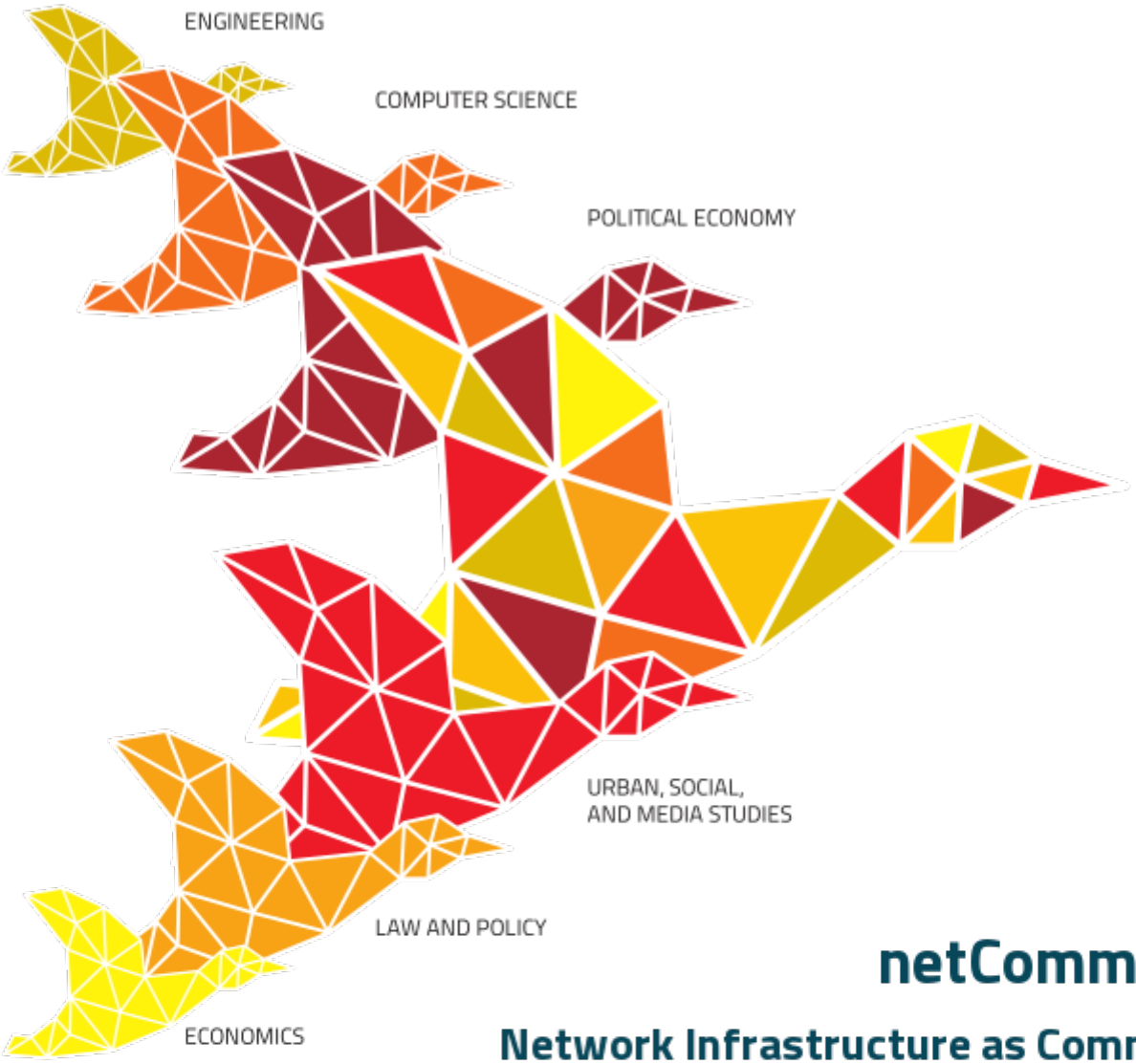

netCommons

Network Infrastructure as Commons

Economic Sustainability of CNs (v2)
Community Currencies for Community Networks

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Executive Summary

Economic sustainability and, in general, sustainability is a very complex issue bearing many interrelated dimensions. To receive funding from an external source, for example, a CN needs to have defined an appropriate governance and administrative structure, and to showcase a healthy community internally and externally. In many cases, the articulation of a clear and inspiring vision is necessary for the engagement of volunteers, but also for addressing legal hurdles through advocacy and policy-making, which are both fundamental requirements for the survival of the CN in its early stages and thereafter.

In this project task, the focus has been placed on a so far minimally studied aspect of economic sustainability in the context of CNs. We refer to the *community* or *alternative currencies*, which can complement existing successful governance models discussed in WP1 and the pricing schemes and incentive mechanisms analysed in Task 2.2, as parts of a holistic strategy towards the economic sustainability of CNs. There are at least two very good reasons why the study of alternative currencies is worthwhile in the context of CNs. First, the relevance of alternative currencies to the economic sustainability of CNs gets all the more important to understand in depth, in light of the recent hype around combining cryptocurrencies with Internet access sharing –a development which was not anticipated at the time of writing the netCommons proposal. Second, by its very nature, the design of a community currency (CC) involves the decomposition of an economic system, in our case the CN, and its surrounding economy, into different parts. This process helps one identify structural issues and opportunities for collaboration with other sectors of the economy, which could be pursued even if the corresponding community currency is not actually implemented.

D2.4 included a tutorial on community currencies for engineers (Martignoni, 2018), and an inspiring analogy between CNs and CCs (Antoniadis et al., 2018). In this deliverable, which is essentially a follow-up of D2.4, we first explore novel currency models that could serve the needs of CNs, as these stem from their distinct economic, social, and political dimensions. More specifically, in chapter 3, we refine and analyze the district currency model (Martignoni, 2013, 2015, 2017). This is a "commons-based" currency model, i.e., it promotes "commoning", as this is evidenced in many of the existing successful CNs. The strong notion of commoning in many CNs is discussed while surveying existing sustainability models of CNs in Chapter 2 and stands as motivation for the broader analysis of community currencies in this deliverable.

Second, we improve and further develop a simulation game based on the district currency model. The game has proven most successful in both explaining the district currency model itself and revealing some of the basic principles behind the nature of money and the complexity of currency design. The better understanding of the link between economy and currencies is often the most important obstacle in the deployment of successful alternative currency schemes, especially after the bitcoin hype. In Chapter 4, we present the design of the game as well as the lessons learned through six implementations of it; we also include guidelines for people who wish to run their own variants of the game.

Third, we analyze possible integration scenarios of existing alternative currency models with different types of community networks. The analyzed models in Chapter 5 range from the novel and untested district currency model to the most visible success stories in this field like Sardex.net, including possible combinations of those. This analysis and the resulting community currency schemes are then presented as alternatives to current assumptions of how an economy built on top of blockchain-based schemes, like Ammbr[1], could look like. More specifically, we stress the need to distinguish between the "accounting" function that cryptocurrencies perform and the management of tokens, which could be in line with the principles of commoning, promoted by netCommons.

[1] www.ammbr.com, see section 5.3

In Chapter 6, our proposals are placed in the overall discussion about the challenge of economic sustainability of CNs and possible future steps are discussed.

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List of acronyms

BCN	Barcelona
B4RN	Broadband for the Rural North
CAPS	Collective Awareness Platforms for Sustainability and Social Innovation
CC	Community Currency
CCs	Community Currencies (plural)
CN	Community Network
CNs	Community Networks (plural)
CSCC	International Conference on Social and Complementary Currencies
CONFINE	Community Networks Testbed for the Future Internet
DAO	Decentralized Autonomous Organization
DC	District Currency
eXO	The Association for the Expansion of Open Network
FLOSS	Free /Libre Open-Source Software
GFOSS	Greek Free/Open Source Software Society
HC	housing co-operative
ICT	Information and Communications Technology
IJCCR	International Journal of Community Currency Research
ISP	Internet Service Provider
LETS	Local Exchange and Trade System
VOIP	Voice Over Internet Protocol
WNDW	Wireless Networking in the Developing World (website & book)
WP	Work Package

1 Introduction

This is the follow-up of Deliverable 2.4 (D2.4), which included a brief report on existing economic sustainability models for community networks (CNs) and introduced the Community Currency (CC) concept as a mechanism that could contribute to innovative sustainability models for CNs. Drawing a detailed analogy between the two domains of local action, community currencies and community networks, we provided a good basis for understanding the similarities and differences of the two domains and their intersection. We also motivated the need to invest on education and learning so as to familiarize people with CNs and CCs and help them overcome their skepticism and reservations, and presented a novel simulation game on CCs in response to this. We run this game in different cities across Europe and received valuable feedback that helped us improve the game design and its actual implementation.

In summary, CCs around the world, like CNs, are very different from each other, also because they aim to serve likewise different local communities and needs. Although most CCs are born in times of economic crisis (much as most CNs were born to address Internet connectivity problems), their benefits extend beyond the satisfaction of direct needs. They raise awareness about the nature of money and they contribute to the engagement and emancipation of communities. Hence, in many cases, CCs have evolved to something more than "emergency" solutions. Success stories like the WIR (Stodder, 2009) and Sardex.net (Littera et al, 2017) provide evidence that they can play a long-term complementary role to the global economy. The same holds for CNs, with the successful examples of guifi.net, B4RN, Freifunk.net, and many more expressing both the diversity and potential longevity of CNs. The CC-CN analogy has been stressed further in Deliverable 2.4 offering insights and inspiration for knowledge exchanges and collaboration between researchers, activists, and practitioners in these two knowledge fields.

In this deliverable, we take a few steps forward in this direction. First, we describe in more detail two innovations in the world of CCs, initiated by Jens Martignoni (NetHood & Flexibles) before the start of the netCommons project and further developed and refined in the context of Task 2.3: the commons-based district currency model (Chapter 3) and the district currency game (Chapter 4). Second, we describe three different, but potentially complementary, scenarios, through which CCs can play a positive role in the economic sustainability of CNs (Chapter 5).

In actual terms, community currencies cannot replace the existing (national) currencies; neither were they designed or meant to do so. They rather aim at creating a complementary tool, preserving additional degrees of freedom and self-determination for local economies, acting as an instrument of diversification and activation of internal community resources.

Our analysis of community currencies is further motivated by the fact that multiple new initiatives have recently appeared proposing the use of cryptocurrencies for the realization of various forms of Internet access sharing and user-centric networking[2] (note that our work on community currencies was originally described at a moment that the discussion about the use of cryptocurrencies for user-centric networking was at its infancy). Ammbr is a particularly interesting cryptocurrency-based model, which is the most aligned one with

[2] The following are four different documents released all toward the end of 2017: http://ammbr.com/docs/20171121/Ammbr_Whitepaper_v2.3_21Nov2017.pdf, https://www.coindesk.com/plan-b-ethereum-innovators-reviving-fight-net-neutrality/, https://iungo.network/docs/iungo-network-whitepaper.pdf, https://www.forbes.com/sites/forbestechcouncil/2017/12/20/improving-global-digital-inclusion-with-tokenized-mesh-networks/.

the values of CNs, enjoys the support of guifi.net and the keen interest of ninux.org, and maintains links to the netCommons project[3].

Most significantly, all these cryptocurrency-based schemes, including Ammbr, are under development, and a deep understanding of community currencies can be very helpful both for *their* developers and *their* potential members. More specifically, as argued in Chapter 5, it is very important to imagine these blockchain technologies as enablers of a wide variety of economic models and systems, besides and beyond the management of tokens, if the goal is really to provide alternatives that lie closer to the values of commoning and serve the multiple dimensions of CNs' sustainability as discussed in Deliverable 2.2 (D2.2).

Chapter 6 summarizes our work and evaluates the potential role of community currencies for enhancing the sustainability of community networks, along the guidelines of the framework provided in Deliverable 2.1 (D2.1).

Before we get into the details of our contributions, we summarize some key concepts that will help the reader understand better our approach and further motivate the work reported in this deliverable.

1.1 Community currencies and economic sustainability of CNs

In its simplest form, a CN could be viewed as a group of people sharing the cost of an Internet infrastructure, when this doesn't exist at all or when it does not fulfil certain requirements either in terms of quality (e.g., symmetric bandwidth) or affordability or ethical concerns (e.g., net neutrality and privacy among others). The sustainability question for such grassroots initiatives is a complex one, bearing multiple dimensions (economical, political, cultural) and demanding a wide variety of resources and expertise for education, policy, legal support, community building, and more.

Within netCommons, sustainability aspects are treated in several tasks. The economic sustainability, in particular, is discussed in different complementary deliverables. In Deliverable 1.1, *Report on the Existing CNs and their Organization (v1)* (D1.1 pp. 18-19 and pp. 61-63), and its follow-up *Report on the Existing CNs and their Organization (v2)* (D1.2 pp. 20-21), the emphasis is on general organizational aspects of CNs, including their stakeholders and their roles. In Section 2 of Deliverable 1.4 (D1.4), the business models of several CNs are documented with the business model canvas method. The economic aspects of network access as one specific issue of economic sustainability are discussed in Deliverable 2.1, *The Multiple Aspects of Politics of Sustainability in Community Networks: Definitions, Challenges, and Countermeasures,* (D2.1 pp. 57-69) as part of the broader analysis of the sustainability concept. Many aspects of economic and socio-economic incentives, including pricing schemes, are described in Deliverable, *Incentives for Participation and Active Collaboration in CNs* (D2.3).

The work presented in this Deliverable is complementary to all these studies, focusing on the different types of "resources" and/or "services" that are involved (or could be involved) in an economy including a CN. This way, it provides additional insights independently of the actual implementation of the proposed currency schemes. In other words, the approach taken in Task 2.3 somehow reverses the perspective of the other project tasks and analyses one specific solution for better economic sustainability, namely the idea of community currency. The question, therefore, becomes: could a community currency (or different ones) have positive impact on the economic sustainability of a CN, and if yes, how? Consequently, the central approach of the Task 2.3 is the development and the introduction of alternative currencies as a potential tool for improving the sustainability and long-term success of community networks as single entities or as a whole movement.

[3] One of the co-founders of Ammbr, and co-director Ammbr Research Labs, Arjuna Sathiaseelan, is member of netCommons advisory board and has participated in early discussions in the context of Task 2.4, which contributed to the engagement of Leandro Navarro (UPC) as a co-director of the Ammbr Research Labs. Since Ammbr has shifted from an Initial Coin Offering fundraising model to a new one with private investors, and to make sure that there is no conflict of interest in the views presented in this deliverable, these represent those of the authors only.

To this end, our arguments are based on a decomposition of the existing economic sustainability models of CNs through a **"community currency"-driven analysis**. Such an analysis consists in understanding a) the economy around a CN as a flow of goods and services that should be ideally balanced between participants, forming what is called *exchange circles;* and b) the relationships of such exchange circles with the "global" system. We present it in Chapter 2, after summarizing the different approaches CNs follow for funding their activities and pursuing their economic sustainability.

The key characteristic of CCs, unlike national (or fiat) currencies, is that they lead to balanced economies (see for example (Amato & Fantacci 2012)) that discourage accumulation and ever growing debts. The cost of this characteristic, however, is that their very survival depends on the sustainability of exactly this balance, which does not evolve "naturally" and, thus, requires constant effort to maintain (New Economics Foundation, 2015, pp.117-136). The difficulty of the task increases significantly because of legal, social, educational, even technical barriers (i.e., the complexity of running a parallel accounting infrastructure).

Similar challenges exist also in the other potential domains of commoning, like housing and energy. Hence, he facilitation of synergies can lead to interesting win-win scenarios, which can be supported by a properly designed community currency, as we discuss throughout the document.

1.2 Why Community Currencies for Community Networks

The role an alternative currency could play in the sustainability of a CN is not only relevant to the internal management of its resources and services. It could also enable the active participation of a CN, as a whole, in a wider ecosystem run by a large-scale currency scheme; namely, a mutual credit system like WIR and Sardex.net. For this, we have initiated a long-term collaboration between guifi.net and Sardex.net, in order to explore possibilities of integrating these two remarkable success stories in the field of community networks and community currencies, respectively (Antoniadis et al, 2017, 2018).

Chapter 5 analyses these two different approaches of treating CNs as potential targets of a community currency scheme, and explains how such schemes can both support and be supported by more recent blockchain solutions, such as Ammbr. Before that, Chapters 3 and 4 analyse in detail the district currency model and the corresponding simulation game, respectively, and summarize the lessons learned from this experience.

We summarize below a few important reasons why members of CNs should care to understand the basics of community currencies (besides the "liberating" role of blockchain technologies) and consider collaborating with other actors in their localities for building more holistic ecosystems:

- Community currencies face very similar challenges (social, economic, political, legal) with CNs and there are many lessons to be learned from their past and recent experiences but also many possible synergies to be developed;
- The cryptocurrencies hype and especially their potential use in the context of CNs brings community currencies (and the corresponding theory, history, and existing tools) into the center of attention. Hence, it is crucial that a better understanding of monetary theory and currency design is shared among those that will try to implement economic mechanisms using the new technology;
- The core design elements of any community currency is the collection of resources and services that the community can provide internally (and which should be balanced), which is a necessary exercise for the design of any economic sustainability model, either including the use of a community currency or not;
- Community currencies can mediate in the creation of links between different commoning initiatives in urban or rural areas, active in areas like housing, energy, food, and more. This way they could place CNs in a wider ecosystem that can support their own objectives and communicate their existence and needs beyond the narrow circles that work in this area today.

1.3 The District Currency CC and the lack of public awareness about currencies

An introduction to the idea of community currencies and a brief classification are provided in detail in Deliverable 2.4 (D2.4, pp.19-38), see also (Martignoni 2018). In this deliverable we add a design perspective as to how to develop a model or how to adapt existing models toward new cases. Non-experts in community currencies should read both deliverables together since they are complementary.

A first goal could be that community currencies provide opportunities for local businesses to become part of a local economy that can give them direct access to local customers, but also help sustain the CN infrastructure on which this activity takes place. Given the identification of an economic cycle in which a CN can be part of, any of the existing community currency models as described in D2.4 could be candidate solutions.

Another goal could be the integration of the commons: The District Currency (DC) model brings a new element missing from all traditional currency models, the consideration of the commons as an integral part of a currency design. More specifically, the two main novelties of the district currency model are as follows:

1. It is defined and managed democratically by a specific community;
2. It includes explicitly work that supports the common good, as decided by the same community.

These two features make it a suitable currency model for groups interested in tools that help them improve mutual relations, develop a transparent, democratic culture and realize a just and proper management of their commons.

The motivation behind such a demanding currency, in terms of community engagement, is the fact that many communities are built around the values of commoning and mutual-help, which are often neglected in practice because of today's economic circumstances like busy schedules, privatization, and more. For this reason, the district currency puts at the core of its design a set of "common work"[4], whose accomplishment is democratically decided by a group.

Since it first handles the common work, the district currency model defines a contribution, membership or "tax" in the local currency, which all community members agree to contribute every month. This way, the community makes sure that everybody carries out a part of the common work. For those not possessing the skills and/or the time, the exchange of other resources and services makes it possible to create a compensation system: volunteers who have contributed more than they would have to, are rewarded with useful services contributed by those in the community who cannot participate in the "common work".

Community networks also require an important amount of voluntary work and their success often depends on a variety of more or less important tasks for maintaining the common infrastructure, as made clear for all three different categories identified in the previous section. However, the introduction of the district currency in such a community is not straightforward, since voluntary work is often performed in a decentralized manner without central coordination and democratic processes. Moreover, the common work is normally restricted to technical aspects, and complementary skills that could benefit the growth and sustainability of a CN (like community engagement, communication, crowdfunding for the infrastructure) are not taken properly into account.

[4] **Common work** is all work that has to be done for the group as a whole. The benefit therefore is for all, but the necessary work had to be done by some people only. Because common work is subject to free-riding phenomena that usually harm a serious community, some compensation is necessary. This can be done either in the form of changing roles (e.g. everybody prepares the meeting in a turn) or by compensation through some rewarding or monetary means. In the bigger picture, common work is provided by the commune or the state for all citizens. The compensation usually is done through taxation. The opposite of common work would be **private or peer-to-peer work** done through mutual exchanges between two parties and (hopefully) a direct benefit for each. In the bigger picture, this is usually called market-exchange.

Finally, there is also limited understanding of the economic aspects of currency design in general. Currencies are not yet a thoroughly researched topic. Only the last few years, when the phenomenon of cryptocurrencies appeared, a greater amount of attention was devoted to this field. But the central question "how the interdependence between a currency and socio-economic interaction could be described" is still not answered. The strong techno-driven excitement around blockchain (see D2.4 p. 63 and following) makes the comprehension of the potential role an alternative scheme could play even more difficult to understand and most of all to communicate.

The question of education then becomes critical, and it was clear out of the experience of many complementary currency pilots, that the topic of money and currency is very difficult to explain. One very promising method to learn about complex systems, used frequently in economic education, especially in management, are planning games (see Section 4.2). That's why we have dedicated a significant amount of effort in improving and implementing the so-called district currency game that both clarifies important high-level concepts regarding the nature of money and also explains the benefits (and challenges) of a democratically managed local currency inside a community.

It is not a coincidence that the specific game was initially developed for the case of cooperative housing projects. It is one of the main arguments and the most important message coming out of this work that Internet access should not be treated as an isolated resource but its treatment as a commons should be integrated together with other forms of commoning in the city. This relates strongly to the concept of the "right to the hybrid city", which we will develop further in Task 5.2 using this work as a point of departure.

1.4 Impact of the work

As an evidence of the impact of our work to date, all three main Chapters of this deliverable have been presented in different formats in the recent conference on currencies in Barcelona (Chapter 3 and 5 as individual papers in a panel, and Chapter 4 as a 3-hour workshop). In addition, Jens Martignoni participated as a consultant for a social currency in Barcelona inside the B-Mincome project of the city government[5].

Also, part of Chapter 5 (together with D2.4) will appear as a book chapter in the upcoming book titled "Decentralizing the Commons" a publication initiated by the CAPS project P2P value and published by the Institute of Internet Cultures (Antoniadis et al, 2018).

Most important, through our intervention in the Barcelona conference, the alternative currencies community got in contact with the world of CNs. This led to an on-going collaboration of netCommons partners (NetHood and UPC) with Sardex through Paolo Dini (LSE researcher with expertise on complementary currencies and Sardex.net's consultant) resulting in joint publications (Antoniadis, Martignoni, Navarro, Dini, 2018) and further discussions with key actors in Sardinia, Catalonia and Zurich on the possibilities for synergies between community networks, complementary currencies, renewable energy, and cooperative housing. Such a networking activity could have a long-term impact of many times more magnitude than its initial effect (a discussion for a possible collaboration).

1.5 Structure of the deliverable and story line

The deliverable is structured as follows.

Chapter 2 summarizes the main economic sustainability models followed by existing CNs around the world, focusing on their two main ingredients: 1) their stakeholders and funding sources; and 2) the way they manage their resources on their everyday operation. These models set the economic environment in which CCs are to be introduced.

Chapters 3 and 4 present in detail a concrete innovation in the world of CCs, the commons-based district currency model and the corresponding district currency game. Both were initiated by Jens Martignoni

[5] http://ajuntament.barcelona.cat/bmincome/en/social-currency

(NetHood) before the start of the netCommons project, during which they were further developed, refined, and presented in leading conferences in this area.

One of the key advantages and, at the same time, challenges of the District Currency is that it opens up the space of currency design and allows for democratic governance putting the emphasis on the commons. This makes it very relevant for the case of community network but at the same difficult to implement in practice. The practical difficulties, i.e., the time and effort required by the members of the community, are added to the general challenges that CCs face to reach a mainstream audience, similar to those of CNs.

Chapter 5 explores different options for these two alternative forms of building local infrastructures (economic and networking) to join forces and support each other on their difficult task to challenge deeply rooted perceptions regarding the inevitability of the Internet and the economy to operate as they do today. More specifically, we analyse three different and potentially complementary scenarios, through which CC models, including the District Currency, can play a positive role in the economic sustainability of CNs:

1. introducing a new CC inside an existing CN, expanding its scope,
2. connecting an existing CN to an existing CC, and more specifically a mutual credit system like Sardex.net, and
3. implementing different CC schemes in the context of a blockchain-based currency solutions.

This discussion comes at a moment that many such blockchain-based solutions for Internet access sharing are under development, including Ammbr, an initiative with the participation of some of the CNs that work with netCommons partners.

For this reason, Chapter 6 ends with a list of guidelines for the developers of such solutions, who often lack basic knowledge of economic theory and history. Before that, it summarizes our work and evaluates the potential role of community currencies for enhancing the sustainability of community networks, along the guidelines of the framework provided in Deliverable 2.1. It also explores the list of costs for running a CN included in the book “Wireless Networking in the Developing World” (WNDW, 2013), and discusses which of those could be substituted by an internal community currency and which could not.

This will serve as a reminder that although CCs cannot replace the standard fiat and commodity currencies, much as CNs cannot replace the global Internet infrastructure, they can provide a local complementary solution that not only brings very practical benefits, but also provides the means for community engagement and emancipation.

