

The symbiotic city

nature-positive urban futures

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Preface

Future cities must be in harmony with nature. Whether it is the goal to restore biodiversity, improve ecosystem services or protect the health and well-being of urban dwellers, more plants and animals are needed in our cities.

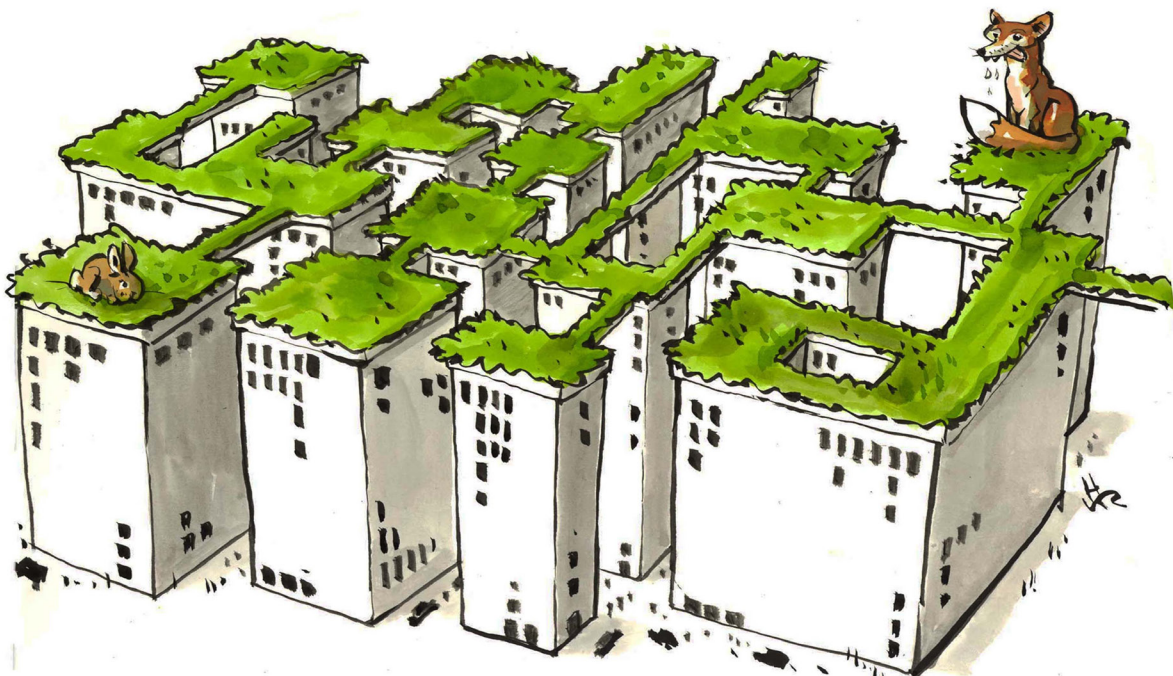
Our living environment connects us to nature almost on a daily basis. This living environment is about so much more than just a roof over our heads. The quality of our living environment is invariably impacted by issues like climate adaptation, circular systems, healthy mobility and social connectivity. All these are also influenced by the state of our natural environment and the biodiverse ecosystems that maintain and restore it.

Together with developers, municipalities, provinces and counties, environmental organizations and a range of other stakeholders, we, at Wageningen University & Research (WUR) are working on nature-inclusive

construction and designs in cities.

The coalitions of stakeholders that are emerging around the world, do not want the development and protection of urban nature to depend solely on the good intentions of the parties involved. Instead, we want assurances. We want nature-based development goals to be reflected in unambiguous legislation and development agendas.

This cannot happen without the development of new knowledge and better information. Nature restoration and climate adaptation are pre-eminent research areas for WUR and other universities around the world. This brochure outlines promising pathways to a nature-based and climate-resilient city. We invite you to join our search for solutions and be energized and inspired by the pathways we have collected so far! Thank you for your interest.



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Chapter 1 The symbiotic city as a solution to climate change and biodiversity loss

Doing nothing is no longer an option. We must distance ourselves from destruction and pollution and get back to basics: living in harmony with nature. After all, we are not separate from nature, but a part of it. This means that we must give nature a place in our cities, and give cities a place in nature. That is the subject of this book.



1.1 The urgency to redesign cities

Nature is speaking loud and clear, especially about our devastating impact on the natural habitats and biodiversity that surround us. Consider the events in the first half of 2022. A glacier breaks off in the Italian Alps, killing 11 people. Huge new cracks become visible in the Marmolada glacier. Portugal, Spain, France and Greece struggled with massive wildfires during sweltering heatwaves. In India, it was extremely hot for months on end and a 150-year-old heat record was broken in Japan. A power shortage loomed and the salinisation of soils due to drought became more severe. Huge waves inundated an island in Hawaii, caused by rising sea levels. Ecosystems in Australia began collapsing, threatening over 1,900 native species with extinction. Arctic ice continued to melt, and the permafrost continued to disappear. People left their homes or went hungry because the land they live on had become too dry to cultivate.

Problems are also accumulating in the Netherlands. The nitrogen emissions crisis is not only impacting agriculture, but also affecting new housing construction. Biodiversity is declining rapidly, and our country is no exception. Butterfly species are disappearing, along with countless species of plants, birds and insects. The climate resilience of the Netherlands is doubtful; we are currently not resilient enough to cope effectively with the consequences of climate change. The urgent need for climate adaptation and the dramatic decline in biodiversity require future-proof solutions for the design of our cities and urban regions.

Cities can have an important role in resolving these crises. According to estimates (UN DESA, 2019), the world's population will grow to 9.7 billion people in 2040, more than two-thirds of whom will live in cities, which now consist almost entirely of apartment buildings, other types of housing, offices and other businesses, and pavement. These cities are often choking with exhaust fumes, scorching hot in summer and threatened with flooding in spring. The solution to these problems lies in the Symbiotic City, where nature returns to the city and becomes part of it. Humans and nature should share the city together and enrich each other by living in symbiosis, i.e., in mutual connection with each other.

This is already happening – there are many examples of humans and nature living in harmony in the city. Citizens, mayors, homeowners, property developers and scientists are already acting by joining hands and forging new coalitions and organisations. Projects take a

comprehensive approach by combining technical solutions with issues such as welfare, safety and income, and with attention to soil, water and biodiversity.

Solutions lie in creating a nature-positive and climate-adaptive city, for example by building 'climate plazas' and wadis, planting native plants and trees in the built environment and designing housing where people live together with birds and insects. There are many initiatives that focus on regenerative agriculture, urban agriculture, soil conservation, the circular economy, new forms of waste processing and developing bio-based housing.



1.2 Basic principles

Strolling in the shade of diverse species of trees, you hear the hum of insects and catch a glimpse of two jays stealing a raspberry and disappearing in the foliage. Further on, neighbours work in their communal kitchen garden and harvest fresh herbs and tomatoes. You take a few tomatoes with you and return home on a grass footpath.

Your house has a 'polder roof' that keeps the interior cool and can absorb excess rainwater. The house has been constructed from natural materials such as hemp and elephant grass that are manufactured by a regional company with no harmful emissions. You look forward to tonight, when a festival will take place on one of the floating pontoons in the river.

The river is not only a perfect place for a party, but it also gives the city resilience and is a source of enjoyment. High water is no longer a problem; the river has enough capacity to absorb it. During the summer, young and old alike enjoy the cool shade under the trees by the river.



Living in a symbiotic city is nothing like living in cities as we know them today (2022), yet this way of life lies within reach. In today's cities, the surface is entirely paved, glass and concrete buildings trap heat, and the soil is hidden and is used for burying cables and pipes. The park has only three species of trees, on hot days it reeks of dog excrement and the yellowed grass is littered with rubbish from the barbecue parties of the past few days.

But we can also live in a city where birds, insects, mammals and plants thrive in harmony with people, where the diversity of people and nature is visible, and where people and nature are interdependent and enhance each other. This city has real nature that attracts insects, birds and mammals. At the same time, the greenery makes people feel better, lowers their stress and cleans the air by reducing particulate matter. Children play in the shade of large trees, where it is nice and cool in the summer.

In the symbiotic city, nature can take its course and greenery is not limited to planters and tidy gardens maintained by residents or businesses. The symbiotic city is all about the positive interdependence between humans and nature, where humans cannot thrive without nature and nature cannot thrive without humans.

This means formulating new principles on how we act – and how we refrain from acting – with nature in mind. The Symbiotic City presents these four basic principles:

- eco-centrism
- symbiosis
- equity
- values of nature

Principle 1: Eco-centrism

Eco-centrism means that nature is the foundation. As such, it is the absolute opposite of anthropocentrism, in which humans are central.

It is important for humans to start realising that nature does not serve humans and human needs. We need to start thinking and acting from what nature needs and not what humans need. This calls for a reversal in our thought and action.

Principle 2: Symbiosis

Symbiosis means that species need each other to live, based on a positive and cooperative relationship. A symbiotic system consists of positive, reciprocal dependencies between humans and nature. In the symbiotic city, real nature flourishes. People feel better as a result: the city is more liveable.

New networks are emerging in which humans and nature are interdependent and mutually reinforcing. Examples include district initiatives that reconnect people with nature, or construction projects that take all living entities into account in their engineering design. But also, the emergence of circular networks that are based on reuse of materials and goods.

Symbiosis also means that classical dichotomies, such as humans versus nature, and economy versus ecology, have become obsolete and are being replaced by networks and links of positive interdependence.



Principle 3: Equity

The symbiotic city exists to benefit all its inhabitants: so not only people, but also plants and animals. The future-proof city enables a high quality of life for all these inhabitants. A city that provides a healthy and safe environment for all and promotes the well-being of all these residents.

The symbiotic city therefore enhances both biodiversity and social diversity (Bourdieu, 1972; Putnam, 2000) and can only be built based on social and ecological equity.

Develop a city with space for all residents: plants, animals and people with diversity of age, religion, sexuality and culture. It is essential to address and overcome exclusion. Everyone has a role in designing and making a city where the connection between people and nature is self-evident. This creates a city in which mammals, insects, birds and plants live in proximity with the people living there.



