

# Multispecies city

**Justice Perspectives for  
the Planetary Planning  
of a Carbon-negative City**

– Summary of expert discussions

Susa Eräranta

The background of the cover features a scenic view of a coastal area. In the upper right, a blue boat is visible on the water. Below the water, there is a dense forest of green trees. The foreground shows a rocky shoreline with some vegetation. The entire image is partially obscured by a large, dark blue, wavy shape on the left side, which contains the text.

Helsinki

The logo for Helsinki, featuring the word "Helsinki" in a white, sans-serif font inside a white outline of a speech bubble or a rounded rectangle with a small tail at the bottom.

**Helsinki**

**Multispecies city – Justice Perspectives for the  
Planetary Planning of a Carbon-negative City:  
Summary of expert discussions**

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# Foreword

The City of Helsinki aims to be [1] carbon-neutral by 2030, carbon zero by 2040, and thereafter carbon-negative. Taking into account that the carbon neutrality target set in 2030 means the city must cut its CO<sub>2</sub> emissions by 80% compared to the 1990 level and the remaining 20% can be compensated outside the city borders, the transfer to carbon zero already requires balancing the CO<sub>2</sub> emissions produced and sequestered by the city inside the city borders. Carbon-negativity, on the other hand, means that the emissions produced inside the city borders must be lower than the city's ability to sequester carbon within its geographical borders.

Achieving the long-term emission reduction target is not only about carbon optimisation but other planetary boundary conditions [2] must also be taken into account (Figure 1) as well as the impacts of the selected actions on the preconditions of living in general. Planetary well-being [3, 4] that supports a diverse life requires changes in how well-being is defined and from whose perspective it is discussed. Planetary well-being requires that human activities must be sustainable in a way that preserves the essential preconditions of life and well-being not only for humans but also for other species, habitats, and ecosystems [3]. An expert survey conducted in May 2023 [5] highlighted the need for greater attention to the perspective of justice as part of the well-being debate. The Helsinki City Strategy also emphasises the justice perspective in connection with concretising climate targets [1]. In addition, according to a recent report on climate justice [6] the social debate on justice in climate policy has so far been too narrow.

The Helsinki City Strategy requires that a scenario review is carried out in order to meet the tightening climate targets, and identify possible pathways to achieving the set targets [1]. This report is part of the review work required by the strategy and aims to support concretising a carbon-negative future by providing research data and methods, both to support the identification and evaluation of the justice of the actions, as well as the identification of the key actors affected. Extending the scenarios to take full account of the preconditions of life requires new methods alongside and partly in place of those already in use.

The report is based on a literature review and expert interviews that clarify the review. Expert interviews were used to identify already established and emerging key themes and literature, and to narrow the scope of the study.

We would like to thank all the interviewed experts and those who otherwise shared their knowledge and views during the work.

Helsinki 6 September 2023,

**Susa Eräranta**



**Figure 1. Previously identified planetary boundary conditions for carbon-negative city planning [2].**

# 1 Introduction

”Progress towards planetary well-being ultimately depends on the ability of human societies to organize the systems for satisfying human needs so that they do not compromise the integrity of Earth system and ecosystem processes” [7, p. 20].

## 1.1 Planetaryism and justice as part of the concretisation of carbon-negativity

Planetary boundaries have already been crossed for many parts [8, 9], and life-support systems are approaching their tipping point [10, 11, 12, 13, 14], leading to rapidly accelerating changes in areas such as climate [15], biodiversity [16, 17, 18] and the decline of raw materials and farmland [19, 20, 21, 22]. In studies, human activity has been identified as a key factor in the emergence of ecological disturbances and, in particular, accelerating their rate of change [23, 24, 25]. It is therefore important that future actions are used to take responsibility for the situation and that the selected actions and their impacts are justly taken into account and distributed both temporally (e.g. history, present, future) and regionally (e.g. local, global), as well as from the perspective of various actors [26, 27, 28, 29]. This may also require giving up achieved gains as global resource consumption has already exceeded the limits of planetary sustainability [6]. It is important to radically reduce environmental impacts in the short term while strengthening the adaptability of

the planetary socio-ecological system to a changing world [30, 31, 32, 33, 34]. In addition to a strong focus on human-centred sustainability, recent research has highlighted the perspective of multispecies sustainability [35, 36], which is also assumed as the starting point of this report.

When aiming for growth and development, they must simultaneously take into account the finity and diversity of the environment as well as the multispecies aspect, both in the present and in the future. Research has increasingly raised concerns that planetary boundaries and justice impacts are not adequately addressed in the current sustainability debate [37, 38, 39, 40, 41]. As Kortetmäki and Hirvilammi [42] have stated: *“The paradox of our time is that when we strive for well-being, we weaken its opportunities everywhere.”*

Achieving the set goals is not possible with the current practices [43, 44, 45], as the root causes of many challenges lie in these very practices. Therefore, the necessary change cannot be brought about with only small sector-specific actions but rather it requires a broader systemic change. As a result, the key challenge of the sustainability

transformation is to enable a fundamental change of the system in an acceptable and just manner [46] so that people maintain their trust in the system [47]. At the same time, it is necessary to pay attention to the impacts of actions and inaction on different actors as, in fact, impacts arise not only from taking action but also from doing nothing. The transformation must be carried out as justly as possible for different actors, and the theme of justice has been emphasised a lot in the recent climate debate. For example, the new Climate Change Act [48] has highlighted the importance of justice impacts and their global intergenerational dimensions [49, 50].

