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## Electronic Currencies: a literature review

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# **Monnaies électroniques: une revue de la littérature**

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## **Résumé :**

Aujourd'hui, le secteur bancaire a le privilège de créer environ 95% de la masse monétaire. En outre, étant donnée que l'argent permet l'intérêt, l'argent impose systématiquement la Croissance économique. Cette dernière a un impact évident sur l'exploitation des ressources naturelles rares, la pollution croissante de l'environnement, et la menace du changement climatique. La poursuite des objectifs interdépendants de la soutenabilité écologique et la justice sociale appelle à des changements par rapport à « money-as-usual ». Cet article se concentre sur les monnaies électroniques en les regardant à travers le paradigme de la Décroissance qui avance la nécessité de changements radicaux pour l'argent, sa nature et sa distribution. Notre question de recherche est ainsi: Qu'est ce que la littérature nous dit sur la façon dont les monnaies électroniques peuvent façonner notre société pour la Décroissance ? Nous employons une revue de la littérature et nous structurons nos résultats en s'appuyant sur le Work System Framework. Cette revue de la littérature montre que les monnaies électroniques peuvent faciliter certains achats, développer des communautés, et soutenir une allocation optimale des ressources. Nous contribuons à la littérature sur la Décroissance en attestant qu'il n'y a aucune preuve dans la littérature pour soutenir l'idée que les monnaies électroniques pourraient façonner notre société pour la Décroissance.

## **Mots clés :**

Décroissance, Monnaie électronique, Work System Framework, Revue de la littérature, Soutenabilité

# **Electronic Currencies: a literature review**

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## **Abstract**

Today, the banking sector enjoys the privilege of creating around 95% of money supply. Moreover, as bank money bears interest as a condition of its existence, it has long been argued that a systemic growth imperative is inherent to its design, which has a clear impact on the exploitation of scarce natural resources, the increasing pollution of the environment, and the looming threat of climate change. The pursuit of the interrelated goals of ecological sustainability and social justice calls for changes to money-as-usual. This article focuses on electronic currencies by looking at them through the novel Degrowth paradigm which advances radical changes in money nature and distribution. Our research question is: does the literature say something about how electronic currency shapes our society for purposive Degrowth? We employ a literature review and we structure our findings basing on the Work System Framework. This literature review shows that electronic currencies can facilitate purchases, build inclusive communities, and support optimal allocation of resources. We contribute to the Degrowth literature by attesting that there is no evidence to support the notion that electronic currency could shape our society for purposive Degrowth.

## **Keywords**

Degrowth, Electronic Currency, Work System Framework, Literature Review, Sustainability.

# 1 Introduction

By one hand, the nature of money influences objects, objectives, and methods of production and consumption. On the other hand, the distribution of money influences human behaviors, supply, and demand of goods. These factors directly affect the price of commodities. Modern society is mainly based on exchange of goods and services. Money is a fundamental commodity which simplifies exchange of goods and services. It acts as the main means of exchange since the end of large scale bartering and gift/counter-gift exchange. *“Today, the banking sector enjoys the privilege of creating around 95% of the money supply ex-nihilo as interest-bearing debt to itself, and sets the direction of the economy by controlling how money enters into circulation, giving preference to lending for short-term profit over long-term value to society (Ritzberger, 2008). Moreover, as bank money bears interest as a condition of its existence, it has long been argued that a systemic growth imperative, antithetical to the second law of thermodynamics, is inherent to its design (Smith, 2001). Reflection upon these somewhat under-publicized issues can suggest that the pursuit of the interrelated goals of ecological sustainability and social justice calls for changes to money-as-usual” (Dittmer, 2013).*

