Appendix

Reviving the Ruhr
Preparing the Peri-urban Ruhr for an uncertain energy & climate future.

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Normal scenario	2012		0,68	PJ	188888888,9	KWh	188888,889	MWh	188,8889	GWh		Currently from fos
	2030		0,5	PJ	138888888,9	KWh	138888,889	MWh	138,8889	GWh		goal for renewable
Eventual value on axis	2050		0,28	PJ	77777777,78	KWh	77777,7778	MWh	77,77778	GWh		goal for renewable

Low scenario	2012		0,68	PJ	188888888,9	KWh	188888,889	MWh	188,8889	GWh		Currently from fos
	2030		0,45	PJ	125000000	KWh	125000	MWh	125	GWh		goal for renewable
Eventual value on axis	2050		0,25	PJ	69444444,44	KWh	69444,4444	MWh	69,44444	GWh		goal for renewable

High scenario	2012		0,68	PJ	188888888,9	KWh	188888,889	MWh	188,8889	GWh		Currently from fos
	2030		0,6	PJ	166666666,7	KWh	166666,667	MWh	166,6667	GWh		goal for renewable
Eventual value on axis	2050		0,5	PJ	138888888,9	KWh	138888,889	MWh	138,8889	GWh		goal for renewable

sil fuels:	87,40%
e energy sources	
e energy sources	

165,0889		From renewable energy sources		23,8	GWh
50%		From renewable energy sources		69,44444	GWh
100%		From renewable energy sources		77,77778	GWh

What needs to be added:			45,64444	GWh
What needs to be added:			8,333333	GWh

sil fuels:	87,40%
e energy sources	
e energy sources	

165,0889		From renewable energy sources		23,8	GWh
50%		From renewable energy sources		62,5	GWh
100%		From renewable energy sources		69,44444	GWh

What needs to be added:			38,7	GWh
What needs to be added:			6,944444	GWh

sil fuels:	87,40%
e energy sources	
e energy sources	

165,0889		From renewable energy sources		23,8	GWh
50%		From renewable energy sources		83,33333	GWh
100%		From renewable energy sources		138,8889	GWh

What needs to be added:			59,53333	GWh
What needs to be added:			55,55556	GWh

		historic city centre					riverbank / wetland						green urba	
	optimistic		18401976,35				optimistic		35450527			optimistic		
	pessimistic		33762816,63				pessimistic		93236476			pessimistic		
										Goal				
	total optimistic			58407207		58,40721		GWH		53 GWH				
	total pessimistic			1,7E+08		170,3764		GWH		115 GWH				

Output per source (in KWh per year)		
	one day	year
Solar panels	0,3	109,5
Wind turbines	30	10950
Micro wind turbines	0,3	109,5
Hydropower	100	36500
Algea	20	7300
Biomass	0	0

n area					peri-urban area					industrial area		
35137,2				optimistic		1296632			optimistic		3222934	
2389330				pessimistic		32835669			pessimistic		8152127	

Optimistic

	historic city centre		
output of patch		432890	
ha of patch		561	
total area in the Ruh		95391,52	
Overall output for the Ruhr;			73607905,38

Source	Output	Amount	Total output
Solar panels	109,5	300	32850
Wind turbines	10950	23	251850
Micro wind turbines	109,5	20	2190
Hydropower	36500	4	146000
Algea	7300	0	0
Biomass	0	0	0

	Riverbank/wetland		
output of patch		433985	
ha of patch		561	
total area in the Ruh		183303,5	
Overall output for the Ruhr;			1,42E+08

Source	Output	Amount	Total output
Solar panels	109,5	600	65700
Wind turbines	10950	20	219000
Micro wind turbines	109,5	30	3285
Hydropower	36500	0	0
Algea	7300	20	146000
Biomass	0	0	0

Pessimistic

	historic city centre		
output of patch		794240	
ha of patch		561	
total area in the Ruh		95391,52	
Overall output for the Ruhr;			135051266,5

Source	Output	Amount	Total output
Solar panels	109,5	600	65700
Wind turbines	10950	33	361350
Micro wind turbines	109,5	20	2190
Hydropower	36500	10	365000
Algea	7300	0	0
Biomass	0	0	0

	Riverbank/wetland		
output of patch		1141400	
ha of patch		561	
total area in the Ruh		183303,5	
Overall output for the Ruhr;			3,73E+08

Source	Output	Amount	Total output
Solar panels	58	800	46400
Wind turbines	10950	60	657000
Micro wind turbines	109,5	0	0
Hydropower	36500	4	146000
Algea	7300	40	292000
Biomass	0	0	0

Optimistic

Green urban area	
output of patch	5475
ha of patch	561
total area in the Ruh	14401,44
Overall output for the Ruhr;	140548,8

Source	Output	Amount	Total output
Solar panels	109,5	30	3285
Wind turbines	10950	0	0
Micro wind turbines	109,5	20	2190
Hydropower	36500	0	0
Algea	7300	0	0
Biomass	0	0	0

Peri-urban area	
output of patch	38325
ha of patch	561
total area in the Ruh	75920,23
Overall output for the Ruhr;	5186529

Source	Output	Amount	Total output
Solar panels	109,5	300	32850
Wind turbines	10950	0	0
Micro wind turbines	109,5	50	5475
Hydropower	36500	0	0
Algea	7300	0	0
Biomass	0	0	0

Pessimistic

Green urban area	
output of patch	372300
ha of patch	561
total area in the Ruh	14401,44
Overall output for the Ruhr;	9557319

Source	Output	Amount	Total output
Solar panels	109,5	400	43800
Wind turbines	10950	30	328500
Micro wind turbines	109,5	0	0
Hydropower	36500	0	0
Algea	7300	0	0
Biomass	0	0	0

Peri-urban area	
output of patch	970535
ha of patch	561
total area in the Ruh	75920,23
Overall output for the Ruhr;	1,31E+08

Source	Output	Amount	Total output
Solar panels	109,5	500	54750
Wind turbines	10950	30	328500
Micro wind turbines	109,5	30	3285
Hydropower	36500	4	146000
Algea	7300	30	219000
Biomass	0	0	0

Optimistic

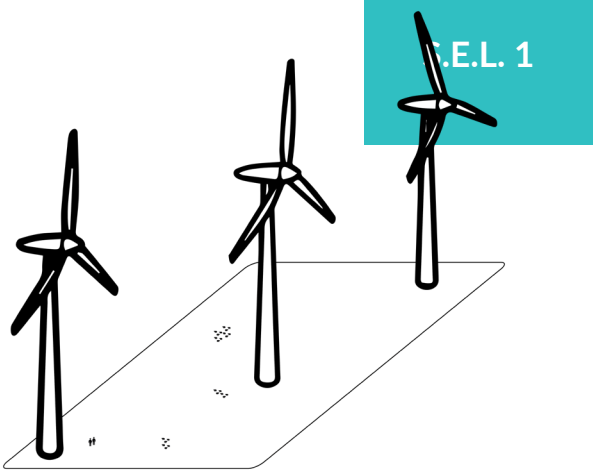
		Industrial area				
		output of patch		372300		
		ha of patch		561		
		total area in the Ruh		19425,9		
		Overall output for the Ruhr;			12891736	
Source		Output	Amount	Total output		
Solar panels		109,5	400	43800		
Wind turbines		10950	30	328500		
Micro wind turbines		109,5	0	0		
Hydropower		36500	0	0		
Algea		7300	0	0		
Biomass		0	0	0		

Pessimistic

		Industrial area				
		output of patch		941700		
		ha of patch		561		
		total area in the Ruh		19425,9		
		Overall output for the Ruhr;			32608510	
Source		Output	Amount	Total output		
Solar panels		109,5	600	65700		
Wind turbines		10950	50	547500		
Micro wind turbines		109,5	0	0		
Hydropower		36500	5	182500		
Algea		7300	20	146000		
Biomass		0	0	0		

Wind-mill park

S.E.L. 1



+
possibility to compose multi-layered solutions, since ground level can be used in a different way.

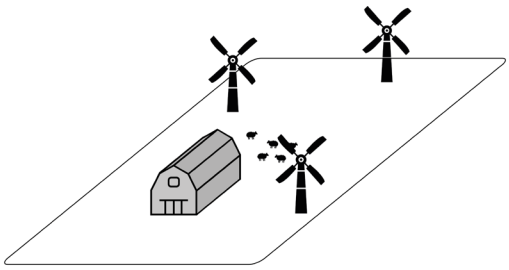
Possibility to use, otherwise uncreachable locations.

-
Huge impact on landscape, destroying morphological structure of current landscape

Certain functions are excluded from being implemented on ground level, due to safety mainly.

Local wind mill

S.E.L. 2



+
possible positive outcome

why would you choose this

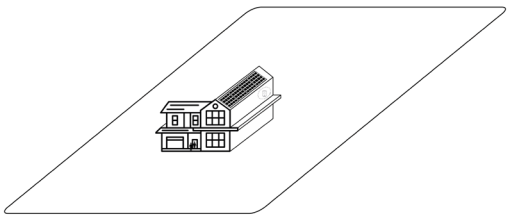
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Solar thermal collectors

S.E.L. 3



+
possible positive outcome

why would you choose this

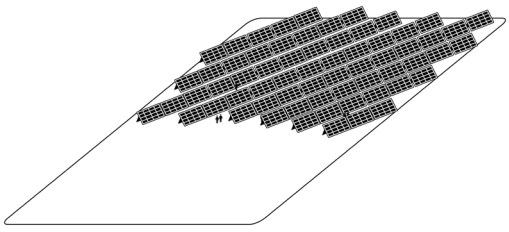
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Photovoltaic cells - solar farm

S.E.L. 4



+
possible positive outcome

why would you choose this

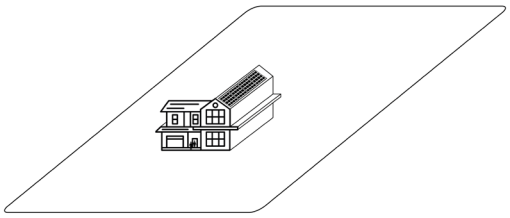
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Photovoltaic cells - rooftop solar

S.E.L. 5



\+
possible positive outcome

why would you choose this

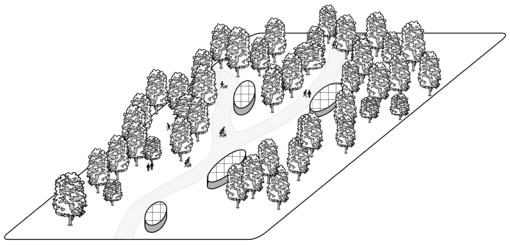
possibility to compose multi-layered solutions

\-
possible negative outcome

what are barriers for implementing this

Photovoltaic cells - (artifical) urba elements

S.E.L. 6



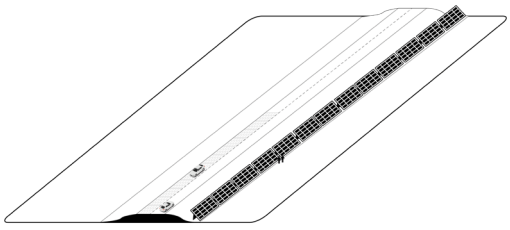
\+
Possiblity to implement in different surroundings, parks, forests, streets, leisure areas.

Can be connected and formed into a leisure corridor, by adding art to the elements.

\-
Efficiency is questionable

Solar roads / solar roadside

S.E.L. 7



\+
Road and roadside is otherwise lost space. Now it is given a function.

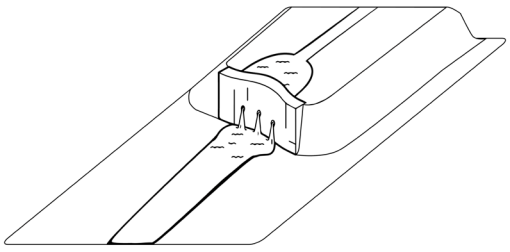
Can serve as a ecologic corridor at the same time, by implementing green/blue infrastructure in the surrounding.

\-
Maintanance is tricky.

Efficiency is questionable.