## 1.2 The aim of the report

The consequences of climate change, such as the benefits of reducing emissions or the disadvantages and risks caused by climate change, are not evenly distributed between different regions, economic sectors or groups of people [6, 51]. Similarly, the effects of climate action are not evenly distributed (e.g. traffic emission reduction measures affect different regions and different actors / groups of actors in different ways) [6, 52, 53, 54, 55]. It is therefore important to clarify what a just transformation means [6] and with what kinds of methods it is possible to take it into account already during the process [56, 57].

The aim of this report is to support the concretisation of carbon-negative futures by raising, in addition to the previously identified planetary boundary conditions, also the justice aspects of the actions under review with a multispecies approach

and at different times (history, present, future). The report describes the situation in summer 2023 in relation to the reviewed themes, and it is based on a literature review and expert interviews (Appendix 1). The report describes the key themes from the justice perspective that need to be strengthened in the implementation of the carbon-negativity target.

The report is divided into three parts:

1. **Dimensions of justice**, which includes a brief overview of the key general themes related to climate justice:
  - Distributive justice
  - Procedural justice
  - Recognitional justice
2. **Planetary planning emphasises the special themes of justice**, which are especially related to the specific issues of intergenerational planning across city and species boundaries:
  - Structural justice
  - Multispecies justice
  - Intergenerational justice
  - Spatial justice
3. **Methods for envisioning carbon-negative futures**, which presents methodological examples and identifies guidelines for the selection and development of methods to be used in the process.

# 2 The need for a justice debate: The socio-ecological system as the basis of cities

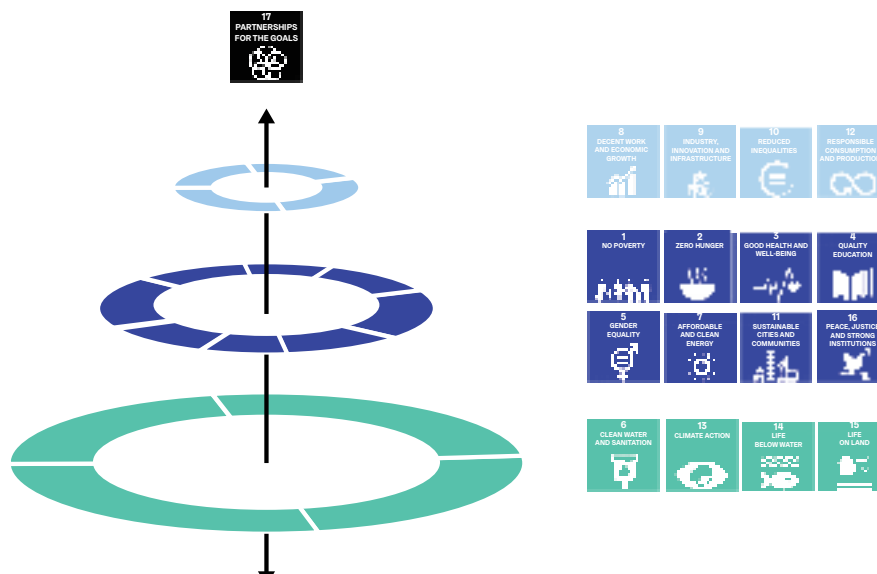
Humans and man-made systems depend on the planetary system and the habitable environment and biological cycle it enables [58, 59, 60, 61, 62, 63].

According to studies, the impact of human activities on many of the challenges faced by the ecological system and, in particular, their rate of change has been significant [64, 65, 66]. The concept of the anthropocene [67, 68] has often been used to describe the impact of change brought about by humans, but the concept has also been criticised for creating the impression that it would not be possible to adapt human activities to ecological boundaries [69, 70, 71]. Based on the studies, the key point is that human activity must remain within the so-called planetary boundaries, as the planetary system guides the stability and resilience of the Earth [8, 72] and that achieving the goal is possible – even mandatory

[73]. Other dimensions of sustainability (social, cultural and economic) rely on the foundation of this ecological dimension (Figure 2). Only operations that maintain or promote planetary well-being are strongly sustainable [42].

However, the debate on strong sustainability has also been criticised for being human-centred, as it still focuses largely on the human point of view, while neglecting, for example, the multispecies perspective or giving it mainly an instrumental value [37, 38]. It is precisely anthropocentrism that has been identified in research as one of the root causes of the sustainability crisis [74, 75, 76]. Therefore, recent research has begun to highlight more prominently the perspective of multispecies sustainability, which emphasises the dependence of human and man-made systems on the surrounding nature and, at the

**Figure 2. In strong sustainability, ecological sustainability lays the foundation for all other activities [based on: 301, 77].**



