LIFE @Urban Roofs

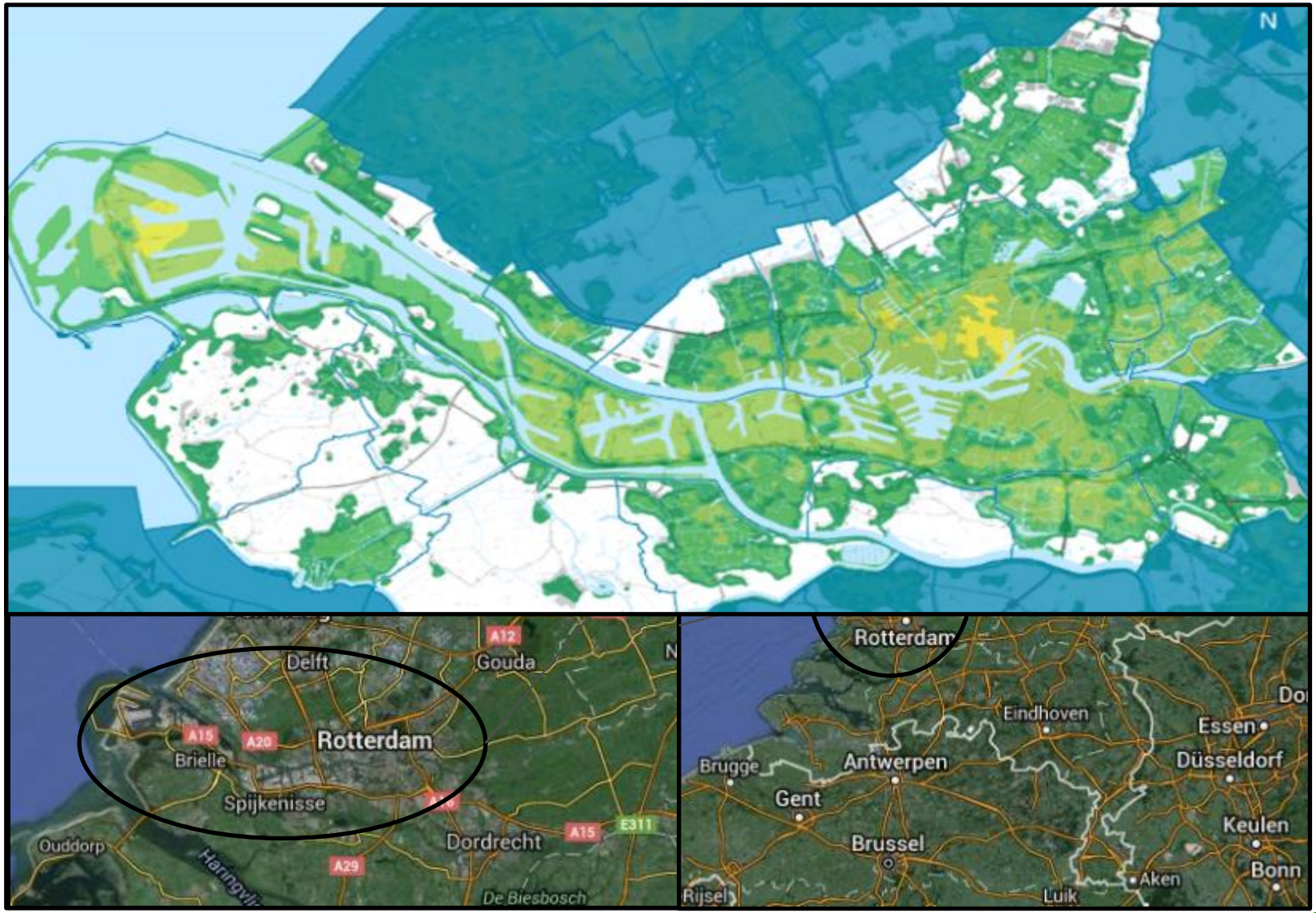
stimulating private investment in climate adaptation - who's afraid of red, yellow, green and blue

Paul van Roosmalen - Rotterdam Municipality, The Netherlands

LIFE @Urban Roofs Rotterdam

Ukraine Green Recovery Conference
Vilnius, Lithuania

Rotterdam, the Netherlands



Gemeente Rotterdam

History

Urban Challenges

Gemeente Rotterdam

Roofs provide space

DE URBANISTEN

Gemeente Rotterdam

Rooftop functions

Green roofs provide space for nature.

Blue roofs retain rain water.

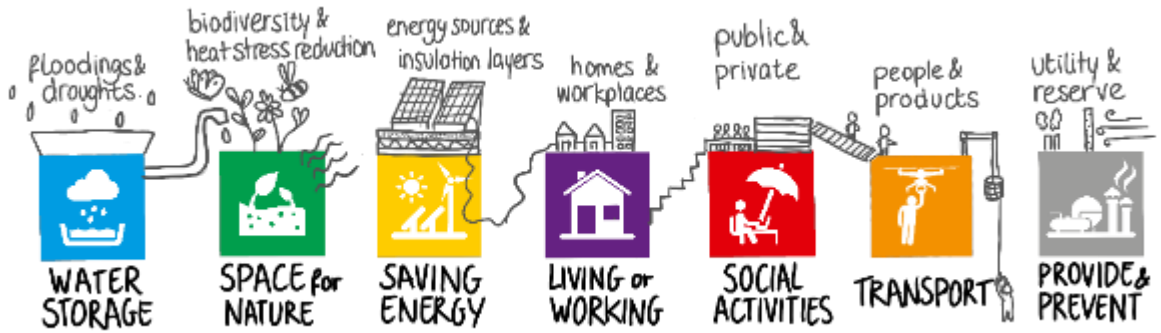
Yellow roofs produce renewable energy.

