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# Don’t kill the goose that lays the golden eggs: Understanding biophysical resources to secure sustained performance

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**Abstract**

You cannot properly manage a resource that you do not understand. Resources such as healthy soils, genetic biodiversity, or freshwater are critical to corporate performance in countless sectors, yet they are too often a blind spot of management discussions, quickly tagged as “physical” or “natural.” These terms have two major shortcomings: First, they overlook the ecosystemic conditions that make these resources available in the first place. Second, they ignore the central role of humans in shaping, threatening or caring for these resources in a complex game of dynamic equilibrium. In this Impact Paper, we argue that developing an understanding of resources as biophysical – rather than physical or natural – can help companies secure sustained performance in a context of socio-ecological polycrisis.

Keywords: biophysical resources, ecosystem services, sustained competitive advantage

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## Introduction

*“To name things wrongly is to add to the misery of the world.”*
Albert Camus, *« Sur une philosophie de l’expression »,* 1944

The story is familiar: A farmer owns a goose that lays a golden egg a day. The farmer wants more of it and slays the goose to take from its stomach the expected gold. Alas no gold is found, and the goose lays no more. This simple story demonstrates an important rule: You cannot properly manage a resource that you do not understand.

And indeed, what do companies depend on to operate and create value? This question has kept many managers busy over the past decades. Extensive time has been spent discussing resources – meaning, anything that firms can use in order to pursue their activities to create value –, including human (and now supposedly artificial) intelligence, financial means, intellectual property… And of course, quickly stated as obvious facts, “physical” or “natural” resources.

But freshwater, biomass, or landscapes are not simply “physical,” like books to be organized on a shelf, nor are they “gifts from Nature” that humans merely receive. Both terms are dangerous as they limit the role of corporations to passive harvesters located outside of “Nature,” ignorant of the processes that make these resources available in the first place.

In a world where over half the GDP is dependent on complex and threatened ecosystem services (WEF, 2020), we argue that this simplistic and inappropriate naming of such critical resources in management is not only adding to miseries “outside” the corporate world: It is a strategic mistake and potential source of corporate failure. Naming these resources properly is a first essential step for companies to secure value creation and sustained and sustainable performance within a fragilized Earth system.

Many, if not all, companies rely directly or indirectly on biophysical resources, meaning resources stemming from the interaction between living (biotic) and non-living (abiotic) components of ecosystems. For example, timber production depends on topography, climate, soil composition, but also mammal, insect, or fungi populations.

As we will present below, naming these resources properly helps understand the boundary conditions for resource availability: Functioning ecosystems then become a strategic concern of corporate activities, not a CSR liability.

## Wanting the golden egg without understanding the goose: misconceiving the source of competitive advantage

Through the prevailing categorizations of “physical” or “natural” resources, biophysical resources are largely misunderstood – when not plainly ignored – and therefore oftentimes mismanaged. Let us first see why both terms currently in use fall short of helping companies secure sustained performance, before explaining what a biophysical approach implies in concrete terms.

## *Physical resources*

Business schools typically teach their students that there are four kinds of resources: financial, human, organizational and lastly, physical (e.g. Barney & Hesterly, 2008). Interestingly, from the four categories exposed by Barney and Hesterly, three led to the development of dedicated disciplines, with their bespoke experts: human resources, finance and accounting, organization theory and marketing, and all are extremely concerned with understanding how to manage and secure human, financial and organizational resources. Which discipline in management is truly concerned with so-called "physical resources"?

Physical resources "include the physical technology used in a firm, a firm's plant and equipment, its geographic location, and its access to raw materials"[1] (Barney, 2001, p.101). Quite tellingly, in this classification, corporate facilities, infrastructure, tables and computers are conflated with access to freshwater, genetic biodiversity, healthy soils, etc. This gives very little guidance to companies when it comes to managing such resources: How do they work? What risks and opportunities are tied to them? What should be done to sustain or secure access and quality?

Beyond the fact that the "physical" resource category has been largely overlooked – often left for engineers to understand as simply technical matters –, it is also quite misleading, as it ignores the importance of functioning ecosystems in the provision of biophysical resources, at the risk of sawing the branch on which companies themselves stand. Indeed, the role of "bio" – life – in these resources cannot be ignored, not only on normative, but also on pragmatic grounds.

Let us consider freshwater resources, vital in many sectors such as agriculture, industry, tourism, or energy production. A classical way of approaching this resource as a "physical" one has been to treat it at purely H2O level: Like a book, a tool, any equipment, this liquid can then be considered easy to store, move around, and contain. Dams, drains, water reservoirs, pipes and filters can do the trick: This is the dominance of supply management approaches.

