The urban ecosystem: Designing the future of cities from an eco-centric perspective

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Abstract

The city as an urban ecosystem is a thought provoking concept providing an alternative perspective on designing the city of the future. The context of this thesis is the research on the role of cities in the human-induced environmental change. The urban ecosystem seeks for a definition of urban environments as a network of dependencies between humans, nonhumans, and the environment. This opposes traditional interpretations of a city as a place for the flourishing of human well-being. In anthropocentric decision making in urban areas tradeoffs between human and nonhuman needs are often made unconsciously, and are therefore too often, devastating for nonhuman life. The goal of the thesis is to seek a different approach to these trade-offs wherein the values of health and flourishing are inclusive to both human and nonhuman living.

The urban ecosystem adopts an eco-centric value system to enable the equalisation of human needs to the ecosystem's needs. One of the main theories used is the Deep Ecologist's theory, that subscribes to the interdependency between life and land, and formulates a set of core values including 'richness and diversity, communal thinking, and harmony' (Naess, 2009). Moreover, the eco-centric, and this turn specifically the eco-feminist, thought, eliminates patriarchal concepts of human domination on urban areas (Haraway, 2013). One of their main claims says all animals, including humans, are dependent on each other and their shared habituation, in order to sustain (ibid). I add upon these eco-centric theories the concern that the urban ecosystem is a place of high human density and influence and that this influence cannot be neglected when making decisions in urban ecosystems but can also not be the sole driver of change.

This thesis states that all professionals working in urban design and decision-making need to consider how to sustain and benefit to the ecosystem's health. Urban decision-making and design has to be performed through well-balanced tradeoffs between human needs in context of the needs of the ecosystem.

Content

Introduction

> "How we deal with environmental problems such as species extinction, global warming, water, and air pollution and wild life destruction largely depends on how our relationship with the land is perceived" (Kortekamp, & Moore, 2001).

The urban ecosystem provokes change for the future of design and decision-making in urban environments. The adopted eco-centric perspective on urban environments will change the how design dilemmas of the future are perceived and solved. The urban ecosystem sparks questions such as; How does building a skyscraper enable space for ants, plants, water, for any other needs than the needs of human living space? What if we imagine public transportation for animals? How could an urban designer enable co-habitation for the possibly native goats when developing an urban area? How can AI aid the native goats in navigating through busy streets, as a guide-dog so they are not crushed by cars and become locals?

This thesis develops an account of the urban as an ecosystem, and adopts eco-centric values onto the running, designing, and planning of future urban environments. The urban ecosystem embraces challenges the current debate on environmental issues in urban areas. By incorporating eco-centric values the interests of the ecosystems will become influential for all design and decision-making in the urban context. Therefore, the urban ecosystem causes a different approach on well-being in the city. One in which humans are part of a network of dependencies with other lifeforms, as for example the trees, the birds, the bees and the buildings residing in the urban area. The health of the ecosystem is dependent on the quality of life of all the parts in the network of dependencies. And the main aim of the urban ecosystem is to increase this ecosystem's health.

In current debates on urban issues, the urban is often valued from an anthropocentric perspective that focusses on the concept of human welfare. To exemplify this, the United Nations in her evaluation of urban habituation, evaluates urban areas by its populations, densities, and the sketching of human needs (United Nations, 2019). The urban ecosystem evaluates cities differently. The concept evaluates cities as multi-species places wherein a broad range of interests and needs ought to be fulfilled and balanced in order to sustain and gain a healthy ecosystem. In other words, the term urban ecosystem lifts misconstructed interests and human prioritisation when thinking on the future of cities by formulating an eco-centric

evaluation of urban spaces as ecosystems. Instead of prioritising human needs, humans will become part of a bigger network of needs and interests wherein tradeoffs decide what is good and what is bad for the health of the ecosystem. Both humans and nonhumans will need to sacrifice for the sake of the ecosystem when a tradeoffs is being made in this way. In the specific context of the urban, the high human density is considered to be one of the most important values and this value leads the way in which the tradeoffs are being done. This means human well-being will stay an important factor when making decisions on urban areas but there will be a nuance towards the extend in which human flourishing is allowed to demolish nonhuman life.

Ecosystem research analyses the fluxes and flows of the materials and energies in a certain environment (Kallipoliti, 2018). The urban is often not regarded as an ecosystem, as environmental research often differentiates 'natural' and 'artificial' environments. This thesis will refute the hard distinction. 'Ecosystem' as a term is value-laden and describes an environment that is wild and untameable but at the same time manageable and in human control (Kallipoliti, 2018). I borrow the concept of ecosystems from Environmental research and adopt it into the realm of Environmental ethics. To evaluate the term as a value-laden concept gives the opportunity to shift the concept onto the urban environments and evaluate these urban environments from an environmental perspective.

Use of theories

I borrow theories on nonhuman values from the domain of Environmental ethics. Environmental ethics is the discipline in philosophy that studies the moral relationship between humans, the environment and its nonhuman contents (Brennan, Lo, 2015). The discipline also questions the value and moral status of this environment with its nonhuman contents (Ibid). In the environmental ethics I decided to focus on three theories from which these four sources have been my main influence;

1. Arne Naess and his theory on 'Deep Ecology' in his book 'The Ecology of Wisdom' (Naess, 2009).
2. Aldo Leopold and his 'Land Ethic', as described in 'A Sand County almanac, and sketches here and there' (Leopold, 1989).

3. And the domain of ‘Eco-Feminism’, wherein I subscribe to the books of Donna Haraway ‘When species meet’ , and ’ Staying with the trouble: Making kin in the Chthulucene’ (Leopold, 1989).

These four works are in the core of all that is written in the thesis. I make use of a multidisciplinary cohesion of theories from domains of Environmental Research, Philosophy of the City, Earth System Sciences, Geology and Design Theory.

Overview of the chapters

This thesis is divided into five chapters;

In the first chapter, I explicate four main theories and their approach to the urban ecosystem. I give a short introduction to what values are by using the Orientation of Values by Kluckhohn and Strodtbeck (1961). Then I formulate the Environmental Ethics that the thesis builds upon. I give the reader an understanding of Naess’s Deep Ecology (Naess, 2004), the Land ethic (Leopold, 1989) and Eco-feminism (Haraway, 2013 & 2016; King & Plant, 1989; Plumwood, 2003) which are needed to ground the concept of the urban ecosystem in.

The second chapter, introduces the concept of a continuum when discussing ‘natural’ and ‘artificial’ environments. I use the theories of the Earth Science Systems (ESS) and the Anthropocene for their work on understanding the world as a human influenced network (Steffen, et al., 2002; Crutzen, 2002; Braidotti & Hlavajova, 2018). The idea of a continuum adds upon these theories by focussing on the social differences within the human presence on different environments.

The third chapter is the core of this thesis. In this chapter cities are theoretically innovated as urban ecosystems. The anthropocentric thinking when discussing urban areas is critiqued, from which the innovation to an eco-centric perception of the urban is being made. This chapter shows how the urban ecosystem puts the ecosystems needs into the environmental debates on the future of cities. The chapter describes what a healthy ecosystem entails and why this is a good thing to strive for by both designers, policymakers, and human citizens. The chapter also investigates if technological innovation could aid in the adoption of an eco-centric perspective on the cities of the future.

The fourth chapter, questions how tradeoffs between human and nonhuman needs are being done in the urban ecosystem. The chapter formulates and evaluates three stages of tradeoffs. Win-win situations wherein every part of the tradeoff gains. Survival-flourish situation wherein often nonhuman life is sacrificed for the cause of human flourishing, and situations where there is a genuine conflict. In this situation of conflict the most practical research is yet to be done. How much will humans need to scarifies for the cause of a healthy ecosystem?

The fifth chapter applies the concept of the urban ecosystem by making a start in creating eco-centric urban design principles. The first application of the concept is done by creating a road map, as a first attempt to bring the theory into practice. The chapter makes a side-by-side analyses of two cases. The first one adopts eco-centric values and the second one neglects them despite efforts of sustainability. The first case is done by an architectural firm based in Rotterdam, that looks into the use of abandoned space, and how to reorganise those for nonhuman purposes. The case delves into the transformation around ring roads to clean air, in specific the Rotterdam Ring Road, by for example the innovation towards electric (self-driven) cars, and the opportunity this innovation makes for more usable urban space for nonhuman animals. The second case investigates the Feyenoord City concept and its anthropocentrism in this idea. The urban development plan wants to repurpose a whole district in Rotterdam around the building of a new soccer stadium. The core values are anthropocentric and exclusive for nonhuman life, as will be shown in this chapter..

Research Questions

This thesis questions **Whether and how can eco-centric perspectives be applied to the highly human dense urban ecosystems?**

The subquestions have been formulated as;

- How are different eco-centric values systems structured?
- Why is the artificial-natural dichotomy an outdated concept?
- Could the urban be understood as a vital part of our planet's ecosystem; as an urban ecosystem?
- What do we ought to in the urban ecosystems with the consequential tradeoffs?
- How do eco-centric values encourage different kinds of relationships in the urban ecosystem?

Contextualisation

The theatre in which this thesis takes place is one of environmental change. To substantiate the need to change urban decision-making this context of environmental change is important to sketch. What is anticipated is that environmental change will vastly influence human and nonhuman life in the upcoming years.

Firstly, research shows more than 100 million people will be dragged back into poverty due to the impacts of climate change, as vulnerable areas will have to deal with increasing extreme weather patterns, flooding, and drought (World Bank, 2017). Next to that a World Health Organisation (WHO) reports explicate the dangers of environmental change for human health, such as the declining biodiversity (WHO - CBD, 2015). This decline impacts human health in many ways: Research shows how the declining biodiversity will lead to a reduced contact of people with animals, which leads to reduced diversity of microbiota, which in itself can lead to immune dysfunction and diseases (WHO - CBD, 2015). Also, poor water quality results in a massive burden on human health, mostly in poor areas (WHO, 2018). In this case maintaining or restoring the freshwater ecosystem benefits both humans and the environment (WHO, 2018). Freshwater ecosystems such as rivers lakes and wetlands that have been threatened by the high demand on water and the intense human interferences such as mining and building dams (WHO - CBD, 2015). Other examples are the framing of air pollution as a big driver to impact human health or the burning of fossil fuels for power transport and industry as the major contributor to bad air quality (WHO, 2018). Air pollution causes diseases such as ischemic heart disease, strokes, chronic obstructive pulmonary disease and lung cancer (WHO, 2018).

On the other hand, research finds that human health benefits from living in healthy ecologies. This flourishing is for example seen in discussing on how biodiversity gives rise to health benefits, as it gives an essential contribution to the agricultural production systems, and how the implementation of emerging technologies leading to a low-carbon healthcare system make the healthcare system more resilient (WHO - CBD, 2015; Ewing, 2018). The WHO suggests a more resilient healthcare system, ready for the extremities of the near future, has to be designed to become a low-carbon healthcare system (Ibid). It is clear that environmental damage will have devastating impacts on human life. Therefore this thesis adds to

the important discussion on how to minimise these impacts by focussing on values that encourages the flourishing of both human and nonhuman life.

Delimitations

To write this thesis in a useful manner, there are a couple of assumptions taken. Critically questioning these assumptions would be useful, but is outside of the scope of this master's thesis.

- First of all, I assume, human life will only survive if there are natural spaces and resources. I reject the possibility of a future wherein natural resources and spaces are obsolete and humans are able to live on technology itself. Therefore, I assume 'good' and 'healthy' natural space and resources are preferable needs.
- I do also assume that the way in which humans live now has many destructive habits for the natural resources and spaces, such as the growing emission of CO2, or the protectionism towards the growth of human consumerism. I accept the idea that these habits need to be overcome. This overcoming of exclusively prioritising human needs will happen in a hybrid way in which ecology and technology co-operates towards the goals of a healthy planet. A technology-driven approach to the future is widely approved upon and there are in-numerous economical and power dependencies upholding this idea of the future. I do not go into a utopian vision of a world without technological innovation but use the technological-driven incentives towards the eco-centric goals.
- I argue for the eco-centric idea of a grounded human duty to let the ecosystem thrive, but I take a distance from the misanthropic ideas of understanding constructed environments as broken or wrecked as seen in the Deep Ecology movement (Naess, 2008). This thesis builds on the idea that humans have high moral significance and ethical questions arise when humans harm the environment. In this thesis humans and other forms of life are both important parts for the future of the planet.

