CLIMABILITY 2100:
Towards a livable urban microclimate

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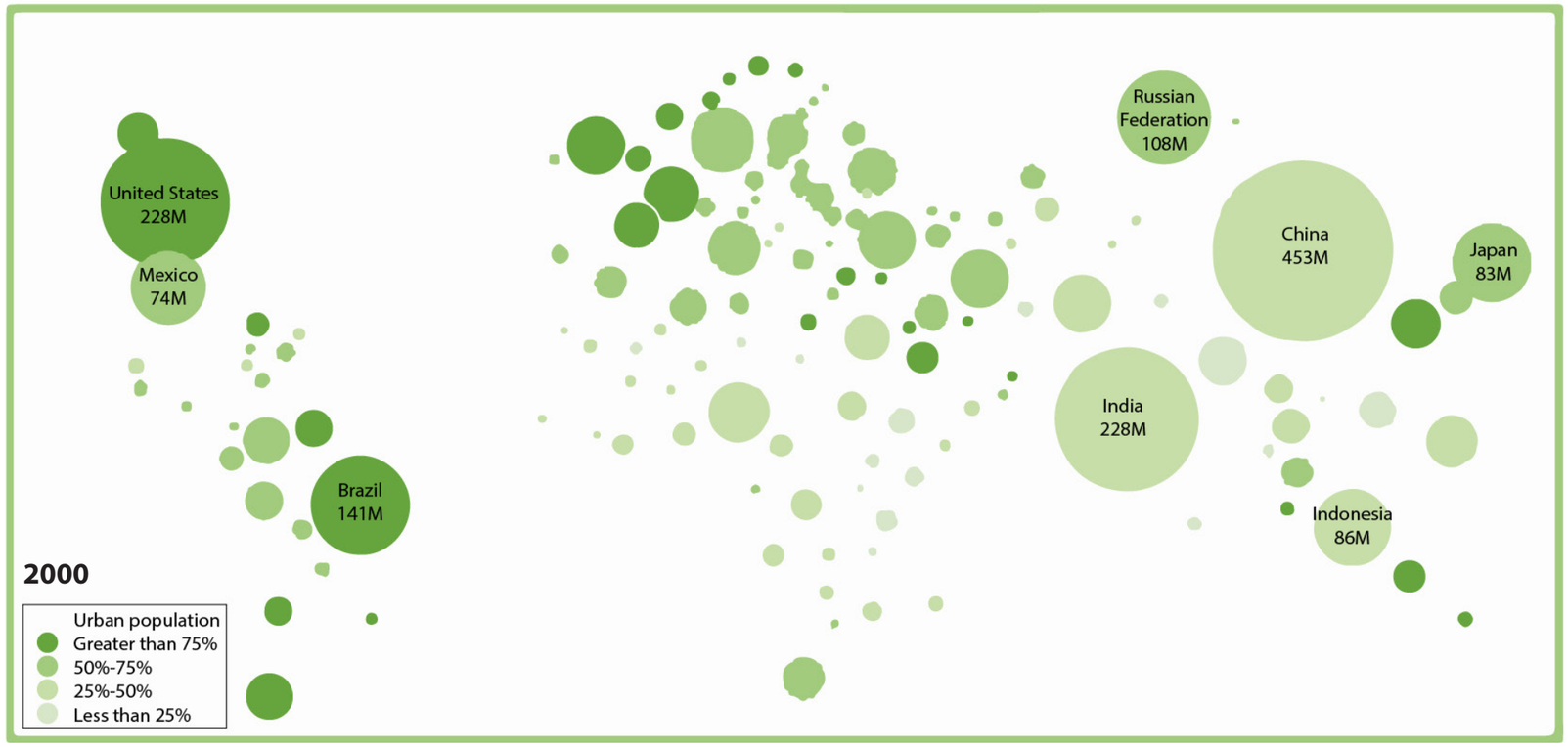
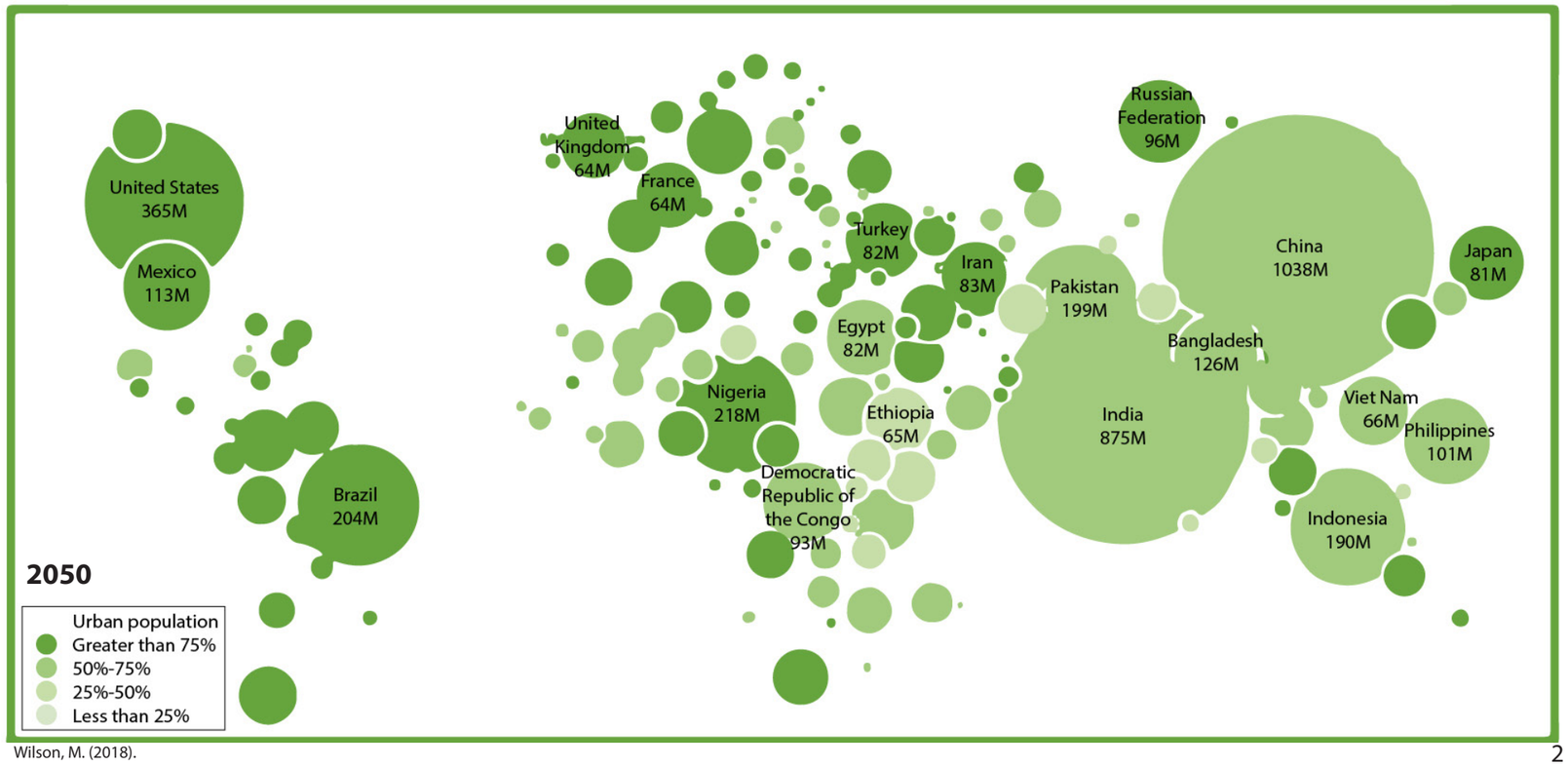
PROBLEM FIELD

- Growing world population
- Urbanization

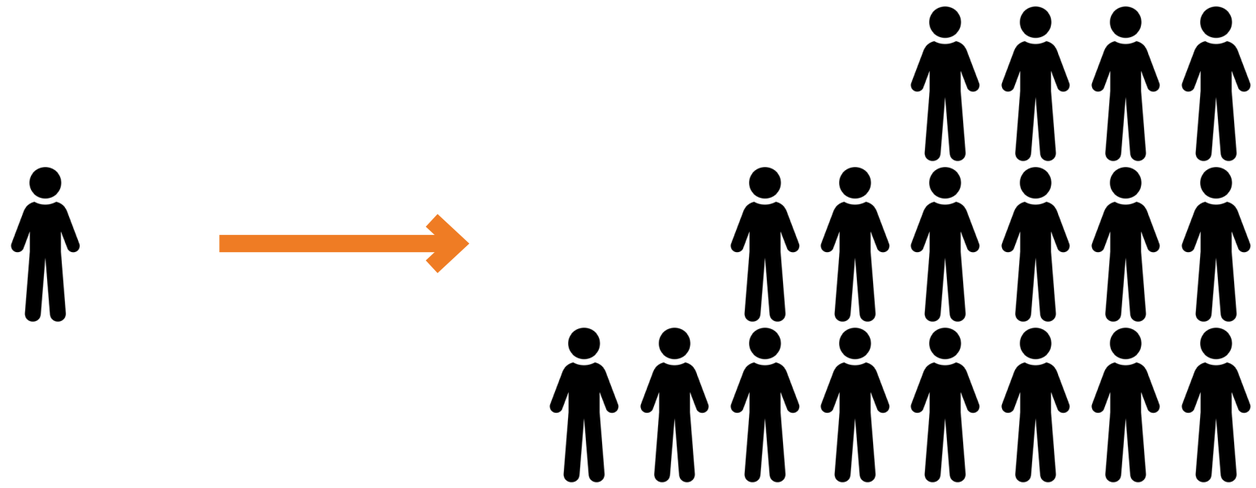


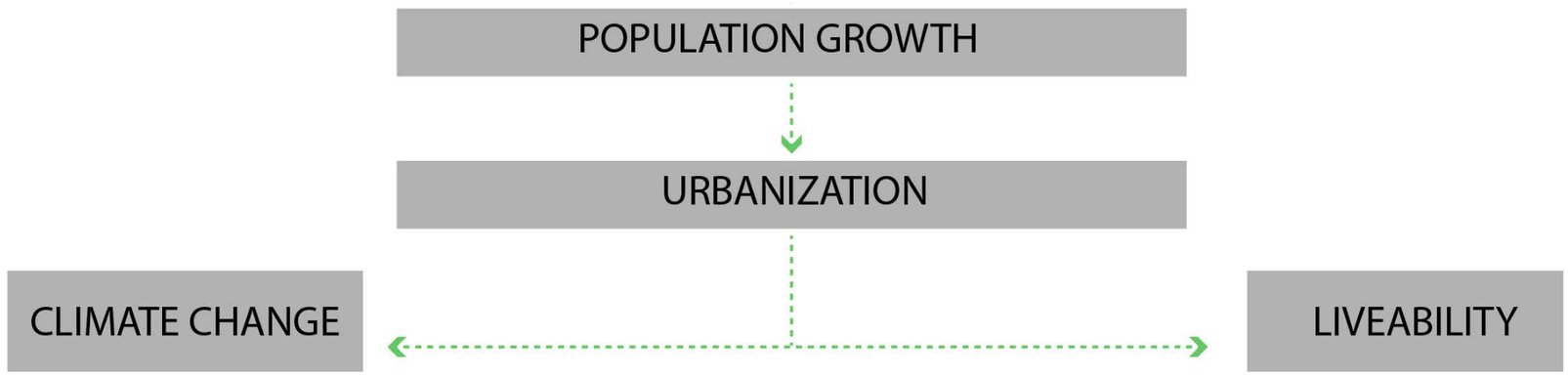


Wilson, M. (2018).

PROBLEM FIELD

- Growing world population
- Urbanization
- More people = limited space, high noise levels and the perception of overcrowding
- More people = more activity = more urban heat = increase of climate effects
- Necessity for adaptation strategies





Sources: Wilson (2018).

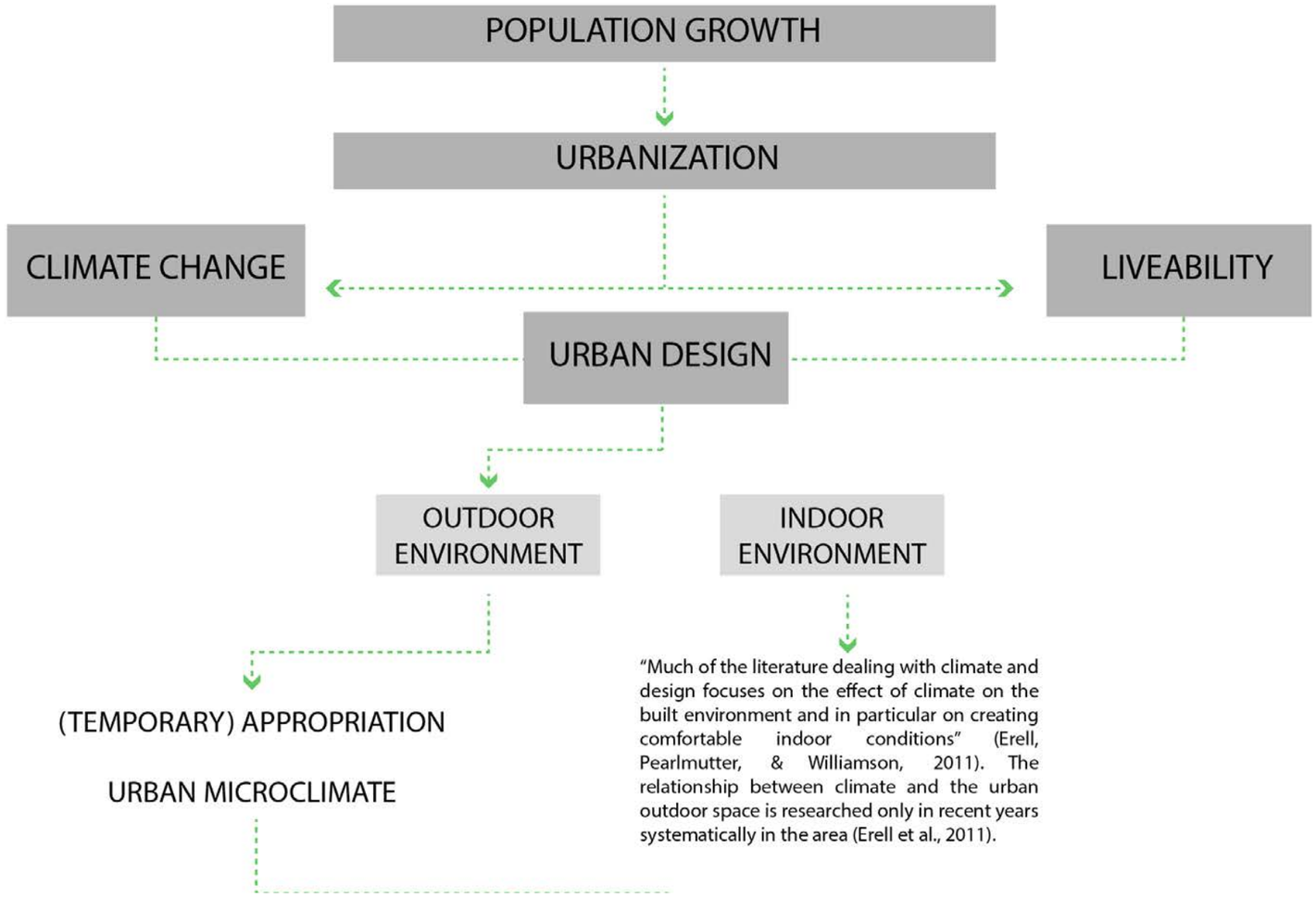
The positive effects of the natural climate are much of the time ignored with urban development that causes residents to rely on air-conditioning for thermal and acoustic comfort and the low amenity of the urban outdoor space

(Kennedy & Buys, 2010)

Goldberg, M. (2015, June 3).

PROBLEM FIELD

- Literature focuses on indoor conditions
- Less knowledge about climate and liveability in urban outdoor spaces



City planning became less climate aware and the opportunity for people to appropriate outdoor spaces decreased.

(Hebbert & Webb, 2012)

Redazione. (2019, August 29).

