by those facing the price change. For instance, businesses could take action to reduce their pollution or else absorb the extra cost. So if farmers faced a tax on pesticides, they may still consider it worth continuing to use the same quantity of pesticides and adjust to the increased cost, particularly if they didn't think they had any real alternatives. Given the uncertainty of outcomes, this approach would be less favoured if it is very important to achieve a particular outcome in order to avoid significantly increased harm – for example, if a tipping point for environmental change might be triggered.

In the second case, the quantity of traded environmental units is controlled. This gives more certainty over environmental impact, but the price emerges because of decisions by market actors, which are difficult to predict with certainty (Dasgupta, 2021). For example, the UK has recently introduced an internationally regulated market for **biodiversity credits** referred to as Biodiversity Net Gain (The UK Government, 2024). Developers, infrastructure providers and others whose actions degrade biodiversity must create an equivalent amount of biodiversity plus 10% in quality and quantity. This can be either in the area they have affected or else they can pay someone else to deliver the biodiversity increase on an external site. So the quantities of biodiversity are regulated, but the price at which units of biodiversity will trade is very uncertain, as the markets are still developing since the system became mandatory in February 2024.

Environmental economists consider all interventions known as market-based instruments, to likely be more efficient than regulations as they allow for more flexible responses by businesses and individuals and, hence, reduce the costs of achieving any given environmental outcome. So, in the short term, those who find it cheaper to respond to these instruments will take greater action, while those who find it more expensive will take less. For example, those who understand how to implement biological pest control would be more likely in the short term to reduce pesticide use when faced with a tax than those who don't have such capability. Over the long term, such a tax could promote innovation in pest control measures that avoid using pesticides. The point is often made that this approach compares favourably with a regulation requiring everyone to reduce pesticide use by, say 30%, which for some could have very expensive consequences if they were unable to implement alternatives (Pearce, Markandya, & Barbier, 1989).

Payments for ecosystem services and nature markets

These broad principles have influenced the development of market-based instruments aimed at promoting more sustainable land management and nature conservation. These instruments are generally referred to as Payments for Ecosystem Services (PES), **ecosystem services** being the various benefits that humans receive from the natural ecosystems discussed in the previous section on valuation. In practice, there are a wide range of approaches to designing PES schemes.

Traditionally, governments, their regulators/agencies and/or international aid agencies have paid landowners and/or managers to, in effect, provide ecosystem services by managing their land differently from what markets alone would dictate – for example, by leaving nature strips around the edge of fields. The payments are generally based on compensating for any costs incurred and income forgone arising from the changes in land use and/or management practices. So if a farmer converts a significant area of a field previously used for dairy cattle into a woodland area by a river, which would sequester carbon, increase biodiversity, reduce water pollution and flood risk, the farmer could receive compensation for the costs of creating the woodland area and the income lost from reduced milk sales. Payments are based on costs and income forgone, partly because the valuation of ecosystem services is not seen as a robust or efficient basis for grant payment schemes by government administrators but also because such payments would be counted by trade rules as subsidies, which are politically and legally discouraged. Even in the UK after its exit from the EU, the payments under the new Environmental Land Management Scheme are constrained by World Trade Organisation rules on subsidies, so remain on a compensatory basis.

More recently policy and regulation have been developed to encourage or require the private sector to fund ecosystem services based either on offsetting damage or on replacing human-made solutions with nature-based solutions:

- For offsetting, Governments require companies to compensate for environmental impacts they cause (ie. loss of ecosystem services), by funding the creation of equivalent ecosystem services elsewhere. So, if a mining, infrastructure or housing development causes biodiversity loss, there may be a requirement on the business causing the loss to fund the development of equivalent biodiversity restoration elsewhere, either directly or through markets for biodiversity credits.

- For substituting, Governments may require their agencies or private companies to deliver environmental services such as flood risk management and water resources and sewage supply by enhancing natural systems, where there is the potential for these environmental services to be delivered through changes in land management and use. So, water supply companies may decide to fund landscape management activities such as peatland restoration to increase water retention in order to reduce the risks of drought and hence reduce the need other new sources of water such as desalination plants.

It is important to note that offset systems will generally seek to maintain the current level of natural capital, while substituting involves increasing natural capital.

The private sector has also sought to pay for ecosystem services voluntarily to meet corporate responsibility commitments, for marketing purposes and to make their businesses more resilient to climate change and ecological risks. In terms of marketing, businesses may want to advertise their

products and services as carbon-neutral and/or nature-positive by buying carbon and/or biodiversity credits to compensate for or offset the impacts of such products and services. As regards resilience, businesses that are dependent on natural resources, such as whisky producers (who rely on high-quality water resources), may want to reduce the risks to their businesses by funding actions to increase the resilience of such ecosystem services. Here, businesses may seek to collaborate to avoid free riding by other companies, who might receive the resulting ecosystem benefit without paying for it (Biodiversity Credit Alliance (BCA), 2023).

