NATURE 4 CITIES

Be Part of the Green Transition

Urban Assessment Module of N4C Platform

GREENPASS®

NATURE 4 CITIES

GREENPASS®

Simplified
Urban
Assessment
Tool
(SUA Tool)

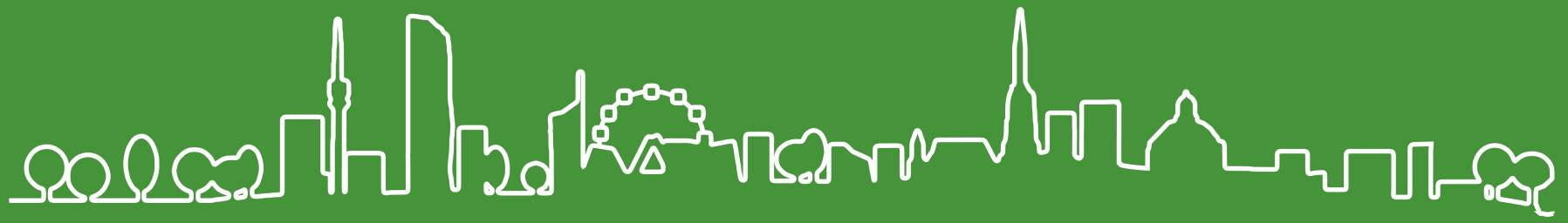
GREENPASS®

colouree

EMBBox

under grant agreement No 730468

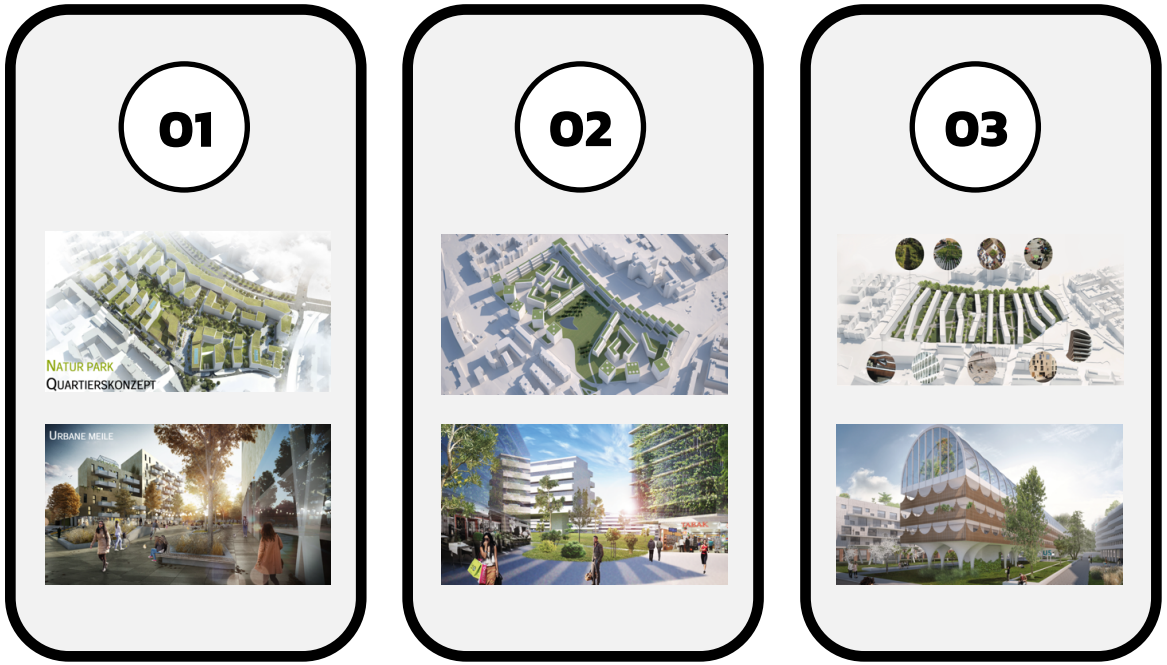
GREEN Performance Assessment SyStem



Most climate-resilient?

