Researching the urban as a metabolism to find a bottom-up strategy for the regeneration of Overvecht

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ABSTRACT

This paper examines a new approach to regenerate the neighbourhood Overvecht in Utrecht by tackling some of its problems using a bottom-up strategy. The neighbourhood is approached as a metabolism using a Material Flow Analysis (MFA) and an Urban Political Ecology (UPE) approach. The UPE unveils relational problems while the MFA gives more insight in the different flows in the neighbourhood. The research is limited to the neighbourhood Overvecht and focusses on the money flows. The goal is to find a strategy which empowers the inhabitants by creating businesses and housing which are using the existing money flows in a more efficient way. The strategy found is one of creating hubs throughout the neighbourhood enhancing the local economy. The steps in the strategy are tested by applying them to an example hub.

KEYWORDS: *NEIGHBOURHOOD REGENERATION, BOTTOM-UP STRATEGY, BUSINESS CREATION, MONEY FLOWS, EMPOWERMENT*

1. Introduction

When one steps out of the train at the train station in Overvecht, one seems to be on a border: a border between popular and not popular, between mainly high educated and low educated, between unemployed and employed; between wealthy and not wealthy. If one looks at the lifebarometer showed in figure 1, one can see the distinction on the map, between dark red (unsatisfactory) and dark green (excellent).

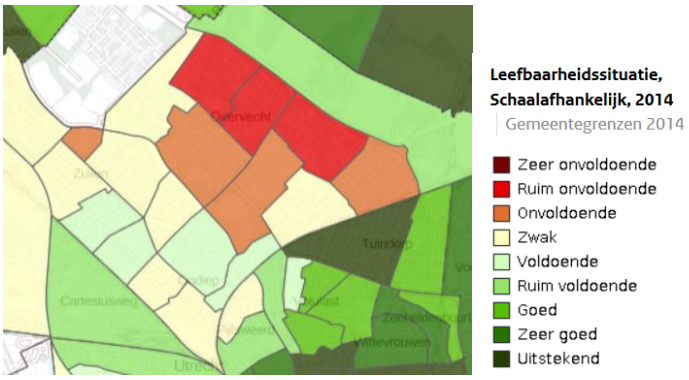

Figure 1. lifebarometer, between red and green (leefbarometer, 2016)

This division has not been like that since the completion of the neighbourhood. On the contrary, Overvecht, a neighbourhood which has been built in the 60's, got a warm welcome by its new inhabitants. In an era with a lack of housing and impoverished city centres people were happy to move to the modern apartments in Overvecht. In the beginning, around 80% of the neighbourhood consisted out of social housing which made it payable for many to move in. Due to the popularity, the number of inhabitants increased quickly to around 37.000 people until the 70's. It was after the 70's and during the 80's that the status started to change. Many inhabitants made career and moved out of the neighbourhood. With 80% of social housing, there was no place for them in Overvecht. They made place for new groups which mainly were low educated guest workers assigned to do low skilled factory work (Swieringa et al., 2011). Coming from a different cultural background, being low educated and

having difficulties mastering the Dutch language, made these new inhabitants belong to the weaker groups of society.

The different problems within the neighbourhood have been rising ever since and it is since 2007 that Overvecht was listed as one of the 40 ‘problem neighbourhoods’ of the Netherlands, initiated by the former minister Vogelaar (Gemeente Utrecht, 2007, Gemeente Utrecht, 2010). There has been critique on the term as it generalizes the problems which exist. A general approach, by a general mindset, seeks for general solutions. Thereby, they do not scrutinize where the problems really come from. Is it the built environment, the social structure, maybe both or something else? As a result, many municipalities use the status of problem neighbourhoods to intervene in the built environment trying to create more mixed neighbourhoods. This mainly happens by demolishing old apartment blocks and rebuild new ones. Some former inhabitants must leave the neighbourhood, while more wealthy, higher educated ones will find their new place. This might improve the neighbourhood, though it likely moves the problems to other areas. By displacing former inhabitants it likely raises the feeling of losing control over their own living environment. Thereby, this process only forms a short-term solution to the problem which raises the question whether this is a necessary and legitimised action (Sakizlioglu and Uitermark, 2014, Musterd, 2009). Can the problems not be solved in a different way? Is it possible to form a strategy starting with the grassroots of the neighbourhood? Can the inhabitants be empowered and become an important actor within the regeneration of the neighbourhood?

Hence, the objective of this paper is to find a strategy which empowers the inhabitants on the one hand and on the other will be able to regenerate the neighbourhood. This broad objective is narrowed down by reviewing the money flows in the neighbourhood to see if the inhabitants can use these to empower themselves by taking control over their own housing and businesses within the neighbourhood. What follows will be a step by step strategy. The strategy is tested on an example hub to review its viability. Altogether this should answer the question:

What strategy can the inhabitants of Overvecht use to empower themselves by using existing money flows to take control over their own housing and businesses?

The structure of this paper exists out of 3 parts. The first part will provide a neighbourhood strategy by starting with a brief research of the environmental, social and economic characteristics of the neighbourhood followed by an overview of the existing money flows and the benefits of a local economy. The second part is a strategy for hubs within the neighbourhood which starts with a research of opportunities within existing systems. After the opportunities certain businesses are chosen and further researched to come to an overview of characteristics and a proposed sequence of applications. Next will be the implementation in which a location needs to be chosen and a space needs to be designed. The third part will use the example hub to make an assumption of the impact of the strategy on the neighbourhood and provide feedback on further improvements of the strategy.

2. Methodology

The approach in this paper is to see the urban environment as a metabolism. To approach something as a metabolism has been done for centuries, but mainly by natural science, such as biology and chemistry, but not by social science (Brunner and Rechberger, 2004). It was Wolman (1965) who first introduced the term urban metabolism and analysed the flows of water, sewage and air pollution by using a material flow analysis (MFA). Since his work there have been many others which used this method to analyse different flows within cities (Kennedy et al., 2011).

The urban metabolism has developed itself further into three mainstream approaches (Newell and Cousins, 2015). One is the Industrial Ecology (IE) (Kennedy et al., 2007), using MFA as their main method. It focuses on the processes within an industrial landscape and tries to find connections between one’s waste as somebody else’s resource. Another stream is the Urban Political Ecology (UPE) (Swyngedouw, 1996, Heynen, 2014), which finds its existence from a Marxist ideology. Within UPE, the urban is seen as process which is produced by many different actors in a network of nodes, and the emphasis lies on the underlying power field active in the production of space. The third stream is Urban Ecology (UE) with a focus on the urban as an ecosystem and thereby seeing nature and the urban as the same thing (Zhang, 2013, Newell and Cousins, 2015).

Within this paper, both an IE as well as an UPE approach will be used to answer the research question. The emphasis will be laid on the IE approach by using MFA as the main method. UPE will be used to retrieve background information to be able to critically reflect on the flows. UPE mainly supports the forming of an understanding of the relations between the different problems by researching literature, newspapers and interviews on YouTube. This forms a more theoretical background. To strengthen the research from the UPE perspective, interviews and surveys can be conducted, though this is left out for this research since the limited timeframe and space.

Within the MFA method there are certain steps to be taken (Moreau and Massard, 2017). Firstly, the boundaries need to be set. In this case, the boundary will be the neighbourhood of Overvecht and the data used will be limited to money flows. The boundary Overvecht is set because this is the location to investigate and money flows are chosen since they are closely related to power and thereby empowerment. Secondly, data needs to be retrieved. For the data the preferred choice is to use as much specific data of the neighbourhood as possible. If this is not possible, more general data is taken and an average is applied to the system. Thirdly, the collected data will be used for calculations and fourthly, the calculations will be interpreted.

It should be clear that the result of this method will be an abstraction of reality at a certain time within a demarcated system. Choosing different borders will give different results. On top of that the amount of data and the quality of the data highly influence the result (Xu et al., 2015). The boundary and data will largely influence the deviations and reliability of the result. Furthermore, by using the approach of the urban as a metabolism, one sees the urban as something continually changing, thereby the result is not and never will be an exact resemblance of reality, but will merely give the means to develop a toolset to intervene within the network.

However, there is a critique on MFA since it concentrates on the flows, but not on the underlying forces behind the certain flows (Zhang, 2013, Newell and Cousins, 2015), which is the main idea of UPE. That is the reason why both of the methods will be used within this research. The UPE approach as a theoretical and qualitative backbone and the IE approach as a practical approach. The practical approach makes it possible to get the theory to a next level by establishing solutions, while the theoretical part forms a critical backbone to the latter. For an overview of the structure and the methods of this paper see figure 2.