Principle 4: Values of nature

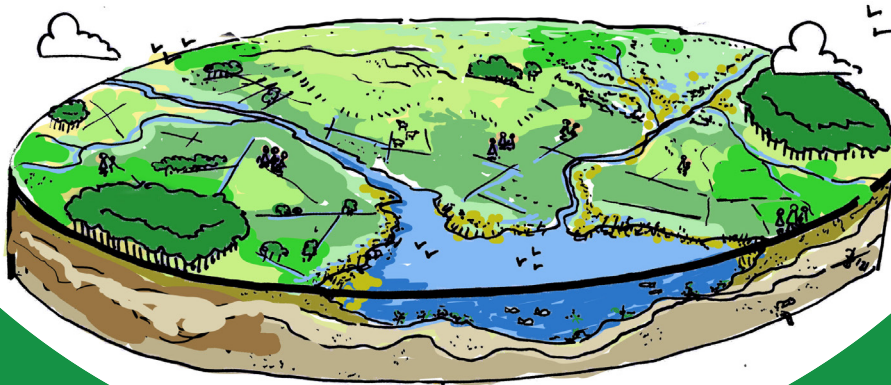
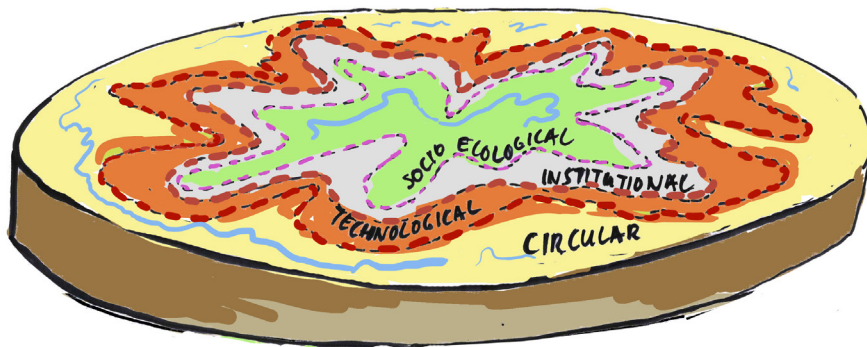
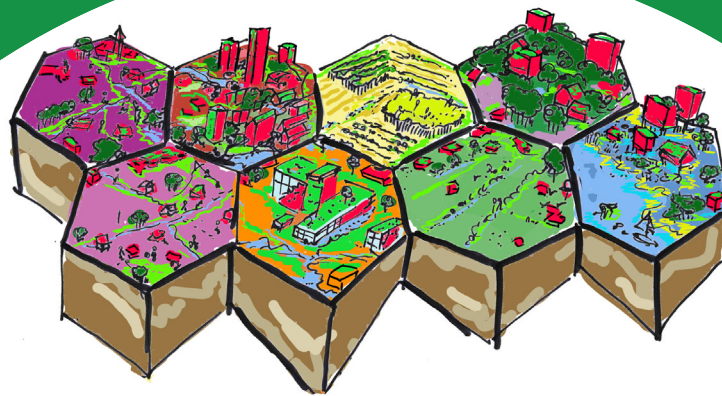
A range of values of nature are visible in the symbiotic city. The value of nature that is most appealing and tangible is different for everyone. Here we distinguish four such values. In the symbiotic city, these four values are crucial; you can see this in the 32 examples from practice that we describe in part 4.

First, there is the *physical* value of nature: The earth supplies food and water to industry and the city. Nature-based solutions help to moderate climate challenges. For example, a river or a wadi can capture excess rainwater. Second, the *intrinsic* value of nature means that nature has its own distinct value and that, for example, nature reserves should be created where nature can take its course without human intervention. Third, the *cultural* value of nature means, for example, that people enjoy walking in the park or going swimming in a nearby lake. Fourth, the *future* value of nature is where water, soil and soil organisms are prioritised and given sufficient space, so they are preserved for the future to benefit both people and natural habitats.

Most people appreciate the cultural value of nature, and the physical value is also obvious to many. But the intrinsic value of nature is also gaining more and more attention, as is the future value.

Chapter 2 The symbiotic city in three layers: the foundation, networks and practices

The symbiotic city consists of three layers that influence each other: the first layer is the natural foundation, followed by the second layer of networks and the third layer of human practice, i.e., our daily living environment.



The first layer of the symbiotic city consists of the natural foundation of living and non-living matter. The second layer consists of the networks between people, nature, infrastructure and technology in the city. The third layer consists of everyday human practices such as constructing houses and roads, verge management, business activities and being together in the city. In part 4, 32 examples are given of those practices that together build the new networks of the symbiotic city.

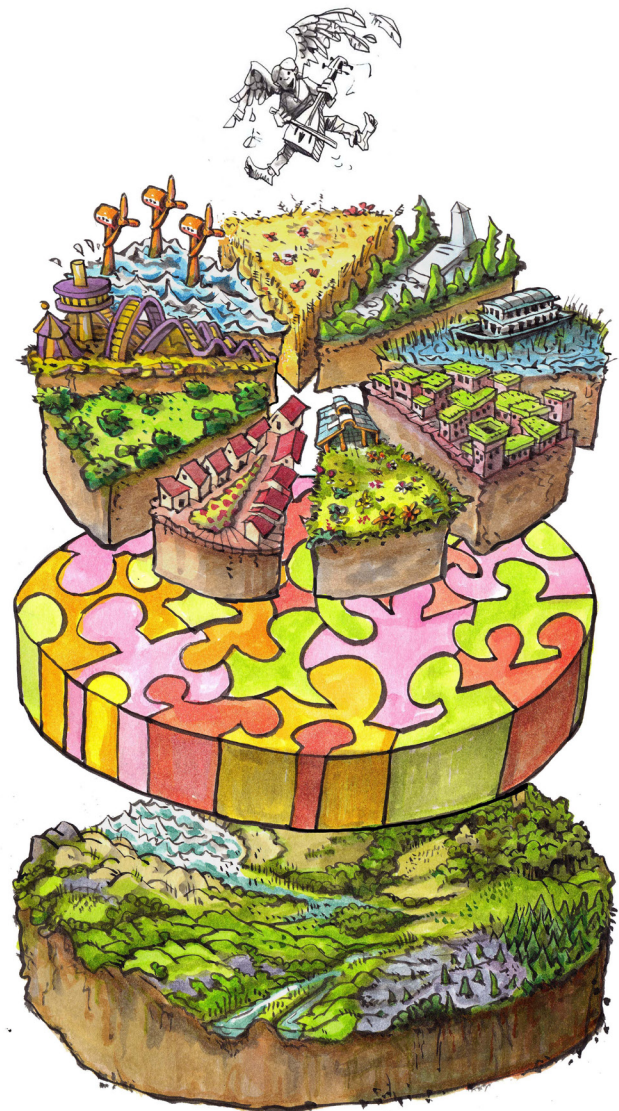
2.1 The foundation

To really understand the symbiotic city, we must step away from people for a moment and start with its most important layer. The first layer is the natural foundation, which provides space for biotic factors such as plants, animals and bacteria as well as abiotic factors such as water, soil and atmosphere. It is a fully alive reciprocal system, from which you can learn what symbiosis is by looking closely at how it works. In the soil, you will find animals like the mole that keeps itself alive by eating baby mice and larvae of crane flies. At the same time, the mole keeps the soil healthy; stirring up soil improves drainage.

Nowadays, however, soil is mostly seen as inert matter on which you can do whatever you want. But there are also other ways to look at it. You can help create a healthy natural foundation by taking good care of the soil. Natural resources should not be depleted, and pollutants or deficiencies of groundwater should not compromise the foundation. When houses or other buildings are constructed, it will soon be self-evident that the piece of land they stand on should be compensated for by providing space for greenery at another location. An additional consideration will be looking at how to preserve and restore the natural foundation as much as possible after the buildings are in place.

2.2 The networks

The second layer consists of the networks, i.e., the connections between people, nature, infrastructure and technology in the city. There are already many kinds of technical networks in the city, such as cables and pipes, roads and pathways and digital systems. To build the symbiotic city, it is important to rebuild these networks, so they also become nature positive. This not only involves new technical networks such as nature-inclusive roads and



housing, but also new socio-ecological and institutional networks. The networks are closely linked and mutually reinforcing.

Socio-ecological networks include parks, forests, road verges and gardens, and provide greater ecological diversity of vegetation in the city. These socio-ecological networks can then sequester essential resources such as water, nitrogen and carbon. In addition, joint management of gardens, parks and other ecological networks provides insight and information that can influence the social side of the networks and enhance cooperation between people (Berkes and Folke, 1998; Olsson et al., 2004).

Socio-ecological networks appear to be the key to increasing both ecological and social diversity in cities (Bélaïr et al., 2010). For these networks to work as well as possible, people need to be involved in their conception,

design and implementation. Social diversity is therefore as important as ecological diversity. A neighbourhood network can share its neighbourhood greening experiences with businesses, government and other citizens. As a result, new natural solutions are devised that can be implemented more effectively precisely because the various parties can find each other quickly and easily.

New institutional networks are needed to build the symbiotic city. These are partnerships between businesses, government agencies and public bodies, schools and research institutions that have close contacts with consumers, citizens, civil society and food organisations (Canal Vieira et al. 2021). These networks aim to reintroduce nature to cities by getting people to work together, learn about nature and find new ways of living with nature.

Neighbourhoods and neighbourhood communities play an important role in building institutional networks and can even restore the loss of interpersonal connections in cities. The neighbourhood can bring people out of isolation, for example by working together in green meeting places. In this way, cities are no longer anonymous places where people sleep and work without having much to do with others (Putnam 2000). Through the networks, individuals can find all kinds of help – from very practical help or material assistance to emotional or professional help. Consequently, residents are motivated to become involved in community initiatives or efforts. Municipalities can take the lead in enabling these kinds of partnerships and can make new, nature-positive, regulations. They can also make the tasks for the municipal landscape service and regulations for construction projects more nature positive.

Technical networks in the symbiotic city consist of houses and infrastructure such as streets, roads and motorways, sewers and digital connections. These networks are now mainly designed for the needs of humans but can also be geared to the needs of insect, bird and bat species. It is essential to include biodiversity restoration and nature based innovations during the planning, design and construction of roads, railways and housing (Cities Biodiversity Center 2017, Lanchester 2018, Van Stiphout 2019, Voskamp et al. 2021). Safeguard the four paramount needs of species: food, reproduction, safety and movement.

In 2021, the manifesto 'Building for nature' called for nature-positive building to be mandatory in new construction projects. According to the manifesto, nature should be present and considered wherever construction takes place. Builders signed this manifesto together with nature conservation and environmental organisations. Every construction project should have measures that address heat stress or enhance biodiversity. There are already several measures you can take, such as installing green roofs or bricking in special nesting stones for house sparrows, swifts and bats in the walls of houses or under roofing tiles.

Finally, there are the circular networks, which are based on nature and how nature works. Protecting nature is essential. How can we replace everything that we have extracted from the earth? We have to reduce what we extract. Reusing and recycling natural raw materials are also important strategies. Circular networks attach value not only to the resources used to produce goods and services, but also to the Earth's many social and ecological sink factors that absorb emissions, process waste and reduce stress.

Oceans can absorb carbon emissions from long-distance transport; plants can absorb nitrogen; soils can absorb rainwater from roads and roofs. Our bodies can absorb vitamins and nutrients, and our social communities can support us to reduce illness and stress. Investing in circular networks is therefore key to sustaining human activity in the long term. This can be done by, for example, minimising soil disturbance, reducing waste and emissions and using as few chemical products as possible. It is also important to consume less, use natural resources efficiently, and wherever possible use bio-based construction materials and grow regenerative food.

2.3 The practices

The third layer of the symbiotic city consists of a variety of human practices. Think of urban planning, water management, food production, business and housing. In the symbiotic city, people express the different values of nature through these practices. These four values are visible in the city of the future in 2040, which will be in part 4 described. The values are:

Intrinsic value



Nature has its own intrinsic value that exists outside human value systems. That is why space is provided for nature in cities, for example through urban forestry and through restoration and regeneration of species. This creates true hotspots for biodiversity (Leclere et al. 2020, Snep 2014). Native plant and animal species that have disappeared are reintroduced to the districts and nature is given a chance to reclaim empty spaces without human intervention.

'Eco-cathedrals' are one example of this value. These were started in 1966 by Louis le Roy, first in Heerenveen and later on his own land in Mildam in the Netherlands. As described by the foundation that continues Le Roy's work, these eco-cathedrals are places where humans, plants and animals work together indefinitely on an equal footing, without a prior plan and with free energy. The motto behind this approach is: "Where space gets time and time gets space." Since 2018, land can be zoned for an 'eco-cathedral process' to make room for such initiatives.

Future value



In the symbiotic city, humans have established a new relationship with nature. Reservoirs of natural resources are being created so that future generations can also live with them. Various partnerships embrace nature and work hard to pass it on to future generations in the best possible way. The resilience of nature is crucial to the resilience of the city itself so it can address the risks of climate change and other threats in the future.

A good example is the Spiegelwaal in Nijmegen, the Netherlands, where the useful (more room for the river when capacity is needed due to high water levels) is combined with the pleasant (a place for canoeing, rowing and sailing).