FIND THE BEST DESIGN

regarding climate-resilience



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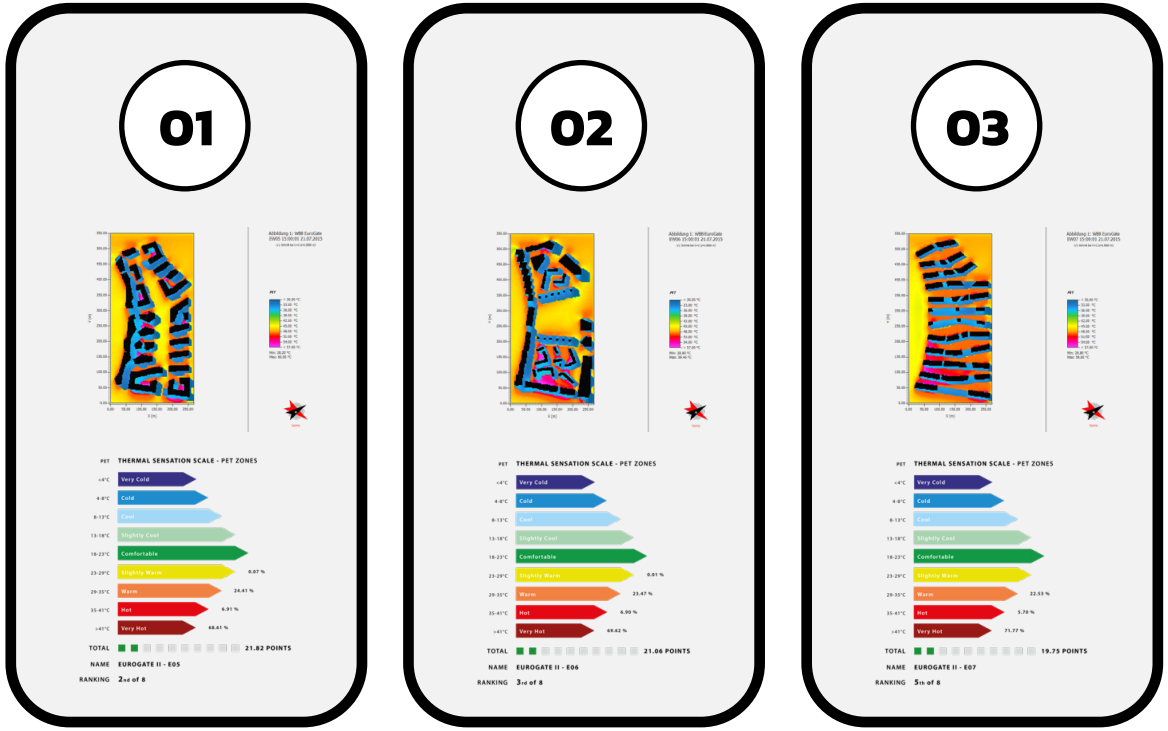
GREENPASS® enables

FACT-BASED DECISION MAKING

in each planning or competition phase



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All-in-one Software-as-a-Service

for

Developer

Architects

Municipalities

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GREENPASS®

enables

Design

climate-fit urban development and architecture

Evaluation

of impacts of buildings, urban structures, materials and Nature Based Solutions (NBS) on environment and humans

Optimization

by enhancing cost-effectiveness and performance of projects

Certification

by offering the 1st international certification standard for climate-resilient urban development

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Solution standardized evaluation for urban development

NATURE 4 CITIES

6 urban challenges

4 tools

1 software and certification

GREENPASS®

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1-STOP-SHOP for urban enviromental assessment

NATURE 4 CITIES

Input from CAD/GIS	Standardized process	Expert simulation	Performance optimization

GREENPASS® Editor

client & partner

GREENPASS®

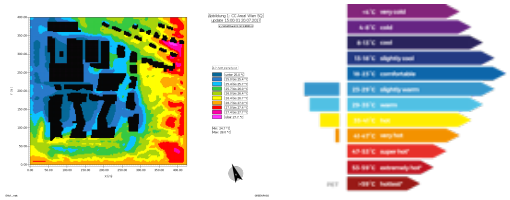
GREENPASS® KPIs

ENVI _MET

Rheologic

microclimate and wind

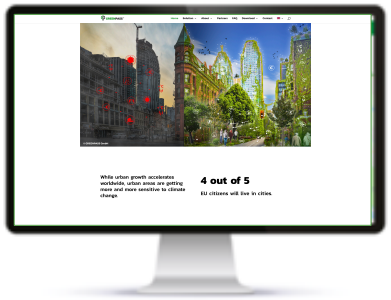
client



fact-based results for decision making

now

future



1-STOP-SHOP

service portfolio extension

GREENPASS®
Urban climate control system
1st pilot disctrict in Vienna

GREENPASS®
3D editor with ML, AI and Live-Accounting system

under development

future development

GREENPASS® MICRO

ENVI _MET

GREENPASS® WATER

MIKE Powered by DHI

GREENPASS® NOISE

NoiseModelling

GREENPASS® simulation suite

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Toolbox

5 Key Performance Scores
(KPSs)

up to 7 Key Performance Indicators
(KPIs)

up to 16 Urban Performance Indicators
(UPIs)

BONUS

qualitative Bonus Indicators
Biodiversity, Resources and Social

NEW

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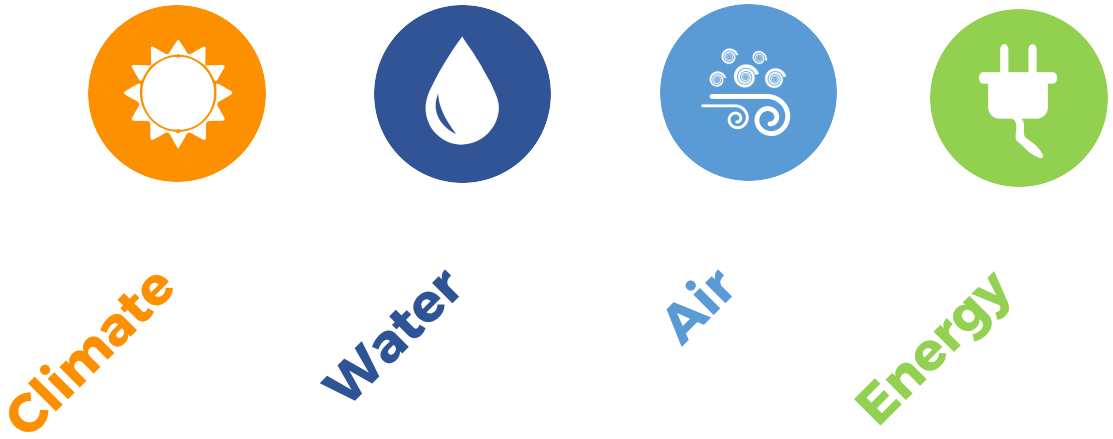
Assessment