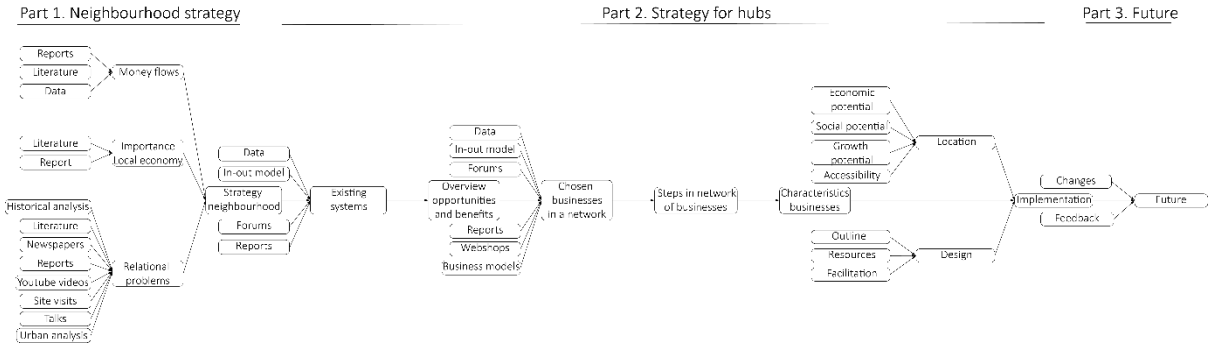

Figure 2. Structure and methods (Slob, 2017g)

3. Neighbourhood strategy

Within this part a strategy for the neighbourhood is demonstrated. This is done by first scrutinizing the characteristics of the neighbourhood to give insight of the different active actors and the relational problems within the neighbourhood. This is followed by the existing money flows through the neighbourhood, to get a better understanding where the money comes from and where it goes. Next will be an explanation of the importance of a local economy and a strategy for the regeneration of the neighbourhood.

3.1 The environmental, social and economic characteristics of the neighbourhood

This paragraph will examine the environmental, social and economic characteristics of the neighbourhood. To do so a small historical analysis is made followed by an recent analysis of the neighbourhood. This together with an analysis of factors outside of the boundary (neighbourhood), influencing problems within the boundary, will make it possible to make a relational scheme of the different problems within the neighbourhood. This is an important start for the strategy, since it gives insight and creates an overview of the different problems and actors active within the neighbourhood.

The historical analysis starts in the 60s, the year in which the neighbourhood was built. Overvecht was initiated due to a high housing shortage after WWII and new housing needed to be created quickly. The architects W. Wissing and K.F.G. Spruit made a plan of large apartment blocks varying between eleven and two stories high. They were made of a strong concrete construction and mainly prefabricated elements (Bijlsma et al., 2008). The apartments were spacious, around 70m2 average, and offered at a good price by the social housing corporations which owned 80% of the stock. Furthermore, many facilities were placed within the neighbourhood: low quality school buildings, an ice skating hall, a shopping centre and a train station. Besides, six big complexes of elderly homes were realised in the neighbourhood, attracting large amounts of elderly people. This together with the spacious apartments for a good price and the housing shortage, made the neighbourhood popular. The amount of inhabitants grew quickly to around 37.000 people in the 70s (Swieringa et al., 2011).

After the 70's, a decline started slowly as people which made career were moving out. Some because they wanted and others because they needed; it is not allowed to live in social housing above a certain amount of income[1]. This together with the way the social housing, which is still 70% of the stock of the neighbourhood (Gemeente Utrecht, 2013b), is allocated to its tenants, meant that wealthy tenants were moving out and weaker groups, mainly low educated immigrants, were moving in (Argiolu et al., 2008, Lenderink et al., 2014). This process started in the 70's and has been changing slowly until now where 43,9% is native and 56,1% is immigrant. Of the total inhabitants, 29% is a first generation immigrant (Gemeente Utrecht, 2015a). These weaker groups are mainly low educated, have difficulties with the Dutch language and are more often unemployed (CBS, 2016, CBS, 2014). Thus, a flow of weaker groups of society moved into the neighbourhood.

These weaker groups were able to do low skilled work in industries during the 70's and 80's, but over the past years the unemployment rate has been going up due to a lower demand of low educated employees (OREO, 2016). These kind of changes have a large effect on a neighbourhood such as Overvecht where now more than 18% of the people live of a social welfare income and of the ones which are working, almost a quarter has a low income. This results in that only 52% of the spendable income comes out of wage (Gemeente Utrecht, 2013a). Also if the inhabitants would like to find work within the neighbourhood it is hardly possible since there are only 36 jobs per 100 inhabitants[2] compared against an average of 72 per 100 in Utrecht (Gemeente Utrecht, 2017b). These characteristics, together with a rolling back of the government resulting in a 'Do it yourself' mentality, makes it for a lot of people in Overvecht more difficult to find a job and greatens the gap to the labour market (Timmerman and Mies, 2013).

These weaker groups, mostly have a worse health and thereby use large amounts of money for healthcare. Looking at Overvecht, 43% 'experience' their health as negative and 21% has a lost 'sense' of control over their own condition (Gemeente Utrecht, 2017a). Diseases such as obesities, diabetes and COPD are more common in Overvecht. This results in a situation in which healthcare costs are considerably higher than the average of Utrecht. In Overvecht a person spends an average of 2730 euro's per person per year (Vektis, 2015b) against 2079 per person per year in Utrecht (Vektis, 2015a).

The social issues are acknowledged by the government and the municipality, which labelled the neighbourhood as one of the 'Krachtwijken' (Gemeente Utrecht, 2007, Leden wijkoverleg Overvecht,

[1] For example, in 2017 80% of the stock is for households with an income up to 36.165, 10% for households between 36.165 and 40.349, and 10% for household higher than 40.349.

[2] Most of the jobs are generated by the shopping centre and the industrial site in the Northern part of Overvecht.

2016). To regenerate the neighbourhood multiple budgets for different programs have been raised. So far these programmes seem not to have the expected effect on the neighbourhood.

Something which does not seem to be a big problem for the inhabitants is the housing stock itself. They give an overall mark of a 7 out of 10 for their housing, which is lower than a lot of other neighbourhoods in Utrecht, but still a 7 (Gemeente Utrecht, 2014). This mark may be fine, but there is quite a large backlog of maintenance and many buildings need to be renovated to meet the energy requirements suitable to the standards of today. Large amounts of money of the corporations are pumped into the neighbourhood to renovate and maintain their stock. This seems to work, though is a long and complex process going slower than wanted.

A full overview of the different problems and the relation between these are shown in a scheme in appendix A. When put in relation 5 main problems occur: polarization, health care, no local economy, lack of local identity and outdated stock. Also what becomes clear is that most of these problems have to do in some way or another with money. Money flows into the neighbourhood, but where do they come from and where do they go?

3.2 EXISTING MONEY FLOWS

Knowledge of the existing money flows serve as an important source of information to understand the location and use them to start vital businesses. To get a better understanding an overview is needed. Data has been collected for the neighbourhood from various websites and calculated to apply to the neighbourhood, for a full overview see the attached Excel sheets. Figure 2 illustrates the total overview of the outcome of the calculations.

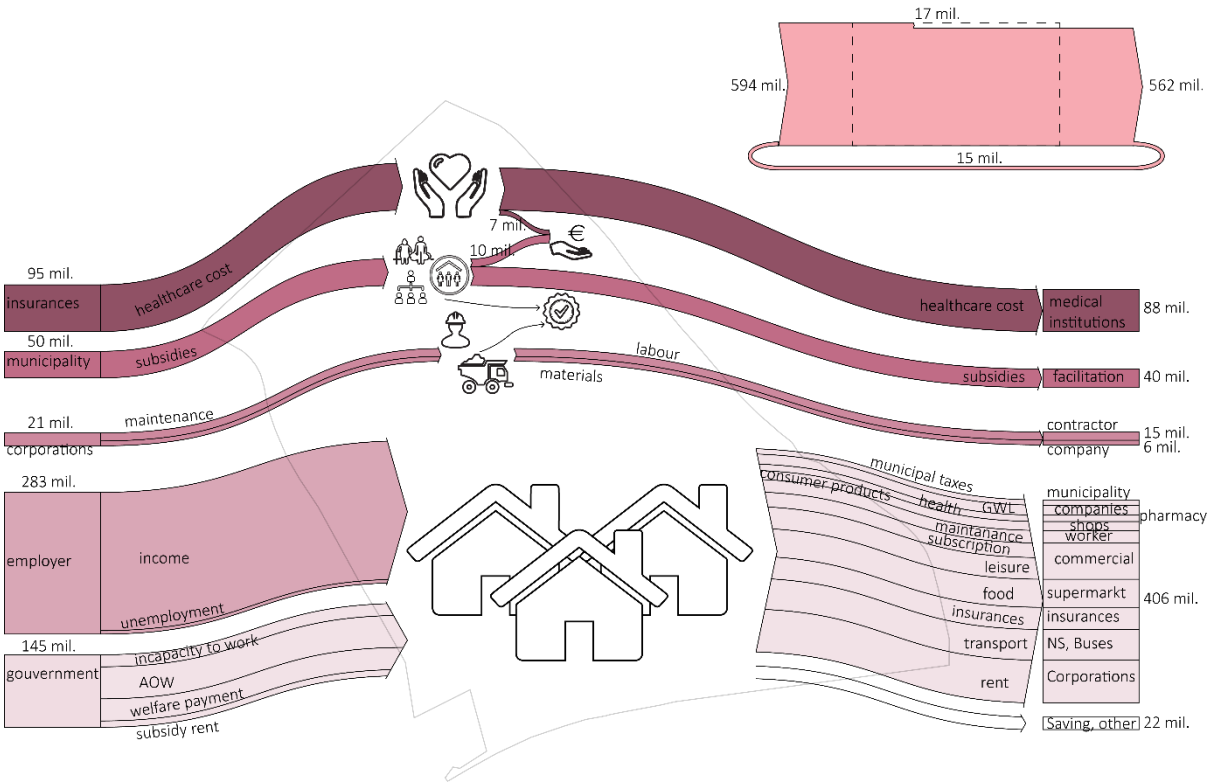

Figure 3. Money flows in Overvecht (Slob, 2017c)

When one looks at the money flows coming into the neighbourhood it stands out that most of the money flowing in, flows out again to large companies and corporations. For households, the biggest expenses are for rent, transport, insurances and food. Also, a big part goes to leisure and subscriptions. In the end, very little is left for savings, other expenses or investments. The same occurs when one looks at the other actors. Corporations invest in their stock by maintaining and renovating it. Maybe some small repairs will be done by local parties, but most will be outsourced to parties outside of the neighbourhood. So most of the money going to labour and materials flows out, but the quality stays as in better materials

and so on. For the healthcare, insurances pay large amounts. Some money will stay as wage for local proficiencies, though most will flow out to large organisations like elderly housing and hospitals. The municipality has various support programmes for different goals as public health, public support, public maintenance, youth support, employment support and sustainability. Some of the money will stay within the neighbourhood as the wage of people from local initiatives and small organisations, while most will flow out to actors outside of the neighbourhood to help facilitating the programmes. What will stay is an enlarged quality of public space, jobs and local projects.

