

# OPPORTUNITIES FOR A SUSTAINABLE ROTTERDAM ROOFSCAPE

Rotterdam has a unique roof landscape created by historic events. After the 2nd world war, a lot of flat roofs have been built ranging from low rise buildings in the harbour to high rise buildings in the city centre. Rotterdam consists of 14.5 km<sup>2</sup> of flat roofs. All these roofs – From flat to inclined and from large to small – offer much more possibilities than expected. The municipality of Rotterdam wants to encourage citizens to actively use their rooftops. With joint forces, a colourful and unique roof landscape can arise in Rotterdam.

In a busy city with a high density, the roof landscape provides space for a multifunctional use. A potential that demands to be exploited. Rotterdam has challenges in terms of water storage, cooling and greening the city and generating sustainable energy. The roofs of the city offer plenty of space to deal with these challenges. The Rotterdam roof landscape is also perfectly suitable for urban activities, such as private terraces and public rooftop parks.

## DIFFERENT TYPES OF SUSTAINABLE ROOFS



Green roofs are vegetated roofs. These can be extensive; for example a sedum roof or a grass roof. An intensive green roof is accessible and contains a broad mix of plants.



Blue roofs buffer extra rainwater in times of heavy precipitation. These roofs often have a special collecting system below a layer of vegetation.



Red roofs are actively used for purposes such as sports, parties, meetings and receptions.



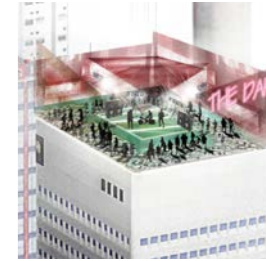
On yellow roofs sustainable energy is generated, e.g. with solar panels or urban wind turbines.



Roofs on high rise buildings offer space for seclusion and concentration, unique views and new insight



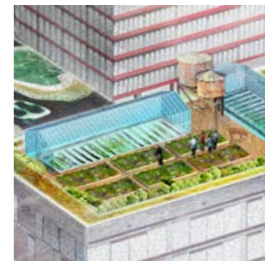
Roofs on high rise buildings are suitable for biodiversity; they are unreachable and provide overview for hunting animals and shelter for prey



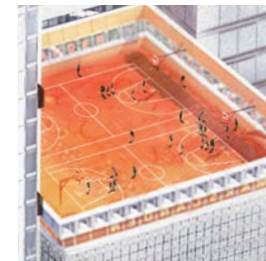
Roofs on high rise buildings are places for celebration and fun with the skyline as scenery.



Roofs on high rise buildings are highly exposed to wind, especially if they are oriented directly west



Solid, firmly constructed, roofs are revived through urban agriculture



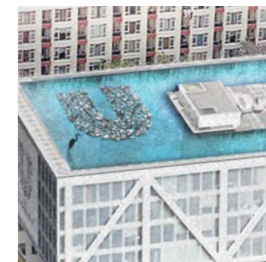
Large roofs of parking garages offer space for sports landscapes



Large commercial buildings are enriched with public roof top parks



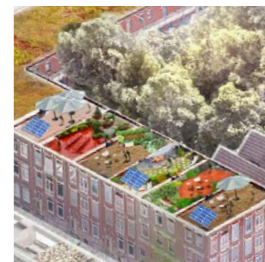
Aesthetic roof gardens contrast with the bold scenery of the city



The blue roof reflects the ever changing Rotterdam sky



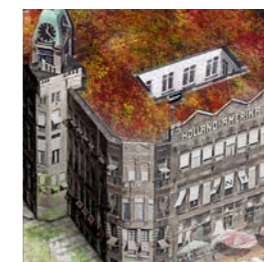
An energy landscape follows the urban composition of the post-war district, characterised by repetitiveness



The 19th century building block has a colourful and intensively used roof landscape



The suburban street has an efficient roof landscape



A monument also gives opportunities for a sustainable roof



There is space for large-scale energy harvesting in solar fields on the roofs of warehouses in the harbour



There is space for large scale roof ecology in the stony logistical area of the harbour