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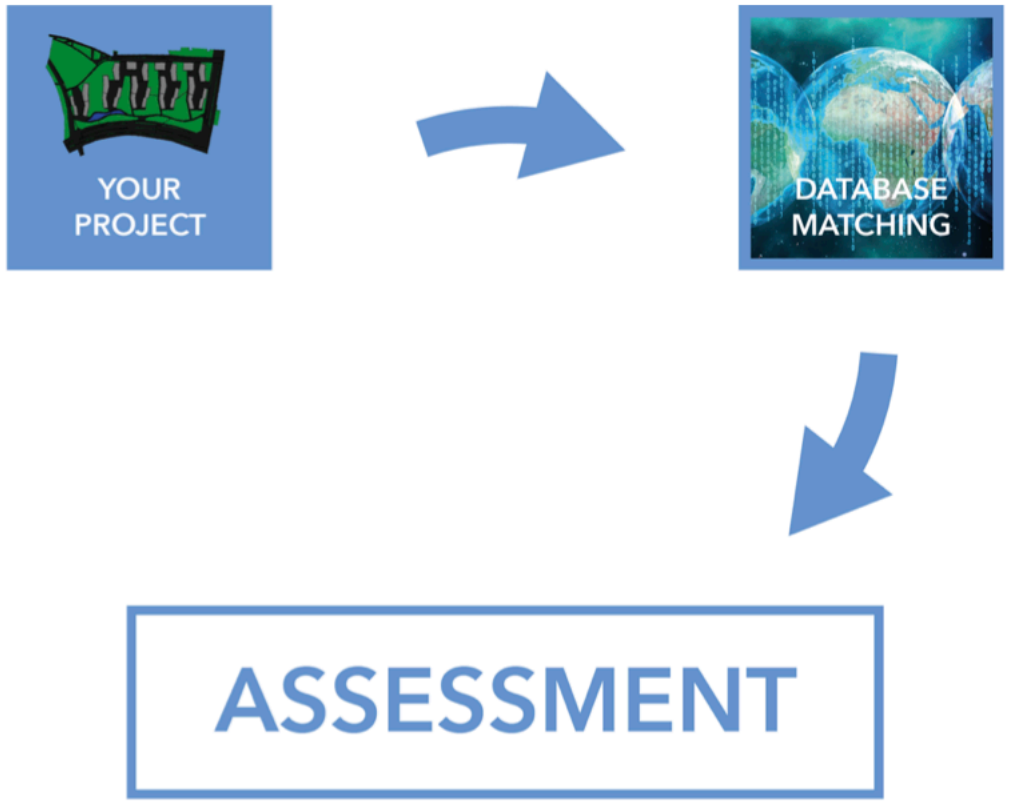

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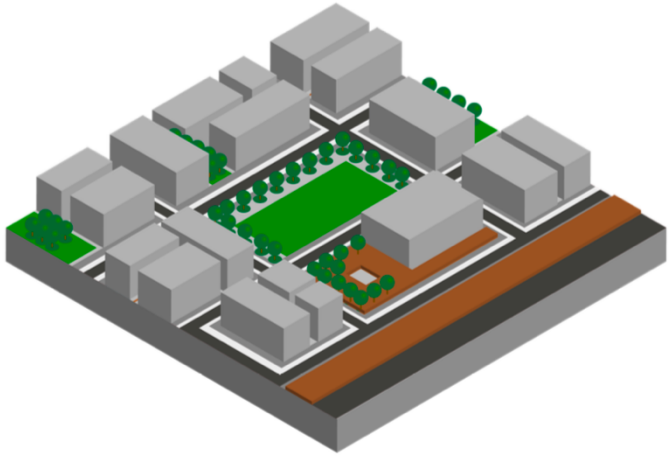
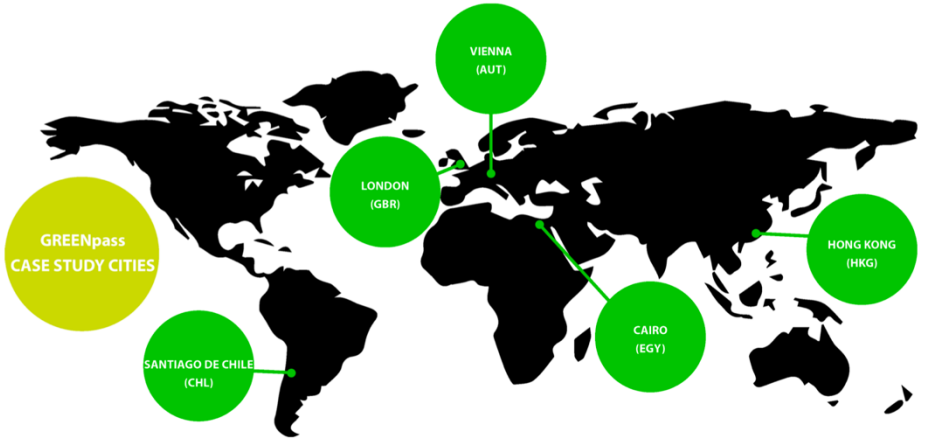
Urban Standard Typologies