Red roofs offer social functions.

Orange roofs are used for mobility.

Purple roofs are used for densification.

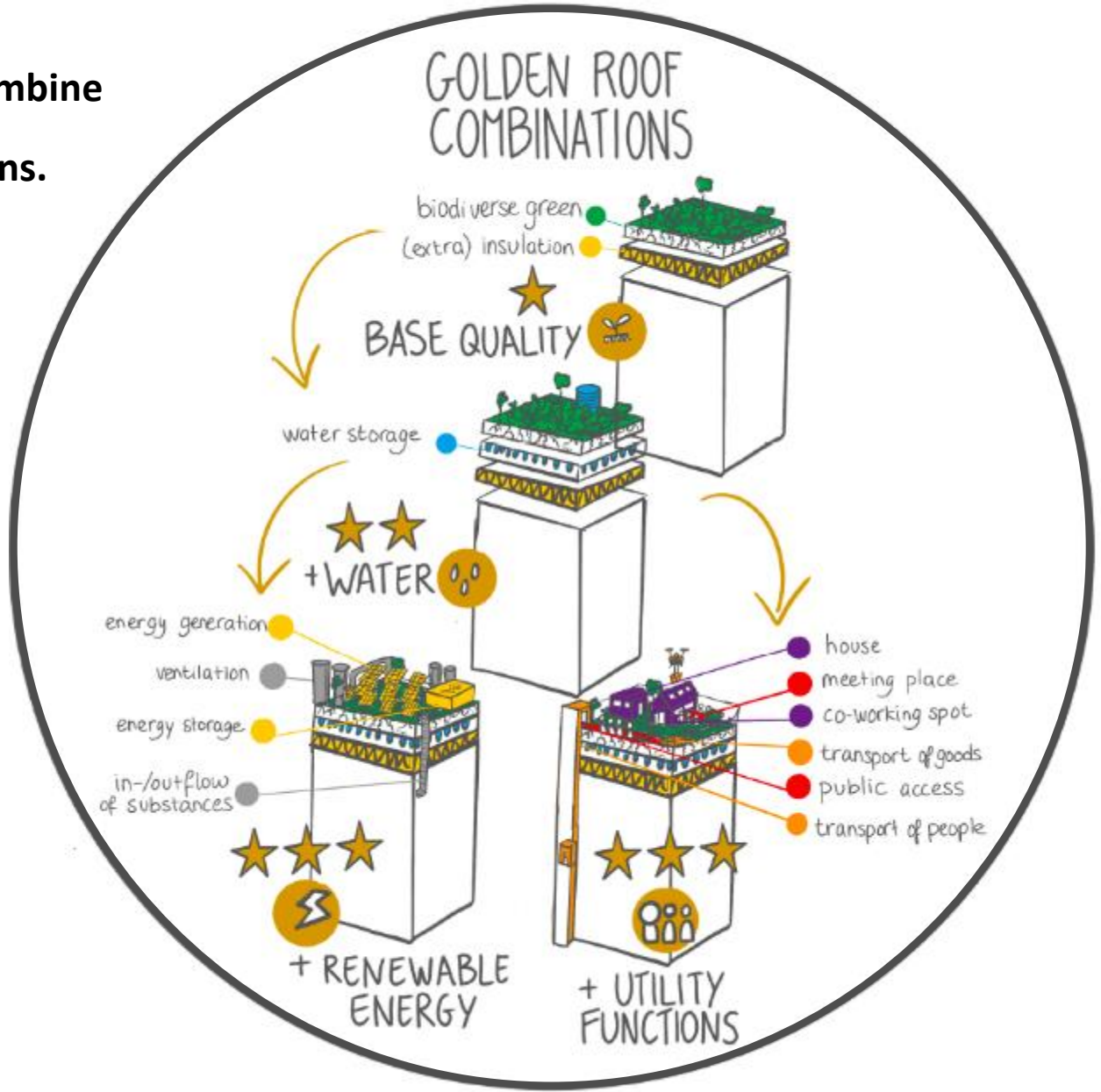
Grey roofs offer utilities en reserve capacity.



Gemeente Rotterdam

Golden combinations

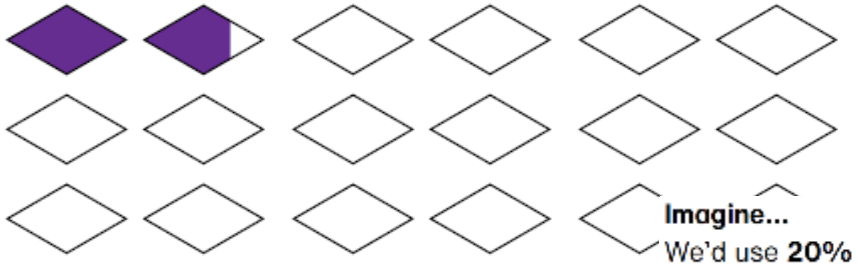
Golden roofs combine multiple functions.



Gemeente Rotterdam

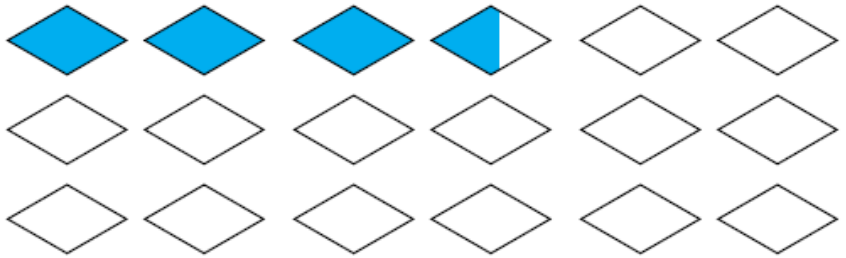
The battle for space

Imagine...
We'd use **10%** of the (Rotterdam) rooftop landscape for housing...

