

Creating City Portraits

A methodological guide from
The Thriving Cities Initiative



**DOUGHNUT
ECONOMICS
ACTION
LAB**



BIOMIMICRY 3.8



**CIRCLE
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foundation

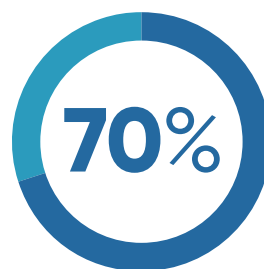
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Towards Thriving Cities

Cities have a unique role and opportunity to shape humanity's chances of thriving in balance with the rest of the living planet this century.

As home to more than 4 billion people – over 55% of the world's population – cities account for over 60% of global energy use, and more than 70% of global greenhouse gas emissions, due to the global footprint of the products they import and consume¹. At the same time, there are vast inequalities in city residents' experience of urban life, ranging from health, housing, and political representation to access to essential services, employment, and wider opportunities.



Cities account for more than 70% of global greenhouse gas emissions

The growing impact of 21st century crises – from climate breakdown, global health pandemic and economic crisis – is placing severe, recurring stress on many of the world's cities. As they seek to manage and emerge from these interconnected crises, cities have a critical opportunity to lead in making the transformations needed to create societies and economies that are far more socially just and ecologically safe. In other words, cities can aim to thrive by building wellbeing and resilience, not only in their own city but in the wider world.

The C40² works with over 90 of the world's largest cities to drive meaningful and measurable action on climate change, on the scale required to limit global heating to within 1.50 Celsius. C40 Cities are taking an integrated and inclusive approach to reducing emissions and adapting to climate risk, aiming to maximise and distribute social, environmental, and economic benefits equitably.

The Thriving Cities Initiative (TCI) is a collaboration between the C40, Doughnut Economics Action Lab³, and Circle Economy⁴, funded by the KR Foundation⁵. TCI aims to work with some of the C40's most pioneering cities to explore and pursue ambitious actions to meet the goal of living well, within the means of the living planet, and in the process, to reduce their consumption-based greenhouse gas (GHG) emissions.

The TCI's 'City Portrait' is a transformative tool for cities to explore and embrace the vision of a thriving city – a vision that recognises what makes a place unique, while also recognising

its global influence and responsibility. The methodology for creating the City Portrait arises out of a conceptual collaboration between Kate Raworth of Doughnut Economics Action Lab and Janine Benyus of Biomimicry 3.8⁶, and is described in detail in this document.

Through the TCI's pilot programme, the methodology was developed and applied in the cities of Philadelphia, Portland, and Amsterdam in 2019. This Guide presents the steps taken to apply this first version of the City Portrait methodology in these three cities, and is illustrated with examples from Amsterdam's City Portrait⁷, along with some ways in which the resulting portrait can be turned into a transformative tool. By publishing this guide, we are making the methodology available to be applied and adapted in other cities and places.

Together with diverse city representatives, we have embarked upon a journey to understand how to create cities that are home to thriving people in a thriving place, while respecting the wellbeing of all people and the health of the whole planet. We believe this place-based methodology has the potential to be adapted beyond its first application to global North cities, in order to make it relevant and useful for cities in the global South, and also for neighbourhoods, towns, nations, and regions. We invite you to join us as we co-create approaches to meet this urgent 21st century challenge.

The Purpose of this Guide

We have created this guide because we are making the City Portrait methodology freely available to all who are interested in downscaling the Doughnut to their city or place, and we want to make it as simple and straightforward as possible for others to do.

For the most effective process and results, we recommend that the team creating the City Portrait works collaboratively and involves:

- multidisciplinary researchers with a mix of qualitative and quantitative skills
- city staff representing a wide range of city departments
- city-based civic organisations and community networks.

Each of the four 'lenses' of the methodology can be investigated in many ways, depending on multiple factors such as context, resources, time, and data availability. Throughout the Guide, we describe the methods that were chosen to create the Thriving City Portraits in Portland, Philadelphia, and Amsterdam, and we also identify useful resources and alternative approaches that we came across in the process.

This Guide represents the first version of an evolving methodology – please share thoughts, comments, and lessons learned from applying it with the Thriving Cities Initiative, through joining the growing community of practitioners at Doughnut Economics Action Lab³, and through the

C40 Thriving Cities Discussion Forum⁸ so that, together, we can keep making it more relevant to more places, at many scales.

The approach described in this Guide was developed primarily with a focus on global North cities with high levels of resource consumption and large ecological footprints. In future iterations, we will be adapting and extending this approach in order to:

- place greater focus on the role and impact of history, power relations, and legacies of colonialism in global North cities
- develop an approach for global South cities that better reflects their needs, interests, and perspectives
- adapt the approach for use at multiple scales, ranging from neighbourhoods to nations or bioregions.

We look forward to discussing, collaborating with, and learning from others through these co-creative processes.

SECTION 1

The Doughnut meets the City

In this section

- Downscaling the Doughnut: From Global Compass to City Portrait 7
- 9 ways to turn the City Portrait into transformative action 9

The Doughnut of social and planetary boundaries envisions a world in which people and planet can thrive in balance – in other words, it offers a compass for guiding 21st century prosperity, as shown in Figure 1¹¹.

The Doughnut's social foundation, which is derived from the social priorities in the UN Sustainable Development Goals⁹, sets out the minimum standard of living to which every human being has a claim. No one should be left in the hole in the middle of the Doughnut, falling short on the essentials of life, ranging from food and water to gender equality and having a political voice.

The Doughnut's ecological ceiling comprises nine planetary boundaries, drawn up by Earth-system scientists in order to identify Earth's critical life-supporting systems and define the global limits of pressure that these systems can safely endure¹⁰. Humanity must live within these ecological boundaries if we are to preserve a stable climate, fertile soils, healthy oceans, a protective ozone layer, ample freshwater, and abundant biodiversity on Earth.

Between the social foundation and the ecological ceiling lies a doughnut-shaped space in which it is possible to meet the needs of all people within the means of the living planet – an ecologically safe and socially just space in which humanity can thrive.

If humanity's goal is to get into the Doughnut, the challenge is that we are currently far from doing so, as shown in Figure 2. Worldwide, billions of people still cannot meet their most essential needs, yet humanity is collectively overshooting at least four planetary boundaries, and is driving towards climate breakdown and ecological collapse. The red wedges below the social foundation in Figure 2 show the proportion of people worldwide currently falling short on life's essentials¹². The wedges radiating beyond the ecological ceiling show the current overshoot of planetary boundaries. The challenge of our times is that we must move within the Doughnut's boundaries from both sides simultaneously, in ways that promote the wellbeing of all people and the health of the whole planet. Achieving this globally calls for action on many levels, including in cities, which are proving to be leaders of driving such change. The City Portrait aims to amplify that potential.

Figure 1 The Doughnut of social and planetary boundaries

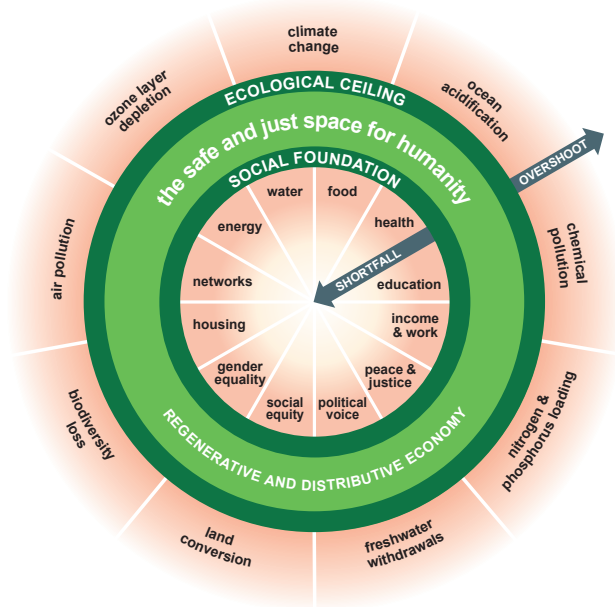
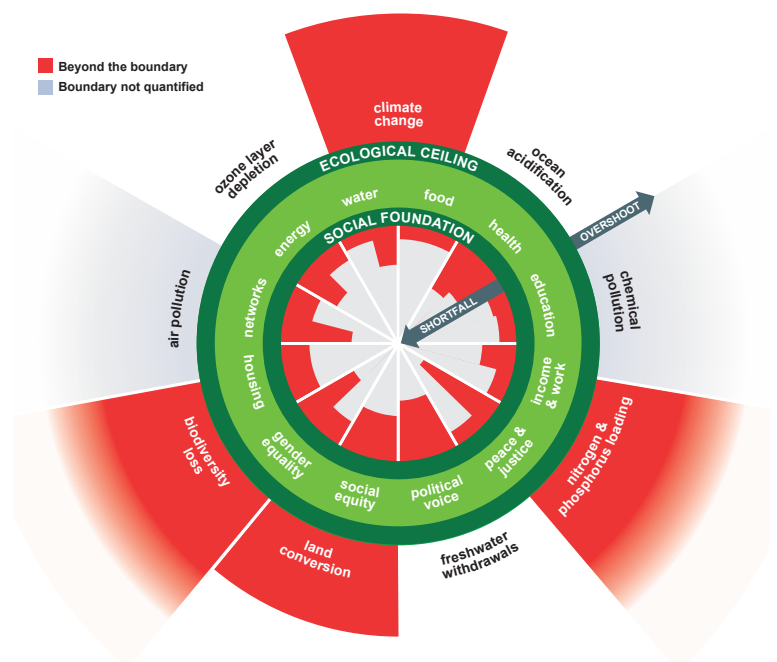


Figure 2 Transgressing both sides of the Doughnut's boundaries



Downscaling the Doughnut: From Global Compass to City Portrait

Since it was first published in 2012, the Doughnut has gained considerable international attention – from cities and towns to the United Nations, and across many layers of society, such as social enterprises, community activists, businesses, educators, and governments. The Doughnut has been downscaled in many ways since it was created, but we believe the City Portrait methodology described in this Guide represents the most holistic approach so far, for two main reasons:

1. Local aspirations, global responsibility:

The City Portrait methodology combines local aspirations – to be thriving people in a thriving place – with global responsibility – both social and ecological – that requires every place to consider its many complex interconnections with the world in which it is embedded.

2. Scalable: Our focus here is on the city scale, but we are confident that the methodology can be adapted to be applied across scales, from neighbourhood to nation (and beyond).

Our motivation is to find the most effective ways to translate the Doughnut into a tool for city-level holistic thinking and decision-making, while recognising cities' very diverse realities. The City Portrait methodology is the best response that we have come up with so far, and it can be distilled down to a single core question for a city:

How can our city be a home to thriving people, in a thriving place, whilst respecting the wellbeing of all people, and the health of the whole planet?

When a city asks itself this very 21st century question, the result is a holistic snapshot of city performance across four crucial 'lenses' that arise from combining two domains (social and ecological) and two scales (local and global). Each of these interconnected lenses focuses on a part of the overarching question at the core of the City Portrait, as shown in Figure 3 below.

Figure 3 The four lenses of the City Portrait

	SOCIAL	ECOLOGICAL
LOCAL	What would it mean for the people of this city to thrive?	What would it mean for this city to thrive within its natural habitat?
GLOBAL	What would it mean for this city to respect the wellbeing of people worldwide?	What would it mean for this city to respect the health of the whole planet?

Taken together, the four lenses of the City Portrait are intended to start and inform a public discussion about what it would mean for your city to achieve local aspirations, while respecting the rights and aspirations of others, and the living planet. With this overall purpose in mind, our design of the City Portrait methodology has followed five broad criteria:

Be locally relevant, rather than comparable between cities.

The City Portrait does not seek to produce directly comparable portraits between cities, either within the same nation or beyond. There are already multiple initiatives that aim to create such city-to-city comparisons, and these can be extremely valuable in situating a given city's performance in a wider context. What is lost in such comparisons, however, is the specificity of place, the character of community, and the relevance of historical and cultural context – all of which can be crucial entry points for civic reflection. The City Portrait forgoes strict comparability in order to best reflect these traits, meaning that each city's portrait and its related metrics will look, feel, and turn out differently.

Aim to compare desired outcomes versus current performance.

The ultimate aspiration for each of the four lenses of the portrait is to be able to compare a city's desired performance to its current performance. The targets and data required to make this kind of comparison are, however, currently lacking for many cities. But in these relatively early days of devising metrics fit for measuring thriving cities, such data gaps are to be expected, and one of the best ways to fill them is to create demand for them.