2 Economic Sustainability of CNs

The approaches of different CNs towards their economic sustainability exhibit a variety that matches the one evidenced in the original motivations for their launch (D2.2-D2.3) and their organization models (D1.3-D1.4). We iterate below on the two main aspects of these approaches: the actors (stakeholders) involved in the CN and its funding sources; and the way its resources and services are actually managed on a daily basis. Both aspects are important for realizing the role that a community currency such as the District Currency model could play in a CN, as well as the benefits that could emerge from the currency adoption and coupling with its operation.

2.1 CN stakeholders and funding sources

CNs typically use one or more of the following four sources to fund their activities and maintain or further grow their infrastructures. Table 1 summarizes how indicative CNs combine these four sources in their own funding model.

2.1.1 Member subscriptions and contributions in kind

This is the most common funding model for CNs. In this case, the members of the CN contribute network equipment and time/effort to the network growth and maintenance. In the case of the B4RN network, which provides fibre connectivity, members even contribute digging effort when fibre is laid out. In most cases, the CN users pay a monthly/annual subscription fee for the CN needs. Several CNs such as the AWMN in Greece, ninux.net in Italy, B4RN in UK, and Freifunk.net in Germany, have managed to scale significantly this way.

Despite its simplicity, this self-funding model comes at several variations. Subscriptions may be mandatory or voluntary; or they may serve as a prerequisite for participation in decision-making bodies and voting rights. In the case of the Sarantaporo.gr, it is villages under the network coverage, rather than individual CN users, that are charged with a fee. How each village splits the cost among local users is left to the CN participants in that specific village to define.

Freifunk.net has a relatively small number of regular members and a large circle of supporting members, which can all participate in the annual general meeting. The membership includes a fee of either 60 EUR (or more) per year to the Association's account as annual sponsor membership, or the monthly equivalent of 5 EUR (or more) for monthly membership. But these are used to cover only very basic costs and the majority of external funding comes through crowd funding[6] and voluntary contributions in kind or subsidies.

What the CN users get in return for their subscriptions is closely related to the way the CN organizes itself and positions in the telecommunications arena. The Sarantaporo.gr CN is run under a non-profit organization that primarily provides Internet access to its members. B4RN operates as a community benefit society, which provides Internet service to its subscribers. The service subscription model includes a connectivity fee and service fees that vary per service and type of users. On a similar note, Zenzeleni.net operates as a cooperative telecommunications operator providing voice and data services to its customers. TakNet has developed a social enterprise called Net2Home. Users have to pay monthly fees that are used for covering fibre, maintenance, equipment installation, technical online support, network management and monitoring costs. Rhizomatica helps communities in Mexico build their networks, receiving a flat rate for equipment installation and community member training as well as a percentage of monthly subscription fees, for advisory and tech-

[6] See https://freifunk.net/wie-mache-ich-mit/spende-fuer-die-projekte/

nical services. TFA practises a self-sustainable business model, where the network relies on ISPs to provide Internet access to its members.

Finally, but far more rarely, a CN may operate as a standard company: Some of the FFDN networks in France are commercial networks that indeed rely on policies such as standard pay-per-use contracts and added value services to customers outside the CN. However, in contrast with traditional commercial companies that extract profit from customers and locals to compensate investors, these CNs reinvest the profits in the commons infrastructure.

2.1.2 Donations from external supporters

Community Networks are often financed through crowd-funding projects or donations, whether periodic or one-time lump sum ones. These donations come typically from remote friends or relatives of community members, activists, and other people that are attracted by the ideals CNs embody. In developing areas or in disaster situations external donors can contribute funds such as in Zenzeleni (ZA), Rhizomatica and Nepal Wireless (NP).

Table 1 Funding actors and legal organization for eleven representative CNs

CN	Location	Networking technology	Legal form	Funding
AWMN	Greece	WiFi	AWMN foundation	Members
B4RN	UK	Fiber	Community Benefit Society	Members
FFDN	France	WiFi, DSL, fibre	Non-profit organization	Members, local authorities, donations
Freifunk	Germany	fibre, wifi	Non-profit organization	Members, public institutions
Funkfeuer	Austria	wireless	None	Members
Guifi.net	Spain	fibre, WiFi	Guifi.net foundation	Members, third-party private entities
Ninux	Italy	WiFi	None	Members
Rhizomatica	Mexico	wireless	Non-profit organization	Members, public funds, donations
Sarantaporo.gr	Greece	WiFi	Non-profit organization	Members, public funds
TakNET	Thailand	WiFi	Social enterprise	Members, private institutions, donations
TFA	USA	WiFi	Non-profit organization	Members, public institutions, donations
Wireless Leiden	The Netherlands	WiFi	Non-profit organization	Members, public an dprivate funds
Zenzeleni.net	South Africa	WiFi	Telecom operator	Members, public institutions

In some CNs, citizens may further invest in the infrastructure: either for a specific reason such as crowdfunding the construction or improvement of a critical link that affects the users (typical in guifi.net); or, for more generic purposes, through the purchase of community shares for expanding the local network or even their home access (in B4RN). These investments can generate tax returns, as the case is with guifi.net Foundation and B4RN. In B4RN, this investment also generates (3%) interest after the third year.

This funding source typically complements other funding sources since it rarely suffices to cover the full funding needs of CNs.

2.1.3 Support from public agencies and institutions

There are cases, where CN initiatives have got generous support from public funds (cash or in kind). Municipalities and local authorities emerge as main actors in this respect. The synergy of commons/public service with civil society/municipality can limit the survival concerns of CNs as far as one finds sustainable models that motivate their cooperation, see (Powell, 2006), (Powell, 2008), and (Forlano, 2011).

One such case is the Sarantaporo.gr CN. The CN set up its first nodes with hardware and equipment received from the Greek Free/Open source Software Society (GFOSS) and, later, expanded the CN through funding received by the European Commission (EC) in the context of the EC Research & Development Framework Program 7 project CONFINE (Braem, 2013). Likewise, a major part of the start-up funding for the TFA CN came mainly from foundations and grants.

In the case of Freifunk, the support from public authorities has been traditionally expressed in-kind, through making available public buildings such as churches or Town Halls for placing and storing the network's equipment (e.g., antennas). Such support has allowed Freifunk to build the "Berlin Backbone", the first instance of a "common infrastructure" for Freifunk, funded by an external actor[7].

Finally, indirect support from public agencies can come through regulation measures. B4RN in UK was awarded with code powers by Ofcom, the national regulator. Such codes, also possessed by traditional telcos, allow network builders to build and maintain infrastructure on streets without having to obtain a specific street works licence. This way, they become immune to town and country planning legislation, and can apply to the courts to obtain rights to execute works on private land if agreement cannot be reached with landowners. The possession of code powers has enormously cut down on the infrastructure deployment cost, both in terms of compensations for traversing private land and bureaucracy.

2.1.4 Funding from third-party for-profit actors using the infrastructure

In the case of guifi.net, CNs have come up with unique innovative models combining voluntary and professional services into a commons-based approach. Commercial service providers offer services over the CN and charge the CN users as typical customers, but also subsidize the CN growth and maintenance subscribing to the commons policies. This way, the CN maintains its non-profit orientation and pursues its sustainability through synergies with entities undertaking commercial for-profit activities, see (Baig, 2016).

Summarizing, member contributions, public or private institutions, public authorities, contests and funding projects are met in different scales within each CN and provide part (or all) of the network's resources. Some CNs operate through regular economic contributions of their members in commercialized subscription models (B4RN, Zenzeleni.net, FFDN), while others adhere to non-regular fees usually gathered in the form of donations by their members (AWMN, Freifunk, Funkfeuer). In cases where the contributions by the CN's own members are not systematic, public funding (Sarantaporo.gr, TakNET) and the private sector involvement contributes to the economic activity of the CN (guifi.net, Wireless Leiden).

When assessing the strengths and weaknesses of the four categories of funding sources, the following remarks are due.

- Some sources (*i.e.,* donations, voluntary contributions, etc.) are one way or another not guaranteed and they make long-term strategic planning difficult. They could also lead to disagreements and conflicts between CN members concerning their fair distribution inside the network, especially if well-defined decision-making and management processes are not in place.
- Unless something dramatically changes on the regulation side, the support of public authorities for CNs cannot be taken for granted in the long-term. Although there are instances where public bodies has shown support for the CN initiatives (Freifunk case, the code powers awarded to B4RN), there are also failure cases. B4RN is one CN instance that tried to access national funding for network infrastructure deployment without success (their bid for the funding was eventually withdrawn). In the case of guifi.net, the municipality of Barcelona has been so far reluctant to provide the CN with access to (part of) the city wi-fi and fibre infrastructure.

[7] A list of the installations that were enabled with the support of Maab (the Media Institute of the Berlin and Bradenburg states, a public law Institution regulating the private TV and radio broadcasters in the two states, is available at https://foerderverein.freie-netzwerke.de/wp-content/uploads/sites/3/2014/06/MABB_BBB_Abschlussbericht_2013_2014 0331.pdf

- The dominant view across CN initiatives is that the funding from own members and resources is the most reliable and favourable option. B4RN and Freifunk, two of the three networks in Europe that have managed to scale in the order of tens of thousands of nodes, have followed this approach.
- Trying to put commercial service providers in the loop while preserving the CN ideals, as guifi.net does, definitely represents an innovative approach. It is also the approach that seeks to engage more actors in the CN case, enlarging its footprint on the local economy and society. The success it experiences in the case of the guifi network renders it a valid model for the economic sustainability of CNs.

Interestingly, only guifi.net so far has managed to involve in its funding model all possible actors (end users/members, private sector and public authorities). Striking the right balance between the roles and contribution modes of these three parts may prove the key towards the economic sustainability of CN initiatives. Community currencies could become an enabling tool in this respect.

2.2 Commons vs. individual services

As stated by Juergen Neumann, co-founder of Freifunk and member of the netCommons advisory board:

> "*the **community franchise model** allows the local communities to adjust their practices to their local needs, but it combines and bundles the efforts of the various local communities to develop and share the power of a shared "brand". This of course includes the sharing of knowledge, resources, public relations, policy making, etc. amongst the local communities. So Freifunk today is not one community, but a community of communities. Each community benefits from the success and efforts of the other communities. If you "google" for Freifunk, you will find more than 500'000 hits. That is the success of all communities united in the shared "brand". So even a very small village can just have one or two nodes but benefit from all the work done over all. The meta community enables the individual to start their local initiative on-site with very little ramp-up costs. From a working firmware to a PR slide show, to lots of online documentation and templates, or information about legal guidelines, many of that is already there. Not to forget about the many success stories and the huge media coverage. The effort to develop and manage the brand, to write blogposts or maintain a website, to develop a firmware, to have meetings, to do public relation work, to give technical trainings is often way too much work for a small local community. So the local communities need a meta- framework, a meta-community. That's what I mean by a community franchise model.*"

In what follows, we assess to what extent the different CNs rely on "commons" practices, as opposed to independent individual contributions of their members, for managing their resources. We distinguish three levels, where such practices may be expressed, that is, infrastructure, services and organizational matters. Such a classification scheme provides a good basis for understanding the potential role of the District Currency model presented in the next Section.

2.2.1 Common services

In this case, funding is welcome to support key infrastructure but is treated as an "add-on" to the main operation of the network, which is based solely on voluntary work and crowdfunding. This makes the community very robust and facilitates its scale-up, but it requires strong commoning values and a core set of services, ranging from a simple web forum to legal consultation, which can provide guidance and a powerful voice for dissemination and advocacy.

Community Networks like AWMN and ninux.org are typical examples of this category. The only centralized processes in these CNs are the management of a web forum and the regular gatherings of the community.

Freifunk[8] is a more advanced example of such a structure, where the main public-facing non-profit organization is concerned also with coordination, advocacy, branding, marketing, and other supporting tasks. Internet access is provided at voluntary basis or subsidies. There are also important core services such as a VPN that helps to avoid the secondary liability issue, the organization of weekly meetings, the development of a customized router that helps the plug & play connection to the CN.

FFDN belongs also in the same category in that the "central umbrella organization" is purely voluntary and does not offer infrastructure.On the other hand, the different supported CNs follow different models internally so that FFDN eventually liescloser to the idea of a cooperative ISP.

2.2.2 Common infrastructure

Guifi.net, Coolab, Rhizomatica, Zenzeleni, Sarantaporo.gr are examples of community networks that feature a central entity with a clear organizational mission. In addition to the coordination and communication tasks, this entity also offers key resources (e.g., Internet backbone) and/or core services (e.g., administration, loans, technical support) with the aim to empower the local communities to develop their local networks with as little cost as possible (thus, making it feasible to share this cost over time). But these resources and services, treated as a commons, bear nevertheless costs that need to be recovered by the community as a whole, and this is a key difference, for example, with the Freifunk strategy described above (see also D1.2). Since the models adopted by guifi.net, Zenzeleni and Sarantaporo.gr have been described in Deliverable 1.4, we focus below on the cases of Rhizomatica and Coolab as examples of this category.

Unlike guifi.net and Sarantaporo.gr, these two models do not maintain actual infrastructure (as the CN backhaul by guifi.net or Sarantaporo.gr) but they do offer concrete services such as accounting or technical assistance, whose cost needs to be recovered. Rhizomatica is a success story from Mexico, whose sustainability model *"is based on the establishment of a local network, which is completely operated and managed by the community, and supported by a cooperative association to which all participating communities belong"* (Beli 2017, p.121). Then the *"community charges a 40-pesos monthly fee (approximately USD$2.50) to each user for maintenance and operation of its network. From this amount, it keeps 25 pesos and transfers 15 pesos for each registered user to the association, to pay for technical and legal services and for assistance regarding the overall operation of the network."* (ibid, p.142)

Coolab is a relatively new project in Brazil that follows a similar federated structure like guifi.net. The key objective is to create a recursive scheme, where seed funding is recovered over time in order to extend it to the creation of more communities (see Figure 1).

2.2.3 Common organization

There also cases of CNs that are fully independent, covering themselves the costs of the provided services by running as local non-profit ISPs. This is the case of the individual local community networks running under the umbrella of the FFDN, or cooperatives and similar organizations such as B4RN. This level of sustainability can be obtained mostly in areas where there is a healthy economy and people can afford to pay for Internet services; it is more challenging in poor areas that need an external supporting organization.

In this scenario, B4RN is perhaps the perfect example. Broadband for the Rural North Ltd (B4RN) was setup as a non-profit social enterprise, a community company whose "purpose is to undertake the supply, installation and operation of a full Fiber-to-the-Home (FTTH) network providing a fibre link directly into every property in its service area." The community can participate in the investment by purchasing shares but has also the opportunity to earn equity through effort, and indeed a large part of the creation of the network depends on such effort, often purely voluntary. But the objective is, according to the current business model, to cover both core operating and staffing costs, which will be possible after a sufficient number of houses are connected and pay the corresponding fee.

[8] It is important to stress that the organizational models of Freifunk and guifi.net are so flexible that allow for variations in the creation of different islands. In this sense, it is difficult to classify them under a single category so that our categorization and corresponding examples should be viewed as only indicative.

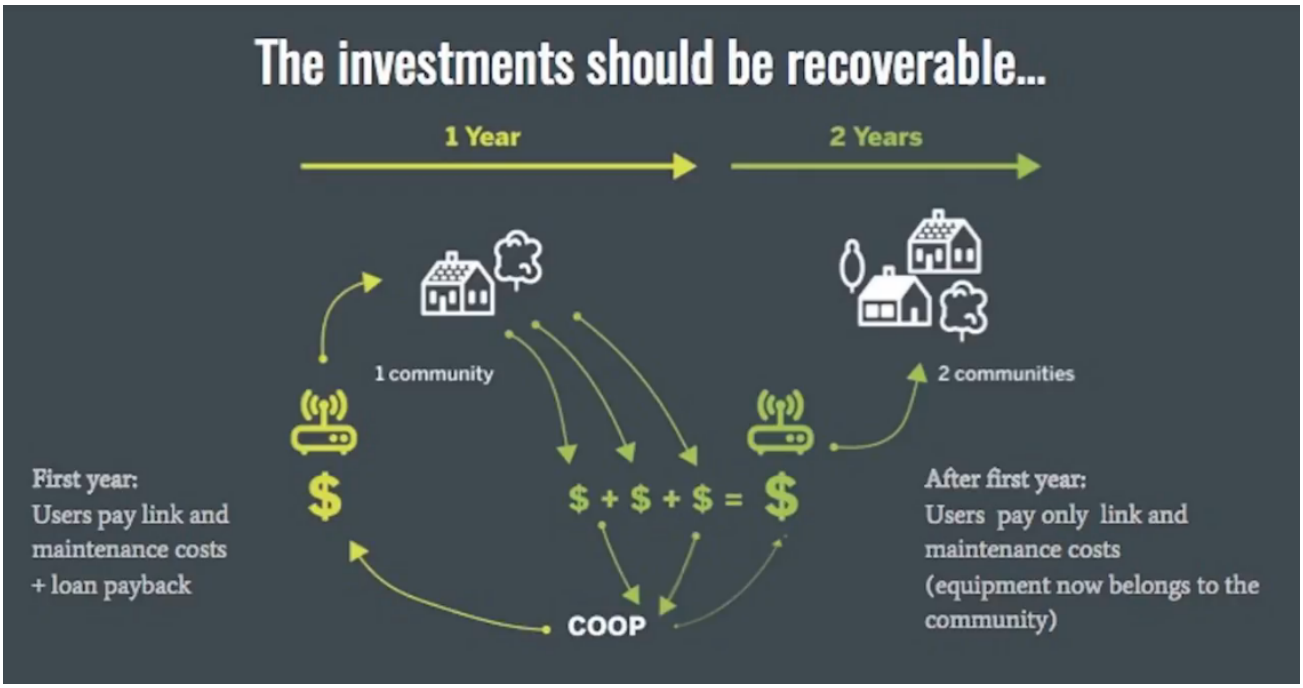

Figure 1 The Coolab recursive funding model, as presented by Bruno Vianna at the Mozilla Equal Rating Innovation Challenge (see https://www.youtube.com/watch?v=gmxtmwUZAkc)

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When this process of cost-sharing is considered in isolation, it is just a question of balancing the available resources with the corresponding costs. In the case of Freifunk, this is a distributed process in which costs are assumed by individuals aligned to an overall vision (e.g., free access to the Internet for all), while in guifi.net and B4RN, for example, there is a strong element of commoning at different scales: from a federated regional initiative to strong small communities operating like consumer cooperatives.

3 The District Currency

3.1 Motivation and background

Monopolistic national or supranational currencies and the corresponding political and economic structures that manage them, affect significantly the non-monetized leisure-time or volunteering areas by either monetizing former free contributions, efforts and spaces, or by occupation of resources, e.g., of the time that has to be used more and more to acquire money (i.e., national currency) (see Edgell, p. 228 and following). In parallel, the question of sustainability becomes more and more urgent. The reduction of energy consumption plays a key role in this respect. The localization of economic activities, the shortening of work and transport routes, the use of regional services and the promotion of shared resource use (sharing) can contribute to more sustainable lifestyles. CCs are not the only way toward this direction[9], but since they are devised and designed exactly around these objectives they have the potential to play an instrumental role, if local communities manage to address some of the main obstacles that need to be overcome in this context (See D2.1 for a detailed analysis and alternative CC designs that have been successful in different environments).

Community currencies can play a key role for addressing these and other challenges. However, most of the community currencies developed over the past 50 years are based on the individual exchange of the free market concept, and are optimized to facilitate the exchanges of goods and services in a network of individuals or companies considered as individual actors. The existing mutual credit systems, LETS or the time-banks concept (see Deliverable 2.4 (D2.4)) for a short introduction), preferably support this market-centred or peer-to-peer view, and most currencies limit joint community activities as far as the operation of the currency system is concerned.

This was the motivation to look for a suitable model of a currency to serve communities trying to include the management of the commons as an integral part of their local currency. One important type of such communities that are built around a commons are cooperatives. They have by their nature the objective to manage economic resources and infrastructure as a commons for their members. Even if most of them are not officially organized as cooperatives, Community Networks are of a similar kind and have as their main target a common infrastructure, the network, and its provision and availability by and for all members.

The first opportunity for imagining such a new currency model came with the recently founded housing co-operative *mehr als wohnen* (meaning “more than housing”) in Zurich (see Hugentobler, et. al. 2015 and Boudet, 2017), which realized its first large-scale settlement, an exemplary flagship project with particularly resource-conserving, sustainable and community-promoting characteristics. These goals were planned to be supported and coordinated by a new community currency model for the co-operative and its surrounding district (Martignoni, 2013). A first model was developed in 2012-2014 and published in German (Martignoni et al. 2013 and Martignoni 2015).

In the context of the netCommons project, this initial model, was refined and generalized in order to make it applicable to the environment of community networks. An extended part of the resulting work is now under publication at the International Journal of Community Currencies (Martignoni, 2017; Martignoni, forthcoming).

[9] compare e.g. the transition movement https://transitionnetwork.org

3.2 Basic concepts

3.2.1 Management of commons

The management of the commons was already identified as a central topic of such a new currency model (D2.4, p.40 and following.). There has been a lot of work to define "the commons" as a clear concept; elaborations and a detailed definition of the commons term can be found for example in (Ostrom, 2009; Helfrich, 2009A; and Helfrich, 2009B). For the basic concept of the district currency, we shall here consider under "commons" all those goods that are administered in the sense of a collective property of a large number of people with a basic claim to general well-being. This includes, in particular, public goods as well as cooperative goods, club goods and jointly managed public resources.

Ostrom has published detailed research results on the management of the commons (Ostrom, 1990; Ostrom, 2009). The eight design criteria (Ostrom, 2009B, pp. 85 and following) have been tested and further developed by (Cox, Arnold and Villamayor-Tomás, 2010). The rules provide a framework in which the management of a commons can be shaped by a community of engaged people (and institutions). Production and consumption play an important role in the use of the commons since they are either used as a production resource or as a means of consumption.

In the case of community networks, the results of netCommons Tasks 1.1 and 1.2, reported in Deliverables 1.1 through 1.4 (D1.1–1.4), provide an organizational framework for CNs with a precise definition of network infrastructure commons. This includes the resource system and extractable resources (connectivity), the governance tools, organizational models in general and in specific CNs, organizational patterns. It also describes the translation of the commons model to the domain of community clouds (D1.4 Section 6).

3.2.2 Co-operative model

A core idea of the co-operative model is the common self-help, which is strongly related to negative external, social or natural circumstances. Henry Faucherre formulates this as follows: "*Economic and social distress, including mental suffering, are the most powerful motives that awaken the community's thoughts. Times of hardship and community building are closely linked."* (Faucherre, 1925, p.8)

Since the beginning of the industrial revolution, the economic hardship has been linked more and more closely to work in the sense of an employment workplace. For workers, their income is equal to their wage, which in most cases was paid out in money. Too little or no payment in money was the direct cause of economic hardship. Consequently the question was addressed as a question of salary, especially by trade unions and left parties in a political sense. The owners and rulers should be compelled or agreed to hand over a sufficient portion of the production profits and capital pensions to the workers.

The co-operative approach, on the other hand, can be seen as an attempt of self-empowerment in which existing production, consumption or trade structures are abandoned and, in parallel, new ones are built up under their own authority. Common property ownership and proper management of the communities play a decisive role in this process. A different approach to money and capital was often demanded and implemented. For example, the approach of the two quite different German founders of credit co-operatives, Raiffeisen and Schulze-Delitzsch, included significant changes in the money supply (savings, loans, decision-making structures). Also consumer co-operatives had an intention to change the money flows, e.g. instead of a profit extraction by individuals, a reimbursement of the surpluses to the purchasing members was provided. This idea was already mentioned in the fifth guiding principle of the original rules of the Rochdale's co-operative pioneers: "*That profits should be divided pro rata upon the amount of purchases made by each member*."[10] Such ideas probably meant a change in cash flows, rights and allocations, but they did not postulate a fundamental change in the monetary order.

[10] See http://www.rochdalepioneersmuseum.coop/about-us/the-rochdale-principles/ access, 10.03.2017

Unfortunately, there are still no scientific reflections on the relations between money forms and company forms. Co-operative science (Engelhardt, 1985; Duelfer and Laurinkari, 1995) also presupposes the existence of money, as it is done in the economic and social sciences in general. Thus in the history of co-operative ideas the co-operatives are linked only marginally with questions of the monetary order.

In the utopia-concept for the development of the modern co-operative system invented by Werner Wilhelm Engelhardt, the utopian designs and the concepts based on them are examined as important starting points by the pioneers of co-operatives, and on this basis the concretization by pioneers, i.e. first organizers, managing directors, managers or other important practical sponsors (Engelhardt, 1985, p.65).

A striking example is Robert Owen, who saw a solution for an adequate remuneration of the workers in a parallel trading and hour assessment system. Through a new currency, Owen promised great economic advantages for the workers' movement. In 1832, he tried in London specially issued Labour vouchers at a new commodity exchange to set an alternative value chain. However, this failed after a short time (see Elsässer, 1984, pp. 190-191). Further practical approaches of co-operatives that proclaimed or introduced their own currency as an instrument of self-empowerment are found in the consumer co-operative movement between 1865 and 1930 with the various systems of consumer money or token money (Martignoni, 2016).