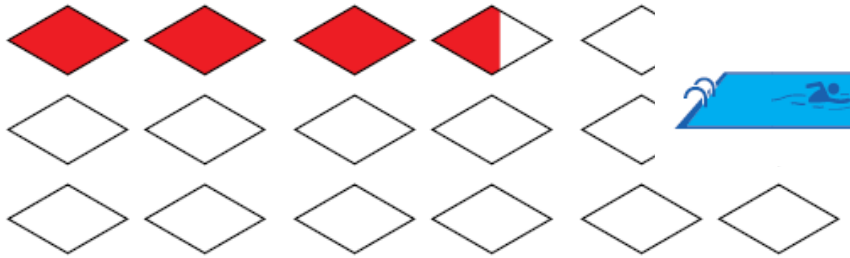


= **15,000 homes**
15.000 woningen

Imagine...
We'd use **20%** of the (Rotterdam) rooftop landscape for water storage...



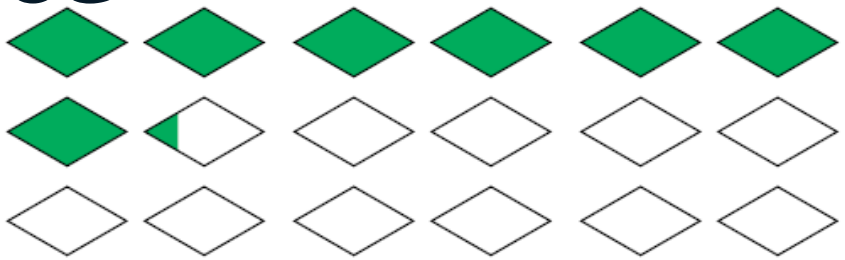
= **100 olympic pools**
100 olympische zwembaden



= **500 football fields**
500 voetbalvelden

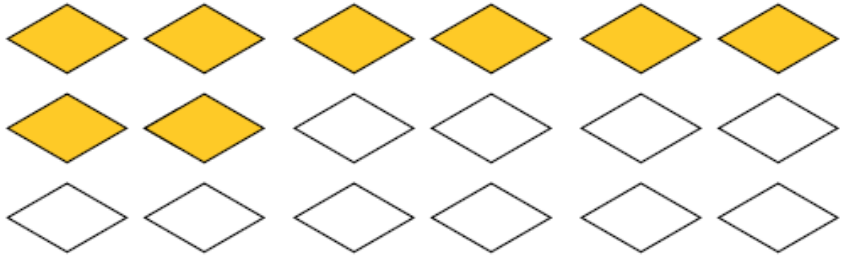
MVRDV

Imagine...
We'd use **40%** of the (Rotterdam) rooftop landscape for greenery...



= **2 times Central Park NY**
2 keer Central Park NY

Imagine...
We'd use **45%** of the (Rotterdam) rooftop landscape for solar power generation...