Create an opportunity for tracking progress and devising policy.

The data and information used to create the four lenses of the portrait can be tracked and updated over time, creating the possibility of tracking progress in each of the lenses. Some monitoring could be done by the city's residents themselves, so they get engaged and participate in the measuring process, and help to amplify – and celebrate – progress. Cities can also use the portrait for reflecting on the possible impacts and implications of initiatives and policies under consideration.

Offer a holistic 'snapshot' for discussing complex issues.

Each of the four lenses depicts just a fraction of the possible city data that could be shown. Rather than overwhelm stakeholders with detail, the City Portrait aims to engage them with judiciously selected data and quotes that give a snapshot of the whole and provide an overview perspective. As these four simple lenses of a city's current reality are brought together, they invite holistic reflection on the very complex dynamics that underpin their interconnections. In this way, the portrait aims to help open up discussions about possible transformative pathways.

Take the long view.

Humanity is in the very early days of creating metrics that are fit for 21st century realities. Our current approach to quantifying the City Portrait has many caveats (set out throughout this Guide). In a decade or so we will look back at this first methodology and see it as very crude. Indeed it is, but we will only make progress in assessing what it means to thrive if we start where we are and keep pushing ourselves to improve. This is teamwork: we invite suggestions.

The City Portrait has proved to be a challenging and thought-provoking starting point to explore the socio-economic and ecological dynamics that are driving consumption-intensive behaviour, lifestyle patterns, and systemic inequalities. At the same time, the City Portrait invites a city to create and pursue a more holistic vision of what it means to thrive through an iterative process of change, as set out in the nine M's on the following page.

9 Nine Ways to Turn the City Portrait into Transformative Action

1 Mirror
Reflect on the current state of the city through the portrait's holistic perspective

2 Mission
Create a compelling vision of what it means to become a thriving city

3 Mobilize
Bring together the city changemakers and stakeholders needed to bring about change

4 Map
Identify existing initiatives, policies, and strategies that are already taking the city in this direction

5 Mindset
Embrace the values, ways of working, and new narratives that underpin the deeper shifts required

6 Methods
Draw on complementary tools that serve to expand the City Portrait's analysis and deepen its insights

7 Momentum
Create an iterative process that drives cycles of transformative policy and action

8 Monitor
Assess progress against leading indicators that enrich the City Portrait

9 Mmm!
Make it irresistible: be creative, have fun, share learning and stories of success - and celebrate!

SECTION 2

Local–Social Lens:

What would it mean for the people of the city to thrive?

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Select City Performance Indicators	13
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The Local–Social lens of the City Portrait asks what ‘thriving’ means to the people of your city, and compares that aspiration with a snapshot of the city’s current performance. Although there are many ways to answer this question, the general decisions that need to be made are shown in Figure 4. In practice, making these decisions will always be an iterative process – a kind of dance between the project team, the availability of data and resources, and the city-specific context.

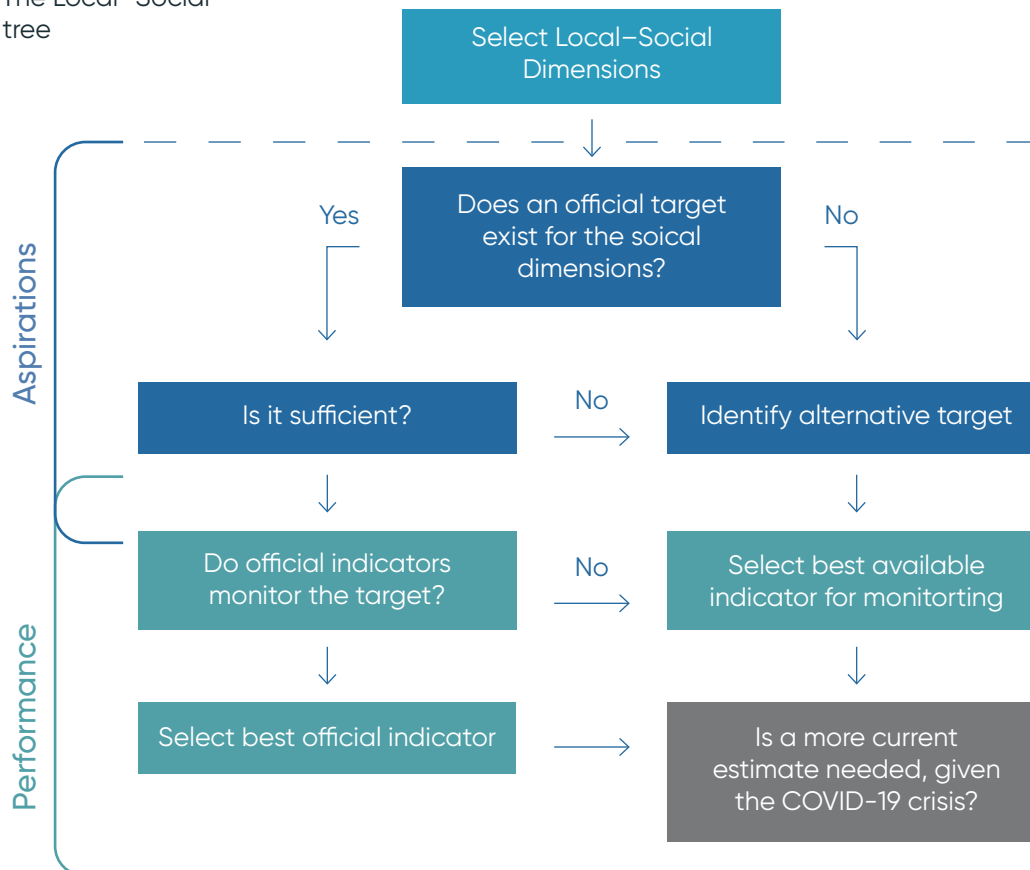
Select Local–Social Dimensions

The Local–Social lens analysis begins by defining the set of dimensions that collectively form the city’s social foundation – a basic standard of wellbeing that all city residents have a claim to achieving. These social dimensions range from nutritious food and decent housing to political voice and community connection. For the three pilot cities,

we selected a set of sixteen social dimensions, most of which are derived from the Doughnut’s social foundation (which, in turn, is drawn from the United Nations Sustainable Development Goals (SDGs)¹³. Other dimensions – such as community, culture, and equality in diversity (adding racial equality to gender equality) – go beyond the SDGs, and have been added because they are widely recognised by cities as essential elements of a thriving life for all city residents. As shown in Figure 5, these sixteen dimensions are grouped into four clusters, focused on the aspiration for all city residents to be:

- **Healthy** - with nutritious food, clean water, good health, and decent housing
- **Connected** - by Internet connectivity, urban mobility, a sense of community, and access to culture
- **Enabled** - with good education, decent work, sufficient income, and access to affordable energy
- **Empowered** - with political voice, social equity, equality in diversity (including gender and racial equality), and peace and justice.

Figure 4 The Local–Social decision tree



Do Official City Targets Exist, and Are They Sufficient?

There are many possible ways of determining what 'thriving' means to the people of a city – such as through a citizen's assembly, through a city-wide survey of residents' opinions, or through official city targets drawn up by elected city authorities.

In the three pilot cities, we followed this third option, given time and resources available, and given that each of the cities had an extensive and recently created set of relevant targets – while recognising that this may not be the case in all cities. It is also important to note that, in some cities, official targets may not reflect the needs and interests of all city residents, especially those who lack wealth, power, and access to decision-makers, and so such targets need to be assessed in terms of their sufficiency in addressing the needs of all.

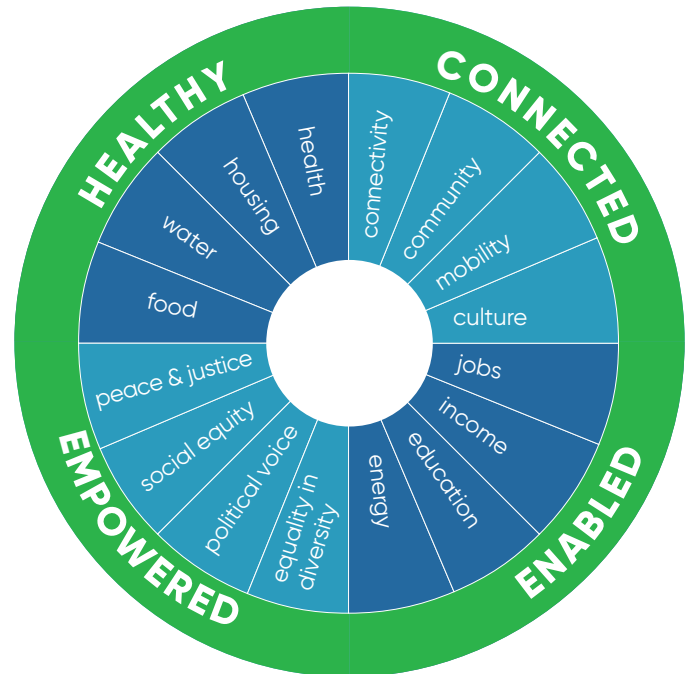
For the three pilot cities, we identified existing targets that had been officially agreed and published by the city, and mapped them onto the sixteen social dimensions through a four-step process.

First, we identified the full range of stated priorities of the city, as expressed in the city's publicly available goals or targets, in consultation with city officials across diverse departments, and through desk-based research.

Second, we categorised these goals by their scope (i.e. vision, target, objective), by their focus, and by their target date.

Third, we identified the city targets that directly addressed the dimensions of the Local–Social lens and, out of these, selected the most representative target or targets, for each of the sixteen social dimensions. This selection was based on a qualitative assessment of the many possible targets, in terms of their specificity and their time-bound ambition. For example, we gave priority to targets that specified a

Figure 5 The dimensions of the City Portrait's Local–Social lens



year, e.g. 2025, as their end date. Please see the Supplementary Information document (referenced in the 'Useful Resources' box on the following page) for an illustrative example of this selection process for Amsterdam's City Portrait.

Finally, we assessed the sufficiency of the selected targets by ensuring that they at least matched or exceeded the level of ambition set out in the Sustainable Development Goals and their related targets. In addition, in workshops later held to present the first iteration of each City Portrait's four lenses to a wide range of city officials and community organisations, participants collectively reflected on the sufficiency of their city's social targets. They noted any social dimensions for which the city had no related targets, and identified areas in which they believed the city's scope and level of ambition should be raised.

Select City Performance Indicators

In many cases, the city target identified for each social dimension can be matched with a number of statistics that provide illustrative snapshots of different aspects of current performance (as shown in the layout of Amsterdam's Local–Social lens in Figure 6). No single indicator can capture the full diversity and complexity of city life against each dimension, nor can it reflect the richness (or paucity) of data available. For example, should the indicator for housing focus on homelessness or rental affordability? There is no single right answer, of course – our approach for the three pilot cities was to select indicators that highlight pertinent aspects of the city's current reality, and that could act as conversation starters for deeper reflections on the many interconnections between the City Portrait's four lenses. Such a process of selecting indicators would ideally involve city residents and city officials who, collectively, are familiar with the most critical issues facing the city.

Contextual Sense-Check

Having selected the best-suited indicators and the most recently available data, it is crucial to sense-check and ask whether these indicators and data reflect the city's current realities, particularly in the context of the COVID-19 crisis, and other rapidly changing situations. When data is very likely to have been superseded by events, additional estimates or indications need to be added, based on the best available information in the city – even if it is as simple as highlighting the likely direction and scale of change (e.g. city employment levels are likely to have fallen significantly in many cities worldwide, in the wake of COVID-19).

Useful Resources

Locally relevant social targets and indicators are often available via the websites of city authorities and national statistical agencies. Some other sources and methods could include:

- The World Council on City Data¹⁴, which has developed an International Organisation for Standardisation (ISO) standard for city metrics, with certified data for more than 60 global cities worldwide.
- The World Database of Happiness¹⁵, which provides indicators of subjective wellbeing, primarily at the national level, and with some city-scale indicators.
- The Sustainable Development Goals (SDG) Tracker¹⁶, hosted by Our World In Data, which monitors national progress towards the SDGs.

For an example of how the targets were selected for this lens in Amsterdam, please see the accompanying Supplementary Information document¹⁷.

Figure 6 Amsterdam's Local-Social lens

WHAT WOULD IT MEAN FOR THE PEOPLE OF AMSTERDAM TO THRIVE?