Hydropower landscape

S.E.L. 8



\+
possible positive outcome

why would you choose this

possibility to compose multi-layered solutions

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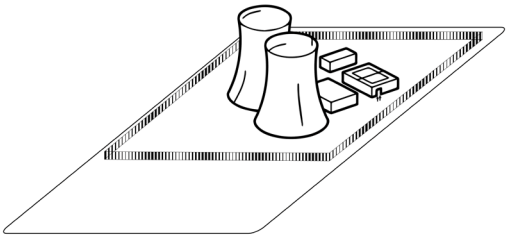
possible negative outcome

what are barriers for implementing this

Nuclear energy landscape

S.E.L. 9



+
possible positive outcome

why would you choose this

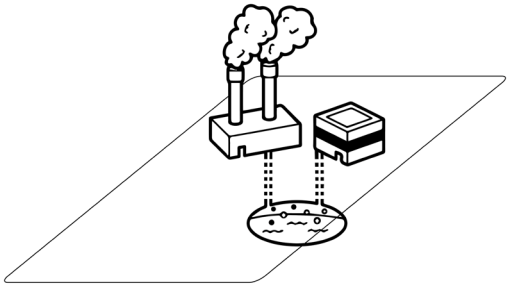
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Geothermal heatplant

S.E.L. 10



+
possible positive outcome

why would you choose this

possibility to compose multi-layered solutions

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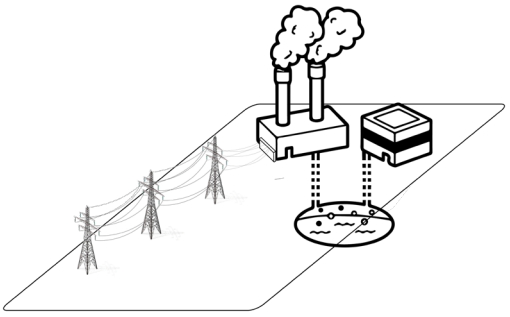
possible negative outcome

what are barriers for implementing this

Geothermal powerplant

S.E.L. 11



+
possible positive outcome

why would you choose this

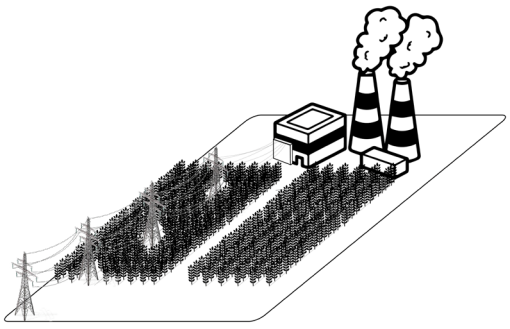
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Biomass cultivation landscape

S.E.L. 12



+
possible positive outcome

why would you choose this

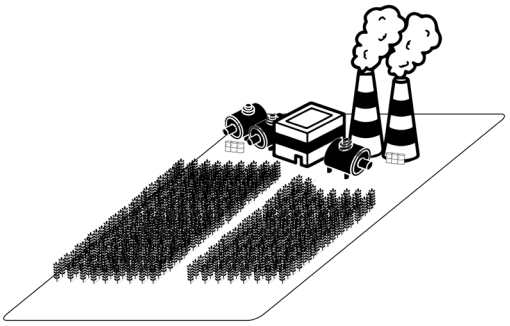
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Biofuel cultivation landscape

S.E.L. 13



+
possible positive outcome

why would you choose this

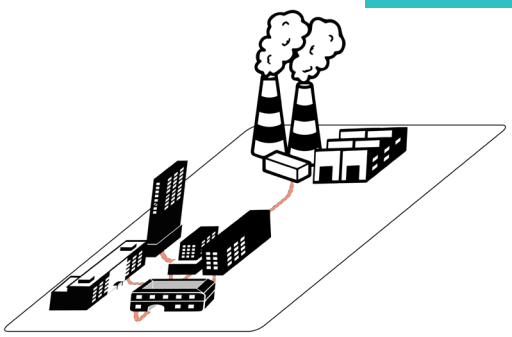
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Residual heat landscape

S.E.L. 14



+
possible positive outcome

why would you choose this

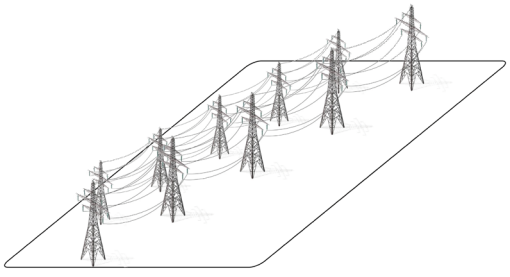
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Energy network

S.E.L. 15



+
possible positive outcome

why would you choose this

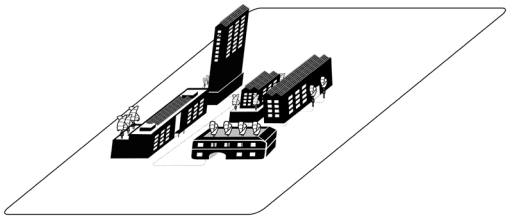
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Microgrid landscape

S.E.L. 16



+
possible positive outcome

why would you choose this

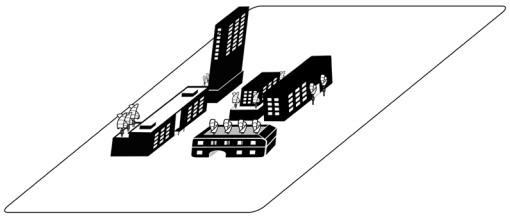
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Micro wind landscape

S.E.L. 17



+
possible positive outcome

why would you choose this

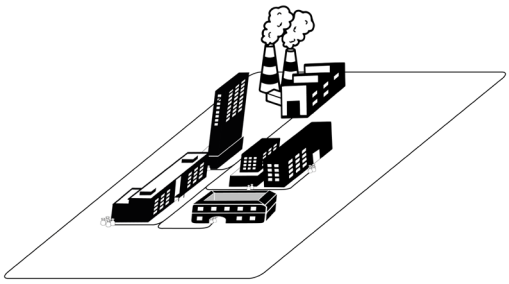
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Waste-to-energy landscape

S.E.L. 18



+
possible positive outcome

why would you choose this

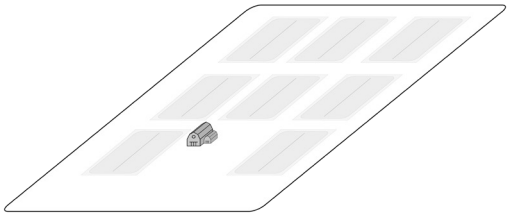
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Algea-energy landscape

S.E.L. 19



+
possible positive outcome

why would you choose this

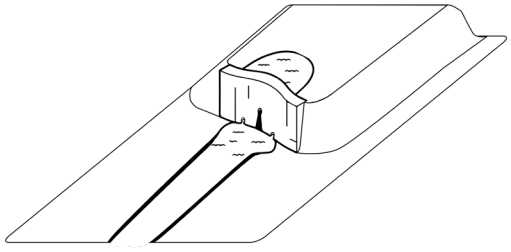
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Electricity storage (PHES/SPHS)

S.E.L. 20



+
Can be covered in solar panels

Can serve as a ecologic node/corridor.

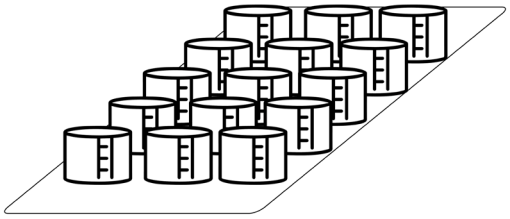
Can serve as water retention, added to a network.

Counter UHI.

-
Geographically huge impact on landscape, by changing morphological layout

Fuel storage

S.E.L. 21



+
possible positive outcome

why would you choose this

possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Heat- and coldstorage (ATES)

S.E.L. 22

+
possible positive outcome

why would you choose this

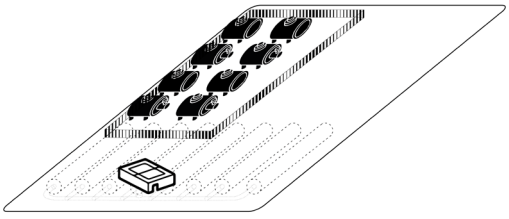
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Hydrogen storage

S.E.L. 23



+
possible positive outcome

why would you choose this

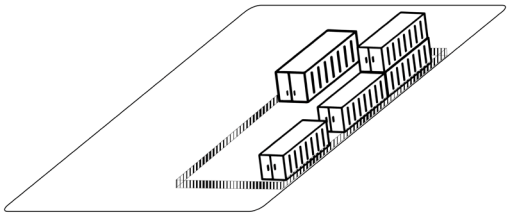
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Battery storage

S.E.L. 24



+
possible positive outcome

why would you choose this

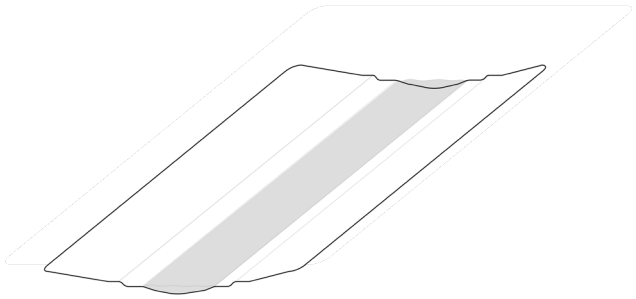
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

River

C.A. 1



+
possible positive outcome

why would you choose this

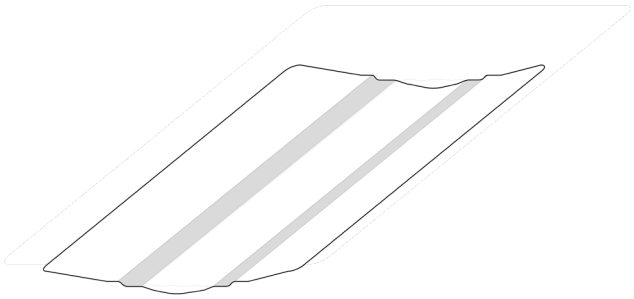
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Wetland

C.A. 2



+
possible positive outcome

why would you choose this

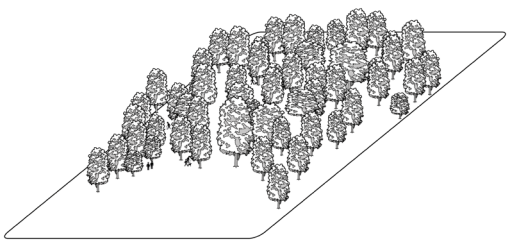
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Forest

C.A. 3



+
Can serve as a ecologic corridor

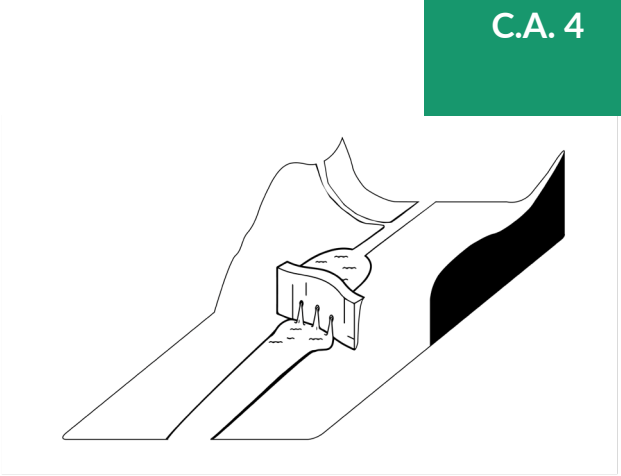
Countering UHI

Possibility to implement solar or wind energy production, can be used multi-functional.

-
If highly concentrated, could serve as a barrier between two sides of the forest.

Dam & reservoir

C.A. 4



+
Can serve as a ecologic node/corridor.

Counter UHI.

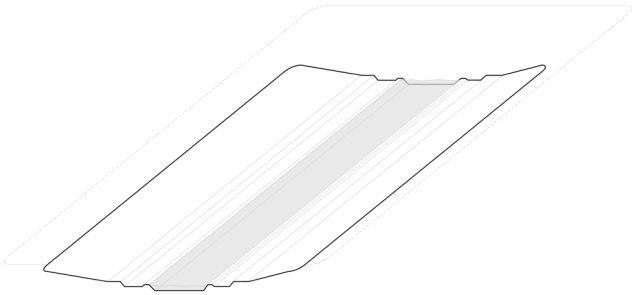
Can be covered in solar panels

Can serve as water retention, added to a network.