Since the early 1980s, considerable research attention has focused on the strategic role of Information and Communication Technology and its potential for changing modern society (Evans et Wurster, 1997 ; Kohli et Grover, 2008, 2008). This is attributed to the cross-functional role of information systems within organizations as well as across entire value chains (Vivacqua, 1999). Scholars have begun to explore the Green Information Systems as opportunities in support of sustainability (Melville, 2010). A lot of attention has been devoted in Information System research to contribute to productivity growth and efficiency gains (Malhotra et al., 2013). Unfortunately, most of these research remained in the *“money-as-usual”* paradigm which includes a *“systemic growth imperative”* that has a clear impact on the exploitation of scarce natural resources, increasing pollution of the environment, and the looming threat of climate change (Jackson, 2008). In order to contribute to reflections for the pursuit of the interrelated goals of ecological sustainability and social justice, we look for changes to *“money-as-usual”*. We accomplish it by studying electronic currency systems. We scrutinize electronic currencies defined as alternatives or complements to legal tender money that circulate in electronic forms. Linden dollars, Warcraft’s gold, Riot Points, Bitcoins, and dozens of other electronic currencies have emerged in the last decade.

Research on the nature of money and its distribution is largely neglected in mainstream economics and sustainability research. A framework to understand the functioning of electronic currencies is also lacking in computer science and information systems. Scholarly advancements can help assess the importance the society’s shaping trend. Degrowth is a new paradigm pursuing the interrelated goals of ecological sustainability and social justice and calling for changes to money-as-usual, advances transformations in money nature, and distribution (Alier, 2009 ; Dittmer, 2013). For example, as far as the design of interest-bearing money determines a systemic growth imperative (Smith, 2001), an electronic currency excluding the possibility to have an interest could free its users from similar growth imperative. This article focuses on the Degrowth paradigm to study electronic currencies in order to explore the extent to which electronic currencies can be considered as practical initiatives for advancing socially equitable and ecologically sustainable Degrowth. Hence our research question is the following one: does the literature say something about how electronic currency shapes our society for purposive Degrowth?

The article is structured as follows: section 2 introduces Degrowth; section 3 defines monies, currencies, and their respective electronic variants; section 4 presents the methodology;

section 5 describes the results; section 6 discusses them and section 7 concludes the paper giving insights on further research.

## **2 Degrowth**

In the field of Ecological Economics, the emerging Degrowth paradigm is studied from a macroeconomic perspective and theorized with the concept of “Socially Sustainable Economic Degrowth” (SSED). The SSED contributions mainly focus on ecological macroeconomics (Alier, 2009 ; Van den Bergh et Kallis, 2012 ; Daly, 2010 ; Jackson, 2008 ; Kallis et al., 2009 ; Kerschner, 2010) . *“Not only are ecological economists working on the idea of sustainable Degrowth and its implications as an emergent paradigm to break locked-in concepts inherited from the very malleable 1980s idea of sustainable development, but there are also vigorous social debates in non-academic spheres, such as within Northern social movements for environmental and social justice”* (Martinez-Alier et al., 2010 ; 1741). Ecological economists call for “management without growth” in our economies for a stable and prosperous Degrowth (Jackson, 2008).

In support of the pioneering work of Nicolas Georgescu-Roegen (Georgescu-Roegen, 1999), many contributions in ecological economics deal with the desirability and feasibility of a Degrowth transition in our economies. *“It can be argued that sustainable Degrowth is both a banner associated with social and environmental movements and an emergent concept in academic and intellectual circles, they are interdependent and affect each-other”* (Martinez-Alier et al., 2010 ; 1742).

It is important to emphasize the fact that SSED is a grounded theory because emerging social movements, practices, experiences, collectives, and networks call for conceptualization. The “Nowtopias” inspire academic research (Carlsson, 2008 ; Kallis et al., 2012). Academic research would thus provide an institutional strategy for Degrowth, especially in times of crisis (Martinez-Alier et al., 2010).

Among the concrete actions endorsed by Degrowth advocates is the creation of alternative currencies mainly in the form of local ones (Douthwaite, 2012 ; Kallis, 2011 ; Latouche, 2009). This endorsement for alternative currencies is attributed to a preference for grassroots initiatives over government policy-making, as the latter is deemed to have failed to implement effective environmental policies during the sustainable development epoch (Kallis, 2011).