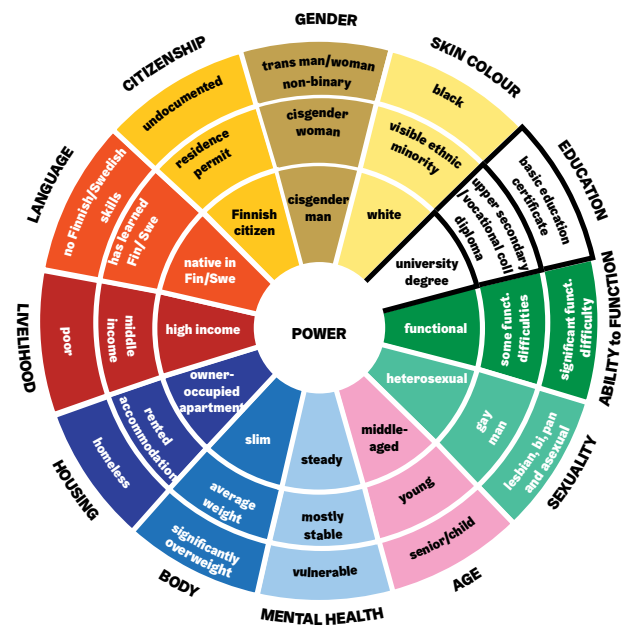
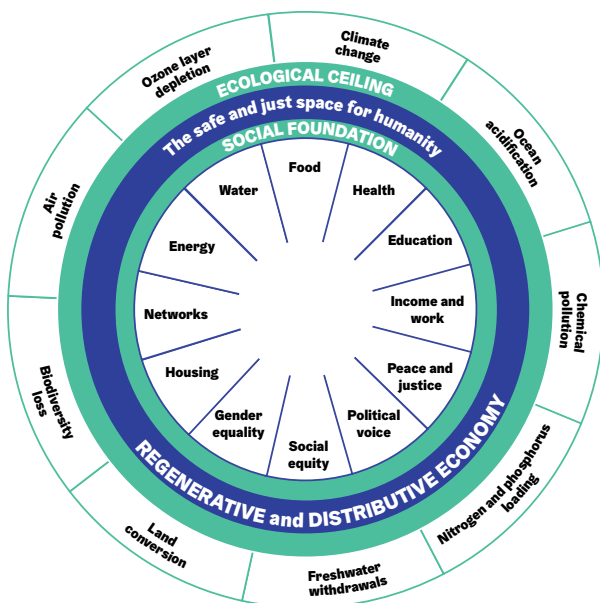
same time, on the entire planetary system [35].

Operating within planetary boundaries highlights the need for a more holistic consideration of the socio-ecological perspective in planning and decision-making [77, 78, 79, 80, 81, 82, 83, 84, 85].

The socio-ecological system as an approach highlights that people, communities, economies, societies and cultures are dependent and evolve together with the life-support ecological system, i.e. the biosphere [86, 87, 88]. This approach highlights that human activities have an impact on the environment, but also vice versa: the environment has an impact on humans [77]. In all of its dimensions, human well-being is based on the carrying capacity of the biosphere. The health and sustainability of the biosphere are also critical for human health and well-being [77]. From the justice perspective, it is important to understand these dependencies. According to the definition of strong sustainability, human well-being must be considered in relation to other living organisms [42] and ecosystems.

For a long time, efforts to combine environmental sustainability and social dimensions were limited [89]. One example of the concretisation of the socio-ecological system is the doughnut model [90, 91, 92] (Figure 3) in which the outer perimeter represents planetary boundaries and the inner perimeter represents the social foundation that

**Figure 3. Inside the doughnut model is a safe and just space for humanity and the economic system that simultaneously takes into account planetary boundaries [based on: 301, 94, 91].**



**Figure 4. The impact of different factors affects vulnerability and the experience of vulnerability, such as between people [based on: 96, 97].**

makes life good (e.g. food security, water supply and sanitation, healthcare, education, work, energy services and justice). The space between these two perimeters is a safe and just space in which humanity should strive to live, avoiding overshooting planetary boundaries and guaranteeing a good life [93]. The doughnut model has been praised, for example, for increasing understanding of and discussion about justice [27]. However, it does not take a sufficiently extensive account of the needs of multispecies and intergenerational justice.

In assessing climate actions, it is essential to weigh the health benefits and risks targeted at different groups and individuals [49]. Social sustainability requires that the basic needs of actors in vulnerable situations are prioritised. With regard to the concretisation of the carbon-negativity target, this means, for example, that it is important to identify groups vulnerable to both climate and planetary system changes (e.g. certain residential areas and types of housing) and those who, for example, suffer or lose the most from the measures taken to achieve the carbon negativity target (mobility system, community structure, etc.) [95]. These processes of vulnerability and loss are different for different actors, and identifying the position of different actors can be challenging at times [73]. Figure 4 illustrates, by way of example, the impact of various factors on the emergence of vulnerability and privileged position from a human perspective [96, 97].



# 3 Dimensions of justice

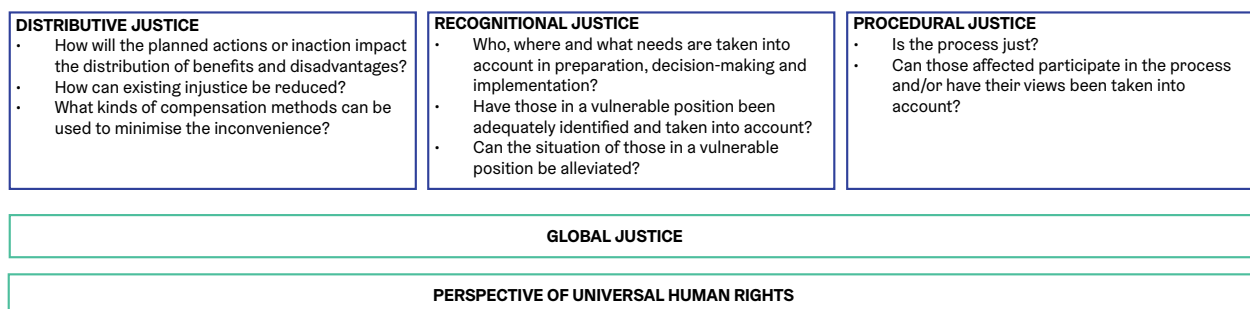
Many researchers [98, 99, 100, 101, 102, 103] have identified the significance of defining a minimum level of justice that can also support the reconciliation of different interests [49, 104, 105, 106]. The minimum level of the content-related justice of Finland’s climate policy, derived from fundamental and human rights, could be, for example, the following [a more comprehensive list: 49]:

- Climate action is sufficient to safeguard life and health.
- Climate actions take into account other environmental targets, in particular the protection of biodiversity and water.
- The standard of living (food, warm accommodation, mobility) is also sufficient in the transformation phase.
- Human rights and environmental rights are realised in supply chains linked to climate policy.
- The use of property and the pursuit of livelihoods is still possible.