3.2.3 Commons-based-currencies

From a sustainability perspective, the economic crises and its negative impact, caused by systemic dysfunctions in the existing national currencies, is another important incentive to introduce such currencies. According to the International Monetary Fund (IMF), there were 208 currency collapses between 1970 and 2010 (Lietaer et al., 2012, p.7). Another important challenge is the system-inherent growing wealth of the rich, which for the poorer part of the population is steadily revoking the vital money flow.

Our goal is to explore currency models which are intended to serve the community explicitly on the basis of communal democracy and which attempt to solve economic, ecological and social problems. We chose the term *commons-based currencies* (Antoniadis et al., 2016, p.22) to describe a new class of currencies with the following goals:

1. They are based on direct (vital) common economic interests of the members;
2. They promote collective mutual-help as one central motivation but are open to serve additional objectives;
3. They are democratically organized around a commons;
4. They use the currency as a means to manage the common property and regulate the work contributions among the members and the liquidity of the currency (see Antoniadis et al., 2016, p.26).

As a first consequence of these points, such commons-based currencies need an economically oriented membership organization as their foundation. The legal form of a cooperative is ideally suited to this since it is already designed to manage joint ownership and it includes by construction governance bodies like the board and the assembly. But other legal forms are possible too.

3.3 Model, design, functions

This section attempts to derive a currency model, which can be issued by economic communities and which is intended to enable a more integrated and efficient management of the communities. We start with some aspects of the design methodology and criteria that will help to motivate the final model proposed. The design of community currency is described by different authors mostly from a very practical point of view addressing preferably practitioners (see among others Kennedy et. al. 2012, North 2013, New economics foundation 2015) and starting from a vision and a need of a group of people (grassroots). Other sources of design processes are specific case studies like Sardex, where some research already had been done (e.g., Litera et.al.

2017). The development of the district currency was a recursive process based on such design ideas but also involving more theoretical research as well as in depth discussions, feedback loops and a game.

3.3.1 Design methodology

The first thing necessary in currency design is the assumption that a currency is a human creation or institution and therefore can be designed or shaped by engineering-like approaches. This is not yet a common understanding and in the science of economics little has been written about the idea that currencies can be actually designed.[11]

The recent hype around blockchain-based currencies, has now put the fact of the coexistence of (completely) different currencies. The idea became more or less accepted recently, but it is not yet well reflected in scientific analysis and results, meaning that there is an actual lack of rigorous theoretical treatment of this area. Then, it is not an accident that the "alternativeness" in the (decentralized) accounting process of the blockchain is confused with the alternativeness of "money function" in a democratized money system. This is maybe because the IT-centred view of the crypto-specialists tends to adapt "the problem", namely an unbalanced and monopolized economy, to their solution, a distributed ledger managed by algorithms and secured by encryption.

Another important aspect of a currency or money that has to be considered is the representative character of it. Money represents a value that might be purchased. If this value decreases, also the according *value* of the money should decrease or better the *amount* of money should decrease. So the two methods for the regulation of this relation are:

1. By changing (all) prices (economically called inflation or deflation);
2. Or by maintaining a basic stability of the prices by creating new or destroying existing money.

In the case of community currencies method 2 is highly recommended because most prices are determined by the national currency (="stable") and if the value of the CC would drop by inflation, the trust in it would drop very quickly too. Therefore, in the design there have to be instruments to **issue (create) and redeem (destroy)** the currency.

Our objective is to design a currency connected to a community not for speculative reasons, so we rooted the design of a new currency in the economic needs of the local community and used a mixture of practitioners' experience and transdisciplinary methods taken from systems engineering or cybernetics, see (Wiener, 1948) to find a suitable model.

The chosen methodology was an engineering approach (parallel to software development) of setting up the requirements from a given case (use-case), design a first draft system and then adopt modifications by an iterative process among simulation scenarios and on-site discussions and interactions with the potential stakeholders. The central feature or the "engine" of the currency was the definition of a primary currency circulation or driving circle of the currency. This element is crucial and has to fill some basic stability requirements. Based on this central feature, secondary circles with additional functions of the currency were added, always considering the possible flow of currency and the ability to balance the whole system. In the context of netCommons we have systematised this process, which was initially intuitively applied, in order to make it more comprehensible and useful as a tool to help communities like CNs to arrange their economies and create coalition with other actors in the economy in ways that promote the commons.

[11] The classical theory of the equilibrium of demand and supply (eg. Marshall, 1895, pp. 401 and following) does preconsider money and so does not allow different "sorts" of money or different currencies. Modern approaches like Mankiw at least talk about "the development of fiat money" but then immediately conclude into the quantity theory of money (Mankiw, 2010, pp. 82 and following), where "the money" is a unique term not able to reflect different currencies except national currencies all fitting the same narrow frame. Also his chapter about "Financial Innovation, Near Money and the Demise of the Monetary Aggregates" (pp. 563 and following) does not consider currency design itself as a subject of discussion.

3.3.2 The proposed model

Our proposed currency model is named *District Currency*. As mentioned, the basic model of the local currency was first developed for a housing cooperative in Zurich and then further developed through the feedback received by the implementation of the corresponding simulation game in different occasions and with different audiences (see next chapter). It is important to stress here that the creative design process that is necessary to create a currency model does not allow all desired criteria to be considered equally or without contradiction.

3.3.2.1 Intention

A new type of community currency was sought for housing cooperatives or cooperatives in general. The currency shall support cooperatives in boosting their internal economy, i.e., attract higher participation and turnaround from its members, strengthen the economic independence (sufficiency) of the cooperative and attract also people in the surrounding neighbourhoods. The community and the management of the commons should be in focus. The model should also be generally applicable to neighbourhood groups and networks of other types.

3.3.2.2 Requirements

- There is (or is being established) an organization of shared self-help (for example a cooperative or a community network). It should exceed a minimum size of 200 members (estimated limit supported by empirical research).
- The members agree democratically to make an effort, in the form of work and participation in favour of the common goals.
- Legal clarifications and arrangements for the possible taxation of the currency turnovers have to be made with the local authorities.

3.3.2.3 Structure of the currency (currency regulation)

The democratic assembly of all members (commons-assembly) defines the monetary order. This means:

- A name for the currency is selected;
- Executive bodies are elected that will manage the currency:
    - A body for issuing, handling and accounting management of the currency (Cash-desk),
    - A commission or body, for the organization and assignments of the work (Commons-commission);

In case of larger structure and more intensive activities, additional bodies might be necessary (see Figure 2):

- A compliance or quality control instance for inspection, quality control and sanctions (Monitoring-centre);
- A (temporary) body and regulation for mediation and conflict resolution (Mediation-council);
- A board for the reserve and balancing funds (Funds-management).

The assembly talks about and decides about the following points.

- The (first) form for the currency is selected; whether coins or notes, electronic accounts are to be used and what technical resources are initially provided for this purpose. These forms can be adapted later or supplemented with other forms. It should be noted, however, that the individual forms have different characteristics and the transition of currency between the forms must be well regulated.

- A standard salary level is defined and quantified. For instance, whether all activities for the community are paid with equal payments, whether there are different approaches and what the decision-making criteria should be. The value system is thus decisively defined.
- Where necessary, a differentiated tax or monthly work contribution is established for the different categories of members (for example, businesses, families, individuals, elderly, disabled etc.).
- The procedures for changing this order are determined.

The decisions shall be recorded in writing in a constitution, statutes or specific regulations and prepare the framework for the currency.

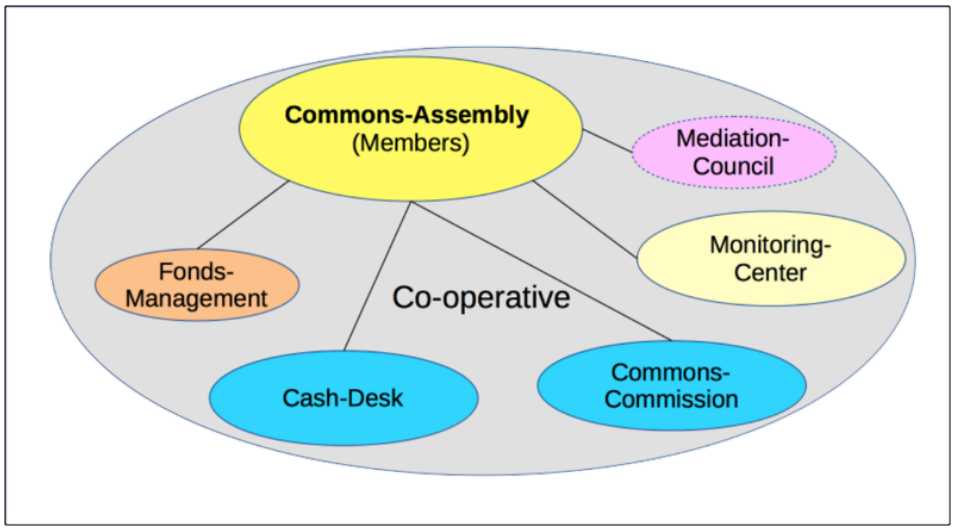

Figure 2: Bodies of a fully developed district-currency

3.3.2.4 Implementation and primary currency circulation

- The members decide in a regular (maybe yearly) budgetary process which and how much work, projects and activities necessary for the Community should be carried out and achieved in the next period. A initial periodical budget is approved.
- A tax or fee is calculated from this, through which the amount spent can be recollected at the end of the period.
- The local currency is now issued by the organization's cash office (planned and controlled issuing), which then passes the approved budget to the dedicated commission (Commons Commission).
- This commission advertises the jobs, projects and activities in specific job descriptions and then selects suitable members who are applying for it. The commission is responsible for the execution of the tasks. After the work has been done, the members receive compensation in the form of the local currency.
- In a second step, the currency can now be freely used by the members in order to meet their individual needs. Other members could provide services or goods according to their talents and abilities. However, each member is prompted to collect at least the necessary tax amount within the period.
- At the end of the period, the planned amount of the currency returns to the organization (cash office) in the form of membership-fees or taxes, or in the case of a housing co-operative as part of the rent. In this way, the currency “disappears” and the cycle is closed.

- The cycle is restarted with a new budgetary process and is therefore cyclically repeated in time (see Figure 3)

This can lead to a constant and controllable circulation of the currency, which also has the potential to replace a (limited) portion of the turnover in national currency (e.g. Euro or Swiss francs).

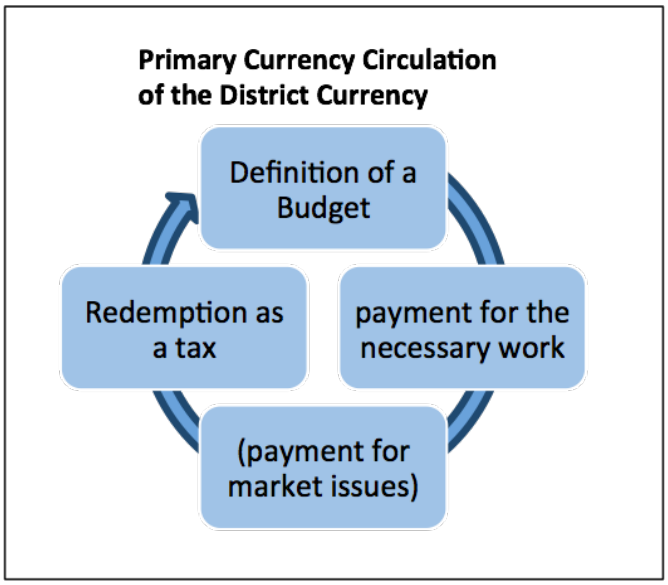

Figure 3: The primary currency circulation of the district currency

3.3.2.5 Management and constraints

- At the start of the system or at the beginning of a period, the members should already have an amount available in order to be able to take action from the beginning. This could be achieved, e.g., by means of a "starting gift".
- In general, the system must be equipped with a basic stock of currency in order to compensate for fluctuations and avoid negative balances of the members as far as possible. Such a stock grows with larger turnovers and more members and corresponds to the *Seigniorage,* the profit that can be made by issuing new money. This benefit could be used directly for the community, e.g. to cover the initial system costs, for the operation of the system or could be spent on jointly defined extra projects.
- Similar to our existing money system, members could try to produce a positive result for each period and begin to accumulate wealth. This case, however, is only possible if the currency volume grows, otherwise a lack of currency would arise for the others. Therefore, measures must be taken, e.g. by defining maximum permitted account balances.

At the center of the local currency are the needs and tasks of the community, the administration and maintenance of public (community) goods and common tasks. These are core and drivers of the currency. In the case of a cooperative, this is particularly clear and simple through the needs of the cooperative property or enterprise. As a secondary element, a traditional individualistic market system is integrated and contributes to the effect.

Further practical aspects of this general framework are described in Section 4.3.

3.3.3 Core Improvements

The basic scheme of the district currency was developed before the start of the netCommons project for a housing co-operative. As the planned implementation was stopped (see section 2.5) the model was not yet fully developed and critics and feedbacks of the housing cooperative as well as from experts had to be taken

into consideration next. One further aim was to develop a more generic model that would fit communities in general, refine different aspects and make it more communicable and understandable. The research consisted of three parts:

- Developing theoretical foundations (monetary theory and contemporary research to support evidences);
- Planning game cycles (dynamic reflection and feedbacks about practicability and communicability);
- Specifying use cases(discussions and reflections about possible use cases, like guifi.net or Freifunk).

The core improvements that were made during the last two years were:

- Improvement of economic parts:
    - buffering elements, like a fond with a fonds management;
- Improvements of the socio-technical parts:
    - Better decision-making structures for the commons assembly,
    - A monitoring center providing necessary data for the decision making,
    - Mediation council for conflict resolution;
- Development of a generic model:
    - Working on different types of organisations beyond housing co-operatives.

3.3.4 Comparison between models

The district currency model has some really different features to all other known new currency models. It is cyclical in time and uses a primary currency circle to close the monetary flow. Depending on the ratio of budget spending versus tax redemption, the monetary amount in the system can be regulated very accurately. This is unique and unlike all models above. But it adds significant complexity in the management of the system, which perhaps could be reduced through the advances of technology (including blockchain-based solutions) as we discuss in more detail in Section 4.3. It is still a very open design that allows for many different variations, and blockchain solutions could be seen as the "supporting" layer of the concept.

The closest to the district currency model in operation is *the turuta*, a currency in the city of Vilanova i La Geltrú in Catalunya. The turuta was started 2009 by groups of the civil society in the city inspired by the transition town movement. One Turuta is equivalent to one Euro but is not convertible. The creation of the turuta is done by budgeting local projects that were decided democratically by the community. There are many examples from saving energy to cultivating land to producing canned goods or soaps. Each hour of work for these projects is remunerated with 10 turuta. Members get an account where transactions are registered. In the beginning this was done on paper like in the old times the savings book, but now it is essentially a cyclos hosted currency. From January to September 2012 a turnaround of 22.401,35 turutas was registered (Hirota, 2012, p.67). In April 2017, 361 members and 38 businesses were counted (Dalmau Llagostera, Alonso, 2017, p.19). The project has also a very positive impact on the voluntary work that increased because not all work in the projects is charged by the members. Meanwhile the city accepts until 25% turuta limit as valid for different local tax and fee payments[12]. Unfortunately most material is only in Catalan or Spanish but it could be worth to evaluate the turuta more closely to get a closer comparison of the models.

[12] See also the project home page at www.turuta.cat

Table 2: Comparison of different currency models

	Euro	LETS	WIR	Sardex	Ammbr[13]	District Currency
Money creation	Central bank (coins+bills) and private banks by credits	Individual payment inside credit limit (negative)	Credit to an applicant (Member)	Company payment inside credit limit	Token generation	Budget of next period for the commons
Money redemption	Repayment of credits	Individual earnings to reset credit to zero	Repayment of credit	Company earnings to reset credit to zero	Repayments to the issuing company	Collecting taxes as fees for common services
Main incentive to use it	Key to nearly all resources necessary to live, interest for temporarily getting it	Unused resources or unmet needs of individuals	Increase turnaround, increase purchasing power of company	Increase turnaround, increase purchasing power of company	Sell data traffic, get additional resources, incentive to sustain and improve the infrastructure and its participants (decentralized platform)	Receiving and contributing to the commons
Liquidity	Mainly based on new credits and interest	Credit limits define total liquidity	Number and value of credits	Credit limits define total liquidity	Sold tokens, and exchange abilities	Ratio of budget spending vs. taxing
Ledger	Scattered ledger	Centralised ledger	Centralised ledger	Centralised ledger	Decentralised ledger	Centralised ledger / decentralised possible
Valuation	By world market	Different possibilities, sometimes hourly based[14]	Bound to Swiss Franc 1:1	Bound to Euro 1:1	Depending on exchange rates	Depending on the valuation of working hours

3.4 Implementation efforts

A good occasion for the development of the district currency model arose in 2012 in Zurich. An inquiry of the building cooperative mehr als wohnen (more than living) was made to the University of Applied Science Northwestern Switzerland and to the FleXibles association in Zurich to support the development of the planned new co-operative settlement Hunziker-Areal. This co-operative follows high ideals and aligned the project to the goals of a 2000 watt society (Stadt Zürich, 2011) for low energy consumption and reduced impact to the environment. On the approximately 40,000 m^2 area, a small town quarter with a living space for 1,200 people and about 150 workplaces was built at a cost of around CHF 185 million. These included new living models, such as satellite apartments, a reception area with a service, a guest house, restaurants, shops,

[13] Information according to material until December 2017 (Ammbr is subject to fast development)

[14] Hourly based currencies define any working hour of their members without distinction between kinds of service as equal, e.g., 1 hr cleaning = 1 hr legal advice

as well as a mobility station (see Martignoni, 2015, p.501-502). The participation and activation of the members was a focal point.

In order to promote, reward and coordinate this participation, the use of a complementary currency was explored in a first study. The aim was to make a specific community currency available for the new area. The developed currency model, which was finally proposed for this situation, was given the name *Quartierwährung* (see Martignoni et al., 2013). As the model was not yet finalized (see Section 2.4.3) and for various external reasons, including the fear that such a requirement in the Bylaws of the cooperative could discourage new tenants of becoming members (the Bylaws included already strict rules like the prohibition of owning a car), the currency was not integrated in the Bylaws at the opening of the new settlement.

Instead, an internal working group of the cooperative leads the on-going discussions and has in the meantime carried out individual actions and efforts for the realization of a currency within the settlement (in the next chapter we summarize the game simulations that have taken place in the same cooperative in 2016 and 2017). So, although the Quartierwährung was not implemented, the internal process is in progress and keeps providing invaluable feedback for the improvement of the model. Thus the model was further improved and translated into English becoming the District Currency model. The next target is to prepare a pilot project and evaluate at least one year of operation to further refine the model and explore in more depth the "human interface", i.e. the behavioural aspects of the currency, based on empirical evidence.

3.5 Relevance for CNs

There are two main reasons why we chose to invest in the District Currency model to explore the use of community currencies for improving the economic sustainability of CNs.

On the **practical side**, DC is considered as an actual model for managing the shared resources of a CN. This is also due to the fact that the DC has positioned itself as a solution lying between voluntary and paid work, between common and individual services, namely, distinctions that play a key role in existing economic sustainability models of CNs, as analysed in Section 2.2.

In this context, it is important to understand how the district currency is used at the interface between voluntary and paid work. On the one hand, certain voluntary work is actually monetized. In the best case, however, it would be difficult to find volunteers or sufficient quality of volunteering (e.g., due to a fast turnover of members or low attractiveness). An important argument is that when someone would be prepared to undertake an activity voluntarily (e.g. neighbourhood assistance), some organized form (for example, knowing one's neighbours), as well as trust and recognition by a group would be necessary for the activity to be implemented. On the other hand, the district currency is designed to bring a part of the paid labour from the sphere of the national currency into the community currency (substitution), as shown in Figure 4. In this way the community gains democratic power over this part and increases its economic independence, as it is less dependent on external investors or the financial world.

Two additional remarks are due when considering the adoption of the DC model by CNs.

First, since CNs are often are less formal and binding than conventional co-operatives, additional measures have to be taken into consideration. This means, for example, that the nature and obligations of membership are different, usually less binding, that the focus is on networking technology, or that synergies and benefits have yet to be worked out and are not so obvious.

Second, the application of the DC model in CNs is a double-edge knife with respect to the required time resources and effort. On the one hand, the significant effort required for its management, decision-making, and so on of the district currency might prove discouraging for communities since organising and maintaining a CN is already a very demanding activity. On the other hand, members of CNs are typically technically savvy and one could imagine digital solutions both for the accounting (see also Section 4.2.5 below), but also for the decision-making processes.

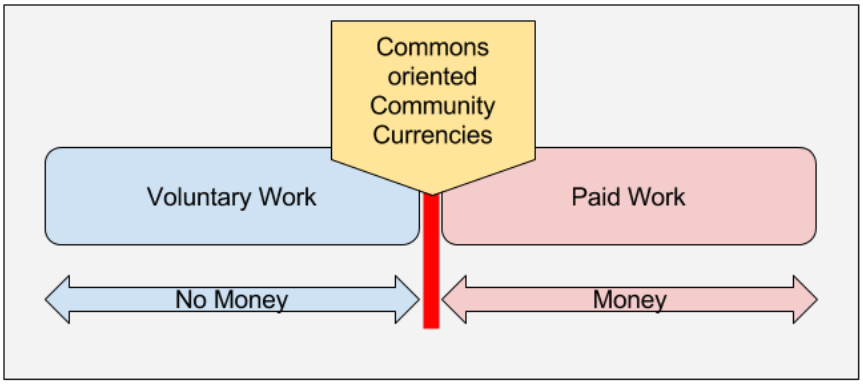

Figure 4: The two strongly separated spaces of today economic activity: voluntary and paid; and how community currencies could bridge it (image by authors)

On the **theoretical side**, DC is in essence a radical approach to currency design that puts aspects of the monetary value system itself under democratic decision making, by creating a framework that allows communities to value commoning activities differently than purely economic ones. This proposition can have a liberating effect in imagining alternative economies, which become more realistic as technology advances and makes their coordination easier.

In Task 2.3, our work focused on the adaptation of the district currency model to the environment of community networks. For this, an important point to make is that a central commons in CN is the network infrastructure itself, including the routers, antennas, and software. Those resources represent a much smaller part of the economic life of the participating members than in the case of a cooperative housing project. However, the introduction of such a currency could exactly motivate the CN participants to broaden their social and economic relationships by including different skills in the operation of the network, resulting in a wider range of services as part of the CN ecosystem (see Chapter 5).

Furthermore, as we will describe in detail in the Chapter 4, the DC has an educational value, exactly because it restructures the currency management processes shedding light to aspects that are taken for granted by today's society.

On the other hand, notice that a weakness of the district currency, as in all community currencies, refers to possible failures to keep a balance in the local economy. This risk is particularly relevant under dynamic conditions, which might result in members failing to pay their taxes, and calls for enforcement and/or correction mechanisms. An advantage of the district currency in this case is the possibility of "fine tuning" of the currency in a democratic way. We discuss these and other open issues together with possible solutions for the adaptation of the DC model to a CN in Chapter 5.

Then in Task 5.1 on "Alternative Internets and the Right to the City" we will consider the integration of all three areas of local action (cooperative housing, community currencies, and community networks) under the frame of the "right to the hybrid city", a perspective that makes the birthplace of the District Currency model, the cooperative housing movement in Zurich, both a starting point and a potential candidate case study for the future experimentation with key concepts behind Community Networks in places where people share similar values.

4 The district currency game

4.1 Introduction

A big part of the introduction for the district currency game was already included in Deliverable2.4 (D2.4, Section 5.3, pp. 58-60). A very brief recapitulation:

The idea of using games for the development of community currencies was derived from the difficulty of evaluating new currency models from their pure description on paper. So after the initial currency model was developed between 2010 and 2013, a special planning game, *the district currency game*, was created to show the effects and possibilities of the currency in action. A similar approach for a freshly designed currency is used in the Libre-currency and its adaption of the Ğeconomicus game as an educational tool (Saint Girons, Fabre, 2017) .

This path was taken by Yoshida and Kobyashi who also explicitly referred to the implementation process: "*We consider that the gaming simulation is suitable for learning how to use a CC as well as for designing how to introduce a CC into communities"* (see Yoshida and Kobyashi, 2015). They also refer to the chances and limits of gaming as a tool for currency introduction:

> *"By using a CCG [community currency game], participants can experience the interactions that can emerge in a community where CC circulates. Further, participants can discuss their experiences in the debriefing session. Participants can also use gaming to create common goals for CC among many different stakeholders. We confirmed that the gaming simulation has an effect on sharing the recognition of a community where CC circulate and on forming the goals for CC. However, the gaming simulation is not suitable for setting the scheme of CC because in the game, the rules of CC are settled in advance. Furthermore, because the number of participants and trading is small, we cannot observe the actual transactions among the residents and the actual changes in the community through the game."* (Yoshida and Kobyashi, 2015, p.9).

Within netCommons, more specifically un Task 2.3 (Economic Sustainability and Alternative Currencies) of WP2, starting from 2016, the existing game was further refined and also translated from German into English. The idea was to have an interactive tool to find out more about the response of communities to the application of a currency and to further develop the commons based approach of a community currency with the case of the district currency. Some first ideas about using games in the community network environment is done already. One example was an approach to use MeshKit as a medium and add some social games mechanisms described in (Baldwin, 2010). There was even *"an extrinsic currency called "Coins" on the physical and network layers."* (Baldwin, 2010, p.5). The game was used to increase *"cross-layer cooperation and building trust fostered in an interdependent social gaming atmosphere"* (Baldwin, 2010, p.11), inspired by the *"cross-layer incentive mechanisms"* for CNs proposed by Antoniadis et al. (2008).

