# ROTTERDAM WEATHER WISE

**URGENCY DOCUMENT**

ROTTERDAM WEATHER WISE

# Preparing our city for a more extreme climate together

The climate is changing. We are seeing a mixture of heavier downpours and long hot periods. But we can handle it! Together we are getting this city ready for this extreme weather. By creating water and green spaces: gardens, parks, green walls, green roofs. Putting our words into action. Making sure we are weatherwise.

# Preparing Rotterdam for a more extreme climate together

**Deputy Mayor**
*B. Wijbenga - van Nieuwenhuizen*

**Deputy Mayor**
*A. Bonte*

‘Increasing damage caused by more extreme weather, and not being ready yet for the changing climate’. Those are the two biggest risks for our planet according to the Global Risk Report 2019. The hot and dry summers of 2018 & 2019 are still fresh in our memory.

We must ensure that we tackle the cause of climate change whilst simultaneously adapting to its effects, namely more extreme weather. It's like playing chess on two boards at the same time. Reducing emissions is an important goal for Rotterdam City Council. The energy transition is about to take place. At the same time we are experiencing the effects of climate change.

In Rotterdam in particular, as a low-lying city in a delta, we need to think about the risks of climate change. In order to keep the city liveable for all its residents, but also to safeguard our status as a secure port city. This Rotterdam Weatherwise sets out the challenge confronting the city, and provides insight into what the consequences could be of a more extreme climate. At the same time it is a call to take (district-)focused action, in partnership with Rotterdammers and companies.

A great deal is already being done in Rotterdam: strengthening dykes and constructing water plazas and green roofs. We are introducing greenery and working with residents to keep vulnerable homes dry. Innovative measures mean that we are known internationally as experts with experience and pioneers in climate adaptation. Now, what is most required, is to push forward throughout the city and thereby link up with other urban transition challenges.

Adapting to climate change requires a tailor-made approach: every district is different and varies in terms of vulnerability and possibilities. A bespoke implementation programme is needed in order to be able to cope effectively with high water levels, extreme rainfall, excessive and insufficient groundwater, heat, drought and land subsidence. A joint action plan that directs our efforts. A climate-resilient city does not just protect us against water and heat: it also forms the base for healthy, liveable and prosperous neighbourhoods.

A more extreme climate affects everyone. An important proportion of the city is owned by individuals, companies and social housing corporations. Just capturing water and bringing greenery to the public space is insufficient. We need all Rotterdammers to take steps on their own land and in their own homes.

"But how?" is often the question. A rainbarrel or replacing paving with greenery in the garden is a good start. Everyone can join in and make sure that we can beat the change of weather. Rotterdam Weatherwise forms the basis for this: preparing the city for a more extreme climate together."

*Rotterdam 19 februari 2019*

## PRODUCED IN COLLABORATION WITH

Gemeente Rotterdam

waterschap Hollandse Delta

Hoogheemraadschap van Schieland en de Krimpenerwaard

Hoogheemraadschap van Delfland

evides waterbedrijf

# INDEX

# Rotterdam 2050: a city suffering from climate stress

**It is autumn 2050. The peak flows from the river combined with high-water and high tide are causing extensive disruption in Rotterdam. This is caused by rising sea level and climate change. The failure to raise dykes and invest in flood risk management in good times has simply increased the likelihood of this. The floods lead to victims, major social disruption and billions of euros in damage. But the port also suffers major economic damage because the Maeslantkering storm surge barrier has to be closed every month.**


The summer prior to this flood was one of extreme drought and heat. Not being able to swim because of blue-green algae is something we've been accustomed to for years, as well as small parts of our peat dykes that collapse as a result of the drought. The parks in the city, once so green, have been transformed into dry wastelands. The homes in the older city districts are also affected by the low groundwater levels caused by drought. Pole rot in the wooden foundation poles makes buildings uninhabitable.

It was also very hot in the city. A number of heatwaves led to 60 Rotterdammers dying prematurely, and labour productivity was low. We are now used to the air quality being poor, as a result of which large groups of residents can no longer go outside due to the rise in infections and allergies.

Alongside the heat that torments us, we see extreme rainfall sometimes bringing the city to a standstill for days. Because the sewers cannot cope with the large volumes of rain, the roads are flooded so that the emergency services cannot get through. Homes are increasingly getting flooded. This means that the damage increases further with every downpour.

Because the effects of climate change are so impactful, people and businesses are leaving the city. Office buildings and apartment blocks are increasingly being left empty. The once thriving economy is hit hard because steps were not taken in time.

# or Rotterdam 2050: the story of a climate-resilient city

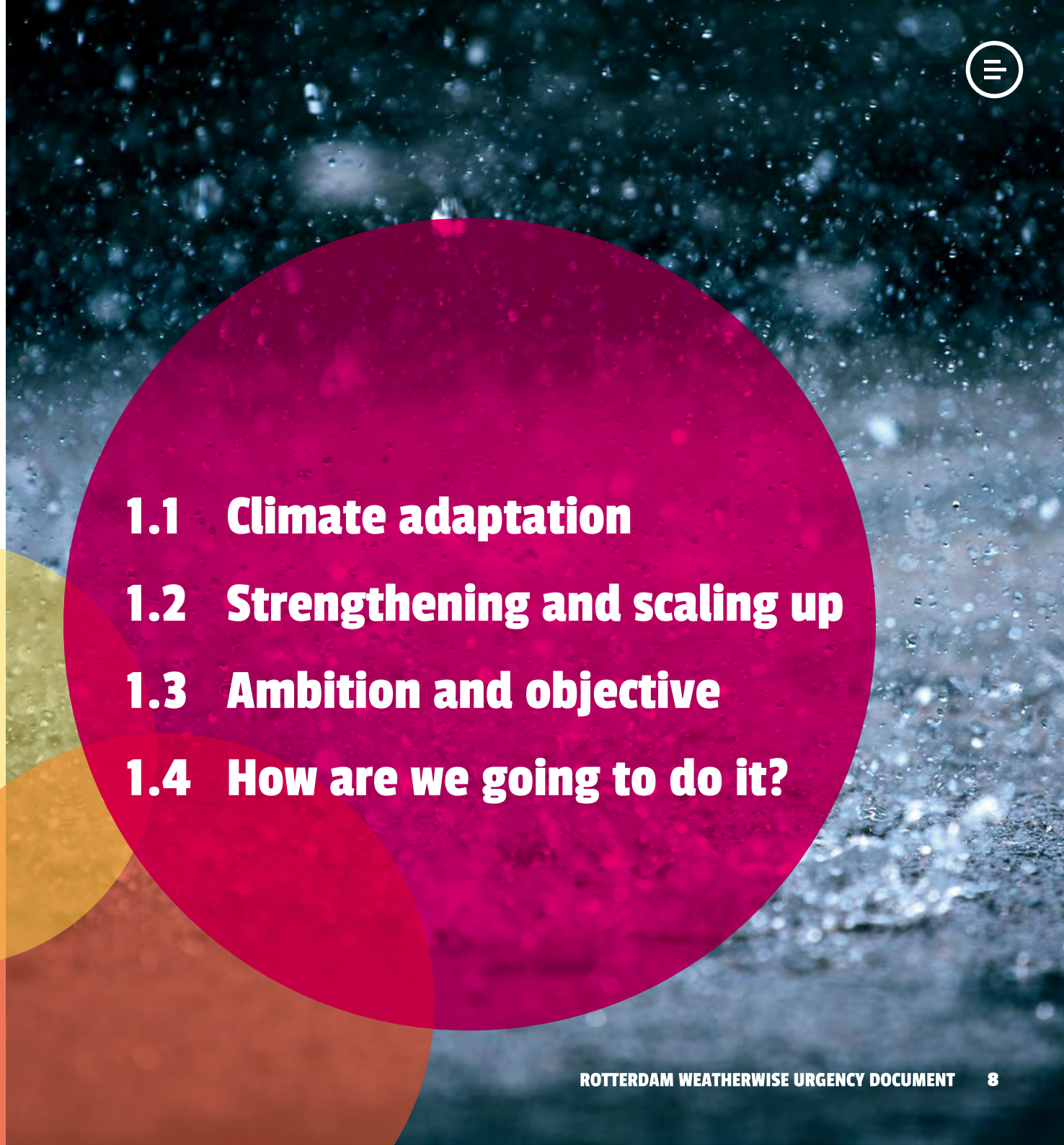
**It is summer 2050. Rotterdam can proudly declare that it has been successful in ensuring that the difference in warming between the city and the surrounding area has not risen further over the past 40 years. Every district has green routes and places that provide cool and attractive spots. The number of leisure locations on and beside the water has increased, particularly alongside the river Nieuwe Maas, in the former harbours and on the river Rotte. The large lakes in and around the city are swimming locations; the water quality meets the required standards throughout the year.**

The port of Rotterdam has been the largest in Europe for many years. This transformation of the port area means that business activities and the layout have changed. By taking account of rising sea levels when making the changes, the sites that are already more than 100 years old have also been protected against flooding for the next 50 to 100 years.

Rainfall is largely processed where it falls. Almost all the buildings built or renovated after 2022 are able to capture 70 mm of rainfall and dispose of it gradually. Usually within the boundaries of the building, and sometimes in conjunction with the immediate surroundings. The public space has a water retention capacity at district level that can prevent damage in the event of heavy rainfall or long periods of drought. Individual residents, building owners and social housing corporations know what the possibilities are for protecting their property against extreme rainfall and fluctuating groundwater levels.

Radical steps have been taken in some places. Climate change and land subsidence meant that some buildings could not be preserved in the long term. In some 10 neighbourhoods and around 100 individual locations Public Private Partnerships have found new uses for these locations. The new buildings in these locations are climate-resilient and futureproof. Climate awareness is so great that residents, owners' associations and social housing corporations treat water and heat-related measures as major maintenance, and make provision for them. The property passport is a tool that shows the building's climate resilience alongside energy and other residential characteristics.

# #01
# CONTEXT



## 1.1 Climate adaptation

The climate is changing. Climate change is increasing the risk of disruption and damage caused by heavy rainfall, heat, drought and flooding. For Rotterdam that poses risks to our economy, safety and health. Damage can be done to buildings and infrastructure by flooding, for example, but also by low groundwater levels as a result of an extended drought. Extreme heat can have negative consequences for society in the form of health problems, reduced labour productivity and an increasing death rate amongst the elderly and vulnerable. Weather extremes are going to occur ever more frequently. Extreme weather leads to a greater risk of vital and vulnerable functions breaking down within the city. On the other hand, the gradualness of climate change may lead to an increase in allergies and infections, and changes and loss in biodiversity as a result of shifting climate zones.

*With the 'energy transition' Rotterdam wants to reduce the impact of climate change, partly by reducing carbon and methane emissions. Limiting and if possible reducing the source of global warming is* ***climate mitigation****. But this will not instantly stop this change. Even if we achieve the Paris climate goals, sea levels will rise. The weather will become more extreme.* ***Climate adaptation*** *- adapting the city and its citizens to climate change - is required. Rotterdam Weatherwise is therefore focusing on climate adaptation and the effects of a changing climate. Preparing the city for a more extreme climate together.*

