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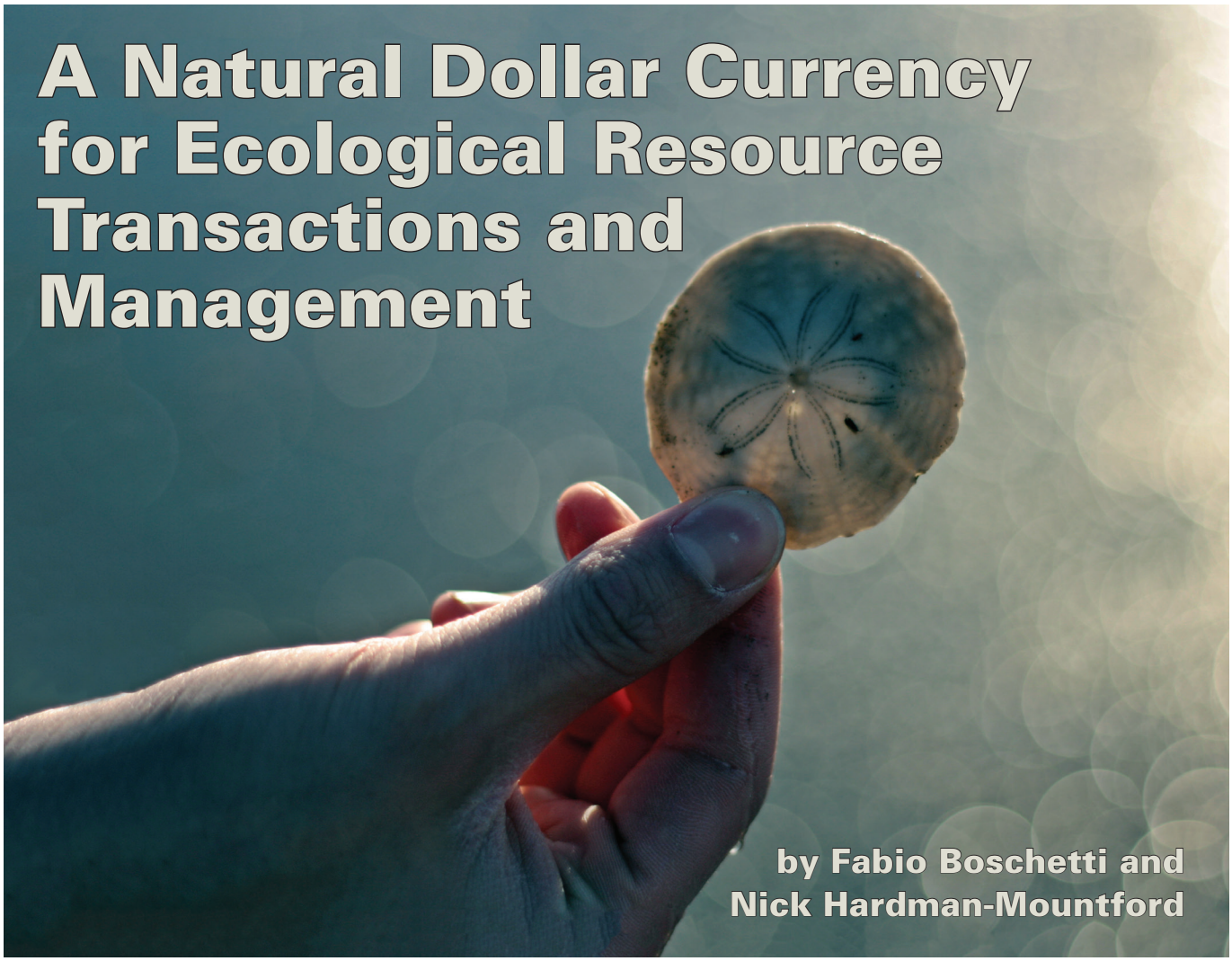
Feature

A Natural Dollar Currency for Ecological Resource Transactions and Management

by Fabio Boschetti and Nick Hardman-Mountford



Kelsi Barr

Natural$ are backed by the natural resources to which they relate, with their value dependent on the protection of that resource.

In Brief

Markets are potentially effective tools in the management of natural resources. This is because of their ability to allocate resources efficiently in the increasingly complex relationship between ecology and the global economy.

Nevertheless, increasing environmental degradation means that system and market failures, which impact the relationship between economic and ecological systems, must be addressed in order to ensure sustainable management of natural resources.

