

A GREEN & DIGITAL DEAL FOR ROTTERDAM

A systemic, mission-driven approach for implementation of the European Green Deal



V3.0

This document was written by SYSTEMIQ with input from the municipal organisation. It has not been formally adopted by the City Government or City Council and therefore does not represent the position of the Municipality of Rotterdam.

FOREWORD

Rotterdam has a unique position in Europe. Much is going to change for the city when Europe transitions to a climate-neutral and circular economy, as the **European Green Deal** envisages. Rotterdam has an exceptionally **strong starting position** to reap the benefits of this transition. At the same time, **the stakes are higher** in Rotterdam than elsewhere. In the port area, where tens of thousands of jobs are directly related to the transit and processing of fossil fuels. And in the city itself: in order to make Rotterdam free of natural gas by 2050, around 10 thousand homes a year will need to be renovated to a greater or lesser extent; there are enormous challenges in the field of infrastructure and education; digitalisation continues to change how people work, learn and spend their leisure time.

The **urgency** is high. The European Green Deal takes 2030 as its reference point.¹ This does not mean that Rotterdam has two more (4-year) terms of its city government to ensure that these developments are positive for the city. The sectors in which Rotterdam is a global leader will soon require substantial investments to secure the future. For citizens, waiting is not an option either. They are already feeling the effects of resource shortages, (air) pollution and nitrogen deposition. This will be complemented by a rise in sea levels and a loss of biodiversity. Many Rotterdammers are concerned about their city and the quality of life for future generations. This calls for a clear, coherent perspective on the changes that are coming, for action and for cooperation. The European Green Deal and the change of administration in 2022 offer a unique one-off opportunity to get this right.

At the invitation of the municipality SYSTEMIQ has written the *Green & Digital Deal for Rotterdam*. This document was drawn up on the basis of conversations and meetings with experts from various parts of the municipal organization and beyond. It is intended to be the integral response of Rotterdam to the European Green Deal. The *Green & Digital Deal for Rotterdam* argues that work on **climate, circular economy, digitalisation** and **resilience** needs to be approached in a systemic manner. In this way Rotterdam can deal with complex situations in a future-proof and crisis-proof manner.

The war in **Ukraine** has confronted us with our dependency on Russian gas and on resources in a broader sense. This comes on top of supply chain disruptions that led to shortages of critical products in the Netherlands, caused by the **covid-19** pandemic. These developments have reinforced calls to reduce dependencies, including by phasing out natural gas more quickly and reducing the resource dependency of production chains.²

This shift in priorities is driven more by safety and security of supply concerns than by the European Green Deal. Nevertheless, the solutions point in the same direction: phasing out gas accelerates the energy transition; reducing resource use is fundamental to a circular economy³; strengthening digital resilience is indispensable to realise these goals and makes Rotterdam less vulnerable to cyber attacks. These are all examples of strengthening resilience.

The **inhabitants of Rotterdam** experience many changes in their city in the coming years. The *Green & Digital Deal for Rotterdam* takes their daily needs as its starting point. The document begins by answering the question of how Rotterdammers will be able to meet their needs while the city becomes net-zero, circular, digital and resilient. To this end, it looks at the built environment, mobility, consumer goods, food and public services. This analysis results in six missions for Rotterdam. The document ends with a call to manage public policy based on **a single unified vision** on climate, circularity, digitalisation and resilience and to build **coalitions** with citizens and economic and social stakeholders to work together on a shared agenda.

We hope that this document will contribute to the strategy and priorities within the municipality and support the dialogue between the city of Rotterdam, citizens, businesses, social organisations, the national government and Europe.

TABLE OF CONTENTS

- 3 Foreword
- 5 Table of Contents

00 EXECUTIVE SUMMARY

- 6 Executive Summary

01 THE CHALLENGE

- 16 The Challenge

02 VISION FOR THE FUTURE

- 20 Vision for the Future
- 23 2.1 Ecosystem 1: Built Environment
- 27 2.2 Ecosystem 2: Mobility
- 28 2.3 Ecosystem 3: Consumer Goods
- 30 2.4 Ecosystem 4: Food
- 32 2.5 Ecosystem 5: Public Services

03 MISSIONS

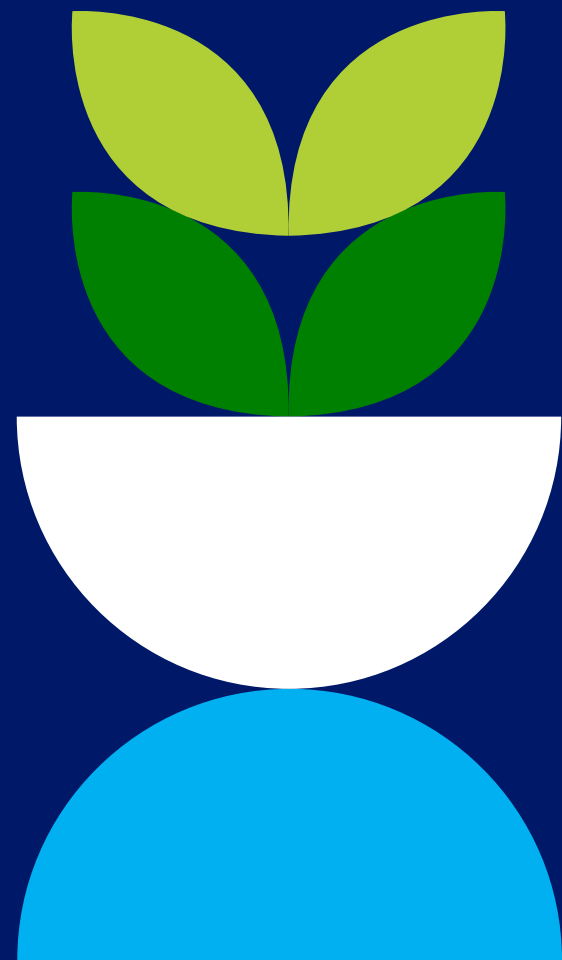
- 34 Missions
- 38 A Future-proof urban infrastructure
- 40 B Knowledge and skills of the future
- 42 C Vibrant neighbourhoods
- 45 D Climate-neutral and circular port-industrial complex (HIC)
- 48 E New circular business

04 FROM MISSIONS TO ACTIONS

- 50 From Missions to Actions
- 55 4.1 Public policy management based on a broad measure of citizen well-being (F1)
- 56 4.2 Mission-driven and investing government (F2)
- 58 4.2.1 Mission leadership
- 59 4.2.2 Roadmap from mission to actions
- 61 Closing Words
- 63 Endnotes

00

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

Europe is in the midst of a major economic and social transition in order to stay within planetary boundaries.⁴ This means becoming a net-zero, circular and resilient society, underpinned by comprehensive digitalisation. These four elements are referred to in this paper as the four **'transition lenses'**. The transition is urgent: to be in good shape as a city in 2030, investments need to be made now.⁵ The city's location by the sea makes it sensitive to the consequences of climate change, and meanwhile citizens are starting to notice the effects of raw material scarcity, (air) pollution and nitrogen deposition. Residents increasingly voice their concerns about the city - and its viability for future generations. This makes it even more urgent to invest quickly and comprehensively in how we will live, move and work in the future.

Rotterdam has a **strong starting position** to capitalise on opportunities, with a diverse and technically skilled population, good education, a good healthcare system and a solid digital base. Rotterdam is known for its daring and its culture of action. However, this is offset by vulnerabilities that make the transitions more drastic for Rotterdam than for other cities. An important part of the current economy consists of fossil industry. This creates the risk of a stagnating economy, with hundreds of hectares of stranded assets and lost jobs.





This document is intended as **Rotterdam's response to the European Green Deal**, the document that articulates Europe's ambitions for an economy within the boundaries of the planet. It can serve as an inspiration for the negotiations for forming the new city government and strategy formation; or for the dialogue between the City of Rotterdam, citizens, businesses, social organisations, the national government and Europe.

The *Green and Digital Deal for Rotterdam* follows the main themes of the European Green Deal: ensuring that the **daily needs of citizens** are met as well as possible and that the transition is fair. ("No city or region left behind".) In addition, climate and circularity targets must be met. Rotterdam adds two components to those of the European Green Deal that are prerequisites for success: resilience and digitalisation. Digitalisation is not only indispensable for the transitions to succeed, it is also an inevitable source of profound change in society. Although not a goal in itself, digitalisation is so far-reaching that it claims an important role in this narrative: no Green Deal without a digital deal.

The four transition lenses are so intertwined that they call for **one integrated perspective centered around citizens.** The *Green & Digital Deal for Rotterdam* therefore first of all argues from the needs of Rotterdammers and then maps out how these needs can be met in a future-proof manner. The analysis of the needs is structured into five ecosystems that represent the core of citizen's daily needs and must undergo a significant transition to remain within planetary boundaries. These five ecosystems are the built environment, mobility, consumer goods, food and public services. Figure 1 on the next page summarises the analysis. This methodology is in line with *A System Change Compass* by the Club of Rome and SYSTEMIQ, which Commission President Ursula von der Leyen called a report that 'provides guidance for a systemic realisation of the European Green Deal by addressing the real drivers of resource use and environmental pressures.'⁶

Based on this analysis and on discussions inside and outside the municipal organisation, six missions were drawn up for Rotterdam. It goes without saying that not all the activities of the city government fall under the six missions. The missions are intended as priorities and not as an exhaustive list.



6 MISSIONS FOR ROTTERDAM




| ECOSYSTEMS | BUILT ENVIRONMENT | MOBILITY | CONSUMER GOODS | NUTRITION | COLLECTIVE FACILITIES |
|---|---|--|---|--|---|
| RESOURCE INTENSIVE NEEDS OF PEOPLE | Space and infrastructure for living, working, learning and relaxing, with room for nature | Fast, reliable, convenient and affordable access to friends, family, work, daily necessities and leisure | Functional daily needs, such as clothing and hygiene products, which are not covered by any of the other ecosystems | Access to an affordable, reliable, tasty and healthy food supply | The social needs that are generally met collectively such as education, health care, safety culture and social security |
| MISSIONS | | | | | |
|  A FUTURE-PROOF URBAN INFRASTRUCTURE | A transition-proof electricity, hydrogen (fuels) and heat network, in which surface and subsurface are integrated | (Charging) infrastructure for electric vehicles and shared transport; public transport and cycling infrastructure | | | The (digital) infrastructure to connect citizens with each other and the municipality |
|  B KNOWLEDGE AND SKILLS FOR THE FUTURE | (Digital and technical) skills required for the jobs of the future: (Electrical) engineering for infrastructure construction such as power grids and heat transition | Electrical and digital technology, e.g. for replacing batteries | Digital & business skills for as-a-service models | | Digital education & training for all Rotterdammers |
|  C VIBRANT NEIGHBOURHOODS | Urbanisation with significantly less material and (climate-neutral) energy consumption, more greenery and climate adaptation | Integrated urban planning that reduces the need for transport and shifts from private cars to cycling, public transport and shared transport | Shift to new consumption patterns (such as as-a-service), affordable and available for all | Catering & retail offerings focused on healthy, plant-based and local food; reducing food waste in the chain | New (digital) ways to involve citizens in developments in their neighbourhoods and to strengthen communities |

