

Harnessing Grassroots Innovations: Complementary Currencies and Sustainability

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Complementary currencies have been researched from a variety of perspectives, including as tools to promote environmental sustainability. This paper argues that in fact there are multiple and overlapping ways in which currencies can be linked to more ecologically sustainable development pathways, but in most cases this potential has yet to be fulfilled. It outlines a theoretical approach that treats civil society as a site of grassroots innovation from which alternative 'systems of provision' such as complementary currencies can potentially emerge. Adopting this perspective enables us to apply innovation related theories that have the potential to shed light on the scaling up, replication and translation of currency systems.

1. Introduction

Complementary Currencies are parallel systems of exchange. They have close association with the New Economics and green political economy (Seyfang 2009a; Boyle and Sims 2009) and they have been researched as instruments which might contribute to sustainable development (Briceno and Stagl 2006; Seyfang 2006; Seyfang 2009a; Seyfang 2009b; Seyfang 2009c; Graugaard 2009). However, despite much rhetoric and experimentation the success rate of currencies is still generally low, and there is a tendency for their proponents to overstate their impact and success (Stott 1996; Aldridge and Patterson 2002; Evans 2009). Thus the question of how complementary currencies might be implemented in order to make a significant contribution to sustainable development is one that remains unanswered.

To date, complementary currencies have been researched using a number of different theoretical and conceptual frameworks. For example, complementary currencies have been conceptualised as types of social movement (North 2006; Collom 2005). Related to this is their conceptualisation as forms of ‘anti-globalisation’ or ‘anti-neoliberal’ political activism (Helleiner 2000). There has also been interest in the extent to which they create alternative financial spaces or circuits of value which are in some sense ‘outside’ capitalism (Dobson 1993; Lee et al 2004; Scott Cato 2006). Finally, many of the key writers activists within the complementary currency ‘movement’ frame them through monetary theory (e.g. Lietaer 2001; Greco 2009). Each of these theoretical approaches has provided some important insights into the development and implementation of currencies. However, this paper argues that re-conceptualising currencies as forms of complex technology can offer productive avenues of academic enquiry.

Part two of this paper sets out the rationale for conceptualising currencies as forms of technology, not least the emphasis that such an approach places on currency functionality and the societal needs that the currency is attempting to meet. Part three then identifies some of the currency functionalities which relate directly to issues of environmental sustainability. Part four of the paper the paper introduces the Sustainability Transitions literature. This section highlights how this area of theory attempts explain how radical technologies can influence socio-technical systems. Section five then makes some suggestions of how such niche theories might be applied empirically in the case of currencies and some of the potential problems of doing so.

2. Conceptualising Complementary Currencies as technologies

Broadly defined ‘technology’ can be understood as a

a product, infrastructure, tool, machine, or other form of material culture that has been designed in order to assist human activity and to make changes in the material and / or social worlds

Hess (2007, 69 - 70)

Rogers (2003) argues that technologies are often a combination of hardware (materiality) and software (information). In the case of currencies different combinations of hardware and software can be perceived. Indeed, a whole paper itself could (and should) be devoted to exploring in more depth what it means to understand complementary currencies as technology. Unfortunately there is

not the space to do so here. As such this paper is based on the analysis that a single given system is a ‘technology’. However, that is not to deny the fact that, at a more detailed level of analysis, such a currency system is itself constructed out of a range of technological components (e.g. notes, computer programmes, handbooks etc). Such systems are socio-technical in that they are socially constructed and human agency is necessary in holding them together. Indeed, the relationship between the human and non-human elements of the currency is itself complex. The technology is not just a tool of the user, it also imposes its own ‘script’ which affects their behaviour and practices (Jelsma 2003). For example, a user of the Brixton Pound is ‘scripted’ to change sterling into Brixton pounds in order to obtain the currency.

Even at a less detailed level of analysis, this paper argues that conceptualising complementary currencies as technologies has a number of advantages. Perhaps most importantly, it places an emphasis on the particular needs that they are attempting to address, the *functionalities*. As Bob Swann (1981), a pioneer of ‘new economics’ and advocate of complementary currencies argued:

from a technological viewpoint, money is a tool. Like any other tool it can be shaped to perform in different ways. Just as both a scythe and a combine are tools for cutting wheat, so money may be designed to perform in different ways with different objectives

Recognising that different CCs have different functionalities help explains the varied nomenclature that exists within the field. For example, to some extent the labels of ‘social currencies’, ‘local currencies’, ‘alternative currencies’, ‘global currencies’ all relate to a perceived *primary* functionality of the currency. However, like any given technology a complementary currency will have a number of functionalities (Ekins 2010). For example, the *Brixton Pound* has a number of objectives which can also be understood as its intended ‘functions’ (see Figure 1):

- To enhance local economic resilience through encouraging more local production and consumption and limiting the ‘leakage’ of money from the local economy.
- Support and protect local independent businesses which
 - protect jobs and livelihoods; and
 - maintain the diversity and identity of the local area
- Create stronger connections between local people and businesses, boosting social capital and cohesion.
- Stimulate thinking and discussion about how money works and how local economies function and could be more sustainable
- Promote the area, create pride for its citizens, a sense of independence and attracting tourists
- reduce carbon emissions through reducing the transportation of products from long distances.

Figure 1: Functions of the Brixton Pound from Ryan-Collins (2011)

This is an ambitious set of functions and some important observations can be made. Firstly, that functions of the currency do not all directly relate to *monetary* functions. Whilst by definition all complementary currencies attempt fulfil a ‘medium of exchange’ function many do not all fulfil the other ‘classic’ monetary functions of ‘store of value’ and ‘unit of account’. Furthermore, most currencies have intended functions above and beyond these monetary functions. In the case of the *Brixton Pound*, it is hoped that by providing an alternative medium exchange it is hoped the currency can deliver a range of wider functions.

Secondly, the functions in Fig 1 relate to the intended functions of the system developers. As Eric Von Hippel (1988; 2005) has argued, users of technology are often responsible for adapting and innovating within a particular technological field. For example, whilst the *LETS* currency model was first developed to fulfil an economic function (the shortage of national currency) the empirical research seems to suggest that, for its users, it fulfils a community building function (Briceno and Stagl 2006; Thorne 1996; Williams 1995). In other words, the users of a currency may prioritise different function, or develop new ones that even conflict with those of the currency developers. Indeed there can be conflict amongst the users and organisers about the primary function of a currency (North 2006). Thus whilst a group may form around a the local implementation of a single currency technology they may have different politics and different ‘social realities’. Under such circumstances there can be conflict over the organisation and purpose of the currency.

