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# Biodiversity royalties: a different approach in bioeconomy

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## 1 Introduction

The short- and long-term use, management, and preservation of biodiversity have always had strong economic implications (Costanza et al, 1997). One of the issues has been the lack of an accurate or comprehensive method for evaluating the current or future positive impacts on the economy. One of the most complex and relevant conservation issues is the need to assign an economic value to biodiversity, the use and management of a particular species, or the preservation of a specific area or ecosystem (Costanza et al, 1997). When a mechanism is established to allocate an economic resource to the use of biodiversity that benefits the local inhabitants, public policies and biodiversity conservation strategies will have a better chance to remain in the long term (Wang et al, 2022).

The methodologies for directly evaluating the effect of the use and exploitation of a species or site on the economy have made good progress and have been implemented in different places (Bovarnick et al, 2010; van der Ploeg et al, 2010). On the other hand, they still have shortcomings related to indirect uses, although progress has been made in recent years (Balmford et al, 2015). We believe there is still a gap in the evaluation of the local economy of a place or region obtaining indirect revenues from a set of activities associated with biodiversity that occur along with other economic activities that boost and diversify the local tourist offer (Snyman and Bricker, 2019).

Population centers that obtain profits from biodiversity-related activities have not been systematically considered in standard assessments, especially if they are not so close geographically. The most common assessments are carried out by quantifying the economic impact of each of these activities separately, such as the sighting of a particular species (e.g., whale shark, whale, sea lion, monarch butterfly; Rowat and Endelhardt, 2007; Monterrubio et al, 2013; Cisneros-Montemayor, 2020).

In regions where a set of activities associated with biodiversity converge, economic relations are not isolated (they don't occur as separate events) but are shared, not only with biological variables but also with different economic and social activities (Spenceley et al, 2017; Snyman and Bricker, 2019). An in-depth quantification of profits obtained from the economic activities directly associated with biodiversity and other indirect or secondary activities carried out in particular populations or regions has not been conducted. The theory of the development or growth poles in national and regional economic development, first described by Francois Perroux in the sixties, highlights the importance of industrialization processes for regional and local economic development from the center to the periphery of cities. Likewise, Boisier (1976) emphasized that the scheme of partial development at the periphery with induction of the center aiming to exploit natural resources generates regional development entities supported by financial royalties from exploiting natural resources under a more extractive approach (oil, natural gas, and mining). However, these conceptions

overlook the role of regional biodiversity as a trigger in the profit escalation processes and their potential socio-economic importance in planning and regional development.

The lack of this economic perspective results in an incomplete picture of the economic income obtained by the population of urban centers as a result of the set of direct and indirect biodiversity-related activities. This quantification of the economic income in these localities is what we are presenting as Biodiversity Royalties.

## 2 Definitions

Introducing the reader to the biodiversity royalties concept requires defining some concepts.

### 2.1 Activities associated to the biodiversity use (ACABIO)

Biodiversity is directly or indirectly used in different ways. We have defined each of these activities as a bioeconomic activity associated with biodiversity use that produces a quantifiable economic revenue–Activities Associated with Biodiversity Use (ACABIOs).

ACABIOs comprise activities ranging from visiting a protected natural area (Gulf of California islands, Yosemite National Park) to sighting one or more species (whale sharks, whales, and birds) or indirect uses of a given species (fishing and release of fish). All these cases involve management that directly obtains a fee for the right to carry out the activity (Spenceley et al, 2017).

In addition to directly generating an economic income from these activities as such, ACABIOs also give rise to secondary economic activities indirectly associated with them. The direct type of economic revenue has been measured in different ways and using various methodologies. The ACABIOs also yield economic revenues deemed external because they are not directly reflected in the immediate area of economic influence where the activity is carried out and for being related to economic income from other activities, so these cannot be easily evaluated. The exception is when a locality is associated with a given ACABIO, so the total primary economic revenues can be easily associated with it, although it is not necessarily the case for the secondary economic revenues. When several ACABIOs take place close to a locality, this locality obtains economic revenues from direct spending by ACABIO users, but these profits cannot be associated with any particular ACABIO. Within this scheme, it is the synergy of several ACABIOs that yields local economic revenues.

The profits from a set of ACABIOs in the localities near these activities become the economic driver. As a result, these sources of income—which have not traditionally been linked to ACABIOs—sustain the economy of the local urban centers. This is what we have coined as Biodiversity Royalties.

