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Urban food production
A contribution to urban resilience in Berlin?

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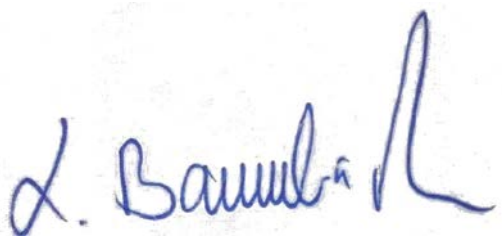

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ABSTRACT OF THESIS submitted by:

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Facing future challenges like climate change, peak oil and population rise on Earth, humanity has to find solutions of how to prevail a stable state of well-being. As the normative concept of sustainable development does not provide a strategic approach, the concept of resilience of social-ecological systems might provide a complementary framework. The industrialized food system with its well-known limitations has provoked the appearance of urban food production in cities all over the world. Although not threatened by a shortage of food, a rising number of citizens are growing vegetables and fruits in Berlin. The current study aims at fusing these two developments by investigating how urban food production can contribute to urban resilience of Berlin. Interviews with seven different types of urban food production in Berlin provided insights into their practices and their stakeholder-networks. Following the conceptual framework for 'resilience thinking', this study shows that urban food producers in Berlin have a high potential to make Berlin's food-system more resilient towards unknown disturbances. It was further found that the interactions with state actors have to be considered specifically when it comes to enhancing urban food production as part of a strategic resilience approach. The analysis revealed the provision of public open space (either, in a spatial and regulative sense) to drive the enhancement of urban food production and thus to contribute to urban resilience.

Keywords: Urban resilience, adaptive governance, social-ecological systems, urban agriculture, urban farming, community gardens, actor's networks, food system, Berlin, open public space, public participation

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This thesis is not my product alone; rather the interim stage of a journey which I have started years ago, when visiting Chile and getting in touch with the permaculture scene there. My interest in community run projects and green areas in cities was intensified while being in so different cities as Valdivia, Hamburg, Munich, Berlin, Budapest, Warsaw, Sofia, Istanbul, Thessaloniki, Malmö, Copenhagen and Wageningen over the run of several years. My search found its temporary climax in this research project. But whatever city I was in, whatever kind of project I got to know, whatever I thought of, I was never alone.

All the time, there were colleagues, friends, flat mates, teachers or family members asking difficult, inconvenient questions and therefore participating and shaping the final product of this journey which took me to the current point. When you read this paper, I want to make sure that you understand it is a community project about communities – my personal community and Berlin's urban food community. What I learned from the projects, the cities and finally the people is a very important lesson: Each city is unique and so are their communities, but there are always things to learn and amazing people doing their work with all their passion and creativity.

For these insights I want to thank so many people that I am not sure it will all fit on these pages, but at least the following should be named: I want to thank

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LIST OF ABBREVIATIONS

ECF	Efficient City Farming
FAO	United Nations‘Farming and Agriculture Organization
IGB	Leibniz Institut für Gewässerökologie und Binnenfischerei).
UA	Urban agriculture
UNEP	United Nations‘ Environmental Program
UPA	Urban and peri-urban agriculture
WHO	World Health Organization

A chain is only as strong

as its weakest link

1 INTRODUCTION

We are an urbanized species now. Since 2007, more than 50% of Earth's population lives in cities[1] (UN-Habitat 2011). In countries of the global north, this share is even higher with 86% (UN-Habitat 2011). These are the indices for a contemporary exodus of humans into the cities which result in a dramatic shift of human spatial and material relationships with the rest of nature (Rees and Wackernagel 1996). This urbanization leads to a centralization of needs for natural resources and energy in densely populated areas. The provision for the needs of these densely populated areas is based on rural hinterlands.

In times of cheap oil, these growing cities have a global impact as their provision networks have expanded to a global scale: their demand for food, fibre, energy and water is being met by a growing network of producers and importers in all parts of the world supported by high-tech communication and transport systems. The German Association of Organic Growers noted, for instance, an increasing need for long-distance transports of food from all over the world (BÖLW 2008). Germany now is a net-importer of vegetables and fruits (Ng & Aksoy 2008). These globalized food supply chains are highly dependent on cheap resources, especially energy for production, processing and transport. The environmental and social impacts of these activities are largely unknown at the place of product consumption.

Cities – not only in industrialized countries – rely heavily on a global hinterland (Sassen 2005: 439). Rees and Wackernagel (1996) understand cities even as black holes for resources. When calculating the ecological footprint of cities it shows that they are highly dependent on more area than they actually possess (Rees and Wackernagel 1996). The

[1] There are numerous definitions to be found about what exactly a city is. In this paper, I assume a city to be a densely populated area of more than 500,000 citizens which is characterized by a strong functional, transport and communication network.

ecological footprint of Berlin's citizens, for instance, expands to 168-times the territory of the city (Schnauss 2001). An important share of this footprint relates to the provision of food, in the case of Berlin over 37% (Schnauss 2001).

1.1 Normative implications of urbanization

Facing global challenges like climate change and peak-oil while the global society is urbanizing, it becomes imperative to reduce this ecological footprint of cities. The international community therefore claims that cities need to become more sustainable. Examples are numerous: Already in 1972, the Stockholm-declaration included in its principle 15 "planning of human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all" (UN 1972). In 1996, UN-Habitat published its "Agenda Goals and Principles, Commitments and the Global Plan of Action" which explicitly addresses "Sustainable human settlements development in an urbanizing world" in its Preamble (UN-Habitat 1996). On the World Environmental Day in 2005, 50 Mayors of major cities all over the world signed the "Urban Environmental Accord" in San Francisco, committing to a list with 21 concrete actions "to promote this collaborative platform and to build an ecologically sustainable, economically dynamic, and socially equitable future for our urban citizens" (UNEP 2005).

But what exactly can a city do to become more sustainable? When is the point reached to declare a city to be sustainable? In their popular book "Urban Agriculture – Food, jobs and sustainable cities" Smit, Nasr and Ratta (2001) claim the definition of a sustainable city to be based on the classic definition issued by the Brundtland Commission report in 1987:

> "A sustainable city is one that is organized so as to enable all its citizens to meet their own need and to enhance their well-being without damaging the natural world or endangering the living conditions of other people, now or in the future" (Smit, Nasr and Ratta 2001).

In this definition, the authors follow the concept of the triple bottom-line but at the same time emphasize the social-ecological system a City represents. The phrase "well-being

without endangering the natural world" emphasizes this interaction between human society in a city and nature as a whole and hints to not misunderstand cities as something detached from nature. The emphasis of the "organization" of cities emphasizes the structure of decision-making in a city, the governance dimension.

The authors describe the ecological dimension of a City's sustainability to require that a city or urban region reduces its negative ecological footprint towards zero. In order to do so, it is important to close the now-open ecological loops with respect to the reuse of waste and cleansing and reuse of water (Smit, Nasr and Ratta 2001). Becoming less dependent on outside supplies by closing the loop is an important theme which can be found in many research articles concerning sustainable cities. Sassen (2005) claims that cities have to adopt a circular metabolic system of nature in order to cope with future challenges, and not overuse the natural systems on which they depend. But are cities able to achieve this claim? And is it enough to declare a certain, vague statement of the goal?

It becomes more and more contested that sustainability as a vague future stable state of the three dimensions (ecologic, social and economic) is precise and concrete enough, especially when it does not emphasize insecurities the reality has to offer (UNISDR 2002, Walker & Salt 2006). Recent history shows that a normative concept alone cannot do the trick to prepare cities for an uncertain future. Life is far more complex than this and keeps a large number of unknown events as surprises. The current global financial crisis, for instance, has let the issue of climate mitigation simply fall down the political agenda (Stokes 2011). Sudden natural disasters which are expected to increase in absolute numbers and in their quality due to global climate change destroy within an instant all efforts which were undertaken to achieve sustainability of a city (take Katrina in New Orleans).

With their high need for imports and their dependence on complex supply systems, cities are extremely vulnerable to sudden changes, even when they are expected like peak oil or climate change (Newman, Beatley & Boyer 2009). But what about the unexpected?

1.2 Towards a strategic approach for an uncertain future: Resilient cities

In the face of natural disasters and sudden, unforeseeable socio-economic changes, the normative claim of sustainable development has to be complemented by a strategic approach of how to prepare for the uncertainty. Instead of a 'fail-safe' state of society a 'safe-to-fail' state is claimed to be needed, while this 'fail-safe' should be based on flexibility to anticipate failures and design systems to minimise failure effects (Dorset 2011). This claim derives out of the research on the resilience of socio-ecological systems[2]. The term resilience was first used for ecological systems only. Grimm & Wissel (1997) found resilience to be one of three terms to describe stability of ecological systems. They defined resilience as the capacity of ecological systems to return "to the reference state (or dynamic) after a temporary disturbance" (Grimm & Wissel 1997).

Walker & Salt (2006) went further by researching case-studies of social-ecological systems and developed a widely cited definition of resilience:

> "Resilience is the capacity of a system to absorb disturbance and still retain its basic function and structure" (Walker & Salt 2006: 113).

This is the first and most important characteristic of social-ecological resilience as found by Folke (2006) who called the basic function and structure "domain of attraction". He emphasizes that the resilience approach is concerned with how to persist through continuous development in the face of change and how to innovate and transform into new more desirable configurations (Folke 2006). He furthermore added the degree to which the system is capable of self-organization (as opposing to a lack of organization, or organization forced

[2] For a comprehesinve summary of the evolution of the resilience concept see Folke (2006)

by external factors), and the degree to which the system can build and increase the capacity for learning and adaptation (Folke 2006).

Folke (2006) calls for the 'same state' or rather 'domain of attraction' or 'desirable configurations' which can be interpreted as a sustainable development, with its three dimensions of environmental, social and economic sustainability. But he extends this concept with the capacity for self-organization and learning-capacities (Folke 2006). In contrast to the normative concept of sustainability, resilience is expressively strategic as – in order to be effective – it must be explicitly based on, and informed by, environmental, ecological, social, and economic drivers and dynamics of a particular place (Pickett, Cadenossa & Grove 2004).

Once applied to social-ecological systems as in the case of Walker & Salt's monography "Resilient thinking", the concept of resilience has started to gain attention and was quickly applied to cities as social-ecological systems. Dorset (2011) declared 'urban resilience' to describe a "notion seeking to capture the differential and uneven ability of places to react, respond and cope with uncertain, volatile and rapid change" (Dorset 2011). The general theme of adaptability to sudden changes can be found in all applications of the resilience-concept (Folke 2006).

This abstract definition, however, is still lacking concrete best-practice examples for resilient Cities. Conceptually, Newman, Beatley & Boyer (2008) tried to close this gap with their book "Resilient Cities" by proposing seven key elements to create a resilient city or community with respect to climate change and peak oil which they derived out of a number of case studies. Even though they did not find one show-case city which shows innovations in all seven areas, they found some of their examples to perform very well in one or two. As can be seen below, these key elements for a resilient city are nothing different than the important provision systems on which the life in a city is based and thus its citizens' well-being: Energy, water, waste, transport and food.

- "The Renewable Energy City: Urban areas powered by renewable energy technologies from the region to the building level.
- Carbon Neutral City: Every home, neighbourhood and business will be carbon neutral.
- Distributed City: Cities will shift from large centralised power, water, and waste systems to small scale and neighbourhood-based systems.
- Photosynthetic City: The potential to harness renewable energy and provide food and fibre locally will become part of urban green infrastructure.
- Eco-Efficient City: Cities and regions will move from linear to circular or closed-loop systems, where substantial amounts of their energy and material needs are provided from waste streams.
- Place-based City: Cities and regions will understand renewable energy more generally as a way to build the local economy and nurture a unique and special sense of place.
- Sustainable Transport City: Cities, neighbourhoods, and regions will be designed to use energy sparingly by offering walkable, transit-orientated options for all supplemented by electric vehicles" (Newmann, Beatley and Boyer 2008).

But how are these changes in the city's systems achieved? Walker and Salt (2008) found some answers by investigating five case studies of social-ecological systems. In their book "Resilient thinking" they describe a general system with certain thresholds beyond which the system would suddenly shift into a new regime or state with different feedbacks between its component parts and a different structure (Walker & Salt 2006).

They point out the importance of identifying and monitoring the economic, social and environmental forces which drive a system towards this threshold (Walker & Salt 2006). To achieve urban resilience the driving actors' mode of thinking has to change – they need "to cross a mental threshold into a systems mind space in which systems with multiple stable states and adaptive cycles make sense" (Walker & Salt 2006); they need to realize the systems' linkages, thresholds, and cycles. Walker and Salt (2006) found resilience thinking to be based on understanding and embracing change, as opposed to striving for constancy. And they harshly criticize the drive for efficiency which basically means to optimize isolated components of a certain system which will automatically lead to a higher dependence on this single component and thus increases the vulnerability of the system to shocks and disturbances as a whole (Walker & Salt 2006).

Resilience thinking might offer a framework for this strategic planning. Based on their model of social-ecological systems with certain thresholds and the research on reasons for historical decline of human-kind and breakdowns of ecosystems, Walker and Salt (2006) developed a concept including factors or rather urban planning and design strategies which make social-ecological systems more resilient:

- Diversity in all forms: biological, landscape, social, and economic
- Ecological variability rather than attempting to control and reduce it
- Modularity of the components the system is based on
- Acknowledging slow variables associated with thresholds
- Tight Feedbacks
- Social Capital, namely trust, well-developed social networks, and leadership (in concert as adaptability)
- Innovation as result of subsidized learning, experimentation, locally developed rules, and embracing change
- Overlap in Governance as "redundancy" in their governance structures and a mix of common and private property with overlapping access rights
- Ecosystem Services would be included in development proposals and assessments (Walker & Salt 2006)

Based on these factors, human society might have a framework to develop ideas of how to become more resilient towards these challenges in order to preserve and improve the well-being of human-kind and the Earth as a whole. In the same way that cities represent the problem of overconsumption and pollution, they are declared to be able to give solutions: Their positive potential for economies of scale, density and the associated potential for greater efficiency in resource use and lower priced options, and dense networks of communication can serve as facilitators to institute new practices (Sassen 2005).

1.3 Urban food systems

Of all the urban provision systems Newman, Beatley and Boyer (2008) listed probably the most widely spread and likewise least visible is the food system. Everywhere in a city, food is visible: Wherever you walk, you will see people eating and you will find baker-shops, ice-cream parlours and restaurants, fast-food places, cafés and supermarkets. They are the ones who provide the urban human-being with food. But these are only the outlets of a long

chain reaching from production to processing, storage and transportation. These parts of the food system are highly invisible. Only the colourful labels of the packaged products in the supermarket shelves give a hint to a highly unlikely situation of free-ranging cows in a green and lush country-side, as Pollan described so neatly in his book “The omnivore’s dilemma”.

Although, food production is mostly invisible in an urban setting, the interconnectedness between a city and food exists but stays unnoticed by citizens and public administrators. Pothukuchi and Kaufman (1999) named a number of factors which make the importance of the food-system clear. They listed not only the high share of retailing related to food-shopping, but the number of employees in the food system, the percentage of overall income dedicated to food, environmental issues like food waste as a major part of domestic waste, the pollution of urban water resources due to fertilizer-use in the rural surrounding, the share of shopping trips in the urban transportation volume, and social impacts like food related health issues (e.g. obesity) (Pothukuchi & Kaufman 1999). This list shows clearly the social-ecological dimension of the food-system. It is a highly important part of the city as a whole; it is not only nurturing the urbanized society but impacts their life in the above-mentioned fashion. Most of us, however, take food for granted.

This can prove to be a highly risky attitude. Following the argumentation of resilience research, the chase for efficiency creates vulnerable systems and exposes them to sudden system shifts (Walker & Salt 2006). The current food system in industrial countries is as efficient as never before in its history and thus gives rise to the assumption of being highly unresilient. Starting with the Green Revolution in the second half of the 20th century the efficiency gains through the Green Revolution were immense (Lang 2004, Pretty 2008), leading to a focus on few high-yield crops and homogenous supply chains. Since the 1960s the aggregate world food production has grown by 145% (FAO 2005), even outpacing global population growth: for each person today, there is an additional 25% more food compared

with in 1960 (Pretty 2008). Productivity has increased due to technological advancements of tools, fertilizers, pesticides and even seeds (Lang 2004). For decades now, the number of farmers in Germany for instance has decreased while the land per farmer has become larger (Destatis 2006). These few farmers are provided by a decreasing number of seed and agrochemical companies (Lang, 2004; Mascarnhas & Busch 1999, ETC 2008).

The theme of "more output with a minimum of input" can also be seen in the market place itself. The number of companies in retailing and production is decreasing, while the size of these firms is increasing. The retailing sector has experienced a similar trend. In concrete numbers this means that the 10 largest retailers provide 34 % of the food in Europe (Dobson 2003). This enabled our societies to have a highly specialized labour market through division of labour and cheap food. For decades, the food variety on the market increased while the price was continuously dropping (Bosshart and Hauser 2008).

Although this high output industry secures sufficient food availability on a global scale (although it does not provide access), this comes with high external costs for the environment. The industrialized agriculture with its monocultures is responsible for deforestation, water over-consumption and pollution, contamination and degradation of soil as well as the loss of biodiversity through pesticides and monocultures to name only a few of the negative impacts of our food production system. Pretty (2008) draws an overwhelming picture of destruction, when she summarizes the negative environmental impacts connected to industrialized agriculture:

> "Increased agricultural area contributes substantially to the loss of habitats, associated biodiversity and their valuable environmental services (MEA 2005; Scherr & McNeely 2008). Approximately 30–80% of nitrogen applied to farmland escapes to contaminate water systems and the atmosphere as well as increasing the incidence of some disease vectors (Smil 2001; Victor & Reuben 2002; Pretty et al. 2003a; Townsend et al. 2003; Giles 2005; Goulding et al. 2008). Irrigation water is often used inefficiently and causes waterlogging and salinization, as well as diverts water from other domestic and industrial users; and agricultural machinery has increased the consumption of fossil fuels in food production (Leach 1976; Stout 1998)" (Pretty 2008).

Although widely known by consumers in industrial countries, it is still difficult to make the right choice when food-shopping. Too intransparent, too unconnected is the product offered in the local supermarket to its actual ecological backpack it is carrying. But efforts are being made.

1.4 Urban agriculture: farming or gardening?

Since these environmental damages have been acknowledged and the media is picking up (in a rather panic-provoking manner) news on food scandals, consumers struggle for more transparency and are looking for alternatives. The demand for organic food, for instance, was continuously rising in Germany in the last 10 years (BÖWL 2011), as is the demand for local food (Bosshart & Hauser 2008). Alternative food systems are enjoying an increasing popularity in numerous major German cities, like farmer's markets and community-supported agriculture or self-harvesting projects are spreading (Rasper 2012, Müller 2012). This is often related to the interest about the origin of food (BÖWL 2011).

Another trend which might relate to the same motivation is the production of food in the city. If in the form of roof-top farms, as allotment gardens or community gardens, these initiatives experience increasing public interest and an inflow of members in all major cities in Europe (BMVBS 2008, Müller 2012, Rasper 2012).

These forms of food production are taking place inside the city limits which is surprising at first glance. As Pothukuchi and Kaufman (1999) find, there is a clear dichotomy between urban and rural space with respect to their relevance for the food system. As the vast rural area is identified with agriculture and food production, the potential of the urban space to host food production is often ignored due to its dense population and sealed surfaces.

However, it is found that urban food production contributes significantly to the global food supply of urban citizens. Schug (2005) estimates that today about 200 million urban

inhabitants produce food for 800 million people. He calculates roughly that 15 to 20% of the global food production is produced in cities worldwide (Schug 2005).

Although significant in quantities in the discussion about food provision for cities and agricultural systems urban space is generally overlooked due to its highly informal and small-scale character. Especially in industrial countries, agriculture has been understood as something contrasting urban life, and was rather understood as potential extension area for the sprawling city (Lohrberg 2010).

Still a very young field of research, several authors have already attempted to give a definition for urban agriculture. As can be drawn from the technical term urban agriculture, the location is usually an important feature to define and differentiate urban agriculture from rural agriculture. UA is understood as agriculture which is carried out within or on the outskirts of a city where a non-agricultural use of local resources is a real option; in contrast to this rural agriculture is found in areas where this option is not an issue (Mougeot 1999).

Jac Smit, an urban planner who dedicated his life work to the research on urban agriculture and is referred to as the father of urban agriculture, defines urban agriculture in his often cited book "Urban agriculture – Food, Jobs and Sustainable Cities" as

> "an industry that produces, processes, and markets food, fuel, and other outputs, largely in response to the daily demand of consumers within a town, city, or metropolis, on many types of privately and publicly held land and water bodies found throughout intra-urban and peri-urban areas. Typically urban agriculture applies intensive production methods, frequently using and reusing natural resources and urban wastes, to yield a diverse array of land-, water-, and air-based fauna and flora, contributing to the food security, health, livelihood, and environment of the individual, household, and community" (Smit, Nasr and Ratta 2001).

The term 'industry' points to UA as being a producing sector with the typical search for evermore efficient production technologies and the focus on increasing productivity as can be drawn from the rural agriculture. At first glance, this seems to contradict with the rather small-scale character of urban gardens which usually produce food on some 100m². As I could experience in the work group on urban agriculture at the "International Conference on

Agriculture in an Urbanizing Society and Urban-Rural Relations"[3], this exclusion of gardening (based on the assumption that gardens do not produce excess food which then can be sold commercially) from urban agriculture in contrast to farming is highly contested in the international research community. An example which argues for an inclusion of gardens might be the city of San Francisco where the legislation has recently enabled urban gardeners to sell their access-food (URL SFUAA).

Canadian geographer Luc Mougeot, one of the world's leading experts on urban agriculture, names a number of conceptual blocks which help to develop a typology of urban agricultural projects. Due to him urban agriculture can be differentiated by:

- types of economic activities
- food/non-food categories of products and sub-categories
- intra-urban and peri-urban character of location
- types of areas where it is practiced
- types of production systems
- product destination
- production scale (Mougeot 1999).

He emphasizes the integration of urban and peri-urban agriculture (UPA) into the urban socio-economic and ecological system and refers to this as "Eco-System" (Mougeot 1999) which is comparable to the resilience concept of social-ecological systems. In his typology, he points to the important factor that the agricultural activity is taking place in an urban setting. But it also hints that in the general trend of urbanization the limits between rural and urban areas are no longer (never were?) clear-cut (Meyer-Renschhausen 2011). The term urban agriculture is understood as the opposite of rural agriculture, set in a different setting, however transition is blurred and the blurry zone between urban and rural has also its huge potential for agricultural activity, the peri-urban agriculture. So the final definition still

[3]International Conference on multifunctional agriculture in an urbanizing society and urban-rural relations, 1-4 April 2012 in Wageningen, The Netherlands. Cf. http://www.agricultureinanurbanizingsociety.com/UK

does not exist, but his description as "Eco-System Urban Agriculture" might help to identify the main theme:

> "Urban agriculture is based on urban resources like land, labour and urban organic wastes, the produce is grown for urban citizens, urban conditions (policies, regulations, markets, prices) have a strong influence and urban agriculture itself influences the urban system vice versa (having effects on urban food security and poverty, as well as having impacts on ecology and health)" (Mougeot 1999).

Van Veenhuizen (2006) distinguishes between three types of urban agriculture. The criteria for this differentiation are the project's main objectives and economic activities. He mentions *subsistence-oriented urban agriculture*, *market-oriented urban agriculture* and *multifunctional urban agriculture*. Subsistence-oriented urban agriculture describes food production for self-consumption only which obviously contradicts Smit's mere market-orientation. Excess produce can either be sold or given away for free. Market-oriented urban agriculture aims at income-generation via production of food and non-food produce. Multifunctional urban agriculture combines food production with other objectives like educational, recreational or environmental purposes (van Veenhuizen 2006).

These conceptualizations and the discussions about how to define a phenomenom based on countless small-scale projects in hundreds and thousands of cities all over the world seem somehow more complicated than helpful for framing the issue. I therefore, will use the term of urban food production in the remainder of this paper, which includes all three forms of urban agriculture – commercial, subsistence-oriented and multifunctional – and furthermore includes both farming and gardening.

1.5 Definition of research gap

From this research background it becomes clear that both, resilience research and research on urban agriculture are very new research areas which have yet to fully develop their theoretical body. Interestingly both areas have a rather interdisciplinary scientific community. Urban gardening initiatives in Berlin, for instance, are studied from different

disciplines, like geographers with respect to public space (Rosol 2006), or sociologist with a special focus on integration (Müller 2002, Allmende-Kontor 2012).

So far, researchers focused on urban agriculture mainly as a way to confront food insecurity for the urban poor in developing countries (Mougeot 1999; Smit, Nasr and Ratta 2001). In industrial countries, the issue has only started recently to raise scientific interest. In Germany, the research on intra-urban food production, except on allotment gardens, has started only since 2005 (Müller 2012). Currently there are three research projects based in Berlin which have started to assess the current initiatives, intending to develop a database of existing projects with their actors (URL Innsula, URL ZFarm, URL VitaCity). Meanwhile several institutes at Universities of Applied Science try to improve urban food production technologies (e.g. Infarming, Duisburg and IGB, Berlin).

Urban Agriculture is often contextualized as an important contribution to a sustainable development. A holistic assessment, however, is difficult and still missing in the research arena. More concrete and strategic, the resilience research has started to generate a concept of resilient cities. This research is still in a very early stage and concrete proposals of what is needed to become more resilient are rare. The urban food system can clearly be identified as one of the social-ecological systems in the resilience concept. So far it has not been attempted to assess the contribution of urban food production to the resilience of a city.