The dimensions and qualities of the environment can really have an effect on the way people will use and appropriate urban outdoor spaces. The outdoor comfort, also called the urban microclimate, is one of the main influencers on the use of urban outdoor spaces by people

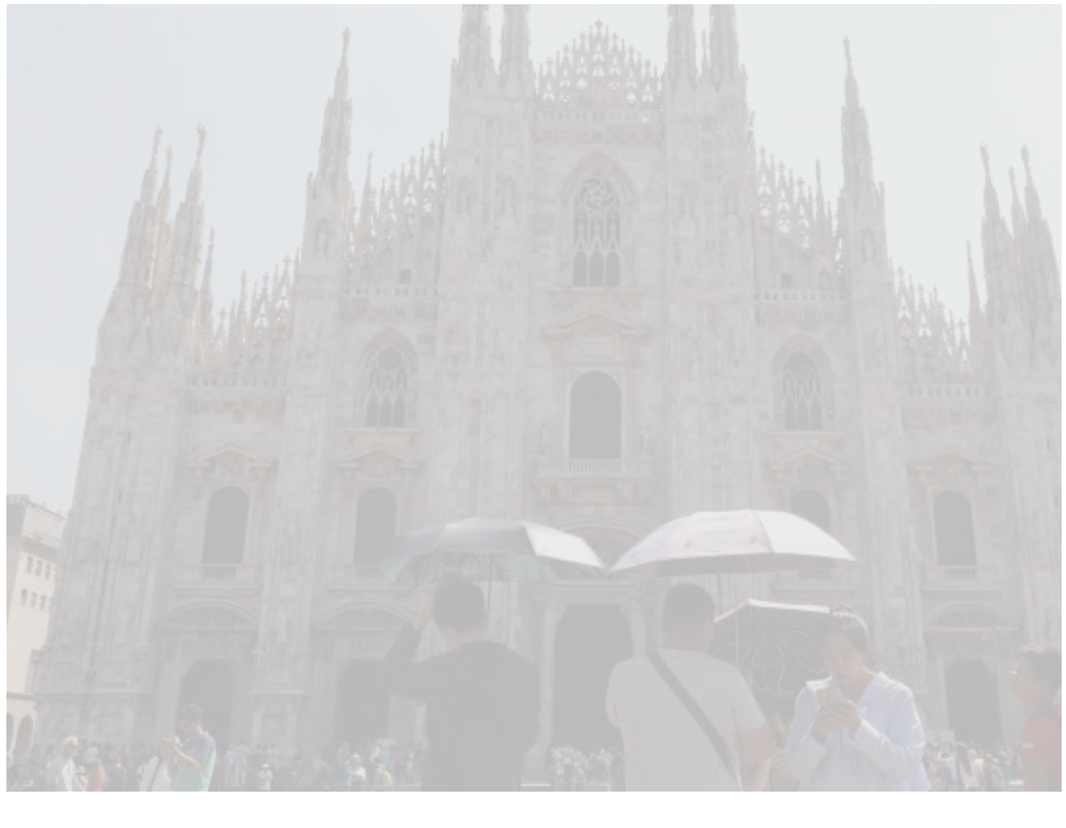
(Santucci et al, 2019)

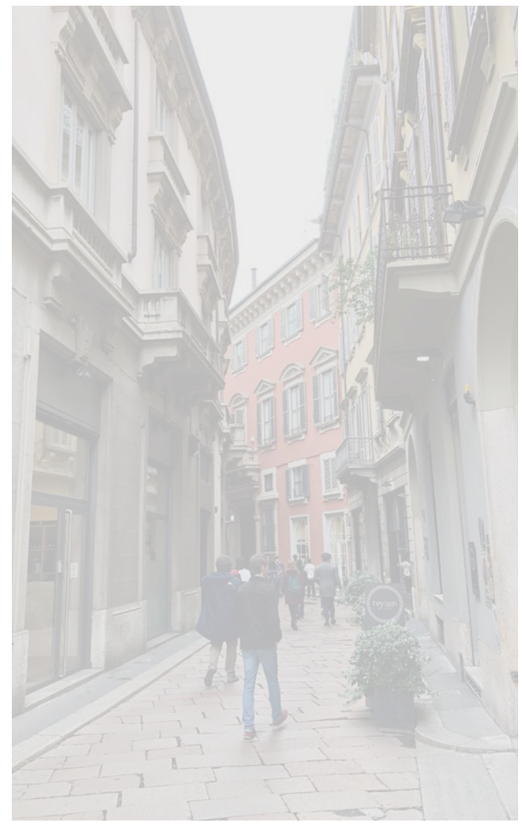
PROBLEM FIELD

- Case study: Milan 2100

- Milan has problems regarding liveability:
  - dense city
  - paved city
  - car city
  - ‘safety’ problems

- Milan has problems regading climate change:
  - high temperatures
  - air quality
  - flooding





Sources: Seveso esondazione a Milano: allagati quartieri di Isola e Niguarda. (2014)
Italia nella morsa del caldo estremo, venerdì 16 città da bollino rosso. (2019)

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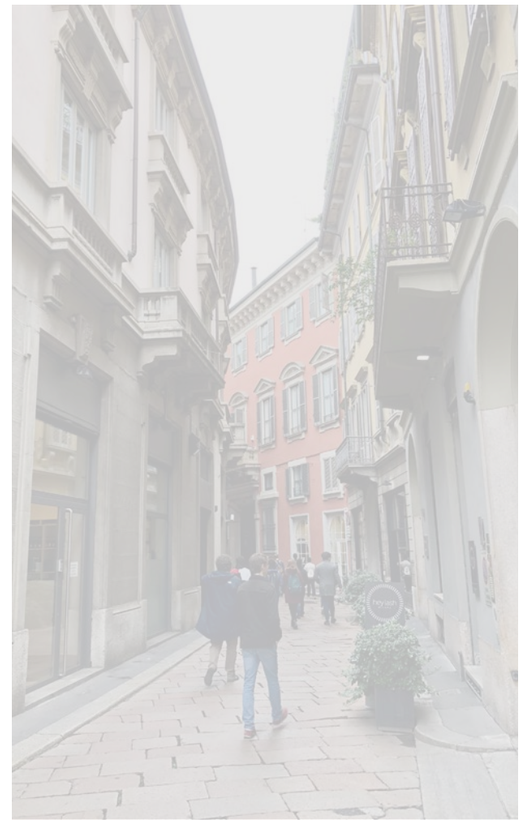

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PROBLEM STATEMENT:

The (temporary) appropriation of- and the climate conditions in urban outdoor spaces are decreasing because of the changing climate. If urban designers are not taking measures towards 2100 to stimulate the appropriation and improve the urban microclimate in urban outdoor spaces quality of life will decrease more.

RESEARCH QUESTIONS

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"How can urban design improve the urban microclimate of- and (temporary) appropriation in urban outdoor spaces to make Milan sustainable towards 2100?"

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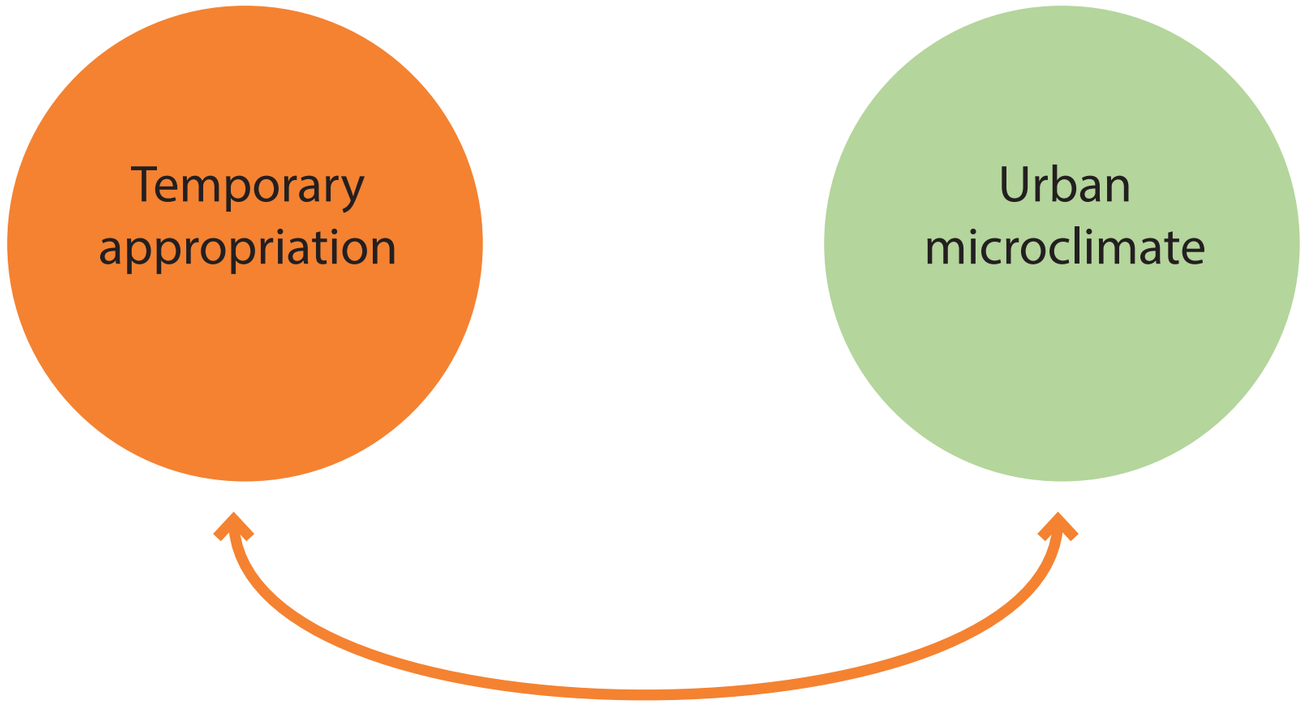

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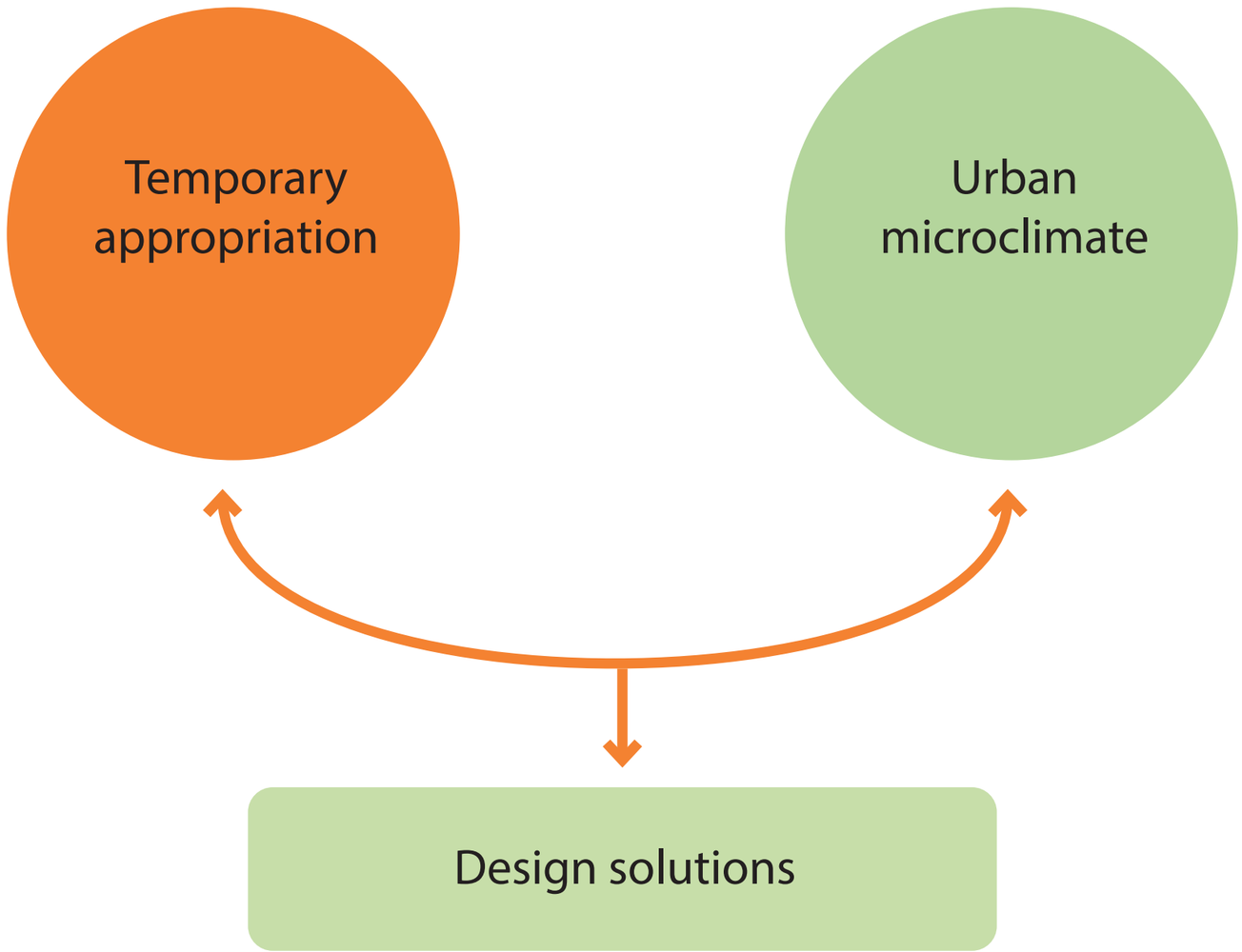

RESEARCH

The appropriation of the urban environment can also be described as the interaction people have with the urban environment. This can be seen through all kinds of activities that are taking place in urban outdoor spaces.

(Lara-Hernandez & Melis, 2018)

APPROPRIATION

- Walkability:

- Cities are walkable when they are comfortable

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- Space to walk
  - wide sidewalk
  - safe crossings

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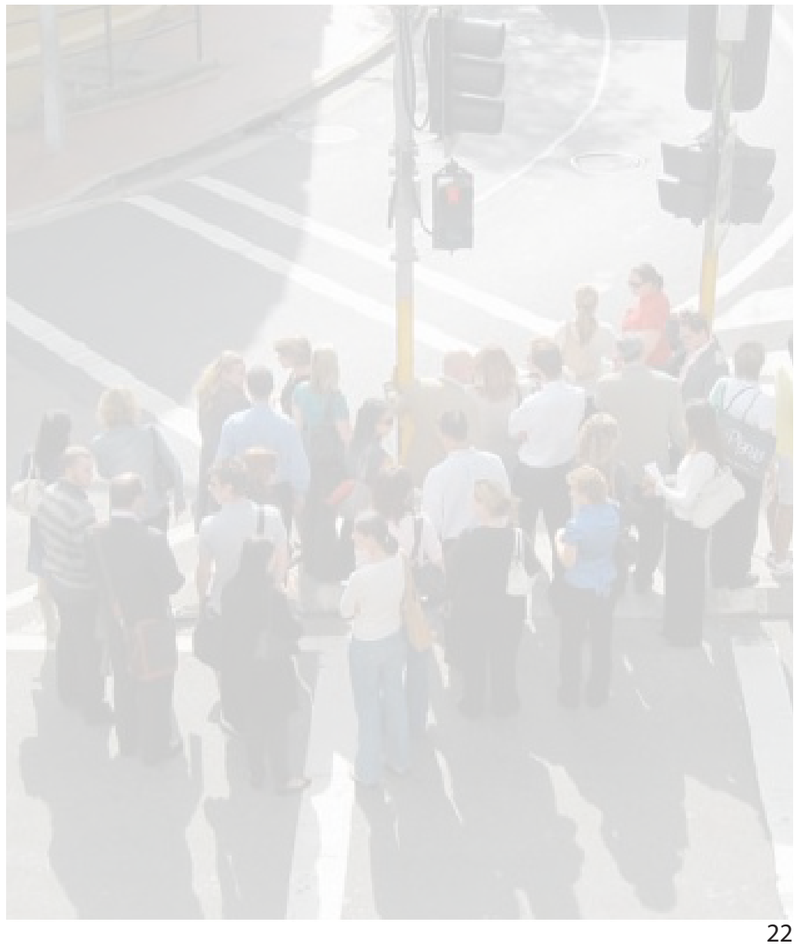

APPROPRIATION

- Walkability:

- Cities are walkable when they are comfortable

- Space to walk
  - wide sidewalk
  - safe crossings

- No obstacles

- No overcrowding
  - no long waiting times
  - no pedestrian islands

APPROPRIATION

- Places for staying
- Social comfortability
- Choice
- Flexible
- Type of seating