Physical value



The physical value of nature is about what nature does for us and what humans can learn from nature. In the symbiotic city, nature provides our food, and we draw inspiration from nature. An urban economy is resilient if it values and conserves its natural resources, for example by retaining water and restoring carbon. Such an economy ensures nature-positive urban food production and consumption by partly embedding these processes in the city and in green technology networks.

An example are Food Hubs in Washington DC and other cities in the United States of America, where local food producers and customers grow, cook and distribute food. The four components of the Food Hubs model of the University of DC incorporates circularity in 4 ways:

1. Food production through bio-intensive methods, hydroponics and aquaponics.
2. Food preparation through kitchens that add value and provide nutrition education.
3. Food distribution through farmers markets, CSAs, restaurants and niche markets.
4. Closing the cycle through composting, water collection, rain gardens and other green infrastructure.

Each Food Hub offers opportunities for entrepreneurship including nutritional health, growing vegetables and herbs for restaurants and retail, composting waste, and growing native plant seedlings for city parks and rain gardens (O'Hara, 2016; Stuiver, 2022).

Cultural value



The cultural value of nature manifests itself in the personal relationships between people and nature and between people themselves. Nature enables people to live healthy lives and meet each other. The symbiotic city offers a plethora of options due to the enormous diversity of nature in the cities. City dwellers can use multiple opportunities to engage with nature and to live according to their personal lifestyle. This value focuses on nature connections, exercise, plant-based diets and more.

A good example is the Steenbreek Foundation in the Netherlands, which enables people to work together to remove urban pavements and replace them with greenery. Together with citizens, municipalities, water boards and provinces, we are working on greening the living environment to increase biodiversity and health. This starts on a small scale, by removing paving tiles and making room for greenery, both in private gardens and in public spaces.

Physical Value



Cultural Value



Future Value



Intrinsic Value

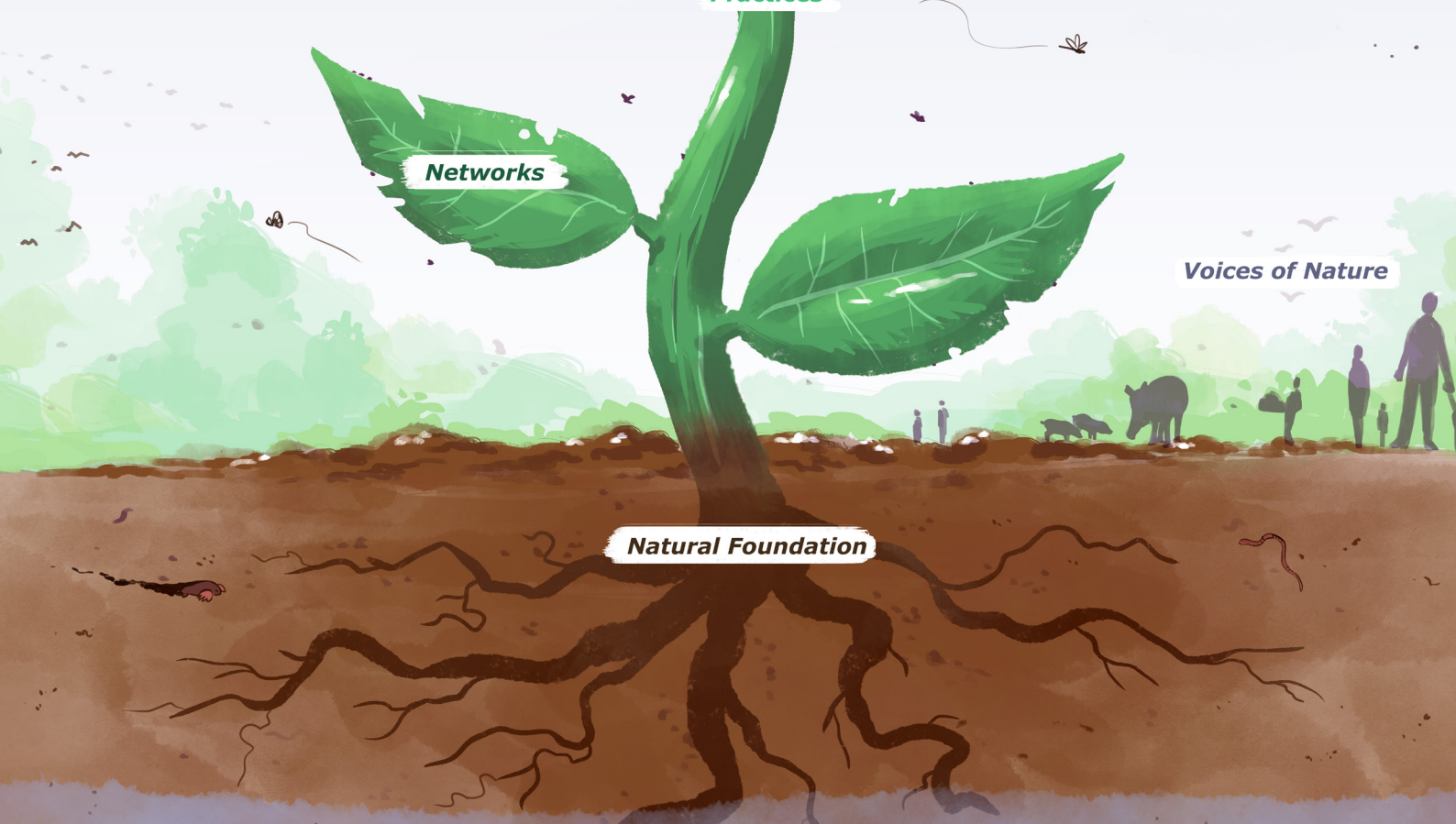


Practices

Networks

Voices of Nature

Natural Foundation



Chapter 3 Transformation to the symbiotic city

Radical transformations are needed to bring about the change towards the symbiotic city. If our goal is to “ultimately influence the patterns of contemporary urbanisation” (Brenner and Schmid, 2015), we must all play chess on many boards simultaneously. We must change our cities irreversibly and ensure that they are rooted in the abiotic and biotic foundations of soil, water, wind and organisms. Besides the practical considerations involved in building this city, we also need to be epistemologically focused (Issar, 2018). Over the years, a lot of knowledge about nature has been lost, so it is high time that we restore this knowledge and reintroduce it to the city. In doing so, we will also learn new things about nature because we will reconsider our existing knowledge.



Radical transformations are only going to happen if we start developing joint ownership of our living environment. Joint ownership means no longer thinking in terms of: “the other person (or the system) has to do it”, or “I have to do it”. Instead, we begin to think in terms of: “we are going to do it together” (Giddens, 1990; 1991). Our living environment is crucial to taking ownership together with others. We no longer put the power to change systems in the hands of others like the government or industry. We also start sharing the responsibility for choices such as what we shop for or where we go on holiday. From now on, we will focus more on the transformation of our living environment, i.e., the places where our daily lives take place, where we have a direct influence, and where we collaborate with others who experience ownership. If we share ownership of this living environment, we also need to understand it better and be able to take moral responsibility for it (Bauman, 1995; Beck, 1992). Humans are learning beings and not robots of their own rational choices, or of the systems or created environment (Bauman, 1997; 2009; Bauman and Tester, 2001)

The city is made up of various groups that can work together on building the various networks in the city: citizens and neighbourhood organisations, businesses, NGOs, corporations, municipalities and knowledge-based organisations. Each group has its own role, and, at the same time, the various groups can reinforce each other. Below is a brief explanation of what each group can do. Which group (or groups) do you belong to?

You can put a spade in the ground and explore the soil. You can provide space for poppies, clover and buttercups in the grass borders around your house. You can also ask your municipal council for permission to plant facade gardens. In Amsterdam facade gardens now start to meander through the city, as a new socio-ecological network.

For citizens and neighbourhood organisations

Residents make the city and can connect with nature, starting in their own neighbourhood. As a neighbourhood resident, you can be an agent of change and you can involve other residents in this process (Anguelovski, 2013, Greuzmacher van Assche, 2022, Knapp et al. 2013). If everyone puts sedum on the roof, has a tree in the backyard, puts climbing plants against fences and replaces the pavement in the garden with shrubs and flowers, the neighbourhood will become much greener and cooler. If you can make use of neighbourhood rights, as neighbourhood residents you gain control over what happens in your neighbourhood and can take responsibility for it.

Make sure there is room in the neighbourhood for biodiverse grassland and for flowering and fruit-bearing shrubs and trees, as these attract insects and small animals. You can install insect hotels and beehives. Piles of leftover paving also attract insects, as do piles of leaves and sand. Nesting stones and wall-mounted nesting boxes give birds and bats a home, especially if street lighting is muted for nocturnal animals.

Make nature part of the house you build. Consider a green roof and make sure the walls and fences are covered with climbing plants, for example. When building, look at things like shade and wind and choose vegetation that thrives in those conditions. Invest in trees and shrubs. A single tree can change an entire neighbourhood (De Smet and Van Reusel, 2018). For example, you can make an agreement with your neighbours that everyone will plant one tree in their garden. This creates a natural network for animals, which can find habitats throughout the neighbourhood.

Start with yourself and look at how much waste you generate. What can you do to reduce or reuse your waste? If you have a garden, composting helps make the soil healthier. Put a worm hotel in your garden: the worms will turn your kitchen waste into very fertile compost. Build houses from bio-based materials or wood.

For local businesses

The local greengrocer, the neighbourhood café, the start-up entrepreneur and the farmer: everyone has a role to play in the symbiotic city. If the company you work for owns buildings or land, start the conversation about making this property more nature inclusive. There are many options.

Various motives come into play when making nature-inclusive investments in a business. This can be on the initiative of business owners themselves because they believe in playing an active role in 'greening the city'. These investments can also be promoted by including conditions in business licences. Business owners will learn how to comply with rules and regulations and will be challenged to get involved.

There is money to be made through job creation, biobased products, biomimicry techniques, nature positive real estate, or through new revenue models. For example, by charging neighbourhood residents a fee to access a large rooftop garden where they can escape from the noise of the city.

For NGOs

Non-governmental organisations (NGOs) such as WWF, Greenpeace and Friends of the Earth (Citizens, 2021) represent the public voice of nature. NGOs can continually devise new ways of effectively reaching various groups of people with their message and showing the importance of nature in the city to legislators and businesses. In recent decades there have been good examples of government and business working together to create plans to enhance nature. Organisations such as IVN, the Society for the Protection of Birds in the Netherlands, the Mammal Society and Dutch Butterfly Conservation play active roles in connecting citizens with nature. There are also organisations like Steenbreek, the Green City and the Healthy City that promote the importance of nature in the city. Youth organisations like the Young Climate Movement have put nature at the centre of their long-term vision.

Another strategy that NGOs can continue to promote is granting legal rights to natural entities such as mountains, rivers or nature reserves. The idea behind this is that when a natural entity becomes a legal entity, it becomes a legal subject instead of a legal object and can thus speak for itself in court (Burgers and Outer, 2021).



For private parties

Large companies and investors can be role models in introducing more symbiosis in the city. For example, Heineken has opted to enhance biodiversity around its brewery in Zoetermeer by creating a large habitat for pollinators. This is a high-profile practice in the field of Business & Biodiversity (Snep, 2014) and has led to the creation of a new institutional network in which the province of South Holland has set the goal of making the entire province greener and healthier with the participation of companies, municipalities and research institutes such as Naturalis.

