IJCCR

www.ijccr.org · ISSN: 1325-9547

Brooks, S. (2015). How Green is Our Money? Mapping the Relationship between Monetary Systems and the Environment. *International Journal of Community Currency Research 19*(1), 12-18. https://doi.org/10.15133/j.ijccr.2015.018

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International Journal of Community Currency Research

Volume 19 (2015) Section D 12 - 18

HOW GREEN IS OUR MONEY? MAPPING THE RELATIONSHIP BETWEEN MONETARY SYSTEMS AND THE ENVIRONMENT

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ABSTRACT

The causal link between economic growth and environmental degradation has received much attention in recent social science literature(s). Although such studies have generated key insights, the role of monetary systems – as central components of all modern economies – has been almost completely overlooked. I argue that monetary systems affect natural environments through the economic activities that particular monetary systems promote. I focus on two specific aspects of any monetary system: governance and scale. With respect to the former, I show how the rules that govern monetary systems can promote economic practices with environmental implications. With respect to the latter, I show how the scale at which money is issued and/or circulates affects patterns and intensities of economic activity, both of which have clear environmental consequences. A corollary of my argument is that changing the governance and scale of monetary systems can alter economic activity in environmentally-harmful or -helpful ways.

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To cite this article: Brooks, S. (2015) 'How Green is Our Money? Mapping the Relationship between Monetary Systems and the Environment' *International Journal of Community Currency Research* 19 (D) 12-18 <www.ijccr.net> ISSN 1325-9547

1. INTRODUCTION

The causal link between economic growth and environmental degradation has received much attention in recent social science literature(s) (Booth 2004; Homer-Dixon 2006; Fournier 2008; Kerschner 2010; Martinez-Alier et al. 2010; Newell 2008; Seyfang 2013). Taking growth as an environmental bad, many scholars have tried to identify the specific interests, institutions, and ideologies that continue to drive economic imperatives at the expense of environmental protection (Booth 2004; Newell 2008; Purdey 2010). Although such studies have generated key insights, the role of monetary systems – as central components of all modern economies – has been almost completely overlooked. The one area of research that has not neglected monetary factors is the work on local currency systems (LCSs), which suggests that localized money systems are more environmentally-friendly than conventional national ones. But despite the important contributions made by the LCS literature, no substantive attempts (to my knowledge) have yet been made to tackle the broader question: what is the relationship between monetary systems and the environment? This represents a major gap in the economy-environment literature. The goal of this paper is to begin to fill this gap.

I argue that monetary systems affect natural environments through the economic activities that particular monetary systems promote. I focus on two specific aspects of any monetary system: governance and scale. With respect to the former, I show how the rules that govern monetary systems can promote economic practices with environmental implications. With respect to the latter, I show how the scale at which money is issued and/or circulates affects patterns and intensities of economic activity, both of which have clear environmental consequences. A corollary of my argument is that changing the governance and scale of monetary systems can alter economic activity in environmentally-harmful or -helpful ways.

This paper is divided into three parts. The first part provides a theoretical overview of money and monetary systems. The objective here is to outline a working understanding of what money is/what monetary systems are. In the second part of the paper, the link between monetary systems and the environment is established. Here, particular attention is paid to the governance and scale of monetary systems. In contrast with national currencies, the euro (supranational) and local currencies (subnational) will be used as examples of monetary systems that operate according to different governance and scale arrangements. The third and final section of the paper will offer final conclusions and suggest avenues for further research.

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2. THEORIZING MONEY AND THE MONETARY SYSTEM

What is money?

Most economics textbooks define money according to its medium of exchange, unit of account, and store of value functions (Krugman and Obstfeld 2008; Mankiw et al. 2006). The problem with these standard definitions – beyond the fact that they do not hold true across time and space – is that they tend to ignore the deeply social side of money. They fail to acknowledge that money is, first and foremost, a social fact (Ganssmann 2012). By this I mean that money has meaning only because a social group gives it meaning. To apply the philosopher John Searle's formula of 'X counts as Y in C,' we can say that pieces of metal and paper (X) count as money (Y) in the context of a monetary system (C) (Ganssmann 2012: 29).