## **3 Monies and currencies**

### **3.1 Legal tender money**

The monetary exchange system is largely influenced by the legal context of the exchange between actors as the laws and regulations could establish specific money as legal tender. For example, Euro is the legal tender in the Eurozone as is US Dollar in the United States of America. It means that if a debtor owes legal tender money, this debtor can clear up her debts instantly by offering this legal tender money. The fact that legislation is delimited by the country frontiers, what is legal tender in a country is generally not legal tender in another one. Euro is not legal tender in the United States of America and the same applies for the US Dollar in the Eurozone. This depicts the importance of the legal context of exchange.

Few exceptions exist to this main legal rule. For example, both parties of an exchange could, beforehand, agree to a sort of payment different from legal tender money. As a consequence, the legal tender can be legally declined by the seller as form of payment. This exception

explains the presence of notices informing customers about the accepted and declined means of payment, at the entrance of many shops.

We use the word money for the legal tender means of exchange (European Central Bank, 2012), which, in modern economies is typically “fiat money”, as legal tender cannot be redeemed for any commodity. People are willing to accept it in exchange for goods and services simply because they trust the authority issuing it.

### **3.2 Electronic money**

Electronic money (e-money) is the digital equivalent of money. E-money is broadly defined as “*an electronic store of monetary value on a technical device that may be widely used for making payments to undertakings, other than the issuer, without necessarily involving bank accounts in the transaction, but acting as a prepaid bearer instrument*” (European Central Bank, 1998). E-monies include the immense torrents of digital funds that transfer through international and national payment networks, such as SWIFT, Fedwire, and CHIPS (Bernkopf, 1996).

We should note that “technical device” does not necessarily mean physical device: e-money can be software or hardware based. E-money stored on a PayPal account on the web is software-based e-money because the PayPal software application runs on general purpose computer hardware. E-money stored on a GeldKarte is a hardware-based e-money because the GeldKarte software application requires specific physical card and specific physical card-reader hardware.

E-money inherits the legal characteristics of its ‘physical/not-electronic’ counterpart and can be exchanged into ‘physical/not-electronic’ money.

### **3.3 Currency**

Opposed to legal tender money, we use the term “currency” as a means of exchange without the regulatory status of being a legal tender. As a consequence, there is no legal obligation for people and companies to accept currency. The role of the context is again fundamental. For example, in the Eurozone, the US dollar is simply a currency, as far as it is not legal tender money in the Eurozone. Nevertheless, some currencies, such as the US dollar in the Eurozone, can be recognized as legal tender money in other contexts, such as the same US dollar in the United States of America. On the other hand, some other currencies do not hold legal tender status anywhere: Green Dollars (Dittmer, 2013), or privately issued bank notes (Skeie, 2008) are good examples.

### **3.4 Electronic currency**

Electronic currency (e-currency) is the digital equivalent of currency. In line with the definition of e-money, e-currency is an electronic store of currency value on a technical device that may be used for making payments to undertakings other than the issuer (European Central Bank, 2012).

## **4 Methodology**

In order to understand the extent to which electronic currencies can shape our society for purposive Degrowth, we base our study on literature review structured around the Work System Framework (Alter, 2013).

#### 4.1 Literature base

As far as electronic currencies are a multidisciplinary issue, we review e-currency English-language scientific publications in different disciplines (Watson et al., 2010): economics, environmental economics, finance, management, information systems, and computer science. We leverage the existing journal rankings to be sure to include the top scientific journals (Table 1).

We exploited the following literature collections: ABI/INFORM Global, Business Source Complete, ScienceDirect, JSTOR, Wiley Online Library, IEEE Digital Library, ACM Digital Library, Psychology & Behavioral Sciences Collection, Springer, Emerald, and Inderscience.