If one looks at the abstraction of the flows one can see that a total of 594 million euro's flows into the neighbourhood, an approximation of 17 million will stay as wage for employers of projects and healthcare proficiencies, 562 million will flow out and an estimation of 15 million will flow back as people will spend some money within the neighbourhood forming the wage of others. So a total of 95% flows out of the neighbourhood. This means money is there, but does not stay within the neighbourhood.

3.3 THE IMPORTANCE OF A LOCAL ECONOMY

It is important to keep money within the neighbourhood and improve the local economy for a number of reasons. First of all, by the creation of local businesses, local jobs will be created. Additionally, local businesses will support each other since they tend to buy from each other. Thereby, the spent money of a costumer at one business will automatically support another. This means money will start (re)circulating within the neighbourhood which supports local taxes and local infrastructure. Furthermore, local businesses will support a local identity and serve as an unique place within a neighbourhood. Thereby, it becomes a connected part of the neighbourhood, making it a likely actor to invest in the neighbourhood and less likely to move out. The connection to its place makes local businesses experts in adjusting their supply to the demand of their customers, resulting in a better suited supply-demand and a higher customer service (Robinson, 2010, FSB, 2013). Additionally, trade means social interaction and thereby, the more trade, the more interactions. If this trade is local, it will directly impact the social relations formed in a neighbourhood enhancing social cohesion (Mulder, 2017). So, taking the extra circulating money into account together with the knowledge that money equals power, it is logically that the improvement of a local economy will empower the inhabitants. Thus, in order to regenerate the neighbourhood and empower the inhabitants it is essential to improve the local economy.

Hence, a strategy can take form which keeps the money flowing out of the neighbourhood within by creating local businesses. These can take shape as grassroot hubs which are scattered over the neighbourhood connected in a network as shown in figure 4 below. These hubs should restructure the money flows through the neighbourhood by using resources more efficiently than the centralised organs. This can be done with the knowledge of the existing money flows, the characteristics of the neighbourhood and using the benefits of local businesses arranged within a local network as stated earlier. This does not mean that the goal is to eliminate all central businesses, but rather, to find a new balance between what is centrally and decentrally organised.

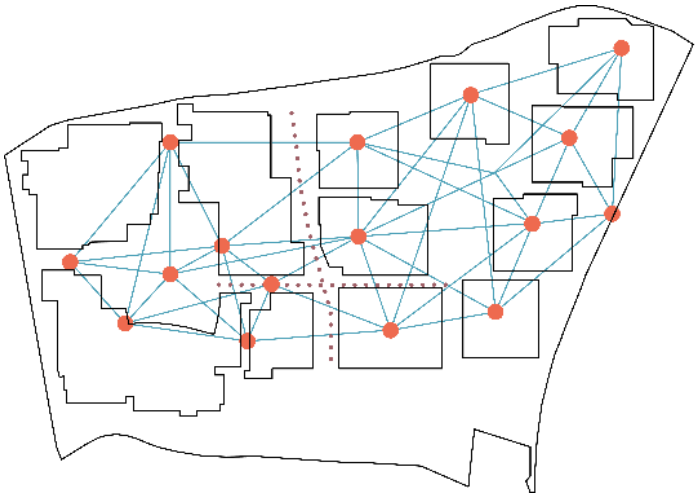

Figure 4. Neighbourhood strategy as a hub network (Slob, 2017a)

4. Strategy for hubs

Within this part a strategy for hubs will be formed. This will be done step by step. To test the strategy an example hub is taken to which will be formed by applying each step of the strategy to it. The first step within the strategy is to create an understanding of the opportunities within existing systems. The second step is the forming of new businesses using the earlier found opportunities and taking the neighbourhood strategy in mind. The businesses will form a network in which they can exchange resources to gain efficiency. At the end of step two an overview of characteristics of the businesses are given in order to give an understanding of which businesses are best to start with and which businesses are better to follow later. The third step is the implementation of the strategy. This will involve the choice of a location and the forming of a plan.

4.1 Existing systems and the opportunities for businesses

The first step in the strategy for the hubs should be an exploration of the opportunities for businesses. This is done by fitting systems to the earlier stated benefits of local businesses, relational problems and existing money flow within the neighbourhood. The scrutiny of existing systems can be made by gathering data, making calculations and read literature. Also the informing of other proficiencies to gather different perspectives and input is a good way to strengthen this step. The result of this step is to get an overview of how money flows through the system and where local businesses can possibly intervene, thus an overview of opportunities and benefits.

The example hub starts in this first step by making an overview of the food chain, funerals, health care, maintenance/renovations and living/moving systems. These fit to certain problems in the relational scheme (coloured orange in Appendix A). Within the existing systems certain opportunities are found. In the table below a summary is made of the systems, its opportunities and the beneficial effects of local businesses (for a full overview with text, see Appendix B).

Sector	*Opportunity*	*Benefits*
Funerals	2/3 of money funeral insurance goes somewhere else than funeral services. Many opportunities for DIY.	People can support each other Cheaper funeral
Food	Much food is thrown away as waste. Food becomes five times more expensive between farmer and supermarket. Overvecht is between city and countryside. Bad health condition in neighbourhood. Public support money for health programs.	More efficient use of resources Cheaper and healthier food Food can bring people together
Maintenance/ Renovations	Local knowledge Wasted materials are brought to waste plants Maintenance backlog Slow improvement energy labels	Better relation between worker, inhabitants and corporations Improved customer service Reuse wasted material (cheaper) Lower costs waste plant
Living/ moving	Lack of housing options for middle class Large amount of social housing Overvecht People move in, out and within Overvecht Many elderly in neighbourhood	Attract and keep middle class Mixed neighbourhood Demand driven housing Take over control housing Support for elderly when moving
Healthcare	Many proficiencies possible on neighbourhood level Large organisations have large management expenses Bad health conditions many inhabitants Many elderly Public support money municipality	Activities improve social cohesion Nearby support for less transport costs, better understanding surrounding, neighbourhood involvement

4.2 New network of businesses

The next step of the strategy is to find new businesses which can be placed within a network of different hubs. The businesses chosen should fit to the opportunities and benefits found. In order to understand the impact of the businesses it needs to be clear where the intervention will take place within the existing system. This can be done by the earlier research of the existing systems combined with the research of data, literature and blogs about the aimed businesses. Additionally, one could collaborate with professionals and conduct interviews. The research of the aimed businesses will give knowledge about the input and output. It will become clear how much space is needed, who the target group is, what products it needs and what it will deliver. This results in an overview of the size, flexibility and the local, economic and social impact.

Next, the businesses should be placed within the local network. This will give information about the interdependency of the businesses. Some businesses are more autonomous than others. Thus, for some businesses it is easier to start, while others are better to be implemented at a later stage. When researching multiple businesses the phases in which businesses can be created becomes clear.

For the example hub the businesses which fit to the researched sectors are a community land trust (CLT), catering, funeral service, transport service, care centre, workshop and maintenance centre. The found characteristics of the business are shown in the table below. For a full overview and explanation of the different businesses see appendix C.

Table 1. characteristics businesses

Businesses	*Size*	*Flexibility*	*Independency*	*Social*	*Economic*	*Local*
CLT	XXL	--	--	++	--	++
Catering	L	+-	+	+-	+	+
Caring/nursing	S	++	++	-	+	+-
Activities	L	--	+-	++	+	+-
Transport	S	+-	-	--	+-	+-
Funeral	S	+	-	+-	+-	++
Maintenance	M	++	++	-	++	+
Workshop	XL	--	-	++	--	+-

To create the businesses within the network of the example hub it seems smart to start with something economically feasible, independent, flexible, small size and with the largest local and social impact. Applying these factors the nursing/caring or maintenance centre seem the best option to start with. Later the catering can be added. Since the catering and maintenance need transport, the transport service seems a logical next step. Next could be the activity centre together with a part of the funeral services. Finally, the workshop will be added and the funeral services will be fully developed. These steps are now chosen by the earlier stated parameters. The order can still change since they eventually will be subjected to the implementation which will follow as the next step of the strategy.

4.3 Implementation

Now that the opportunities for new businesses, the chosen businesses and in which steps they can be added to the network are clear, it is time to think about a strategy for the implementation. First of all, it is important to choose a location. An overview needs to be made of different locations possible and their characteristics. It is reasonable to use parameters for every location taking the accessibility, potential for growth, commercial potential and social potential into account. This will reduce the amount of options and leaves a couple of locations in which the impact will be highest. Next the different areas can be further researched looking for other nearby actors, distance to target groups, nearby useable materials or any other particularities. Lastly, the different areas should be judged by taking the prior research and the chosen businesses into account to come to a decision.