Again, in the first case, the aim will be to maintain the current level of natural capital, while the second should actually lead to enhanced natural capital. These differences are important where the overall aim is to enhance and restore natural capital and ecosystem services rather than just maintain them at current levels. In signing the international Convention on Biological Diversity, governments have committed to the former and recognised that ecosystems are seriously degraded.

Several models have emerged for PES to work for the private sector:

- **Private funding through markets:** Private companies buy nature credits based on the delivery of defined ecosystem services in nature markets where they exist. For instance, land managers sell credits generated by planting woodland or restoring peatland, based on a recognised science-based standard demonstrating the relationships between woodland planting or peatland restoration and carbon sequestration over time.

- **Private funding without markets:** Private companies, singularly or collectively, enter into direct agreements with land managers to deliver ecosystem services, based on negotiated prices. These may be related to the resilience of their supply chains – see the Landscape Enterprise Networks (LENs) example below.

- **Mixed or blended funding:** Private and public sector organisations negotiate payments to landowners and/or managers for delivering ecosystem services with and without the existence of markets in those services. So a number of landowners with land adjoining a stretch of river may collaborate to renaturalise the floodplain, thereby providing a range of services for which markets, in some cases, do not currently exist or indeed realistically could exist, such as for flood risk management. Natural flood risk management based on slowing flows with human-made or naturally created obstructions (such as beaver dams) cannot clearly be converted into tradeable units, given the complex locally specific relationships between such obstructions and flood risk. If a series of natural flood risk management actions were put in place to reduce the flood risk to a particular settlement, they would clearly have value to that settlement, but it is not clear how they could have any significant value to any other settlement which would allow a trade to occur. This might be contrasted with a carbon market where climate change affects everyone and a reduction in carbon in the atmosphere has the same effect wherever it happens.

In practice, the focus of interest has been on developing nature-offsetting markets to facilitate the private sector's PES, for a number of reasons that we will now explore.

Environmental pragmatists' support for nature markets

Environmental pragmatists, working with business and government, are promoting nature markets on the assumption that the power of markets can help in achieving the goals of ecosystem restoration. Businesses have supported nature markets because they see them to be a more flexible solution and less costly than uniform regulation. For instance, the Business and Biodiversity Offset Programme (BBOP) set up in 2004 led by Forest Trends, an NGO aiming to make forests more valuable to preserve than destroy, has been a key international promoter. BBOP involves a transnational coalition of 40 conservation organisations, companies, financial institutions and government agencies working to establish development projects that do not lead to a net loss in biodiversity. This approach was ultimately accepted by the Convention on Biological Diversity and has become incorporated into national laws and policies in over 50 countries (Chandrasekhar, 2023).

Over the same period, voluntary 'carbon offsets' markets developed, building on US-regulated offset markets in lead, sulphur dioxide and nitrous oxide, which were supported by such US environmental pragmatist organisations as the Environmental Defence Fund and Nature Conservancy (Chandrasekhar, 2023). In Europe, the most significant market developed to date has been the EU Emissions Trading System. Currently, carbon offset schemes enjoy a much higher profile but have also faced a stronger backlash against claimed 'greenwashing,' as discussed below. Carbon offsets have spanned a wide range of actions aimed at reducing carbon emissions, including certain land use and management practices that sequester carbon, such as woodland planting (Gabbatiss, et al., 2023).

The International Taskforce on Nature Markets was established in April 2022 'to support the development of a new generation of purposeful nature markets, so that they deliver nature positive and equitable outcomes, and in so doing contribute to meeting climate goals'. The Taskforce comprises 15 senior representatives from international governmental organisations, business, academia, conservation groups and indigenous groups and was set up by Nature Finance, an NGO whose vision is to align global finance with nature positive and equitable outcomes (Taskforce on Nature Markets, 2023). This task force and other similar initiatives, led by environmental pragmatists, do bring a stronger focus on the need for the right governance frameworks to ensure markets deliver real and equitable environmental outcomes, particularly following bad publicity around Verra accredited schemes in 2023 (Greenfield, 2023) which has undermined faith in voluntary carbon credit markets (Taskforce on Nature Markets, 2023).