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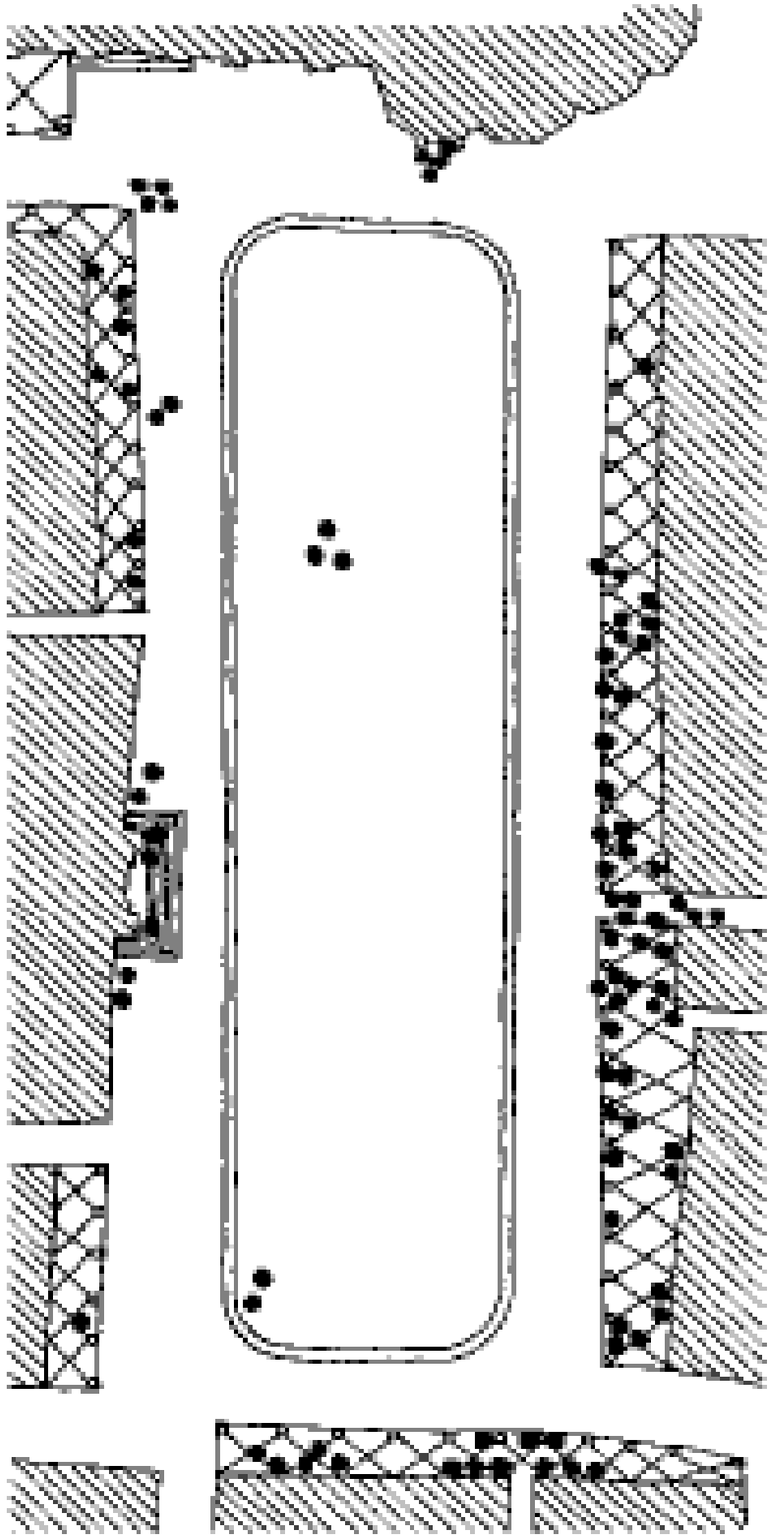
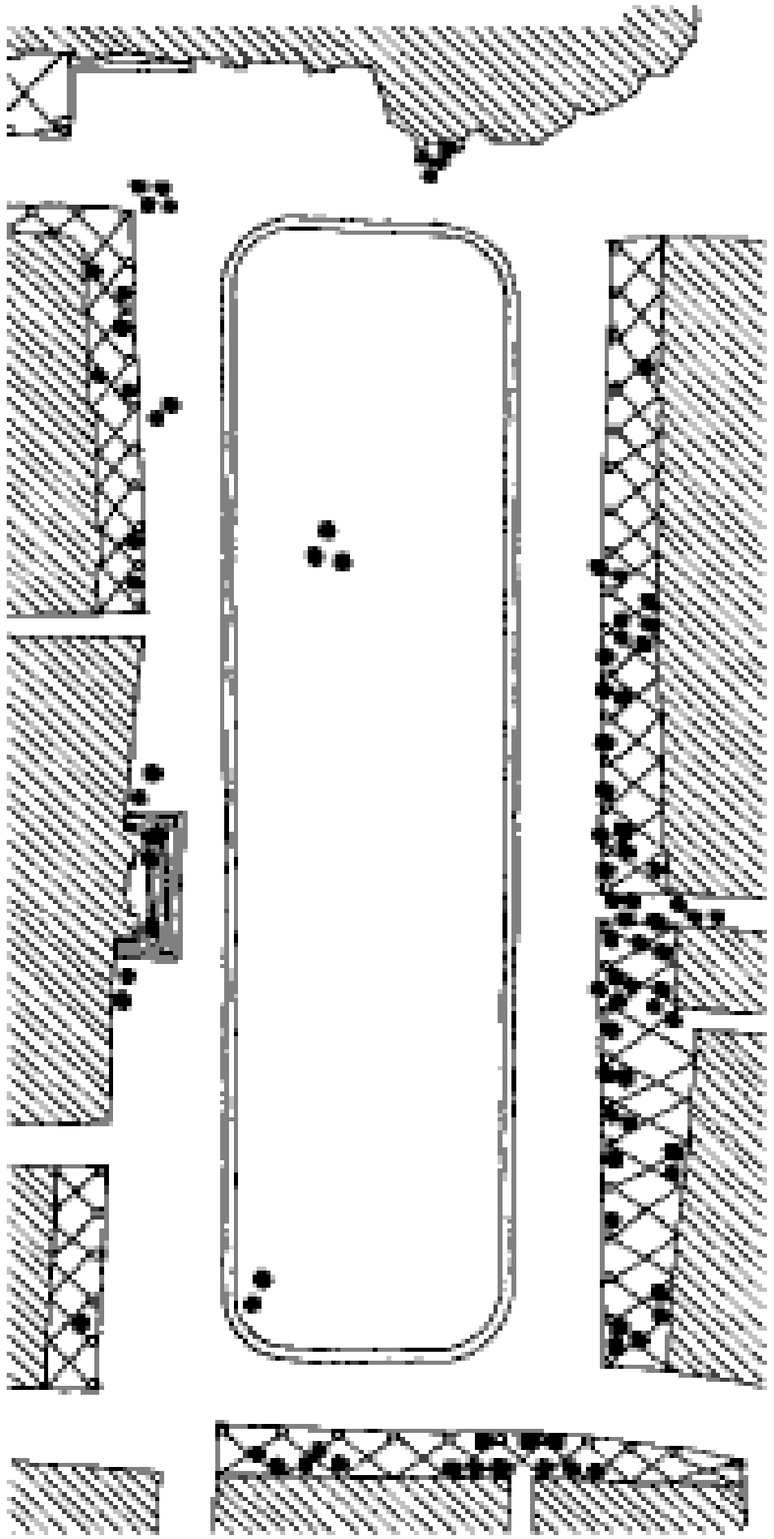
APPROPRIATION

- Edges
- Most popular zones



APPROPRIATION

- Edges
- Most popular zones
- Connection inside-outside
- Emergence architecture and urban design
- Most natural places
- (Semi)private staying options



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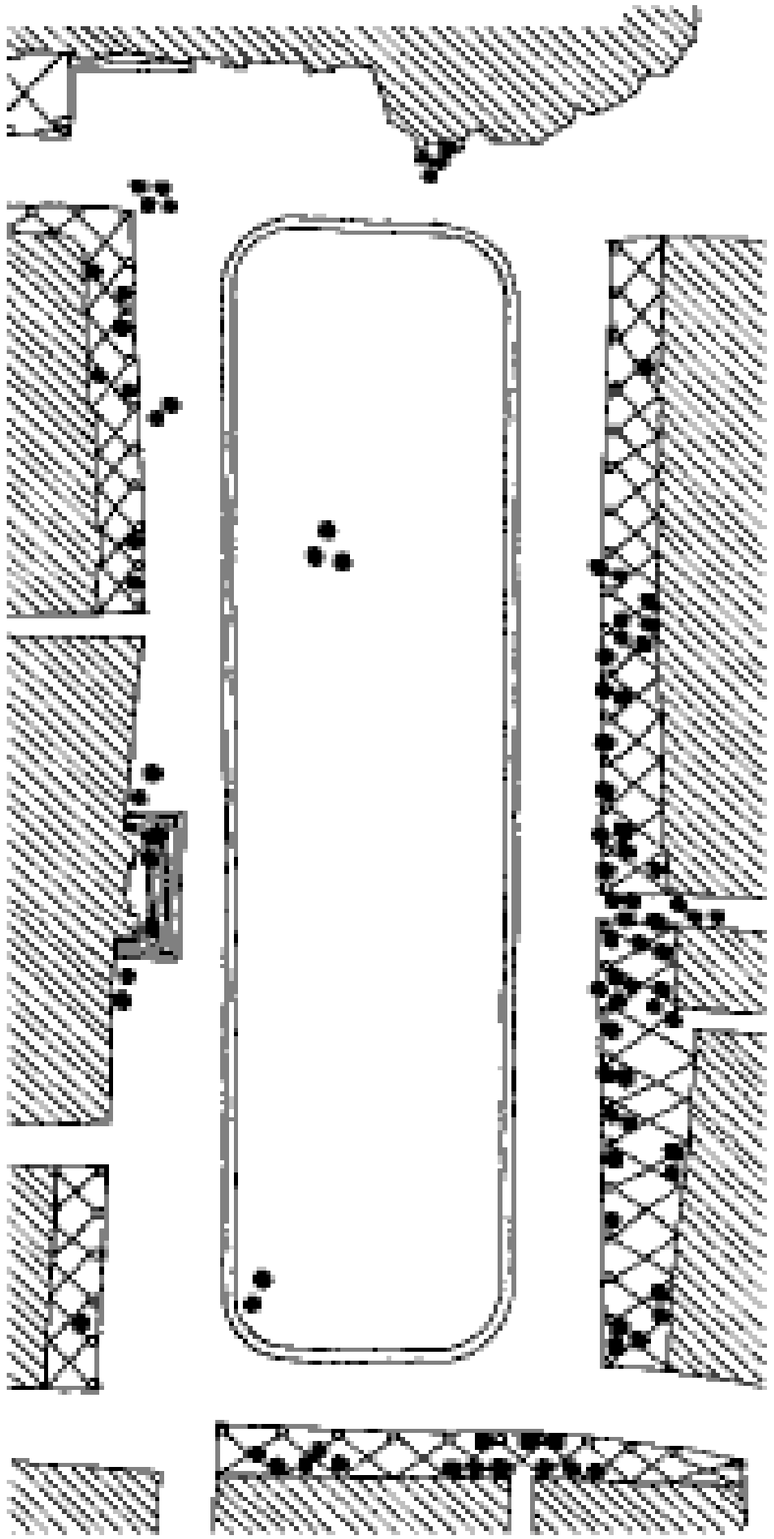
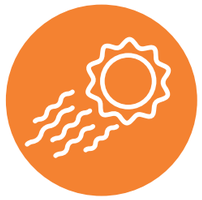


Conclusion appropriation:

- Space for pedestrians
- Create choice for people in places where they can stay
- Start with the edges of urban outdoor spaces.

URBAN MICROCLIMATE

- Highly influenced by morphology, materialization and landscaping
- Every intervention to a place will have an influence on the microclimate
- 6 Different climate elements