Conceptualising currencies as technologies therefore not only draws attention to the way in which currencies are attempting to meet specific social needs, but also how different functionalities might conflict. Thus, in the case of environmental sustainability there may be currencies which have explicit functionalities that are intended to deliver environmental benefits. Where these are an explicit element of the currency design we could term these *emic* functionalities. On the other hand, currencies may, through their operation, deliver environmental benefits which are not specifically intended by the originator or even the users themselves. Such functionalities could be labelled as *etic*.

Thinking about currencies as technologies therefore offers a way of conceptualising complementary currencies that avoids the presupposition of a specific and unifying ideological purpose. Instead, it suggests that complementary currencies are tools that might be used for a range of different purposes. This suggests that the field of different currency ‘models’ might be more usefully

conceptualised as a ‘technology cluster’ rather than a single, homogenous ‘movement’. A technology cluster consists of one or more distinguishable elements of technology that are perceived as being closely inter-related (Rogers 2003, 14). The notion of a cluster is preferred here to the notion of a *technological field* because that tends to be used to relate to the technologies that compete to fulfil a recognised societal function, e.g. energy (Hess 2007, 74 - 75). As has been argued above, Complementary currencies are technologies which can be put to a range of different purposes. A ‘cluster’ is also preferred to the notion of a ‘social movement’ because that implies some kind of ideological unity.

The notion of a technology cluster has the added advantage of offering a different approach to solving the difficult problem of classifying complementary currencies (see Blanc *forthcoming*). Much of this debate revolves around conflict over the meaning of ‘community’, ‘local’ or ‘complementary’. A cluster approach avoids this by grouping currencies around factors of similarity. For example, all complementary currencies can be considered as a single technology cluster. However, this cluster can be subdivided in numerous different ways. E.g. geographic clusters for different territories. Clusters based on the ‘sector’ from which the currency originates (public / private / third). A great advantage of this approach is that also permits the ‘nesting’ of clusters where in cluster is sub-divided into further distinct clusters. For example, a cluster of mutual currencies could be subdivided into a range of different models. Such an approach also allows clusters to be identified around specific functionalities, as illustrated in the next section which discusses the sustainability functionalities of complementary currency systems.

3. Complementary Currencies and Environmental Sustainability

This section discusses the different ways in which complementary currencies can be linked to ideas of sustainability. It outlines six different functionalities which link complementary currencies to sustainability. These are detailed below, however the link between monetary reform and sustainability is briefly discussed as it reflects an important part of the wider context from which some currency systems emerge.

3.1 Complementary currencies and the critique of ‘capitalist credit-money’

It is important to recognize that there is a connection between the critique of capitalist credit-money and the promotion of (certain) complementary currencies. Marxism, the dominant ideological critique of capitalism over the last two hundred years does not pay much attention to the role of the monetary system in capitalist economies and their periodic crises (Ingham 2008, 24). However, the ‘utopian socialist’ contemporaries of Marx such as Robert Owen and Pierre Joseph Proudhon argued that reforming the monetary system was an essential component reforming capitalism itself. Owen’s experimental labour exchanges, which issued notes denominated in hours of labour, were the first example of a complementary currency that was developed as a political challenge to capitalist money (North 2007, 43). Other important advocates monetary reform movements such as Silvio Gesell were also closely involved in inspiring currency experiments (ibid 63). The ideas of Gesell continue to influence the contemporary complementary currency movement in his native Germany nearly 100 years after his death (Thiel *forthcoming*). It is therefore important to recognise that currency experiments are in some cases linked to wider critiques of capitalism, and in particular to debates about monetary reform, of which there are various political strands. Thus many advocates of monetary reform movement are also endorse complementary currencies (e.g. Lietaer 2001; Greco 2009, Robertson 1989; Kent 2005).

The essence of the critique of capitalist credit-money revolves around the way that money is created in contemporary capitalist society. The problem, it is argued, lies in the way in which conventional money is created as debt by the banking system:

far more than ever before, new money is not issued by the state but by banks. Ninety seven pounds in every one hundred circulating in the economy will now have been issued by banks (in the form of sight deposits, printed into customers’ accounts as interest-bearing debts). Only three pounds are cash, issued by the state (in the form of banknotes and coins, issued at no interest). The cost to the state of issuing new money is only the cost of producing banknotes and coins. The cost to the banks of issuing new money is virtually zero. The state receives public revenues from issuing cash, but banks make private profits. The benefits of the money system are therefore being captured by the financial services industry rather than shared democratically.

Huber and Robertson (2000, iii)

This critique of ‘fractional reserve banking’ is commonplace within the monetary reform movement. Robertson and Huber argue that there are strong economic arguments for restoring ‘seniorage’ (i.e. the benefits of money creation) to the state and the role of the state in the money creation process. However they also make a wider range of arguments about the benefits of monetary reform including environmental benefits. Thus a particular critique of the the creation of ‘money as debt’ is that it is a key driver of economic growth, requiring a constant expansion of economic production in order to repay debt (Rowbotham 1998). In other words, the monetary system is one of the key drivers of capitalist expansion, which in turn is seen as having a deleterious environmental impact (Mellor 2010). It is this particular argument which provides a strong linkage between elements of the monetary reform movement and some grassroots environmental movements. Thus monetary reform is seen as a key element of a transition towards sustainable development. On this basis advocates arguing for monetary reform often argue that such reform involves complementary forms of money. Thus, in the case of Robertson and Huber above, it is an increased role for state issued money, for others, such as Douthwaite (1999) it is the development of a range of currencies which can fulfill different societal functions.

This critique of capitalist credit money is significant because it informs some of the experiments as well as some of the key texts and organisations who develop currency experiments. However, it should not be assumed that all currency developers / activist subscribe to this analysis, nor are all systems designed to directly address this perceived failing of the dominant monetary ‘regime’. Similarly, not all complementary currencies within the wider technology ‘cluster’ necessarily have explicit links with sustainability. However, many models have been associated with different forms of sustainable development and sustainable consumption (North 2010a; Seyfang 2009a). This section now discusses some of the different ways in which some complementary currencies are linked to sustainability by highlighting some key functionalities that complementary currencies are proposed to deliver.