**Table 1: Study Measures**

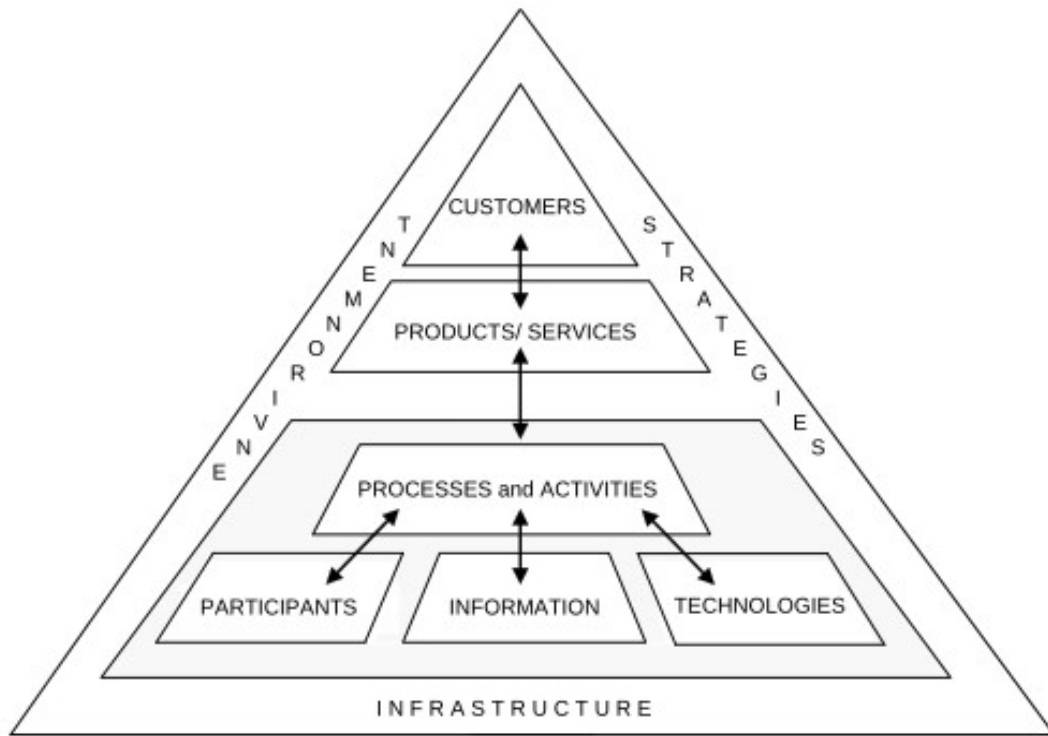
Discipline	Reference	Number of journals
Environmental economics	(Horrace, 2010)	30
Economics	(Ritzberger, 2008)	25
Economics	(Kalaizidakis et al., 2011)	50
Economics	(Keele University, 2006)	121 (4* and 3* categories only)
Finance	(Chan et al., 2013)	20
Finance	(Currie et Pandher, 2011)	20
Economics Management and Finance	(The Financial Times, 2012)	45
Information Systems	(Lowry et al., 2012)	11
Management Information Systems	(Rainer et Miller, 2005)	50
Computer Science	(Era, 2014)	46 (A+ category only)

We searched for electronic currency articles in Title, Abstract, and Keywords fields. We input in the search fields the following unions of, by one hand, “electronic”, “digital”, “virtual”, “internet” and their abbreviations (v-, i-, e-...) and, on the other hand, “money”, “currency” in singular and plural. It gave for example: digital money, internet monies, e-currency, and internet currencies. We also tried with other text separators, beyond “-” and “ ”, like “\_”. We extended the search giving the possibility to accept up to three words between the first part of the search string (such as “electronic”) and the second one (such as “money”) in order to include it in the output articles with similar text: “electronic peer money”.