Housing associations also have an important role to play. Providing housing is more than ensuring that there is a roof over one's head. The immediate living environment is also the responsibility of a housing association. Houses and apartment buildings can be made symbiotic, allowing you to house not only people but also animals. More greenery in social housing also works the other way: more greenery makes tenants happier. Residents from vulnerable groups particularly benefit from more green space in the neighbourhood because it provides healthy air, reduces stress and invites them to exercise more (de Vries et al., 2020). This green space does not always have to take the form of a park. Small natural plantings, façade gardens and groups of trees next to a block of flats already have a positive effect.

Housing associations own many buildings and often own land as well. They have the possibility of making entire districts greener and more climate resilient, for example by drawing up rental contracts for houses and gardens, taking measures against unneeded pavement and making agreements with residents.



For local governments

Every city and every municipality provide local governance that has great influence on the design of the city and on the prevailing regulations. Cities and municipalities have their own offices and real estate, but they also make decisions about other people's land and buildings, for example through rules and regulations on housing construction. Local authorities make decisions on the construction of a park, bike path or houses. Therefore, they can be among the first to act towards including nature in the city. To get residents excited about such plans, municipalities can spread a hopeful message about the positive effects of a green, liveable city, such as beautiful presentations about the city of the future in 2030, 2040 and beyond.

Municipalities can take an active role and make substantial progress with simple measures. For example, when citizens remove paving tiles to plant a façade garden, municipalities can accept the tiles without charging for their disposal. They can take control about what the construction industry can and cannot do when building new districts. Amsterdam and The Hague already have a clear scoring system that determines whether building projects are nature inclusive. As a municipality, you can also make agreements with project developers on how they invest in soil and water in the new neighbourhood and how builders protect the soil during construction.

Make sure that heavy construction traffic stays out of areas that will be planted, as the weight of the vehicles compacts the soil, and little can grow afterwards. Motivate residents to make their own compost to enhance the soil. Choose vegetation that suits the soil on the site. The soil in cities often contains drainage and cable systems. Those systems and the greenery above them should not interfere with each other. After the neighbourhood is finished, invest in restoring the soil by ensuring that soil life returns. Ensure that water can be retained in the soil, for example by creating underground rainwater storage systems. Storing water in a wadi or pool is an attractive option because this also provides habitats for aquatic insects, amphibians and birds (Van Hattum et al. 2016).

For knowledge centres

Knowledge-based organisations such as universities, but also consulting firms, architects and designers, can help build the symbiotic city with their expertise. Scientists play an important role by working with stakeholders to develop innovations that make the city increasingly green, diverse and symbiotic.

There is a great need for knowledge and for new scientific insights, such as the relationship between nature and climate change or the relationship between nature and health. It is also important for scientists to reflect on knowledge and position. They can work with people to develop knowledge, connect people together, highlight and value the knowledge of non-scientists and look for blind spots inside and outside science. They can also play a major role in driving the transformation processes when it comes to applying knowledge in measures, tools and maps of the city.

We need to rethink our existing knowledge. Think about how we look at the soil in the city. We know little more about that soil than that it is a substance in which we lay cables and pipes. If we think from a symbiosis perspective, this soil and its biotic and abiotic characteristics take on a much larger and different role in our daily living environment.

Finally, they have a major role to play in educating future generations (Boyer, 1996). This involves developing knowledge programmes for the professionals who are needed to create the symbiotic city – from gardeners to professors.

Since 2023, nature organizations, entrepreneurs, governments, education centers and knowledge organizations work together within the program “Working landscapes of the Future” to redesign business parks in the Netherlands towards green and biodiverse areas. Special attention is paid to the development of new training courses. Future employees from construction, infrastructure and real estate companies learn how to make biodiversity and nature part of the business parks.



3.2 The importance of inclusive leadership

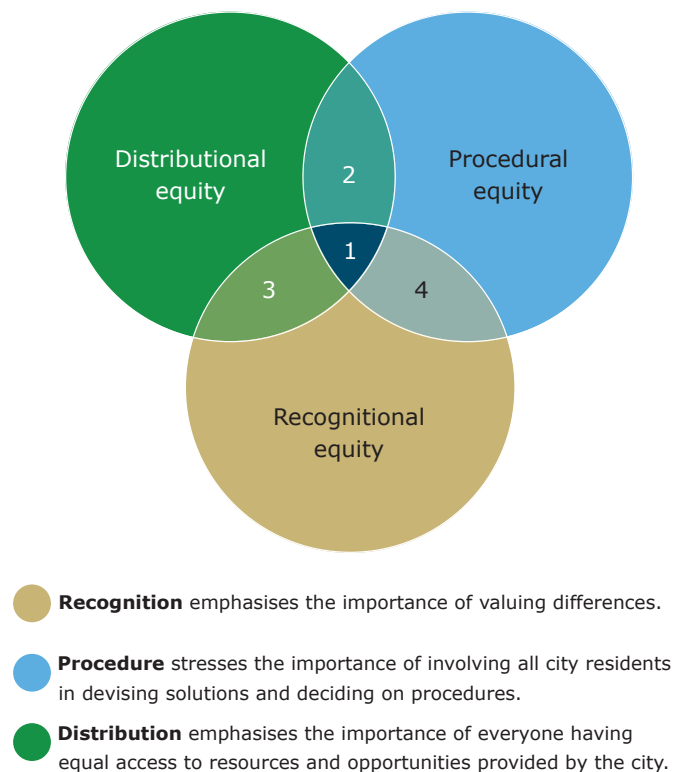
To make cities suitable for all inhabitants, we need leaders who offer equal opportunities to all of them: not just people, but also animals and plants (Stuiver, 2022). We need forerunners, connectors and agents of change who stand up for all inhabitants in the city - in short, leaders who think and act inclusively.

Inclusive leadership means working actively for social and ecological equity within urban projects. This is a comprehensive task and starts with ensuring that all inhabitants in the city are visible. It is also important to involve all these actors and enable them to participate in decisions on their own living environment. A special challenge here is how to give a voice to all non-human inhabitants. How do you give nature a voice and ensure that all inhabitants are visible in the decision-making, and how can you create a more equitable distribution of amenities and access to green space for them?

The inclusive leader can build the city of the future on the following four pillars: empathy, placement, access and identity. All four pillars represent a different focus on social and ecological equity but cannot exist without each other. They offer a new way of thinking about the city and provide inspiration and tools to anyone who wants to work on cities that are future proof for all the entities who live in them.

The four pillars of inclusive leadership are intended for all thinkers and doers who want to learn how to make a city for all. These may include project managers and implementers of urban projects, neighbourhood residents, architects, municipal officials, urban planners, technical designers, scientists and policymakers. Today, when implementing urban projects, a select group of technical experts, policymakers, planners and architects often make the strategic and operational choices. To future-proof the city for all its inhabitants, in the coming years these people from the private and public sectors can lead in an inclusive manner in both thought and action.

Figure 1 The four pillars of inclusive leadership: 1. empathy, 2. placement, 3. access and 4. identity. These four pillars are partly based on Meerow et al., 2019, Franz et al., 2022 and Stuiver, 2022.



The three dimensions depicted in figure 1 relate foremost to social justice. The four pillars in figure 1 add the aspect of ecological justice and emphasize the importance of both human and non-human actors in the city. The four pillars are:

- Empathy: understanding
- Placement: visibility
- Access: equal distribution
- Identity: embracing diversity

1. The pillar of empathy

Empathy is the central pillar in the figure. Any inclusive design starts with understanding the needs of all humans and non-human actors (such as birds, butterflies, insects, but also water and soil) in the city. You explore ways in which people can work together – with each other and emphatically also with nature – and give space to each other in what they need.

Based on empathy, you delve into improving the relationships between residents in the city and explore solutions for building social, cultural and ecological capital. In practice, this means focusing on the city as a place where everyone can meet and get to know each other, where there is attention for each other and where inhabitants work together to make their streets and neighbourhoods more nature-positive and pleasant.

Example: In Amsterdam, the Netherlands, citizens have founded *Oost Indisch Groen*, through which they want to transform their district (Indische Buurt) into a more sustainable and liveable area. It started with the creation of a community garden where everyone is welcome, regardless of ethnicity, gender or socio-economic background. The municipality acknowledged the importance of this initiative and paid for the community garden.

2. The pillar of placement

Placement is the pillar by which you want to give both nature and people a visible place in the city. Placement recognises the importance of making space for all beings (human and non-human) in the city to create truly symbiotic environments where humans and nature are mutually reinforcing and visible. You focus on making nature and people visible in the designs of houses, streets and districts, where nature and people are equally represented. As a result, ecology and economy can go hand in hand and all inhabitants benefit from the city's circular economy, energy transition and climate adaptation.

Example: Tampere in Finland, Eindhoven in the Netherlands and Genova in Italy are frontrunners in the international project *UNaLab*, which stands for Urban Nature Laboratories. This European project aims to make nature visible in the city and introduces Nature Based Solutions (NBS) to prepare cities for the effects of climate change, such as heat waves and flooding. By conducting experiments in the city, cities are essentially being used as laboratories for NBS. This should lead to solutions inspired by nature itself, such as planting additional trees, shrubs and other plants to make the city cooler.

The four pillars of inclusive leadership were developed by a group of pioneers who have been working on inclusive and green cities for years. These pioneers work as architects or urban planners, are policymakers and implementers, scientists and designers, develop community projects or run civic organisations. They are of all ages and backgrounds, have a rich history of knowledge (including local knowledge) and life experience, and embrace a range of identities (including genders) and beliefs. They recognise the value of nature, soil, water and animals and plants in the city.

3. The pillar of access

Access focuses specifically on equitable distribution of resources (such as money, social contacts, work, education, access to greenery and well-being). How do you distribute these resources to people in the city? This pillar works to eliminate inequality between people and aims to give everyone equal access to urban solutions from architecture, planning and circular design. The pillar also stands for better access to decision-making processes: urban inhabitants are encouraged to participate actively in and take responsibility for the design of their street, neighbourhood and district. Residents representing the voice of nature also get a seat at the table and ensure that this nature is accessible to all.

Example: The 15-minute city is an initiative that has received much attention, especially after the pandemic. One of the main goals of this approach in Paris is to reduce the share of urban spaces occupied by cars and dedicate them to other uses. In this way they aim to increase the liveability of streets and public areas, improving health and well-being, and many more benefits. This concept has been adopted increasingly by cities, especially across Europe, for a better recovery from the COVID-19 pandemic and a just sustainable transition.