1.6 Matching research question

- Does urban vegetable production contribute to urban resilience in an industrialized country context, and if so, how? Which factors for resilience are fulfilled by urban vegetable production?
- How do urban vegetable producers perceive the interaction with state actors: how do these interactions hinder or facilitate the local production of vegetables in an urban setting?

- How do growers feel that local and national regulations and organisations are affecting their projects?

1.7 Aim of the thesis

- To explore the reality of urban vegetable producer's in a concrete case study of one city in a highly industrialized country, identify the different variations of urban vegetable production, exploring their perception of how they contribute to the urban system with respect to urban resilience, getting to know their important stakeholders network and their form of interactions in order to understand what would help urban vegetable producers to enhance their scheme in cities of industrialized countries.
- To understand how urban vegetable producers are part of urban governance structures and identify policy interventions to enhance their capacity to produce food in an urban setting
- To help urban governance actors increase the amount of locally produced vegetables in cities of industrialized countries in order to enhance the resilience of cities.

1.8 Target group

- Practitioners of urban food production
- Policy makers and public administrators in cities of industrialized countries
- researchers and students in the area of sustainable urban development, urban agriculture, urban planning and resilient cities

2 METHODOLOGY

I started my research project with the observation that community-based gardening projects in German cities were increasing in absolute numbers. A first internet search showed me that this was not a German phenomenom at all, but that community gardens had their origins in the United States. There, the development had gone further and commercial projects in the form of Roof-top farms are successfully operating and contributing a new food-provider for the urban food systems in the US.

2.1 Case study selection

Based on the research background, I described in Chapter1, I decided to take a city in an industrial country as a case study. I was looking for a major city in a highly industrialized country, where a number of different food-producing initiatives have spread in recent times. I was searching for a city with actors' networks unknown and detached from me, in order to keep some kind of personal distance to the object of my research. As I am very familiar with the German culture and context and the already extensive collection of projects in Germany, I decided to take it as the national background for my case-study.

The decision to select Berlin was based on some first investigative interviews with gardeners in Hamburg and some email-exchange I had with several German research projects on urban agriculture: I found that in Germany, Berlin is expected to show the greatest variety of different types of urban food production. With 3.5 million citizens and an area of 892 km², Berlin is by far the biggest city in Germany and judging from this size the only German city somehow comparable to other European capitals. In this respect, urban food producing projects in other German cities (e.g. in GartenDeck in Hamburg) tend to look towards the German capital for inspiration. As will be shown in section 3.1 on the history of urban food production in Berlin, it has a long tradition of urban agriculture inside the city limits.

From the point of decision, I started a desk research of the currently available literature on urban food production in Berlin. For the internet search I googled key words like "Gemeinschaftsgärten Berlin", "Interkulturelle Gärten Berlin", „Urbane Landwirtschaft Berlin", „Urbane Lebensmittelproduktion Berlin". Furthermore I communicated via emails with scientific experts to learn about the different projects and forms of urban food production in Berlin. When I identified a project, I searched their website for interlinkages to other projects or networks furthermore I read online news articles on the topic. Selection criteria for the projects were:

1. Projects should explicitly or implicitly produce food in the city centre;
2. Projects should be organized as legal entities.
3. Projects should be situated in one of the central districts of Berlin (i.e.: Mitte, Friedrichshain- Kreuzberg, Pankow, Reinickendorf; Tempelhof-Schöneberg, Charlottenburg-Wilmersdorf, or in the very North of Neukölln)

Based on this I identified 30 projects of which I selected seven projects to become my samples. They represent 6 different forms of urban vegetable production, i.e. allotment gardens, 1 roof-top aquaponic farm, 1 mushroom farm, 1 intercultural garden, 1 neighbourhood garden and 2 mobile garden concepts (cf. section 3.2).

2.2 Semi-structured interviews

Due to the limited number of projects I found and the analytical framework the study is based on, (see below) I decided to carry out semi-structured interviews of experts (following Patton 2001). This enabled me to receive the subjective perceptions of practitioners of different forms of urban vegetable production. I contacted the projects via email or called them directly on the phone, explained my research idea and asked for an appointment for a face-to-face interview with a representative. I conducted the interviews in German.

The interviews were based on an interview guide (cf. Appendix 1: Questionaire); however, I purposefully created a personal, conversational atmosphere through my behavior

(in some cases I visited the site of their vegetable production and let them explain the organisational structure to me). This personal approach was accepted as I always received the invitation to address the interviewee in an informal way, to use “Du” instead of “Sie”. I also did not stick too close to the interview guide, but let the interviewee answer freely and decide about the next area of discussion. In the end, however, I tried to have all questions answered. The interviewees were informed that the conversation was recorded, their approval was obtained. The interviews took from half an hour to 3 hours and were recorded with a small MP3-player which only rarely picked up the attention of the interviewee. Three of the 7 interviews were conducted on the telephone as a personal meeting was not possible. They followed the same semi-structure approach.

The interview was structured in two parts:

Part 1: following the interview guide.

Part 2: filling out a Stakeholder-Portfolio-Matrix with power/ interest-dimensions (cf. Appendix 2: Stakeholder-Matrix) based on the stakeholders mentioned throughout the interview.

In order to fill out the stakeholder-matrix, I explained the significance of the matrix to them and further gave them the following instructions, how to fill them out:

- Interest related to the perceived intention of the actor with respect to urban food production (from high to low)
- Power/ influence relates to the ability of the stakeholder to threaten the existence of the urban gardening project or to change its current state (from high to low)
- The stakeholders are distributed in relation to each other, there are no quantitative measures for the axes

The second part was either filled out directly after the interview, or prepared by me, sent to the interviewee via email and then corrected by the interviewee during a phone-call which was as well recorded. These stakeholder-portfolios were then manually transferred to a simple actors’ network, which shows how the projects are interlinked. This network was

created with VUE (Visual Understanding Environment), an open source network-creator with simple analysis tools[4].

The recorded interviews were then transcribed using the program F4[5].

2.3 Analysis and theoretical framework

After reception, I coded the documents manually, using Microsoft Word Comment-function along the keywords of the analytical framework which is described below. I also extracted important quotes and fed them into the citation software Citavi[6] and connected them to keywords of the analytical framework (for this see below). I translated the direct quotes which are used in the following analysis into English. Although I did it as precisely as possible, this might have led to a loss in information due to the differences in languages.

I then extracted information on the history of the urban food system of Berlin from literature and the interviews of the urban vegetable producers and provided an overview of the current state of the food system of Berlin (cf. chapter 3) in order to understand certain patterns of the social-ecological system of food-provision in Berlin over time (cf. section 3.1.) Following this, I described the 7 projects under research and compared them with respect to their active participants, their main goals, their legal form, their source of financing and their plans for the proximate future (cf. section 3.2).

Then followes the analysis of the contribution of urban food production for a more resilient food system in Berlin (cf. chapter 4) with a main emphasis on the projects stakeholder-networks (cf. sections 4.2 and 4.6). The stakeholder-portfolios (cf. Appendix 3: Stakeholder-Portfolios) played an important role in this respect. They offered the possibility to understand the projects' perception of the importance for and interest of their stakeholders in their project. The identified stakeholders were grouped based on the following typology:

[4] VUE (Visual Understanding Environment) retrieved from: http://vue.tufts.edu/.
[5] Freeware to manually transfer recordings into written text. Retrieved from: http://www.audiotranskription.de/english/f4.htm
[6] Reference management program, for Microsoft Windows. Retrieved from: http://www.citavi.com/.

This typology enabled me to group the mentioned stakeholders and understand better the importance of different legal forms of organizations for the urban food producers.

Table 1: Typology of stakeholders

Type of stakeholder	Clarification
Individuals	Private individuals: members of non-profit associations, family of members, former members, clients,
Public administration	Federal, state and local administration and subdivisions
Private companies	Small start-ups, but also large multinational companies
Registered non-profit associations	Other gardening initiatives, and others
Politicians	Individuals, not named
Churches	Catholic and protestant
Researchers/ education	Public bodies with a focus on scientific research or education
Press	Newspapers, television, journals, magazines, blogs etc.
Foundations	Privately funded foundations
networks	Chambers or associations of several other organizations, not necessarily with an own organizational body

The stakeholder-portfolios also helped to derive a simple actor network (cf. Appendix 4: Actor-Network) which is based on the stakeholders, the interviewees found either interested in their project or influential on the existence or both. Stakeholders in quadrant D (unimportant and uninterested) were not taken into account.

The further analysis of the interviews was based on the conceptual framework for resilient social-ecological systems following Walker and Salt (2006) (cf. chapter 4). I followed their argumentation in "Resilience Thinking" on what factors a resilient world would value in order to answer the first research question "Does urban vegetable production contribute to urban resilience in an industrialized country context, and if so, how? Which factors for resilience are fulfilled by urban vegetable production?"

Walker and Salt (2006) developed the following conceptural framework which includes factors which are imperative to manage the resilience of a social-ecological system:

- "Diversity – a resilient world would promote and sustain diversity in all forms (biological, landscape, social, and economic).
- Ecological variability – A resilient world would embrace and work with ecological variability (rather than attempting to control and reduce it).
- Modularity – a resilient world would consist of modular components.
- Acknowledging slow variables – A resilient world would have a policy focus on "slow", controlling variables associated with thresholds.
- Tight Feedbacks – a resilient world would possess tight feedbacks (but not too tight).
- Social Capital – A resilient world would promote trust, well-developed social networks, and leadership (adaptability). Individually these attributes contribute to what is generally termed "social capital", but they need to act in concert to affect adaptibility.
- Innovation. A resilient world would place an emphasis on learning, experimentation, locally developed rules, and embracing change. A resilient world would subsidize experimentation – trying things in different ways – and offer help to those willing to change.
- Overlap in Governance – A resilient world would have institutions that include "redundancy" in their governance structures and a mix of common and private property with overlapping access rights. Totally top-down governance structures with no redundancy in roles may be efficient (in the short term), but they tend to fail when the circumstances under which they were developed suddenly change. More "messy" structures perform better during such times of change.Ecosystem Services – A resilient world would include all the unpriced ecosystem services in development proposals and assessments" (Walker & Salt 2006: 145ff.).

In chapter 4, I introduce each factor more extensely, before analysing my data on the urban food producers with respect to their contribution to this resilience factor.

In chapter 5, I than took a final step of analysis bydescribing and analysing the special interactions of the urban food producers with state actors in order to answer the second research question "How do the urban vegetable producers perceive the interaction with state actors: how do these interactions hinder or facilitate the local production of vegetables in an urban setting? " and the third "How do growers feel that local and national regulations and organisations are affecting their projects?" I did this by identifying important forms of interactions with state actors, which happened to be the following:

- Financial support
- Urban planning and the provision of public land

- Regulations
- Information, coordination and responsibilities
- Administrative processes

I discussed these findings in respect to how they support or prevent the scheme of urban agriculture to advance with respect to productivity, land-area used and participation of Berlin's citizens. All my findings were furthermore cross-checked with scientific literature on the issue.

2.4 Limitations of Scope

Due to the limitation of time to 4 months dedicated to the fulfilment of this research project, I limited the scope of this study to one city only. In the form of an explorative study, I identified the existing forms of intra-urban vegetable production in this city, the main actors and their networks. Finally, I selected only 7 different projects and interviewed one representative each. This limits the extracted information to the very subjective perspective of one person who was usually one of the initiators of the projects. The subjectivity of their perspectives can therefore not include the perception of the larger group of other members some of the projects were based on. I only investigated the perspectives of the practitioners themselves and left actors from their networks unquestioned.

I also think it important to mention, that I only chose the perspective of the urban food producers and left out to investigate their stakeholder's opinion to cross-check their perceptions. My findings therefore are only triangled with the current state of research on resilience and urban agriculture.

As I visited Berlin only for the interviews and visits of the vegetable production sites, my knowledge of the local structures, institutions and circumstances are only theoretical, derived from the interviews or literature. This might have led to misunderstandings and misinterpretations of the interviewee's statements.

The method of collecting stakeholders during the interview and then directly distributing them on the stakeholder-matrix might have led to missing important ones. The alternative of extracting stakeholders from the interview transcript and having a re-check of the matrix with the interviewees generally led to a higher number of identified stakeholders.

3 INTRODUCING BERLIN'S FOOD SYSTEM

Every journey starts with the first step.

But before I get into the analysis of such a complex system as the food provision system of a major city, I want to take on step back and face the past. You only learn from the past. To do so, I first give a historical overview of the urban food production in Berlin from the Industrial Revolution until today. I identify the disturbances the system experienced in this time, their consequences and intensity. As a result I collect challenges and weaknesses of the historical Berlin's food system.

In the next step I then describe the seven selected case studies and give a short summary of their differences and common grounds in order to provide an understanding of what forms of urban agriculture are currently present in Berlin.

The following step then is to apply the conceptual framework for resilience thinking of Walker and Salt onto this then described system of urban food producers and find out in how far they are able to contribute to Berlin's resilience.

In the last chapter of the analysis, I take the special focus on understanding the interaction of the urban food producers with the state's actors.

3.1 History of a phenomenon: Urban food production in Berlin

Following the resilience framework of Walker and Salt (2006), a historical overview of a social-ecological system is the starting point for understanding the adaptive cycles and system regimes of such a system. An adaptive cycle due to the authors is a path on which loops of growth and adaptability are followed by back loops of creative destruction and new beginnings (Walker & Salt 2006). The frequency and intensity of these events cannot be predicted, only modelled with high uncertainty on the basis of stochastic processes and

disturbances; looking back in history helps to understand how a city has formerly coped with such challenges.

In the following chapter, I summarize the timeline and evolution of Berlin's food-system throughout the last 150 years. I point out important historical events in connection to the population's development, the situation of food provision, distrinct sources of food and related public policies. This description provides answers to questions about the nature and dynamics of the food sector; its evolution over time; the major changes in supply and demand, the performance of the food system to provide Berlin's citizens with food, the main players which supported this food system, the historical challenges the sector had to face and the effectiveness of policies and support structures.

Few publications concentrate on the issue of food production and provision in Berlin. I had difficulties to find quantitative data with the specific focus on Berlin and its historical food provision system. The information I collected in the following was scattered in different publications which come from different contexts. Some sources specialize on a specific form of urban food production and sketch its evolution. This was true for the allotment gardens (URL Gartenfreunde Berlin) and urban gardening initiatives (Meyer-Renschhausen 2012). Schmidt (2008) has gathered a valuable collection of administrative documents and minutes regarding the post-war years 1945-1949 in his book "Red roots on the Olivaer square". Further information could be gathered from history and trends of the German retailing system which is applicable to Berlin until World War II. I further consulted history books and included some narratives from the interviewees. The following table gives an overview of the historical development.

Table 2 Timeline of urban food production in Berlin

	Historical events	Food provision	Allotment gardens	Backyard and community gardens	Commercial urban farming
Prior to 1910	1877: Berlin's population exceeded 1 million Fast growth during the Industrial Revolution 1905: Population exceeded 2 millions	Berlin and Mark Brandenburg (the surrounding region) are closely interrelated; inflow of food e.g. from Spree-Region (Allmende-Kontor 2012)	1833: First public gardens for the poor were created in Berlin (Berlin 2011) 1867: First "Schrebergärten" were created in Leipzig 1880 -1900: Number of allotment gardens in Berlin increased from 2,000 to 40,000 (URL Gartenfreunde Berlin) 1909: Foundation of first workers and allotment gardeners association (URL Gartenfreunde Berlin, Berlin 2011)		urban agriculture disappeared in Europe due to improving communication and transportation networks; cities are growing, food was provided by the surrounding rural areas (Schmidt 2008b)
1910s	1914-1918 World War I 1914: Public administration was allowed to confiscate private fallow land for food production 1919: Founding of the Weimar Republic	1915: food scarcity led to rationing; during WW I 750,000 Germans died of hunger	1915: garden colonies for war widows 1917: protection against eviction of allotment gardeners from fallow land 1919: Ordinance for allotments of the Weimar Republic	1919: Migge found a garden of 400 m² enough to provide for a four-headed family	
1920s	1920: Golden twenties: Berlin was economic and cultural Capital in Europe; formation of Greater Berlin: Incorporation of surrounding towns and communes, population rises to 4 million;	Berlin was provided with food from its surrounding region of Brandenburg	1921: foundation of the central association of allotment gardeners 1925: Maximum number of 165,000 parcels on 6,239 ha		

	Historical events	Food provision	Allotment gardens	Backyard and community gardens	Commercial urban farming
	1929: Black Friday introduced the World economic crisis				
1930s	1933: Hitler took power and Berlin became capital of the Third Reich	Beginning of the 1930s: 6 million Germans were unemployed and lived in very poor conditions	1931: the president of Germany ordered the creation of more allotment gardens on public land for the unemployed		30,000 ha of horticultural farms and market gardens (Schmidt 2008b)
1940s	1939-1945: World War II Post-war: global food crisis (only 36% food production in comparison to prior the war) 1948-1949: Berlin-blockade and Berlin Airlift 1949: Creation of two German states (and separation of West-Berlin and East-Berlin)	1939-1945: food provision from the occupied countries and surrounding country side 1945-1949: Rationing of food and market regulation 1945: fallow land ordinance 1946/47: Food scarcity, led to hunger winter in Berlin (Schmidt 2008b)	1944: lease contracts for parcels were declared non-redeemable 1945: It became temporarily allowed to live in the garden huts due to a lack of housing in post-war times	1947: at least 12 % of all Berlin citizens were using their own garden for a part-self-provision (Schmidt 2008b)	During the last years of the war, more and more commercial producers had their infrastructure destroyed, work force was lacking, as well as fertilizers (Schmidt 2008b) 1947-1949: commercial producers were forced to grow certain vegetables and provide them to central distribution hubs (Schmidt 2008b)
1950s	Western Germany experienced the Wirtschaftswunder: rapid reconstruction and development of economy Eastern Germany introduced the "Planwirtschaft" and fused separate farms to "Genossenschaftsbetriebe"	In East-Berlin, the food retailing market was mainly served by the direct surrounding of Berlin. West-Berlin was then provided by transports from West-Germany	In post-war times, vast areas of allotment-gardens were used to reconstruct the city (scarcity of living room)		
1960s	1961: The wall separating East and West Berlin was built 1961: The student movement started in Western Germany	Self-service shops spread in West Berlin, however general stores were still the main source for food in West-Berlin 1962: First Aldi market opened	Allotment-gardens were highly important for West-Berlin due to its status as island in Russian sector Also in East-Berlin the so		

	Historical events	Food provision	Allotment gardens	Backyard and community gardens	Commercial urban farming
		in West-Berlin and introduced the still prevailing era of discount supermarkets	called "Datscha" provided the families with leisure and food		
1970s	1973: Oil crisis led to economic downswing Diversification of W-German student movement in peace movement, feminists, environmentalists; leftist etc.	Other discount supermarkets are appearing, competing with self-service stores. The range of products is diversifying, deepening and broadening (Wortmann, 2003)		Illegal fallow land squatting in West Berlin as side-phenomenon of house squatting (Meyer-Renschhausen 2012, Holm & Kuhn, 2010)	
1980s	West-Berlin starts a sensitive renewal process of old buildings to contrast former speculation on land during the 70s (Holm & Kuhn 2010)	supply chains for food are extending from regional to international (Wortmann, 2003)		1983: West-Berlin provides a funding of 50 DM/m² for the greening of backyards as a part of the program of urban renewal (Meyer-Renschhausen 2012)	
1990s	1991: the wall came down, reunification of Eastern and Western Germany, Berlin loses additional funding as frontier city of the Cold War		1991: Reunion of allotment garden associations of East and West Berlin	New green wave: creation of community gardens and children's farms in Berlin 1996: First intercultural garden is founded in Göttingen	
2000s		2008: Discount supermarkets are dominating the food retailing. Direct marketing on farmers markets have only a 0.5% market share (Berlin 2008)		2003: First intercultural garden is founded in Berlin, taking the garden in Göttingen as model 2009: Prinzessinnengarten invents the mobile gardening concept	2006: BioPilze Berlin is founded 2009: Self-harvesting project Bauerngärten is founded 2011: ECF is founded
2012			74,500 allotment gardens on 3,060 ha = 3.5 % of Berlin territory	24 intercultural gardens, numerous neighbourhood gardens	

From the timeline in Table 2, it becomes clear that urban food production always became more relevant in the time of social or economic crises, represented by wars, post-war struggles and regime shifts. These shifts provoked (partly temporary) changes in the food provision of Berlin as the former system did not work anymore due to destruction or loss of providers. So it happened during First and Second World Wars, but also during the economic crisis in the late 1920s. The allotment gardens, for instance, were always extended or legally secured once such a crisis set in. Urban food production was always reinvented and supported as a "safety valve" once the conventional systems were highly impacted by outer circumstances (Lohrberg 2011).

Besides these sudden shifts, the Industrial Revolution and its impact on the cities was another trigger for changes in the urban food system. Cities were industrializing and workers districts were developing. Workers did not receive high enough wages, so allotment gardens, back than called worker's gardens were provided by the big industrial companies to keep the work force nurtured and functioning. The aspect of health was important in the development process of the typical German phenomenon of "Schrebergärten", allotment gardens, originally developed to improve the health of urban children, later being the retreat for the proletarian citizens of the industrialized cities (Schug 2005). During the crises mentioned above, the allotment gardens usually received more public land or some kind of regulation, ensuring their existence as an important food supply for the urban population. The climax of this development was in 1919 when the Weimar Republic released the ordinance to provide every Berlin citizen with enough land to cover their demand for vegetables and potatoes (URL Gartenfreunde Berlin). This resulted in the maximum area of more than 6,000 ha for allotment gardens in Berlin in 1925.

In war-times the food-provision of the cities was especially bad: The worst food crises happened during World War I when 750,000 Germans died of hunger (Müller 2003). Due to

the lack of fertilizers and a bad yield, in 1915 food had to be rationed. In World War II, the war-time did not so much put pressure on food provision, but the post-war time did. In 1947 a worldwide food crisis lead to the so called “hunger winter” 1946/47 in Berlin which imprinted in the collective memory of this generation and has shaped their consumption behavior until the present day (Schmidt 2008a). Since then, the food system has stabilized. The Green Revolution which started in the 1960s and the appearing retail-system of supermarkets seems to provide sufficient food as to secure food availability in Berlin (Krawinkel 2005). However, the lessons to be learned from the crises during war-times is that high dependence on imports of material, such as fertilizers, seeds, tools and a lack of work force as men were at the front or already dead, weakens a food system in times of need (Schmidt 2008b).

The public administration always played an important role during times of crises. During both wars food was rationed and given out centrally for ration stamps. The administrators made public and private land available for the population to grow their own food as last instance to ensure additional provision of fresh vegetables. It is important to point out the fallow land ordinance which was introduced in 1945. It ordered the Berlin population to grow vegetables on every unsealed land (Schmidt 2008a). The district administration was allowed to confiscate private fallow land and to provide interested gardeners with access to these fields. Whole parks were transformed to vegetable gardens comparable with the Victory Gardens in the US and UK (Meyer-Renschhausen 2012). The still existing and functioning horticultural farms were obliged to only produce vegetables and provide them at central public food collection points (Schmidt 2008b). In the end, the fallow land ordinance was found to be partly successful, as one third of Berlin’s vegetable demand could be covered from its own land (Schmidt 2008a). Confronted with the enormous food demand of a 3 million-city with respect to milk, cereals and meat, this was not sufficient and food transports form the surrounding region were necessary (Schmidt 2008b). However, in the end 1 million Berliners received an additional vegetable input thanks to this ordinance (Schmidt 2008b).

Until the separation of Germany following WW II, Berlin had been highly connected to its surrounding rural region "Mark Brandenburg"[7]. Following WW II, Germany was separated until 1991 and so was Berlin in West- and East-Berlin. Especially West-Berlin as an island in the Russian sector had some difficulties with respect to its food provision. From 1948-49 the Soviets blocked West-Berlin from all provision networks and the Berlin Airlift with the Candy-Bombers had to provide the Wester-Berlin population with food (Müller 2003).

In the more recent past, urban agriculture did not play such an important role in the food system of Berlin anymore. However, it started to reappear as a means of protest against the "establishment" and against speculations on housing and sky-rocketing prices. When the student movement in the late 1960s in West-Berlin started to live in squatted houses, they also tried to realize their ideals by creating the first community gardens in Berlin (Meyer-Renschhausen 2012, Holm & Kuhn 2010). Meyer-Renschhausen (2004) noticed that from the start, community-gardening was about reclaiming the commons, using public space in a community-based fashion. Through the struggle to claim public space to create gardens, the community gardening evolved from a social-ecological motivation towards a political-economic today (Meyer-Renschhausen 2004). In the US they are seen as "both subversive, in that they allow consumers and producers market-based and community-based avenues to avoid the "placeless foodscapes" of impersonal retailers and a national "cheap food" policy "and are also being slowly embraced by governments in developed countries" (Donald 2010). In recent years, starting in the end of the 1990s intercultural community gardens have been founded in Germany and since the millennium numerous of these projects have grown in

[7] One of my interviewees told me the story of her family who originates from the area close by Berlin called "Spreewald". Once the survival rate of the farmer's offspring improved due to medical advances, the tradition to split the farm land between the sons of the farmers ended as the farm land became too small to support the families. Following this change, the eldest son received the land and the others were sent to the city (Berlin) to become either teachers or preachers. Most of them stayed in Berlin and thus a strong interconnectedness between the city and its surrounding rural hinterland developed. This tradition ended with the second World War and the following divide of Germany, at least in the Western part of Berlin.