#### 4.2 Work System Framework

The identified literature was analyzed based on the Work System Framework (Alter, 2013). Its choice depended on the nature of the object of analysis and on the objective of the framework. As far as money and currency carry information (Greco, 1994), monies and currencies can also be defined as “*information system we use to deploy human effort*” (Greco, 2001). The information system reference is even more appropriate when money and currency are fiat money and currency. As far as fiat money and currency cannot be redeemed for any commodity, they do not simply carry information, they are pure information which can be conserved and exchanged because people trust the authority issuing it.

On the other hand, Work System Framework is an analytical theory (Gregor, 2006) which provides a perspective for understanding systems, in particular where Information and Communication Technology is used intensively (Alter, 2013). The central idea of this framework is that processes are the application of human, informational, physical, and other resources to deliver products/services for specific customers. Environment, infrastructure, and strategies are outside of the work system but have direct effects in the work system hence their inclusion in the framework (Drawing 1).



**Fig**

**ure 1: Work System Framework**

Conforming to the Work System Framework, we review the literature in order to present the electronic currencies. We identify the customers, the products/services offered to the customers, the processes, the participants, the information, and the technologies of the electronic currency system. Finally, the environment, the strategies and the infrastructure are also traced.

## **5 Results**

### **5.1 Demographics**

Throughout all the analyzed literature, 19 articles were identified: 12 full research papers, 2 short opinion articles, 4 book reviews, and one editorial article introducing a special issue (Table 2).

The 12 full research papers adopt the same positivist philosophical perspective. Methodologically speaking, out of 12 articles:

- nine perform a theoretical development and 3 of them experiment a simulation of the functioning of their electronic currency after their theoretical development,
- two are based on empirical examination of an existing reality, and
- one is built on a literature review.

### **5.2 The Work System Framework of the electronic currency system**

The application of the Work System Framework to the electronic currencies identified in the literature allows structuring the gathered data in the different components of the Work



Systems Framework: customers, products/services, processes, participants, information, technology, environment, strategy, and infrastructure, with their references (Table 3)

**Table 2: The list of articles**

The articles are sorted by first author and year: the name of the first author, the year of publication, the name of the journal, the impact factor of the journal, the title of the article, the type of article and the Google Scholar number of citation on 2 June 2014

Reference	Journal name	Journal Impact Factor	Article Title	Type of article	Number of Citations
(Amor, 2001)	Journal of Information Technology Theory and Application	Not available	The industrialization of the Internet Gold Rush	Short opinion article	
(Azariadis et al., 2001)	Journal of Economic Theory	1.07	Private and public circulating liabilities	research article	24
(Camp, 2001)	Transactions on Software Engineering	1.55	An atomicity-generating protocol for anonymous currencies	research article	12
(Carbunar et al., 2011)	Journal of Parallel and Distributed Computing	1.12	Conditional e-payments with transferability	research article	6
(Copler, 1995)	Database	Not available	Money on the Internet	Book review	
(Copler, 1996)	Database	Not available	Making Money on the Internet	Book review	
(Hartmann et al., 2001)	Journal of International Money and Finance	0.86	The microstructure of the euro money market	research article	133
(Hu et al., 2012)	Journal of Parallel and Distributed Computing	1.12	Peer-to-peer indirect reciprocity via personal currency	research article	1
(Jacobs, 1971)	Journal of finance	4.33	The electronic money: evolution of an electronics fund-transfer system	Book review	
(James, 2000)	Financial Management	1.33	The bucks here	Short opinion article	
(Li et al., 2014)	Transactions on Parallel and Distributed Systems	1.8	LocaWard: A Security and Privacy Aware Location-Based Rewarding System	research article	0
(Marimon et al., 2003)	Journal of monetary economics	1.65	Inside-outside money competition	research article	21
(Mbiti et Weil, 2013)	American Economic Review	2.53	The home economics of e-money	research article	2
(Nurnberg, 1972)	The Accounting review	2.42	The electronic money: evolution of an electronics fund-transfer system	Book review	
(Pfitzmann et Waidner, 1997)	Transactions on Computer Systems	0.8	Strong loss tolerance of electronic coin systems	research article	28
(Skeie, 2008)	Journal of financial intermediation	2.21	Banking with nominal deposits and inside money	research article	23
(Smith, 2001)	Journal of Economic Theory	1.07	Introduction to monetary and financial arrangement	Introduction to special issue	
(Sumanjeet, 2009)	Asia pacific journal of finance and banking research	Not available	Emergence of payment systems in the age of electronic commerce	research article	25
(Zhang et al., 2012)	Journal of Parallel and Distributed Computing	1.12	An efficient incentive scheme with a distributed authority infrastructure in peer-to-peer networks	research article	1