4. The pillar of identity

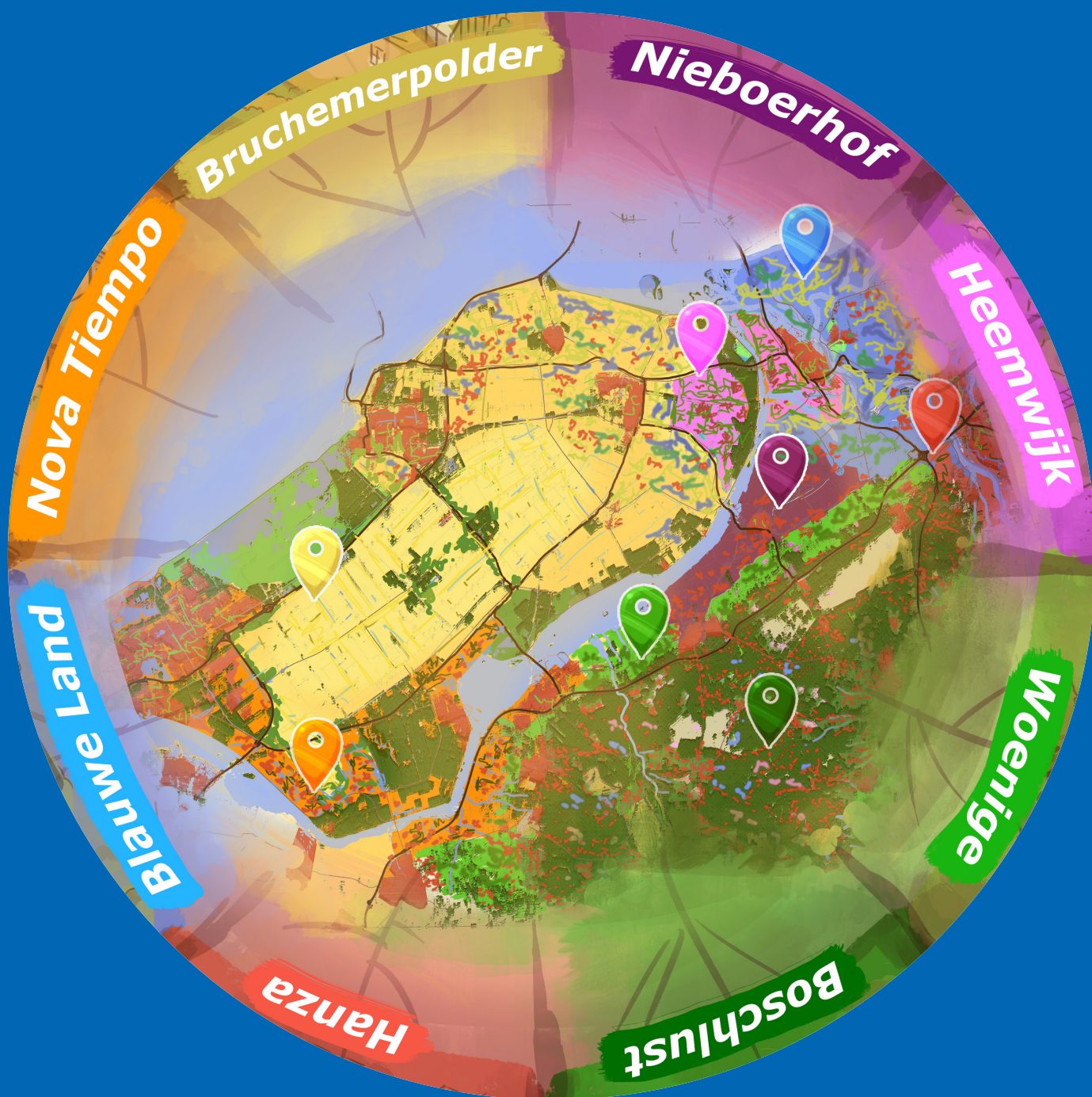
Identity stands for celebrating the various lifestyles and identities in each city. From this pillar, you focus on the individual. The pillar stands for developing understanding and embracing diversity in human histories, skills and needs. Every person has their own needs for physical, social, mental and spiritual health. Identity therefore means that people can and may express themselves in their identity, while of course respecting others. It is therefore a dynamic pillar because it always needs open discussion and dialogue and cannot do without the pillar of empathy. You can go the extra mile by also giving animals and plants their space and making sure they can live and flourish in the city.

Example: Bureau Ruimtekoers in the Netherlands, uses art to let residents express themselves. In the Zonnestad project, children and their parents build a city in clay to exchange ideas about the energy transition. While the children learn about solar energy, their parents talk to experts about their concerns, challenges and questions concerning solar energy, cost savings and sustainability in their own homes.



Chapter 4 The Symbiotic City in the Netherlands in 2040

We present the future vision of the symbiotic city in 2040 using eight diverse districts that are closely interconnected. These districts illustrate a set of practices from the third layer, focusing on our daily lives together with nature. These urban practices include people's personal relationships with the land, soil and water, with the plants and animals that live there, with rivers and with new technologies.

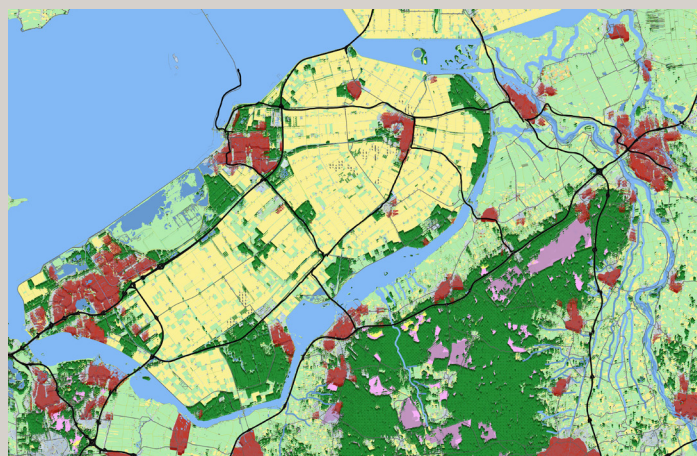


4.1 A vision for the Netherlands

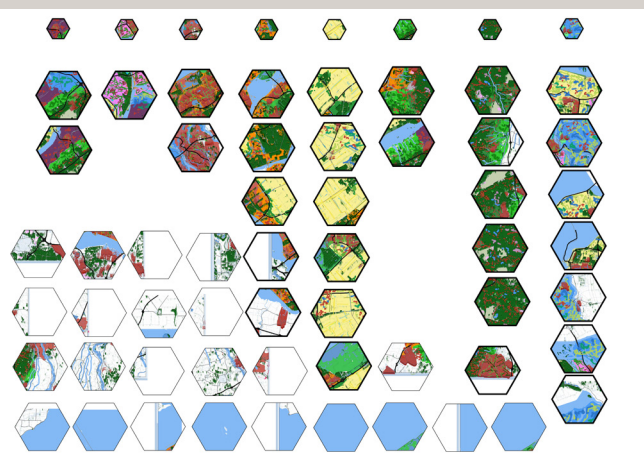
The story outlines a vision for a region in the middle of the Netherlands in 2040. The area consists of eight districts, each of which has its own storyline about the different values that people attach to water, soil and biodiversity.

Data from the eight districts was compiled from scientific

research conducted over the past 15 years on a variety of initiatives established by people who realised early on that it was urgent to give nature a voice. In addition to global initiatives, it is also based on existing practices in the Apeldoorn, Almere, Zwolle triangle. The vision is built from these pre-existing initiatives and was created in symbiosis thanks to the help of these trailblazers. (Stuiver, 2022).



Current situation



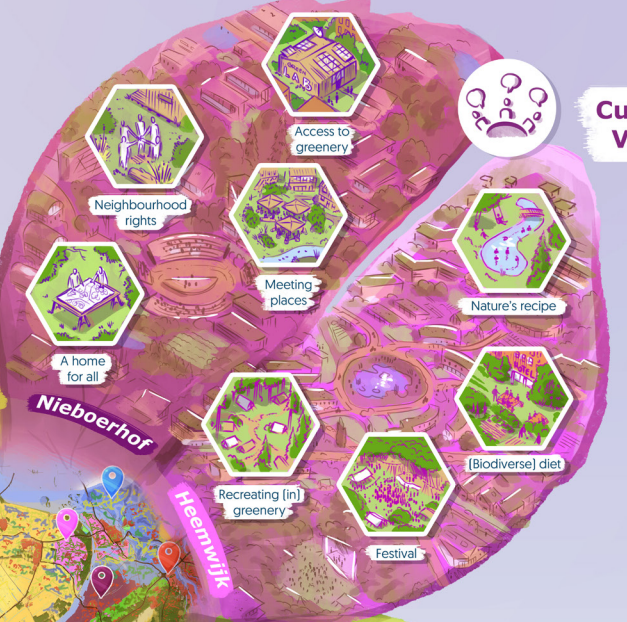
Puzzling with practices

The urgency of this vision is the enormous task to shape the urbanization of the Netherlands in a natural way. The story aims to paint a positive future and deliberately goes beyond existing doomsday scenarios of flooded coastal areas, energy shortages and excessive heat. It wants to show a multitude of nature-positive practices in which citizens, companies and governments can inspire each other and encourage each other to take even more practical steps towards a sustainable urban future. This is in line with recent climate reports that emphasize the importance of finding natural solutions in an increasingly urbanized world (IPCC, 2021; 2022).