HEALTHY

	CITY TARGET	CITY SNAPSHOT
HEALTH	All citizens have an equal chance of living a healthy life, regardless of socioeconomic status, or background.	Around 40% of citizens are overweight and almost half (49%) have a moderate-to-high risk of depression or anxiety.
HOUSING	There is sufficient availability of affordable and decent homes.	In 2018, almost 60,000 homeseekers applied online for social housing, while only 12% were successful. Overall, almost 20% of city tenants are unable to cover their basic needs after paying monthly rent.
WATER	Public water is accessible, attractive, clean and safe for all users.	Tap water quality in 2017 was rated well above the legal standard.
FOOD	A target is currently under development	In 2018, over 1,200 households made use of the city's food banks.

CONNECTED

	CITY TARGET	CITY SNAPSHOT
CONNECTIVITY	The digital city is designed in collaboration with citizens, and many other city actors. The municipality's interaction with citizens is accessible, understandable and inclusive?	98% of Dutch households had access to the internet in 2017. 13% of Amsterdammers over 19 years old experience severe loneliness.
COMMUNITY	Amsterdam is an inclusive and connected city.	81% of city residents stated that they felt connected to the city in 2017. Residents' ratings of their neighbourhoods ranged from 6.8/10 in Nieuw-West, to 8.1/10 in Zuid.
MOBILITY	The city is accessible to everyone via public transport, in a safe and sustainable way.	In 2017, citizens made an average of 665,000 journeys by bike every day, and in 2018 they gave the city's public transport a rating of 7.7 out of 10.
CULTURE	All citizens and visitors are provided with a high-quality, innovative and diverse cultural offering; and all Amsterdam children become acquainted with art and culture.	In 2017, the City's Kunstenplan introduced a programme of after-school activities in arts and culture, predominantly for children from low-income households.



EMPOWERED

	CITY TARGET	CITY SNAPSHOT
PEACE & JUSTICE	Amsterdam is a safe and liveable city for residents and visitors.	In 2017, 25% of citizens were the victim of a crime, and 3% of citizens said they had experienced domestic violence over the past five years.
SOCIAL EQUITY	Citizens enjoy greater independence and seldom experience inequality of opportunity.	16% of residents in lower-income neighbourhoods feel they lack control over their lives — higher than the national average of 11%.
POLITICAL VOICE	Citizens have an increased say, involvement and role in deciding what happens and how it gets implemented.	Voter turnout for the 2018 city elections was 52%, compared to 79% for the 2017 national election.
EQUALITY IN DIVERSITY	Amsterdam is an inclusive and connected city.	In total, 15% of residents reported experiencing discrimination in 2017: 39% of incidents concerned ethnicity, or skin colour; and 29% concerned nationality.

ENABLED

	CITY TARGET	CITY SNAPSHOT
JOBS	Citizens are provided with attractive commercial facilities throughout Amsterdam, plus entrepreneurs benefit from a good business climate.	Local entrepreneurs gave the city business climate a rating of 6.75 out of 10, in 2017.
INCOME	Financial (income) security is assured for citizens who cannot (completely) provide for their own livelihoods.	Almost 1 in 5 of all households (18%) qualified to apply for the social benefits scheme due to their low income and savings in 2016.
EDUCATION	Every child receives a good education in a high-quality school environment.	In 2019 there were 175 unfilled teaching posts in city schools.
ENERGY	Make the city natural gas-free before 2040.	The City is currently working on making 28 neighborhoods become natural-gas free.

SECTION 3

Local–Ecological Lens:

What would it mean for the city to thrive within its natural habitat?

In this section

Select the Local–Ecological Reference Ecosystem	18
Identify & Select Ecosystem Services	18
Identify & Select Methods and Ecological Data Sources	18
Select City Performance Indicators	19



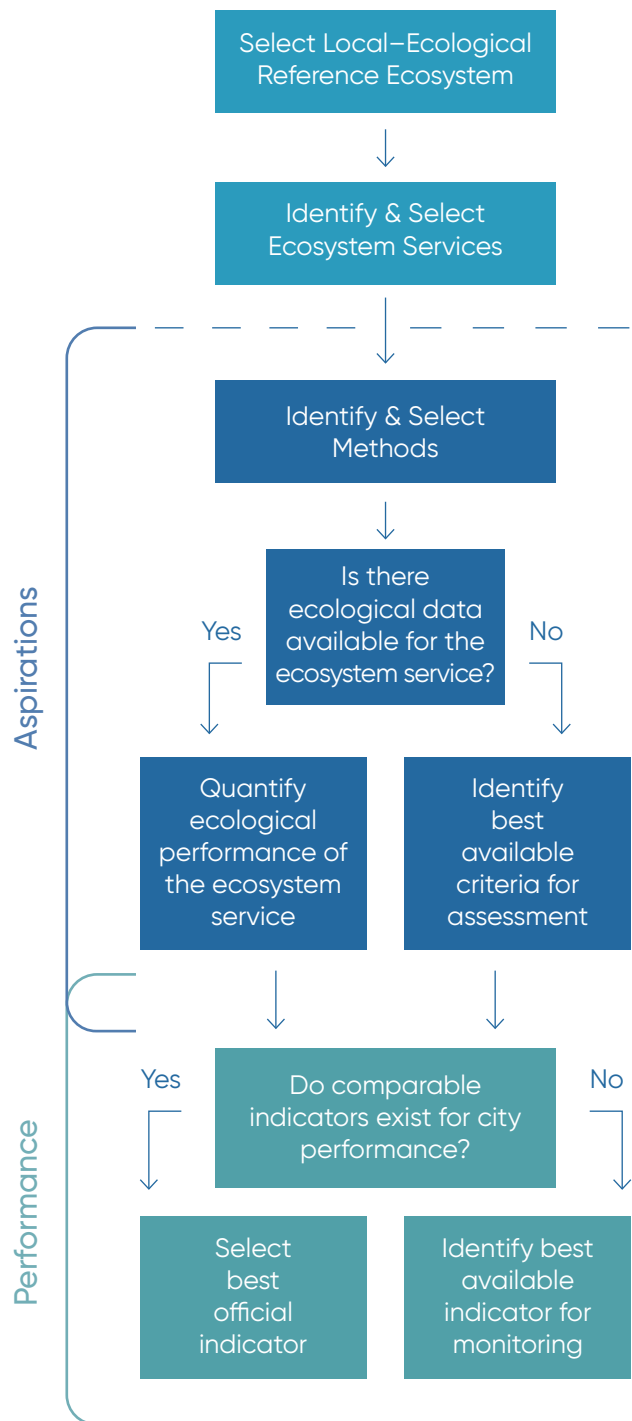
Nature’s ecosystems are generous, delivering a stream of measurable benefits and services that create conditions conducive to all life. Cities benefit enormously from the healthy and resilient urban conditions that these ‘ecosystem services’ create, as they continually purify the air, cleanse the water, moderate the climate, build the soil, store carbon, calm floodwaters, house diverse species, and much more (see the Useful Resources box below for an overview of the full range of ecosystem services).

The Local–Ecological lens asks: what if a city generated these ecosystem services just as its healthy surrounding habitat does? What if its buildings, greenways, and infrastructure worked together to purify as much air, filter as much water, store as much carbon, and house as much biodiversity as local high–performing ecosystems? In other words, how can the city become as generous as the wildland next door?

This question invites a paradigm shift in the way that cities are designed, and it arises out of the innovative practice of biomimicry⁶, which offers a city a vision of itself as part of the larger ecosystem in which it is embedded, and provides an abundance of design strategies – informed by nature – that help to create resilient and regenerative urban communities.

Through exploring and creating the Local–Ecological Lens, cities have the opportunity to review and raise the ambition of their existing environmental targets. This lens invites cities to identify and adopt a new set of Ecological Performance Standards¹⁷ that are scientifically based in the local ecological context, and that aim to generate key ecosystem services on a par with nature. In this way, cities can become generous, thriving, and resilient members of the natural habitats in which they are embedded. A general decision–making process for creating the Local–Ecological lens is shown in Figure 7.

Figure 7 The Local–Ecological decision tree



Select the Local–Ecological Reference Ecosystem

The first step is to identify and select healthy local ecosystems to act as a reference point for establishing and prioritising ecological performance goals specifically relevant to that city's location. This step includes understanding key local ecological dynamics that create ecosystem resilience, as well as the needs of city residents, which combine to shape the priorities for local ecological performance. In some places, the story is about regular fires and the need for recovery; in others, it's a story of alternating wet and dry seasons, with water storage as a key function.

We began by identifying each city's ecological location. Philadelphia, for example, is situated in the wetlands of the Atlantic coastal plains, nestled against the Piedmont forests. Portland is located within a matrix of forest, upland prairie, oak savanna, and wetlands, while Amsterdam is based in the temperate broadleaf and mixed forest biome, which includes forests, but also wetlands, coastal dune formations, and heathlands. Each of these very different habitats provides a host of opportunities for its respective city to explore how it can best learn from nature how to be healthy and resilient for the long term in its specific location.

Select Key Ecosystem Services

Cities are part of their local ecosystems, and so have an important role in supporting their health. To be part of a thriving and resilient ecosystem, a city must do more than reduce its damaging impact on its surroundings: it must aim to deliver and support key ecosystem services in a way that matches or exceeds the ecological performance of the wildland next door. This ambition first requires the selection of key ecosystem services that the city should seek to deliver and support.

For the three pilot cities, we identified seven key ecosystem services that provide highly valuable benefits to the cities and their surroundings: provisioning freshwater, regulating air quality, regulating air temperature, harvesting energy, supporting biodiversity, protecting against erosion, and sequestering carbon. Of course, these are not all of the benefits that ecosystems provide to cities, but these seven provide critical guidance for cities on how to live generously and resiliently in a biome.

Identify & Select Methods and Ecological Data Sources

The Local–Ecological Lens looks to a city's healthy local ecosystems to provide guidance, models, metrics, and – ideally – science-based targets, ensuring that cities are setting their performance targets and metrics based on their specific location. On this basis, each of the three pilot cities would, for example, take on the ambition of matching the performance of its respective local habitat, by storing as many tons of CO₂ each year as its nearby forest, cooling the air as much as the forest does from the treetops to the forest floor, and absorbing then releasing as many gallons of water in a storm. Setting such aspirational yet tangible targets can restore a community's connection to the surrounding living world, support community health and wellbeing, enhance the city's climate resilience, and dramatically enliven the design of buildings, hardscapes, and landscapes.

Where time and resources permit, cities can create such locally specific ecological performance standards by quantifying the performance of the selected key ecosystem services, through on-site data collection in the reference habitats of their healthy local ecosystems. Although some relevant secondary data can often be found in publicly available sources, site-specific data collection requires ecosystem service measurement tools; this can be technically demanding and may require the support of biomimicry specialists to research, identify, quantify, and suggest design recommendations.

Where time and resources to create these new metrics are not available, the city's existing ecological targets can be taken as a first proxy for setting ecological performance ambition. We took this approach in Philadelphia, Portland, and Amsterdam, mapping each city's existing local ecological targets against the set of key ecosystem services identified. In doing so, we noted where there were gaps in the coverage of ecosystem services that were addressed by those targets; this process provided a valuable opportunity for city staff and community to reflect and recognise where new and additional local ecological targets may be required.

Select City Performance Indicators

Ideally, the city would monitor its current ecological performance using indicators that match and reflect the key ecosystem services provided by the healthy local ecosystem. Such a comparison would make it possible to assess, prioritise, and focus on strategies and solutions that start to close ecological performance gaps between the city and the local high-performing reference ecosystem, while generating benefits to support the health and wellbeing of the community.

In practice, however, if time and resources do not permit such an in-depth approach, then the city can instead identify the most relevant and reliable indicators and data available for assessing each ecological target, with an illustrative statistical snapshot of that city's current performance. This is the approach taken in the three pilot cities, as shown in the presentation of Amsterdam's Local–Ecological lens in Figure 8. This approach represents an approximation to biomimetic standards and practice, but still provides a valuable conversation starter for city officials and changemakers to identify and consider the possible design strategies that could take the city far closer to matching the performance of the wider ecosystem in which it is embedded.

Useful Resources

There are multiple resources to help identify local reference habitats and the potential benefits that they produce.

- The Ultimate Guide to the Genius of Place¹⁸: this blog post by Biomimicry 3.8 gives a concise overview of the steps involved in identifying a city's ecological location and learning to mimic nature's success there. It also provides links to several databases and reports that can support and deepen this analysis.
- EcoRegions 2017¹⁹, which provides an overview of Earth's fourteen biomes and 846 ecoregions, giving a first understanding of any city's ecological location.