Chapter 1. A literature review of the eco-centric value system

Chapter one is a literature review on the theories underlining the concept of the urban ecosystem. The urban ecosystem is an eco-centric account of the urban that opposes the leading anthropocentric thinking in Urban Theory. Eco-centrism endorses that nonhuman needs and interests take part in a network of dependencies with the ecosystem's needs and interests. The urban ecosystem subscribes to this idea of a network of dependencies. The urban ecosystem aims to be a normative term to aid in the urban decision-making process

I will start with a definition of values, following Kluckhohn's and Palmer et al.'s account (Kluckhohn, 1951; Palmer et al., 2014). Then, I sketch out the main points of Eco-feminism, the Land Ethic, and the Deep Ecology Movement (Haraway, 2013 & 2016; (Naess, 2009; (Leopold, 1989). I show how each of these theories are distinctive and how they share components that can aid in constructing the urban ecosystem. Lastly, I introduce Ecosystem Research and the value-leadenness of the term 'ecosystems'. Later in the thesis I will adopt these theories to validate the concept of the urban ecosystem as a useful eco-centric account on how to make decisions in the urban environment.

Values

The first concept on which the urban ecosystem is build is the definition of values. I use Kluckhohn's understanding of values as the idea of the desirable that influences, implicit or explicit, the selection of available modes, means and ends of actions of groups or individuals (Kluckhohn, 1951). In other words, when values change, the behaviours of a group change. Kluckhohn's interpretation of values is a call for action. The urban ecosystem has similar goals as a normative term aiming to engage in the changing of making decisions in urban environments. Palmer et al., (2014) pursue from this definition of Kluckhohn. In their paper on Environmental Ethics they differentiate intrinsic from instrumental values (Palmer et al., 2014). Instrumental values evaluate the means to an end (ibid). Non-instrumental or intrinsic values give worth beyond the instrumental value (ibid). Nonhuman needs and interests have been often referred to as instrumental values. Things that aid in serving human needs. The eco-centric account evaluates the ecosystems as intrinsically valuable. By doing so, the ecosystem becomes worthy beyond human needs, and changes the dominating human prioritising in making decision in urban environments.

This thesis tries to prove the urban has intrinsic value as an ecosystem. The city as an environment is intrinsically valuable for the world beyond serving the human need for shelter, food, or even culture, and art. The urban as an ecosystem claims the city is a place of importance for much more than these human needs. It is an important ecosystem for the nonhuman animals living there, and has the potential to be valuable in the race against the environmental crisis, as cities are the places where the most change is possible. The city holds many species, flows of waters and (artificial) energies. Also the high human density gives space for other ecosystem to be less human influenced and dense. So the urban as an ecosystem is intrinsically valuable in context of the other ecosystems that are less human-densed and serve nonhuman and ecosystem needs more naturally. What defining the urban as an ecosystem does is giving the urban a different moral justification (Palmer, et al., 2014). In stead of seeing the city as a place for human well-being the city will ought to be valued as a network of dependencies between humans, nonhumans and the ecosystem, which obliges human citizens to take care of the environment and take responsibility on providing for the ecosystems and nonhuman needs.

Introduction to eco-centrism and ecosystems

The eco-centric view comes from an ecological tradition therefor it is important to shortly introduce the ecologist way of researching. Ecologists perceive the natural from an all-inclusive angle (Kallipoliti, 2018). Rather than referring to green and sustainable, ecology in its essence ecologists asks questions to reassess contemporary debates on the environment (ibid).

Ecology comes from the word ‘oekologie’ which refers to the “relation of the animal both to its organic as well as its inorganic environment”, coined by Ernst Haeckel (1834-1919) in The General Morphology of Organisms (Kallipoliti, 2018). Since Haeckel, ecology has been the study of the interrelationships between organisms and the environment (Andrewartha & Birchm, 1986). In ecology, there are different schools, such as the Deep Ecologists (Naess, 2007), the Environmentalists (Leopold, 1989; Norton, 1994), Eco-feminists (Haraway, 2016; Salleh, 1997, Plumwood, 2002; King & Plant, 1989) and more. All of these schools suggests in different ways a re-circulatory understanding of the world and its resources (Andrewartha & Birchm, 1986).

A brief use-of-terms introduces how values are incorporated in the term 'ecosystem' and in Ecosystem Research. The overall agreement on the term 'ecosystems' is that the concept sets boundaries to characterise environments by five factors including the climate, the material (rock, sand etc), topography, potential biota, and time (Jenny, 1980). In short, Ecosystem Research studies environments by considering all the organisms (biotic pools), the quantities of abiotic pools, and the fluxes/flows of materials and energies (Chapin, 2011). The abiotic pools being water, atmosphere, soils, et cetera and the biotic pool being all the sentient animals, microbes, plants (ibid). Global variations caused by climate are called biomes and are taxonomies in categories such as wetlands, savannahs, or tropical forests, wherein different life forms are present (ibid). A healthy ecosystem will be an equilibrium between these five factors characterising the environment. If one influences the other in such a way degradation takes place, the ecosystems is disturbed and needs to find its way back to a considered normal.

'Human activity' has been mentioned to be the sixth factor in setting the boundaries of an ecosystem (Jenny 1941; Amundson and Jenny 1997; Vitousek 2004). Ecologists have claimed that the human exploitation of the ecosystems has increased more in the last half-century than in the entire previous history of the Earth (Steffen et al., 2004). There are multiple occasions in which the growing numbers of humans living and their extending activities has influenced all ecosystems directly and indirectly (Chapin et al., 2011). For example, people inhabit 75% of the Earth's ice-free land surface (Ellis & Ramankutty, 2008). These inhabited areas include cities and villages (7%), croplands (20%), rangelands (30%), and forests 20% (ibid). The 25% of uninhabited places are most barren lands and woods. The inhabited landscapes (25/40%) is used for productivity and food production (ibid). Humans have also altered freshwater and marine ecosystems. 25% of the runoff of the water from the land to the ocean is used by human (Vörösmarty et al. 2008). Fishery has changed the composition of the population of species both by commercial fishing and incidentally caught fishes. 70% of the marine fisheries are overexploited or even collapsed. Humans reside close to the coast so also the human activities have influences the coastal margins of the oceans deeply (Chapin et al., 2011)

The above figures transform human's descriptive presence to active actants influencing the composition of the Earth and the equilibrium of the ecosystems. Also the above shows

that there are no ecosystems outside of human influence. The distinction between artificial and natural environments, between cities and ecosystems does not hold in the context of the sixth factor of setting boundaries. The human ability to change ecosystems endorses ecosystems to be value-laden, as humans have a choosing in the shaping of these ecosystems. By choosing one way or the other a tradeoff automatically is being made.

Next to that, new technologies in ecosystem research give opportunities to 'predict and control' the habituation of species (Golley, 1993.). Ecologists in the 19th century solely did observational research, but ecosystems studies have become quantitive and branches such as ecosystem management imply a human control of the ecosystems (ibid). The ecosystems approach links the biotic systems that people are part of, with the systems on which they depend. Therefore, is the ecosystems approach one that integrates the management of the resources, with the growing human population and the rapid changing global environment (ibid). The use of data interpretation leads to a deep understanding of the systems of the physiological and behavioural requirements, but also calls for action such as 'predicting and conserving' the habituation of species (ibid). The change from descriptive research to predicting and conserving has made the field more dependent on decisions and changed the role of the ecologist to an active councillor. This role needs moral consideration, as the role has great impact on many different life forms.

The anthropocentric perspective is still the dominant in envisioning the future of the planet. However, studies in varying fields show that anthropocentrism fails itself, and a healthy future requires a deeper understanding of the interrelated network wherein humans take part (Pinto, 2020). Eco-centrism is one of the main ethical domains challenging the leading anthropocentric perspective. The ontological history of the anthropocentric thought was developed through the succession of the following; Humans and other animals are not equal because humans have reason and therefore they cannot have the same rights and morals considerations (Pinto, 2020). Intrinsic value is human owned. All other forms of life have instrumental value, in other words they are a means to an (human-needs) end and they are not an end in itself (ibid). Human values will have to be considered through a long-term ethical framework of moral considerable obligations to the world and the environment. All other forms of life are instrumental and therefore dependent on this human evaluation (Pinto,

2020). One of the ways to challenge nonhumans' value as intrinsic instead of instrumental has been done through the works of the eco-centric theorists.

The eco-centric value system agrees to gives moral interest to humans and nonhuman needs. Plants, animals and all forms of life are taken to have intrinsic value. The eco-centric theories give alternatives to the dominant anthropocentric thinking in Ecosystem Studies and can act as a guide to redefining future cities (Pinto, 2020). Eco-centric value systems characterise the imbalance in interests when discussing urban environments, which provides a framework for the creation of the alternative urban ecosystem. The aim for the urban ecosystem is to neutralise, in a practical sense, this imbalance of interests by formulating design principles that include human and the ecocystem's needs.

The three main eco-centric theories

This thesis expands upon three different eco-centric theories being Eco-feminism, the Deep Ecology movement and the Land ethic.

Eco-feminism is one of the branches of philosophy that critically questions the origin of division between humans and animals and proposes a shift in thinking. Eco-feminism allows for the restructuring of power relations between biological beings (King & Plant, 1989). One of the main aims for framing the city as an urban ecosystem is following this restructuring of the current power relations of human as the overpowering force of all other forms of life. In stead of positioning humans on top of the food chain, King and Plant, claim that between humans, and between them and the rest of the nonhuman world there is no hierarchy (King, Plant, 1989). We live on a planet with one of the species being humans, but there are millions more. It is patriarchal to have this conscious belief that we as humans are entitled to dominate all other species and the planet, as we cannot live without the others, and nature could for sure live without us (ibid). That is why Eco-feminism concerns with human liberation of our relation with the nonhuman nature (ibid). The Eco-feminist perspective gives space to a different kind of politics and culture wherein "integrated, intuitive, spiritual, and rational forms of knowledge embrace both science and magic insofar as they enable us to transform the nature-culture distinctions and to envision and create a free, ecological society" (Haraway, 2013). In the urban ecosystem, as will be shown later, human' needs will not be dominating but co-dependent.

The Eco-feminist domain has normative tendencies towards human attitude in context of their surroundings. These normative claims are not solely based on idealistic concepts, even though King & Plant state Eco-feminism supports utopian visions of "harmonious, diverse, decentralised communities" (King, Plant, 1989), but are backed up by calls to embrace interconnectedness and to go beyond the Great Divides between what is seen as nature and as society, as nonhuman and as humans (Haraway, 2013). In this tradition of interconnected thinking this thesis blooms. The urban ecosystem borrows from these ideas that an expansion upon the defined concepts – such as the human-nonhuman duality or natural-artificial space duality - necessitates a broader consciousness. The Eco-feminist consciousness enables a broader understanding of the urban environment. Haraway is a leading figure in breaking seemingly fixed concepts surrounding ideas on human life. Her vocabulary criticises human exceptionalism. In her book 'When Species Meet' she describes the human exceptionalism with the premise that humans are the only specie not taking part in the spacial and temporal network of interspecies dependencies (Haraway, 2013). She states that humans are cut off from all the Others, and she frames this conception as a 'Western fantasy of institutionalised marination that places humans in the domain of the artificial, deracinated, alienated, and therefore free' (ibid). To turn to Mother Earth is to turn away from "the Man - the Destroyer" (ibid). I borrow from her the freedom to interpret the necessary future as one in which humans are framed as part of the interspecies dependencies. One in which human thinking overcomes the ideas of human exceptionalism with grace. The urban ecosystems could be seen as a practical and analytical proposition of Donna Haraway's overcoming of human exceptionalism.

Deep ecology focusses on the development of a new balance and harmony between different environmental scales, individuals, communities and in the end all of Nature (Devall & Sessions, 1985) Devall and Sessions push for a concept meant as self-reflexive, under the denominator 'cultivating ecological consciousness' and prescribes a consciousness towards the idea that everything is connected (ibid). This is one of the values I take to the urban ecosystem. Next to that, Devall and Sessions state that the Deep Ecology movement urges to question ourselves deeper, and question the dominant worldview in our culture, the meaning of

our reality (ibid). Questioning the urban has not been done in the Deep Ecology movement so far, therefore, this thesis adds upon the movement.

Deep Ecology founder Arno Naess stated that the environmental crisis of the 20th century has its core in philosophical prepositions and attitudes (Naess, 2009). He has made an eight point plan for a better future (which you can find in addendum 1). The plan states as much as, nonhuman life has inherent values of 'richness and diversity' (ibid). Humans have no rights to reduce these values (ibid). Human-interference with the nonhuman lives is too interfering and has to be reduced by changing policies (ibid). The eight point plans states that approving to the above means participating (ibid). It is not about the quantity but about the qualitative living of humans amongst the other species (Ibid). The eight point plan will be adopted to the urban ecosystem in chapter four.

Lastly, I introduce the **Land Ethic** theory. This distinctive theory is useful for incorporating communal thinking in the urban ecosystem. The Land Ethic proposes to add the ethic dealing with the relation between humans and the animals and plants they grow upon (Leopold, 1989). In how far is land not solely owned and used, but is there a moral obligation towards the land humans inhabit? Using a type of communal thinking and acting that holds individuals in a combining the interdepended members. The Land Ethic in general revolves around the premise that somebody is part of a bigger community, and Leopold's proposal specifically uses animal instincts as guides of social expedience that is full of new ecological situations (ibid).