Physical Value



Cultural Value



Future Value



Intrinsic Value



Nova Tempo

Blauwe Land

Hanza

Nieboerhor

Heemwijk

Woentje

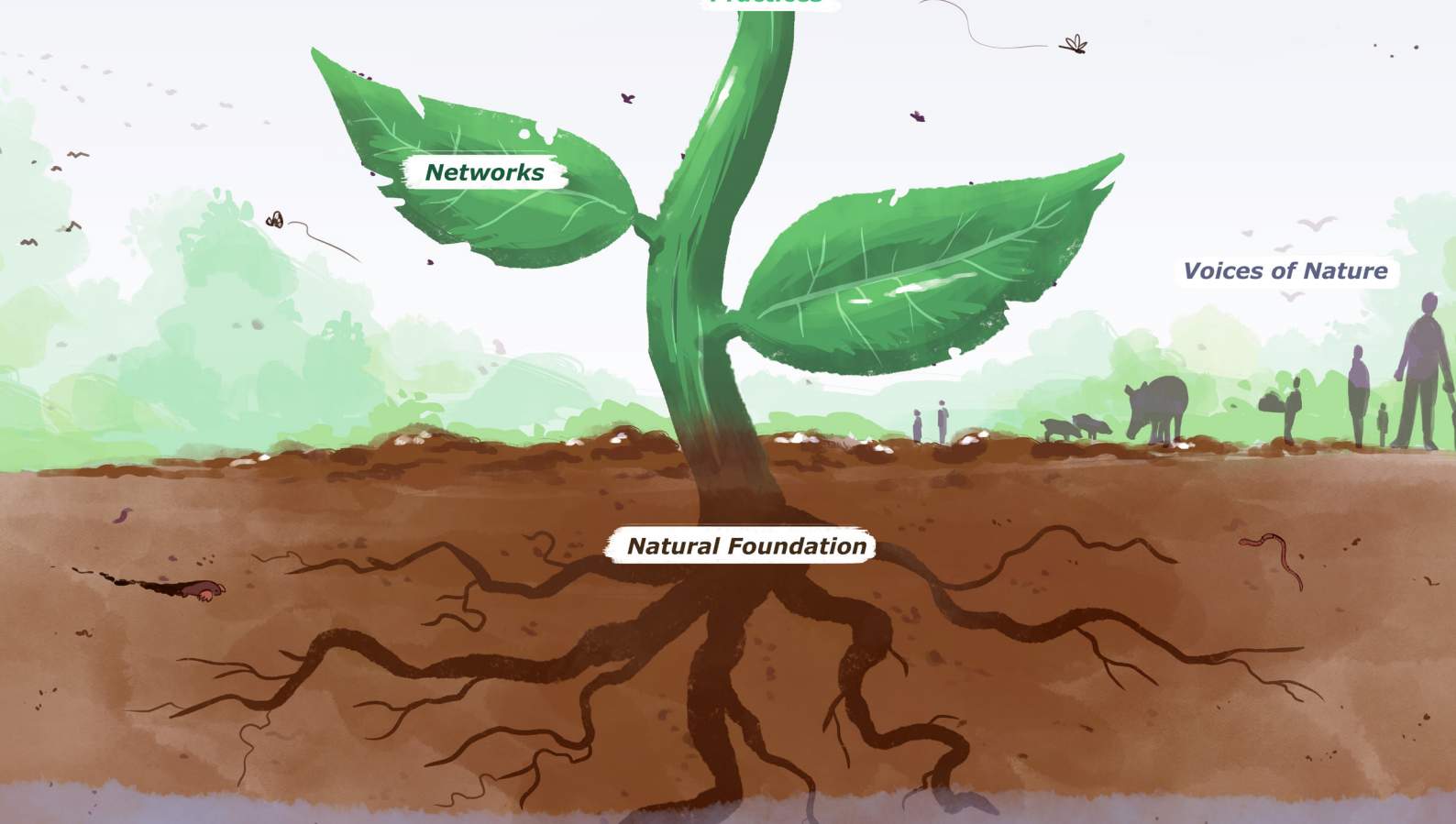
Boschlust

Practices

Networks

Voices of Nature

Natural Foundation



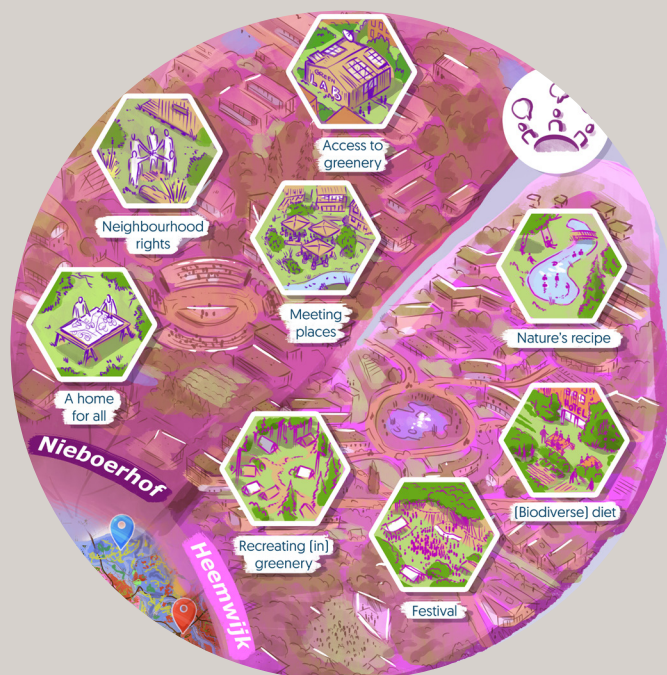
4.2 Heemwijk and Nieboerhof: the cultural value of nature

Heemwijk | Value: Culture

In Heemwijk, health and healthy living are central. Doctors prescribe nature as a treatment. Whether you cycle, run, hike or visit the climbing wall, exercising outdoors and in nature is important. You follow a diet tailored specifically to your body, with less meat and more plant-based foods. In this way, nature promotes your health and that of people in the district.

Heemwijk hosts the country's oldest camp-ground – Saxenheim – which is famous for outdoor camping and hospitality. Every year, Saxenheim attracts two million visitors who go there not only for its camping facilities, but also for its various nature activities. Recreation in nature while camping in nature.

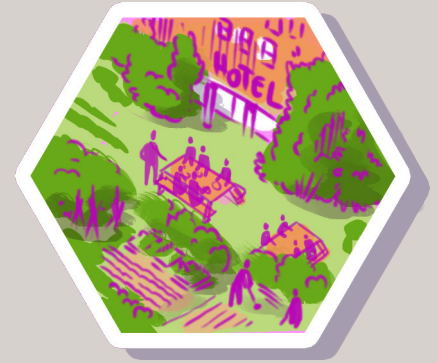
Heemwijk is also known for its various lifestyle festivals and nature-based attractions, such as nature museums. Walking meetings are another popular activity: walking through nature while discussing plans and making agreements. Research in Heemwijk has shown that the more you become part of nature, the longer you live.



Heemwijk | Practices

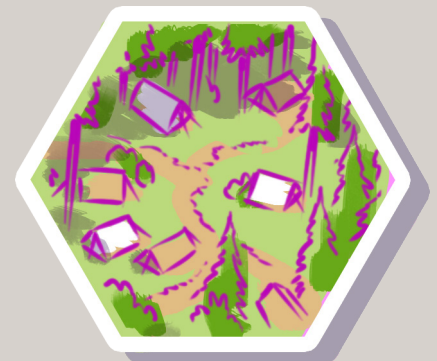
1 *Diverse (and bio-diverse) diet*

You follow a diet tailored specifically to your body, consisting of less meat and more plant-based foods. Thus, nature promotes your health, and you are better for nature.



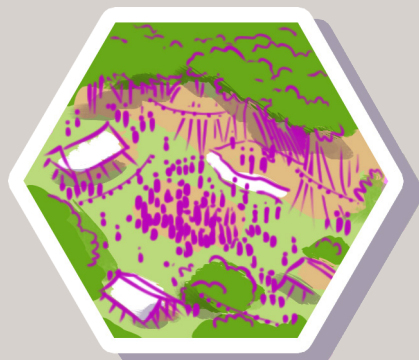
2 *Nature's recipe*

Doctors provide nature on prescription: you become more active in the outdoors. Whether you cycle, run, hike or visit the climbing wall; exercise and contact with nature make you feel more vital.



3 *Recreating in greenery*

Every year, Saxenheim receives two million visitors. It is the oldest campground in the country, known for its tremendous hospitality. You can camp outdoors and help in nature, for example by pollarding willows, cleaning bird boxes and working on the natural banks where the canoes are ready for use.



4 *Festival*

Outdoor yoga classes, lifestyle festivals and various nature attractions such as nature museums are Heemwijk's big attractions. "Walking meetings" are another popular activity: walking through nature while discussing plans and making agreements.

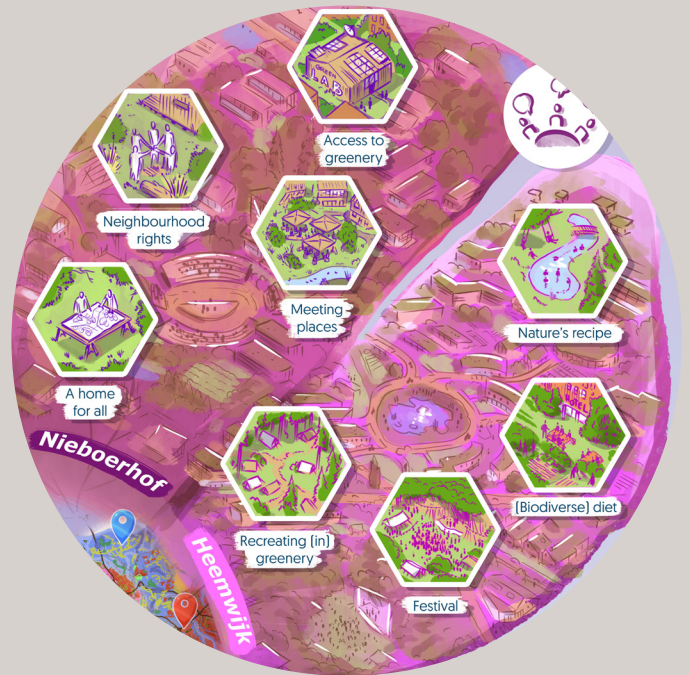
Nieboerhof | Value: Culture

In Nieboerhof, residents not only design and build their own houses, but also plan the streets on which the houses are built. The designs also provide habitats for birds, hedgehogs and bats; after all, everyone needs a home, not just people. Residents have neighbourhood rights: you have a say in what happens in your own neighbourhood and you take care of it yourself. It is a neighbourhood with a diversity of people and lots of greenery. Public spaces such as schoolyards, sports fields and cemeteries have been transformed into green meeting places, which you maintain together with other residents.

Kitchen gardens have been established throughout the district, including urban greenhouses that provide income for local entrepreneurs. As a resident, you are constantly thinking about and experimenting with 'green ideas', such as vertical farming or indoor farming. Housing associations invest in rental houses with natural gardens, and the houses themselves are well insulated against heat and cold.

Due to the composition of the district, residents have a high regard for each other. It is a social neighbourhood, where people help each other with all kinds of goods and services. For example, civic initiatives have resulted in recycling projects for natural resources.

In the symbiotic city, everyone is equal. This provides opportunities to people who live in disadvantaged areas in today's cities or are at a disadvantage in the job market. For such groups there are also abundant opportunities to start new businesses. In Nieboerhof, equal rights apply to everyone.



Nieboerhof | Practices

1 *A home for all*

There are many nature-positive homes in Nieboerhof. Everyone builds their own home, for themselves and for the flora and fauna around them. Birds are your neighbours, there are habitats for everyone.



2 *Neighbourhood rights*

Neighbourhood residents have a great influence on their living environment through neighbourhood rights. This means that they have a say in everything that happens in their own district and take responsibility for this. They make effective agreements with the municipality on the management of green spaces.



3 *Meeting places*

Schoolyards, sports fields, fitness centres and cemeteries are no longer enclosed, paved spaces. They have become green spaces where residents meet.



4 *Access to green space*

Throughout the district, there is access to nature for all inhabitants of the city. Housing associations invest in rental houses with natural gardens and open spaces, and the houses are well insulated against heat and cold while still providing space for animals. Local businesses are also emerging with new business models, such as timber and biobased constructions, water filtration systems and vertical farming systems.

4.3 Blauwe Land and Hanza: the future value of nature

Blauwe Land | Value: future

If you live in het Blauwe Land (the Blue Land), then you live on and around the water. Rivers and streams meander through the landscape, just like in the old days, when they could follow their natural courses. The banks have a gentle slope and are full of all kinds of riparian and aquatic plants, which in turn attract many insects and animals.

Protecting soil, bodies of water and water quality is very important. Rainwater is collected in reservoirs and stored. Soil and water quality are monitored continuously. Building literally on the water and using water as a new form of energy are core tasks for residents of het Blauwe Land. Floating in the water are the houses and offices where most inhabitants live and work. There are also special islands for growing food.

The highlight of the year is the Blue Lands Festival. National and international artists perform on stages built on pontoons. Festivalgoers can rent smaller pontoons to watch all the performances or enjoy them from their own boats. In het Blauwe Land, nature follows its own course.



Blauwe Land | Practices

1 *Water ecosystems*

Rivers meander as before, following their natural path. Also, the banks become vegetated again, turning into oases for dragonflies, salamanders and fish.



2 *Reservoir*

Because water and soil are the natural foundation and future of the district, caring for them is important. Water is collected and stored, and soil and water quality are continuously monitored. The district has a soil biodiversity plan that is being monitored.



3 *Water generation*

Energy is generated by the flow of water and used by residents as a basic energy source. A lot of innovation is taking place around energy production from water.



4 *Floating venues*

Residents not only live from the water, but also on it. Houses and offices float in the water, where most of the residents live and work. These floating islands have become a successful export product around the world.

Hanza | Value: future

The Hanza district is located closer to the city centre. It is green there, as roads and pavements have been returned to nature and form green-blue corridors where water also takes its own course. As a result, Hanza is cool in summer, and heat stress is a thing of the past. There are special climate plazas where you can learn and experience how to collect and store excess precipitation in winter in a natural way. In summer, the plazas are dry and become meeting places for residents.

The heart of the district is always in motion. This is the location of the climate-neutral distribution centre for regional products from neighbouring countries, from Norway to France. Those products arrive by road and water via carbon-neutral transport and are shipped to the next destination in the same way.

Hanza is also home to the museum of the future, Museum Futura. It gives new generations a glimpse of the future and is also a place to relax. At the outdoor museum, young and old can experiment with mud and water. But you don't have to get wet: you can take a boat ride or walk on the special path just above the treetops. At Hanza, you can glimpse the future.



Hanza | Practices

1 *Green-blue corridors*

The city centre of Hanza has as little paving as possible. People walk along the natural corridors consisting of semi-paved paths or paths covered with wood chips and grass, where water also follows its own path. Ancient trees and native shrubs make it cool in summer.



2 *Climate squares*

Special climate plazas demonstrate how to collect and store rainwater. These plazas are green oases in the city and are meeting places for residents where education is central.



3 *Distribution Hub*

Hanza is a distribution centre where products are delivered and traded with climate-neutral transport throughout north-western Europe.