FIGURE 1: SIX MISSIONS FOR ROTTERDAM BASED ON AN ANALYSIS OF FIVE ECOSYSTEMS 1/2

6 MISSIONS FOR ROTTERDAM




| ECOSYSTEMS | BUILT ENVIRONMENT | MOBILITY | CONSUMER GOODS | NUTRITION | COLLECTIVE FACILITIES |
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| RESOURCE INTENSIVE NEEDS OF PEOPLE | Space and infrastructure for living, working, learning and relaxing, with room for nature | Fast, reliable, convenient and affordable access to friends, family, work, daily necessities and leisure | Functional daily needs, such as clothing and hygiene products, which are not covered by any of the other ecosystems | Access to an affordable, reliable, tasty and healthy food supply | The social needs that are generally met collectively such as education, health care, safety culture and social security |
| MISSIONS | | | | | |
|  D CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX | Electricity and hydrogen infrastructure needed for HIC's transition to climate-neutral and circular use | Production, storage and transshipment of climate-neutral fuels; climate-neutral, digitally optimised (return) logistics | Production of circular and climate-neutral basic chemicals and raw materials for consumer goods | | |
|  E NEW CIRCULAR BUSINESS | Availability of climate-neutral and circular building materials | Repair and overhaul hub for circular material flows for mobility | Increasing the utilisation per "kilogram of material"; more intensive (re)use, repair, remanufacturing, the sharing economy and design | Closing the 'food chain'; recovering nutrients from waste (water) with, among others, circular brokers for waste streams | Collaborations, co-location and knowledge institutions that innovate |
|  F WHOLISTIC, MISSION-DRIVEN GOVERNANCE MODEL | More systemic governance model and mission-driven leadership to meet the future needs of Rotterdammers within the various ecosystems and exploit synergies | | | | |

FIGURE 1: SIX MISSIONS FOR ROTTERDAM BASED ON AN ANALYSIS OF FIVE ECOSYSTEMS 2/2

6 MISSIONS FOR ROTTERDAM

The first three missions focus on making the city **resilient**:

A FUTURE-PROOF URBAN INFRASTRUCTURE

Adapting and building the infrastructure for a net-zero, circular, digital and resilient Rotterdam.

B KNOWLEDGE AND SKILLS OF THE FUTURE

Equipping citizens with the digital and technical skills required for the jobs of the future – skills that are often already in short supply today – accompanied by an ambitious educational agenda to ensure that all Rotterdammers have the opportunity to participate in the city of the future.

C VIBRANT NEIGHBOURHOODS

Creating living environments which promote healthy lifestyles, enhance quality of life, build a sense of community, and are affordable to all, while being less energy and resource intensive. All of these help to improve the resilience of communities in the face of economic, social or environmental challenges. Success here requires a holistic approach at the level of the neighbourhood, with full use of digitalisation.

Two missions focus on **future-proofing** the economy:

D CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEXⁱ

Deeply transforming the port-industrial complex so that it maintains its leading position in the global economy, but as a champion of a climate-neutral and circular approach. This means transitioning from being a fossil fuel hub to a hydrogen and bio-based hub, from a linear to a circular chemical complex and net-zero transport systems.

E NEW CIRCULAR BUSINESS

A boost to Rotterdam's economy akin to the opening of the "Nieuwe Waterweg" canal to the sea in 1872 that gave the port its leading position: investing at scale in innovation and knowledge to achieve circularity, by developing the manufacturing, repair, refurbishment and recycling industry in Rotterdam and the associated circular business models (as-a-service models, commodity trading). The initial focus will be on a small set of value chains critical to delivering mobility, food, the built environment, public services and consumer goods.

This holistic citizen-oriented approach requires a fundamentally different governance model:

F HOLISTIC, MISSION-DRIVEN GOVERNANCE MODEL

That steers us towards a more equitable and prosperous society, in which prosperity is measured by more than just GDP and where the needs of all citizens are met in way that is fair, inclusive, and within planetary boundaries. A bold, mission-driven government is required to implement this model and to mobilise other key actors across the system. This requires a governance model centered around public-private cooperation, which can identify priority projects, support their implementation, monitor progress and make adjustments where necessary. This governance model also includes proactive and intensive cooperation with the city's stakeholders who have a key role in funding and implementing the missions.

6 MISSIONS FOR ROTTERDAM







| MISSIONS | | | |
|------------------------|---|---|---|
| A RESILIENT CITY |  | A FUTURE-PROOF URBAN INFRASTRUCTURE | <p>A1 Integrated infrastructure for urban systems</p> <p>A2 Digitalisation of these urban systems</p> |
| |  | B KNOWLEDGE AND SKILLS FOR THE FUTURE | <p>B1 Workforce of the future</p> <p>B2 Equal opportunities for all in a digital and circular world</p> |
| |  | C VIBRANT NEIGHBOURHOODS | <p>C1 Climate-neutral and circular physical environment</p> <p>C2 Social capital in a network society¹</p> |
| A FUTURE-PROOF ECONOMY |  | D CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX | <p>D1 Hydrogen (and bio-based)² hub</p> <p>D2 Climate-neutral and circular basic chemicals</p> <p>D3 Climate-neutral and circular logistics</p> |
| |  | E NEW CIRCULAR BUSINESS | <p>E1 Circularity innovation and knowledge hotspot</p> <p>E2 Circular manufacturing, repair and recycling industry</p> <p>E3 Circular services (XaaS³ and commodities trading)</p> |
| |  | F HOLISTIC, MISSION-DRIVEN GOVERNANCE MODEL | <p>F1 Policy management based on a broad measure of citizen well-being</p> <p>F2 Mission-driven and investing government</p> |

FIGURE 2: 6 MISSIONS FOR ROTTERDAM

1 Including use of digital communication platforms; 3D models (digital twin) for one shared truth

2 Bio-based economy to a limited extent for fuels without good alternatives, such as aviation fuel; as a source of sustainable CO₂ for chemical processes

3 XaaS is an abbreviation for X-as-a-Service. The X stands for all products or services that can be offered in user form.



The implementation of **MISSIONS A** to **MISSION E** will require new structures and processes, as described in **MISSION F**. It is important to embed a broad definition of well-being in the heart of the decision-making process. This means that the advantages and disadvantages of proposals must be weighed up against the transition lenses referred to in this document and a broader set of prosperity indicators, such as the Monitor of Well-being of Statistics Netherlandsⁱⁱ and the sustainable development goals (SDGs) of the United Nations (UN). An assessment framework for policy proposals and other projects can help test the extent to which (current and future) projects will contribute to this picture of broad well-being. To maintain oversight of the missions, to monitor progress and to make adjustments, a body needs to be established that coordinates the public-private cooperation between the municipality and other stakeholders, a **mission leadership team**. This team ensures that strategic decisions are made efficiently and effectively, and, crucially, in an integrated manner. It strives to shape markets and ensures that public and private investments in (technological) innovation are made.

Six steps, supported by these new processes and structures, will help to move from mission to action:

6 STEPS

STEP 1

Map ongoing initiatives and identify what is missing to implement the missions.

STEP 2

Define ownership of the missions both within the municipality and in partner organisations.

STEP 3

Build impact coalitions with the private sector, knowledge institutions and/or other parties in society. Identify which existing coalitions can be strengthened to own a mission. In areas without an obvious coalition (e.g. **MISSION E**), establish one.

STEP 4

Develop implementation plans setting out concrete annual targets, measurable indicators and the actions required to achieve these targets. Parties involved deploy their own resources (funds, land and environmental allowances), each based on their own mandate.

STEP 5

Secure extra funding by jointly approaching The Hague and Brussels in applying for funds, and deploy own resources strategically, in line with the missions.

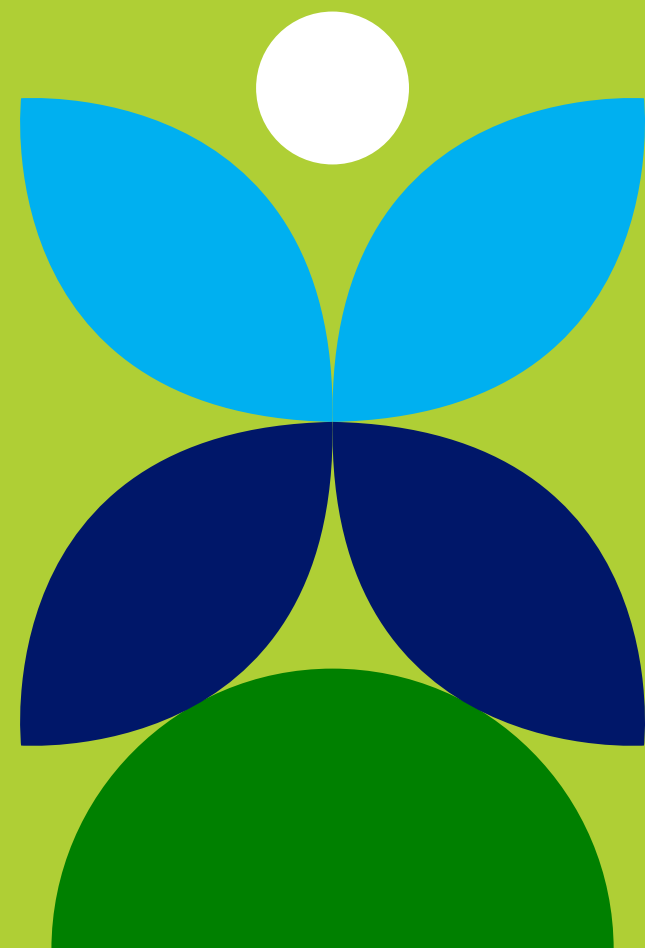
STEP 6

Monitor and adjust where necessary.

These six missions put Rotterdam on a path towards achieving its climate and circularity goals, and a high quality of life across society, increasing the city's resilience and readiness for a digital future.

01

THE CHALLENGE



THE CHALLENGE

OVERVIEW

Rotterdam faces a major challenge: to **better meet the needs of all citizens while transitioning to an economy that is less energy- and resource-intensive. Digitalisation** will be critical to delivering across all of these goals, as is **resilience**. We therefore break the challenge down into four transition 'lenses': circular, climate-neutral, digital and resilience.

The **climate-neutral** lens is based on the target to reduce emissions by at least 55% by 2030, and reach net-zero by 2050.² This means reducing emissions as much as possible and compensating any small remaining amount with carbon capture. The circular lens refers to the decoupling of economic growth and material use by reducing the need for materials in the first place (meeting needs with less material use), increasing material efficiency (e.g. through more intensive use, reuse and repair) and keeping materials in circulation through increased recycling. We define **digitalisation** as the at-scale conversion of processes to digital, which will have profound implications for the way society and even politics function.³ Digitalisation is critical to the overall transition as it facilitates new, innovative models and processes and better enables collaboration.

Finally, **resilience** is a combination of resilience, learning and change capacity that determines how well people, communities, organisations and systems cope with large and small changes. It therefore concerns both physical and social resilience and the resilience of systems and society.

The transition will not be without its challenges: "Europe's transition to climate neutrality will not be easy and we need to have policies across the economy that bring everyone along."⁴ This will not be possible without making clear choices and taking an integrated approach to implementing the missions. This reflects a European consensus: in order to be fully climate-neutral and circular by 2050, the *European Green Deal* argues that these transitions are so intertwined that they must be approached from one integrated perspective.



Achieving the climate goals must not come at the cost of failing to meet the needs of citizens – these need to be put first. A successful transition would be one in which citizens do not face a trade-off between choices which are convenient and/or affordable, and those which are better for the environment, for example making public transport more attractive than driving a private vehicle, or ensuring that a well-insulated home is the cost-effective option. One challenge here will be in ensuring that the benefits of the transition are felt by all Rotterdammers, and that the solutions do not leave anyone behind. For example, driving still needs to be an accessible option for those whom public transport is not an option, while landlords need to be incentivized to invest in insulation so that their tenants are not locked out of the financial benefits of more efficient energy consumption.