Berlin. These new forms of urban agriculture show a great variety of motives. They are seen as important steps toward moving toward a more sustainable form of food capitalism (Donald 2010) as they contribute to food security, engage with ecological practices as well as even having the additional benefit of breaking down racial and cultural tensions (Donald 2010).

Looking into the history of Berlin, it becomes clear, that urban food production always received a push when socio-economic circumstances turned bad. This happened during war times and economic recessions, but also during social development processes like the protest movement of the students in the late 1960s and the search for alternative ways of integrating immigrants into the German society in the end of the 20th century. The challenges of wars, economic, policitical and social crises were challenging the food provision several times in Berlin's history of the last 150 years. Urban agriculture was often introduced as the safety valve.

3.2 The seven vegetable producing projects

In the following part, I want to give a more detailed description of the selected projects (find an overview in Table 3) and provide insights to answer the following questions: Who are the initiators and active gardeners? What are their main goals and motivations? What is the legal form of their projects and what does this mean for their activity? Where and how do they receive their financial capital? Where do they produce food and how? Besides this I give an overview of the current problems they are facing and their short-term future plans. Further details will then be provided in Chapters 4 and 5). This section is based on the interviews I have conducted with representatives from each project and include not only the self-perception of the interviewees but also the perception of the other interviewees and studies focusing on them.

Table 3: The seven case studies

Project	Type	Contracting organisation	Legal form	Founding year
Laskerwiesen	Neighbourhood garden	Bürgergarten Laskerwiesen e.V.	Registered non-profit association	2003
Pyramiden-garten	Intercultural garden	Multikultureller Nachbarschaftsgarten Neukölln e.V.	Registered non-profit association	2006
Allmende-Kontor	Mobile garden +coordination agency	Workstation e.V.	Project of a Registered non-profit association	2011
Prinzessinnen-garten	Mobile garden	Nomadisch Grün gemeinnützige GmbH8	Private company	2009
Allotment-gardens Berlin	Allotment gardens	Landesverband der Gartenfreunde Berlin e.V.	Registered non-profit association	1919
Biopilze Berlin	Indoor mushroom farm	Biopilzfarm, Christian BioPilze	Private company	2006
ECF Center	Rooftop aquaponic farm	Efficient City Farming GmbH	Private company	2011

Laskerwiesen is a community-based garden with the goal to offer a social anchor point for the formerly marginalised neighbourhood. Founded in 2003, it is organized as a non-profit organization.

> „We are mainly a social ankor point, because some of our gardeners would have few social contacts otherwise and could never afford their own garden. And with respect to the inteaction: Here everyone is meeting everyone on the same level" (Laskerwiesen 2012).

Some of the active gardeners are highly dependent on the vegetable production of their plot while others are just trying themselves out, want to spend their free-time gardening and bring their children in contact with fresh soil and plants. The garden functions as social meeting point in the neighbourhood and also stabilizes socially precarious members (Laskerwiesen 2012).

[8] GmbH translates into company with limited liability, this indicates that the owner of the company is not personall y liable for the company's debts.

Other initiatives see the Laskwiesen also as an important knot in the gardening network of Berlin. It is locally and functionally strongly connected with an association called Workstation, representing the topic of neighbourhood gardens and public participation of civil society (Allmende-Kontor, 2012)

The garden is organized as a registered non-profit association. Currently the association has 39 active members who are mainly direct neighbours of the garden and have heterogeneous social backgrounds. Besides the active members of the association, their family-members but also non-member neighbours are coming regularly into the garden for gardening activities or leisure. The garden is open to the general public and offers regular workshops on topics like pruning, old potatoe varieties and how to make jam and chutneys (Laskerwiesen, 2012).

It was created on a former abandoned lot of public fallow land. The district owns the plot and excavated polluted soil and replaced it with fresh soil; the whole infrastructure of paths, fences was also provided by the district. (Laskerwiesen, 2012); storage facilities and sanitation is provided inside old ship containers on the garden plot. The gardeners are using 35 parcels of 10 m² each. Besides the garden the plot offers a pond, an adobe-stone oven, lawns with fruit trees and shrubs and a football plot (Laskerwiesen 2012).

Laskerwiesen is mainly financed by member fees (10 Euros + 6 Euros of water per year). Once the infrastructure and tools are there, there is no need for more money to run the garden (Laskerwiesen 2012).

The initiative is facing several problems, including the difficulty to find people who want to take on responsibility as head of the association's board, or writing applications for fundings. It is not only the lack of time but also the lack of knowledge about how to write applications that keeps the members from engaging themselves in the administrative activities (Laskerwiesen, 2012). The topsoil also creates problems. Due to war ruins, the ground water

cannot be pumped out as contamination would spread, therefore the garden has a rain-water collection system and takes further water from the pipe which results in the highest costs (10 Euros/per month member fee + 6 Euros for water) (Laskerwiesen 2012).

In the close future, the initiative wants to extend their cooperation with a bee-keeper and build a "bee-house" and plant a wild-berry hedge (Laskerwiesen 2012).

Pyramidengarten is an intercultural garden in the marginalized district Neukölln, close to the district border of Schöneberg-Tempelhof. It was founded in 2006 and is organized as a non-profit association.

> „Pyramidengarten is the second intercultural garden in Neukölln. […] The association has set its goal, to create an intercultural garden and involve at least 50% immigrants as members. We support integration, we are a communication hub, we are a place to receive information and exchange knowledge, a place where you can eat together, celebrate and get to know people" (Pyramidengarten 2012).

Other initiatives appreciate Pyramidengarten as a place to gain information about soil contamination and soil quality as the garden-initiative is closely interlinked with a private consultancy with expertise in soil ecology (Laskerwiesen 2012).

On an area of 1000 m², 35 members and their families, summing up to 100-150 individuals from a broad variety of cultural backgrounds, are using the 800 m² garden plots for their indidivual and communal activities. The land is owned and rented from the district and includes a building with meeting rooms, and workshop and sanitation facilities.

The garden is financed by the member fees and furthermore by private donations. Their projects, e.g. workshops on soil testing, but also cooking activities, are partly funded by public and private foundations (Pyramidengarten 2012).

In the close futue, the initiatve will create an environmental lab (financed by a private foundation) to improve their educational program for soil testing, chemical analysis, observation of the soil fauna (Pyramidengarten 2012).

Allmende-Kontor is one of the projects which are currently settling on the green land of the former Airport Tempelhof. It was founded in 2010 as a subproject of workstation, a non-profit organization

> "Allmende Konto is first of all a garden to put its hands on Tempelhofer Feld. Allmende-Kontor is the idea for the different urban gardening initiatives which have spread all over Berlin in recent years. The idea is to have a place, a drop-in centre, an information centre in the city for these initiatives and the topic" (Allmende-Kontor 2012).

Based on the idea to "have the hands in the soil and our heads in the world" 13 iniators of whom most are experienced in organizing community gardens, decided to apply for the interim use of a 5,000 m² piece of land on the fields of the closed down Airport Tempelhof where they wanted to build a knot for all existing garden iniatives (future and existing) in Berlin. They want to provide guidance to new initiatives with respect to finding a plot or forming a non-profit association (Allmende-Kontor 2012). They hold workshops on the practicalities of gardening, e.g. how to plant seeds and preserve them, how to make compost (Allmende-Kontor 2012). Another important dimension of the project is the motivation to create a local community in the city. The active gardeners' focus has shifted from gardening in a community to a focus on the current food-system and the relevant societal-political processes (Allmende-Kontor 2012).

As participants of the innovative planning concept called "Tempelhofer Freiheit" (Tempelhof's freedom) citizen initiatives in Berlin can apply for a plot of public land on the former Airport fields to realize their ideas. Some of the group of 13 have a research background in the area of urban gardening and agriculture which guarantees a running assessment process on the way. The idea of the initiators was to open up a field for the public to start gardening in small raised beds.

Within a few weeks the field was covered with 285 raised beds, built from whatever recycled material the volunteer gardeners could find. These active gardeners are registered

and come from all kinds of differen cultural and social backgrounds. On the weekend, there can easily be 500 people found on the field. There are young people with no former gardening experience at all, young families with children and pensioners and also immigrants planting their herbs and vegetables from their homelands (Allmende-Kontor, 2012),

Other initiatives perceive Allmende-Kontor as an avant-gardist which is creating a way to cooperate successfully with the public administration and push the discussion about how to cope with public open space to a new level of public participation (Laskerwiesen 2012). However, they fear about the short-term character of this "urban gardening-hype" which is currently appearing in Berlin and other German cities, supported by very positive press coverage (Pyramidengarten 2012). The broad engagement of the initiators in numerous other projects in Berlin is also seen critically. It is interpreted as a lack of focussed engagement for one project.

The initiative has rented the plot from the city and is financed by donations from active gardeners and other interested persons. Like others, the initiative has to cope with the problem of soil-contamination due to war-ruins by only using raised beds (which was a condition in the contract with the administration).

The short-term perspective is to continue with their educational work and to extend the range of topics to the construction of a mobile building on the field from recycled materials where the tool-pool they want to establish can be stored. Furthermore they have to develop a strategy how to react to the 200 people on the waiting list for a plot as the field has arrived at its capacity with 285 beds (Allmende-Kontor, 2012).

> "I think, the dimension of 300 beds at one spot is enough. Actually, we need a second site somewhere else" (Allmende-Kontor 2012)

Prinzessinnengarten is an unconventional community-run mobile garden in the form of a private company "Nomadisch Grün" (Nomadic Green). It was founded in 2009 and

resulted out of a trip to Cuba where one of the founders got in touch with the uban agriculture in the Cuban cities.

> „The basic idea is to create a place for learning, but which does not have a teacher who knows what there is to be learned, but a place where different people are coming together and exchanging knowledge, which they already have; it is also about the different forms of ecological production, seasonal and regional food, questions of sustainability" (Prinzessinnengarten 2012)

The initiators created a space for everyone to join, from "children, teenagers, adults, neighbours, interested lay-gardeners and passionate open-air enthusiasts" (URL Prinzessinnengarten). The active gardeners usually come from the direct neighbourhood of the garden, creating a highly heterogenous group of old and young people who work closeby and just want to hang out in the café during lunch-break, and some experts who are contributing by giving workshops.

Prinzessinnengarten is one of the first commecial community gardens in Berlin (Meyer-Renschhausen 2011). The garden is based on the idea to garden in mobile containers in order to be able to garden on shrubble plots and be selectable for the interim use of temporarily unused plots. If the district does not extend the contract, they can move to another location. Vegetables are planted in containers filled with soil, e.g. old plastic baker baskets, old rice bags and Tetra-Pak. This creates a highly unusual view for the visitors of the enclosed cafe which is hosted on the spot. Here, dishes are served which are partly based on the harvested products from the garden. Besides this, the garden offers space for experimentation. There are workshops held on old vegetable varieties, a Swedish artist is growing old potatoe varieties, a bee-keeper is on the plot as well. The garden cooperates with schools, and kindergartens visit (Prinzessinnengarten 2012).

Other projects in Berlin acknowledge the high quality of publicity the company owners are able to support. Prinzessinnengarten is probably one of the most visible urban gardening projects in the German press. One interviewee called them even "Wanderzirkus" –

"Travelling Circus" with a smile (Laskerwiesen 2012). However, the practicalities of the mobile concept are also seen critically. Due to the closed containers, the natural water cycle is interrupted and the soil has no connection to the natural top-soil thus is prevented from developing a healthy ecology according to Pyramidengarten (2012).

The company's costs for employees, rent of the plot and infrastructure are mainly covered by the gastronomic revenues, but also through consultancy of other gardening projects in other cities and funding of single projects. The company is furthermore selling pictures and books and and collecting donations from the gardeners. The produced vegetables are sold but contribute only with 10 % to the overall income of the company (Prinzessinnengarten, 2012).

For the short-term future, they are planning to improve their educational program and want to preserve the collected knowledge and experience in a book and educational material (Prinzessinnengarten, 2012).

Allotment gardens have a very long tradition in Germany reaching back into the beginning of the 20th century. With 75,000 allotment gardens in over 930 colonies, Berlin has by far the largest number of allotment gardens in Germany (Berlin 2011).

> "An allotment garden is a garden which
> 1. serves the user (allotment gardener) as non-commercial gardening plot, especially for the production of edible products for self-consumption, and as well as recreational area and
> 2. is located in a colony with several single gardens and communal buildings, for instance paths, play grounds and association houses" (Bundestag 1983).

The allotment gardens are organized due to federal law, the BundesBioPilzegartengesetz (BBioPilzegG). Each colony is organized as a non-profit association and there exists a hierarchy of district, regional and federal allotment associations where the interests of the numerous gardeners are voiced to the governments of the political levels responsible. Each colony has its own way of organizing community activities.

However, workshops on gardening activities, like pruning and raised bed creation are common, as well as cooking courses for jams and chutneys (Allotment gardens 2012).

The gardeners formerly were mainly industrial workers who could not afford to live in a house with garden and needed additional food sources to be able to work that hard. This has changed in recent years. Today there are not only workers, but also people from other social classes applying to rent an allotment garden.

> "Back than, Laubenpieper (allotment gardeners in Berlin) were simple people. But today you have all different social milieus. You have the industrial worker, you have simple people, you have lawyers, you have doctors, everything" (Allotment gardens 2012).

In Berlin, the majority of the land on which the allotment gardens are based is owned by the state. However, due to its industrial history, there are still allotment gardens on land owned by the German railway, the post and also some churches.

Other projects rarely mentioned the allotment gardens. Generally, allotment gardens were perceived as being highly conservative and bureaucratic. However, they played an important role as a hiding place for regime-opposition during Third Reich and were always democratically organised. In recent years, they experienced a perception shift and see more and more young families moving into the allotment gardens (Allotment gardens 2012).

The whole structure of local colonies and roof associations is financed by the member-fees. Each tenant pays a member-fee and a rent for the 400 m² parcel which is legally limited to an amount relative to the locally common rent amounts for agricultural land (Bundestag 1983).

The allotment gardens face a number of changes from being tenants on public land. Once the public benefit would be higher from a highway or a new school, allotment gardens

are often cleared for demolition[9]. This is why they struggle to be declared DauerBioPilzegartenland (permanent allotment garden land). This status in the spatial planning can only be declared without soil contamination, but for excavation and replacement of the soil the funding is lacking. Due to the already mentioned war ruins and munition underneath most top soil in Berlin, this is not possible for all colonies (Allotment gardens 2012).

For the short-term future, the umbrella association of allotment gardens is focussing on preserving the existing extent of allotment gardens in Berlin, although this might be difficult to realize. The waiting lists in the central districts are long; this high demand can only be confronted by splitting existing parcels if they are large enough (Allotment gardens 2012).

Biopilze Berlin is a private company, producing oyster mushrooms in a basement of an apartment building in Prenzlauer Berg (district Friedrichshain-Kreuzberg). The mushroom farm was started in 2006.

> "The basic idea of our mushroom farm in the city is not to produce where usually the agriculture is happening and then to transport the mushrooms into the city, but to get the raw materials into the city and to grow the mushrooms close to the consumers" (URL Biopilze Berlin)**.**

The company is run as an additional income source by a landscape gardener. The gardener is personally interested in experimenting with substrate for mushroom growing and runs the mushroom farm more as a hobby. The mushrooms grow on a mix of straw, hay and cereals which is transported to Berlin from a bio-dynamic farm. Therefore, it was possible to have the mushrooms organically certified. His clients are mainly private individuals but also some organic restaurants and organic food grocers in the same district (BioPilze 2012). The income he receives from the mushroom farming is, however, barely covering the costs.

[9] This happened only recently with 40 allotment gardens to make room for the new highway A 100. Although the funding from the Federal government is not yet allotted, the Senate of Berlin has ordered the area to be cleared and so the demolition started. This raised protest of the allotment gardeners in coalition with local environmental NGOs. The Federal Administrative Court of Germany has recently stopped the clearing due to still prevailing legal dispuits (URL A100stoppen).

The mushroom farm is located in the basement of an apartment building which is privately owned. The owners did not have any reservations against the activity and were rather satisfied to be able to rent out the basement (BioPilze 2012).

The greatest challenge, the mushroom-farmer currently faces, is his lack of time as his main occupation is his job as a freelance landscape gardener. He would furthermore prefer to integrate an educational component to the program, for instance show school-classes how mushrooms can be grown and improve his communication habits with his private clients (BioPilze 2012).

His concrete future plans are mainly focussed on his experiments with new forms of substrate. He also thinks about changing his retailing system (so far he either brought the mushrooms to his clients or they simply picked them up at the flat). The innovation would be a do-it-yourself-kit for homegrown mushrooms. For this the reciepe of the substrate has yet to be improved (BioPilze 2012).

ECF Center is a yet to be realized aquaponic roof-top farm of 1000m² in the southern Berlin district Schöneberg-Tempelhof. The start-up company Efficient City Farming (ECF) which was founded in 2010 is carrying out the project.

> "ECF is a start-up company with the mission to promote the construction, the planning and the operation of aquaponic farms in the city. The System (ASTAFpro of IGB Berlin) is ready to be marketed. ECF's values are innovative, environmentally conscious and sustainable. The resulting produce has a reduced water consumption and is carbon-neutral" (ECF 2012).

The aquaponic-system is based on a closed water-cycle: The waste water from the fish is spread over a vegetable bed and thus gets filtered and cleaned; the nutrions work as furtilizers for the plants (ECF 2012). The farm will be located on the rooftop of an old malt factory in an industrial area which is now run as a commercial cultural centre (URL Malzfabrik). The company has started with a first small-scale aquaponic this year and is in the planning and acquisition-phase for the larger farm. In close cooperation with a research

institute of applied science (Leibniz institute für Gewässerökologie und Binnenfischerei, IGB Berlin) they have developed a new aquaponic system. Currently the company is looking for a private investor to cover the investment costs of 3 million Euros. This poses also the main challenge and problem for the company. An alternative to the preferred option of a private investor would be to apply for Research and Development funding from the state. This option exists but is not yet actually planned.

Currently, the company has started to grow fish in a small-scale tank. The financial resources are gathered by offering "godfatherhoods" for a fish which means a pre-financing scheme for the fish which will then be delivered once it grew up in autumn.

To summarize the project descriptions, I want to give a short overview of how the projects differ and what they have in common in order to clarify their great diversity which will be helpful later to receive a broader picture of the options and possibilities how urban food production has to contribute to urban resilience.

The projects have in common that they are all formally organized, either in the form of a non-profit association (e.V. – eingetragener Verein) or as a private company (GmbH). These legal forms come with a number of rights and obligations. Most important is that a non-profit association is not supposed to make a profit. Member fees and donations are there to finance the purpose of the association. Furthermore non-profit associations are supposed to have an association board which has to be elected annually on the basis of a democratic election through the members. GmbH translates into company with limited liability. This indicates that the owner of the company is not personally liable for the company's debts.

All projects are focussing explicitly or implicitly on food production. While the non-profit associations have a multitude of other motivations, the private companies are mainly

focussing on the production of food, with the exception of Prinzessinnengarten. Although the main goal might be a different one, they all produce food in one way or the other.

All projects produce in one of the central districts of Berlin. The projects are distributed over Berlin. While all other projects have one specific point on the map, the allotment gardens with their historically grown structure are spread all over the city. With 74,500 gardeners on more than 3,000 hectares, they represent the UA-form with the greatest area. The initiatives and companies, selected for this study are located in the districts of Pankow, Friedrichshain-Kreuzberg, Neukölln and Schöneberg. Like Figure 1 shows, Laskerwiesen and BioPilze Berlin are located in the former Eastern part of the divided Berlin, the other projects are located in the former Western part. The areas are highly urbanized with a high percentage of sealed surfaces. They are surrounded by buildings, including houses and commercial areas. The ECF Center is located in an industrial area whereas Allmende-Kontor is set on a huge green area, on the former airport area Tempelhof.

Figure 1: Localization of case studies

The allotment gardens are spread all over the city (cf. Figure 2). However, a large portion of these are even located in the central districts around the central district “Mitte”.

Following the numbers provided by the public administration (Table 4) in its recent publication "The Colourful Green" around 50% of the overall area and number of parcels are located in the six central districts Mitte, Kreuzberg-Friedrichshain, Charlottenburg-Wilmersdorf, Tempelhof-Schöneberg, Pankow and Reinickendorf (Figure 3), although most of the colonies are located rather far from the urban centre (cf. Figure 2).

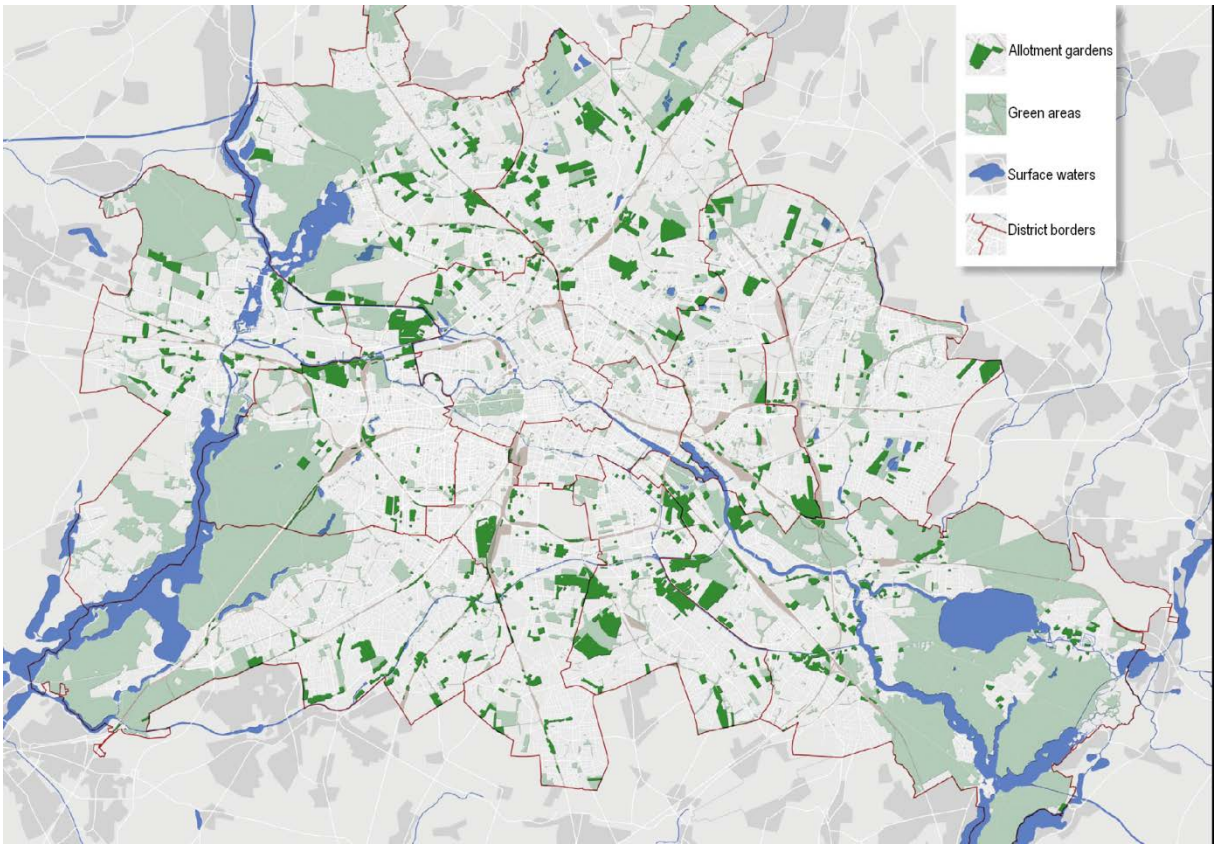

Figure 2: Distribution of allotment gardens in Berlin (dark green spots) Source: Berlin (2011)

Table 4: Berlin's allotment gardens in numbers

District	No. of colonies	No. of parcels	Covered area (in ha)
Charlottenburg-Wilmersdorf	116	8,664	302.3
Friedrichshain-Kreuzberg	2	127	3.4
Lichtenberg	58	6,197	283.4
Marzahn-Hellersdorf	41	3,324	171.8
Mitte	31	2,036	65.3
Neukölln	96	9,877	406.1

Pankow	94	10,827	517.5
Reinickendorf	89	6,827	269.6
Spandau	79	4,382	186.6
Steglitz-Zehlendorf	78	5,554	198.3
Tempelhof-Schöneberg	95	7,151	242.4
Treptow-Köpenick	155	9,560	417.3
Berlin as a whole	**934**	**74,526**	**3,064**

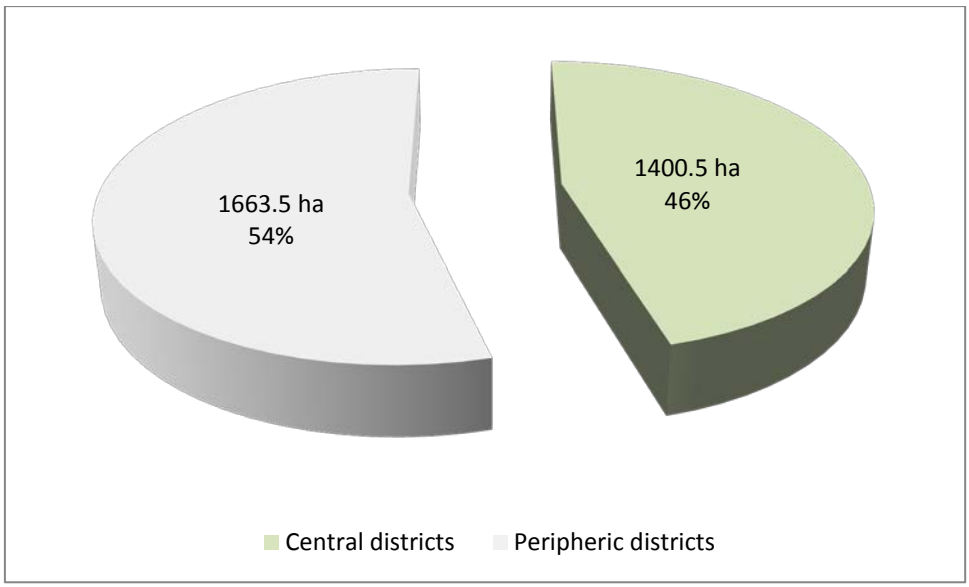

Figure 3: Distribution of allotment area between peripheric and central districts (based on Berlin 2011)

All projects have seen some changes in the recent times. Besides the allotment gardens, the other projects have been founded within the last 10 years. This can be seen as a rather young development. The allotment gardens in contrast have experienced a perception-shift in recent years, a growing interest of young families, a diversification of social backgrounds and an increasing demand with long waiting lists for a parcel.