Private finance and nature business models

An important and increasing focus for environmental pragmatists is to gain private finance, often known as **green finance**, for **nature-based solutions** (NBS). NBSs are defined internationally as 'actions to address societal challenges through the protection, sustainable management and restoration of ecosystems, benefiting both biodiversity and human well-being' (IUCN, n.d.). Environmentalist pragmatists consider that public finance will not be enough to reverse the decline in natural ecosystems (this is often referred to as the 'finance gap'), and that significant levels of private finance are needed to fill it (Dasgupta, 2021). For instance, this financing gap was estimated at between US$598 billion and US$824 billion per year in 2019 in a major report entitled "Financing Nature: Closing the global biodiversity financing gap", commissioned by philanthropists, conservationists and academics (Deutz, et al., 2019). From the viewpoint of private finance, they could be willing to lend money to or invest money in entrepreneurs promoting NBSs if they see a clear potential profit from selling credits into carbon and nature offset markets. They may also be able to gain positive PR from being seen to support ecological regeneration.

An emerging approach is for 'nature entrepreneurs' to develop a business proposal to pitch to providers of nature finance to cover the upfront costs of actions to deliver NBSs, providing investors with a return and potential repayment arising from revenue gained from selling biodiversity, carbon and other credits into markets (e.g. **Palladium Group**). For instance, finance might be raised to cover the costs of compensating farmers for taking land out of dairy production, fencing it off to prevent livestock access and managing the land to increase both biodiversity and carbon sequestration, which is then measured in terms of credits that are sold in markets to repay the financial investment and make a profit. So for instance, the UK Government, which is seeking to position the UK finance sector as a leading provider of green finance, has created a grant programme called the Natural Environment Investment Readiness Fund to support farmers, as sellers of credits into nature markets, and potential buyers of such credits, working with technical professionals, to develop investment-ready business proposals.

It is important to note the difference between this private finance-based approach and government grant funding to farmers that is awarded to cover the costs of changes in land use and management to deliver the environmental outcomes that government seeks. Such grant funding is not repayable, while private finance always creates a claim on the recipient, whether it is in the form of a loan or equity investment. So, it is important to understand that replacing public grants with private finance is not replacing like with like. The purpose of private finance is to cover any timing difference between expenditure and future revenue, while public funding directly covers expenditure.

This model involving private finance, nature markets, and nature recovery business models reflects the broad environmental economics approach, which places the onus on governmental bodies to address market failure and create markets that work 'better'. Many pragmatic environmentalists promote this approach, arguing that it provides funding to achieve nature conservation outcomes in the context of what they consider to be historical underfunding and neglect.

The ecological economic critique of nature markets and private finance

Ecological economists believe that there are fundamental tensions between this approach of using markets, private finance and business models and the equitable regeneration of ecosystems (see Figure 2). Their concerns include the following:

- The need to pitch nature-based business proposals to gain private finance encourages overestimation of potential future revenue in what is a complex process of assessment involving significant elements of judgment. In particular, it involves assumptions of what would happen without the project – the counterfactual, which is open to manipulation. As a result the promised gains of NBSs may not happen to the extent promised (Swinfield, Shrinkanth, Bull, Madhavapeddy, & zu Ermgassen, 2023).

- Demonstration of real equivalence between ecosystem loss and benefits of an offsetting project is not possible. Ecosystems are highly variable, with a huge variety of species, and their equivalence is difficult to measure objectively. It is not clear that different species can be equivalent in any real sense, particularly as we may not fully or even partially understand their role in ecosystems. Furthermore, places have unique value to some people, which cannot be 'equivalised' (Neuteleers, 2022).

- To create effective markets, standardised environmental units need to be established so they can be traded easily, an activity often referred to as commodification. It must be clear what 'quantity' of an environmental service is being traded for a market to function. This quantity of environmental services, such as carbon tonnes or biodiversity units, is generated by a management change on a specific area of land, e.g. by creating a wetland. This approach involves breaking ecosystems down into different units with separate values. This makes it harder to take a holistic approach to ecosystem regeneration because the real value of ecosystems often lies in the connections and networks they form (Swinfield, Shrinkanth, Bull, Madhavapeddy, & zu Ermgassen, 2023).

- 'Sellers' of nature, such as landowners, tenants, conservation and Indigenous groups, may have less capacity, resources and expertise to understand these markets (which are likely to become increasingly complex) and so may be exposed to exploitation by better-resourced private businesses and finance (Reed et al., 2022).

- Unlike most markets, the delivery of ecosystem services needs to be maintained over the long term, and this is very difficult to guarantee.

- Given its very different demands, private finance lacks the capacities and systems to deliver effective nature finance. Private finance looks for large, liquid markets with low transaction costs and short-term returns, while nature markets involve relatively small-scale, ecologically and socially complex nature-based solutions with uncertain long-term gains (Kedward, zu Ermgassen, Ryan-Collins, & Wunder 2023).

