

Urban Apiculture
– *A Way to Reconnect Society and Nature?*

Marco Claussnitzer

Examensarbete i Hållbar Utveckling 191
Master thesis in Sustainable Development

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Abstract

In recent years honeybees have attracted a great deal of attention, an attention that seems to be rather unlikely when one looks at the general relationship between humans and the environment, which is often taken for granted. This study aims to look into one kind of corporate initiative in urban apiculture to reconnect humans and nature again. In particular the focus is on motivation, implementation and the impact these initiatives have on sustainable development. A transdisciplinary approach has been adopted that combines different perspectives of beekeepers in the field, scholars and business. It is thereby important to note that adopting apiculture as part of a corporate sustainability strategy is a rather recent trend, which reflects both the scope and the results of the study. This study has found the primary motivation behind apiculture projects for corporations to be raising awareness about the fate of honeybees (*Apis mellifera*) and supporting honeybee population numbers. This also reflects in the impact on sustainable development. Not only does the urban environment offer an ideal habitat that shows benefits for honeybee health and their honey, but honeybees also benefit the urban environment through their pollination services. And although the connection between corporations and apiculture seems to be alien at first glance, benefits also extend to the corporations themselves, including a greater identification with the corporation by its employees, more cooperation both within one corporation and with other corporations and more publicity. Urban apiculture can thus help reconnecting society and nature in different ways. However, the greater the abundance of honeybees the more limited seem their benefits and initially positive impacts might even turn negative. To prevent this, the study therefore concludes that it is important to decide about the extent in which urban apiculture is adopted on a case by case basis that is possibly supplemented by planting additional forage.

Keywords

Corporate Responsibility, Honeybees, Sustainable Development, Urban Apiculture, Urban Beekeeping, Urban Ecology

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Popular Summary

In recent years honeybees have attracted a great deal of attention, an attention that seems to be rather unlikely when one looks at the general relationship between humans and the environment. It is us that depend on the environment for our life on this planet and it is us that also depend on honeybees and their pollination services. However, often this relationship is taken for granted and our dependence forgotten. This study aims to look into the questions as to why certain corporations return to initiatives supporting the environment and urban beekeeping in particular and the impacts their initiatives have for sustainable development. To answer these questions a transdisciplinary approach has been adopted that combines different perspectives of beekeepers in the field, scholars and business. It is thereby important to note that urban beekeeping as part of a corporate sustainability strategy is a rather recent trend, which reflects both the scope and the results of the study. The question why certain companies choose to do beekeeping can be answered as follows. They want to raise awareness that honeybee population numbers are declining and they want to counteract this trend and support population numbers. This approach also reflects in the other question about the impact of urban beekeeping. Not only does the urban environment offer an ideal habitat that shows benefits for honeybee health and their honey, but honeybees also benefit the urban environment through their pollination services. And although the connection between corporations and beekeeping seems to be alien at first glance, benefits also extend to the corporations themselves, including a sense of pride for the beekeeping initiatives and thus a greater identification with the corporation by its employees, more cooperation both within one corporation and with other corporations and more publicity. Urban apiculture can thus help reconnecting society and nature in different ways. However, the greater the abundance of honeybees the more limited seem their benefits and initially positive impacts might even turn negative. To prevent this, the study therefore concludes that it is important to decide about the extent in which urban apiculture is adopted on a case by case basis that is possibly supplemented by planting additional forage.

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Table of Contents

- TABLE OF CONTENTS I
- 1 INTRODUCTION 1
 - Background 1
 - Problem formulation 1
 - Aim and research questions..... 2
 - Scope and limitations 3
 - Methodology 4
 - Outline..... 5
- 2 ESTABLISHING THE FRAMEWORK 6
 - Urban development 6
 - Urban development as a driver of environmental change 8
 - Reconnecting urban life to the biosphere 10
 - The role of corporate responsibility 14
- 3 INITIATIVES IN URBAN APICULTURE 18
- 4 DATA PRESENTATION 21
 - Impact of an urban environment on honeybees..... 21
 - Impact of honeybees on an urban environment..... 22
 - Issues of too many honeybees 23
 - Impact of urban apiculture on a corporation 24
- 5 ANALYSIS AND DISCUSSION 28
- 6 CONCLUSION 30
- ACKNOWLEDGEMENTS 31
- REFERENCES..... 31

1 Introduction

Background

"Life on Earth, in all its diversity, shapes the environmental, social and economic processes and resources that are ultimately key to human well-being [...]. Losing biodiversity erodes the basis for sustainable development by undermining ecosystem services and social and ecological resilience, which reduces the capacity for adaptive responses in a rapidly changing world. Biodiversity should thus be integrated in all the Sustainable Development Goals and become a goal in its own right" (Rockström and Baptiste, 2013).

This statement was issued during a side event to the eighth meeting of the United Nations General Assembly Open Working Group on Sustainable Development Goals in New York February 3, 2014, and highlights both the interconnection of society and the environment and their dependence on biodiversity. Both of these themes correlate with the main theme of this study. And similar to the event which aim was to "broaden and enhance the understanding of biodiversity not as a problem to solve, as it is often perceived, but as an important opportunity and solution for sustainable development" the study is looking into the application of sustainable development (Hermansson Török, 2014). In particular it is business that has been chosen as the means of such an application as corporations offer another perspective that complements the ones of society and the environment. Together, these three, society, the environment and the economy that is here viewed through corporations, are often referred to as the three pillars of sustainable development.

Problem formulation

Although society at large and the environment are fundamentally interconnected this relationship has for the most part been either taken for granted or simply forgotten. Too often human beings behave as if they are totally separated from nature. As a collective, we alter the composition of the atmosphere and degrade land and oceans as if these actions do not have any negative effects. The relationship of society to nature is a one-way relationship. To reach its present status society has been exploiting nature rather than recognising its dependence on it. Much of human behaviour can thereby be attributed to simply losing touch with nature. In particular urban societies fall in this category. There is of course a general understanding of the interconnection of society and the environment, but the direct link to the source of resources that are used and the implications their use has for nature is often missing. Usually these things are simply out of sight.

The implications of human actions are becoming more and more noticeable, particularly in recent years. This becomes clear even by only looking at the relationship between societies and honeybees (*Apis mellifera*). It is estimated that about 84 per cent of crops in Europe are depended on pollination from honeybees and other animals (Klein *et al.*, 2007). Like other

environmental services pollination is thus invaluable for our life on this planet. There are, however, continuous attempts to put a price on them nonetheless. In terms of worldwide monetary value, pollination services provided by insects, and mainly honeybees, are thought to be worth between 24 billion and 60 billion Euros each year (Black, 2006). Some estimates even suggest numbers of up to 153 billion Euros (Gallai *et al.*, 2008). That amounts to 9,5 per cent of the total value of world agricultural food production. Particularly affected by pollination are fruits and vegetables at an estimate of 50 billion Euros each and oilseed crops at an estimate of 39 billion Euros. Crops pollinated through insects are on average also valued significantly higher than crops that are not depending on insect pollination. In recent years a great decline in honeybee population has been observed. It is not the first time such a decline has happened. Oldroyd compiles a list of notable cases in the past including “the great mortality of bees” in Ireland in 950, and again in 992 and 1443, loss of all honeybees on the Isle of Wright in the United Kingdom in 1906 and several cases in the United States (2007). The reason to why this more recent phenomenon has been gaining such attention is the fact that it is not regionally limited but has a global appearance. In addition, some population decline has been at the absolute higher end of an order of 80 to 100 per cent (Oldroyd, 2007). The phenomenon has been dubbed colony collapse disorder and is simply characterised by a low number of adult honeybees. No dead bodies and no outward signs of disease are present and often there is still sufficient food and immature honeybees in the hives. This indicates to a death of adult workers away from the hives. Colony collapse disorder is likely caused by a combination of factors such as habitat loss, changes in agricultural practices and parasitism (vanEngelsdorp *et al.*, 2009). Although beekeeping has been carried out for thousands of years much of present knowledge has been accumulated through experience and the practical work with honeybees. The implications of a changing human behaviour and colony collapse disorder in particular, however, show that there is also great need for scientific research in this field.

Aim and research questions

Instead of meeting trouble halfway, the focus of this study is to realise that the implications, that such a turning away from nature has, also offer great opportunities to reconnect to it again. The aim of this study is thus to look into the question of how a turning away from ecosystem services and biodiversity in particular can be alleviated from a business perspective. This is interesting, as corporations, due to profit and stakeholder interest, often tend to adopt initiatives that are benefitting them rather obviously. It is more difficult to find initiatives whose benefits are gained more implicitly such as the benefits that come along ecosystem services and biodiversity schemes.

As a particular example urban beekeeping is chosen. This research accesses the motivation of corporations that have decided to adopt urban beekeeping initiatives in favour of or in addition to other initiatives as part of their corporate social responsibility schemes. This leads to the following research question:

How are urban apiculture initiatives adopted by different corporations and what is the motivation for doing so?