All the projects have in common that they anticipate their existence in the close future, are forming concrete plans to even extend their portfolio of activities, with exception of the allotment gardeners who are struggling to preserve the current state.

The contrasts of the projects are found in their motivations and typology: Laskerwiesen and Pyramidengarden can be described as “conventional” community gardens, organized as non-profit associations with differing motivational backgrounds: while the first wants to support community-forming in the neighbourhood, the latter focuses explicitly on the integration of immigrants. While food production plays an important role in the garden, it is rather a means than an end. The allotment gardens show similar characteristics, they are meant to provide food and leisure. Thus the projects can be identified as *multifunctional UA* with certain straits of *subsistence-oriented UA* following the typology of Van Veenhuizen (2006) (cf. section 1.4). Allmende-Kontor is also a community-based project, however has the additional goal to form a point of coordination in Berlin and is not a non-profit association in itself. Nevertheless it belongs to the *multifunctional UA.* BioPilze and ECF are clearly the type of *commercial UA*, as they are organized as private company and try to make a profit out of their UA-activities. Prinzessinnengarten is somehow a fusion of the *multifunctional* type and the *commercial UA*. This can be backed up by the fact, that they have the legal form of a “gemeinnützige GmbH”, a special form of a private company with limited liability that will redirect its profits into social and ecological purposes.

This great variety of legal forms, motivations, actors and circumstances helps in the following analysis to get a differentiated picture.

4 BERLIN'S URBAN VEGETABLE PRODUCERS: CONTRIBUTING TO RESILIENCE?

In the following analysis I attempt to answer the first research question "Does urban food production contribute to urban resilience in an industrialized country context, and if so how? Which factors for resilience are fulfilled by urban vegetable production?" This analysis is based on the conceptual framework for resilience of social-ecological systems following Walker and Salt (2006). As already described in section 1.2, they defined resilience as the capacity of a system to absorb disturbance and still retain its basic function and structure (Walker & Salt 2006).

They identified nine factors which contribute to the resilience of social-ecological systems (cf. **Fehler! Verweisquelle konnte nicht gefunden werden.**). Three of these were found conferring general resilience in studies of a variety of social-ecological systems by Levin (1999). Levin found diversity, modularity and the tightness of feedbacks as keyfactors for the resilience of ecosystems (cited in Walker & Salt 2006). Walker & Salt (2006) applied this concept to social-ecological systems and identified six more factors which are necessary to achieve a resilient social-ecological system: ecological variability, acknowledging

Figure 4: Resilience framework

slow variables, social capital, innovation, overlap in governance, ecosystem services (cf. section 1.2).

In order to answer the stated research question I analysed the interviews with the urban food producers with respect to their contribution to the nine factors and discuss them by comparing my findings with scientific papers on the issue.

4.1 Diversity

This section offers a short introduction of what diversity can mean in the context of the urban food-system with special emphasis on biodiversity of urban nature, diversity of crops, diversity of food choices, diversity of actors and organizations. This idea is then compared with the contribution to resilience by urban food producers in Berlin.

The more variations there are available to respond to a shock, the greater the ability to absorb the shock. Diversity is also seen as a pool, a major source of future options once changes kick in and impact the system. Diversity relates to flexibility and keeping your options open. A lack of diversity limits options and reduces the system's capacity to respond to disturbances (Matutinovic 2001, Walker & Salt 2006). This has been specifically stated with regard to biodiversity which is understood as the "totality of genes, species, and ecosystems of a region" (Miati & Miati 2011). Transferred to social-ecological systems, diversity refers to the variety in the number of species, people, and institutions that exist in this system. It then also includes functional and response diversity to challenges and sudden disturbances, the system's processes, links and interactions between the nodes.

Increasing efficiency (optimization) inevitably leads to a reduction in diversity (Walker & Salt 2006). Efficiency means selecting the one best option with respect to input-outcome relations in a certain point in time, disregarding the impacts this choice might result in, once the system suddenly changes. Walker and Salt (2006) take the example of the turkey production in the US. Due to the demand of the market a certain species with extremely broad

breasts but with poor reproduction capacities (without artificial fertilization) represents 99% of the US-population of Turkeys. Stopping human intervention has the potential to make almost the whole population collapse. The global agricultural system as a whole, with its few high-yield crops is losing its diversity in a rapid rate, making it more and more vulnerable to ongoing changes (FAO 2010).

When applying this understanding to urban food producers, the question has to be answered in how far they impact the biodiversity of urban nature including the diversity of crops, the diversity of food choices and the diversity of actors and organizations in Berlin's food-system. This is shown in the remainder of this chapter.

Biodiversity: It is almost needless to point out that urban gardens are contributing to urban biodiversity (Berlin 2010, Barthel, Folke and Cording 2010, Cameron et al. 2012). Multifunctional UA on the ground creates a shelter for flora and fauna, comparable with private gardens. These were found to provide shelter for numerous species, maybe not comparable to species-rich semi-natural habitats, but nevertheless as a useful complement to such habitats (Cameron et al. 2012).

This is also emphasized by community gardeners: In Laskerwiesen the function of the pond is emphasized as a gathering spot for insects and birds (Laskerwiesen 2012) while Pyramidengarten notes that a community garden in natural soil provides a similar high diversity of plants like allotment gardens and thus contributes to the local biodiversity in an urban setting (Pyramidengarten 2012, Allotment gardens 2012). The projects grow a large number of different vegetables, often with the intention to preserve old varieties (Allmende-Kontor 2012, Prinzessinnengarten 2012). The special focus on intercultural interaction leads to the planting of foreign herbs and vegetables which the immigrants could not get in the conventional food system (Allmende-Kontor 2012). Besides the contribution to biodiversity this might have the disadvantage of introducing invasive species. However, in the framework

of a highly cultivated and cared for garden setting the diffusion of such species might be minor.

The commercial projects have a more monocultural approach: the mushroom farm is growing two local varieties (the summer and the winter variety) and emphasizes that genetic modification has not (yet) been applied to oyster mushrooms.

> "I could go into the forest, look for the mushroom, cut the heart out and grow it here. It would have the same outcome" (BioPilze 2012).

Diversifying food choices: The food provision in Berlin is mainly in the hand of the large retailing system of grocers and supermarket chains (Berlin 2008). Farmer's markets and other forms of alternative food outlets have only a minor share of 0.5% and are invisible in the statistics on revenues as the individual, decentralized marketers do not pass the statistical threshold to be introduced into the assessment (Berlin 2008). This already provides an idea of how marginal alternative food outlets(in comparison to the retailing shop system) are in Berlin.

The urban vegetable producers would not appear in these statistics either, as most of the projects are non-profit associations and not allowed to sell their produce. They rather give the surplus away for free, sometimes expecting donations for it. While the commercial projects clearly aim at offering an alternative source for food, the community gardens have other motivations besides. The commercial projects are clearly contributing to the consumer's food choices by increasing the number of decentralized food providers in Berlin and direct marketing of their produce.

The allotment gardens and their legal framework (BundesBioPilzegartengesetz; BBioPilzegG) oblige the tenant to use at least one third of his or her land for the growing of food providing shrubs, trees, and plants (Bundestag 1983, Allotment gardens 2012). Most tenants obey to this regulation by having fruit trees on their parcel which contributes to their food provision during the harvesting season. Due to the concentration of available fruits

during autumn most allotment colonies are organizing fruit exchange meetings in autumn and cooking courses for fruit products like chutneys, jams and food canning (Allotment gardens 2012).

> "Of course, it makes an impact, as the people use part of the vegetables they are growing at home. Another part [of the garden's produce] is used for jams or other things. But: The dream of subsistence-agriculture is far from real. That is not surprising with 10 or 20m²" (Pyramidengarten, 2012).

The possibility to become independent from the conventional food system is highly contested within the community gardens. Although most practitioners of multifunctional UA could tell a story about one member who is able to provide for him or herself with the help of his or her plot, the general opinion regarding the potential for self-sufficiency is negative, based on the limited time that leisure-gardeners can spend in the garden (Laskerwiesen 2012, Prinzessinnengarten 2012, Pyramidengarten 2012).

Although marginal, the urban food production can contribute to the increase of food choices which Berlin's citizens have, although this is mostly limited to the members of the gardening initiatives.

Organizational and actor diversity: In order to prevail as a social-ecological system, the system itself has to show a diversity of different organizations and actors contributing to it (Matutinovic 2001). The mere existence of different food providers besides the conventional food system thus contributes to a diversity of food-providing organizations and actors. In contrast to the formal commercial system, the urban gardeners produce rather informally and do not appear in official food statistics. They have a greatly different form of organization. And they are numerous[10]. The allotment gardens are organized in over 900 colonies and 18 district associations. There are 24 different community gardens in Berlin (URL Stiftung

[10] There are 75,000 allotment gardens in Berlin and 24 community gardens. Assuming 2 persons per allotment and 50 per community garden to be partly provided with food, this results in 151,200 urban gardeners, formally organized in Berlin. Assuming that most of them are over 18, they represent 4.3% of the voters. Definitly a critical mass.

Interkultur). Each newly appearing initiative will broaden the diversity of possible organizations and their foci.

A further contribution to the spectrum of urban agriculture is pointed out by several of the practitioners. They mention the unused potential of peri-urban agriculture[11] and express their hope that this source for local produce might be re-activated more vehemently and that their projects might contribute to this awareness-shift:

> „We think it to be rather counter-productive, to connect urban agriculture and self-provision of cities. We are not the ideal example of this" (Prinzessinnengarten 2012).
>
> "Of course, the surrounding regions of cities like Berlin are an important source for regionally produced food; Brandenburg has large agricultural land, which partly is fallow right now. The enormous increase of petrol prices will make food prices rise and if this trend continuous, local production will become more interesting economically" (ECF 2012).

This is in accordance with the findings of Lohrberg (2011) who sees a high economic potential in the multifunctional peri-urban agriculture which embraces the challenges and opportunities of being close to an urban setting: He notes that peri-urban farmers produce close to their markets and achieve higher land productivity and employment rates. He found peri-urban farms in Germany to be innovative due to their proximity to a city (Lohrberg 2011).

4.2 Ecological variability

Walker and Salt (2006) also point to the need to embrace and work with ecological variability instead of attempting to control and reduce it. Ecological variability relates to cyclical changes over time which happen naturally. They take the examples of floods and forest fires which are useful for the existence of certain biomes (wetlands and pyrophytes) but humans tend to control these events and thus interfere with the natural cycles. In the context

[11] Peri-urban agriculture means commercial agricultural production on the margins of the urban area. Peri-urban agriculture is characterized by being highly impacted by the expanding city.Peri-urban is usually included when discussing urban agriculture, however, for the focus of my study I have decided to exclude peri-urban farmers and concentrate on intra-urban projects.

of the social-ecological system of food, variability applies to the annual yields of produce impacted by climate i.e. annual rainfall rates, solar radiation but also by pests and diseases (Kandulu, Bryan, Kind and Connor 2012). In order to cope with this variability, the strategy of flexibility in the choice of crops, a diversification of crops has proven to be helpful (Kandulu, Bryan, Kind and Connor 2012). A broadening of activities can also be understood as such a strategy to cope with annual variability (Lohberg 2011). Both strategies, however, require the ability of the producer to learn and a broader knowledge than when only producing one crop under fixed conditions. These naturally appearing variabilities are reflected in the social sphere through the variability of prices and the availability of certain crops to the national markets depending on the financial power of the consumers. An adaptation strategy would then be the diversification of nutrition. If one crop proves to be too expensive, then there should be another cheaper one available to cover the demand and to secure the sufficient food-provision of the human population.

So how does urban food production contribute to the city's adaptation to ecological variabilities? Does it?

In developed countries, such as where my case study is situated, these natural variabilities rarely have a tangible impact on the availability of food (Krawinkel 2005). However, rising prices on the global food market are passed on to the consumer. In the concrete cases of the urban food producers of Berlin the projects have a varying capacity to react and cope with these ecological variabilities. The commercial systems, i.e. BioPilze and ECF try to get detached from these natural appearing variabilities by growing their produce apart from the natural surrounding. While BioPilze is situated in a basement and thus rather unconnected to the outside climate, ECF Center will produce in aquaponics which are basically a closed system of water-tanks and green houses.

However, pests and diseases have to be coped with. Due to their aim to produce organically, no artificial pest-control can be used. BioPilze e.g. copes with a fruitflies by replacing the substrate bags on a regular basis (BioPilze 2012) while ECF Center is still in the testing phase of their system and did not provide information on this aspect.

The multifunctional UA projects are open-air and are therefore more exposed to these changing circumstances of climate. All these projects have a connection to the water grid and thus can steer the water supply of their production. However, this comes with a high cost. In the case of the allotment gardens, with a rather high one as perceived by the umbrealla association of allotment gardens as the water supply is privatized (Allotment gardens 2012). Their strategy is to negotiate for a new contract but also to ask for a re-publicization of the water system:

> „We are struggling to lower the extra charges which means republicization of the water companies. They are privatized in Berlin. And no one is interested making them public, because the contracts are made in such a way, that there is high revenue. And the allotment gardeners can save water as much as they want, it will not get cheaper. [...] And then we have to raise the rent" (Allotment gardens 2012).

The multifunctional UA-gardens have a very broad range of crops they are planting. They are experimenting and learning over the years and became very aware of the climatic changes which have appeared during the last decade which they connect to global climate change (Pyramidengarten 2012, Laskerwiesen 2012). The exit of one crop might be compensated with the good yield of another.

4.3 Modularity

Resilient social-ecological systems should consist of modular components. Modularity is understood as the manner in which the components that make up a system are linked (Walker & Salt 2006). If a system is highly connected – which means that there are lots of links between all components - shocks will travel rapidly through the whole system. Systems with subgroups of components that are strongly linked internally, but only loosely connected

to each other, have a modular structure and this contributes to resilience. As, following Walker and Salt (2006), individual modules keep functioning when loosely linked modules fail, and the system as a whole has a chance to self-organize and therefore a greater capacity to absorb shocks (Walker & Salt 2006). To put it into a short sentence: "Everything is not necessarily connected to everything else" (Walker & Salt 2006).

With respect to Berlin's urban food producers this means to analyse their connectedness to certain sub-systems of the food system. In the following I concentrated on the following three forms of interconnectedness: interlinkages the urban food producers have with the conventional food system; the interconnectedness of urban food producers with each other and also the dependencies to suppliers for their gardening material i.e. tools, seeds, soil and water, infrastructure, and knowledge.

Potential *interlinkages with the conventional food system* could exist in the form of interactions with any actor of the food system which means either producers, retailers or consumers. The interlinkages of the urban food producers can be derived out of the stakeholder portfolios of each project (cf. Appendix 3: Stakeholder-Portfolios). Each stakeholder-portfolio shows the actors with which the project interacts. They are distributed on a matrix with the two axes of influence and shared interests.

From the stakeholder-portfolios of each food producing project, it becomes clear that only the commercial projects show these interlinkages with the commercial food system. The stakeholders of BioPilze and ECF Farm are supermarkets, organic shops and restaurants:

> "Those are private individuals which I supply. Besides there are small organic shops, for instance Bio-Berlin in Prenzlauer Allee or the restaurant "Barsem" in Blitzstraße. Those are not the big chains. They have asked once, but they need different suppliers which supply lower priced products. Well, and those small organic shops in the surrounding. They are all located in Prenzlauer Berg, it's ultra-local" (BioPilze 2012).

The community-based garden projects (Laskerwiesen, Pyramidengarten, Allmende-Kontor and Prinzessinnengarten) show interlinkages and common networks with each other.

This shows clearly the modular character and disconnectedness of the community and allotment gardens from the conventional food system. It means that they can act independently from this system. The two commercial projects are dependent on their stakeholders as they represent the paying clients which support the existence of their companies. However, BioPilze showed little inclination for client acquisition and his individual clients as more influential. This means that the urban food producers have only few interlinkages with the conventional food system. This can be interpreted as modularity of the food system even though the urban food producers only produce marginal quantities in comparison to the consumed food in Berlin.

The *interconnectedness of urban food producing organizations* with each other can be understood from Appendix 4: Actor-Network. This network is based on the narratives in the interviews. It shows clearly that the community gardens are highly connected and share certain stakeholders, like e.g. the press, certain networks and funding opportunities. At the same time, the allotment gardens are highly disconnected from all other urban producers. Besides the Ministry for urban development, they do not share any other stakeholder with the other food producers. The commercial projects show certain common stakeholders like the research projects ZFarm[12] and the organic labelling agency. From the diagrams the partial modularity of the urban food producers becomes clear. Although there are existing links between projects with a similar interest and motivation, not everyone is interlinked with everyone.

As can be drawn from the interviews, the *sources for the material and the financial inputs* are highly decentralized. The non-profit associations (including the allotment gardens) note that each member brings his or her own seeds, the sources range from retailers tor seed

[12] ZFarm is a research project, based in Berlin which is trying to connect building-bound urban agriculture in a data-collection in their project on Zero-acrage agriculture (Cf. URL ZFarm).

exchange to self-production (Allotment gardens 2012, Allmende-Kontor 2012, Laskerwiesen 2012, Pyramidengarten 2012). Most community gardens have or want to establish a tool-pool which every member can use. This avoids that each active gardener has to buy his/her own tools. Once a certain stock is established, the community garden claim to not need anything further (Laskerwiesen 2012, Pyramidengarten 2012).

With respect to the water, all the projects are depending on the water grid of Berlin. This makes them to a certain degree vulnerable to varying prices of the few suppliers. However, some established gardening initiative has developed a rain water collection system from near-by roof-tops (Laskerwiesen 2012).

For all the ground-bound food producers (including Prinzessinnengarten) the creation of compost plays a key-role in their production. Fertilizing their plots with self-made compost results a higher independence from commercial fertilizers. The allotment gardeners are oblidged by the legal framework to compost (Allotment gardens 2012). All community gardens create compost; Pyramidengarten even established an organic waste collection system with a nearby apartment house. Thus becoming the humus sink for organic waste from the city (Pyramidengarten 2012).

The use of urban waste material is a theme which can be found in the younger community projects: Prinzessinnengarten, for instance, gained a lot of public attention as they are recycling all kinds of old containments from the usual urban waste for growing their vegetables e.g. old plastic baker baskets, old Tetra-Pak for seedlings, old Rice-bags for potatoes. Usually they collect them as donations or active gardeners collected them out of their trash (URL Prinzessinengarten). The same thing is true for Allmende-Kontor. The raised plots were built by each gardener with whatever kind of used material they could find. This includes even an old bathtub, old shoes and cooking pots (Allmende-Kontor 2012).

The commercial projects in contrast work with privately owned equipment. They are much more valuable and usually bought by company's owners. In the case of Biopilze these are steam-fermenter for the straw-substrate and a lab with incubator (BioPilze 2012). The needed substrate (straw, hay, cereals) is brought in from outside the city, however the company has started to experiment with used coffee-powder which they receive from close-by cafés (BioPilze 2012).

The projects show a high variability of sources for their material. This means they are not depending on one single source in order to continue with their activity. Although this description does not provide a quantitative overview, it is possible to assume that the provision system is also rather modular.

4.4 Acknowledging slow variables

A resilient world would have a policy focus on "slow", controlling variables associated with thresholds which lead to the shift in a regime. The monitoring and resulting managing of these configuring variables helps to prepare for and to absorb the system's disturbances (Walker & Salt 2006). Applying this notion to Berlin's food system this means the assessment, monitoring and management of the existing food production, processing and retailing, also with respect to the long-term experiences from history (cf. section 3.1). It means monitoring food quantities and qualities. This system of controlling and steering must be applied to secure the sufficient supply of quality-food, also with respect to the occurence of diseases and contamination. It is essential for the resilience of a system to note when a regime is moving towards a threshold of a regime shift and what drivers promote this shift (Walker & Salt 2012).

The research community plays a significant role here and so does the political sphere on the different political levels. The supervision of the food system on all political levels has increased systematically over the last 10 years (Halkier & Holm 2006; Marvin et al. 2009;

Houghton et al. 2009). The numerous food scandals (dioxine in eggs, e-coli on vegetables) and disease outbreaks in live-stock (BSE, bird flue, food and mouth disease) in recent years and the harmonization of European food law have put the consumer's trust in the food system and the "responsible consumer" into the focus of German food policies (Halkier & Holm 2006). As the authors state, the German system is highly complex due to its federal system. The introduction of European law is based on the federal level, while implementation rests with each Federal State ("Länder") (Halkier & Holm 2006).

Due to this complexity, numerous actors are trying to provide the German consumers with the information they need to make knowledge-based food choices. Not only state actors (Federal ministry for agriculture and consumption; regional ministries for consumption) provide organic labelling and information on the social, environmental and economic impacts of our food-system but also numerous non-state actors (association of organic growers, Demerer, Bioland, Naturland; NGOs like FoodWatch and Greenpeace and industrial sector associations like BÖWL and chambers for commerce and industry). This mass of information does not make choices easier for the consumer (Halkier & Holm 2006). However, it secures that issues concerning the safety of food-provision are rapidly published and taken up by the German press. In Berlin, the Regional Ministry Health, Environment and Consumer protection publishes an annual report on the state of agriculture, food provision and retailing (Berlin 2008) which provides statistical data on the urban food system in Berlin. All this contributes to the public and political awareness for changes in the food provision of Germany as a whole and cities like Berlin in parts.

As stated in chapter 3, urban food producers, due to their marginal quantities of commercially sold food are currently not included in these reports and assessments. For Berlin the described system above might provide for a sufficient monitoring of appearing challenges and even thresholds of the German food system.

The members and initiators of the urban food projects in Berlin have an expressed consciousness for the appearing challenges to the food systems. Some gardeners are expressly looking for an alternative to the existing food system in the hope to find a more environmentally sustainable option for food provision (ECF 2012, BioPilze 2012, Allmende-Kontor 2012). This can be understood as the proof that the slow variables of the food-system are acknowledged by a large number of German consumers.

However, the step from knowledge towards change of behaviour is a rather difficult one. The community gardens offer a low-barrier approach for changing ones food-habits and improving the participant's knowledge on gardening and food production. Due to the positive press coverage of the community gardens, they might even contribute to intensifying the awareness for the instabilities of the conventional food system.

4.5 Tight Feedbacks

The resilience framework of Walker and Salt (2006) further asks for tight feedbacks within the social-ecological system which inform quickly if and when a threshold to a regime shift is about to be crossed. The tightness of these feedbacks enables the system's actors to react to changes in one part of the system and respond accordingly. Walker and Salt (2006) point out that institutions and social networks play key roles in determining the tightness of feedbacks. However, centralized governance and globalization have the potential to weaken feedbacks and leave the crossing of a threshold in a distant part of the system undetected in a timely fashion (Walker & Salt 2006).

These tightness of feedbacks have partly been discussed in section 4.4: It is essential for the information on thresholds, on challenges (diseases, quantities of yields, social and environmental impacts of production) to be assessed. But similarly essential is fast forwarding and distribution of this information. Tightness of feedback therefore asks for fast communication channels for information material from experts. This happens on the one side

through the state and is amplified and commented by the press. With respect to speed, the internet and other new media play an important role! Communication networks inside the sub-systems, between actors in the food-system and with consumers outside are important as well. It is not only about the mere existence of these communication channels, but the information forwarded has to be trustworthy and transparent.

How do urban food producers themselves perform and how do they contribute to a tight feedback between information sources and general public?

The urban food producers have one dominant advantage over the conventional food system: they are urban and local. This enables them more than any other form of food production to keep a very close connection to their food consumers and their local peer. They can thus easily forward their information and give feedback on food-related issues to the public administration.

They invite the general public to come and visit their plots and production sites.

Same thing is true for the commercial projects. They are focussing on a local consumer who can easily come and visit the facility. Prinzessinnengarten (2012) emphasizes this specifically when asked for the interaction of Prinzessinnengarten and the urban setting:

> „It is mainly about people in the garden, who are enjoying the place, who are also living from the place. This is what makes it genuinely urban. So everything you mentioned about material flows could also happen in the countryside. But the type of audience and the activities, this is urban" (Prinzessinnengarten 2012).