## 1.2 Strengthening and scaling up

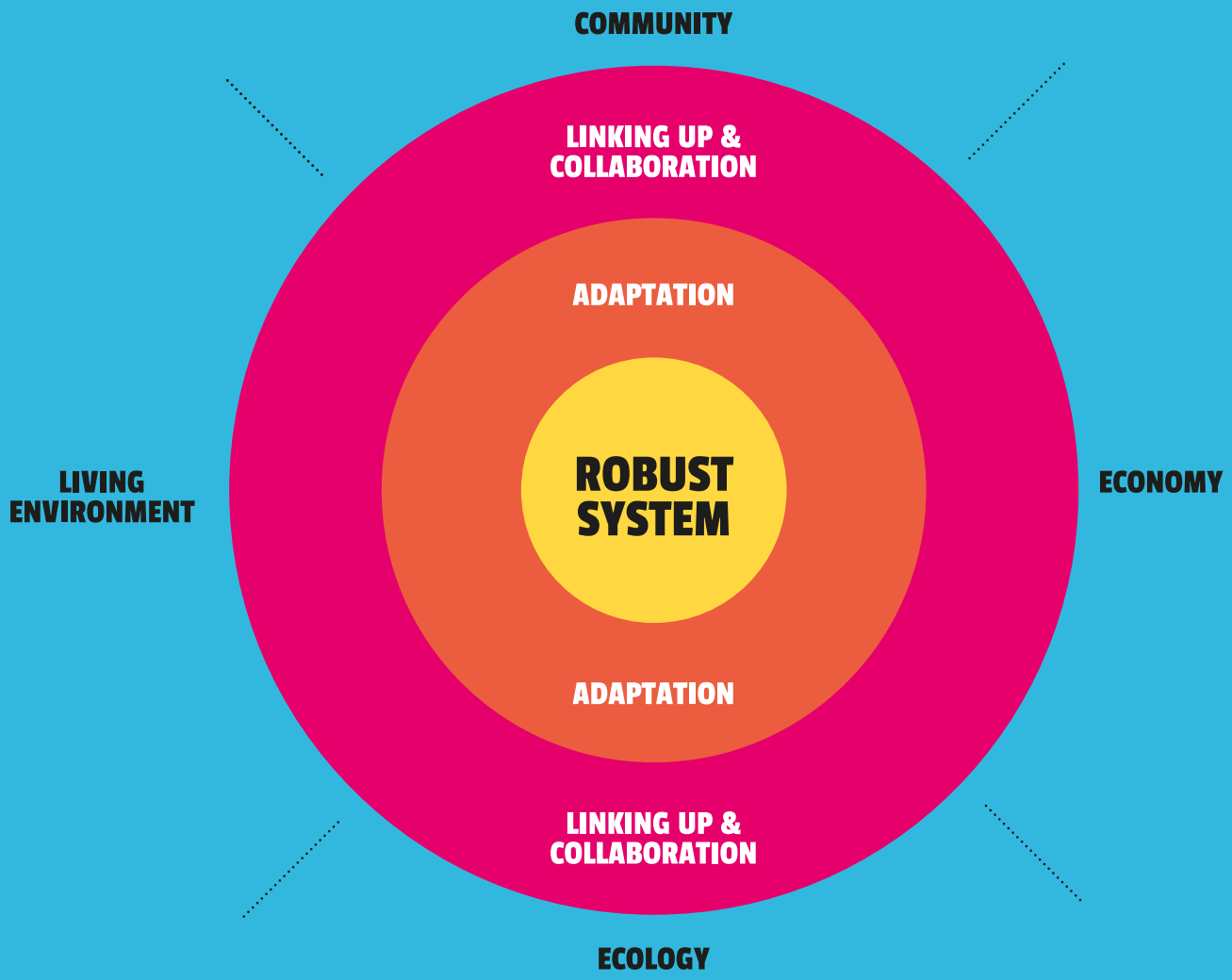
Since the consequences of climate change are already visible it is urgent that we adapt to the effects of climate change. Over the past decade we have already been working on climate adaptation based on a clear vision and strategy relating to rainfall, heat, drought and flooding risks. The vision and strategy for water management in the city were set out in 2008 in the Water Plan 2. This laid a direct link between water as an opportunity and the spatial development of Rotterdam for the first time. It was acknowledged that the climate is changing, and that more space is required for water retention. The climate adaptation programme 'Rotterdam Climate Proof' - launched in 2009 - emphasised that climate adaptation in a broad sense is very important for Rotterdam, resulting in the Rotterdam Adaptation Strategy. This has been shaping Rotterdam's adaptation to climate change since 2013. Policy development and planning at regional and national level have supported and strengthened Rotterdam's approach.

A Rijnmond-Drechtsteden preferential strategy for regional flood risk management and fresh water provision was also drawn up in 2014 under the direction of the National Delta Programme. Work on climate adaptation within the existing (regional) working structures of the Spatial Adaptation Delta Programme and the National Adaptation Strategy is also being done at national level. Rotterdam Weatherwise is a local implementation of this.

One important lesson we have learned in Rotterdam is that climate change is not just a threat, it also offers opportunities. Physical adaptation of the city offers an opportunity for a more attractive, multifunctional public space.

And a appealing city to live and work in. The Rotterdam Adaptation Strategy already set the direction with examples. The city has already implemented many new green spaces, sewerage and water projects in recent years. These include the water plazas and the construction of the Blauwe Verbinding (Blue Corridor), but also the improvement and introduction of greenery on the Rotterdam Riverside. The 'smart' introduction of greenery is a solution to counter heat with which we can add quality to the city. Linking initiatives by citizens and businesses to the goal of a climate-resilient city contributes to neighbourhood engagement, reduces loneliness and mobilises the ideas and creativity of Rotterdammers. This is the water-sensitive approach. Asking citizens for input at an early stage of municipal projects will improve the plans and this means they will be better embedded. By offering space for entrepreneurs with innovative solutions for climate adaptation we strengthen Rotterdam's economy.

*In order to make the entire city climate-resilient and remain a pioneer, we need to take the next big step: scale up the approach and continue to finetune it based on new insights about the speed and effects of climate change. These are not yet entirely clear. That means that we must be flexible in order to achieve climate adaptation and adjust the pathway throught uncertainty.*




# ROTTERDAM ADAPTATION STRATEGY (RAS)

At the heart of the RAS - launched in 2013 - is a robust system. Sewers, pumping stations and canals form the backbone of the urban water system, and are essential for a climate-resilient city. These are therefore being well maintained. But that is not enough: even a robust system cannot cope with heavy downpours. The urban development needs to be adapted in order to deal with these climate effects. This is climate adaptation. We cannot do that alone as a municipality, so we are linking up and collaborating with everyone who is active in the city. And climate adaptation also offers opportunities. If we do it right it offers added value for the living environment, society, ecology and the economy. The RAS is a useful roadmap and forms an integral part of Rotterdam Weatherwise.

## 1.3 Ambition and objective

The essence of the Spatial Adaptation National Delta Programme is that the Netherlands must be designed to be climate-resilient and water-robust by 2050.

Public authorities must work together to ensure that the damage caused by heat, excessive water, drought and flooding increases as little as possible. And take this into account in the construction of new residential districts and commercial sites, the renovation of existing buildings and green spaces, the replacement of sewers and road maintenance. Rotterdam endorses this approach, but as a vulnerable city in the Dutch Delta this is not ambitious enough for Rotterdam and Rotterdammers. With Rotterdam Weatherwise we want to accelerate and intensify adaptation so that everyone in Rotterdam is acting in a water-robust and climate-resilient way by 2025.

Scaling up and intensifying the implementation is necessary if we want to achieve a widely supported climate-resilient approach in the city that takes account of the other urban challenges such as the energy transition and the shift to being a city with a circular economy. Districts where challenges coincide will be given priority.

*The objective of this Rotterdam Weatherwise is to transform a climate-resilient Rotterdam in 2025 and the scaling up and acceleration that it requires, into practical measures and actions that we will be carrying out both on a city level as well as a district level.*

This ambition is translated into an implementation programme with climate measures for the coming years. This is a big challenge that we need to tackle together: public authorities, the private sector, community organisations, knowledge institutions and the citizens of Rotterdam. This objective can only be achieved through collaboration, engagement and good agreements.

Rotterdam Weatherwise thereby provides the framework for all the initiatives, both small and large. The city will support this programme and facilitate the translation of dreams, ideas, wishes and plans into practical actions and measures.

**The city's involvement consists of[1]:**

- We set objectives together with everyone in the city and identify the desired results;
- We identify opportunities together and work on solutions;
- All stakeholders contribute and come up with solutions for the negative effects of climate change;
- Together we balance out interests on the basis of equality of interest;
- Together we implement solutions and ensure progress.
- Develop more knowledge over the coming years relating to groundwater, land subsidence and drought.
- Develop area-specific measures for the whole of Rotterdam with regard to rainfall, heat and water safety within 2 years.
- Increase the percentage of properties that do not have an increased risk of flooding in the event of heavy rainfall from 88% to 90%.

*1 These sub-objectives follow from the commitment 17bb4704 and motions 18bbb1876, 18bb1879 and 18bb1874*

## 1.4 How are we going to do it?

In Rotterdam Weatherwise we set out what we are doing in Rotterdam in terms of climate adaptation and which climate risks are urgent. We will identify the challenges for each theme, and will provide an overview of the most significant solutions and the associated costs.

In an implementation programme to be drawn up jointly in 2019 we will indicate the districts and areas where the priorities will be over the coming years. Naturally we will harmonise this with the other urban challenges as much as possible. Ultimately this should end up in the district agendas drawn up by the area committee, district council or district committee, which bring together all the ideas to improve the district. Operating in the 'city's capillaries' requires a tailor-made approach; nowhere in Rotterdam are the circumstances exactly the same. Every district has its own 'water

character' and its own opportunities and challenges in terms of rainfall, heat, drought and land subsidence. Every district also has its own residents with their own characteristics, specific interests, needs, problems and behaviour. By conducting a 'risk dialogue' about climate change with all district partners and district water boards we create awareness about the vulnerability to climate extremes and land subsidence. Alongside the residents of the district, the district partners also consist of social housing corporations, project developers, utilities operators, businesses and community institutions, foundations and associations.
Initiating and maintaining a dialogue with all these different groups and collecting their views, ideas, insights and stories requires differentiated communication. The communication strategy that we are still to develop must therefore engage closely with Rotterdammers and particularly communicate enjoyment, so that residents want to participate in tackling climate change.

Finally we will continue on the pathway that we have already taken with the large scale measures in the public space. But also with small scale measures at street level, on public and private land. Whereby we will not leave any opportunity unexploited to simultaneously improve the liveability in neighbourhoods and districts, enhance biodiversity in the city and increase Rotterdammers' engagement and active participation in the community.

*The climate-resilient design of cities is a real challenge. With Rotterdam Weatherwise we will be taking the next step over the coming years to identify and execute concrete implementation measures on every scale (city, district, street and building). Thanks to this programme the city and Rotterdam's water boards will therefore work towards 2025 with Rotterdammers in creating a water-robust and climate-resilient but above all more enjoyable and stronger Rotterdam.*

Rotterdam Weatherwise is therefore a starting point for a change that will develop further over the coming years. It will have succeeded if many more Rotterdammers and Rotterdam organisations feel engaged and responsible - both now and in the future - for preparing the city for a more extreme climate. By making use of the knowledge and (intellectual) strength of Rotterdammers you can put good ideas into action.

# #02
# A CHANGING ROTTERDAM

## 2.1 The climate is changing

It is a fact that the climate has already significantly changed in recent decades, and that change is continuing unabated. The consequences of climate change for the Netherlands have been worked out in climate scenarios by the Royal Netherlands Meteorological Institute (KNMI). We are using the most up-to-date climate scenarios from 2014. These climate scenarios show a range of possibilities for the most likely consequences of climate change in the Netherlands. The analyses and risk assessment for the adaptation strategy are also based on the Delta scenarios that have been developed for the National Delta Programme.

For Rotterdam it involves effects such as:

**Temperature**
from 48 to 20 days of frost by 2050
from 20 to 35 summery days by 2050

**Temperature**
>30°C from 1 day now to
5-12 days by 2050

**Temperature**
average temperature rises from
22.1°C now to 23.5°C by 2050
maximum daytime temperature rises from 36°C to 39°C

**Tropical nights**
From 7 nights of > 20°C to
around 3 weeks by 2050

**Drought**
Rainfall shortage increases from the current
230 mm to approx. 288 mm by 2050

**Rainfall**
Rainfall increases to 925 mm.
Winters wetter and more extreme rainfall volumes

**Rainfall**
Maximum daily rainfall rises to 94 mm by 2050.
Number of days when rainfall > 50 mm increases

**Rivers**
Flow increases in winter,
However lower water levels in summer

**Sea level**
Sea level rise by 40 cm by 2050 and 100 cm by 2100. This causes high-water levels to rise in Rotterdam

Although it is a gradual process, the rise in sea level has consequences for the Netherlands and in particular for Rotterdam in the lower reaches of the Rhine-Maas Delta. If dykes and other flood defences such as the Maeslantkering storm surge barrier do not 'grow along' with the average higher water levels, the risk of flooding of the land within the dykes increases. The same applies for the land outside the dykes, where 65,000 people live in the Rotterdam region. Another consequence of the rising sea levels is increased salinity at collection points for fresh water and groundwater. Rising sea levels can also lead to a higher seepage pressure, with negative consequences for the water quality and a need for additional discharge capacity.

For the city the occurrence of longer hot periods increases the risk of heat and will raise the energy demand for cooling together with the demand for fresh water in order to maintain surface water and groundwater levels. The high temperature also increases the risk of a decline in the water quality and an increase in harmful organisms such as blue-green algae. These effects result in a decline in the city's liveability.