= **1,000,000 households**
1.000.000 huishoudens

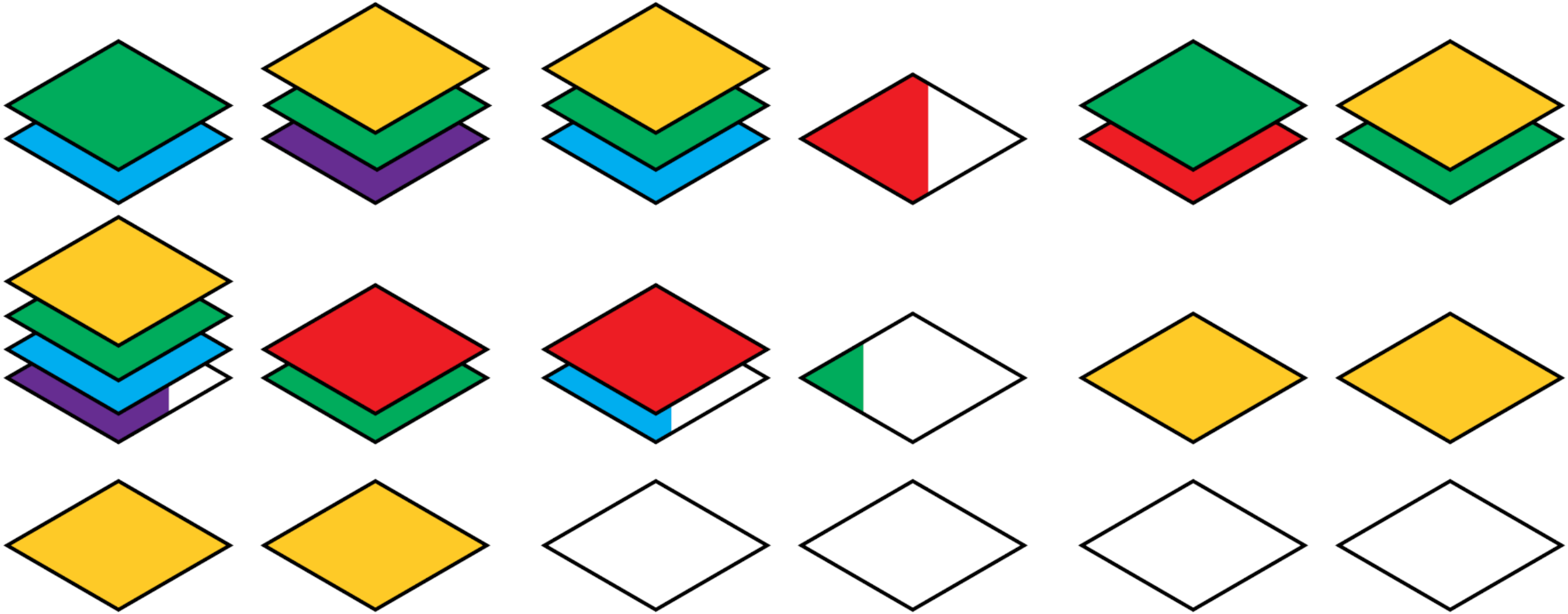
= 1km2

Gemeente Rotterdam

Integral approach

Imagine...

We'd combine all this potential to one multifunctional roofscape...