Resources that give an introductory overview of the range of ecosystem services which nature generates include:

- The 2005 Millennium Ecosystem Assessment²⁰, which sets out the concept of ecosystem services and classifies the services into four broad clusters of supporting, provisioning, regulating, and cultural services.
- Green Facts²¹, a website providing peer-reviewed information on environmental issues to non-specialist audiences, including on the topic of ecosystem change.
- The Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (IPBES)²², which provides global and regional assessments of human–nature interactions.

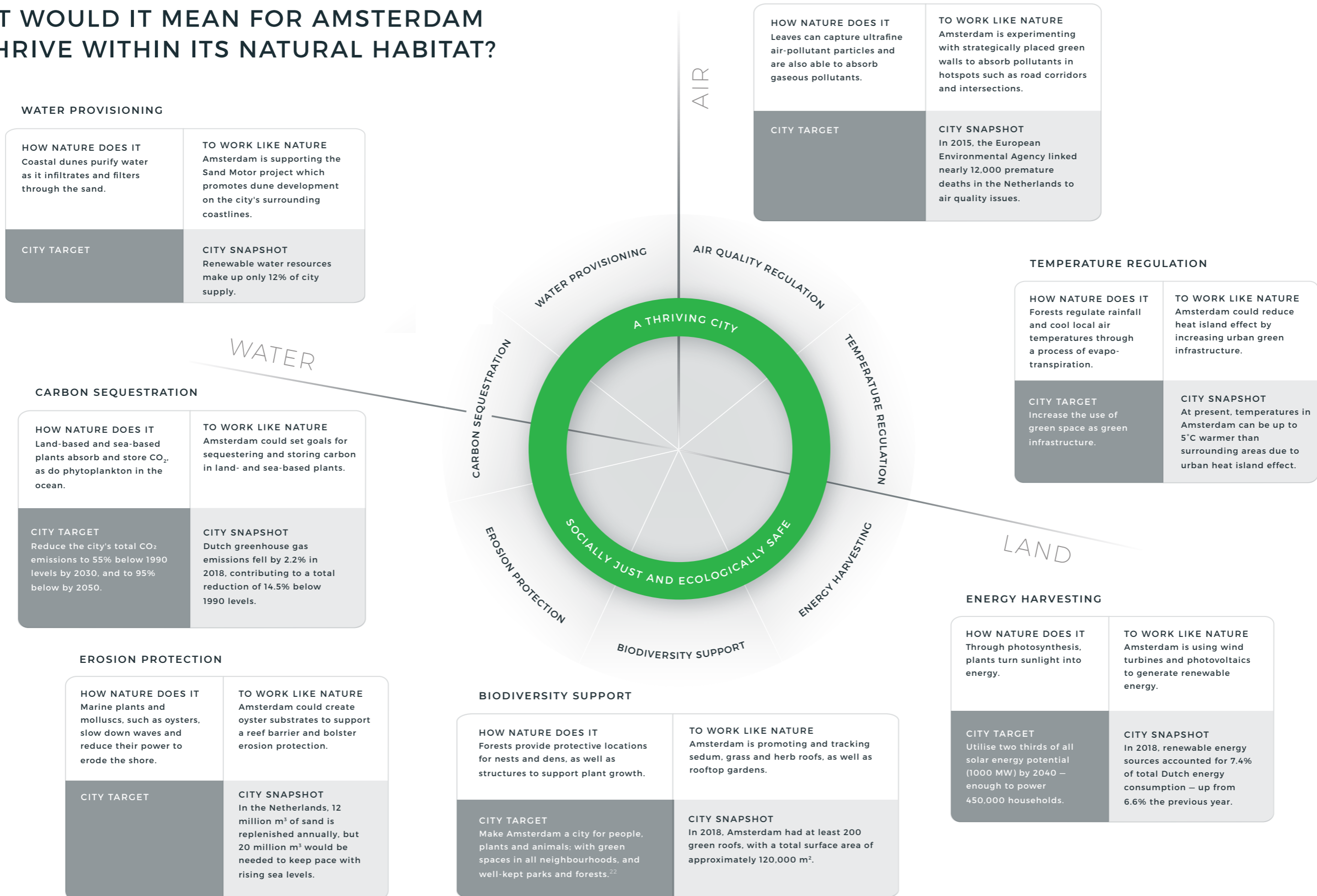
Resources providing indicators and data on the ecological performance of cities include:

- The World Air Quality Index²³, which provides historic and real-time air quality data for more than 1,000 cities in over 100 nations.
- The Carbon Disclosure Project²⁴, which tracks a range of datasets that are relevant to cities' local ecological performance, such as ensuring water security, harvesting renewable energy, and adapting to the impacts of climate change.

For an example of how the data was compiled for this lens in Amsterdam, please see the accompanying Supplementary Information document¹⁷.

Figure 8 Amsterdam's Local-Ecological lens

WHAT WOULD IT MEAN FOR AMSTERDAM TO THRIVE WITHIN ITS NATURAL HABITAT?



SECTION 4

Global–Ecological Lens:

What would it mean for the city to respect the health of the whole planet?

In this section

- | | |
|---|----|
| Select Global–Ecological Dimensions and Gather Data | 23 |
| Define City Shares of Planetary Boundaries | 24 |
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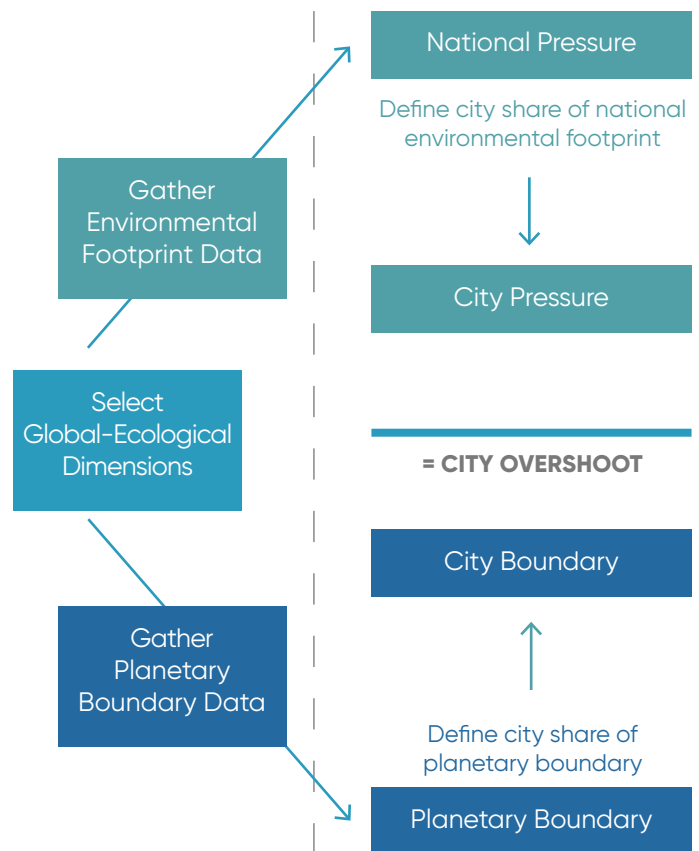
The Global–Ecological Lens asks whether the resources embodied in products and services consumed by the people in your city could be extended to everyone on the planet without degrading Earth’s critical life-supporting systems, such as a stable climate and healthy oceans. Essentially, this lens compares your city’s consumption of resources to your city’s fair share of a globally sustainable level of resource use. This lens is relatively technical compared to others in the City Portrait because it combines two evolving fields of knowledge, namely approaches to ‘downscaling’ planetary boundaries to places, and ‘environmental footprint’ accounting. The general process is shown in Figure 9.

Select Global–Ecological Dimensions and Gather Data

The starting point for defining the set of dimensions in the Global–Ecological lens of the City Portrait is the nine planetary boundaries¹¹, which collectively form the ecological ceiling of the global Doughnut (shown on page 6). An immediate issue, however, is that these planetary boundaries aim to describe Earth–system processes that operate from continental to global scales, and hence were not designed to be ‘downscaled’²⁵. At the same time, most regulatory decision-making takes place within smaller political jurisdictions – especially at national, sub-national, and city levels – and people understandably want to know how these different places are doing, with respect to staying within global boundaries. Analysts have been refining downscaling methods ever since the planetary boundaries framework was first proposed in 2009; these methods are continually evolving, but some current best practices are emerging²⁶.

For the three pilot cities, we selected nine Global–Ecological dimensions, which we clustered into three broad categories: air, water, and land (but with hindsight, we feel this clustering may not be a necessary step). Seven of these dimensions are directly derived from the planetary boundaries

Figure 9 The Global–Ecological decision tree



framework (climate change, ocean acidification, excessive fertiliser use, ozone-layer depletion, air pollution, excessive land use, and freshwater use). Five of these seven dimensions had sufficient downscalable data for quantification, and this data was collected from the EXIOBASE²⁷ database and the Global Footprint Network²⁸. The other two dimensions are overfishing – for which adequate data was not available in all pilot cities – and waste generation, for which city-level data was used.

Define City Shares of Planetary Boundaries

Once the Global–Ecological dimensions have been selected, the next question is how to define a city's 'fair share' of resource use relating to each dimension – but of course there is no right answer to this question. Planetary boundaries can be shared according to many principles, such as equality, capability, or sovereignty, among others (see Table 1 for a summary of sharing principles commonly found in the planetary boundaries literature). For the Global–Ecological lens in the

three pilot cities, we used an equal per capita approach to determine city-scale shares of Global–Ecological boundaries, which is the most common sharing principle found across studies. At the same time, given the historical responsibility of high-income nations for excessive resource use, we specified that cities in these nations should commit to moving back within planetary boundaries far faster than cities in less wealthy nations.

Table 1 Overview of Sharing Principles for Global–Ecological Boundaries

Sharing Principle	Description
Equality	People have equal rights to use resources, resulting in an equal share per capita. Equality can be envisaged between people living in a particular year or between people over time.
Capability	Places have different levels of economic wealth. Places with higher financial capabilities could contribute proportionally more to the mitigation efforts, or use less than their allocated share of resources, since their ability to pay is higher.
Right to Development	People have the right to have a decent life (e.g. rights for covering basic needs). Places with lower development levels could thus be allocated more resources to meet development objectives.
Needs	People have different resource needs. This could be due to their age, the size of the household they live in, or their location. As a result, their right to resources could be differentiated.
Sovereignty	Countries have a legal right to use their own territory as they decide. This implies that current levels of environmental pressure (generated domestically and in foreign economies) are taken as starting points for sharing the Global–Ecological boundaries on national and sub-national scales.

Source Adapted from European Environment Agency (2020)³¹

Define City Shares of National Environmental Footprints

Environmental footprint accounting is useful because it can attribute resources used (and wastes emitted) to the place in which a given product is consumed, regardless of where that product was produced, often using a modelling technique called input-output analysis (see the Useful Resources box opposite for more detail). The use of environmental footprints takes into account the upstream environmental burdens that arise from producing and transporting the goods that are consumed in a city, no matter where in the world those burdens take place.

Environmental footprint data is typically available at the national level, which means it must be downscaled to the city level. Similar to the question of how to share planetary boundaries, there is no right answer for how to divide national environmental footprints into sub-national shares. For the Portland, Philadelphia, and Amsterdam City Portraits, we collected national footprint data for the United States and the Netherlands, and calculated their respective city shares using an income-adjusted approach.

Our income-adjusted approach is based on the observation that people with higher incomes tend to have more resource-intensive lifestyles than people with lower incomes³⁶. For each footprint indicator, we calculated the per capita value for the relevant nation, and adjusted it by the average household income in the pilot cities (relative to national average household income). Finally, we calculated the level of city overshoot by dividing each income-adjusted city footprint indicator by its respective per capita boundary (i.e. overshoot if greater than 1). The resulting lens from Amsterdam's City Portrait is shown in Figure 10 below. Appendix 1 provides additional details of the indicators and data sources used to quantify the Global-Ecological lens in the Amsterdam City Portrait, and it also includes an extended explanation of the additional methods used to calculate the climate-change boundary.