Once a location is chosen, a space needs to be designed. These spaces can be newly built or re-used buildings. It highly depends on the resources of the initiators how this will take shape. Just as the shape, the needs will differ. These differentiations will not only differ at that moment, but will also change per

user overtime. Thereby, a dynamic process will be present within these spaces. To house these dynamic processes, a flexible plan is needed which is able to adjust to the needs at a certain moment of its user(s). The architect has the responsibility to design these spaces and control the quality. One way to do so is to set a certain bound of rules in which the user is free to control its own living environment. To set the outline of rules will need another research, but one can find inspiration in the theory of John Habraken and its Open Building theory (Teerds et al., 2011) and the plan made by Thomas Lommée and Christian Hoegner of Autarkytecture[3].

For the example hub a possibility is used by reclaiming one of the empty schools. The school has more or less the amount of square meters needed for all the businesses to be situated within the building. On top of the building a new layer of housing can be added. The school building can be renovated into an open plan building in which the businesses easily can make adjustments. Even if the businesses decide to move out, the function of the building can change again. The housing on top can be added on a framework in which the inhabitants can make their own adjustments as long as they will stay within the given outline. What the outline will be and how this step is exactly implemented needs another research.

Now that the different businesses and their location is known a full diagram can be made of how the businesses will work together and what money flows are used within the hub. For a full overview see appendix D. It seems that all the businesses are feasible and able to create an added value for the neighbourhood. Also one sees that the CLT will pay quite high interest rates for the loan and mortgage to obtain the building. This will make it more difficult to maintain an affordable rent. It is here where some friction can be found by being in-between a market which only seeks for economic value (maximum profits) and a holistic market which seeks for economic, social and ecological value. Thus, this step needs a continuous feedback loop to the earlier steps in order to strengthen the plan for a hub.

5. Impact of the example hub

Knowing the way the example hub is functioning, a model can be made of the different money flows throughout. The amount of money coming from outside and inside the neighbourhood becomes clear. Also the total revenue of the businesses is visible. The same accounts for what goes out. A part stays within the neighbourhood as wage, a part flows out and a part circulates within the hub. A full overview of these flows is given in figure 5 below.

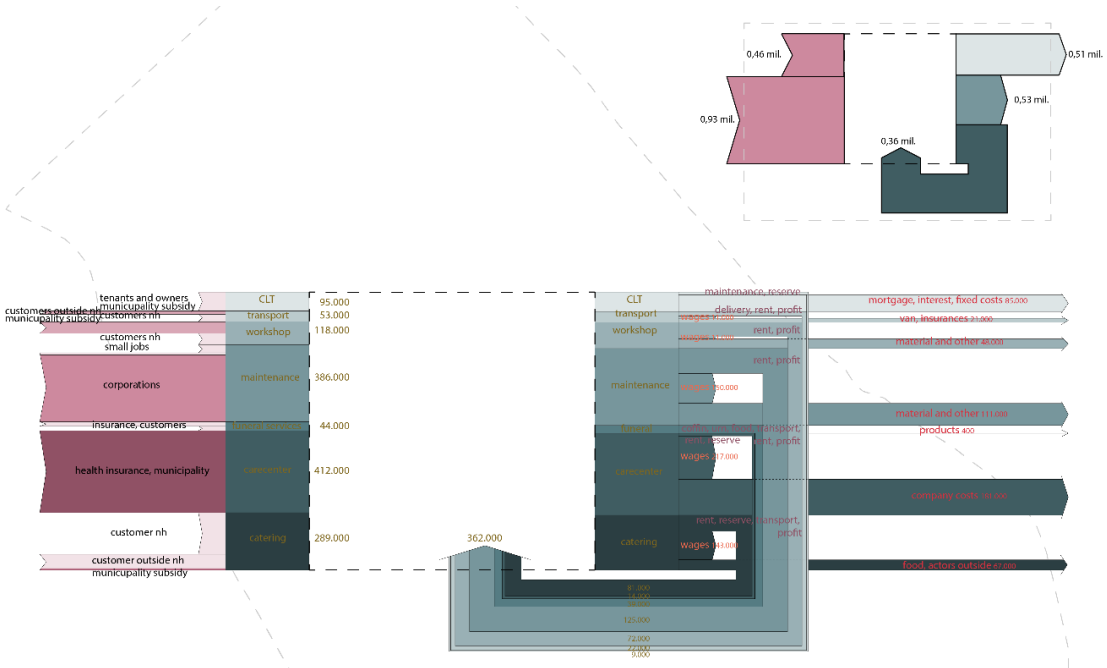

Figure 5. Money flows through businesses within CLT (Slob, 2017b)

[3] http://blog.openstructures.net/pages/os-autarkytecture

The above figure shows that around 2/3 of the money comes from outside the neighbourhood by consumers, health insurances, municipality and corporations. Of all the money around 37% flows out again, 38% stays as wage and 25% flows back into the CLT as shared services, rent and profits. Thereby, it creates jobs within the neighbourhood and is able to increase a local economy.

If one takes the example hub as a typical one within the neighbourhood and makes the prediction that there will be around 25 of these scattered throughout the neighbourhood, it is possible to make an assumption of the impact on the neighbourhood scale. A total of around 35 million will flow into these hubs. Of this 35 million, 13 million will flow out again, 13 million will stay within the neighbourhood as wage and 9 million will circulate within the hubs. Combining these new numbers with the existing situation into a new abstraction of the money flows is shown in figure 6 below.

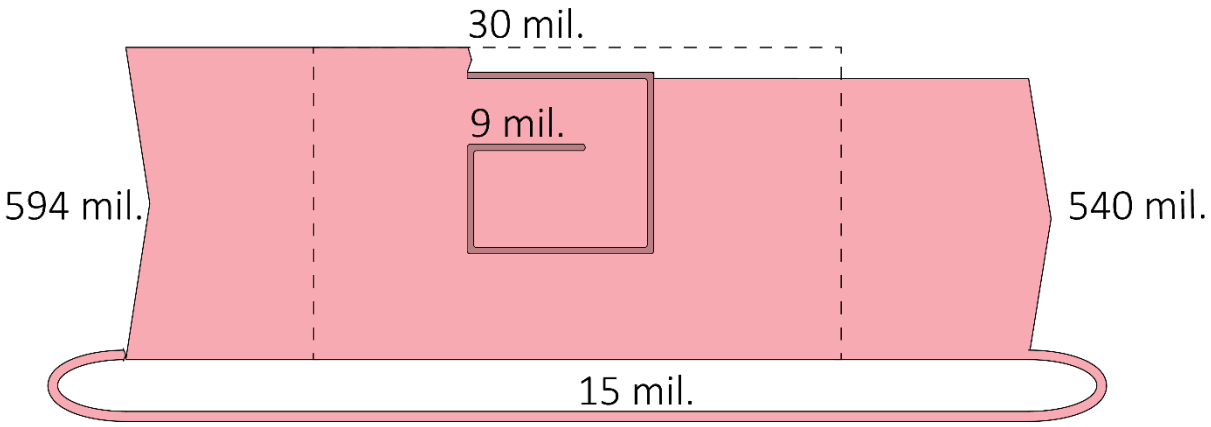

Figure 6. Preliminary foresight neighbourhood effect (Slob, 2017c)

Furthermore, a total of 600 jobs will be created meaning that the number of jobs per 100 inhabitants will rise from 36 to 38 jobs per 100 inhabitants. Taking the benefits of a local economy in mind and the network in which they will function, it seems possible that a snowball effect will be created. Ones local businesses are created and viable, they will make it easier for other local businesses to start and flourish, since they are all supporting each other. Considering the average of Utrecht of 72 jobs per 100 inhabitants, it seems possible to create even more hubs.

6. Conclusion

The strategy which inhabitants can use to empower themselves by using existing money flows to take control over their own housing and businesses seems clear now. The strategy is divided in three parts. The first part is to create an overall strategy for the neighbourhood. This is done by researching the existing money flows in, throughout and out of the neighbourhood. This is supplemented with the characteristics of the neighbourhood by an analysis to create an overview of the relational problems. By adding the benefits of a local economy it is possible to make a neighbourhood strategy. For Overvecht an overall strategy is formed as a network of hubs. These hubs are created by the inhabitants and exist out of housing and businesses.

The second part of the strategy is to create a plan for the creation of such hubs. This starts by using the input from the overall neighbourhood strategy to research existing systems. This will give an overview of different opportunities to start local businesses which will fit to the neighbourhood. This will be followed by choosing businesses which can use these opportunities and research them further to get to know their particularities as size, flexibility, revenue and so on. The chosen businesses are placed within the network which will give information about their interdependency. At the end of this step, an overview of characteristics of the businesses is created together with a possible sequence in which they can take shape. The next step is the implementation in which a location needs to be chosen and design of a space needs to be made. The location is chosen using a set of parameters and the design needs to be able to be adjusted in time and serve the user’s needs.

The last part will take place after the implementation and consists out of the feedback by the user(s) and the changes which will be made in the future. This step is only possible after completion of a hub.

An overview of the overall strategy can be seen in figure 7.