The idea of an ecological community expects a land owner to take care for the community on her land. It is expected within a land ethic approach that the land owner proudly adds a reasonable proportion of the biotic communities through the use of 'conservation' (ibid). 'Conservation' is a state of harmony between human and land (ibid). A land owner in their turn will then add 'diversity and beauty' to her farm and community (ibid). The word 'beauty' seems to be used as an evaluation of the good. I propose a landowner could also be a city planner, and therefore the city planner ought to follow the same Land Ethic and take good care of her community. In my words, what the Land Ethic provides is a concept to enable dealing with the relation and integration between individuals, other living beings, and the place they live in. The Land Ethic opens-up the concept of a community

to include the soil, the water, the plants, the animals. It includes their right to a continued existence as a core, as it cannot get prevented by management and alteration of what have become called 'resources and services '(ibid). From humans as masters towards humans as part of the community, respecting the community and the fellow-member (ibid). This thesis stretches out the community instinct on the urban environments. Urban are spaces much more human-densed than what Leopold envisions, but I argue they serve as big a community as other environments. Stretching the community thinking onto the urban will give important insights in how the city fulfils anthropocentric need and by doing so neglects the needs of fellow-members. In stead of coming to 'healthy' and 'beautiful' relation with other animals, urban animals are often framed as pests, such as rats, or plants are called weeds in stead of being welcome in the place they live in.

To summarise, values, as used in this thesis, are defined two folded. Palmer et al., proposes there are instrumental and intrinsic values (Palmer et al., 2014). Values have the power to ask for change. The eco-centric thought enables thinking on nonhuman life as intrinsically valuable. This thesis grows upon the premise that an ecosystem has intrinsic value and her needs ought to be considered when making environmental decisions. In order to substantiate this claim three theories are being used; Eco-feminism, the Deep Ecology movement and the Land ethic. Eco-feminism does two things for this thesis. Firstly, the anthropocentric thinking is being places within a network way of thinking, in stead of a hierarchical situation. Secondly, the definition of the terms used in theories on ecological issues are being opened up. Deep ecology provides an eight point plan wherein 'richness and diversity' are the core values to evaluate nonhuman life. This plan will be hold against the concept of the urban ecosystem to validate the theory. The Land Ethic centralises the community humans take part in. Only by taking care of the whole community good living for humans can be possible. This idea is one of the main aims of the urban ecosystem: To see the city as a place wherein not only humans, but many forms of life together reside and have the right to flourishing. The terminology and theories enable thinking on the urban from an eco-centric perspective. The three theories give the opportunity to investigate if a city from an eco-centric perspective will be a place wherein well-being for more life forms is possible, and if this will lead to a better ecological future.

First objections

Critical sounds on eco-centric ethics mainly concerns the defining what an ecosystem regards. What does fall in the boundaries and what not? Are they sufficiently cohesive and bounded (spatial and temporal) to think of them as having interests? What does an ecological whole mean, and what falls under the umbrella of communities?

The generic idea of a community of all, the whole ecosystem as a community is a problem. A taxonomy of all the different life forms and their interest will need to be made. The thesis is a thought provoking concept that is not yet to be completed. The intention is to insert the ecosystem needs and interests is what the urban ecosystem seeks to do. That the needs and interests will never all be met is taken as part of the concept, because even though the tradeoffs will never be perfect, I claim you should still strive to come closer and do better. Chapter four elaborates on these tradeoffs.

Chapter 2. The continuum; a classification of environments by the amount of human-interference

The terms ‘artificial’ and ‘natural’ in the environmental context have been defined as opposites. This idea of opposition might be obsolete. This chapter analysis the borders of environments by focussing on the human-interference and human-density in all diverse environments. Then the thesis proposes to link the borders of different environments in a continuum. The analysis of human-interference aims to change the traditional bordered concept of diversity in environments. The urban ecosystem sets out to apply values that traditionally have been used in environments with little human interference, onto the highly human dense environment of the city. The perspective of seeing all environments as a continuum enables the possibility to apply these eco-centric values onto urban environments.

Firstly, I demonstrate how artificial and natural ecosystems are divided in traditional theoretical context. I exemplify the theoretical partition between concepts with the struggle in defining the hard borders of urban environments as seen in a UN-report (United Nations, 2019). The UN report could be seen as a status quo within the environmental debate. This specific UN report writes on the urban ecosystems and their services, and is an explicit example on how hard bordering environments in these day and ages is because of human influence (ibid).

Then, I analyse how the distinction between the concepts of ‘natural’ and ‘artificial’ environments is already challenged in different domains. There is an ongoing paradigm shift trying to overcome the bordered thinking in defining environments. I use the examples of the Earth System Sciences (ESS) and the concept of the Anthropocene (Steffen et al., 2020; Crutzen, 2002). Following the thoughts in the ESS and the Anthropocene leads to adopting the idea of a continuum when discussing human influence on planetary environments. The continuum is a nuanced addition to the concepts, because the continuum asks for a study wherein the contextual differences of human influences are at the core. This more complicated view leads to a sophisticated understanding of how all environments are more or less human-influenced and allows for the urban ecosystem to adopt eco-centric values. The questions this chapter asks are; How easily are ‘artificial’ and ‘natural' environments separated from each other? At what point of human-interference does an environment become consid-

ered an 'artificial' environment? What is unnatural about an ecosystem cycle in which humans take part?

'The Divide between 'Artificial' and 'Natural'

In environmental research, there is a hard division between 'artificial' and 'natural' environments/ecosystems (Zimmerman, 1993). As seen in Fig. 1, the theoretical divide takes place in how plants and animals are present, and how their lives are shaped. A 'natural' ecosystem seems to have a circular character as the nutrients naturally cycle and the ecosystems are naturally sustainable. The diversity of animals in natural ecosystems is higher than in the 'artificial' ecosystems.

Natural ecosystem	Artificial ecosystem
Consists of many species of plants and animals	Species diversity is low
Genetic diversity is very high	Genetic diversity is very low
Sunlight is the energy source for plants and this energy drives all biological cycles	Sunlight is the ultimate energy source for plants but artificial fertilizers and other nutrients are externally supplied to the soil
Food chains are long and complex	Food chains are simple and often incomplete as other species are killed as pests or weeds
Ecological succession takes place over time	No ecological succession
Natural nutrient cycling	Incomplete nutrient cycling
Naturally sustainable	Unsustainable as most fertilizers are made from non-renewable fossil fuels, and they add to water pollution, biomagnification and other ecological disturbance

Figure 1. A theoretical divide between natural and artificial ecosystems (Zimmerman, 1993).

In the traditional sense, a 'natural' ecosystem is the result of interactions between organisms and the environment (Chapin III et al., 2011). For example, a sea is classified as a marine ecosystem and consists of algae, consumers, and decomposers (ibid). The ecosystem is a natural system because it begins with algae converting energy via photosynthesis. Then consumers like omnivores and predators feed on the algae and generate energy for and between organisms (ibid). Once the consumer dies, the decomposers turn the consumer in or-

ganic matter that keeps the water quality on the right level. This natural process happens over time and in concept does not need human intervention. The lack of human intervention is what is often seen as a ‘natural cycle’(ibid).

The modern conception of an ‘artificial’ ecosystem does not have these self-sustaining qualities and needs human assistance to flourish. An example would be a farm wherein plants and species live outside their natural habitat. Human help ensures the existence of crops and animals. In this perspective, the main difference between an ‘artificial' environment and the ‘natural’ environment is the complexity of the relations between organisms, and the environment (ibid). In question now is whether the ocean as a natural ecosystem still exists, as human influence becomes so vast all the natural cycles are influenced by human-interference as for example seen in the example of the ‘sea snot in the Turkish coastline’ (NOS, 20 June 2021) The sea snot are algae growing in such a fast manner because of climate change and pollution (ibid). Is there still a ‘natural cycle’ in such a context?

Urban environments are often defined as ‘artificial ‘environments. The UN determines cities for their human presence, cities being the places with the highest human density. Cities are places where humans work, live, and reside, and where governance, commerce, and transportation take place (United Nations, 2019). They have been built to serve human convenience. There is food, toilets, shelter, rules, transportation. Humans are the centre of policy making and their needs are being provided for (Ibid). This anthropocentric thinking is what the leading accounts prescribe. Interestingly, the UN acknowledges that defining cities depends on human presence because drawing city borders is a difficult task. The UN defines non-urban spaces as ‘rural‘ ,’wild', ‘countryside’ or ‘nature’, but also acknowledges that the divide between the ‘urban’ and the ‘rural' is a dynamic interchange of definitions and actual space and that are not at all a fixed-line (United Nations, 2018). Cities become variable when, for example two adjacent cities which might have with proper individual city centers become considered one urban area (ibid). An example being the Randstad in the Netherlands which includes several different cities but is framed as one urban environment. The UN acknowledges the traditional divide between cities and rural has become perforated, as the borders of cities expand and change (ibid). The lack of a strict border between the urban and the rural and methodologies for defining each is questioned here in chapter two, and gives the opportunity for an eco-centric analysis of the urban environments.

The analysis of 'artificial' and 'natural' environments demonstrates the importance of human-interference in defining the borders between the different environments. Defining the interference is what this chapter further unfolds, but the first step is the differentiation made in traditional environmental science between 'bad' human-interference and 'good' human-interference in the ecosystem. The 'bad' interference consists of pollution, waste, climate change, biodiversity decrease, deforestation, amongst others (Chapin III et al., 2011). The 'good' interference is what is called 'preservation and conservation' of ecosystems. In the 'good' interference humans are allowed to interfere in a natural ecosystem for the cause of its ecosystem's health. What is assumed is that ecosystems change (Hobbs et al., 2009). If the changes are novel, which historical version of the ecosystem is the one to restore to, and what if these versions of the ecosystem are no longer available (ibid)? The idea of preserving, maintaining, or restoring an ecosystem as a way of 'good' interfering, already is at odds with the idea of the natural ecosystems being free from human interfering. Humans decide what an ecosystem should be and how to preserve, maintain or restore this ideal.

Another thought-provoking step to align 'natural' and 'artificial' artefacts in the environmental debate I borrow from Steven Vogel. This environmental philosopher of the city states that in the environmentalist traditions the idea of the 'environment' it wishes to protect and conserve should include the built environment such as cities and infrastructures (Vogel, 2015). Environmentalism has been concerned with this old idea of 'nature', but nature has ended (ibid). He states when a building is demolished this does not happen in the realm of environmental damage (ibid). Demolishing a building might cause environmental consequences but is in itself not an environmental damaging action. Why is a building not a natural artefact? In stead of protecting 'nature', environmentalism could also embrace what is traditionally seen as the unnatural. The questions on the borders of the artificial and the natural artefacts immediately spark a need for deeper evaluation of environments beyond these traditional borders.

The Anthropocene

This chapter grows on the idea that different environments cannot be strictly bordered areas but exists as a continuum. This continuum divides environments for a part by the extent to

which human influence is taking place. In this continuum, the number of human interferences will determine decision-making in environmental issues. Where environmental issues are still mostly concerned with natural environments, the continuum suggests investigating these issues planet-wide. The concept that I use to break away from the traditional natural-artificial dichotomy is the Anthropocene. The idea suggests that the Holocene has been followed up by the accelerated human impact on the planet (Crutzen, 2002). The planet has entered a new geological epoch (Malhi et al., 2014). We now live in a geological time wherein humans have influenced all of the Earths environments. The Anthropocene claims no biome is free from interaction with humanity (ibid). In the Anthropocene conceptually there is no difference between walking in the woods, near the ocean, or in the city, because all environments are being monitored and managed by humans. The substantiation of this claim is illustrated by for example how air has changed worldwide, and how drones and chips monitor the population of animals in wild woods (Guardian, 2013). The Anthropocene as a concept has been adopted in many different fields and has triggered a massive amount of data, discussions, philosophical papers and artworks (Braidotti & Hlavajova, 2018).

For the urban ecosystem the Antropocene as a trend is useful. Environmentalist are forced to look beyond the traditionally framed natural environments as the Antropocene has gotten rid of the division. If the borders between artificial and natural environments are loosened, urban areas automatically become part of the environmental debate. The urban as an ecosystem suggest there is a natural and an artificial part in cities as much as there is in woods, of savannahs. The difference lays in the amount of human-interference and needs. The Anthropocene predicts an exchange between methods of concern in environmental issues is possible between what once was the divided natural and artificial environments. This aligning brings knowledge on preservation to the city planners table and knowledge about human needs to nature conservation. The nuance in how to define the human social differences taking place in the different contexts is what makes the bifurcation a continuum. The Anthropocene overcome bordered thinking on environmental issues by addressing the permeated impact of human action on the environment, and both aims towards overcoming the distinction by aligning the natural with the artificial in a non-hierarchical network. The Anthropocene aids in critically examining human decision-making skills in environmental debates.