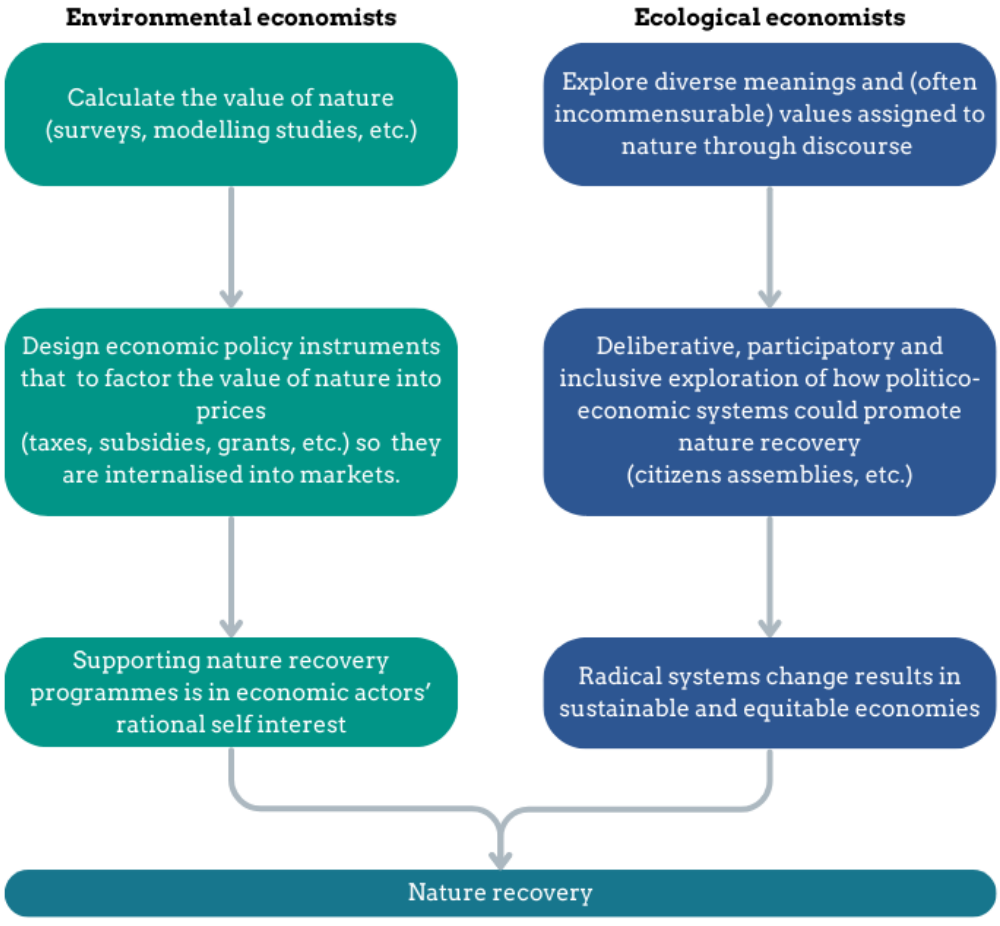

Figure 2: A flowchart demonstrates how environmental economists and ecological economists each imagine the pathways to nature recovery.

Ecological economists argue that even if these more practical issues can be addressed by design, they will certainly not deliver the substantial improvements in ecological regeneration which are generally believed to be necessary. As they are mainly based on some form of offsetting (Biodiversity Credit Alliance (BCA), 2023), nature markets at their very best, will only maintain the status quo by replacing losses elsewhere, as offsets are designed to do. Even then, the results are uncertain as the offsets could fail to deliver the projected outcomes (Green Finance Observatory, 2023).

Furthermore, they argue that these markets could support greenwashing on a number of levels:

- Individuals can buy carbon offsets to continue justifying their luxury overseas holidays or buy products with green credentials while maintaining their high consumption levels.
- Businesses can claim to be carbon neutral and nature-positive while failing to transition to truly sustainable business models that do not depend on ongoing growth.
- Governments can claim to be committed to achieving net zero and biodiversity regeneration while exporting the need for change to the Global South. In other words, they avoid taking steps to achieve real system change by buying their way out of their responsibilities.

Ultimately, businesses and governments may rely on future offsets delivered in the Global South for their net-zero strategies when, in fact, there is not enough land to offset all the environmental impacts of the Global North.

Ecological economists also point out that offsetting projects can ignore the needs and rights of local communities and Indigenous Peoples in the Global South, who have traditionally stewarded much of the world's high-value ecosystems. They argue that these conservation activities are yet another iteration of colonial forms of exploitation, including mining, oil extraction, and agriculturally motivated land grabbing.