- Everyone has the preconditions for practising, maintaining and transmitting their culture to future generations.
- Climate action does not put anyone in a different position without an acceptable justification on the basis of sex, gender, age, origin, language, religion, belief, opinion, health, disability or some other reason related to the person.

Fundamental and human rights are an important touchstone for defining a minimum level of justice, but it is important to assess the justice impacts also more broadly and to identify possible conflicts between them [6, 49]. The dimensions of justice in climate action can be examined using the distinction commonly used in the study of environmental and energy justice [6, 107, 108, 109, 110, 111, 112] between distributive, procedural and recognitional justice (see Figure 5, Figure 6).

**Figure 5. Three dimensions of justice and two intersecting themes [based on: 6, p. 3].**



### 3.1 Distributive justice

Distributive justice examines both the distribution of risks and vulnerabilities related to the changing climate as well as the distribution of benefits and disadvantages arising from mitigation and adaptation measures or inaction between different actors [6, 113]. Impacts can be targeted at many different areas, such as the environment, nutrition, housing, mobility, health and well-being, safety, social relations and economic resources [6, 49, 52, 110, 114, 115]. As perspectives, the justice impact assessment includes, for example, an examination of the magnitude, duration, permanence and likelihood of harm and benefits, as well as the uniformity and total impacts of the disadvantage distribution [49, 116, 117, 118, 119, 120].

From the perspective of distributive justice, it is important to ensure the opportunities for the basic needs of different actors to be met and, if necessary, the use of compensatory measures, for example, can be considered, while ensuring that the steering effect is not lost [49]. Alongside distributive justice, restorative justice has been proposed, which seeks to compensate for the actual disadvantages or reduce their impacts by various measures equalising the distributive effects [121, 122, 123]. However, the impacts are not always only disadvantages, and from the perspective of restorative justice, the ability of actors to adapt to the necessary changes can be supported [49].

As part of distributive justice, the principle of pri-

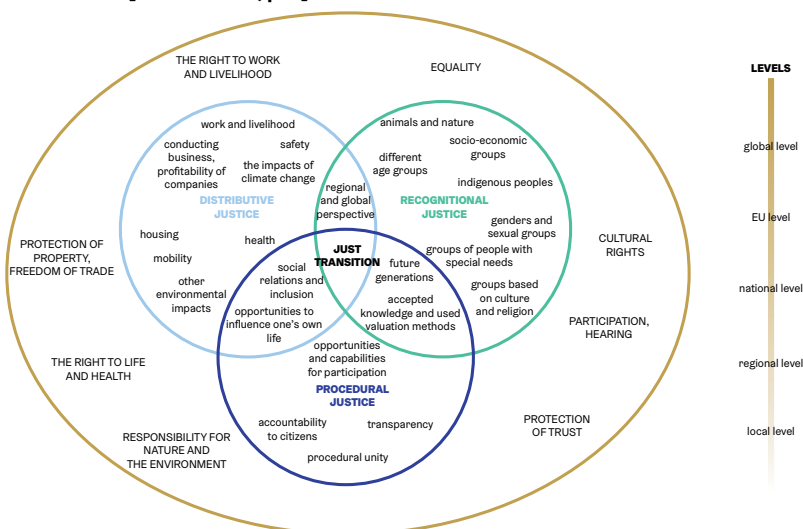
macy can be discussed, according to which the worse off actors are, the greater weight should be given to their needs in the process [95]. Regarding of the impacts of the transformation, it is essential to identify the different legitimate and non-legitimate expectations on which the actors have based their decisions. Based on these expectations, the need for restorative justice, such as compensations, can be assessed [95]. When talking about justice and climate action, it is also important to keep in mind that the situation may not be permanent when it comes to all actions. For example, it may be the case that during the transformation period more restrictions are needed, but after that it is possible to dismantle them as new solutions emerge.

Auxiliary questions for assessing distributive justice [based on 49]:

- Does the action/inaction significantly reduce the livelihood and living conditions of some actors now or in the future?
- Does the action/inaction reduce the opportunities of some actors to, for example, work or conduct business?
- Does the action/inaction reduce the well-being and health benefits or disadvantages of some actors now or in the future?

**PRECONDITION 1: Among other factors, discussions must take into account how the impacts are distributed among different actors and groups of actors – also temporally.**

**Figure 6. The dimensions of justice are partly overlapping, and impacts may vary on different scales [based on: 49, p. 8].**



## 3.2 Procedural justice

Another dimension of justice, i.e. procedural justice, is related to the justice of processes and the methods used in them [6]. This requires that the processes are open, transparent, impartial and accountable, with equal opportunities for different actors to participate [6, 112, 124, 125, 126, 127]. Procedural justice requires that the opportunities for different actors, especially those in the most vulnerable positions, to participate in the process are supported or special attention is paid to taking their perspective into account [49, 126, 128].

At the moment, inclusion processes can lead to a situation in which the views of the loudest and most affluent are particularly emphasised [129, 130, 131, 132]. It is typical that the most vulnerable actors are not easily involved in discussions, partly due to the fact that not all the actors to be taken into account are already born or even people, and they have opportunities for participation among themselves [133, 134].

Auxiliary questions for assessing procedural justice [based on 49]:

- Has the preparation taken into account the differences between different actors, different positions and special needs and vulnerabilities arising from differences?
- Has the impact assessment considered those who are expected to be directly and indirectly affected?
- Have the process and decisions been prepared in a data-driven manner? Have the impact assessments had an impact on the proposed measures?