SOLAR RADIATION

TEMPERATURE

WIND

PRECIPITATION

AIR QUALITY

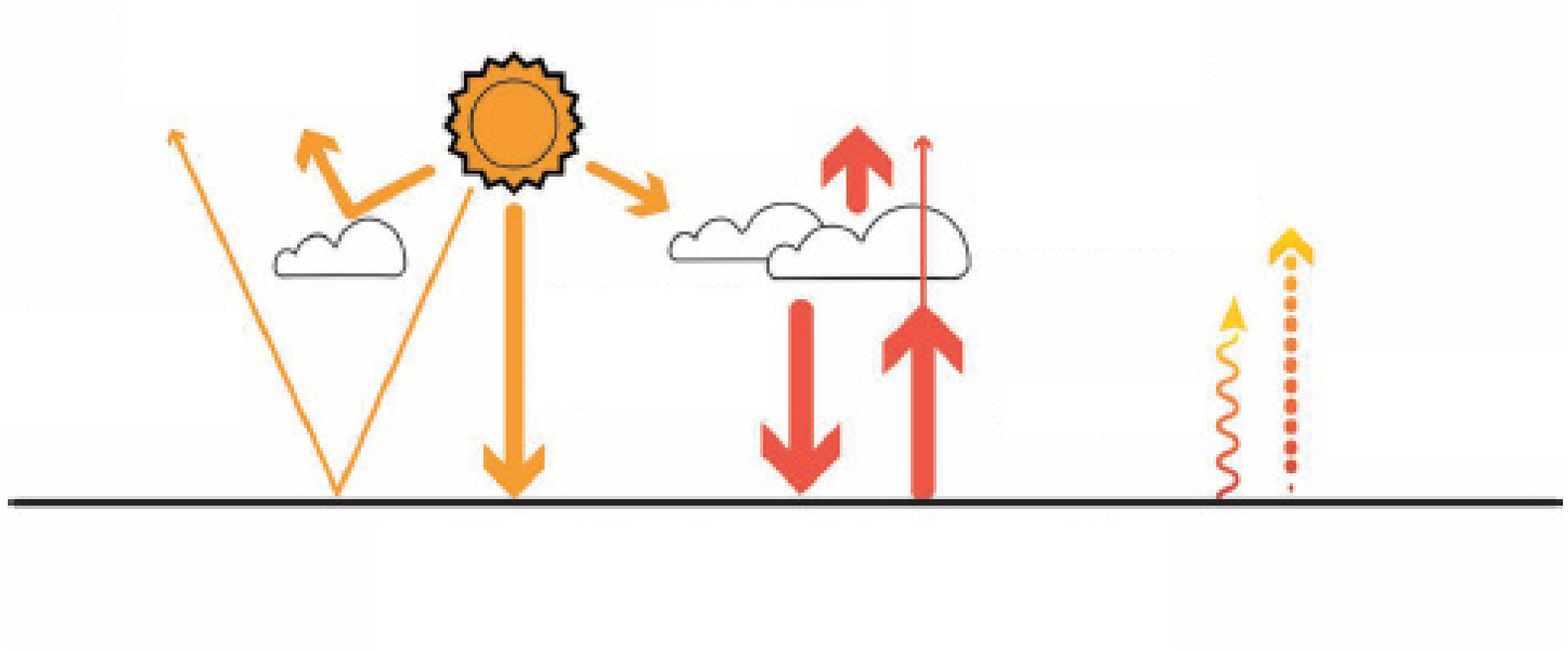
NOISE

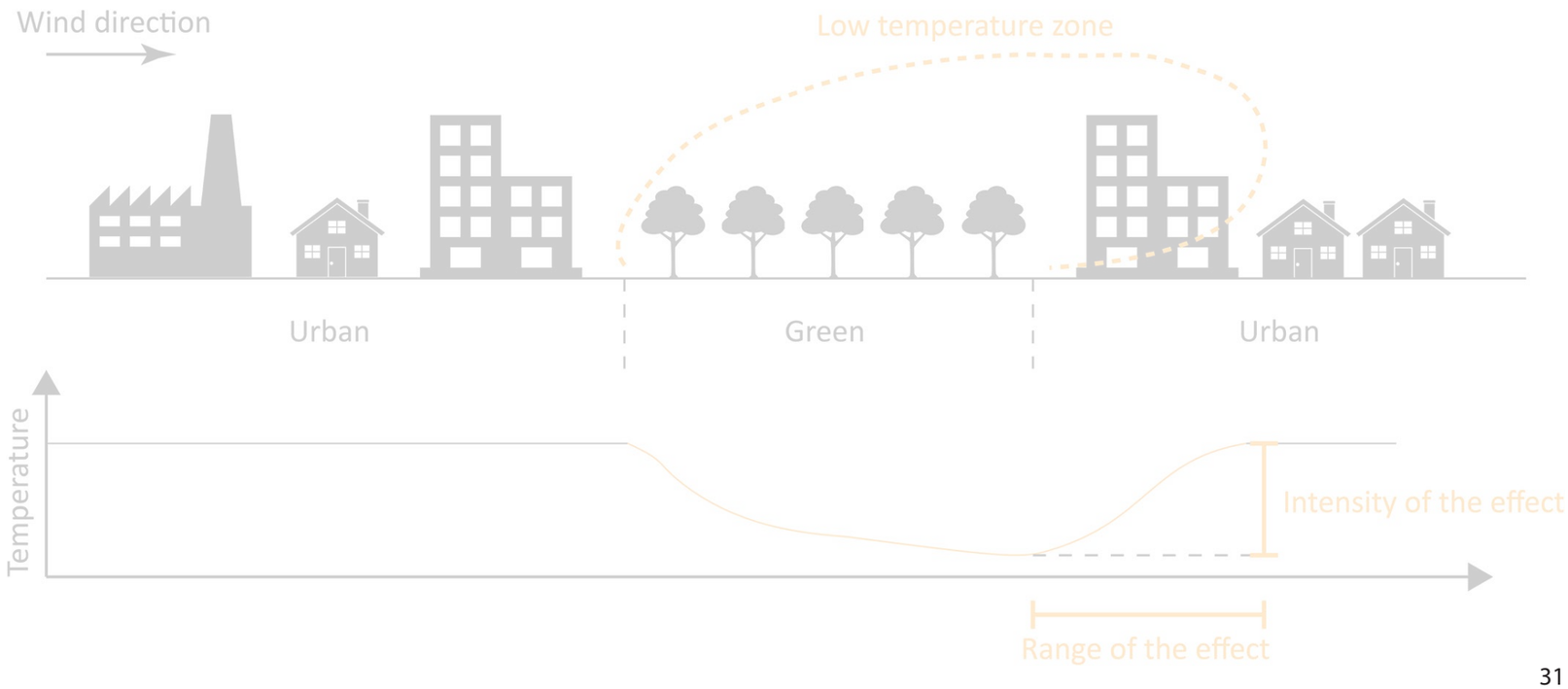
URBAN MICROCLIMATE

- *Solar radiation*

- Direct radiation, absorption and reflection

- Orientation of the streets
- Light colored surfaces
- Provide shade





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- Orientation of the streets
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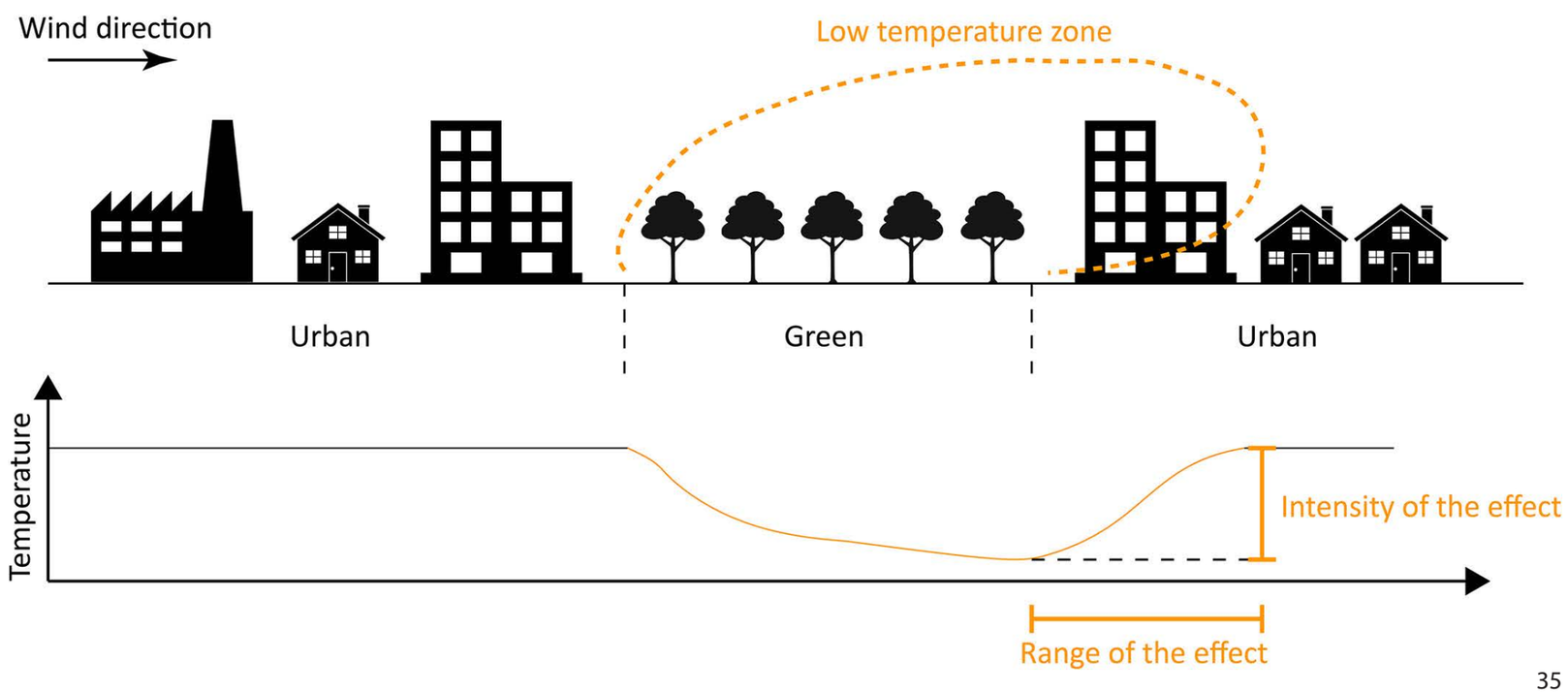
- Provide shade

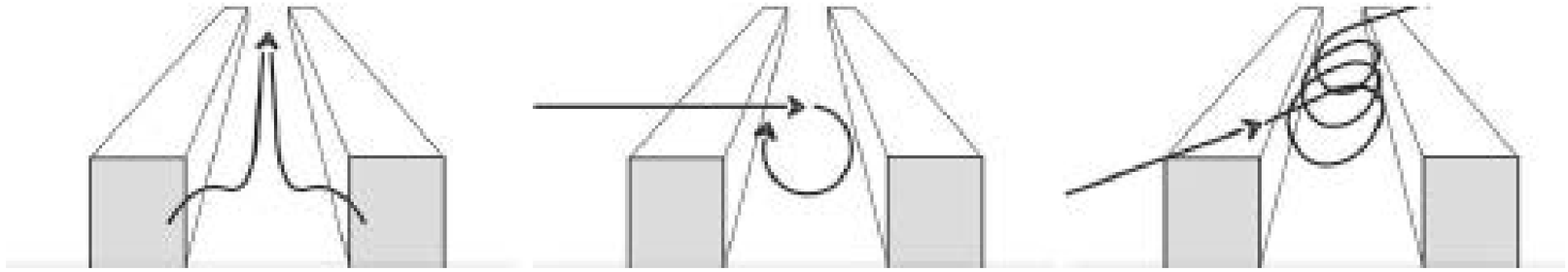
- *Temperature*

- Create green spaces



URBAN MICROCLIMATE

- Prevailing wind direction



- Cold periods: decrease wind speeds
- Warm periods: increase wind speeds

- No high height differences
- Vegetation as wind breaks

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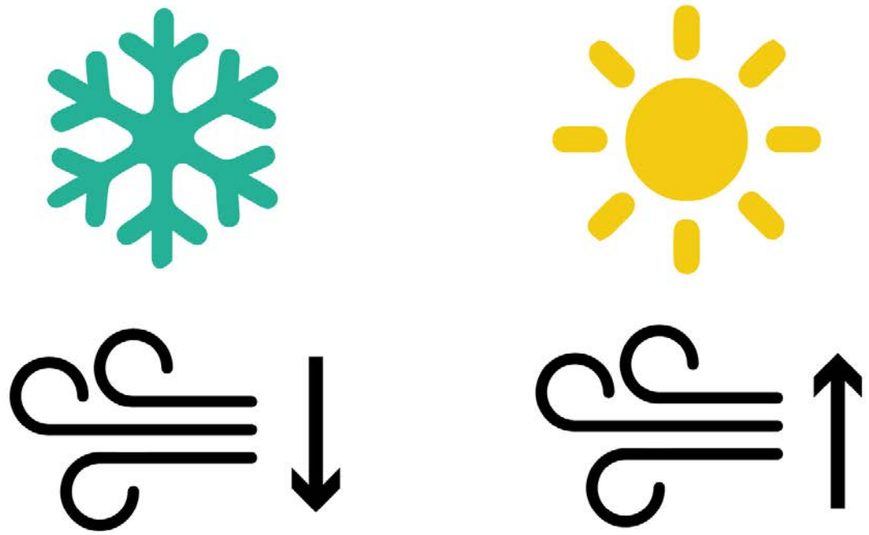

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URBAN MICROCLIMATE

- *Wind*

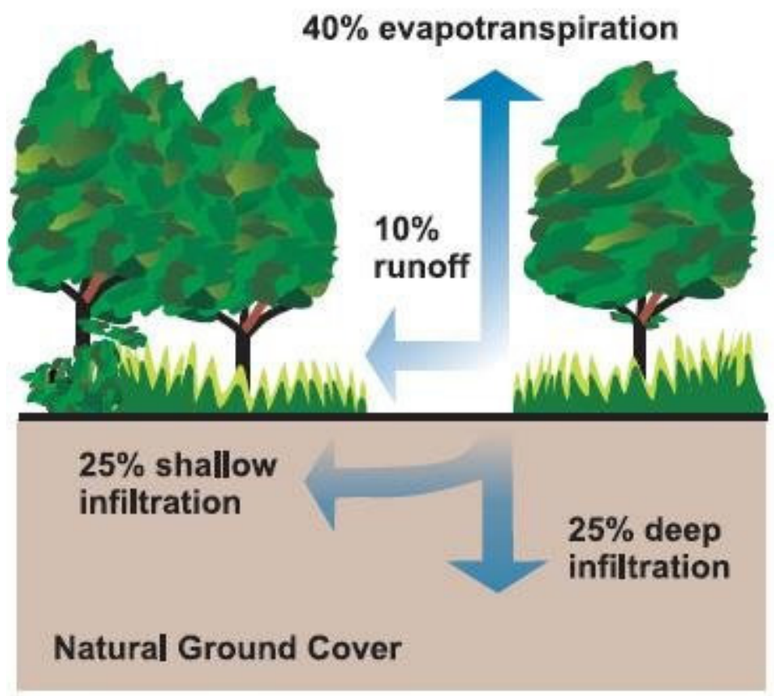
- Cold periods: decrease wind speeds
- Warm periods: increase wind speeds

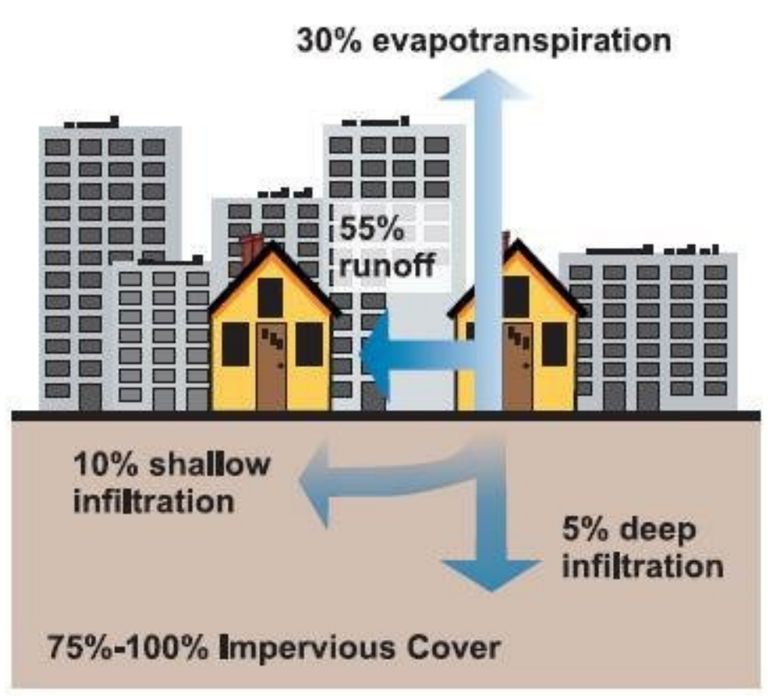
- No high height differences
- Vegetation as wind breaks

- *Precipitation*

- Drought and heavy precipitation events

- Water storage
- Green surfaces for infiltration





URBAN MICROCLIMATE

- *Air quality*

- Low quality of air is bad for the liveability
- Air pollutants are trapped where wind speeds are low

- Places for staying at distance
- Create ventilation

before covid-19 **during covid-19**

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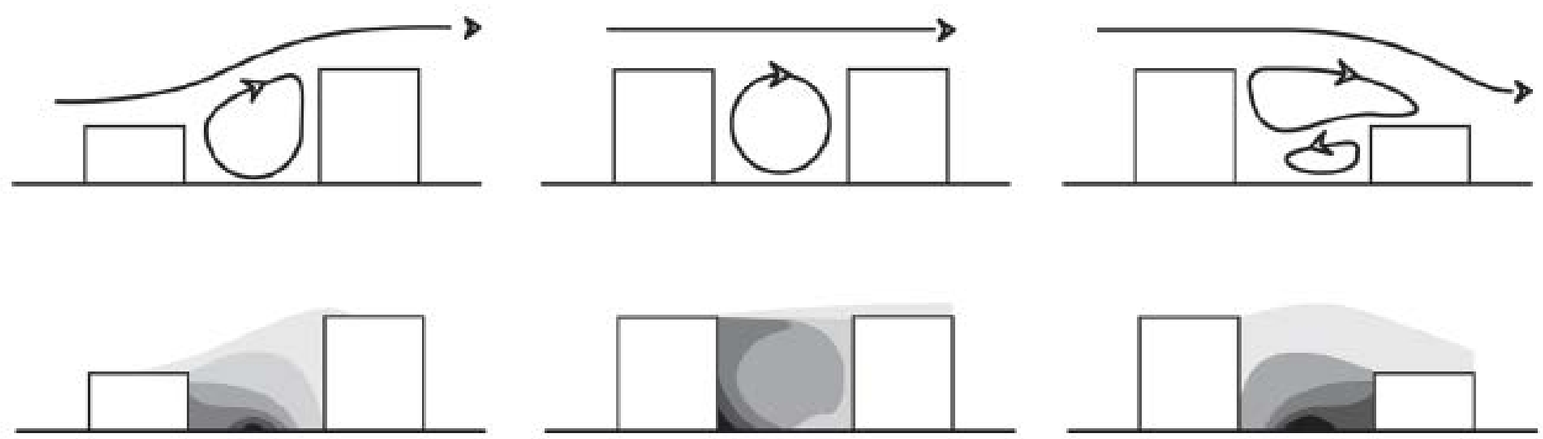

URBAN MICROCLIMATE

- *Air quality*

- Low quality of air is bad for the liveability

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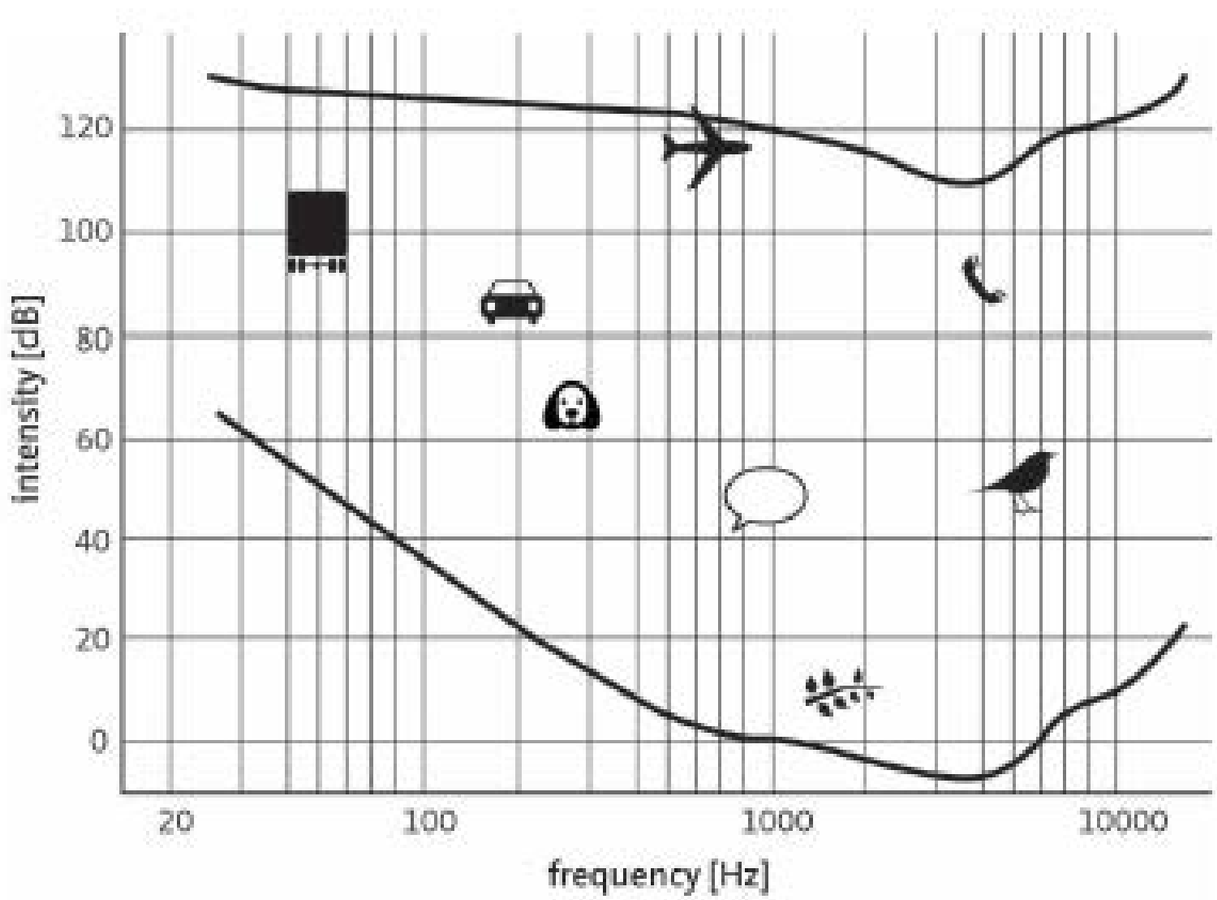
- *Noise*