4 *Museum of the Future*

Museum Futura, the museum of the future, teaches all generations about the past and future of nature in the Netherlands. Of course, there is also time for relaxation, for example by taking a boat ride, having a mud fight or hiking through the treetops on elevated pathways.

4.4 Nova Tiempo and Bruchemerpolder: the physical value of nature

Nova Tiempo | Value: physical

Walking through Nova Tiempo, you move from one surprise into another. Nova Tiempo is the urban district of the new age, with high-tech solutions. In all the projects here, nature and technology enhance each other. There are dozens of local start-ups and in the large innovation centre people are working on inventions such as natural, circularity-based carpets and lifestyle and nature apps for residents of other districts.

In the adjacent industrial hall, hemp-fibre walls are prefabricated that are used for houses like those you can find in Woenige. Biomimicry – technology based on examples from nature – is a key concept in Nova Tiempo. These include experimenting with climbing techniques like suction cups under the legs of reptiles, which the master gardeners can use to maintain the vertical gardens. Termite mounds are also studied as an example of natural ventilation. Fresh air enters all the rooms in such a mound, and the temperature remains stable day and night.

Waste does not exist in Nova Tiempo; with circular technologies, used materials become raw material for new products. The innovation at Nova Tiempo is also reflected in the design of its buildings, because they too are symbiotic as a matter of course: people live on the inside and the outside layer provides living space for bats and



other animals and insects. Roof tiles have nesting boxes, and bats can live in the insulation material. New applications are constantly emerging so that flora, fauna and humans can live together in symbiosis.



Nova Tiempo | Practices

1 *Nature based innovations*

Local start-ups are hard at work on innovations to integrate nature even more into the lives of the inhabitants. In doing so, nature and technology enhance each other. Virtual Intelligence will be used to build apps that people in the symbiotic city can use for their personal experiences, such as lifestyle apps and nature apps.



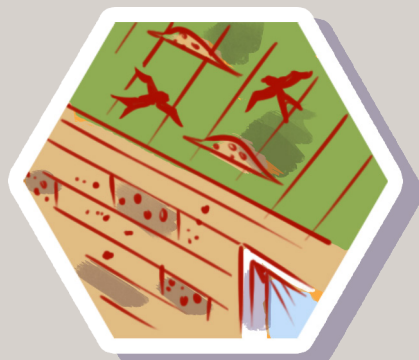
2 *Biomimicry*

The start-ups take inspiration from biomimicry: technology based on examples from nature. The inventors experiment with climbing techniques like the suction cups under the legs of reptiles, which the master gardeners from Woenige and Boschlust can use to maintain the vertical gardens. They also explore how termite mound technology can be used to design office spaces. The temperature in a termite mound is the same day and night, and each room is supplied with a constant flow of fresh air.



3 *Waste is gold*

Waste does not exist in Nova Tiempo. New applications in circular waste management, air purification and water technology are being sought for all materials.



4 *Green designs*

Nova Tiempo is a prime example of a green business park. Businesses are constantly improving applications like the green roofs, green façades, rain gardens and green buildings not only in Nova Tiempo, but also in Boschlust and Woenige. They also look at innovations in natural waterways, buildings, infrastructure and green cycle paths.

Bruchemerpolder | Value: physical

The Bruchemerpolder is largely about agriculture. If you fly over it, you will see that the district consists of a centre surrounded by two large rings where many different crops are grown. In the centre, nutrient-rich crops grow in the fields and plots, which are sold directly to residents and local restaurants. The first ring around the centre provides space for crops such as spelt, hemp and hops, which are needed for basic products such as bread, clothing and beer. There is also room for chicken runs, beehives and potato cultivation, always interspersed with flowery patches that provide pollen and nectar for insects.

The outer ring of Bruchemerpolder contains 'industrial' crops such as flax and elephant grass that can be used for bio-based housing construction. The whole district forms a single, large ecosystem (3). Learning and continued development are prioritised, resulting in the emergence of new products with new possibilities for use.

Growing so many different types of crops demands a lot from the soil. Taking good care of that soil is important in the Bruchemerpolder. Crops are constantly rotated to ensure soil biodiversity and protect soil structure. This enables nature to produce natural raw materials. Biodiverse design and construction are the norm.

Context

The Bruchemerpolder is named after Wageningen researcher Dr. Jaap van Bruchem, one of the founders of circular agriculture. Born in 1945, the son of a dairy farmer, he became a scientist and was far ahead of his time, looking at things from a circular perspective. He



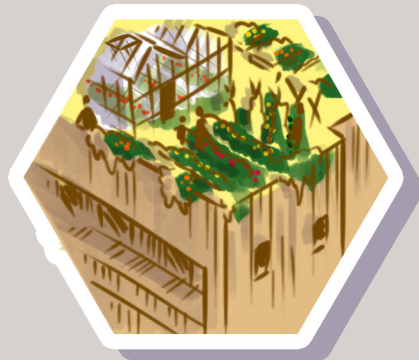
soon realised the value of cow manure by using it to feed soil organisms. He also discovered that cows give more milk when grazing on healthy soil and eating a low-protein diet. But his work was not always taken seriously by fellow scientists. Only in recent years has the value of van Bruchem's work been rediscovered. Van Bruchem died in November 2021. (Source: the VVBM).



Bruchemerpolder | Practices

1 Regional produce

Bruchemerpolder is the paramount international example of regenerative agriculture. Crops such as spelt, hops and hemp are grown around the residential centres. Those crops are used as resources for clothes and food. In plots slightly further away from residential centres, products such as hemp, elephant grass and flax are grown that can be used for bio-based housing and infrastructure.



2 Food for humans and nature

Crops are interspersed with flowery strips and native shrubs and trees. This provides food and habitats for humans and nature. Innovative verge management is carried out by government agencies and private landowners.



3 Learning ecosystem

In Bruchemerpolder, farmers, businesses and governments are working closely together on new production chains for nature positive cropping systems. Research is being conducted together with entrepreneurs from Nova Tiempo. As a result, the district has become a major learning ecosystem for regenerative regional agriculture.



4 Restoration and care

Because all these crops affect the soil in their own way, good soil management is essential. Crop rotation and effective care ensure vital soil and water.

4.5 Boschlust and Woenige: the intrinsic value of nature

Boschlust | Value: Intrinsic

The hamlet of Boschlust is also known as 'the lungs of the city'; it has more trees than houses and many of them, often native species such as elm, ash and willow, are hundreds of years old. In Boschlust, trees can live until they die of natural causes. During their long life, they are part of the food forest that is used by the residents. The fruits and nuts go directly to hotels, restaurants and residents, creating a special form of botanical gastronomy. In and around the trees live squirrels, woodpeckers and other animals who move around as they please.

Birds and insects fly overhead as you lounge in the shade of those mighty trees. The animals use the ecological paths, a special route in which nature itself guides them through the district. As a resident of Boschlust, you recognise a lot of the tree species and the greenery that grows beneath them. You play an important role in allowing that nature to exist and grow as optimally as possible.

When constructing the houses and neighbourhoods, much attention has been paid to the surrounding flora and the insects and animals that live in this habitat. This district lives in harmony with nature and is so special that UNESCO has listed it as a World Heritage Site. In Boschlust, you can really live in nature.



Boschlust | Practices

1 Ancient trees

Boschlust provides homes and habitats for people and animals. The district has more trees than houses. There are many native tree species such as elm, lime, willow, alder and poplar. The wooded areas provide good habitats for mosses, ferns and other plant species. The old pollard willows and chestnut trees provide shelter to many species of insects and birds.



2 Botanical gastronomy

Part of the district is used as a food forest. Hotels and restaurants obtain their produce directly from the trees and shrubs, creating a special form of botanical gastronomy. Cooks are winning international awards with this source of food.



3 Natural foundation

Soil and water provide the natural foundation of the district and are the guiding principle for the design of paths, verges, gardens and roofs. Soil and water help birds and insects find their way to food-rich plants and flowers.



4 Protected status

In Boschlust, the city is one with nature. Like in Woenige, the houses and the rest of the urban infrastructure is based on wood or biobased materials. The technical networks are symbiotically connected with the abundance of nature in the district. The value of the district is also acknowledged worldwide: UNESCO has placed the district on the World Heritage list.

Woenige | Value: Intrinsic

If you live in Woenige, your house is built of wood, flax or hemp with a roof full of sedum, bellflowers and primroses. Bio-based construction is the norm, often with vertical gardens as walls and using as many recycled materials as possible. There is a wadi in the garden, which collects rainwater. Several gardens have natural pools where the water is purified by a natural filtration system.

The nature-inclusive homes are set amidst plantings designed by the district's master gardeners. The diversity of plants, trees, shrubs and herbs is enormous, carefully composed and in harmony with the soil they grow on. Many residents work for the municipality and help maintain the gardens.

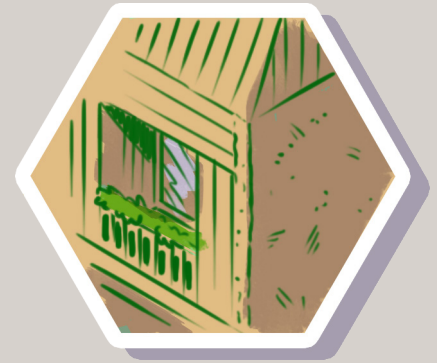
Paved paths or roads are scarce in Woenige. Everyone is welcome to use the large and green public spaces such as parks, ponds and rain gardens. The many walking and cycling routes lead Woenige residents to other districts of the city and are used for both recreation and commuting. Everything is in harmony.



Woenige | Practices

1 *Biobased buildings*

If you live in Woenige, you live in a house made of wood, flax or hemp. On the roof is sedum and bellflowers and primroses grow there as well. Bio-based construction is the norm in Woenige. The buildings also provide shelter for birds and bats with special nesting boxes.



2 *Symbiotic real estate*

The homes in the district are symbiotic. They consist of several concentric layers. People live in the first layer, while the layers surrounding it provide habitats for insects and other animals like bats. The outer layer provides space for greenery, which can grow there indefinitely.



3 *Master gardeners*

The district is designed and landscaped by master gardeners. The species of plants live in harmony with each other and with the fauna and attract many insects and other small animals. Special apps created by the businesses in Nova Tiempo enable residents to check the health of the flora and fauna around their homes and workplaces.



4 *Public greenery*

The nature-positive homes are located amidst public greenery consisting of plants, shrubs, herbs and grasses. The parks, ponds and rain gardens are open to all. Its many walking and cycling routes are mostly green and semi-paved.

Manuscript: 5 priorities on the way to 2040

Transformation into symbiotic cities is essential to develop a future for future generations (IPC 2022, JKB 2022). All actors in the urban eco-innovation network can collaborate in new practices and build new networks to make this symbiotic city a reality (Gunderson and Holling, 2002; Hölscher et al., 2021; Termeer et al., 2017).

You are always part of a group that can build one or more of the various networks in the city. Everyone can get started right away. This process is already underway but can be expanded and accelerated if all city inhabitants feel more connected to each other and to nature. They can put the following priorities on their list.



1 Focus on nature



In every urban planning decision, put nature back at the centre of attention in the city. Choose an eco-centric starting point. The voices of nature must once again become loud and clear in the design of cities. A related aspect is to recognise the legal rights of nature more often. Nature is no longer something to be exploited, but always has a voice and becomes a legal entity. When major interventions are made to rivers, soil, trees or other natural landscapes, they are legally protected.

Make nature part of the house or the neighbourhood you live, or the company you work for. In short, of the places you care for. Provide housing for both people and nature in the city. This is more than providing a roof over everyone's head. Think about how animals and plants can also feed, move and reproduce in your city. Get out there and take the time to enjoy and understand nature every season. Look around you and see where you can make a difference.