Alternative currencies are not new and are used for transactions in specific markets for a variety of reasons, usually to avoid some of the consequences of using an official currency. We propose extending this concept to develop a currency that is designed to define a market for specific natural resources, while simultaneously preventing their exhaustion.

The core idea is that the proposed currency is backed by the very resources to which it relates, rather in the way that the US dollar used to be tied to the value of gold. Thus, when the resource is exhausted, so is the value of the currency. We believe this would deter resource owners/managers from allowing the exploitation of a critically declining resource as its sale, should it occur, would destroy the value of the currency and thus provide no benefit to the seller.

Unconstrained free markets by their nature pose a threat to the natural environment. Few people believe that without regulation of these markets, the environment can avoid irreparable damage. However, experts disagree on the *cause* of this threat. Some authors see this as a *system* failure, which can be addressed only via a significant restructuring of our economic system, our relationship with nature, and our social values. Others see this as a *market* failure, that is, a consequence of markets not working as they should.

In the latter group, we find representatives of both mainstream (market-centric) and ecological (i.e. eco-centric) economics. Both agree that properly designed markets are our best option for addressing current environmental challenges. Their main motivation is that, according to traditional economic theory a properly functioning market provides information on resource and service scarcity,[1] leading to efficient allocation.

This information is provided in a decentralized manner by traders, who detect local scarcities through their market transactions and communicate this information globally in the form of prices. Within this view, it is argued that alternatives to market systems, like centralized price-setting and regulations, would be likely to fail even in the hands of the best-intentioned policymakers because of the sheer complexity of accounting for the vast network of ecological and economic relationships.

In this paper, we do not address the relative merits of a market versus a regulatory approach to environmental management. Rather, we suggest a novel instrument that could help markets to account for their environmental impacts.

In order to do so, we need to understand why markets currently fail to address environmental challenges. One reason is that markets are not responsive to the actual costs of production, including environmental impacts, which are commonly either ignored or undervalued. If these costs were properly accounted for in prices, economic production would treat ecological scarcities like that of any other commodity.

The second reason is that traders have vastly differing purchasing power and market access. The welfare of poor farmers in a developing country may be totally dependent on a local water resource, and they may be willing to invest a considerable portion of available financial resources towards it. But they cannot compete against a wealthy investor from a developed country who may have the means to pay a much higher price for the same water resource in order to produce goods for a market the poor farmer cannot access. Addressing this issue would require global market restructuring on a scale far beyond what is needed to account for environmental externalities.

Key Concepts

- We imagine a currency (Natural$) which has the dual purpose of defining a market for ecological resources and preventing their overexploitation.
- A Natural$ market has two aspects:
  - (a) The natural resource can be purchased only in Natural$ and
  - (b) Natural$ can be freely traded in the market for real $.
- Feature (a) addresses conservation by reducing the incentive to sell the natural resources as its availability diminishes.
- Feature (b) provides efficient resources allocation by standard market mechanisms.

The third reason is that natural and financial resources can (and are expected to!) grow at incompatible rates. This concept can hardly be described more effectively than by using the positive–negative pigs story.[2,3] It illustrates the core relationship between natural and financial resources by employing a fictitious market consisting of only one financial provider (a banker) and one producer (a farmer). In brief, a farmer borrows $100 at 5 percent interest, say, to start a pig farm. In time, the number of pigs grows but not past a certain carrying capacity: sooner or later no more pigs can fit on the farm. The loan, however, can grow indefinitely—but only in mathematical terms. When the banker tries to cash in the loan, the repayment cannot be larger than the number of pigs on the farm. Thus, the apparent financial growth is not backed by equivalent actual physical growth.

There is a parable-like feel to this story, as it describes a vain attempt to generate ever-increasing wealth from a limited resource. Particularly pertinent to our discussion, it reverses the commonly held relationship between money and resources. We are used to valuing resources (pigs in the story) in terms of money. The story highlights that, once a certain threshold is crossed, it makes more sense to value money in terms of resources: no matter how fast money grows, its overall worth is limited by the number of pigs, since that is all it can buy. While, of course, real markets consist of a large number of producers and financial actors, the fundamental insight remains that all the money in the world cannot buy more than the total amount of available resources or services. Our *perception* that the value of money is independent of natural resources may lead us to dangerously undervalue the latter.

In this section, we have summarized three reasons for market failures: externalities, uneven purchasing power and market access, and incompatible growth of natural vis a vis financial resources. Of these, we believe the third is easier to address because it involves a less far-reaching, albeit still considerable, restructuring of the markets in environmental resources.