Useful Resources

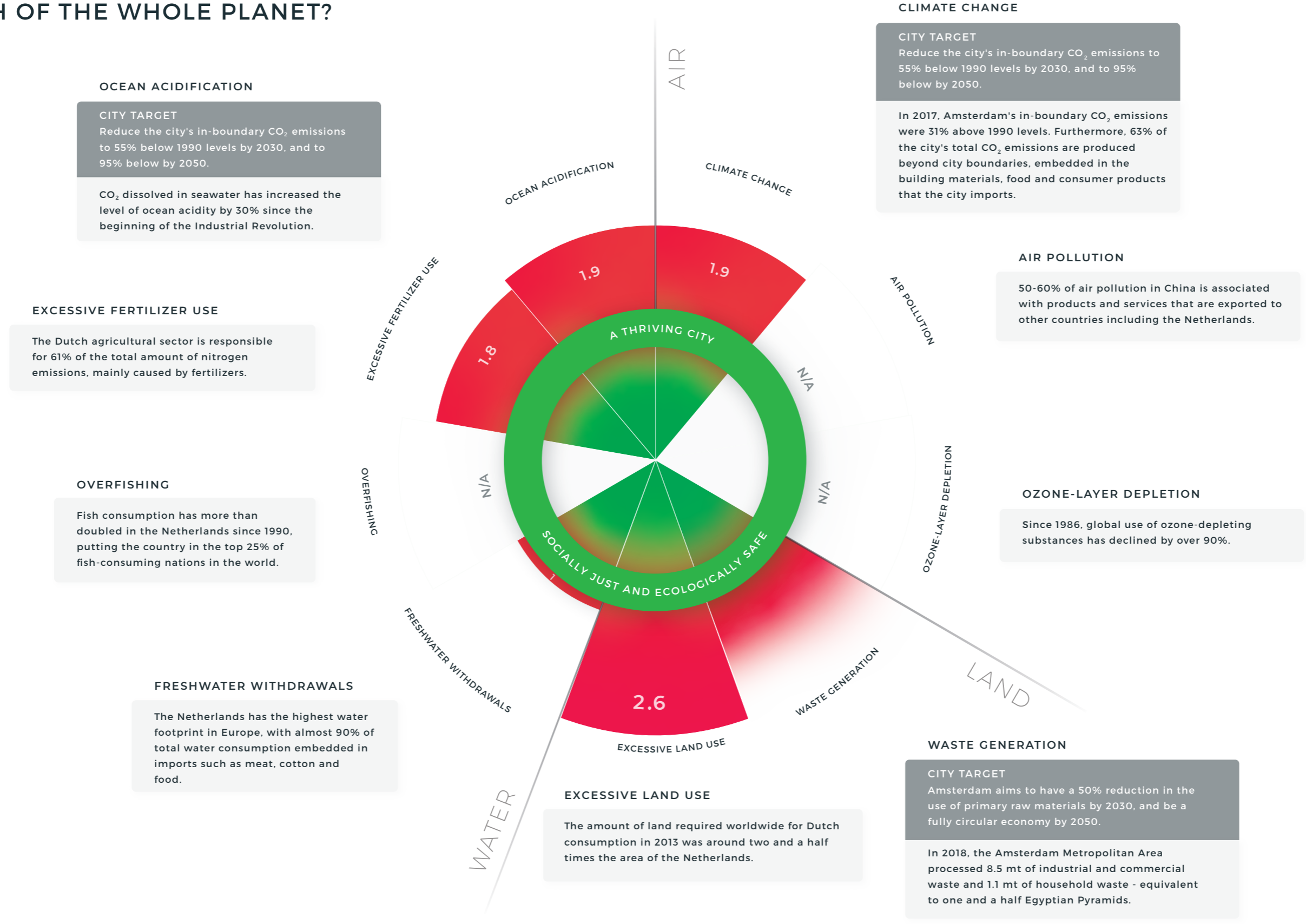
The data and tools available for combining environmental footprint accounting with the planetary boundaries framework are continually evolving, and have become increasingly accessible over the past five years or so. Some useful resources include:

- The Environmental Footprint Explorers²⁹ website, hosted by the Norwegian University of Science and Technology. Environmental footprint data from multiple international databases is available for nearly 50 countries, along with state-of-the-art resources on input-output analysis.
- The EXIOBASE²⁷ database, which contains detailed input-output tables for more than 40 countries and estimates of resource extractions and waste emissions by industry.
- The Global Footprint Network's Open Data Portal²⁸, which provides ecological footprint and biocapacity data that can be explored and downloaded, for more than 190 nations.
- The Eora³⁰ supply chain database, which provides environmental footprint indicators and associated data for 190 nations (though it requires a degree of technical proficiency).
- A report published by the European Environment Agency (April 2020)³¹, entitled 'Is Europe Living within the Limits of the Planet?', which provides an accessible analysis of environmental footprints to downscaled planetary boundaries in practice.
- The Stockholm Resilience Centre³² maintains a webpage dedicated to planetary boundaries research³³, which includes publications, figures, and data sources.
- Metabolism of Cities³⁴ and the Global Initiative for Resource Efficient Cities³⁵ both provide concepts, reports, and datasets aimed at reducing the flow of resources and waste through cities.

For an example of how the data and calculations were compiled for this lens in Amsterdam, please see the accompanying Supplementary Information document¹⁷.

Figure 10 Amsterdam's Global-Ecological lens

WHAT IS AMSTERDAM'S IMPACT ON THE HEALTH OF THE WHOLE PLANET?



SECTION 5

Global–Social Lens:

What would it mean for the city to respect the wellbeing of people worldwide?

In this section

Selecting Global–Social Dimensions and Targets	29
Selecting Interconnections and City Performance Indicators	30

Every city has a unique pattern of connections with other parts of the world, which is shaped by its location, history, commerce, and culture. The Global–Social lens of the City Portrait asks how these patterns and interconnections flowing through a city generate direct and indirect impacts – both positive and negative – for the wellbeing of people worldwide. Many of these impacts, and the global issues that they touch upon, have typically been beyond the scope of city targets. The City Portrait seeks to bring them into view, as part of a holistic recognition of the global implications of city life.

The current design of this lens was created specifically for high-consuming cities in the global North, but it can be adapted to focus more on the context and interests of cities in the global South, and we welcome suggestions for doing this. A general process for creating the lens is shown in Figure 11.

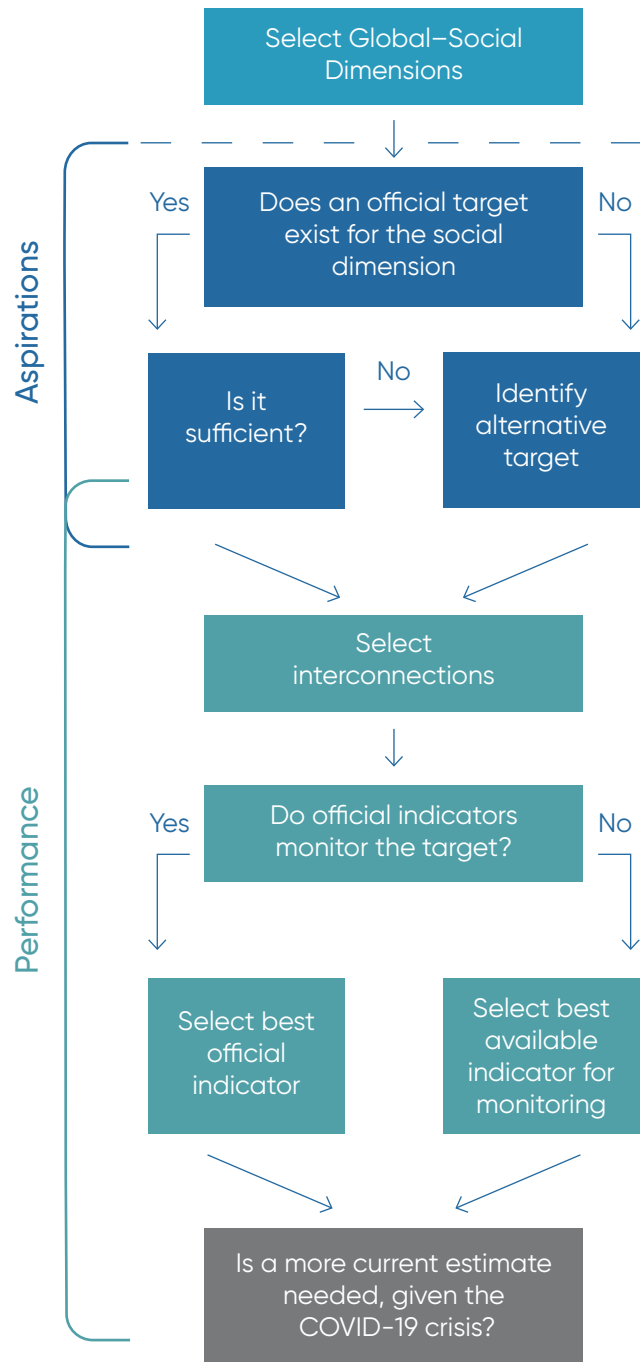
Selecting Global–Social Dimensions and Targets

The dimensions comprising the Global–Social lens are drawn from the UN Sustainable Development Goals (SDGs)¹⁰, because they constitute an internationally recognised minimum standard of human wellbeing that all nations have recognised for all people worldwide. These dimensions can, as with the Local–Social lens, be clustered into being healthy, connected, enabled and empowered.

For each of the SDGs, the agreed international target becomes the target for this lens. For example, SDG 8 commits to ‘promote full and productive employment and decent work for all’, and SDG 5 commits to ‘achieve gender equality and empower all women and girls’.

Whether the SDG targets are sufficient can be debated in each context. In this context, we deemed them to be sufficient, while recognising the importance of specifying what constitutes, for example, decent work, or a living wage.

Figure 11 The Global–Social decision tree



Selecting Interconnections and City Performance Indicators

There are many routes through which the life of a city can impact upon the wellbeing of people worldwide, given the diversity of actors involved, the many forms of interconnection, and the diverse possible ways that people worldwide can be affected, as illustrated in Table 2 below.

Of the many diverse activities in the three pilot cities that have Global–Social impacts, we focused the analysis for this lens on the cities’ consumption choices, expressed through household purchases and business and governmental procurement, and on the social impacts – on workers and on surrounding communities – that arise through global supply-chain dynamics³⁷. Within this sphere of consumption, we focused sectorally on global supply chains supplying the city with food, clothing, and electronics.

We selected these three sectors both because they are significant contributors to the city’s consumption footprint, and because there is sufficiently detailed research available that traces the connection between brand name products on sale in the pilot cities, and the impacts on workers and communities connected to their supply chains. Furthermore, these products are familiar household items, and so provide a tangible means for all city residents to recognise their interconnection with workers and communities worldwide. We would have also included the production of infrastructure and construction materials in the analysis, if sufficient relevant research and data on labour conditions and community impacts in this sector had been available.

There are many ways to investigate the links between farmers, workers, and consumers, ranging from quantitative analyses using global supply-chain databases³⁸ across nations and multinational enterprises³⁹, to qualitative mapping of the ‘systems of provision’⁴⁰, that link actors across a unique chain of production with a context shaped by culture, history, and power relations.

Table 2 Illustrative Global–Social Interconnections of Cities

Actors in each city	Engage in diverse activities	That affect social groups worldwide
Households <ul style="list-style-type: none"> • families • shared living 	Purchases/procurement <ul style="list-style-type: none"> • services • products 	Households <ul style="list-style-type: none"> • income • social aspiration • opportunity
Civic organizations <ul style="list-style-type: none"> • faith groups • community groups • clubs 	Income transfers <ul style="list-style-type: none"> • remittances • philanthropy 	Communities <ul style="list-style-type: none"> • employment • land grabs • power/intimidation
Businesses <ul style="list-style-type: none"> • small and medium enterprises • corporations • financial institutions 	Cultural influence <ul style="list-style-type: none"> • inter-city networks • scholarships • sports and arts • legacy and leadership 	Workers <ul style="list-style-type: none"> • wages and earnings • terms and conditions
Public institutions <ul style="list-style-type: none"> • City Hall • hospitals • schools • universities • utilities 	Practices & innovations <ul style="list-style-type: none"> • business models • technology • community action 	Students <ul style="list-style-type: none"> • knowledge and skills • inspiration • opportunity

For the three pilot cities, we conducted desk-based analysis of research reports and publications produced by think tanks, NGOs, and academic institutions, which focus on the connection between business supply chains, labour rights, and human rights. From this analysis, we identified more than 30 studies with documented evidence linking food, clothing, and electronics products on sale in Portland, Philadelphia, and Amsterdam with positive and negative impacts on livelihoods, labour rights, and community impacts worldwide.