What is a port city without wind? Because the consequences of climate change for wind patterns in Rotterdam are still uncertain and the anticipated effects are limited, the adaptation strategy does not examine the change in wind patterns any further. The possible effects of storms and hail have also not been elaborated further.

# COUNCIL TARGETS

The current city council priorities have been translated into various targets. Some have a direct relationship with tackling climate change:

- **Increase the percentage of properties that do not have an increased risk of flooding in the event of heavy rainfall from 88% to 90%.**

- **Add 20 hectares of green space by 2022 compared to 2018.**

Other more indirect related targets are:

- During this council period the rise in carbon emissions will be converted into a downward trend that leads to a 49% carbon reduction in 2030 measured against 1990
- The average air quality throughout the city will have improved in 2022 compared to the 2017 level. From 2020 there will be no streets where the European health standard for $NO_2$ is breached.
- Rotterdammers feel that they are more involved in thinking and deciding about measures in their neighbourhood (citizen participation)

## 2.2 Rotterdam is changing

In addition to climate change, other social transitions and trends will also pose major challenges for Rotterdam over the coming decades.

### TRANSITIONS

#### Migration to the city

People and businesses are migrating to attractive cities and regions around the world. Rotterdam has put itself on the map in recent years. In order to offer space for everyone, we need to build considerably more houses over the coming years within an already densely built area.

#### Energy transition

We are in a transition from using fossil energy to sustainable energy. This has major consequences for both the city and the port, particularly since the industrial complex in the port currently still largely runs on fossil fuels.

#### Circular economy

Thinking and acting circularly is on the rise. The idea is that waste no longer exists and that raw materials cycles are closed. This means that we will need to add ever fewer new raw materials into production chains. The rise of the 3D printer is accelerating this development.

#### Digital transition

The increasing digital possibilities are creating new business models and are having a major impact on our daily life, the labour market and education. Every Rotterdammer and every organisation is becoming a creator, guard and user of information.

#### Mobility transition

The way in which we move around the city is changing. More walking, more cycling and more public transport. Mobility services are improving, so that there is less need to own a car. The transportation of goods and urban distribution will also change under the influence of technological developments.

#### Network society

Society is becoming more diverse. Individualisation is continuing, but at the same time the need for connection is growing. New spontaneous social and economic networks are arising of like-minded people who work together towards a shared goal.

These transitions have been included in a vision of the city's development. This Spatial Vision sets out five perspectives which are used to shape the future of Rotterdam. These five perspectives are the guiding principles for new policy, plans and projects.


*Climate adaptation overlaps with the transitions and the 5 perspectives from the spatial vision result in a number of areas where they reinforce or supplement one another.*

## CHALLENGES

### Migration to the city

- Densification of the city offers challenges and opportunities in the form of the multiple use of space
- Designing and implementing buildings, sites and infrastructure in a climate-robust way
- The introduction of greenery contributes to the city's cooling and water retention
- More people and businesses lead to a greater risk of flooding

### Energy transition

- Utilise water's capacity to store heat (sewers, surface water, water retention)
- Utilise the river Nieuwe Maas salt water/fresh water transition zone to generate energy
- Creating running open water in the city provides cooling during hot periods (the effect can be the opposite at night)
- Circular economy
- Reuse (waste) water flows and close cycles

### Circular economy

- Hergebruik (afval)waterstromen en sluiting kringloop

### Digitalisation

- Monitoring climate effects with more sensors, e.g. private weather stations
- Connect infrastructure (e.g. pumping stations) to the Internet

### Mobility

- Fewer lanes and parking spaces through 'shared mobility' and 'autonomous vehicles' creates space for more water retention
- Water retention under roads/cycle paths
- Maintain accessibility by making road and rail infrastructure climate-resilient

### Network society

- Awareness and opportunities for action with regard to climate measures for citizens/businesses on private equity
- Link with citizen initiatives

The big challenge is to combine the implementation of the desired measures arising from all these urban challenges in an effective way. For example, making new homes both energy-neutral and climate-adaptive. This demands effectiveness on the part of the city, social housing corporations, regional water authorities and other district partners, but it also requires residents' commitment to their own living environment. The combined approach to climate change with the energy transition, for example, can thereby offer opportunities for new forms of construction, new entrepreneurship, reduced unemployment, improved healthcare and health, and new forms of cohabitation. Utilising those combined opportunities is good for Rotterdam and all Rotterdammers.

This approach is not new. Initiatives are already taking place to contribute to this and tools are already being used which have this broad(er) perspective. Examples of this are the Extrema app, Water Sensitive Rotterdam and the Urban Water Buffer Spangen.

## EXTREMA-APP

*Rotterdam City Council has been offering the new public digital heat app Extrema Rotterdam since 2018. The app shows what health risks people run during heat waves and what they can do about it. The app provides Rotterdammers with personal advice about the risk of health issues as a result of the heat. Extrema Rotterdam calculates this risk on the basis of the current weather, age, gender and state of health. The app also displays maps of Rotterdam showing the cool spots and drinking water locations within the city. This app was developed in collaboration with other cities like Athens and Paris.*



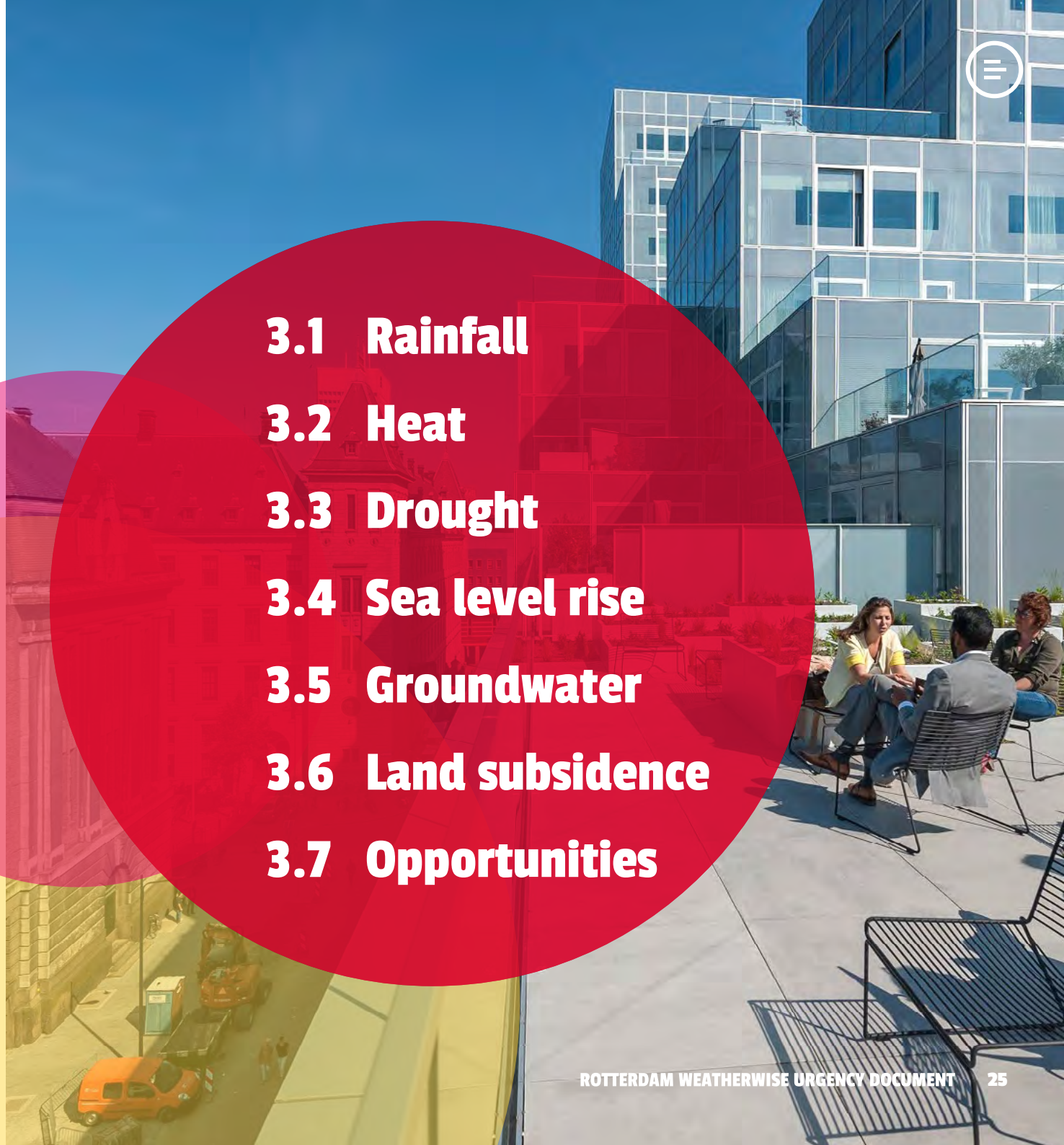
## WATER SENSITIVE ROTTERDAM

*We're making the city more enjoyable and stronger together! Water Sensitive Rotterdam links the city's ambitions for green spaces and climate to professionals and residents' initiatives. It brings people together, creates awareness about the climate in the city's districts, and makes the city a bit more attractive and more enjoyable. A downpour should not cause disruption. This can be done by not discharging the water through the sewers, but by storing and reusing it. It can also be done by making use of gardens and public green spaces. By removing paving and creating space for more greenery.*

## URBAN WATER BUFFER SPANGEN

*The Sparta stadium uses around 10,000 $m^3$ of drinking water per year to water the soccer pitch. At the same time it is located in a district where there is flooding during heavy rainfall. The Urban Water Buffer captures, cleans and stores the rainwater from the surrounding area, and reuses it when required. A good example of a circular and climate-adaptive measure that offers opportunities which can also be used elsewhere in the city.*

# #03
# OUR CHALLENGES



## Climate themes

Four major climate trends can be identified:

**It's getting wetter**

**It's getting hotter**

**It's getting drier**

**Sea levels are rising**

Rainfall, drought and sea level rise are also the four main themes in the National Delta Programme. For Rotterdam specifically it is essential that the themes of groundwater and land subsidence are also included. The effects of all these themes are related and reinforce one another. Rotterdam Weatherwise therefore focuses on six climate themes.

Although the six climate adaptation themes each require their own approach, the required measures can reinforce or impede one another. Measures that reinforce one another will be given priority. Measures that impede one another require considered choices.

**The most important reinforcements are:**

- Introducing greenery in the city as an adaptation measure to counter heat also contributes to retarding rainwater.
- Replacing paving with greenery or permeable paving increases the ability to absorb rainfall and supplements the groundwater. This is good for areas with (excessively) low groundwater levels.
- Combining water retention facilities on buildings with cooling measures (green roof) helps reduce flooding and heat. Solar panels on green roofs have a higher yield.
- Installing essential services higher up reduces the risk of flooding both from the river and from extreme rainfall.

**The most important impediments are:**

- More trees and greenery in the city result in a greater demand for water, which intensifies the effects of periods of drought.
- Replacing paving with greenery or permeable paving increases the ability to absorb rainfall and supplements the groundwater. This is bad for areas with (excessively) high groundwater levels.

## Stress test

For each theme we first identify the locations in the city where the effects are noticeable and are most influenced. The city's vulnerability is mapped. This is part of the stress test made obligatory under the National Delta Plan Spatial Adaptation.

The maps are based on existing cartographic material and up-to-date data that we have measured and collected.

The national climate effect maps that are available are still being extensively developed, and where possible we have made use of the latest insights. For the port area we do not have the necessary data for a number of climate themes.

This gives us a good first impression, but it needs to be refined in order to be able to identify the climate effect in practical terms at district level. This refinement can only take place in collaboration with the residents of the district, who know their own neighbourhood best. The further detailing is therefore an important part of the risk dialogue.

## 3.1 Rainfall

### More intense rainfall

There is more rain falling with a higher intensity over shorter periods. Extreme rainfall will occur five times as often as now by 2050, and ten times as often by 2085. If the sewers cannot immediately process the volume of water it causes disruption. Paved, densely-built districts are particularly vulnerable to disruption and flooding.

### What is required?

The rain that falls must be captured and stored and/or reused temporarily so that it can then be discharged to the soil, open water or sewers. We want to reduce the number of properties that are vulnerable to flooding. The passability of the urban infrastructure must also be protected.

### What approach is required?

In order to be able to cope with this more intense rainfall, we must:

- Take adequate steps within the urban water system.
- Create water retention and water-retarding (green) provisions in the public space.
- Require and encourage private individuals and businesses to create water retention and water-retarding (green) provisions on their own land.
- Monitor the health effects of (new) water retention facilities in the city.