The Anthropocene is limited defining different amounts of human-interference in environments. The continuum between environments suggests the need for a categorisation system of human-interference within varying environments. Whereas the continuum does not adopt any misanthropy or disvaluing humanity that might be found in writings on the Anthropocene but sees humans as a vital part in the defining of environments. What is adopted is the idea that all environments are some what impacted by humans. What should be measured is the co-dependence between humans, nonhumans and their environment as being done in what traditionally is called a natural ecosystem. In stead of trying to make environments absolute human managed and controlled, the urban ecosystem suggests more sensitivity to the validation of the natural components and a complex weighted understanding of the continuum between human, nonhuman and their environments.

The continuum as a classification of environments

I suggest the classification of environments has to include the sociological, or human interfering, components of an area. A qualification of environments does not end with the analysis of flora and fauna but includes a quantification of human-interference and human-density. The continuum between environments asks to also consider human density in the bordering of environments. By doing so, this way of classifying environments will include the influences humans have on all environments. The classification of human-interference could start with the ordering of the human-density. The human-density in, for example, places regarded to as 'natural wonders' is extremely high, and therefore their level of human-interference is also high and defining and should be taken in to considerations when classifying environments. Because how 'natural' is an environment such as the Wadden sea, if millions of tourists walk there every year and a invasive infrastructure is built for humans so they can enjoy? This example shows a different bordering will happen when human-interference is taken to be part of the classification of environments.

Conversely, the way in which human-interference takes place will also be part of the classification of environments. For example the extent to which humans have domesticated and cultivated flora and fauna, or the amount of technological manage and control is applied. These categories that form the continuum between environments will need more and exten-

sive research which is beyond the scope of the thesis, but a start of a classification of environments is done in Fig 2.

Human-interference in environments
1. Human density
2. Domestication and cultivation of flora and fauna
3. Technological interference
4. …

Fig. 2: Human-interference as part of the classification of environments (a first attempt)

The classification human-interference in environments makes space for the bigger goal of the urban ecosystem that is to incorporate ecosystem's values in the environmental debate on the urban environments. The urban ecosystem evaluates the highly dense spaces of the urban with the values of a less dense spaces, and prescribes that eco-centric thinking should be incorporated in the unilateral anthropocentric decision-making in urban areas, for the inclusivity of human and ecosystem's interests.

Chapter 3. The urban ecosystem

Chapter three examines the concept of the urban ecosystem. The urban ecosystem eliminates anthropocentric favouring when making decisions in urban environments by adopting an eco-centric perspective. In the urban ecosystem humans will be one of the species that have to sacrifice for the interest of the ecosystem. What this chapter shows is how anthropocentrism is wrong in evaluating humans as the only beings with intrinsic value. I argue that an ecosystem has intrinsic value such that gaining the ecosystem's health justifies decreasing the interest of human individuals.

Chapter three is constructed into three parts;

The chapter starts with introducing the current anthropocentric prioritisation in urban areas when discussing environmental issues and what is problematic about this anthropocentric thinking.

Then, the urban ecosystem will be introduced as a counter view to the anthropocentric illusion. The urban ecosystem is a highly human dense place wherein human interests are deeply entangled but the eco-centric view assigns intrinsic value to the ecosystem as a whole. The prioritisation of human interests will be done by tradeoffs, wherein many urban life forms are considered valuable.

Lastly, the first obvious objections to the idea of the urban ecosystem are discussed. The three objections are philosophical questions regarding the validation of the concept. How can an ecosystem have intrinsic value as the ecosystem cannot think? How do you do a trade-off if the ecosystem cannot voice itself and is always in need of human interpretation? The last section of this chapter tries to answer those questions.

Anthropocentric prioritisation in urban areas

Anthropocentrism dominates the general discussion in environmental issues in urban areas. I use two examples from different domains to investigate the vastness of these anthropocentric tendencies. The first example are the 'urban ecosystem services', a term coined in the Netherlands on how the use of 'natural' resource benefits human health (Gómez-Baggethun, et al., 2013). The second example uses the term 'Smart Urban Ecosystems' as a techno-ecological idea of the city of the future (Cicirelli et al., 2019). I engage in the human preference in this

approach to the urban. The two examples certify the anthropocentric prioritisation in design and policy making, that the later part of the chapter tries to overcome.

*'*Anthropocentrism*'* is defined by common consensus as the claiming of human well-being as the value that regards all other things and lifeforms to instrumentally valuable (Callicot, 1989). An anthropocentric environmental problem would solely consider the effects people create, or the resources people consume, on other people. The solution to these framing of environmental problems will be evaluated by how much they impact/benefit the human living (ibid). Other life forms will always be evaluated in the context of human needs (ibid). The question now is why the anthropocentrism is problematic when discussing environmental issues in urban context?

One example of anthropocentric thinking in the environmental debate is the trending concept of *'*ecosystem services'. This concept claims ecosystems to be important for the benefit of human life (Bolund, Hunhammar, 1999). Ecosystem services are defined as direct or indirect benefits to human well-being from the ecosystem functions (Costanze et al 1997). In this definition the anthropocentrism is seen, but the term is trending in the discussion on how to create a 'healthy, resilient and sustainable' planet and also has crossed the debate on the urban ecosystem services (Gómez-Baggethun, et al, 2013). The ecosystem services' are an example of an anthropocentric vision that leads to favouring humans by the cost of other lifeforms needs, in stead of understanding the extent to which human population is dependent on the quantity and quality of natural resources to sustain (Borgström, et al., 2013). The services to human needs include indirect services such as the pollination of plants, next to the direct services such as rainwater drainage (Bolund, Hunhammar, 1999). The question this concept tries to answer is, how could the natural resources in urban areas be increased for the benefit of human well-being (ibid)? This quest to reconnect the biosphere with the urban seems aligned to the goals of the urban ecosystem but they differ in their tenacity to keeping human flourishing always centralised.

In the urban as a human service, the evaluation of the opportunities in the urban is measured along the lines of 'cultural values, health benefits, economic costs, and resilience'. (Gómez-Baggethun, et al, 2013). Ecosystem services frame natural components of built ecosystems as servicing human needs, and by doing so it instrumentalizes the intrinsic needs

of other than human life forms. In stead, humans are dependent on the ecosystems health to thrive (ibid). For example, from an ecosystem services perspective, deforestation would cause for poor air-quality and therefore regrowing trees is an important endeavour. The conclusion is not wrong, but the premise excludes for trees to have value in itself. Trees, in an ecosystem service perspective, are limited to how they serve human needs for better air quality. If there is no human incentive, the ecosystem services will not proceed, but a tree has much more qualities than providing clean air. A tree is a home for birds, holds food for birds and insects, as well as the trees is a place for shade for the plants living next to their roots, and adds nutrients to the soil it lives in. If the tree would be depreciated to the bare minimum of its service to human needs, oxygen machines might soon get rid of their function. A tree is a vital part in the network, the ecosystem, of dependencies, and therefore has value far beyond the instrumental evaluation done by the trend of 'the ecosystems services'. By showing this example the oversimplifying tendencies of human-centered thinking becomes visualised. This oversimplification is a topic that will return at different moments in the thesis, as it is an important consequence of limiting urban design to anthropocentric needs.

Another example that demonstrates how anthropocentric prioritisation in technological innovation cause limited outcomes is the concept of Smart Urban Ecosystems (SUE) (Cicirelli et al., 2019). The urban rapidly changes due to technological innovation (Amin & Thrift, 2002). Cities have become a chain of metropolitan areas connected by infrastructures such as wifi, airports, asphalt (ibid). SUE connects the techno-ecological influences by combining the Smart City with ecosystems (Cicirelli et al., 2019). SUE uses a holistic way of thinking on to define how the future smart city will look (ibid). Smart Cities are defined under six axes: 'smart economy, smart energy, smart mobility, smart environment, smart living and smart governance' (ibid). The Smart City uses ICTs to optimise the 'efficiency' and 'effectiveness 'of useful and necessary city processes activities and services (ibid).

As seen, the SUE's are highly concentrated on human needs. The SUE's values are 'efficiency' and 'effectiveness' next to prioritising transportation, energy, education, health and care, utilities, for humans (ibid). The SUE's do state to adopt problems from a techno-environmental perspective, as a SUE redesigns the relationships between government, private sector, non-profits, communities, and citizens, but in defining their citizens they neglect that there are more than just human citizens. This thesis embraces the technological character of

the urban of the future, but distances itself from the core values of of ‘efficiency’, and ‘effectiveness'. An urban environment full of life and structures does not simplify into these two values, and the concept of SUE’s favours humans in this definition of citizens. Again a simplification of the complex network of dependencies is being done to come to quick and solvable problems and solutions. If a concept for future environments wherein many lifeforms live includes only one of the million species present, then the theory can never uphold its premise. As said, prioritising human needs in this way simplifies the complexity of a city. Therefore, the anthropocentrism in the SUE’s limits its value in organising the cities of the future. Instead of proposing a way of designing the city of the future as one of ‘efficiency’ and ‘effectiveness’ , the use of processes and services in a techno-ecological urban space should embrace a whole array of needs and values, starting with the Deep Ecologists’ ‘richness and diversity’ of an urban environment.

The two examples are just a scratch on the surface of the simplification done bit anthropocentrism when researching the city and its environmental issues. Although a greater discussion is always welcome and needed, I now deviate to offer a counter perspective on how to define the quality of life in urban environments from an eco-centre perspective.

The urban ecosystem

The urban ecosystem takes part in the research and design for healthy futures of cities by introducing an eco-centric perspective when discussing environmental issues in the urban. The urban ecosystem builds on the traditional eco-centric thoughts, but differentiates in its allowance of partial anthropocentric prioritisation. The the high human-density makes human needs important, but the urban ecosystem at the same time emphasises on the need for a sophisticated consideration of the intrinsic values and needs of the whole ecosystem. In the urban ecosystem humans take part in a network of dependencies between all sorts and forms of life, and they are subservient to the health of the urban ecosystem.

To understand the concept of the urban ecosystem I have divided the concept into four parts. All four parts lead to understanding an urban environment as an urban ecosystem.
The concept of the urban ecosystem starts with the value-leadenness of the term ‘ecosystems’. The values give meaning to the term and open up interpretation. A contemporary definition of urban areas aids in overcoming the simplification in the anthropocentric

understanding of urban environments. I apply the eco-centric values onto this contemporary definition of the urban and the value-leaden term ecosystems. This rounds up the definition of what an urban ecosystem entails. Then, lastly, I lay out the human responsibility of living in the urban ecosystem.

Ecosystems

To understand the urban as an ecosystem, the term ecosystem needs further defining. A couple of circumstances when talking about an ecosystem are important to point out.

First of all, the term 'ecosystem' is value-leaden by the way the term is constructed to make sense of the world around us. In general understanding, ecosystems are a way to interpret environments as integrated complex communities, wherein there is a co-dependency between all parts of the biotic pools, the abiotic pools, and the fluxes/flows of materials and energies (Chapin III, et al., 2011). As stated in chapter one, the variable factors structuring and controlling an ecosystem are proposed to be the climate (1), the present materials (2), the topography (3), the potential biota (4), time (5), and human activity (6) (ibid). A healthy ecosystem consists of constant tradeoffs between these six factors and how they impact each other. This definition is the basis on which the urban is defined as an ecosystem. A place of research and design wherein these six axes are constantly considered and measured. Already its seen that human activity is one of the axes, but not in a hierarchical order. Ecosystem research integrates human intervention into the assessment of species well-being. The health of the urban ecosystem depends deeply on the way this human influence is taking place. Even though traditionally ecosystems are 'natural' environments there are little to no theoretical restrictions on why an urban environment could not be defined as such, this has been shown in chapter two.

What is also important to note is that ecosystem research, historically, always had normative tendencies. The term ecosystem was coined by Tansley a British terrestrial plant ecologist in 1935 (Golley & Slobodkin, 1994). His understanding came with a great deal of interpreting what you see. He proposed a holistic and integrated ecological concept combining living beings with their physical environments into a system (Golley & Slobodkin, 1994). Tansley's concept states the more stable the system is the most likely it is to persist (ibid). How and what the stability is build of is what the ecosystem researchers need to define. This

finding of an equilibrium, again, requires tradeoffs between needs. When humans influence an ecosystem, they influence the stability and make direct choices on behalf of the ecosystem's equilibrium. Urban policy makers and designers, when defining the urban as an ecosystem are therefor ecosystem researchers that influence the equilibrium of the urban ecosystem.

