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# Valuing nature: the case of tropical forests and Costa Rica

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The paper focuses on the failure to account for the value of standing tropical forests, and of ecosystem services in general, in economic decision-making. This blindness to the values of nature has led to overexploitation, degradation and destruction of tropical forests, which, in turn, has also significantly contributed to greenhouse gas emissions. Forest conservation and restoration has a critical role to play in the fight against climate change and brings a vast array of additional benefits, from security in water, energy, food, health and livelihoods to maintaining biodiversity itself as a core component of our living planet. As first Minister of Environment and Energy under President Oscar Arias (1986–1990), I brought these views into societal decision-making in Costa Rica and here I briefly describe how.

This article is part of the theme issue 'Bringing nature into decision-making'.

The classical economists were keenly aware of the importance of nature's contribution to human welfare. Earlier, the physiocrats believed that only land was productive. David Ricardo based his theory of rent on the differential productivity of the land [1] and John Stuart Mill included a chapter on the 'steady-state' in his *Principles of political economy* [2]. Sadly, however, these concerns were lost with the rise of orthodox or neoclassical economics.

Over half a century ago, in 1966, economist Kenneth Boulding [3] published his path-breaking article 'The economics of the coming spaceship Earth', where he framed the challenges to economists posed by the transition from what he called the 'cowboy economy' of the past to the 'spaceship economy' of the future. He stated that: 'Economists, for the most part, have failed to come to grips with the ultimate consequences of the transition from an open to a closed earth'.

Although economists recognize existence value, in usual practice, a standing majestic *Ceiba* tree, the sacred tree of the Maya, or a magnificent tuna or swordfish has no value when it is alive, but it acquires value once it is dead, and then we only count the extraction costs. At the academic level, there has been considerable progress in 'trying to get the prices right' and to have full cost accounting, but these efforts have failed to gain widespread acceptance so far. The United Nations (UN) has led the way to a more comprehensive wealth accounting, but if we look at the practice of economics and development policy, Boulding's statement is largely true today.

It is widely recognized by economists that human-induced climate change is an 'externality' and that global climate is a 'public good'. Although there is a growing field of ecological/environmental economics that attempts to deal with local externalities, the political economy, and global externalities such as those that lead to climate change and species extinction have proven much more challenging. By their own choice, most economists fail to deal with questions of intra- and inter-generational equity. Climate change introduces two new sources of global inequality: those who pay the highest costs are the ones who contributed the least to the problem, and we are transferring a huge ecological debt to future generations.

Our definition of resources has also changed considerably—we used to believe that fossil fuels (oil, gas, coal) were the resource, while today we understand that the binding constraint is the capacity of the atmosphere and the oceans that absorb the greenhouse gases that they generate. By nature, I mean not only individual species, products or services, but also entire

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ecosystems at the local and global scale, including global common resources like the oceans, the atmosphere and the totality of biological diversity.

Nature has no legal standing in the United States and almost all other countries. So far, only one country, Ecuador, has given the *Pacha Mama* rights under their constitution. Natural or environmental rights are seen as an extension of human rights and many countries have amended their constitutions to recognize the right to a healthy and ecologically balanced environment. Recently, the Chilean Constitutional Assembly has made some far-reaching proposals, including the state's duty to prevent and mitigate climate change.

In 1957 Roger Revelle warned about the experiment being conducted on planet Earth [4]:

> Human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future … we are returning to the atmosphere and the oceans the concentrated organic carbon stored in the sedimentary rocks over hundreds of millions of years.

We have used a significant proportion of the stored carbon on Earth and valued the corresponding emissions at an implied cost of zero, although we have been aware for a long time that greenhouse gas emissions cause significant damage and should be priced negatively (taxed). In spite of the efforts of many, including the United Nations and global development institutions, there is still no internationally agreed carbon tax and the political economy of carbon pricing has become extremely complex and fragmented.

In most societies today, decision-making is dominated by economic criteria and some form of cost–benefit analysis. Standard externality and cost–benefit approaches can be useful for addressing marginal changes, but they abstract from dynamics, risk and the existence of nonlinear effects. Under standard economic theory, as practised today, nature is mostly assigned a default prize of zero, which means that it has no value. The economy has become 'globalized' but it has yet to become 'planetized', meaning that it has not internalized the principles to operate within the physical and biological constraints imposed by the biosphere.

Markets fail for global common resources like the atmosphere, which is global, finite and openly accessible to all polluters. Collective international agreements are required to manage global common resources like the oceans and the atmosphere, and, as we are painfully aware, these agreements have been particularly elusive and so far ineffective. The science and the politics of climate change have been on different tracks. I say this with a measure of sadness given my personal experience of many years of involvement in international climate negotiations.

Some countries, like the UK, or groups of countries like the European Union, have taken steps to impose a carbon tax on emissions, but this is by no means generalized and some of the largest emitters are still not ready to adopt these measures. International agreements under the United Nations Framework Convention on Climate Change (UNFCCC) have made some slow progress, but commitments remain far in the future, and greenhouse gas emissions in the atmosphere continue to increase.