The municipality is the key actor in delivering the transition, but success is dependent on effective collaboration with stakeholders across the city, including companies, knowledge institutes and other organisations. Particularly critical to the success of the transition is a strong partnership with the Port of Rotterdam, to ensure that the strategy does not treat the port area and the rest of the city as separate entities.

An understanding between the municipality and the Port of Rotterdam on their shared (and unique) challenges will also be essential to shaping a solution together and avoiding duplicative (or indeed conflicting) efforts. The role of the municipality is crucial to the success of the transition 'civil servants can make the difference' in the words of transition professor Jan Rotmans,⁵ but the implementation can only be done together with others. The urgency of climate change and decreasing biodiversity means that Rotterdam cannot rely completely on market forces alone. The municipality will inevitably be faced with choices about how to phase out old systems and build the climate-neutral, circular systems of the future. This also means reviewing current programs based on the objectives and starting new ones. And all this in an environment where crucial 'old systems', such as the gas supply for heating homes, must continue to operate until new systems are fully operational.

Tackling this challenge requires courage and boldness.

Rotterdam's history shows that daring pays off. On several occasions, bold investments at the start of an economic transition, such as the creation of a 40 km canal to the sea ('Nieuwe Waterweg') in the late 19th century, helped to fuel economic growth and 'future-fit' the city as a whole, not only impacting the industry in question (in this case, the shipping industry). A similarly proactive, forward-looking mindset will be essential to foster the innovation that will deliver the transformation required today. This calls for a role for a more **proactive, investing, mission-driven** role for the municipality. This means that the city will set its agenda on the basis of concrete strategic challenges that need to be met by e.g. 2030. Part of this is an innovation agenda that moves beyond fragmented innovation resources and hotspots to make way for an **innovation complex**. This complex would bring together initiatives such as living labs, accelerators and innovation districts, and allow investment to be aligned. Local (citizen) initiatives would also be supported and given the resources to scale up where successful. This must all be accompanied by policies that will catalyze investment and foster cooperation between stakeholders across the economy.

MAIN QUESTIONS

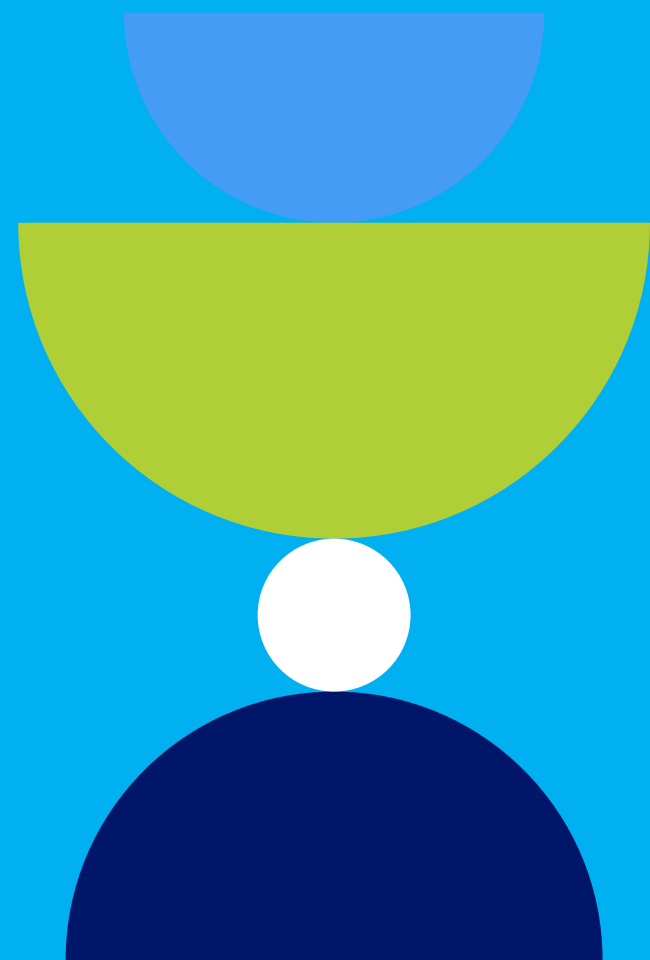
The **what and the why** of the transitions is now a given. The main question is **how to get there**:

- How can Rotterdam become a resilient, thriving city that provides a good quality of life for its residents, whilst staying on track to achieve its goals around circularity, climate change and resilience?
- How should Rotterdam reshape its role in the European economy to ensure its economy is future-proof?
- How should public administration be organised to manage the complexity of the transition and ensure it is a success?

To answer this, chapter 2 contains a vision of the future based on five 'economic ecosystems'. Each ecosystem represents a different daily need of citizens, which in today's economy is associated with large-scale use of natural resources such as materials and energy. Chapter 3 discusses the six missions that emerge from these ecosystems: the spearheads for a climate-neutral, circular, digital and resilient Rotterdam. Ultimately, it is about how we get from the missions to concrete changes in how the needs of the people of Rotterdam are met. The paper therefore ends with a perspective on the implementation of all the missions in chapter 4.⁶

02

VISION FOR THE FUTURE

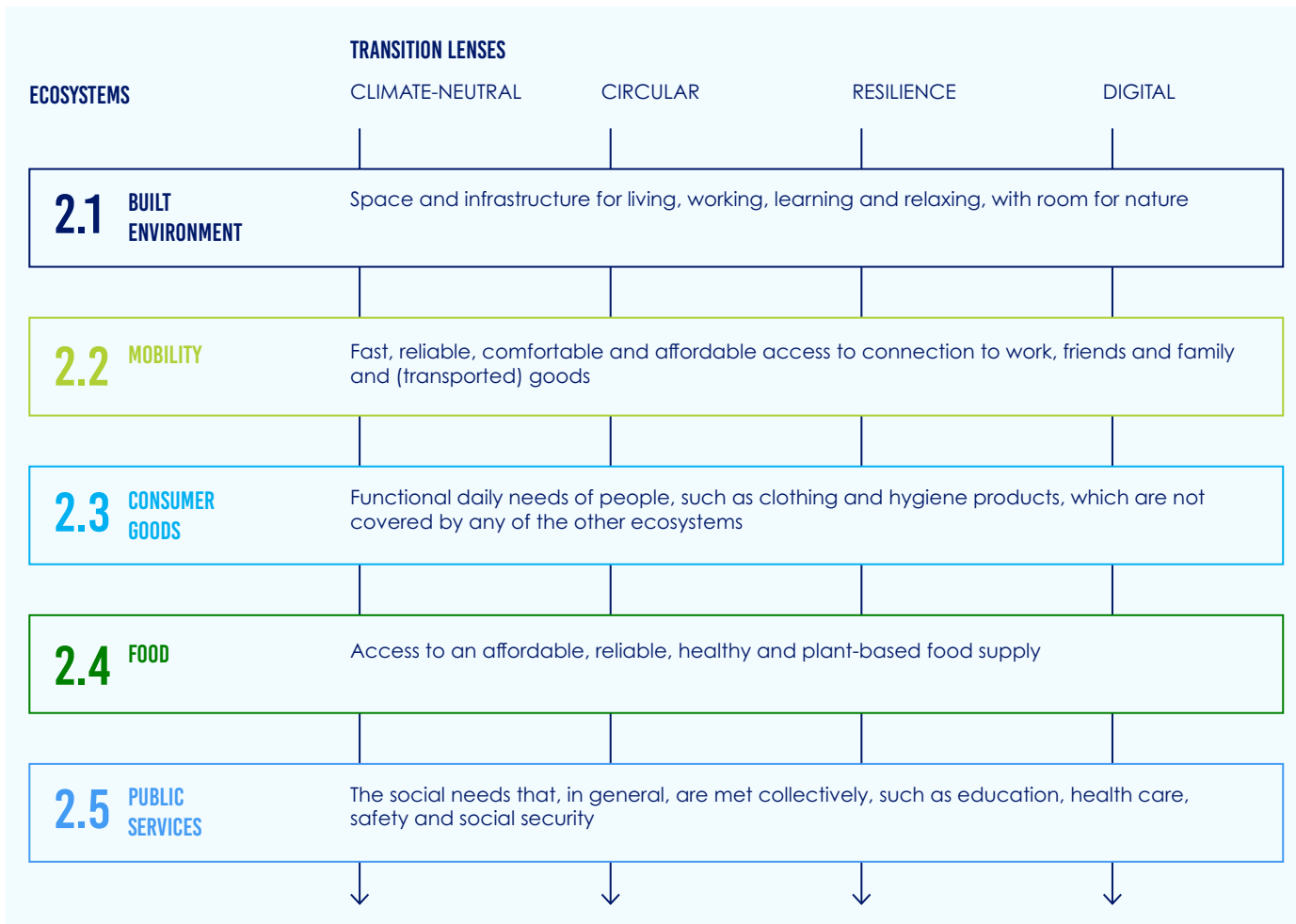


VISION FOR THE FUTURE

Creating a city that better meets the needs of its citizens while becoming climate-neutral, circular, resilient and digital is a major challenge, but one that Rotterdam can meet. This chapter outlines how this transition could take place, using five 'economic **ecosystems**' that each represent an essential daily need for citizens, and which are also material- and energy-intensive.



FIVE ECOSYSTEMS



MAIN TASK

- Ensuring that the daily needs of all Rotterdammers are met...
- ...while at the same time making the city net-zero, circular, digital and resilient
- 5 ecosystems have a direct link to material/energy-intensive basic needs
- These ecosystems are viewed through four transition lenses

FIGURE 3: FIVE ECOSYSTEMS THAT EACH REPRESENT A DAILY NEED OF CITIZENS AND CONSUME MATERIALS AND ENERGY ON A LARGE SCALE IN TODAY'S ROTTERDAM

These ecosystems are inspired by the System Change Compassⁱⁱⁱ to align the thinking in this analysis with the European Green Deal. They focus on the underlying needs of citizens, not on the products or services we use in today's economy to meet those needs.

2.1 ECOSYSTEM 1: BUILT ENVIRONMENT

The 'built environment' ecosystem includes everything that has been constructed to meet the living, working, learning and leisure needs of the city's residents. This includes buildings, parks and industrial areas as well as infrastructure such as data and electricity cables and sewers.^{iv} Not all citizens engage with the built environment in the same way: what is considered 'affordable' or 'accessible' for one person, is not necessarily for another.

The living environment of citizens has always had both a physical and a social component. Digitalisation has added to this. Fueled by increasing digitalisation, networks are beginning to take precedence over centrally managed structures.

This affects, for example, the way that citizens interact with government.⁷ New platforms can streamline this interaction, but also risk excluding those who cannot, or struggle to, access the internet, such as the elderly and those with low literacy levels.