-
Geographically huge impact on lands-cape, by changing morphological layout

Artifical canal/river

C.A. 5



+
possible positive outcome

why would you choose this

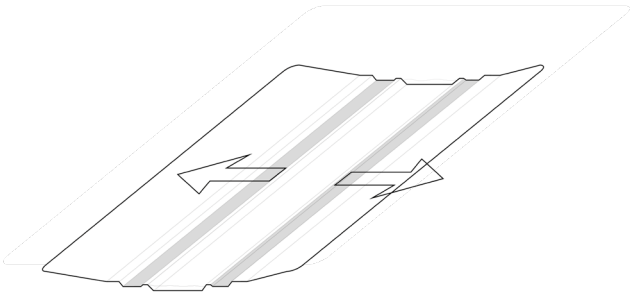
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Artifical wetland

C.A. 6



+
Added function can serve as water retention.

By adding greenery, UHI is countered.

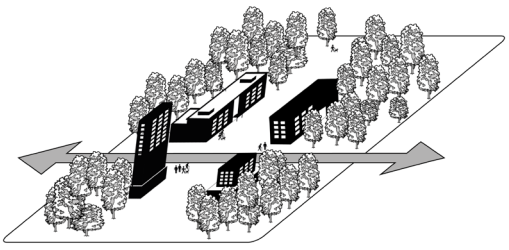
Can function multilayered, by implementing hydroculture, algea production, floating solar panels or wind mills.

Creating more space for ecologic corridor.

-
If applicable, urbanization is pushed away from river.

Wind corridor

C.A. 7



+
possible positive outcome

why would you choose this

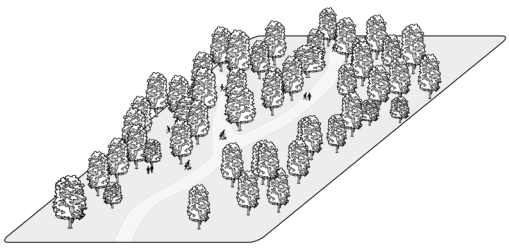
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Park

C.A. 8



+
possible positive outcome

why would you choose this

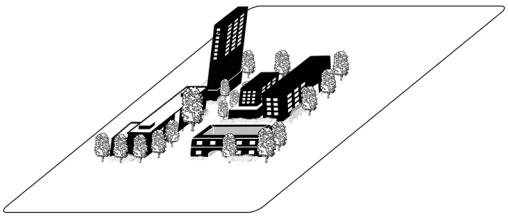
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Green streets & urban trees

C.A. 9



+
possible positive outcome

why would you choose this

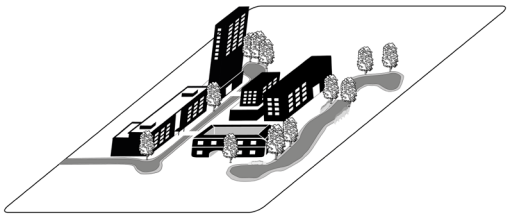
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Urban creek & water retention

C.A. 10



+
Counters UHI

Creates ecologic network, could also be linked to park.

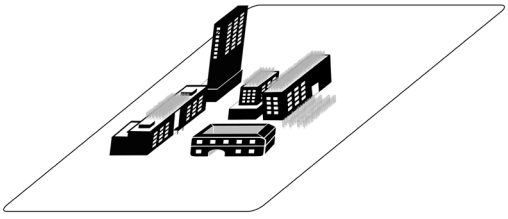
Could be linked to hydroculture, urban farming, algea production, solar or microwind energy production.

Possiblity to connect to biomass production. Could be linked to Hydrostorage.

-
Takes up a lot of (valuable) space in urban areas.

Urban farming

C.A. 11



+
possible positive outcome

why would you choose this

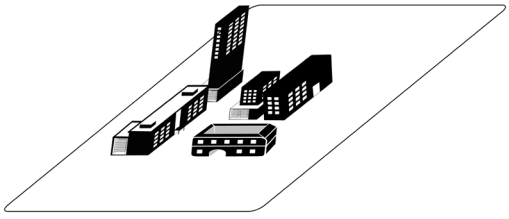
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Vertical farm

C.A. 12



+
possible positive outcome

why would you choose this

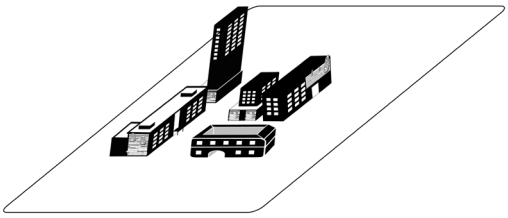
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Green wall & waterwall

C.A. 13



+
possible positive outcome

why would you choose this

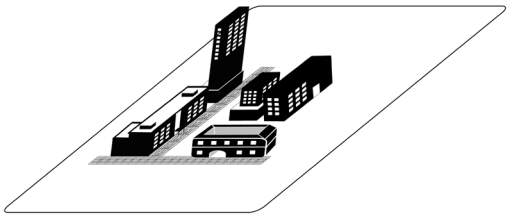
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Permeable paving

C.A. 14



+
possible positive outcome

why would you choose this

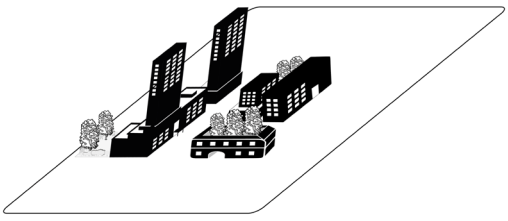
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Private garden & courtyard

C.A. 15



+
possible positive outcome

why would you choose this

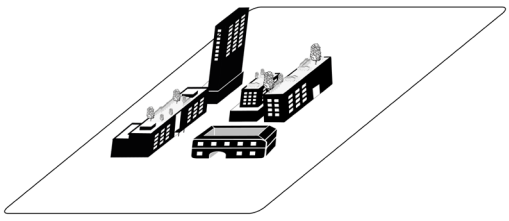
possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Green roof & rooftop garden

C.A. 16



+
possible positive outcome

why would you choose this

possibility to compose multi-layered solutions

-
possible negative outcome

what are barriers for implementing this

Agriculture

\+
Multilayered, agriculture and solar and wind energy production

Biomass production

Biodiversity and ecologic corridor along edges

Implemented in urban areas

\-
Production of greenhouse gasses

Effect on groundwater

Production is heavily climate dependant

Park

\+
Countering air and noise pollution

Multilayered, water retention and energy production can be imbedded in the fabric

Biodiversity and ecologic corridor

Leisure (reduce stress)

Countering UHI, cooling and shading

Pocketpark can be imbedded in urban fabric

social (meeting), Economic (increase value of area) and Enviromental (Water retention) consequences.

\-
Altering the park could alter/damage the ecologic structure

Wetland

\+
Water retention

Biodiversity and ecologic corridor

Buffer space

Countering UHI, cooling and shading

Adjusted to serve as energy landscape, hydropower

\-
Altering the wetland could alter/damage the ecologic structure

River

\+
Water retention

Biodiversity and ecologic corridor

Hydropower

Hydrostorage

Countering UHI, cooling and shading

\-
Altering the river could alter/damage the ecologic structure

Creates a physical barriere between both sides of river

Meadow

\+
multilayered, solar and wind

Biodiversity and ecologic corridor along edges

Cooling

transform to agriculture

suitability for biomass production?

water retention?

certain geographical condition might make it suitable for hydropower and hydrostorage

\-
Altering the meadow could alter/damage the ecologic structure

Forest

\+
CO^2 storage

Biodiversity and ecologic corridor

Suitability for biomass production

Leisure (reduce stress)

Countering UHI, cooling and shading

Water retention

\-
Altering the forest could alter/damage the ecologic structure

Buseniss sector / service sector

\+
Vast paved parking area, suitable for multi-functional use, solar carports, wind energy production and urban creek for countering UHI.

Roof area highly suitable for solarpanels.

\-
Paved parking area is not suitable for trans-forming to urban creek, due to parkingpres-sure.

Logistic area

\+
Vast paved area, suitable for multifunctional use, solar and wind energy production

If close to canal, hydrostorage could be im-plemented

Logistic area is often a node in a network, could function as a node in energy network

\-
Logistics sector is a heavily polutant sector, requires a lot of energy.

Canal

+
Cooling

Ecologic corridor and Biodiversity along embankment

Water retention

Biodiversity and ecologic corridor

Hydropower

Hydrostorage
Countering UHI, cooling and shading

-
Embankment disallows canal to be ecologic node, where crossing from one side to the other is not possible.

Is restricted in possibilities due to foremost transport and logistical function as corridor in network.

Industrial area

+
Needs to transform

Morphological shapes offer possiblity to implement sustainable energy production into the area

heat network, residual heating

-
Identity, so morphologically characteristics have value and can not be altered.

Pollutant

Leisure and sports area

source

+

lot of green open space

applicable for solar and microwind

could be transformed to ecological corridor

-
Area works because of easthetics. Implementation of energy landscapes should be carefully considerated.

Public space

+
Multifunctional

Multilayered

Solar, urban elements

Temporal

-
possible negative outcome

what are barriers for implementing this

In Urban areas, mostly paved,

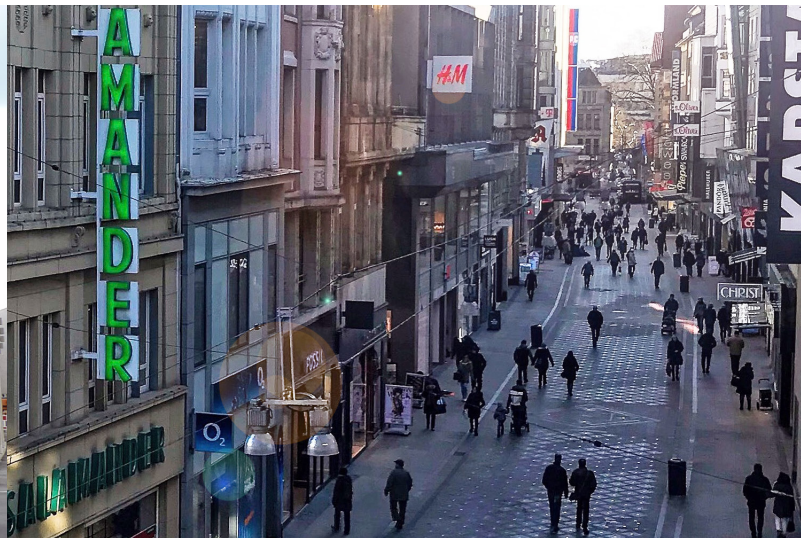
Lack of ecologic corridor

City centre

source

+	-
Due to design, sufficient open space is generated	Often monofunctionally designed, not active throughout the entire day. When closed, socially unsafe (mono-functional) Lack of green spacces, designed for cars Water retention is lacking

Historic city centre



+	-
Designed for pedestrian Economic strong area Multifunctional High concentration and variation of functions, creates attrection and economic value	UHI, due to design and materialisation Lack of green spaces Water retention is lacking

Energy landscape (renewable energy source)

+	-
Sufficient open spaces Could be connected to ecologic corridor Water retention could be imbedded in the patch	implementation aesthetically influences area

Energy landscape (non-renewable energy source)

+	-
Drosscape, so a lot of possiblities either hydropower, hydrostorage	Soil needs to be regenerated ecologically unconnected

Low density suburb (very low density urban fabric)

+
sufficient open green spaces

node/corridor in ecologic network

biomass production

solar energy production

could alter urban area to become, biomass production hub

Water retention is done naturally

-
car dependant

monofunctional

poorly connected

Green suburb (low density urban fabric)

+
sufficient open green spaces

node/corridor in ecologic network

could alter urban area to become, sustainable energy production hub, due to sufficient possibilities for energy production

playes key role due to availability of certain functions in relation to other smaller settlements in the surrounding

Water retention is done naturally

-
car dependant

Peri-urban (medium density urban fabric)

+
node/corridor in ecologic network

playes key role due to availability of certain functions in relation to other smaller settlements in the surrounding

connected via public transport and car

-
Located between edges, sufficient open space is lacking

Potential urban (disc. dense urban fabric)

+

Designed for pedestrian as well as car

Well connected, via car and public transport

Concentration of function and variation of function

Microgrid is possible

-
Clear ecologic corridor is lacking

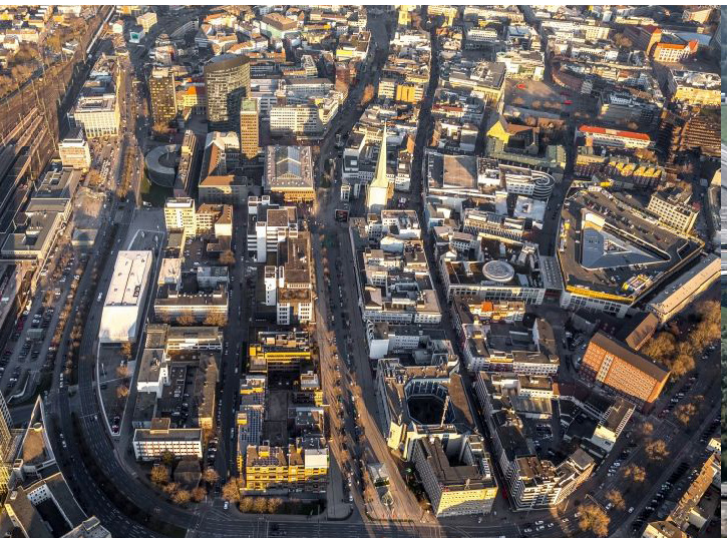
Water retention is lacking

Lack of open spaces

No ecologic corridor

UHI

Urban area (continuous urban fabric)



+

Designed for pedestrian

Well connected, public transport

Multifunctional

concentration of network operators, heat network is possible

tructure could be altered to function cond groundlevel, with green rooftops and urban farming

-

UHI

No ecologic corridor

No open space, buffering is not possible, solutions only possible in multi-layered way.