A start has already been made on this challenge in recent years. We now need to intensify and scale up these activities.

### What choices need to be made?

In order to carry out the strategy effectively there is a need:

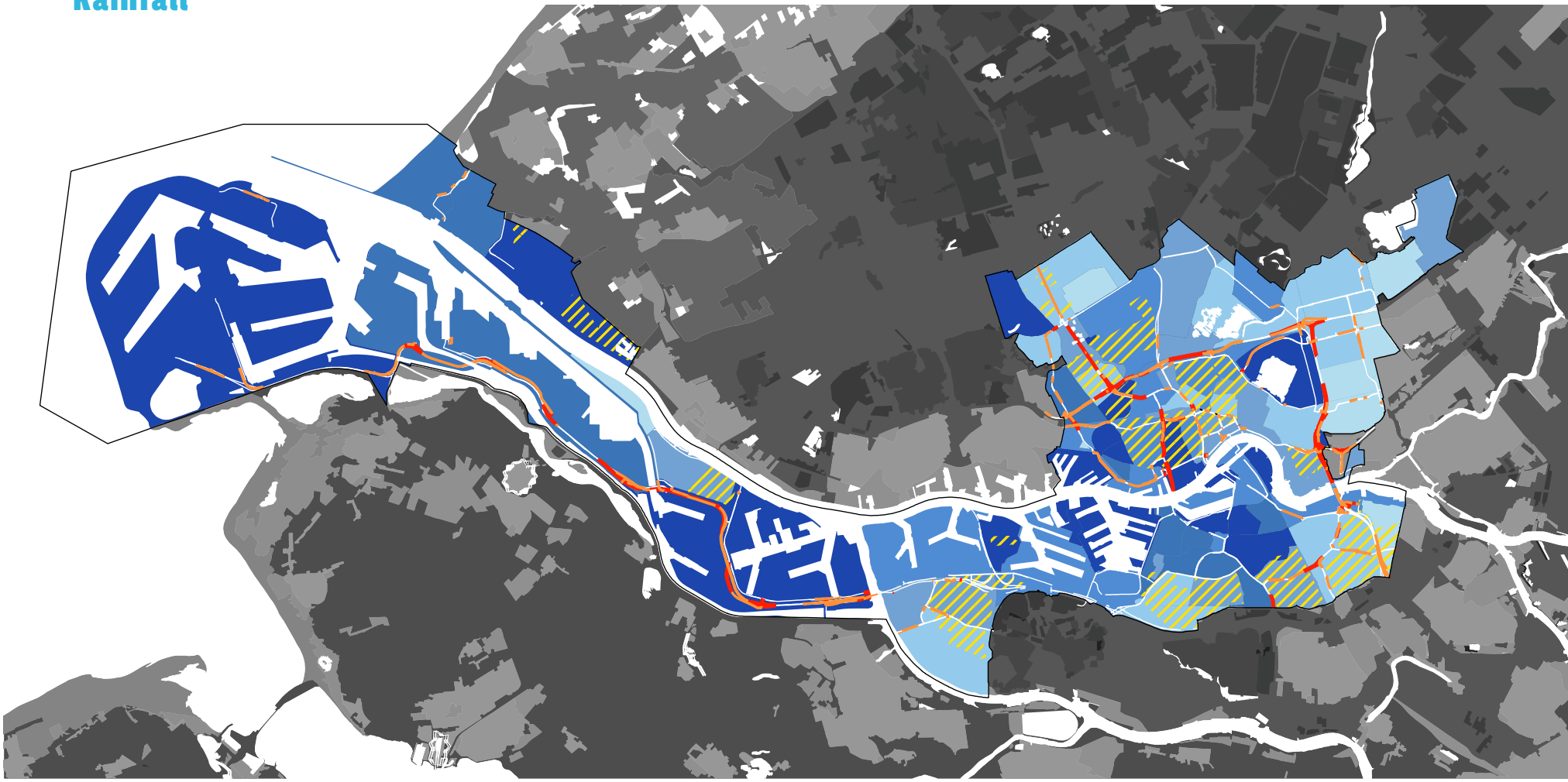
- To give priority to designing a water-resilient public space.
- For every redevelopment to offer opportunities for water retention. Water must form an integral part of such developments as early as the planning stage.
- For requirements for the water retention and retardation capacity for new construction plans to be included in regulations.
- To communicate about the need for water storage with builders and project developers.
- For sufficient funding to be available to construct water retention.

**Notes on the map (rainfall)**

*Heavy rainfall can cause problems in the city because the sewers cannot remove all the rainwater immediately and the water cannot be stored adequately. This can lead to impassable roads and damage to buildings etc. in certain places. A (model) calculation has been used to identify the districts where that risk is greatest. This has been based on 70 mm of rainfall in one hour as being representative of extreme rainfall in 2050. The map also shows the areas where there is still an inundation of the canals and where potential vulnerable objects are located. Heavy rainfall can lead to problems in the surface water system in certain areas. These areas have a water challenge that the waterboards are addressing in partnership with the City of Rotterdam.*

… from canals (correctie niet duidelijk).

## Rainfall



**% of properties at risk per neighbourhood**

- >25%
- 20-25%
- 15-20%
- 10-15%
- 5-10%
- 0-5%

**Vulnerable main roads**

- impassable
- accessible to emergency vehicles

**Lack of surface water storage capacity**

- 2018

## Rainfall

**8x** extreme rainfall events since 2000

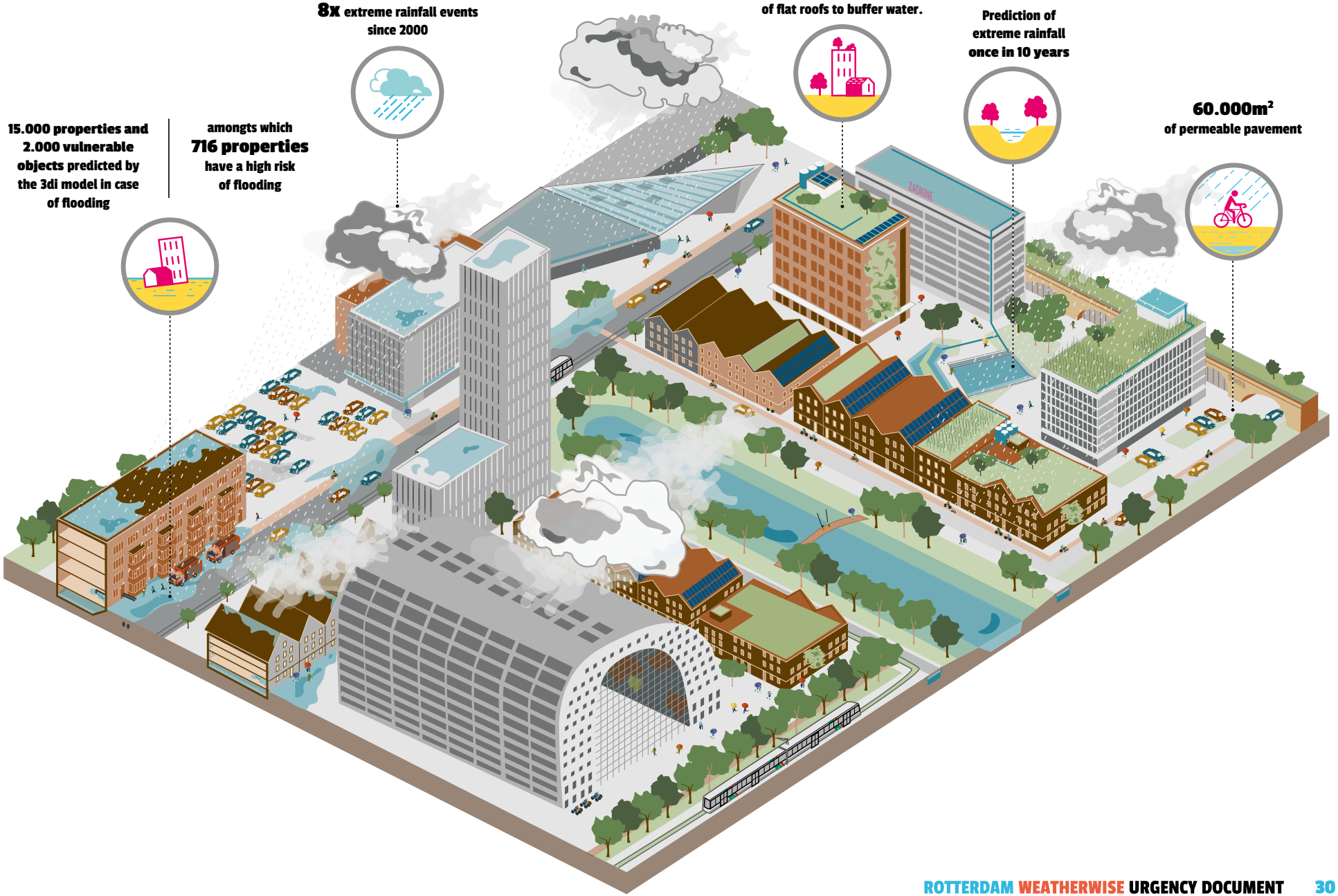
Rotterdam has 270,000m² green roofs out of the 14.500.000m² of flat roofs to buffer water.

Prediction of extreme rainfall once in 10 years

**60.000m²** of permeable pavement

15.000 properties and 2.000 vulnerable objects predicted by the 3di model in case of flooding

amongts which **716 properties** have a high risk of flooding



## 3.2 Heat

More and longer periods of high temperatures in the city rapidly cause the quality of life in the city to deteriorate. This can particularly lead to health problems for vulnerable residents (the elderly and the sick). It also makes staying in the city unpleasant for other residents and visitors. Currently around 30% of residents do not have any cooling in their own home or district during heat waves. It can also interfere with the opening and closing of bridges, reducing accessibility in the city.

### What is required?

There must be sufficient cooling available in homes, businesses and the public space during heat waves. Residents also need to know what they should do in order not to be affected by the heat.

### What approach is required?

In order to be able to deal with periods of heat, we must:

- Continue installing greenery in the public space and on roofs and façades, particularly in places where heat disruption is most common (paved and poorly shaded areas).
- Include heat-resistant construction and design as a requirement when designing new buildings and public space.
- Define procedures with managers of green spaces, urban infrastructure and health specialists in order to prevent problems in the event of heat, including developing a local heat plan.
- Develop more knowledge about the effects of heat on people, public space and infrastructure, and about the most effective measures in specific situations.

### What choices need to be made?

In order to carry out the strategy effectively there is a need:

- To introduce a 'Climate Adaptation' incentive scheme with which we encourage the construction of cooling measures on private land.
- To include regulations for heat-resistant construction and well-shaded design in schedules of requirements for area developments and plans for public space.
- To include investments for cooling measures in the public space in plans for public space as standard.