Lastly, I point out how ecosystem research traditionally already speaks of 'active communities'. Kerner in 1897 used the term 'community' to describe the interrelated connections between all parts of the environment (Chapin III, et al., 2011). Also, John Phillips (1931) emphasised in his career as an ecologist on combining both animals and plants as members of the structures of communities (Golley & urbanising, 1994). To study these relations in a holistic way, he stated, will elucidate companionships by individual organisms living in a shared habitat (ibid). Companionship is a virtue, because companionship enables prioritising, and moral justification of behaviour (ibid). The bond between two entities under the name companionship conceal a sense of relationship (ibid). Relationships are a value-laden connection wherein entities care for each other.

It is important to understand that the network of dependencies in a form of a community is in the core of defining the urban as an ecosystem. How this communal thinking functions will be later analysed in this chapter.

The urban

The urban ecosystem is not just an ecosystem, it is also an urban environment. Therefore a sophisticated understanding of urban area's is needed. The urban has been researched in many ways, one of which is the Philosophy of the City research group. This research group sees arising conflicts in competing visions on what the urban environments. They envision their goals in threefold. First of all, they develop accurate conceptions of the city and/or aspects of urban life. Next to that, they analyze the taken-for-granted assumptions in form and function, and they create a new structure and future meanings (Philosophy of the City, 2020). In this context, the urban ecosystem arises. The urban ecosystem falls in the goals of the PotC research group to take the city as an object of study and investigate her political, social, epistemological, metaphysical, ethical, and environmental dimensions beyond data in a broader sense. The research is vital in our vastly urbanising world.

Defining a city as an urban ecosystem overcomes anthropocentrism in making policy and design. The definition of a city as an urban ecosystem centralises the interdependencies between organisms and environments, because the character of cities is 'pluriverse', to borrow William James's (1975) phrase (Amin & Thrift 1993). Reframing the urban as an ecosystem will centralise questions regarding the dynamics between different life forms in the urban area. From an eco-centric perspective, the city will become a place for complex living, beyond human needs, wherein a resilient future for all is enabled (ibid). Amin and Thrift approach the term city as highly relational, as there is no base or structure (ibid). Their definition seems to be open and dynamic. Conceptualising the city to understand their 'traffic, exchanges, and interactions' (Ong, 2009). This dynamic, open concept of a city gives room for a new non-anthropocentric perspective, leading researchers away from the aforementioned anthropocentric simplistic tendencies.

Health

A 'healthy' urban ecosystem is the main aim of this thesis. The 'urban' and the 'ecosystem' have been defined but the value of 'health' still need clarification. The term 'health' usually deals with 'human health', and solutions prelude human-rights, interests, and needs, first (Ghebreyesu, 2017). The urban ecosystem demands an eco-centric account of what 'health' is.

The human-centred definition of 'health' is what the World Health Organisation (WHO) defends as 'a state of complete physical, mental and social well-being, not merely the absence of disease or infirmity, and as a human right' (WHO, 2015; Ghebreyesu, 2017). This means. to be pain free but at the same time being a sad, or lonely person, should be able to get help to move forward to the intended state of 'health'. This definition justifies every form of healthcare because of the human right to obtain the complete status of 'being healthy'. This definition is anthropocentric and, therefore, not immediately useful for the urban ecosystem. In an attempt to apply the WHO definition in an eco-centric manner, the definition would mean that the whole ecosystem has the right to 'well-being' and degrading this well-being could be an act against a basic right, even in the cause of decreasing human standards of living (also see chapter four on tradeoffs). This eco-centric interpretation of the WHO's definition explores different ways of living. Why is this different definition of health impor-

tant? Glotzbach and Baumgärtner (2003) claim human freedom will be declining through issues of environmental change. Already the impact of climate change on human health is seen in the news on a day-to-day basis (ibid). Humans are still widely perceived as an indestructible force, and technology as the way to move forward (ibid). By keeping up current strategies and policies in the context of anthropocentric thinking and promoting human health over the health of the ecosystem, the most important overarching concept seem to be forgotten; Human health is dependent on a healthy planet (ibid). And in this context it is important to state that the WHO definition does not lead to health of humans as it does not lead to a healthy planet. For example hospital are demanded to become more ecologically sustainable by reducing their carbon footprint, without questioning how a hospital should function ecologically (Worldbank, 2017). Maybe an ecological hospital would mean a whole different infrastructure of health care.

The paradox of health in the anthropocentric conception is outdated, and an inclusive eco-centric definition might be the way forward. The eco-centric concept of health is based on the idea that when health gains, the environment flourishes. A better environment is a better health. To reach this goal health should involve every citizen to adopt watchful attention to the environment (Spence, 2012). Adopting and partaking in ethical responsibility has to be an active part of every human citizen, policy makers could aid in providing the right information, and design and education should focus on eco-centric solution to issues of health (ibid). Applying the eight point plan of the Deep Ecologist movement on this new definition of health, (addendum 1), suggests the overall life quality should be appreciated and, when discussion the standard of living, their should be a profound awareness on the difference between ‘more’ and ‘good’. In stead of wanting more human quality of life, a good quality of living should be the main aim. An eco-centric definition of ‘health' means aiming for an equilibrium wherein as little as possible harm is done to the species and plants living in this environment.

This thesis does not fully adopt the traditional eco-centric ideas on benefiting the planets health over human health, because these definitions have shown to be highly misanthropist and controversial. For example, the Deep Ecologists suggest controversial things such as: limiting human birth numbers, making health-care age appropriate, or controlling meat intake, amongst others (Naess, 1993). The urban ecosystem does not follow this line of

thought because the highly human-dense nature of the urban ecosystem proclaims a high human-interest. The urban ecosystem does not exclude humans to loose in a tradeoff for the benefit of the ecosystem, but will always try to find win-win situations.

The healthy urban ecosystem

As stated before, the urban ecosystem grounds in the idea that only in a healthy ecosystem, individuals can be healthy. As Rolston (2012) argues, people and their earth have entwined destinies, because our integrity is inseparable from the Earth's integrity (Rolston, 2012). The Earth is not a place we can outgrow, or rebuild completely to our human likings. It is the ground of our being (ibid). The urban ecosystem will give humans living in these environments a comprehensive philosophy that could deeply affect the way they live and how they take care of their surroundings, and gives designers and policy makers the opportunity to overcome their simplistic anthropocentric tendencies. The eco-centric perspective might lead to more integral solutions benefiting the equilibrium of the ecosystem and by doing so the concept benefits all individual life. The eco-centric values lead to a set of core values. From these core values the equilibrium can be reach. The values are based on the eco-centric theories introduced in chapter one. I describe the core values of the urban ecosystem as:

- Humans acknowledge their interdependencies between humans, nonhuman animals, and plants living in the urban ecosystem.
- Human and nonhuman life is part of an ecosystem.
- Ecosystems and all of her components are considered to be intrinsically valuable.
- Human and nonhuman needs are being proportioned in tradeoffs serving the ecosystem.
- Human density explains prioritising human interests in the urban ecosystem, but do not give exclusivity towards human needs.
- Designers and policymakers actively need to consider nonhuman/ ecosystem needs.
- Instead of controlling or managing the urban system, humans are empathic to their interdependent place in the network of dependencies.

The attitude for humans living in the urban ecosystem

The urban ecosystem also researches how to form an engaged community in which interaction and a sense of responsibility for humans are at the core. The old concept of cities serving human needs is being transformed into a concept that invites other life and animals to live and be happy in the urban environments. Together with designers and policymakers, human citizens can improve the ecosystem's health wherein all lifeforms have the change to flourish. How to become a human citizen of the urban ecosystem starts with understanding our relations with the environment. Relations are used as in Haraway's interpretation of a citizen being an 'active participant in determining the relations, not a passive dissolved and defined by others is used. The relations within the urban ecosystem are by choice and therefore the human reasoning on this relation is important. We recognise both kinship and difference, that is mutuality (Benjamin, 1988).

> "The relational self gives respect, benevolence, care, friendship, and solidarity a place within the ends of the primary self. A movement beyond the self/other dualism, beyond nature/culture dualism, makes more sense and leads to incorporation beyond denying differences. Individuality conceives as mutuality bound by the interaction between others through self relationships" (Haraway, 2016, p.155).

In other words, we need nuanced and loving relationships with life in the urban ecosystem for the sake of the ecosystem and in those terms also for the sake of ourselves.

Responsibility, or as Haraway states response-ability, is an important value in shaping conditions for multi-species flourishing in urban environments. The urban ecosystem begins with the idea that if humans start considering the interests of other life and the ecosystem more, other animals will be more welcome and safe. Haraway's response-ability is about remembering who does and who lives, absence, and presence (Haraway, 2016). If we make sure humans have encouraging spaces to have a good life in, they will have space to enable others to have the same. Haraway's response-ability asks us to look to how we relate with other sentient beings (ibid). Do we ought to encourage birds living in the urban by taking fewer pet cats, or giving the cats less freedom, or do we just build more places for birds to live? Why is a healthy bee population necessary in a city? And if we agree a healthy bee pop-

ulation is necessary, do we need to take out streets to plant flowers wherein bees can eat and reside? When is a street for cars more important than a green space for bees? And what about the rats and mice? Cockroaches? If they are infectious and dangerous species for human health, are we allowed to get rid of them? As urban ecologists how would you answer the question does maintaining provide richness and diversity? And if not, how can we plan and behave more responsibly?

A human citizen living in the urban ecosystem needs 'awareness' and a sense of 'responsibility' towards its environment and the others living in the environment (plant or animal). But how to behave in a responsible sense? Plumwood calls this 'caring for a relational paradigm of Selfhood' (Plumwood, 2002). Her relational approach gives the welfare of others part in the desire for your welfare and compassionate goals become the main aim (ibid). The Self as a closed system is, according to Plumwood, a misleading and impoverishing dimension of social experience. As an example the mother is mentioned, and how a mother will always centralise the child's flourishing as part of her desires. This idea of being part of the flourishing of others brings forth concepts of 'care', 'solidarity', and 'friendship'. These concepts change instrumental relationships into non-instrumental solidarity, which are the grounds for action and choice (ibid). Every citizen should think for themselves to what extent her surroundings with all its life is worth sacrificing for, and to what extent a healthy ecosystem benefits more than just the ecosystem, but also her children, friends, and in the end herself.

The topics of green and sustainable futures of cities are trending. So has Toronto adopted the City of Toronto Green Roof Bylaw (Biophilic cities, 2012), and Munich has a flock of sheep using their Englischer Garten (Muenchen, *unknown*). Citizen initiatives under titles such as green urban initiatives, or bottom-up strategies and participatory approaches are rising in number all around the world, and urban farmers are growing in numbers (Hassink et al., 2016). Relationships between green urban citizens' initiatives and local governments (Jans, 2021). Changing environmental behaviour from the bottom-up: The formation of pro-environmental social identities (Nicolin, 2017). These trends show a possible willingness by human citizens to change behaviour which is encouraging for the initiative of the urban ecosystem. Also, the Guardian reported how Frans Timmermans warned us older peoples need to make sacrifices for the climate crisis in the near future (Guardian, 30 April 2021).

Citizens of the urban ecosystem will have to become empathetic and conscious of these questions of growing and maintaining a healthy ecosystem. When people consciously live in an urban ecosystem, possibly tradeoffs will be easier. By intrinsically evaluating their choices in the context of the health of the urban ecosystem, personal tradeoffs will become part of the day-to-day life of citizens.

Preliminary objections to the concept of the urban ecosystem

The concept of the eco-centric urban ecosystem has many hooks and eyes. The validation of the concept has yet to be done and there is a strong need for more researchers and designers working on and with the concept. Two main objections arise;

The first objection: The theory of the urban ecosystem does not uphold in the practical world, because, firstly, we multiply values and do not have a clear idea about the tradeoffs. The multiplicity of values will lead to incommensurable values, and therefore there is no way to make this into a useful policy making tool.

Response; Yes, that is the case. The ecosystem and all its forms of life will need representatives and this is far from ideal. However, to acknowledge the intrinsic value of the ecosystem will change city planning and design. Even though perfection will never be reach, aiming to do better is still more than doing nothing. Chapter four extends on this answer.

The second objection; It is a naturalistic fallacy to say we ought to further the health of the ecosystem. Simply because there is 'natural' dependency that does not mean that it is good. How does the urban ecosystem respond to the fallacy that because gaining the health of the ecosystem is 'natural' it is 'good'?

Response; Urban ecosystems are nor natural, nor unnatural. The concept is a specific domain that derives on different dependencies and does not grow on the sharp distinction. To say what is natural is good, does therefore not count for the urban ecosystem. Next to that, the point of ecosystems is not to remain ecosystems for ecosystems sake, the concept tries to further certain kinds of values in current debates on urban environments. As shown in this chapter, talking about an ecosystem is a value-laden conversation. Ecosystems are a way of organising certain values in a different way than what happens in the current anthropocentric de-

bate. Looking to an urban ecosystem allows us to see certain values that we would not ordinarily be able to see. We are not moving from what the urban environment is to what it ought to be, but the urban ecosystem enables us to see the way the world is more clearly.