The next sections will tell more about the planning games method, the game design and the actual plays. The detailed game description is included in the appendix. This section provides an overall evaluation of a series of plays during the last two years with special remarks and lessons learned. At the end of the section some conclusions are drawn towards the use of planning games as well as the implications for the district currency. More information and descriptions about the specific events are included in the Appendix.

4.2 Planning Game Method

The goal of planning games, educational games and gaming simulations, also known as "serious games", is the promotion of experience-based teaching and learning forms that contribute to the simulation of processes (i.e. economic, technical and social processes) and the development of systems. Planning games are used in various fields of scientific research and there is an international research community that has been working on the theme of planning games for more than four decades (see, for example, Greenblat, 1988). The ISAGA (International Simulation and Gaming Association) declares, for instance, the following:

> *"The goal is the promotion of experience-related teaching and learning forms that contribute to the simulation of processes (i.e. economic, technical and social processes) and to the development of systems-competence in various areas of life. This particularly includes the following: the construction and support of a network and promotion of communication between professional applicators, developers and users of methods of gaming simulation in businesses and public institutions (science, educational and cultural matters, administration, NGOs, etc.); realization of research projects for developing, applying and evaluating the method of gaming simulation, gaming didactics and individual applications of gaming simulation; promotion of training, further education and further development of gaming specialists in developing, applying and evaluating methods of gaming simulation."*[15]

One example of a similar gaming approach in another CAPSSI-project is the Empaville-game for participatory budgeting in the Empatia project[16]. The description of the aim of this tool is very similar with ours: *"one of the main problem of designing public participation is the risk of implementing untested solutions in the wild."*[17] For the currency model we share the goals of such gaming tools:

a. a possibility to teach the model

b. design new features and test them in a sandbox

c. user test the "social technology" and the currency-flows

The already existing Flexonomix game for the district currency was considered as a good starting point to further develop and adapt the model.

4.3 The Game Design

The central issue for the game design was the simulation of the democratic processes using an equilibrium state of the whole system during a certain period of time. This was the base of the playing-rounds, each one simulating periods of a month of living in the co-operative or district.

The basic design is therefore a time-oriented cyclical process with intermediate feedback and adjustment breaks for all types of roles together. The game starts in cycle X as it would have been running for a long time before and then starts to add new cycles. Table 3 reports the cycles of the game starting from a generic Month 0 and evolving toward equilibrium. Each "month" represents one budgetary cycle of the life in the district or co-operative. The commons assembly of all members decides about tasks and duties to be done for the commons and fixes a budget in the district-currency, named "Q", and also fixes an amount for the necessary taxes to retrieve the money for the following month. Examples had been cleaning streets and places, setting up and watching children's playgrounds, attending elderly, etc. The type of goods would ideally be selected after discussion during the assembly of all inhabitants. During the following cycle everybody has to earn some Q to pay their contribution for the common goods the society of all inhabitants produced during that time.

15 http://www.sagsaga.org/index.php/english-page-header
16 https://www.empatia-project.eu
17 https://www.empatia-project.eu/page/tools/empaville

Table 3: Cyclical game design of the district currency game

Cycle	Step	Commons	Businesses	Residents
X (Month 0)	Game initialisation	Report about tasks done during cycle X ("fake")	Reception of the initial cash ("resulting" from business in past cycle)	Reception of the initial cash ("resulting" from participation in past cycle)
	Commons assembly	Defining new tasks and deciding budget	Participating in the assembly	Participating in the assembly
X+1 Month 1	Starting Month	Creating jobs and hiring people	Doing business / meeting own needs	Doing jobs or offering things on the market / meeting own needs
	Living	Make sure everything is done well	Doing business / meeting own needs	Doing jobs or offering things on the market / meeting own needs
	Ending Month	Collecting taxes	Paying taxes	Paying taxes
	Commons assembly	Reporting about results	Participating in the assembly	Participating in the assembly
X+2 Month 2	Starting Month	Creating jobs and hiring people	Doing business / meeting own needs	Doing jobs or offering things on the market / meeting own needs
	Living	Make sure everything is done well	Doing business / meeting own needs	Doing jobs or offering services on the market / meeting own needs
	Ending Month	Collecting taxes	Paying taxes	Paying taxes
	Commons assembly	Reporting about results	Participating in the assembly	Participating in the assembly
X+3 Month 3	Starting Month	….	….	…..

With this operation, the commons assembly creates and pays jobs for producing the desired common goods. Modulated by the amount of work performed, a certain amount of the currency enters the system and can be used also individually to buy services and products from other inhabitants or from the affiliated shops (businesses). At the end of the cycle, most or all of the money is retrieved again by the taxes (primary currency circulation, see Section 2.4.3) and therefore the loop is closed and an equilibrium can be reached for the ensemble of the system. All sub-systems, i.e., the businesses and the residents should also strive for an equilibrium in their budgets. This creates a graded and highly interdependent system of relations. The main currency-flow-loop is induced by the commons, but each shop or resident has its own budget and target, as it is in the official economy. Still the spending of the commons has the major influence and the behaviour of the whole local economy is highly dependable on the ratio between in-flowing commons-budget and retrieved tax-amounts.

To keep the game simple, a flat tax is applied for all residents and for all businesses so that the calculation can be made easily. Define:

B_C: Budget of the commons commission (in Q)

R: Number of residents

B: Number of businesses

T_R: Tax residents (in Q)

T_B: Tax businesses (in Q)

then the idealized equilibrium for one month is simply expressed as:

$$B_C = (R * T_R) + (B * T_B).$$

Usually the game is starting with a ratio 1:2 of $T_R : T_B$, but this can be changed by the assembly if it is felt as necessary to have another ratio. For example, sometimes the businesses complain about their higher rate because they do not get so many customers during one round. But if the ratio is lowered, the residents tax will increase so in most plays (5 of 6) until now the ratio was not changed. What is important is that these trade-offs reveal some important challenges behind a commons-based currency and they create opportunities for very interesting and educational discussions on the nature of money and currency design.

4.4 Practical Implementation and Material

The initial idea for a practical implementation of the district currency model into a planning game came from the case study “mehr als wohnen” (see Section 2.5), where a need arose to experience the currency as a trial experiment before deciding whether to implement it. So the question was: “If we would have such a currency in our cooperative, how would this be like?” A plausible next step was to choose a scenario with a role play close to the real situation. It should be lively and involve at least 20 or more people playing in a rather large room or even in different rooms. The bodies of the district currency (described above in Chapter 3) were reduced to the two most important ones: The commons assembly or commission and the cash desk. A kind of map (see Figure 5) was developed as a help for the imagination of the gaming situation.

Another task was to find a good and brief description of the game, motivating and useful in the divulgation and the announcement of the workshop. Figure 6 reports the English translation of the invitation leaflet that was used for the game workshop in Amsterdam.

For the first five games we conducted, to keep the cost low, the material needed was produced directly by printing on a regular office printer. This is fine for initial tests, but it creates a temporary and unprofessional feeling. One important decision about the game material was therefore to print professionally designed currency notes and improve all material by better quality and more robust handling like laminated papers. The notes got German and English inscriptions and show buildings of young housing co-operatives in Zurich in the background as shown in Figure 7, giving a clear indication of an existing environment where the CC could be used.

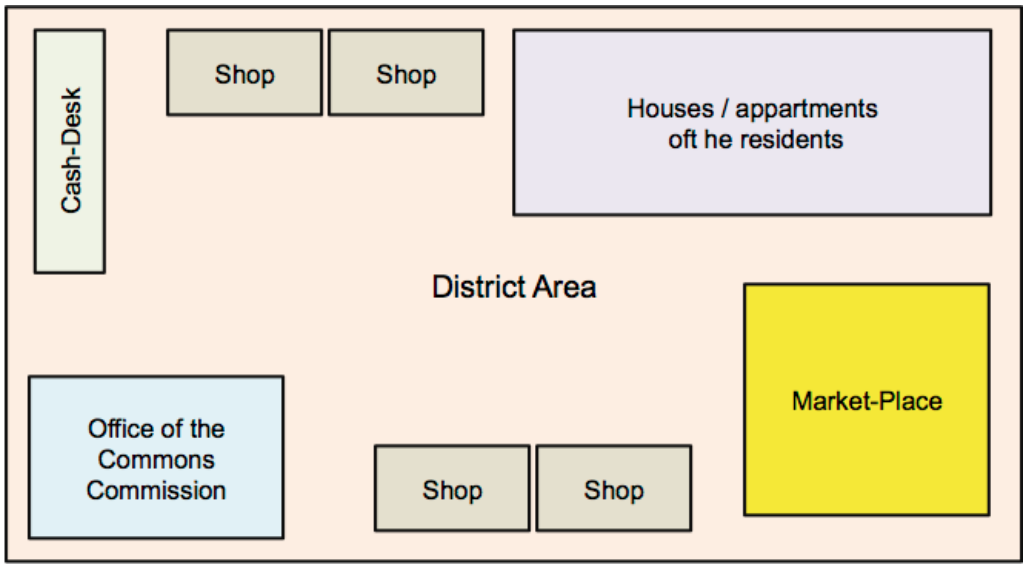

Figure 5: Imagination (map) of the district for the district currency game

Figure 6: 1-Q-note (front and back) of the district currency designed specifically for the game

4.5 Game Evaluation

4.5.1 Overview

The first versions of the game was developed and tested before the netCommons project started. A first play of a prototype in a Swiss school was held in 2014 and an improved version was played twice in 2015. These games (Nr. 1-4) were used to initialize the game and make sure that it worked in practice. There was only a very limited data collection in these games and therefore they are not included in this report.

For the netCommons project, starting January 2016, the idea was to use the game as a tool in groups and communities to get useful information about the district currency model and its implementation. It was not possible to introduce the game directly to a community network group, so NetHood kept the focus on housing cooperatives as the target groups, but reached also to a more diverse audience during two International conferences, which were great opportunities to compare the collected data with the "standard" cases.

During the two years 2016-17, six events were held, where the game was introduced as a workshop (see Table 4, events are numbered 5-11). All six events were very successful, and generated a broad spectrum of experiences and feedback.

Invitation text to the game workshop in Amsterdam

The District Currency is a newly designed commons-based community currency developed by FleXibles in Zurich and now being implemented by NetHood and the netCommons project. The district currency is used as a role model to demonstrate the power of democracy and the commons through an interest-free monetary system.
The Flexonomix® District-Currency-Game introduces a district currency for housing cooperatives. The workshop will experiment with how a district currency could be implemented in housing co-operatives and lead to a commons based local economy. By inhabiting the role of a co-op member, participants will be asked to improve living conditions for the district using the skills and requirements of the community. At the end of each round, new decisions will adjust the process. Commoning through a currency incorporates the abilities, needs, freedoms and obligations of the individuals, as well as the collective effect of the community. The question of how to realize such a currency will be challenged through this workshop and different opportunities or threads might be explored further.

Figure 7: Invitation text to the game workshop in Amsterdam

In spite of a strong reduction of reality, the game provided a very complex structure and the observation and evaluation of all the happenings and processes during the play were not easy to manage. The participants often identified very strongly with their roles and forgot about their tasks of documenting and bookkeeping. Sometimes also receipts or lists with notes were not properly filled or even went away with the players at the end. The first games therefore had some unexpected data-loss. The excel-sheet for the book-keeping of the cash-desk was another topic that still has to be improved to be easily used and also prepared for a simpler evaluation. The feedback and evaluation methods were improved by the introduction of the *Hybrid-Letterbox* in games Nr.9 and 11. This tool, developed by the parallel CAPS project MAZI, was a very good help to introduce and maintain feedback and "the voice of the people" inside the game, as well as getting proper material for the evaluation.

Table 4: Game events (plays) 2016 and 2017

Nr.	Date	Event	Place	Time (hours)	Months (rounds)	Lead, Support	Participants	Residents	Businesses	Cash-Desk	Commons Commission
5	29.02.16	Wandellust	Zürich	3	3	5	19	11	5	1	2
6	22.10.16	Baugenossenschaft mehr als wohnen, Hunzikerareal	Zürich	3.5	2	3	11	5	3	1	2
7	02.12.16	MoneyLab Conference	Amsterdam	1.5	1	3	21	12	6	1	2
8	09.03.17	ZHdK (Utopoly)	Zürich	0.5	0	2	5	n/a	n/a	n/a	n/a
9	08.04.17	Genossenschaften Karthago und NeNa1	Zürich	4	2	4	18	11	4	1	2
10	13.05.17	International CC-Congress	Barcelona	4.5	2	3	17	11	4	1	1
11	18.11.17	Baugenossenschaft mehr als wohnen, Hunzikerareal	Zürich	4	2	3	20	12	5	1	2
TOTAL				**21**	**12**	**23**	**111**	**62**	**27**	**6**	**11**

The hybrid letterbox, equipped with an offline local network powered by the MAZI toolkit was also a good opportunity to introduce the concept of DIY networking in the context of cooperative housing, which will be the focus of Task 5.2 of the netCommons project.

4.5.2 Core improvements brought to the Game

The district currency game was developed before the start of the netCommons project. Besides its function as a tool or testbed for the advancement of the district currency, one more goal was to improve the game itself and make it more usable and available for a broader public. This was a successful process during the last two years and led to the following major improvements:

- Completely redesigned structure and guidelines for the democratic commons assembly,
- Increased number of possible participants (from 20 up to 31),
- Improved introduction and game instructions,
- More realistic businesses and services,
- Introduction of live feedback via hybrid letterbox,
- Instant tax calculation (Excel sheets),
- General improvements of the gaming materials.

4.5.3 Summary of plays in 2016 (Nr.5 - Nr.7)

The appendix of Deliverable 2.4 documented short reports for the games Nr.5 and Nr.7 and the minutes of the final discussion of game Nr.6 (D2.4, Appendix). In this Section we add some overall reflections about these three games which were all used to improve the game (Nr.5, Wandellust and Nr.6, Mehr als wohnen I) or have it translated first time into a second language (Nr.7, MoneyLab Conference).

From these three games we collected a bunch of questions that were asked at the final discussion by the participants. The selection in the following table shows that the game is able to induce a very serious reflection ("lessons learnt") on personal economic behavior, social and democratic issues, game improvement ideas, as well as general questions about economy and money as documented in Table 5.

Figure 8: Play Nr.5 at Wandellust: The Commons-Assembly deciding about necessary work (photo: P. Antoniadis)

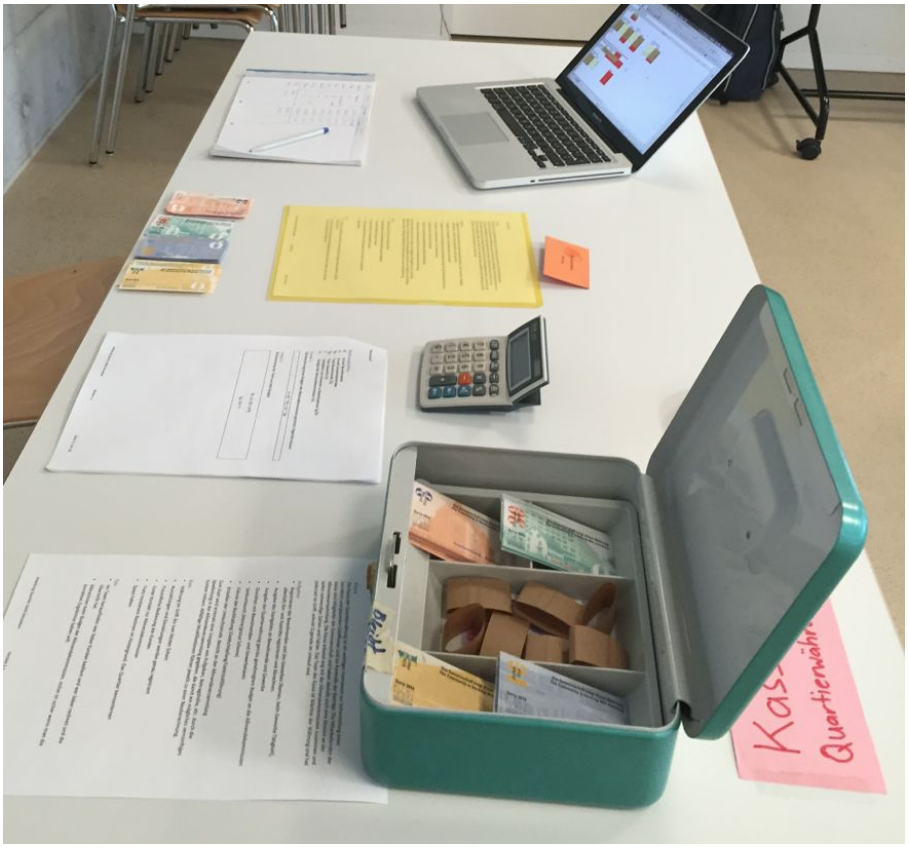

Figure 9: Play Nr.6 at mehr als wohnen: The highly professionalised cash-desk, including the new bills (photo: J. Martignoni)

Table 5: Selected questions asked in the final discussions of the plays

Topic	Questions	From Play Nr.
Personal economic behaviour	After two rounds of the game, there are big differences in the wallets of the players, what does that mean? Why is that?	6
	The question is: What happens with collectors? Because these have effects, they cause blockages in the others.	6
Internal economy, relations between the people	How is it when there are too few jobs to generate Qs?	6
	How is performance measured? Is the local currency tied to performance?	6
	Is not this encouraging black labor?	6
	Is redistribution possible? And how would it be feasible? What are the possibilities for redistribution?	6
	How much is the tax an enforcement and how much free riding is allowed?	7
	Is it really a good idea to monetize all that voluntary work?	5,7
Democracy issues	Why did the assembly not allow to discuss more fundamental aspects in the game	7
	Who did elect the commission?	7
	Why must everybody pay the tax?	5,7
Realisation questions	What is a working system size? What is the experience for a good size of a local currency?	6
	Is a basic income possible?	6
	How are outsiders involved? How is it for people who are not living here in the district?	6
	How to start such a currency?	6
	Who prints the money?	6
	Is such a currency legal?	7
	What about government taxation?	6
Ideas for improving the game	How to shift from fiction more to reality during the game?	7
	Why the commission and the cash-desk do not earn Q's and have to pay tax?	5,6.7
General question towards money and the economy	Debt and tax authorities, what does it look like in Switzerland?	6
	What is the base of money-creation?	6
	I don't think such a currency will change anything?	5

4.5.3.1 Specific Remarks

The participants of these three plays showed impressive engagement with their assigned imaginary roles, some offering "real" commons-based services like free hugs or attracting new people to our workshop room from the outside, and even participated with passion in the assembly, some of which noting that we should not rush them to take decisions before allowing everyone to talk.

One possible improvement that came out of this series, given the limited time especially in Amsterdam, could be the assignment of a smaller initial amount of currency per person to be below the calculated tax of the first month; in our 1-round version of the game people were given enough money to pay their tax so a non-participation during the first month would not be of much consequence. Finally, one of the criticisms, as it is often the case, was related to the quantification of voluntary activities, as also mentioned in the detailed blog entry reviewing the game in Amsterdam by the organizers. Overall the feedback was very positive, and after integrating all feedback after play 7 at the beginning of 2017, the game was well designed, fully functional and ready to some more extended testing and deeper evaluation of the happenings during the plays.

4.5.4 Summary of plays in 2017 (Nr.8 - Nr.11)

A first planned workshop (Nr. 8) in March in the Zurich University of the Arts ended up only as a slide presentation and game discussion without a play because of a lack of participants. Nevertheless some interesting feedback was given by the participants and most of them joined a following workshop with a full game. The first regular game workshop (Nr. 9) in 2017 was held 8th of April 2017 at the housing cooperative Karthago in Zurich. Two more events were the International Conference on Social and Complementary Currencies in Barcelona and a second play in the housing cooperative mehr als wohnen in Zurich. All of these events were successfully carried out with the now completely developed game including the specially designed participatory budgeting (democratic decision taking).

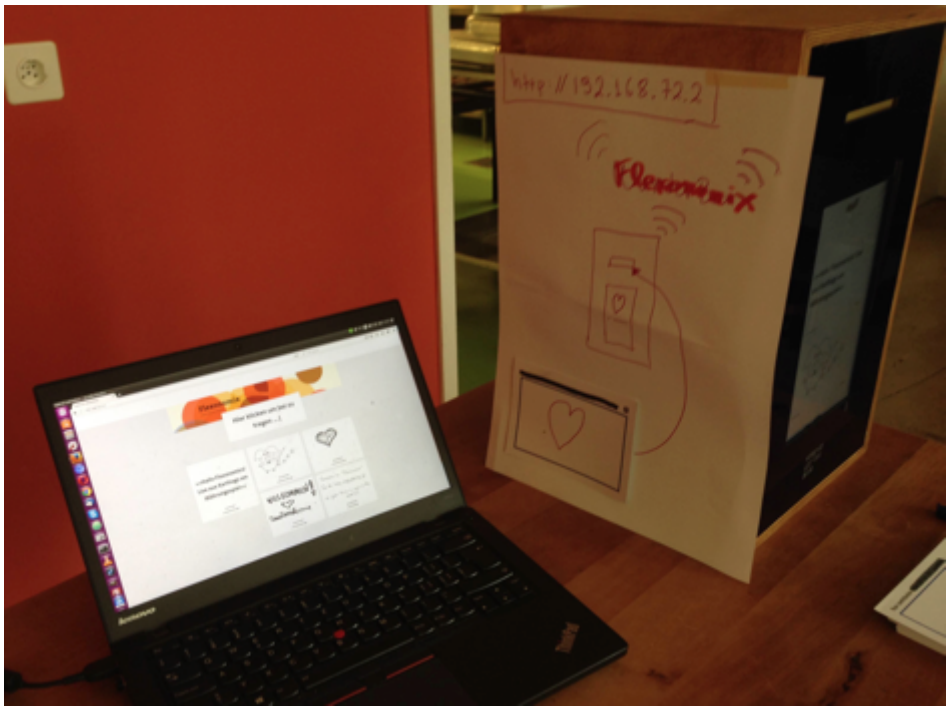

Figure 10: The MAZI-Zone "Flexonomix" and the hybrid letterbox installation in Karthago (photo: P. Antoniadis)

Figure 11: The participants of the workshop in Barcelona showing proudly their Q-currency (photo: J. Rasch)

4.5.4.1 Specific Remarks

The results of these three plays with the improved game version were impressive and revealed the potential and the limits of such a gaming simulation. Each group had its own main issue that somehow defined the culture of the play. But individual behaviour and ideas, moods, resistances, motivations, knowledge or acceptance of rules, many aspects did influence the total performance and the findings for the participants a s well as for us as the organisers and scientific evaluators. The game was capable to provide a near enough reality to experience in general a community currency in action as well as to demonstrate the specific features of the District Currency.

4.6 Summary of lessons learned

These events of the game have already yielded many interesting feedbacks as mentioned above, included in the appendix or described already in D2.4.

One of the most frequent feedbacks of people about such a local currency, is that the monetization of voluntary work is considered negative, which we discussed in Deliverable 2.4 (D2.4, p.61-62). In spite of this opinion, the voluntary work did remain or even increase during most plays because many people decided to add or replace transactions of Qs by reciprocity or free gifts depending on the specific situation or partner the transaction was made with.

Another feedback that appeared several times was the observation of participants that the Q-money was somehow “worthless” (compared to the feeling towards national currency) and only useful when it was possible to spend it. This could be registered as educational success in the understanding of currency in the sense that “different money” could be recognized as having different qualities.

A third major feedback was the question of how to recognize or value contribution and how to deal with weaker or stronger persons and balance everything. While some people could see a strong influence of the management and of the regulations and agreements done or to be improved, others emphasised the freedom of non regulation and free gifts as a solution.

In general, the game was able to open a field of learning and understanding economy on a small scale. Below we summarize the open challenges and lessons learned regarding the game design and implementation, considering also possible applications among members of CNs.

First, there are certain fundamental trade-offs in the game implementation that need to be taken into consideration and decisions would depend on the specific context and intuition of the game initiator:

- Realistic vs. imaginative services,
- Low vs. high tax,
- Short vs. long assemblies,
- Feedback within the roles as members of the cooperative vs. feedback from a spectators point of view,
- More months (rounds) to play, getting more towards a flow vs. more time for the discussion, getting more towards a deeper reflection,
- More jobs and tasks for the commons and so more money supply vs. lesser jobs but also less money entering.

Second, there are certain possible "problems" that might arise or more general challenges:

- People leaving the game or arriving later (distortion of money-supply),
- Lack of imagination during the simulation leading to inactivity,
- Feedback on "what's going on" might help (some game participants commented),
- Shortcuts in assembly decision-making that do not reflect the actual complexity of the process,
- Tax calculations that are tricky and that, if done wrong, could influence the community quite strongly towards "recession" or "inflation",
- Level of cash permanently staying in the system (this influences the level of Qs in the wallets and by that the subjective well-being by setting the stress level: "How much work do I need to do during the current month or could I postpone my participation and if yes how long."