### 2.2 Town with biodiversity economy (TOBIECO)

Urban centers associated with biodiversity-related activities (towns with biodiversity economy–TOBIECOs) are those localities in which a major part of their economy is related to at least one ACABIO. When TOBIECOs have a portfolio of ACABIOs within a geographic and temporal buffer, the economic contribution of ACABIOs allows the local inhabitants to obtain sustained economic revenues throughout the year. This implies that as the ACABIOs portfolio becomes wider, the TOBIECO will become more economically viable over time, with increasing resources in the long term due to more opportunities of different sorts. In other words, the TOBIECO will gain more biodiversity royalties derived from ACABIOs throughout the year. The portfolio of opportunities not only provides economic diversity to the population receiving economic revenues but also offers a broad range of activities for users.

### 2.3 Common concept of royalty

Typically, a royalty is conceived as the payment made to the owner of any intellectual property right, whether copyright, trademark, or know-how, in exchange for the right to use or exploit it, or to the government for the right to use or exploit certain—usually non-renewable—natural resources, for example, mining (Anderson, 1997). In the case addressed here, the term is applied under the principle that no one owns biodiversity; however, the local inhabitants can be the recipients of revenues from rational, controlled, and planned use.

## 3 Discussion

From Economics, various methodologies and techniques have been developed to assign approximate economic values since many natural resources have no market value as such, and it isn't determined way by the market system in a comprehensive way (Sarkar, 2005; Osorio, 2006). Examples of the methodologies and techniques developed for the economic valuation of nature are the payment for environmental or ecosystem services and the transfer of benefits, among others (de Groot et al, 2012).

The evaluation of the profits (revenues) derived from protected areas quantifies only the direct profits, such as entrance fees (at the cash register) or those charged by service providers such as guides and boatmen, as well as the fees for lodging and catering within the area or related to activities associated with biodiversity. All these activities are commonly considered for estimating the revenues from an activity associated with biodiversity. In all cases, there is a TOBIECO, which may be located kilometers away, which serves as the "distribution" center for the different ACABIOs and is the actual recipient of environmental royalties, ultimately being the entity directly receiving most of the profits.

Nature tourism has one or more ACABIOs as final products, giving rise to an economic market around them with benefits for different sectors of the related populations (Buckley, 2011; Cisneros-Montemayor et al, 2020). These are frequently combined with other types of activities, such as Sun + beach, cultural, or social destinations. The key aspect is that the TOBIECO receives economic resources associated with ACABIOs and other types of activities, with its anchor products related to biodiversity. Therefore, if ACABIOs were not carried out, this source of income would not exist on that site, regardless of the other activities that are supplementary or secondary to ACABIOs. For example, wildlife tourism contributed

approximately USD 120.1 billion to the global GDP in 2018 (WTTC, 2019).

Protected areas are frequently the target of nature tourism (Snyman and Bricker, 2019). These areas are of great interest to visitors, and some would even agree to pay a fee or tax for visiting these areas; however, this resource is not directly allocated to the protected area (Malavasi and Malavasi, 2004). In contrast, the highest economic revenue reaches TOBIECOs directly, that is, directly from users to the group of people that provide services or organize activities. However, these revenues are not directly linked as the product of a biodiversity-related activity, as under this context, it is assumed that biodiversity requires an "investment from all the society."

In the transfer of benefits and payment for environmental or ecosystem services, the quantification of economic resources received by the TOBIECO is evaluated as a benefit directed from biodiversity to humans. On the other hand, biodiversity royalties shall quantify and include anthropogenic (human) activities outside the ACABIO that provide benefits to the inhabitants in the region, contributing to local economic wellbeing through an activity associated with biodiversity while reducing the pressure on it. In the case of biodiversity royalties, the quantification of economic valuation is directed from human beings to biodiversity.

Biodiversity and the economic and social costs associated with the environment are usually considered incompatible and even unvalued in biological and conservation terms. In TOBIECOs, the effect of ACABIO is usually underestimated, and the existence of biodiversity royalties is denied. As a result, the sector that obtains profits within the TOBIECO has a marginal commitment to the ACABIOs, and there is no economic return Rosenberger and Loomis, 2003

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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## Conflict of interest

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