The challenge is to design the built environment in a way that is future-proof, so that it will continue to meet the needs of Rotterdammers for many years to come, while using less material and energy. Three major developments are necessary: providing the necessary physical infrastructure, redesigning neighbourhoods and implementing the heat and energy transition – all in a way that leaves no one behind.



iii The System Change Compass distinguishes four 'grey ecosystems' (circular materials, energy, nature and information processing) that largely correspond to the four transition lenses in this paper. In addition, there are four coloured ecosystems that correspond to the ecosystems in this chapter. To these, this paper has added the ecosystem *Public Services*

iv Transport infrastructure and the built environment associated with transport (container terminals, car parks, etc.) are dealt with under *Mobility*; industrial infrastructure and built environment (industrial pipelines, factories, etc.) under *Consumer Goods*

2.1.1 PHYSICAL INFRASTRUCTURE

The city's physical infrastructure needs a major update to meet the electricity, heat, data and traffic demands of the future. For both households and industry, electrification is often the cheapest and most efficient solution to reduce greenhouse gas emissions.⁸ As a result, the total demand for electricity is expected to rise, even with efficiency improvements. In general, it is expected that electricity consumption in the Netherlands will increase by a factor of 2 to 3 by 2050 as a result of the electrification of mobility, industry and part of the demand for heat.⁹ In the Rotterdam-Moerdijk industrial cluster, the demand for electricity is expected to increase by a factor of 3.5 between 2020 and 2030.¹⁰ The current electricity grids are insufficiently equipped for this.¹¹ As the transition to renewable energy sources gathers pace, and electrification increases, grids must be extensively digitalised to better manage the expected peaks in electricity supply and demand.¹² All this requires major investments in physical and digital infrastructure, better use of existing infrastructure and the manpower to install these improvements in the time-frame required.

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In the port area, sufficient production capacity and safe infrastructure for transport, storage and (off)loading of green hydrogen (products) is essential. For industrial processes for which there is no electrification solution in the short term, infrastructure for the capture, transport and storage of CO₂ can offer a transitional solution.¹³ In order to map out the infrastructure transition for industry, in September 2021 the first Cluster Energy Strategy (CES) Rotterdam-Moerdijk identified six key infrastructure projects which "are simultaneously a catalyst for the energy transition in the region and important for the country's economy and future earning capacity".¹⁴

It is important that the infrastructure transition take into account how climate change will impact the area, so that critical infrastructure is not located in the most vulnerable locations. More details can be found under the missions from Chapter 3: **A. FUTURE-PROOF URBAN INFRASTRUCTURE**, and **D. CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX**. A skilled and qualified workforce will be essential to build and maintain this infrastructure, and existing personnel shortages need to be addressed. This makes investing in the: **B. KNOWLEDGE AND SKILLS OF THE FUTURE** crucial for the success of this part of the transition.

2.1.2 REDESIGNING NEIGHBOURHOODS

The next challenge is to design **neighbourhoods** in such a way that, almost without realising it, residents can go about their lives whilst using less energy and fewer materials, and that neighbourhoods are built in a way that increases resilience. In the first place, this means shifting to **climate-neutral, circular and resilient construction**: building neighbourhoods that produce net-zero emissions, use (reused) materials of higher quality, are well-insulated and, to the extent that is possible, are climate adaptive.

One of the routes to achieving this will be more intensive use of space and materials. The International Resource Panel has calculated that 80% of the potential greenhouse gas reduction in the built environment can be achieved through more intensive use – by doing more with less.¹⁵ This requires two key approaches: one is managing the urbanisation and densification of Rotterdam, as proposed in the city's Spatial Vision.¹⁶ The other is to design buildings in such a way that they can be relatively seamlessly re-purposed for a different use in the future.

More intensive use saves space, and consumes fewer materials and less energy during construction but, more importantly, it can improve the quality of life for Rotterdammers. Denser districts generally have better access to public transport than suburbs and villages in the municipality of Rotterdam such as Rozenburg and Hook-of-Holland.¹⁷ Having good access to green spaces and amenities within walking distance make it easier to live a healthier lifestyle. More green space is also essential to improve the resilience, air quality and biodiversity of neighbourhoods. Housing in denser areas also helps to foster thriving local economies made up of local retailers, restaurants and cultural initiatives. Research shows that density also has a positive effect on innovation in neighbourhoods.¹⁸

Chapter 3, under: **C. VIBRANT NEIGHBOURHOODS**, offers solutions for improving neighbourhoods without compromising affordability. Better and more intensive construction will eventually lead to cost savings.^v These cost savings can be redeployed to design the public space in such a way that it is perceived as more pleasant by Rotterdammers.

To keep neighbourhoods affordable, a significant part of the financial benefits must be returned to the residents themselves. Many of the advantages mentioned are easier to realise through newly constructed buildings than with renovation. However, in many cases, renovation is still the preferred option from both a financial and environmental cost perspective. This can only be weighed up per building and infrastructure project, based on life-cycle impact assessments.

2.1.3

HEAT AND ENERGY TRANSITION

The **heat and energy transition** inevitably requires adjustments in buildings – both new and existing. Retrofitting existing homes will involve substantial investments. The objective that all homes should be gas-free by 2050 means that, for Rotterdam, an average of 10,000 homes a year will have to be renovated to some extent.^{vi} Although the benefits are almost immediately felt (e.g. though lower energy costs), the modification process can be very inconvenient for residents. It is important that these adaptations are affordable and accessible for all, and new investment models are needed to ensure that rental housing is not left behind. As far as new construction is concerned, the Spatial Vision states that at least 200,000 homes must be built in the province of South Holland by 2030.¹⁹ It is essential to do it right the first time, in line with the vision as described above.

To successfully transform the built environment, inclusivity must sit at the core of the approach to developing neighbourhoods. Strong communities, human capital and social cohesion will drive the transition. **Digitalisation** is a crucial factor in this. On the one hand, it opens up new possibilities to engage with citizens: making it easier to involve them in developments in their neighbourhoods; providing tools and platforms for circular construction and making better use of space; and facilitating the deployment of smart electricity grids. On the other hand, digitalisation changes society itself, among other things because citizens organise themselves more in networks. The municipality's approach must change to take this into account.

NATIONAL PROGRAMME FOR SOUTH ROTTERDAM

As of 2012, several parties such as Woonstad, the Port of Rotterdam Authority and the municipality are making joint efforts to improve quality of life in South Rotterdam, which is disadvantaged compared to other parts of the city. This is done integrally and on a large scale, with partners in the “school, work, housing, residents, culture and safety” sectors.²⁰ At the moment, the results of this approach seem positive; students are opting for higher education with more job security and secondary school test results are improving.²¹

2.2

ECOSYSTEM 2: MOBILITY

The mobility ecosystem includes passenger and freight transport. Cars and trucks are dominant in Rotterdam at 42% of passenger kilometers and 55% of freight transport.²² Both score poorly in terms of air pollution and CO₂ emissions relative to other means of transport in both construction and in use.²³ Parked cars collectively occupy about 450 hectares of the city, an area almost as large as the entire center of Rotterdam.²⁴

The function of the mobility system is to connect goods and people quickly, reliably and comfortably: the transition must deliver on this in a way that helps us reach our climate goals. These needs can be met in three different ways. Firstly, by **reducing the number of kilometers** traveled by passengers and goods. More local facilities and digitalisation (working from home) take away part of the need for passenger transport, thus reducing the number of kilometers traveled. Shorter supply chains reduce the transportation distance for goods. At the same time, a circular economy increases the need for return logistics, see also section 2.3 Consumer Goods.

Secondly, by **increasing the efficiency of energy use** and optimising transport movements through digitalisation. For passenger transport, an important part of the solution lies in switching to cycling, public transport and shared (eventually autonomous) transport. Shared vehicles have particularly significant potential, unlocking a lower material- and energy-footprint per kilometer traveled compared to private vehicles. They also take up less parking space because they are on the road more (private cars are parked 59% of the time).²⁵ For many people, shared mobility turns out cheaper than private car ownership.²⁶

Thirdly, by sourcing the **remaining energy demand from renewable sources**. This means the electrification of road transport, and the partial electrification of aviation and shipping, using bio-based and hydrogen-based fuels (for longer distances). For freight transport, Rotterdam has the opportunity to remain a logistics hub, with, for example, increased platform efficiency through digitalisation and a shift for freight transport from road to rail.

Four missions have been identified to realise the transition of the mobility ecosystem, as described in chapter 3: **A. FUTURE-PROOF INFRASTRUCTURE** digital, roads, parking, electricity, charging, fuel and storage); **B. SKILLS OF THE FUTURE** for the manpower to build it and the broad skills to keep up; **C. VIBRANT NEIGHBOURHOODS** for good integration into urban areas and **D. CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX** for the leading role that Rotterdam plays in making Europe's logistics of the future climate-neutral and circular.



2.3

ECOSYSTEM 3: CONSUMER GOODS

The Consumer Goods ecosystem is about meeting the daily needs of people that are not met by any of the other ecosystems. Examples are hygiene products, clothing and home furnishings. Currently, energy and material consumption per person is very high and many products are disposed after use – only 30% of consumer goods are recycled to some extent.²⁷ This is called a 'linear' economic model.

There are three ways to move from a linear to a circular economy without compromising citizens' needs for consumer goods. Firstly, **reducing the need** for materials without increasing energy use. Digitalisation is one route to achieving this in some contexts, think of how many letters have been replaced by e-mails.^{vii,28} Secondly, **increasing the utility** per 'kilo of material'. This can be done through more intensive use and reuse, design that increases lifespan and reusability, repair, remanufacturing, and the sharing economy and 'as-a-service' or XaaS models.^{viii}



vii It is not always clear whether digitisation actually leads to less use of resources; for example, research shows that film streaming and DVDs do not seem to be very different in terms of resource use.

viii XaaS stands for x (anything) as a service.



In XaaS models, providers tend to own the product for its full lifespan, and are therefore incentivised to make products with a long lifespan and increased repairability.²⁹ With the right incentives, XaaS can make a significant contribution to reducing material consumption. Besides commercial XaaS models, such as Peerby,³⁰ there are also local initiatives such as the Ruilpunt (“Exchange Point”) of Aktiegroep Oude Westen.³¹ These models are not only good for reducing material and energy use, but also spread capital costs across a wide group and encourage social connections within communities.³² Thirdly, **recycling** in order to reduce the use of primary raw materials. This requires good systems to be in place for collecting, sorting and processing raw materials.³³

A successful transition in the Consumer Goods ecosystem requires both economic and social interventions. On the economic front: making the **D. PORT-INDUSTRIAL COMPLEX CLIMATE-NEUTRAL AND CIRCULAR** and allowing new **circular activities** to emerge **E. NEW CIRCULAR BUSINESS**.

In 2.1 and 2.2 above we described the transformation that industry and logistics must go through to become climate-neutral and circular. Hydrogen and electrification play an important role in this, with CO₂ capture as a transitional solution. In chapter 3, this is explained further, along with what Rotterdam can do to become the center of the European circular economy.

From a social perspective, the transition in the *Consumer Goods* ecosystem requires **MISSION B. SKILLS OF THE FUTURE**, covering not only professional skills, but also the everyday skills that ordinary Rotterdammers need, to be able to reap the benefits of the transition, including digital literacy. The consumption of the future also has repercussions for neighbourhoods: as more and more retail is going online, what does that mean for local bricks-and-mortar retail?³⁴ Furthermore, it is necessary to be mindful of the social consequences that, for example, the sharing economy can entail. This is further elaborated in **MISSION C. VIBRANT NEIGHBOURHOODS** in chapter 3.