Environmental justice organisations may take an even more hard-line position than ecological economists on nature markets, believing them to be fundamentally driven by greenwashing. Global North governments and businesses pretend to take action while actually seeking to maintain the status quo, an exercise in distraction by the powerful to protect their position (Melanidis & Hagerman, 2022).

Environmental pragmatist promoters of nature markets increasingly recognise many of these issues (Melanidis & Hagerman, 2022). They have begun to emphasise the need for proper governance, standards, and engagement with Indigenous peoples, as evidenced by the extensive recommendations of the international Taskforce for Nature Markets (2023). They recognise that scandals have undermined the credibility of carbon credit markets and want to avoid this in nature markets since it will discourage private finance from investing (Chandrasekhar, 2023).

However many ecological economists and environmental justice organisations are yet to be convinced by these proposals for improved governance (Melanidis & Hagerman, 2022). They argue that nature market governance will inevitably be driven by politics and vested interests, and will maintain the current focus on unequal capital accumulation based on unsustainable resource use (Spash & Ryan, 2023). Part of the basis for this position is that nature markets have involved significant privatisation of regulation; many standards and assessment approaches are, in fact, designed by the private sector, and this increases, it is argued, their potential for manipulation (Green Finance Observatory, 2023).

A pragmatic alternative to nature markets and private finance

There are environmental pragmatists who focus less on private finance and markets, and more on building collaborations between ecosystem service beneficiaries and land managers. For instance, some see promise in a payment-for-ecosystems model developed by a consultancy in the UK called Landscape Enterprise Networks (LENs). This involves an approach that is very different from transactional nature markets, because it is fundamentally about building long-term collaborations. A facilitator or broker seeks to facilitate collaborations between:

- A group of private companies together, who have common commercial interests in increasing the resilience of ecosystems their businesses depend on. For example, Nestlé is one such collaborator in **the first LEN in Cumbria**.
- Land managers willing to enhance ecosystems' resilience in return for payment from these companies.

In this case, the payments for ecosystem services from the private companies can be agreed to match expenditure needs so that private finance is not required to cover the upfront costs (Reed, et al., 2022).

The LENs initiative allows for a more holistic approach to ecosystem regeneration in so far as private funders are looking to support the delivery of multiple ecosystem services. It also allows for the value of ecosystem services delivered by farming system change, which could be essential for such farming approaches to be economically viable (Cumulus , 2022).

This contrasts with the approach driven by revenue from nature markets, which may focus solely on carbon sequestration (for example, planting fast-growing trees) rather than on integrated ecosystem outcomes and can require nature separated from agricultural systems, so it can be more easily commodified into a tradeable asset. Furthermore, the funding aims to deliver more resilient ecosystems from productive systems like dairy livestock rather than offsetting damage caused elsewhere. This should provide an overall improvement in environmental outcomes rather than only maintaining the status quo as nature markets tend to do.

However, the LENs approach is in its early days and has yet to be independently proven to deliver holistic environmental gains. The current focus is mainly on private-sector collaboration without wider governance involving the public sector and interested communities, so it is unclear whose interests LENs will promote.

The ecological justice perspective

Ecological economists and environmental justice organisations argue that there is a need for much wider and deeper institutional reform than achievable through the approaches adopted by environmental economists and environmental pragmatists. Here, institutions are understood to encompass social norms, cultures, laws and regulations –all socially constructed formal and informal rules that influence behaviour. As a result, their position challenges the current political consensus, which assumes that businesses, markets and economic growth are central to delivering human well-

being. They are agnostic at best on the benefits of growth and generally consider it environmentally damaging, promoting instead the need for post-growth and/or degrowth policies.

Those within the ecological economics and food justice movement, do recognise the need for payments for ecosystem services similar to environmental economists and pragmatists i.e. the need for beneficiaries of ecosystem services to provide funding to cover any resulting costs of delivering such services (Farley, 2012), if the complexity and interconnectedness of ecosystems is recognised (Norgaard, 2010). This could involve either active management or excluding human development from areas. Their focus, though, is more on whether the institutional processes underpinning such funding are just and focused on public benefit over the long term. Funding is also not seen necessarily in a market transactional context but more as part of a reciprocal, collaborative relationship between beneficiaries and providers of ecosystem services (Vatn, 2010).

Exactly what the required institutional changes are and how they should come about remains, however, a matter of discussion and a range of positions may be taken. Key proposals include:

- Reforming the nature and purpose of corporations so they focus on public benefit rather than profit-generation, which is often based on exploiting people and nature (Goodwin, 2023; Mayer, 2024). This might require changes in how major food companies are governed to give stakeholders decision-making powers and/or specify company public purposes that directors are duty-bound to deliver.