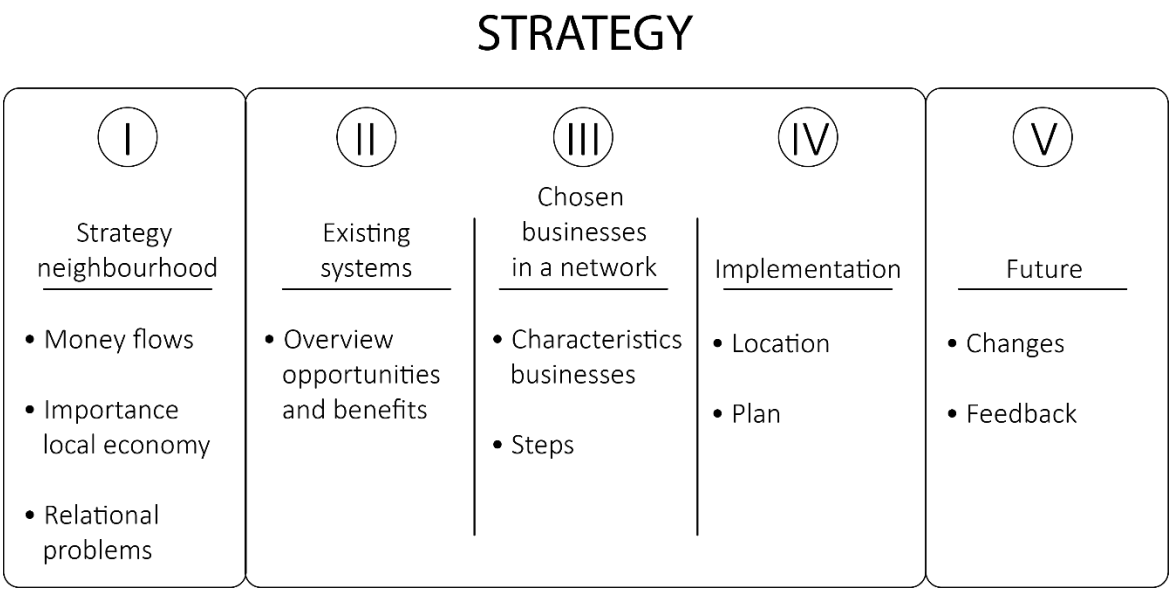

Figure 7. Strategy (Slob, 2017f)

The strategy is applied to an example hub in order to test the strategy. This test is preliminary and could be different when other parameters are used, but gives important feedback for the strategy. The research for opportunities, chosen businesses and placing them in the network works well. The research can be enlarged by collaborating with different proficiencies. For the implementation step the choice of a location by a set of parameters is clear, but the design of a space needs more research. The implementation requires a feedback loop to the earlier steps in other to strengthen the plan for the hub. As for now one can see that the example hub has difficulties with the CLT. The interest rates payed over the capital injection are so high that it is difficult to maintain affordable rents; something which is needed to create accessible workspaces. It seems that one of struggles is being in-between the market of the big money and maximised profits (value as money) and the market to gain a positive effect on both economic, social and environmental sustainability (value as money, social and ecological).

In the end, the example has shown that it is possible to use the strategy to create a plan for different hubs in the neighbourhood. The hubs will enhance the local economy and thereby also the social cohesion. On top of that, it is likely that once some local businesses have started, it will be easier for others to follow, since local businesses support other local businesses by exchanging resources. In the end, such businesses empower/give a voice to the inhabitants by obtaining real estate, creating added value and forming a close community.

REFERENCES

ARGIOLU, R., VAN DIJKEN, K., KOFFIJBERG, J., BOLT, G., VAN KEMPEN, R., VAN BECKHOVEN, E., ENGBERSEN, R. & ENGBERSEN, G. 2008. Bloei en verval van vroeg-Naoorlogse wijken. nicis institute.

BIJLSMA, L., BERGENHENEGOUWEN, G., SCHLUCHTER, S. & ZAAIJER, L. 2008. Transformatie van woonwijken met behoud van stedenbouw-kundige identiteit. Rotterdam & The Hague: Ruimtelijk Planbureau & NAi.

BRUNNER, P. H. & RECHBERGER, H. 2004. Practical handbook of material flow analysis. *The International Journal of Life Cycle Assessment,* 9**,** 337-338.

BUNCE, S. 2016. Pursuing Urban Commons: Politics and Alliances in Community Land Trust Activism in East London. *Antipode,* 48**,** 134-150.

CBS. 2014. *Integratie verloopt moeizaam* [Online]. Available: https://www.cbs.nl/nl-nl/nieuws/2014/47/integratie-verloopt-moeizaam [Accessed 15 December 2017].

CBS. 2016. *Werkoosheid naar herkomst* [Online]. Available: https://www.cbs.nl/nl-nl/achtergrond/2016/21/werkloosheid-naar-herkomst [Accessed 10th December 2017].

DUIC. 2016. *Relatief meeste scheefwoners in Binnenstad en Leidsche Rijn* [Online]. Available: https://www.duic.nl/wonen/relatief-meeste-scheefwoners-binnenstad-en-leidsche-rijn/ [Accessed 11th November 2017].

FSB 2013. Summary document of the Local procurement, making the most of small businesses, one year on. Blackpool: FSB.

GEMEENTE UTRECHT. 2007. *Doe Mee in Overvecht, Wijkactieplan Overvecht* [Online]. Available: https://www.rijksoverheid.nl/documenten/brochures/2010/09/27/wijkactieplan-utrecht-overvecht [Accessed 30th September 2017].

GEMEENTE UTRECHT. 2010. *Wijkactieplan Utrecht Overvecht* [Online]. Rijksoverheid. Available: https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/brochures/2010/09/27/wijkactieplan-utrecht-overvecht/waputrechtovervecht.pdf [Accessed 30th September 2017].

GEMEENTE UTRECHT. 2013a. *Inkomen huishouden wijk XLS* [Online]. Available: https://utrecht.dataplatform.nl/resource/6d187267-9bd6-4d4e-93cc-dfa1b3d3070e [Accessed 20th Oct 2017].

GEMEENTE UTRECHT. 2013b. *Woningvoorraad wijkniveau* [Online]. Available: https://utrecht.dataplatform.nl/resource/a758c020-84a6-4ceb-802f-82bb22a0c121 [Accessed 4th October 2017].

GEMEENTE UTRECHT. 2014. *Oordeel woningen wijkniveau* [Online]. Available: https://utrecht.dataplatform.nl/resource/456d4041-05e0-4dde-bb79-eff508e69ffe [Accessed 4th November 2017].

GEMEENTE UTRECHT. 2015a. *Herkomst percentage wijkniveau* [Online]. Available: https://utrecht.dataplatform.nl/resource/4bf59c8d-67e5-4f47-927c-e563cb14ec06 [Accessed 23th Oct 2017].

GEMEENTE UTRECHT. 2015b. *Leeftijd inwoners wijkniveau* [Online]. Available: https://utrecht.dataplatform.nl/resource/bc157844-5d52-486a-b78b-890bd2d95dc3 [Accessed 23th October 2017].

GEMEENTE UTRECHT. 2017a. *Wijkwijzer Utrecht 2017, Gezondheid* [Online]. Available: https://utrecht.buurtmonitor.nl/dashboard/-h3-Gezondheid--h3-/ [Accessed 17th October 2017].

GEMEENTE UTRECHT. 2017b. *Wijkwijzer Utrecht 2017, sociaal-economisch* [Online]. Available: https://utrecht.buurtmonitor.nl/dashboard/-h3-Sociaal---economisch--h3-/ [Accessed].
HEYNEN, N. 2014. Urban political ecology I:The urban century. *Progress in Human Geography,* 38**,** 598-604.
HOOVER, J. 2015. The human right to housing and community empowerment: home occupation, eviction defence and community land trusts. *Third World Quarterly,* 36**,** 1092-1109.
HOUSTON, A. 2012. *THE CO-OPERATIVE SPIRIT: BRIDGING SOCIAL CAPITAL IN MIXED-INCOME HOUSING DEVELOPMENTS THROUGH RESIDENT EMPOWERMENT, INVOLVEMENT AND COOPERATION.* Master, Virginia Commonwealth University.
KENNEDY, C., CUDDIHY, J. & ENGEL-YAN, J. 2007. The Changing Metabolism of Cities. *Journal of Industrial Ecology,* 11**,** 43-59.
KENNEDY, C., PINCETL, S. & BUNJE, P. 2011. The study of urban metabolism and its applications to urban planning and design. *Environmental Pollution,* 159**,** 1965-1973.
LEDEN WIJKOVERLEG OVERVECHT 2016. Wijkactieprogramma 2017 Overvecht, Samen maken we Overvecht sneller vitaal. *In:* WIJKBUREAU OVERVECHT. (ed.). Utrecht: Gemeente Utrecht.
LEEFBAROMETER. 2016. *Leefbaarheidssituatie, Schaalafhankelijk, 2016* [Online]. Available: https://www.leefbaarometer.nl/kaart/#kaart [Accessed 8th November 2017].
LENDERINK, T., NORDEMAN, R. & SIERMANN, T. 2014. Woningtoewijzing en leefstijl in Overvecht, Evaluatie van het leefstijlexperiment 2004-2013 Enschede: I&O Research.
MILIEU CENTRAAL. 2012. *Feiten en cijfers over verspillen van voedsel door consumenten in 2010* [Online]. Available: http://www.voedingscentrum.nl/Assets/Uploads/Documents/Voedingscentrum/Perskamer/2012/Factsheet%20Verspilling%20april%202012%20def.pdf [Accessed 10th October 2017].
MOREAU, V. & MASSARD, G. 2017. Material and Energy Flow Analysis. *Oxford Research Encyclopedia of Environmental Science.*
MULDER, F. 2017. De overbodige klasse van Overvecht, 'Iedereen heeft pijn in zijn rug'. *De Groene Amsterdammer,* 141.
MUSTERD, S. 2009. Probleemwijken! Probleemwijken? *Idee,* 30**,** 34-37.
NEWELL, J. P. & COUSINS, J. J. 2015. The boundaries of urban metabolism:Towards a political–industrial ecology. *Progress in Human Geography,* 39**,** 702-728.
OREO 2016. Omgevingstrends en SWOT-analyse Utrecht 2016. Utrecht: EBU.
ROBINSON, N. 2010. Why Buy Local? An Assessment of the Economic Advantages of Shopping at Locally Owned Businesses. Michigan State University.
SAKIZLIOGLU, N. B. & UITERMARK, J. 2014. The Symbolic Politics of Gentrification: The Restructuring of Stigmatized Neighborhoods in Amsterdam and Istanbul. *Environment and Planning A,* 46**,** 1369-1385.
SLOB, A. 2017a. Hub network as a neighbourhood strategy.
SLOB, A. 2017b. Money flows businesses in CLT.
SLOB, A. 2017c. Preliminary foresight neighbourhood effect.
SLOB, A. 2017d. Relational problems Overvecht.
SLOB, A. 2017e. Scheme of businesses in a conceptual network.
SLOB, A. 2017f. Strategy.
SLOB, A. 2017g. Structure paper and methods.