Besides these observations and findings, there is still a lot of potential for evaluation. "*Games are notoriously hard to evaluate*" as mentioned by (Grenblat/Duke, 1981, p.59) and this game, trying to simulate a whole small scale economy is very complex. Future measures could help, e.g.: By the introduction of an electronic currency instead of the paper bills, a better description of the economic happenings and of the actual flow of the currency would be possible. This would allow a better comparison between different plays and could give important information about stability and long term behaviour of the system.

4.7 A currency game for CNs?

The district currency game was offered in two different types of communities:

1) different cooperative housing projects in Zurich, including the initially targeted mehr als wohnen (see Chapter 2) and

2) the wider community of CC activists and practitioners in two high profile events in Barcelona and in Amsterdam.

Its adaptation to address explicitly CN practitioners would be rather straightforward when a critical mass of interested people in a specific group is achieved, which is not the case today. More specifically, the context-

specific aspect of the game is the definition of the circumstances, the different characters and businesses and corresponding tasks.

The adaptation for CNs would be very easy by changing names, terms and circumstances in the game description and in the material needed.

The circumstances or scenario of the game could be a community network association with clear membership of people living in a district (neighbourhood), having the aim to set up and develop a stable mesh network among them. The commons commission would maybe be renamed towards “network council” and the main common tasks would be maintenance and setup of the nodes, putting antennas or fixing software issues etc. The tax could be renamed as membership fee but had to be paid in Qs. The residents would be ordinary members and the businesses could stay the same except that they would also provide like free internet access in the shopping zone or have more professional skills for the topic. As an additional circle the data transactions through the nodes could also be included (even in a live setting with a fully working mesh) and members could either gain Qs by their node serving others or pay Qs for the use of others. Additional services would be included in the needs and talents of the roles, like childcare, help in the gardens, hair-cutting, fitness coaching, food-conservation, etc.

Such an adapted game could be called *The mesh commoning game* as to point out the closer relation towards community networks. An advanced stage would be to include the currency directly on the network by either a blockchain solution or easier a central database with e.g., a Cyclos instance. This could be done in a first instance still as a game and training environment, maybe used during workshops or meetings as trial and fun. But this could also be the first step of the implementation of a District Currency for a CN.

5 Community currencies for Community Networks

The problem of designing and implementing an alternative currency is rather complex, leading to an almost unique model for every different (successful) case study. The same actually holds for Community Networks as well (see D1.2). After different approaches were compared in the first year of the project (see D2.4), the analysis of the second year resulted in three main possible ways of combining CNs and CCs:

1. A CN *as a participant in* a wider community currency (**joint solution**, analysed in Section 5.1)
2. A CN *creating* its own local community currency (**internal solution**, analysed in Section 5.2)
3. A CN technically *implementing* a specific *blockchain solution* (**technical solution**, analysed in Section 5.3)
4. Various combinations of the above that we discuss in Section 5.4)

5.1 A CN as a participant in a wider community currency

A CN can be viewed as a more or less distributed system that can generate and manage a proper infrastructure for the provisioning of connectivity and services at the local or regional scale. Through this role, a CN could participate in existing community currency schemes, and more specifically centralised mutual credit systems such as the WIR and Sardex.net, simply as a factory of Internet connectivity. Participants can join to either produce, share or consume that connectivity, and therefore organize differently than a typical ISP. We could call this a **joint solution** (for a first discussion of this possibility see D2.4, Section 5.2).

The central currency type for this solution would be the (so-called in D2.4) *business currency* such as Sardex since they provide the most successful models using the mechanism of mutual credit. The Local currency type would also be possible but because of the strong connection to the national currencies they would not provide the full features (like mutual credit) of an independent currency.

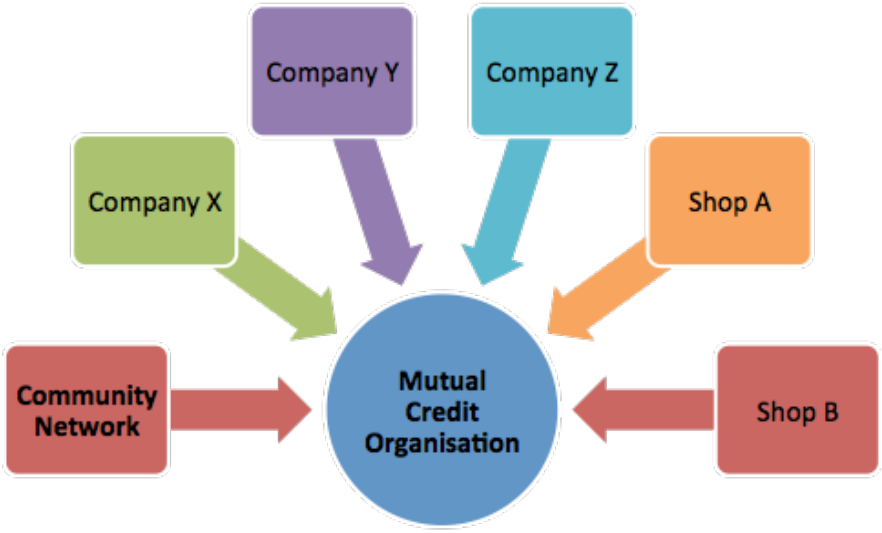

Figure 12: A community network in the context of a wider ecosystem of a business currency (sketch of a centralised mutual credit scheme like WIR or Sardex)

In WIR and Sardex, the value of the services is kept the same as in the real economy (so the rate is 1:1 between Sardex, for example, and the Euro), but no direct exchangeability is allowed between the local and the national currency. This has proven to be a successful model because it really helps to develop an extra market.

Concerning the aspect of sustainability as mentioned in the case of CNs the report (WNDW, 2013, p.369) states:

> *"Potential users could consist of a wide variety of individuals and organisations that include, but are not limited to: Farmers' associations and cooperatives, Women's groups, Schools and universities, Businesses and local entrepreneurs, Health clinics and hospitals, Religious groups, International and local non-governmental organizations (NGOs), Local and national government agencies, Radio stations, Organisations in the tourism industry."*

All these organizations mentioned as target "users" of a CN do match very nicely the target groups of a community currency of this type. So both systems could attract together more preferred users and they could be easier convinced to become active members of a whole healthy ecosystem.

5.1.1 Services provided by the CN

To be a member of such a wider community currency, the CN as an organisation has to offer services (or goods) to "earn" that currency. What could this be? The business models of CNs detailed in D1.3 and D1.4 illustrate the value propositions of diverse CNs. The following list is generic and the actual candidate services would depend on the individual CN's circumstances and organisation:

- Internet connectivity (interconnection with external networks),
- Local connectivity (regional connectivity, like an Internet exchange point),
- Local infrastructure (links, computing, storage),
- Local cloud computing services (PaaS or SaaS),
- IT-services (installation and maintenance of infrastructures, provision of services like VOIP, VOD),
- Technical assistance,
- Education and events.

In this scenario, all the above options must be provided by members of the network in the name of the network.

For the wider system especially the Internet connectivity could be a unique and valuable resource and it would be great to be able to use the local currency for such a service, which in essence could play even the role of "backing" for the whole currency, since Internet access, both for accessing or serving content, is always needed and paid for.

CN services as currency backing solution: The idea of **backing a currency** is an option to incentivise a high level of trust in such a new and maybe questioned instrument and also a kind of emergency case idea or maybe better a risk reduction strategy. If the currency is to be "stopped", typically when trust in the currency is vanished, then a last and stable ability to redeem something of (stable) value needs to be provided. To make such a promise credible, this backing has to be "stored" constantly and it has to be available anytime and it should be a "core resource" useful for most of the participants, see (Renert, 2013). The backing good has to be very reliable and controllable, so everybody is convinced the organisation will be able to redeem the currency, even in worst circumstances. If the backing can be integrated as a part of the concept like it could be in a CN by having the net resources, which are constantly used anyway and obviously useful for the members (a high demand resource (Renert, 2013, p.7) this could be done. In the case of a backing by network capacities, the backing would be a guarantee, that always as a last ability such and such amount of net-

work traffic, Internet access or data transmission would be available against the currency. How would this now look like for a CN?

Community networks are networking infrastructures and services governed as open commons with the contribution of any number of participants that can be expanded organically to cover a region and able to provide abundant connectivity. The value of the infrastructure itself or the connectivity it provides can be used as a representation of the value of a currency. For instance, the guifi.net infrastructure in 2015 was valued 7.35 M€ in infrastructure (CAPEX) and 3 M€ annually in OPEX, and an average of 1.33 Gbps incoming and 360 Mbps outgoing traffic to the Internet (Baig et al. 2015). A theoretical "Catalunya-Network-Currency CNC" could now use a part of these values to back the currency.

Version A: A part of the future net-capacity-value would be assigned to the tokens, let's say 50% = around 1.5 M€. Now this amount could be issued as CNC tokens and Guifi.net would have the ability to spend this sum but had to guarantee it by its services. This would in reality look very much like "vouchers for net access".

Version B: The infrastructure itself as backing or collateral. This would allow a higher amount of backing e.g., 50% of CAPEX = 3.675 M€ but the redemption would be more complicated because then Guifi.net would have to sell or hand over the infrastructure in the last instance.

However, CNs as open commons have the advantage of the network effect: The more participants and areas covered, the more value of the infrastructure, more connectivity is produced, more services become available and therefore it can support a larger number of participants. So the limited backing would at least have some flexibility parallel to the growth.

Other examples of "backing" schemes for community currencies include energy (Ryan-Collins et.al. 2012) or as in a Japanese example of the Musubi, a currency that is backed by rice. For each bill 75 grams of brown rice are stored and easily redeemable (Hirota, 2011, p.25).

If the CN is just one participant in a wider community currency, the backing of the whole big system would probably not fit in the long term. Then the network capacities would become maybe the assets backing credits for the CN itself. In the worst case the credit could, e.g., be repaid by direct means of N hours internet access towards the other participants.

This scenario is suitable for CNs of moderate size (e.g., a guifi.net island covering a certain rural area or the Sarantaporo.gr CN), whose scope is providing affordable Internet access, and have an established democratic governance structure (or interested in creating one). More research about the detailed implementation of such a net-resources-backing would be useful as soon as a such pilot currency would be launched.

5.1.2 Services consumed by the CN

After earning the currency, the CN would have the ability to spend the money for its own needs but also for the needs of the membership, and surrounding community (the beneficiaries). The main things consumed can be found as costs already in a conventional CN (see the business model canvases in D1.3 and D1.4). Specifically, D1.4 lists for several CNs not only their cost structure and revenue streams to compensate these costs, but also their specific social and environmental costs and benefits. The surpluses after compensating direct costs can go to bring about social and environmental benefits and mitigate the social and environmental costs. A nicely described list of the categories of costs was provided in (WNDW, p. 349 and following), and is used to check the potential of substitution in Section 5.2.2.

Other services may be made possible only through the community currency, which could include:

- Cultural activities;
- Running of open spaces for training and dissemination;
- Maintenance of local services including data center, moderation, etc. (see D3.3);

- Training and education;
- Local food provision for meetings.

As already mentioned, one of the roles of community currencies for supporting the sustainability of CNs could be exactly to encourage and thus reveal complementary needs for the proper functioning of a CN and its role in the society, beyond affordable connectivity.

5.1.3 Loops and circles

As closed loops are very important drivers and a requirement for stability of a currency, a possible important loop for this first scenario could look as follows:

CN would ask for a credit limit of 4000 units and would use 2000 to buy the yearly electric energy from a solar-energy supplier A. This company would rent a roof at a hotel B for 2000 a year. The hotel B would ask the CN for the installation of their WLAN-network (at cost of 1000 units) and the yearly support of the network for another 1000 units. So at the end of the first year 2000 were spent and 2000 came back in the balance of the CN. For the second year, another income has to be found for 1000. Additionally the potential of the credit-limit of the CN is not yet exhausted.

Because the possibilities of spending or earning are fewer in the community currency than in the national currency, special attention has to be put on finding good opportunities. Within Sardex, special "brokers" or "mediators" help the participating members find favourable opportunities and close economic circles or loops.

In the guifi.net economic compensation system, there are these circular mechanisms to account for contributions to the infrastructure commons (Baig et al. 2016). The compensation system promotes investment in joint telecommunication infrastructures and makes it possible to obtain a fair return both economically and socially. This system is articulated around the Compensation Tables (local commons), in which the various actors from all over the territory are involved.

Compensations apply objective criteria for maintenance and improvement of the network that make the management of this telecommunication infrastructure efficient and efficient as a bank of common resources. There are three levels of compensation: Internet exchange (across all participants using Internet connectivity), CAPEX compensation (one area), OPEX (in four areas). All contributions are auditable (attested by third parties or backed by documentation), while some are reported as pure contributions (nothing expected in return) while others are reported for compensation (counted as part of periodic settlements across participants in a given Compensation Table).

5.1.4 Challenges

First, there are only a few successful currency schemes in which a CN could become a "member", in addition to WIR and Sardex.net perhaps also RES, a currency in Belgium and Catalonia and not more than a handful of other systems worldwide. But the CN community faces similar challenges and this challenge could be also seen as an opportunity for the two areas of local action to support each other.

Second, many CNs are not organized entities to be able to participate in a centralized mutual credit system like the WIR or Sardex.net. Such business currencies usually only take enterprises or legally constituted and credit-worthy organisations as members. In fact the only practical solution for a CN to enter the WIR system, for instance, would be to apply as an established legal person (e.g., association) for membership. Many CNs do not fulfil today this requirement, but there are examples of CNs that could play this role like some of the members of the FFDN, or other well established CNs as discussed in D1.2.

Third, depending on the internal organization of a CN it might be more or less complicated to decide how the "profits" from Internet access service provision will be "shared" amongst the individual members of the CN. As long as only the association itself uses the currency as a whole it would be perfect, but if also the members should get the ability to receive the currency it gets more difficult. A possible (in the sense of the CC)

solution could be the following: The members of the CN could be registered as employees and get their individual account receiving a remuneration by the association in the community currency. Of course this interferes strongly with the issues of voluntary work and also with the social security and tax-systems. In some countries very moderate compensations could be tax exempt or some special regulations for quasi-voluntary work exist, but in others this would turn the network fully into a professional enterprise.

A well-established model for an internal rebalancing is the Guifi.net compensation scheme. This very developed case could serve as a model how to honour internal contributions in case a CC would be introduced (see Baig et.al. 2016 and D1.4). See also more in the section 4.2.

Finally, there are some "standard" challenges for community currencies, with most important the problem of liquidity that needs to be considered.

5.1.5 Conclusion and future steps

Given the challenges described above, in this scenario, it makes sense to invest to improve the development in areas where there are mature mutual credit systems or political will to develop them (Sardinia, Switzerland, Nantes, Catalonia).

Clearly, there are two options for interested parties to further explore and develop, beyond the study of it, the potential of this currency model for CNs:

1. Already established CNs connecting to existing centralized mutual credit systems. From our research this is feasible with stable and big enough systems like in:
    - Nantes with the SoNantes (https://sonantes.fr),
    - Belgium with RES (http://www.res.be),
    - Catalunya with RES (http://res.cat), a branch of RES Belgium,
    - Sardinia with Sardex (http://sardex.net),
    - Switzerland with the WIR system (http://wir.ch);
    - The Bristol Pound is now in the process of establishing a new central mutual credit system parallel to the regional currency type existing (http://bristolpound.org).
2. Build a new CN under the guifi.net model in Sardinia, and maybe even use Sardex to deploy it. Sardinia and Sardex are clearly examples, and other locations can be perfectly suited if they have similar characteristics.

As a first step, during the development of this task, we managed to bring in contact members of guifi.net with members of Sardex and discuss possibilities for collaboration, which started already with the co-authoring of a book chapter (Antoniadis et al, 2018) between netCommons members and Paolo Dini, interdisciplinary researcher at LSE and Sardex's consultant since 2017. Concluding the task, we give back to communities a methodology that can be explored to improve the health and sustainability of CNs.

5.2 A CN democratically managing its own local community currency

It has been stressed in various netCommons deliverables that CNs could be much more than structures providing affordable Internet access and include a wide variety of local ICT-based services. In other words, a CN could also constitute an actual community of diverse individuals sharing knowledge and services both online and offline, which could be even a cooperative housing project like the ones experimenting with the idea of the District Currency, see Chapter 2 and (Antoniadis, 2018). A possibility to consider combining the CN and CC models would therefore be the implementation of an internal CC in an existing CN (for a first discussion of this possibility see (D2.4, Section 5.1)) or the integration of both CN and CC together in another community project like a Cooperative Housing project of appropriate scale.

For this approach, the District Currency is a suitable candidate model because it is based on the commons, aims at organisations with the intention to boost their internal economy and helps surrounding districts to develop economically. As a CN is always bound locally to its physically deployed nodes and antennas, this solution fits also in this respect. In guifi.net the existing compensation scheme comes already very close to the scheme of a District Currency, see Section 4.2.2.

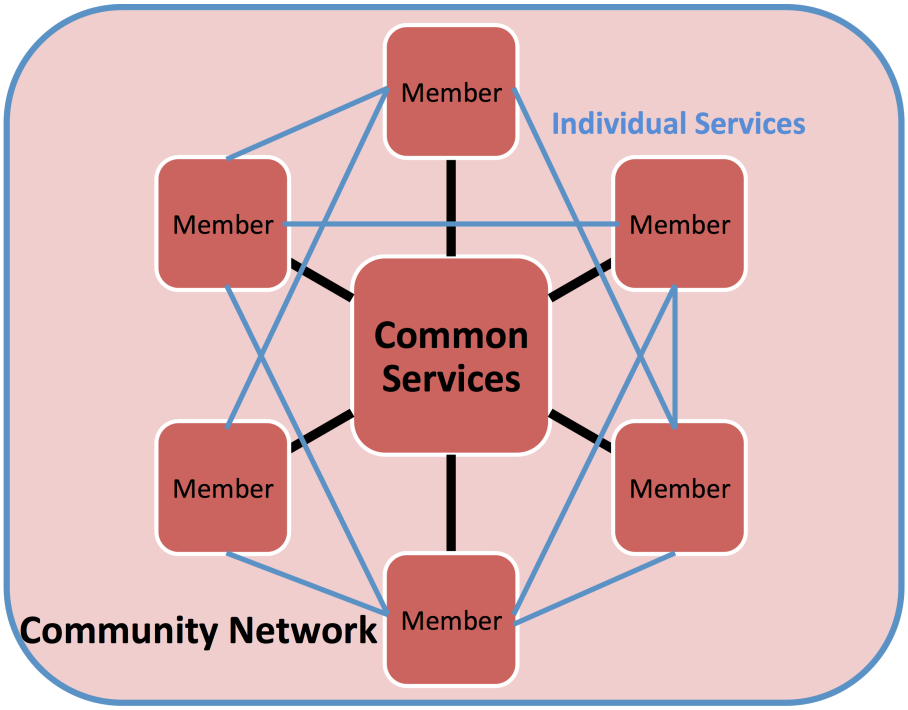

Figure 13: Having identified a set of common services that a CN should provide to its members, a District Currency can facilitate the fair distribution of contributions to the commons and at the same time make possible that such contributions come from individual services for people or organizations that cannot contribute directly to the common pool.

But the scenario per se is not limited to the District Currency. Other types of currencies like LETS, Timebanks or incentive-currencies could fit as well, but would only partially use the power of the commons as explained in Chapter 3.

5.2.1 Motivation

Before analysing this scenario, we should answer the question why such an internal approach makes sense in the first place. This answer comes as a summary of the discussion included in Deliverable 2.4:

- Such a currency will bring the focus on a wide variety of "commons" tasks that were either neglected or not properly and democratically managed inside the CN;
- Enlarge the community, enforce the resilience and stimulate contact and democratic processes between technical and non-technical people;
- Remunerate the efforts of the highly engaged people, like members of the board;
- Develop an internal drive by making internal investments easier or affordable at all;
- Stabilise the activities in the community because the amount of currency in circulation can easily be adjusted towards the actual needs and efforts.

5.2.2 Services provided and consumed by the CN and its members

Unlike the previous scenario, in this case we consider the possibility to transform a CN to a local economy run with the help of a district currency. The central tasks in this case are the ones needed for the commons, e.g., maintenance of the network, deployment of infrastructure and software, complementary services, etc. The guifi.net compensation scheme does already manage to balance contribution and consumption between the more professional members, companies and groups but still using the national currency to do the final clearing. This could easily be replaced by a calculation in a CC but would alone not really make sense. The scheme would have to be integrated into a whole currency-concept, what e.g., the District currency would provide.

Especially in this case, the services exchanged between the members should go beyond networking services or technical issues and create more "loops and circles" outside the direct management and maintenance of the network. Members of CNs represent usually a group of technically oriented people but nevertheless do have skilled and talented people in many ways. For the operation of such an internal currency, it is important to have enough complementary skills and needs, and a minimum number of active members.

One important question would be how the cost of the main Internet access service (that is paid in EUR) is covered. As long as the provider doesn't become a member of the CN, the EUR have to be paid and therefore earned. But by the district currency the CN gets the ability of shifting costs strategically. It could resell the Internet access to its members (maybe partly) against Qs as far as it has the possibility to buy formerly Euro paid services from its members through Qs.

5.2.3 Implementation issues

As already discussed in netCommons deliverables D1.1 and D1.4, a unique characteristic of guifi.net as a CN is the introduction of a concrete notion of a "commons" as an integral part of a compensation system. guifi.net places the members of the network in three categories based on their commitment to the support of the common infrastructure:

1. Fully committed to the commons: 100% of business activity created and investments made will be under a commons ecosystem giving priority to the commons;
2. Mixed commitment to the commons: Sometimes doing business with the commons, but also including others with proprietary infrastructures;
3. Opportunist: Just using the Commons occasionally / for some interest or under request, but while promoting business/investments, remain and believe always on a proprietary network.

In addition, volunteers need also to be compensated for their contributions to the commons. However, for the case of guifi.net, volunteers typically feel less legally bound to the project and may disregard or dislike accounting, paperwork, or procedures. Thus, the group must understand that a methodology and some metrics are needed for recognizing results and reputation and that there is no way to claim contributions made without accounting for them first.

It is easy to see the common characteristics with this aspect of guifi.net with the commons-based currencies introduced above and more specifically the District Currency, which tries also to balance professional and voluntary contributions highlighting the importance of the commons and the need to devise specialized mechanisms to manage them efficiently.

Also Freifunk.net has a policy regarding voluntary work vis-a-vis the sustainability of the network. As stated by Juergen Neumann and Iris Rabener[18] of the Freifunk Network (interview by Jens Martignoni, 29.03.2017), the idea of making the contributed working hours more visible, maybe compare them or even

[18] Juergen Neumann, co-founder of Freifunk and Iris Rabener, member of the board of Förderverein Freie Netzwerke e. V., Berlin, Germany

remunerate them by a community currency has been already discussed several times. But the idea was not followed up until now. Four reasons for that were identified:

- The volunteers are happy to learn and contribute and mostly do not have a feeling of lack of remuneration or urge for more transparency of others contributions;
- The network of contributors is relatively small and therefore reasonably transparent, as most know each other;
- There were always enough volunteers in number and in skills, ready to help, until now;
- The volunteers can afford to donate their work, i.e. they are able to make their living out of their profession, or have other income; as Juergen Neumann mentioned "one has to afford to contribute as a volunteer".

The difference between Freifunk and guifi.net lies in the use of the compensation system by guifi.net. In many areas both CNs are self-sustaining. In small settings such as small rural towns, there is no need to actively seek to compensate volunteers for their services: volunteers develop small and isolated networks in a locality and these networks are self-sustaining, since the contributions of the volunteers in economic or effort terms gets compensated and exceeded by the social benefits. In larger settings such as a city or a neighbourhood, there are cases of private of public sponsorships (e.g., libraries, municipalities, universities, corporate social responsibility) to reduce the costs of larger and more costly infrastructures. Guifi.net has gone one step forward to enable the development of SME companies that expand, operate and offer services connected to the infrastructure commons. To handle the sustainability of a much more expensive, widespread and capable infrastructure such as fibre-based regional interconnection, guifi.net has created the compensation tables to balance these costs. However volunteers do not and cannot participate in this sustainability mechanism individually. They either do not use the infrastructure subject to compensation and rely on infrastructure contributed by other volunteers, or associate to aggregate and participate in a compensation table collectively as a single participant (an association, as in the case of the Bàges and Barcelonès areas).

So, interestingly, for the moment a community currency seems not to be necessary to improve the sustainability in the Freifunk network while guifi.net is open to this possibility as an exploratory activity or in the form of a research question. Big local associations like Freifunk Rheinland or Hamburg might have another situation and different needs and could be interested in talking about such a tool.

We next try and provide a more detailed view of how the district currency model could be integrated in an existing CN.

5.2.4 Loops and circles

First we describe an example of how circles could work within the District Currency and then take a look at the guifi.net compensation system.

Let us assume an idealised CN with 200 members. It would start a fiber project and create a budget of 4000 units to remunerate the work (the material would have to be bought from Euro money on the market). The project cost should be covered within one year and use a flat rate compensation scheme so the membership fee would be x Euro plus 20 units of the district currency that year.