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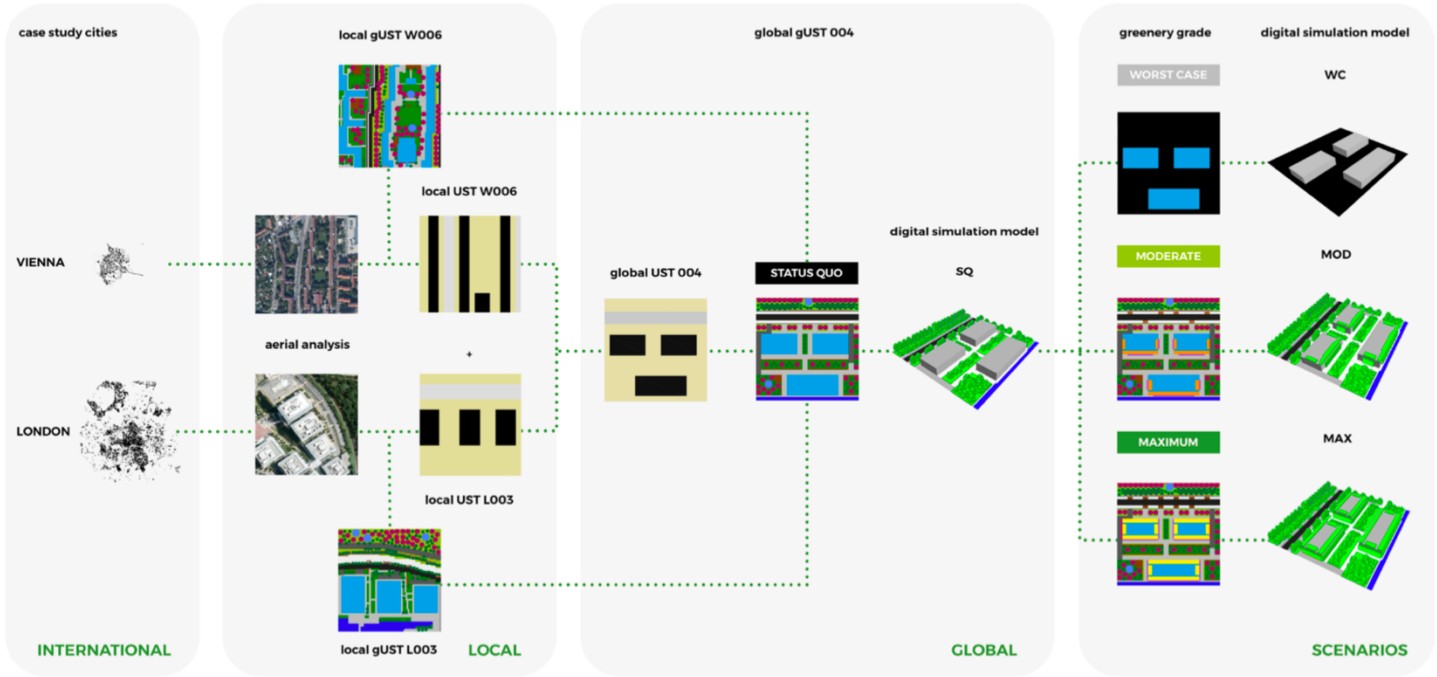
Urban Standard Typologies