Chapter 4. Tradeoffs in the urban ecosystem

In chapter three we saw how the urban ecosystem revolves around the aforementioned tradeoffs when making decisions for urban planning and design. The tradeoffs are decisions made in the urban ecosystem between human-centred and ecosystem-centred needs and interest. The incorporation of eco-centric needs and interest is aligned with the obviously present high human-density. By making tradeoffs the urban ecosystem distinguishes herself from all compassing anthropocentric prioritising, but also from hard eco-centric prioritisation. The tradeoffs in the urban ecosystem aim to make well advised decisions with the consideration of both human and nonhuman needs. The tradeoffs are the practical outcome of the theoretical concept of the urban ecosystem. The allowing of human favouring in context of the high human density makes the tradeoffs applicable. Chapter four questions: How much will humans need to sacrifice, when a healthy ecosystem is the main aim? What can humans demand in terms of sacrificing animal interests when they come into conflict?

In general, chapter four gives an account on how evaluate the interests of the ecosystem in the urban environment, because even though human interest are still leading in the urban ecosystem the thesis claims other than just human interests should become part of every urban design and policy decision to reach environmental goals.

This chapter is build up in two parts;

The chapter starts with an investigation of the operation of conducting tradeoffs, by using the proportionality principle. This first part shows the different forms of tradeoffs and how to evaluate them. The second part, exemplifies the tradeoffs and forms a deeper understanding of eco-centric values in the urban ecosystem derived from these tradeoffs.

Eco-centric tradeoffs

Ecosystems need to be defined by the relevant moral relevant interest at play. In denying the moral interest when discussing ecosystems, no healthy ecosystem could be reached. What is a mistake in the eco-centric value system is the equalisation of human needs towards nonhuman needs. In the urban ecosystem adaptation of eco-centric values enables the interest of other species and plants to become part of the debate wherein no interests are neglected, but human favouring might still exist. In the urban ecosystem tradeoffs are deliberately done. Human favouring will still be possible but with a conscious mind about the cost for the

ecosystems stability. The proportionality principle states there are rules you can set up for understanding all decisions we make have good an evil consequences. The value of fairness is the one that is at the centre of all these tradeoffs. The urban ecosystem discloses how unseen tradeoffs are being made in current city design and policy making and gives awareness and direction on how to make good tradeoffs. Firstly, it is important to state that tradeoffs are constantly being made in city design and planning and have been made since humans started influencing their environments. What is new about the tradeoffs in the urban ecosystem is the awareness and direction the concept gives because the main problem with the urban tradeoffs is that they are often done without a conscious choice unlike the more hierarchical anthropocentric tradeoffs. Human needs are flourishing while ecosystem's needs are confined. There are many examples in which a tradeoff falls into human favouring; When building new houses on empty lots where animals and plants live, or when constructing highways for animals not accessible to cross. The vast anthropocentric prioritisation leads to degrading or even neglecting nonhuman needs. As discussed, the consequences of this anthropocentric prioritisation are broad, from the declining biodiversity to climate change, and do not lead to a healthy urban ecosystem. In order to have a stable urban ecosystem, the urban ecosystem proclaims human will need to make sacrifices too. A misunderstanding in most anthropocentric environmental debates is that humans will be able to not sacrifice anything, and their green, sustainable goals will still be reached. This is a farce that no longer upholds (BBC, 2020). Therefore, I claim a different approach to these tradeoffs is urged wherein a deliberate choice on sacrifices will be done for the greater good, the health of the urban ecosystem.

There are different stages of tradeoffs. The first and most easy stage is when a tradeoff has a **win-win** outcome. In these best-case scenarios, interventions will have a positive impact the health of the urban ecosystem and on human well-being. These win-win interventions should be un-negotiable. An example might be decreasing the amount of air-pollution by planting more trees, or cleaning toxic soil before building anything. These example would not only benefit humans, they benefit the whole urban ecosystem. In this scenario, the human and human and nonhuman interests are aligned. There is no favouring of interests in this scenario.

Then there are cases in which there is an unequal outcome and one or more parties will have to sacrifice something for the health of the ecosystem. I propose to look at those situation in two different scenarios;

1. The first scenario plays out when there is an unequal outcome but it is a questioning of **survival or flourish**. This might be the most basic tradeoff. Because to the questions: Is human flourishing worth animal distinction? Does human flourishing extend above the existence of other life-forms? The urban ecosystem will always answer: No. In a case of a survival or flourish situation, the human need will always loose. There are great amounts of examples in which human needs, sometimes literally, kill off the place of habituation of others. In the Netherlands there are rules and regulations on wildlife protection and tree preservation, but still in many cases nonhuman life forms have to make way for human progress, for example when Tata Steel builds a dune with contaminated residual material (Wesseling, 2021).
2. Then there are situations where there is a **genuine conflict** between human and nonhuman interests. This calls for a deliberate tradeoff between humans, nonhumans and the ecosystem's needs. In this context, the eco-centric approach would state that all actants sometimes sacrifice. To make these tradeoffs ecologists need to be incorporated into the system of design and decision making. The principle of proportionality might aid in making the urban tradeoffs where there is a genuine conflict. The proportionality principle talks about the relation between ends and means (Hermeren, 2012). The general idea seems to be that the relationship should be 'appropriate' or 'adequate' (ibid). Hemeren states that it is foremost important to make explicit what is taken for granted in the context of choice. In defining the tradeoffs in the urban ecosystem the moral principle of proportionality is helpful as a guide in decision-making (ibid). The principle demands to recognise that people in different situations make different choices. If there are no guidelines on how to decide ecocentrically, the chances are great that anthropocentric decision making will stay to be mainstream. The theory is not always conclusive but raises awareness to the context-dependent reactions between means and ends (ibid). The start of an ecocentric guideline for decision making is done in chapter five, but I want to illustrate how the proportionality principle works by using an example. In an eco-centric line of thought zoo's are considered outdated, because they serve human pleasure (which is bad) and the animals live in a cruel

and degrading manner. The eco-centric line of thought might lead to this ideal of a tradeoff wherein the animals win and are being let free from their cages. In concept this idea sounds promising but in a practical sense this idea will no uphold. The zoo is not a structure that could just be dissolved without looking at the consequences for both humans and the animals. An ideal tradeoff for the zoo's of the future would be investigating what parts benefit the ecosystem, such as education for humans on animals life, and for what parts a different approach is needed, for example bigger cages, or scaling down breeding programs. The proportionality principle aids in the discussions about making these conflicting tradeoffs.

Two more examples for tradeoffs in the urban ecosystem: Birds and rats

I illustrate the concept of tradeoffs in the urban ecosystem by two examples. I use these two examples to deepen how living in the urban ecosystem as a nonhuman animal would be, because the objection from chapter three, humans cannot know how animals feel, still upholds. For the urban ecosystem to flourish into a healthy equilibrium a great deal of work on understanding nonhuman interest still needs to be done. These two examples are a preliminary attempt to incorporate thinking on the ecosystem when discussing urban environmental issues

The first example looks at what the urban ecosystem could learn from the policies made in other ecosystems where human and nonhuman animals and plants' needs are preferred. In this example I chose to investigate the ecosystem of the Dutch natural parks. Every year the national part shut down for a couple of weeks because of the early breeding seasons for birds (NOS, 03-03-2020). In this case humans are sacrificing for the needs of birds, because humans are not even welcome anymore because of their intrusive presence. In an urban context this ought to happen too, but completely closing the city of for humans because of the breeding systems might do more harm than good. Where should all these people go? And what if they do no leave? A genuine conflict arrises. An eco-centric account of an urban breeding season might still be preferring bird needs over human need, as the bird breeding might be more important than human needs at some point, but the urban ecosystems would not recommend to close down the city for the breeding season. The urban ecosystem tradeoff would look into keeping the bird population growing because deep ecology states human partaking in animal needs is not only necessary but ought to be obliged (Point 8 of the addendum

1.) (Naess, 2009). Measure will need to be taken to make sure there are enough birdhouses, enough green safe spaces for birds by still keeping human living in their houses possible. In the case of birds, the urban ecosystem perspective might suggest keeping pet animals such as cats inside while the birds are breeding, because in the Netherlands alone they kill between 17 and 200 million birds a year, and small new birds are even more unsafe (NOS, 13-09-2020).

The second example reframes the thinking about pests and in particular rats in urban areas. Rats are seen as pests that need to be exterminated. Rats do well in living together with humans (Guardian, 20-09-2016). They live in human shelters such as houses, warehouses, barns, shops, office buildings (ibid). Rats eat pretty much anything, they are not picky, and they nest in dark man-made places without predators. Therefore, in the context of an anthropocentric city wherein human interests are favoured, rats will be favoured too. Human well-being make rats present in big numbers (ibid).

There are multiple ways to control the problem of rats in the city, but extermination by poisoning is the main way to go in the anthropocentric approach to the problem. From an urban ecosystem perspective, the diversity and harmony of the community are off when the rat is over-represented. So the idea of having rats in a city is not wrong, but the amount of the same species might have to be controlled for the sake of a stable community. To come to the desired equilibrium solutions such as natural predators, or birthing control come into play. The aim is to understand the city as an interconnected place, so if the interests are differently divided, the concept of rats as a big problem may also change. From a land ethic perspective, the rat population should tell us something about the state of the context. A huge amount of rats shows there is a lack of some sorts. The land ethic deals with relations between humans with the animals and the plants they share soil with, and in applying this to the urban ecosystem the integration has not been done well. The rats are an example of the state of the living community in a city. From a land ethic perspective, humans do have the moral obligation towards the whole community to make good living possible and the urban ecosystem aligns with this conception of the community. If rats poison the soil, a solution within the community ought to be sought. We do not want as many rats as could possibly come into being, but we want a good amount of rats that is appropriate to a city. The tradeoff will lead to organising the life of rats differently without putting them in the box of ‘pests' destined to be exterminat-

ed. In stead there should be search for ways to discourage rats procreation by creating less living space and enough predators.

At the core of the urban ecosystem lays the inclusion of nonhuman interests as independent from the usefulness towards human purposes but as intrinsically valuable. The evaluation of the nonhuman interests reaches beyond the human moral interest in animals and plants. The urban ecosystem will always strongly advocate for a city in which healthy living for animals and plants is recognised as a core value. For the future of the urban ecosystem, practical design principles such as a route planner will have to be made to enable partaking for policy makers, designers, and citizens. The ideological change is mainly that of appreciating life quality (dwelling in situations of inherent value) rather than adhering to an increasingly higher standard of human living. The practical change in the long run will affect economic, technological, and ideological structures. The resulting state of affairs will be deeply different from the present and will make possible a more joyful experience of the connectedness of all things (Addendum 1 point 6) (Naess, 2009)

Chapter 5: The urban ecosystem design principles, and living in the urban ecosystem

Chapter five seeks to be thought-provoking in how the urban ecosystem is applied. The application of the theory is done in a practical sense, with the eco-centric urban design principles, and in a more imaginative search for a good way of designing for the urban ecosystem. Until now the thesis has given a theoretical framework of the values in place when adopting an eco-centric perspective on urban issues. Chapter five discusses the practical consequences when designing for an urban ecosystem.

Firstly, the chapter draws out a first version of what eco-centric urban design principles might entail by designing an urban ecosystem's road map. The aim is to make the normative eco-centric value-system discussed in Chapters three and four, applicable to the cities we live in so that the urban has the opportunity to become a more healthy equilibrium.

Then, a side-by-side case analysis studies the positive outcomes when the eco-centric thought is used for practical application. The first case consists of the restructuring of the no-mans land surrounding ring motorways, done by the architectural firm 'open fabric' in Rotterdam (Open fabric, 2013). The second case it the megalomanic concept of Feyenoord City, an area development project involving a soccer stadium and the surrounding neighbourhood Feyenoord City, 2021).

The eco-centric design principles

For he urban ecosystem to become a valuable theory in the design domain, the underlying principles should be clear and applicable. Beyond the ethical and philosophical considerations on how an urban ecosystem ought to be, the theory needs to be practical and adoption by design experimentation needs to be done. The urban ecosystem as a concept will only become worthy when it is applied, because the theory speaks about real-life environments. Therefore, there is a need for a general framework on how to do eco-centric design in urban areas.

Literature research demonstrates there are no eco-centric design principles formulated or agreed upon yet in the urban design domain. I use the approach of Design Research as a guideline for the first attempt to formulate Eco-centric Design Principles (EDP). What is ap-

pealing about Design Research is their necessity to investigate a subject before a solution is proposed (Badke-Schaub et al, 2005). Where other design approaches lean to the fast and economic solutions, Design Research opens up possibilities for longer periods of analysis before the actual making takes place. This approach appeals in the context of the urban ecosystem, because the tradeoffs ask for deep considerations as they might not always have clear-cut answers right away. Considering the needs of life that cannot speak for itself asks for multidisciplinary insights and a great amount of empathy. Design Research might later fail to be the right approach to the eco-centric design principles, but that conclusion can only be drawn when practical and theoretical design experiments have been done using the urban ecosystem design principles.