Water retention is not possible naturally

Road network

source

+

Due to function, possible to implement solar and wind energy production

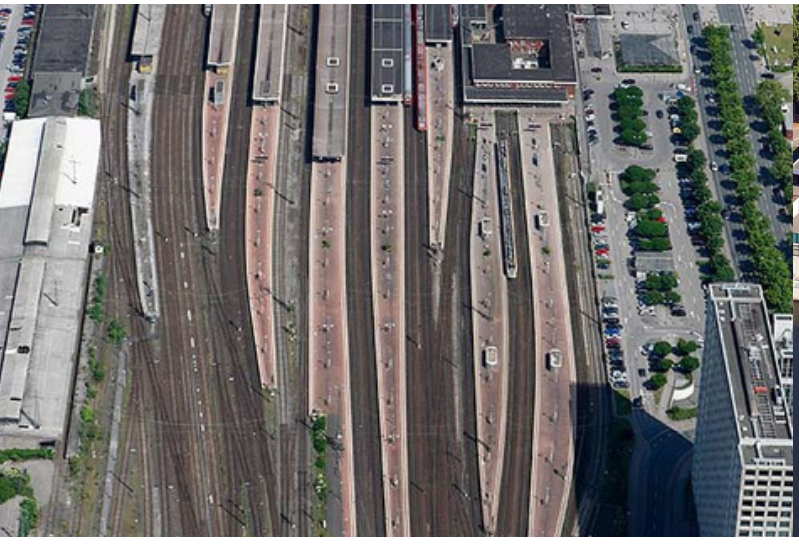
aesthetically, (almost) anything is possible

Forms long nodes, could be linked to ecologic and energy network

-

Forms a barrier, fron one side to another side for network operators such as residents or animals

Rail network



+

Due to function, possible to implement solar and wind energy production

aesthetically

Forms long nodes, could be linked to ecologic and energy network

-

Forms a barrier, fron one side to another side for network operators such as residents or animals

Lack of sufficient green and open spaces

Lack of ecologic corridor

Water network

+

Water retention

Biodiversity and ecologic corridor

Hydropower

Hydrostorage

Countering UHI, cooling and shading

-

Altering the river could alter/damage the ecologic structure

Creates a physical barriere between both sides of river

Buffering needs to be taken into account, since flooding has enormous influences

Energy network

+

ecologic corridor

water retention

sufficient open space

solar and wind production can be added to network

-

certain functions are excluded from use, due to safety

Heat, below ground
Fuel, transported, otherwise below ground
Electricity

Ecologic network

+

Can be transformed to implement secondary function in relation to energy production

UHI

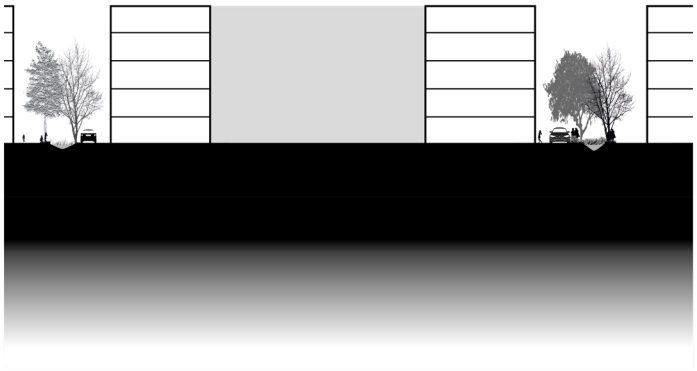
Can serve multiple functions, as long as it is connected to network

-

Altering the structure could alter/damage the ecologic structure

Certain functions are excluded, to preserve the ecological function

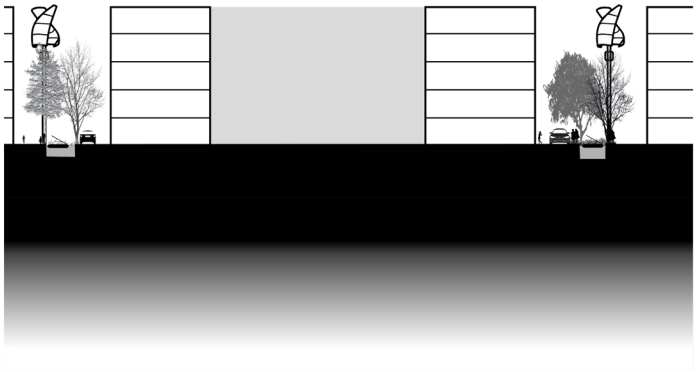
Concept: Greenblue streets
Minimum scenario



Description of concept:
Streets where the main principle is the implementation of green and blue; public recreational and environmental creeks and meadow. This has a cooling effect and adapting effect in terms of heavy drought and precipitation.

Hierarchy:
Hub city, Creek city, Wall city, Waterfront

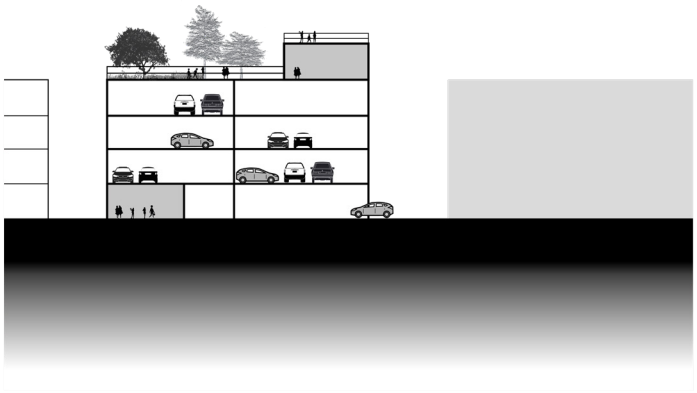
Concept: Greenblue streets
Maximum scenario



Description of concept:

The streems are transformed to form narrow canals, with a open bottom. This is done to further increase the capacity of this stream in times of heavy precipitation. Furthermore, energy production is added to the streets, in the shape of microwind turbines and floating solar panels.

Concept: Hub city
Minimum scenario

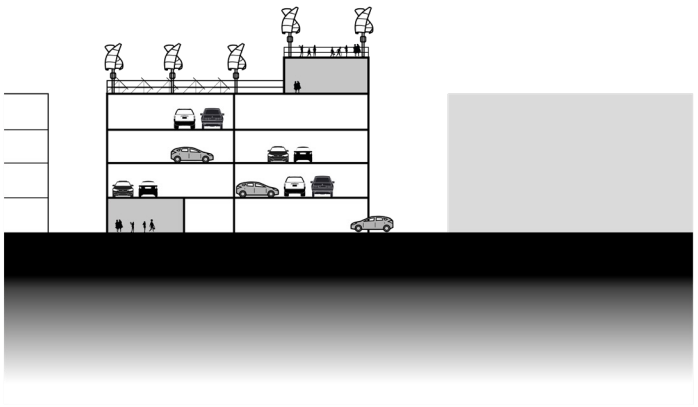


Description of concept:
A hub city is an area where parking is tackled centralised. This is done in a hub, a multilayered parking facility with a public function on the roof and in the plinth.

Hierarchy:
Linked to greenblue streets, wall city, creek city,

System requirements:
Mobility transformation

Concept: Hub city
Maximum scenario

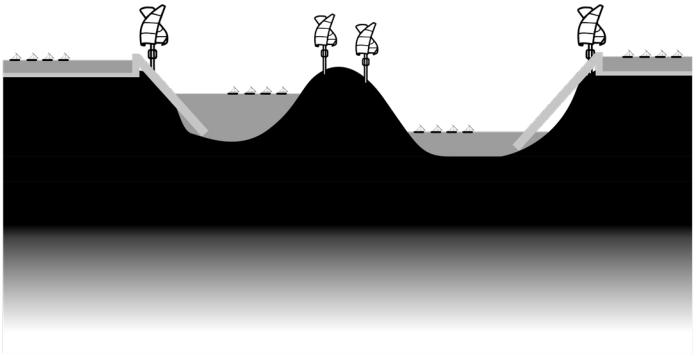


Description of concept:
The hub city is transformed from a concept with urban farming to a concept with solar and wind production on the roof. This is done to optimise the potential of this surface.

Concept: Energy mines
Minimum scenario

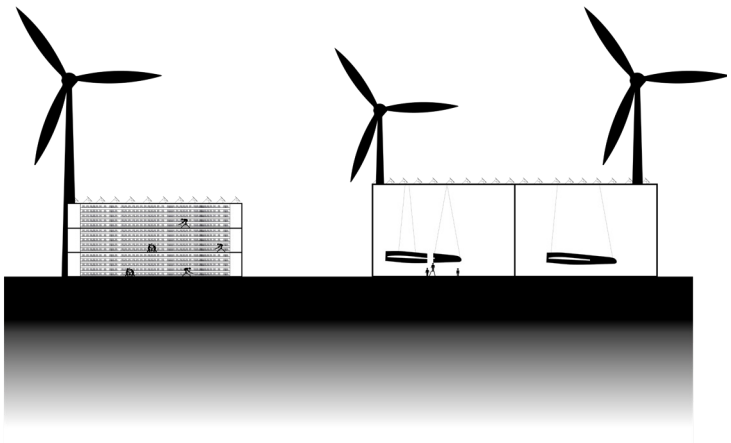
Description of concept:
A former mine or storage for bulk transformed to a biomass forest,. This biomass can be harvested from where electricity or fuel can be produced.

Concept: Energy mines
Maximum scenario



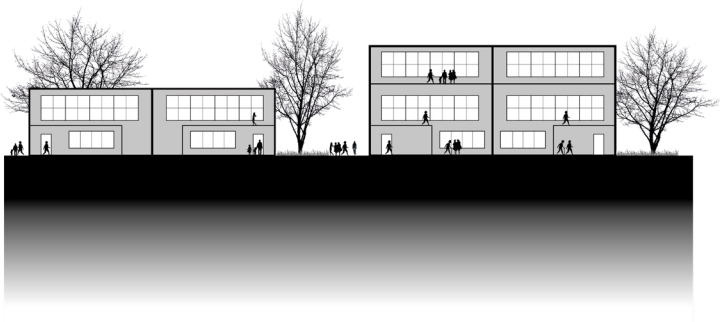
Description of concept:
A former mine or storage for bulk transformed to a energy landscape, the shapes dictate the renewable energy source, with wind driven energy production on the higher parts and solar energy production on the sides of these 'hills'.

Concept: Energy = economy
Minimum scenario



Description of concept:
Economic development is based on principles for sustainable energy landscape components or processes aiding climate adaptation, such as vertical farming or the production of windmill components.

Concept: Loft urbanisation
Minimum scenario



Description of concept:
Transformation from industrial building (loods??) to a residential building. In this way, buildings are re-used and former industrial areas are kept intact and alive, with a transformation of service taking place.