3.2 Sustainability functionalities of complementary currencies

3.2.1 Stimulating economic localisation

In recent decades the idea of economic localisation has been developed as a goal of a diverse, generally grassroots social movement (Hess 2009). The localisation movement has arisen in part as

a response to the perceived problems of economic globalisation. Globalisation is perceived to undermine the economic security of communities and localities, leaving them at the mercy of forces that are beyond their control (Shuman 2000). This has led to the emergence of a localisation movement which advocates a range of policies and interventions to ‘relocalise’ the economy. Such localists argue:

for a focus first on producing as much as possible as locally as possible, then within the shortest possible distance, with international trade only as a last resort for goods and services that really cannot be produced more locally (for example, tea or citrus in the UK). Consequently, Localisation suggests developing diverse economies at the lowest level appropriate for that activity: in places, localities and regions firstly, then countries, or groups of countries where a lower level does not make sense.

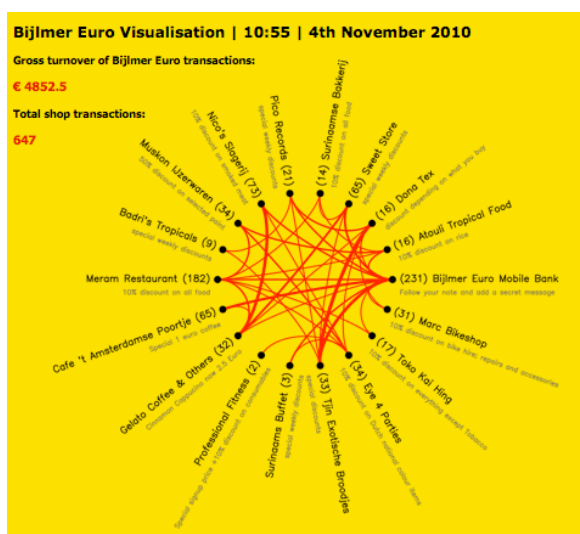
North (2010b)

One strand of the this localist movement, eco-localisation, is rooted within the ecology movement, highlighting the ecological problems associated with processes of globalisation. In particular it is argued that contemporary industrial society is underpinned by ‘cheap’ fossil fuels of which the price will be inevitably rising in the near future (Hopkins 2008). Localisation is therefore promoted also as a mechanism for both reducing the environmental impacts of global trade and mitigating the impact of natural resource depletion through processes of import-substitution. The interest in reducing ‘food miles’ and supporting the re-localisation of food production reflect one aspect of this movement (e.g. Norberg-Hodge 2002).

Some advocates of localisation argue for a ‘top down’ approach suggesting that institutional reform is a necessary precursor to the emergence of more localised economies (Hines 2000). A more ‘radical’ strand argues that localisation can be developed from the ‘bottom up’ through the development of community based initiatives and social activism (e.g. Douthwaite 1996; Hopkins 2008). It is such grassroots based eco-localisation that is most closely associated with the promotion of complementary currencies as a mechanism to support localisation. The role that currencies can play in this role is to build circuits of value that are linked to a specific locality. In other words, the usage of a local currency is intended to prevent wealth from ‘leaking out’ of a locality and facilitate the rebuilding of local economic circuits. Furthermore, by retaining wealth within a geographic locality it is hoped that a local ‘economic multiplier’ can be stimulated whereby the money recirculates within a delineated geographic community. Prominent currency models that attempt

fulfill this function include the UK Transition currencies, *Regiogeld* currencies in Germany and some of the currencies of the USA including *Berkshares* and the ‘Hours’ model.

A recent example of a currency experiment which attempts to promote economic localisation is the *Bijlmer Euro*.¹ It is particularly interesting because the currency is ‘created’ by combining discarded RFID tags from travel cards with conventional Euros. This combination of technologies creates a new local currency which, unlike many models, the circulation of which can be traced. Other novel models in development include the Liquidity Network in Ireland, which involves the public issue of a parallel electronic currency.²



Figures 2 and 3: Image of a Bijlmer Euro and visualisation of the transactions in the currency

Other examples of backed ‘local’ currencies include the *Kékfrank* (Hungary),³ the *Bee* (France),⁴ and the *Salt Spring Island Dollar* (Canada)⁵ all backed with national currency and the *Boulder Gaiian*⁶ which is itself silver coinage.

3.2.2 Building the ‘informal’ economy

The informal economy can be understood as the economy which exists outside of the conventionalised monetised labour market (e.g. see Williams and Round 2008). For example, such work might involve housework, community work, or self-provisioning. Since the 1970s arguments have been made by some feminists, greens and alternative development theorists that the informal economy can offer an emancipatory space from the dominance of the capitalist market (e.g. Gibson-Graham 2006). Such an economy it is argued, would be built around sufficiency and meeting needs without the necessity of engaging in the capitalist ‘growth’ economy (Trainer 1995). Building this

informal economy is therefore invoked in some of the more radical visions of eco-localisation, beings seen to consist of

collectives and co-operatives, buying clubs, community enterprises, not-for-profits, barter and skills exchanges, mutual aid, voluntary activity, household and subsistence production, and what is variously termed the informal or underground sector.

Curtis (2003, 86)

Thus, complementary currencies are promoted as a tool which can help to build this more convivial and personal economy, and which can help to value skills which go unrecognised by the conventional labour market (Scott Cato 2006). Mutual currencies, those which are created by their users and therefore can negate the need for mainstream currency. To some extent they are therefore a tool for ‘monetising’ the mutual economy. Models such as *LETS* and *Timebanks* can be seen to deliver this functionality. Another example is the virtual currency *Superfluid*, a recently launched mutual online currency.⁷ It has also been argued that mutual currencies can also build social capital by creating new social networks and connections (Thorne 1996). Interestingly, when first developed in 1983 *LETS* was intended as a local economic development tool, more in keeping with the ‘localisation’ functionality discussed above. However, as the model diffused its potential as a mechanism to develop a parallel economy became more prominent and was proposed in some of the literature which advocated the model (Dobson 1993). Thus within the UK, many *LETS* currencies were connected to the green milieu and DIY culture (travellers, road protesters, independent media) that emerged in the 1990s (McKay 1998; Aldridge and Paterson 2002). Indeed it was hoped by some that it might lead to the development of an economy ‘outside’ capitalism (Plows 1998). As mentioned above, conflict over these different functions led to disagreement amongst currency organisers (North 2006). There are also examples of recently emerged models which operate on similar principles and have similar deep green objectives such as the Monteseny Exchange Network in Catalonia which uses a mutual currency.⁸

3.2.3 Reducing ecological footprints

The concept of an ecological footprint was developed by Wackernagel and Rees (1996). It is a tool which enable you to

define and visualise environmental injustice in terms of the inequitable distribution of 'ecological space' (the footprint of resources and pollution absorbing capacity) taken up by individuals, cities and countries.