In addition to being a social fact, money is a universal good, or what Marx called the 'universal equivalent' – an object that is the measure by which all other commodities are compared and exchanged in the market (Ganssmann 2012: 83). A hypothetical comparison of economic exchange before and after the introduction of money illustrates its universal character. Prior to money, exchange could take place only if there was a 'double-coincidence of wants' between two potential traders. This means that in a two-player game, exchange between 'player A' and 'player B' only occurs if 'player A' wants the good that 'player B' has and 'player B' wants the good that 'player A' in return. Hence a double-coincidence. From a game-theoretical perspective,

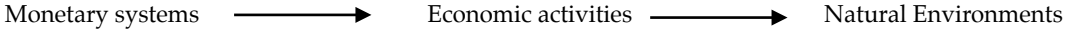

Figure 1. (Simplified depiction of the causal relationship between monetary systems, economic activities, and natural environments. This does not account for any potential feedback loops or intervening variables).

we can see that this barter scenario leads to three outcomes in which no exchange occurs, and only one in which it does (see table 1).

Table 1. Game Theory: Do you have something I want?

Player A / Player B	Yes	No
Yes	Exchange	No exchange
No	No exchange	No exchange

The creation of money resolved the double-coincidence of wants problem. Serving as a universal good, money turned every box in the above table into an "exchange" outcome, thus multiplying the potential for mutually-beneficial economic exchange. It is important to note, however, that money is a social fact and universal good only within its particular socio-spatial domain of acceptability. In other words, money has meaning only within the context of a socially- and spatially-defined monetary system.

What are monetary systems?

There are two conceptions of monetary systems that are relevant here. The first is more ecological, presenting monetary systems as "complex flow networks." The second is more sociological, viewing monetary systems as social games played with monetary objects. I will briefly outline each approach, before moving on to illustrate and analyze the relationship between monetary systems and the natural environment.

Presenting what he calls a 'monetary ecology' view, Bernard Lietaer (2013) likens monetary systems to natural ecosystems, arguing that both are complex flow networks governed by tradeoffs between efficiency and resilience. Efficiency is understood as the capacity of a system to process volume, while resilience refers to a system's ability to adapt to new circumstances. The sustainability of a complex flow network requires an appropriate balance between efficiency and resilience – the emergent properties of two structural variables: interconnectivity and diversity. The problem with modern monetary systems, argues Lietaer, is that they privilege efficiency over resilience and are thus prone to instability and collapse. For many reasons, having a single currency is more economically efficient than having multiple monies But the monetary system is also much less resilient as a result. If the currency collapses, there are no other monies to ensure stability and prevent the economic system from falling apart. The equivalent is a financial system built around a single bank. If that bank goes bust, the entire system implodes. Lietaer thus endorses a multi-currency system, where a degree of efficiency is sacrificed in order to increase systemic resilience.

From a sociological perspective, monetary systems can also be seen as 'games' played with monetary objects (Ganssmann 2012: 28). If monetary systems are understood as games, we can say that *governance* arrangements are the rules of the game and scale is the spatial terrain on which the game is played. Governance determines the legal rules and social understandings according to which the monetary system operates, such as legal tender laws and legitimate authorities, while *scale* sets the spatial parameters of the system. Together, governance and scale determine what I call a money's socio-spatial domain of acceptability – the area in which, and rules according to which, money works. Money systems create and are created by such domains, which become legible as distinct and coherent economic units because money tightens social and economic interconnectivity within them. To the extent that they alter economic activities within a social and geographical space, the establishment of such domains has important environmental consequences.

3. MONETARY SYSTEMS AND THE ENVIRONMENT

Having theorized money and monetary systems, I now turn to the central question: how do monetary systems affect the natural environment? As mentioned, two prominent features of monetary systems shape economic activities in environmentally-consequential ways. The first is governance – what and whose rules govern the system? The second is scale – what is the *de jure* and/or *de facto* jurisdiction or space in which a given currency circulates? These two features are the crucial link between money systems and the natural environment.

Governance is important because it shapes the basic rules of the monetary 'game', such as the conditions under which liquidity is created and credit can be obtained. The prevailing monetary governance model is a sort of public-private hybrid, whereby the state – vis-a-vis the central bank – retains control over the printing of money (liquidity creation) and setting of interest rates, and private commercial banks, under the fractional reserve system, are responsible for much of the actual money creation through the provision of interest-bearing loans. "In the current money system," according to Antal and van der Bergh (2013: 58), "more than 90% of the money in circulation is created in the form of loans by private banks. [...] Accordingly, more than 90% of the money in circulation has a debt counterpart somewhere else in the system." Another aspect of monetary governance is capital account management, which rest firmly within the state's grasp. In most advanced economies, capital accounts have been liberalized, making currency convertibility and free capital mobility the norm. These features of the current monetary governance model – fractional reserve banking and capital account liberalization – promote certain modes of economic activity, which in turn have real environmental consequences.