**Notes on the map (heat)**

*The red on the map shows the heat in the city due to physical spatial characteristics such as a high level of paved public space and little shade (urban heat island effect). This is based on the Hotterdam study (2015). This involves the heat index temperature. In a number of districts people have insufficient cooling in their home and immediate surroundings (based on survey). The elderly are particularly vulnerable to heat.*

## Heat

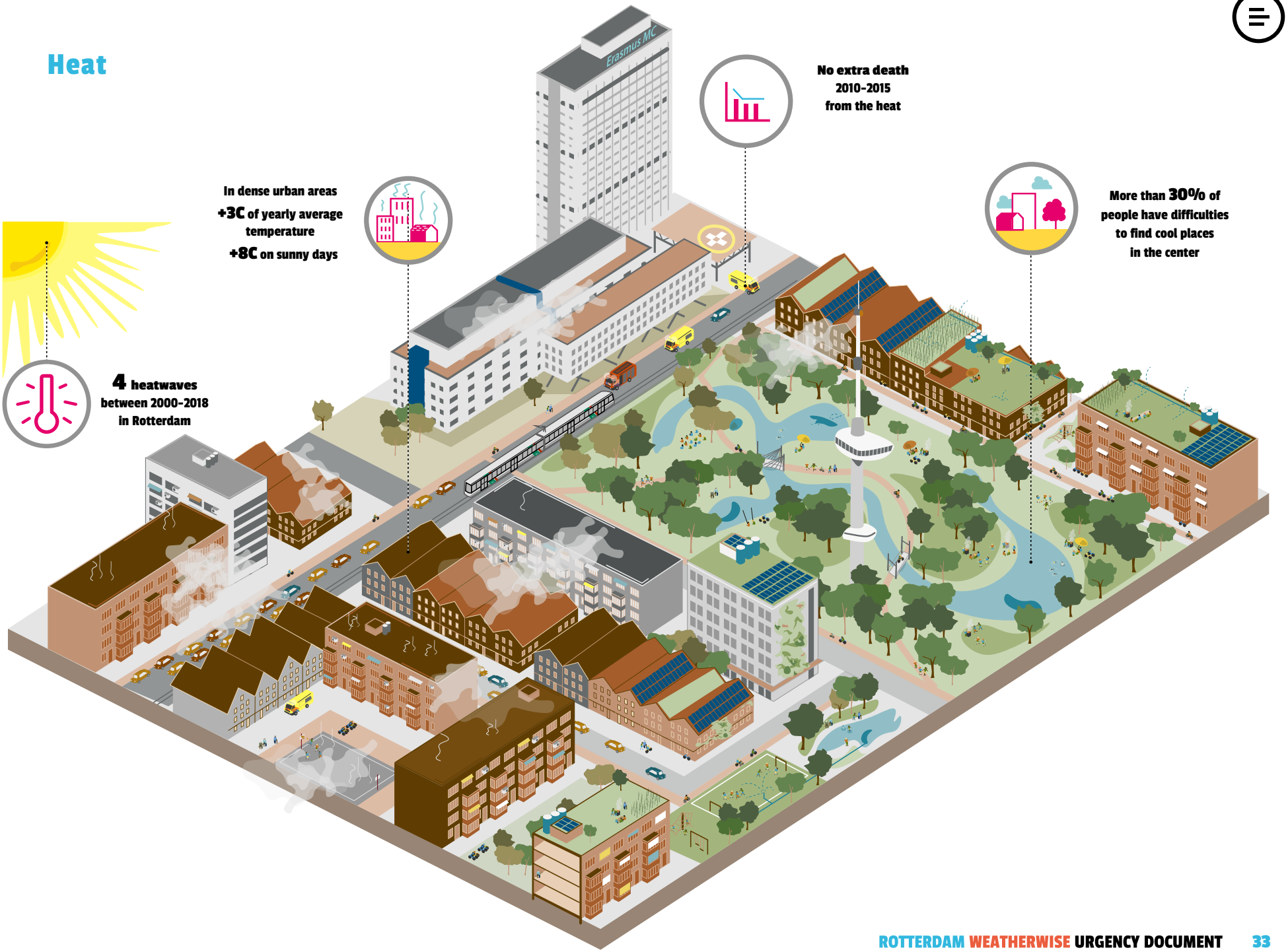
**Rotterdam score**

- very high
- high
- average
- no data

**Vulnerable areas**

- insufficient cooling in home, business, garden or immediate surroundings
- large concentrations of population aged 75 and older

# Heat


Erasmus MC
No extra death
2010-2015
from the heat
In dense urban areas
+3C of yearly average temperature
+8C on sunny days
More than 30% of people have difficulties to find cool places in the center
4 heatwaves
between 2000-2018
in Rotterdam

## 3.3 Drought

Longer periods of drought can result in a lack of (ground)water. Drought can also affect the quality of the urban surface water, for example because of saline seepage. That means that extra water needs to be obtained for rinsing through. Another solution to this is to retain water for longer (flexible water level management) or to set up areas that are suitable for storage. Although the latter is hard to implement in the existing urban area. Peat dykes can dry out, and wooden foundation piles can be left dry. This theme therefore has a direct relationship with the themes of groundwater and land subsidence which are discussed later on. Drought is expected to result in a 30-40% increase in fresh water consumption by 2050.

### What is required?

More insight is needed into the consequences of poor water quality and increased salinity on green spaces and the ecology of the urban water. Green space management must be adapted in order to cope with more periods of drought. The inspection of peat dykes during dry periods must continue. In areas with wooden foundation poles, investigation is required for each area in order to determine whether there is a problem of insufficient groundwater and what interventions are effective. There also needs to be an approach that is aimed at saving, retaining and supplying high quality readily available fresh water.

### What approach is required?

In order to be able to deal with longer periods of drought we, together with the regional water authorities, must:

- Develop more knowledge about the occurrence and prevention of damage caused by drought
- Work with managers of green spaces, water and dykes to develop a suitable approach that takes account of various interests
- Expand the connections with the regional water system in order to be able to supply additional fresh water.
- Store and utilise fresh water during periods of drought where this makes sense.

### What choices need to be made?

In order to carry out the strategy effectively there is a need:

- To increase knowledge of and insight into the drought problem and a possible fresh water shortage for the city of Rotterdam.
- To develop an approach for periods of drought in the city jointly with all stakeholders.

**Notes on the map (drought)**

*Long periods of drought can lead to damage to trees and other greenery, but also to peat dykes and foundations made of wooden piles. The map shows the percentage of vulnerable trees per area (there are 600,000 trees in Rotterdam, of which 1/3 are managed by the City). Together with the parks and large green spaces that are vulnerable to drought because of their need for water. Peat dykes can dry out and thereby crack and shift. They must be kept wet during long periods of drought. The swimming locations in open water that are vulnerable to poor water quality have also been marked.*

## Drought

**% vulnerable trees per neighbourhood**

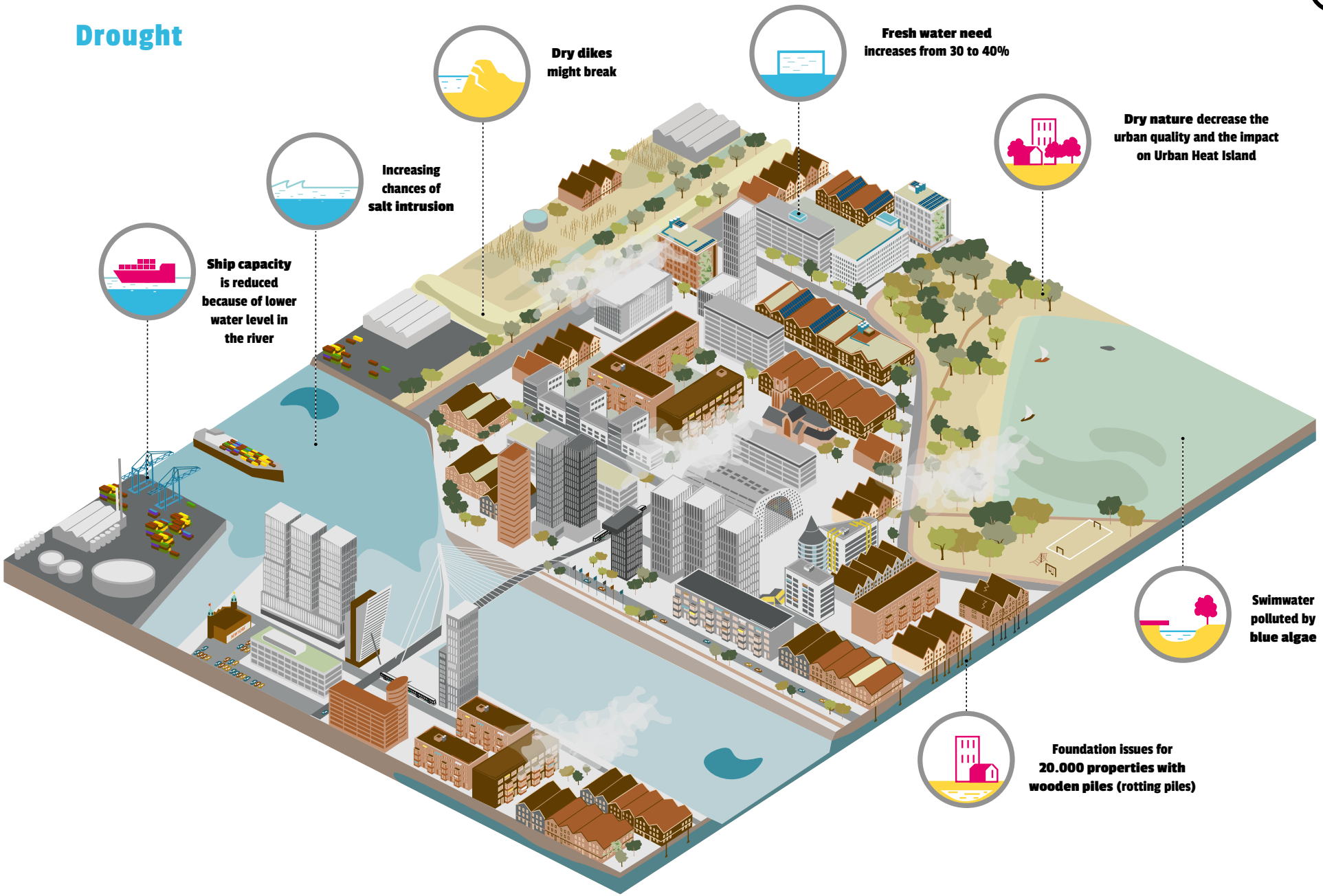
- <65%
- 30-35%
- 50-65%
- >35%

**Objects sensitive to drought**

- peat dykes sensitive to drought
- green spaces with high water demand during drought periods

**Swimming water**

## Drought


Dry dikes might break
Fresh water need increases from 30 to 40%
Dry nature decrease the urban quality and the impact on Urban Heat Island
Increasing chances of salt intrusion
Ship capacity is reduced because of lower water level in the river
Swimwater polluted by blue algae
Foundation issues for 20.000 properties with wooden piles (rotting piles)

## 3.4 Sea level rise

Global warming is causing sea levels to rise, and thereby also the river water level. The Nieuwe Maas sometimes carries a great deal of water, and sometimes very little. Higher water levels increase the pressure on dykes and flood defences, increasing the risk of flooding, as well as in the area located outside the dykes. Sea levels are expected to have risen by 100 cm by 2100 compared to 1900.

### What is required?

In order to protect us against higher water levels, dykes and flood defences need to be strengthened and raised periodically. In addition, an assessment must be made for each area - both inside and outside the dykes - of which measures for prevention (dykes), spatial planning (e.g. building with higher floor level) and crisis management are required in order to limit the consequences of a flood.

### What approach is required?

In order to be able to deal with high water levels, we must:

- Strengthen dykes and other flood defences so that they continue to comply with the statutory safety standards.
- Match the necessary measures with regard to flood defences to the decisions that result from the Delta Programme, the High-water Protection Programme and the regional water authorities' maintenance programme for the regional defences.
- Adopt adaptive construction for the area outside the dykes in order to create adequately protective, dynamic and flexible living environments.
- Pay extra attention to protecting vital objects against the risk of flooding when designing the public space.
- Increase awareness amongst citizens and businesses about the risk of flooding and offer them tools to act when necessary. In view of the great depths of water, vertical evacuation in the immediate surroundings is preferable.