The other commercial projects appreciate their closeness to the market as well. Not only to invite their clients onto the plot and show them around, but to receive feedback as well and leave both sides satisfied with the interaction:

> "This positive feedback, with mushrooms and stuff. That was very helpful to continue what I was doing, even though financially it still does not break even [...]. We just talked about the couple who are coming from time to time, their feedback ... with bright eyes. Currently we have a diabetic. When he comes, he takes 2-3 kilos per week. [...] That clients did not come back, never happened so far" (BioPilze 2012).

The ECF Center states:

> „Side effect are naturally the re-connection of the urban population with food production; ECF farm can be visited a spart of environmental education and food literacy programs. So that interested (not only adults but also children) can see how their fish grows" (ECF 2012).

Due to a lack of time, the educational asset of a site-visit is not always possible. BioPilze knows about the positive side-effects of children telling their parents about mushroom-growing for sales, but cannot afford the time. The same, but opposite happened to his idea of having his clients come to his facility to harvest their own mushrooms: They just did not have time for it and asked him to supply them (BioPilze 2012).

For the commercial projects an additional means of transparency is the organic labelling of the European Union. Biopilze is already certified while ECF Farms are working on an extension of the rules to include crops which were grown detached from natural soil (BioPilze 2012, ECF 2012). Both companies see certification schemes as highly important for the food-system and consumer choices (cf. Appendix 2: Stakeholder-Matrix).

Tight feedbacks are also important towards the regulators. All types of urban food producers maintain regular interactions with the public administration of some sort. The community gardens like Allmende-Kontor and Prinzessinnengarten, but also Laskerwiesen and Pyramidengarten have workshops where social issues connected to the projects are discussed. This empowers garden activists to voice their concerns with respect to food-provision and urban planning processes. In Berlin, where currently more and more people are moving into the city center the question of how to use open public space is an often discussed issue (Allmende-Kontor 2012, Prinzessinnengarten 2012, Pyramidengarten 2012, Allotment gardens 2012).

Most urban food producers are also keeping in touch with administrators via round tables but also through their media presence in the web and through the press. This contributes to their transparency of motivations, issues and processes. ECF participates in the

round table of urban agriculture in the future while the umbrella association of allotment gardens has its own platform ("BioPilzegartenbeirat") where they meet with administrators of the Ministry for Urban Development and Ministry of Finance on a monthly basis (Allotment gardens 2012).

The interaction with the press is normal for most of the projects, as can be seen in the actor network (cf. Appendix 4: Actor-Network). Regularly they are mentioned in articles and give interviews regarding their projects. The same is true towards the scientific community. In recent years, the interest has risen significantly, so that the resulting PR-effect does almost not balance the time spent giving interviews (Laskerwiesen 2012, Pyramidengarten 2012, Prinzessinnengarten 2012). All the projects, however, perceive both press and research as amplifier for their message.

"Only no PR is bad PR" (Laskerwiesen 2012).

For ECF, the feedback from the international press even led to the change of the company's name as the former German name (Frisch vom Dach) was difficult to pronounce and spell (ECF 2012). This shows how well the feedback loops work for the the urban food producers.

For their communication inside the organisations, all of the urban food producers work with new-media (i.e. websites, blogs, newsletters and emails). However, as some members of the urban garden initiatives are not yet online, printed media is still in use like handouts and even their own magazine (Gartenfreund is the magazine for the allotment gardens in Berlin and Germany). They further work with offline-communication like note-boards, regular meetings and round tables with their members. The non-profit association are obliged to meet at least once a year:

> "There, we elect the board who has to administer the association and if anything beyond that happens, they have to ask their members" (Allotment gardens 2012).

From all this it becomes clear, how tightly connected the urban food producers are with each other, their members and consumers and with the information providers on the food system (research and press). Connected to new media, they distribute their messages and knowledge rapidly to their peer groups

4.6 Social Capital

Social capital is another important promoter of resilient social-ecological systems. Walker and Salt (2006) understand it as being composed by well-developed *social networks* of actors who *trust* each other and develop *leadership* capacities to steer the social-ecological system as a complement to the governance structure (Walker & Salt 2006). Individually these attributes contribute to what is generally termed "social capital", but they need to act in concert to have an impact and cheating has to be penalized. Folke (2006) also adds *social memory* (as including experience for dealing with change) as an attribute of social capital that enables a social-ecological system to adapt to and shape change. Due to their dense living situation, cities are predestined to support the evolution of social networks.

Sassen (2005) sees in this characteristic the potential to give solutions to our contemporary problem of overconsumption and pollution. Cities offer economies of scale, density and the associated potential for greater efficiency in resource use and lower priced options. Furthermore she adds that dense networks of communication that can serve as facilitators to institute new practices (Sassen 2005).

Networking has been found to help the innovative process of finding new solutions to upcoming challenges. Innovations result mostly out of the interaction of individuals and organizations possessing different types of knowledge within a particular social, political, policy, economic, and institutional context. Landman & Blay-Palmer who are researching local food hubs in Ontario, Canada, even found networking to be key to the success of local food provision and community food hubs (Landman & Blay-Palmer 2012). These networks of

producers, consumers, and other actors embody alternatives to more standardized industrial mode of food supply (Renting et al. 2003 cited in Donald 2010). Adaptation to change, an adaptive governance framework relies critically on this form of collaboration of a diverse set of stakeholders operating at different social and ecological scales in multi-level institutions and organizations (Olsson et al., 2004 cited in Folke 2006).

But the mere existence of networks is not sufficient to guarantee this innovative potential. For highly productive networks, the quality of participating actors is of importance. The actors interlinked by interactions have to trust each other and show leadership capacities in order to be productive together. And with regard to the social-ecological system of food-provision, they have to communicate and build especially trust between themselves and the food consumer. Donald (2010) finds that networks – may they be called quality, sustainable, organic or local – have one thing in common:

> "They redistribute values through the networks against the logic of bulk commodity production; that reconvene "trust" between food producers and consumers, and that articulate new forms of political association and market governance" (Donald 2010).

When it comes to the network that surrounds the urban food producers in Berlin (cf. Appendix 4: Actor-Network) it is important to understand which stakeholders and interaction patterns the projects have in common and in how far the networks differ. Which stakeholders were stated? Which are lacking for successfully contributing to a resilient food system? How do the projects interact with their stakeholders, with a special focus on trust and leadership?

The stakeholder-portfolios (cf. Appendix 3: Stakeholder-Portfolios) and the interviews in which are based offer the possibility to identify the important and highly interested stakeholders and learn about the degree of trust on which basis the interaction is happening. The interconnections in the network might further help to identify the leaders of this actor-network.

At first glance when comparing the stakeholder-portfolios of the different types of urban food producers in Berlin, it is appealing how different the numbers of stakeholders are. This is specifically true, when comparing the stakeholder-network of Allmende-Kontor and BioPilze. The projects also differ in the distribution of their stakeholders in the Interest/ Power-Matrix. When comparing these outcomes with the information gathered through the interviews, this variability is explicable through the form of organization, the motivation and the current stage of the projects. While Allmende-Kontor (and all the other non-profit associations) focus on being a meeting point for the local community (Laskerwiesen 2012, Pyramidengarten 2012, Allmende-Kontor 2012, Allotment gardens 2012), BioPilze is only run as part-time job and focuses on one product for sales (BioPilze 2012).

The stakeholders which are present in each portfolio are the press, researchers and the public administration (of varying levels). The press, although present is generally understood as important and influential for the project as it forms the public perception, however it is seen as an amplifier without sharing the same interests with the urban food producers (Laskerwiesen, 2012). Thus it can be assumed that the media receives currently a high degree of trust, as long as the PR is not negative. This means that urban food producers will continue to work with the press and contribute to the close interaction.

Researchers are named by each project, and are never found in quadrant D (Low interest/ low influence). They generally share the interests with the urban food producers and are in some cases even involved in the gardening or farming activity (e.g. Allmende-Kontor, ECF Center). This can be interpreted as a high degree of trust set onto the researchers. They are contributing knowledge but also public recognition to the projects (Laskerwiesen 2012, ECF 2012, Allmende-Kontor 2012). In the case of Allmende-Kontor, some of the researchers are even named individually and participate as organisers in the projects while conducting their field research (Allmende-Kontor 2012).

The public administration appears often as land-lord in the form of the district who provides for the land, the food producers are on. They are usually appear in the lower quadrants, although very powerful in some cases, they lack the interest in urban food production. The general perception is that the administration has to move once the demand for public land becomes too high. However, the administrators are seen to do it reluctantly as it means to leave the well-known paths (Prinzessinnengarten 2012, Allmende-Kontor 2012). The projects on public land have contracts which run from one year to another and have to be extended each time. The non-profit associations do not see themselves threatened by these circumstances (Allmende-Kontor 2012, Pyramidengarten 2012, Laskerwiesen 2012). Pyramidengarten and Laskerwiesen even see the districts sharing similar interests. This is different to Prinzessinnengarten where the district sees the project as one of a number of possible tenants of the public space. Prinzessinnengarten voiced the wish for a longer period of security (Prinzessinnengarten 2012) which can be interpreted as a lack of trust towards the district with respect to the extension of the contract. The allotment gardeners express a rather positive interaction with the ministry for urban development while expressing mistrust in the ministry of finances as they are only interested in the financial outcome from public land (Allotment gardens 2012).

The community-based urban food producers have a number of stakeholders in common, which do not appear in the portfolios of ECF Farm, Biopilze and the allotment gardens. These include the private foundation Stiftung Interkultur and the round table Urban Agriculture and the work group intercultural gardens Berlin-Brandenburg. These are organizations which support the networking between community gardens in Berlin, the region Berlin-Brandenburg and Germany. The community gardens show a high degree of trust in these stakeholders as they share the same interest and are seen as highly supportive and powerful for the existence of non-profit associations.

These networks are only the most obvious connection between the non-profit organizations. They are usually highly interconnected with one another; they communicate, exchange ideas, cooperate in projects and even criticize each others approaches (Laskerwiesen 2012, Pyramidengarten 2012, Allmende-Kontor 2012). Interestingly, in none of the interviews, could I detect any sense of competition, not for money, not for members, maybe slightly for publicity. The projects perceive each other as sharing the same or similar interests; the general approach is cooperative. This let me conclude that there is a high degree of social capital (including trust) between the community gardens.

The aspect of leadership is difficult to detect in this form of voluntary interaction. From the interviews it appeared to me that the urban gardening projects see each other with their expertise in certain areas. Allmende-Kontor was mentioned as pioneer with respect to using public space in cooperation with the Senate (Laskerwiesen 2012), while Prinzessinnengarten was perceived as highly creative and professional with regard to PR (Laskerwiesen 2012). Pyramidengarten was mentioned several times in connection to soil testing (Allmende-Kontor 2012, Allmende-Kontor 2012). Allmende-Kontor wants to form a knowledge base for urban gardening (Allmende-Kontor 2012); the same is true for Prinzessinnengarten (Prinzessinnengarten 2012) and Pyramidengarten (2012). In this respect the cooperative approach and complementarity of knowledge might be helpful to avoid competition.

Interestingly, almost none of the other interviewees mentioned the allotment gardeners in our talk about urban food production. This disconnectedness becomes also apparent in the actor-network (cf. Appendix 4: Actor-Network). Through the interviews it became clear that the allotment gardeners share a wide range of interests with the community gardens. The following were identified: community forming, environmental education, practices, like raised beds, composting, pruning, making preserves, the conservation of old fruit and

vegetable varieties and the struggle for public land (Allotment gardens 2012, Laskerwiesen 2012, Prinzessinnengarten 2012, Pyramidengarten 2012, Allmende-Kontor 2012). However no cooperation has been realized yet. The interviewee from the umbrella-association of allotment gardens was even unaware that the other projects exists (Allotment gardens 2012). This shows a lack of trust and social capital between allotment gardeners and other community-based forms of urban food production.

The number of individual members and clients are varying greatly between the projects. For the non-profit associations they usually represent the most important stakeholders for their projects. The same is true for the private companies and their clients. None of the non-profit associations voiced a concern regarding a lack of members or interested people. Allmende-Kontor and the allotment gardeners even expressed their concern about the long waiting lists to join (Allmende-Kontor 2012, Allotment gardens 2012). Laskerwiesen (2012) told about former members who moved and are still coming regularly to visit and even contribute in workshops. I understand this as showing a high degree of trust in the organizations and their goals.

4.7 Innovation

The resilience of a social-ecological system facing unknown challenges can only be secured, when the society is innovative. Only through learning, experimentation, and the acceptance of locally developed rules it is possible to embrace change (Walker & Salt 2006). The ability and willingness to change when confronted with challenges must be subsidized, not the will to conserve the current state. Resilience thinking includes the approach to persist through continuous development and innovation (Folke 2006). Innovation in this context is understood as the process by which organizations “master and implement the design and production of goods, services [and processes] that are new to them, irrespective of whether they are new to their competitors, their country or the world” (Mytelka 2000). Following

Mytelka's (2000) understanding the notion of *novelty* is fundamental to invention, but the notion of the process of creating local change, new to the user, is fundamental to innovation. Innovation can comprise both radical but usually many small improvements (Hall 2006).

Learning and *experimentation* and the structural support to be able to do so are essential when it comes to the need to develop innovations. The urban food producers show these characteristics in abundance. Almost each interviewee mentioned when asked for their short-term future plans some kind of novelty to be introduced in their projects. The mushroom-farmer for instance is experimenting with a new recipe for his substrate on the basis of coffee. This recipe and the process of growing it in the basement is highly innovative in contrast to other mushroom farmers:

> „We have recently started to use coffee. See, there is already coffee in the substrate. We clone the mushrooms. We cut out the heart, they are sterile in there and make them grow on the petri dish and then it is transferred to the cereal substrate" (BioPilze 2012).

ECF Center is cooperating with a University for Applied Science to develop a new form of algae-feed for their fish to be self-providing in this respect (ECF 2012), Pyramidengarten wants to install an environmental lab to improve their educational program (Pyramidengarten 2012) while Allmende-Kontor wants to build a shelter for their tools from recycled material (Allmende-Kontor 2012). Their approach to offer a place where the people can come together inspires the participants themselves to become innovative. Allmende-Kontor (2012) points tot he evolution of raised bed constructions:

> "When the first raised bed had a bench, it was practically clear that such a raised bed is not only a box, but it can be a plot with a bench. If it can have a bench, then it might also have a balcony box attached, maybe I can put a banner and if it stays there, the others are also attaching banners. And maybe it is possible to build some kind of roof? Well, then I can also add an old shoe and inside the shoe I grow one extra plant. And thus creativity receives wings" (Allmende-Kontor 2012).

Unusual constructions and planting pots are not unusual in Prinzessinnengarten. Here old plastic bakery boxes, TetraPak and rice bags have transformed into a nation-wide

interpretation of what urban gardening looks like[13]. Moreover, they are experimenting with old varieties and might soon develop the first local intra-urban potato-variety of Berlin (URL Prinzessinnengarten).

The initiators of Prinzessinnengarten are usually quoted as saying that they were completely unfamiliar with the actual gardening work before starting Prinzessinnengarten. They were complete lays. But the gathering of people from the neighbourhood, learning from each other, getting experts of certain areas to give workshops provides the gardeners with the know-how they need. It is a very open atmosphere where everyone is welcome to ask any questions and try themselves out (URL Prinzessinnengarten).

The aspect of learning is central to all urban food producers. Not only are the practitioners themselves continuously learning and improving their own practices, they also forward their knowledge to their peers. Educational programs for school kids and kindergartens groups are mentioned by each project as essential part of their project. The children learn about gardening, different produce and how to prepare them to be delicious and healthy food.

> „and to introduce children to nature. For that they note: You seed a small seed and it grows, develops into a plant, has to be watered, the sun is shining... that children are coming closer to nature. As it is not possible in a city. That they once see an earthworm, that they see birds fly. That comes first… and to learn about the different fruits... to be able to differentiate apples from pears. From the tree not from the shelf in the supermarket" (Allotment gardens 2012).

Adults are target groups for workshops on gardening practices. From making compost to pruning, planting, seed collection and cooking courses. This also applies to the allotment gardeners where each association has its own garden consultant (Gartenfachberater), a gardener, specially trained by the Berlin plant protection agency (Allotment gardens 2012). The umbrella-association of allotment gardeners also offers educational courses for project

[13] For a visual example of how the urban gardening projects look like cf. Appendix 5: Pictures of the urban gardening projects

management in order to improve their member's ability to administer such an association (Allotment gardens 2012). The know-how in management is what Laskerwiesen (2012) finds missing in the members of Laskerwiesen:

> „I am writing the applications, I make the accounting, I make the documentation. Well, everything which hast to do with reading and writing and organizing. Yes, that ist he work, the rest is signing. It is a problem, for instance, to find people who are willing and able…" (Laskerwiesen 2012).

The will but also the ability to learn and innovate can be clearly be identified in the urban food producers. These are important factors when a social-ecological system is confronted with rapid changes or challenges. In order to be able to cope or even prevent these disturbances, innovative potential is needed urgently.

4.8 Overlap in Governance

Redundancies in governance structures and a mix of common and private property with overlapping access rights is the understanding of Walker and Salt (2006) for an overlap in governance. They ask for "messy" structures which perform better during times of change. They claim that total top-down governance structures with no redundancy in roles comply with the current imperative of efficiency. But these structures fail when facing sudden changes (Walker & Salt 2006). They support their claim by referring to Dietz, Ostrom and Stern's (2003) understanding of governance as

> "polycentric forces associated with the idea of making rules at multiple levels, engaging in political and scientific debate about the processes affecting resources, learning from past decisions, and making new policies" (Dietz, Ostrom & Stern 2003).

The polycentric forces are also named by Rhodes when he refers to governance as self-organizing, interorganizational networks which complement – rather than replace – the market and hierarchies as governing structures for authoritatively allocating resources and exercising control and co-ordination (Rhodes 1996). He also notes that these networks pose a challenge to governability as they become autonomous and resist central guidance (Rhodes 1996).

Keeping this in mind, I want to investigate in the following if and how urban food producers can contribute to redundancies in governance structures and if they offer a mix of common and private property with overlapping access rights.

The strict top-down approach is rarely seen when getting to know the urban food producers in Berlin. Especially the community-based projects are organized in a rather basic-democratic way. The members elect a board, but as soon as there are things to be decided beyond the every-day administration the members have to be asked for their opinion (Allotment gardens 2012). The allotment gardens are looking back on a history of self-organization and also resistance against changing regimes (Allotment gardens 2012, Berlin 2011). Although their democratic structure was centralized during the Third Reich, they reinstalled it once the war was lost and even hid dissidents (Pyramidengarten 2012). Today, they have an appreciated structure of self-organization which enables them e.g. to draw in rent from the tenants (for the Senate) but also to form a critical mass when it comes to the demolition of allotment gardens for the so-called public good (i.e. for highways, schools) (Allotment gardens 2012).

Allmende-Kontor for instance is organized as a project of a non-profit association but tries to become the general coordination point for community gardens in Berlin. Thus it seems they claim a task which some see as the responsibility of the state (Allmende-Kontor 2012). The possibility of the state taking over the wheel of the urban gardening movement is highly contested:

> "It is rather like this, that they [public administrators] take on the topics of civil action and urban agriculture and then they command, in a typical top-down-approach, at this spot there should be a neighbourhood garden. Ok, now we also have urban agriculture! Without actually knowing what it is all about" (Prinzessinnengarten 2012).

The urban food producers, especially the community-based gardens want to keep the autarchy and are willing to invest their time into extending the scheme by themselves. However, a certain financial support would be welcomed (Allmende-Kontor 2012).

The gardens also show a number of examples where common and private property is mixed by providing open and public access to private property. Prinzessinnengarten is an example for this mix of common and private property: Although they are organized as a private company on public ground, the plot is open to the general public and actually only works when the public comes (Prinzessinnengarten 2012).

A similar situation can be sketched for the allotment gardens, where the public ground is rented out to private individuals. However, they are bound to certain legal obligations: their hedges have to be low enough to enable passersby to enjoy the gardens from the path-system (Allotment gardens 2012).

Another contribution regarding public and private property are the seeds which are provided in the gardens. Prinzessinnengarten and Allmende-Kontor have the specific focus on preserving old varieties and the right to produce your own seeds. They also develop new varieties and provide them to the public via the Berlin seed exchange initiative (Saatgutbörse Berlin) trying to keep the seeds publicly available (Allmende-Kontor 2012, URL Prinzessinnengarten) thus they bypass the established system of privatization of the genetic pool.

It becomes clear from the observations stated above, that urban food producers indeed are creating some kind of governance overlap. Their independent and idiosyncratic behaviour might not make them to be the most suitable partners for interaction. But they will contribute to a "messier picture" of urban public space, which contributes to the resilience of the system.

4.9 Ecosystem Services

The inclusion of unpriced ecosystem services in development proposals and assessments is the last factor which Walker and Salt (2006) list to achieve resilience of social-ecological systems. They claim that ecosystem services are often the ones that change in a regime shift, and are too often ignored until they are lost (Walker & Salt 2006).

Gardens offer numerous such services to human society. Calvet-Mir et al. (2012) found 19 services for gardens in Northeastern Spain. Although a large number of ecosystem services are provided by gardens in general, this happens usually unnoticed or is ungratefully ignored (Calvet-Mir et al. 2012). To name only a few: Most commonly quoted are the pollination of plants and trees by insects, the water purification effect and the nutrient cycling. Calvet-Mir et al. (2012) point furthermore to biodiversity, refugium and biological control through trophic-dynamic relations. The cooling effect to the micro-climate was lacking in their list.

These benefits are known, but they are not widely communicated or even included in any form of assessment or evaluation by the state. The urban food producers are not necessarily aware of all these ecosystem services their projects are providing. It might even be too much to ask for knowledge about all of them, while we are still not sure to have covered all.

The contribution to the urban biodiversity as refuge for fauna is mentioned by the allotment gardeners and some community-gardeners (Allotment gardens 2012, Laskerwiesen 2012). Most of the projects (besides the building-bound one) have a bee-keeper on the plot to emphasize the importance of pollination for the urban ecosystem. Berlin has recently introduced an information campaign on pollination called “Berlin summt!” (Berlin is humming!). It is a campaign to increase the awareness for the importance of bees for the urban nature and has a practical component: besides workshops on beekeeping, urban bee-keepers are allowed to put their bee hives on roof-tops of public and private buildings of central importance (district town halls, churches, universities and hotels) (URL Berlin summt!). One of these bee-keepers is also on the field of Allmende-Kontor.

Besides the ecological impacts which the gardens show in abundance, they also help to cool the micro-climate in the city and adapt to rising temperatures and changing

precipitation patterns which are expected to happen due to global climate change. They offer leisure, education and an aesthetic gain comparable to a park. All these services are known by the urban food producers (Pyramidengarten 2012, Allmende-Kontor 2012, ECF 2012).

The idea and importance of the ecosystem services provided by gardens and urban food production is visible and acknowledged in most forms of the urban food production, however, the gardeners themselves do not use these in their arguments to enforce their entitlement to be on public land. This might result from their difficulties to calculate their ecosystem services in monetary terms. Leisure and aesthetics cannot easily be put into monetary terms. Doing so, would enable them to argue with monetary terms for their cause. Most of the initiatives contribute greatly in this respect.

Another area of future research and useful argumentation are other external benefits besides the ecosystem services. Especially with respect to social impacts, the external benefits are expected to be high. The community gardens help with integrating immigrants, stabilizing precarious neighbours and helping to provide environmental education. The appreciation of their services by state actors is not yet established, especially in environmental terms. This has yet to happen.

4.10 Interim discussion

In the former nine sections I investigated the potential of urban food production in Berlin to contribute to the resilience of the city's food system. In order to do this, I analyzed the interview-material of my seven case studies and the resulting actor-network and stakeholder-portfolios in how far they contribute to the factors for a resilient world, developed by Walker and Salt (2006) (cf. sections 1.2 and 2.3). I studied the projects contributions to diversity and ecological variability, modularity and acknowledgment of slow variables, tight feedbacks and social capital, innovations and overlap in governance and finally ecosystem services.

Generally, the projects were found to enable Berlin to cope better with future challenges. These challenges are understood as causes for the reduced capacity of the currently existing food system to provide sufficient availability of food in an unknown future. These challenges are expected to influence the system and shift it towards a different, undesired configuration. Acknowledged challenges are climate change, peak oil, economic crises, wars and disease outbreaks. However, the unknown is important as a potential source of disturbances.

Due to their great variety of motivations, organizational forms, locations and activities, the projects were found to always contribute to the resilience factors. Some UA-forms performed better in one factor while another contributed more to a second.

In general terms, the projects were found to contribute to diversity. Urban food production in the current form contributes to the biodiversity of Berlin's flora and fauna. The initiatives and companies represent a marginal, but nevertheless, existing extension of the current conventional food system. They show a high variety of different legal forms and participating individuals and organizations.

The projects embrace ecological variabilities. The urban food producers have developed a set of strategies how to cope and embrace ecological variabilities, a broad variety of crops, the detachment from natural surrounding and water supply systems are only some strategies to be named to cope with ecological variability.

Berlin's urban food producers were also found to show a high degree of modularity. They are organized in a modular fashion. The different types of urban food production are mostly linked via the public administration or the press and public education, i.e. schools and kindergartens. The community gardens share more common nodes with each other than with the non-community-based types. This might create high dependencies, especially when it

comes to funding, although they declare to be mainly based on member fees, all of them are connected to and funded by the same foundation (i.e. Stiftung interkultur).