Analysing this set of studies, we identified the recurring social impacts and mapped them to the most closely related Sustainable Development Goals. We then selected statistics, qualitative evidence, and quotes from people's lived experience that provide an illustrative snapshot of the city's performance in this regard. The results for Amsterdam's City Portrait are shown in Figure 12.

Useful Resources

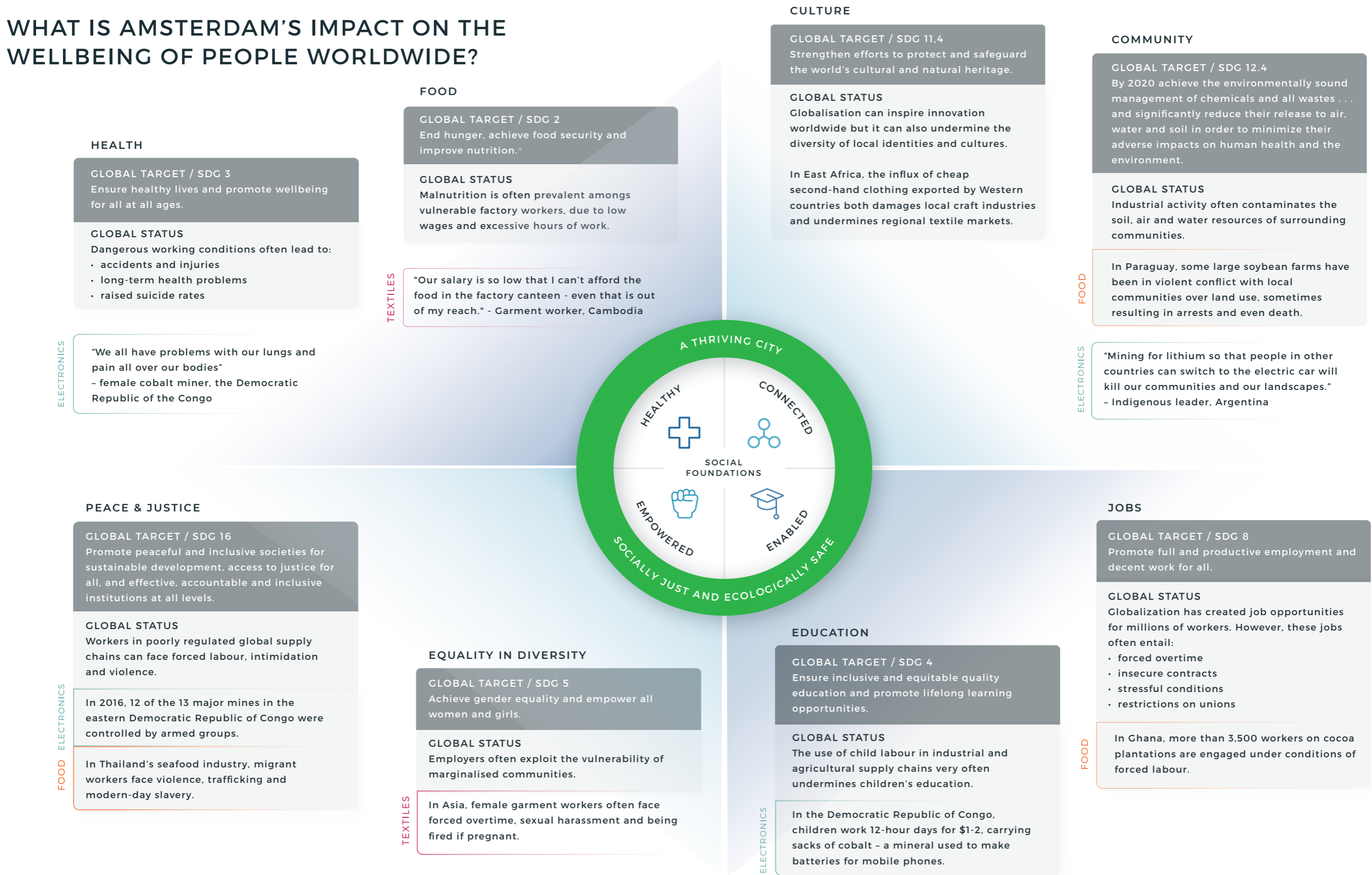
There are many valuable sources for tracing and documenting the impacts of global supply chains on labour rights and community wellbeing. The most useful sources may vary according to the city's location in the world, but some include:

- The Clean Clothes Campaign⁴¹, a global network of over 230 organisations dedicated to improving working conditions and empowering workers in the global garment and sportswear industries. Their website contains a rich set of resources covering supply chains worldwide.
- Oxfam's Behind the Brands⁴² campaign, which has developed an indicator-based method that monitors the policies of the world's largest food and beverage companies in terms of the social and environmental policies and practices in their global supply chains.
- The Living Income Community of Practice⁴³, which provides useful summaries and resources on different methods to compare decent living incomes with the incomes that people actually receive (with a focus on the Global South).
- Fairfood⁴⁴, an NGO using blockchain and other technologies to bring transparency to global food supply chains and ensure living wages and incomes for those employed within them.
- Fairtrade International⁴⁵, a leading organisation in the global movement to make trade fair, which provides a certification process for producers and businesses who meet internationally agreed standards (including minimum pricing data for products).
- KnowTheChain⁴⁶, which documents corporate policies and practices on addressing forced labour in their global supply chains, specifically in the production of electronics, food and beverages, and apparel and footwear.
- The Environmental Justice Atlas⁴⁷, which documents the impact of environmental resource extraction – such as mining, dams, and fracking – on the land, air, water, and forests that local communities depend upon for their lives and livelihoods.

For an example of how this data was compiled for this lens in Amsterdam, please see the accompanying Supplementary Information document¹⁷.

Figure 12 Amsterdam's global-social lens

WHAT IS AMSTERDAM'S IMPACT ON THE WELLBEING OF PEOPLE WORLDWIDE?

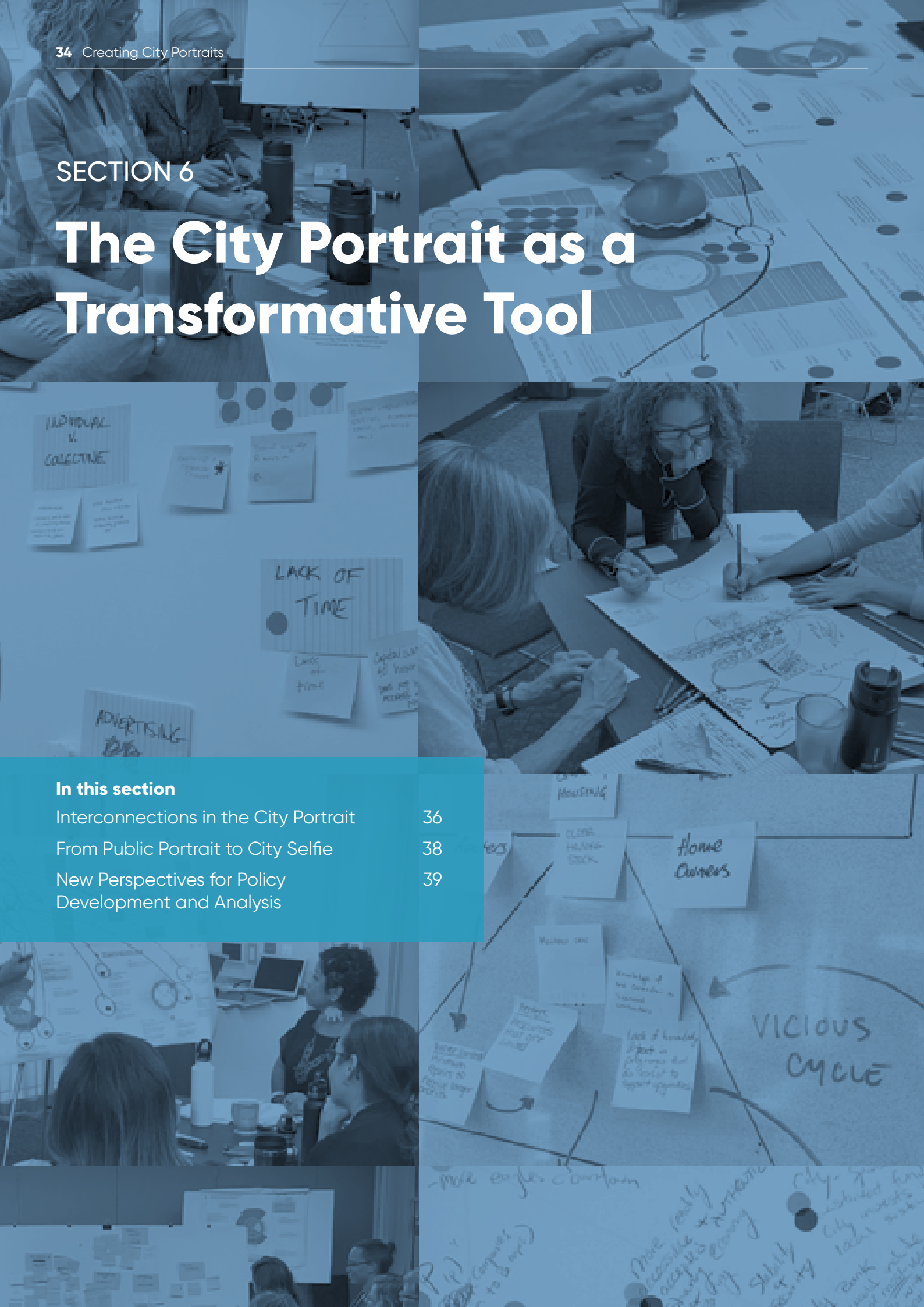


SECTION 6

The City Portrait as a Transformative Tool

In this section

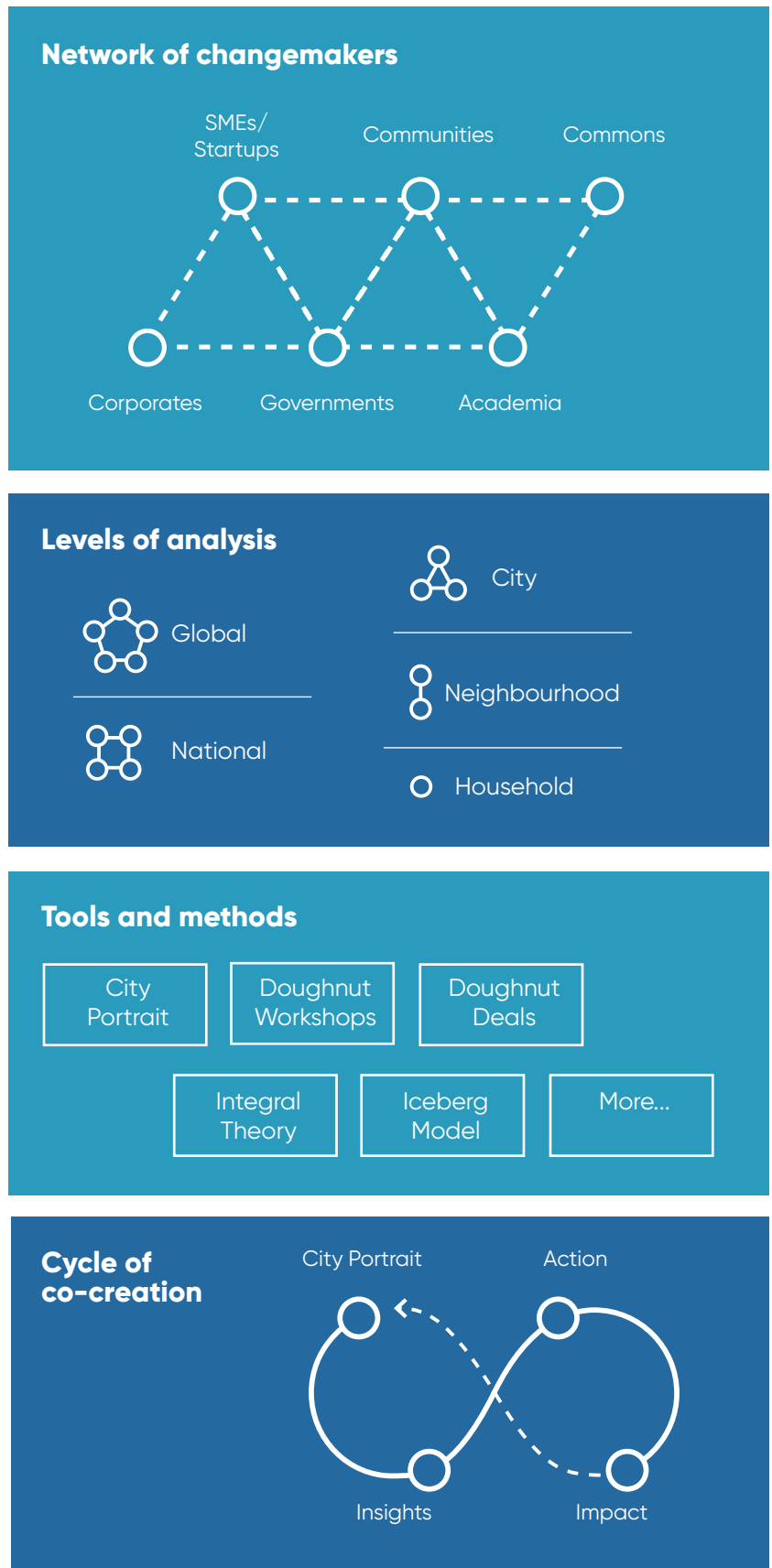
- Interconnections in the City Portrait 36
- From Public Portrait to City Selfie 38
- New Perspectives for Policy Development and Analysis 39