### What choices need to be made?

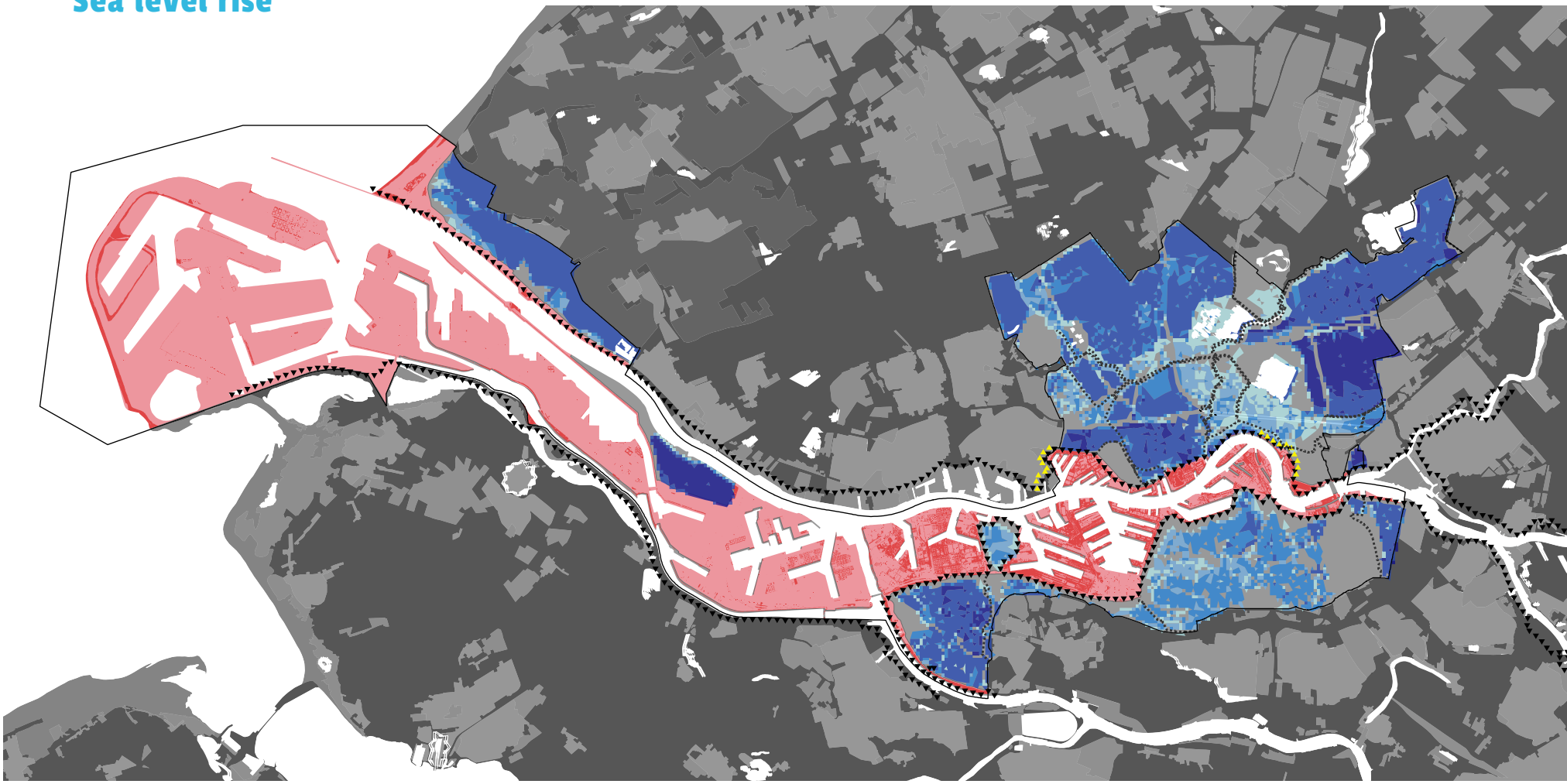
In order to carry out the strategy effectively there is a need:

- To make acceptance of the flooding risks the starting point for (re) development in the unembanked areas.
- Strengthening dykes often requires more space. This has consequences for the use and attractiveness of the city. Conversely, spatial developments near flood defences must allow for possible future dyke strengthening.

**Notes on the map (flooding)**

*Flood risk management involves protection against rising sea levels and high river water levels. Areas outside the dykes are not protected by a dyke, unlike the area inside the dykes. For the area outside the dykes the map shows which areas are higher and which are lower than 3.60 m above sea level (NAP). This is the current base construction level for new construction plans behind the Maeslantkering. Many older areas are at a lower elevation, and have a greater chance of flooding. The flooding depth has been shown for the area inside the dykes (the polder areas behind the primary flood defences). This shows what the water level could be in the event of a dyke breach in the primary defences. Parts of the primary defences that may need to be strengthened are marked in yellow.*

## Sea level rise



**Flooding risk outside dykes**

- above 3.6 metres
- below 3.6 metres

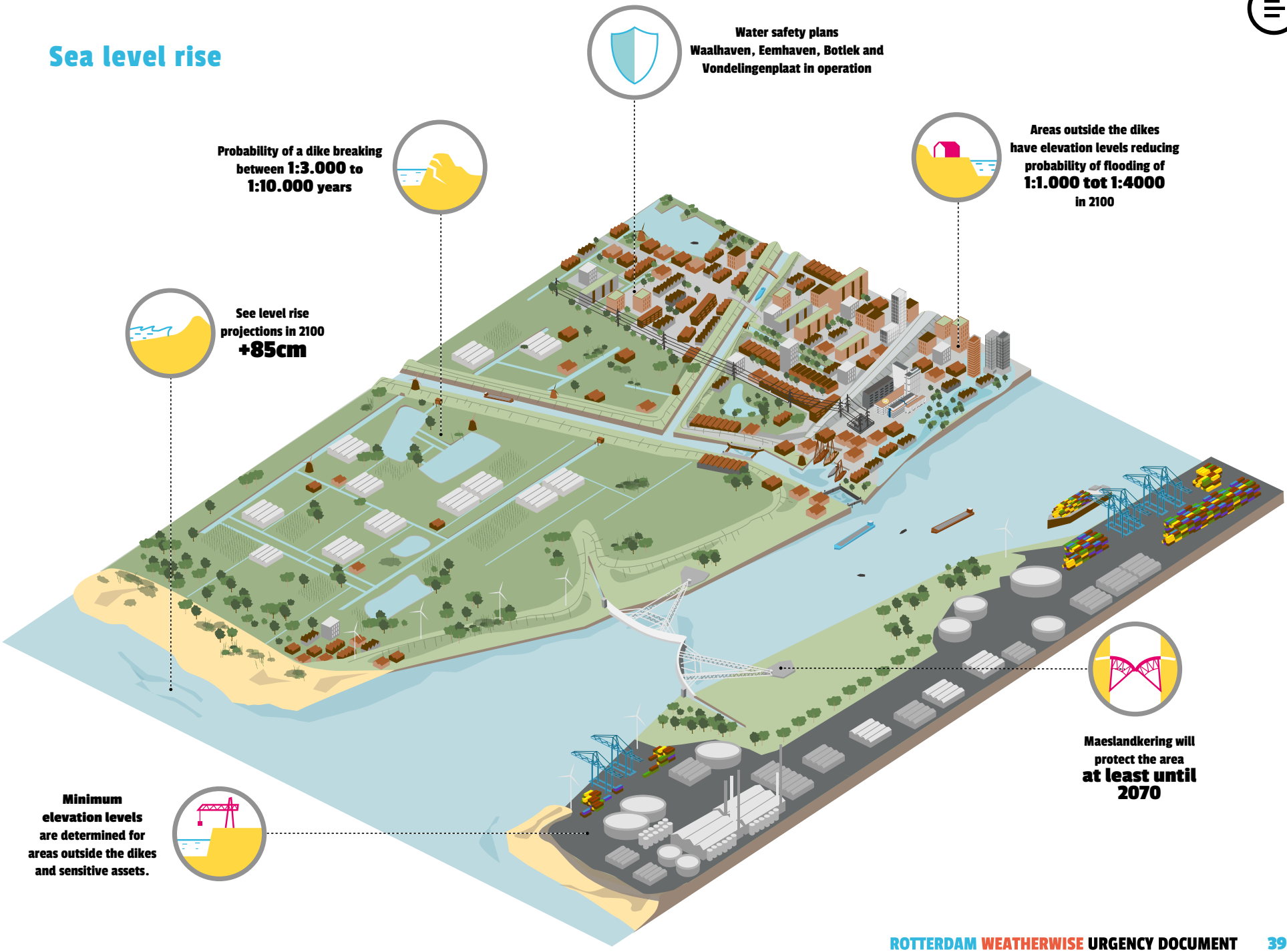
**Dykes**

- primary dyke
- regional dyke
- possible dyke strengthening required

**Flooding risk inside dykes (maximum flooding depth)**

- <1 metre
- 1-2 metres
- 2-3 metres
- 3-4 metres
- >4 metres

# Sea level rise



## 3.5 Groundwater

Rotterdam is not just confronted with water-related disruption risks above ground. The groundwater is an issue in many areas as well. In a number of districts there is structurally excessively high groundwater. This manifests itself in wet basements, pools of water and excessively wet gardens. However, in other districts the groundwater is excessively low. This can result - for instance – in foundation problems arising in properties on wooden poles (approx. 20,000 properties). Low groundwater levels also increase the risk of land subsidence. Land subsidence can cause properties that do not have pole foundations (approx. 11,000 properties) and low-lying gardens to suffer damage and disruption from excessive (ground)water. Finally there are risks of saline seepage (salt intrusion from the deep subsoil) which reduces the quality of the urban surface water.

### What is required?

In areas with wooden pole foundations or vulnerable green spaces where groundwater levels are too low, renovation and/or management measures need to be implemented in order to prevent the damage from being exacerbated. In areas with properties without poles, land subsidence management measures need to be implemented and/or housing blocks/neighbourhoods must be rebuilt.

**Notes on the map (groundwater)**

*The map shows where groundwater problems can arise due to excessive or inadequate groundwater levels. If the difference between ground level and open water level (drainage) is less than 80 cm there is an increased risk of excessive ground-water, particularly for buildings without poles (footing on subsoil). When groundwater levels are too low, problems can arise with wooden poles, which leads to land subsidence. Replacing sewers can lead to a change in the groundwater levels. That is why the areas with wooden poles where sewer replacement is being given priority have also been marked.*

## Groundwater

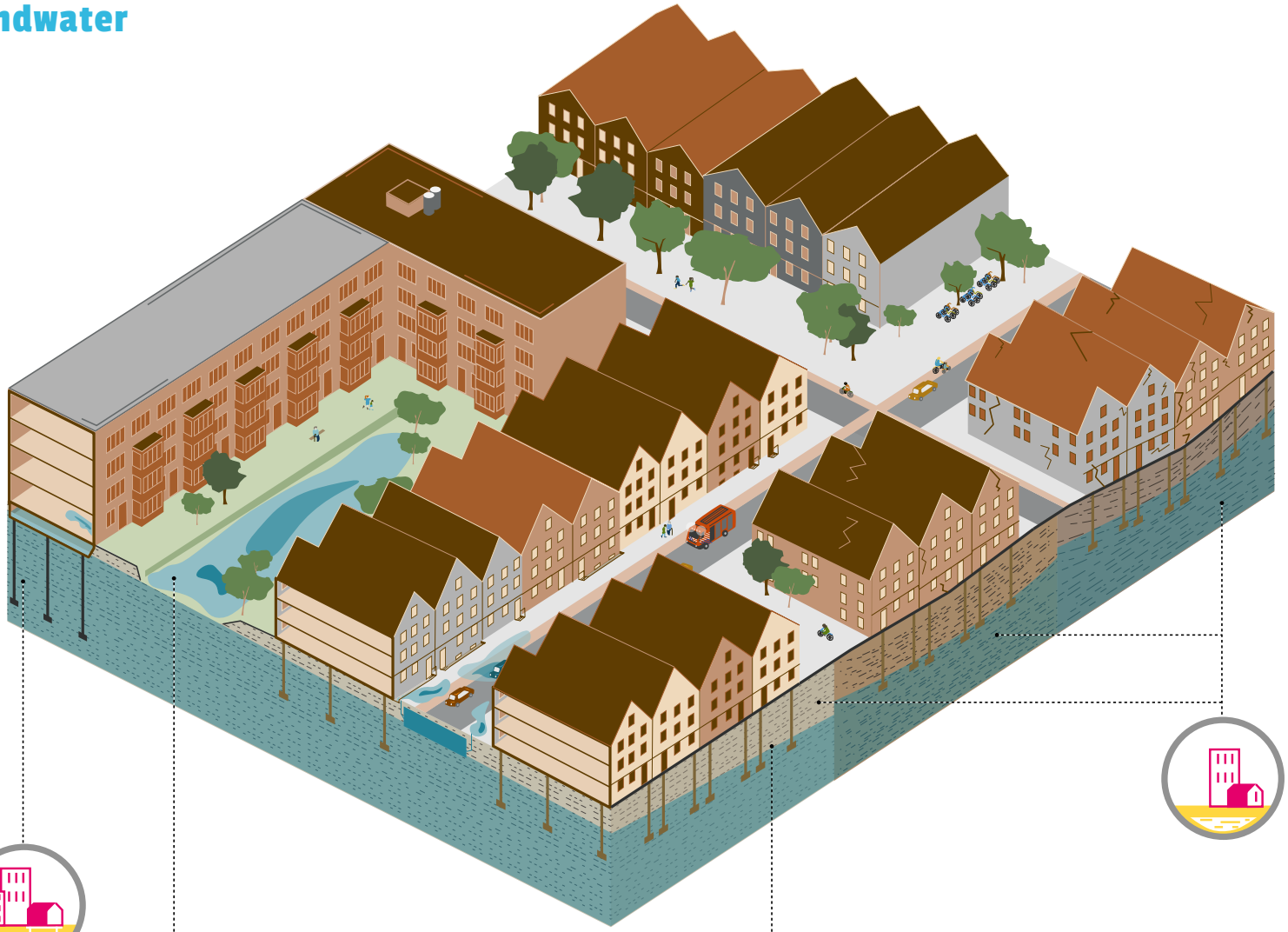
**Vulnerable areas for excessive groundwater**

- drainage less than 80 cm footing on sand
- footing on sand

**Vulnerable areas for inadequate groundwater**

- wooden pile foundations
- priority areas for sewer replacement

## Groundwater



**Foundation problems**
**11.000 buildings**
on steel (sagging)
**20.000 buildings**
on wood (pole rot)

**Vulnerable areas**
Cellars, basements and low gardens are the most vulnerable

**Responsibility**
Your roof is watertight, so your basement (and foundation) is as well

**Subsidence**
**5 to 10 mm per jaar,**
this is 0.15 to 0.3 meters within 30 years

**Risk of settling per soil type:**
- Peat: high risk
- Clay: moderate risk
- Sand: low risk

## 3.6 Land subsidence

### What approach is required?

In order to be able to deal with high or low groundwater levels and land subsidence, we must:

- Conduct area-specific and issue-focused investigations into what approach is effectively and socially justifiable in a specific location.
- Identify the problems together with the property owners concerned and also explore possible solutions together.
- Keep measurement data and knowledge about problem locations and risk locations up-to-date.
- Adopt a clear position and communicate clearly what responsibility each party is taking and where this stops (this includes the city, regional water authorities, property owners or residents).
- Share experiences of consequences of land subsidence.