- Using 'missions' involving multi-stakeholder 'coalitions of the willing', including governments, to reshape markets to deliver major environmental, social and economic goals (Mazzucato, 2023). This approach has been explored with stakeholders in the UK to promote nature recovery, with stakeholders proposing that regulation would also be needed, as well as mission-driven innovations (zu Ermgassen, et al., 2024).

- Designing institutional systems to manage shared environmental resources, makes it more likely that people and organisations collaborate for the common good than in competition-based market systems (Ostrom, 2009).

This latter focus on institutional design has underpinned proposals for alternative approaches to governing and funding the regeneration of landscapes. For instance, multi-stakeholder cooperatives have been proposed as a legal basis to formalise mutually agreed decision-making rules for long-term collaborations between multiple local parties such as businesses, government agencies, land managers and community/Indigenous organisations to regenerate ecosystems based on payments for ecosystem services. Agreements for funding projects to deliver ecosystem services (e.g. flood plain naturalisation) paid for by business and government agency members of the cooperative and delivered by landowners could then be negotiated within these governance rules. This approach would support a more integrated approach to ecosystem regeneration and would be better suited to recognising the value of ecosystem services provided by changes to farming practices such as agroecological and regenerative farming, in a similar way to the LENS system.

This approach has yet to be applied to landscape regeneration, but it has been applied to digital network management in the UK, which represents a similar challenge: groups of owners of cables and hardware need to collaborate to create larger more useful networks and with digital service providers who wish to use these networks similar to beneficiaries of ecosystem services (see **Cooperative Network Infrastructure**).

As well as potentially providing fairer and more transparent governance, it is argued that such governance rules would reduce transaction costs and allow for relatively easy adaptation as

circumstances, science and policy change. This compares to the LENs approach described above, where formal governance is delivered via contracts, which, it is argued, are less supportive of collaboration, particularly as they are less transparent due to the extensive small print involved and because they are less flexible when it comes to dealing with changing circumstances (Leveson-Gower & Mills, 2024). For similar reasons, Community Asset Trusts have also been proposed (Constanza, Alkins, Hernandez-Blanco, & Kubiszewski, 2012).

The challenge, though, with these approaches is whether formal governance can effectively moderate the effects of existing power imbalances between the different parties. More powerful parties may be able to insist on their greater importance being recognised in the governance arrangements and may seek to exclude parties they see as potentially challenging their interests – these may include community and Indigenous groups. Even if the formal rules are, on the face of it, equitable, some parties may be able to leverage their control of external resources to achieve decisions that favour them e.g. by threatening to withdraw funding, or simply by being able to argue for their interests more consistently over the long term. Governments could seek to require and support fairer decision-making, but to date, there has been a greater focus on governance of national and international nature markets than local spatial economic collaboration.

More broadly, these and other related proposals for significant institutional change face the challenge that those who gain the most from current institutional systems will likely oppose changes that they believe will negatively affect their position. These actors are also likely to have influence with political actors in a position to implement institutional change. So, we have seen how fossil fuel interests have sought to delay action on climate change. Transformations in how our economic systems interact with natural systems may be opposed by multiple commercial interests, such as large international livestock processing companies, producers of fertilisers and pesticides, mining multinationals and so on. This opposition may not always be transparent; for instance, it is claimed that large US livestock interests are promoting the dangers of ultra-processed food to undermine a shift to alternative proteins (Changing Markets Foundation, 2024).

Hence building coalitions to drive the level of institutional change that ecological economists believe is required is very challenging, and there is no consensus on what strategies are most effective. In contrast to the environmental economics approach of government-led policy change, proponents of socio-ecological transformation often focus on bottom-up strategies to counter dominant actors who, they believe, focus on reproducing the status quo. The process is also important for them to avoid reproducing existing hierarchies of oppression, such as patriarchy and colonialism (Schulken et al., 2022). Some also believe that the climate and ecological crisis is accelerating so fast, and the drivers, particularly the financial system, are so embedded that we cannot reform institutions fast enough to avoid a collapse of our current economic system (Bendell, 2023).

So, for ecological economists and environmental justice organisations, addressing the current ecological crisis must be based on reforming institutional systems. This requires strategic political projects to build coalitions for change responding to specific circumstances.

Implications for food systems

Our economic systems all exist within natural systems and draw upon them, but food systems are most obviously directly dependent on natural inputs. They also have some of the largest impacts, from the destruction of natural habitats to chemical pollution and the emission of greenhouse gases. As a result, any change in the cost or regulation of these environmental inputs and impacts will likely substantially affect the viability of farm businesses – unless the price of food also increases, which could then impact the ability of many people to afford the food they need. On the other hand, ecological degradation could substantially reduce food security and increase prices. The accelerating speed of climate change is increasing the risks of multi-breadbasket failure (Hasegowa, Wakatsuki, & Nelson, 2022), which will pose challenges in particular for African countries, which tend to be importers of grains. It is also driving competition for land use from carbon sequestration and biofuels.