- Activities produce noise

- Protect areas from noise
- Sound absorbing materials



Conclusion urban microclimate:

- Take into account the guidelines for each element

- Microclimate is different at each place in the city

- Maximize the urban microclimate

The design of urban areas affects the different elements of climate - temperature, wind patterns, humidity, precipitation, air quality – which in turn have direct consequences for the liveability in those places

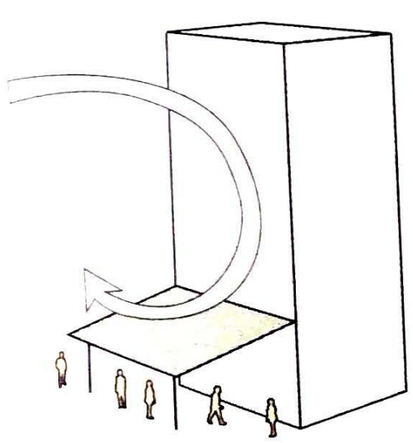
(Hebbert & Webb, 2012)

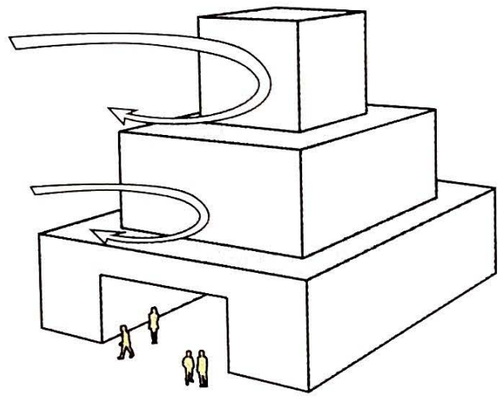
CLIMABILITY

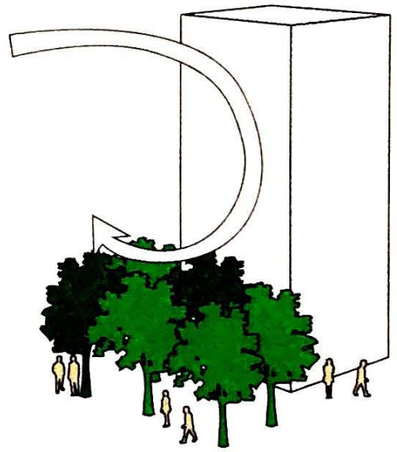
- *Solar radiation and appropriation*
- Sun appreciated during winter
- Shade desired during summer
- Create choice for places in the sun or shade
- Add green to avoid overheating

CLIMABILITY

- *Wind and appropriation*
- Create winding streets
- Design solutions around tall buildings
- Create ventilation





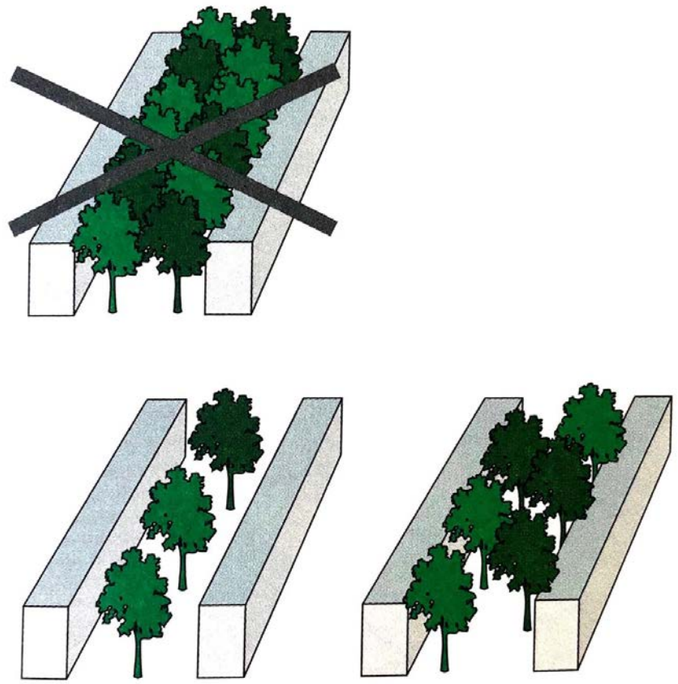


CLIMABILITY

- *Precipitation*
- Dry feet at sidewalks
- Protection at pedestrian routes and places for staying

CLIMABILITY

- *Air quality*
- Create green
- Know what kinds of green
- Routes where clean air enters
- *Noise*
- Create distance
- Add sound barrier



SITE ANALYSIS

- North Milan analysis
- Problems appropriation and microclimate
- Opportunities appropriation and microclimate

SITE PROBLEMS

SITE ANALYSIS

- North Milan analysis
- Problems appropriation and microclimate
- Opportunities appropriation and microclimate

SITE OPPORTUNITIES

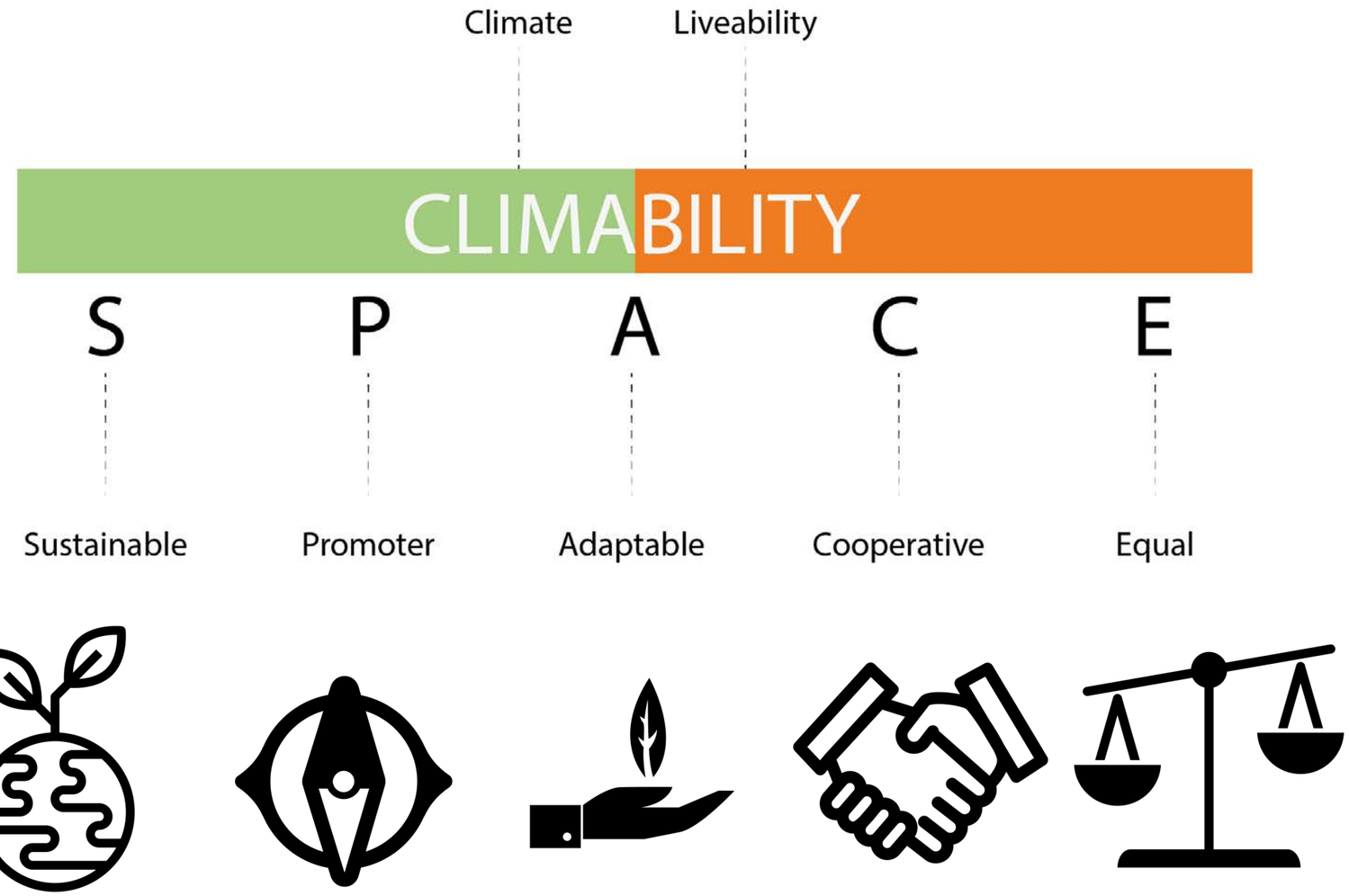
SITE ANALYSIS

- Safe crossing
- Green spaces
- Hard edge

SITE ANALYSIS

- Safe crossing
- Green spaces
- Hard edge
- Degraded areas
- Low quality places for staying
- Paved surfaces
- Noise

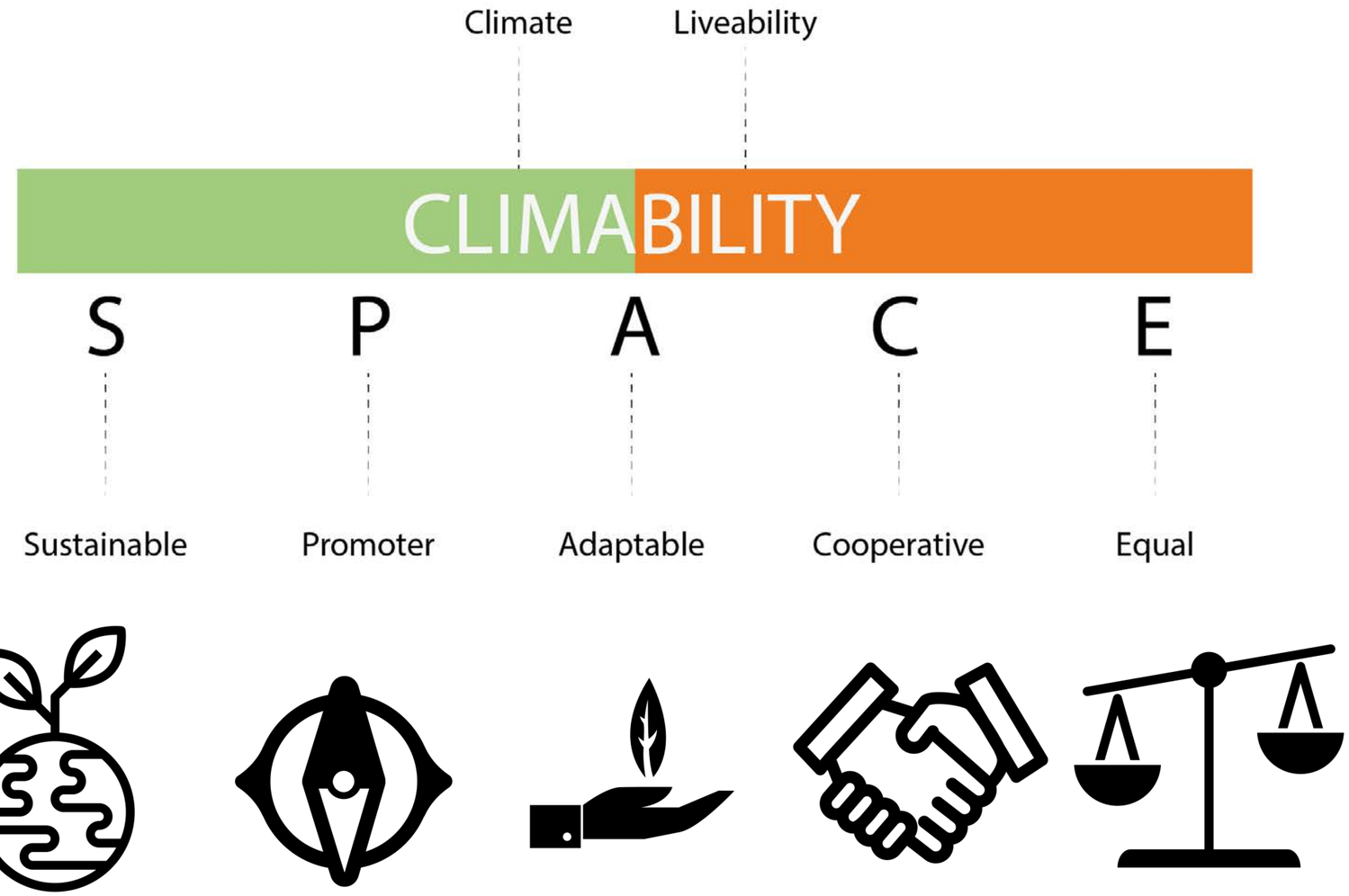
VISION 2100


Climate
Liveability
CLIMABILITY
S
P
A
C
E
Sustainable
Promoter
Adaptable
Cooperative
Equal

VISION 2100

VISION STATEMENT:

In the year 2100 Milan will be environmental- and social sustainable by providing climate adaptive solutions focussing on the urban microclimate that stimulate the (temporary) appropriation of urban outdoor spaces.



VISION 2100

APPROPRIATION
- Comfortable walkability
- Pleasant places for staying
- Soft transition zones

- URBAN MICROCLIMATE
- Pleasant urban microclimate

- Strong identity in the two belts

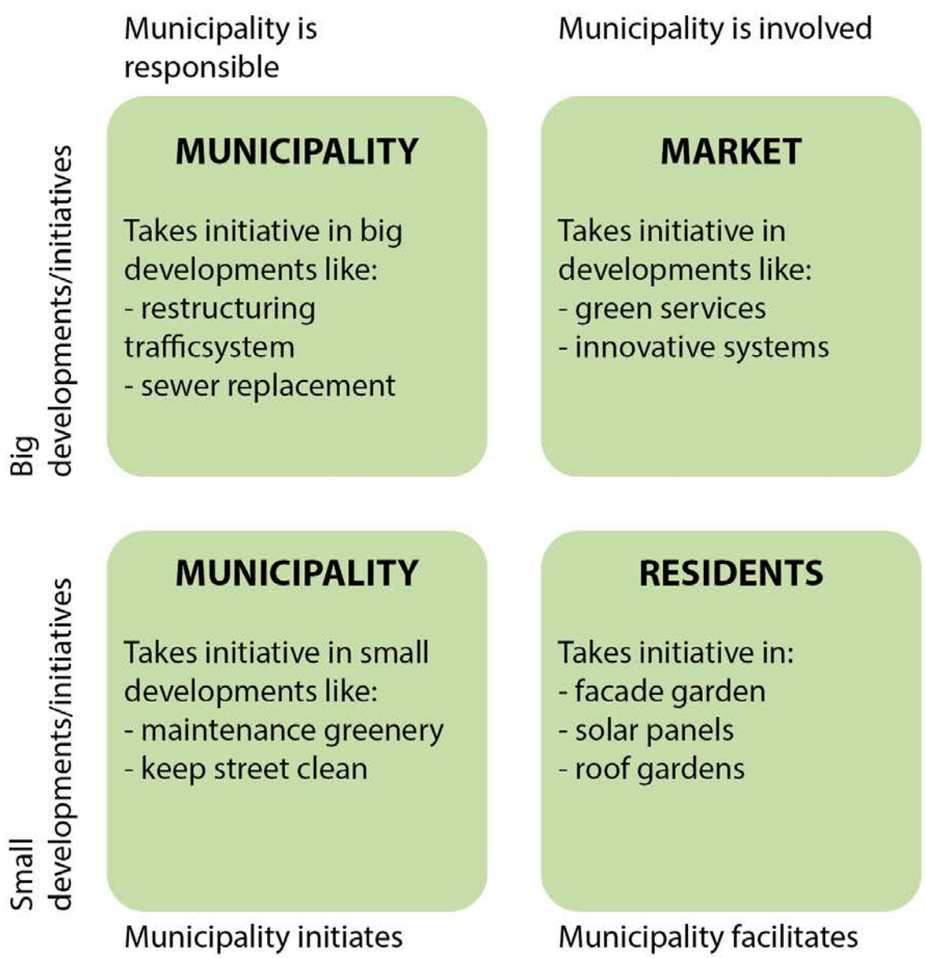
- Focus on combination of appropriation and urban microclimate

DESIGN STRATEGIES

- BIG DEVELOPMENTS
- Municipality and market

- SMALL DEVELOPMENTS
- Municipality
- Residents

Look for collaborations between stakeholders



DESIGN STRATEGIES

- Create support among resident
- Cooperation with residents
- Different types of residents
- Different approaches

SKEPTICS

Character:
Climate change is not a thing, moreover, I've got my own issues. This person is not active in the neighbourhood.