But clean freshwater is actually interdependent with healthy ecosystems, with processes full of life. Heavily modified watersheds are areas where water flows become more erratic, accelerated, with a loss in quality, as biophysical processes of infiltration, retention, and purification disappear. These ignored ecosystem services manifest themselves through their absences, in crises such as floods, eutrophication or droughts. The more one tries to control water supplies as something that can be adapted to organizational constraints (and not the reverse), the more organizations are exposed to water risks (Di Baldassarre et al., 2018).

## *Natural resources*

Regarding research conducted in business schools, an alternative to this mechanistic view of biophysical resources has been considered with the notion of "natural" resources. In scientific papers focusing on "natural" resources, the definition of what constitutes such a resource is often left implicit or insufficiently specified (George et al., 2015), relegating natural resources to the status of inherent and largely unchangeable givens. Even in research fields that have dedicated considerable attention to biophysical resources, such as the literature on commons (Ostrom, 1990), "natural" commons are often treated as self-evident categories requiring little conceptual elaboration. While the notion of "natural" resources has seldom

[1] A traditional alternative is the classification between tangible and non-tangible assets, which has similar issues.

been questioned, and remains vague and underdeveloped, other types of resources have undergone substantial conceptual refinement and systematic classification (cultural, social and civic commons, network resources, knowledge and digital resources).

But the term "natural" does not properly describe biophysical resources: It fails to consider the interaction between the ecosystems and humans. Indeed, this term is frequently used to describe resources which could exist in "nature," meaning without human intervention. This term is often culturally loaded and evokes idioms such as "Mother Nature" or "Gift of the Earth." The term "natural" falls short of understanding the role of human activities and interventions – often over centuries – in influencing these resources and reproduces a false impression of separation between humans and the rest of living beings (Descola, 2005). Humans interact with ecosystems through their activities, and from these interactions, "natural" resources can be transformed. Although such resources are not initially created by humans, they are shaped, molded, irreversibly altered or destroyed due to the interaction with humans.

Consider fruit varieties: Banana and apple varieties can be present in ecosystems without human intervention or creation. However, any change to these varieties is not only due to random mutation as in the process of natural selection, but also through deliberate human actions (i.e., selective breeding), in a quest for value creation and competitive advantage. But as the result of economic reasoning, the diversity of apple varieties in the United States has sharply declined over the past centuries, being centered around a narrow range of commercially viable varieties. Similarly, the monoculture of the Cavendish variety of banana is not due to the prevalence of this variety, but to the extinction of the dominant cultivar of the 1950s, the Gros Michel banana, due to the Panama disease. Humans selected species that fit best their activities, leading to some varieties being more cultivated than others. Seeing fruit varieties as not purely "natural" but the result of interactions between humans and other forms of life shows our responsibility in maintaining or altering a certain equilibrium with our ecosystems.

## Taking care of the goose: understanding biophysical resources as a source of competitive advantage

Why should companies care about reconsidering biophysical resources? Like the farmer killing its own goose, the main risk is that companies can kill their competitive advantage by poorly identifying biophysical resources as such. Meanwhile, companies that understand that the resources they depend on require them to be involved in dynamic equilibria within healthy ecosystems will be more likely to achieve sustained performance and competitive advantage. Biophysical resources can in theory exist independently of direct human intervention, like timber in primary forests. But nowadays almost all biophysical resources evolved following interactions with human activities, especially as numerous planetary boundaries are passed. In the specific case of timber, only 34% of the world's forests are considered primary (FAO, 2020) and all forests are feeling the bite of anthropogenic climate change.

Consider, for instance, the terroirs of Burgundy in the case of wine. Saying that the "physical" resource is at the source of competitive advantage considers the tangible aspect of the resource (topography, geology), but overlooks the interaction between living and non-living, especially soil. Soil health is indeed determinant to product quality, and thus competitive advantage. Can we also consider that the slopes of Burgundy vineyards and the climates are a "natural" resource that enables competitive advantage? This denomination fails to consider that this resource comes from centuries of work of winemakers on the slopes of Burgundian vineyards (Côte de Nuits and Côte de Beaune), i.e. resulting from an interaction between winemakers and ecosystems with a strong cultural

component. Despite the recognition by UNESCO of Burgundy terroirs as "an outstanding example of traditional human settlement, land-use or sea-use which is representative of a culture (or cultures), or human interaction with the environment" (UNESCO selection criteria iii and [2], ref. 1425), research and companies have largely overlooked the conceptualization of such resources. But for winemakers, shaping and preserving ecosystems is central to their sustained performance and competitive advantage.