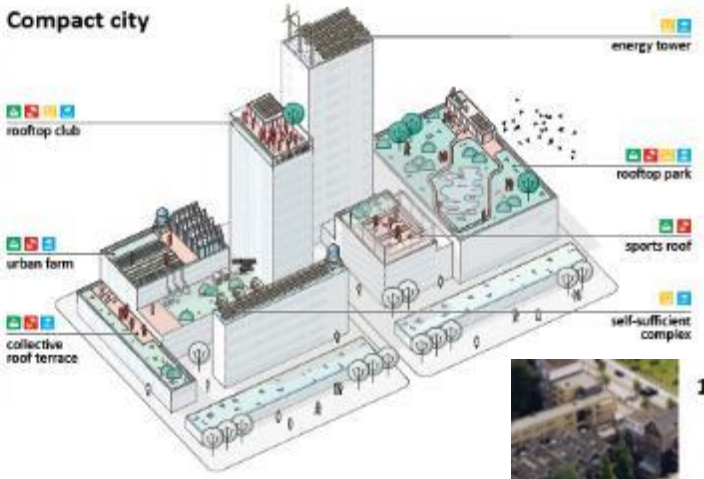
MVRDV

= 1km2

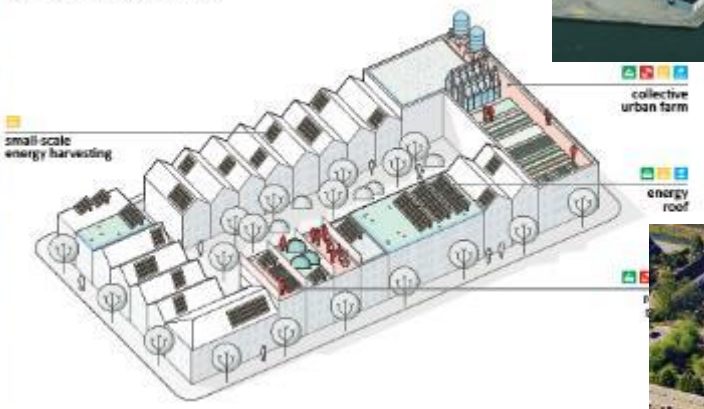
Gemeente Rotterdam

Area-oriented

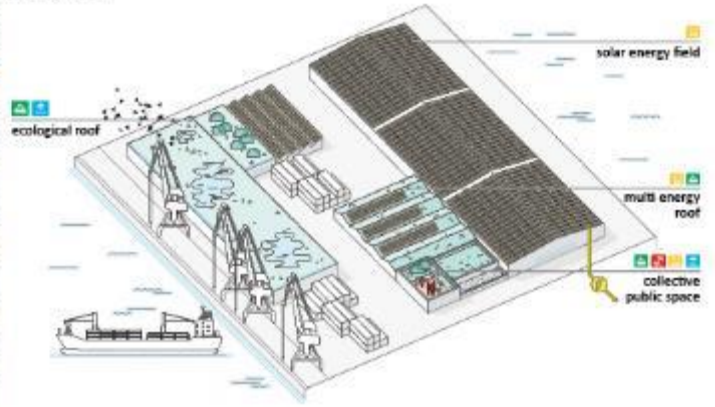
Compact city



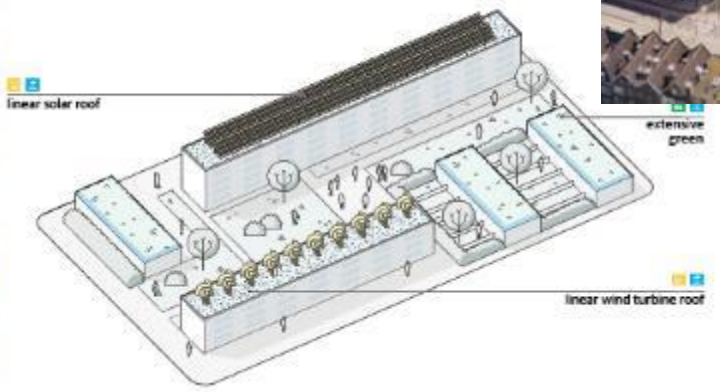
19th century district



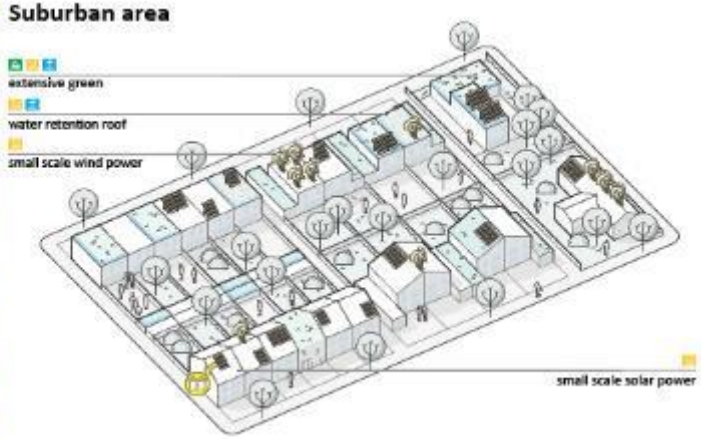
Harbour



Post-war district



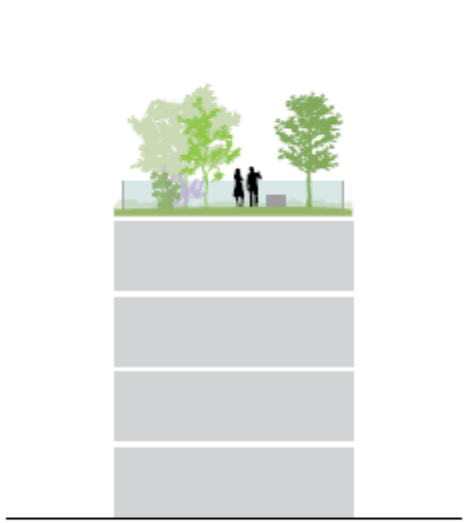
Suburban area



DE URBANISTEN

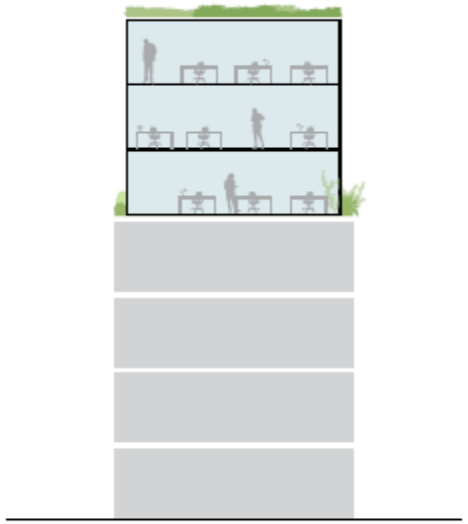
Gemeente Rotterdam

Functional benefits

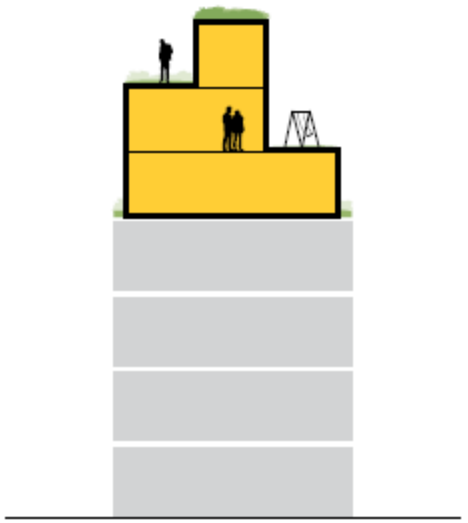


Adding (private) gardens [often in short supply in the city centre]

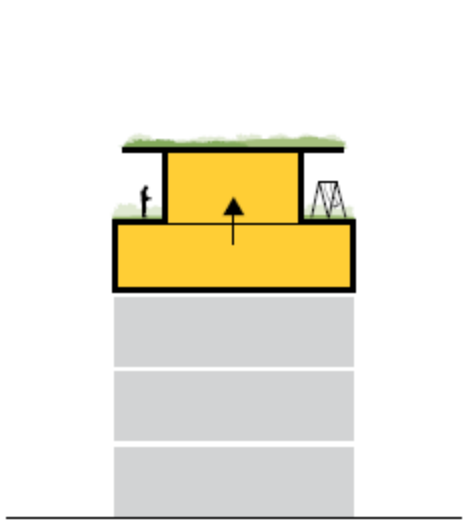
Adding facilities for the block



Adding another function for the purpose of a 16-hour neighbourhood



Adding a new type of housing for a more inclusive neighbourhood

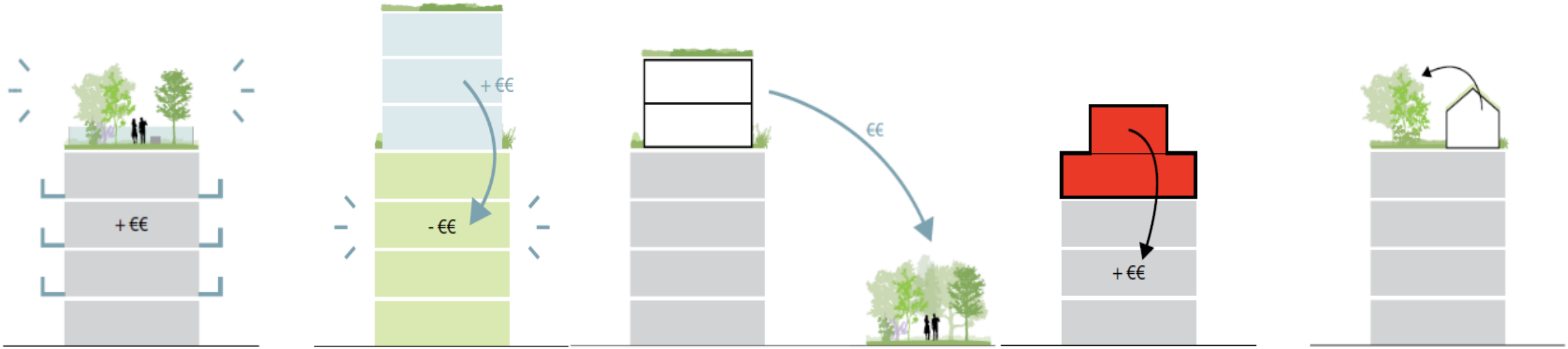


Expanding homes to keep people in the neighbourhood (reducing the need for people to move)