**PRECONDITION 2: Among other factors, discussions must take into account that the process has been prepared with a data-based approach and that the differences between actors, different positions and special needs and vulnerabilities have been taken into account in the preparation and selection of methods.**

## 3.3 Recognitional justice

Recognitional justice takes into account in particular the differences between actors, different positions in society and special needs and vulnerabilities [6, 49, 135]. It aims to promote the realisation of the rights of actors in a vulnerable position [136, 137]. In studies, vulnerability has been defined as the ability of an actor to respond to the impacts of changes or actions [49, 138, 139, 140, 141]. From the perspective of recognitional justice, the key question is what is, in principle, identified as the object of justice and how well the needs of different actors can be identified [95]. Often, for example, those who are in the most vulnerable position in terms of many different criteria are also the most underrepresented in the processes. Recognitional justice is important, for example, when creating new models and practices for more sustainable lifestyles [49].

From a human perspective, recognitional justice pays attention to, for example, the status of indigenous peoples, children, seniors, groups with different socio-economic status, and immigrants [6, 142]. Based on research, current inclusion processes have identified that, for example, those with the lowest levels of education, immigrants, illiterate, undocumented, young people and other kinds of actors are underrepresented [35, 73, 95, 143, 144, 145].

Auxiliary questions for assessing recognitional justice [based on 49]:

- Are actors in a different position in relation to the impacts because of, for example, their background, culture, wealth, age, place of residence, education or profession?
- How has the background of the preparing officials or assessors influenced the formulation and evaluation of the actions?
- Has it been ensured that the actions do not discriminate against anyone due to factors such as nationality, age, gender or illness?

**PRECONDITION 3: In discussions, it must be taken into account, along with other factors, that different types of actors – including future generations and other species – have been considered sufficiently.**

# 4 Special themes of justice emphasised in planetary planning

From the point of view of planning that takes into account the carbon-negativity target and other planetary boundaries, justice highlights four special themes: structural justice, multispecies justice, intergenerational justice and spatial justice.

## 4.1 Structural justice

In the justice debate, the structures that enable or prevent it are a central theme [95]. The studies have highlighted, for example, the challenges of the democratic decision-making system in enabling long-term and multispecies, far-reaching change [134, 146, 147, 148, 149, 150, 151]. However, this report is based on the assumption of preserving the current decision-making model, as the aim is to find operating models that could also be utilised within the framework of the current social and decision-making model. In this case, structural justice is discussed, which refers to inequality that is constantly renewed through social structures.

Well-off actors often have better preconditions for adapting to changes, but also stronger representation in different institutions that are important for decisions-making. Thus, structures tend to create advantageous positions for those who already have a good position in the first place. It is important to note that the process does not only involve those for whom making their voice heard is the easiest due to, for example, existing networks or power structures [128]. Structural justice is difficult to fix, as imagining futures and decision-making often do not include the most vulnerable actors who are most extensively affected and who

do not already have an established representation in existing systems. In addition to vulnerable individuals and groups of people, these include, for example, nature and future generations. Structural justice is characterised by the following special characteristics [69, 152]:

- It is not caused by the effects of individual actors or actions, but a wide range of different actors, structures and influences.
- It arises from long-lasting and extensive processes, the starting moment and responsibilities of which are difficult to define unambiguously.
- It is caused by a variety of uncoordinated activities.
- Many of its consequences stem from actions that are not generally considered morally reprehensible.

**PRECONDITION 4: With the help of the methods, the perspective of different actors in the process also from outside the existing networks and administrative structures is made more visible.**

## 4.2 Multispecies justice

The impacts of planning never affect only one type of organism [73, 153, 154, 155, 156, 157, 158]. Particularly in relation to the exploitation of natural resources and the destruction of natural habitats, the ongoing biodiversity loss has also highlighted the rights of other species, ecosystems and habitats [35, 159]. The change in the climate has been rapid, and nature has not had enough time to adapt to it. As a result, the extinction rate of species has accelerated in recent decades [160], increasing the need for greater attention to the multispecies approach. In a multispecies approach, the key is not only to take into account the perspective of different species but also to perceive the nested nature and interdependencies between them [161] (Figure 7).

Multispecies planning seeks to reduce the central role of humans as the only central focus of planning [164, 165, 166, 167, 168, 169, 170]. Taking it into consideration has become more common, especially on the research side [167, 168, 171, 172, 173, 174, 175, 176].








Multispecies justice challenges our way of perceiving the environment and our desire to divide it into clearly defined individuals whose needs could be

unambiguously defined. From a multispecies and multiactor perspective, ‘individuals’ are always interdependent and nested within each other [73]. For example, as residents of and actors in a certain city, we simultaneously produce impacts (e.g. emissions, materials) on many other organisms, species and ecosystems in several different places at the same time through our actions. Our actions should be just in all these places all the time [73].

Various inclusion practices have grown rapidly over the past decades. From the point of view of practices, it is important to assess who is actually included, as the group of participants also strongly influences the setting of questions and the understanding of necessary solutions [162, 163]. Recent research [159] has shown that inclusion practices are strongly selective and often disregard, for example, the perspective of other species or impacts on entire ecosystems.