Seyfang (2009a, 24)

There are a number of different currency systems which can be linked to the reduction of ecological footprints. Seyfang (2001) suggests that *LETS* currencies can facilitate the sharing of resources amongst users as well as providing an accessible 'market' for the reuse of unwanted goods. Another example of a currency facilitating reuse would be the *Tauchticket* model from Germany which facilitates the trading of second hand books and other goods.⁹ It might also be argued that some mutual currencies such as *LETS* encourage the meeting of needs through the immaterial consumption of services associated with wellbeing (e.g. therapies) as opposed to material consumer consumption.

Currency systems can also be used more directly to promote behaviour that reduces ecological impact. A longstanding example has been the publicly issued currency in the Brazilian city of Curitiba. In exchange for participating in recycling residents can earn credits which can be spent on other services, including public transport (Rabinovitch 1992). Similarly the Wales based NGO Spice are developing agency-to-person timebanking models which reward individuals for 'green' behaviour. Another example is the *Sharehood* is an online based system that encourages the sharing of resources.¹⁰

There has also been a growth in green loyalty cards systems which reward sustainable behaviour. An early experiment was the *Nu Spaarpas* which was piloted in the Dutch city of Rotterdam between May 2002 and October 2003 (see van Sambeek and Kampers 2004). The systems rewarded people for points for recycling, using public transport and shopping in local shops. Other systems which are part of the green loyalty card cluster existence such as the *E-Portemonnee* system in Belgium,¹¹ as well as *RecycleBank* in the US / UK,¹² the *ICE* loyalty card (UK)¹³ and the *umwelt.plus.karte* from Germany.¹⁴

3.2.4 Credit for small / green businesses

Just as the informal economy is perceived to offer the potential for sustainable economic development strategies, so too are small and green businesses advocated as more sustainable forms of economic institution. Small and family owned businesses, it is argued, are not necessarily driven by profit and expansion, and are thus counterposed to corporations and publicly limited companies who are driven to maximise shareholder value (Ross 1986). Small businesses are also favoured by proponents of economic localisation as they are believed to have more loyalty to the community and locality (Shuman 2000). Complementary currencies can support the development of such businesses by providing mutual credit in a parallel currency. One of the most successful complementary currency schemes is the Swiss *WIR* which provides members with credit and the ability to trade amongst themselves in a parallel currency. Similarly a significant commercial business barter industry has developed in North America and the UK (Healey 1996).

Some currency models attempt to provide such credit functions for small or green businesses as part of a wider commitment to sustainable development. One such example is the *C3* model developed by the Dutch NGO STRO primarily in South America. This enables small businesses to monetise their outstanding invoices, increasing their cashflow and enabling them to trade with other members of the scheme. If applied on a small geographic scale such a model might also contribute to a localisation functionality but it does not necessarily need to be just a local model. Thus the STRO *C3* model is now receiving formal support from the Uruguayan government for a national roll-out. STRO also develops commodity backed and loan backed currencies as part of its local economic development strategies (Brenes *forthcoming*). Another recent model which attempts to fulfill a similar function for 'green' businesses is the *Vermont Sustainable Exchange* in Burlington, Vermont. This provides a mutual credit function for member businesses of the Vermont Businesses for Social Responsibility network. A similar model is in the process of being rolled out nationally in the USA by the NGO *Green America* (Kirschner *forthcoming*).¹⁵

3.2.5 Providing investment mechanisms for green technologies

The idea that currencies could be backed by energy was proposed by both Bob Swann (1981) and Buckminster Fuller (1981) in the early 1980s. Such proposals are linked to the idea of reforming the fiat money system by backing it with something of 'real' value in this case Killowatt

Hours (see also section 3.2.6 below). It has also been argued that such currencies could facilitate the development of renewable energy. The basic idea was that an energy company could raise investment capital by issuing notes backed by future energy production (see Turnbull 2009). At some later point in time these could be redeemed in exchange for energy. Whilst Swann's efforts to implement the scheme faltered, the basic model does have some precedents, such as the example of *Deli-dollars* which were a currency issued in order to raise finance for a new restaurant and which were redeemable in meals (Douthwaite 1996, 139). Indeed the dutch NGO QOIN have recently launched a similar model, the *Kiwah* which is intended to stimulate investment green energy. ¹⁶

3.2.6 *Embedding economic activity within ecological limits*

As noted above, a critique of the current monetary system is that the debt based fractional-reserve banking system fuels unsustainable, exponential economic growth. Some currency systems therefore attempt to re-embed economic activity within biophysical limits. The backing of currencies with energy reflects one way in which money can be linked to bio-physical limits. Unlike the current fiat monetary system, which has no tangible constraints on its expansion, currency backed by kWh would be directly linked to energy production. Swann (1981) envisaged that such a currency system could form part of the stimulus toward a more localised, economically benign society. A similar form of currency instrument that has been proposed to embed human economic activity within ecological limits is the introduction of a 'global reference currency' such as the *Terra* proposed by Bernard Lietaer (2001). This currency would be backed by a basket of commodities and would replace the US dollar as the global reserve currency. A number of potentially beneficial claims are made on behalf of the currency, not least that it would, through the built in 'demurrage' (a tax on holding the currency) encourage long term and sustainable investments. A number of other experiments in carbon and resource backed currencies (such as water or ecosystem services) are currently in development.

Another example of a resource backed currency is given by Personal Carbon Trading (PCT). This would involve the mandatory allocation of carbon credits to individuals who would then be required to spend them on energy consumption. The underlying logic of the system, first developed by David Fleming (1996) as Domestic Tradable Quota's (DTQs) is that this parallel system of exchange would incentives energy conservation, due to the fact that frugal energy consumers could sell excess credits. This idea of PCT has received some policy interest and academic interest (Fawcett et

al 2007, Seyfang 2009b). The DTQ approach has been developed into the Tradable Energy Quotas (TEQs) model and has recently been advocated as an approach to peak oil and climate change by the House of Commons All Party Parliamentary Group on Peak Oil.¹⁷ A parallel system, Special Emission Rights (SERs), has been proposed for the industrial sector, with some proposals envisaging PCT and SERs operating in parallel as part of a strategy of Contraction and Convergence to reduce global CO2 emissions. Under such a scheme a global body (such as the IMF) would issue SERs to governments with *energy backed currency units (ebcus)*. Douthwaite (1999) characterises the system as a return to the gold standard with emission rights as the ‘gold’ and the ebcus as the dollar.