The Berlin food system connected to the urban food producers shows a high awareness of slow variables leading towards thresholds of regime shifts. Berlin's citizens are known for their high awareness of political issues and social-ecological impacts. Public awareness for food issues has risen in recent years due to food scandals and is revealed in Germany with an increase in demand for organic and local food.

Urban food producers in Berlin are found to have very tight feedbacks. Their major advantage of being inside the city, close to their consumers enables them to forward and exchange information with customers, members and the surrounding political system. This possibility is high in use. They use online and offline media to communicate and have improved their press presence in recent years.

Especially the community-based projects show a large contribution to social capital. Organized in interconnected networks, they show a high degree of self-organization and leadership in certain areas of expertise. They are interacting with a high degree of trust and refuse to accept the top-down approach the administration is trying to put onto the system. However, the degree of *trust* between the administration and the initiatives has increased in recent times, exemplified by the pioneering process "Tempelhofer Freiheit" initiated by the Senate, appreciated by the non-profit organizations.

The will but also the ability to learn and innovate was clearly found in all forms of urban food production. The projects offer workshops and educated adults and children with respect to the environmental and social impacts of our food system. They collect and forward know-how on gardening practices and show a high degree of innovation potential in each project.

An overlap in governance can be stated when looking into the actors-network. Urban food producers are creating some kind of governance overlap. Their independent and idiosyncratic behaviour might not make them to be the most suitable partners to interact with the administration. But they will to contribute a “messier picture” of urban public space and thus contribute to the resilience of the system.

The ecosystem services provided by the urban food producers are partially recognized by themselves. Pollination and biodiversity are present in the interviews. Social impacts, like integration and social cohesion are acknowledged. However their positive external benefits are not yet used in their argumentation to strengthen their position towards their stakeholders. Quantification of these effects might help them to make their point.

In all nine factors stated in the resilience framework of Walker and Salt (2006), urban food producers show a high degree of performance. They are a valuable contribution to the resilience of Berlin’s food-system although their actual food output might be marginal.

In the analysis above, however, it showed that the exact interpretation of each factor with respect to a certain social-ecological system is missing. Walker and Salt (2006) work with case-studies and examples but leave it to the reader to develop his/ her own interpretation and fill each factor with a concrete counter-part from the system under investigation. I applied the framework supported by literature on each factor to Berlin’s food-system. Currently I cannot tell, if I missed to interpret the framework in a certain way and thus missed a certain threat of the system.

The analytical framework further lacked the approach to evaluate the factors and compare them with each other. It became clear, that the factors can not be replaced by each other. However, Walker and Salt (2006) do not provide guidance of how to evaluate the existence of the factors with respect to their importance for resilience. There is no order, no hierarchy, none of them is claimed to be more important than another. This makes the

evaluation difficult. It can only be stated, that urban vegetable production has a large potential to contribute to urban resilience as they show all nine factors when applying the conceptual framework of Walker and Salt (2006).

Although contributing to urban resilience, from the interviews it became clear that none of the urban food producers assume that a complete self-provision of cities with food is possible. The historical overview supports their assumtpion: Even in times of extreme use of urban food production (post WW II) self-provision could only contribute a share of the overall demand for food in Berlin (1947: 30% of vegetables) (Schmidt 2008b). Confronted with advancing technologies and strategies for urban food production, it does not mean that nowadays a self-provision of the city would be possible but a partial one would.

Furthermore, the open question remains if they lack to identify an important factor. The authors leave it to the nine factors, but in the end of their book they ask for reader contributions to make it ten. They point out that they have numerous ideas how to continue the list but wanted to learn from their reader-community (Walker & Salt 2006).

Besides these points to be acknowledged it is even more important to state, that resilience has so far been treated as a marginal topic on the political agenda. Facing the current economic crisis, state actors show a higher interest in this than in potential future crises from climate change, peak oil or anything unknown. This can be understood as being blind-folded towards future challenges. At the same time it poses a window of opportunity to discuss resilience thinking when facing the current crisis. The need for the political arena to take on the issue of resilience shows how important state actors are with regard to the development of a resilient urban system. This might hint to a neglected factor for resilience which so far has not been investigated: the role of the state actors for a resilient social-ecological system.

5 SPECIAL FOCUS ON INTERACTION WITH STATE ACTORS

As seen above, urban food production shows essential characteristics to contribute to urban resilience in Berlin. This leaves the question how this capacity can be supported and enhanced? What are the framing conditions with which urban food producers are confronted with in the urban setting?

The role of the state has been mentioned in most cases as important. The resilience research is also emphasizing state actors as being responsible for changing these framing conditions. State actors play a significant role in this urban play about urban food production, alternative food systems and the right to use public open space is focused in the following chapter. The analysis above showed the importance of actor diversity and their forms of interaction for the resilience of Berlin's food-system. The state actors were present in all stakeholder portfolios and play a significant role in setting the institutional and spatial framework for the urban food projects.

The resilience research acknowledges this interplay of practitioners and state actors. In the book "Resilient Cities" Newman et al. (2008) concluded that positive examples which illuminate the steps toward resiliency were achieved by a mixture of visionary grassroots initiatives demanding more options for sustainable living and transport, innovative business, and strong political leadership. In the analysis before, I found the strong political leadership in Berlin to be lacking and not welcomed by the urban food producers. Donald (2010) calls for a more positive policy environment which can only come about through multi-scaled governance approaches with sophisticated organizational capacity and commitment to move toward a more sustainable form of food capitalism (Donald 2010).

The current financial crisis might lead some to question this call for food capitalism and the connected scheme of efficiency has been rejected by Walker and Salt (2006) as being opposes to the need for diversity. However, Donald's call for multi-scaled governance

approaches might find resonance with urban food producers. The broad number of organized actors working towards the adaptability of the system confronted with unexpected changes is framed with the concept of "Adaptive Governance". As an extension of conventional resource management, it consists of at least four essential parts, following Folke et al. (2005): understanding ecosystem dynamics; developing management practices that combines different ecological knowledge systems to interpret and respond to ecosystem feedback and continuously learn; building adaptive capacity to deal with uncertainty and surprise including external drivers; and supporting flexible institutions and social networks in multi-level governance systems. These are all themes which have been investigated in the analysis of Berlin's urban vegetable production. But how do the societal managers in Berlin – the administrators – perform when confronted with the current development of increasing food production in Berlin?

In the following excurse, I will extract the impressions of my interviewees with respect to their perception of the state actors in Berlin and answer the following the research questions "How do the urban vegetable producers perceive the interaction with state actors: how do these interactions hinder or facilitate the local production of vegetables in an urban setting?" and "How do growers feel that local and national regulations and organizations are affecting their projects?"

When extracting the forms of interactions with state actors from local to regional and national administrators, it became clear that the interactions can be divided into the following five forms of interactions which the urban food producers have with state actors:

- Funding
- Provision of public land
- Regulations, especially urban planning
- Information/ coordination
- Administrative processes

The following chapter will be organized along these forms of interactions and give a clear picture of how state actors in Berlin can contribute to the enhancement of urban food production in Berlin.

5.1 Funding

The financial situation of the urban food producers is highly varied. While the non-profit associations are mainly funded by their member-fees, the commercial projects struggle to find investors, and acquire new clients. The question in how much they actually receive or if they would even accept funding from the state is answered in a broad set of answers.

Most non-profit associations are furthermore applying for project funding from private foundations and public funding sources which then are to be used for one certain project. The urban food producers perceive their funding situation as non-critical for the existence of their project (with the exception of ECF Center who is currently searching for an investor to actually construct the roof-top farm):

> „We are financed by the member-fees when it comes tot he basic necessities. And all the projects are icing on the cake“ (Pyramidengarten 2012).

Some projects focus more than others on applying for funding and are pretty successful as can be seen in their stakeholder-portfolio (cf. Pyramidengarden in Appendix 3: Stakeholder-Portfolios) while other initiatives are mainly looking for material and informational support (e.g. Allmende-Kontor).

When asked if they wished for more financial support from the state, Laskerwiesen (2012), Pyramidengarten (2012) and Prinzessinnengarten (2012) clearly stated that this would be not needed. One reason for this reply could be found in the time-intensive process of applying and the resulting procedure of granting and documenting and the main focus on project funding instead of institutional funding. Prinzessinnengarten (2012) summarized these issues when he said:

> „We did not receive support or funding from communal or national side. [...] We avoided this on purpose and did not get anything especially in the start because we could not think of an adequate partner. And the funding you would receive is usually project-bound and this rather harms than helps if you want to build up something. A project has a start and an end… […] So, projects and sustainability, those are two things which exclude each other" (Prinzessinnengarten 2012).

A project which successfully works with project funding is Pyramidengarten. They state this to be highly time-consuming and further note that specific skills are needed which not everyone posseses.

> "The funding is not the problem, but the men- and women-power to write applications and to communicate and to do this and that. There are several funds, but we have problems of capacity to make use of them" (Pyramidengarten, 2012).

The private companies see the procedures and conditions as main barrier to make use of public funding. ECF would only apply for R&D-funding from the Federal Ministry for R&D as a last resort, in case they do not find a private investor (ECF 2012). The owner of BioPilze mentions the conditions which have to be fullfiled to apply for start-up funding:

> "It would not help us. Say, we would not be considered. For this, we would need to find a new company and show that we are employed full time" (BioPilze 2012).

The flexibility and rather part-time or even free-time activity of urban food production is not considered when it comes to public funding. So could the state then help the urban food producers with an additional funding system? Rather not, reply most community-based initiatives. Allmende-Kontor (2012) states that state actors prefer to steer and set certain conditions for funding. The highly self-organized projects often reject this kind of paternalism (Prinzessinnengarten 2012, Allmende-Kontor 2012).

This shows that funding-options for urban food producers is not necessarily lacking. However the conditions and procedures are repelling the practitioners, that they would rather not make use of them and stay independent from the state's subsidies. When applying for funds, some initiatives prefer to receive it from other sources, e.g. the private foundation

Stiftung Interkultur which seems to be able to provide community-based projects with the conditions they need.

In order to support the urban food production financially, state actors have to understand the specific necessities of the producers. Most of them work in their free-time or as part-time activity in the projects. This results in a general lack of time. Procedures for applications have to be downsized and the application procedure has to be short and uncomplicated. The conditions to be eligible for funding should be developed with respect to the reality of the urban projects. The variety of legal forms and the variety of motivations should be included rather than excluded from the conditions.

5.2 Urban planning and provision of public land

The interaction of urban food pruduction with regard to urban planning and the state of public land provision for this purpose should be focused in this section.

All the community-based projects and a major part of the allotment gardens are located on public land. In rare cases, the district provides this land for free, e.g. for Laskerwiesen. In most cases, however, the districts rent public space to the initiatives which then have to pay a rent. This is true for the allotment gardens, Prinzessinnengarten, Pyramidengarten and Allmende-Kontor. Like in the case of Allmende-Kontor this lease-contracts are connected to some kind of obligations and restrictions:

> „That is why they told us: You can have 5,000m², you are not supposed to build a fence and you are not supposed to get into the soil [...]. There is a general fee to be paid to the city: An annual 1 Euro per m². That means we need to pay 5,000 Euros [...] and you need to find a legal person, which is than contractor for the City, that's how it is written in the contract" (Allmende-Kontor, 28 March 2012).

Allmende-Kontor is an exception as they have a contract with a public company run by the local government. Most community-gardens are in a contract with their districts. 75% of the allotment gardens are situated on public land as well. However some colonies, however, are leased out by private companies like the German Railway (Deutsche Bahn), the

post (a formerly public company) and also the Catholic and Protestant churches (Allotment gardens 2012). The individual tenent has a lease contract with the colony association which then forwards the money to the land owner. The public land is managed by an interim agency, called "Liegenschaftsfonds" who acts in order of the Ministry of Finance. This creates complications as the monetary value of the land often becomes more important than its practical use and non-monetary benefit for the society. Asked for the support from the Ministry of Finance, the urban gardener replied: "They prefer to see money." "Die wollen am liebsten Geld sehen" (Allotment gardens 2012).

The perceived problem from this form of interaction is the contition of interim use. Most projects are allowed the public land as long as there is no need for it for another purpose. For the projects this means a high uncertainty with respect to their future. The contracts are extended each year and so can they end. After several years and with an increasing success of the projects this becomes improbable, however, there is still uncertainty for most of the projects.

> „The contract runs one year and has to be extended. […] Currently, there are no hints that this should not be the case anymore. Besides, we have a comparably good standing in the district, it would create a public outcry" (Pyramidengarten, 2012).

These contracts can end easily and this then results in the final close-down of the projects, it threatens the mere existence of the projects (Rosol 2010). For the commercial project Prinzessinnengarten, this insecurity poses problems for the long-term planning for the company and its employees. However with their mobile concept they could easily move to another plot, however this needs to be provided as well:

> "The only problem we have is the insecurity for planning. It would make sense if the administration created a framework with which we could work on the long term [...] say, that – disregarding this specific plot - we could plan for the next fice, sive, seven, eight years. As a private company you cannot work without a certain longterm frame. We have employees and it would be helpful to be able to tell them: Yes, we now for sure, we can stay here for the next three or four years, and if not here, than on another plot." (Prinzessinnengarten 2012).

This raises the question about the use of public land. The community gardens in Berlin have a long tradition of opposing to the single-sided strategy of urban planning to create high-value districts through building strategies of upgrading[14] (Meyer-Renschhausen 2004). How fallow public land is used in the city centre is a main point of discussion between the urban food producers and the public administration. The community gardeners appreciate the unregulated activities on fallow plots as public green has certain guidelines which even prevent gardeners in some places to grow food (Prinzessinnengarten 2012). This is supported by findings of Rosol (2010) who sees the political implication of open space as inspiration and motivation for urban gardening activists to participate in the projects.

Another problem which results out of the use of public land in Berlin centre is the soil contamination which still results from war ruins and munition from World War II. This results in certain regulations, e.g. that gardeners are not allowed to dig into the soil and have to transport in raised beds and clean soil. This was mentioned by almost all projects which are working on natural topsoil.

Allotment gardens (2012) mentions the poor money household of Berlin to be responsible that these circumstances still prevail. In the 1980s, there were broad excarvations of polluted soil. Nowadays they propose their gardeners to use raised beds instead (Allotment gardens 2012). This circumstance however has legal consequences as polluted soil cannot be converted into “Permanent Garden Land” (Dauergartenland) in the spatial Land-use plan for Berlin. They have some kind of interim stage and can easier be demolished (Allotment gardens 2012).

Another problem which was identified when it comes to the use of public land, is the need to interact and communicate with public administrators. Several projects mentioned problemts of understanding and interaction. The public administrators act very cautiously

[14] This issue is currently highly discussed in German urban planning under the key-word of “Gentrification”.

with respect to anything unknown and irregular. However, the urban food producers also emphasize that this is not necessarily the administrations fault. Their action is based on public law and if these regulations do not include certain actions, it is understandable that administrators rather decline certain requests (Laskerwiesen 2012, Prinzessinnengarten 2012, Allmende-Kontor 2012). These complexities and attitudes also result out of the historical background. As some community gardens showed a former dedication of squatting public space and criticize strongly the urban development policies in Berlin, their relations with local politicians and administrators was temporarily quite tense (Rosol 2010).

Taking this current situation in consideration how can the interaction between urban food producers and urban planning be improved?

The interaction between state actors and urban food producers is based on trust. State actors trust in their contractors to accept and stick to the conditions and urban food producers have to accept these and follow them. This interaction is based on experience which still has to be gathered. Community gardens on public land are not new to the administration and have proven to be a highly successful scheme to improve the liveability of precious districts. After 10 years of experience in the Berlin districts, the administrators should feel confident in extending the contracts to longer time-spans than one year.

However, circumstances are not always supportive as the gardens are often seen as an interim-use for plots which might be used for other purposes or even be sold. Another strategy could be then to offer alternative plots with similar characteristics and proximity to the neighbourhood. In the urban setting this poses problems due to the highly competitive situation of a scarce resource: open space.

That is why it is essential to integrate urban garden space into the land-use plan for Berlin. Several strategies can be helpful how to achieve this. One strategy is to create a new urban planning catergory of land use for gardening use besides the system of allotment

gardens. However this poses to be difficult as no contaminated plots can be included in this category (Allotment gardens 2012). Here, community gardeners could coalize with the critical mass of allotment gardeners and ask for the the inclusion of contaminated plots into the category of permanent allotment garden land (Allotment gardens 2012). Important for the community gardens is also, that this form of urban planning should not be misused for the intentional upgrading of districts in order to raise rents (key word gentrification). The allotment gardeners furthermore ask for the extension of the so-called protection periods for allotment gardens which are not selectable for permanent allotment garden land (Allotment gardens 2012). A last strategy could be the reduction of regulations on public green in order to enable citizens to garden in parks and other green area. However, it is important that the financially challenges city of Berlin does not externalize their costs for the preservation of public green onto the public (Rosol 2010).

The same is true for the clean-up of polluted plots. The excavating works and replacement of soil is highly expensive but should be a long-term goal for the city of Berlin. Urban gardeners proved to be able to contribute when it comes to superficial contamination, as the example of Pyramidengarten shows:

> "We did some clean-up and restoration works, this was rewarded by the district by subletting two years of rent" (Pyramidengarten 2012).

In general the urban planning poses a great potential to support and enhance the scheme of urban food production despite the high competition for urban space. It is imperative to keep open space for gardening activities with regard to the well-being of the society and the resilience of the City. Lohrberg (2010) summarized this notion by claiming:

> „Urban planning should not solely act as an administering instrument to keep order. In the future it needs to design and create foresightfully. For this show-cases and experimental plots are needed. Only the courage for experimenting provides the urban society with the knowledge and flexibility necessary to cope with future, unpredictable changes" (Lohrberg 2011).

5.3 Regulations

Law and other regulations are the first to come to ones mind when talking about state actors. However, it is surprising to find how little regulations actually apply to urban food production. The section above already covered the most important for the land based urban food-producers: The urban planning. The interviews only revealed little knowledge about additional legal guidance.

The most comprehensive form of legal regulation, decidedly develope for urban food producers is the Federal Law on Allotment garden (BundesBioPilzegartengesetz – BBioPilzegG). In 22 paragraphs, the Federal government of Germany defines the use, the rights and obligations of allotment gardens. It regulates the form of organization (non-profit association), the area per parcel (<400 m²), the qualitative use of the space (max. 6% sealed; a hut of max. 24 m², half of the rest for leisure, the other half for food production) and restricts the rent to a maximum of four times the rent for local agricultural land (Bundestag 1983, Allotment gardens 2012).

Such legal framework does not exist for other urban food producers and would not be appreaciated by the community-gardens. The creativity which is shown in these projects derives its dynamic from the absence of such strict regulations (cf. Allmende-Kontor 2012, Prinzessinnengarten 2012).

The Plant Protection Law (Pflanzenschutzgesetz) defines what kind of plant protection agents are allowed in the private and commercial growing activity. This applies not only to the commercial projects but also to the allotment gardeners and community gardens. For the enforcement of this law it is valid: no complaint, no redress. The overuse of pesticides is a still-prevailing prejudice against allotment gardeners (Allotment gardens 2012). Nowadays, allotment gardens have a gardening consultant in each colony who helps the gardeners to make the right choices with respect to fertilizers and pesticides (Allotment gardens 2012). All community gardens have their own rules with respect to the use of artificial fertilizers or

pesticides. In general they are opposing to any use at all and prefer natural pesticides (Pyramidengarten 2012, Laskerwiesen 2012).

The Law for Plant Protection also refers to commercial projects. This is only one of a number of regulations to follow. Prinzessinnengarten mentions regulations with respect to hygieny and gastronomic services which apply to their cafe and restaurant on the plot (Prinzessinnengarten 2012). ECF is still in the process of accessing which regulations apply to their project (ECF 2012). Biopilze even mentioned to be surprised of the lack of regulations with respect to hygiene when it comes to mushrooms (BioPilze 2012).

To sum up, legal regulations are not seen as problematic or difficult to fulfil. However, for commercial projects with an innovative approach, it seems to be highly time-intensive to identify all relevant regulations.

One strategy with respect to regulations could be the central collection of relevant regulations applying to urban food production. This will be argued in the following section on information, coordination and responsibilities.

5.4 Responsibilities, Information and coordination

The following section will give an overview of the practitioners' perception with respect to responsibilities of the state with a special focus on the task of providing information and coordinating urban gardening activities.

The institutional responsibility with respect to urban food production are scattered in Berlin's administrative structure, when following the hints of the practitioners. As mentioned before, most urban gardening projects see the district's administration and their sub-divisions for public green as their main point of contact (Laskerwiesen 2012, Pyramidengarten 2012, Prinzessinnengarten 2012, Allmende-Kontor 2012). The regional level (of the City and Federal State of Berlin) is mentioned more rarely. If they mentioned them, then with respect to the Agency for Plant Protection is named by some practitioners (Allotment gardens 2012,

BioPilze 2012), the Ministry of Urban Development and Environment and the Ministry of Finance (Allotment gardens 2012, Allmende-Kontor 2012). Some of the practitioners refer to the "Senate" in general which means the regional government of Berlin, representing the cabinet and the thus the heads of all ministries as such. These are the main state actors in their stakeholder-portfolios (cf. Appendix 3: Stakeholder-Portfolios).

Their perceived responsibility can be summarized with "supervision". The allotment gardeners for instance declare this explicitly with respect to the Agency for Plant Protection. From their point of view, the state actors should mainly provide guidance to each allotment association with respect to the correct implementation of the Federal Law on Allotment Gardens and Plant Protection (Allotment gardens 2012). The district si mainly understood as the landlord by the community gardens. This reduced perception of responsibility results out of the high independence and self-organization of most non-profit associations. Other forms of urban food production are expressing their wish and observation not to "have much to do with state actors" (Prinzessinnengarten 2012, Pyramidengarten 2012). This might be understood as a hint of critique with respect to the procedures but also a sign of high self-organization.

One concrete responsibility for urban agriculture is missing. It is even mentioned as a problem that the administrative responsibility for agriculture in Berlin has been fused with the one of the Land Brandenburg which surrounds the City of Berlin. This is seen as a signal that agriculture and food production is not perceived as important in Berlin (Allmende-Kontor 2012). The administrative unit in Brandenburg has furthermore a different expertise as Brandenburg's agriculture is a large-scale production on vast areas of the Federal State and small-scale production in an urban setting is not on their agenda at all (Allmende-Kontor 2012).

These findings are supported by Lohrberg (2011) who criticizes that urban agriculture has no importance, neither in academic education nor on the political agenda in Europe and Germany. There are no study programs taking the specific focus on urban agriculture and its necessities. The whole subsidy structure of the EU and its member states focuses only on the rural area (Lohrberg 2011).

This low profile of state actor's responsibility might also result out of a lack of knowledge about these. Prinzessinnengarten for instance said when questioned about their interaction with state actors:

> „We have contact, but… we have also been to symposia and workshops, but there is actually no concrete coorperation between „Nomadisch Grün" and a… we do not even know who would be our contact person in the Senate's Chancelery" (Prinzessinnengarten, 2012).

Even when searching for a responsible division, urban food producers find themselves confronted with a lack of interest as the mushroom farmer tells:

> „I called the Veterinary Office and they have told me, that they are not responsible. Because I also thought that it had something to do with hygiene. But it is not that severe. And this makes sense in a way, because it is a basic product [...]. The veterinary office does not have anything to do with us" (BioPilze 2012).

This lack of information about responsibilities is an important issue voiced by most of the newly-emerged community-projects and the commercial projects (Prinzessinnengarten 2012, ECF 2012, BioPilze 2012). As the administration often shows a lack of interest and it is difficult to identify the responsible department, Allmende-Kontor has started to take the guidance of newly emerging community gardens on:

> „That is our idea as Allmende-Kontor: We act as consultants for new initiatives. We support them when they are searching for a plot. That is happening anyways, we are in contact with numerous right now" (Allmende-Kontor, 2012).

The community gardens are also helping each other when it comes to developing their articles of association for instance (Laskerwiesen 2012, Allmende-Kontor 2012). This also

means that state actors, even when responsible, seen unlikely to be approached. The projects are rather helping each other then consulting state actors for information.

An exception poses the interaction of the allotment gardeners with the Plant Protection Agency. The allotment gardeners receive information with respect to plant protection from there. The Agency also provides education for the Garden consultants (Gartenfachberatung) of each colony (Allotment gardens 2012).

Due to their need for information on free plots, regulations and practices on how to develope a non-profit association for instance, most community-gardens are voicing their need for a central coordination agency. Most refer to Green Thumb, the independent coordination agency for the urban community gardens and farms in New York (Prinzessinnengarten 2012, Allmende-Kontor 2012). Such an organization is expected to provide guidance for interested citizens and existing projects. It would help create a network and also work as interest group for the numerous initiatives to voice their concerns towards the state actors. This would help to facilitate the founding of more community gardens in Berlin (Allmende-Kontor 2012, Prinzessinnengarten 2012).

The discussion is happening right now if such an agency would be rather situated in the responsibility of the Senate or if it rather should be independent:

> "We knew each other from before, we have been connecting before, we already had several meetings with the Senate, voicing the need for a coordinating function towards the Senate's people and the administrators" (Allmende-Kontor, 2012).

Since then, the administration did not react and provided such a coordination agency. Meanwhile, however, Allmende-Kontor was founded with the aim to create it instead. It has been developed to be either, a community garden to learn the practice but also a major node in the network of community gardens. Judging from it being mentioned by several other community gardens in the interviews and from their general perception by the press and their online-appearance this can be seen as acknowledged and appreciated by the urban food

producing community (Laskerwiesen 2012, Pyramidengarten 2012, Prinzessinnengarten 2012, ECF 2012, URL Urban Acker).