# OPPORTUNITIES FOR A SUSTAINABLE ROTTERDAM ROOFSCAPE

## EACH TYPE OF NEIGHBOURHOOD OFFERS DIFFERENT POSSIBILITIES

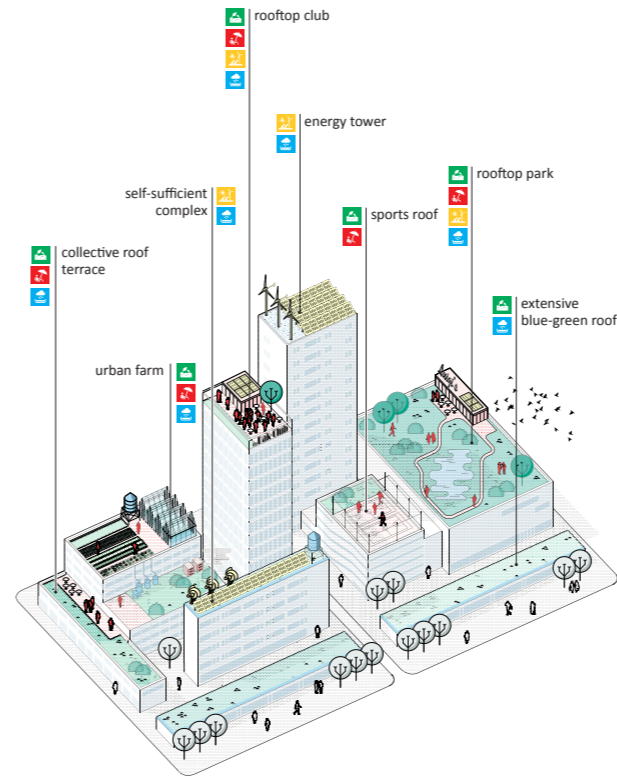
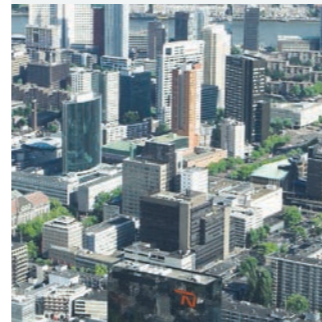


HARBOUR POST-WAR DISTRICT COMPACT CITY 19TH CENTURY DISTRICT SUBURBS



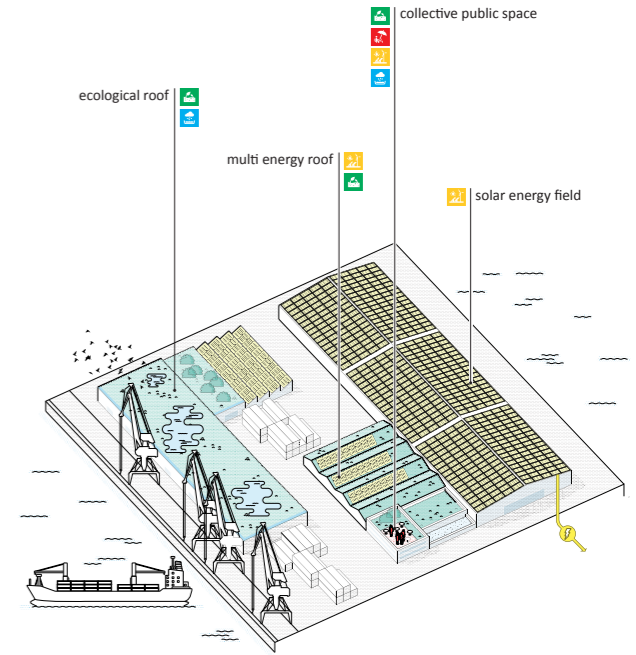
### COMPACT CITY Diversity and urban life

The compact city offers a various urban roof landscape with varying potential for sustainable use of roofs. The density of the built environment and the population density are high in the compact city, the amount of public space is limited. The roof landscape can be seen as an extension of the public realm at ground level. Differing activities are possible, depending on height and the size of the roof surface. This applies in particular to public buildings and offices. Residential buildings offer opportunities for collective use of the roof. Various forms of greening, ranging from park to sedum offer an attractive view. The stony urban character makes that roofs are suitable for retaining and possibly reusing water. The roofs of tall buildings catch more wind and have no shade making them suitable for energy production.