The four lenses of the City Portrait combine to create a tool – a starting point for new ways of thinking, shared inspiration, and transformative action towards becoming a city that thrives for people and planet, locally and globally. Its potential as a transformative tool will be best realised when put into practice:

- by a network of changemakers, bringing government, business, and academia together with innovators from SMEs, start-ups, the commons, and community networks
- on multiple levels, connecting analysis and action from the global level to the national, from the city through to the neighbourhood and household
- using a wide range of tools and methods that continually evolve through innovation and learning
- as an iterative cycle of co-creation, instigating new action, and amplifying what’s already working
- in the spirit of our ‘Principles for Putting Doughnut Economics into Practice’ (see p. 41).

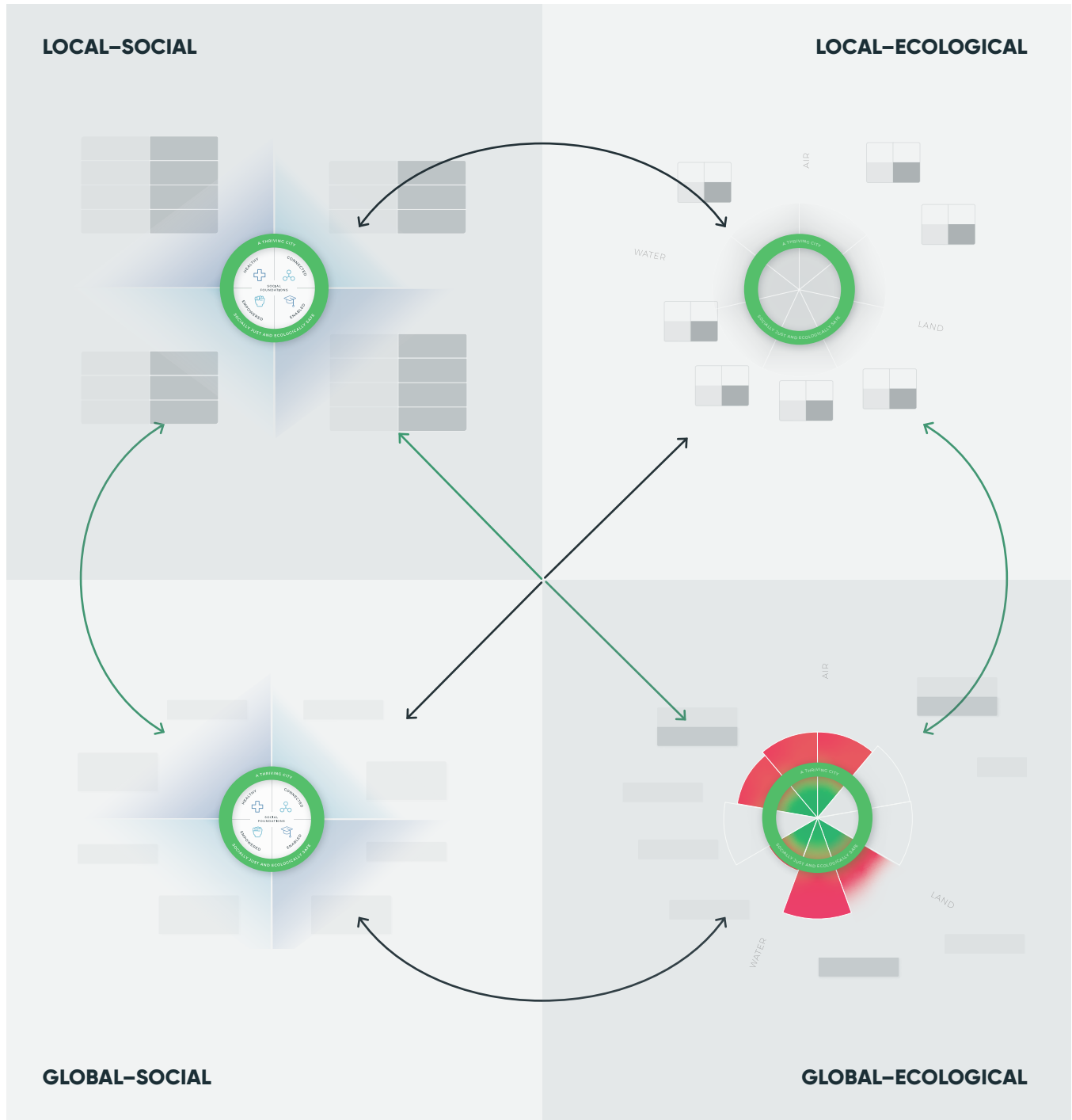
Figure 13 Turning the City Portrait into transformative action



Interconnections in the City Portrait

The City Portrait comprises four distinct lenses, but it is their many complex interconnections that reveal both the opportunities and challenges facing 21st century cities (Figure 14). Some illustrative examples of interconnections between the lenses are described below (there are of course many more).

Figure 14 Interconnections between the portrait’s lenses



The heat island effect

Local–Social and Local–Ecological

Cities often suffer from ‘the heat island effect’, experiencing sharply elevated temperatures in summer months, which results in illnesses and premature death among local residents, and hostile conditions for local wildlife. The effect is typically pronounced in low-income neighbourhoods where there are far fewer trees lining the streets, with the effect of exacerbating urban social inequalities. A ‘city forest’ programme targeted to these neighbourhoods can significantly cool the streets and enrich local wildlife, while simultaneously generating local jobs, improving community health and wellbeing, and reducing city-wide inequalities.

Car culture

Local–Social and Global–Ecological

Many 20th century cities were designed to be dependent upon the private car, with distant neighbourhoods connected to downtown by highways, and with each household owning multiple vehicles. As a result, people now meet their mobility needs in ways that drive excessive greenhouse gas emissions and intensive global resource use in car production. Cities now have the opportunity to maintain mobility but dramatically reduce their environmental footprints by creating accessible, affordable, and reliable low-carbon transit (such as walking, cycling, light rail, electric buses, and trams), and to encourage public culture and behaviour that turns these forms of travel into commuters’ preferred options.

Jobs lost and gained

Local–Social and Global–Social

The last 30 years have seen industrial production – from cars and steel to food and clothing – relocate from cities in high-income countries to manufacturing hubs across low-income and emerging economies, with dramatic social consequences for all involved. Many cities have been hollowed out by the loss of core manufacturing jobs, leading to income poverty, housing crises, growing urban inequality, crime, and community breakdown. Meanwhile, the globally dispersed hubs of outsourced production – from China and Vietnam to Ethiopia and Honduras – have benefitted from mass job creation that has raised household incomes, and often women’s economic empowerment too; but such jobs in global supply chains are also often poorly paid, insecure, and exploitative. Looking ahead, the rise of automated manufacturing is likely to bring many of these industries back to their countries of origin, but without bringing back the jobs – a transformation that will hit both local and global workers.

Beyond clean air and water

Local–Ecological and Global–Ecological

High-income cities have too often boasted about their environmental credentials by pointing to the high quality of their city air and water. These local environmental conditions do generate invaluable benefits for the health and wellbeing of city residents, but they are far from the whole picture of the city’s ecological record. In many cases, improvements in local air and water quality have been the result of industries relocating overseas: city consumption continues to grow, but the environmental impacts are incurred far away. Hence environmentally ambitious cities must likewise take responsibility for, and act upon, their global ecological impacts such as greenhouse gas emissions, virtual water consumption, global land use, and nutrient footprints.

Urban farming

Local–Ecological and Global–Social

Should cities import their food, or aim to grow their own? The choice has far-reaching implications, socially and ecologically. Globalised food production can create valuable rural jobs in both high- and low-income countries, but may also carry a high carbon footprint for distant transport. Urban food farms create good local jobs, and can also enrich urban biodiversity, enhance food security, and promote community understanding of the connection between food, human health, and the living world. At the same time, they may reduce valuable market opportunities for rural areas and producers overseas.

Fast-fashion

Global–Social and Global–Ecological

The business model that underpins the fast-fashion industry puts excessive pressure on both people and planet globally. The fashion brands’ and retailers’ drive to deliver high returns for shareholders and company owners motivates the ‘52 seasons a year’ consumer strategy of selling fast-moving, low-priced, short-life clothing, producing resource-intensive textiles that too soon end up in landfill. The same business model also motivates the cost-cutting production strategy of outsourcing manufacturing to low-paid, insecure garment-factory workers worldwide. City shoppers may enjoy buying cheaply priced clothing, but it comes at a high price for workers and the living world.

From Public Portrait to City Selfie

The methodology set out above for creating a City Portrait is based on using publicly available data and reports, essentially producing a public portrait of the city. But this is just the beginning: what if you were to layer onto the resulting City Portrait all of the ongoing initiatives that are helping to bring the city into the Doughnut and make it thrive?

Doing so would effectively create a 'City Selfie': a living representation of current challenges, organisations involved, and transformative policies and practices underway, thus helping to make visible the seeds of a thriving city that is already emerging. A community of changemakers in your city could be pioneers of this process, inviting all contributors to bring:



existing policies, projects, initiatives, and start-ups



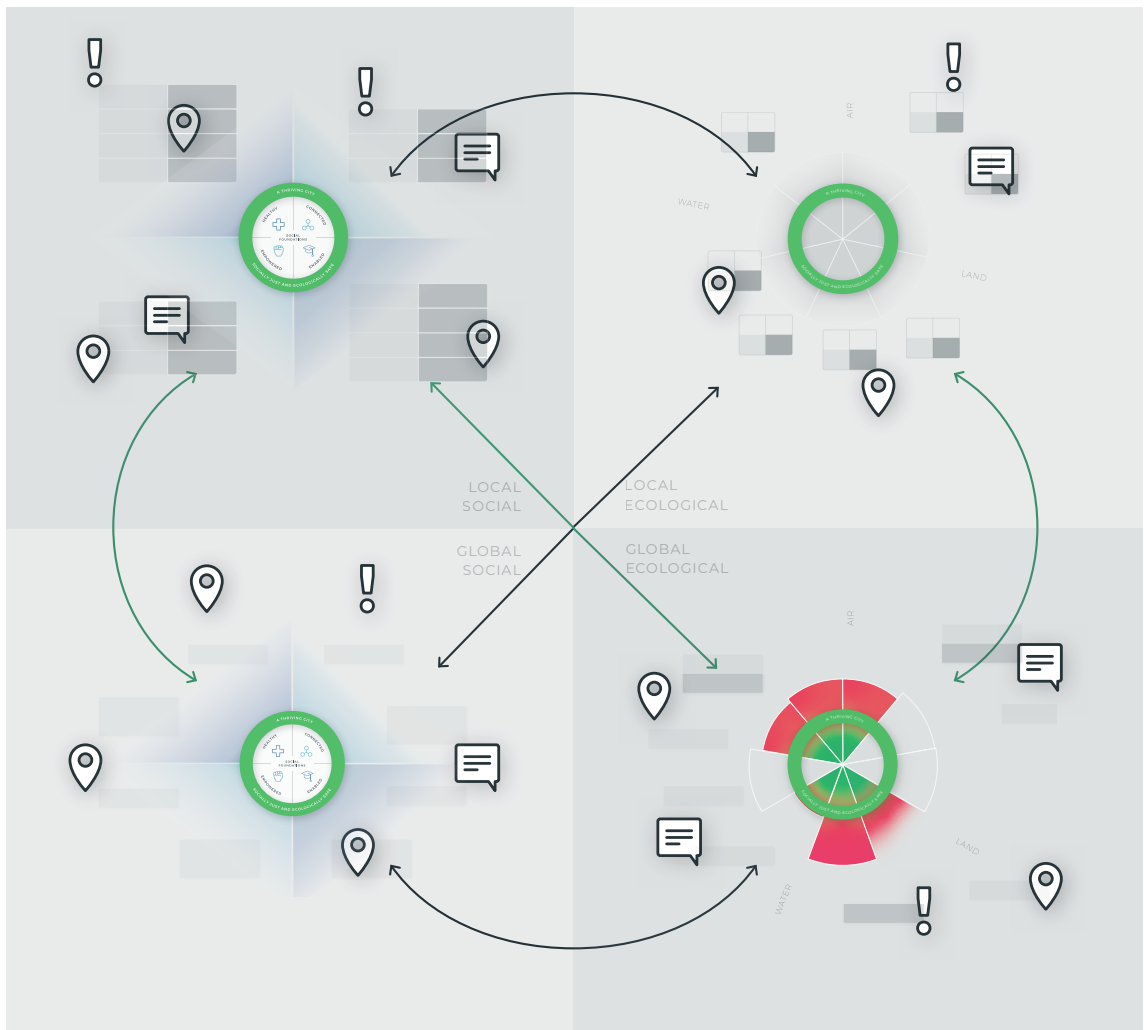
stories, histories, and images from diverse neighbourhoods



visions, proposals, and new initiatives for transforming the city.