5.5 Administrative processes

All the interviewed urban food producers interact with state actors on a regular basis. Some are highly dependent on the district administration as landlords; most of them have contacted administrators in the need for information. Judging from their narratives, most of them were at least negatively surprised by the speed of how administrators processed their concerns. It could also be identified that some of the projects were confronted with highly bureaucratic procedures (e.g. application procedures for funds) and that some even were frustrated when innovative ideas where blocked as they were unknown to the administration's procedures (Laskerwiesen 2012, Allmende-Kontor 2012, Prinzessinnengarten 2012, ECF 2012, Laskerwiesen 2012). This sounds like the enumeration of prejudice against German bureaucrats, in this specific case they are based on experiences.

The long-time experience with the administration lead to the development of certain strategies of approaching them. Allmende-Kontor (2012) for instance told me about the importance of the Local Agenda 21 action plan in Berlin.

> "We have a decision for a Local Agenda in Berlin, enacted by the Regional Government, which declares the intercultural gardens as substantion for the Integration and the social cohesion. [...] The is is recommended that each district should have two such gardens, and that the administration should support them with plots and PR. These tasks are not obligatory, […] it was enacted in 2006 and I think, this paper has already helped in Berlin several times. Well the Local Agenda is a nice book to carry with you when going to the administration and then you can point to the decision of the Logal Government" (Allmende-Kontor 2012).

This not only shows the gardeners' capacities to cope with the administration's processes, but it also points to the main problem: The administration only acts in accordance with the legal or governmental dictate. This is not surprising as it is the Executive. However, the administrators are more commonly referred to as contacts than local politicians. The appreciation of actually approaching local politicians in order to change legislation is not yet

common practice in the urban food production culture. However, Allmende-Kontor might have to the potential to actually change this.

The mere existence of Allmende-Kontor is the example of how the administrative processes in Berlin can be influenced and changed towards more citizen participation in planning processes. This happened in cooperation rather than in conflict. Allmende-Kontor is situated on Tempelhofer Feld, the former airport in the south of Berlin. The now unused open field has been opened to the public until the city has decided what to do with it. The interim use of the immense field (it is 4 km broad!) is organized by a public company called Tempelhofer Freedom (Tempelhofer Freiheit, cf. URL Tempelhofer Freiheit). This company organizes an innovative process called Pionierverfahren (Pioneer Procedure) which includes allowing citizens' initiative to realize whatever idea they have which has to be accepted by a Jury (Allmende-Kontor 2012).

The 13 intiators from Allmende-Kontor are all pioneers of urban agriculture of some sort in Berlin. They developed the concept of a community garden in connection with a point of information and consultancy for urban gardening initiatives in Berlin and were accepted. They highly appreciate this approach, although they had to cope with the administrators' scepticism in the beginning:

> "I dare say with all precaution – not everyone was happy with the idea of the Pioneer Procedure. That is a way, theoretical and practical, where it is not 100% regulated, what is going to happen. And after four weeks when there was not much to be seen, I recollect numerous comments in some meetings, saying that it was a dead-born child" (Allmende-Kontor 2012).

The first four weeks passed and in end of July more than 500 people were seen on the field, planting, building and communicating about urban agriculture. The administration learned as well. Formerly critized for their typical top-down approach, they are now even presenting the clearly visible community garden as innovative administrative procedures:

> "The administration's scepticism has transformed, I think, into persuasion. This is one of the pioneering projects which works, which they can show around. This proofs the

> intention of sub-letting the field for interim use to result in something presentable, and it also justifys this administrative action as something positive" (Allmende-Kontor, 2012).

This example makes clear that administrative processes can impressively contribute to the enhancement of urban gardening initiatives and thus urban food production. It almost makes it imperative for the administration to offer open space for the creative experimentation of their citizens. The initiatives highly appreciate this concept. They use the space for innovative approaches to grow food in the city.

5.6 Interim discussion

This chapter gave concrete examples for Berlin and its administrative structure of how to reorganize in order to help the urban food producers enhance their concepts. It can be noted that it is not at all about making more funding sources available to the projects. The current structure and procedures to receive this money are highly inconvenient and time-intensive for the small, rather flexible projects which are mainly run by volunteers or part-time workers. Although the commercial projects are in the need for financial support, they are rather searching for this in the private sector than in the public.

Also the rephrasing of regulations are rather unimportant for the projects. However, a clearer picture of what kind of regulations apply to them would help them to comply with the legal rules. The central provision of information regarding regulations and knowledge about administrative responsibilities was formerly lacking in Berlin's administrative structure. Instead of creating another administrative body, the administration embraced the innovative and highly self-organized nature of the urban food producers and provided them with space to organize their own coordination agency in the form of Allmende-Kontor.

Providing space, providing land and preserving gardening land in connection with reliable mid-term lease contracts is the essence for the enhancement of urban food production

through administrative action, at least when it comes to the forms of community and allotment gardens.

In a city like Berlin, where more and more people are moving back into the city centre as the liveability is increasing in the central districts (btw. urban gardens have a share in this), the need for land and housing is rising and competing demands have to be supplied. For the urban food producers the interaction with the urban setting and its inhabitants is key to they project concepts. They have to find support in the administration in order to prevail in the city (and not to be pushed to the margins of it). The successful participative approach on Tempelhofer Feld, although limited to five years, until an international gardening exhibition will take place there, might have the capacity to change the interaction between urban food producers and the state actors on the long run. It is a perfect example for what Walker and Salt (2006) found about open space (although they used space more metaphorical than spatial):

> „A resilience framework is all about creating space. [...] Pathways that foster experimentation and innovation maintain the kinds of diversity that build resilience and enhance the social networks operating in a region. These pathways have the greatest chances for achieving long-term well-being“ (Walker & Salt 2006).

6 DISCUSSING THE IMPLICATIONS OF THE RESULTS

In this chapter I want to discuss the results of both analyses chapters by imagining how this form of resilience thinking could be implemented. I will furthermore discuss what this means with respect to future research areas of the resilience concept.

Following the conceptual framework of resilience thinking I found urban food production in Berlin to contribute to the resilience of Berlin's food system. I further identified the interactions between state actors and urban food producers to be an additional important factor to add to the framework, as the interviews, the network-analysis and literature on resilience suggest that state actors have an essential role in providing urban food producers with the framing conditions to actually produce food in the city.

Although urban food producers might never be able to create a self-sufficient city they have the potential (shown from historical examples) that at least a much higher share than nowadays could be contributed. Besides this function, urban food producers have numerous more functions, especially with respect to food literacy (as counter-move to increasing obesity rates), biodiversity, pollination, cooling effects etc. This list is long; the important contribution to the well-being of the urbanites is clearly there.

Urban food production is one thread in the stream of relocalization of food which happens right now in Germany and in other industrial countries. With their high innovative capacity, urban food producers can even be understood as the front-runner of the relocalization trend. They are essential to the future of an ever more urbanizing human society.

With all these positive capacities, what needs to be done to enhance the scheme to a larger scale? This was investigated in chapter 5 with the specific focus on the state actors. The provision with public open space for their creative and innovative processes is the key to the enhancement. What else needs to be done? Walker and Salt (2006) claim that a shift in

thinking and planning is needed in order to take on the mind set for resilience thinking. With respect to urban food provision it will be necessary to breaking down the existing dichotomy between rural and urban space (Lohrberg 2011, Mougeot 2005). This clear cut between the the attributed functions of consumption = urban, production = rural has to be changed to more interchangeable approach. That food can be grown in cities should not be surprising, but rather an addition to rural and peri-urban food production.

And it has to be reflected in institutional structures. Food production needs to find its responsible administrators who have expertise in their field and reflect the interests of the urban society; this structure needs to leave space for creativity and innovations. Such administrative structures have to reflect the most essential social-ecological systems, i.e. food, energy, water and transportation. How these systems have to be changed in order to become resilient must be a future step of research.

The change towards a more decentralized food production as the urban food production system is one, comes with a reduction of efficiency. Decentral food production like in an urban and peri-urban setting can never achieve the prices of the highly subsidized industrialized agriculture with its immense externalization of environmental and social impacts. The change of the mind-set has to include the consumers as they will have to pay higher prices if not self-provided with food. Germans are throwing tons of food away (Noleppa & Witzke 2012) only proving that cheap food results in an underestimation of its actual value. Food is so essential to our everyday live and despite this we are only paying a minor share of our monthly income on food. It needs to be reevaluated in industrial societies.

Reevaluating food means to create a set of indicators which help to compare certain costs and benefits. Convincing important decision-makers to take on the resilience mind-set will need convincing results from empirical research. My results can only give a first short overview of the contribution of urban agriculture to the resilience of cities in developed

countries. Each factor has to be studied more intensely than it was possible in the shortness of time. Resilience factors have to be investigated in more depth and for the sake of convincing decision-makers they will need to be quantified in some way.

The findings presented here, however, can be the start of a more comprehensive and wholistic discussion on the importance of the currently marginal appearance of food provision through gardening and farming within the city limits. The question remains, however, how we can know that a resilient system is in place, that the strategic approach has been successfully applied. This will be another area for future research.

The current case study was based on the German legal system and situated in Berlin. This creates highly unique outcomes, especially in chapter 5 when it comes to the interaction of the specific governance structure in Berlin. Germany as a federal system and Berlin as a city and a federal state at the same time provided the stage for my analysis. This might reduce the applicability of my findings to another city in another country. Due to the choice of a very broad variety of urban gardening types, it can be assumed that depending on the present forms of UA, the findings from Chapter 4 can be transferred to another place. Chapter 5 in contrast was the analysis of actor's interactions in a highly specific setting and constellation. It might be probable to find the same forms of interaction in another city, especially when it is set in an industrial country. The exact outcome of the analysis of the interactions with state actors would probably be different.

This research scheme has proven to be valuable to understand the contribution of urban food production to the resilience of Berlin's food system and to understand in how far state actors have the power to enhance the scheme. It might also be of very high interest to apply this research scheme to an industrial country which is currently on a threshold due to intensive disturbances and see in how far urban food production could help to prevent the system to shift (e.g. countries who have been hit hard by the global recession).

Assuming that the contribution of urban food production could result in a 30% share of urban food provision (with respect to vegetables and comparable to the post-WWII phase). Then the question is how the existing food system would react. In the analysis above, I only investigated the perceptions of the urban growers themselves and their interaction partners in the administrative structure. Difficult as it is, political actors are not the only ones who need to be convinced. When asking for a more resilient food system with mainly local provision, there are numerous stakeholders who will see their goals threatened. Farmers in the rural areas might understand urban food production as competition, so might the retailing system. Logistics will experience severe losses, assuming that 30% of the production happens locally leading to a loss of 30% of the transports of food. The perception of urban food production and resilience through other stakeholders in the urban food system is another important area of future research.

To conclude this discussion: Although the analysis of urban food production showed a contribution to resilience of the food system and thus an important part of urban resilience, and the interaction with state actors showed large potential to improvements, of course this does not cover the research gap at all. The question of how to change the mind-sets of important actors towards resilience thinking and how to quantify resilience effects of certain factors, how to quantify resilience as a whole is still not clear and need to be studied. The applicability of the used framework onto other cities has to be tested

7 CONCLUSION

Sustainable development is regarded as normative concept, and as such it is regarded to be insufficient for a global society that is facing sudden and evolving disturbances of their main social-ecological provision systems. In the moment that human kind has become an urbanized species, we are confronted with a global recession which threatens our world economic system. Global climate change and peak-oil are threatening the natural and fossil resources this economic system is based on. Resilience seems to provide a strategic complement to sustainable development as it is understood as the ability of social-ecological systems to adapt to disturbances.

Meanwhile urban food producers are establishing their projects in highly industrialized countries like Germany. Despite or exactly because of the high availability of industrially produced food a broad variety of initiatives, companies and projects have evolved which grow vegetables and fruits in the highly unlikely surrounding of the urban setting. Observing the evolution of the urban food production, I wanted to explore the reality of urban vegetable producer's in a concrete case study in order to find out about its contribution to urban resilience.

Following the conceptual framework of resilience thinking (Walker & Salt 2006) I analysed how Berlin's urban food producers contribute to the resilience of Berlin's food system as a social-ecological sub-system of the city. The conceptual framework was based on nine factors which were listed as diversity, ecological variability, and modularity, acknowledging slow variables, tight feedbacks, social capital, innovation, overlap in governance and the acknowledgment of ecosystem services.

The expert-interviews about seven different urban food initiatives and companies helped me to understand their contribution to the resilience-factors stated above. Diversity helps in a social-ecological system to absorb shocks from sudden disturbances easier. Urban

food producers showed to contribute either to biodiversity, to diversity of food choices and to organizational and actor diversity. The ability to embrace ecological variability means the ability to cope with natural occurring cyclic changes. For food systems these are climatic changes, but also naturally occurring diseases and pest. From the data it showed that the urban food producers had varying strategies how to cope with these ecological variabilities which ranged from keeping the production separated from the outside to irrigation systems and natural pest control. The modularity of the food system was supported by the urban food producers' low interconnectedness with the conventional food system and the high independence of each project to provide for their needed material input. The close network and personal interlinkages between some community gardens might enable shocks to be forwarded quickly, i.e. spread of disease or pests. The acknowledging of slow variables can lead to regime shifts when ignored and not managed. These are e.g. production capacities. The quantitative assessment of data has a low priority in the urban food projects. However, they contribute to the communication of information regarding the general food system and thus provide knowledge about these slow variables to their peer. The interlinkages of the projects actors' networks are tight. They forward information easily through work groups but also on- and offline media. The social capital of urban food producers, based on trust, networks and leaderships is very high as I found. Only with social capital the innovative processes are possible which prepare a social-ecological system to cope with sudden changes. This high social capital results in the very high innovative and learning capacities, the projects show. Berlin's urban food producers were also found to create overlap in governance. This helps the system resilience as redundancies is systems makes them more shock-proof. The appreciation of ecosystem services can also be noted in the projects' self-descriptions. They do not only provide these through their gardens but also use them as argumentation to enhance their projects.

The analysis of the urban food producers with regard to the nine factors revealed that the interaction with state actors is another important factor for resilience as state actors were mentioned to be mainly central as landlords. In the second part of the analysis I investigated how the interaction with state actors was perceived and which strategies for improvement of state activity there were named. I also analyzed the grower's perception of local and national regulations and organisations? This second step of analysis revealed a high degree of interaction between urban growers and state actors. Especially, urban planning but also administrative processes have the potential to enhance the scheme of urban food production. While the responsible administrator for certain issues were difficult to find. Especially with regard to information and coordination of urban food producers, the capacities of the state were marginal and therefore bypassed by urban food producers themselves.

This analysis showed the potential of urban food production to contribute to the resilience of Berlin's food system. However this still not guarantee that the strategical concept will be introduced and thus helps supporting urban food producers.

Resilience has to enter the political agenda. The importance of resilient systems has to be realized and accepted by state actors. This can pose problems as the general paradigm of efficiency is widely spread but opposes to resilience of social-ecological systems. State actor will have to be convinced with quantitative numbers on the long-term benefits of preserving a certain regime instead of letting it shift to other configurations. A resilience strategy has to be developed with the holistic approach to include not only the food system but all the essential provision systems a resilient City would be based on.

Therefore, further research has to be conducted with respect to the assessment of resilience factors. They must be evaluated in quantitative terms in order to provide a strict guide of how to prepare for the unknown future.

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9 APPENDICES

9.1 Appendix 1: Questionaire

Aktueller Stand des Projekts – *Current state of the project*

1. Bitte beschreiben Sie, was ihre Initiative/ Ihr Unternehmen genau macht.
   Please describe what exactly your initiative/ your company is doing.
2. Wer ist an dem Projekt beteiligt? (Personen, Organisationen)
   Who is participating in the project? (natural persons/ organizations)
3. Was ist das Ziel der Initiative/ des Unternehmens?
   What is the initiative's/ company's goal?
4. Würden Sie die Initiative als urbane Landwirtschaft bezeichnen?
   Would you declare your initiative/ your company to be urban agriculture?
5. Wie genau funktioniert der Garten? Was wird produziert?
   How does your initiative/ your company work? What are you producing?
6. Wem gehört die Fläche? Woher stammen die Gartengeräte? Woher das Saatgut?
   Who owns the land? Where do you get the tools from? Where does the seed/ seedlings come from?
7. Welche Mengen können Sie im Verlauf eines Jahres produzieren?
   What are the quantities you can produce throughout one year?
8. Was für Pläne haben Sie für die Zukunft (z.B. die nächsten 5 Jahre)? Wovon hängt die Realisierung dieser Pläne ab?
   What are your plans for the future (say the next 5 years)? What do the realization of these plans depend on?
9. Planen Sie, Ihr Gemüse zu vertreiben? Ist Ihr Gemüse bio-zertifiziert?
   Are you planning to sell your vegetables? Is your vegetable organically certified?

Lebensmittelproduktion in der Stadt – *Urban food production*

1. Welche Rolle spielt die Produktion von Gemüse bzw. Lebensmittel in der Initiative/ dem Unternehmen?
   What role does the production of vegetables/ food play in your initiative/ company?
2. Welche Rolle spielt die Initiative/ das Unternehmen gerade in Berlin?
   What role does your initiative/ company play in Berlin?
3. Welche Bedeutung hat der Standort der Stadt für die Initiative/ das Unternehmen?
   How important is the city for the initiative/ company?
4. Betrachtet man die Initiative/ das Unternehmen mit allen Stoffströmen (Energie, Wasser, Material, Kompost): Welche dieser „Zutaten" werden direkt aus der Stadt bezogen?
   When focussing on the material/ energy inflow (i.e. electricity, water, soil, compost, material): Which of these 'ingredients' are provided by the city?
5. Welche ökonomischen Auswirkungen hat die Initiative/ das Unternehmen?
   Which are the economic impacts of the intiative/ the company?
6. Welche ökologischen Auswirkungen hat die Initiative/ das Unternehmen?
   Which are the ecological impacts of the intiative/ the company?

7. Welche sozialen Auswirkungen hat die Initiative/ das Unternehmen?
   Which are the social impacts of the intiative/ the company?
8. Welches Potential sehen Sie in dieser Form der Lebensmittelproduktion, die Lebensmittelversorgung von Großstädten zu verbessern?
   What potential do you see in urban food production of your kind, to improve the food provision of cities?

Rahmenbedingungen – *Framing conditions*

1. Wie kam es zu der Idee, die Initiative/ das Unternehmen zu gründen?
   Where did the idea for the initiative/ the company origin from?
2. Wer oder was hat Ihnen am Anfang geholfen?
   Who or what did help you in the beginning?
3. Was für Probleme sind aufgetreten?
   What problems did you face?
4. Wie ist die Situation heute? Mit wem arbeiten Sie zusammen? (Nenne wenigstens 5 Einzelpersonen bzw. Organisationen) Wer oder was erschwert das Projekt?
   How is the situation today? With whom are you cooperating? Who or what is making your work difficult?
5. Welche Hilfestellung erfahren Sie von staatlicher Seite (Bezirksämtern, Senatsverwaltung, Bundesverwaltung, Politiker)?
   What support do you experience from state actors (district administration, regional administration, state administration? Politicians?)
6. Welche Hindernisse erfahren Sie von staatlicher Seite?
   Which barriers do you experience through the state actors?
7. Welche Rechtsvorgaben betreffen Ihre Initiative/ euer Unternehmen? Wie haben Sie davon erfahren? Was hat sich als schwierig erwiesen?
   Which regulations are applied to your initiative/ company? How did you learn about it? What was difficult to handel?
8. Wie finanziert sich die Initiative/ das Unternehmen?
   How do you finance the initiative/ company?
9. Welche Hilfestellung erfahren Sie von dritten(z.B. Stiftungen, Forschung, NGOs, Unternehmen)?
   What kind of support to you experience from third-party actors (i.e. private foundations, research, NGOs, private companies)?
10. Welche Hilfestellung würden Sie sich wünschen?
    What kind of support would you wish for?

Weiterführende Hinweise – *Further Hints*

1. BioPilzee Kreative-Aufgabe: Wie stellen Sie sich Berlin 2050 vor? Welche Rolle spielt urbane Lebensmittelproduktion?
   Small creative task: How do you imagine Berlin in 2050? Which role will urban food production then play?
2. Welche Projekte beschäftigen sich in Berlin noch mit ultra-lokalem Gemüseanbau?
   Which other initiatives/ companies are working on ultra-local vegetable production?
3. Gibt es Kooperationen und wie sehen die aus?

Do cooperations exists and how are they organized?

Stakeholder-Analyse – *Stakeholder-Analysis*

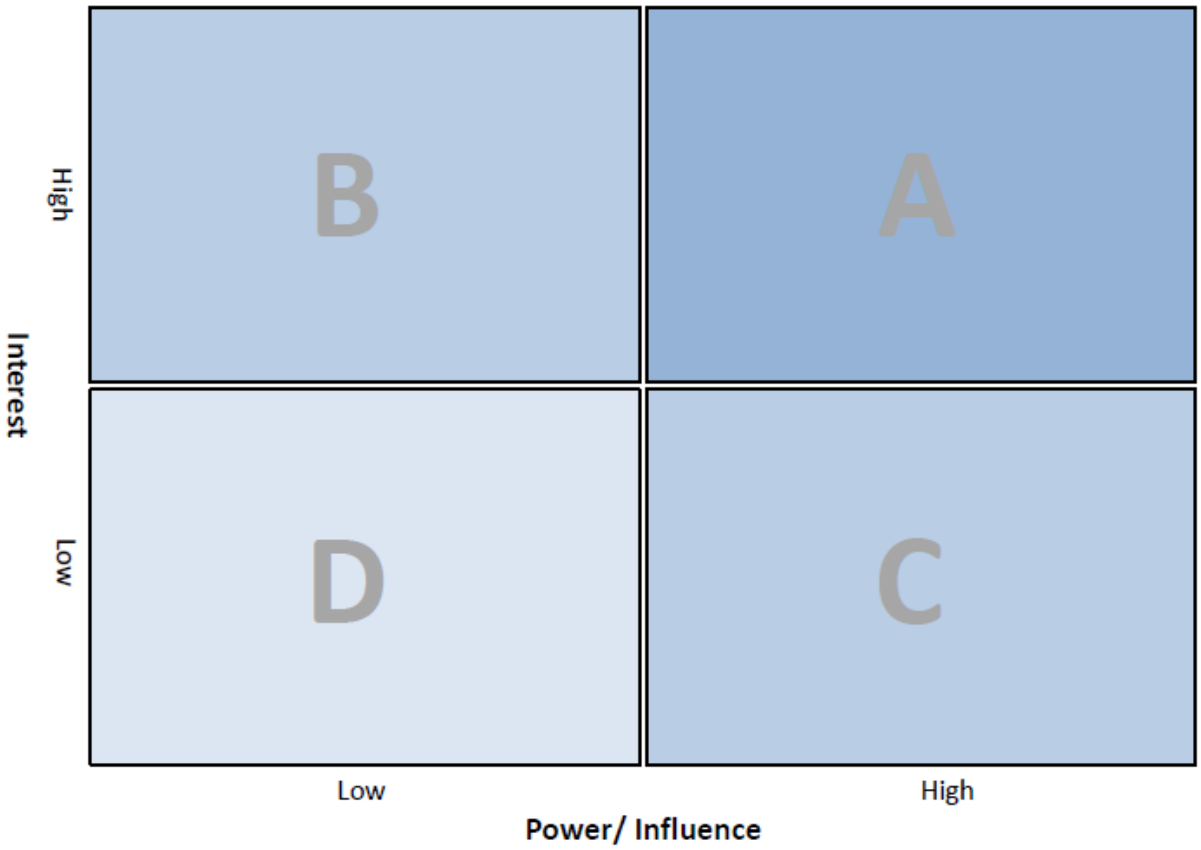
Bitte ordnen Sie die von Ihnen genannten Stakeholder in die Stakeholder-Analyse-Matrix ein, entsprechend ihrer Macht/ ihrem Einflusspotential auf die Existenz der Initiative/ des Unternehmens von hoch bis niedrig und ihrer Zielübereinstimmung von hoch bis niedrig.

Please rank the stakeholders named by you within the stakeholder-analysis-matrix with respect to the power over the existence of the initiative/ company (from high to low) and their agreement with the project's/ company's goals.

Stehen Sie für weitere Fragen zur Verfügung?