**Table 3: The Work System Framework for electronic currency systems**

Components	Declination for electronic currencies
Customers:	Buyers in electronic currency (Camp, 2001 ; Carbunar et al., 2011 ; Li et al., 2014 ; Mbiti et Weil, 2013 ; Hu et al., 2012 ; Pfitzmann et Waidner, 1997 ; Zhang et al., 2012 ; Sumanjeet, 2009) ; Holders of electronic currency (Mbiti et Weil, 2013 ; Sumanjeet, 2009); Commercial entities accepting electronic currency (Camp, 2001 ; Carbunar et al., 2011 ; Li et al., 2014 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009 ; Vivacqua, 1999 ; Zhang et al., 2012) ;

Services:	<p>Currency exchanging service for the members of a virtual community where each individual community member can issue a personal electronic currency (Hu et al., 2012 ; Zhang et al., 2012), to facilitate purchases of virtual goods and services within the same virtual community</p> <p>Purchasing service for the buyers exchanging electronic currencies for goods and services offered by the electronic currency issuers (Camp, 2001 ; Hu et al., 2012 ; Zhang et al., 2012) and by third parties, for virtual goods and services (Azariadis et al., 2001 ; Mbiti et Weil, 2013 ; Sumanjeet, 2009), as well as for physical goods (Azariadis et al., 2001 ; Camp, 2001 ; Carbanar et al., 2011 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009);</p> <p>Value storing service for holders of electronic currencies (Sumanjeet, 2009);</p> <p>Rewarding service for holders of electronic currencies (Li et al., 2014 ; Zhang et al., 2012);</p> <p>Revenue sharing service among the members of the virtual community (Zhang et al., 2012);</p> <p>Privacy and anonymity preservation service for the buyers with electronic currencies (Camp, 2001 ; Carbanar et al., 2011 ; Li et al., 2014 ; Pfitzmann et Waidner, 1997);</p> <p>Security service for the exchanges with electronic currencies against free-riding (Hu et al., 2012), electronic attacks (Hu et al., 2012 ; Li et al., 2014 ; Pfitzmann et Waidner, 1997), collusion (Zhang et al., 2012) and loss (Pfitzmann et Waidner, 1997).</p>
Processes:	<p>Issuance of electronic currency by the mining, supply, withdrawal, load of new electronic currency (Azariadis et al., 2001 ; Camp, 2001 ; Carbanar et al., 2011 ; Hu et al., 2012 ; Li et al., 2014 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009);</p> <p>Transaction of electronic currency, which is the agreement carried out between a buyer and a seller to exchange electronic currency for payment of a good or service (Azariadis et al., 2001 ; Carbanar et al., 2011 ; Li et al., 2014 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009);</p> <p>Redemption, i.e. the cancellation of electronic currency by the issuer with compensation (Azariadis et al., 2001 ; Carbanar et al., 2011 ; Li et al., 2014 ; Pfitzmann et Waidner, 1997 ; Mbiti et Weil, 2013 ; Sumanjeet, 2009);</p> <p>Conversion, in case of the agreement carried out between a buyer and a seller to exchange electronic currency for other currencies or monies (Mbiti et Weil, 2013).</p>
Participants:	<p>Issuers of electronic currency, i.e. the organization that developed the electronic currency system (Mbiti et Weil, 2013 ; Sumanjeet, 2009), acting as lender of electronic currency (Azariadis et al., 2001 ; Camp, 2001 ; Carbanar et al., 2011 ; Li et al., 2014 ; Pfitzmann et Waidner, 1997);</p> <p>Owners of electronic currency, who is the buyer and holder of electronic currency (Camp, 2001 ; Carbanar et al., 2011 ; Bharadwaj et al., 2010 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009 ; Zhang et al., 2012), acting as borrowers of electronic currency (Azariadis et al., 2001);</p> <p>Payees in electronic currency, who receive it in exchange for goods and services (Camp, 2001 ; Carbanar et al., 2011 ; Hu et al., 2012 ; Li et al., 2014 ; Pfitzmann et Waidner, 1997 ; Zhang et al., 2012)</p> <p>Trusted third party, that is the organization holding money deposit reserve, backing electronic currency value in case the electronic currency can be converted in money (Mbiti et Weil, 2013) or holding, collecting, publishing critical information useful for electronic currency system functioning (Camp, 2001 ; Carbanar et al., 2011 ; Li et al., 2014 ; Zhang et al., 2012).</p>