Twenty of the members would help in this project doing maybe survey engineering, digging, deploying the fiber, or do the electrical and technical stuff etc. It would be in total 400 hours of work, each hour paid with 10 units so the average payment for the 20 working members is 200 units each. By this, each member could pay the membership (20 units) and have 180 units left to spend for their personal needs against services from other members, not helping directly in the project. If all the other 180 members would find a way to contribute something to members and get at least 20 units reward, everybody would be able to pay the membership fee and the loop would be closed.

The current version of the guifi.net economic compensation system is designed as a periodic process of clearing or - parallel to the above example - as a circle of compensation for investments into maintenance or expansion of the network:

> *"The economic compensation system has been developed and implemented to compensate for imbalances between investment in the commons infrastructure and network usage among the professionals. Expenditures are declared by the professionals are periodically cleared according to the network usage. The calculations are performed by the Foundation and are made available to the professionals. The Foundation centralises and manages the billing system (each professional only makes or receives a single payment)."* (Baig et.al. 2015, p.155)

A non periodic process was made at the B4RN where the labour spent by members was turned into shares.

> *"Clearly equipment and materials have to be purchased so there is no way of avoiding needing to raise the cash for these. However the labour element can be contributed by the community in return for shares. From our viewpoint there is no difference between us receiving funding via shares purchased which we then spend to build the network and community members doing the work directly and taking the appropriate number of shares in return."*[19]

If instead of a share, the members would have been paid with an internal currency, then later on they could e.g. pay their net-use by this and the currency would be redeemed.

5.2.5 Challenges and next steps

The above short story cannot possibly reflect the whole complexity of the district currency model. In each case there are additional rules needed (according to the laws of the commons, Ostrom 2009, and the needs of the specific community) to define exceptions, rebalancing methods, fines or exclusion and so on. This would need a community culture friendly towards negotiation, discussion and willingness to accept the self defined rules.

An issue of a district currency would be in the field of activation of skills and talents. As stated in (WNDW, p.354)*: "A network is only as good as the people who work and operate it. The team you put in place can mean the difference between success and failure. That is why it is important to reflect on your team's qualifications and skills, including those of staff and volunteers, in comparison to the competencies needed for a wireless project."*

The personal abilities of the team and of the people are not directly affected but of course the ability of understanding a second likewise complicated topic of economy and money at least basically pushes the level of skills. In case of an internal CC, the difficulties rise again to find at least some key people that are able to bridge the connection between network and IT based discussions and needs with the currency and economy based ones. This is for sure a crucial point for the first networks that would try this innovation and combine CN and CC without having a running example somewhere else to get guidance and support.

A simpler alternative to foster volunteering might be to use an Incentive currency like Spice time credits[20] as a measure to strengthen the commitment for voluntary work. But this would need additional partnerships with sponsors what also could require a considerable amount of resources and skills.

In its current form, the district currency is described, at least in its "game" version, as a traditional community currency using printed notes and a lot of "manual" work that could be rather discouraging given the limited available time and other restrictions. But the game is just an abbreviation and of course it would make very much sense especially for a CN to develop and use a digital version of the District Currency. This would allow to implement a lot of the necessary management and rules directly into the software. Using al-

[19] See https://b4rn.org.uk/wp-content/uploads/2011/11/B4RN-Business-Plan-v5-2.pdf, p.22
[20] See http://www.justaddspice.org

ready existing software for currencies like Cyclos[21], most of the job is already done and a working currency could be set up in a short time.

About the Institutional framework: Some CNs are not legal entities and most of them are not cooperatives. The District Currency might be adapted also to a (legally) loose network but the commitment of the users/members nevertheless has to be on a high level. If the CN is already a co-operative, then an easier adaptation should be possible. Examples of existing cooperatives are:

- HSLnet in the Netherlands,
- Broadband for the Rural North (B4RN) in UK,
- several equivalent local initiatives in UK,
- the Scani in France, now evolving towards the status of a cooperative (Société coopérative d'intérêt collectif or SCIC).

Finally, it is important to stress that setting up a new community currency scheme includes additional costs for the operation of the currency, which could be considered as an additional "common" infrastructure, see also (D2.4) and (Antoniadis et al., 2017, 2018). Such a cost could be prohibitive for many existing CNs that struggle already to maintain their "core" infrastructure. For this, the use of a blockchain system might prove beneficial as discussed in the next section.

5.3 A CN technically implementing a specific blockchain solution

The blockchain-related technology has provided new ways to account for contributions in P2P systems and, as described in (D2.4, p. 56 and following), there have been ideas to integrate it into the infrastructure of CNs. During the last two years, a very fast and disruptively evolving process of new currencies' creation is on-going and every week another white paper goes online describing a new solution. This development has evolved parallel to our efforts to find suitable currencies for community networks.

The increasing hype around the use of blockchain and distributed ledgers for cryptocurrencies such as Bitcoin, Ethereum and numerous others has led to more ambitious efforts in this area, and more recently some specific solutions for networks are popping up, too. One promising approach is **Ammbr[22]**, whose vision is to build "*the world's largest decentralised, community-distributed, telecommunications network based on blockchain technology*".

5.3.1 The Ammbr Mesh Network and Ammbr token

Current information on the approach of Ammbr is based on their white paper[23] describing their vision and approach. The paper was released in the context of an Initial Coin Offering (ICO), which on the way was cancelled since enough investments were secured through other means and the offering was deemed redundant. Moreover, the Ammbr Research Labs was founded with the participation of one netCommons partner (UPC). Most probably many details of the Ammbr approach will be reconsidered now that there is no need to attract investments by non-experts in the area (the general public).

However, it is interesting to evaluate the initial ideas of this effort and discuss key challenges and shortcomings. The main idea is straightforward: *"Each Ammbr unit (or node) consists of a core router capable of communicating across a combination of WiFi, Bluetooth®, LoRaWAN™ etc. for broadband and IoT- a first for consumer router devices. Additionally, each unit presents computation and storage resources facilitating edge computing applications. This turns a network of Ammbr nodes into a dedicated mesh of micro-datacenters at the edge of the network, as well as "last mile" connectivity."* (Ammbr whitepaper[22], p.18)

21 See https://www.cyclos.org
22 Ambbr portal https://www.ammbr.com/
23 http://ammbr.com/docs/20171121/Ammbr_Whitepaper_v2.3_21Nov2017.pdf.

In other words, besides being a standard wireless router, an Ammbr node includes a blockchain module. This module is responsible for accounting for the exchange of service (typically Internet access) between the owner of the node and an external user and/or between nodes of a mesh network to which the Ammbr node is attached. This is intended as an "economic incentive that allows users to share their unused bandwidth for profit. Monetising the free exchange of bandwidth, via a secondary market, allows for free market forces to drive network growth where it is most needed." This incentive is implemented as a blockchain-based currency using tokens or "coins" named Ammbr (upper-case).

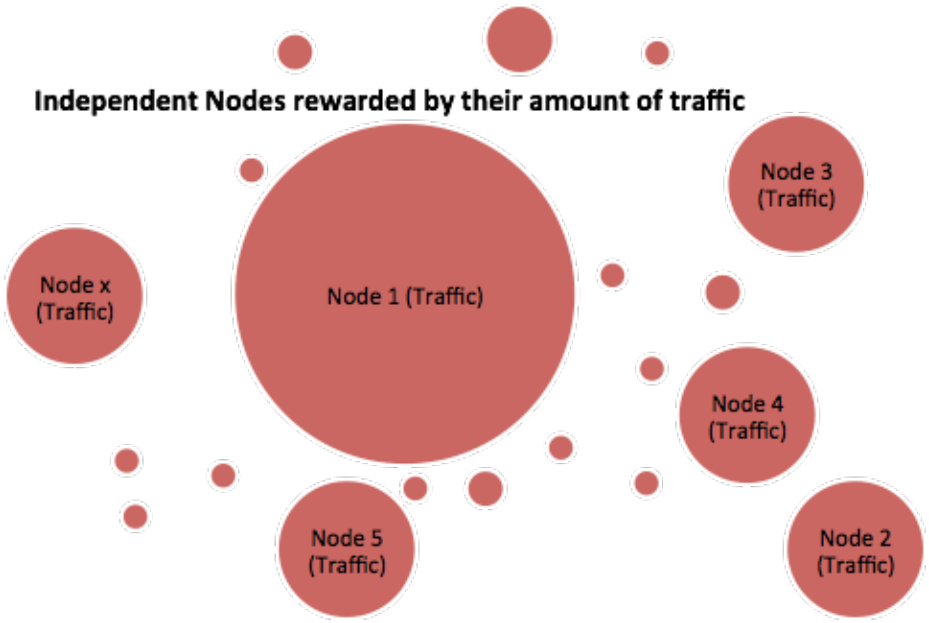

Figure 14: The baseline scenario of most blockchain-based currency schemes, where each node or participant is selling her products or services on a "free market", trying to maximise her benefit.

The first key decision that the designers of the Ammbr system will have to face is, as stressed above, the exchangeability of the tokens accumulated by Internet access providers in the Ammbr network with other currencies. In the current version of the white paper, it is stated that the Ammbr tokens will be *"a micro payment medium of exchange among the network's participants"* and *"its value would be determined by market forces such as supply and demand."*

It seems that the initial intention is to allow the exchange of Ammbr tokens with other cryptocurrencies, *"the exchange rate of Ammbr relative to other cryptographic assets will be the largest determining factor in the valuation of Ammbr."*, the main assumption being that *"as the Ammbr network grows and the volume of activity on the Ammbr network increases, the underlying value of the services on offer, i.e. Internet connectivity, will drive the value of Ammbr."*

In essence the Ammbr as proposed now, is only a kind of voucher for connectivity. The "economic model" as described in the White paper[22] (p.41) is in fact a very narrow proposition of how Ammbr could be used, but far from any necessary model, which needs at least a probable currency circulation and overall description about systemic stability and balances (see more in Section 3.3.3). Maybe the inventors of Ammbr thought that Ammbr tokens would be used "naturally" for other transactions or start up as a new kind of general transaction currency or Bitcoin rival, but no measures for such a transformation seem to have been initially planned.

If no exchange were allowed between Ammbr and other cryptocurrencies (and thus to fiat money) the whole system would suffer severely from imbalances, since in that case the "exchange" would "fill" the nodes with best locations and "empty" all the other ones in less favourable places.

By adding the possibility for exchange, the incentive to collect Ammbr and thus provide services increases as well. Still, the inherent imbalance of an access network is not addressed and in the now proposed case Ammbr would become just a way to resell Internet access, which actually can be also subject to legal limitations.

However, the above is just one possible outcome, depending on the business models adopted. One possibility is that participants in the Ammbr network will be treated as economic agents free to maximize their profit. But this is by no means the only way. Given the support for smart contracts, the Ammbr system will be managed by Decentralized Autonomous Organizations (DAO)[24] implemented as smart contacts that will facilitate, verify, enforce the performance of the organizational rules and business models. It is up to its members to use this power in different ways, which could really improve the sustainability and the social impact of the network.

For example, Ammbr empowers a community to share a single Internet connection and account for the level of consumption of each participant in a very accurate and trustworthy way. How these levels of consumption will determine the individual contributions to the overall cost of the Internet access, and the corresponding mesh network could be then subject to a collective decision, and implemented as a smart contract. Even schemes like the district currency could be implemented with the support of such technology.

Smart contracts, a piece of code that represents the rules of a contract of a community, will ultimately define, facilitate, verify, or enforce the negotiation or performance of such contracts. Related to D1.4, that explores the internal organizational model of community networks and community clouds, the challenge is how to translate the governance agreements of a community into code of a smart contract that can be implemented in a network infrastructure to mediate economic transactions to comply with the overall aims of that community network. One of the most popular examples of such organizations is the DAO.

5.3.2 Other new crypto-currencies

There seems to be a "wave" of "mesh" crypto-currencies in addition to Ammbr[25].

For example, a public offer similar to the ICO initially planned by Ammbr just took place for the IUNGO.network, a solution whose proposer self-proclaim: "*At iungo we believe that affordable Internet access is a basic human right*"[26]. This idea is economically very close to the Ammbr as it is fully based on exchange into "real" currencies and therefore could also be called a voucher system.

Another idea to use crypto-currencies stems from the fight for independence and net neutrality: An idea of a "mesh-coin" using Ethereum as a technology was lately proposed in a tech meetup in New York reported on coindesk[27]. One activist called Floersch described an ethereum-based system that runs "in the background" of any mobile device. Using an interconnected series of smart contracts, the mobile device could theoretically be turned into a Wi-Fi-enabled "node," helping expand the mesh network's reach. And all this could be incentivized with a blockchain-based "meshcoin." *"Ethereum and mesh networks are a fantastic combination,"* Floersch said, adding: *"Ethereum will allow for the kind of payment back-end which makes a mesh network scalable."*

On the other hand, in the same article software engineer Brian Hall (NYCMesh) is quoted stressing that there are *"two things that all these projects fail to adequately understand: first, mesh nodes have to be in geographically close proximity to one another, unlike blockchain nodes, and second, growing these networks requires huge amounts of social capital to gain adopters."* He added that *"Ninety percent of the work is a social problem … and that's kind of left out of all these meshcoin ideas."*

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24 See https://en.wikipedia.org/wiki/The_DAO_(organization) for a definition

25 At the time of submission of this deliverable an analysis of different cryptocurrencies by Dean Bubley (Ammbr's advisor) was published, which resonates with many of the points we make in this section; see http://disruptivewireless.blogspot.ch/2018/01/update-telecom-network-cryptocurrencies.html

26 See https://iungo.network/ and its Whitepaper https://iungo.network/docs/iungo-network-whitepaper.pdf

27 See https://www.coindesk.com/plan-b-ethereum-innovators-reviving-fight-net-neutrality/

RightMesh is a second Ethereum-based architecture that appeared around the same time[28], which *"empowers users to monetize surplus digital assets like data, connectivity, on-device storage, processing power or any content they create through easily transferable tokens"*. As the initial narrative of Ammbr, the RightMesh whitepaper[29], states that "*Any device on the RightMesh network can buy and sell bandwidth from other users. Users reselling their data can name their price and, like any marketplace, supply and demand will ultimately determine the rate."*

Such questions are surely very interesting and offer additional arguments for the use of complementary or in this way alternative currencies, but will be only successful, when also economic and social impacts to the stakeholders are considered and adapted to the currency design. The District Currency and the corresponding game provide a framework for exploring alternatives to the "free market" model advocated by most block-chain-based solutions today.

In other words, these developments makes the knowledge on Community Currencies more and more relevant if we don't want all those solutions to end up instead of commons-based alternatives to high energy-consuming supporters of the current inflationary economy (as in the case of bitcoin). To this respect, there are two very challenging issues that one needs to keep in mind:

- The huge hype and the mixing in people's minds of the role of cryptocurrencies as "alternative economies" with the speculation and easy profit-making in the current one;
- The technology used to implement the cryptocurrency, as different technologies have different impacts and consequences; on the one hand, the energy costs implied behind non-permissioned blockchains adopting the Proof-of-Work consensus mechanism are important both for the ecological impact and for the balance of the economy around cryptocurrencies since the resources needed to sustain the corresponding infrastructure have non-negligible costs; on the other hand, permissioned blockchains and in general consensus mechanisms rooted in the existence of a trusted authority may not meet the requirements of Community Currency.

In any case, the key decision for a "mesh currency" designer is whether to allow the currency to be exchanged (eventually) to fiat currency. Models like Sardex and District Currency depend exactly on the non-exchangeability of the local currency, while maintaining "compatibility" with the global economy.

Such a decision could lead to a more "social" and commons-based currency but then it should operate at a small-scale (and be replicated across different regions with the possibility for exchangeability between the different "local" currencies) and a fair way to recover the computational costs, among others, should be devised.

5.3.3 Loops and circles

The current Ammbr model does not yet discuss the maintenance of currency-circles as already mentioned above. If the current whitepaper would be implemented as it is, an economic "circle" in the system might look like the following: As a user someone would need to buy tokens first, i.e. take roughly 800 EURO and buy 1 ETH, then from this 1 ETH he would buy 2500 Ammbr tokens (proposed token price in the white paper). Then let us say he would use connectivity during one year and pay the node-owners with tokens. Node A would get 1500, node B 1000. Maybe node B would need most of it to buy connectivity too at node A. Node A at the end of the year would have around 2500 collected and then need to change back into ETH or EURO to be able to buy meaningful things on the world market. Our initial user would need to buy again 2500 Ammbr for the next year and the circle would be closed. But the economic activities remain limited to connectivity; most advantages and features of a currency are not used. Instead Ether (ETH) and EURO are the "real currencies" responsible for the wider economy.

[28] https://www.forbes.com/sites/forbestechcouncil/2017/12/20/improving-global-digital-inclusion-with-tokenized-mesh-networks/#4b2bdc87ecea

[29] https://www.newsbtc.com/press-releases/rightmesh-releases-white-paper-outlining-first-truly-decentralized-internet-sharing-network/

There are still some economic advantages in the system related to prepaid services:

- Capital: Because a (paid) stock of Ammbr has to be there to make it work first, the organisation gets a basic credit of all prepayments and stocked Ammbr for free as a kind of shares of the users;
- Customer loyalty: Users and node-owners can use their Ammbr only inside the network. The default seller for all customers, therefore, are the Ammbr-accepting nodes and loyalty becomes more institutionalized.

Alternatively, one could imagine a system that aims to implement exchange circles like the ones described in Sections 5.1 and 5.2, but using a cryptocurrency like Ammbr instead of a centralized mechanism like Cyclos (used today by Sardex.net) or printed notes.

From a technical perspective, such a scheme would be realistic if less resource-hungry mining processes are devised like the "Proof-of-Stake" instead of the "Proof-of-Work" considered for the Ethereum blockchain[30] and if the cryptographic protocols can keep their good qualities even if the scale of the system is not very large.

5.4 Other possible combinations

As already discussed, the three presented schemes are actually complementary and one could think of interesting combinations. For example, a CN could employ a district currency model for its internal management of resources as a commons, using Ammbr as the accounting mechanism and the platform to run the organizational rules as a smart contract, and as a collective entity participating in a higher-level mutual credit system.

If we take a more long-term view the first two options could merge and actually become the same, as the CN becomes part of a wider economy but with different "starting points". In the case of the joint solution the CN "enters" a circuit, while in the second, the democratic solution, the circuit is created step-by-step "from" the initial CN as it connects with complementary initiatives. Maybe their character would be different like the joint solution would remain a more technocratic, centralized and business oriented system whilst in the second a more democratic, confederated system might be the result.

Another possibility for combining a regional mutual credit system with a community District Currency could be to allow for exchangeability of currencies between the two schemes. Imagine then an (extended) CN community using an internal DC to manage democratically the internal exchange of services and resources, participating in a wider mutual credit system like Sardex. Then the surpluses and deficits created in the internal system could be compensated with the provision and consumption of services in the external one.

Such more complex systems with abilities to exchange the currencies always have to consider second level trade-balances for the whole systems respectively sub-systems. To achieve long term stability a more advanced governance and periodic negotiations might be necessary (see Martignoni, 2015A).

[30] See https://www.coindesk.com/information/ethereum-mining-works/

6 Conclusions

In this final Chapter of this deliverable, we wish to go back to the initial questions posed in D2.1 regarding sustainability at large, and try to answer them first on a more general level in Section 6.1 and then bring the spot closer to the specific issues and implications of CN's from the perspective of a community currency designer for CNs (Sections 6.2 and 6.3). This will allow us to get as close as possible to straight conditions and propositions of how a suitable currency for a CN should look like and how it might be usefully implemented. As these are no final solutions yet, next steps in research are suggested in the final Section 6.4.

6.1 Community currencies and sustainability in Community Networks

The role of community currencies in the sustainability of community networks could not be addressed directly until now because of two reasons:

1. There are no living examples of combined currency-network-communities;
2. Even more important: The role of money or currency (i.e., the national/fiat currency) itself is very poorly reflected in the whole sustainability discussion in science[31].

So we try to compensate this theoretical lack by indirect methods and indicators of evidence. Our question is therefore: To what extent would a proposed currency model enhance or deteriorate the role of CNs with respect to the corresponding (un-)sustainability issues described in (D2.1, pp. 75-77). Table 6 considers each of the questions posed in D2.1, reported here for the sake of easy reference, and gives initial answers on the effective contribution (or absence of it) toward a higher sustainability.

Table 6: Possible effects of CC integration to the sustainability of CN's: Initial answers to questions raised in D2.1

Questions of sustainability for a CN (D2.1, pp.75-77)	**Contributions to a higher sustainability by CC**
***Nature, Energy use**: To which extent does the community network rely on relatively environmental-friendly energy sources (wind energy, solar power, tidal power, wave power, geothermal energy, biomass and waste energy)? To which extent does the network rely on suppliers of such energy forms? What is the share of the total energy consumed per year by the network that is based on relatively clean power sources?*	When a CN is part of a wider system like WIR or Sardex.net, it could have access to clean energy providers that are also part of the system, as it is often the case that local, smaller and more environmentally sensitive suppliers are members of these. In the case of Sardex, for example, the Evolvere SpA (http://www.evolvere.io - in Italian) provides local solar electricity and energy saving technologies. The incentive to buy electricity through the CC "inside" is high because the second currency is easier to get and has to be spent anyway, as saving of these CC is neither encouraged nor supported by mechanisms like interest on savings.
***Nature, e-waste**: What is the average lifespan of different hardware types used in*	Recycling of devices and e-waste is not properly evaluated in our current economic system. Community currencies could incorporate in their valuation the critical sustainability bene-

[31] One exception is Lietaer et.al. (2012), Money and Sustainability - The Missing Link

the community network? Can measures be taken for ensuring the long-term re-use and update of hardware? If hardware devices have to be replaced, is it possible to recycle the old ones? How? If hardware devices have to be trashed, is it possible to do so in a way that does not threaten humans and nature? How? If hardware devices have to be trashed, is it possible to do so in a way that avoids the creation of e-waste that is shipped to developing countries where it poses threats to e-waste workers, humans and nature? How? If old hardware devices that a network no longer uses are donated to other networks, can it be ensured that this does not result in a two-tier Internet access structure, in which poorer communities have slower Internet access than others?	fits of such processes and provide additional incentives to perform them at larger scale. A direct valuation of such used material would be easier by a community currency than by the national one because new equipment has still to be paid in national currency which is more scarce and more difficult to get for the CN. Also because of no or very little capital revenue labour inside the CC is comparable cheaper than external labour. As an illustration we can address the prices set to buy a new router, prices that are the base of a possible decision making. In world economy (or "normal economy") • Router new (from China) 20$ • Router recycled (repaired) 50$ (because of labor costs) In local CC economy • Router new is not available (because CC does not buy in China) • Router recycled (repaired) 20 Units On such a case and especially when enough units of the CC are in one's wallet, the decision most likely will be to buy the recycled router with local currency, a decision that creates value to local labor around repair or refurbishment and for the global environment, reducing the ecological footprint (Franquesa et al. 2017).
***Economy, Monopoly power and corporate concentration**: How strongly concentrated is the Internet access market in a specific region, country and the world? What share of users and financial resources (revenue, capital assets, profits) does the incumbent Internet service provider have in a specific region, country and the world? Does the operation of the community network help to challenge the financial and market power of dominant Internet service providers and to advance a plural economy? How? What are the dangers and what happens when a community network suddenly faces competition by a private for-profit Internet service provider?*	Through the use of community currencies a CN allows people to pay for Internet access through contributions in kind, at least partly. This brings the costs for running a CN lower than for-profit providers, and if legal or other attacks by corporations against CNs like the exclusion of public infrastructure, hurdles against Internet access sharing, violations of net neutrality, and more, are addressed a CN can become really competitive, as many success stories around the world have proved (even with all those unfair policies against CNs in operation).
***Economy, Survival and resources**: Does the community network manage to survive economically, i.e. to afford the necessary hardware and labour-power necessary for running the network? How does it do that? What are its financial sources? Can the community network ensure that it has enough resources, supporters, workers, volunteers, and users? Can the risk be avoided that the community*	This is the key challenge and most difficult question regarding the effect of community currencies on CN economic sustainability. The effect will be positive to the extent that a CC will fulfil its promises for mobilizing and more fairly rewarding previously voluntary labour, increase the community spirit, and integrate more actors in the internal ecosystem, and also become part of a wider one.

network is a "secondary Internet" that is marginal, slower and less attractive than other services? How? What strategies can be used for avoiding marginalization and resource precarity? Are there possibilities for the community network to obtain public or municipal funding or to co-operate with municipalities, *public institutions or the state in providing access?*	The effect could be negative if the design and management of the currency proves too costly and complex to understand and carry out, discouraging people from participating and reducing even more the "target group", instead of expanding it.
***Economy, Economic democracy**: Is the community network collectively controlled by its members as a common good? How can the community network best ensure that it is a not-for-profit project? Are those, who work professionally for the maintenance of the network, fairly remunerated for their labour so that they can lead decent lives? To what extents does the network rely on community control, municipal control, or private control? What are potential dangers of collaboration with or inclusion of private for-profit companies? How can they be avoided?*	This is a question that we can definitely answer positively. The fair compensation of voluntary work and the enhancement of the democratic processes that run a CN lie at the center of the motivations and objectives of the community currency models discussed in this deliverable. CCs could also enhance the positioning of CNs for receiving subsidies, e.g., if Internet access could be considered as a "backing" of a wider mutual credit system (see Section 4.1.1).
***Economy, Tragedy and comedy of the commons**: Is the network large enough to attract significant numbers of users so that this community can have mutual benefits from network effects? How can possible congestion and slowdown of the network best be avoided if it is very popular?*	Successful community networks reduce significantly the cost of Internet access per member (and typically for better quality), while perfectly capable of setting and enforcing access rules. A community currency can implicitly support this aspect to the extent, first, that it succeeds to help CNs grow and become sustainable, but also by requiring and thus encouraging more participatory and democratic process around the management of common resources.
***Economy, Network wealth for all**: How can the community network provide gratis/cheap/affordable network and Internet access for all? Can it help to lower the digital divide? How? How can the community network help to avoid a two-tier Internet with slower Internet access for some and faster for others? How can the community network avoid the commodification of a) access (i.e. using access fees) and b) users?*	These issues are not directly accessed by a second currency, but the indirect contribution would be to guarantee a higher independence for the CN. Especially in the case of political differences or even disabilities or prohibitions due to anti-democratic developments, a CC could become a very important pillar of an ongoing operation toward self-determination.
***Politics, Participation**: How is the community network governed? How does it decide on which rules, standards, licences, etc. are*	As mentioned above, CCs can answer these questions only implicitly by assuming a certain level of democratic governance and participation. But as visible in the ruling political

adopted? Does the community network allow and encourage the participation of community members in governance processes? How? Are there clear mechanisms for conflict resolution and for proceedings in the case of the violation of community rules?	system, democracy is very much reduced by an unjust monetary system and might be sold to the wealthy. If the CC is able to support a more equal distribution of wealth, even if it is in small sector, it would contribute toward a better democracy in the society as well.
***Politics, Privacy-enhancement and protection**: How can a community network best be designed and governed from surveillance so that the privacy of users is guaranteed, it is technically secure, and protects users from corporate and state surveillance? How can privacy-enhancing and privacy-friendly community networks best face the threat that in a culture of law-and-order politics and a surveillance society, in which governments believe that surveillance is a way of preventing crime and terrorism, they are outlawed? How can they best challenge the argument that they provide a safe harbour for the communication of criminals and terrorists? How does the community network deal with actual crime occurring in its network? How can it best minimise the occurrence of crime?*	CCs have no special effect in this regard.
***Culture, Conviviality, learning and community engagement**: Does the community network provide mechanisms for learning, education, training, communication, conversations, community engagement, strong democracy, participation, co-operation, and well-being? How? To which degree is the community network able to foster a culture of togetherness and conviviality that brings together people? How?*	CCs contribute implicitly to these goals as described above. A well introduced and used CC allows the members to get a contrast towards the usual monetary system and start to "see" where it is failing and is a source of manipulation. On the other side a comparably small currency is much easier to get and could help to detect problems of injustice or lacking togetherness.
***Culture, Unity in diversity**: To which degree is the community network a "geek public" that has an elitist, exclusionary culture or a "community public" that is based on a culture of unity in diversity? How can a culture of unity in diversity best be achieved?*	CCs can bring in close contact people from different sectors of the economy and thus improve their exposure to other actors in the society and vice versa. The use of a currency is strongly merged with exchange, needs and contributions and relations between people. A "diverse" currency, if well implemented, would help to understand the aspects of unity in diversity.