SLOB, A. 2017h. Systems specified: food, funeral, healthcare, public support, living-moving, maintaining-renovating.
SWIERINGA, P., DE GROOT, H., RUURDA, T., WUURMAN, N., VAN ROESSEL, T., STEK, J., CUVELIER, A.-M., MAAS, J., STRAVER, L. & BORST, H. 2011. *Overvecht 50 jaar* [Online]. Available: http://www.experimentele-flats.nl/static/docs_archief/20110330_Dreefnieuws_50jaar_editie.pdf [Accessed 10th October 2017].
SWYNGEDOUW, E. 1996. The city as a hybrid: On nature, society and cyborg urbanization. *Capitalism Nature Socialism,* 7**,** 65-80.
TEERDS, H., HABRAKEN, J. & HAVIK, K. 2011. Define and Let Go, An interview with John Habraken. *Oase,* 85**,** 8-16.
TIMMERMAN, R. & MIES, J. 2013. Deel je rijk - relevante trends voor overheidscommunicatie. The Hague: DPC.
VEKTIS. 2015a. *Open databestanden op gemeenteniveau* [Online]. Available: https://www.vektis.nl/uploads/Docs%20per%20pagina/Open%20Data%20Bestanden/Vektis%20Open%20Databestand%20Zorgverzekeringswet%202015%20-%20gemeente.csv [Accessed].
VEKTIS. 2015b. *Open databestanden op postcodeniveau* [Online]. Available: https://www.vektis.nl/uploads/Docs%20per%20pagina/Open%20Data%20Bestanden/Vektis%20Open%20Databestand%20Zorgverzekeringswet%202015%20-%20postcode3.csv [Accessed].
VLAK, A., VAN MIDDELKOOP, M., SCHILDER, F. & ESKINASI, M. 2017. Perspectieven voor het middensegment van de woningmarkt. Verkenning van maatregelen ter bevordering van het aanbod. The Hague: PBL.
WOLMAN, A. 1965. The metabolism of cities. *Scientific American,* 213**,** 179-190.
XU, M., CAI, H. & LIANG, S. 2015. Big Data and Industrial Ecology. *Journal of Industrial Ecology,* 19**,** 205-210.
ZHANG, Y. 2013. Urban metabolism: A review of research methodologies. *Environmental Pollution,* 178**,** 463-473.

Appendices

A. Problems in relation

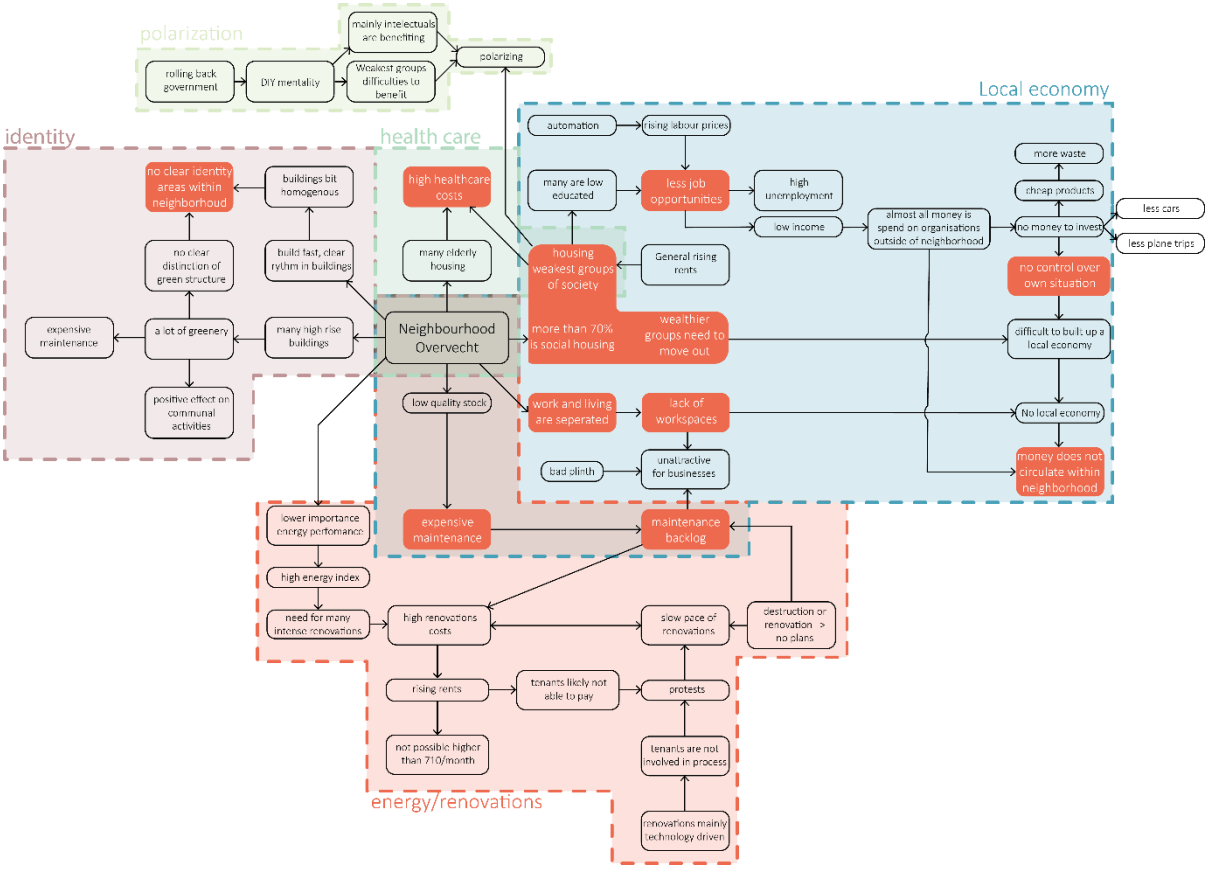

Figure 8. relational problems Overvecht (Slob, 2017d)

Additional problems

The renovating of apartments seems to be a long and painful process for the corporations, since they need to find the right balance between refurbishment, investment and rising rents. Due to how the social housing system in the Netherlands is arranged, the rents are not allowed to surpass a certain limit[4]. While normally investments in the energy performance would mean that the rent goes up, while the energy bill goes down, this is not the case for the housing corporations. They need to find ways to not let the investments surpass the rent limit. On top of that their seems to be a lack of communication with the tenants, resulting in a reluctance towards changes and rising rents. This mostly means that the renovation process takes a lot of time and energy to persuade at least 70% of the tenants. Thus, a difficult process of renovations finds place making it hard for the corporations to meet their goal to have an average energy performance level B in 2020.

Another influence comes from the structure of the neighbourhood. Designed in the 60s with an ideal to keep work and housing separately, there are almost no jobs within the neighbourhood. In Overvecht there are only 36 jobs per 100 inhabitants against an average of 72 jobs per 100 inhabitants in Utrecht. Knowing that a big part of the jobs is created on an industrial site in the north, one can imagine that there is basically no local economy within Overvecht making it harder for the inhabitants to earn money and keep it within the neighbourhood.

[4] For 2017 this rate is 710,68 https://www.aedes.nl/artikelen/klant-en-wonen/huurbeleid/huurprijsbeleid/hoofdpunten-van-het-huurbeleid-2017-inkomens--en-huurgrenzen.html

Within neighbourhood not much has changed after the completion in the 70s. Still 80% of the stock is built between the 60s and 70s and only 20% is from the period afterwards. Together with the distinction between living and working, also still 70% of the stock consists out of social housing and almost a quarter of the population is older than 55. This also leaves the neighbourhood as it was, meaning that it still has a lack of identity due to the large homogenous building stripes and large anonymous greenery.

The neighbourhood is being rated as the worst neighbourhood in Utrecht with a 4.9 against a 7.1 average for Utrecht. The main problems are caused by the unsafe feeling and the disturbance of youth on the street. 37% of the people does not see this change in the near future and has a negative future image for the neighbourhood. Luckily there are people which feel responsible for their neighbourhood and It seems that most of the work has to be done in the social structure of the neighbourhood to create a positive impact on the neighbourhood.