Furthermore this research aims to give an idea about the impact of such initiatives. Through the course of this study the difficulties of measuring the impact of beekeeping, however, became very much apparent and thus the focus has shifted a bit more towards corporations and their perception of the impact. That, however, does not necessarily mean that an environmental perspective is entirely omitted. It is the relationship between the impact on the environment in general, and the honeybee more specifically, and a corporation that in particular offers room for later discussion. This leads to the second research question:

What is the impact of urban apiculture on sustainable development? In particular, how does it affect the environment and honeybees themselves, and what are the implications for corporations and thus the economy at large?

Scope and limitations

The scope and limitations of this study are first and foremost defined by its research questions. Although the problem at hand is a general turning away from nature urban beekeeping has been chosen as a particular solution to address it. Urban beekeeping is then, however, looked upon from every possible angle. This includes motivation, different forms of implementation and the impact of the solution on the environment, the corporation and partly society at large. As qualitative data has been gathered first-hand another problem is the dependence on responses. Participation in this study has been exclusively voluntary and all responses are thus held in high regard. It must, however, be said at this point that due to other duties not all people whose perspectives have been kindly requested have been available to include in this study. Although this study is thought to be giving a well-rounded picture it naturally could have benefitted from additional insights. Another limiting factor is time constraints. The study has been conducted in the time between January 15, 2014, and June 1, 2014. This timeframe did not allow for a first-hand observation of several business and honeybee activities that follow an annual rhythm. There has for instance been no possibility to directly observe honey harvest processes or honeybee overwintering. At points where these limitations become important for answering the research questions the study relies on second-hand data. Furthermore, as the phenomenon of urban beekeeping is also a relatively young trend, research crucial to the study, especially addressing the issue of too many honeybees in a particular area, is still in the process and has not been officially published yet. Naturally, researchers who conduct these studies have been hindered to answer any questions. Their answers would have further benefitted this study.

Methodology

In order to answer the research questions posed by this study a combination of different research methods is used. This is done to ensure that the topic at hand is illuminated from different angles and follows the approach of triangulation (Johansson, 2007). The idea in mind is to strengthen confidence in the results of this study through cross verification from different sources. The approach is most clearly seen when assessing the impact of the honey-bee on the urban environment and the other way around. Here scientific research is complemented by further insights of scholars and companies as well as observational data from beekeepers.

To establish a framework a literature review of the academic discourse on the topic at hand has been conducted. The literature presents relevant knowledge and ideas that so far have been established by accredited scholars and researchers. The literature review serves as a basis of this study and ensures a common ground among readers. The composed ideas are taken up again in the later part of the study.

The research questions were thereafter more directly addressed in the data gathering process. Most of the data was thereby of qualitative nature and reflects the personal insight given from researchers and most notably the corporations involved in beekeeping. This qualitative data was, however, also supplemented by quantitative data at certain points. Throughout the data gathering process it thereby became apparent that different initiatives in a single region might be quite similar to each other. This is due to beekeeping being implemented by only a limited number of companies, which in turn offer their services to other companies that themselves might be interested in beekeeping. To look at the problem more in its entirety and hence include more than one beekeeping initiative more than one region has to be considered. This is why the scope of the thesis had to be broadened and a more holistic approach had to be adopted.

Interviews have been the primary means of gathering data. As urban beekeeping is a rather recent trend, all the more on a corporate level, the choice of interviewees has, however, been limited. Therefore initiatives with the most exposure and initiatives that were pointed out to me in separate interviews were chosen to be included in this research. Due to the interviewees being located in different countries, no face-to-face interviews were possible. The desired form to conduct interviews has therefore been calls through Skype and other web based conference tools such as Cisco's WebEx, as then interviews were more similar to a conversation and it was easier to include follow-up questions. These interviews did not strictly follow a predefined set of question, although important key points were prepared that addressed motivation, implementation and impacts to a range of sustainability issues. Interviews thus assumed an unstructured and semi-structured form. In most cases, however, a call was not possible and interviews were conducted through email. These were exclusively structured. Questions addressed the same points as in interviews through calls but were customised to the interviewee. Companies that only offer beekeeping to other companies were, for instance, not asked about the impact of beekeeping on their business and their employees. During the

interview process a snowball approach was kept in mind at all times, that is that as soon as contact to one key person is established this person is used to get in touch with others, for instance the person's colleagues or business partners. This method worked out particularly well with beekeepers and companies offering beekeeping services and costumers that demand such a service from them, since a contact to one of them assured getting in touch with the other as well.

Apart from qualitative data quantitative data was used when addressing the second set of research questions. However, no quantitative data was gathered for this study. At points where quantitative data is used, it is from secondary sources.

The data is analysed and discussed by means of an impact assessment. That means that the different options of corporations to adopt beekeeping are shown and their potential environmental, social and economic consequences evaluated. Advantages and problems of adopting beekeeping as a corporation are outlined.

Outline

Following the introductory chapter, a general framework is established in chapter 2. This chapter aims to present all knowledge that is judged important for this study in a precise and concise form. A line of consecutive perspectives is followed that starts out with the history of urban economic development and aims to highlight the connection between urban areas and corporations. The consequences urban development has on nature are shown. Thereafter a turning point is introduced that aims to point out the importance of not turning one's back on nature and instead reconnect to it. This is done by going into great detail on the relationship between society and the environment. The chapter is rounded off introducing the role of corporations, which have been so profited from an exploitation of nature, in that process of reconnection. Chapter 3 presents the first findings to how such a reconnection can look like from a business perspective, keeping in mind the narrower relationship between society and honeybees compared to society and the environment. Chapter 4 subsequently looks into the impact these corporate initiatives have as a whole. The impact on nature has to be split into the impact the urban environment has on honeybees and the impact honeybees have on the urban environment. Here more information is given to the issue that has been arising regarding too many honeybees in a particular region. The impact on the corporation is presented thereafter. Chapter 5 offers an analysis in form of an impact assessment and a discussion before chapter 6 draws a conclusion of this study.

2 Establishing the Framework

Urban development

Urban areas are a form of human settlement that each of us knows but still struggles to fully comprehend. There is no clear boundary of what is considered urban and what is considered rural. Of course there are definitions that state if population number or population density surpasses a certain figure one can speak of the transition from a rural to an urban area. These figures, however, are defined by the national census and differ in part immensely according to region (UN Department of Economic and Social Affairs, 2012). In Peru for instance an area is considered urban if it exceeds a population of 100. In Japan it is 50 000. In the following, the term of urban areas is therefore not a numbers game. Urban areas are rather seen as areas for “political and social organisation; for the development and expression of cultural identity; for the organised division of labour; and [...] for the development of trade and the accumulation of wealth” (Watson, 1993, p. 3).

Urban areas are often associated with the process of urbanisation. This simply refers to the growing of urban areas. In the most obvious sense the growing is physical and describes the transformation of land for urban purposes. Hall *et al.* follow this lead and go more into detail of the nature of an urban purpose (1973). It connects to the idea that urbanisation can also be defined in a functional sense and describes a range of human activities, whether they are economic, social or cultural. Many of these activities differ a lot depending whether one refers to an urban or a more rural setting. The process of urbanisation is a rather recent phenomenon. In 1801 only 17 per cent of the population of England and Wales lived in urban areas defined by a population of more than 20 000 (Watson, 1993). Up to this point in the early nineteenth century nothing much has changed on this number for quite some time. And the rest of the world looked very similar to this. The reason of course is the great amount of human labour that had to go into the production of agricultural commodities. People lived in rural areas simply because they had to be close to their fields. Short of a century later, in 1891, urban population in England and Wales has suddenly risen to 54 per cent, 72 per cent if a broader definition is applied. And the rest of the world soon followed. This immense change, that had its starting point in England, has of course been brought by industrialisation. Technological innovation allowed more and more people to leave the agricultural sector without fear that its output might be dropping. However, “the substantial nature and scale of the urbanisation experience [...] cannot be explained by industrialisation alone but rather by a combination of industrial activity, and the development of business and commerce” (Watson, 1993, p. 5). The role economics that plays in this process cannot be denied.

Modern economic thought came up about the same time as industrialisation. Adam Smith, the father of modern economics, in fact published his most important treatise in *The Wealth of Nations* only slightly ahead of the industrial revolution (1776). In its basic form economics is thereby described as the study of allocation of scarce resources. For the most efficient allocation the instrument of a market is usually used. This instrument, however, is rather

conceptual and only defined by the interaction between supply and demand. That misses an important aspect, as allocation also happens in a geographical space. If a market is on the other hand imagined as something more physical different aspects suddenly become much more important. For instance, the ideal location of such a market, and the ideal location of its suppliers and consumers as a result, are coming to the focus. This frame of mind better allows discussing why economic activities are unevenly distributed in space and still remain persistent as such over time.