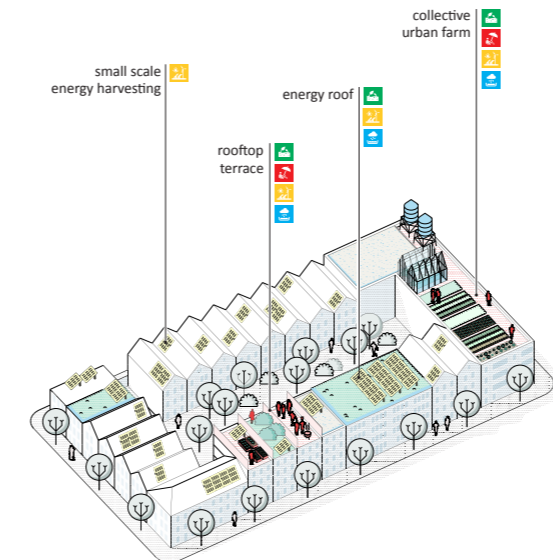
### HARBOUR Efficiency and large scale

The harbours of Rotterdam are characterized by a functional structure and organisation. Large scale contiguous buildings are surrounded by pavement, necessary for infrastructure and logistics space. Together they form an almost completely paved context. By greening roofs here, in intensive or extensive form, the ecological potential of the harbour can be increased considerably in combination with energy saving and reduction of the urban heat island effect, which occurs here in the summer. The large roof areas are also suitable for substantial energy harvesting by means of placement of solar panels on a large scale. Structural integrity and the context of buildings determine the most appropriate rooftop functions.



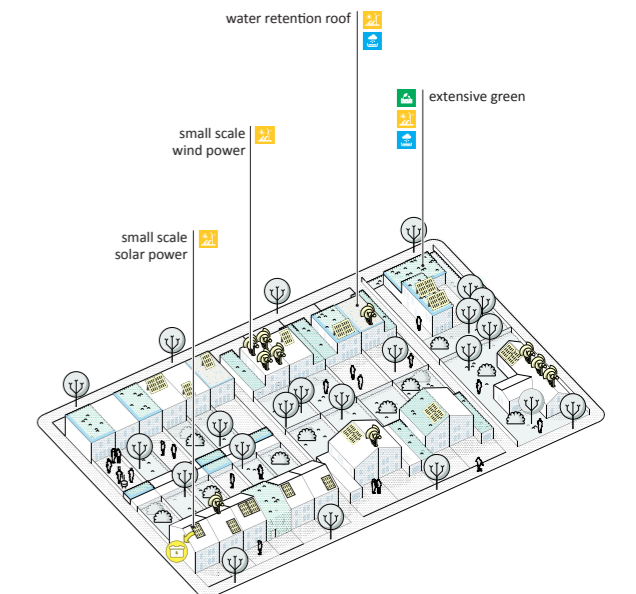
### 19TH CENTURY DISTRICT Mix of private and collective initiatives

These urban districts with closed building blocks have high pressure on public space. As a result, the roof is a suitable place for human activity e.g. as a roof terrace or a vegetable garden. The larger volumes may provide integral use, for example through urban agriculture on a collective scale. This only applies to buildings with a flat roof. These surfaces are also suitable for retaining and re-using rainwater. Pitched roofs can be used to produce energy. All these ingredients make the roof landscape of the 19th century district a rich and diverse mix of private and collective initiatives.



### SUBURBS Private initiatives

The suburban areas mainly consist of ground level homes with gardens. The low density of the built environment and low population density provide little reason for activities on roofs. Roofs can be used more efficiently for saving energy. Installing solar panels connected to a privately owned battery lowers the energy bills. Small wind turbines have a similar effect. Extensive green roofs insulate and cool homes, thus lower energy costs. Households increasingly generate their own energy demand. Homes with a mostly paved front and back garden can be provided with a water retention roof, a roof that (temporarily) stores rainwater.



### POST-WAR DISTRICT Collectivity and efficiency

The post-war neighbourhoods with their repetitive character have a particular plan based approach. There are many green spaces in these districts. A roof that can be functionally used for energy saving is particularly interesting, given the social composition of the population in these districts. By means of placing solar panels or small wind turbines in line with the modern design of the buildings, they support the urban composition. Extensive greening contributes to the insulation and cooling of homes and also provides a more attractive view for higher apartments. The power efficient interventions can be combined with water retention