B. Existing systems specified

To specify some businesses which could start within the neighbourhood using the existing money flows some existing systems are scrutinised. To have a positive effect some problems are chosen to deal with: high healthcare costs, lack of identity, high maintenance costs, maintenance backlog, lack of workspaces, wealthier groups move out, losing control of own situation and money which does not circulate within the neighbourhood. The systems chosen to research are related to the chosen problems to deal with: the food chain, funerals, health care, maintenance/renovations and living/moving. The systems are analysed by gathering data and make calculations, a full overview can be seen in the attached Excel file. For an overview of the different systems in which the most suitable options are coloured orange, see appendix B. This paragraph should point out where the opportunities lie to start more efficient businesses.

Funeral

Around 70% of the people in the Netherlands has a funeral insurance [5]. If this percentage is applied to the neighbourhood, around 3,5 million euro's goes to the insurances every year. In the most positive situation they will cover for the whole funeral, which means that not more than 1,35 million euro's is actually spent for the funerals. So, almost 2/3 of the money goes somewhere else. As shown by the television programme 'Rambam' many of the services needed for a funeral one can do themselves to press the expenses[6]. One can easily build a coffin, treat the body, build an urn, do the transport, provide general support, make flower bouquets, send cards, rent a space and make food. These are all services which can be applied by a small business.

Food

Within the food chain it is mainly the striking amount of wasted food which asks for attention. The waste starts at the producer/farmer, which wastes around 10% (Milieu centraal., 2012). The main interests of the retailers is in 'primary' fruits and vegetables. To transport and sell the fruits and vegetables, which are a bit smaller, bigger, oddly shaped or anything else, seems not profitable enough and are wasted. What if one could surpass the distributers and retailers within the chain and buy these 'secondary' resources directly from the farmer? One could contribute to less waste and buy food cheaper, since supermarket prices are around four to five times more expensive. Since Overvecht is in between landscape and city it forms a perfect spot to collect resources from nearby farmers, hence another opportunity for a business.

[5] https://www.verzekeringen.com/nieuws/70-procent-nederlanders-heeft-een-uitvaartverzekering
[6] For the broadcast go to: http://www.uitzendinggemist.net/aflevering/25752/Rambam.html

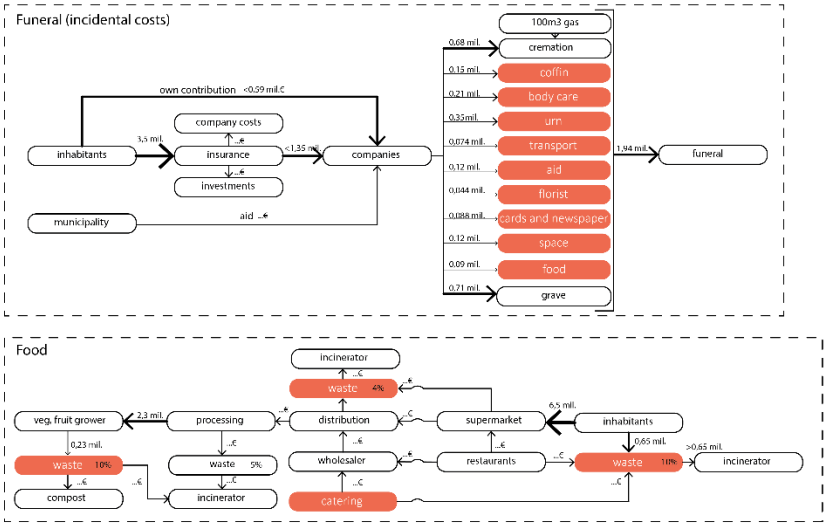

Figure 9. funeral and food system (Slob, 2017h)

Maintenance-renovations

To keep the housing stock in a good state the corporations invest large sums of money in the existing apartments in Overvecht. The work being done is mainly outsourced to large parties outside of the neighbourhood. The question here is whether inhabitants cannot do parts of the work themselves? By doing so the corporations could improve their customer friendliness since the transport time can be reduced, there is direct feedback from inhabitants to workers, workers know the neighbourhood and quality checks can be done more frequently.

Another opportunity lies within the treating of waste. Now building waste is mainly collected by a third party, brought to a waste plant, sorted and processed. Most of the collections and sorting could already be done in the neighbourhood. Useful materials could either be used again for maintenance and renovations. Materials which are not directly applicable to these can be sold to anybody interested. The effect would be a lower material price and lower prices for the treating of waste.

Living and moving

Money flows into the neighbourhood to the household mainly by income or governmental welfare. If the income rises above 36165 euro's a year one is less likely to find an apartment in Overvecht due to the high percentage, 70%, of social housing.

Furthermore, 13% lives with a high income in a social housing apartment, meaning they pay less than they actually should (DUIC., 2016). One of the reasons is the lack of opportunities for the middle segment to find a suitable apartment with a payable rent (Vlak et al., 2017). Why not step in this gap by creating or buying housing themselves as cooperation or community land trust? In this way the middleclass can stay and find a payable place within the neighbourhood and at the same make Overvecht a more heterogenous neighbourhood from an income perspective. On top of that it will empower the inhabitants by taking over control of some of the real estate (Bunce, 2016, Hoover, 2015, Houston, 2012).

At the same time people are all the time moving in, out or within Overvecht. Every time somebody is moving, this costs money. It highly depends on how they plan the moving, how much one pays. Though, with the high percentage of elderly, almost 25% is 55+ (gemeente Utrecht, 2015b), it is likely that more often than usual support is needed by professionals. One could offer support, boxes and transport.

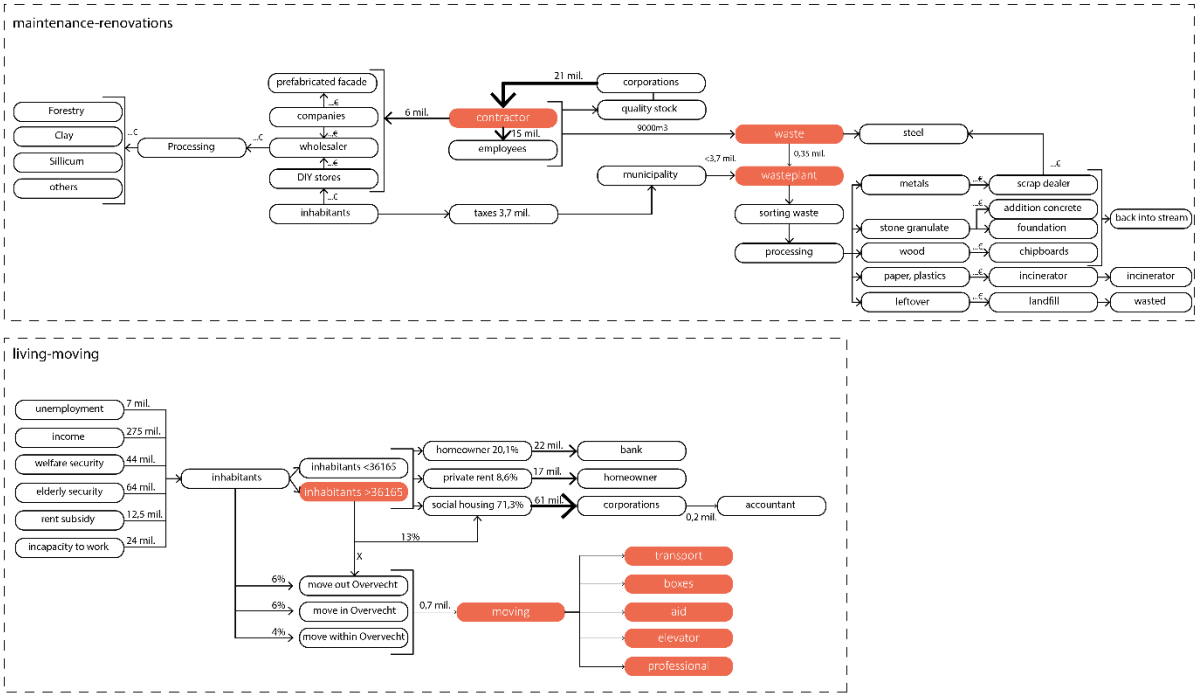

Figure 10. maintenance-renovation and living-moving system (Slob, 2017h)

Healthcare insurances

As shown before, large sums of money are flowing through the neighbourhood for healthcare. The inhabitants do not pay enough for their premium to cover the costs, meaning that the health insurance fund needs to fill the gap. Everybody in the Netherlands pays for this fund and thereby everybody will benefit from a positive effect on the health situation in Overvecht. Though, the healthcare system is mainly focussed on the treatment of symptoms and not on the underlying situation causing the symptoms. This situation should change in order to gain positive effects on the healthcare situation in Overvecht. For now, the best changes are to work with the system to create revenue for businesses. Some likely proficiencies are picked out as maternity care, neighbourhood care and nursing. A neighbourhood business has the ability to have low fixed costs by an efficient workspace, small management and less travel costs.

Public support

From the municipality money flows into the neighbourhood for public support. A small part is used for healthcare programs to deal with the underlying situation causing healthcare symptoms. A business could start a special programme funded by the municipality. This would be a business which is vital on itself and uses the subsidy to create extra value for the neighbourhood.

Another part goes to youth help. This is divided over neighbourhood teams, additional support, education and protection. One could start a business in order to support any of these, but most suitable seems the education part since this could be combined with another business. Also additional support is possible as extra support for the youth in the neighbourhood. Again, these funds could be used by an existing business to create extra value in the neighbourhood.