Several thoughts on taking the multispecies perspective into account in co-planning processes have been presented [58, 177]. There are also examples of non-human participation in planning: represented by humans, by exploring other actors in their natural habitat or through direct participation [178, 179, 180, 181, 182]. However, an established

**Figure 7. From the perspective of multispecies planning, actors are partly nested and interdependent. A 7-step classification can be used to identify actors [based on: 35].**

<b>INDIVIDUAL ORGANISMS</b>		e.g. plants, animals (e.g. humans, mammals, birds, reptiles, insects, amphibians, crustaceans, molluscs)
<b>ONE-SPECIES COLONIES</b>		e.g. insect colonies, bryophyta, algae, fungi
<b>MULTISPECIES COLONIES</b>		e.g. bacterial colonies, lichens, soil, compost, manure
<b>LIVING SYSTEMS</b>		e.g. gardens, lawns, greenhouses, forests, rivers
<b>LIFE-SUPPORTING PROCESSES</b>		e.g. photosynthesis, decomposition of organic matter, respiration, nitrogen sequestration
<b>BIOGEOCHEMICAL CYCLES</b>		e.g. carbon cycle, nitrogen cycle, phosphorus cycle, water cycle
<b>ATMOSPHERIC PROCESSES</b>		e.g. weather, seasons, climate

theoretical basis on which co-planning and inclusion planning involving nature could be built has not yet been formed [159]. Three factors [35] have been highlighted to take into account the multispecies planning aspect. It:

- contributes to finding solutions that are in line with both the multispecies approach and human-driven needs;
- challenges past worldviews and methods to better consider impacts on other species and ecosystems; and
- reveals structures that maintain unsustainable solutions.

However, taking the multispecies aspect into account alone is not enough to ensure sustainability [183, 184, 185, 186, 187]. It is therefore important to also take into account other key boundaries for planetary sustainability [2].

**PRECONDITION 5: With the help of the methods acknowledgement of whether the action/ inaction improves/weakens the state of nature, biodiversity or the living conditions of other species is increased.**

### 4.3 Intergenerational justice

The impacts of justice may occur directly or over a longer period of time, and they may be direct or indirect [49], which is why it is important to also take into account the intergenerational effects of actions or inaction [188, 189, 190, 191]. Many of today's actions are unsustainable, both locally and globally, and also exploit resources at the expense of future generations [146]. Future generations in particular depend on decisions made by the current generation, but cannot defend their rights or question the decisions made, as they have not even been born yet [146]. Indeed, studies have shown that the further into the future we move, the more distant those affected by the decision and its effects will feel [192, 193, 194].

The impacts of decisions made in the future may therefore be unjust from the perspective of future generations due to the temporal distance [146]. Due

to this delay bias, people tend to prefer immediate benefits over long-term benefits [195, 196]. For example, according to research, intergenerational justice has become strongly biased in favour of the present [197, 198, 199, 200, 201, 202]. This highlights the need to consider impacts also from the perspective of those living in the distant future [192, 203]. It is therefore important to find methods that also enable taking into account the perspective of future generations [133]. From the perspective of intergenerational justice, it is also important to distinguish between needs and wants [159], so that it is possible to outline the distribution of resources between different generations.

**PRECONDITION 6: With the help of the methods acknowledgement of the perspective, needs and wants of future generations is supported.**

### 4.4 Spatial justice

The impacts are often locally linked, but also extend to wider areas and are unevenly distributed across different regions [49]. Global resources continue to be unequally used both between and within regions [29, 204, 205, 206, 207, 208]. When it comes to climate targets, the debate on justice often focuses on either the burden sharing between states or the responsibility of individuals. As the 'BAU Scenario for the City of Helsinki's Emissions up to 2050' report showed [209], for example, the activities of Helsinki and Helsinki residents also cause emissions outside the city (Scope 3). Less attention has been paid to the unequal impacts of climate change within states and cities [69].

**PRECONDITION 7: With the help of the methods acknowledgement of whether the impacts have significant regional differences or if they increase disadvantages/benefits crossing the regional borders and globally is supported.**

# 5 Methods for envisioning carbon-negative futures

Studies show that our choices do not always follow the assumption of internal consistency and that we tend to find information that supports the decisions we have already made [210, 211, 212, 213, 214, 215]. That is why it is often challenging to tune in to what it would be like to have a good life in a really different world and how to secure the fulfillment of basic needs in a way where life would still be meaningful. Instead, it is easy to convince oneself of the idea that change is only far off in the future and meeting short-term needs is more urgent than imagining and foresight of the future [304, 305]. For this reason, it is important to take into account the specific issues of planetary-aligned planning using new types of methods.

Research has highlighted the importance of developing imagination in future-driven processes in order to avoid a lack of alternatives [216, 217, 218, 219]. Concerns have even been expressed about the weakening of the social imagination and the increasing difficulty of imagining a society adapted to planetary boundaries and being able to live a good life in the future [220, 302]. Social imagination and the ability and willingness to imagine desirable futures are essential for the vitality of society [303]. Imagining can also be used to support the identification of systemic needs for change in addition to needs required on an individual level.

Sustainability sciences have for long emphasised the importance of individuals' inner worlds, such as world views, values, and beliefs, as enablers of change [177, 221, 222, 223, 224, 225, 226, 227]. The transformation towards regenerative sustainability requires a change in thinking and practices, but also in world views and values. However, studies have

highlighted that such a change is not possible in the context of the current anthropocentric worldview [228, 229, 230, 231].

Information and increased training have often been considered as the means of supporting activities that take the environment better into account. However, studies show that people's perceptions of the environment do not support environmentally friendly actions, and changing attitudes is not a sufficient way to achieve this [232, 233, 234, 235, 236, 237, 238]. For example, broader systemic factors [237] may hinder environmentally friendly behaviour. Indeed, promoting environmentally friendly behaviour is one of the most difficult objectives of behavioural change [237, 239, 240, 241, 242, 243, 244, 245]. Although change on an individual level is important, it is not enough, even if implemented well (Figure 8). Simply changing attitudes is not enough, as it is also important to change the entire system to enable the desired change in behaviour [232, 246, 247].