### What choices need to be made?

In order to carry out the strategy effectively there is a need:

- For all stakeholders to have a role and bear responsibility in the search for an optimal approach.
- To make a basic choice for problem locations and risk locations between 'managing' the situation (measures, groundwater and/or buildings) and 'rebuilding' (the structures)
- For designers and developers to take account of the effects of the structure on the groundwater when producing planning or construction plans.

**Notes on the map (land subsidence)**

*Peat soil is particularly sensitive to settlement and uneven land subsidence during long periods of drought. This can result in damage to homes, roads, cables and pipes, amongst other things. The groundwater level also plays an important role in this. This map shows the annual average land subsidence per sub-neighbourhood calculated over the period 2008-2014. Local land subsidence can vary considerably. Areas with properties without poles which are vulnerable to uneven settlement of the soil have also been marked. The prioritisation shown indicates the urgency for measures to keep these districts liveable in the long term.*

## Land subsidence

**Land subsidence in mm per year**

- 0 to -4
- -4 to -7
- -7 to -10

**Urgent areas**

- 3rd priority

## 3.7 Opportunities

### Climate themes

The map is based on a combination of the 6 challenge maps per theme. It shows where one theme is an issue, but also locations where multiple themes apply. These locations offer good opportunities for a combined approach, but it also means that the solution becomes more complex.

### Energy

There are 4 pilot areas that have been designated within Rotterdam for implementing the energy transition and going ‘gas-free’. One or more challenges from Rotterdam Weatherwise apply within each of these areas.

### Building challenge

Rotterdam will build 18,000 new homes within the next 4 years and a total of 50,000 new homes in Rotterdam by 2030. This affects many different locations in Rotterdam, usually in places with a combined challenge. The new properties to be built also offer opportunities for storing rainfall, multifunctional roofs, etc. Every newbuild plan must be build in a climate-adaptive way.

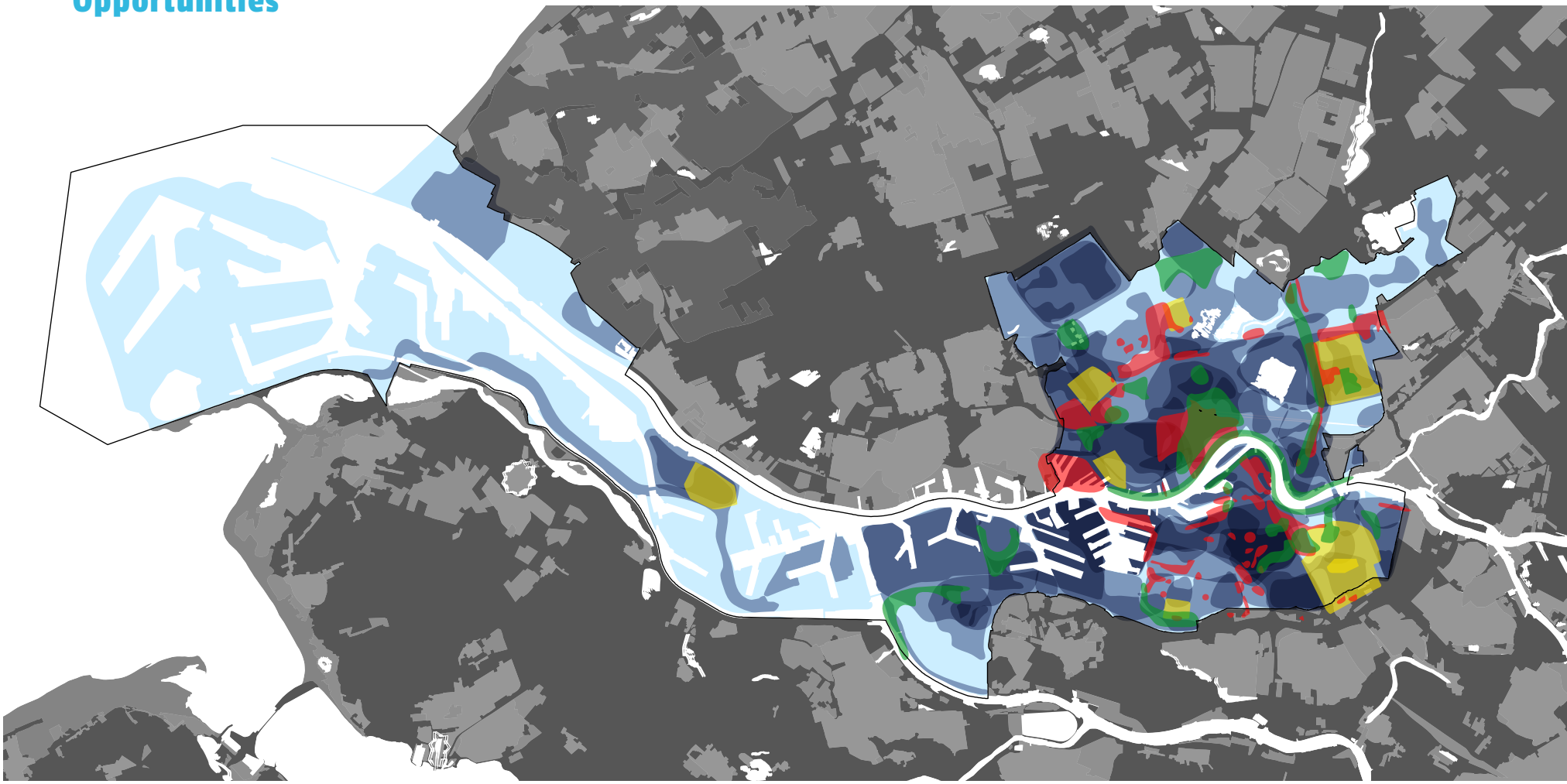
### Greenery challenge

Greenery can make a contribution to the challenges from the Rotterdam Weatherwise in many places. By establishing this link, it is possible to look far more accurately at street, location or district level at what form of greenery would make the biggest contribution to the challenges.

**Notes on the map (opportunities)**

*The other transitions in Rotterdam are not standing still either. Pilots for energy have been identified, the compact city is giving rise to new locations which will be densified, and there is a desire to introduce greenery for reasons of liveability and health. Placing these on top of the Rotterdam Weatherwise challenge maps provides insight into where other major programmes within Rotterdam overlap, influence one another and can reinforce one another. These are high opportunity locations where we can make the biggest steps towards being climate-resilient together.*

## Opportunities



**Number of climate themes per area**

- 1 to 2
- 3 to 4
- more than 4

**Links with other programmes**

- energy transition
- housing densification
- introducing greenery

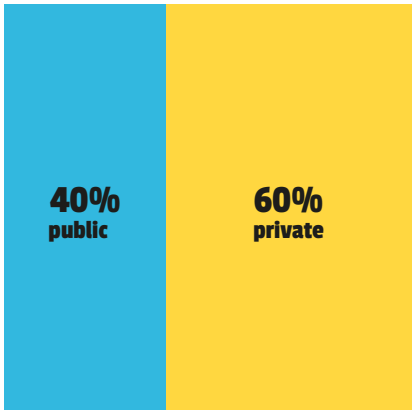
# #04
# NEXT STEPS

## 4.1 Citizens in the lead

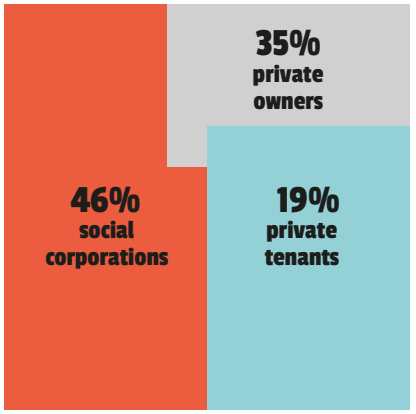
We are translating the developments confronting our city and the trends that we are seeing into a 'new' adaptation pathway for the coming years. One important step change from the early years is the use of more small-scale climate-adaptive measures in the public space at street level. The use of climate-adaptive measures previously usually involved major projects whereby Rotterdammers had little or no involvement in the process, such as water retention in the Museumpark car park. Water plazas are projects that were already addressed in a more integrated way with the neighbourhood residents, but this still involves the public space.

The future lies with Rotterdammers in their own living environment. As 60% of the space in our city is privately owned, we will never achieve the climate targets by focusing only on measures in the public space. This is one of the most important findings that shapes this strategy. The key to a successful climate adaptation strategy also lies in the private sphere.

If we look at the breakdown of private property, the most important parties with whom we need to make agreements are the social housing corporations. In view of the anticipated substantial building challenge of 18,000 new homes in our city, project developers are also an important party with whom to make concrete agreements. A water-robust and climate-resilient design ultimately requires commitment from everyone: the city, the regional water authorities, social housing corporations, the private sector, community organisations and Rotterdammers.




*Ownership in Rotterdam*



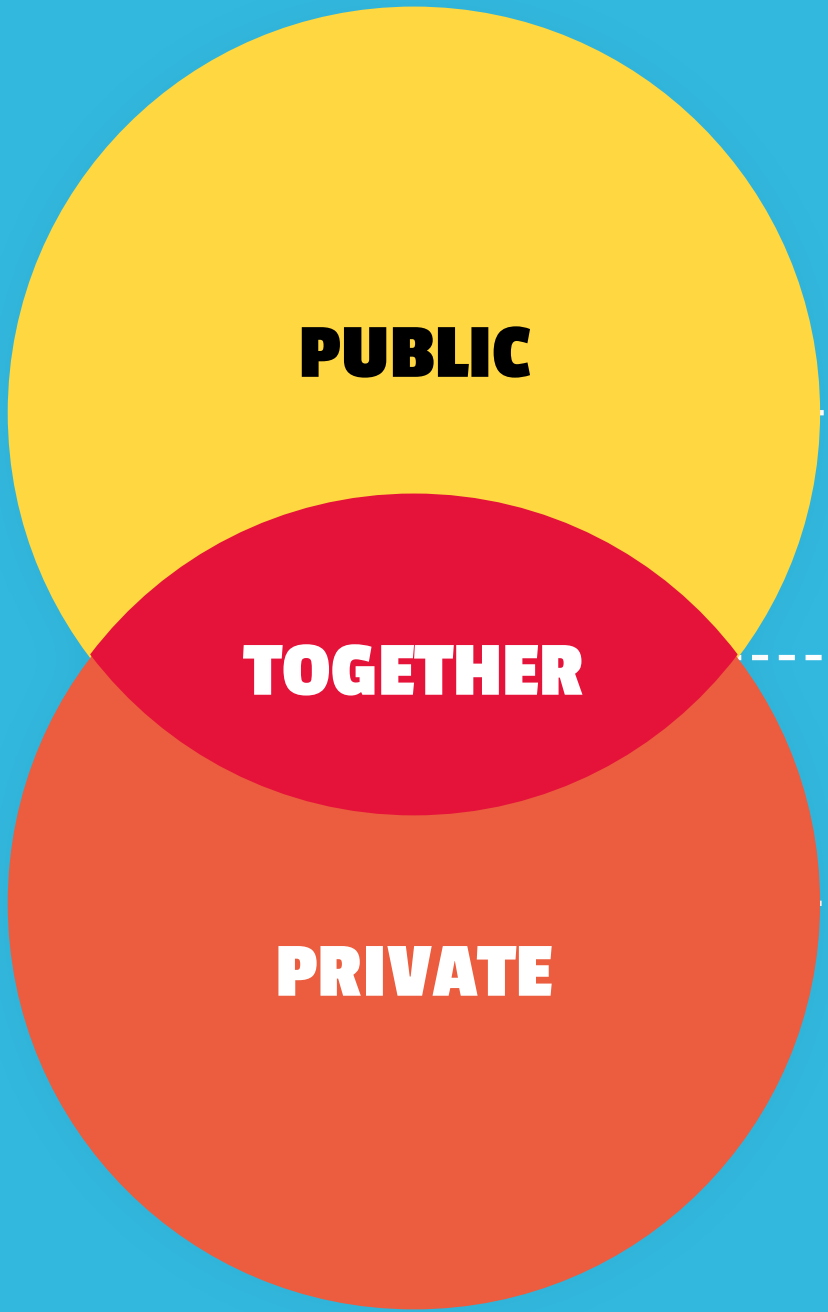

*Home ownership in Rotterdam*

### From strategy to practice

Three types of activity are needed in order to achieve the presented approach for each theme:

1. Activities aimed at the public space, for which the initiative lies primarily with public organisations;
2. Activities aimed at private space or property, for which the initiative lies primarily with private organisations or persons;
3. Activities where the link between public and private activities is explored together and furnished with added value.