2 From “me” and “them” to us

Take the lead and join the conversation about the symbiotic city. Describe how you envision the coexistence of man and nature, share your dreams and involve your neighbours in those dreams. For example, ask them what is valuable in their lives now and later, or what they need to live well. Bring it closer by linking the conversation to things people enjoy: for children, it is more exciting to play outside in nature; for adults, you can make jam with the blackberries you find, or make tea from the leaves of edible flowers (Stuiver and Koffijberg, 2022).

Involve your own networks of colleagues, neighbours, acquaintances, family and friends in your dreams and plans. Look for each other and build new symbiotic networks with each other. Encourage each other to dare to stick your neck out in this time of transformation. Give the people around you the confidence that they are doing it right and give each other the space to do things differently. Get to work together and dare to make mistakes. Speak to the people who lead the way in politics, business and science. Ask them to commit to a central place for nature in the city. Invite them to guarantee and make this possible together with the residents.



3 Inclusive leadership

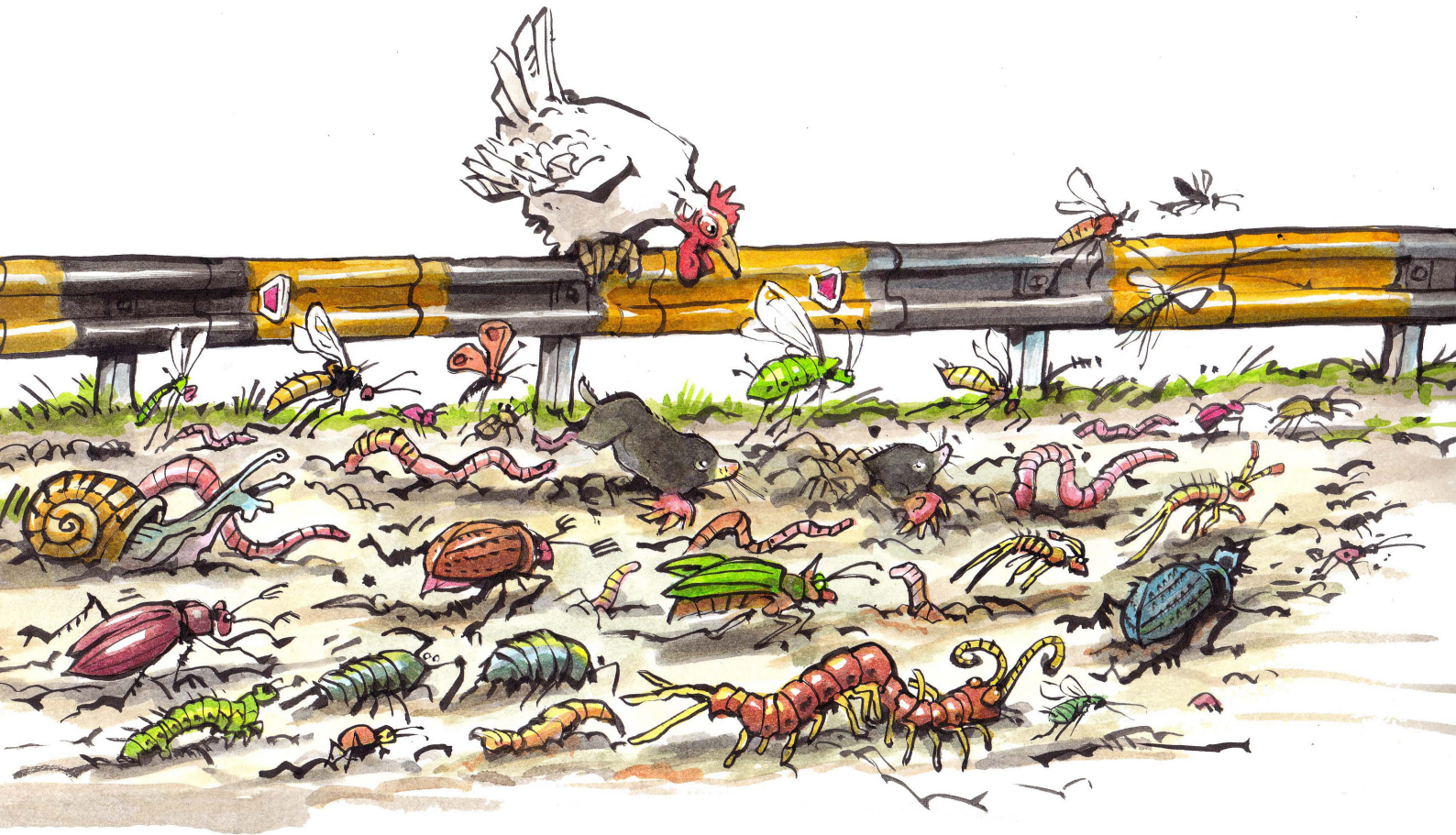
Start by recognising that not explicitly including city inhabitants in your projects, designs or plans will almost always lead to the exclusion of certain groups and communities – humans or animals and plants. Be bold and dare to address the topic in your own life. Try to understand the terminology and language used.

Do you know your own blind spots? What do you know yourself about nature? Do you know people who understand what birds and butterflies need to live? What happens in the soil under your house? Dig a hole and look at the soil profile. Do you start the conversation with people you don't know yet but who live and work close to you in the city? To what extent do you include non-human inhabitants of the city in your daily decisions? How do you give voice to nature? Are birds, butterflies and insects already sitting at your drawing board?



4

Soil and water guide urban development

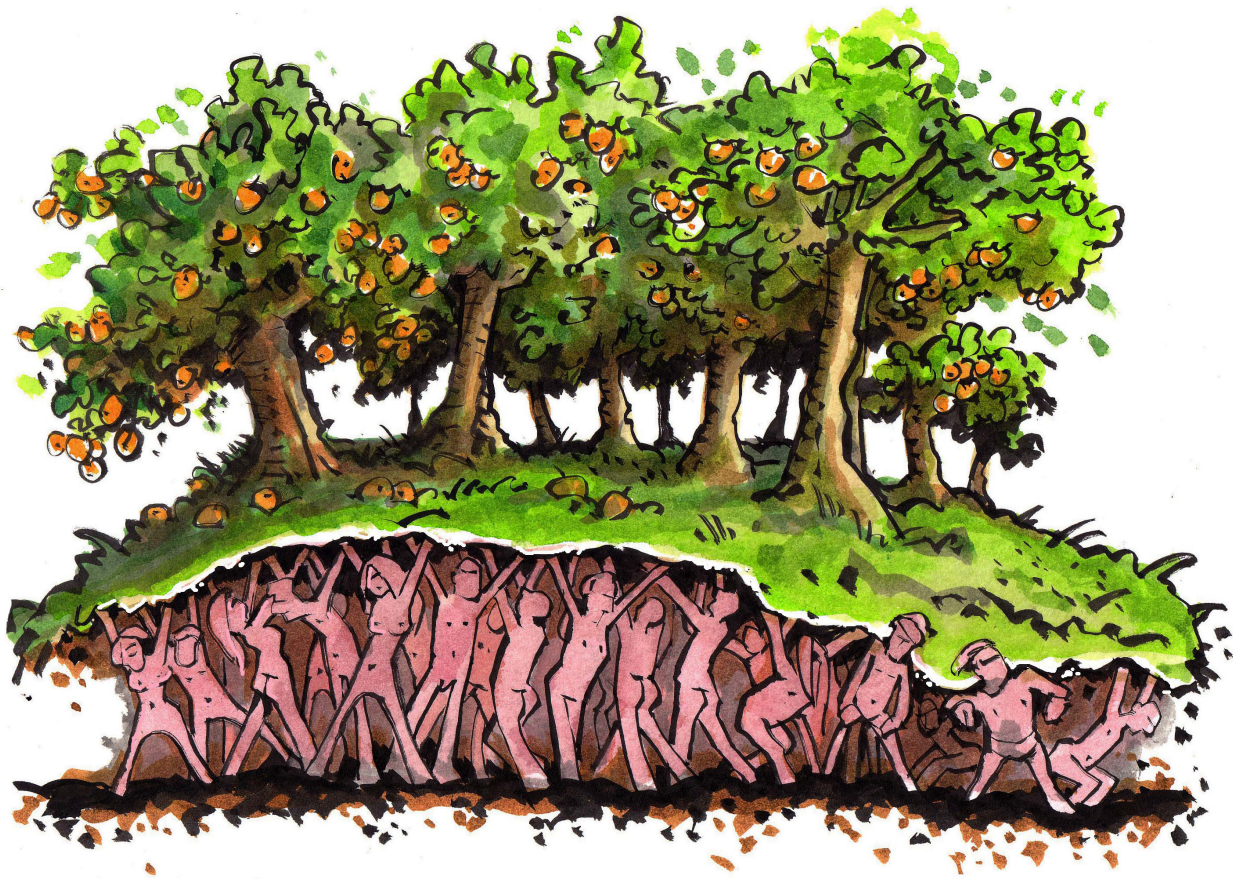


Look at the situation of water and soil in the built environment. Reducing the amount of paved (impervious) surface area will reduce the amount of runoff (EC, 2012). It is also important to avoid soil compaction as this will make the soil unsuitable for plant growth. It is crucial to increase organic matter in the soil: higher organic matter content increases soil fertility and its capacity to retain water and sequester carbon.

If you are developing an urban area, whether it's your backyard or an entire new neighbourhood, think about your underground land use planning. How do we get everything united in the soil? Quite a challenge. A clear example is the networks of drainage and cable systems in the soil. If you want to plant new trees, it is good to know what is happening underground. Above-ground vegetation may not compete with the underground technical infrastructure. Conversely, this technical infrastructure should not be an obstacle for plant growth and vegetation development. This is still quite a puzzle (FAO & ITPS, 2022).

5 An economy that embraces nature

Any company or organization can decide to become a forerunner in the market to embrace nature radically. Suppose you work for an organization or company that owns real estate or land. You can implement many of the measures from this brochure on your own land or in your own homes and gardens. You can also green the business process itself and develop new products and innovations that will make the symbiotic city possible. You can put it on the agenda in your own networks of government, municipality and housing corporations. You can discuss it in your Supervisory Boards and Works Councils.



Introducing nature into the economy will create many win-win situations, such as improved living conditions for citizens, better use and management of soil and water, new employment opportunities and nature-based innovations. However, this transformation will not be without compromises. New products, markets and companies will emerge and (unsustainable) products and companies will disappear. The new system will gradually replace the existing one.

This transformation will disrupt several unsustainable practices. Companies will have to be resilient and find new balances and opportunities in their market strategy. The changes on the path to the symbiotic city therefore require continuous monitoring of the unexpected social-economic consequences. By predicting potential changes and addressing them in a timely manner, every company can benefit from this transformation to an economy that embraces nature.

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The voyage of discovery to the symbiotic city has been extremely educational. I want to thank colleagues from inside and outside Wageningen University and Research for this journey. I learned so much about ecology and economics, about people, about architecture and urban planning, about media and politics.

I had such a learning moment of the phenomenon of “bee hotel” after a conversation with a nature lover. In recent years, a market has emerged for bee and insect hotels. These often consist of hollow bamboo stems, pinecones and wooden blocks with holes. They are made for wild bees and insects to shelter, nest and hibernate. Different companies offer them, and the quality varies enormously. I also see them in my city, sometimes in the strangest places. I notice that they are not used well by the bees and insects they are intended for. They hang in full sun; the straws are too sharp, or materials are used that the animals do not like.

It is important that we design the entire living environment in a healthy and safe way for the animals. Just like humans, animals need safety, food, reproduction and movement. *Bed and Breakfast.*

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