In most developing countries the decision-making framework is dominated by outdated and ineffective economic criteria. Although in theory we know that greenhouse gas emissions represent a cost, in practice we continue to value them at zero. Economist Lord Nicholas Stern [5], who has written an important review on *The economics of climate change* has called this problem 'the mother of all externalities'. The size of this externality can be estimated and it is huge. Over the last 150 years anthropogenic carbon dioxide emissions of 2.5 trillion metric tonnes have caused concentrations in the atmosphere to rise by 50% from 280 to 420 parts per million (ppm). If we assume a price of US$50 per tonne of carbon dioxide equivalent, the costs are on the same order of magnitude as the world's gross domestic product (GDP) in 2022 (nearly US$100 trillion).

The situation in most tropical developing countries is complicated because, in addition to energy, land-based emissions coming from deforestation represent an important share of total emissions. In tropical countries land-use change for agriculture or cattle-raising are important sources of emissions. Traditionally, land was seen as the basic resource, and the forest was seen as a barrier to access the land. Two critical tropical myths arose: that the forest was a barrier to access rich soils, and that the standing forest seemed inexhaustible and had little value. Property rights issues complicate the situation because if the landholder is not sure that he can keep his forest, he may decide to cash in the trees for a few dollars. Most soils in forested lands are not good for agriculture and most nutrients are already bound in standing biomass. Land-use potential, determined by soils and topography, should be a key guiding principle of development. Most tropical forests do not have agricultural potential; however, they are tragically being converted into cash crops like palm oil, soy or cattle raising.

To consider the problems we face, let us consider GDP (gross domestic product, or GNP, gross national product), which is the leading indicator of economic activity worldwide and is a broad measure of the value of production within a nation's borders. Unfortunately there are logical inconsistencies in its definition that have long been pointed out. For example, by the GDP definition, everything that has a price is multiplied by the quantity and added together. Things that do not have a price, like household labour or ecosystem services are not counted. If an economic activity generates pollution that requires clean-up, both the activity and cost of clean-up are added, but these 'defensive expenditures' as Boulding called them, should be subtracted and not added to GDP.

GDP lumps together quantitative growth with qualitative development, two very different things. GDP treats both production of goods and services and the value of asset liquidation as part of the product of the nation. Thus a country can grow its GDP by depleting its stocks of forest and minerals and GDP *would* grow, but the process would be unsustainable. GDP is a measure of activity, like a little bee flapping its wings, but the velocity of flapping tells us nothing about direction, and the bee could be headed for a crash! Markets by themselves do not provide long-term guidance in critical issues like energy and sustainability. Long-term direction needs to be introduced in the political, legal and institutional systems.

The UN Statistical Commission has developed a system that integrates economic and environmental data to provide a more comprehensive view of the relation between the economy and the environment and the stocks and changes in stocks of environmental assets, like water and carbon [4]. This effort includes a system of satellite accounts to include natural capital in wealth accounting. This system was adopted in 2012 and international development institutions have promoted its adoption [6].

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In 2021, it adopted a definition of gross ecosystem product (GEP) to be considered alongside traditional measures. A growing number of countries, including Costa Rica, are implementing this system, which should become adopted by all.

As Costa Rica's first Minister of Environment and Energy under President Oscar Arias (1986–1990), I had to face the critical issue of who speaks for nature: not only the forests, but also the rivers, the high *paramó*, the lowland coastal marshes, and myriad other ecosystems and their biodiversity. In the societal decision-making process, I saw my role as Minister as to speak on behalf of nature and design policies to close, or at least attempt to address environmental externalities, in particular greenhouse gases, climate and biodiversity. National Parks, forest policy and economic incentives were under the Ministry of Agriculture, where either they got little attention or the wrong policies were implemented—harmful policies. The Minister of Agriculture's agenda was dominated by pressure groups like rice growers, coffee growers, sugar, banana and cattle producers, all of them having well-funded lobbying organizations. I also faced the critical issue that standing trees had no value: you could go to the bank and obtain a loan with the land, and with a tractor or a cow as collateral, but living trees or forests would not be accepted—again, a default price of zero. The entire system promoted cutting down the native forests and we were losing about 1% of our forested areas per year.

I realized that if we had any chance to slow and eventually reverse deforestation, we had to find a way to **give value to the standing trees and forests** ***from the perspective of the private landowners***, on whose land most of the deforestation was occurring. The way we did this was by changing the structure and character of forest incentives (described in further detail in [7]). This policy required that we invest a lot of resources to close the climate externality ahead of the international community, which at the time we hoped would follow shortly. We were naive in this expectation.