In Design Research, a good design methodology integrates knowledge that is being developed, applied, and evaluated to be meaningful (Badke-Schaub et al, 2005). Designing is seen as a human activity, involving cognitive and motivational processes (ibid). Designing is a form of complex problem-solving in an environment with numerous influences which are interconnected (ibid). To use and combine the eco-centric knowledge which derives from research in the fields of philosophy of the city, environmental ethics, ecology studies, and urban studies, I borrow this integrated research approach (see Figure 3) as proposed by Badke-Schaub et al.,.

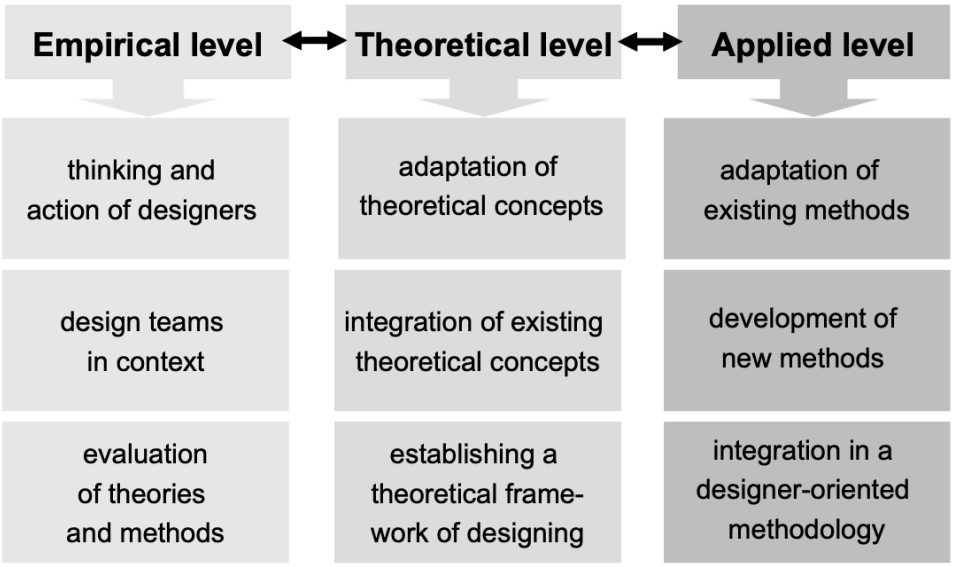

Fig. 3: An integrated research approach: synchronisation of theory, empiricism and application in design research (Badke-Schaub et al., 2005).

As said, the chosen approach differs from other design approaches by its obligation to research in the design process. This approach fits the innovative goals of the urban ecosystem as design principles. The approach is based on three interrelated columns:

1. The theoretical column: theories and theoretical concepts are the starting point for Design Research (ibid, p.29). The theories in an eco-centric design approach are partly already available, and partly will grow as the design approach grows.
2. The empirical column: empirical studies aim to evaluate hypotheses about the thinking and acting of the designers and the teams of designers (ibid, p.29). The validation sets the results in context with the designers in practice. The empirical studies oblige the designer to consider the contextual situation of the design problem.
3. The application column: the application of methods includes existing methods as well as the development of new methods (ibid, p.29). A designer-oriented methodology supporting the designer in its way of designing and is based on theories, for which the urban ecosystem could be an example.

Eco-centric city design will ask for a specific cognitive human decision-making in the design process. This specific set of values will need to be educated to students of design before eco-centric thinking in design can become a standalone design process. Different design methods will need to be developed next to the human-centered design methods as seen in Design Thinking (Ideo, 2021). To modify the design methods of a designer, their intentions will have to change. The eco-centric values will need to be adopted by the designer to have eco-centric outputs. Universities with urban design programs will have to add the eco-centric thought for both theoretical and practical experimentation and design. As the first step in adding this eco-centric thought I propose a road map as seen in Fig. 4. After this roadmap experimentation and further developing the design, principles will have to be done. What the road map shows is an easy way to familiarise yourself with the eco-centric values. The road map gives an overview of, or reminds upon, some of the vital questions for designers to ask themselves in an eco-centric design approach. The road map will provoke thoughts and discussion on how eco-centric tradeoffs in a design solution take place. These discussions are vital in growing the eco-centric urban design principles into a grown-up design and ethical theory.

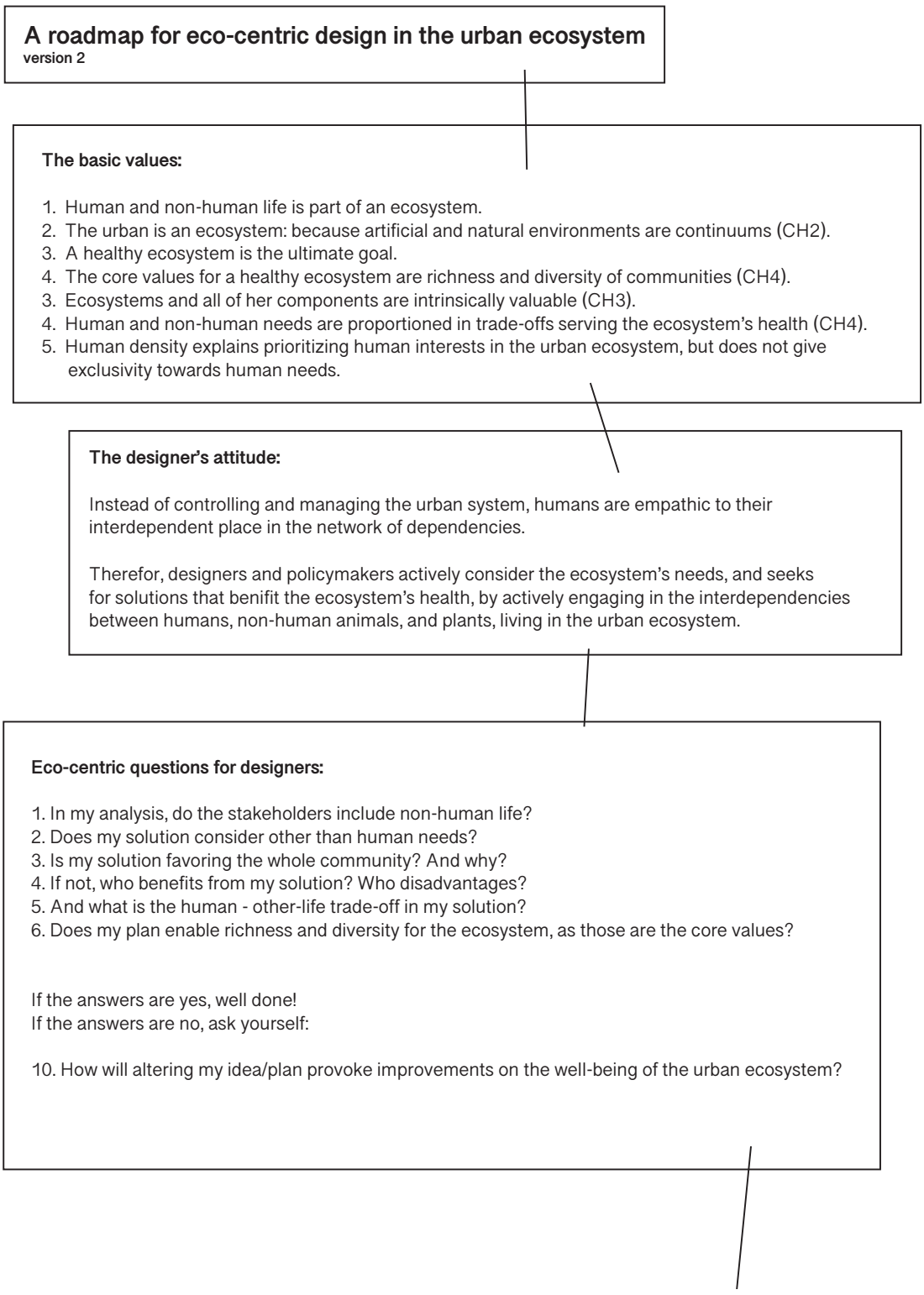

Fig. 4: A first attempt to formulate a roadmap for eco-centric urban design.

Possible risks for the eco-centric design methodology

I follow Badke-Schaub et al., (2005) who recognise at least three pitfalls when designing by a specific methodology;

1. Humans tend to reduce complexity to reduce the cognitive load (ibid). For an eco-centric approach to city design, deep and complex empathy is needed. This empathy is what Haraway calls 'companionship', which has been explained in Chapter three. I see a big risk for this theory to not be able to find designers and policy-makers willing to adopt the eco-centric methodology.
2. The eco-centric methodology will lead to complex and difficult cases, because the interest of the ecostystem's will have to be guessed and interpreted. The ecosystem is not something that speaks out about its needs, and the individual interests in the ecosystem together with the overall interests will sometimes be in conflicting states in all possible solutions. For example, if the premise is to have freedom of living for all who want to live in the city, predators such as bears will become a danger to human life in the city. When is a bear's interests more important than human safety in the context of the ecosystem's health? The theoretical ideas on eco-centric designing will cause difficult situations. In a lot of cases, an analysis will indicate there might be no solution. This non-availability of solutions will, as Badke-Schaub et al, reduce the feeling of competence and self-efficacy by the designers (ibid).
3. Errors will occur when the problem becomes more complex (ibid). The eco-centric thought prescribes engaging in a much wider pool of interests when designing for the future city. This widening of the occurring interests will slow down design processes and will enable future errors to occur as there is little to no consensus yet on how to analyse ecosystem's interests in urban design.

Side-by-side case analysis

The side-by-side case analysis is important to dignify the opportunities and tackle the risks of the urban ecosystem. Foreseen is that cities will radically change due to ecological change and technological innovation (Dobbs, 2012). How we shape these changes is what is at stake in the future of the urban ecosystem's health. In concept, the combining of techno-ecological changes could benefit the health of the urban ecosystem. To make the positive changes possi-

ble, the eco-centric value system will need to be broadly adopted, and although there are no structured design principles yet, these two cases will exemplify the consequences of anthropocentric prioritisation in designing urban areas. The first case seems to adopt the value of the ecosystem's health as a main aim, the second case does not. The analysis shows the different outcomes to the different design approaches for the well-being of the ecosystem.

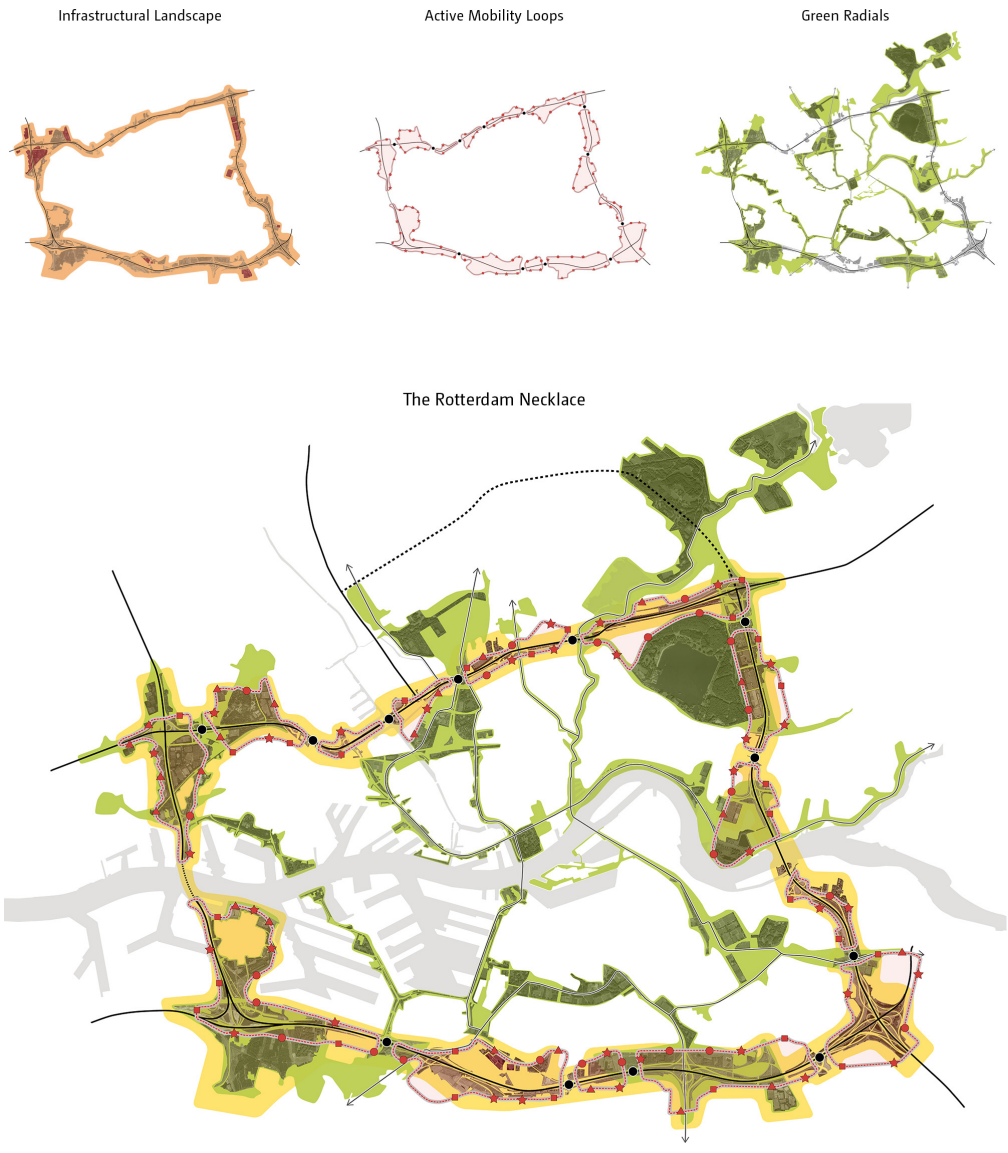

Fig. 5: A visualisation of 'The Rotterdam Necklace' by Open Fabric (Open fabric, 2013).