Our solution is designed specifically to address this issue. It does so by defining a currency that 1) can be used for transactions involving a *specific* environmental resource or service, 2) is subject to market forces, 3) accounts for the impact of economic activities on the resource, and 4) prevents resource exhaustion. In the next section, we describe how our solution might work.

A Tentative Solution: Natural$ Mediate between Traditional Markets and Resource Dynamics

We propose an alternative currency, which we call Natural$, that can be used to buy access to a *specific*, *local* ecological service or resource. Natural$, which would be issued by the local government responsible for the management of that specific natural resource, has three main features:

1. Access to the ecological service/resource can be bought only with Natural$. It would be forbidden to use real $ for these transactions.
2. Natural$ can be freely traded in the market for real $.
3. The local government would issue the Natural$ once only. Thus, the total amount of Natural$ in circulation at any time (Tot-Natural$) would be constant.

For example, a local council could issue Natural$ in relation to a local pine forest. Assuming the forest is divided into several lots, each managed by a different private owner or public entity, the following steps illustrate how the Natural$ would work:

1. Each manager independently sets the price (in Natural$) for access to the resource in the lot that he or she manages.
2. A company or business wanting to access the resource needs first to acquire Natural$.
3. These Natural$ are bought using real $.
4. Access to the resource in a specific lot is then bought from the manager with Natural$.
5. The manager has the option to retain the Natural$ as an investment or to convert them into real $ at the prevailing exchange rate.

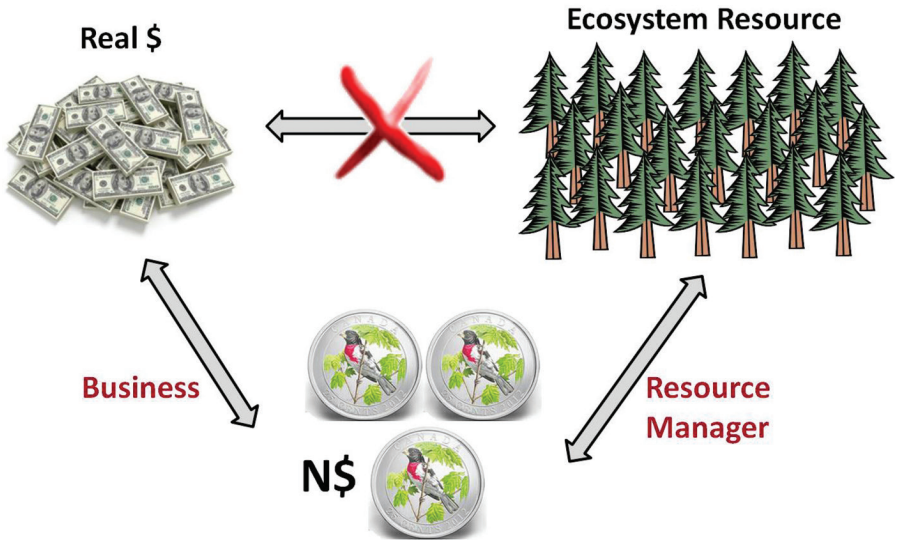


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Figure 1: Schematic representation of the relation between a natural resource, real $, and Natural$. A manager sets a price to access a forest lot. Access can be purchased in Natural$ but not in real $. A business can acquire access to the resource with Natural$, which it can purchase with real $. The manager can then sell the Natural$ for real $ and use them to improve ecosystem services in the area. A resource market is then established in Natural$, while the conversion rate between real $ and Natural$ is determined by standard market mechanisms. Crucially, a manager has no incentive to grant access to a critically declining resource, because when the resource is exhausted, the Natural$ lose all value. This should prevent overexploitation of the resource.

A regular market for Natural$ is thus established and, as a result, the conversion rate between real $ and Natural$ is determined by standard market mechanisms.

We suggest using Natural$ as an intermediate currency in transactions between ecological resources and real $ because the value of Natural$, unlike real $, is intrinsically coupled with and *fully dependent on* the state of the resource. Its growth potential is limited and it vanishes if the resource gets exhausted. Holders of Natural$ need to safeguard their value, which can be done only by ensuring the resource is not fully exploited. Let's see why:

As an extreme case, let's assume that Region A (where Natural$ apply) is left with a single available pine forest lot. If this last lot could be sold in real $, its value could in principle grow without bounds. As discussed above, extremely rich buyers, possibly with access to external markets, could afford to make a large real $ offer that the local manager may not resist. However, access to the last forest lot can be bought only with Natural$ that, crucially, will become worthless once the last lot is sold, because once that happens, there is nothing else Natural$ can buy. As a result, the manager has no reason to sell and the last forest lot is left unexploited.