6.2 Potentials for a supportive co-operation

In case a community currency would be implemented in a CN, the image of economic sustainability would transform partially to another picture, as the term economic acquires a larger perspective compared to "financial", which is what people normally think about: does it cost more or less? The exact circumstances and influences are dependent as well on the shape and organisation of the CN, as of the chosen model of the CC, as already emphasized, and overall the economic sustainability of the system depends on the local values and exchange models, rather than on the global arbitrary value of a fiat currency.

To give a closer understanding of what might be possible, we present and discuss in the following a table of costs (Table 7) included in an important text on the issue of sustainability of CNs: Chapter 17 of the well-known book about designing, implementing, and maintaining low-cost wireless networks titled “Wireless Networking in the Developing World” (WNDW, 2013).

For each cost category we indicate in Table 7 the possibility of shifting or transforming costs from the national currency to a community currency in our first two scenarios. The third scenario would be a mixture of both, as already mentioned in Section 3.3.

Shifting or transforming costs does mean that costs or expenses now a part of the “national-currency-economy (NCE)” switch into the “community-currency-economy (CCE)”. As a result the CCE “wins” economic power and the NCE “loses” it. But while for the NCE this transformation is very small relatively to its size, it would be an essential building brick for the small size CCE. That is why it is important to check the potential of substitution of national-currency-paid-costs towards community-currency-paid-costs.

As it can be observed, the substitution abilities of the internal version are mostly labour based costs. The external version would better fit in substituting some market needs, but could not so easily help with labour and engagement of the members as explained above.

One interesting recent development within CNs is the community cloud and the alternative business models as described in D1.4 (Figure 6.2). In the infrastructure or platform commons scenarios (b+c) an introduction of a currency could be investigated. This could be a next step in research.

Legend for Table 7:

- Substitution by internal currency: Cost factors that could be a part of an internal currency and therefore saving expenses in national currency
- Substitution by external currency: Cost factors that could be a part of an external currency and therefore saving expenses in national currency
- Substitution difficult: Integration in a community currency difficult because such elements are part of the world market (technical equipment) or very unlikely to be resources of the community network and its environment.

Table 7: Categories of costs and their potential to become substituted by a community currency

(WNDW, 2013, p.349 f.)

Labour costs	**Substitution by internal currency**	**Substitution by external currency**	**Substitution difficult**
Check ups (analyses) and consultancies	X		
Development costs for programming, testing, integration etc.	X	X	
Installation costs	X	X	
Recruiting costs	X		
Training costs (introduction and on-going)	X		
Handling costs / salaries for employees or freelancers, including your-self	X	X	(X)
Equipment maintenance staff costs	X	X	
Software support staff costs	X	X	
Security personnel			X
Non-labour costs -			
Acquisition and production costs (for hardware like PCs, VSAT, radio link equipment and software)			X
Ancillary equipment (e.g., switches, cables and cabling, generator, UPS, etc.)		X	
Data protection and security		X	
Start-up inventory (chairs, tables, lighting, curtains, tiles and carpeting)	X	X	
Premises costs (new building, modification, air conditioning, electrical wiring and boxes, security grills)		X	
Legal costs, such as business registration			X
Initial license costs (VSAT)			X
Initial marketing costs (flyers, stickers, posters, opening party)	X	X	
Operating costs for hardware and operating systems (Internet access, telephone, etc.)		X	
Rent or leasing rates (for tower space for example)			X
Depreciation of hardware and equipment			X
License fees			X
Consumables and office supplies (e.g., data media, paper, binds, clips)		X	
Operational costs to maintain data protection and security		X	
Insurance premiums			X
Costs for energy and to ensure power supply			X
Loan payments, capital			X
Costs for paying back your setup costs		X	
Costs for advertising		X	
Local fees		X	
Legal and accounting services			

6.3 Conditions for CNs

The question whether a CN should think about the integration of a currency or the connection to one has to be carefully evaluated. The following checklist might give some guidance to decide whether such a project might be worthy to start. It is also summarizing the actual state of research where no living example of a combination CN-CC yet has appeared. These conditions therefore are our estimations resulting from the research about existing cases of CNs and CCs and from basic economic knowledge and sustainability issues n the management of organisations and networks. The following table provides a first help for an evaluation.

Table 8: Questions for community networks for a first evaluation of the idea of a community currency

Questions about the Community Network	Yes	Unknown	No
1) Does it have at least 200 members?			
2) Do many members not know each other personally?			
3) Is it difficult to find enough volunteers?			
4) Do many volunteers have low incomes or difficult economic situations?			
5) Does the network has a broad mix of members, concerning skills, professions and possible needs?			
6) Is there a formal membership with some kind of fee?			
7) Is it organised as a legal entity?			
8) Is there a kind of economic compensation scheme already?			
9) Are a greater number of enterprises and organisations among the members?			
10) Does at least one CC already exist in the area where the CN is active?			
11) Is there a general depression or lack of local economic activities in the area where the CN is active?			
12) Has the topic of community currencies already been discussed among the members?			
13) Is there a strong identification of the members with the CN and its mission?			
14) Are a good part of the members of non-technical and non-IT backgrounds?			
15) Would support or cooperation from local authorities or public entities be possible?			
16) Are there sufficient resources available for projects not directly targeting IT and the network?			
17) Would a long-term project, binding comparatively large resources be supported by the decision makers and the members?			
18) Are the board/leading members easy to inspire when it comes to good (but also complicated) ideas?			

An evaluation of these 18 questions could give strong indications as to whether a discussion about a community currency would be meaningful for the CN.

Hints for the evaluation of the questions:

- More than 6 question unknown ⇒ try to get more information first
- 14-18 times Yes ⇒ CCs might be a very good option for the further development of the CN.
- 8-13 times Yes ⇒ CCs could be taken into consideration but a deeper analysis is necessary.
- 0-7 times Yes ⇒ There is not enough evidence a CC could be a meaningful option for the CN.

6.4 Final remarks and research agenda

As a final remark, at the time of final editing of this deliverable an important event, the Internet Governance Forum, took place in Geneva and included two panels on CNs. In both panels the main discussion revolved around the question of economic sustainability.

This was the main topic of the first one, titled "Financing and Building Sustainable Community Networks - The Coolab experience"[32] chaired by Bruno Vianna, whose scope was actually much broader than the experience of Coolab in Brazil including interesting aspects of and a experiences of economic sustainability issues of community networks[33].

And sustainability was also the main question addressed by the panel[34] on a new book (11/2017) on Community Networks "Community Networks the Internet by the People, for the People", edited by Luca Belli[35]. A participant mentioned an examples of a fibre-based community network in Sweden, which collapsed after the founder retired or in an Indian example where public private partnership did not work out of economic perspectives but in some cases was able to be transformed into a community managed system including small private businesses of women what then came out to work sustainable.

This is an indication that despite the numerous successful examples around the world and the above referenced excellent analysis in the "bible" of Wireless Networks "Wireless Networking in the Developing World"[36], the issue of economic sustainability stays as one of the most challenging questions that CNs across the world need to address to survive.

But since there do exist sources of funding like the "Mozilla Challenge", the "Beyond the Net", and EU Horizon 2020, among others, the big question is how to invest them in ways that can generate organizations and communities that become afterwards independent, one of the key characteristics of sustainability.

As discussed already, community currencies could be seen as an additional common "infrastructure" that can support one or more CNs and which requires a certain level of investment to put in place initially but then can activate a wider range of economic actors around the Community Network and reduce significantly its overall monetary cost.

This dimension is extremely important in case the challenge is beyond covering the cost of the networking infrastructure. Lilian from Colnodo.apc.org (Colombia) highlighted at the IGF2017 panel a few such complementary areas that need to be taken care of toward economic sustainability, including the following:

- People have different abilities and could take different roles, which are all important (from technical to communication),
- Participation of different groups is required, including women,
- Flexibility is important and a need of diverse kinds of organization involved because things might not go as expected and one needs to be flexible,
- Making transparent the difficulties and the challenges for people to assume their responsibilities.

Exactly these topics could be addressed by community currencies. They are a useful instrument to foster these aspects of economic sustainability since by construction they include different skills and services and make visible the nature of the economy.

32 http://www.intgovforum.org/multilingual/content/igf-2017-ws-111-financing-and-building-sustainable-community-networks-the-coolab-experience
33 The live recording: https://www.youtube.com/watch?v=nAQx0nQFEXU
34 The live recording: https://www.youtube.com/watch?v=cplL3Owpcao
35 http://tinyurl.com/CommunityNetworks
36 http://wndw.net/

As stressed multiple times, the blockchain technology poses both challenges and opportunities for community currencies. The challenges are related to mis-information and lack of deep understanding of the nature of money while the opportunities lie in the increased interest on alternative solutions to currency design and the technological means to implement more complex currency models, like the District Currency, for example.

Since the submission of this deliverable marks also the end of the corresponding task, we can only conclude with a few important points regarding a future research agenda that might prove useful for initiatives like Ammbr, with whom netCommons has interacted from the very beginning, and has probably influenced in its early stages.

So, for endeavours like Ammbr, the following four challenges are identified that any blockchain-based currency scheme for CNs could consider, address and research about:

1. Explore in depth the trade-offs from allowing or not the exchangeability of the currency with other cryptocurrencies (and through them to fiat currency);
2. Separate the accounting from the currency management layers and for the latter allow for the customization of important variables and ideally assume collective decision-making processes about their actual value;
3. Consider federated scenarios in which currencies have a “regional” scope but can be exchanged between different systems allowing both for local autonomy and self-determination and sufficient scale;
4. Pursue collaborations with existing community currency schemes that have experiences in alternative approaches in managing an economy and include also non-technical dimensions, like community building, in the corresponding project.

Bibliography

netCommons Deliverables and Links to their Public Web Page

D1.1 Report on the Existing CNs and their Organization (v1)

D1.2 Report on the Existing CNs and their Organization (v2)

D1.3 Report on the Governance Instruments and their Application to CNs (v1)

D1.4 Report on the Governance Instruments and their Application to CNs (v2)

D2.1 The Multiple Aspects of Politics and Sustainability in CNs: Definitions, Challenges, and Countermeasures (v1)

D2.2 The Multiple Aspects of Politics and Sustainability in CNs: Definitions, Challenges, and Countermeasures (v2)

D2.3 Incentives for Participation in CNs (v1)

D2.4 Economic Sustainability of CNs (v1)

D2.6 Economic Sustainability of CNs (v2)

D2.8 Incentives for Participation in CNs (v2)

References

B. Braem, J. B. (2015). Analysis of end-user QoE in community. *Sixth ACM Symposium on Computing for Development (ACM DEV)*. London.

B. Braem, R. B. (2013). A case for research with and on community networks. In A. S. Communication (A cura di)., *43*, p. 68-73.

Amato, M. and Fantacci, L. (2012). The End of Finance, Cambridge UK

Antoniadis P. (2018). The Organic Internet: Building Communications Networks from the Grassroots. In: Giorgino V., Walsh Z. (eds) Co-Designing Economies in Transition. Palgrave Macmillan, Cham. Available at: https://rd.springer.com/chapter/10.1007/978-3-319-66592-4_13

Antoniadis, P. (2016). Local Networks for Local Interactions: Four Reasons Why and a Way Forward. First Monday. Available at: http://firstmonday.org/ojs/index.php/fm/article/view/7123/5661

Antoniadis, P. and Apostol, I. (2014). The Right(s) to the Hybrid City and the Role of DIY Networking. The Journal of Community Informatics, special issue on "community informatics and urban planning". Available at: http://ci-journal.net/index.php/ciej/article/view/1092

Antoniadis, P. , Ott, J., Passarella, A. (eds.) (2014). Do It Yourself Networking: an interdisciplinary approach (Dagstuhl seminar 14042). Dagstuhl reports, 4(1):125-151. Available at: http://drops.dagstuhl.de/opus/volltexte/2014/4538/

Antoniadis, P., Martignoni, J., Navarro, L. (2016): Economic Sustainability of CNs (v1) - Introducing Community Currencies (v1), Deliverable D2.4 from the netCommons.eu research project, Available at: http://netcommons.eu/?q=content/deliverables-page

Antoniadis, P., Martignoni, J., Franquesa, D., Baig, R., Navarro L. (2017). Community Currencies for Community Networks, paper and presentation at the IV International Conference on Social and Complementary Currencies, May, 10 to May, 14, 2017 in Barcelona

Antoniadis, P., Martignoni, J., Navarro, L., Dini. P. (2018). Complementary networks meet complementary currencies. In D. Rozas, P. De Filippi, and H. Samer, "Decentralizing the Commons", Amsterdam: Institute of Network Cultures.

Baig, R., Roca, R., Freitag, F., Navarro, L. (2015). guifi.net, a crowdsourced network infrastructure held in common, Computer Networks, http://dx.doi.org/10.1016/j.comnet.2015.07.009

Baig, R., Dalmau, L., Roca, R., Navarro, L., Freitag, F., Sathiaseelan, A. (2016). Making Community Networks economically sustainable, the guifi.net experience. In Proceedings of the 2016 workshop on Global Access to the Internet for All (GAIA '16). ACM, New York, NY, USA, 31-36. DOI: http://dx.doi.org/2940157.2940163.

Baldwin, J. (2010). MeshKit, Building & Sustaining Community Mesh Networks Parsons The New School for Design, Design + Technology Department New York https://de.scribd.com/document/62320219/MeshKit-jrbaldwin

Barnes, G. (2014). Money as a Commons, FEASTA The Foundation for the Economics of Sustainability, Briefing paper, September 5, http://www.feasta.org/wp-content/uploads/2014/09/money-as-a-commons1.pdf

Belli, L. (ed) (2017). Community networks: the Internet by the people, for the people http://bibliotecadigital.fgv.br/dspace/handle/10438/19401

Blanc, J. (2011). Classifying "Ccs":Community, complementary and local currencies types and generations, International Journal of Community Currency Research, ISSN 1325-9547

Bollier, D., Conaty, P. (2015). Democratic Money and Capital for the Commons – Strategies for Transforming Neoliberal Finance Through Commons-Based Alternatives, Report on a Commons Strategies Group Workshop, Heinrich Böll Foundation, Berlin

Boudet, D. (Ed.) (2017). New Housing in Zurich - Typologies for a Changing Society, Park Books, Zürich

Braem B. et al (2013)., "A case for research with and on community networks," ACM SIGCOMM Computer Communication Review, vol. 43, no. 3, pp. 68–73.

Cook Network Consultants (2015). Enabling the Network Commons. COOK Report. Volume XXIII, No. 12 & XXIV No. 1 March - April 2015, ISSN 1071 - 6327.

Cox, M., Arnold, G., Villamayor Tomás, S. (2010). A Review of Design Principles for Community-based Natural Resource Management, Ecology and Society 15(4): 38. [online] URL: http://www.ecologyandsociety.org/vol15/iss4/art38/

Dalmau Llagostera, T., Alonso, C.D. (2017): La turuta, moneda social local y ciudadana. The turuta, a local and community currency, Paper for the IV International Conference on Social and Complementary Currencies: Money, Awareness and Values for Social Change, May, 10 to May, 14, 2017 in Barcelona

D-CENT (2015): Design of Social Digital Currency, Report 4.4, Decentralized Citizens Engagement Technologies, EU-CAPS-Project, Available at: http://dcentproject.eu/wp-content/uploads/2015/03/design_of_social_digital_currency_publication.pdf

De Filippi, P., Tréguer, F. (2015). Expanding the Internet Commons: The Subversive Potential of Wireless Community Networks. Journal of Peer Production, Issue #6, 1-11. Available at: http://peerproduction.net/issues/issue-6-disruption-and-the-law/peer-reviewed-articles/expanding-the-internet-commons-the-subversive-potential-of-wireless-community-networks/

Dini, P., Kioupkiolis, A. (2014). Community Currencies as Laboratories of Institutional Learning: Emergence of Governance through the Mediation of Social Value, Presented at the Inaugural conference of the World Interdisciplinary Network for Institutional Research (WINIR), London, September 10-14, 2014.

Dodd, N. (2014). The Social Life of Money, Oxford

Duelfer, E., Laurinkari, J. (1994). International handbook of cooperative organizations, Goettingen

Edgell, S. (2012): The Sociology of work - continuity and change in paid and unpaid work, London, 2nd edition

Elsässer, M. (1984). Soziale Intentionen und Reformen des Robert Owen in der Frühzeit der Industrialisierung, Duncker & Humblot, Berlin

Engelhardt, W.W. (1985). Allgemeine Ideengeschichte des Genossenschaftswesens. Einführung in die Genossenschafts- und Kooperationslehre auf geschichtlicher Basis, Darmstadt

Faucherre, H. (1925). Umrisse einer genossenschaftlichen Ideengeschichte, Erster Teil, Heft 19, Verband schweiz. Konsumvereine (V.S.K.) Basel

David F., Navarro, L. (2017). Sustainability and participation in the digital commons. interactions 24, 3 (April 2017), 66-69. DOI: https://doi.org/10.1145/3058139

Forlano L., Powell A., Shaffer G., and Lennett B. (2011). "From the digital divide to digital excellence: global best practices for municipal and community wireless networks," lse research online documents on economics, London School of Economics and Political Science, LSE Library.

Fuchs, C. (2017). Sustainability and community networks. Telematics and Informatics, 34 (2): 628-639. Available at: https://zenodo.org/record/163751

Greenblat, C.S., Duke, R.D. (1981). Principles and practices of gaming simulation, Sage Publications, Beverly Hills.

Greenblat, C.S. (1988). Designing games and simulations. An illustrated handbook. Newbury Park: Sage Publications.

Grüske, K-D., Recktenwald, Horst Claus (1995). Wörterbuch der Wirtschaft, Kröner Verlag, Stuttgart, 12. Auflage

Helfrich, S., Kuhlen, R., Sachs, W., Siefkes, C. (2009). Gemeingüter – Wohlstand durch Teilen, Heinrich-Böll-Stiftung, Berlin

Helfrich, S., Heinrich-Böll-Stiftung (Hrsg.) (2009). Wem gehört die Welt? Zur Wiederentdeckung der Gemeingüter, oekom, München

Hirota, Y. (2011). What have Complementary Currencies in Japan really achieved? - Revealing the hidden intentions of different initiatives, International Journal of Community Currency Research 15 (2011) D 22-26

Hirota, Y. (2012). Monedas sociales y complementarias (MSCs): Experiencias, su papel en la economía social, estrategias, marketing y políticas públicas, master thesis, Universitat de València, Spain

Hugentobler, M., Hofer, A., Simmendinger, P. (2015). More than housing: Cooperative Planning - a case study in Zurich, Birkhäuser Verlag, Basel

Iosifidis, G., Charette, Y., Littera, G., Tassiulas, L., Christakis, N. (2015). Network Analysis of the Sardex Community Currency (September 23, 2015). Yale Day of Data. Paper 4. http://elischolar.library.yale.edu/dayofdata/2015Posters/4

ISOC report: Supporting the Creation and Scalability of Affordable Access Solutions: Understanding Community Networks in Africa https://www.internetsociety.org/wp-content/uploads/2017/08/CommunityNetworkingAfrica_report_May2017_1.pdf

Kennedy, M., Lietaer, B.A., Rogers. J. (2012). People Money - The promise of regional currencies. Axminster, Devon

Lietaer, B., Arnsperger, C., Goerner, S., Brunnhuber, S. (2012). Money and Sustainability - The Missing Link, A report from the Club of Rome, EU-Chapter, Triarchy Press, Axminster UK

Littera, G.,, Sartori, L., Dini, P., Antoniadis, P. (2016). From an idea to a scalable working model: merging economic benefits with social values in Sardex. International Journal of Community Currencies, December 2016.

Mankiw, G. (2010). Macroeconomics, Worth Publishers, New York, 7th edition

Marshall, A. (1895): Principles of Economics, MacMillan & CO, New York, 3rd edition

Martignoni, J., Gröbly, T., Weber, J., Klöti, M. (2013). Quartierwährung – Vorschlag einer eigenen Komplementärwährung für die Baugenossenschaft mehr als wohnen auf dem Hunziker Areal; Fachhochschule Nordwestschweiz (Hrsg.); Windisch

Martignoni, J. (2015). Quartierwährung – Ein Modell zur Ressourcenmobilisierung für Bau- und Wohngenossenschaften, In: Andeßner, R./Greiling, D./Gmür, M./Theuvsen L. (Hrsg.): Ressourcenmobilisierung durch Nonprofit-Organisationen- Theoretische Grundlagen, empirische Ergebnisse und Anwendungsbeispiele, Linz

Martignoni, J. (2015A):.Cooperation and Intertrade between Community Currencies : From fundamentals to rule-making and clearing systems, including a case study of the Zurich Area, Switzerland, International Journal of Community Currency Research 19 (D) 137-151

Martignoni, J. (2017). The District Currency – a new currency design for managing the commons, Paper and a presentation at the IV International Conference on Social and Complementary Currencies, May, 10 to May, 14, 2017 in Barcelona

Martignoni, J. (2018). Das Geld neu erfinden - Alternative Währungen verstehen und nutzen, Zurich

Martignoni, J. (forthcoming). The District Currency – a new currency design for managing the commons, paper for the International Journal of Community Currencies

Medosh, A. (Forthcoming). The Rise of the Network Commons. Draft available at: http://www.thenextlayer.org/NetworkCommons

Micholia, P. et.al. (2016). Incentives for Participation and Active Collaboration in CNs. Deliverable D2.3 from the NetCommons.eu research project, Available at: https://www.netcommons.eu/?q=content/incentives-participation-cns-v1

Micholia, P., Karaliopoulos, M., Koutsopoulos, I., Navarro, L., Baig, R., Boucas, D., Michalis, M., Antoniadis, P. (2017). Community Networks and Sustainability: a Survey of Perceptions, Practices, and Proposed Solutions, submitted to IEEE Communications Surveys and Tutorials/COMST-00238-2017 (9th of June 2017)

Navarro, L. et.al. (2016). Report on the Existing CNs and their Organization, Deliverable D1.1 from the NetCommons.eu research project, Available at: https://www.netcommons.eu/?q=content/report-existing-cns-and-their-organization-v1

Navarro, L., Baig, R., Freitag, F., Tréguer F., Maccari, L., Micholia, P., Antoniadis, P. (2016). Report on the Existing CNs and their Organization (v2), Deliverable D1.2 from the NetCommons.eu research project, Available at: http://netcommons.eu/?q=content/deliverables-page

Navarro, L.,, Baig Vinas R., Barz, C., Bonicioli, J., Braem, B., Freitag, F., Vilata-i-Balaguer, I. (2016). Advances in wireless community networks with the community-lab testbed, in IEEE Communications Magazine, vol. 54, no. 7, pp. 20-27, July 2016. doi: 10.1109/MCOM.2016.7509374, or under http://ieeexplore.ieee.org/document/7509374/

New Economics Foundation (2015). People Powered Money – Designing, developing & delivering community currencies, New Economics Foundation, London. (free e-Book available under http://communitycurrenciesinaction.eu/peoplepoweredmoney/)

North, P. (2013). Ten Square Miles Surrounded by Reality? Materialising Alternative Economies using Local Currencies, Antipode Vol.46 No. 1, pp 246-265, doi: 10.1111/anti.12039

North, Peter (2014): Complementary currencies, In: Parker Martin, Cheney, Georg, Fournier, Valérie, Land, Chris: The Routledge Companion to Alternative Organization, Oxon, UK, pp.183-194

Ostrom, E. (2009A). Beyond Markets and states: Polycentric Governance of complex economic systems, Nobel Prize lecture, Dec. 8, 2009 Stockholm, p. 408-444

Ostrom, E. (2009B). Was mehr wird, wenn wir teilen. Vom gesellschaftlichen Wert der Gemeingüter. Herausgegeben, überarbeitet und übersetzt von Silke Helfrich. Oekom, München. Download unter https://dl.dropboxusercontent.com/u/15261457/ostrom.pdf (27.10.2014)

Ostrom, E. (1990). Governing the commons: the evolution of institutions for collective action. Cambridge University Press, Cambridge, UK.