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Urban Standard Typologies

4.5. UST003

Name

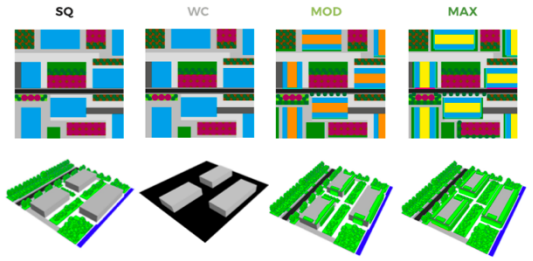
- Open high-rise

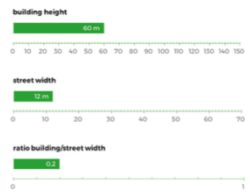
Local UST

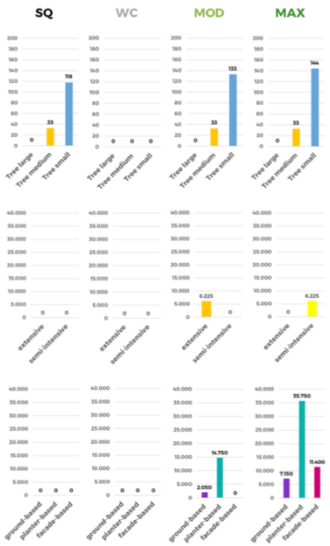
- HK007
- HK008
- KH013
- L011

LCZ

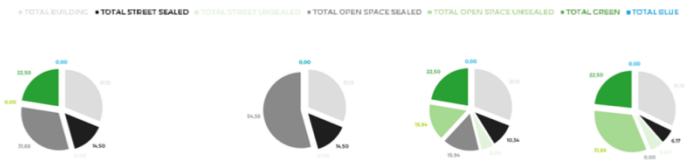
- 4







Area		
	TOTAL Area	
	Area	
Building	TOTAL BUILDING	
	Building	
Street	TOTAL STREET SEALED	
	Roadway	
	Sidewalk	
	Parking lot	
pu	TOTAL STREET UNSEALED	
	Roadway	
	Sidewalk	
	Parking lot	
Open space	TOTAL OPEN SPACE SEALED	
	Roadway	
	Sidewalk	
	Parking lot	
pr	TOTAL OPEN SPACE UNSEALED	
	Roadway	
	Sidewalk	
	Parking lot	
pu/pr	Sand	
Green	TOTAL GREEN	
	Total public	
pu	Lawn	
	Shrubs	
	Total private	
pr	Lawn	
	Shrubs	
Blue	TOTAL BLUE	
pu/pr	Water	
Trees	TOTAL TREES NUMBER	
	Total trees area	
	Total trees area public	
pu	Tree large	
	Tree medium	
	Tree small	
	Total trees are private	
pr	Tree large	
	Tree medium	
	Tree small	
Green roofs	TOTAL GREEN ROOFS	
flat	extensive	
	semi-intensive	
inclined	Total extensive inclined	
	extensive South	
	extensive West and East	
Green walls	TOTAL GREEN WALLS	
ground-based	Total ground-based	
	ground-based - south	
	ground-based - east	
	ground-based - west	
planter-based	Total planter-based	
	planter-based - south	
	planter-based - east	
	planter-based - west	
facade-based	Total facade-based	
	facade-based - south	
	facade-based - east	
	facade-based - west	



STATUS QUO		WORST CASE		MODERATE		MAXIMUM	
m2	%	m2	%	m2	%	m2	%
40.000	100,00	40.000	100,00	40.000	100,00	40.000	100,00
40.000	100,00	40.000	100,00	40.000	100,00	40.000	100,00
12.450	31,13	12.450	31,13	12.450	31,13	12.450	31,13
5.800	14,50	5.800	14,50	4.134	10,34	2.468	6,17
2.468	6,17	2.468	6,17	2.468	6,17	2.468	6,17
2.992	7,48	2.992	7,48	1.496	3,74	0	0,00
340	0,85	340	0,85	170	0,43	0	0,00
0	0,00	0	0,00	2.000	5,00	2.000	5,00
0	0,00	0	0,00	0	0,00	0	0,00
0	0,00	0	0,00	2.000	5,00	2.000	5,00
0	0,00	0	0,00	0	0,00	0	0,00
12.750	31,88	21.750	54,38	8.375	15,94	0	0,00
1.100	2,75	0	0,00	550	1,38	0	0,00
6.810	17,03	16.980	42,28	3.405	8,51	0	0,00
4.840	12,10	4.940	12,30	2.420	6,05	0	0,00
0	0,00	0	0,00	8.375	15,94	12.750	31,88
0	0,00	0	0,00	550	1,38	1.100	2,75
0	0,00	0	0,00	3.405	8,51	6.810	17,03
0	0,00	0	0,00	2.420	6,05	4.840	12,10
0	0,00	0	0,00	0	0,00	0	0,00
9.000	22,50	0	0,00	9.000	22,50	9.000	22,50
500	1,25	0	0,00	500	1,25	500	1,25
500	1,25	0	0,00	450	1,13	375	0,94
0	0,00	0	0,00	50	0,13	125	0,31
8.500	21,25	0	0,00	8.500	21,25	8.500	21,25
2.200	5,50	0	0,00	1.980	4,95	1.650	4,13
6.300	15,75	0	0,00	6.520	16,30	6.850	17,13
0	0,00	0	0,00	0	0,00	0	0,00
0	0,00	0	0,00	0	0,00	0	0,00
193	0,21	0	0,00	193	0,21	177	0,19
4.909	0,00	0	0,00	5.203	0,00	0	0,00
786		0		942			
0	0,00	0	0,00	0	0,00	0	0,00
3	0,01	0	0,00	3	0,01	3	0,01
27	0,07	0	0,00	36	0,09	39	0,10
4.343		0		4.281			
0	0,00	0	0,00	0	0,00	0	0,00
30	0,08	0	0,00	30	0,08	30	0,08
91	0,23	0	0,00	97	0,24	105	0,26
0	0,00	0	0,00	6.225	15,56	6.225	15,56
0	0,00	0	0,00	6.225	15,56	0	0,00
0	0,00	0	0,00	0	0,00	6.225	15,56
0	0,00	0	0,00	0	0,00	0	0,00
0	0,00	0	0,00	0	0,00	0	0,00
0	0,00	0	0,00	0	0,00	0	0,00
0	0,00	0	0,00	4.100	10,25	14.300	35,75
0	0,00	0	0,00	2.050	5,13	7.150	17,88
0	0,00	0	0,00	2.050	5,13	2.050	5,13
0	0,00	0	0,00	0	0,00	3.100	7,75
0	0,00	0	0,00	0	0,00	2.000	5,00
0	0,00	0	0,00	14.750	36,88	35.750	89,38
0	0,00	0	0,00	14.750	36,88	10.250	25,63
0	0,00	0	0,00	0	0,00	15.500	38,75
0	0,00	0	0,00	0	0,00	10.000	25,00
0	0,00	0	0,00	0	0,00	11.400	28,50
0	0,00	0	0,00	0	0,00	5.130	12,83
0	0,00	0	0,00	0	0,00	6.270	15,68
0	0,00	0	0,00	0	0,00	0	0,00