2.4

ECOSYSTEM 4: FOOD

Every inhabitant of Rotterdam must have access to **healthy, tasty and affordable food**. In many parts of the city, the current food supply is not in line with this: the percentage of overweight among Rotterdammers is higher and life expectancy lower than the national average.³⁵ Today's food system also has a major impact on the planet. Land use (excluding carbon capture) for forestry and food production contributes around 30% of gross global emissions.³⁶ Animal products, particularly beef, pork and dairy have a much higher greenhouse gas footprint than most plant-based foods. Long supply chains also play a role in these high emissions. Overall, a shift to a local, plant-based and seasonal diet saves around 30-40% in emissions and 25-40% in land footprint compared to an average diet.³⁷

A transition to a more plant-based diet also means a healthier diet.³⁸ The average meat consumption in 2019 was more than 2.5 times higher than recommended in the EAT-Lancet diet.³⁹

The European Green Deal indicates that public awareness is a prerequisite for increasing the consumption of plant-based foods. It is also essential to ensure that healthy, tasty, affordable alternatives are available so that consumers are in a position to make these choices. Collaboration with partners in the catering and retail sectors will be key to make this change. Sufficient availability of a wide range of food options throughout the city is therefore part of **MISSION C. VIBRANT NEIGHBOURHOODS**, explained in more detail in chapter 3, with planning priority given to businesses that contribute positively to the transition to a more environmentally friendly and healthier diet.⁴⁰





THE GEZONDO10 FOOD CHALLENGE

Around half of all adults in Rotterdam are overweight. To encourage healthier food consumption, 16 organisations, from large supermarket chains to local sports clubs, made their food offerings healthier in 2018, and tested the effect this had on consumers. In total, 41 new healthy products appeared on the partners' menus, and more than 132,000 additional healthy products were sold.⁴¹

Rotterdam also has a role to play in closing the loop in the food supply chain.⁴² International research shows that less than 2% of valuable nutrients from fruit, vegetable and garden waste and wastewater are used on average.⁴³ These nutrients could be recovered and kept in use: for example, the reuse of nitrogen and the mineral phosphorus from wastewater, or the production of biogas from organic waste streams.⁴⁴ For various reasons, including regulation, large-scale nutrient recovery from wastewater is not yet possible, so investment is required to realise its potential. Digitalisation can facilitate the solutions just mentioned for example in the form of 'digital circular brokers' for organic waste streams.⁴⁵

2.5

ECOSYSTEM 5: PUBLIC SERVICES

The Public Services ecosystem focuses on the societal needs that are generally met collectively. These include education, healthcare, culture, safety and social security. Though typically not major consumers of materials and energy, they are essential for well-functioning communities. Each service faces their own unique challenges in the transition, which we do not address exhaustively in this paper. However, we will highlight a number of points that are closely related to the transitions in the other ecosystems.

A network society offers opportunities to tailor solutions more closely to the needs of individual citizens, for example in the areas of healthcare and education.⁴⁶ Here one can think of both physical and digital platforms where residents can participate in easily accessible ways to change the neighbourhood.⁴⁷ Facilities of the municipality of Rotterdam contribute specifically to the cyber-security of the city and the port,⁴⁸ the formation of communities and the provision of the necessary knowledge and skills to achieve the transitions.



CONVERGENCE ALLIANCE

TU Delft, Erasmus University Rotterdam and Erasmus MC work closely together in the Convergence Alliance to exchange expertise, knowledge and methodology. In this way, complex and urgent social challenges can be tackled such as climate change, sustainability, pressure on healthcare, urbanisation and digitalisation. Kick-start funding of 5 million euros per year was made available for this in early 2020. The alliance is working on three different topics, one of which is the Resilient Delta Initiative. The mission of this initiative is to design resilient solutions for the city and then implement them all over the world.⁴⁹

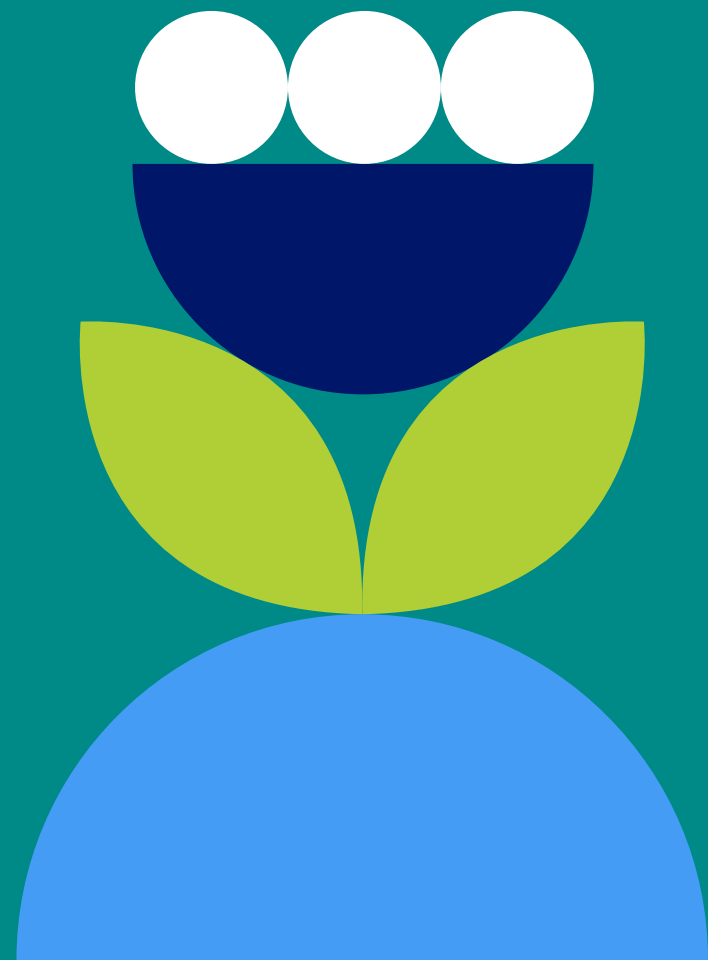
Community engagement is necessary for implementing plans that actually work for the city. Close-knit communities are also better able to absorb shocks.⁴⁹ The importance of strong communities for the resilience of a city is widely recognised.⁵⁰ They are better able to exchange knowledge, products and services. This contributes to a just transition as emphasized in the Green Deal Going Local project.⁵¹ By carrying out **MISSION C. VIBRANT NEIGHBOURHOODS**, the municipality can contribute to strengthening communities.

Changing consumption patterns and technological developments demand different knowledge and skills from Rotterdammers; both in daily life and in the labour market (as also described in the *European Green Deal*). **MISSION B** deals with this in more detail.

Finally, the transition will only succeed if everyone is able to participate and wants to, and if the systems are designed accordingly. This has consequences for how public administration operates: with empathy, steering from a broader perspective of prosperity and with a more mission-driven approach. **MISSION F** discusses this in more detail.

03

MISSIONS



MISSIONS

The vision of the future presented in the previous chapter makes it clear that Rotterdam will have to do a number of things fundamentally different if it is to meet the needs of its citizens in the future. It is crucial that this is done in an integrated manner, paying attention to all four transition lenses: climate neutrality, circularity, digitalisation and resilience. Existing plans often only touch on one of these elements. Climate plans, for example, often primarily look through the lens of climate neutrality, ignoring the fact that a circular economy can make a major contribution to achieving the climate targets. Digitalisation and resilience are similarly under-appreciated in many climate plans.

This chapter articulates six missions for Rotterdam to meet its stated objectives and to position the city as a leader and example city within the Europe of the *Green Deal*.

They focus on those points where Rotterdam is already a leader in Europe or can become one. The aim is not to set out an exhaustive list of what is needed, but to identify which areas should be a priority for Rotterdam.

The set of missions were identified based on the ecosystem analysis from the previous chapter, combined with an analysis of the so-called 'champions' – concrete implementation pathways – included in the *System Change Compass*.⁵² Analysis of these champions involved understanding the impact on CO₂, material use, resilience and the possible competitive advantage for Rotterdam.



The first three missions address how Rotterdam can shape the transition so that all citizens can thrive and that the systems are equipped to enable this. In other words: how do we ensure that the transition is fair and effective? By:

- A. climate-proofing the **infrastructure for the** energy and digital transition;
- B. facilitating **human capital**: building the digital and circular skills of the future for both the labour market and society; and
- C. developing **vibrant neighbourhoods** that are climate-proof and in which the physical, social, and digital life of citizens is paramount.

The next two missions address how Rotterdam can become an economic forerunner in a digitalised, future-proof Europe. Given Rotterdam's unique position, we set the bar high: how can Rotterdam become the main economic center-point and industry example for the Europe of the *Green Deal*? By:

- D. making the **port-industrial complex** and its activities climate-neutral and circular, underpinned by a strong role for digitalisation; and
- E. stimulating **new circular value chains**: manufacturing, repair, refurbishment, remanufacturing and recycling and to become a distribution point for as-a-service models.

The last mission answers the question of how Rotterdam can create a **governance** model that safeguards an integrated approach to the transitions. By:

- F. Embedding broad definitions of well-being (*brede welvaart*) and resilience as guiding principles, enabling local government to take ownership of the transition, and co-investing where necessary.

The first five missions (**MISSION A** to **MISSION E**) are explained in more detail below. **MISSION F** is elaborated on in Chapter 4 because it forms the link to proceed to implementation and execution of the missions.

6 MISSIONS FOR ROTTERDAM







| MISSIONS | | | |
|------------------------|---|---|---|
| A RESILIENT CITY |  | A FUTURE-PROOF URBAN INFRASTRUCTURE | <p>A1 Integrated infrastructure for urban systems</p> <p>A2 Digitalisation of these urban systems</p> |
| |  | B KNOWLEDGE AND SKILLS FOR THE FUTURE | <p>B1 Workforce of the future</p> <p>B2 Equal opportunities for all in a digital and circular world</p> |
| |  | C VIBRANT NEIGHBOURHOODS | <p>C1 Climate-neutral and circular physical environment</p> <p>C2 Social capital in a network society¹</p> |
| A FUTURE-PROOF ECONOMY |  | D CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX | <p>D1 Hydrogen (and bio-based)² hub</p> <p>D2 Climate-neutral and circular basic chemicals</p> <p>D3 Climate-neutral and circular logistics</p> |
| |  | E NEW CIRCULAR BUSINESS | <p>E1 Circularity innovation and knowledge hotspot</p> <p>E2 Circular manufacturing, repair and recycling industry</p> <p>E3 Circular services (XaaS³ and commodities trading)</p> |
| |  | F HOLISTIC, MISSION-DRIVEN GOVERNANCE MODEL | <p>F1 Policy management based on a broad measure of citizen well-being</p> <p>F2 Mission-driven and investing government</p> |

FIGURE 4: 6 MISSIONS FOR ROTTERDAM

1 Including use of digital communication platforms; 3D models (digital twin) for one shared truth

2 Bio-based economy to a limited extent for fuels without good alternatives, such as aviation fuel; as a source of sustainable CO₂ for chemical processes

3 XaaS is an abbreviation for X-as-a-Service. The X stands for all products or services that can be offered in user form.



A. FUTURE-PROOF URBAN INFRASTRUCTURE

CONTEXT

In cities, energy, water and information systems are essential to allowing a large number of people to live and work together safely and healthily. These systems depend on infrastructure such as electricity and heat grids, water pipes and internet cables, mostly below ground. Without fundamental change, these systems are at risk. Either because the capacity of these systems cannot keep up with increasing demand. Or because they are not climate-proof. As 80% of Rotterdam lies below sea level, rising sea levels and more extreme weather conditions are a major concern. Grid managers Stedin and TenneT predict that, at most locations in Rotterdam, the current infrastructure and planned investments will not be able to meet the increasing (peak) demand for electricity.⁵³

Many of the other underground infrastructure and systems, such as water pipes and sewers, are also reaching the limits of their capacity.⁵⁴ Our infrastructure must therefore undergo fundamental changes to facilitate the transition and become sufficiently climate-proof. This task is made even more complex by the fact that upgrades must take place while existing systems remain operational.