MVRDV

Gemeente Rotterdam

Financial benefits



Increasing value of building below

Generating income for the Owners Association and making the rooftop more sustainable

Contribution new construction for making the street level more green

Contribution new construction to make building below more sustainable

Contribution for community functions on the rooftop

MVRDV

Gemeente Rotterdam

Value based approach

- Real estate value
- Avoided healthcare
- Avoided workloss
- Biodiversity
- Heat-stress
- Reduction of particulates
- CO2 emissions
- Air quality
- Renewable energy
- BREEAM
- Water retention
- Alternative land use due to water retention
- Cultural history
- Water quality
- Water reuse
- Living space
- Exploitation
- Social cohesion
- Climate awareness
- Business climate
- Image
- Mobility

Green roofs provide a green environment and are useful in cases of extreme dry, hot and wet weather.

	Input	
How much surface area would you like to cover?	1500	m²
How many people have a view onto your roof?	meer dan 100	persons
Are you combining multiple types of green roofs?	Yes	

If you select "No", the tool will assume you will use a extensive or sedum-roof.

What type of green roof would you like to use?

How does a green roof work?	Type 1 Sedumroof	Type 2 Nature roof	Type 3 Roof garden

**multiple types are possible*

Sedumroof — 500 m²

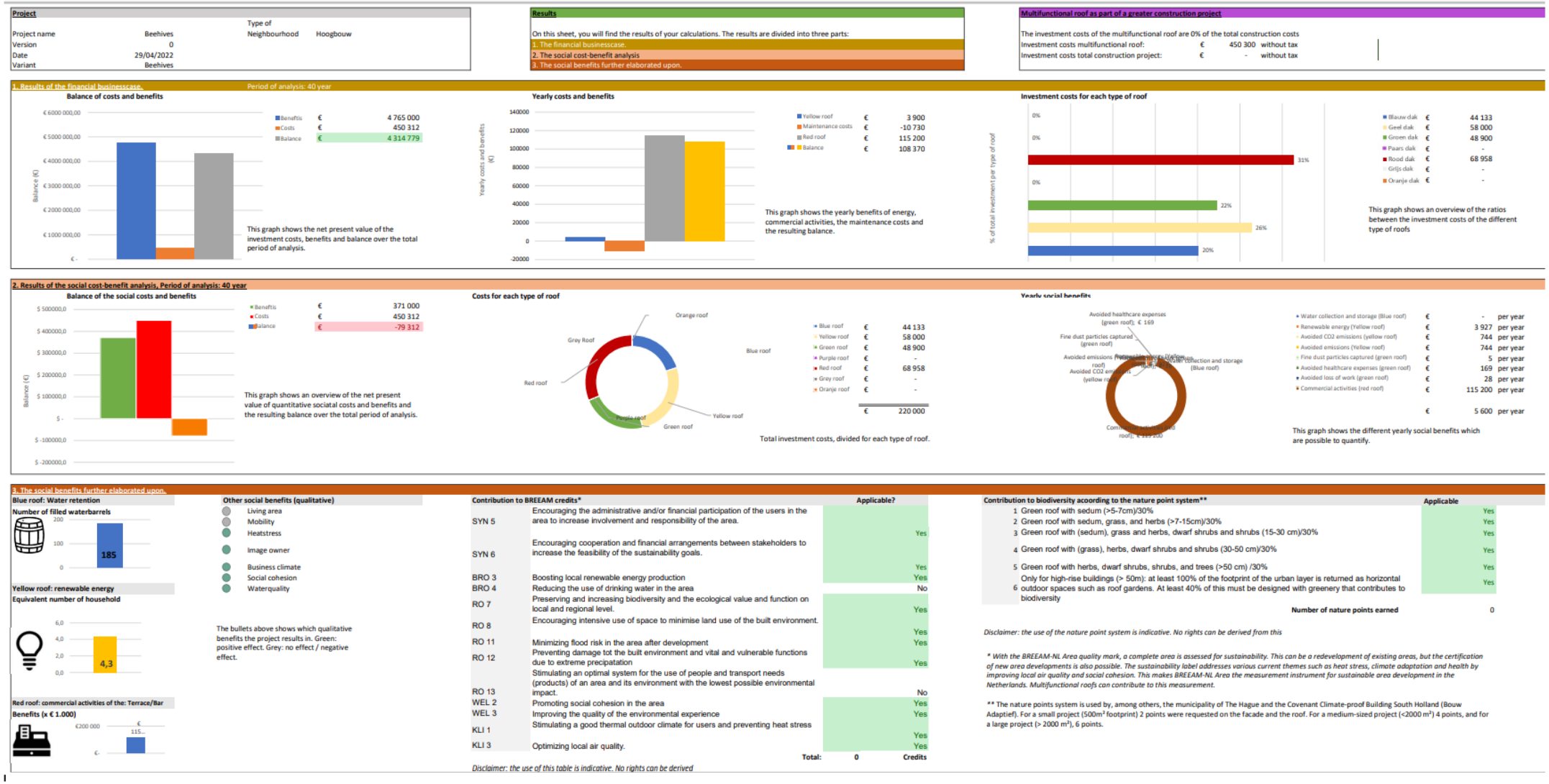
Costs			
Investment costs	€	50,00	per m² without tax
Yearly maintenance costs	€	1,20	per m² without tax
Replacement period (after X years)		60	Year

An extensive green or sedum roof system contains vegetation, ranging from sedums to small grasses, herbs and flowering herbaceous plant.