The scale at which monetary systems operate is also crucial. Scale is important because it defines the spatial boundaries within which the monetary game is played. For the past century and a half, the boundaries of the monetary game have, more or less, lined up with the territorial borders of sovereign states (Helleiner 2003). There has thus

been a nice, seemingly natural, fit between the scale at which money operates (throughout the state's sovereign domain) and the primary governor of the monetary system (state). To reiterate, the national scale has been the dominant level at which money is issued and circulates. Crucially, the level at which a currency operates affects the pattern and intensity of economic activity within a given domain. These activities have distinct environmental implications.

Despite the dominance of national currencies, other forms of money – operating at different scales and according to different governance arrangements – do exist. Taking national monetary systems as a baseline, I draw on the euro as an example of a money that has been "scaled up" to the supranational level, and whose governance has been further centralized. By contrast, I use local currency systems to illustrate the "scaling down" of money to the subnational level, and the decentralization of monetary governance. As these examples show, changing the scale and governance of monetary systems can alter patterns of economic activity in environmentally-harmful- or -helpful ways.

3.1 Scale and the Environment

Economic Geography

The first way scale affects environment is through the shaping of economic geography. Changing the scale at which money circulates alters patterns of economic activity. This is because, *inter alia*, money or a monetary system lowers transaction costs, which are simply the costs of doing business (Ganssmann 2012; Cohen 2011). Exchange between different monetary systems faces a transactions barrier – much like an unofficial trade barrier but for all transactions – because of the costs associated with buying and selling currencies. Typically, a good will be priced in a particular currency, and to buy that good a firm or individual in another monetary system will first have to buy the currency in which the good is priced. This purchase represents an additional cost. Doing business between monetary systems also brings with it exchange rate risk – the risk that a firms operations or an investment's value will be negatively affected by changes in exchange rates (Cohen 2011). Buying insurance to offset this risk is another cost associated with doing business between monetary systems. While transacting between systems can therefore be costly, exchange within a monetary system has no such transaction costs, meaning that – holding the price and availability of goods equal – firms and individuals will prefer to do business within, rather than between, monetary domains. As a result, levels of interconnectivity (between sectors, firms, individuals) will also generally be higher within, rather than between, monetary domains.

For the above reasons, the scale at which money circulates affects economic geography by directing/orienting patterns of economic activity in ways that align with the monetary domain. National currencies, for example, have long promoted economic activity and interconnectivity at the national level (Helleiner 2003). By the same logic, changing the scale at which a money system operates – by either supplanting national currencies with a supranational currency or supplementing them with subnational monies – *re*orients patterns of economic activity. Take the euro. By replacing a number of national currencies, the creation of the euro reoriented patterns of production, trade, investment, and finance within Europe (Cohen 2011). It did so by scaling up economic activity, from the national to the supranational level, to match the scaling up of the currency. By reducing transaction costs inside the euro zone, the euro also strengthened economic interconnectivity within this newly forged monetary domain (Cohen 2011). In sum, by lowering transaction costs and thus increasing economic efficiency and interconnectivity inside the euro zone, the scaling up of money in Europe has meant that more economic activity is now taking place and on a larger scale. Hence the euro changed patterns of economic activity by changing scale of the monetary system.

At the subnational level, local currency systems (LCSs) provide an example of scaling down economic activity. Being issued locally, LCSs are able to alter economic geographies and reorient patterns of economic activity toward the local level, thus enabling more localized production and consumption. Among other things, this allows for import substitution and thereby cuts down on the energy needed to transport goods across long distances (Douthwaite 1996; Lietaer and Hallsmith 2011). Because local currencies circulate locally among community members and businesses, "they encourage the purchase or exchange of local goods and services – exchanges that come from the community or from its immediate surroundings, thus reducing realities such as the carbon footprint of long-haul transportation" (Lietaer and Hallsmith 2011: 102). Local currencies are not convertible into national currencies. Therefore, their spatial domains of acceptability are limited to the local community in which they are issued and circulate. This further encourages the localization of economic activity.

Economic Intensity

In addition to influencing economic geography, the scale at which the monetary system operates affects the intensity of economic activity. The intensification of economic activity stems first from money's basic ability to multiply opportunities for exchange (as shown above in Table 1) – what Ganssmann (2012: 32) refers to as the "general level and intensity of action coordination made possible by the use of money." But with reference to scale, the intensity of economic activity has much to do with the opportunities for greater economies of scale and divisions of labour that larger markets provide. By lowering transaction costs inside the euro zone, the euro created a more integrated European market. According to economic theory, more integrated, and therefore larger, markets open up opportunities for bigger economies of scale. And economies of scale result in more concentrated and intense production processes because they are characterized by increasing returns to scale, meaning that a doubling of input in the production process more than doubles output (Krugman and Obstfeld 2008). Thus at a larger scale, more can actually be pro-

duced; larger markets encourage more economic growth. Furthermore, because economies of scale concentrate production in fewer locations, goods have to travel further to reach consumers. Higher transportation demands translate into more carbon-intensive energy use and environmental damage.