VISION OF THE FUTURE

A bold municipal government drives the transition, taking a systemic approach to prioritisation of projects, investment decisions and changes of uses of space in the city. The energy system has become a smart system. All infrastructure projects take into account the four transition lenses: climate neutrality, circularity, digitalisation and *resilience* (such as climate adaptation⁵⁵, biodiversity and cyber security).





A. FUTURE-PROOF URBAN INFRASTRUCTURE

SCOPE

This mission builds on current plans as laid down in the Spatial Vision, the Energy System Vision and the *Resilience Strategy*. The focus is on electricity networks, heat networks, gas networks, water networks, sewer systems and digital information. Coherence between the urban and industrial environment is essential. This mission is therefore strongly connected to **MISSION D**.

APPROACH

Integrated infrastructure for urban systems (A1) can be realised by taking an integrated approach to planning surface and underground infrastructure. This requires developing a long-term vision and organising central coordination. In some settings, existing infrastructure can be used more intensively and efficiently.

Energy generation, use and storage can be located in closer proximity to each other. Where new infrastructure is needed, the timing of above-ground and underground projects are aligned and climate resilience is integrated into the planning, to protect against potential future extreme weather conditions. It should be investigated how to accelerate this process within established assessment frameworks, for example, by placing the mandate outside political processes and by shortening permit procedures. The Gridmaster and WarmtelinQ projects, as well as the key project to reinforce the electricity grid (including an extra connection to shore for offshore wind farms) are important first steps in delivering this mission.⁵⁶

Rotterdam is developing a digital 3D-copy of the city's above and underground (digital twinning).⁵⁷ This can serve as the basis for an integrated approach and planning for the transitions of the systems mentioned. Far-reaching **digitalisation of these systems (A2)** is required to make use of this technology and create, for example, a smart electricity network.



B. KNOWLEDGE AND SKILLS OF THE FUTURE

CONTEXT

The transition will change which knowledge and skills that Rotterdammers need in their daily lives. Many Rotterdammers are still missing some of these skills and/or require assistance in moving from job to job. While the Netherlands has a relatively developed skill base, this is still a pressing issue.⁵⁸ In 2021, 70% of the companies in the Rotterdam port and industrial area had hard-to-fill vacancies, such as for electricians and welders.⁵⁹ The importance (and urgency) of addressing this will grow as new jobs are created, old jobs disappear and many experienced employees retire. With about 12,000 Rotterdammers working in jobs related to fossil industries, this poses a real risk in the coming decades.⁶⁰

IT CAMPUS

Resilient Rotterdam, the Security Directorate and the CDO Office have joined forces to increase the digital resilience of the people of Rotterdam in a neighbourhood-oriented way. The goal of the IT Campus is to better train and retain IT talent in Rotterdam. And to make all Rotterdammers digitally literate. This involves, for example, computer skills, cyber security and dealing with fake news. By 2020, around 2,000 students will have had courses at the IT Campus, and 75 workers aged 23+ will have had extra training or retraining.⁶⁷





B. KNOWLEDGE AND SKILLS OF THE FUTURE

VISION OF THE FUTURE

Rotterdamers are committed to the continuous development of digital and technical (circular) skills of the future. By doing so, Rotterdam can create a stronger, more adaptive society and workforce. Through cooperation between the business community, educational institutions and the city, future developments are planned for. Lifelong development⁶² with a positive impact on the Rotterdam economy.

SCOPE

Everyone who lives and/or works in Rotterdam, from young to old, because everyone will be impacted by how the transition affects the labour market and society more broadly. This mission therefore focuses on the knowledge, key skills and craftsmanship that will drive the new economy and foster Rotterdam as a competitive city and innovation hub.

APPROACH

Rotterdamers must acquire the digital and technical skills necessary for the **workforce of the future (B1)**.⁶³ This requires a continued focus on further strengthening skills-based education,⁶⁴ which in turn depends on communication and collaboration between the municipality, innovative companies and educational institutions, and that the education on offer is adjusted accordingly. Currently, the link between education and the specific needs of organisations is not always clear. In addition, attention must be paid to the importance of social and technological innovations so that Rotterdamers are well-informed about the necessity of the transitions and the new skills that go with them.

There must be equal access to the opportunities of a digital and circular world (B2). To the extent possible, every citizen of Rotterdam must have the means and skills to participate, for example to do their taxes or banking online. Teaching general 21st century skills to all Rotterdamers is also linked to **MISSION C**, Vibrant neighbourhoods. Schools, apprenticeship centers and other neighbourhood initiatives have an important role to play in making these learning opportunities accessible, particularly around digital skills. To deliver this effectively, the municipal organisation needs to understand the different needs of different residents when it comes to digitalisation.



C. VIBRANT NEIGHBOURHOODS

CONTEXT

The effects of the transition will be most clear to Rotterdammers in their own homes and neighbourhoods. The challenge is to work with and for Rotterdammers to physically, socially and digitally structure neighbourhoods in such a way that improves their quality of life, whilst still being convenient, while consuming less materials and energy, and thus generally increase the resilience of neighbourhoods. On a physical level, integration between above-ground and underground infrastructure and buildings is needed to accommodate the space requirements of the various transitions. At the social level, strong community cohesion is important. Research shows that close-knit communities respond better to change.⁶⁵ There is room for improvement here; Rotterdam exhibits characteristics of a low-trust society.⁶⁶

RESILIENT BOTU 2028

This project aims to make the Bospolder and Tussendijken areas the first resilient neighbourhoods in Rotterdam by taking an integrated approach. With an integrated approach, since 2018 the programme has focused on social and physical resilience, and has made it clear that both aspects are closely linked. For example, in BoTu the outdoor space is being greened to promote resilience to extreme weather conditions, in conjunction with work on energy transition and changing mobility. So far, this project has led to an increasing social index score, and a positive development in the overall quality of life score.⁶⁷





C. VIBRANT NEIGHBOURHOODS

VISION OF THE FUTURE

All houses in Rotterdam are not only well insulated and comfortable, but most are also built or rebuilt in a resource-efficient way and receive sustainable heating.⁶⁸ The neighbourhood design and retail offerings in all districts have changed so that the needs of Rotterdammers are met with less material intensity and there is more room for greenery and biodiversity. The transitions in the physical domain are successful because of strong communities within the neighbourhood. This also works the other way around; the transitions strengthen social interaction. Furthermore, many Rotterdammers have chosen to set up small-scale initiatives that form the beginning of larger-scale transitions. An existing example of this is the Delfshaven Cooperative.⁶⁹ Digitalisation makes it easier to form and strengthen communities, and create a pleasant living environment in general.

SCOPE

This mission focuses on the municipality of Rotterdam and its 14 boroughs and 71 districts.⁷⁰ It encompasses the physical, social and digital domain as well as urban and community development. Finally, this mission focuses on cooperation of the municipality with organisations, such as housing corporations and home owners associations.

APPROACH

A systemic approach is needed in collaboration with organisations such as housing corporations and home owners associations to make the transitions in neighbourhoods a success. This involves creating a **climate-neutral and circular physical environment (C1)** in neighbourhoods that is pleasant to live, work and relax in.⁷¹ Such an approach requires a tailor-made approach for each neighbourhood, with active involvement of residents that is fed by insights gained from transitions in other neighbourhoods.

Such an approach starts with a 5- or 10-year vision for each neighbourhood in which challenges, goals and future functions are defined for the services of the municipality. The approach takes an integrated look at what is needed above and below ground, paying attention to climate adaptation, modular construction and access to green space. In addition, **social capital in a network society (C2)** needs to be strengthened. Digitalisation offers opportunities to involve Rotterdammers in important issues in their neighbourhood via networks. This can go hand in hand with the new district-based governance model to which Rotterdam is switching.⁷²



C. VIBRANT NEIGHBOURHOODS

The circular economy offers opportunities to strengthen economic resilience at the neighbourhood level by making better use of what is already available, and using sharing platforms and repair and reuse shops. The district approach also includes a more citizen-oriented service provision by the municipality. This can be achieved by providing services that help people through one 'counter' instead of different counters for different (parts of) questions and problems. This applies not only to the transitions as mentioned in this document but also to other public services such as mental health care and social services that focus on the youth.





D. CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX (HIC)

CONTEXT

Over 15% of the Dutch CO₂ emissions in 2019 came from activities in the Rotterdam port area.⁷³ Oil accounted for 38% of the cargo throughput through the port of Rotterdam in 2019. Of this, about 60% is processed in refineries in the port area, of which over 85% is made into fuel for transport and the remainder largely into raw material for chemicals.⁷⁴ In addition, over 30,000 seagoing vessels and 100,000 inland barges call at the port of Rotterdam annually.⁷⁵ This model will undergo fundamental changes due to the transition to a climate-neutral and circular economy. The transition to a circular economy could, for example, lead to a shift from deep-sea trade (East Asia-Rotterdam) to more intra-European return logistics via short sea or inland shipping.

The transition to a climate-neutral economy is estimated to reduce the global need for refinery capacity by about 50% by 2040 and 85% by 2050.⁷⁶

VISION OF THE FUTURE

Rotterdam is an electrified port and the hydrogen and bio-based, chemical and logistics hub for Western Europe. Rotterdam has been able to maintain its leading position because it benefits from economies of scale, including reliable infrastructure for electricity, carbon and hydrogen. This infrastructure is climate proof, taking into account rising sea levels, more extreme weather conditions and other climate adaptation plans. In addition, the production, storage and (off)loading of hydrogen fuels such as ammonia, methanol and synthetic paraffin will be promoted, as well as certified sustainable biomass. To generate sufficient sustainable electricity, Rotterdam has actively ensured a good connection to wind energy from the North Sea.^{ix,77}

As a pioneer of circular, climate-neutral return logistics with a strong focus on climate adaptation, Rotterdam remains an attractive location for the transport of goods.

SCOPE

This mission focuses on the added value of the port-industrial complex for the population and economy of Rotterdam. Geographically, this mission encompasses the entire industry in Rotterdam and the industry directly connected to it in the region and the connection to Dutch industry clusters, Antwerp and the Ruhr area.⁷⁸



D. CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX (HIC)

APPROACH

We build on the most recent strategies and projects of the municipality and the port-industrial ecosystem. These include projects such as H-Vision, Porthos and the European Hydrogen Hub.⁷⁹ The transition will require specific attention to winding down the current fossil fuel-based industry as well as building up the new climate-neutral and circular industry – all while systems continue to work in the meantime. To do this successfully, an integrated view from the four transition lenses is necessary. The transition can be accelerated by identifying and removing bottlenecks, reducing investment risks and stimulating cooperation within the entire chain. Reducing port dues for climate-neutral ships⁸⁰ can help in the development of new systems. This mission sees three different components to achieve this build-up and phase-out.

New infrastructure for a **hydrogen (and bio-based) hub (D1)** must be built, including circular raw materials and fuels for industry and (heavy) transport. This will be a fundamentally different economic model than the current import, processing and transit of oil. A transition to **climate-neutral and circular basic chemistry (D2)** is needed. This requires significant investment in electricity infrastructure and sufficient availability of climate-neutral feedstocks such as hydrogen and biomass. As a transition technology, carbon capture and storage (CCS) can contribute to the required reduction in emissions in the short term in those places where technology for the avoidance of CO₂ is currently insufficiently developed. An important condition is that investments in CCS always go hand in hand with a credible plan to reduce emissions to a minimum.