However, breaking habits (at the system level for example building infrastructure or changes in urban planning, at the individual level for example changing an apartment or the birth of a child) can create the opportunity for a change in behavior [237, 248, 249, 250, 251, 252]. In terms of behavioural change, it is essential to promote systemic change so that the system itself steers towards sustainable solutions. The change must be promoted simultaneously at all three levels: personal, structural and policy-related [253, 254] (Figure 9).

Envisioning desired futures is important [303]. Imagining the apocalypse and the innovation or tech-dependent depictions of the future is often easier

**Figure 8. The impact of individual-level actions and choices is often not enough to achieve for example the set emission reduction targets, which is why cities' own agency is also important.**



This is Pekka. Pekka wants to reduce his emissions as much as possible. In order for Pekka's carbon footprint to be at a climate-sustainable level, it should be reduced by 90%.

Pekka lives in a housing company with 50 flats, which is connected to the district heating network. Taken together, 25% of Pekka's emissions come from housing, 25% from food, 25% from mobility and 25% from other consumption.



Pekka can reduce his emissions with personal choices. He lowers the temperature of his apartment by 3 degrees, uses as few lights and electrical appliances as possible and reduces the use of hot water by 25%



With these choices, Pekka's personal emissions are reduced by **1.88%**.



If all the residents of the city acted in the same way as Pekka, the emissions of the entire city would be reduced by **0.5 %**.



Pekka lives in a city where 50% of its emissions come from heating.



The city replaces the production of one coal-fired power plant with a low-carbon production method. Emissions from heating are reduced by 40% and the city's total emissions are reduced by **20 %**.

The city also wants to make it possible for private housing companies to switch the production of heating to low-carbon and offers housing companies an energy renaissance service that the housing company can use to switch from district heating to geothermal heating. Pekka's housing company switches to geothermal heating. The housing company's emissions are reduced by 30% with no need to lower the indoor temperature.

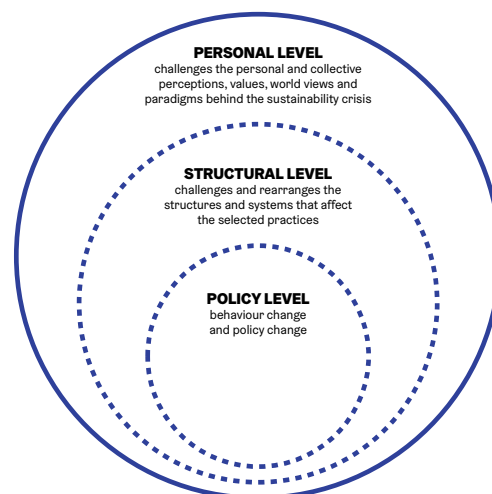
(Koskinen & Oilinki 2023)



than imagining positive alternatives, because it is natural for a person to experience the uncertainty of the future as somewhat scary [220]. However, when imagining futures, it is important to take into account planetary boundaries, because a society that does not operate within these limits is not sustainable and is incapable of functioning in the long term [220].

To support long-term decision-making, it is important to utilise new types of methods that support creativity and imagination [255, 256, 257, 258, 259]. Below is a list of some of the methods presented in the literature that support the outlining of positive futures and future-driven decision-making [192]. Methods based on these and developed further can be found on the constantly updated website [260].

- **Civil dialogues.** Deliberative forms of planning, such as civil dialogues, aim to bring together groups of people representing different views [203, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271]. Before the dialogues, participants can be offered background information packages and expert lectures for them to get to know the topic [261]. To strengthen a multi-perspective approach, civil dialogues can take the form of forums composed of randomly selected participants [263, 266]. In smaller discussions, it is possible to use a quota, in addition to random sampling, with the aim of ensuring that the group of participants is representative or at least demographically diverse with regard to predefined criteria [272]. Although reflective civic discussions open the process up to wider discussion, studies suggest that they often fail to address many of the key development needs identified from the perspective of long-term planning, such as intergenerationality, the multispecies approach and taking into account the most vulnerable groups [273].
- **Representatives of future generations.** A possibility highlighted in the research literature for taking long-term impacts into account is appointing representatives of future generations to the processes, acting as negotiators on behalf of future generations [198]. Potential conflicts of interest between generations often emphasise the needs and interests of the present generation, while the needs and interests of future generations are ignored [274]. Representing future generations has sought to mitigate people's inherent tendency to prioritise the perspective of actors similar to themselves and temporally close [275, 276, 277, 278, 279]. Consciously assuming another perspective improves the ability to pay attention also to those



**Figure 9. The change must be promoted simultaneously at all three levels: personal, systemic and policy-related [based on: 35, 253, 254].**

- actors whose interests or perspectives would otherwise be overlooked [203, 280, 281, 282, 283].
- **Temporally dependent future groups.** In one of the methods presented in the research literature [198], participants were divided into three generation groups, each of which had access to the resources left behind by the previous generation, and they had to decide how much of the remaining resources they would use themselves and how much they would pass on to subsequent generations. The aim of the method was to raise awareness and debate about the needs of future generations and also about decisions that are sustainable from their perspective [198, 203, 284]. There are other similar thought exercises [285, 286, 287, 288, 289, 290, 291]. However, the challenge has been that the views expressed by the representatives of future generations have not received sufficient weight in decision-making where there is often pressure to implement shorter-term objectives [261]. Future generations, as the present, consist of actors in different positions [261] and require multivoiced representation. In addition, the legitimacy of the representatives of future generations has been questioned, as their views do not necessarily represent the perspectives and interests of future generations extensively [148, 198]. In any case, representing future generations in decision-making is always based on research, because future generations cannot express their own views in the processes [192, 292].
- **Making use of art, stories and literature to open up the debate.** Art can also be used to promote understanding from the perspective of future