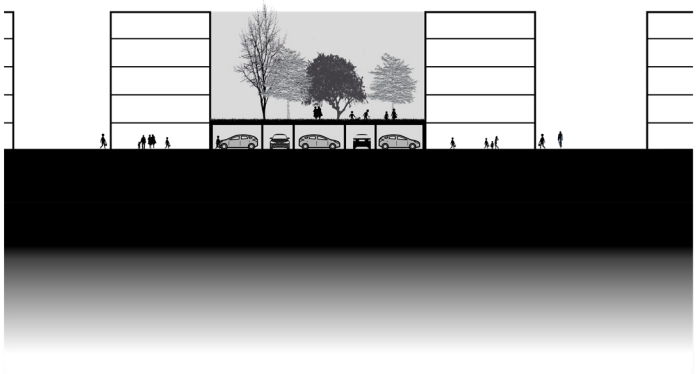
Concept: Food forest
Minimum scenario

Description of concept:
A food forest is a biomass production site where urban farming is implemented. The level of biomass production is a variable, depending on the scenario. With the minimum scenario, places for recreation are implemented.

Concept: Food forest
Maximum scenario

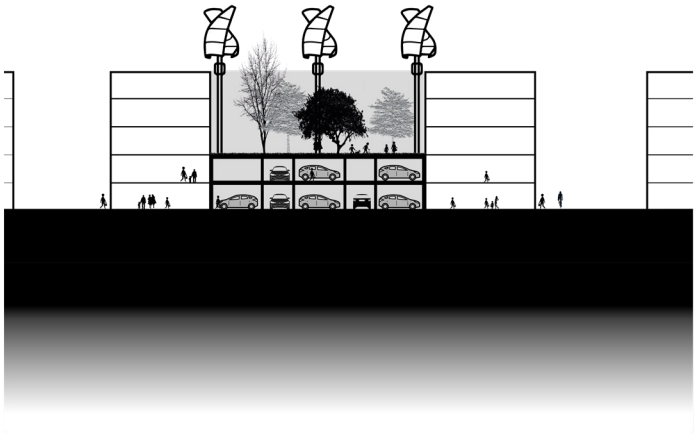
Description of concept:
A food forest in the maximum scenario is transformed from a an area with a recreational component to an area for the production of energy and food.

Concept: Public pocket courtyard
Minimum scenario



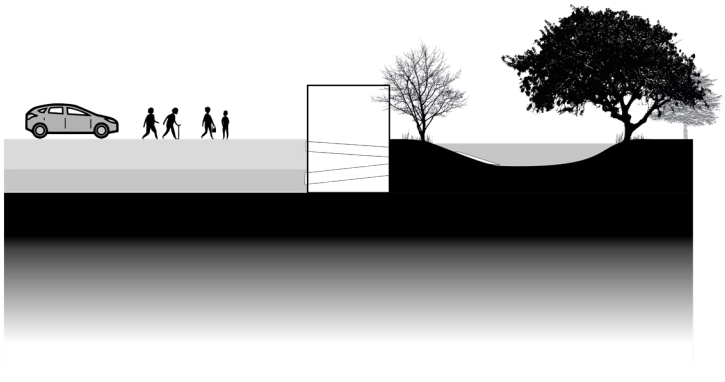
Description of concept:
A courtyard that is transformed to a public area, where, depending on the context, the courtyard is transformed to a smaller public park, hub, or a combination of this.

Concept: Public pocket courtyard
Maximum scenario



Description of concept:
In the maximum scenario, the height can be adjusted, with the plinths of buildings activated.

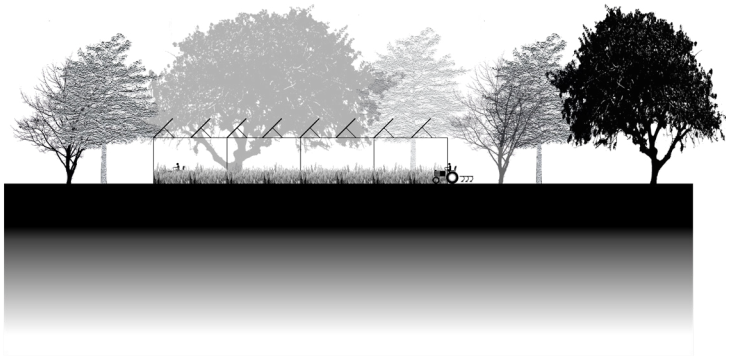
Concept: Creek city
Minimum scenario



Description of concept:
Street where water is retained and transported through the city to counter UHI and provide public green area. These creeks are connected to a major river, canal or waterreservoir, where the height level provides results in potential energy.

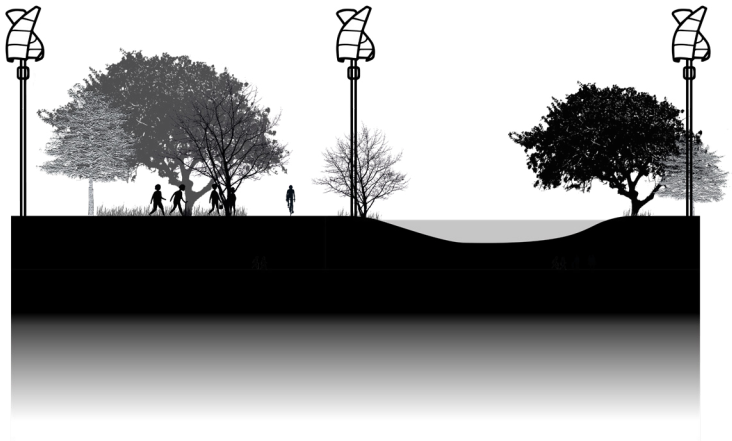
Hierarchy:
Linked to greenblue streets

Concept: Agrivoltaics
Minimum scenario



Description of concept:
A combination of agriculture and pv voltaics. This increases the efficiency of the agricultural process and protects the crops in times of extreme weather.

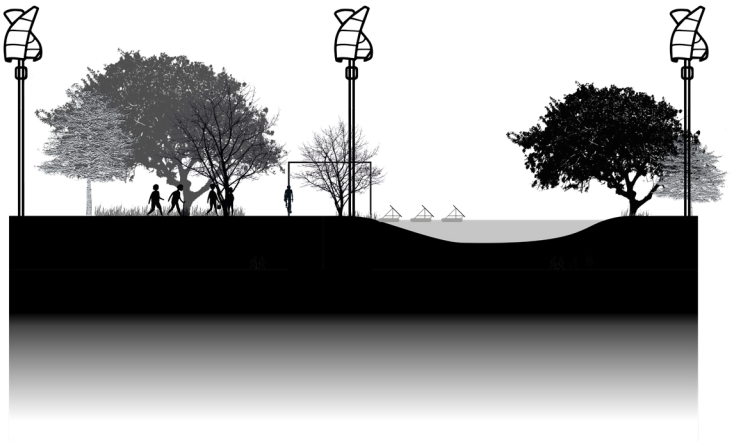
Concept: Wall city
Minimum scenario



Description of concept:
A wall city is an area where the old (historical) wall of a city is reactivated and transformed into a ribbon park, with water, wind emphasis in a recreational park.

Hierarchy:
Combined with Hub city, greenblue streets and creek city.

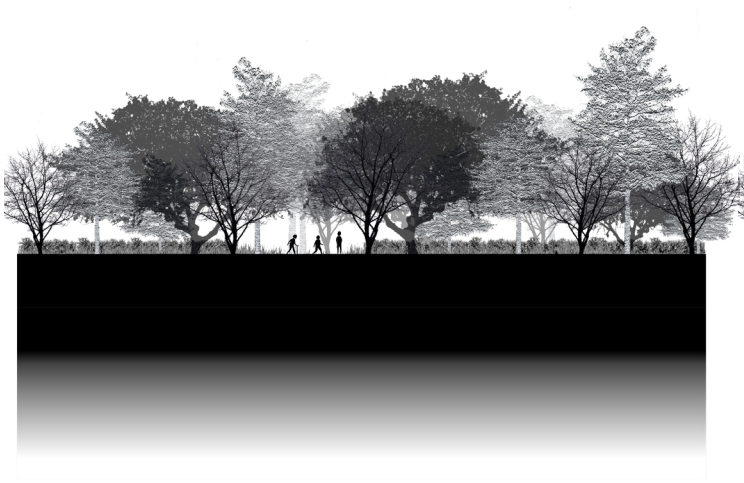
Concept: Wall city
Maximum scenario



Description of concept:
In the maximum scenario, floating solar panels and hydropowerplants are added.

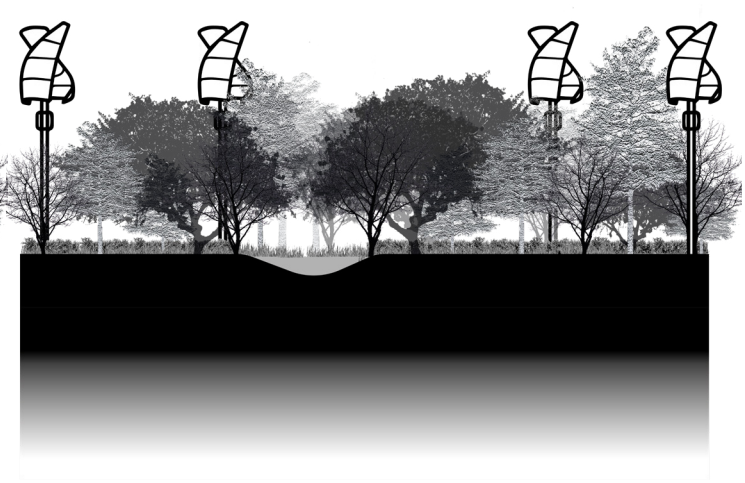
Hierarchy:
Combined with creekcity, greenblue streets, hub city.

Concept: Biomass forestation
Minimum scenario



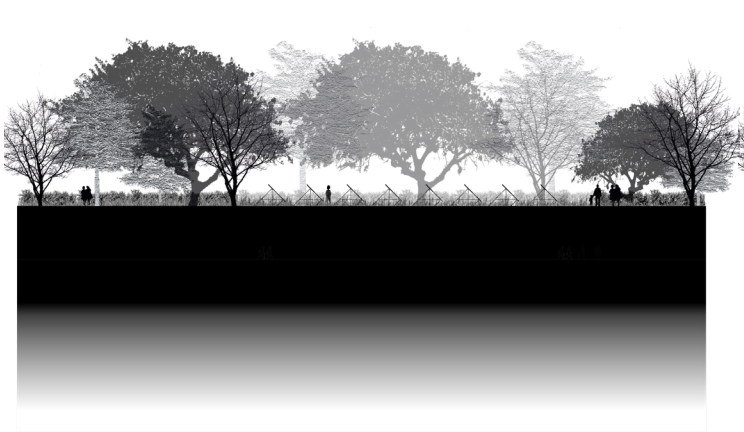
Description of concept:
Biomass forestation is an an concept that is defined, designed and maintained for the sole production of biomass. In the minimum scenario this can be combined with a recreational value of walking or resting, in a small park like setting.

Concept: Biomass forestation
Maximum scenario



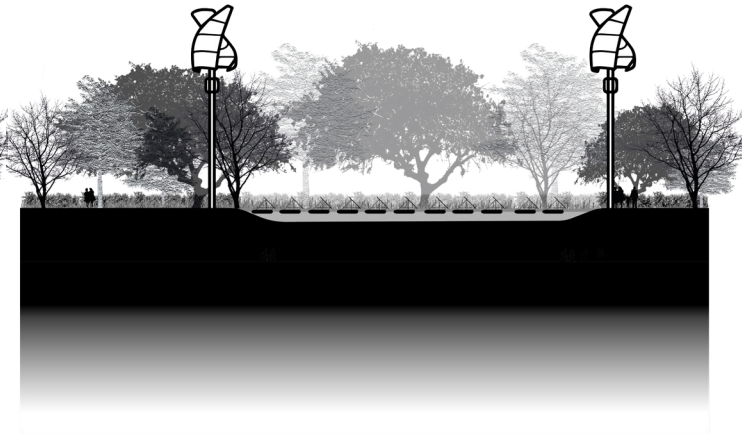
Description of concept:
Biomass forestation is an an concept that is defined, designed and maintained for the sole production of biomass. In the maximum scenario this can be combined with wind emphasis and solar production. Some area's can even be transformed to aquaculture, where biomass is produced in partly submerged areas.