Rotterdam has a good starting position as the largest industrial cluster in the world using biomass as a feedstock.⁸¹ Furthermore, several studies are already underway, such as the VNCI Roadmap called *Chemistry for Climate*.⁸² **Climate-neutral and circular logistics (D3)** must also be realised. This requires sufficient availability of (infrastructure for) climate-neutral fuels for shipping and road transport. The increasing circulation of secondary materials requires digital optimisation of transport chains.



D. CLIMATE-NEUTRAL AND CIRCULAR PORT-INDUSTRIAL COMPLEX (HIC)



DELTA CORRIDOR

This is one of the six key projects of the Energy Strategy Cluster (CES) Rotterdam-Moerdijk. This project involves the roll-out of 'common carrier pipelines' from Rotterdam via Moerdijk / Geertruidenberg to Geleen in the South of the Netherlands and the connection to North Rhine-Westphalia, Germany.⁸⁹ Various parties can make use of these pipelines. This pipeline corridor for hydrogen, CO₂, LPG, propylene and possibly also direct current and circular raw materials can facilitate sustainability projects and help to maintain Rotterdam's position as a global energy hub.⁹⁰



E. NEW CIRCULAR BUSINESS

CONTEXT

The transition to a circular economy implies creating new business activity. Rotterdam needs to become a front-runner in circular economy, if only because the move away from a fossil-based economy will lead to job losses in the industrial area. **MISSION D** can be seen as the big renovation of the current port-related industry. The declining importance of importance of fossil and linear business models means that a future-proof port and that a future-proof port and industry alone cannot support a future-proof economy. This will require a major breakthrough, comparable to the construction of the Nieuwe Waterweg canal, which laid the foundation for Rotterdam's economic prosperity 150 years ago.⁸⁵ This means that Rotterdam must attract new activities that create value in the value chains of the future.

VISION OF THE FUTURE

Rotterdam is the hub of new circular (raw) materials value chains. The access to high-quality materials, (return) logistics, talent and the proximity of large consumer markets make Rotterdam's position in this unique. These circular activities will help drive the circular transition both in Rotterdam and the EU more broadly. The municipality plays a role in this by encouraging participation in circular models. Local SMEs also benefit from this new circular activity and are stimulated and facilitated by the city.

QUOTE

"All actions under the strategy must take account of small and medium-sized enterprises, which are the main vehicle for innovation in the various ecosystems."
- European Industrial Strategy ⁹³



E. NEW CIRCULAR BUSINESS

SCOPE

This mission focuses on promoting circularity in Rotterdam by building innovation and knowledge to create an attractive climate for circular industry and circular services. This builds on the work of Rotterdam Circulair and MKB010>>Next.⁸⁶ Geographically, this mission focuses on Rotterdam and the directly surrounding regions to stimulate activity within Rotterdam and the region. Further focus on a number of value chains where extra efforts are being made, such as plastics, metals, building materials and batteries, should be determined, for example by using the *EU Circular Economy Action Plan* and the *EU Critical raw materials strategy*.

APPROACH

The transition to a circular economy requires innovation and knowledge development. That is why it is necessary to create a **circularity innovation and knowledge hotspot (E1)**, covering technical, social and business innovation. This hotspot should bring (scientific) research, start-ups/ scale-ups and investment capital together, facilitating investment in living labs, campuses, knowledge development and space for new businesses. An attractive business climate is needed for the development of a **circular manufacturing, repair and recycling industry (E2)** at scale, and the phasing out of the old system. At a national level, this requires, amongst other things, a shift in taxation from labour to resources. Rotterdam can play a role in realising this. To build the new system, scalable pilot factories are needed that prove the new technologies.

Circular services (E3), such as 'anything-as-a-service (XaaS)' and local repair hubs are important. In XaaS models, the consumer pays for the use of the product rather than for the product itself. This builds the bridge between industry and consumer. Another necessary element is the tracking and tracing of materials and waste streams, for example by using materials passports. Other examples of circular services are financing models, insurance models and the management of circular material flows. For the latter, digitalisation plays an essential role and it is possible to build on Rotterdam's existing strength in commodity trading.⁸⁷

04

FROM MISSIONS TO ACTIONS



FROM MISSIONS TO ACTIONS

The *Green & Digital Deal for Rotterdam* sets in motion the transition to an economy and society within planetary boundaries. We look at this transition through four lenses that are fundamental to its success: climate neutrality, circularity, digitalisation and resilience (the *transition lenses*). The transition lenses, and therefore also the missions, are closely linked and therefore strategies based on individual lenses or problems alone will not be effective. This is what **MISSION F. INTEGRATED, MISSION-ORIENTED MANAGEMENT MODEL** is all about, detailed out in this chapter.

CONTEXT

Systemic and strategic interventions are necessary to achieve the targets of a 55% reduction in CO₂ emissions by 2030, and climate neutrality and circularity by 2050. The current governance mechanisms do not ensure that daily needs are met as fully as possible, that communication is always clear and that synergies between transitions are optimally exploited.

Given the scale of the transition and the complexity of the decision-making process, effective management and decision-making can make a difference to position Rotterdam as a model city for the implementation of the European Green Deal. We are not starting from scratch. Rotterdam has taken steps towards climate neutrality, circularity, digitalisation and resilience with the ambition of an integrated approach.⁸⁸

There are also several programs and projects taking a systemic approach such as the *Fieldlab Industrial Electrification*, the RDM Campus and *Plant One*.⁸⁹ The Spatial Vision brings various spatial and environmental aspects together in a holistic way. What is missing is a management model to speed up the transition. Accelerating the transition and implementing the missions can only be done with a systemic and integrated perspective, and if flexible processes are set up to enable the municipality to make decisions quickly.

The *System Change Compass* provides guidance for implementation through three steps that can be carried out simultaneously (figure 5):

- I. **MAPPING AND ENVISIONING THE SYSTEM**
redefining prosperity, natural resource use and progress;
- II. **DESIGNING AND IMPLEMENTING INTERVENTIONS**
redefining metrics, competitiveness, incentives and consumption;
- III. **MOBILISING AND ENABLING ACTORS**
redefining finance, governance and leadership.

Whereas component II must be carried out mainly at the ecosystem level as described in **MISSIONS A** to **MISSION E**, I and III are more overarching. This is what **MISSION F** is about. **MISSION F** for Rotterdam consists of two elements.



SYSTEM CHANGE COMPASS



FIGURE 5: SYSTEM CHANGE COMPASS

MISSION F1

PUBLIC POLICY MANAGEMENT BASED ON A BROAD MEASURE OF CITIZEN WELL-BEING.

Policy implementation is managed from a broad definition citizen well-being, for a society within planetary boundaries. The concept of 'broad well-being' will be explained further in section 4.1. The Council for the Environment and Infrastructure (RLI) also focuses on developing a vision of the future based on broad well-being in its advisory report on government steering during transitions.⁹⁰ The focus is on fulfilling citizens' needs as well as possible within these boundaries. Consider, for example, considerations about the use of scarce space and the required reduction in nitrogen deposition. A report by the Clingendael International Energy Program provides insight into the required use of space in the Port Industrial Complex (HIC).⁹¹ Various stakeholders expect pressure on the use of space during the transition. A holistic approach is essential to make optimal use of the available space and to make choices to accelerate the phasing out of 'old systems' and make room for new models.

MISSION F2

A MISSION-DRIVEN AND INVESTING GOVERNMENT.

To give substance to the management of broad well-being and thereby mobilise and facilitate all actors in the system, a mission-driven and investing government is necessary. This means that a governance model is needed that selects and prioritises projects, supports the implementation, monitors progress and adjusts where necessary. This **governance model** also entails proactive and intensive cooperation with the stakeholders needed to realise and finance the missions.

For the implementation of steering based on a new vision of the system and the mobilisation of actors, it is advisable to start with the interventions in the areas that will benefit most in the short term. For instance, the focus could initially be placed on **MISSION E** 'New Circular Business'. For the creation of a circular economy and related infrastructure, the market has yet to be created and the government will, to a large extent, have to define the playing field.



4.1

PUBLIC POLICY MANAGEMENT BASED ON A BROAD MEASURE OF CITIZEN WELL-BEING (F1)

VISION OF THE FUTURE

The municipality will manage the transition on the basis of an integrated vision of prosperity, with resilience as the guiding principle. The Statistics Netherlands defines "broad well-being"^x as 'the quality of life in the here and now and the extent to which this is at the expense of future generations or of people elsewhere in the world'. The starting point is to shape policy based on the needs of Rotterdammers, within economic ecosystems and within the limits of the planet. The systems of the past in which we defined prosperity in terms of gross domestic product (GDP) are no longer fit for purpose. The new system must ensure that we provide fairly and inclusively for the needs of all Rotterdammers (and others around the world), within planetary boundaries. This means a broader vision of prosperity than is commonly used today.

While today's system has had benefits for society, these benefits have tended to be unevenly distributed. In 2018, one in seven Rotterdammers lived below the Statistics Netherlands low-income threshold – twice the national average.⁹² Moreover, one in five has difficulty reading and writing.⁹³ These groups will be less prepared for the transition. A concrete and current example is energy poverty. In 2018, 12% of households in Rotterdam had a home with an unfavourable energy label (D or lower) and an income below 130% of the social minimum.⁹⁴ With rising energy costs, these households will (and already do) face challenges, as was evident with the rising gas prices in late 2021, exacerbated by the war in Ukraine in 2022.⁹⁵

APPROACH

For the transition to be fair, public policy management must be based on a broader and longer-term vision of prosperity. Broadly speaking, the guiding principle is still that a growing economy will better meet people's needs through the dynamics of supply and demand. The distribution of prosperity is not an integral part of this.

Our current understanding of prosperity is often limited to economic impacts that can be (easily) measured in euros, such as car sales or infrastructure construction. However, many of the unintended side effects that are relevant to ensuring that we remain within the planetary boundaries are not taken into account. Think, for example, of the effects of nitrogen deposition on nature and the effects of CO₂ emissions.

The traditional methods of measuring economic progress, such as gross domestic product/regional product, therefore no longer suffice. However, there is no global consensus yet on which indicator or set of indicators are best suited to measure the concept of broad prosperity. In the Netherlands, Statistics Netherlands has made a good start with the Monitor of Well-being. The indicators in this monitor are combined with the indicators of the Sustainable Development Goals (SDGs) of the United Nations, on which Statistics Netherlands reports annually.⁹⁶ Together, these form a good basis for a new perspective on prosperity.

For the concept of broad well-being to gain momentum and be implemented, this thinking needs to be embedded at the heart of the decision-making process. This means that the pros and cons of proposals must be weighed against the aforementioned transition lenses and a more comprehensive set of well-being indicators, with the Monitor of Well-being and the SDGs as a good starting point. Existing processes and structures will then need to be adjusted accordingly. An assessment framework for policy proposals and other projects will help to test the extent to which current and future projects contribute to the mission(s), and, more generally, to broad well-being. This will not be a one-off exercise but an iterative process to consider proposals and implementation in the best possible way and to refine them where necessary. In addition, an assessment framework helps to evaluate the municipality's activities that do not directly fall under one of the missions, but can contribute to the realisation of the missions. For example, the construction of a swimming pool in Overschie does not fall directly under one of the six missions, but an assessment framework can ensure that a swimming pool is built in as circular and climate-neutral a manner as possible and can also answer the question of how the swimming pool can fulfill a social function in the neighbourhood.⁹⁷

4.2 MISSION-DRIVEN AND INVESTING GOVERNMENT (F2)

VISION OF THE FUTURE

The transition of Rotterdam is led by a mission-driven and investing government. Without a more systemic governance model and mission-driven leadership, realising the required transitions is impossible. That is why we endorse Mariana Mazzucato's plea for a government that is mission-driven, (co-)invests in technological infrastructure and stimulates private investment to achieve the transition.⁹⁸ In this way, the municipality shapes the playing field and proactively creates the markets needed to realise the missions. History shows that such government investments pay off many times over, as with the Apollo project in the 1960s, when the entire American industry was mobilised with the same goal: the first man on the moon. The transition we are now facing has several objectives and perspectives instead of one clear and concrete goal. This requires even more focus and systemic thinking than during the Apollo project.