As an economist Alfred Marshall looked into these questions as one of the first. It has been him who observed that economic productivity is higher in cases industries are located close to each other (1890). Or in other words, that productivity in urban areas is higher than in their rural surroundings. According to Marshall the gain in productivity is caused by economies of agglomeration coming into effect. In his explanation Marshall thereby focuses on human capital externalities and knowledge spillovers. He identifies three different sources, namely sharing of local inputs, a greater pool of skilled labour and increased opportunities for knowledge spillovers. Sharing of local inputs comes into play when, for instance, a manufacturer for coats is able to purchase its fabrics from a local draper. In turn the draper may also sell its fabrics to other manufacturers for different clothes. This also allows for specialisation to occur more easily. Instead of providing a number of different fabrics the draper may specialise on only the most profitable, and thus leave a niche to fill by others. Labour pooling then exists when, for instance, a manufacturer for coats can quickly hire a tailor as many specialised tailors are already present in the area. Similarly, a tailor that has been let go has a higher chance of finding new employment with another manufacturer. Spillovers of knowledge then simply describe the sharing of ideas among all those individuals. As economies of agglomeration by definition enhance production Marshall's initial observation can be proved with estimating a production function. Empirical evidence for the sources identified by Marshall has also been offered by a number of economists. Holmes shows the presence of input sharing (1999), Costa and Kahn find that individuals of higher education are proportionally more often located in urban areas as chances of finding a good match for their specialisation are higher (2001), and Jaffe *et al.* discuss that patent citations are geographically localised (1993), showing the presence of knowledge spillovers.

A different approach that explains the geography of economic activities are natural advantages (see Ellison and Glaeser, 1997, 1999). Here some locations are naturally more favourable than others due to the fact that they are close to production resources or offer better means of transportation. This is also known as first nature (Krugman, 1993) and location fundamentals (Davis and Weinstein, 2002).

The New Economic Geography approach is a third approach for economic geography that emphasizes the interaction between trade costs and internal economies of scale (Head and Mayer, 2004). This approach shies away from the focus on a manufacturing based industry and turns to a service oriented industry. Here, cooperation becomes a defining aspect of success and tacit knowledge and interpersonal relationships play a much greater role than in other concepts.

The United Nations estimate that by today slightly more than half of the world population lives in urban areas (UN Department of Economic and Social Affairs, 2011). It is also expected that the process of urbanisation has not yet come to a halt. By 2050 the share of urban population is likely to increase to 67 per cent, from 3.6 billion in 2011 to 6.3 billion. All prospected population growth is thus expected to be absorbed by urban development. However, the rate of urbanisation is noticeably slowing down.

Urban development as a driver of environmental change

Urban areas might be the single most apparent aspect of how human behaviour has changed the face of the planet. It is not only land use in places of the urban area itself that alters nature fundamentally; the impact of urban areas goes far beyond a local scale. As mentioned above, slightly more than half of the world population lives in urban areas. However, one has to keep in mind that only about three per cent of the world's land surface are covered with urban areas (Balk *et al.*, 2006). That means that half of the world population lives within three per cent of the world's land surface. To support these significantly more land is required. 78 per cent of total carbon emissions, 60 per cent of residential water use and 76 per cent of wood used for industrial purposes is attributed to urban areas (Grimm *et al.*, 2008). Some estimates discuss numbers of a total resource use of up to one and a half planets for the entirety of the world population, although both methods and results of such estimates are openly discussed (WWF International *et al.*, 2012). Having such a large impact on the planet the time our generation shares is thus often referred to as the anthropocene, indicating that "human activities have become so pervasive and profound that they rival the great forces of nature" (Steffen *et al.*, 2007). Such as urbanisation the anthropocene is considered to have begun with the industrial revolution. Since then atmospheric carbon dioxide has risen from 270 ppm to currently almost 400 ppm. In the years following the Second World War from 1945 a great acceleration of these trends has given further reason for concern that an increasing human impact could be destabilising and lead to a sudden or irreversible change of the environment.

The impact human actions might have on the planet without compromising human life itself have been quantified in the *Planetary Boundaries* (Rockström *et al.*, 2009). Precise thresholds or tipping points whose exceeding might result in the irreversible changes that are mentioned above are difficult to locate. The planetary boundaries therefore define a range thresholds are supposed to lie in and refer to the lower end of this range as the eponymous boundary. Anything that is lower than the boundary is considered safe operating space. A total of nine boundaries have been identified. The nine boundaries are climate change, ocean acidification, stratospheric ozone depletion, interference with the global phosphorus and nitrogen cycles, rate of biodiversity loss, global freshwater use, land-system change, aerosol loading and chemical pollution. Thereof seven have already been quantified and three are said to be crossed, namely climate change, biodiversity loss and the nitrogen cycle. Climate change, which is indicated through atmospheric carbon dioxide, has a boundary value of about 350 ppm. Biodiversity loss is indicated through species extinction rate. An average extinction rate based on fossil records is thereby considered to be around 0.1 to 1 per million species per year for marine organisms and mammals respectively. Since the beginning of the anthropocene

extinction rate has increased to a value of 100 to 1000 per million species per year. A value of 10 has been defined as the boundary of biodiversity loss. Impacts on the nitrogen cycle are indicated through nitrogen that is removed from the atmosphere through human action. A boundary value has been preliminary defined at 35 million tonnes per year. The current value corresponds to 121 million tonnes per year.

In regard to the impact of urban economic development and the purpose of this study, out of all the boundaries, biodiversity loss and changes in land-use in respect of biodiversity loss are particularly interesting. Physical urban expansion alone has the effect “of decreasing, fragmenting and isolating natural patches by altering the size, shape, and interconnectivity of the natural landscape” (Güneralp *et al.*, 2013, p. 438). Between 2000 and 2030 the amount of urban areas close to protected areas is estimated to increase three times on average, close to biodiversity hotspots it is four times on average (Güneralp *et al.*, 2013). China is considered to have the most urban areas within a 50 km range of protected areas by 2030. However, the highest increase of urban areas close to protected areas will be in Africa and the highest increase in biodiversity hotspots in South America. Although these estimates are subject to many uncertainties the increase will likely be significant, being of the order of 15 to 25 times the 2000 value. In addition to physical expansion, human behaviour further has “a myriad of cascading effects that have impacts on biodiversity, including changes in biogeochemistry [...], local temperature [...], climate change [...], and hydrologic systems [...]” (Güneralp *et al.*, 2013, p. 438). For biodiversity this usually means a reduction in both species richness and evenness (Grimm *et al.*, 2008). Urban areas are thereby seen as “homogenizing forces” (McKinney, 2006). They are habitats built to meet the need of human societies as its only species. This leads to a small number of other species that adapt to the urban habitat and can thus be found all over the world. However, “as urbanization often produces a local gradient of disturbance, one can also observe a gradient of homogenization” (McKinney, 2006, p. 1). The more suburban an area becomes the higher the amount of native species that can utilise suburban habitats. These are regionally widespread. This effect is strengthened through the importation of other species and food resources for human use. All of this, however, comes at the cost of a suppression of indigenous species. Urban human populations as a result often inhabit “richly cultivated suburban [areas] with a relatively high floral and faunal diversity” that simultaneously mask a “global impoverishment [of species] by urbanization” (McKinney, 2006, p. 1).

The impacts on climate and biogeochemical cycles, the two other boundaries that have been exceeded, can be related back partially to urban areas as well. It has already been mentioned that globally 78 per cent of carbon emissions can be attributed to urban areas. In addition to that, effects can also be observed on a local scale, for instance the urban heat island effect. The effect describes the tendency of urban areas to have higher air and surface temperatures than the surrounding landscapes due to a combination of greenhouse gas emissions and heat absorption of built surfaces. Urban heat islands in turn influence water resources, air quality, ecosystem services and thus living conditions in general. Urban heat islands are indirectly also contributing to climate change through an increased energy demand for cooling. It is estimated that in the United States between 3 and 8 per cent of energy demand is used to

compensate the effects of urban heat islands (McPherson, 1994). Biogeochemical cycles are affected by urban areas through pollution. Air pollution, for one, “influences nutrient cycling and primary production in adjacent, exposed ecosystems” (Grimm *et al.*, 2008, p.757). Due to being often located along streams and coastlines pollution also contributes to eutrophication in these. And, in addition, natural cycles might also be affected by the large accumulation of waste in urban areas in a more general sense.

Reconnecting urban life to the biosphere

As great as their impact is, “cities themselves present both the problems and the solutions for sustainability challenges of an increasingly urbanized world” (Grimm *et al.*, 2008, p. 1). It is thereby important to not separate human beings and their societies from the environment they are so inherently embedded in. After all they are also part of the biosphere. And as much as our actions alter it, we human beings depend on functioning and life support of that biosphere. If we continue to behave as if disconnected from it, our actions may eventually undermine our capacity to adapt to these changes (Folke *et al.*, 2011).

This thought had not been recognised in the social sciences for some time and it posed a great problem. The natural sciences and studies in ecology in particular, however, did not tend to include any kind of human component, either (see Pomeroy and Alberts, 1988; Likens, 1992). Truly reconnecting to the biosphere requires both sciences to collaborate in search of a solution. Too often one science has thereby been fitted onto the other, but combing the knowledge of both like this can be a great challenge, as both sciences developed so independently from each other. So ultimately a new approach was needed, an approach that incorporates the environment on the one side and human decisions, cultural institutions and economic systems on the other side into a common framework (Redman *et al.*, 2004).