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Urban Standard Typologies

GP typology	Worst Case	Status quo	Moderate	Maximum
Building The wall structure is adapted to the prevailing construction of the facade in the respective temporal epoch (Gründerzeit era - brick wall; New construction - light-weight concrete, etc.) The building height varies corresponding to the specific UST. Roof inclination is further taken into account in the numerical analyses by an additional attribute assignment in the model, but not in the simulation.	unchanged	like planning	unchanged	unchanged
Green roof - extensive The extensive roof greening is defined with a construction height of 15 cm and has the color orange in the models. In addition, the greening type includes ecological and biodiversity-promoting elements (deadwood, etc.). The plant society is composed out of various succulents, grasses and herbs.	×	like local UST / global UST	50 % of flat roofs	50 % of flat roofs with exposition S, W, E
Green roof - semi-intensive The semi-intensive green roof is defined with a height of 30 cm and has the color yellow in the models. In addition, the greening type includes ecological and biodiversity-promoting elements (deadwood, etc.). The plant society is composed out of a more diverse selection of grasses, herbs, perennials and shrubs.	×	like local UST / global UST	unchanged	50 % of flat roofs
Green roof - intensive The intensive roof greening is defined with a construction height of 60 cm and has the color light beige in the models. The plant society is composed of a more diverse selection of grasses, herbs, perennials, large shrubs and small trees.	×	×	×	×
Green roof - super-intensive The super-intensive green roof is defined with a height of 150 cm and has the color yellow-green in the models. The plant society is composed out of all types of vegetation up to large trees.	×	×	×	×
Facade greening - facade-based (living wall) For this greening type, a facade-bounded system with automatic and sensor-controlled irrigation is assumed, which is displayed in the models in the color pink. For the simulation, a mix of different perennials is assumed. 50 % of the façade surfaces are greened due to windows, doors, etc.	×	×	only at big public spaces	at all public areas, starting at 3m height 50 % of all facades with focus on south exposition
Facade greening - planter-based Planter-based systems are recognizable in the UST scenarios in the color cyan. The planters used are standardized and planted. Climbing plants are defined in terms of plant selection for the scenarios.	×	×	all south exposed facades at public areas, starting at 3m height, private at 10m height	private above or instead of ground-based facade greening only south, southwest and southeast exposed facades
Facade greening - ground-based In purple, the ground-based facade greening is recognizable in the UST scenarios. This type of facade greening has a direct ground connection. The climbers growing up to 10 m in height with a root space of min. 1 m².	×	×	only private, if enough rootspace available, growing height up to 10m	only private, if enough rootspace available, growing height up to 10m
Public lawn Public lawns are defined as open space with a lawn mixture, an organic plant mixture and a height of 10 cm. In the UST scenarios, these green areas are displayed in dark green.	×	public lawn 100%	public lawn 90%	public lawn 75%
Public shrubs Shrubs are composed out of planting societies with biodiversity-promoting structure-rich shrubs and hedges in the UST scenarios and they are shown with light brown color. For the shrubs an average growth height of 2 m is assumed.	×	public shrubs 0%	public shrubs 10%	public shrubs 25%

GP typology	Worst Case	Status quo	Moderate	Maximum
Private lawn Private lawns are defined as open space with a lawn mixture, an organic plant mixture and a stature height of 10 cm. In the UST scenarios, these green areas are displayed in bright green.	×	private lawn 100%	private lawn 90%	private lawn 75%
Private shrubs Shrubs in private use are composed out of plant societies with biodiversity-promoting structure-rich shrubs and hedges and can be recognized in the UST scenarios as a dark brown area.	×	private shrubs 0%	private shrubs 10%	private shrubs 25%
Public roadway These surfaces are defined as black asphalt in the UST scenarios and are non-permeable. You can see public streets as black areas.	unchanged	public street 100% sealed	public street 100% sealed	public street 100% sealed
Public sidewalk These surfaces are defined as black asphalt in the UST scenarios and are non-permeable. In the moderate and maximum scenarios, the surfaces of the public sidewalks are partially permeable and they are to be recognized in the USTs in the color dark gray.	unchanged	public 100% sealed	public 50% sealed	public 0% sealed
Public parking lot These surfaces are defined as black asphalt in the UST scenarios and are non-permeable. In the moderate and maximum scenarios, the surfaces of the parking lots are partially permeable. Public parking lots can be seen in the USTs in the color light gray.	unchanged	public 100% sealed	public 50% sealed	public 0% sealed
Private roadway These surfaces are defined as black asphalt in the UST scenarios and are non-permeable. In the moderate and maximum scenarios, the surfaces of private roadways are partially permeable.	unchanged	private 100% sealed	private 50% sealed	private 0% sealed
Private sidewalk These surfaces are defined as black asphalt in the UST scenarios and are non-permeable. In the moderate and maximum scenarios, the surfaces of the sidewalk can be permeable.	unchanged	private 100% sealed	private 50% sealed	private 0% sealed
Private parking lot Private parking areas are also made of asphalt and are non-permeable. In the moderate and maximum scenarios, the surfaces of the parking lots are also partially permeable.	unchanged	private 100% sealed	private 50% sealed	private 0% sealed
Water Water surfaces in the UST are standardized and usually defined as artificial surfaces.	×	like local UST / global UST	unchanged	unchanged
Public tree large Trees are divided into three sizes. Large trees have a crown diameter of 15 m and a height of 15 m. The default standard selected for the UST is Platanus x hispanica.	×	like local UST / global UST	New plantings adapted to the building structure	New plantings adapted to the building structure