3.3 Summary: Currencies as innovations for sustainability

This section has sought to outline some of the societal functions which it is argued that complementary currencies might fulfill in order to contribute to environmental sustainability. Figure 4 (overleaf) summarizes this cluster of functions and the overlap between systems. As can be seen, some models can be expected to deliver several of these functions, others might only deliver one. It is not claimed that this list is exhaustive, only that it reflects some of the more common features of models and claims within the literature. Presented here, the cluster consists mostly of the models mentioned in this paper along with some of the more famous examples and is illustrative rather than definitive. Other models could be added and no doubt the extent to which different currencies deliver functionalities could also be contested. Furthermore, different currencies within a given sub-cluster (e.g. Regiogeld) might occupy different locations. However, despite its weaknesses it does illustrate the range and diversity of complementary currency models that are can be linked to sustainability functionalities.

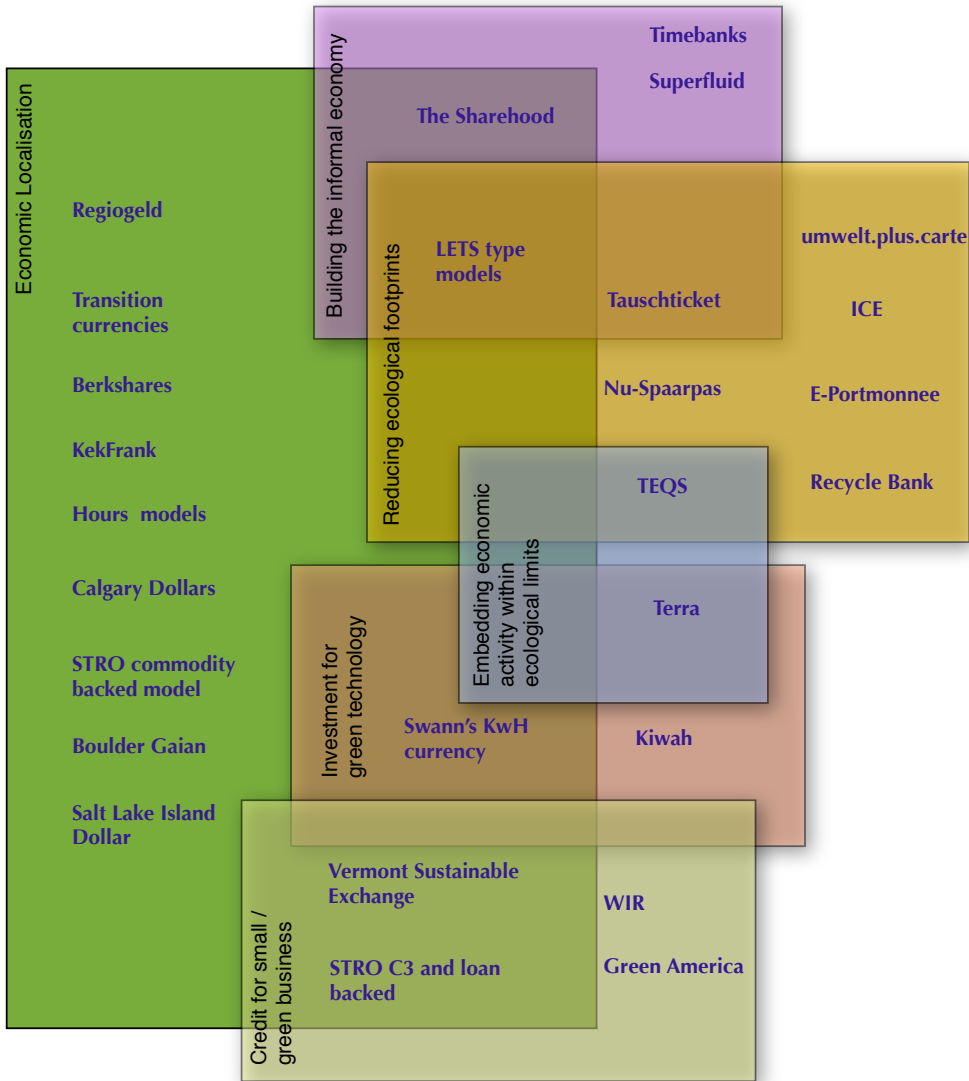


Figure 4: Cluster of complementary currencies with sustainability related functionalities.

4. Complementary currencies and Sustainability Transitions theories

An analytical benefit of conceptualising complementary currencies as technologies is that it opens up a different set of theories which can provide insight into their development and role in society. In particular, with reference to the core concern of this paper, there is a growing literature on the processes of sustainability transitions and how ‘radical’ technologies might play a role in wider systems change.

4.1 Sustainability Transitions literature

Over the last two decades a literature has emerged initially from the Netherlands which is specifically interested in processes of systems innovation at a societal level. This socio-technical transitions approach is based on a co-evolutionary view of technology (i.e. society and technology are co-constitutive) and has developed a number of different theoretical strands (see Kemp (2010); Smith et al (2010) or Grin et al (2010) for recent reviews of the literature). Of particular interest to this paper are those aspects of theory which seek to explain the conditions under which new technologies can prosper or fail. Central to this idea is the concept of ‘niches’ and two different approaches to niches are discussed below, *technological niches* and *socio-technical niches*.