Sustainable development is exceptionally well suited to fill this role. It is a transdisciplinary research area and as such it promotes common frameworks of research across and beyond disciplines and establishes lasting networks of communication (Pickett *et al.*, 1999). The idea of sustainable development is thereby not new. Although the concept has an even longer history, its essential definition goes back to the so called *Brundtland Report* of 1987, entitled *Our Common Future*, and was the result of a commission convened by the United Nations to propose “a global agenda for change” (UN World Commission on Environment and Development, 1987). The report describes sustainable development as a development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN World Commission on Environment and Development, 1987). Although this particular definition leaves much room for interpretation, it has been the first of its kind to address concerns about the environment in the Global North as well as demands for further development in the Global South. The report recognised that environment friendly economic growth is needed to accommodate these different interests. This issue has later been continuously addressed at the Earth Summit conferences of the United Nations and remains heavily debated. A number of scholars argue that economic growth is not compatible with

environmental concerns and the path taken is therefore against the true nature of sustainable development (see Sachs, 1999). For this study a definition of sustainable development as a process that includes ecological, social and economic aspects, and that implies “not challenging ecological thresholds on temporal and spatial scales that will negatively affect ecological systems and social systems” is, however, seen as sufficient (Berkes *et al.*, 2000, p. 4).

The term of ecological systems or ecosystems Berkes *et al.* use thereby refers to the environment and simply describes the entirety of its living and nonliving organisms that interact with one another as a functional system. An ecosystem can thereby have an intrinsic value (Light, 2002). That means it has a value in itself. It is appreciated for what it is and not regarded as a means for something else. Human beings, however, often tend to see the use of things for their own purposes. This is regarded as instrumental value and can also be seen when looking at ecosystems. From an anthropocentric perspective ecosystems entail certain processes that benefit the life of human beings. The UN Millennium Ecosystem Assessment report that has been carried out to assess the consequences of ecosystem change to human well being defined these benefits as ecological services or ecosystem services (2005). It distinguishes between four different categories of ecosystem services. These include “provisioning services such as food, water [and other resources]; regulating services that affect climate [and ecosystem processes]; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling” (UN Millennium Ecosystem Assessment, 2005). The ability of organisms to sustain these services is critical for human beings. Daily describes them in fact as “the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life” (1997).

Table 1 shows an outline of the most important ecosystem services for urban areas. It must be kept in mind that not only ecosystem services that are generated within the urban area itself are shown, but also those from the outside. This connects to the concept of ecology in cities and ecology of cities (Jansson, 2013), which recognises the dependence of urban areas on eco-systems that are often great distances away.

Table 1
Classification of selected ecosystem services both in and of urban areas

<i>Ecosystem service</i>	<i>Examples</i>
Provision of food	Only a small share of the total amount of food that is consumed by the urban population is effectively also produced within the urban area itself. A far larger share comes from outside. It is estimated that about 35 per cent of the surface of the planet are solely used for agriculture and livestock farming. About 3 per cent of the surface is urban areas. The increasing need to feed the global population has thereby led to a focus on efficiency and thus a loss of genetic diversity.
Provision of fresh water	Ecosystems are fundamentally important for fresh water provision through the hydrological cycle. In particular forests have shown to influence it through their higher rates of evapotranspiration. Soil quality and soil biodiversity are linked to fresh water filtration and storage.

Climate regulation	Plants mitigate a natural greenhouse gas effect by absorbing atmospheric carbon and thus regulate the climate. Plants further have a direct cooling effect through the process of evapotranspiration and by providing shade. This direct cooling effect can be used to partially mitigate an urban heat island effect.
Air purification	Pollutants and other particles are filtered out of the air through plant processes before reaching amounts that can be harmful to human health. Filtration is especially important in urban areas as the amount of matter due to combustion processes from heating and transportation is significantly higher than in rural areas.
Noise reduction	Plants can act as a natural sound barrier.
Pollination	<p>Pollination services are important to uphold all forms of biodiversity. Pollination is also hugely important for agriculture as it is estimated that 75 per cent of crop plants rely on pollination by animals.</p> <p>In recent years a great decline in honey bees as one of the most common pollinator has been observed. Research indicates that a combination of factors such as habitat loss, agricultural practices and parasitism is a probable cause. Urban areas provide a habitat that has been largely ignored so far.</p>
Recreation and education	Ecosystems offer great opportunities for recreation and education. Urban green spaces have thereby measurable physical and psychological benefits for human well being.

Source: Based on Gómez-Baggethun and Barton (2013) and Jansson (2013)

Urban ecosystems are commonly researched within the field of urban ecology. Urban ecology “integrates the theory and methods of both natural and social sciences to study the patterns and processes of urban ecosystems” (Grimm *et al.*, 2008, p. 1). Cities are thereby viewed as “heterogeneous, dynamic landscapes and as complex, adaptive, socioecological systems, in which the delivery of ecosystem services links society and ecosystems at multiple scales” (Grimm *et al.*, 2008, p. 1). Along with ecosystem services also come disservices, which describe functions of ecosystems that are perceived as negative to human well being (Gómez-Baggethun and Barton, 2013), such as the competition of habitat with other animals and plants, and accidents and other damages caused to infrastructure. Finding the balance between ecosystem services and disservices in urban ecology is one the most important tasks when reconnecting urban areas to the biosphere.

Following the United Nations’ Millennium Ecosystem Assessment ecosystem services of urban areas have been gaining further attention in initiatives such as The Economics of Ecosystems and Biodiversity (TEEB, 2011). The aim of these initiatives is not only to draw attention to the importance of ecosystem services but to also develop uniform standards that help accounting them. It thereby becomes apparent that urban areas can in fact not be generalised. They differ in their size, their prosperity as well as the climate they are built in. The ecosystem service and its value to the urban area largely depend on this context (Bolund and Hunhammar, 1999). But still, initiatives like the Millennium Ecosystem Assessment offer great opportunities to build urban sustainability and resilience and are an important step in reconnecting urban areas to the biosphere.

In his definition of sustainable development Berkes *et al.* also mention social systems. These, on the other hand, deal with “property rights, land and resource tenure systems, systems of knowledge pertinent to environment and resources, and world views and ethics concerning environment and resources” (2000), or in other words with the implications of humans living in nature. It can be seen that all of these aspects are interlinked with one another. To emphasise this linkage between human beings and the environment and to stress that the delineation between them is only constructed the term social-ecological system can be used. As systems in general social-ecological systems also consist of different components and the interactions between them. The identity of the system is to preserve all these different aspects despite its nature that is dynamic and constantly subject to change and thus defined at several spatial, temporal and organisational scales (Redman *et al.*, 2004).

Ecosystem services are, in general, mentioned in tandem with biodiversity. Biodiversity is thereby described as “the variety of ecosystems, which compromise both the communities or organisms within particular habitats and the physical conditions under which they live” (Wilson, 1992). Folke *et al.* observe that much of the efforts to preserve biodiversity have been going into establishing protected areas (1996). In these natural reserves species are supposed to be shielded from any human influence. This is not to say that these efforts are futile, but the problem here lies in the fact that these reserves are embedded in a larger environment, and that is in most cases still exposed to the human influence after all. Protected reserves thus go against the notion of an interlinked social-ecological system. This, however, also implies that the preservation of biodiversity must be addressed differently. It must in fact be addressed everywhere, and particularly in places where it decreased due to human behaviour. In this regard Folke *et al.* mention a shift, to not protect “all biodiversity in some areas, but biodiversity thresholds in all areas” (1996). Urban development has thus to be reconciled with biodiversity conservation. It is no longer a question of one or the other.

Biodiversity has a positive effect on many ecosystem services (see Balvanera *et al.*, 2006). The greater biological diversity is the greater is also the ability to maintain ecological services under different conditions. For instance, the ability of a single species to respond to change is rather limited. A community of species, however, may have members that fulfil similar functions within an ecosystem, but respond differently to change. This is also called response diversity (Elmqvist *et al.*, 2003). A loss of biodiversity, in turn, reduces the ability of many ecosystem services to maintain their positive effects. That means the function of a system to sustain ecosystem services and thus the foundation for human well being is threatened (Folke *et al.*, 1996).

Biodiversity therefore does not only provide benefits that society enjoys in the present, it also has as an insurance function for the future and is thus a huge part of resilience thinking. It is resilience, which is coming more and more into the focus these days, that also provides a valuable framework to analyse social-ecological systems (Folke, 2006). In its essence resilience is described as “the amount of disturbance a system can absorb and still remain within the same state or domain of attraction; the degree to which the system is capable of self-organisation (versus lack of organisation, or organisation forced by external factors); and the

degree to which the system can build and increase the capacity for learning and adaptation” (Carpenter and Gunderson, 2001). In other words, resilience describes the ability to bounce back, and to get back on feet after being pushed over. Much of the focus in research has been given to the first part of the definition, the ability to be persistent and withstand change. It is rather easy to then mistake resilience as a concept that describes the maintenance of a desired system. The definition, however, brings together different perspectives. To alleviate this Cumming (2011), for instance, defines resilience as the ability of a system to maintain its identity in the face of internal change and external perturbations. Persistence is mentioned with the same emphasis as adaptability and transformation (see Folke *et al.*, 2010). The scales defined by Redman are thereby of fundamental importance. Otherwise the different perspectives may seem rather opposing to each other. Persistence of a system describes its ability to maintain its identity. In order to do so a system must also show adaptability. That means it must have the capability to learn and adjust its responses according to a situation. It must be able to transform into a new system when ecological, political, social, or economic conditions make the existing system untenable (Walker *et al.*, 2004). Resilience is thus all about opportunities that open up in disturbance and allow for continues development (Folke, 2006).