GP typology	Worst Case	Status quo	Moderate	Maximum
Public tree medium The medium trees are defined with a crown diameter of 10 m and a height of 10m. The default type selected for the UST is Tilia cordata.	×	like local UST / global UST	New plantings adapted to the building structure	New plantings adapted to the building structure
Public tree small Small trees with a diameter of 5 m and a height of 5 m are also defined. The selected standard is Acer campestre.	×	like local UST / global UST	New plantings adapted to the building structure	New plantings adapted to the building structure
Private tree large Trees are divided into three sizes. Large trees have a crown diameter of 15m and a height of 15m. The default standard selected for the UST is Platanus x hispanica.	×	unchanged	Replantings adapted to the building structur	Replantings adapted to the building structur
Private tree medium The medium trees are defined with a crown diameter of 10 m and a height of 10m. The default type selected for the UST is Tilia cordata.	×	unchanged	Replantings adapted to the building structur	Replantings adapted to the building structur
Private tree small Small trees with a diameter of 5 m and a height of 5 m are also defined. The selected standard is Acer campestre.	×	unchanged	Replantings adapted to the building structur	Replantings adapted to the building structur
Public perennials Public perennials are defined as an open space with a perennial mix. For the perennials an average growth height of 25 cm is assumed.	×	×	×	×
Private perennials Private perennials are defined as an open space with a perennial mix. For the perennials an average growth height of 25 cm is assumed.	×	×	×	×
Public meadow Public meadow areas are defined as green space with a height of 50 cm and an ecological biodiverse plant mixture.	×	×	×	×
Private meadow Private meadow areas are defined as green space with a height of 50 cm and an ecological biodiverse plant mixture.	×	×	×	×

Properties / Selection can be customized

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SUAT – GREENPASS®

GREENPASS® ASSESSMENT

GREENPASS® Database:

Urban Standard typologies: 25 USTs + Subversion (31 versions) + 4 scenarios + 4 wind directions + 3 latitudes = +1.200 simulations
NBS - Factor analysis: 10 NBS types + up to 4 variations (exposition) + 4 wind directions + 3 latitutes = 480 simulations

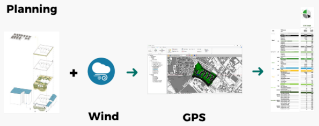
TOTAL = +1.600 simulations

simulations powered by ENVI-MET

Step 1.

Digital input of planning

For the **GREENPASS®** Assessment a digital input of the planning area, in the style of the **GREENPASS®** system typology, is needed. The planning area has to be georeferenced (GPS data) and the information of the main wind direction is needed for the database allocation and simplified assessment.



Project area

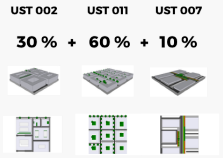
area analysis due to **GREENPASS®** system typology
GPS coordinates or geolocalization (for solar altitude)
main wind direction

Area analysis

Step 2.

UST match for planning

The project area will be allocated to one or more Urban Standard Typologies (USTs), based on building structure related parameters. Every matched parameter will count for the respective UST and leading to a UST allocation ratio. For the regression, the simulation results from the respective UST in the applied wind direction and interpolation from the closest latitudes will be taken into account and weighted considered in the calculation of the mean KPI value.



UST(s)

Building structure parameters:
- total area
- building area
- building ratio
- building number
- building volume
- building heights
- building volume/total area
- building area/total area
- building volume average
- sky view factor

Database framework
- wind direction
- latitude (GPS)

Parameter check

Step 3.

Correction factor according to building structure parameter

A correction factor is calculated and applied for the planning in relation to the standardized UST-size and applied for the building structure related parameters.

Project area x Factor 2.0

Correction

Step 4.

Correction factor for single NBS types

Correction for NBS impact on KPIs. Comparision of project NBS with UST NBS and application of correction factor by difference. Performance gain of the planning in comparison to the worst case scenario is calculated and the impact of the different NBS types is calculated too. Contribution of every NBS type is calculated regarding the impact profile.

x Factor 0.9

NBS parameters
- NBS total area
- NBS types
- NBS types area
- NBS types area ratio
- NBS types number
- NBS total area/NBS types number

no/less NBS types in project than in UST: negative correction factor (<1)
more NBS types in project than in UST: positive correction factor (>1)

Correction based on Factor analysis calibrated via LAI/LAD

Step 5.

KPI results

The final output for a simplified and rough assessment are the regressed **GREENPASS®** KPI results out from **GREENPASS®** database for the planning and greened reference scenarios.