Total			
Surface area green roof		1.450	m²
Investment costs	€	103.800	without tax
Maintenance costs	€	2.180	without tax per year

ARCADIS CE Delft Gemeente Rotterdam

Value based approach



Project

Project name	Beehives	Type of Neighbourhood	Hoogbouw
Version	0		
Date	29/04/2022		
Variant	Beehives		

Results

On this sheet, you will find the results of your calculations. The results are divided into three parts:
1. The financial businesscase.
2. The social cost-benefit analysis
3. The social benefits further elaborated upon.

Multifunctional roof as part of a greater construction project

The investment costs of the multifunctional roof are 0% of the total construction costs

Investment costs multifunctional roof:	€	450 300	without tax
Investment costs total construction project:	€	-	without tax

1. Results of the financial businesscase — Period of analysis: 40 year

Balance of costs and benefits

Benefits	€	4 765 000
Costs	€	450 312
Balance	€	4 314 779

This graph shows the net present value of the investment costs, benefits and balance over the total period of analysis.

Yearly costs and benefits

Yellow roof	€	3 900
Maintenance costs	€	-10 730
Red roof	€	115 200
Balance	€	108 370

This graph shows the yearly benefits of energy, commercial activities, the maintenance costs and the resulting balance.

Investment costs for each type of roof

Blauw dak	€	44 133
Geel dak	€	58 000
Groen dak	€	48 900
Paars dak	€	-
Rood dak	€	68 958
Grijs dak	€	-
Oranje dak	€	-

This graph shows an overview of the ratios between the investment costs of the different type of roofs

2. Results of the social cost-benefit analysis, Period of analysis: 40 year

Balance of the social costs and benefits

Benefits	€	371 000
Costs	€	450 312
Balance	€	-79 312

This graph shows an overview of the net present value of quantitative sociatal costs and benefits and the resulting balance over the total period of analysis.

Costs for each type of roof

Blue roof	€	44 133
Yellow roof	€	58 000
Green roof	€	48 900
Purple roof	€	-
Red roof	€	68 958
Grey roof	€	-
Oranje roof	€	-
	€	220 000

Total investment costs, divided for each type of roof.

Yearly social benefits

Water collection and storage (Blue roof)	€	-	per year
Renewable energy (Yellow roof)	€	3 927	per year
Avoided CO2 emissions (yellow roof)	€	744	per year
Avoided emissions (Yellow roof)	€	744	per year
Fine dust particles captured (green roof)	€	5	per year
Avoided healthcare expenses (green roof)	€	169	per year
Avoided loss of work (green roof)	€	28	per year
Commercial activities (red roof)	€	115 200	per year
	€	5 600	per year

This graph shows the different yearly social benefits which are possible to quantify.

3. The social benefits further elaborated upon

Blue roof: Water retention

Number of filled waterbarrels: 185

Yellow roof: renewable energy

Equivalent number of household: 4,3

Red roof: commercial activities of the: Terrace/Bar

Benefits (x € 1.000)

Other social benefits (qualitative)

- Living area
- Mobility
- Heatstress
- Image owner
- Business climate
- Social cohesion
- Waterquality

The bullets above shows which qualitative benefits the project results in. Green: positive effect. Grey: no effect / negative effect.

Contribution to BREEAM credits*

		Applicable?
SYN 5	Encouraging the administrative and/or financial participation of the users in the area to increase involvement and responsibility of the area.	Yes
SYN 6	Encouraging cooperation and financial arrangements between stakeholders to increase the feasibility of the sustainability goals.	Yes
BRO 3	Boosting local renewable energy production	Yes
BRO 4	Reducing the use of drinking water in the area	No
RO 7	Preserving and increasing biodiversity and the ecological value and function on local and regional level.	Yes
RO 8	Encouraging intensive use of space to minimise land use of the built environment.	Yes
RO 11	Minimizing flood risk in the area after development	Yes
RO 12	Preventing damage tot the built environment and vital and vulnerable functions due to extreme precipatation	Yes
RO 13	Stimulating an optimal system for the use of people and transport needs (products) of an area and its environment with the lowest possible environmental impact.	No
WEL 2	Promoting social cohesion in the area	Yes
WEL 3	Improving the quality of the environmental experience	Yes
KLI 1	Stimulating a good thermal outdoor climate for users and preventing heat stress	Yes
KLI 3	Optimizing local air quality.	Yes
	Total:	**0** **Credits**

Disclaimer: the use of this table is indicative. No rights can be derived

Contribution to biodiversity acoording to the nature point system**

		Applicable
1	Green roof with sedum (>5-7cm)/30%	Yes
2	Green roof with sedum, grass, and herbs (>7-15cm)/30%	Yes
3	Green roof with (sedum), grass and herbs, dwarf shrubs and shrubs (15-30 cm)/30%	Yes
4	Green roof with (grass), herbs, dwarf shrubs and shrubs (30-50 cm)/30%	Yes
5	Green roof with herbs, dwarf shrubs, shrubs, and trees (>50 cm) /30%	Yes
6	Only for high-rise buildings (> 50m): at least 100% of the footprint of the urban layer is returned as horizontal outdoor spaces such as roof gardens. At least 40% of this must be designed with greenery that contributes to biodiversity	Yes
	Number of nature points earned	0

Disclaimer: the use of the nature point system is indicative. No rights can be derived from this

** With the BREEAM-NL Area quality mark, a complete area is assessed for sustainability. This can be a redevelopment of existing areas, but the certification of new area developments is also possible. The sustainability label addresses various current themes such as heat stress, climate adaptation and health by improving local air quality and social cohesion. This makes BREEAM-NL Area the measurement instrument for sustainable area development in the Netherlands. Multifunctional roofs can contribute to this measurement.*

** The nature points system is used by, among others, the municipality of The Hague and the Covenant Climate-proof Building South Holland (Bouw Adaptief). For a small project (500m² footprint) 2 points were requested on the facade and the roof. For a medium-sized project (<2000 m²) 4 points, and for a large project (> 2000 m²), 6 points.