Concept: Pocket solar field
Minimum scenario



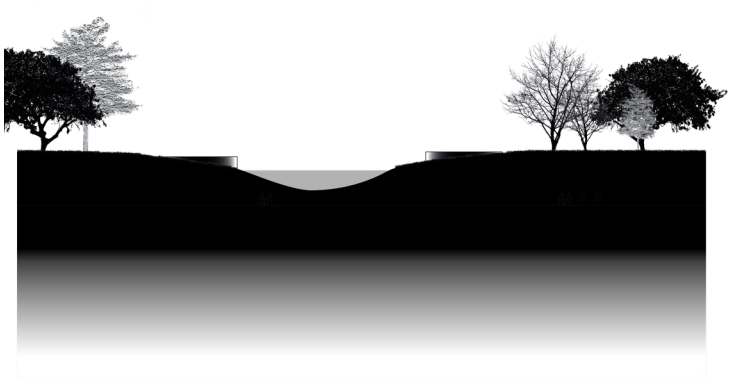
Description of concept:
A pocket solar field is a solar field that is shielded by surrounding (food) forests or other agricultural or ecological areas, disguising it and shielding it from the view of residents.

Concept: Pocket solar field
Maximum scenario



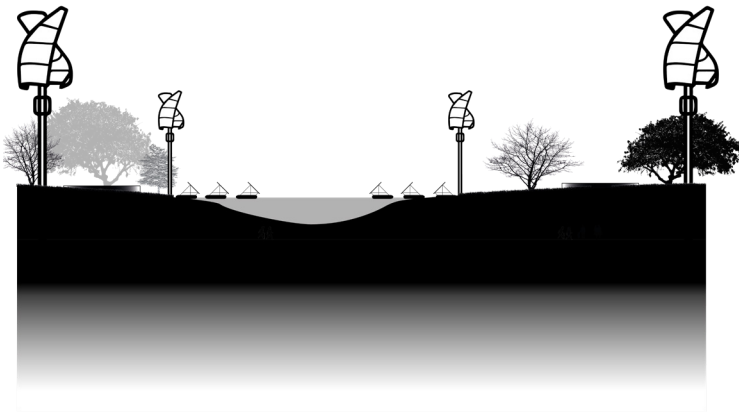
Description of concept:
A pocket solar field is a solar field that is shielded by surrounding (food) forests or other agricultural or ecological areas from the view of residents. In the maximum scenario this can be transformed to a floating solar field, with water retention wind emphasis or transformed to a tidal park with solar energy power.

Concept: Algea + wetland
Minimum scenario



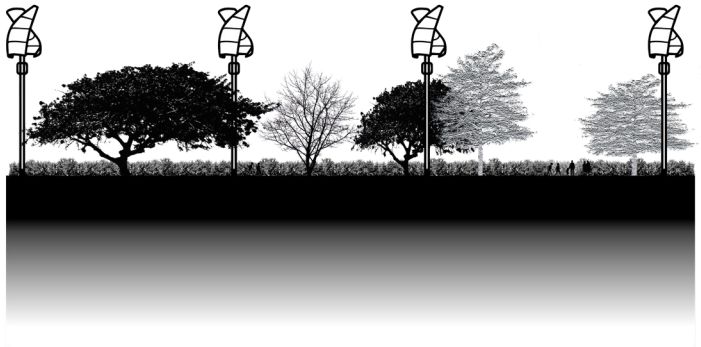
Description of concept:
An area that is a wetland, where the buffer areas, or areas that are unlickely to be flooded are areas where algeas are produced. This algea production can be used for biofuel. In the minimum scenario, this wetland has a recreational function.

Concept: Algea + wetland
Maximum scenario



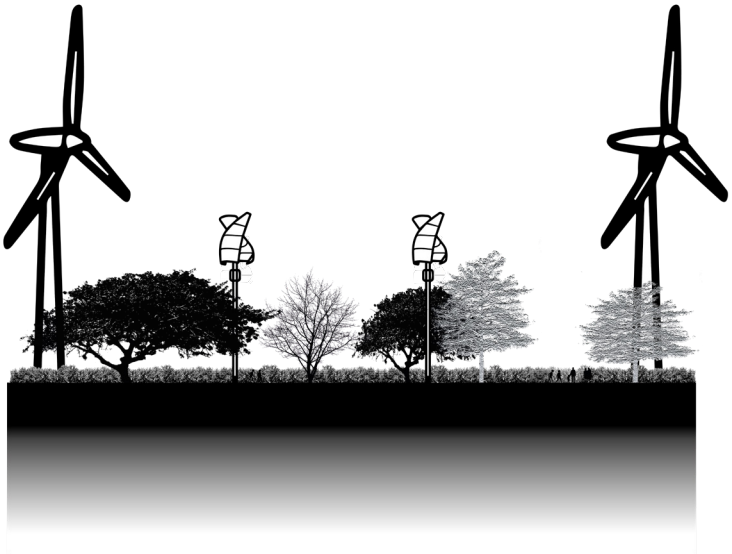
Description of concept:
An area that is a wetland, where the buffer areas, or areas that are unlickely to be flooded are areas where algeas are produced. This algea production can be used for biofuel. In the maximum scenario, this is combined with floating solar and wind emphasis. wetland has a recreational function.

Concept: Wind emphasis
Minimum scenario



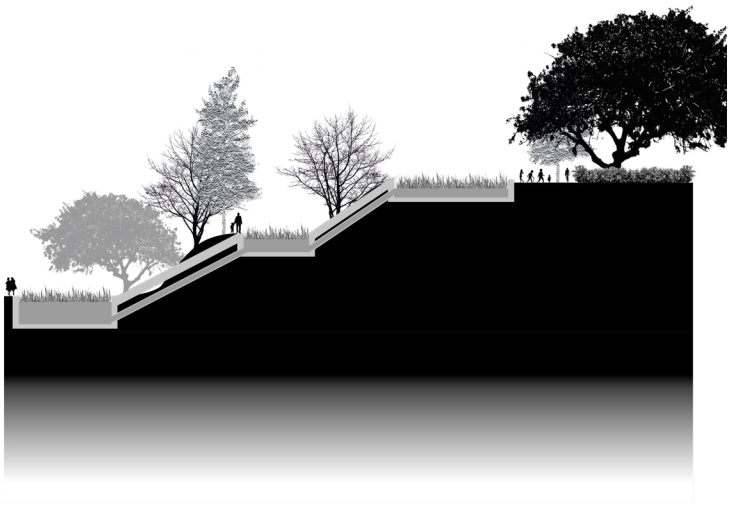
Description of concept:
Wind emphasis is the implementation of wind turbines on a line in the (urban) landscape, to emphasize that line. The level of wind turbines differentiates in the scenarios. In the minimum scenario, these turbines can be implemented in (crouded) urban areas.

Concept: Wind emphasis
Maximum scenario



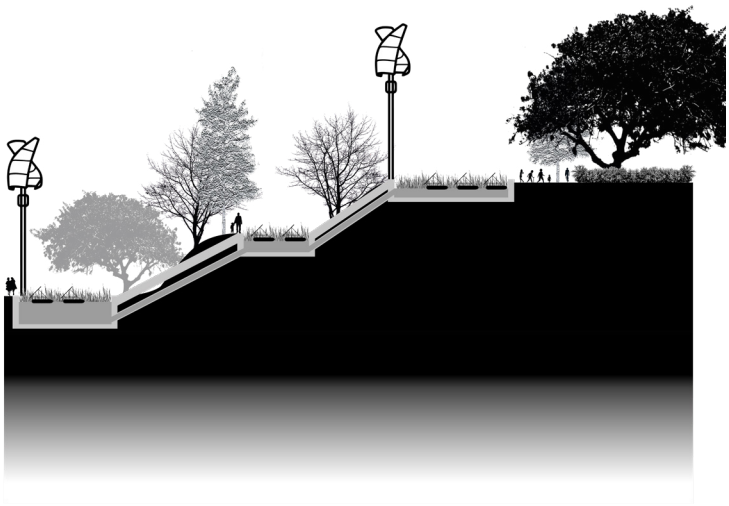
Description of concept:
Wind emphasis is the implementation of wind turbines on a line in the (urban) landscape, to emphasize that line. The level of wind turbines differentiates in the scenarios. In the maximum scenario, these turbines are bigger in size, placed further a part and have certain rules and regulations in the distance to certain surrounding functions.

Concept: Waterstairs
Minimum scenario



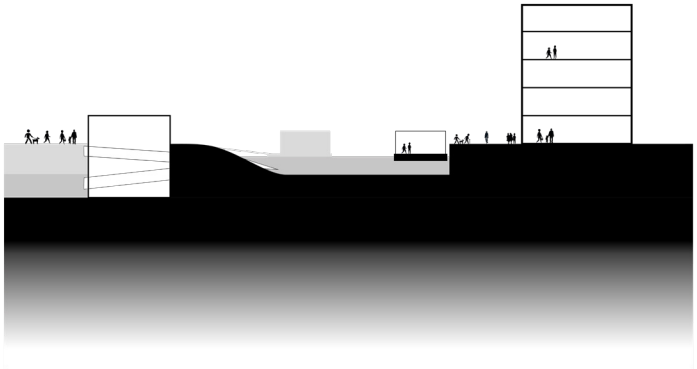
Description of concept:
Waterbody's, different in size, all with a height level towards each other. This height difference creates potential energy, which can be transformed to kinetic energy. In this way, this offers a possiblity to produce and store energy through water.

Concept: Waterstairs
Maximum scenario



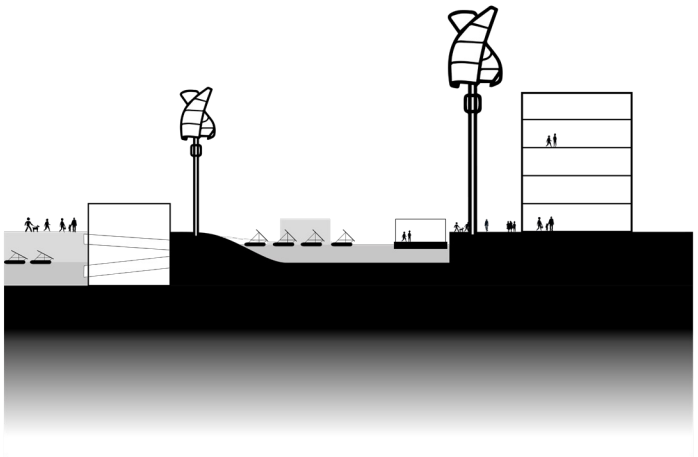
Description of concept:
In a maximum scenario, these waterbodies can house floating solar panels, biomass forestation in a aquaculture way or become a tidal park.

Concept: Urban energy waterfront
Minimum scenario



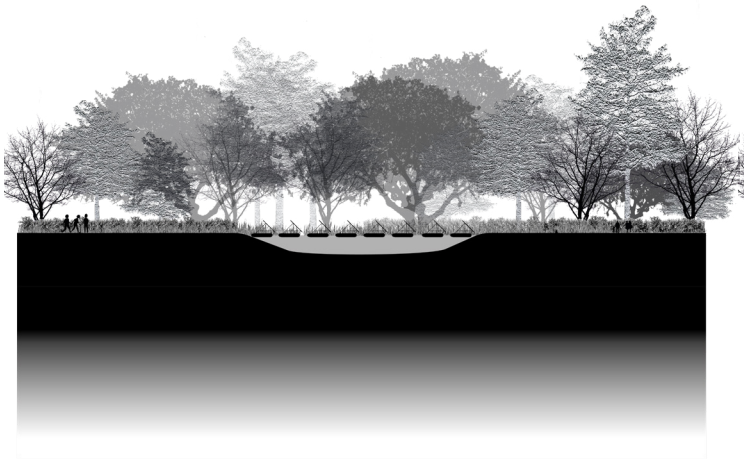
Description of concept:
A urban waterfront is an area , , where urbanisation is taking part on and close to the water.