The New York Times has pushed on an interesting discussion about resilience by telling us to “Forget about sustainability. It’s about resilience” (Zolli, 2012). The article questions the ability of sustainability to sufficiently address change. Sustainability is here rather seen as a means to a perfect balance between society and the environment. And risk to this balance is aimed to be mitigated at the source of it. But the world is constantly changing. So instead of trying to put it back into balance society should rather look for ways to manage imbalance. Resilience is such a way. “It doesn’t propose a single, fixed future. It assumes we don’t know exactly how things will unfold, that we’ll be surprised, that we’ll make mistakes along the way” (Zolli, 2012), but that in the end we will be able to adapt. Resilience does thereby not address the underlying causes of change. This is why many scholars reason that if society focuses on adaptation rather than mitigation the responsibility of causing change in the first place is pushed away, and a scenario where more and more change is asking for more and more adaptation is inevitable. Neglecting the idea of sustainability altogether is thus a bit rash.

Recognising that biodiversity is a prerequisite for building resilience and thus human well being can only be the first step, utilising that knowledge is another one altogether. This other step, however, is made in the following chapters.

The role of corporate responsibility

Corporations are generally understood to be the prevalent form of business today and although they come in all kinds of forms and functions some distinct features are shared among all. The basic definition of corporations comes down to their status as an independent legal entity (Crane and Matten, 2010). As such corporations share many similarities with individuals and are often regarded as artificial persons. Like an individual they enjoy many

rights and the responsibilities that come along with them. They are for instance able to enter into contracts, loan and borrow money, sue and be sued and own assets. But unlike individuals corporations are owned. This ownership is usually expressed in liquidity shares of shareholders. A corporation is thereby not bound to a certain shareholder and its ownership can change over time. Shareholders have the right to participate in decisions and profits of a corporation. But due to their independence from the corporation itself they cannot be held responsible for a corporation's mismanagement and debts. Responsibility is only addressed through their shares. This is called limited liability. Often the business of corporations is not carried out by shareholders but by managers. These act in the best interest of shareholders and are supposed to maximise and protect shareholder value through maximising profit. A stakeholder of a corporation is "any group or individual who can affect or is affected by the achievement of the organisation's objective" (Freeman, 1984, p. 46). This can reach from people directly involved in a corporation, a community or society as a whole, up to mass media (see Henriques and Sadowsky, 1999). In the study performed in the later part of this paper the urban community is particularly brought into focus.

It has been former General Secretary of the UN Kofi Annan that said during the World Summit on Sustainable Development that "Business and society stand to benefit from working together. And [...] that it is only by mobilizing the corporate sector that we can make significant progress. The corporate sector has the finances, the technology and the management to make all this happen. The corporate sector need not wait for governments to take decisions for them to take initiatives. [...] Business has come to realize that if it wishes to thrive in a complex and sometimes hostile global economy, it must respond to the major social and environmental trends and challenges that are reshaping our world" (2002). It is not too farfetched to think of corporations as a valuable piece of the puzzle that is sustainability. It is maybe most clearly seen in Marshall's description of economies of agglomeration that urban economic development provided an ideal setting for them to grow in. Although not accountable for the problems that came along with that development they must in turn hold some part of the responsibility to address them. Corporate responsibility can furthermore also be seen as an investment in the future. It is this perspective that Annan's appeal for action takes and thus each and every corporation is addressed by it.

In his statement Annan urges the corporate sector to take on a more active role in achieving sustainability. Just how exactly this role might look is left open by him. The relationship between business and society regarding a sustainable development has fortunately been in the focus of research for some time now. It is thereby commonly agreed upon "the contributions each can make to a better quality of life for all people" (Wood, 1991, p. 385). Only the purpose and extent of this relationship has been highly controversial (see Whetten *et al.*, 2002).

Friedman argues that the only responsibility of business is "to make as much money as possible while conforming to the basic rules of the society, both those embodied in law and those embodied in ethical custom" (1970). This is equitable to the premise of profit maximisation. Friedman supports his position by bringing forward three different thoughts

(see Crane and Matten, 2010). First of all, although corporations do have a legal responsibility they cannot have a moral responsibility. It is one thing to say a person feels a sense of moral obligation towards something but it is another to attribute this feeling to a corporation. Moral responsibility is thus only held by the people who are individually responsible for the actions of a corporation. A second point is the legal framework society set up for corporations. It dictates that a corporation and their managers are obliged to maximise profit to protect shareholder value. Any renunciation from this responsibility corresponds to a betrayal of shareholders. And lastly, corporations and its managers are in no position at all to know what is in the best interest of society, neither are they in a position to utilise such knowledge. This is the task of the government.

Corporations must on the other hand also acknowledge the “far reaching scope and consequences of their decisions” (Lee, 2008, p. 58). Although the legal responsibilities for corporations are thereby clearly defined for individual countries Scherer *et al.* point out that these might not be enough anymore (2009). Due to globalisation, corporations today act on a much larger scale. They are not confined to a single country anymore and thus face a multitude of issues regarding legal, accountability and cultural aspects (Crane and Matten, 2010). National governments on the other hand are limited to a certain territory. This means that corporations can no longer rely on a single legal framework to do business. Too often they are also simply able to choose the framework that is most convenient in a certain situation. Globalisation thus reduces the ability of national governments and institutions to regulate and enforce behaviour that is socially responsible. One can also argue that corporations are as influential and as economically powerful as certain countries. Corporations “own much of the mass media which influence much of the information and entertainment we are exposed to, they supply global products, they pay people’s salaries, and pay (directly or indirectly) much of the taxes that keep governments running” (Crane and Matten, 2010, p. 19). Economically corporations and countries are often compared through plotting the growth national product of countries against the sales revenue of corporations. This approach, however, can lead to misleading results, as is pointed out by a number of scholars (see De Grauwe and Camerman, 2002). A better picture is shown when instead government tax revenue is compared to corporate revenue (Chowla, 2004). This results in a list that gives at least an idea about the relations between them. It is topped by the G7 nations but still includes 71 corporations within the top 100 economic entities. The problem here lies in the accountability of corporations. Unlike governments they do not face any elections on a regular basis and much of the people that are influenced by corporations have no saying in the business of them at all. In regard to culture globalisation also exposes corporations to a multitude of different moral values. In some cases these may even contradict each other. Crane and Matten point out that although globalisation makes regional differences seem less important people are confronted with them on a much more regular basis. All these implications of globalisation thus call for a greater corporate responsibility than established management theories are addressing (Walsh, 2005).

Many corporations follow an approach of corporate responsibility that is entirely voluntary based and goes beyond legal requirements. The term corporate social responsibility can also

be used to describe responsibility in this regard. This voluntary approach turns its back from pure profit maximisation and aims to create a growing standard of living for stakeholders by acting in a socially responsible manner and preserve the profitability of the corporation and its stakeholders at the same time (Hopkins, 2003).

In recent years ecosystem services became more and more part of the equation that is corporate social responsibility. Business for Social Responsibility (BSR) observes that “corporate engagement with the issue [of ecosystem services] is clearly on the rise” (Waage and Kester, 2013, p. 4). Thereby corporate work on ecosystem services can assume different shapes. “Some companies have crafted corporate policies of no net, or net positive, impact on ecosystems or ecosystem services. Other corporations are exploring the issue and pilot testing analytical tools. Yet, others simply state that they recognize the importance of ecosystem services” (Waage and Kester, 2013, p. 4). In BSR’s report to the current state of play four distinctive trends among 53 international operating companies, all stating their interest in ecosystem services publically, are pointed out. First of all, “a growing number of corporate representatives state that they see ecosystem services and biodiversity as their next set of issues to address” (Waage and Kester, 2013, p. 6). Thereby, as a second trend states, “the span of corporate efforts [...] is quite broad”, reaching from overarching decision making processes to more specific activities such as an Environmental and Social Impact Assessment (Waage and Kester, 2013, p. 6). However, BSR also states in the third trend they observe that “moving from ecosystem services to action remains a challenge” (Waage and Kester, 2013, p. 8). This is due to little publically known successful initiatives that have actually the potential to serve as guidance for other initiatives that follow. Every theoretical initiative brought into practice so far has thus been like a leap in the dark. In chapter 3 some of these initiatives in urban apiculture are presented in more detail. And lastly, “corporate managers’ primary conclusions about ecosystem services assessments are that they generate insights, particularly around business dependencies, that may be at risk within a changing climate” (Waage and Kester, 2013, p. 10). In the later part of chapter 4 the issue of corporations being more aware of the importance of ecosystem services and more confident to address them and other sustainability issues in a working environment is brought to attention in detail again.