4.2. Strategic Niche Management and Technological Niches

The theory of Strategic Niche Management (SNM) emerged in the 1990s and has been an important strand of the Sustainability Transitions literature. It is intended both as a analytical framework and an approach to support the implementation of environmentally favourable technologies. Early proponents of SNM were interested in how technological niches could be constructed that provided the protective space in which promising new ‘green’ experimental technologies, such as electric cars, could be developed and nurtured (Kemp et al 1998). The starting point for such analyses is the novel technological artefact itself. Empirical work has led to three different sets of processes being identified which lead to flows of resources and the development of networks that enable such experimental projects to ‘scale up’ (see Schott and Geels 2008):

1. Shaping heterogeneous social networks
2. Articulating shared, tangible and specific expectations
3. Broad and second order learning

Since its initial development SNM has been developed in a number of directions. Firstly it has led to the development of the Multi-level Perspective (MLP) which explores the wider interactions of niches, regimes and the landscape (Geels 2002; 2004). These are three core concepts within the Sustainability Transitions literature which have evolved to have a number of different meanings (Raven et al 2010). Broadly speaking the regime refers to the dominant ways of realising a particular societal function (Smith et al 2010). Socio-technical regimes therefore relate to particular

socio-technical systems and are given a certain degree of durability by the ‘rules’ which constitute their existence as well as the fact that they are embedded in institutions and infrastructure (Geels 2002, 2004). The ‘landscape’ refers to the wider societal background within which the regime and niche are situated and which can bring pressure upon regimes.

The broadening of analysis beyond the niche itself has raised questions about the extent to which niche processes themselves are sufficient to lead to the emergence of new technologies and the transitioning of socio-technical systems. It has been suggested that regime crises are a necessary precursor for a niche to transform the regime, extending the analysis to wider questions of Transition pathways (Geels and Schott 2010). The concept of the niche has also been developed by Geels and Raven (2006) to recognise the way that local experimental niches can sometimes aggregate to form a global niche that leads to

an emerging field or proto-regime supported by a network of actors that is concerned with defining decontextualised, shared rules such as problem agendas, search heuristics and abstract theories and models, independent of their local context.

Coenen et al (2009, 3)

A ‘global’ niche therefore reflects a network which connects together a range of different actors who are developing similar experimental technologies. The global niche provides a mechanism by which information sharing are facilitated.

4.3 Socio-technical niches

Strategic Niche Management has inspired a different strand of niche analysis that focuses on what in this paper are defined as *socio-technical* niches. Such analyses start not from the point of an experimental technology but from the point of analysis of a societal regime and then identifying niches of activity which are in some way oppositional to the dominant regime and attempt to fulfil the identified societal function in a different way. In this case then, the niche is not an experimental ‘space’ around a new technology but is instead, reflects a set of ‘practices, institutions and markets’ (Smith 2006a, 2007). Unlike technological niches, socio-technical niches do not focus on a single technological artefact. Instead, they reflect a substantively different way of delivering a societal function. Based on the argument that regimes are nested (i.e. that the electricity regime

nests within the energy regime, see Smith et al 2005) socio-technical niches can be understood as proto-regimes that are antagonistic to the dominant regime. As such analysis of a socio-technical niche starts not with a novel technology but with a defined socio-technical system, within which niches might be potentially identified. As such socio-technical niches can be contrasted to the regime using the seven different dimensions of regimes: Guiding Principles; Technologies; Industrial Structure; User Relations; Policy and Regulations; Knowledge; Cultural Meanings (Geels 2002; Schott 1998).

Smith (2006, 2007) has pioneered work in this vein using the examples of the the organic food and alternative technology niches in the UK. His work has focused on the way in which such niches have an impact on mainstream regimes, in particular through the process of ‘translation’; the process by which elements of the niche are adopted by the mainstream regime. Seyfang and Smith (2007) have further developed this variety of niche to reflect argue that civil society can be an important site in the development of such ‘green’ socio-technical niches. These niches consist of ‘grassroots innovations’:

networks of activists and organisations generating novel, bottom up solutions for sustainable development and sustainable consumption; solutions that respond to the local situation and the interests and values of the communities involved.

Seyfang and Smith (2007, 585)

The work on grassroots innovations makes a number of important contributions to an understanding of both experimental and socio-technical niches. Firstly, it suggests that both technological innovation and socio-technical niches might emerge from non-traditional sites (see also Hess 2007). Thus experimental niches might be instigated by civil society actors such as NGOs or community based organisations (see also Verheul and Vergragt 1995). Furthermore, the ‘innovations’ around which such experiments are organised might not just be technology but call also include new practices or institutions. Secondly, social movements and other actors in civil society might also be important in the development of certain socio-technical niches, such as organic food, or sustainable housing. In addition to translation, Seyfang and Smith (2007) suggest two other ways in which such niches might influence the dominant regime. The first is through the processes of replication whereby innovations within the niche are reproduced by niche actors. The second is through scaling

up, where the niche itself grows in size through participation and activity. Table 1 provides a summary comparison of experimental and socio-technical niches.

Table 1: Comparing Technological and Socio-technical niches

	Technological	Socio-technical
Purpose	Protective space around a novel technology	Delivery of societal functions
Starting point of analysis	Technological artifact	Socio-technical system / regime
Empirical nature of niche	Flows of resources and social networks	Markets, institutions, technologies, practices.
Proposed niche processes	<ul style="list-style-type: none"> - Shaping networks - Articulating expectations - Second order learning 	<ul style="list-style-type: none"> - Translation - Replication - Scaling up

5. Applying niche theory to complementary currencies

Having argued that currencies can be conceptualised as technologies and introduced theory which is particularly interested in how sustainability focused technologies can scale, this section suggests how currencies can be researched through a Sustainability Transitions framework. In doing so, it also raises some difficulties which present challenges for the current theoretical models.

5.1 Researching complementary currencies as technological experiments

5.1.1 'Local' currency experiments

The first approach to researching the sustainability transition theory to complementary currencies is to empirically explore the development of protective niches around specific currency experiments. This paper takes the position that each manifestation of a currency system develops its own protective 'niche' in order to survive and exist. Without this 'niche' the currency system cannot survive in the 'selection environment'. Indeed, the high failure rate of currencies would suggest that many currency systems are unable to sustain protective niches over time.

Research on technological currency niches would contribute to Smith et al's (2010) request for a deeper understanding of niche processes. In doing so, Genus and Cole (2008) advocate a close analysis of the behaviour and assumption of the protagonists and affected parties in niche development. Empirical questions could focus on question of the niche is initially developed? And how are new actors and agents enrolled as supporters or advocates of the currency system? What flows of resources sustain the experiment?

A focus on technological currency niches can provide empirical case studies of the types of niche which sustain grassroots innovation. How such non-market technological niches differ from the 'conventional' niches would be of theoretical interest. For example, in a conventional niche, the ultimate aim is the commercialisation of the technology, which itself may lead to system transitions. What are the objectives of the currency niche builders? Of particular interest might be the factors which sustain the protective niches around longstanding systems. Are the processes suggested by Strategic Niche Management relevant? What 'types' of protection does the niche offer (see Smith and Raven *forthcoming* for a fuller discussion of this issue). A different kind of research could be conducted on those currency innovators who are currently trying to develop new types of system. As opposed to the historical analysis of successful niches such case studies would provide access to the actors and networks which are in the process of building new types of experiment, particularly those focused on sustainability functionalities.