Strategy: Conform
- don't use climate change
- use social norm
- emphasize negative consequences for themselves

UNINFORMED

Character:
Climate change is a problem and I would like to do something, but I don't know what and how.

Strategy: Empowering
- emphasize impact from them
- give usefull examples
- connect them with others

ACTIVELY INVOLVED

Character:
Climate change is a big problem. I would like to help improving my neighbourhood for a better future.

Strategy: Participate
- nudging
- use them as promoters
- seduce with benefits

INSPIRERS

Character:
Climate change is THE problem. I'm doing a lot to fight climate change and I've a lot of ideas for initiatives.

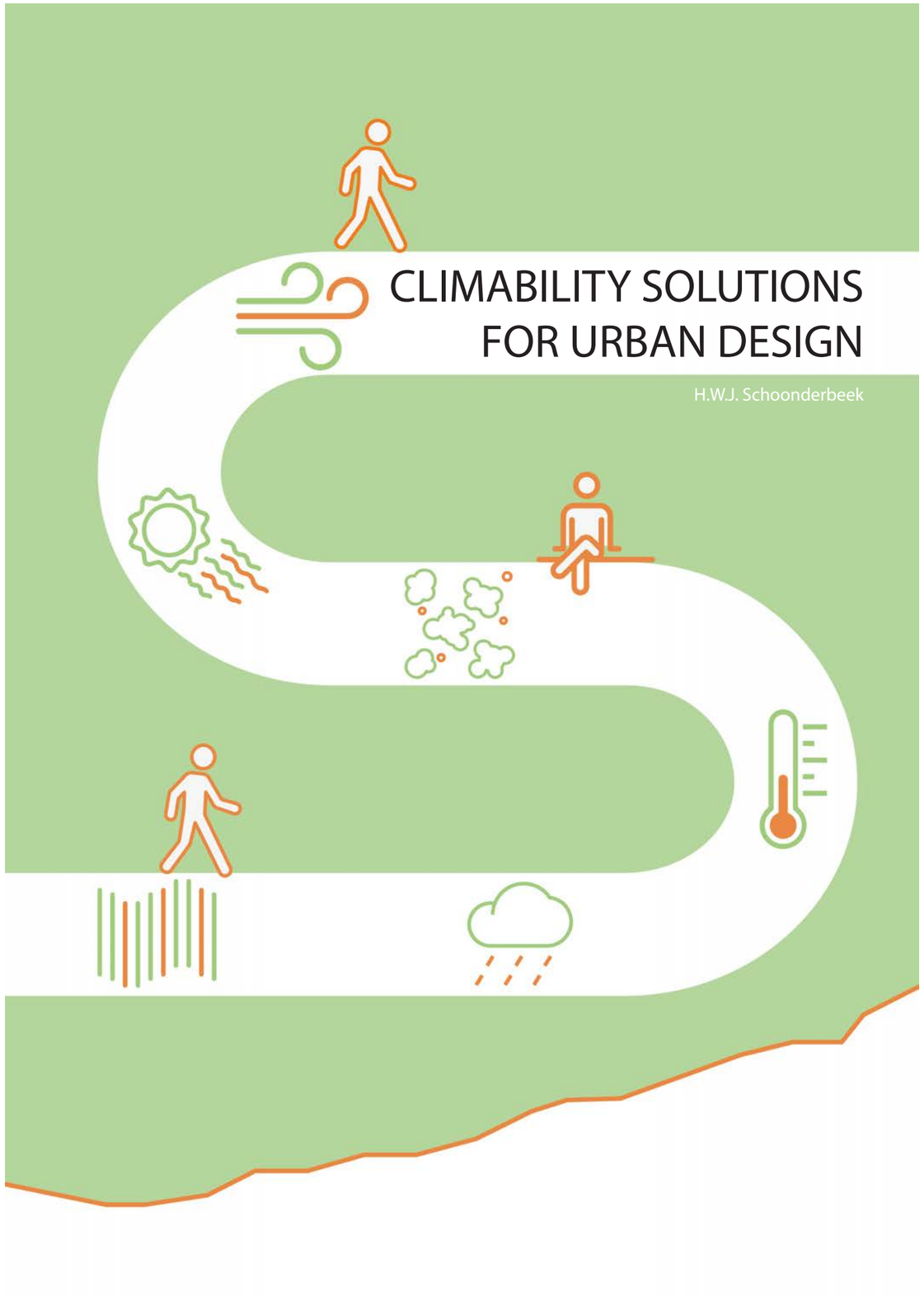
Strategy: Inspire
- use them as influencers
- provide inspiration
- inform about implementation

DESIGN STRATEGIES

- Look for initiatives
- Community gardens
- Climate competitions
- Information events
- Workshops etc.

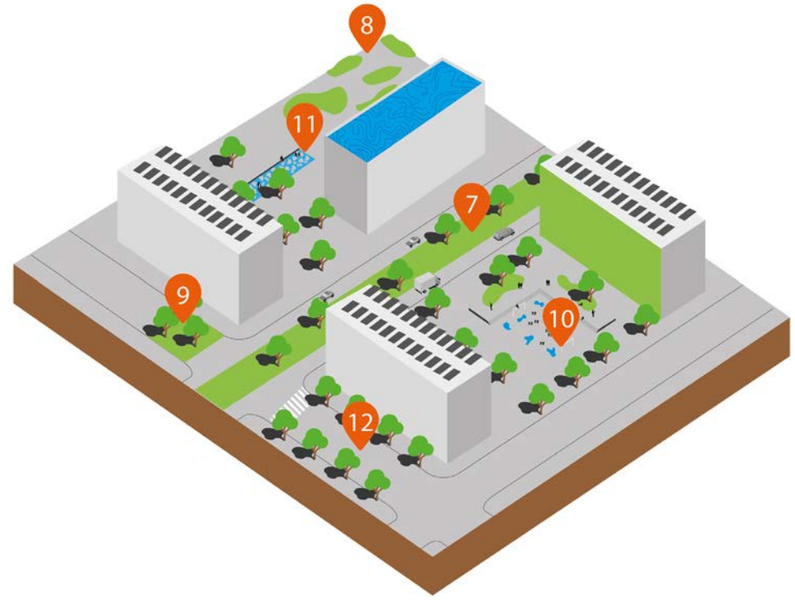
DESIGN SOLUTIONS

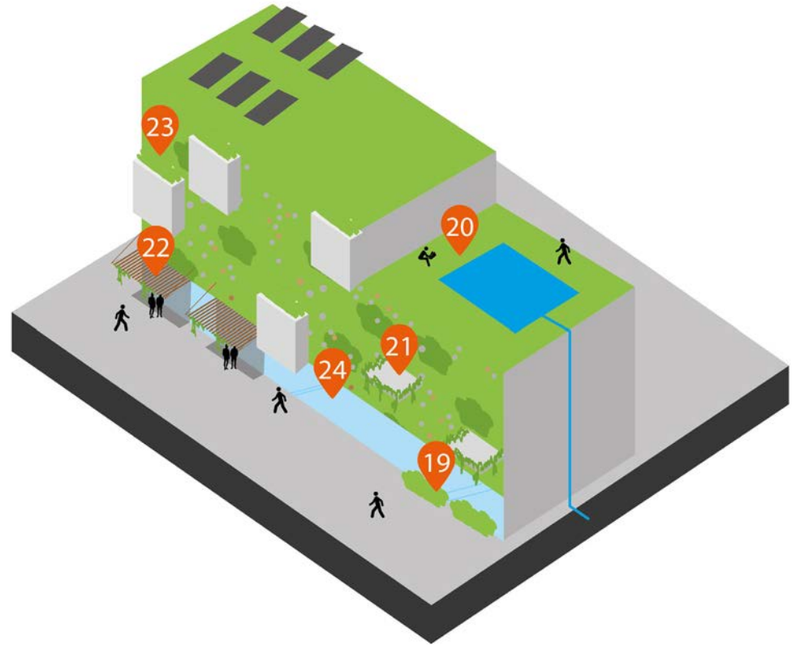
- Guidelines from literature
- Combination of appropriation and urban microclimate
- Assessed on 9 different elements



DESIGN SOLUTIONS

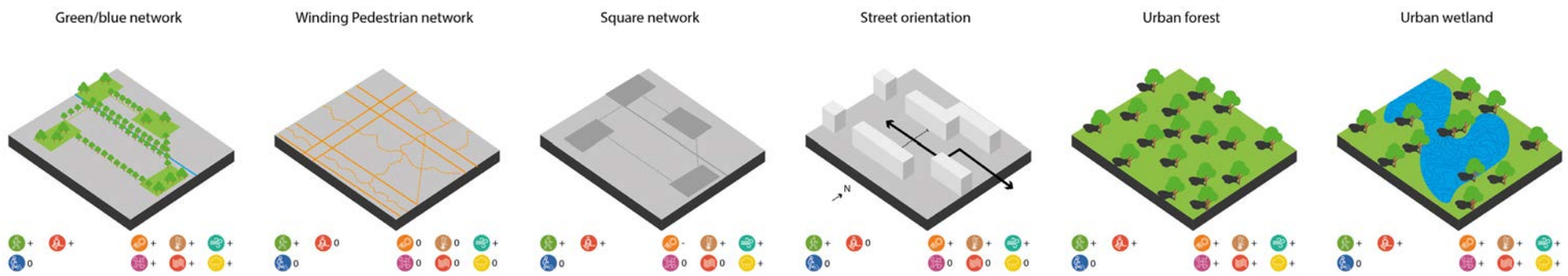
- Interventions of different scales
- DISTRICT SCALE
- NEIGHBOURHOOD SCALE
- STREET SCALE
- BUILDING SCALE





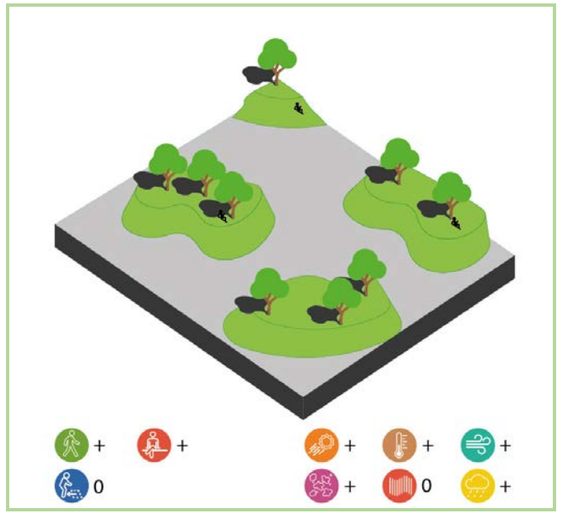
DESIGN SOLUTIONS

- Relation between urban design and architecture
- Interventions can be different according to context, designers, stakeholders etc.



DESIGN SOLUTIONS

- Intervention assessed on 9 elements
- General information
- Advantages appropriation and urban microclimate
- Leadership
- Reference images



GREEN HILLS

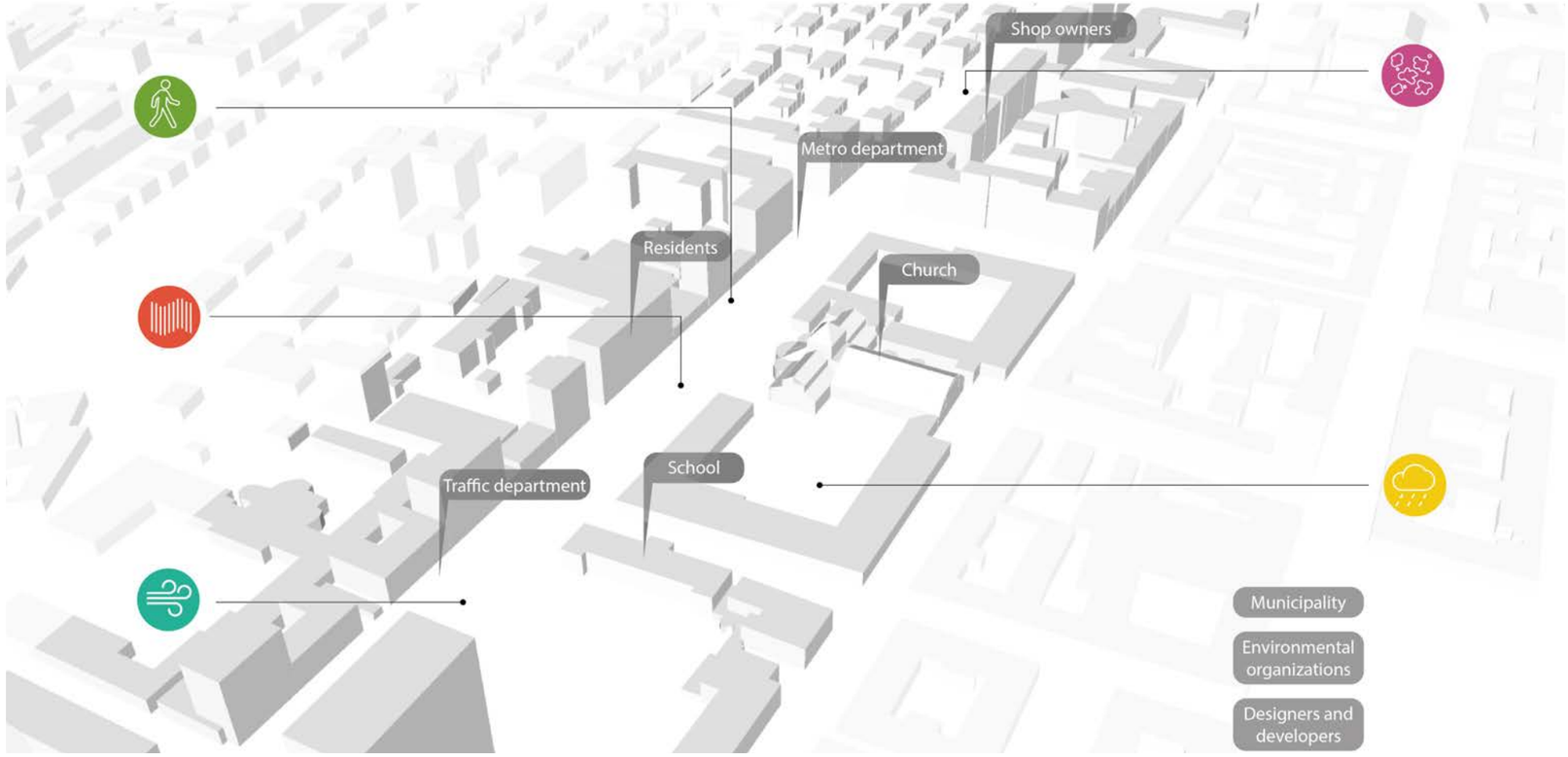
General information: The creation of height differences in the form of hills provide many advantages regarding appropriation and urban microclimate.The hilly terrain invites people to appropriate the space.
Appropriation: The height differences provide choice to the people where and at which height they want to stay. At the same time, pedestrian routes through the hills create a pleasant and interesting walkability.
Urban microclimate: Water runoff can be steered towards lower placed surfaces. The hills combined with trees offer places in sun or shade, improve the air quality, give protection against wind and provide water storage during heavy precipitation events.
Leadership: Mostly the intervention is quite a large intervention in the public space, so the municipality owns the space and should commission the design.
Costs: €€
Maintenance: Municipality

KEY ASPECTS
- **Height differences**
- **Multiple sitting options**
- **Stormwater run-off and temporary water storage**

STAKEHOLDERS
- **Municipality**
- **Landscape designers**
- **Community organizations**
- **Residents**

TRANSFORMATO SONDRIO

- Transformation of busy street
- Walkability of low quality
- Wind nuisance
- Low infiltration of water
- Air pollution
- Traffic noise