Having said that, the Natural$ would start to play a positive role well before a single lot is left unexploited. At any point in time, the current owners of Natural$ should aim to maximize the value of the Natural$ they hold. The cumulative value of all Natural$ (Tot-Natural$, as defined above) depends both on the exchange rate with real $ *and* on the general state of the resource. If either goes to zero, so

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The 'parable' of the pig farmer illustrates the logic of valuing money in terms of resources, rather than the more commonly accepted inverse relationship.

does the value of each Natural$. At any point in time, Natural$ owners thus have an interest in protecting at least some of the resource. Quite how much will be protected and at what point the Natural$ will start to affect the exploitation process will depend on the specific local context and on potentially complex dynamics between Natural$, real $, and the state of the resource.

Three contrasting processes will be at play. First, the greater the amount of available resource, the more 'resource' a single Natural$ can buy. Second, the greater the amount of available resource, the less valuable the resource (and the Natural$ that depend on it) is. Finally, when the amount of available resource moves towards zero, its real $ value may soar but the Natural$ will tend to become worthless, as described above. This suggests that the 'worth' of a single Natural$ should reach its maximum somewhere between the two extremes of very high and very low resource availability; exactly where will depend on the conversion rate with the real $ and thus on the dynamics of the real economy.

This leads to two crucial questions: 1) Is there a single maximum or multiple maxima? and 2) Do any of these maxima provide for an ecologically sustainable state? Answering these questions requires a mathematical analysis, probably aided by computer modelling, that we hope to carry out in future research.

Scaling Properties

The strict coupling between Natural$ and a specific resource can be exploited so that several different types of resources and services can be managed concurrently such that several different *types* of Natural$ could be issued, each coupled with a specific resource in a specific region (see Figure 2). This adaptability provides a 'scaling' element to the Natural$, which could be issued at a global, national, regional, or local level—thereby preventing resource exhaustion at any of those levels. The larger the number of small-scale Natural$ types, the lower the level at which resource exploitation can be prevented.

Implementation Challenges

Traditional markets develop over decades or even centuries. They incorporate (and often come to represent) cultural norms and expectations and are regulated in order to improve or modify their outcomes. Like any institution, markets rarely burst forth as fully functioning organisms. Rather, they evolve. We do not suggest that Natural$ could bypass this lengthy process. On the contrary, it needs to be seen as the seed of a solution, a proposition for a novel type of market. For the proposition to become a real market, many details need further theoretical analysis, political and social negotiation, and crucially, experimental verification followed by proper tuning.

Should a local government attempt to implement this solution, a number of issues and challenges would need to be addressed. It is important to distinguish between the types of challenges inherent in the implementation of any environmental management instrument (e.g. zoning and closures, ecological offsets, quotas, regular markets, etc.) and the ones that are specific to the Natural$ solution. The first group includes, *inter alia*, such challenges as how the Natural$ should be issued; how existing property rights should be recognized and addressed; how we should develop and finance the infrastructure and accounting systems that are needed to implement, manage, and regulate the Natural$ market; how collusion and other market-altering behaviors should be prevented; and to what extent speculative behaviors should be accepted or even encouraged.

However, of greater relevance is the second group. One specific challenge is represented by the unusual relationship between the Natural$ and the resource (and the potential existence of multiple Natural$ for various different resources) in a culture accustomed to using a single currency both to value and to establish equivalences between unrelated objects/resources. Nevertheless, alternative currencies, while not mainstream, are already used for transactions in specific markets when there is a need to circumvent undesired consequences resulting from some properties of standard money. They are also increasingly proposed as a way to address different forms of market failures. An interesting discussion, including a number of examples, can be found in a previous *Solutions* article.[4]

A second challenge would be to ensure that the resource is not traded in real $ but only in Natural$. Obviously, any market needs regulation to function properly, and the Natural$ market is no exception. Transactions in real $ could be treated

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The value of Natural$ is maintained by ensuring that a resource is not fully exploited. For example, the owner of the last remaining pine forest in a region would have an incentive to maximize the Natural$ value of the lot by protecting it.