Environmental economists, supported by many environmental pragmatists, consider that changing the incentives that farmers face through taxes, subsidies, nature markets, and regulations is the key to changing farmer behaviour to deliver more sustainable food systems. This approach is often known as full cost accounting and aims to ensure that all the costs of food production, including costs to the environment, are factored into the final price. They argue that these changes in incentives will cause farmers and growers to change their production and land management practices in ways that reduce their negative environmental impacts in order to qualify for payments for ecosystem services and meet regulatory requirements. So for instance, if farmers received revenue for the improved ecosystem services they provided, they would be able to better compete with less environmentally positive agricultural practices (Cumulus 2022). The result should be much more sustainable agricultural and horticultural systems. They do accept that this could increase the cost of food, which risks increasing inequality – and that this, in turn, will require a government response, perhaps in the form of transfer payments (Lord, 2023).

There could be some divergence between environmental economists and **environmental pragmatists** over the goal of changing incentives. 'Strict' environmental economists will aim for prices that reflect the values of the environment as determined by their methodologies, which could be quite low, meaning that the resulting environmental outcomes will be less than the environmental pragmatists feel to be justified by environmental science. Pragmatists might then demand higher incentives to achieve the environmental outcomes they are looking for. Environmental pragmatists will also be seeking to influence *how* people value the environment, rather than seeking to objectively discover those values, as environmental economists attempt to do (Spash 1999). Ultimately any changes to incentives will be subject to political negotiation influenced by existing power relationships. Environmental pragmatists will seek to influence these rather than just providing environmental economic analysis.

Ecological economists could potentially join in a common cause with environmental pragmatists in that they seek to work with stakeholders to establish a common vision for the sustainability of food systems and practical economic paths to achieve those outcomes. For instance, both would have an interest in the economic requirements for a transition to farming systems which mimic ecosystems as far as possible, which could require building new supply chains (Cumulus 2022) (Buckton SJ, 2024). However, Ecological economists often focus more on food justice and nutrition as desirable end goals. They are interested in overall material and energy flows and their relationship to satisfying needs (Rauschmayer & Omann, 2017). They are concerned with understanding the reality of markets in all their complexity within wider institutional systems of ethics, social norms and politics rather than relying on the neo-classical economic theories of efficient markets detached from wider contexts that underpin environmental economics. They are interested in rebuilding moral economies, where

food provision is placed within wider sets of social and political relationships to deliver fair access to sustainably produced healthy food (Johanisova & Frankova, 2017). This would include how prices of food are set to be fair. Generally, farmers and growers are not in control of the prices they receive for their produce, so find it very difficult to pass on increasing costs to their buyers, which makes them particularly wary of changes in market conditions. Ecological economists would generally recommend more strategic intervention in economic systems, rather than just influencing prices, to support system change, potentially drawing on both the mission and landscape governance approaches discussed above.

So for instance, one approach would be to develop a coalition of willing collaborators around a mission to substantially increase the amount of food sourced from agroecological production and make it available to citizens on an equitable basis. It has been argued that agroecology (see the TABLE explainer **What is agroecology?**) is likely to produce much more diverse products with efficiency gains from synergies rather than economies of scale (Food and Agriculture Organisation of the UN, 2024). This could suggest a strategy based around local food systems reform where it could be easier to develop common cause and collaboration along the supply chain and where the potential of local public procurement could be tapped, a type of commoning (Akbulut, 2017). This approach could also include developing local systems to achieve greater food justice through forms of wealth transfer. Building this common cause locally might also make it less easy for powerful interests in the current food system to resist the change. The resultant learning could then be shared with other areas to support them in achieving the same objectives with strategies tailored to the local circumstances.

Environmental justice groups will also focus on food system change, particularly in the Global South. This might involve empowering those with traditional knowledge of agroecological subsistence agriculture while challenging those promoting mainstream cash crop export strategies and reliance on imported staples, all controlled by commercial interests. The key focus will likely be on rebalancing power over food production away from international commercial interests to local farmers and growers and making food supply more resilient, particularly as food security risks rise.

These outlines of potential interventions are intended only to illustrate how different groups might approach food system change. The environmental economic approach is easier to describe as it focuses on changing price-based incentives to reflect what it claims are the environmental costs of food. Strategic system change interventions argued for by ecological economists and environmental justice organisations are more difficult to articulate and define at a general level as they would need to be tailored to the particular opportunities and threats present in different countries and political systems.