Concept: Urban energy waterfront
Maximum scenario



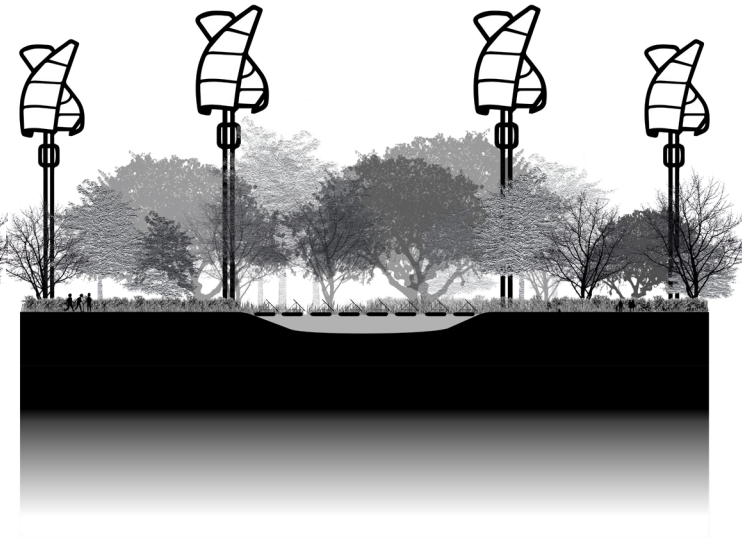
Description of concept:
with wind emphasis, hydropowerplants as a consequence of creek city and floating solarpanels

Concept: Floating solarfield
Minimum scenario



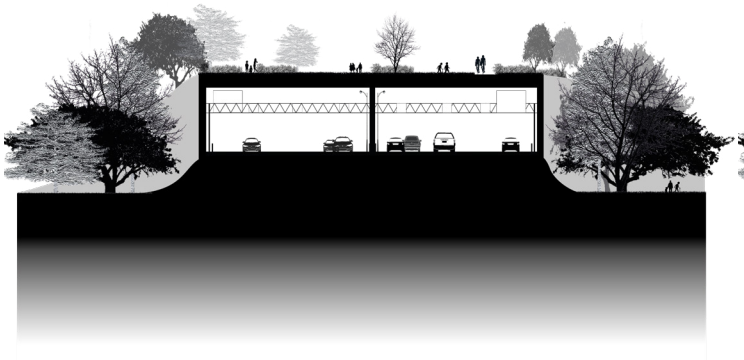
Description of concept:
Floating solar are several solar panels on a water body, they are floating and can thus adapt to the different water levels.

Concept: Floating solarfield
Maximum scenario



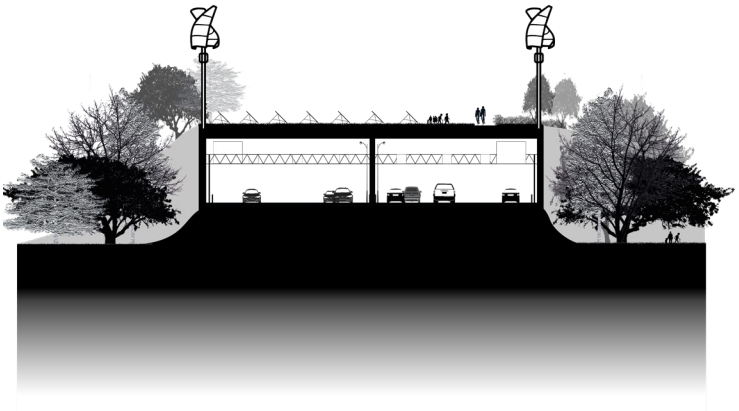
Description of concept:

Concept: Roof infrastructure
Minimum scenario



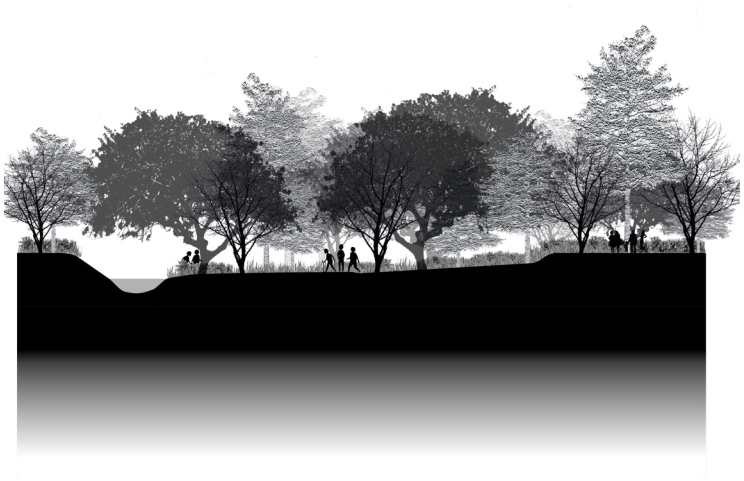
Description of concept:
Infrastructure can be fitted with a roof, which can function as a ecological wedge in a city. This ecological function can also play a part in the water retention system of an area.

Concept: Roof infrastructure
Maximum scenario



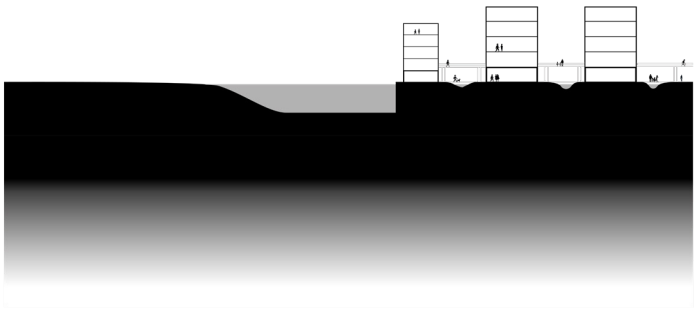
Description of concept:
In the maximum scenario, (a part of) this area can be fitted with either solar panels or wind turbines.

Concept: Tidal park
Minimum scenario



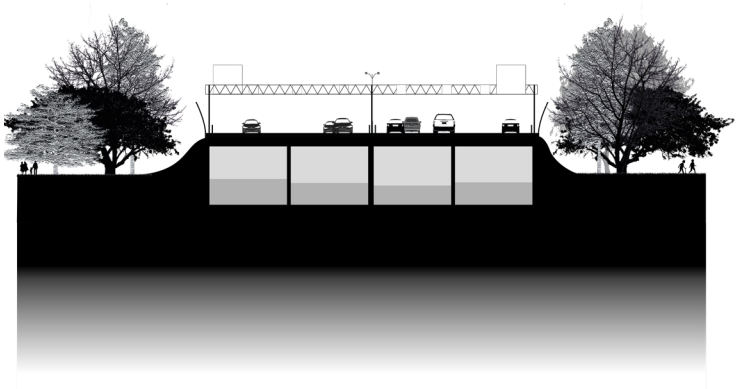
Description of concept:
An area, that is outerdike or innerdike, that is a public park, which depending on the water level, is either flooded, partly flooded or not flooded at all.

Concept: Working with water
Minimum scenario



Description of concept:
Where important regions close to water where a flooding risk is present, where buildings and the ground level are modified to work with water. Trenches are dug to and strategic new entrances are created.

Concept: Water & infrastructure
Minimum scenario



Description of concept:
Infrastructure in a highly densified area has the capacity to store water in times of major precipitation, this can be strategically implemented in, around and especially below infrastructure.

Historic city centre | Water city

Optimistic scenario

1 The implementation of the **Hub City**

Parking spaces become available due to the implementation of hubs throughout the city

2 The implementation of the **Greenblue streets**

2 The implementation of the **Creek city**

Green public space is added to the city

3 The implementation of the **Food forest**

The watersystem is ready to be activated with the implementation of the hydropower plant

4 The implementation of t

4 The implementation of t

Waterfront is ready

1 Regulation:
Tourist are forced to park their cars in these hubs. Where residents are allocated one place per household.
Subsidies:
For developers to include (part of) hubs into their new devleopment.
For residents of that city to decrease car usage, switching to shared mobility

2 Regulation:
Land use plans are altered to allocate space to greenblue streets as well as creeks and hydropower plants.
Residents co-create locations for parking of shared mobility .

3 Regulation:
Land use plans are altered to allocate spaces
farming and biomass production in forests &
Subsidies:
For shops selling these products in these pla

4 Regulations:
Once agreed, the state
these windmills in size i
changes.
Subsidies:
For farmers and other o
ground, subsidies are al
motivate people to impl
energy production using
resource.

Pessimistic scenario

2 Converting the **Greenblue streets** to pessimistic scenario

3 Converting the **Food forest** to pessimistic scenario

4 Converting the **Wind emphasis** to pessimistic scenario

he **Wind emphasis**

he **Urban energy waterfront**

5 The implementation of the **Public pocket courtyard**

5 The implementation of the **Tidal park**

5 The implementation of the **Water & infrastructure**

Tidal park is ready, can be connected to working with water

6 The implementation of the **Working with water**

6 The implementation of the **Roof infrastructure**

s to urban
parks.

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can change
context

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wind as a

5 Regulations:
Water retention is seen as a integrated aspect of infrastructure.
Subsidies:
For residents considiring to change their courtyard to a public pocket courtyard, where multilayered parking, (energy & food) production and a public function are integrated.

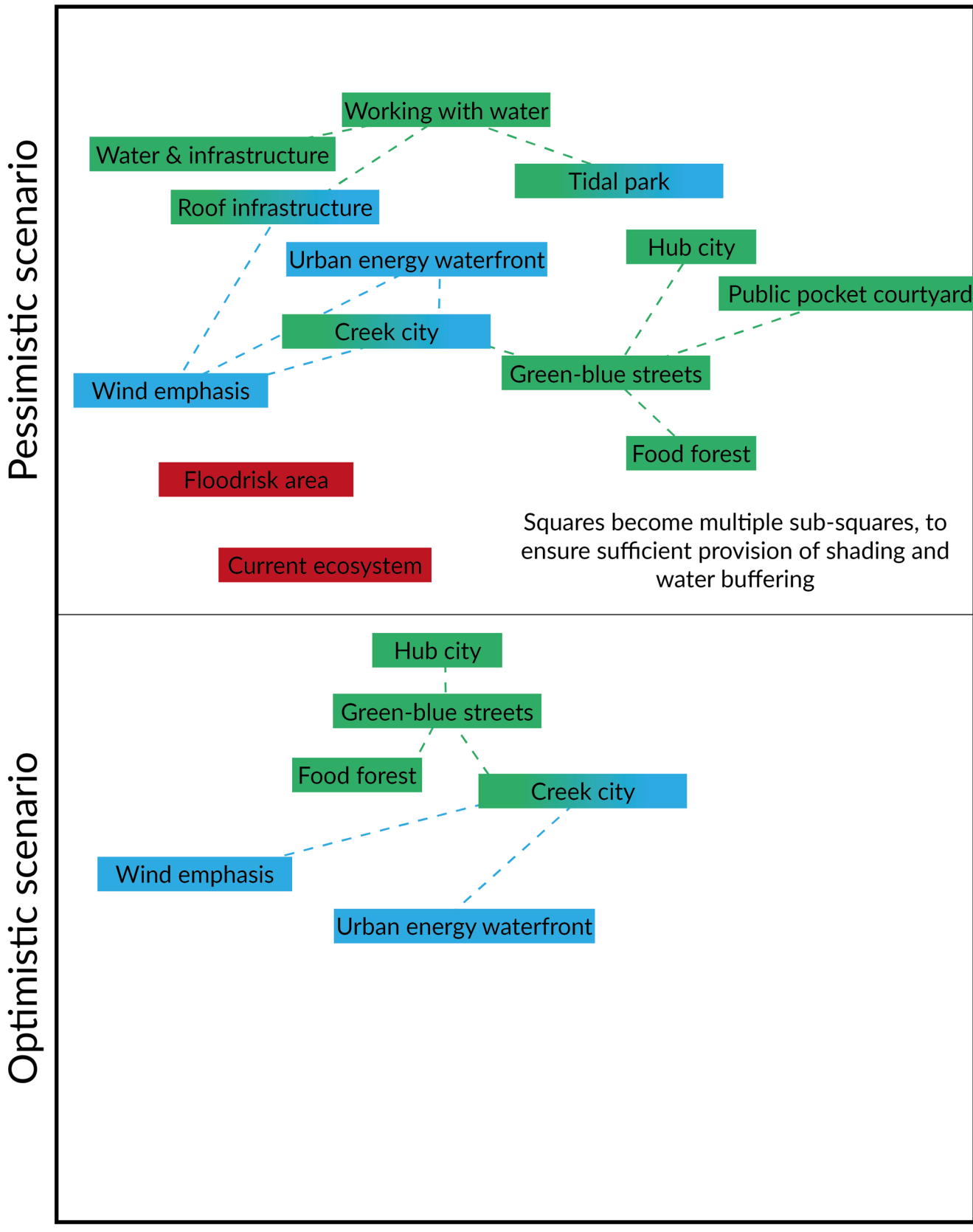
6 Regulations:
Roofs of infrastructure have to be taken into account in new plans and renovations to realise the potential.