LIFE@URBAN ROOFS ROTTERDAM

ARCADIS

CE Delft

Gemeente Rotterdam

LIFE Project Peperklip

Gemeente Rotterdam

LIFE Project De Heuvel

LIFE@URBAN ROOFS

Gemeente Rotterdam

LIFE Project De Doelen

LIFE@URBAN ROOFS

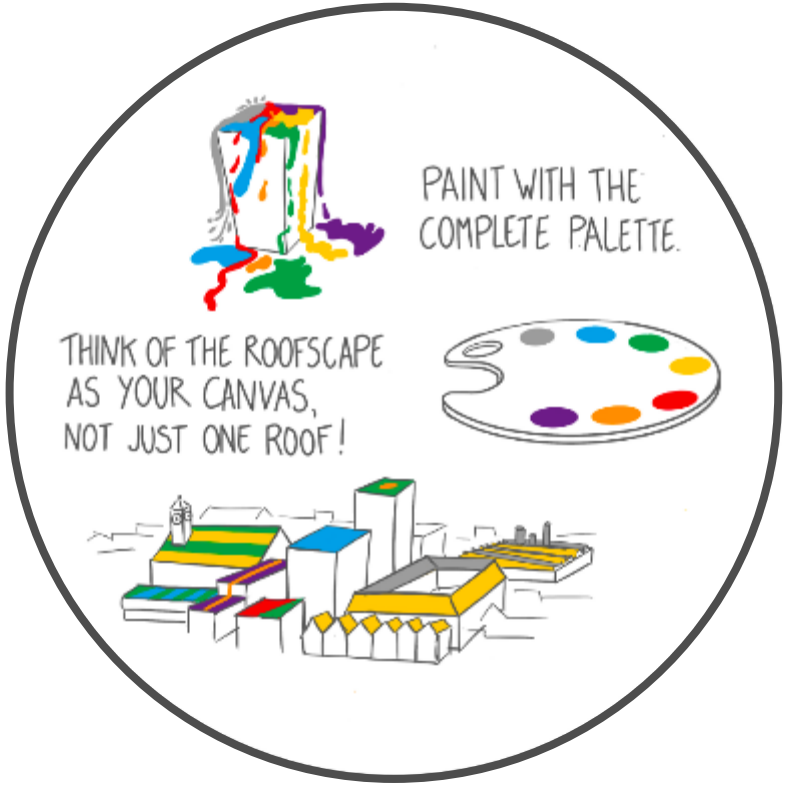
Gemeente Rotterdam

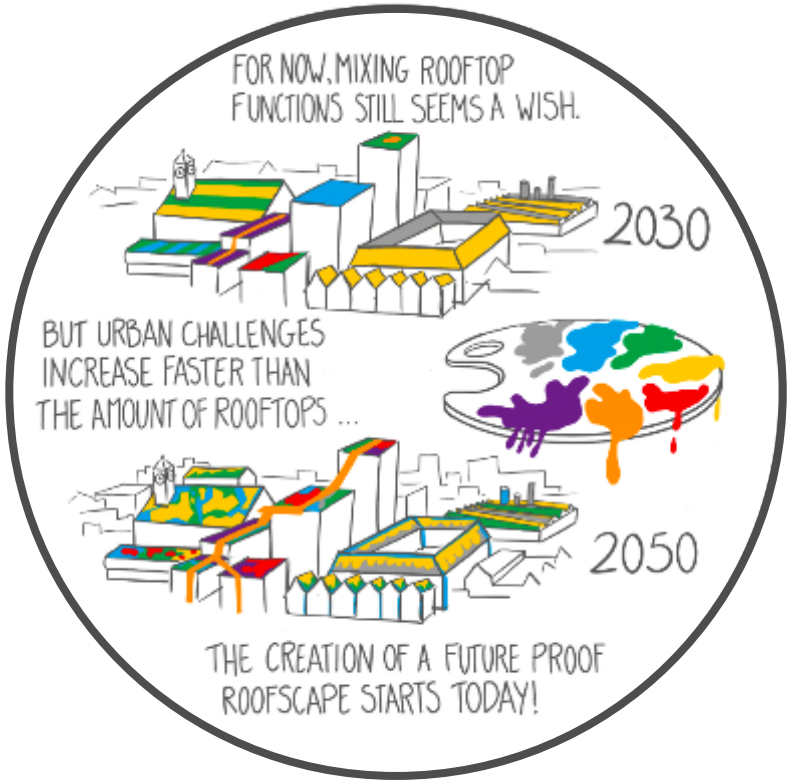
LIFE Project Experimental roof

LIFE@URBAN ROOFS

Gemeente Rotterdam

Start in 1-2-3





Gemeente Rotterdam

Thanks
for your attention.

Name.	**Paul van Roosmalen MSc.**
Function.	Programme manager Multifunctional Roofs
Email.	pap.vanroosmalen@rotterdam.nl
LIFE project.	LIFE@Urban Roofs
LIFE code.	LIFE16 CCA/NL/000096