Monarch butterflies rest on the trunk of a mossy tree during migration. Photo by Erika Lowe via Unsplash.

Glossary

Term	Definition
Biodiversity credits	A tradeable unit indicating the provision of a defined improvement in biodiversity that companies or individuals buy to offset or neutralise an equal reduction in biodiversity they have caused elsewhere.
Critical institutionalist economics	Critical institutionalist economics is a field of economics that studies the relationship between institutions and the economy; How institutions like regulations, culture, businesses, markets, and property affect economic performance, innovation, and productivity.
Complexity economics	Complexity economics is the study of economic systems as complex systems. Complex systems are systems which consist of interacting individuals that change their actions and strategies in response to the outcome they mutually create. Complexity economists study the emergence of structures and the unfolding of patterns in the economy and they regularly dispense with the assumptions of individual optimization and/or systemic equilibrium usually employed in mainstream or neo-classical economics (see below).
Cost benefit analysis	A process to inform decisions involving calculating the related costs and benefits.
Discounting future costs and benefits	Discounting as a process of reducing future costs and benefits so they can be compared with current costs on a like for like basis based on the assumptions that people prefer value the present over the future and will be richer in the future.
Economic instruments	These are government interventions designed to influence prices in markets such as taxes and subsidies or to create markets, where none exist. See also market-based instruments.
Economic value	Economic value is the value to consumers of a product or service i.e. how much they would be willing to pay for the good or service, which could be higher or lower than the market price.
Ecosystem services	The flow of services provided by the environment or stocks of environmental assets or natural capital (see below) that humans benefit from including provisioning, regulating and cultural services.
Environmental assets	Environmental assets describes stocks of natural features that provide flows of benefits through ecosystem services (see above) to humans. See also natural capital.
Evolutionary economics	Evolutionary economics focuses on economic change. Hence processes of change such as growth, innovation, structural and technological change, as well as economic development in general are analysed.
Feminist economics	Feminist economics is a field of study that examines the relationship between gender and economics, and aims to create a more gender-equal society
Green finance	Private finance, such as loans and equity investment, used to fund nature-based solutions (see below).
Heterodox economics	Heterodox economics is a broad term that refers to economic theories and schools of thought that are not part of the mainstream. Heterodox economics includes a wide variety of theories, assumptions, and methodologies that are different from or contradict those used in mainstream economics.

Institutional economics	Institutional economics focuses on the role of social institutions in terms of laws or contracts, but also those of social norms and patterns of human behaviour that are connected to the social organisation of production, distribution and consumption in the economy.
Market based instruments	These are government interventions designed to influence prices in markets such as taxes and subsidies or to create markets, where none exist. See also economic instruments.
Marxist socialist economics	Marxist socialist economics is an economic and political theory that analyzes capitalism's flaws and proposes a socialist alternative.
Monetary value	The value of assets, capital, costs or benefits delineated in monetary terms.
Natural capital	Natural capital describes stocks of natural features that provide flows of benefits through ecosystem services (see above) to humans. See also environmental assets.
Nature based solutions	Nature based solutions are actions to address societal challenges through the protection, sustainable management and restoration of ecosystems, benefiting both biodiversity and human well-being.
Nature markets	Nature markets involve converting ecosystem services into tradeable commodities which are bought by others mainly to offet the damage to ecosystems they are causing elsewhere either on a voluntary or regulated basis.
Neo-classical economics	Neo-classical economics, also known as mainstream economics, is a tradition in economic thinking that dominates economic research and teaching around the world emerging at the end of the 19th century. Its focus is on the mathematical modelling of markets on the basis of simplifying assumptions such as humans being self-interested utility maximisers interacting mainly in markets that tend towards equilibrium-maximising human welfare.
Offsets	Offsets are proofs of environmental improvement often purchased from third parties, and used to counter or neutralise equivalent environmental degradation caused by the purchaser.
Post-Keynesian economics	Post-Keynesian economics (PKE) is an economic theory that builds on the work of John Maynard Keynes and other economists to explain economic performance. PKE argues that social interactions create distinct systemic properties at the macroeconomic level. It analyzes human behavior based on social conventions and heuristics embedded in specific institutional contexts.
Procedural justice	Fair processes to allocate resources, deal with disputes and make other decisions affecting multiple parties.
Strong sustainability requirement	Strong sustainability is a concept that aims to maintain economic, environmental, and social capital while ensuring that the natural environment can continue to support human well-being. It's based on the idea that natural capital often can't be replaced by other types of capital.
Weak sustainability requirement	Weak sustainability is the idea that the total capital stock should be maintained or increased over time, and that natural and man-made capital are essentially interchangeable. This means that it's acceptable to use up non-renewable resources as long as enough other capital is created to compensate.

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