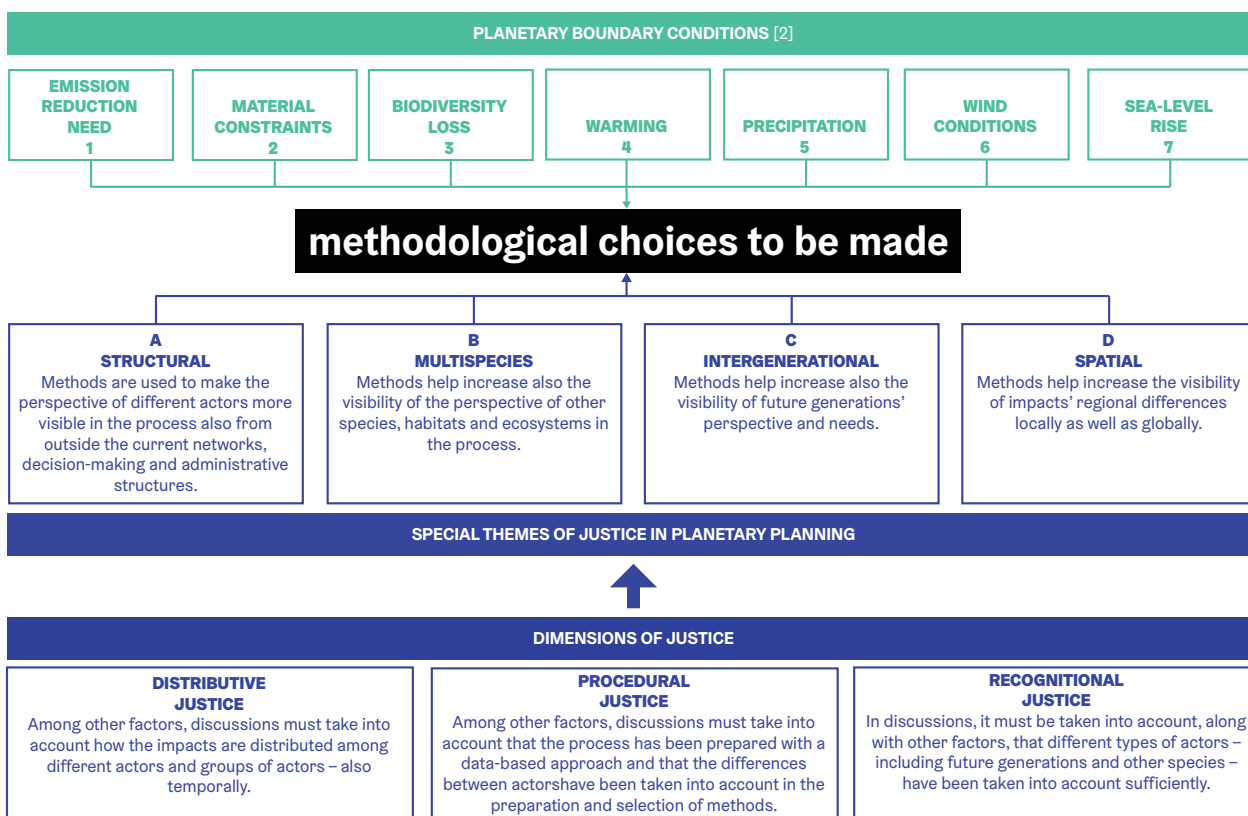
generations [192]. In studies, for example, science fiction and films have been highlighted as effective ways of making the experiences of and impacts on future generations and other actors more concrete and understandable [192, 293]. In the discussions, it is also possible to use imaginary time travel exercises where the participants assume the position of future generations and consider the effects from their perspective [203, 263, 284]. In addition to these, discussion can be stimulated and supported, for example, through visualisations [294]. Studies show that making the changes concrete, especially from the point of view of the participants' own immediate environment, helps start a discussion [295, 296, 297, 298, 299, 300].

theme was also emphasised in the expert survey on carbon negativity organised in May 2023 [5]. Justice as a theme is often perceived as general and the methods for taking it into account in future-oriented planning are not yet part of established practices. Based on a literature review and expert interviews, this report aimed to identify the specific justice themes emphasised in planetary (carbon-negativity target and other planetary boundary conditions [2]) planning that are important to take into account in the next steps of the process: structural, multispecies, intergenerational and spatial justice. In the methods utilised in the process, it is important to ensure that these themes are sufficiently taken into account alongside planetary boundary conditions. The table (Figure 10) can be used to help in the development of methods and in the evaluation of suitable methods.

## 5.1 Next steps

The Helsinki City Strategy emphasises the justice perspective in connection with the concretisation of climate goals [1], and the importance of the

**Figure 10. Methods aimed at imagining carbon-negative futures must support not only the consideration of planetary boundary conditions, but also the consideration of the four special themes of justice (structural, multispecies, intergenerational and spatial).**



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# APPENDIX 1:

## The participants in the expert discussions

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Previously identified planetary boundary conditions for carbon-negative city planning [2]. (Images: Emissions reductions, Yiping Feng & Ling Ouyang; Material limitations, Jussi Hellsten; Biodiversity loss, Jussi Hellsten; Warming, Jussi Hellsten; Precipitation, Jussi Hellsten; Windiness, Carmen Nguyen; Sea level rise, Yiping Feng & Ling Ouyang).	
<b>Figure 2.</b> .....	<b>7</b>
In strong sustainability, ecological sustainability lays the foundation for all other activities [based on: 301, 77].	
<b>Figure 3.</b> .....	<b>8</b>
Inside the doughnut model is a safe and just space for humanity and the economic system that simultaneously takes into account planetary boundaries [based on: 301, 94, 91].	
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