Rotterdam Weatherwise differentiates between 10 categories of measures and activities. These will be elaborated further into an implementation programme over the coming period. The Rotterdam Weatherwise implementation agenda will list the activities for each district. We will do this together!




- Measures in public space
- Measures in public real estate
- Measures for schools and sports pitches
- Embedding in primary processes and organisation
- Innovation & example projects
- Development of knowledge and
- (inter-)regional collaboration

- Risk dialogue and district approach
- Broad communication

- Incentive scheme, regulations and agreements
- Multifunctional roofs

## 4.2 Communication

### External Communication

Engaging people and institutions does not happen of its own accord. Effort is required in order to be able to involve the 60% of Rotterdam that is privately owned. A high profile, awareness of the risks and projecting enjoyment are thereby crucial. A communications team will focus on effective communication and an appealing invitation to participate in climate solutions. Examples include being visible at festivals, markets, district and neighbourhood evenings and other events in the city, both offline and online. The communication strategy that forms part of Rotterdam Weatherwise ensures that people know how they can provide input, and on what subjects. Change is not brought about through compulsion, but because the change is appealing and is communicated in an appealing way. A coherent communication and marketing strategy will seek to establish a much closer link between climate adaptation and Rotterdammers, Rotterdam businesses, visitors to Rotterdam and the various programme partners. We are adopting a differentiated approach that therefore speaks to the residents in the different districts and with different characteristics in a different way.

The objectives of the joint or corresponding communication strategy are:

- We transform Rotterdam Weatherwise from a city plan into a joint plan by involving organisations and residents in the communication at an early stage.
- Discussing current and potential thresholds and local urban developments and (physical) developments.
- Inspiring and inviting residents to take action themselves.
- Facilitate and highlight local opportunities and initiatives, and showcase the results of citizens taking action.
- Expand and optimise the participation process with all stakeholders.
- The new relationship between the public authorities, citizens and businesses will be one of equal partners.

*A joint communication and marketing strategy is still in its infancy. This will be elaborated further over the coming years. The focus is on talking about and showing the development into a climate-resilient Rotterdam. This will be presented with appealing design and good content for neighbourhood meetings.*

An (advertising) campaign about climate change will be launched in 2020 that will serve as a pilot for Rotterdam Weatherwise. This campaign will be carried out in 2 districts. The knowledge acquired with this pilot serves as the basis for the city-wide communication.

### Internal communication

Rotterdam Weatherwise applies to almost all clusters of the City of Rotterdam. It is therefore important that the internal communication is also of a high standard. Climate-adapting action and resilience must be in the DNA of everyone who champions the city's public space and adaptability. We will therefore actively inform colleagues about Rotterdam Weatherwise and particularly about their role within it.

## 4.3 Finances

### Budget from existing strategy

Making and keeping the city climate-resilient requires additional resources. The water management basis is financed from the municipal sewer plan. This is used to maintain the sewerage system.

Climate adaptation measures that are not directly linked with the sewers cannot be funded from the sewerage levees. A new budget is required for this. The budget for a number of programmes such as the green roofs scheme and the water plazas is expected to run out in 2019.

### Budget from the Climate Adaptation Administrative Agreement

Cities, provinces, regional water authorities and central government signed the Climate Adaptation Administrative Agreement (Bestuursakkoord Klimaatadaptatie) on 20 November 2018. A total of 600 million euro will be made available over the coming years to make the Netherlands more able to deal with the effects of climate change. This budget serves to take extra steps and to design our streets, gardens and living space to be adaptive.

### Budget from European subsidies

The city council and partners in the city are participating in various European subsidy programmes which are enabling projects to be realised (Sponge, LIFE UrbanAdapt, Life@Urbanroofs, Interreg). Alongside a financial benefit, European collaboration also results in the development of knowledge. We will therefore continue to explore the possibilities of utilising European subsidy programmes over the coming years.

### Link with major transitions and programmes

Major transitions in the city offer synergistic benefits by linking projects that arise from city council programmes such as Riverside (Rivieroevers), Green Vision (Groenvisie), Energy Transition (Energietransitie) and Housing Challenge (Woningbouwopgave). By linking the various challenges together and combining activities in the city's districts, the budget is spent as efficiently as possible. The greenery challenge for 20 hectares during this council period is a good example. By introducing greenery in precisely those places that have a level of urgency because of heat and water-related disruption, both targets are met. Financial benefits of linking can therefore particularly be anticipated in the longer term. In the further elaboration of the urgency document, the implementation programme will be supplemented with a (partly) shared investment strategy.

The city council's investment must lead to (leverage) co-financing by other parties. The proposed climate incentive scheme requires investment by residents and professional private parties (e.g. companies). Agreements are proposed with social housing corporations about taking steps for climate-robust properties and public space which they own. Agreements will also be made with the regional water authorities about investments in the water system that contribute to a climate-resilient Rotterdam.

# IMPLEMENTATION of the proposed measures and activities

### Measures in public space

The public space in districts will be designed to be climate-adaptive by ensuring that projects incorporate climate-adaptive measures. By modifying the Rotterdam Style and including climate adaptation guidelines in the design planning procedures we ensure that climate-adaptive measures in the public space are applied consistently. These measures supplement the current design, for which additional budget is required.

**Ambition**

**The public space is designed to be climate-adaptive in 20% of the planned activities.**

### Measures in owned property

The city council will set a good example with its own properties. An assessment will be made of the properties where climate-adaptive measures would be effective, and a long-term plan will be drawn up to make city council properties climate-adaptive.

**Ambition**

**75 properties are made climate-adaptive.**

### Measures for schools and sports pitches

Most Rotterdam schoolyards are currently mainly paved. Schools spend as much time and money as possible on their main task: providing education. An action plan will be drawn up to help schools financially and practically with modifying their schoolyards. The temperature in the classrooms within school buildings may not get too high. Additional attention will be paid to this within the current 'Fresh Schools' (Frisse scholen) programme.

Children's farms, nature education gardens and playgrounds are also important green spaces within the city. As with climate-adaptive schoolyards, they offer a great educational value of which climate adaptation can form part.

We are also carrying out an exploration for sports pitches on how these intensively used sports facilities can be designed in a climate-resilient way. With all these measures we will reach all parts of Rotterdam's community.

**Ambition**

**12 of around 600 Rotterdam schoolyards and 10 sports pitches are designed in a climate-adaptive way.**

### Embedding in primary processes and organisation

Playing a directing role for the various climate themes requires civil servants with expertise. Experts who closely monitor developments within their field can identify and implement opportunities for Rotterdam.

Hence climate adaptation must be embedded by including it in working processes as standard. For example, incorporating climate adaptation frameworks and guidelines in the Schedule of Requirements for a Design Plan or maintenance project. Appointing climate ambassadors within the various clusters could form part of this.

One important area for attention when constructing 18,000 new homes is that they must all be climate-resilient. An action plan is being developed for this.

The city is responsible for a good link between public health and emergency services (Wpg - Public Health Act). We will ensure that (new) tasks resulting from climate change are identified. The preparation with partners in healthcare for climate disruption situations must also be embedded.

**Ambition**

**6 additional substantive FTEs within the civil service organisation. Also, more Rotterdam civil servants are able to incorporate climate adaptation in their daily work.**

### Innovation & example projects

We will execute a number of example projects to inspire Rotterdammers to get stuck in themselves and that are an icon for the transformation to a climate-adaptive city. Particular attention will thereby be paid to learning from the approach and looking ahead to scale up, as well as currently underexamined topics such as heat and groundwater management.

**Ambition**

**1 iconic project that can serve as an example for the future in the city, nationally and internationally.**

### Risk dialogue & district approach

Risk dialogues and district approaches will be developed together with the clusters Urban Management, City Development and Social Development, the area organisations, area committees, district councils, district committees, social housing corporations and partners in the district, starting with four districts. Discussions will take place with residents and users of each district based on the question of what opportunities there are for the district and which climate risks are acceptable. We will thereby make use of the risk, challenge and opportunities maps, amongst other things. Based on these discussions we will draw up an approach for each district. This will list the measures that we will take together in order to restrict the effects of climate change in the district.

**Ambition**

**A risk dialogue and district approach is drawn up in 15 of the 43 districts.**

### Broad communication

We want all Rotterdammers to be able to participate in making the city climate-resilient. This requires awareness and opportunities to act. We will therefore work with partners from the districts to develop a communication strategyand appropriate tools so that as many Rotterdammers as possible are aware of the possibilities. We will create a digital and physical platform where people can exchange knowledge, can inspire one another and can meet. In so doing, we will establish a link between the various districts.

Supporting small initiatives (street or neighbourhood level) to implement climate-adaptive measures also fits with this. We will share knowledge, provide information and facilitate space. We will pay specific attention to opportunities to link up (Water Sensitive approach).

**Ambition**

**An online and offline platform (app) with which Rotterdammers can obtain information about climate adaptation.**

### Incentive scheme, regulations and agreements

The aim of setting up a climate adaptation subsidy scheme is to encourage climate-adaptive measures in the existing urban area on private land. The subsidy is given for measures and activities that contribute to increasing the water retention capacity in the city, reducing the amount of rainwater in the sewers, countering warming of the city, countering the consequences of drought and increasing knowledge and awareness of climate change and climate adaptation amongst a wider audience. Alongside this broad subsidy scheme, specific schemes will be established for blue green roofs and climate-resilient schoolyards.

As well as encouraging and inviting, we will also work to embed climate adaptation into (building) regulations. The development of the environmental vision offers the right opportunity for this. We will explore possibilities and make agreements about embedding in collaboration with the Rotterdam environmental vision team and other experts. Action will also be taken with respect to national regulators with regard to national regulations.

Agreements are made every year with social housing corporations about various subjects. We will ensure the climate adaptation becomes a fixed element in these agreements.

**Ambition**

**225 subsidised projects by individuals and 225 companies (incl. social housing corporations) in the private space in order to encourage climate adaptation.**

### Development of knowledge & (inter-)regional collaboration

A solid knowledge base, a firm coordinating role and ongoing collaboration with knowledge institutions are required in order to achieve a climate-adaptive Rotterdam. We will therefore draw up a research programme in conjunction with knowledge providers from universities and experts from research institutes such as Erasmus MC.

Rotterdam is a global and national pioneer with regard to climate adaptation. At the same time we can also learn from the experiences in other (pioneer) cities. Our position offers opportunities for co-financing from the EU and other sources. We are therefore making an active contribution to international, European and national networks (incl. C40, 100 Resilient Cities, Connecting Delta Cities). An activities agenda will be drawn up and executed in collaboration with Rotterdam Partners and others and in line with the city council's international policy. We will also ensure that lessons learned are applied internally on subsequent projects.

**Ambition**

**Develop further knowledge about flood risk management and flooding. Gather new knowledge about other themes. Partly by being active in (inter)national networks.**

### Multifunctional roofs

The multifunctional roofs programme has been running for some time in Rotterdam. The 14.5 km² of flat roofs in Rotterdam can be a significant solution for multiple themes in Rotterdam Weatherwise.

**Ambition**

**150.000 m² of extra blue green roofs.**

# ROTTERDAM WEATHER WISE

## URGENCY DOCUMENT