= 5 KPIs

Simplified assessment

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SUAT – GREENPASS®

NATURE 4 CITIES

Key Performance Scores

- Thermal Load Score (TLS)
- Thermal Comfort Score (TCS)
- Thermal Storage Score (TSS)
- Run Off Score (ROS)
- Carbon Sequestration Score (CSS)

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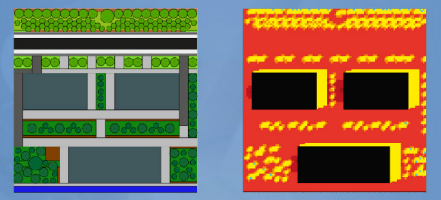
Cologne | GER | Casa Colonia



UST 004 | Open midrise

°C	Thermal Load Score (TLS)	-0.049 °C
	Thermal Comfort Score (TCS)	30.25 TCS
	Thermal Storage Score (TSS)	14.73 J
	Run Off Score (ROS)	0.52
CO_2	Carbon Sequestration Score (CSS)	18.91 kg/day

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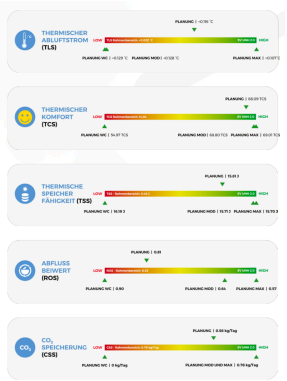

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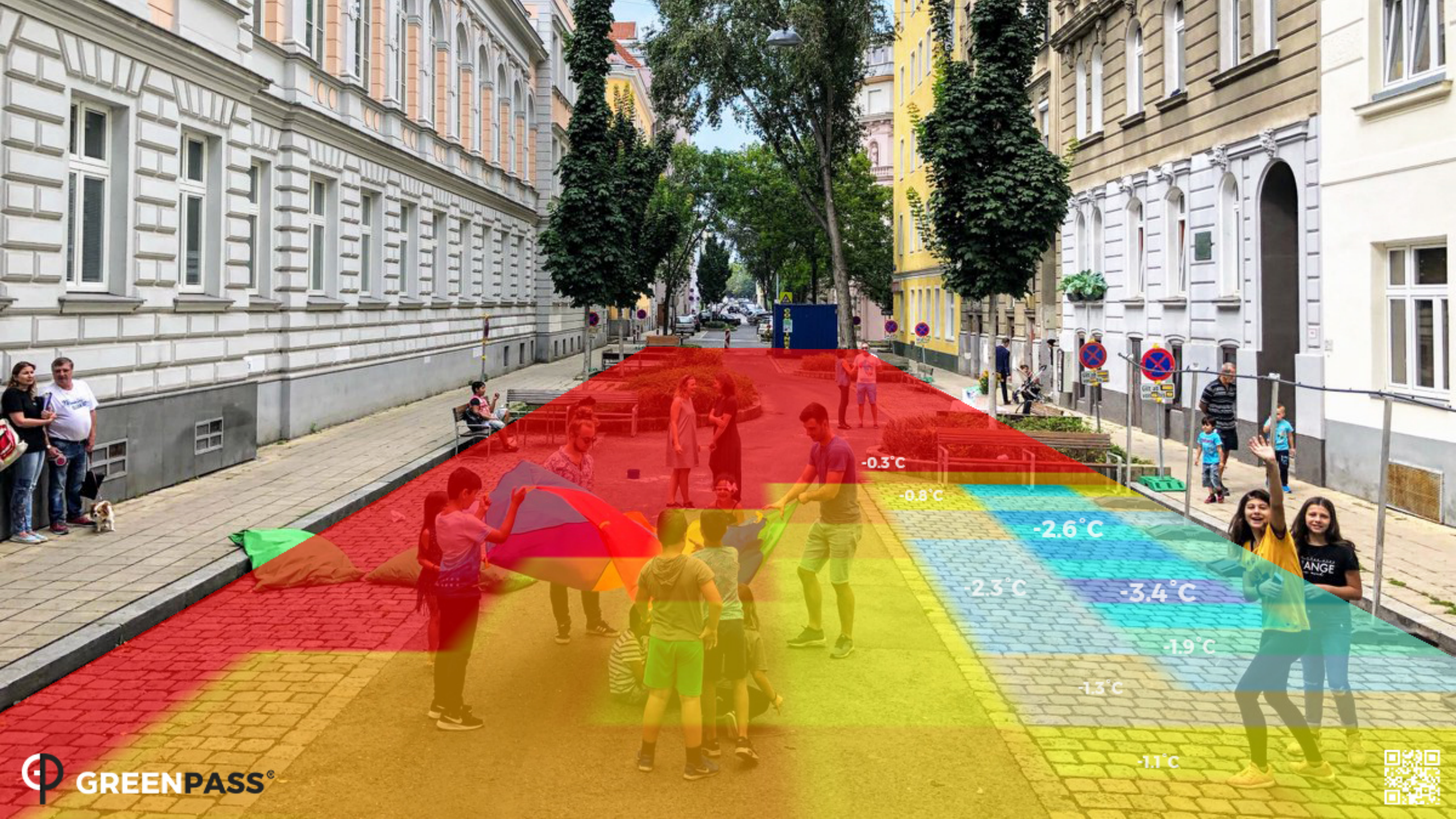
-0.3°C
-0.8°C
-2.6°C
-2.3°C
-3.4°C
-1.9°C
-1.3°C
-1.1°C
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