Larger-scale monetary systems promote larger-scale and more intense economic activities. The resulting economic situation has a number of negative environmental consequences. Two such consequences stand out. First, the larger the scale of economic activity, the more carbon-intensive energy is required to transport goods across long-distances (Lietaer and Hallsmith 2011; Seyfang 2013). Second, the intensification of economic activity tends to lead to a larger, more concentrated, and more growth-oriented production system. The economies of scale made possible by large-scale markets are especially growth-oriented. While a thorough discussion of growth is beyond the scope of this paper, it is sufficient to say that the quantitative expansion of worldwide economic output/throughput, or growth, has been the chief cause of global environmental degradation. It therefore seems clear that smaller-scale monetary systems are, on average, better for the environment than larger-scale ones. So far, however, economic efficiency has been privileged over environmental protection. In the face of large-scale environmental destruction, we will have to ask ourselves if bigger is always better

3.2 Monetary Governance and the Environment

As the basic rules of the system, monetary governance can shape economic activity in a number of environmentally-significant ways. I focus on three. First, governance directly influences scale, the significance of which has already been shown. Second, governance arrangements determine the conditions under which money is created and credit is provided, and these conditions influence the economy's propensity to grow. Third, the rules of the monetary game can be designed to intentionally promote pro-environmental behaviour.

Scale can be seen as a product of governance for two reasons. First, the scale at which a currency is issued depends on who governs the monetary system. If it is the state, then currency will be issued at the national level; if it is a supranational authority, such as the European Central Bank, then currency will be issued at the supranational level; and if it is a local community, then currency will be issued at the local level. Second, the scale at which a currency circulates may depend on the rules governing the capital account. For instance, states can promote the international use of their currencies, or they can actively restrict the international use of their currencies by tightly regulating the capital account – that is, by not allowing for currency convertibility or free capital movements. As mentioned earlier, the inconvertibility of local currencies limits the scale at which they operate by very clearly marking out their domains of acceptability. Monetary system governance can thus influence the scale at which money is issued and circulates. And as we have seen, scale has a clear impact on the environment.

The rules that govern the creation of money and provision of credit are fundamental in shaping the underlying characteristics of the economy, including its tendency to grow. Recently, a number of scholars have argued that the current debt-based system of money creation relies on an ever-expanding economic system, to allow for repayment of loans with interest (Daly 2012; Lietaer and Hallsmith 2011; Seyfang 2013). They then argue that because a finite system (the environment) cannot sustain an ever-expanding sub-system (the economy), this monetary model is unsustainable.

Antal and van den Bergh (2013) suggest two further problems with the loan-based money creation model. First, because loans are given out at interest, money creation is a lucrative business. This is a problem because, according to the authors, "[m]ore than 90% of the profits go to private actors, while less than 10% goes to the central bank, ending up in the treasury to potentially serve environmental goals like environmental protection" (Antal and van den Bergh 2013: 58). This arrangement also contributes to the power of the financial industry. Second, lending institutions are major proponents of economic growth, because they stand to lose lots of money if default rates increase in the absence of growth. Since "these institutions are very powerful both economically and politically, they are able to reinforce the growth imperative; namely, through exerting pressure on politicians or influencing public opinion through the media" (Antal and van den Bergh 2013: 59).

To alleviate the some of the problems associated with current money creation model, Herman Daly (2012) advocates a 100 percent reserve banking system to replace the current fractional reserve system. This would, according to Daly (2012: website), "restrict borrowing for new investment to existing savings, greatly reducing speculative growth ventures—for example the leveraging of stock purchases with huge amounts of borrowed money would be severely limited." Furthermore, Daly (2012: website) explains, "the fact that money no longer has to grow to pay back the principal plus the interest required by the loan responsible for the money's very existence lowers the general pressure to grow. Money becomes neutral with respect to growth rather than biasing the system toward growth."

On top of curbing growth, a 100 percent reserve system would have the added advantages of redressing the power imbalance tilted toward the financial sector, and increasing the spending power of governments (Antal and van der Bergh 2013). The profit made from money creation would remain in the public purse, and could thus be put toward the provision of key public goods, such as environmental protection. The downside of such governance reform is that it would get rid of the good with the bad, drastically reducing all private investments – including sustainability projects – due to diminished credit availability (Antal and van den Bergh 2013). To address this concern, Antal and van den Bergh suggest that gradually increasing reserve requirements, and stopping before 100 percent, could shift the balance without fully nationalizing money creation.