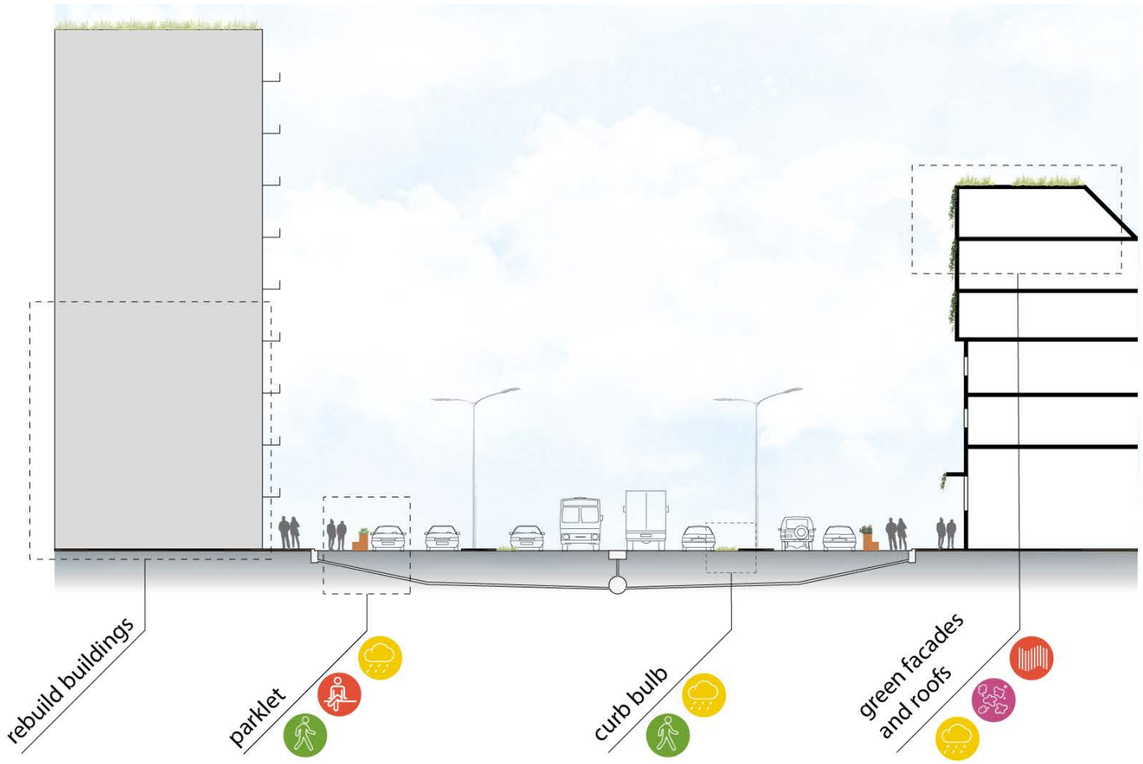



BEAUTY CENTER
INGRESSO

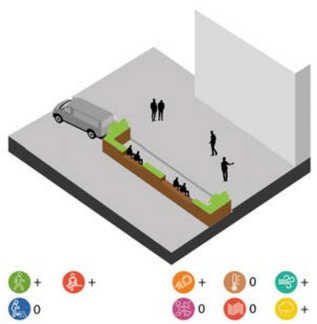
TRANSFORMATO SONDRIO

- 0-10 Years

- Parklets



Parklet

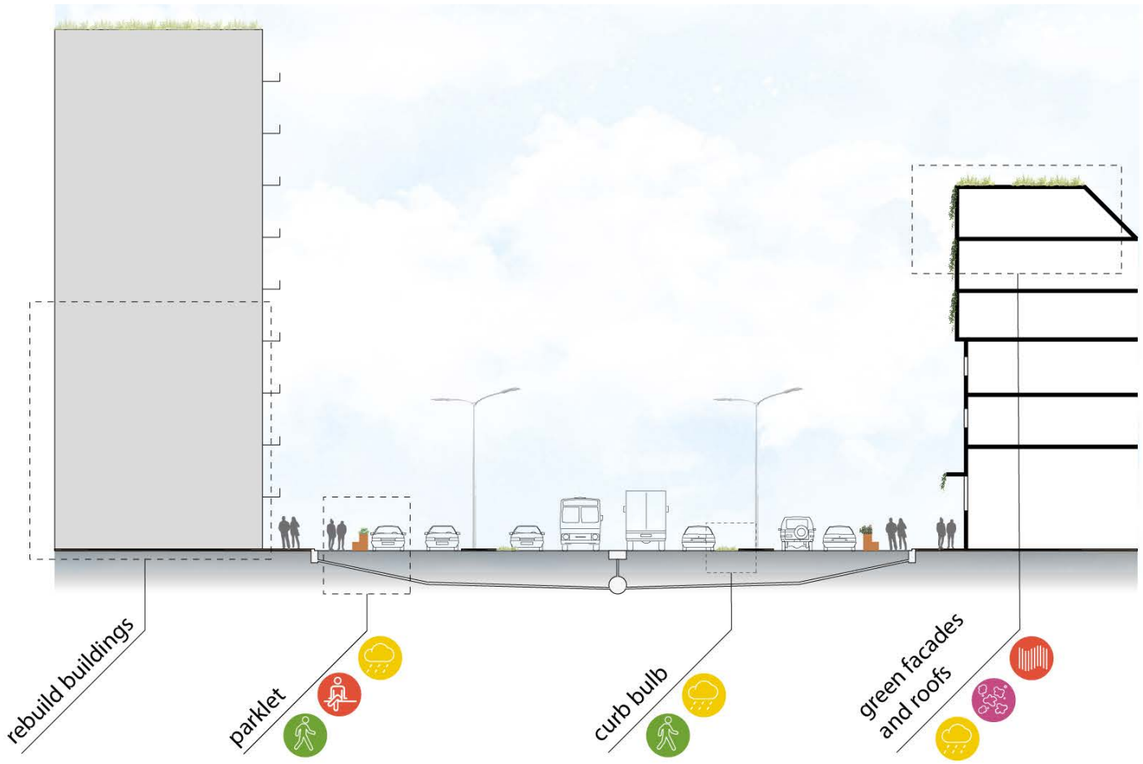


curb bulb

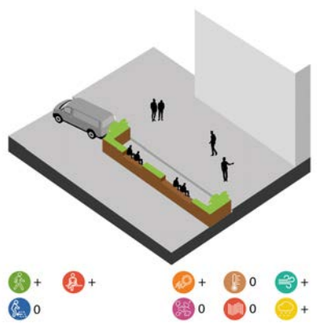
Green balconies

TRANSFORMATO SONDRIO

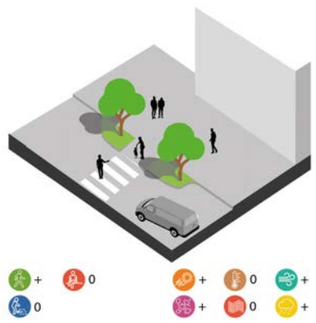
- 0-10 Years
- Parklets
- Curb bulbs



Parklet



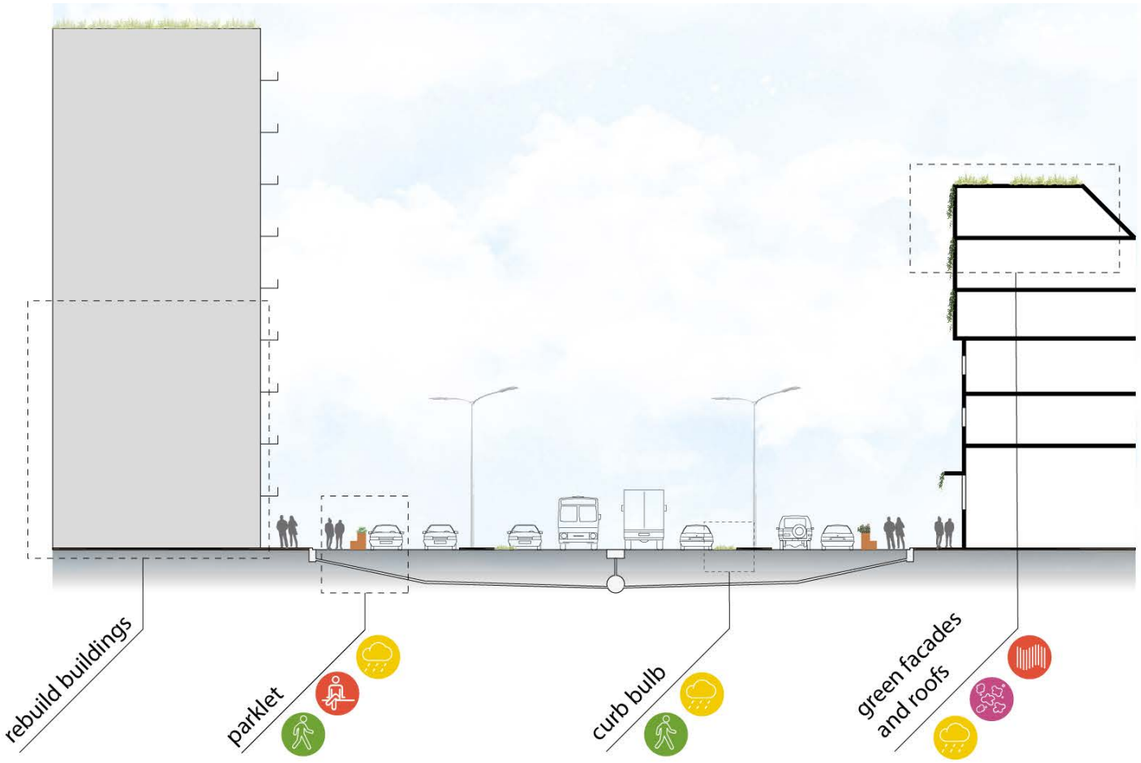
curb bulb



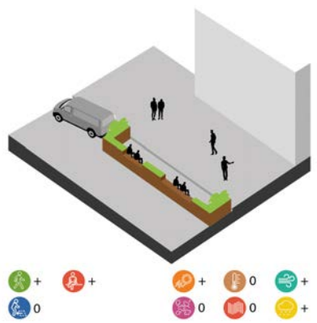
Green balconies

TRANSFORMATO SONDRIO

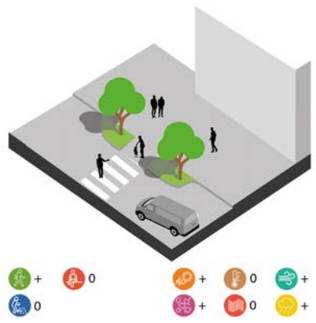
- 0-10 Years
- Parklets
- Curb bulbs
- Green facades and roofs



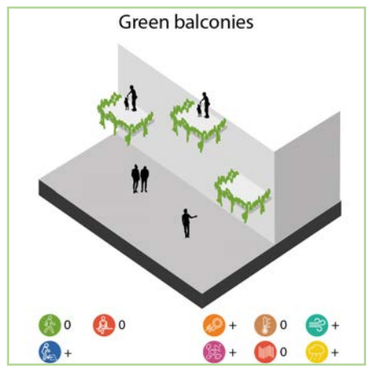
Parklet



curb bulb



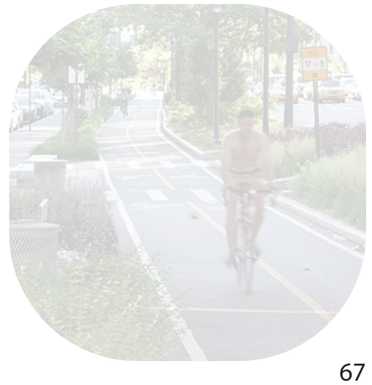
Green balconies



TRANSFORMATO SONDRIO

- 10-30 Years

- Replacement of degraded buildings

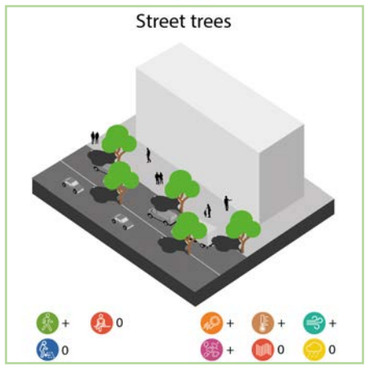


TRANSFORMATO SONDRIO

- 10-30 Years
- Replacement of degraded buildings
- Adding street trees

TRANSFORMATO SONDRIO

- 10-30 Years
- Replacement of degraded buildings
- Adding street trees
- Stimulate active modes of transport



Green balconies

Pedestrian zone

Facade gardens

Street tree

Hollow street

Green roofs

Pergola

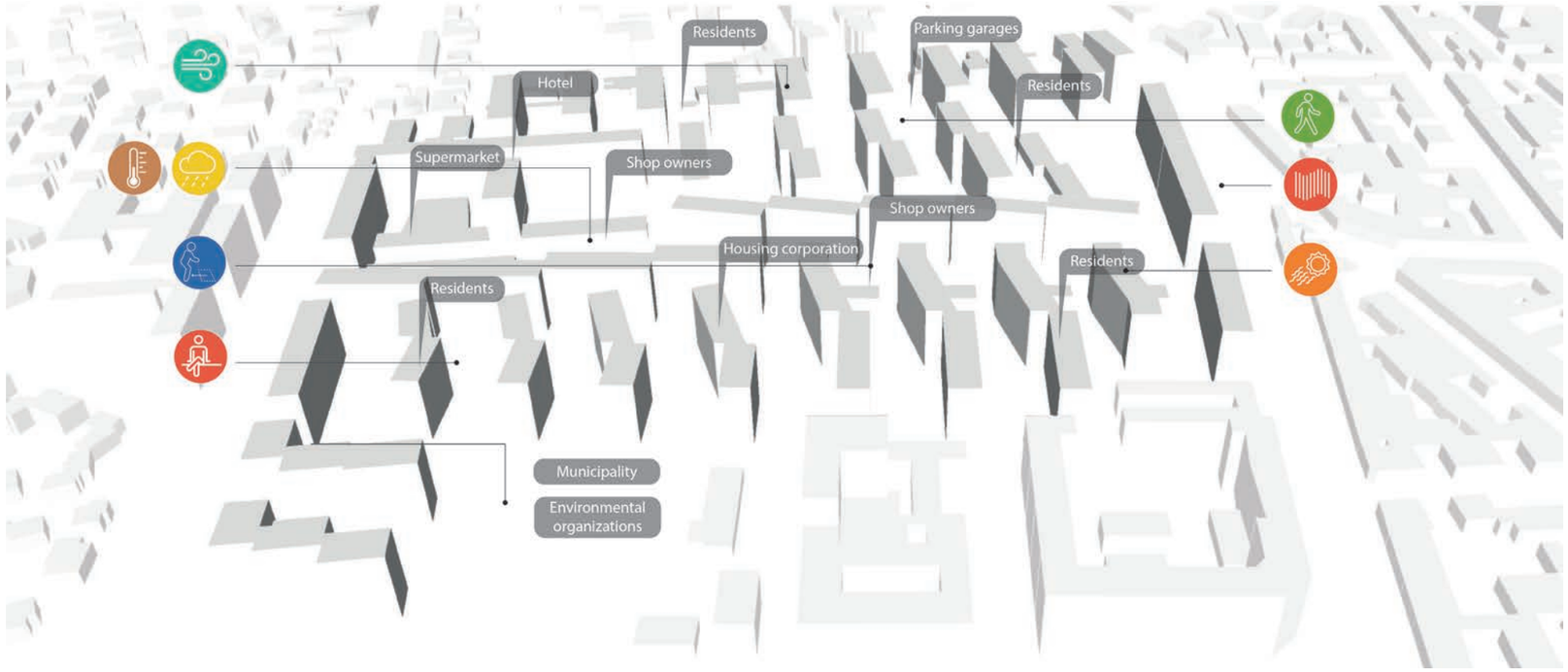
1:200

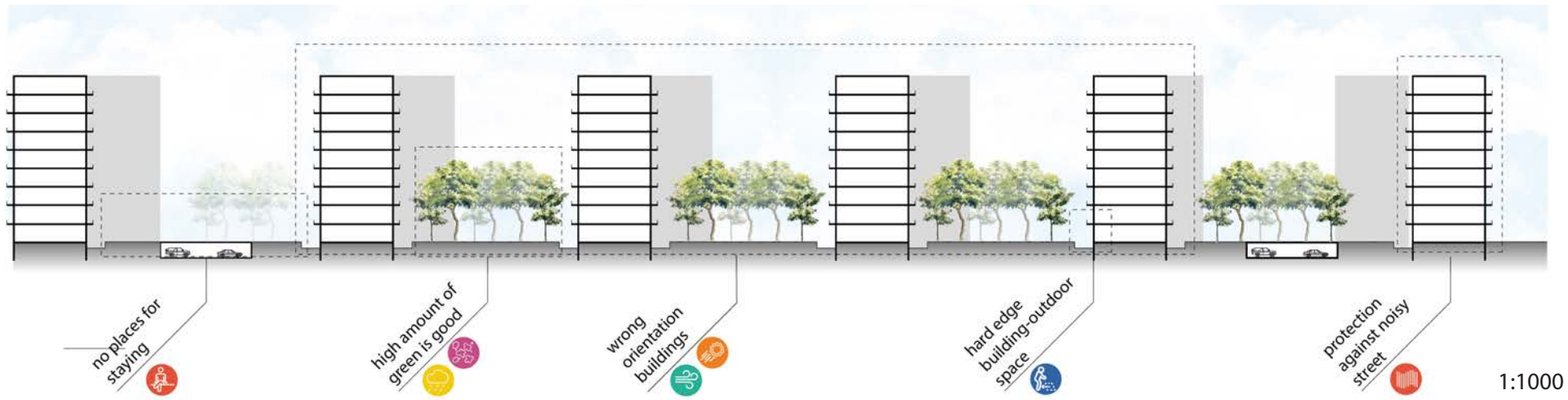

P
A ORE
LAVAGGIO A MANO
50 m
entrata
CONVENZIONE
GIORNALIERO 10€


BEAUTY CENTER
INGRESSO

MISTO MAGGIOLINA

- Mix development in high density area
- Low quality walkability
- No space for staying
- Hard edge between building and outdoor space
- Orientation causes wind tunnels
- High amount of paves surfaces