5.1.2 'Global' currency niches

Within some of the more longstanding currency clusters there appears to be examples of situations where 'global' niche have emerged. An obvious example would be the Regiogeld systems where a certain degree of infrastructure has emerged to support the wider systems and other experiments (see Thiel *forthcoming*). Global niches also appear to exist for other longstanding systems such as Timebanks and LETS where organisational capacity has emerged above and beyond the existence of individual systems. Figure 5 illustrates the small 'global' niche that has emerged around the Transition currencies in the UK.

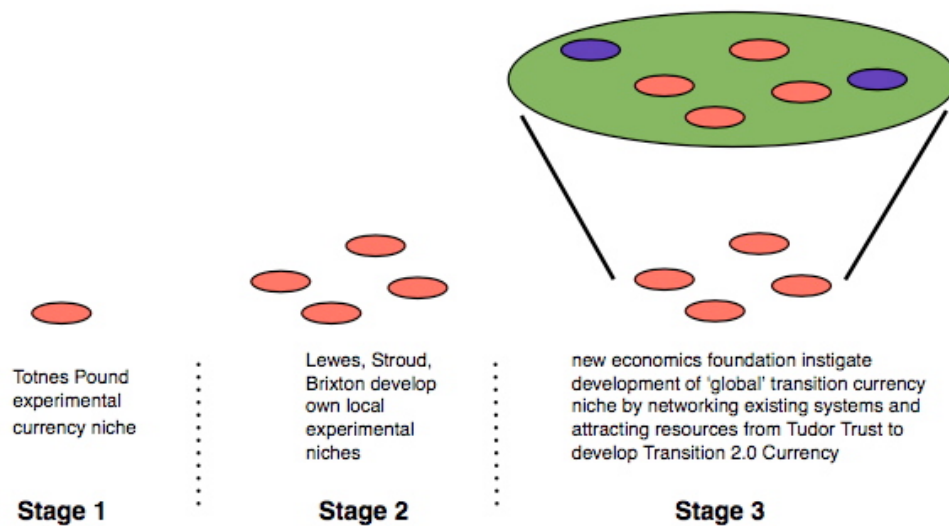


Figure 5: Technological niches in Transition Currencies (see Longhurst 2010; North 2010a; Ryan-Collins *forthcoming*).

The processes which are summarised in Figure 5 could clearly be explored in much more empirical depth. Firstly the processes between each stage could be explored: how one currency experiment led to a cluster which led to a global niche being created. This would lead to an understanding of how experimental currency clusters and niches ‘scale up’. Secondly, the nature of different global niches could be explored and the extent to which the theorised global niche processes are present (see Figure 6 below).

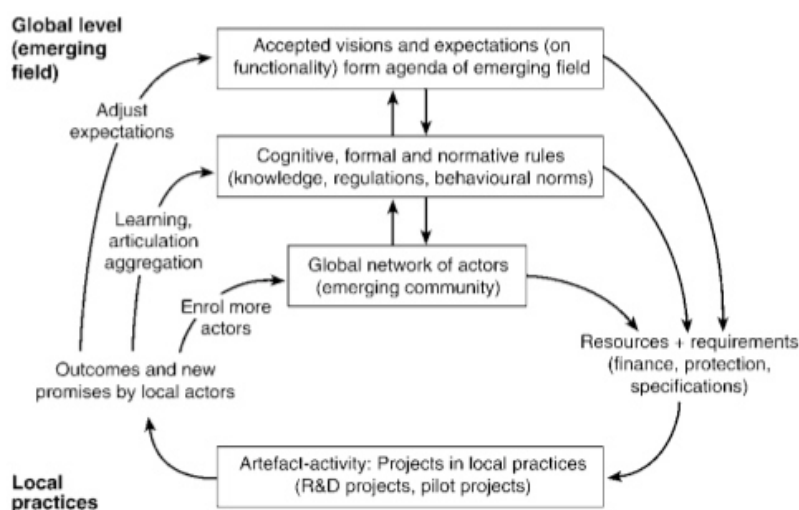


Figure 6: The dynamics of niche development trajectories (Geels and Raven 2006)

The presence of the different processes (represented by the arrows) could be empirically explored as well as the three areas of activity that the niche supports (adjusting expectations; learning, articulation expectation; enrolment of actors). Of particular interest here is the role of NGOs in the development of ‘global’ currency niches. Verheul and Vergragt (1995) have noted the role of NGOs in the development of sustainable technologies. In the case of complementary currencies, there are several examples of NGOs who are involved in supporting the implementation of localised currency experiments as well as the development of global processes (see Table 2). Some of these NGOs have emerged from currency niches (e.g. LETSLink in the UK) whereas others have led the implementation of currency experiments in a more ‘top down’ manner (i.e. not emerging from a group of grassroots experiments). The development of both ‘types’ of NGOs, their networks, resources and relationships with the local experiments are also potential avenues of empirical enquiry.

Table 2: Examples of NGOs involved in currency development

NGO	Models Geographic Scope of Operation
STRO	Three different currency models in South and Central America
Spice	Agency to Person Timebanking (UK)
new economics foundation	Transition currency 2.0 (UK)
E.F. Schumacher Society	Berkshares Currency (USA)

5.2 Socio-technical currency niches

Researching complementary currencies from the perspective of a socio-technical regime is less straightforward than experimental approach discussed in the last section. As suggested above, this approach involves starting from the identification of a societal regime (e.g. personal transport) and then identifying those niches of socio-technical provision which deviate from the dominant modes of provision (e.g. car-sharing). One particular challenge is to identify the societal function which currencies fulfil. This paper has argued that currencies can have varied and complex functionalities, that to view them simply through the lens of monetary functions is to miss the purpose of many of them. As such many currencies do not follow the traditional case studies from the Sustainability

Transitions literature where there is a ‘simple’ alignment between the experimental technology, the regime and the societal function.