Information:	<p>Amount of value of the issued, transacted, deposited, redeemed and converted electronic currency (Camp, 2001 ; Carbanar et al., 2011 ; Li et al., 2014 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009 ; Zhang et al., 2012);</p> <p>Denomination of the currency (Pfitzmann et Waidner, 1997);</p> <p>Information references about the issuers, the owners and payees, and trusted third parties (Camp, 2001 ; Hu et al., 2012 ; Li et al., 2014 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009 ; Zhang et al., 2012);</p> <p>Fee for the operations of issuance, transaction, conversion and redemption of electronic currency (Mbiti et Weil, 2013 ; Sumanjeet, 2009 ; Zhang et al., 2012);</p> <p>Signatures, keys, certificates, and watermarks to prevent counterfeit electronic currency (Camp, 2001 ; Li et al., 2014 ; Mbiti et Weil, 2013 ; Pfitzmann et Waidner, 1997 ; Sumanjeet, 2009 ; Zhang et al., 2012);</p> <p>Time value of the transaction (Pfitzmann et Waidner, 1997)</p> <p>Back-up and historical information (Pfitzmann et Waidner, 1997 ; Zhang et al., 2012)</p> <p>Sequence numbers by counters for transactions, withdrawals, backups (Camp, 2001 ; Pfitzmann et Waidner, 1997 ; Zhang et al., 2012)</p> <p>Purchasing contract and conditions stating the acceptance of the electronic currency for the good and services (Mbiti et Weil, 2013 ; Carbanar et al., 2011 ; Hu et al., 2012 ; Zhang et al., 2012)</p>
Technology:	<p>Information and Communication Technology, such as smart cards (Sumanjeet, 2009), mobile phone handset (Li et al., 2014 ; Mbiti et Weil, 2013) tamper resistant purse and till (Pfitzmann et Waidner, 1997), with Wi-Fi interfaces (Li et al., 2014) and/or wired network (Li et al., 2014).</p> <p>Protocols, for real identity untraceability (Camp, 2001 ; Carbanar et al., 2011 ; Li et al., 2014 ; Pfitzmann et Waidner, 1997 ; Zhang et al., 2012), transaction verification (Camp, 2001 ; Pfitzmann et Waidner, 1997 ; Zhang et al., 2012), currency recovery (Pfitzmann et Waidner, 1997), operation synchronization (Camp, 2001 ; Pfitzmann et Waidner, 1997), payment (Pfitzmann et Waidner, 1997), currency distribution (Li et al., 2014), currency redemption (Li et al., 2014), supervision distribution (Hu et al., 2012 ; Zhang et al., 2012), credit limitation (Hu et al., 2012), seller selection (Hu et al., 2012)</p>
Environment:	<p>A banking system to manage trust funds (Mbiti et Weil, 2013),</p> <p>Trade habits accepting electronic trade and transactions (Sumanjeet, 2009)</p> <p>Public/private key pairs distribution (Zhang et al., 2012).</p>
Strategy:	<p>A for-profit business strategy of a particular company (Mbiti et Weil, 2013),</p> <p>A pursuit, at the society level, of the optimal allocation of resources, when an electronic currency complements legal tender money (Azariadis et al., 2001)</p> <p>Inclusive community-building for the members of the virtual community, by sharing revenues equally among all the members (Zhang et al., 2012);</p>
Infrastructure:	<p>Electronic telecommunications (Sumanjeet, 2009) and, in particular, mobile phone networks (Mbiti et Weil, 2013), network anonymizer or mix network (Camp, 2001 ; Carbanar et al., 2011), peer-to-peer network (Hu et al., 2012 ; Zhang et al., 2012)</p>