3 Initiatives in urban apiculture

Urban beekeeping is more and more growing in popularity for corporations and although this research has been concerned with corporate initiatives on a global scale urban beekeeping is in fact not restricted to them. Apart from beekeeping schemes adopted by corporations for non commercial purposes, beekeeping is also done by professional beekeepers for commercial purposes and by hobby beekeepers. These are, however, of lesser interest for this research.

Through the course of this research three different kinds of trends have been observed how beekeeping is actually approached by different corporations. Keeping the differences in regions in terms of conditions and legal frameworks in mind these approaches do not seem to be linked to a particular region, but rather depend on the nature of the corporation that is involved in a particular scheme itself.

A fairly large international corporation seems to be able to implement beekeeping schemes completely by itself and does not have to rely on external support for it. I had the chance to talk to Olivier Seznec from Cisco in Paris, France, and Matthieu Minguet from Cisco in Amsterdam, Netherlands, as a representative corporation of this group. Olivier Seznec has been involved in the corporation's beekeeping scheme as the Chief Technology Officer of Cisco France from the very beginning in 2009 and thus been able to provide valuable insight. The idea of beekeeping was initially brought to Cisco by one of its own employees, Giles Clugnac, who happened to be a beekeeper at the same time. In a presentation he told of the fact that honeybee population number has been decreasing in recent years. In the process several of his colleagues were so captivated by the idea of helping out honeybees that together this idea was brought forward to the management of Cisco. Although dismissive of the idea at first Mr Seznec and his colleagues could convince the management of the impact such a project can have and Cisco Connected Bees was launched. When I had the chance to talk to Mr Seznec about this initial phase it became apparent that no formal evaluation of the situation of honeybees in Paris has been made. Furthermore, there has been no consideration of similar projects at the time which could have been indicating further benefits for the corporation. The sole purpose of the project has been to raise awareness towards the decline of honeybee population and the importance of biodiversity. Pollination has not been thought of as a priority. The first hives were installed in the following year in 2010 and involved 15 employees of Cisco. These also received training in beekeeping. Today this number has increased to 41 employees in a corporation of around 800 at the location of Paris. Including the locations of Amsterdam and Reading where the project later spread to more than 90 employees are involved today. The initial costs for equipment and training amounted to 3000 to 4000 Euro. Thereby it has to be noted that Cisco as a technology company is also utilising its own technology within the honeybee hives for measuring and monitoring purposes to further ensure the success of the project. The legal responsibility that comes along with beekeeping is shared with a union, Groupement Apicole de la Bréviande Intercommunale (Gabi). Being first and foremost a technology company Cisco has no food license that allows selling the honey they harvest. As a result honey is either given away for promotional

purposes or offered to employees in a company restaurant. No monetary benefits are gained directly from the honey.

A second trend that can be observed is partnerships of corporations that are not able or simply do not wish to carry out beekeeping on their own with companies that provide this service for them. The business models of companies sponsoring the honeybee hives and the services they offer can thereby be quite different from each other. Bee Urban in Stockholm, Sweden, for instance leases hives and their maintenance for a cost to other corporations interested in the initiative. As beekeeping is done entirely through Bee Urban these companies only get directly in touch with honeybees under its supervision, but still gain all its benefits in turn. Inmidtown in London, United Kingdom, on the other hand funds honeybee hives and their initial maintenance itself, but asks for volunteers to eventually enable each site to become self-sufficient. I had the chance to talk to representatives of both companies, Pim Bendt, Project Director at Bee Urban, and Mitch Steprans, Business Manager at Inmidtown.

Bee Urban started out as a social initiative and non profit organisation as a response to a guided tour in the Royal National City Park in Stockholm in 2010. There, founders Josefina Oddsberg and Karolina Lisslö learned that plant species in the park are disappearing due to lack of pollination. The founding of Bee Urban has thus been the result of a decline of pollination services, although no particular formal evaluation of the state of honeybees has been made. Bee Urban aims to raise awareness of this decline and the overall importance of pollination and therefore also connects sustainability talks to their urban apiculture. Due to a lack of initial support, however, the once social initiative has since then developed into a business, leading to a better recognition in general and getting in touch with other companies, municipalities and the Swedish government. Today, Bee Urban is collaborating with 20 different companies that are located in Stockholm, Västerås and Karlstad. Gothenburg and Malmö might be added to that list in the near future. The honey that is processed by Bee Urban through urban apiculture is returned to the sponsoring companies.

Inmidtown is a membership based organisation that represents the interests of 570 London companies and its beekeeping is only one of their member services. Others are to promote urban greening and gardening and to eliminate the waste that is sent to landfills. The initiative reaches back to 2005 and aims to make Bloomsbury, Holborn and St Giles districts a more sustainable area to work and live in. Currently their bee-keeping projects are limited to three different sites, with three more in planning, and focus more on providing additional forage to supplement them. The honey that is processed, initially by an Inmidtown beekeeper and later by the sponsoring company itself, is split half and half for each side to decide what is done with it.

Lastly, a third trend is corporations that benefit from the honey that comes with bee-keeping or from the beekeeping itself first hand. Hotels are strong trendsetters in this regard since they have a food license that allows them to sell honey to its customers. Some hotels even maintain their own gardens where herbs are grown. Similar to other international corporations such as Cisco fairly large hotel chains are thus capable of carrying out beekeeping by themselves. In

other cases, however, it can also be observed that hotels are not able or simply do not wish to be involved so thoroughly. These corporations then form partnerships with local beekeepers. The Intercontinental Berlin, in Germany, is one instance that falls into the former category. It is part of the corporation's Green Engage initiative that measures the environmental impact of the hotel, and other hotels of the chain, on a day to day basis. Beekeeping is here only one of several aspects of a larger sustainability strategy also including cutting energy, water and waste usage. For its efforts the Intercontinental Berlin has recently been awarded with the Green Globe Certificate for sustainable tourism. Like its honey this further supports the marketing of the hotel. Hotel Berlin, Berlin is a hotel that falls into the latter category. For this study I had the chance to talk to its executive chef Susanne DeOcampo-Herrmann. Susanne DeOcampo-Herrmann has been supporting the beekeeping project from the beginning in 2012, and although she had the preservation of honeybee population in mind the final decision in favour of the project has been made due to the benefits of honey for the hotel.

4 Data presentation

Impact of an urban environment on honeybees

To get an idea about the impact of an urban area on honeybees one has to look into its characteristics as a habitat first. The most noticeable feature that distinguishes urban from more rural areas are, naturally, built up and impervious surfaces and therefore a lesser amount of green spaces. This seems to strengthen the notion that habitat loss is an important factor in the decline of honeybee population. And indeed, an increase in buildings that is associated with urbanisation and a concurrent decrease in green spaces directly correlates with a loss of more specialised bee species (Zanette *et al.*, 2005). Apart from their built up surfaces, urban areas, however, also have a small amount of green spaces, including different kinds of gardens and parks. It is these green spaces that can serve as ideal habitats, as they are defined by a great range of different plants and flowers, and harbour a great abundance of honeybees and other pollinators (Tommasi *et al.*, 2004, Ahrné *et al.*, 2009).

The great diversity of different plants that are often brought into urban areas artificially thereby seems to affect honeybee populations more than anything else. It is plant diversity that lets honeybees feed on many different plants and, as a result of it, develop stronger immune systems than bees with more limited diets (Alaux *et al.*, 2010). That means that honeybees with polyfloral diets are healthier than honeybees with monofloral diets. And consequently, as plant diversity decreases so does the number of pollinators (see Biesmeijer *et al.*, 2006). Pollinators that rely on certain plants and plants that rely on certain pollinators have thereby done worse, whereas more flexible species have done better. An underlying factor for the decline of honeybee populations thus seems to be biodiversity.

A number of field observations further strengthen this view on dependence on biodiversity. Whereas urban areas tend to have a much greater diversity of plants, the countryside seems to be dominated by large areas of monocultures for agricultural purposes, such as oilseed rapes, nowadays. In Paris, for instance, more than 250 different kinds of pollen have been found, in surrounding areas it has been as few as 15 to 20 (Schofield, 2010). That is less than a tenth. In addition, monocultures only provide forage for bees from one plant species over a relatively short period of time of the year, whereas plants in urban areas likely bloom throughout the entire growing season (Cussans *et al.*, 2010). This difference between urban and rural areas in terms of forage is rather noticeable. Beekeepers in the United States proceeded to transport their honeybees around the country so that they could pollinate high selling crops of a particular kind and population decline there has been particularly great (Black, 2010). In San Francisco, on the other hand, although bee populations, in this case bumble bees, has been declining on average, the abundance of bees in urban green spaces has been greater than in nearby wild areas (McFrederick and LeBuhn, 2006). It thus looks like urban areas can serve as refuges for bees and, counter intuitively, even favour them as a habitat.