Costa Rica had started a system of fiscal incentives for reforestation in 1979. So, one could buy forested land, cash in the native forest, and then reforest with exotic species and obtain a fiscal incentive of US$2000 per hectare. This programme was used primarily by corporations or wealthy individuals who could use the tax break. People were more interested in the tax deduction than in the trees, so many of these plantations failed.

At the same time, the programme was becoming unmanageable to the Finance Ministry because of its size and because they could only know what the deductions were after the year ended. So, with a new Forestry Law approved in 1986, as I started as Minister, we changed the system to soft-loans and grants to small private holders (1 to 5 hectares maximum (1 hectare = 10 000 $m^2$)). To bring the programme to scale quickly we used existing cooperatives or agricultural organizations as financial and technical intermediaries. The loans would be paid out over a 5 year period, with 50% in year 1 to establish the plantation, and the idea was that if the trees were healthy by year 5, they would become the guarantee of the loan and the papers would be torn up. Repayment rate for these loans was 97%. We accomplished what we were seeking: to provide value to the standing forest.

The new programme was a big success and demand grew rapidly. We needed additional resources to be able to bring the programme to scale, and the new debt-for-nature swap mechanism that we had adopted provided those resources. Costa Rica and The Netherlands devised an innovative mechanism of commercial debt swaps that was devoted entirely to the forest sector. The Dutch government provided a grant to Costa Rica and hired a Dutch bank, Rabobank, to buy Costa Rican commercial debt. In turn, the Central Bank of Costa Rica exchanged this debt for local currency bonds that were used to finance the transition to the new system of payment for ecosystem services (PES). With a US$5 million grant, Rabobank bought US$33 million face-value of commercial debt, which was exchanged by the Central Bank for the equivalent of US$9 million in local currency short-term bonds. In total these funds financed about 13 000 hectares of reforestation.

The PES programme was formally adopted in 1996 as a land-based programme of incentives to include four environmental services: carbon sequestration and storage, water purification, biodiversity, and scenic beauty. In addition to reforestation, the PES system also included forest protection and conservation, and this has been the largest share of the programme since reforestation is much more expensive. Stable governmental funding came in the form of a 3.5% tax on fuels, which is equivalent to a carbon tax since Costa Rica does not use any coal and all fuels are imported. By means of this tax, supplemented by two World Bank loans, and grants, the programme expanded through the nineties.

From 2005 to 2015, the Costa Rican government paid for a total of 100 million tonnes of carbon at a cost of US$20 per tonne. This carbon was sequestered prior to any international agreements, so it cannot be sold in today's markets, but Costa Rica showed the world community that it could be done.

A set of critical complementary policies included prohibition of land-use change in forested areas, clarification of property rights, expansion of the system of protected areas, and the development of hundreds of private reserves. All these elements were needed and implemented for a period of over 30 years. This resulted in a reversal of deforestation.

The main lessons learned are:

— Forest carbon has a significant role in greenhouse gas emissions, and forests can play a role in biodiversity conservation and the fight against climate change.
— Land must be used according to its potential, and ecosystem services—including production of food as well as the full array of benefits that make life possible and meaningful—should be the basis for planning. Land tenure regimes are very important.
— A mechanism to provide value to standing forests needs to be designed according to local conditions and implemented based on provision of ecosystem services.
— It is necessary to maintain these systems over time (decades) and bring them to scale.
— Bringing these to scale requires considerable financing, which must be secured either from internal sources or, eventually, from international cooperation and private forest carbon markets.

In October 2021 the Royal Foundation of the United Kingdom awarded Costa Rica the first Earthshot Prize for a 'scheme of paying local citizens to restore natural ecosystems that has led to the revival of the forest'.

In closing, let me jubilantly pay my respects to Her Majesty, the late Queen Elizabeth II, who asked us to plant a tree for her Platinum Jubilee in 2022!

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## References

1. Ricardo D. 1911 *On the principles of political economy and taxation*. London, UK: JM Dent.
2. Mill JS. 1848 *Principles of political economy,* book IV, ch. VI. London, UK: JW Parker.
3. Boulding K. 1966 The economics of the coming spaceship Earth. In *Environmental quality in a growing economy* (ed. H Jarrett), pp. 3–14. Baltimore, MD: Johns Hopkins University Press.
4. Revelle R, Suess HE. 1957 Carbon dioxide exchange between atmosphere and ocean and the question of an Increase of atmospheric CO during the past decades. *Tellus* **9**, 18–27. (doi:10.1111/j.2153-3490.1957.tb01849.x)
5. Stern N. 2006 *The economics of climate change*. Cambridge, UK: Cambridge University Press.
6. UN Statistical Office. 2012 *System of environmental and economic accounting (SEEA)*. See https://unstats.un.org/unsd/envaccounting/seearev/eea_final_en.pdf.
7. Umaña Quesada Á. 2019 The case of Costa Rica. In *Green growth that works: natural capital policy and finance mechanisms from around the world* (eds L Mandle, Z Ouyang, J Salzman, GC Daily). Washington, DC: Island Press.

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