By far the largest part of the money goes to public support such as shelter, basic services, additional support and neighbourhood teams. Within these it is the basic services and additional support which seem most viable to start businesses with. These two flows of money can be used to start businesses in order to support elderly or disabled people within the neighbourhood.

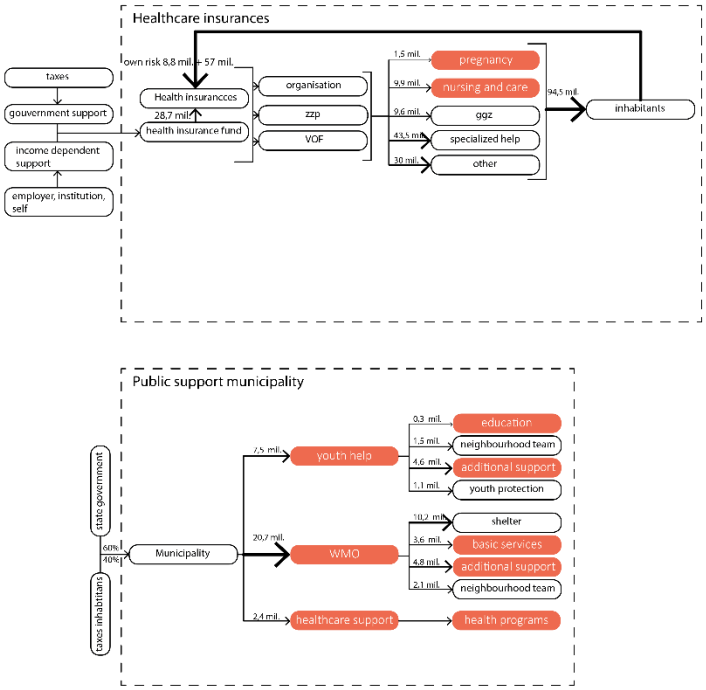

Figure 11. healthcare and public support system

C. New businesses

The CLT will be a non-profit organisation led by the inhabitants which controls housing and spaces for businesses. They obtain land and build or renovate spaces in order to rent or sell them. The ground is owned by the CLT and the real estate will be circulating within their organisations. A buyer will only buy for the unit while the land will stay within the CLT. The new owner will pay a small fee for the land, but can obtain a unit for a smaller price. When somebody will move out, an unit is bought back by the CLT. In this way the real estate will stay under the control of the CLT. This makes it possible to keep the prices affordable and the units accessible. The CLT will maintain three segments of prices: an affordable, a middle and a market price one. It will need a capital injection from private investors, banks and/or crowdfunding to obtain the resources needed.[7]

The catering will use the wasted food of the farmer and supermarket to make healthy meals for schools, elderly houses, the neighbourhood, the care centre and provide a catering service for the neighbourhood and beyond. The catering will be the most commercialised part of the business, while the neighbourhood meals and meals for the activities of the care centre are mainly supporting the social cohesion. All services will have a positive effect on the health situation in the neighbourhood. The kitchen as proposed makes a profit of 387€/m2, has four cooks and four interns to cook around 250 simple, but healthy meals a day. To run, the whole restaurant needs around 90m2.

A care centre can have neighbourhood services for care and nursing. These can be supplemented with a standby team since the caretakers are living very close. Also activities with elderly can be held. They can use the space of the restaurant and combine activities with services such as flower bouquets, card making for funeral services and the maintaining of the garden for the CLT. They receive money from the health insurance and public support money from the municipality. The caretaking can be done by eight freelancers and does not generate any profit. The care centre for nursing and caring happens mainly at the inhabitants their houses and therefore only needs around 16m2 of flexible workplaces. For the activities more space is needed to house groups in a common room. The space of the restaurant can be used during the day time, but needs to be supplemented with an extra 50m2 to get to a total of 100m2.

[7] For more information on CLT's: http://www.communitylandtrusts.org.uk/what-is-a-clt/about-clts and https://community-wealth.org/strategies/panel/clts/index.html

The transport service is mainly a shared service by the different businesses to gain efficiency. It is supplemented with the service for moving to gain some extra revenue. For the catering it will transport the vegetables and fruits of the farmer and the meals to the locations. For the funeral service it provides transport and one of the cars is owned by the maintenance centre. By driving around the neighbourhood they can scavenge materials. The transport service is able to make a profit of 1133 €/m2. This is high, but only possible to generate when the other businesses are viable and working together. The transport centre does not need much space, 16m2 would be enough to have an office and storage space. There is room for one socially supported employer. The parking spaces are not accounted in the square meters.

The funeral service is another shared service. It uses the transport service, workshop centre and care centre to provide some of its services. These will be supplemented with an employer who can aid the different families with the process. The service will receive its money from insurances and customers. The funeral service is able to generate a profit of 1579 €/m2. This seems rather high, but is a bit distorted since the funeral service centre uses the services of other businesses, does not have an employer and does not need much space, 16m2 (it is sharing a big part).

Lastly, there is the workshop and maintenance centre which are closely related to each other. They can use each other their tools, space and expertise. The maintenance focusses on the existing stock and mainly uses money from the corporations. The workshop supports more the social cohesion in the neighbourhood as a place where one can rent a working space, use tools and visit workshops. The maintenance and workshop centre can renovate the old school building and help creating the add-ons. The workshop space is large, 240m2, to house workshops, machines and store materials. Thereby, the revenue per square meter is quite low, 191€/m2. It is managed by multiple interested people as a way to gain some extra revenue and there is space for one socially supported employee. For the maintenance centre a lot less space, 40 m2, is needed since it works at the stock itself. The revenue per square meter is 2912€/m2. The maintenance centre is able to have a team of three employers and three interns.

D. Scheme of the network of new businesses

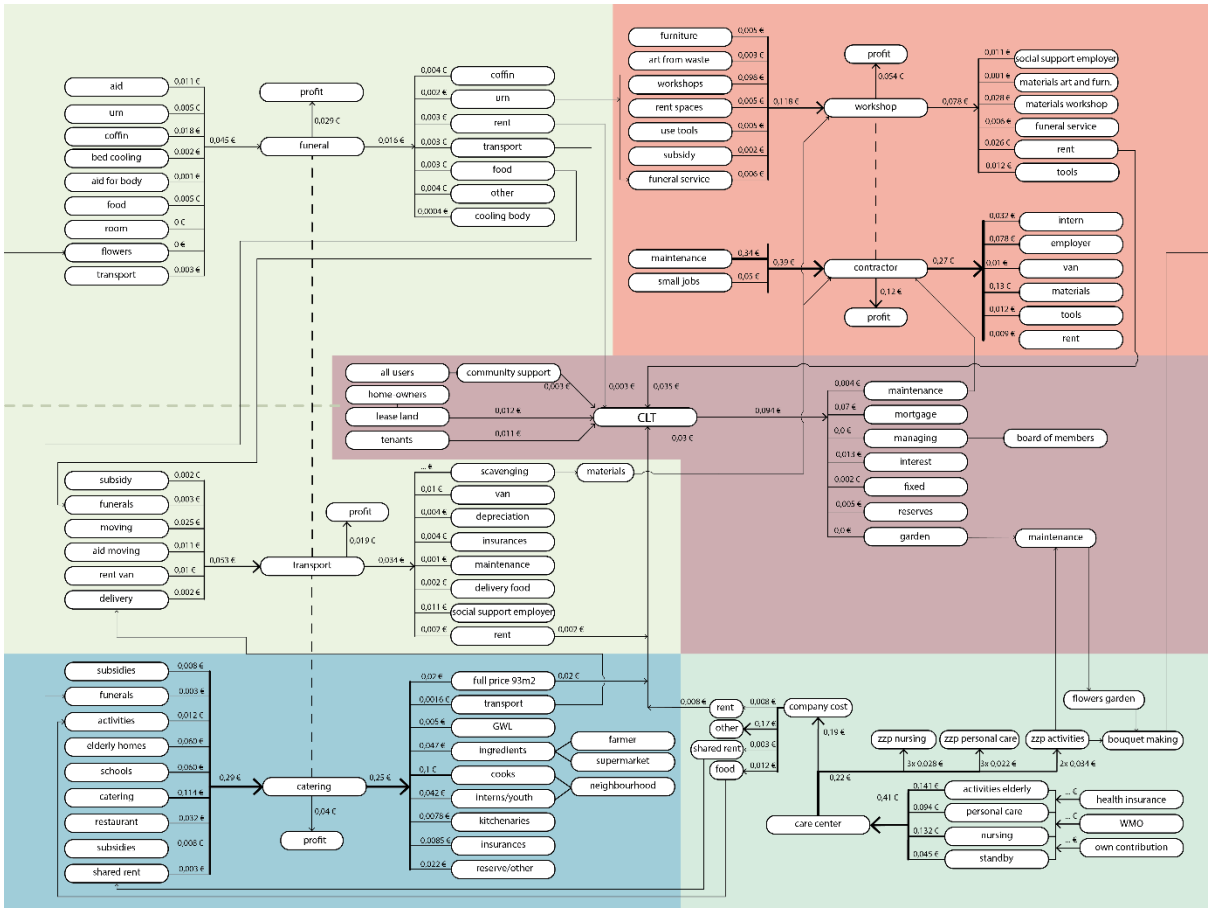

Figure 12. scheme of businesses in a conceptual network (Slob, 2017e)