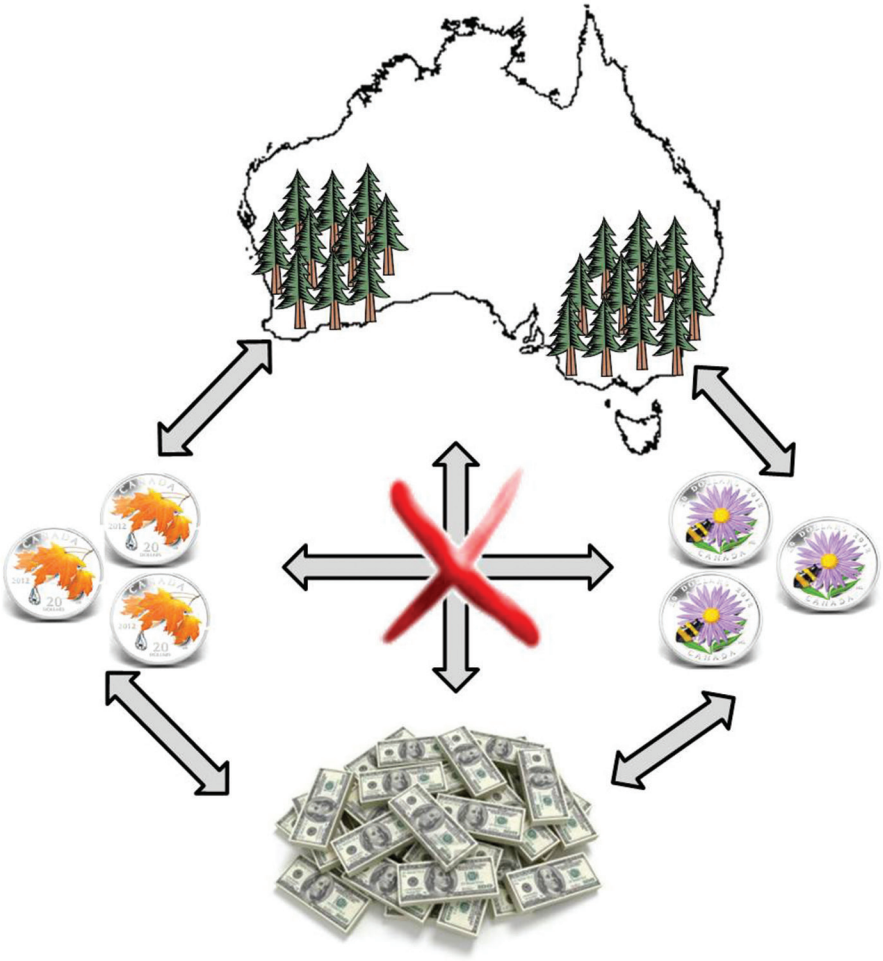

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Figure 2: Relation between real $, Natural$, and multiple natural resources, in this case, two forests in different locations. A different Natural$ type is issued for each forest. Each Natural$ type can be traded with real $. Natural$ types cannot be traded with each other. As before, direct trading between resources and real $ is also prevented.

as a form of corruption or bribery and existing regulatory instruments commonly used to counter these unlawful market behaviors could be employed. Certainly the process would require sophisticated institutional supervision.

A further challenge would involve the prevention of any attempts by pro-environment groups to buy up all Natural$ (Tot-Natural$), as this would effectively block any trading in the resource. While, of course, this would constitute a drastic form of resource conservation, it would defeat the main purpose of the Natural$, which is to establish a market for the resource in question. Accumulation of Natural$ in a small number of hands should be avoided.

Final Comments

The purpose of our solution is not to dismiss or replace nonmarket approaches in environmental management, whether they be exclusion zones, multi-use management, parks, quota restrictions, or other regulatory interventions. These obviously have an important role to play that we strongly support. Rather, we believe that Natural$ are worth exploring in situations in which market approaches are chosen or deemed suitable as a possible means of preventing a specific form of market failure, as discussed above.

Crucially, it could accomplish this while still fulfilling the role envisioned by both traditional and ecological economists by reflecting the degree of scarcity that arises from decentralized market transactions.

Market sceptics should notice that, by its very nature, this would inevitably be a highly regulated market; the local council would decide which resource could be traded in Natural$ transactions, how much of it, and within what geographical limits. Furthermore, to ensure the market functioned properly and to monitor exchange rates between real and Natural$, the local council could require official registration of each transaction.

This requirement would also provide a means of accounting for both the quantity and quality of the resource. In fact, since potential growth of the Natural$ is limited, its value depends on the extent, quality, and distribution of the available resource, and holders of Natural$ should reasonably aim to maximize the Natural$ value. A Natural$ market may generate a further incentive for the establishment of an effective ecological accounting system as envisaged by the Wentworth Group of Concerned Scientists.[5,6]

Acknowledgments

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