BUILDING ORIENTATION

CLOSED OUTDOOR SPACES

PAVED SURFACES

MISTO MAGGIOLINA

- New development connected to existing architecutre
- Wide variety of outdoor spaces
- Accessible and interesting for all kinds of groups
- Protection of the inner areas

Municipality/developers initiatives/development

climate square

1st big important development is the climate square. A center for the neighbourhood is created

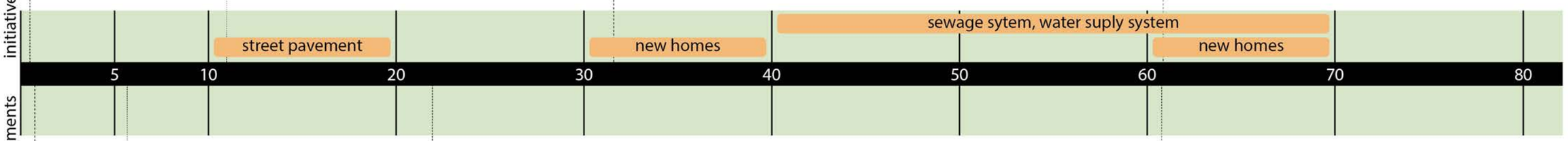
infiltration strip

curb bulb

Possibility to redesign above street, e.g. infiltration strip and curb bulb

Sustainable renovation new architecture and redesign outdoor spaces; strong construction for green roofs and facades

Developers invest in new development of buildings and should redesign the outdoor spaces between the buildings



Residents/market initiatives/developments

When working on the sidewalk, facade gardens can be created and parking lots replaced by a parklet

facade garden

parklet

greening balconies

After construction of infiltration strip residents can appropriate the edge zones of it

With the redesign of outdoor spaces communal gardens can be created to stimulate social cohesion

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Municipality/developers initiatives/development

street pavement

5 10 20 30 40 50 60 70 80

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sewage sytem, water suply system

new homes

new homes

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Balconies

Green facade

Trees

Orientation

Vegetation

Drainage

1:200

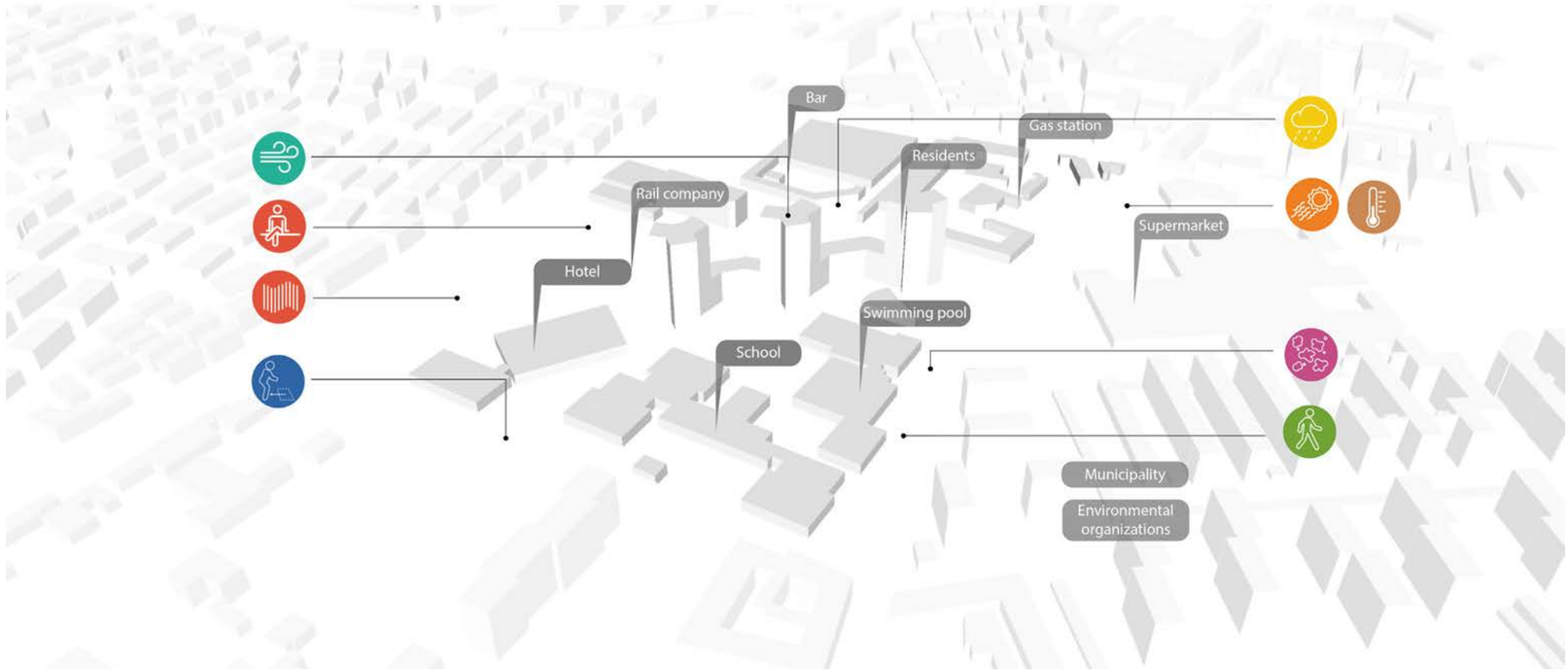
Water square

Seating options

Movable chairs

NUEVO GRECO

- Totally new development in degraded area
- Bad walkability
- No quality in outdoor space
- Hard edges public-private
- Paved surfaces
- Wind discomfort
- Noisy train tracks



BAD WALKABILITY

NO PLACES FOR STAYING

HARD EDGE ARCHITECTURE

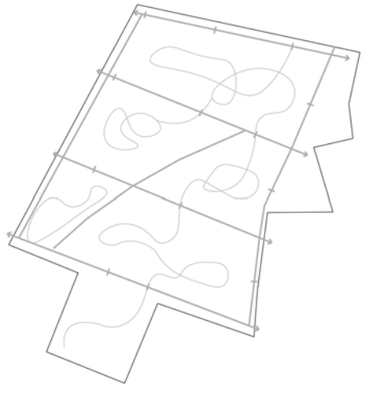
PAVED SURFACES

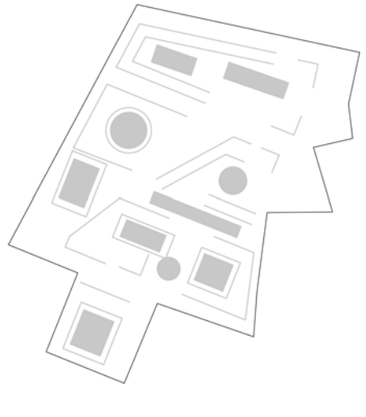
WIND DISCOMFORT

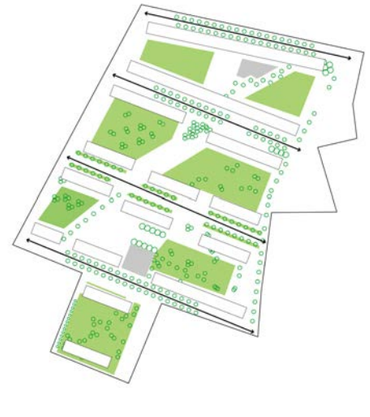
NOISY TRAIN TRACK

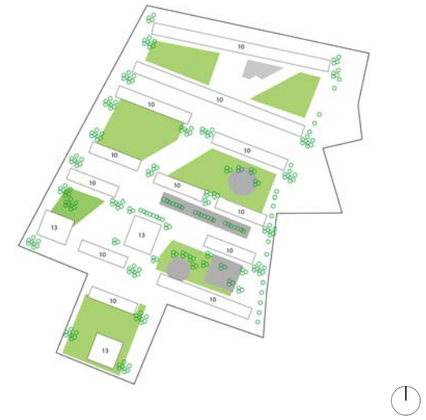
NUEVO GRECO

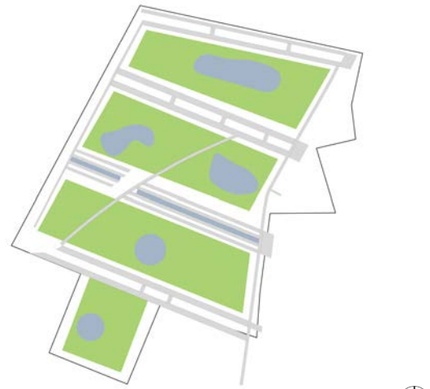
- Maximization method
- Multilevel building blocks with towers
- Fit in the train tracks
- Lot of outdoor space

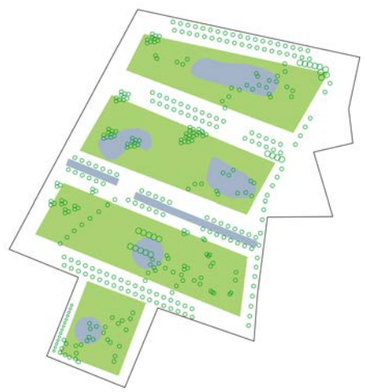












NUEVO GRECO

- Maximization method
- Multilevel building blocks with towers
- Fit in the train tracks
- Lot of outdoor space

1:2000

























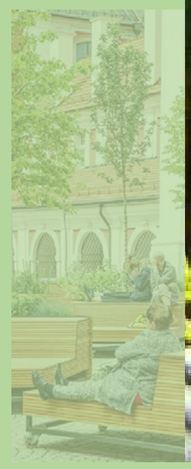


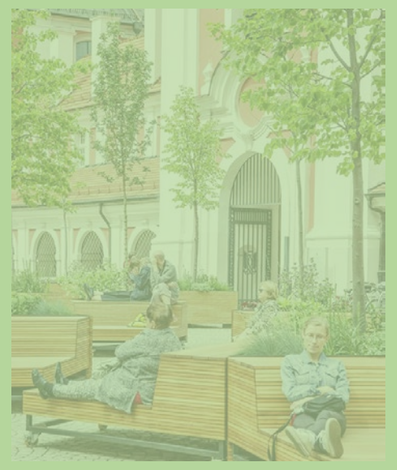








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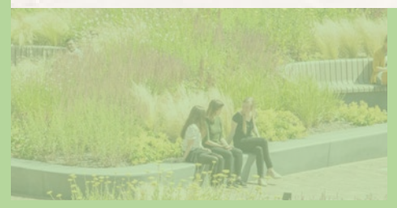
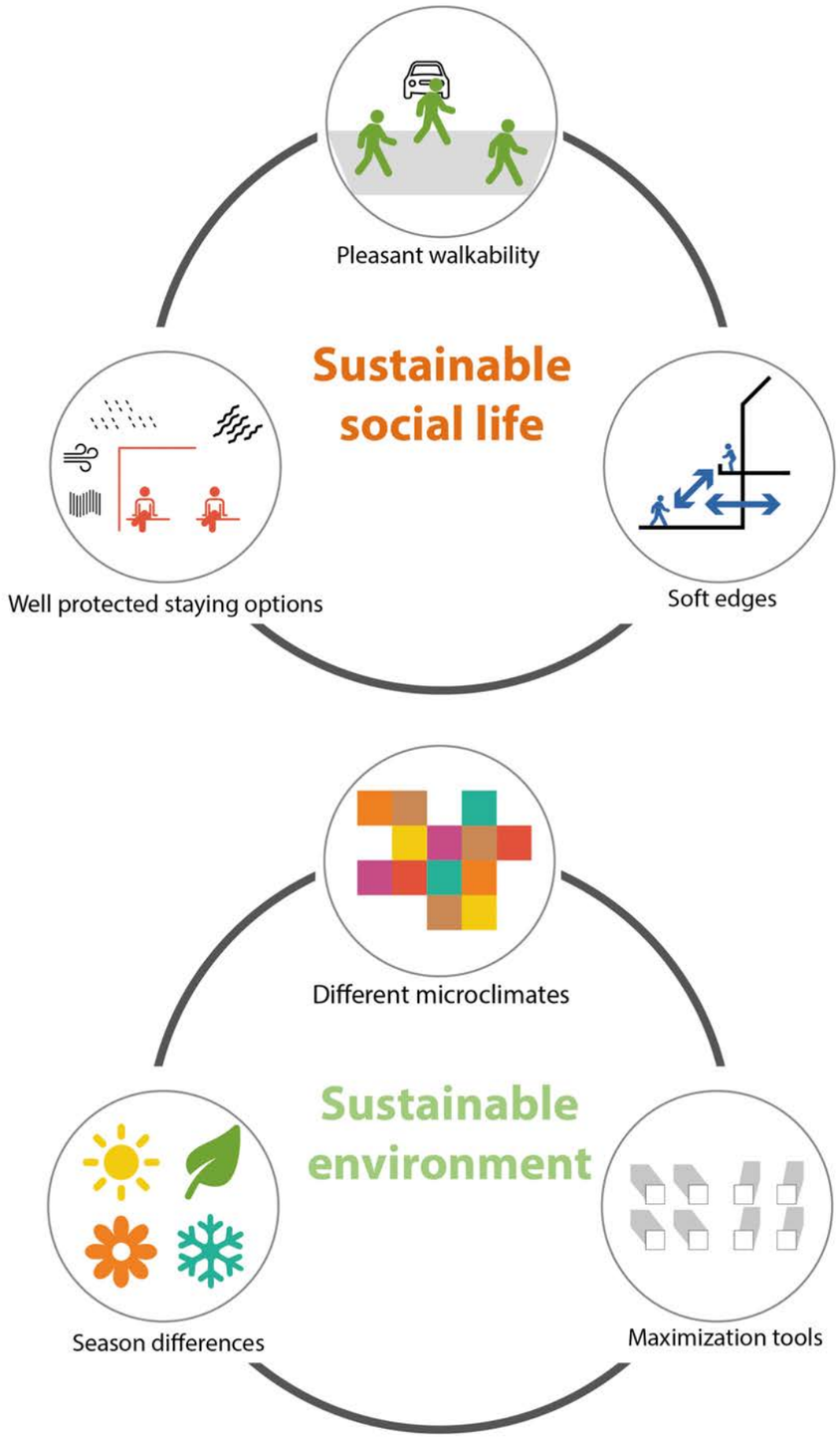


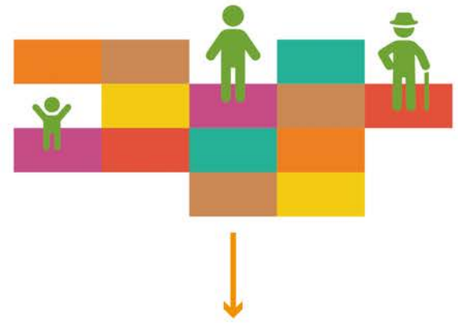
CONCLUSION

- Good walkability
- Pleasant places for staying
- Soft edges public-private
- Different microclimates
- Different diserables
- Microclimate tools



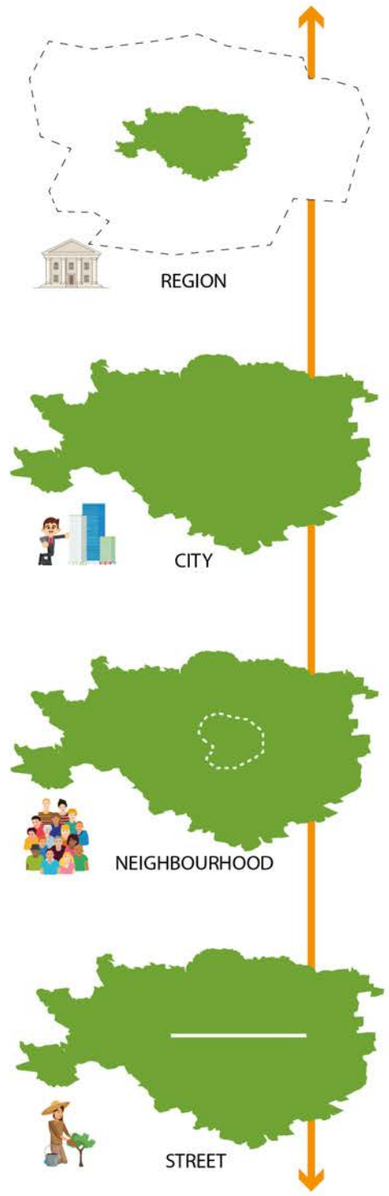
CONCLUSION

- Offer choise and opportunities
- Integrated design on each scale



CHOICE

Different users and may different microclimates require a wide variety of solutions where choice should be integrated in the design



"The solution is not only about creating more green. It is more about creating effective green".

THANK YOU FOR YOUR ATTENTION

QUESTIONS?