The resulting City Selfie (as illustrated in Figure 15) would be a diverse, lively, ever-changing, challenging, but also energising portrait of a city that is already in transformation.

Figure 15
Imagining a
City Selfie



New Perspectives for Policy Development and Analysis

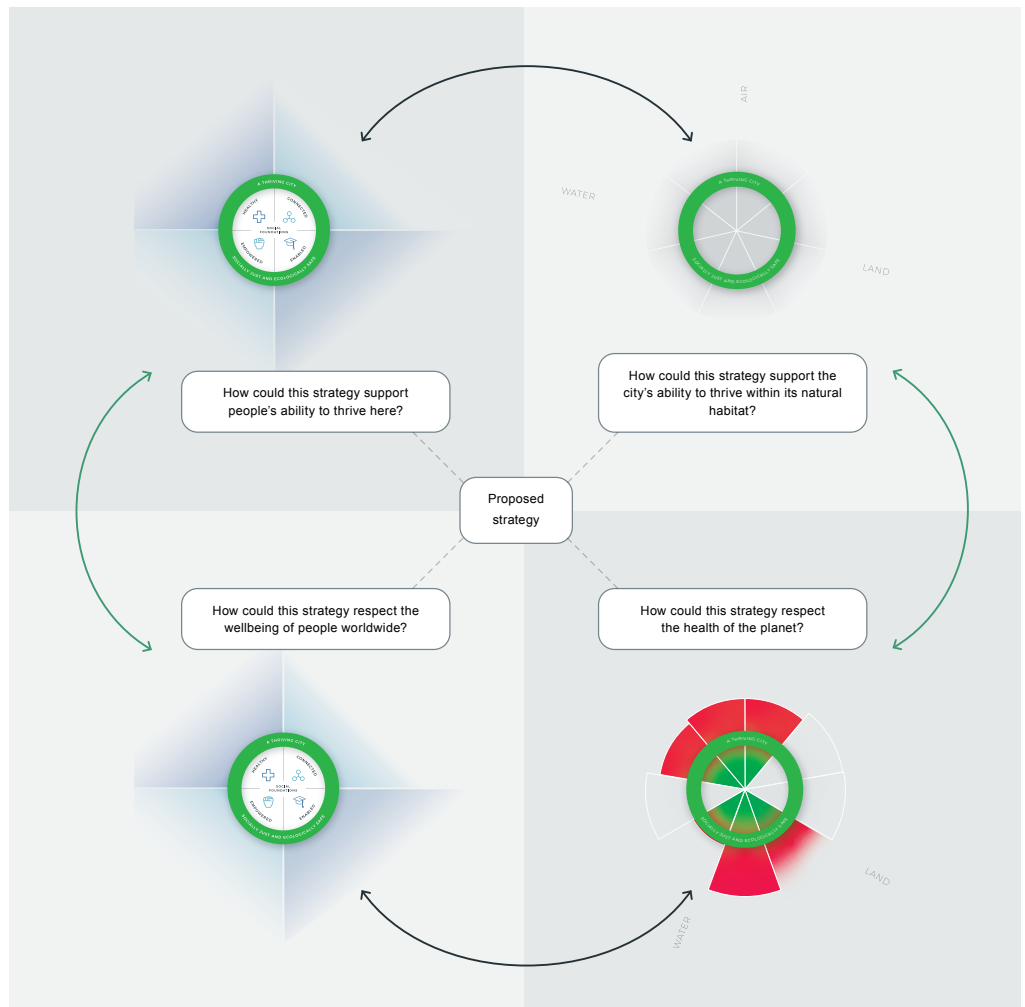
The City Portrait can be used by policymakers and stakeholders as a starting point for reflecting on the opportunities and challenges, and synergies and tensions, of alternative strategies and policy initiatives under consideration, as shown in Figure 16. By taking a holistic perspective on possible approaches, they can build the insights gained into the policy design process. If the portrait is first turned into a City Selfie, the interconnections and insights will be even richer. Policy-relevant questions that could be explored using the City Portrait include:

- What will be the benefits of the city pursuing this strategy – socially and ecologically, locally and globally?
- Where are the possible synergies between the lenses, and what’s needed to unleash them?
- Where are possible blind spots, and what’s needed to make them visible?

- What tensions might arise across the different lenses as a result of city action? How might they best be resolved?
- What changes are needed in city norms and city-wide systems, along with changes in the predominant values and behaviour of city residents?
- How can the city’s diverse network of changemakers create synergy between their existing initiatives, and collaborate more effectively?
- What kinds of changes are needed within the city government’s own organisation in order to address the interlinkages of social and ecological issues and solutions?

The Thriving Cities Initiative partners are working together with city changemakers to co-design further participatory processes for turning the City Portrait into a workshop tool for reflection, discussion, policy making, and action. These additional tools and resources will – like this methodology – be made publicly available when ready.

Figure 16
The City Portrait as a tool for policy analysis



Principles for Putting Doughnut Economics into Practice

Doughnut Economics Action Lab has developed a set of principles to guide our own evolution and our choice of collaborators. We also request that these principles are placed at the heart of any project and initiative that aims to put the ideas of Doughnut Economics into practice.



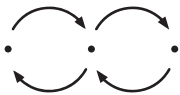
Embrace the 21st century goal. Aim to meet the needs of all people within the means of the living planet. Seek to align your organisation's purpose, networks, governance, ownership and finance with this goal. Expect the work to be challenging, innovative and transformative.



See the big picture. Recognise the potential roles of the household, the commons, the market and the state - and their many synergies - in transforming economies. Ensure that finance serves the work rather than drives it.



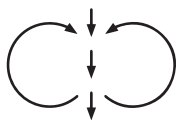
Nurture human nature. Promote diversity, participation, collaboration and reciprocity. Strengthen community networks and work with a spirit of high trust. Care for the wellbeing of the team.



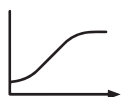
Think in systems. Experiment, learn, adapt, evolve, and aim for continuous improvement. Be alert to dynamic effects, feedback loops and tipping points.



Be distributive. Work in the spirit of open design and share the value created with all who co-create it. Be aware of power and seek to redistribute it to improve equity amongst stakeholders.



Be regenerative. Aim to work with and within the cycles of the living world. Be a sharer, repairer, regenerator, steward. Reduce travel, minimize flights, be climate and energy smart.



Aim to thrive rather than to grow. Don't let growth become a goal in itself. Know when to let the work spread out via others rather than scale up in size.

Further Development of the City Portrait Methodology

This first iteration of the City Portrait methodology was created through piloting it in Philadelphia, Portland, and Amsterdam. We learned much in the process of creating it and we are now adapting and extending this approach in order to:

- place greater focus on the role and impact of history, power relations, and legacies of colonialism in global North cities
- develop an approach, in collaboration with global South cities, that reflects the context of their needs, histories, interests, and perspectives
- adapt the approach for use at multiple scales, ranging from neighbourhoods to nations and bioregions.

All potential users and adapters of this methodology are invited to join the community at Doughnut Economics Action Lab³ to discuss, collaborate, and learn from others through these ongoing co-creative processes.

C40 Cities can likewise join the Thriving Cities Discussion Forum⁸ for peer-to-peer exchange on how to turn the City Portrait into transformative action. This forum currently includes the three pilot cities of Amsterdam, Philadelphia, and Portland, as well as advisory cities Copenhagen, Durban, Lisbon, New York City, Paris, Rio de Janeiro, and Vancouver.

Acknowledgements

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Appendix 1: Additional Details for Amsterdam's Global–Ecological Lens

Dimension	Indicator (Unit)	Data Source	Global Boundary	City Share of Boundary
Climate Change	CO ₂ Footprint from Fossil Sources (Mt CO ₂ per year)	EXIOBASE (3.3.17)	See the extended explanation below for the conversion from atmospheric concentration to annual emissions	2019 CO ₂ Boundary = 95% of 2018 global emissions (0.95 * 37.1 Gt CO ₂), divided equally among the global population
Ocean Acidification	CO ₂ Footprint from Fossil Sources (Mt CO ₂)	EXIOBASE (3.3.17)	Same as Climate Change	Same as Climate Change
Excessive Fertiliser Use	Nitrogen Footprint Applied to Erodible Soils (Mt N per year)	EXIOBASE (3.3.17)	62 Mt N per year (Steffen et al., 2015)	Planetary boundary divided equally among the global population
Overfishing	Ecological Footprint, Fishing Grounds (gha per year)	Global Footprint Network (2018)	1,095 million gha per year, Biocapacity	Global biocapacity divided equally among the global population
Freshwater Withdrawals	Blue Water Footprint (Mm ³ per year)	EXIOBASE (3.3.17)	4,000 km ³ per year (Steffen et al., 2015)	Planetary boundary divided equally among the global population
Excessive Land Use	Ecological Footprint, Cropland (gha per year)	Global Footprint Network (2018)	3,985 million gha per year, Biocapacity	Global biocapacity divided equally among the global population
	Ecological Footprint, Forest Products (gha per year)	Global Footprint Network (2018)	5,112 million gha per year, Biocapacity	Global biocapacity divided equally among the global population
	Ecological Footprint, Grazing Land (gha per year)	Global Footprint Network (2018)	1,504 million gha per year, Biocapacity	Global biocapacity divided equally among the global population
Waste Generation	Total Household Waste Separated (% per year)	Afvalmonitor (2017)	Planetary Boundary Not Defined	N/A
Ozone–Layer Depletion	Emissions of Ozone–Depleting Substances	N/A	<5% reduction from preindustrial level of 290 Dobson Units (Steffen et al., 2015)	N/A
Air Pollution	PM 2.5 Footprint (t per year)	EXIOBASE (3.3.17)	Global Boundary Not Defined	N/A

Notes: Please see the accompanying Supplementary Information sheet¹⁷ for more details on the data, sources, and calculations of the Global–Ecological lens in Amsterdam.

Extended explanation of CO₂ boundary

The long-term sustainable net amount of CO₂ emissions is approximately zero, and the 350 ppm boundary proposed by Steffen et al.¹¹ (2015) has already been exceeded. To derive a meaningful boundary consistent with keeping cumulative emissions below 1.5 degrees of warming, a straight-line decrease from current level of emissions to zero is assumed over the appropriate number of years (see Millar et al.⁴⁸ for discussions about the remaining carbon budget). Note that this boundary gets more stringent year-on-year, dropping rapidly to zero, and that it is close to status quo in the initial years (this year). The number of years remaining in such a budget is approximately 20 years from today, given a remaining carbon budget of approximately 400 GtCO₂ and current annual emissions of ~40 Gt CO₂ per year⁴⁹. The '1.5 degree IPCC report' states that 'staying within a remaining carbon budget ... implies that CO₂ emissions reach carbon neutrality in about ... 20 years for a 420 Gt CO₂ remaining carbon budget'⁵⁰.



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