Healthier honeybees naturally have a higher chance to survive through winter periods. Here, another difference between urban and rural areas becomes noticeable. In one case in Boston, in the United States Massachusetts, overwintering success has been around 62,5 per cent in urban areas compared to around 40,0 per cent in more rural areas (Wilson-Rich, 2012). A similar trend has been observed by the French beekeepers' association Union Nationale de l'Apiculture Française (Unaf) in Paris where urban survival has been around 95 to 98 per cent and rural survival has been around 60 to 70 per cent (Hattam, 2010; Benjamin, 2011). Unfortunately attempts to get hold of any of these data have been unsuccessful for different reasons. It has to be pointed out, however, that further research is currently underway and until that is concluded it is difficult to determine what leads to the difference in success of overwintering. Other factors than diets might come into play here as well. Urban areas are, for instance, about 1 to 2 degrees warmer than their surroundings, a difference that can be critical in winter. Furthermore, pesticides are more commonly used in rural areas that are used for agricultural purposes than they are in urban areas. In some urban areas, such as Paris, the use pesticides is even completely prohibited.

In addition to such a direct impact on honeybees in terms of health a high diversity of plants and flowers also affects the honey that is produced. Observations, again, come from Boston and Paris and indicate a higher average quantity of honey in urban areas. In the former case honey yield has been 56,7 per cent stronger, in the latter it has been as much as 66,7 to 166,7 per cent depending on the season. Personal concerns about the quality of honey in urban areas due to air pollution can thereby be neglected, as honey as any other comestible is subject to food controls.

Impact of honeybees on an urban environment

The impact of honeybees on the urban environment seems to be far less than the impact of the urban environment on honeybees. Much of this has to do with the fact that urban areas are for the most part artificially shaped. That means that many of its plants are cultivated by humans to have amenity value more than anything else. And even in cases a plant is held for its seeds and fruits, if it does not carry a desired amount another plant is most likely being added. The dependency on honeybees is therefore no longer a given.

It is rather difficult to estimate a definite impact of honeybees on an environment of any kind. Often it seems to be sheer impossible due to impracticality. Research that aims to estimate the impact of pollination is thus limited to a small number of plant species rather than a reflection on the entirety of them. Such kind of research indicates that pollination services are rather low in anthropogenic areas including both the urban core and other suburban areas (Pellissier *et al.*, 2012). Pollination services from honeybees and other insects are, nonetheless, still very much noticeable. After all, pollinators are needed for seed and fruit production, and due to a generally low abundance of honeybees and other pollinators within urban areas pollination services are perceived even stronger. Cussans *et al.*, for instance, show that seed production is

higher in urban gardens that are frequently visited by bees than it is in rural arable farmland (2010). In Stockholm something similar can be observed.

“[A] story I like to tell is a women who has chillies on her balcony close to one of our hives on western Södermalm [in Stockholm, Sweden]. The shop told her the chilly plant she bought would get 5 fruits. Then she saw bees visiting her plant all of last summer. By the end of the season she had harvested 50 fruits from this plant. [...] It shows both how pollinating insects make a big difference to harvests even in cities, but perhaps more interestingly, it also shows how shops selling plants don’t expect there to be much pollination at all, since they tell customers to expect only a tenth of potential harvests. Or perhaps the shops aren’t even aware of the impact pollination can have on the plants they sell. The latter scenario is quite sad.” *Pim Bendt, Bee Urban*

Through benefitting the urban environment honeybees also benefit the process of pollination as a whole. They help sustain a greater diversity of plants, which, in turn, serve as forage for more pollinators. In most cases artificially introduced honeybees therefore also support the return of other wild bee species into these areas again.

Issues of too many honeybees

Through the course of this study London, United Kingdom, emerged as the only case that discussed the issue of honeybee saturation, or the question of what happens if there are too many honeybees. Starting point of this discussion has been Boris Johnson’s, Mayor of London, Capital Bee initiative that offered financial support in beekeeping to up to 50 community food-growing groups (Benjamin, 2010). John Chapple, former chair of the London Beekeepers’ Association, LBKA, commented that London already has enough beekeepers and neither needs nor can support more inexperienced newcomers. BeeBase, a register of beekeepers maintained by the UK’s National Bee Unit, NBU, documents that in the span of five years the number of beekeepers in London tripled from 464 to 1.237, and the number of hives doubled from 1.677 to more than 3.500 by 2013 (Ratnieks and Alton, 2013). LBKA’s secretary Angela Woods noticed this trend but said that although honeybee population increases as a result of it honey yields decrease at the same time (BBC News, 2012). This raises the question if there is too little forage for the abundance of honeybees and other pollinators in London. As a result of such an increase in beekeepers and hives certain allotments across London presently even restrict the number of beekeepers on their ground.

It is needless to say that such a discussion about too many honeybees questions the work of Inmidtown and other beekeepers in London. An Inmidtown spokesman thereto said that “our team that led [the urban beekeeping project] has been trained and guided by sustainability experts to ensure the flower to bee ratio is right before any hives are installed” (BBC News, 2012). Upon further request Mitch Steprans elaborated on this procedure.

“There’s no actual ratio that anyone can confirm for bees to forage, so it’s really a case of working closely with our beekeeper to judge what’s around the site as well as on the site, and always starting off very slowly (one hive at a time) to make sure that there’s enough forage. Some sites haven’t been able to go ahead because of lack of greenery, whereas in others we’ve installed loads of planting to get some hives in.” *Mitch Steprans, Inmidtown*

The issue of too many honeybees is pursued in a number of studies that are supported by the Insect Pollinators Initiative, IPI, funded by the government, and carried out right now. Jane Memmott of University of Bristol, for instance, received an IPI grant of about 1,5 million Euros to identify biodiversity hotspots and compare pollinator diversity in urban areas and nature reserves and farmland. Her results will serve as a blueprint for urban planning in the United Kingdom (Benjamin, 2011). Geraldine Wright of Newcastle University also received an IPI grant to examine nutritional needs of honeybees and bumblebees and nutritional quality of pollen and nectar (Benjamin, 2011). This allows an estimate whether the amount of forage is sufficient and nutritionally complete. A general recommendation about the number of honeybees and hives in a particular area will still be difficult as it depends on the amount of plants and flowers within that area and varies further from month to month. However, an increase in forage supports all kinds of pollinators. John Chapple says that if “Londoners want to help bees [they] would do better planting bee-friendly trees and flowers and lobbying for a more bee-friendly city, rather than keeping them” (Benjamin, 2010). Thus, urban beekeeping and the development of urban green spaces have to go hand in hand.

First successes of this can be seen in the focus of Inmidtown to complement beekeeping with projects that increase forage. The same is true for Cisco Amsterdam which aimed to follow in the steps of Cisco Paris until they realised that there is not enough forage in close proximity to their honeybee hives. Their initiative has therefore also been supported by planting of flowers.

Impact of urban apiculture on a corporation

As far as the impact of beekeeping on the corporations themselves goes Dr Susan Parham from the Centre for Sustainable Communities at the University of Hertfordshire conducted a study on behalf of Inmidtown regarding the effect on employees (2011). Although the study is limited to five companies, all of which are associated with Inmidtown, and 13 employees and thus represents only a small qualitative sample, it will serve as a basis for findings of this research. It has to be noted that all employees taking part in the study have also been directly involved in the beekeeping. The study covers a range of topics but can essentially be broken down into three parts. These are the effects on an individual level, the effects on an organisational level and the effects of the initiative in regard to sustainability issues.

As far as the effects on an individual level go the majority of participants of the study have stated that they enjoy coming to work more since honeybee hives have been adopted by their respective companies. About half of the participants further stated that they also spend more

time outdoors. Participants from the other half commented that they already spend a large amount of time outdoors and the project has not made any significant difference to that. Correlations to an increase in motivation and a decrease in stress at the workplace could not be clearly shown by the study. This particular part of Parham's study is difficult to confirm as none of the companies I have been in touch with over the course of this study has done a formal evaluation of a similar form. However, the individual responses that I got still complement Parham's results. They confirm that employees are supporting their beekeeping projects thoroughly. Employees have often been rather cheerful and grateful of the interest that was shown and the overall tone towards the honeybees themselves has been very inclusive. Honeybees have been seen as a part of the company and have often been referred to as "our bees" or "our friends".

The effects on an organisational level have been even stronger than on an individual level. Although an increase in work productivity has been denied by a majority of the participants, beekeeping has shown to have a positive impact on building morale and developing work relationships within the company. Usual responses here have been along the lines of "Everyone was very excited about the arrival of the bees, and even if not directly involved, has been interested in the progress of the project" and "[The] project has enabled me to meet colleagues that I would not normally interact with during the day" (Parham, 2011, p. 3). The responses from Parham's study have been confirmed by the observations of this study. For instance, in the case of Cisco a virtual community within the company has developed that connects employees from their locations in Paris, Amsterdam and Reading and keeps them constantly in touch with one another to exchange ideas about their respective projects.

"The bees are bringing a very specific atmosphere [to] Cisco, whether the employees belong to the Connected Bees group or not. It gives a sense of pride of doing something very unusual at work. [...] From my own experience, it brought me interesting new contacts within or outside Cisco." *Olivier Seznec, Cisco Paris*

Similar statements are even given by companies whose employees are not getting directly in touch with the honeybees on such a regular basis.