For a truly mission-driven government, actions and interventions must be tackled in a coherent way to achieve its goals. This thinking also underlies the *EU Green Deal* and the *System Change Compass*.

QUOTE

"We do not have all the answers yet. Today is the start of a journey. But this is Europe's 'man on the moon' moment." - Commission president Ursula von der Leyen at the presentation of the European Green Deal



APPROACH

A mission-driven government needs systemic leaders who take responsibility and set clear ambitions. These ambitions form the basis of action plans that give direction, enable (public-private) investments and instruct proper monitoring of progress and results. Creating a resilient Rotterdam based on the resilience strategy is the guiding principle. This cannot be achieved without the government proactively shaping the enabling environment, through updated and new legislation and by co-investing in technological innovation. To shape the markets of the future, collaboration with relevant stakeholders will be key to bridge the differences between various parties, particularly between public and private organisations. An existing example of this is the Clean Tech Delta. Mechanisms for public-private partnerships that distribute risks and rewards fairly and enable reinvestment in future innovations are also needed.

CLEAN TECH DELTA

Large and small companies, research and knowledge institutions and governments work together structurally in the Clean Tech Delta, with the aim of realising innovative, sustainable and clean projects. For example, Clean Tech Delta has led a pilot project to integrate urban planning and autonomous vehicles, published a regional Bio-based Roadmap and set up a test installation to filter nutrients from waste water (RINEW).¹⁰⁹

4.2.1 MISSION LEADERSHIP

VISION OF THE FUTURE

To lead the missions, a structure has been set up with a focus on public-private collaboration between the City of Rotterdam, businesses and other organisations in the region, i.e. a **'mission leadership team'**.

This team leads the design of the required markets and the necessary public and/or private investments in (technological) innovation. The mission leadership stimulates public-private cooperation, for instance by making use of Design Thinking, freely accessible innovation and information (open source) and the bottom-up development (by citizens, companies, organisations) of a range of solutions that support the missions. The mission leadership builds on the Resilience Strategy of Rotterdam, which is already experimenting in several areas with mission-driven management from the perspective of creating broad prosperity.⁹⁹

APPROACH

The mission leadership team is comprised of both the public and private sectors. The mission leadership team primarily drives the process of developing a concrete action plan for each mission, as described in more detail in the next section. The mission leadership team ensures that when strategic intervention is required, decision-making takes place in an integrated way and within short time lines.

This requires agile processes and structures, for example setting up dedicated working sessions where integrated teams meet for a short period of time to make proposals and decisions in an intensive process. In addition, clear indicators on progress (and management of these indicators) by the mission leadership team are needed to monitor progress and quickly identify bottlenecks.

In order to perform its task well, the part of the mission leadership team for which the Municipality of Rotterdam is responsible must be anchored centrally in the municipal organisation with sufficient technical knowledge and experience in systems thinking to successfully shape the coordinating role of the municipality. It is essential that decision-making within the municipality of Rotterdam converges at one point. This makes it possible to monitor whether the missions are being implemented in an integrated way and to ensure that the cross-links between the missions are highlighted. For example, **'MISSION B. KNOWLEDGE AND SKILLS OF THE FUTURE'** can only be carried out by defining the specific skills that follow from the other five missions.

4.2.2

ROADMAP FROM MISSION TO ACTIONS

A number of steps are necessary for each individual mission to move from mission to action. The mission leadership team oversees the whole process and supports where necessary.

STEP 1: MAP ONGOING INITIATIVES AND IDENTIFY WHAT IS MISSING TO IMPLEMENT THE MISSIONS.

The first step is to map current programs and projects related to the missions, both within and outside the municipal organisation.¹⁰⁰ This will show which programs and projects contribute to which mission, their coherence and how they can (further) reinforce each other. This way, initiatives which can be accelerated and expanded, and those which are still lacking, can be identified.

STEP 2: DEFINE OWNERSHIP

From the start, a clear owner per (sub-)mission will be appointed for building and leading an impact coalition. This can be someone within the municipality, from the Port of Rotterdam, from the business community or from a societal organisation. In addition, for each mission a leader will be appointed within the municipality who has the mandate to coordinate internally across the municipal clusters, with the main aim of breaking through the current silo-ed way of working and to help keep things on track. This leader is in close contact with the overall mission leadership team. The leader will often have a coordinating role in order to bring parties together and identify synergies. Coordination is needed both to phase out the current systems and to build new ones at the same time.¹⁰¹ Naturally, attention must be paid to the pace at which a fair and inclusive transition is possible, together with the pace required to achieve the goals. The leader must be sufficiently positioned to address and resolve bottlenecks.



STEP 3: BUILD IMPACT COALITIONS

The next step is to identify parties for each mission who together can make the mission a reality. The municipality can only realise these missions by working together with the business community, social organisations, knowledge institutes and citizens. The obvious solution is to build on existing coalitions such as those established for climate policy and circularity (RKA). However, if these structures are not sufficient, it is necessary to set up new structures. The analysis in step 1 forms the basis for determining which specific parties should join for each mission. In some areas, projects can be undertaken in cooperation with like-minded (foreign) cities. Rotterdam is already part of the Resilient Cities Network, has several partner cities and could become part of the recently published (Nov 2021) mission of the European Commission, called *Mission towards climate-neutral & smart cities*.¹⁰²

STEP 4: DEVELOP IMPLEMENTATION PLANS

The impact coalitions per mission mentioned above will have to draw up an implementation plan. This is not an overarching vision document, but concrete objectives and actions for the next 1, 3 and 5 years. This plan also contains measurable indicators and a financial strategy. In developing this plan, the assessment framework is used intensively to define the actions sharply and to view them from the various transition angles. The aim is to ensure that no unintended, undesirable impacts on broad prosperity are overlooked. Stakeholders deploy their own resources (funds, land and environmental allowances), each from their own mandate.

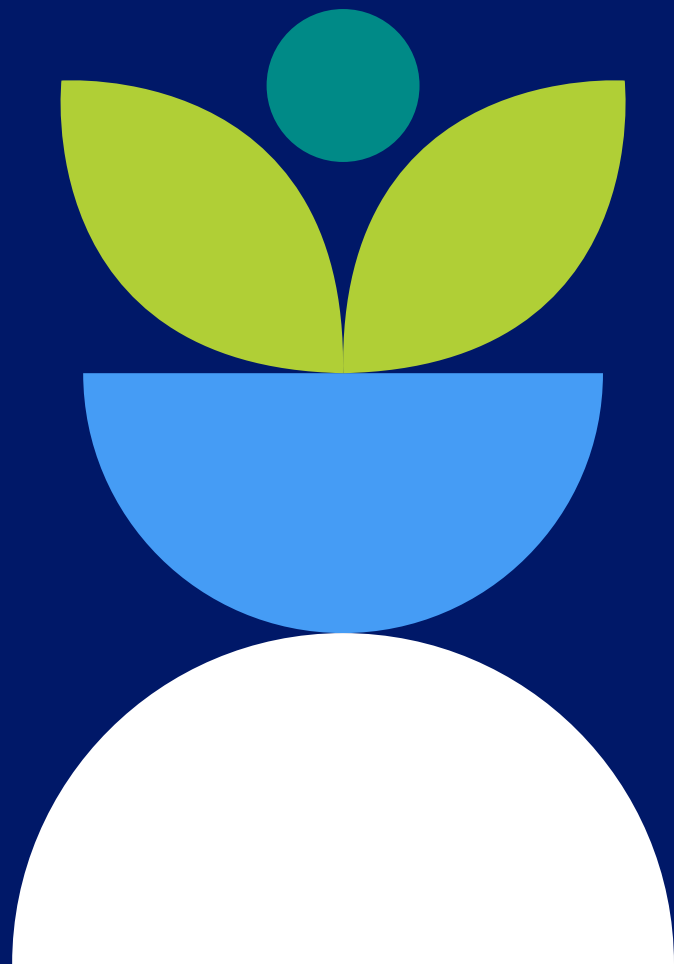
STEP 5: SECURE FUNDING

from private and public sources to realise the plans. This starts with mapping already available resources and the resources needed on the basis of the implementation plan. Subsequently, well-developed and substantiated project and financing proposals are needed to attract the required private and public funds. Jointly approach The Hague and Brussels in applying for funds, and deploy own resources strategically, in line with the missions.

STEP 6: MONITOR AND ADJUST

In order to ensure that the implementation plan is realised and where necessary adjusted, it is important to report regularly on the progress. Based on the assessment framework, the transition missions and broad prosperity are explicitly included in this. Whenever the missions seem to be lost from sight or cause unintended, unwanted impact, timely intervention is required. The mission leadership plays an important role here.

CLOSING WORDS



CLOSING WORDS

The European *Green Deal* sets a clear and high ambition for the transition to a climate-neutral and circular European economy. This transition is necessary to secure the future of our continent and our city. This paper wants to show that staying within planetary boundaries and making Rotterdam an even finer city than it already is are not contradictory goals.¹⁰³

Major changes are afoot in Rotterdam's society and economy. However, if there is one city that has shown itself capable of reinventing itself, it is Rotterdam. The *Green & Digital Deal for Rotterdam* shows that these transitions offer opportunities to strengthen the resilience of Rotterdam; a necessary condition for and an outcome of the transition. There is an opportunity to improve the quality of life: a more pleasant and healthier living environment with cleaner air, neighbourhoods that are as vibrant as ever and that offer what Rotterdammers expect from their lives in the city.

In economic terms, there is also an opportunity to reposition Rotterdam as the hub of the European economy and to play an essential role in the climate-neutral, circular value chains of the future.

The six missions in this document are based on an analysis of the needs of Rotterdammers and necessary transitions within five economic ecosystems.^{xi} They form the starting point of a systemic implementation approach for the transition to the Rotterdam of the future. Each of the six missions looks at the assignment from the four transition angles: climate neutrality, circularity, digitalisation and *resilience*. The six missions are also interrelated and can only be effectively achieved through a systemic approach. To position Rotterdam as a model city for Europe and the rest of the world, a strategy based on a vision of broad prosperity is essential.

The vision described in this document and the tools for implementation based on the *System Change Compass* are only the start of the systemic transition in Rotterdam. It is now up to everyone who envisions a net-zero, circular, digital and resilient Rotterdam to make the step from mission to action. Implementation of the six missions is only possible if all stakeholders in Rotterdam work together. This starts with focusing on the needs of Rotterdammers both now and in the future, and across the different economic ecosystems. The transition requires engagement from businesses, knowledge institutions and other organisations such as those in the Port-Industrial Complex, as well as new organisations such as start-ups driving the circular economy and, of course, the people of Rotterdam themselves. The power lies in the collaboration between all of these parties with the citizens and the municipality of Rotterdam.

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