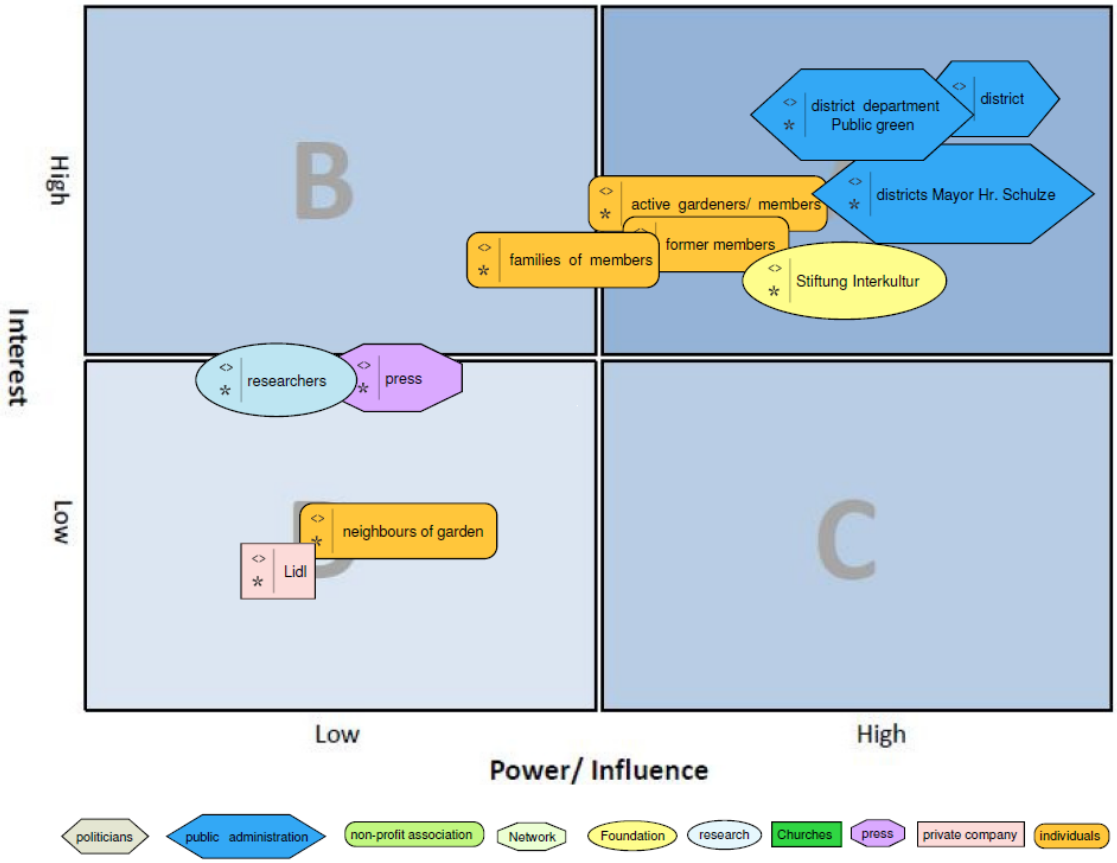
Would you be ready to answer further questions?

9.2 Appendix 2: Stakeholder-Matrix

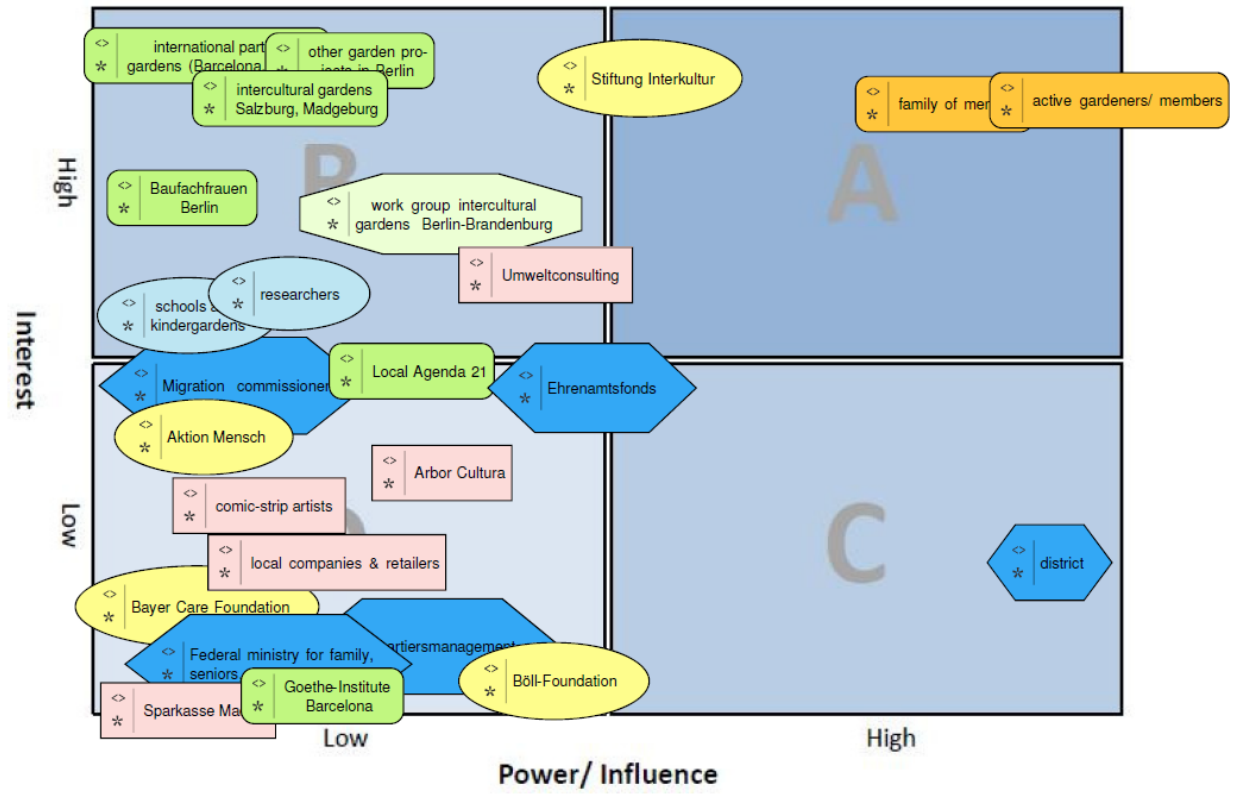


9.3 Appendix 3: Stakeholder-Portfolios

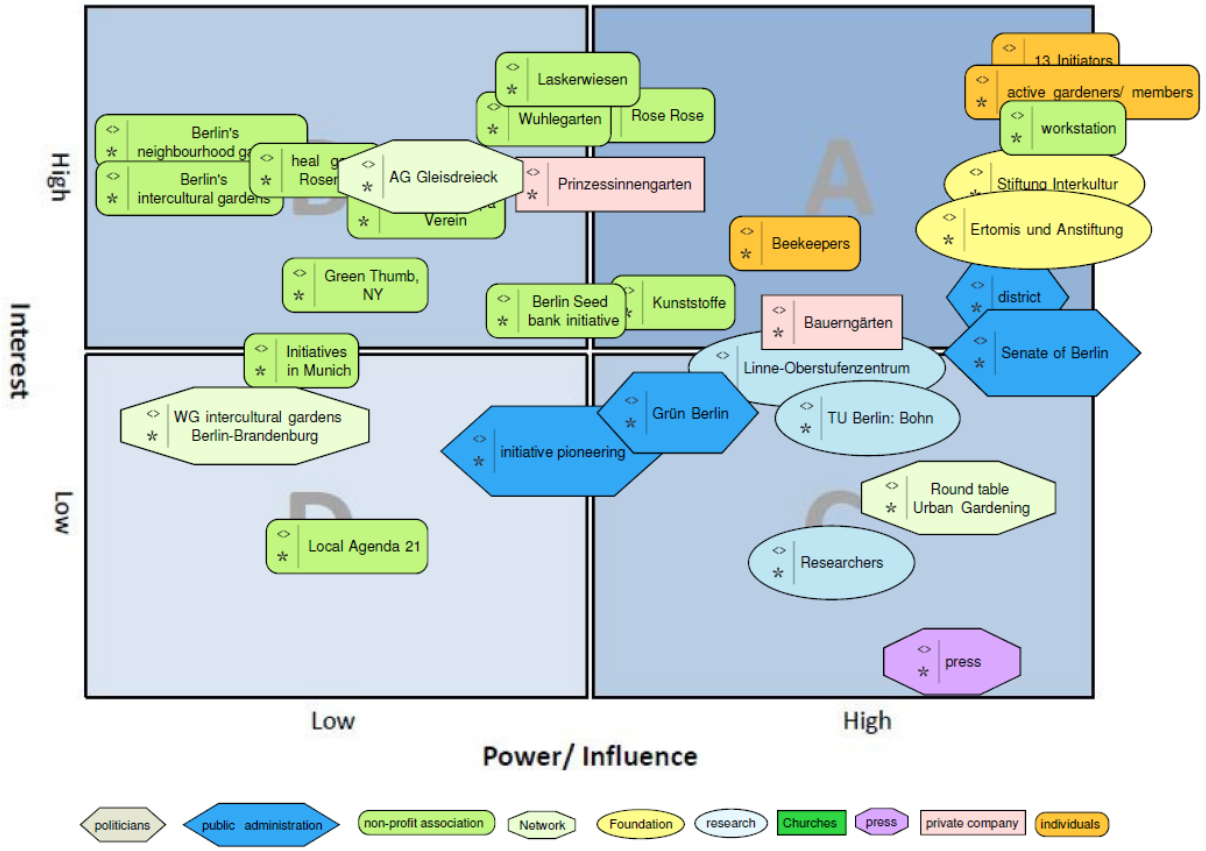
Laskerwiesen



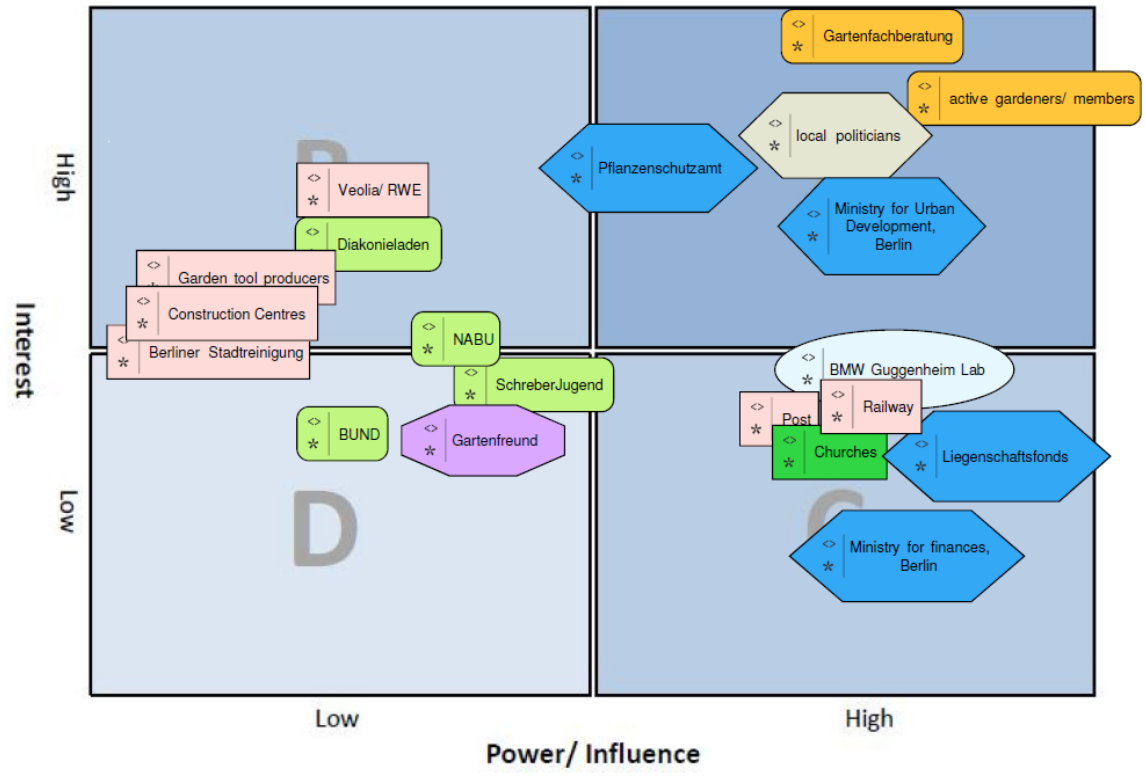
Pyramidengarten



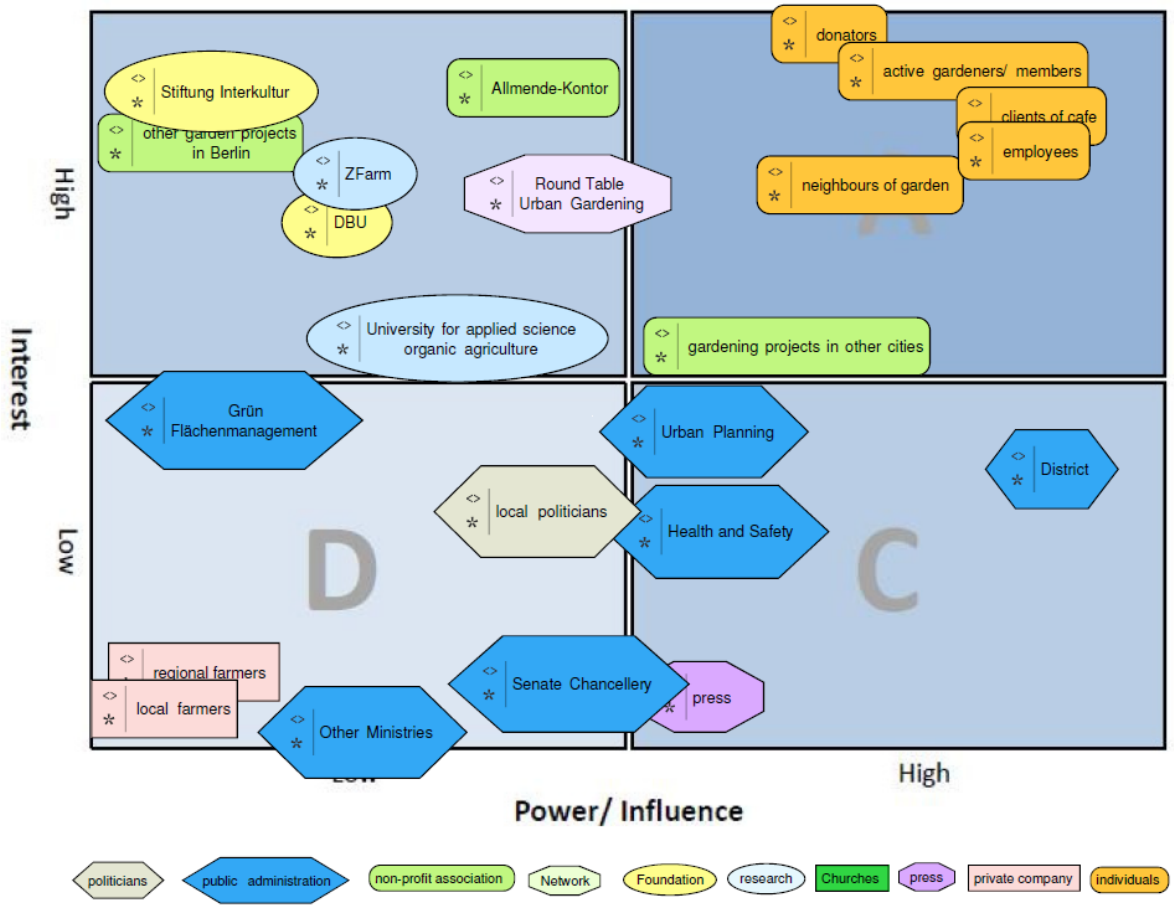
Allmende-Kontor



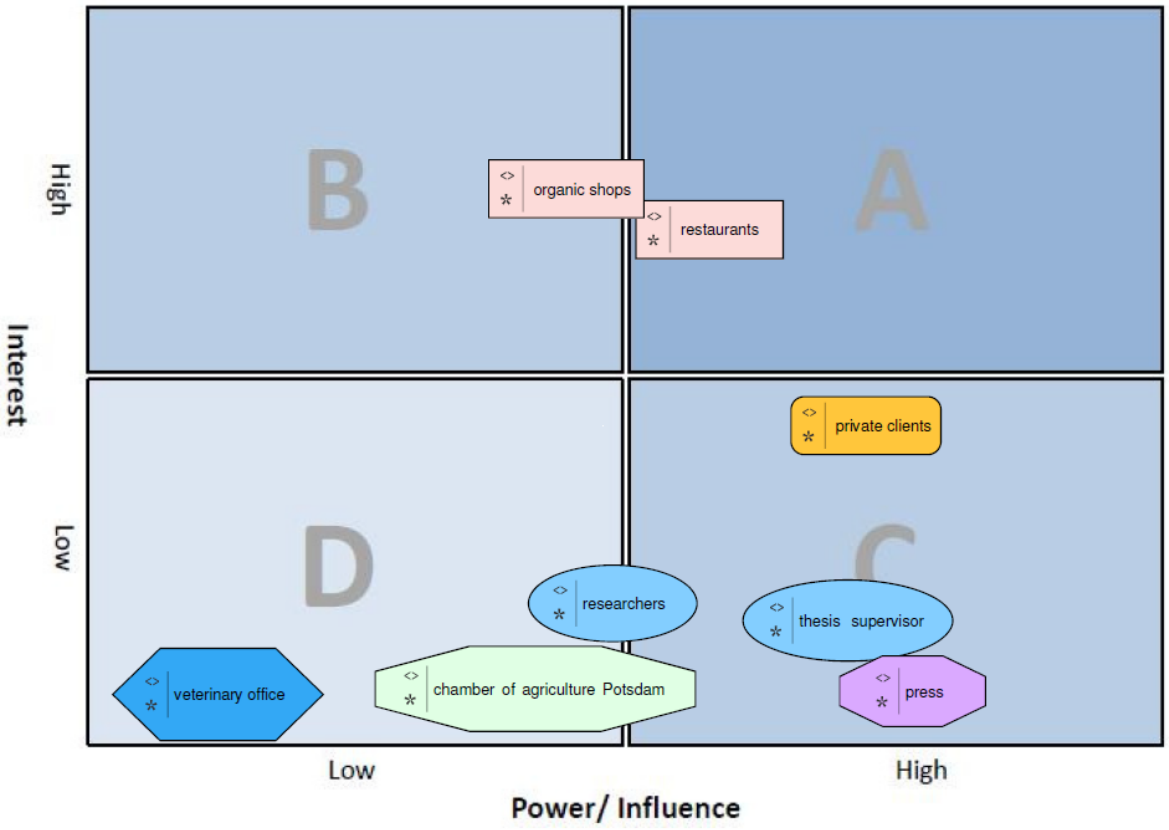
Allotment gardens Berlin



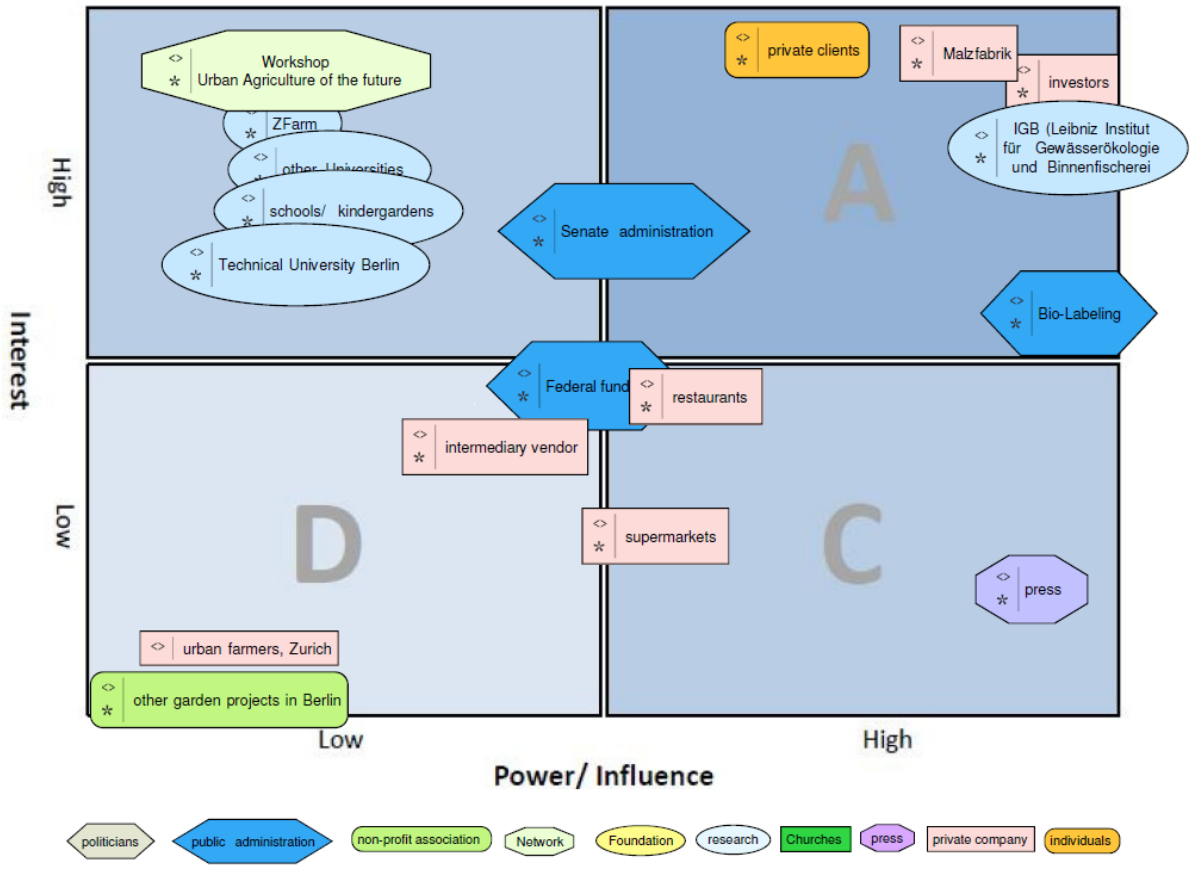
Prinzessinnengarten



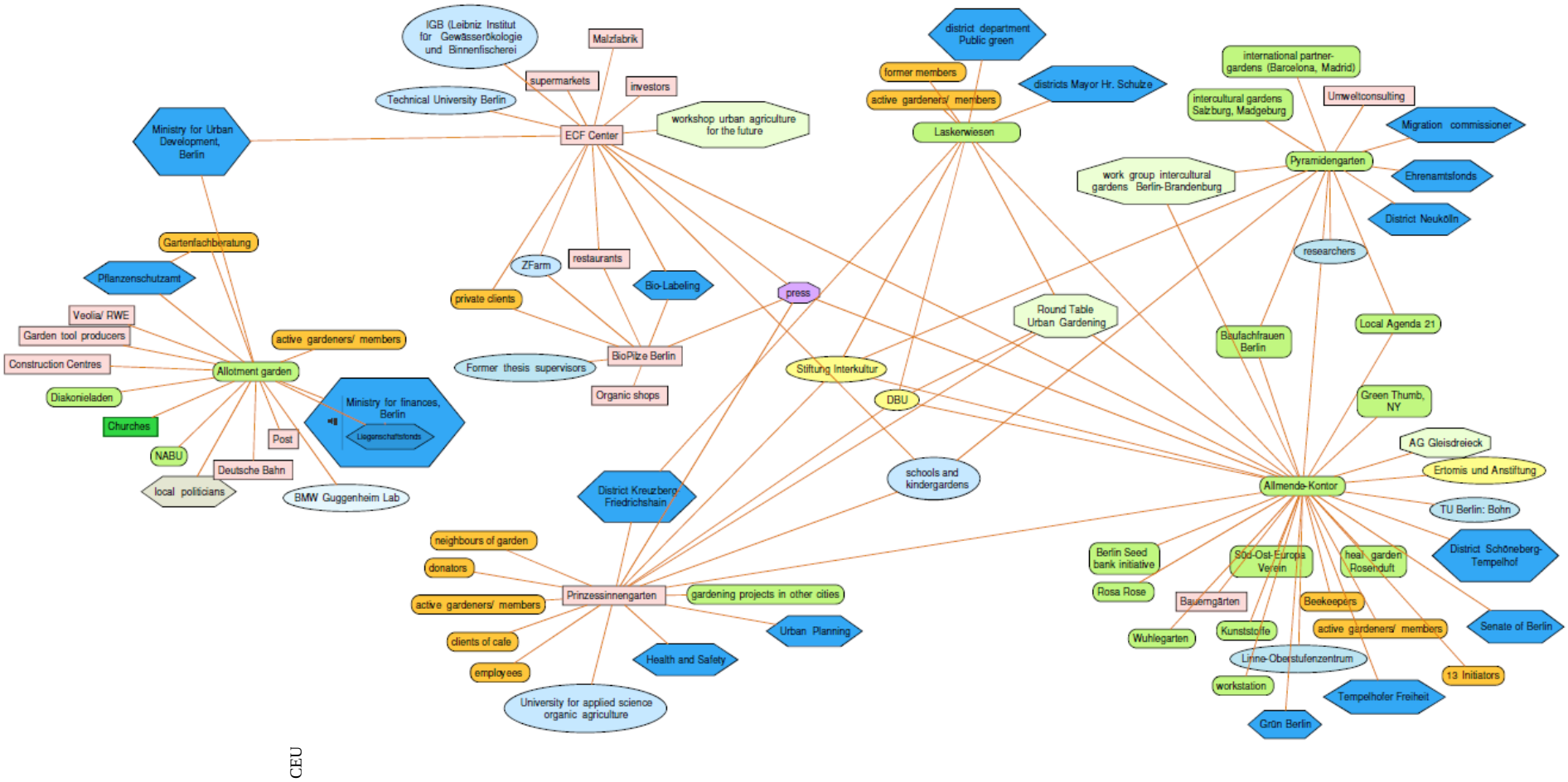
Biopilze Berlin



ECF Center



9.4 Appendix 4: Actor-Network



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9.5 Appendix 5: Pictures of the urban gardening projects

LASKERWIESEN

PRINZESSINNENGARTEN

ALLMENDE-KONTOR

BIOPILZE BERLIN