"Everytime Pim [Bendt from Bee Urban] or someone is here maintaining the bees, one or several of us pop out on the roof to ask questions. [...] What has surprised me since the bees came here is that everybody (even the most grumpy old man) seems to care about them. The first season I got questions a couple of times every day about how they were, if they seemed to like it here and if it wasn't too cold during winter. [...] I believe everybody here is proud of our bees and proud of the small jar of honey they get to take home every year." *Kristina Philipson, White*

"The bees offer us a unique talking point to bring attention to the wider environmental work that we do." Engaging in these environmental questions in general makes "Linklaters a place where we are proud to work. It matters to clients [as well]". *Jens Hornstedt, Linklaters*

“We are definitely proud of our beekeeping, our trainees are in particular very engaged in the project.” *Susanne DeOcampo-Herrmann, Hotel Berlin, Berlin*

Regarding the effects of honeybee initiatives towards sustainability issues the study shows that a large proportion of employees are aware of the role of honeybees for sustainability and value the educational aspect of the project a lot. The question on employees being aware of these issues has for instance been answered with “Yes, but only since becoming involved in the project” and “Yes, that's the great thing about the programme - it's been educational” (Parham, 2011, p. 5). The observations of this study are similar.

“[There is] greater sustainability awareness amongst Cisco employees” *Olivier Seznec, Cisco Paris*

“Karolina [Lisslö from Bee Urban] had a lunchtime lecture here last spring. I think that everybody here has learned things about pollination and ecosystem services in some way. [Hence] I've noticed that talking about urban ecology issues with our customers today seem less distant to many of us [...]. To me the greatest [...] benefit having bees on our roof is exactly this; to raise awareness of ecosystem services, getting familiar with them and feeling comfortable with integrating them in future building [and] development projects.” *Kristina Philipson, White*

“The bees are Linklaters’ contribution to safeguard the species and at the same time [...] awake and maintain an interest for these questions in all staff. [...] We have [...] offered our co-workers a chance to participate in the practical work with the hive as well as hosting seminars with bee urban in the office for all staff. [...] We have a number of colleagues who have taken an interest in the hive and continuously report to Bee Urban about what goes on with the 60 000 extra tenants.” *Jens Hornestedt, Linklaters*

Apart from the impact on employees, urban beekeeping schemes are furthermore interesting for marketing purposes. Especially in cases where a beekeeping project offered competences supplementing the core business of a corporation. Cisco is once more the corporation that comes to mind first. Through installing monitoring and measuring technology within the bee hives Cisco showcases the applicability of their technology to its business partners and customers.

“We are convinced by [Cisco Connected Bees], it changes the way we perceive Cisco.” *Credit Agricole*

Cisco Connected Bees has also been established as a brand that enjoys recognition both within the media and the presentation through internal events. Ogilvy France, an international operating advertising, marketing and public relations agency, for instance estimated advertising costs savings of 450.000 to 520.000 US Dollar through media presence in the years of 2010 and 2011. Increased publicity has also been observed by other companies

whether they are only sponsoring urban beekeeping as a service on their roofs or adopting it altogether.

“We had some publicity the first two seasons about our bees, which we of course appreciated.” *Kristina Philipson, White*

“During [the past year] Linklaters and our bee hive were mentioned in media four times [...]” *Jens Hornestedt, Linklaters*

Hotels are furthermore in the unique situation to combine education and marketing purposes through cooking classes where their very own honey is used. This has been confirmed by Susanne DeOcampo-Herrmann to be very well-liked. The Intercontinental chain also uses honey for their marketing. In one particular tasting event honey has been offered for tasting and for comparison from the Intercontinental hotels in Berlin, Hamburg, Boston, Melbourne and Vienna, where the tasting took place.

5 Analysis and discussion

Several means to adopt beekeeping as a corporation have been presented in chapter 3, including the cooperation with local beekeepers as well as the cooperation with companies dedicated to making beekeeping accessible for a number of companies at once. In the end, however, seems that no matter which option a corporation chooses impacts remain similar. Impacts have been following the same trends for each studied area but one; and no correlation between this one case of London and other cases can be found as both London and Stockholm use similar means to implement beekeeping on a business level. The different impacts in London rather seem to spring from the great number of initiatives and projects supporting beekeeping and an abundance of honeybees as a result. Such abundance has not been confirmed in any other area.

It is thereby apparent that different projects do have an impact on sustainable development. In fact honeybees seem to do rather well in those areas the projects are situated in and the overall trend of declining population numbers cannot be observed. Urban areas offer an environment that suits the life of honeybees. Initial observations show a more diverse diet and therefore a better immune system, a higher rate of overwintering survival and a higher honey yield. It must be kept in mind, however, that all these have only been observations from the first few years urban beekeeping is done, as is noted by Noah Wilson-Rich.

“The data I presented during my Ted talk were observational, and not part of a research study. We are currently working on a multi-year data set comparing urban, suburban, and rural honey bee health.” *Noah Wilson-Rich, Best Bees*

The impact of beekeeping on the urban environment seems to be more difficult to measure. Theoretically one might determine pollination success of each hive, without taking pollination from other sources into account. In practice this seems neither doable nor is it attempted by any business. This study therefore relies on single case observations and a process of elimination. That means that if plant species are disappearing like it has been observed in the Royal National City Park in Stockholm and such a trend comes to a halt since the beginning of the urban beekeeping project, the impact of honeybees might indeed be significant. Because it is so difficult to measure and evaluate the impact of beekeeping on an environment, corporations rather label the aim and success of their work as raising public awareness instead of bringing actual change, even though changes can be observed. They acknowledge the impact their projects have but do not measure it.

The impact on a corporation is positive all through. Employees are proud of their projects and the contribution their corporation has to sustainable development. Some of them even wish to become more engaged than they presently are. This strengthens the bond between employee and employer and might lead to increased loyalty and therefore longer terms of employment and lesser costs for initial training. Another benefit for a corporation is that beekeeping opens

doors for cooperation that have previously been closed. Corporations make new connections through a common interest in beekeeping, either with other companies or the public. Some corporations even state that beekeeping changed the way their business is perceived as a whole.

The impact of honeybees in all of these fields, however, only goes so far. Beekeeping seems to be beneficial until a certain threshold is reached and an area is saturated. An increasing abundance of honeybees from this point on leads to less and less benefits and eventually a turn into problems as is most clearly seen in the case of London. Impacts on the environment thereby seem to be limited by an area and its vegetation. A greater abundance of forage supports a greater abundance of honeybees. Honeybees, however, only make up between 20 and 60 per cent of flower dependent insects in London. A shortage in forage due to an abundance of honeybees through human introduction may thus endanger other pollinators whose population numbers are more threatened by extinction (Ratnieks and Alton, 2013). Furthermore, awareness can only rise up to the point all people are educated about the issue. It is then at the latest when the aim has to shift from raising awareness to bringing actual change. Interest in urban beekeeping might also be high presently since these projects follow a rather recent trend. Impacts on the corporations thus seem to spring from this initial phase of urban beekeeping. Corporations that are involved in urban beekeeping have an advantage over other companies simply due to the unique selling point that beekeeping offers. It looks more like a first mover advantage. If more and more corporations adopted beekeeping benefits for a single business would decrease.

6 Conclusion

In recent years honeybees have attracted a great deal of attention from the media, the general public, as well as organisations and companies. And many of them come with a good intention of helping honeybees. Unlike the environment as a whole honeybees thereby have the advantage of giving larger issues a face. Naturally people are concerned about the wellbeing of honeybees, something they already became familiar with at an early age, and want to share this concern with others. This is seen in their motivation as the primary aim of all studied initiatives is raising awareness. Honeybees can therefore be seen as a proxy for the whole environmental debate.

The impacts of urban apiculture on sustainable development are as multilayered as sustainable development itself. Environmental impacts include both benefits for honeybees and benefits for the urban environment through their pollination service. Particularly the advantages of the urban environment as a habitat must thereby be emphasised. Fairly large benefits can also be found for corporations that decided to keep honeybees, reaching from the single individual to larger partnerships with other companies.

To reach its conclusions this study attempted to combine the perspectives of beekeepers and scholars that are involved in the fields of urban ecology and pollination ecology on the one hand and corporations that adopted beekeeping on the other hand. The deeper insight that is thereby gained benefits both. As this study includes perspectives from outside of science it thus truly follows a transdisciplinary approach. In line with such an approach goes the presumption that not all elements from the different fields are utilised and, naturally, only a number of perspectives are included. Nonetheless, this study selected its cases very carefully, taking different motivations and, depending on the region, different impacts into account. It is also this variety that supports the conclusions that have been reached. Like the idea of sustainable development, however, the idea of urban apiculture has to evolve further. One can take the time and appreciate the impacts that have been made so far but one must also constantly bring the current course into question. A possible direction into which a development might go can be seen in London. Initially the same course as in any other case has been followed. The impact, however, has been less beneficial than elsewhere, particularly regarding the environment. As a result urban beekeeping there has been more and more supplemented by growing of plants and flowers that offer additional forage for honeybees and other pollinators.

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