Another potential solution to the growth dependence of conventional monetary systems comes in the form of local currency systems. Although LCSs are diverse in design, an almost ubiquitous feature of the local currency governance model is the use of interest-free money (Lietaer and Hallsmith 2011; Seyfang 2013). Because they are not inherently growth-inducing, interest-free money systems are more environmentally sustainable than conventional ones. If critics are right to say that the current system of money creation encourages continuous economic expansion, interest-free monetary systems could be critical innovations in the move toward greener economies.

Regardless of how monetary systems are governed, they can be governed according to social and environmental, rather than strictly economic, principles. As such, monetary governance arrangements can be designed to promote pro-environmental behaviour. LCSs provide the best example of this in practice. Because they are issued by local communities, rather than states/central banks, LCSs have decentralized and localized governance structures that can tailor the monetary system to the particular needs and concerns of a given community. For instance, some local currencies directly address pro-environmental behaviour, such as rewarding citizens who participate in recycling programs or who purchase more sustainable products or use public transit (Seyfang 2013: 68). Furthermore, some advocates suggest that local currencies could potentially encourage the development of new green technologies by raising investment capital by issuing notes backed by future energy production, and redeemable against future production (Seyfang 2013: 68). Further still, Lietaer and Hallsmith (2011) argue that we can restore the environment with eco-currencies, or even a carbon currency system. Clearly, monetary governance has and can make money work for the environment.

This paper has shown that monetary systems *do* affect the natural environment. They do so by promoting economic activities that have real, often deleterious, environmental consequences. The scale at which the monetary system operates influences the pattern and intensity of economic activity. Unsurprisingly, larger-scale monetary systems result in larger-scale patterns of more intense economic activity. Insofar as large-scale, high intensity economic systems promote more growth and require more carbon-intensive transportation than small-scale, low intensity systems, large-scale monetary systems seem, on average, to be environmental bads. Monetary system governance, for its part, can be built around rules that promote environmentally-harmful, -neutral, or -helpful economic activities. Findings presented in this paper suggest that the dominant governance model – centered on the fractional reserve system – promotes an inherently expansionary, and thus environmentally unsustainable, economic system. At the same time, LCSs have shown how interest-free money and other monetary governance innovations can be used to break from the growth imperative and even encourage pro-environmental behaviour. Beyond what has actually been implemented, there are scores of innovative ideas for constructing environmentally-friendly monetary systems (see Lietaer and Hallsmith 2011). For the time being, we can say that scaling down money systems and changing monetary governance arrangements can help promote more environmentally-favourable economic activities.

4. FUTURE RESEARCH AGENDA

While this paper has set up a basic framework for understanding monetary systems according to their scale and governance properties, and has shown how these properties affect the natural environment, much work remains to be done in this direction. First, much more empirical evidence needs to be gathered to support – or refute – the claims made in this paper. Second, there is reason to believe that the scale of monetary systems affects not just patterns and intensities, but also types of economic activity. This connection should be further investigated. Third, the monetary systems framework laid out in this paper can be further elaborated. For example, insights from the "complex flow networks" perspective could potentially strengthen the framework by connecting efficiency and resilience to scale and governance. At first glance, scale and efficiency seem to be positively correlated (the greater the scale, the more efficient the activity), while the relative centralization of monetary governance may relate to the resilience of the system. Exploring these relationships in greater depth, and integrating key findings into the existing framework, could help to develop a more comprehensive socio-ecological model of monetary system-environment interactions. Third, the causal relationship outlined in this paper could be further interrogated to see if there are any intervening variables or feedback loops at play. Finally, more work needs to be done on the practical and political barriers to, and opportunities for, monetary system reform. To compliment this research, scholars should also explore the political economy of potential alternatives – such as multi-scalar, multi-currency systems. Only by engaging with these underexplored areas of inquiry can researchers hope to provide a fuller picture of the relationship between monetary systems and natural environments.

As the impending environmental crisis draws nearer, and climate change shows no signs of slowing, innovative solutions to humanity's most complex problems are desperately needed. It is now acknowledged that something must be done to curb the ever-expanding economic system that continues to drive global environmental destruction. But how this change can be achieved remains unclear. This paper provides the seedlings of a potential way forward. After all, if monetary systems have such a profound impact on the natural environment, the greening of money will be a key reform on the pathway to a more sustainable world.

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