Powell A. and Shade L.R.(2006). “Going wi-fi in canada: municipal and community initiatives,” Government Information Quarterly, vol. 23, no. 3-4, pp. 381–403

Powell A. (2008), “Wifi publics: producing community and technology,” Information Communication & Society, vol. 11, no. 8, pp. 1068–1088.

Renert, J. (2013): Increase Community Currency Circulation: Back It with Appropriate Core Resources, Paper for the 2nd International Conference on Complementary Currency Systems (CCS), Den Haag, 9-23 June 2013 available at https://www.iss.nl/sites/corporate/files/Joey_Renert.pdf (access 09.02.18)

Ryan-Collins, Josh, Schuster, Ludwig, Greenham, Tony (2012): Energising Money – An introduction to energy currencies and accounting, the new economic foundation, London

Saint Girons, S., Fabre, C. (2017). Libre-currency for sustainable social change - Une monnaie Libre pour des innovations sociales soutenables, conference paper, the IV International Conference on Social and Complementary Currencies in Barcelona 2017

Samuelson, P. A., Nordhaus, W.D. (2010): Volkswirtschaftslehre, 4. Auflage, München.

Schlager, E., Ostrom, E. (2015). Property-rights regimes and natural resources: A conceptual analysis,” Elinor Ostrom and the Bloomington School of Political Economy”: Resource Governance, vol. 2, p. 101.

Stadt Zürich, Umwelt- und Gesundheitsschutz Zürich UGZ (2011): Unterwegs zur 2000-Watt-Gesellschaft - Wie Zürich zu einem nachhaltigen Umgang mit Energie kommt; herunterladbar unter https://www.stadt-zuerich.ch/gud/de/index/umwelt_energie/2000-watt-gesellschaft/publikationen/unterwegs-zur-2000-watt-gesellschaft.html, Zugriff 15.03.17

Stodder, J. (2009). Complementary Credit Networks and Macro-Economic Stability: Switzerland's Wirtschaftsring, Journal of Economic Behavior & Organization, 72, October, 2009, pp. 79–95.

Widmer, H.E. (2013). „The Power of Neighbourhood" und die Commons, Verein Neustart Schweiz, Zurich

Wiener, N. (1948). Hermann & Cie, ed. Cybernetics; or, Control and communication in the animal and the machine. Paris: Technology Press. Retrieved 3 June 2012.

WNDW (2013). Wireless Networking in the Developing World, Third Edition, February 2013, available at http://wndw.net/download/WNDW_Standard.pdf

Appendix

Play in Karthago (Nr.9)

Our first regular game workshop in 2017 was held at the housing cooperative Karthago in Zurich, 8th of April 2017 including the deployment of a local wifi-zone and the hybrid letterbox as a win-win collaboration with the MAZI-project to support the democratic processes in the game. The 18 participants were guided by three game managers, introducing the situation and facilitating the process.

Changing the tasks of the commons assembly into job descriptions and job offers by the commons commission (Photo: I. Apostol)

Questions and discussions during the final evaluation (Photo: I. Apostol)

Special Remarks

An interesting situation occurred with the children's caretaking in the game. After the first round a lack of caretaking abilities was stated and the commons assembly assigned unused rooms to a new childcare site. But this official supply did not satisfy all parents. So later on two competing private initiatives emerged and offered cheaper service for childcare. Surprisingly, all of these “businesses” did survive and provided a wider variety of selection options, as a real market would do as well. The initially unsatisfying situation for the parents was resolved. Another discussion was how the quality of work paid by the commons commission would be secured and how the community would handle either lacking quality, or the event that no qualified person for the work could be found among the members. It became clear then that an implementation of Ostrom’s rules for the commons (Ostrom, 2009A) would be necessary and that clear and detailed regulations had to be negotiated to properly implement the district currency.

Examples of Hybrid-Letterbox-Feedback-Cards

used at Game Nr.9, Karthago, Zurich 08.04.2017 (selected sample)

Hallo!
I am very exited to be here today!
:)

What is of utmost importance to me is the free, collective spirit of a cooperative. I very much enjoy to be together with people who share the same ideas with me and have the opportunity to partake in common actions with them!

THIS IS A GUESTBOOK

Connect to "Flexonomix"
Go to: http://192.168.72.2/
or just throw a card in the box!!!

WILLKOMMEN!
Quartierwährung

Umbenennung des Wortes „Freiwilligenarbeit"
→ unbezahlter Beitrag für eine schönere Welt

VORSCHLAG
DUTY-FREE ZONE

Studis können sich individuelle Kinderbetreuung nicht leisten →
Wir brauchen eine Kita!

Handwerker gesucht!
Extern?

Taxen, wofür?

WER TEILT MIR MEINE ZEIT ZU?

WOHIN MIT MEINEM LUXUS?

ich arbeite gern ehrenamtlich, aber woher kann ich dann meine Taxe nehmen?
Adelheid, Allmendkommission

Play in Barcelona (Nr.10)

During the 4th International Conference on Social and Complementary Currencies in Barcelona (10. to 14. of May 2017) a next game workshop was held. While the workshop in Karthago was directed towards cooperative members or possible users of such a district currency, the audience in Barcelona comprised mostly currency experts, typically more critical towards new currency designs and the promised effects. So it was very nice to see that the game did also work among such participants and that some of them got very excited about the capabilities of the game as an educational instrument.

The cash-desk and the office of the commons-commission had a lot of traffic (Photo J. Martignoni)

Trading and shopping around the coffee shop (Photo J. Martignoni)

Discussions and decision taking in the commons assembly was a challenge for the internationally compiled participants (Photo J. Martignoni)

Special Remarks

The question of "how close to reality" the game could be was inherent. A new idea for a possible service emerged with a participant offering "photo services" that were real portrait-photographs on her digital camera which she promised to send after the conference. The service was very well used. The feeling of scarcity caused by the taxpaying was also discussed and compared to the feeling of abundance of others receiving a lot by working much. How the ideal balance should look like? Ideas of income related tax appeared and were held against mor flow-oriented models if everybody would start to feel more comfortable with the Q after some rounds.

Play in mehr als wohnen II (Nr.11)

As the first game in mehr als wohnen 2016 was very successful but did not reach enough participants and especially did not involve people of the governing bodies of the co-operative, the local group wanted to repeat the game in 2017. They were also interested to gain more experience and have the game more adapted to the local situation. So a second attempt was started and prepared much more carefully than the first. The members of the local group were introduced in the details of the game and the scenery, roles and tasks were adapted as much as possible to the actual situation in the co-operative.

The commons assembly preparing to start the discussion (Photo: T. Rozniece)

The commons assembly voting to take decisions (Photo P. Antoniadis)

Special Remarks

One most interesting aspect of this play was a kind of recession in the local economy happening due to an initial miscalculation of the tax amount. The monetary supply was therefore shortened by 30% in the first round. The effect was an increasing difficulty for the residents as well as for the shops to earn their necessary monthly amount to pay the tax. The players started to complain about these difficulties. One idea that was proposed to solve the problem was a substitution of the lacking Q-money by a possibility to buy in with Swiss Francs. Another idea was to improve the turnaround by purchasing more and selling more at the same time, and so compensate the missing supply. During the second month of the play much of this pressure

could be removed due to the now correctly calculated tax. This interesting happenings showed that indeed recession could be caused by an insufficient money supply and that the management and proper or improper stirring of the currency does immediately affect the economy. For a real deployment of the District Currency a set of reliable indicators has to be prepared and the sufficient money supply has to be ensured also by buffering options.

Game Instruction District-Currency-Game

Introductory Version (Workshop A)

(Edition E/A-1.8, 10.05.2017)

Introduction

Today's money is not neutral, but forces growth at all costs. It does not prevent the exploitation of human beings and nature, nor does it respect the boundaries of nature, nor of a functioning community: the rich are richer and the poor are poorer. But there are other monetary systems that allow and promote solidarity and justice - the complementary currencies. In the workshop the example of the newly developed district currency is presented and tried out with a simple game.

The game shows in a rough outline how a community-based district currency can function in a neighbourhood or housing cooperative or settlement environment. The processes and cycles of money are made visible and the function of money in a sustainable economy becomes apparent. In the game a paper currency with money notes is used to make the money movements easier to grasp. In real implementation the same could also happen with cards or mobile phone-based money.

Tasks and goals of the game

General goal: Make the experience of a totally different commons centred money!

- Identify what is done for the community
- Ensure participation for all
- All Community tasks are carried out
- Many other needs can also be fulfilled
- As many skills as possible can be introduced
- Everyone makes a contribution to the periodic tax contribution
- Achieve a stable circulation situation for the entire system

Roles

Characters	**minimal** number of actors*	**maximal** number of actors **
Commons commission (coordination, budget, jobcentre, reporting)	1	3
Cash desk (Cash management, accounting, reporting)	1	2
Residents (collaboration, services, consumers)	5	20
Businesses (Services and products)	2	6

TOTAL between	9	31

In addition, 1-3 coaches (game managers) who explain the game initially guide it until all know how to do it, then watch and assist, and ensure the evaluation and documentation.

*) A minimum number of people is given by the functions of the game with a minimum of exchange possibilities necessary.

**) A maximum number of people is given by the number of available role cards and the entire complexity.

Schedule of the workshop

Overview

This is the short introductory version (Workshop A). The game is played only one round (Month) so it gives a first glimpse of the effects and happenings but does not allow too much in depth investigations. Some elements of the full version are taken out to simplify the game. Strict time management is necessary to make it happen in such a short time.

Part		Time (min.)
I	Introduction	10
II	Preparation	15
II	Game	45
IV	Closing discussions	30
	Total	***100***

The necessary time for preparation of the room and material for the leading team is at least 15 Minutes. After the game at least 15 Minutes are needed to collect, recover and repack all material.

Details step by step

I) Introduction

1) Welcome, structure and schedule (audience sitting versus screen and presenters)

2) Introductory Powerpoint:

- What is it about
- What is a District Currency
- The Game
- Scenery

3) Get up and come together in a circle (take chairs)

II) Preparation

4) Explanation of the game in the room:

- Play situation: Quartier (room) explain: 4 quadrants residential, commercial, administration, open spaces and parks, plus "central" market place
- Instructions: Read the example and the illustrating sequence
- General presentation of the 4 actors (role-types), roles description

5) Roll distribution:

- Election of Commission and cash desk
- Business (who wants what)
- Residents receive plates (random selection)
- Self presentation, who is who (short from tag: only name, profession, family!)

6) Briefing and preparation of the teams by coaches:

- Cash desk
- Commons commission
- Businesses and residents

7) Registration of residents and businesses at the cash desk, receiving starting contribution by cash desk

II) Play

1. Month

8) 1st Signal beginning of the month

9) **1. Commons Assembly (C.A.)** *->see agenda*

10) Opening Marketplace with adds from residents and opening businesses with attractive range of products and services

11) Opening oft he application for jobs by commons commission

12) Working and shopping (Q against product and service cards), consumption -> life

13) 2nd Signal near-end of the month:

- Paying the tax at the cash desk desk (residents and businesses)
- Checking and balances by cash desk
- Checking and logging commons commission activities

14) 3rd Signal end of the month

IV) Closing discussions

15) Commons Assembly (C.A.) for overall evaluation

- Official reports cash desk and commons commission
- Reports of the residents&businesses about their lives, telling their cash balance

- Complete the game, checking out the bills & tags at the cash desk and leave the game-setting

16) **Final open discussion:** Opinions, questions and contributions, discussion of the district currency idea

17) conclusions, reflection on reality (to be logged if possible)

18) Good bye, clean up

Scenery (read out)

Initial Situation: Description of the housing cooperative:

The residential building cooperative was able to acquire a large former industrial property a few years ago and has now been able to build a whole new quarter in ecologically advanced construction. In the new apartments that could be recently moved into, a colorful mixture of people of all ages, income classes and nationalities lives. All of them share the conviction that they are resource-conserving and that the care of the neighbourhood is important. In addition to the lease, they have also signed a document that they are committed to participate in the revival of the Community and to actively cooperate. This is done by means of a regular inhabitant tax, which has to be paid in a special complementary currency the District Currency with its denomination "Q" (Quarter). One can acquire this complementary currency through cooperation and participation, by offering talents or by offering services and goods.

Example (read out)

A deliberately reduced example of the use and function of the local currency could be the following:

- The General Assembly approves a budget of 200 Q for the next period for care for the greens. An occupancy tax of 50 Q and commercial tax of 100 Q per month applies.
- The commons commission is creating a job for this, for example: A gardening aid of 20 hours à 10 Q.
- Resident A receives the whole job. The money is thus paid to him after the work is done.
- He does a computer training with resident B (who has put an ad on the board) 2.5 hours à 20 Q = 50 Q and goes with the family to the restaurant with businessman C to eat for 100 Q.
- At the end, the tax is drawn in by all (A = 50 Q B = 50 Q and C = 100 Q). The circuit is closed and the money redeemed

We therefore have cycles of the currency, which allow to be satisfied both, the needs of the cooperative, ie the commons, as well as many personal needs of the inhabitants. And all this happens locally and as sustainably as possible.

Task Sheets

Following task sheets are basic checklists for the different roles. Please let the players read them carefully.

Commons Assembly (C.A.)

Agenda

1. Welcome and introduction by moderator (commons commission member or coach in first round)
2. Counting and determination of the valid number of voters and the minutes
3. Report about work and previous budget (CC)
4. Upcoming and permanent regular work (CC)
5. Other applications for work or projects
6. Request and vote on budget
7. Determination of individual and commercial contributions. Resulting taxes
8. Summary

Welcome and Introduction

I warmly welcome you to the monthly General Assembly for the definition of community work and contributions. I lead the meeting as an external moderator.

We have (xx) present voting members of the cooperative. As an external, I will also act as a voice counter. The colleagues from the commons commission make out who is to draw up the short resolution protocol. Aha, Mrs (zz) will do it, thank you (write on paper).

Stand work and previous budget

Default for Round 1:

- You are reminded that we set the benchmark for the hourly rate for work for the cooperative at 10 Q. The range for justified deviations for the commissions is 5-25 Q per working hour.
- Last month, we were able to generate a total of (yy) working hours with a budget of (xxx) Q. The following work was done:
    - Maintenance work for building Alpha
    - Waiting for house gamma
    - clearing and gardening in the Permaculture
    - Detachments Reception Weekend
    - Area tours for visiting groups
    - Renovation work wooden wall nordwest (finished)
    - In the short term, we were able to use a new help at the children's playground because the budget for the clearing of the leaves had not to be exhausted.

The above values and list is depending on number of participants. From round two it has to be adapted to the real reports.

Upcoming and permanent regular work

- Next month, we want to continue the above work. In addition, help at the children's playground is asked to be established.
- We therefore request to approve the previous budget of xxxx Q also in the next month.

Other applications for work or projects

- Are there other applications for work and operations?
- Evtl. from round two: also consider cultural projects or groups.
- Discussion and voting

Cooperation in the cooperative, determination of individual and commercial contributions

- As information for all: Up to now, the ratio of individual contributions of the inhabitants to the contributions of the industry has been set to 1: 2.

  The question is whether this can be left as it is (voting)
- Poll
- Then we have the following conditions for the coming month: Residents have to pay a tax of xx Q and commercial enterprises one of xxx Q.
- Thank you, so we can conclude the meeting.

Cash desk

The cashiers of the district currency cash desk are important facilitators for ensuring a correct and healthy cash flow and for monitoring contributions. The "employees" of the cash desk are members of the cooperative and therefore also have a vote at the commons assembly. The cash desk office works closely with the commons commission and provides necessary facts and figures. The team of the cash desk is the guardian of the currency and has at all times under control how much Q are currently in circulation.

Tasks

- Registration of the residents and businesses (names, commercial activities), registration and withdrawal of accounts and settlements.
- Issuing the start-up money to residents and businesses
- Issue of the district currency according to the approved budget of the commons assembly to the commons commission
- Money exchange (small / large notes)
- Carrying out the accounting (money creation / return)
- Preparation of the circulation statistics, report at the Commons Assembly
- Checking out of participants: Collecting all bills and name-tag, logging both

For the beginning, a set of tasks, contribution levels, etc. is given by the Commons Assembly, which initiates the system. Any modifications lead to deviations and would need a new calculation.

Goals

- Currency under control, until the last bill!
- Payouts and deposits are accurately registered
- Friendly customer service
- Good contact with the commons commission
- Despite dry arithmetic in the background: get to know the neighbourhood
- Have fun

Tips

- Find out in the team who would rather serve customers and who would prefer to have the financial overview.
- Count exactly the number of bills of each denomination at start and at the end!

Commons Commission

The Commons Commission is an important body within the cooperative. Their (in reality chosen) members are members of the cooperative and therefore also have a vote at the commons assembly. This assembly is, however, managed by them, and in the case of conflicts of interest they enter into the standoff or do not vote.

The Commons Commission primarily regulates cooperation and participation in the commons (common property, building, land, infrastructure, common tasks) and contributes to ensuring that the cooperative meets the objectives of sustainability and low energy consumption. To this end, it promotes the internal and local economy in the district and among cooperative members, as well as settles suitable commercial enterprises. The Commission shall receive the decided monthly budget (paid by the cash desk), which will be issued as fully as possible for the tasks and activities defined by the General Assembly. To do this, the CC derives tasks as jobs and assigns them to suitable applicants. After the work has been completed, they are paid out.

Tasks

- Split the (monthly) budget into the different work orders, define the tasks and jobs
- Advertising the jobs on the board
- Choosing and hiring the applicants
- Paying out wages
- Control the results and move the products performance cards
- Display the results (flip chart)
- Conducting the General Meeting (together with the moderator / leader)
- Suggesting necessary tasks, calculating the budget for the work

Goals

- Optimal performance of tasks
- Good selection of candidates, in case of professional possibility wide and alternating consideration of the applicants
- Friendly handling of employees, transparent selection procedures
- Overview of the district, what tasks it needs in the future, proposals to the Commons Assembly
- Calculate budget
- Good contact to the cash desk
- Despite many tasks: to get to know the quarters
- Have fun

Tips

- A person works in the budget, one more with residents and the applications
- Jobs with good title clear and brief, what is expected, note the number of hours and payment
- At the General Assembly report on how the tasks could be fulfilled, what difficulties occurred and what was recommended for the next period.

Budget of the Commons Commission

The following presumptions and decisions were valid for the work of the commons commission:

- Guideline for the approach for work for the cooperative 10 Q per working hour
- The bandwidth for justified deviations of regulation a) for the commissions is between

  5-25 Q per working hour. Reasons for deviation could be:
  - plus: more difficult work, higher qualification, difficulties finding people
  - minus: easier work, smaller efficiency (young people, elderly), very popular jobs

Example

The cooperative has 6 residents and 2 businesses. Three tasks are prepared as follows:

Budget draft

- Renovation of a wall — 20 hours à 10 Q, = 200 Q
- Gardening assistance — 30 hours à 10 Q = 300 Q
- Computer support for cash desk — 25 hours à 20 Q = 500 Q
- Total proposed budget of the Commons Commission — A = 1'000 Q

This would result in a residents tax of 100 Q and a business tax of 200 Q

(f = 2: 1), Tr = (1'000 / (6 + 2 * 2)) = 100, see formulas)

This can be too much, so the CA maybe would reduce the budget to reach e.g. only 50 Q for residents. Then the CC has to adjust all jobs to the new budget, e.g.:

Budget Version 2

Total accepted budget of the Commons Commission — A = 500 Q

- Renovation of a wall (without painting) — 10 hours à 10 Q, = 100 Q
- Gardening assistance (lesser weeding) — 10 hours à 10 Q = 100 Q
- Computer support for cash desk — 20 hours à 15 Q = 300 Q

Businesses

The companies are renting space in the cooperative, are members of the cooperative and therefore have a vote at the Commons Assembly.

They want to be as sustainable as possible and therefore trade as much as possible of the sales locally in the district and among co-operative members.

Businesses sell products and services and can purchase them from the residents. At the end of the month, they pay a business tax as a contribution to the general services of the cooperative, which they also benefit directly or indirectly.

Tasks

- Shop / store well set up
- Sale of services or products against local currency.
- Benefits of services of the other trade or the inhabitants.
- Keep an overview of the products and services sold (may make list)
- Payment of the business tax at the end of the period.

Goals

- Create a good offer that is needed in the neighbourhood
- Meet their own needs in the internal market
- Get in contact with people, get to know the neighbourhood
- Sufficient district currency to pay the tax
- Have fun

Tips

- Make offers and make them visible. Create imaginative cards.
- You can also place ads on the Marketplace at Offers / Demands.

Residents

The residents are members of the cooperative and also live in appartments of the cooperative. They are involved in the cooperative and participate in the work, among other things that their rent in official-currency remains low.

Residents can either work directly for the cooperative work and apply for jobs at the Commons Commission or offer their services and products to other members to contribute to the community. They can purchase any products and services from businesses or buy from other residents. At the end of the month, they pay the residents tax as a contribution to the general services of the cooperative, from which they benefit directly and indirectly.

Tasks

- Cosy home setting
- Offer their own services according to their abilities
- Cooperation in the cooperative, acceptance of a job or job of the Commons Commission (voluntary)
- Benefits of services of the trade or other residents
- Payment of the residents tax at the end of the period
- Overview of your own cash position

Goals

- Use your own abilities needed in the neighbourhood
- Meet their own needs in the internal market
- Get in contact with people, get to know the neighbourhood
- Sufficient local currency to pay the tax
- Have fun

Tips

- Create offers and post well-designed advertisements on the marketplace offers / demands.

Help sheet: Possible tasks and duties in the district

Questions

- What needs our neighbourhood, where are problems that we want solved?
- What is missing, must be done or should be improved?
- What do we want to achieve together and are ready to do?
- How can we live better and have more fun?

Fields

- Cleanliness
- Waste, recycling
- Construction, infrastructure, maintenance
- Safety
- Child friendly, Senior friendly
- Nature, garden, green
- Learn, network, talk
- Knowledge, education
- Celebrations, parties

Possible tasks and job-descriptions, list of ideas

1. Maintenance Permaculture community garden: Saturday or evening, weeding, watering, harvesting
2. Help desk (s) for three houses (alpha, beta, gamma): Saturdays or evenings, cleaning, small repairs
3. Guided tours for visiting groups: during the day, good knowledge of the neighbourhood, languages
4. Reception, administration, information and telephone service Saturday or evening, language skills
5. Cultural events: Organization of artists
6. Help with recycling: Saturday or evening, clean up, sort, clean
7. Supervision Children's play area: during the day and weekend, contact person, guardian, clean up
8. Help with snow clearing: very early or during the day, powerful, handling machines
9. Painting and renovations, assistance with the renovation team, craftsmanship
10. Office and storage: On Friday afternoons, simple office work, exact, dutiful, reliable
11. IT help, help with the design and updating of the website, maintenance database

Further Information

Toolbox, Download

All the material necessary for the game is open source and will be prepared and available online during 2018 as District-Currency-Game Toolbox at http://flexonomix.games.

There will be available a more detailed game instruction for the long version of the game and Excel-sheets for the management and evaluation of the game. Video tutorials are planned but depend on further funding of the project.

Legal terms

Version E/A-1.8, 10.05.2017, jm

Game design and currency design: Jens Martignoni

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