## 6 Discussion

The review of literature put revealed limited research in economics, finance, management, information systems, and computer science on electronic currencies. Grey literature is abundant in newspapers and magazine but it seems that academic community has not been able to deliver content on electronic currency. The few identified articles provide advantages, disadvantages, and the functioning of electronic currencies. None of the articles gave indications about the development, implementation, and the life cycle of electronic currency systems (Alter, 2013).

The literature identifies three conceptually distinct but empirically overlapping customers evident in peer-to-peer networks: the buyers who purchase products/services, the holders who store value with electronic currencies, and the commercial entities accepting electronic currency. To satisfy these customers, the electronic currency is issued, transacted by the owner in exchange of products/services, eventually converted for other money or currency, and finally redeemed by the issuer. Literature showed that electronic currency is fundamentally electronic thus requiring the compulsory need for technology infrastructure. The introduction of electronic currencies can be part of a for-profit business strategy of a particular company (Mbiti et Weil, 2013). However, more interesting for our research aims, its introduction could lead to, at the society level, the optimal allocation of resources (Azariadis et al., 2001) and inclusive community-building for the members of the virtual community. These could be achieved by sharing particular electronic currency revenues equally among all the members (Azariadis et al., 2001).

The results show that electronic currencies can support purchases at the individual level, build social equity and inclusion at the community level, and support optimal allocation of resources at the society level. In line with a complementary study on alternative non-electronic currencies (Dittmer, 2013), nothing clearly emerged supporting the hypothesis that electronic currency could shape our society for purposive Degrowth. Hence, our next steps will be, by one hand, to look empirically at the actual use of electronic currencies by the population. In this way it could be possible to explore the extent to which electronic currencies can practically support behaviours promoting purposive Degrowth. On the other hand, we will extend the scope of the literature review to include less prestigious academic journals. We hypothesize that new emerging issues are firstly published in less prestigious journals. Only subsequently, and gradually, these emerging issues are more and more theorized and they become publishable in top journals.

## 7 Conclusions

By one hand, the nature of money influences objects, the objectives and the methods of production, and consumption. On the other hand, the distribution of money influences human behaviors, the supply and the demand of goods, and hence their prices. The paper focuses on electronic currencies as alternatives or complements to legal tender money that circulate in electronic forms. The objective was to look at monies with the fresh regard suggested by the original Degrowth paradigm as an opportunity for ecological sustainability and social justice. This review of literature revealed limited research in economics, finance, management, information systems, and computer science on electronic currencies. Only a few interesting aspects for Degrowth were identified coming from electronic currencies: their introduction could result in the optimal allocation of resources and inclusive community-building. As far as it has been asserted, information systems occupy a unique role as they are both a contributor and a potential solution to environmental degradation. Moreover, electronic

currencies are an important society shaping trend that requires more research to identify the interrelationship between electronic currencies and sustainability.

None of the articles gave indications about the development, implementation, and life cycle of electronic currency systems (Alter, 2013). Given nothing clearly emerged from literature supporting the hypothesis that electronic currency could shape our society for purposive Degrowth, the next step would be to look at the empirical use of electronic currencies to explore the extent to which electronic currencies can practically support purposive Degrowth as has been done for non-electronic currencies (Dittmer, 2013).

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