Introduction of the cases

The first case is called Da-Ring and is devised by Open Fabric, the Landscape Architecture and Urban Design firm based in Rotterdam [NL] and Milan [IT] (Open Fabric, 2013). Their concept starts with the ring motorways that have been build around many European towns and cities (ibid). The infrastructures often separate an inner part of the city from an external part. The highways create disturbed conditions for the spaces surrounding these infrastructures such as noise, (air)pollution, disconnection, et cetera (ibid). This disturbance has created 'no man's land', leftover spaces with no use or identity that have no dedicated function (ibid). Trends in mobility, such as smart mobility technologies, will change the typology of these spaces (ibid). The number of cars might be reduced and electric mobility reduces issues of noise and air pollution (ibid). These technological changes will dramatically improve the areas surrounding the ring roads. The Rotterdam Necklace is in its core a concepts in which leftover space surrounding the city is seen as a potential hub of green spaces for multi-species needs (ibid). The case states reclaimed spaces will enable urban but as well regional services to the whole community and not humans only (ibid). "Re-thinking infrastructural spaces can increase quality and generate opportunities for the inhabitants, while providing a larger urban and regional service" (ibid)". The inhabitants are inclusively defined and have a say in the purpose of the opened up space. As said before, in urban ecosystems all citizens live in an interdependent network wherein no hierarchy takes place. The bottom-up approach of the Rotterdam Necklace subscribes to this core element.

The second case is a megalomaniac plan to not only build Rotterdam biggest soccer team a new stadium, but while doing so also develop the whole area surrounding the new stadium. The project is called Feyenoord City. The internationally well-known architectural firm OMA is behind the plans (OMA, 2021). The core values in their so called 'masterplan' are; Community, healthy living, and performance (Feyenoord city, 2021). By analysing the Masterplan, a couple of pointers indicate an interest in ecological sustainability. For example the Masterplan has a sub-chapter on 'sustainability' in which the healthy living is mentioned. Healthy living in their determination means: promoting and facilitating an active lifestyle for young people (ibid). They do mention nature and biodiversity as one of the spearheads in the sustainability vision, but these just consist of five sentences on the new park and gardens that will be build. Concepts of nature and biodiversity are stripped down to services (nature as

human service) and green spaces (ibid). Nothing is said about living in the Feyenoord area as an animal population. The quality of the public space is guaranteed by making a lot of fun interventions such as playful stairs, places to sit and and space for pedestrians (ibid). Where and how nonhuman animals will able to live in the area is not mentioned. Living in green spaces is mentioned a lot, but in the illustration seems to be a lot of grass, and some trees and plants (ibid). The Feyenoord City Masterplan aims to bring back the river banks (ibid). The Nieuwe Maas is a tidal river but has been used as a channel for ships to come in and out. To change the river banks into soft tidal banks has ecological potential. The main values in this part of the Masterplan are accessible and experienceable (ibid). In relation to the tidal river the Masterplan aims to convince the reader because of the everyday changing landscape of the river bank.

The main problem with the Feyenoord case is what I would call the sustainable hype that designers and architects often fall into. What happens all around is that designers seem to use the container term sustainability to create a bigger audience, get funding, get people to engage. In stead of in all its complexity deal with the problem of ecological degradation and environmental change the designers chose to adopt sustainable goals in a shallow manner. The urban ecosystem as a concepts tries to open up the narrow minded thinking by repeating the responsibility designers have in creating the healthy city of the future. There is deep understanding of the responsibilities taken by being a designer needed to reach goals of sustainability. Making parks and green roofs is going about the business of designing in the same manner as before. This reduction of complexity is what I described as the first main risk. Time is always limited and precious, therefore deep investigation on the impact on the ecosystem is difficult to achieve.

The second risk is one that has no solution but therefore should not be neglected. Non-animal citizens should be part of every design process as they are as much citizen of cities as human are. The taking out of nonhuman or ecosystem's needs as a designer causes to miss a huge part of whom she is designing for. This will lead to human prioritisation and exclusivity. The first case mentions a bottom-up approach in which the whole community will take part. The second case does have a part about 'participation' in the Masterplan but does not intent to let nonhuman citizens take part in any sense. The exclusivity towards human needs will in definition lead to an exclusive human territory. Nonhuman animals will be inva-

sive exotics that will lead to problems such as pests, and nuisance. Not integrating the needs of the ecosystem leads to problems of integration for animals other than humans.

The third risk is the most exciting to overcome because it ask for creativity and courage. A eco-centric project will involve risk, as the task is too vulnerable for mistakes and the tradeoffs are too complex to be done completely 'right'. Until we as humans are able to understand the ecosystem's needs completely there will always be the problem of nuanced interpretation. In design the concepts are often so neat and tightly build that there is often no space for problems of these ecological order to arise. The problem needs to be defined, explained and overcome. The urban ecosystem does not attach to this level of efficiency, because of the problem of nuanced interpretation.

The two cases have similar opportunities but are different in their values. The first case does adopt eco-centric values to a certain extent, as it is a real attempt to create more space for nonhuman animals and natural places. The first case seeks the opportunity for city planners to think about eco-centric options by using the community including humans as their stakeholders. The second case is a hardcore anthropocentric idea. All green space and natural environmental choices are there because of values such as accessibility and experiencability. The green in the Feyenoord City Masterplan has the feeling of a marketing strategy rather than an ethical decision on what is right and wrong for the goal of sustainability. I suggest for both cases to follow the urban ecosystem roadmap as a guide to incorporate more inclusive ideas for the whole ecosystem to benefit, because both cases would benefit from evaluating their ideas from a different perspective. Even when a designer does not belief in the urban ecosystem, it is worthwhile to look at the same design from a different perspective. The second case has a lot more to gain, as it serves only human interests, but both cases will need encouragement to deepen their thought on what ecological sustainability entails, and how to reach a healthy environment.

By creating the term urban ecosystem, ideas such as the Rotterdam Necklace could become part of a movement, a bigger context wherein policymakers, and designers caring for the ecosystem's health of the city unite themselves in their shared goals. The urban ecosystem is not a fixed concept and will only grow to become valuable if great ideas such as the one above gather under the umbrella term and value system.

Final conclusion

The urban ecosystem changes decision-making in urban context by adopting an eco-centric perspective. Eco-centrism is a sub-field in environmental ethics, that encourage thinking about planetary environments in an interconnected manner. In urban design and decision-making there is still a leading anthropocentric thinking on providing well-being for humans. The urban ecosystem asks for designers and decision-makers to adopt a different perspective on the urban environment. One in which well-being for all living being, the ecosystem, is central.

The traditional debate on how to border ‘artificial’ and ‘natural’ environments has been critiqued to enable the application of ‘natural’ eco-centric values on the ‘artificial’ urban ecosystem. The idea of a continuum of environments focusses on a classification of environments by its human-interference and density. This focussing on human-interference enables borders between environments to shift and open up. The eco-centric thought can be applied onto the urban environment because of this opening up in bordered thinking about different environments.

The healthy urban ecosystem is a place wherein human acknowledge their interdependencies between humans, nonhuman animals, and plants living in the urban ecosystem, as human life is part of the ecosystem they reside in. Humans have the obligation to take care of the whole community as the ecosystems has been stated to have intrinsic value. This active partaking in nonhuman and ecosystem needs, has to be done in a non-hierarchical and emphatic way. The healthy urban ecosystem is a requirement for a healthy community as the definition of ecosystems in chapter one describes. Every human citizen should self-reflect on their actions and choices in living in the urban ecosystem and what lives are worth sacrificing for individual needs, because all decisions made to benefit the ecosystem will in the end benefit human life as well. In order to make the right decision tradeoffs will need to be thought out.

The proposition is to look at the tradeoffs in the urban ecosystem in a threefold categorisations; win-win situations, flourishing-survival situation and situations where there is a genuine conflict. This categorisation is a first attempt in making a practical theory on trade-

offs in the urban ecosystem. The tradeoffs in the urban ecosystem aim to make well advised decisions with consideration of both human and nonhuman needs. The tradeoffs are the practical outcome of the theoretical concept of the urban ecosystem. Allowing human favouring because of the value of human density makes the tradeoffs practical.

The way forward is to experiment in both practical and theoretical sense through design concepts and debates. I have proposed a roadmap as a first tool for doing eco-centric design in urban context. A lot more research and experimentation needs to be done to make the urban ecosystems a worthy theory for a different future of the city. The urban ecosystem is a practical theory on how we ought to deal with ecological problems in the urban environment. It is not a truth. It is merely an interesting perspective to engage in new ways of thinking. A tool to analyse problems in the urban environment differently, more inclusive. To see the urban as an interdependent network of parts whereof humans are just one part will enable different choices and possibilities for designers and policy-makers. Why adopt this different perspective? Simply because urban areas become less and less liveable for humans, due to the constant prioritisation of human interests. Cities have become places where animals are called pests, there are humans suffering from noise and air-pollution, and their are the highest rates of CO2 emissions (Chapin, 2011). To invent the city of the future in an ecological sense will entail human sacrifices, but will lead to a more well-being for all.

Recommendations: The urban ecosystem roadmap

The ambition for the urban ecosystem is to make the representation of the ecosystems' interests possible. The theory as it is now is in its is starting phase. The first phase was to formulate a concept overarching all attempts to a more inclusive an ecological future of cities, but the concept needs evaluation. This evaluation needs to be done in a more resolute manner and by a bigger group of researchers and designers. I would suggest a broad research by a group of experts from different domains to get more in-depth perception of what concept the urban ecosystem provokes. I see the urban ecosystem as a collective endeavour that entails a human community testing and getting more grip on the proposed design principles. The community should be an interdisciplinary group of people consisting of philosophers, ecologists, designers, architects, lecturers, students, …. I would recommend this community to, at least, invest time in asking these eco-centric questions;

Does my idea/plan include nonhuman living?
Does my idea/plan enable 'richness and diversity' for nonhuman living?
Is my idea/plan favouring the whole community?
What is the nonhuman/ecosystem tradeoff in my idea/plan and is this an ethical tradeoff?
Did I think enough about the interests of human and nonhuman living?

If the answers are yes, well done and keep going!
If the answers are no, ask yourself:

How could altering my idea/plan enable human and nonhuman well-being?

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Addendum 1

The 8 points of change in the Deep Ecology movement:

"1. The flourishing of human and nonhuman life on earth has inherent value. The value of nonhuman life-forms is independent of the usefulness of the nonhuman world for human purposes.

2. Richness and diversity of life-forms are also values in themselves and contribute to the flourishing of human and nonhuman life on earth.

3. Humans have no right to reduce this richness and diversity except to satisfy vital needs.

4. The flourishing of human life and cultures is compatible with a substantial decrease of the human population. The flourishing of nonhuman life requires such a decrease.

5. Present human-interference with the nonhuman world is excessive, and the situation is rapidly worsening.

6. In view of the foregoing points, policies must be changed. The changes in policies affect basic economic, technological, and ideological structures. The resulting state of affairs will be deeply different from the present and make possible a more joyful experience of the connectedness of all things.

7. The ideological change is mainly that of appreciating life quality (dwelling in situations of inherent value) rather than adhering to an increasingly higher standard of living. There will be a profound awareness of the difference between big and great.

8. Those who subscribe to the foregoing points have an obligation directly or indirectly to participate in the attempt to implement the necessary changes." (Naess, 2009, p.117)