However, some example of currency based socio-technical niches can be drawn from the historical literature. For example, there are examples of socio-technical currency niches emerging to fulfil the societal function of economic exchange when the dominant monetary regime is in crisis. Thus it is possible that the emergence of a socio-technical currency niches during the Great Depression or in Argentina in the early twenty-first century could be explored using this particular approach. At first sight, such examples appear to corroborate the argument that regime crises are necessary for niches to emerge (Geels and Schot 2010, Smith 2007). However, they also reflect examples of ‘failed’ transitions which might shed light on how ‘regimes’ can restabilise and reassert themselves. Alternatively, the emergence of the dominant monetary regime - state backed credit money - could be explored through the sustainability transition lens drawing on the historical literature (e.g. Helleiner 1999). Either way, such examples would also provide insight into the evolution of a socio-technical system (the financial and monetary system) which has yet to be explored through the Sustainability Transitions literature.

5.3 Theoretical challenges

As described above, there are a number of different ways in which the Sustainability Transitions theory can be operationalised and applied to complementary currencies. Such an approach could yield deeper understanding about the development of currencies as well as develop the sustainability transition theory in a new direction. However, there are also a number of potential areas of tension where initial empirical scoping suggests an uneasy ‘fit’ between the theory and this particular technology. Such challenges are not necessarily critical, but do suggest areas where particular attention needs to be paid. Four particular theoretical challenges are detailed below.

5.3.1 Identifying regimes

This paper has argued that complementary currencies have a high degree of functional malleability (Geldhill 1994 cited in Walker et al 2006) in that they can be used for multiple and simultaneous purposes. As mentioned above, such complex functionality raises questions about which non-monetary ‘regimes’ specific currency system relates to. It also suggests that it is likely that some

currencies may relate to multiple regimes. Whilst there has been some work on the way in which a given technology can relate to more than one regime (e.g. Raven and Verbong 2009) there is as yet little work in this area. It seems possible that complementary currencies will relate to multiple regimes and/or domains. For example, the implementation of Personal Carbon Trading would be likely to impact on travel and energy regimes, and perhaps others. In other cases it may not even be immediately clear what ‘socio-technical systems’ the currency relates to, such as in the case of Timebanking. In this case the regime may relate to the specific context in which the Timebank is being implemented e.g. healthcare. Does the healthcare system constitute a socio-technical regime? Therefore whilst certain complementary currency technological ‘niches’ can be empirically identified and investigated, the relationship with identifiable socio-technical regimes is less obvious. Furthermore, in some cases the very nature of the monetary system is actively contested by the advocates of complementary currency systems. How such different framing should be reconciled with more conventional or ‘official’ views of the system is not immediately clear.

5.3.2 The scaling of technology

Sustainability Transitions theory is explicitly interested in the scaling up of sustainability focused technologies. Much of the theory has been developed through the historical study of the displacement of one technology by another (Kemp 2010, 295). Therefore there is an implicit assumption that niche actors are seeking to scale their innovation and displace competing technologies. However, as the terminology indicates, many currency developers are attempting to develop *complementary* technologies, as opposed to displace an existing socio-technical system. Such niches have been described as ‘simple’ as opposed to ‘strategic’ (Seyfang and Smith 2007). Understanding the ambitions and the way in which such niche actors frame socio-technical systems will help understand how the theory can be developed to recognise such complementary technologies.

5.3.3 Geographies of transition

If analysed from a diffusion of innovation perspective (e.g. Rogers 2003) it is clear that the more established currency models have diffused across multiple nations and continents. Therefore there is a tension between taking a ‘national’ perspective on the socio-technical system (as much of the literature does) and that development of a global technology cluster based around a certain currency

model. This leads to the question of how such extra-national connections are accommodated within the theory. For example, there appears to be a potential ‘global’ niche based around the Community Exchange System online mutual currency model. However, their data suggests that such technological ‘experiments’ using the *CES* system are taking place in 34 different countries. Furthermore, how does this ‘global’ niche relate to other global niches that are working on similar technologies such as Letslink in the UK and SEL in France? Analysing currency related niches therefore raises questions about the national scale of analysis which often underpins the Sustainability Transitions approach. This also applies to ‘global’ socio-technical niches, such as the rise of complementary exchange systems during the global Great Depression of the 1930s. Is it possible to describe accurately transnational regimes?

5.3.4 Non-market innovation

Many complementary currencies are forms of social innovation in that they are intended to address perceived social or environmental problems (Mulgan 2006). Therefore their protective niches are not intended to evolve into market niches, the normal intended trajectory expected by niches under Strategic Niche Management (Raven 2005). Whilst there is some emerging interest in how social innovation ‘fits’ with the SNM theories (Raven et al 2010; Witkamp *forthcoming*) there has been little empirical work on how protective niches evolve and are institutionalised. Empirical work may therefore suggest new trajectories and processes for such non-market niches.

6. Concluding remarks

This paper has sought to argue that conceptualising complementary currencies as technologies opens up a number of new avenues for research which may help to deepen understanding of how systems can be developed and the mechanisms by which they might impact on wider societal systems. One such example is the theoretical work which is being developed around Sustainability Transitions which is explicitly interested in how radical ‘niches’ might be supported to have a positive impact on environmental sustainability. As this paper has argued, there are a number of currencies models which, it is argued by their proponents, can deliver functionalities which lead to environmental sustainability. As such, used to guide empirical enquiry, this theory might shed some light on the factors which lead such systems to succeed or fail. Such research, it has been argued,

would also develop this theory in new directions, through the exploration of technologies which have, in many cases emerged from the grassroots.

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Endnotes

¹ see <http://www.bijlmereuro.net/?lang=en>

² see <http://theliquiditynetwork.org/>

³ see Szalay (*forthcoming*)

⁴ see <http://www.agirpourlevivant.org>

⁵ see <http://www.saltspingdollars.com/>

⁶ see <http://www.bouldercurrency.com/>

⁷ see <https://thesuperfluid.com/>

⁸ see <http://ecoseny.blogspot.com>

⁹ see <http://www.tauschticket.de/>

¹⁰ see <http://www.thesharehood.org/>

¹¹ see <http://www.bondbeterleefmilieu.be/milieuopdekaart/>

¹² see <http://www.recyclebank.com/>

¹³ see <http://www.myice.com/>

¹⁴ see <http://www.umweltpluskarte.de/>

¹⁵ see <http://marketplace.vbsr.org/> and <http://www.greenbusinessnetwork.org/green-america-exchange.html>

¹⁶ see <http://www.qoin.com/en/kiwah/kiliwatt-hour-money.html>

¹⁷ see <http://teqs.net/report/>

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