**Table 1 provides an overview of why this reconceptualization matters.**

| Concept | Physical | Natural | Biophysical |
|---|---|---|---|
| **Feature** | Considers the material nature of the resource (i.e., mass and volume) | Emphasizes a non-anthropogenic origin of a resource | Acknowledges interdependence between living and non-living components within an ecosystem. |
| **Shortcomings (when applicable)** | Ignores biotic-abiotic interactions and their anchoring within ecosystems; "default" category | Overlooks the influence and role of humans (i.e., considers the resource as a "Gift from Earth") | - |
| **Examples** | **Water as $H_2O$** A watershed is not made of only a highway for $H_2O$. Its functioning depends on the interaction between life (e.g., vegetation) and other physical processes, such as temperature or flow rates. | **Fruit Varieties** The Cavendish banana dominance is grounded in economic and social trends. Similarly, the current small amount of cultivated apple varieties is due to market dynamics. | **Burgundy Vineyards** Vineyards are the fruit of an interaction between soil, humidity, crops and the implication of winemakers and their culture to work the land. |

## Key takeaways on managing biophysical resources

In order to manage these biophysical resources properly, managers should keep two rules in mind:

### *1) physical resources require functioning ecosystems to be secured, with specific boundary conditions.*

A quick look at our mostly-empty universe is enough for us to understand that life has boundary conditions. The same goes for biophysical resources within ecosystems. This means that companies dependent on biophysical resources have a direct interest in understanding what makes ecosystems function the way they do.

[2] https://whc.unesco.org/en/criteria/

That represents a significant mind shift in management practices as ecologists are not a dominant breed in corporate boardrooms. Indeed, while managers have historically tended to count on standardization and reliability, ecosystems behave in variable and even unpredictable ways. Extensive literature in ecosystem dynamics shows that variability, non-linear changes, or surprises are not a bug in ecosystem functioning, but a defining feature (Gunderson & Holling, 2002). On the contrary, attempts at command-and-control strategies (e.g., demanding every year, the same quality, quantity and kind of timber, fishing always at a set estimated "carrying capacity") can greatly endanger ecosystems.

### *2) Working with biophysical resources means continuous adjustments.*

Once we have stated that biophysical resources are characterized by unpredictability and variability, the question is how firms manage these constraints.

In a destabilized Earth system, firms can adapt to and embrace the unpredictability and variability of the biophysical resources they depend on by dynamically adjusting their operations to these resources. Companies should start by running an audit of the biophysical resources they rely on, and their associated constraints, guided by insights from natural sciences. This understanding of biophysical resources would be complemented with a continuous adjustment of operations. Firms thus need to find a dynamic equilibrium with the ecosystems encompassing critical biophysical resources, to reconcile their own and the biophysical resources' long-term survival.

Only the combination of these two aspects (understanding boundary conditions; embracing continuous adjustments) can bring a sustained competitive advantage when relying on biophysical resources. By trying to find a dynamic equilibrium and actionable continuous adjustments, firms can also foster innovation, in terms of products and processes, to manage the variability of ecosystems and their biophysical constraints.

## Conclusion

Camus (1944), in the same text as the quote introducing our Impact Paper, further develops his thoughts: *"What characterizes our century is perhaps not so much having to rebuild the world as having to rethink it."* We believe this statement still holds today: Pointing to current limits of management discourses, we offer companies a clear path forward. First ask yourself: What are these biophysical resources your activity depends on? What is your golden eggs' goose?

Companies that learn how to manage biophysical resources are companies who have understood their position is not outside of, but within ecosystems. We encourage managers to rethink the foundations of long-term value creation in a world shaped by ecological constraints. Working with life also entails working with pests, uncertain yield, logistical headaches, and certainly not an idealized "reconnection with Gaia" kind of approach. Sometimes difficult and complex trade-offs have to be made. But they have to be made within the respect of the overall dynamics of ecosystems: Sustained performance emerges thanks to the sustained functioning of ecosystems, not in spite of them. Take a hard look at your activities: What makes your biophysical resources available, qualitative, resilient? Are you killing your own golden eggs' goose?

Soon you will find that functioning ecosystems will find their place in your corporate strategy plan.

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