Historic city centre

Concept for energy landscapes
Energy landscape connection
Concept for mix

Food forest
Creek city

Current state



Strategic component
Concept for climate adaptation
Climate adaptation connection

Floodrisk area
Wind emphasis

Principle for further development

Strenghtened public transport system

Further development

Buffer capcity for water retention

Buffer capacity implemented in and on infra-structural networks, since there is inadequate open space

Strenghtened public transport system

Network is key, since buffer capacity is uneven distributed throughout the area

Mobility transition

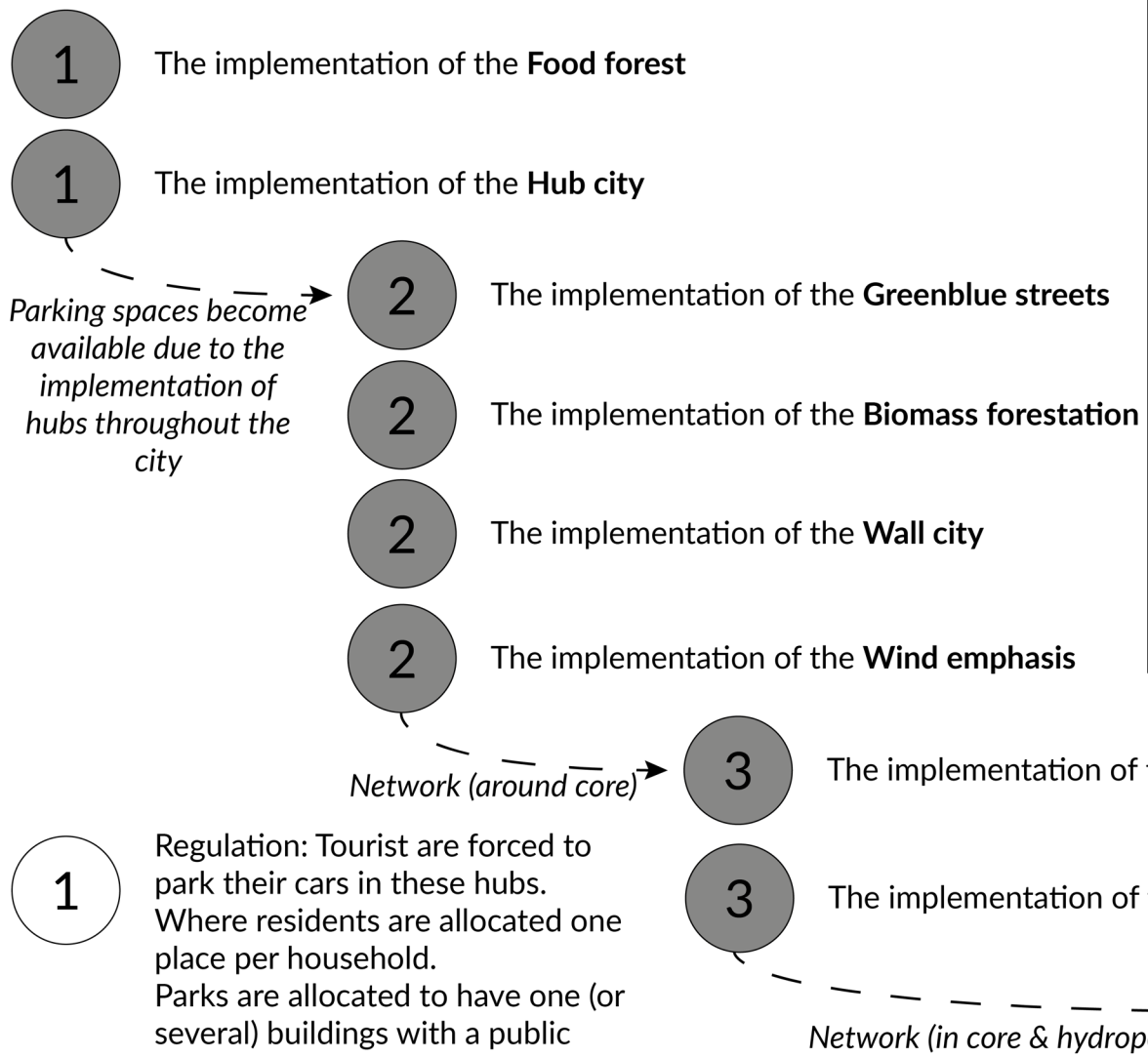
This transition, from a car-oriented mobility system to a shared mobility system takes the longest to implement. Parking rules have to be changed, residents are allocated a spot in these hubs with extra space for visitors. Land use rules have to be changed as well, with the implementation of hubs when densifying. Furthermore, public transport should be intensified and connected to these hubs.

Ecosystem defines locations for further development

The network of ecosystem defines where new developments can take place, based on the characteristics of the ecosystem

Green urban area | Agricultured green urban area

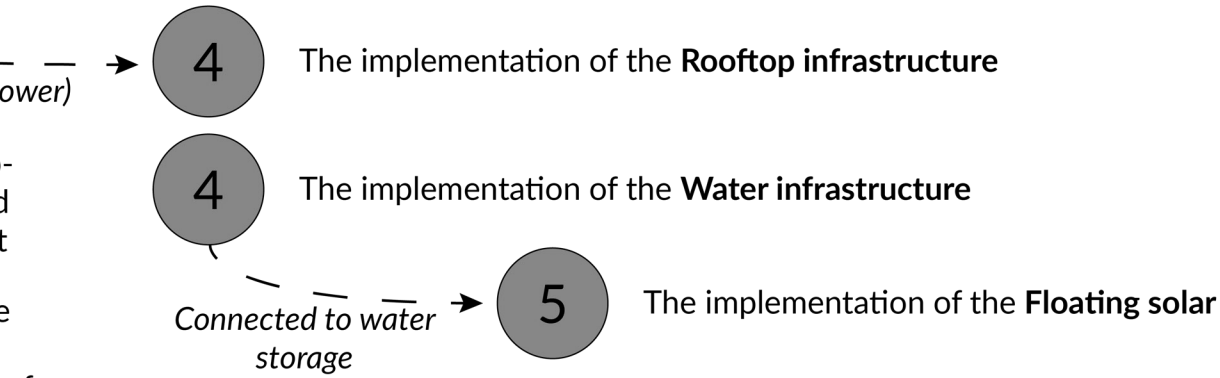
Optimistic scenario



Pessimistic scenario

the **Creek city**

the **Public pocket courtyard**



s for

ents considiring to change their
c pocket courtyard, where
g, (energy & food) production
n are integrated.

4 Regulations: Roofs of infrastructure have to be taken into account in new plans and renovations to realise the potential. Water retention is seen as a integrated aspect of infrastructure.

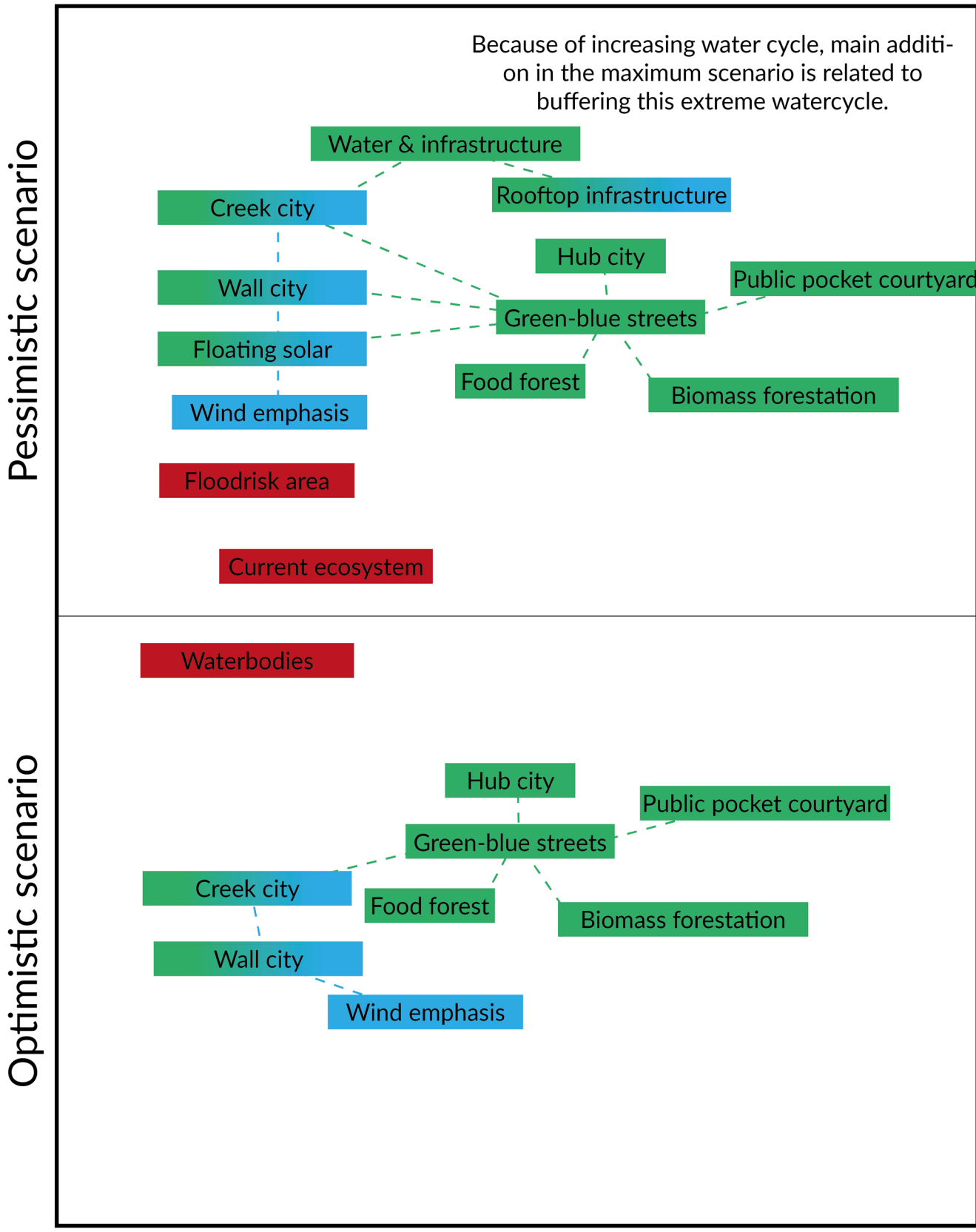
5 Regulation: land use allows for implementation of floating solar, subsidies for exploiting companies

Green urban areas

Concept for energy landscapes
Energy landscape connection
Concept for mix

Food forest
Creek city

Current state



Strategic component
Concept for climate adaptation
Climate adaptation connection

Floodrisk area
Wind emphasis

Principle for further development

Strenghtened public transport system

Further development

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Ecosystem defines locations for further development

The network of ecosystem defines where new developments can take place, based on the characteristics of the ecosystem

Industrial area | Green-blue industry

Optimistic scenario

1 The implementation of the **Hub City**

1 The implementation of the **Energy = economy**

1 The implementation of the **Energy mines**

1 The implementation of the **Food forest**

1 The implementation of the **Water stairs**

Mobility change

2 The implementation of the **Greenblue streets**

Network is ready for urbanisation

3 The implementation of the **Loft urbanisation**

3 The implementation of the **Wind emphasis**

3 The implementation of the **Floating solar**

3 The implementation of the **Biomass forestation**

Network change

1 Regulation: Tourist are forced to park their cars in these hubs.
Where residents are allocated one place per household.
Parks are allocated to have one (or several) buildings with a public function.
Subsidies: For developers to include (part of) hubs into their new devleopment. For residents of that city to decrease car usage, switching to shared mobility. For (urban) farmers to grow crops in these parks/forests, to start their new business.

2 Regulation: Land use plans are altered to allocate space to greenblue streets as well as creeks and hydropower plants. Residents co-create locations for parking of shared mobility .

3 Regulation: former buildings used in industrial processes, that are now redundant, become residential buildings.
Subsidies: for farmers to implement biomass forestation and wind emphasis on their land.
Regulation: once accepted biomass forestation and wind emphasis can be transformed to pessimistic scenario once required.

Pessimistic scenario

1 Converting the **Energy mines** to pessimistic scenario

2 Converting the **Greenblue streets** to pessimistic scenario

Network is ready for the implementation of creek city

4 The implementation of the **Creek city**

Network is ready for furhter intensifying

5 The implementation of the **Urban energy waterfront**

5 The implementation of the **Algea + wetland**

4 Regulation: Land use plans are altered to allocate space to creeks and hydropower plants.

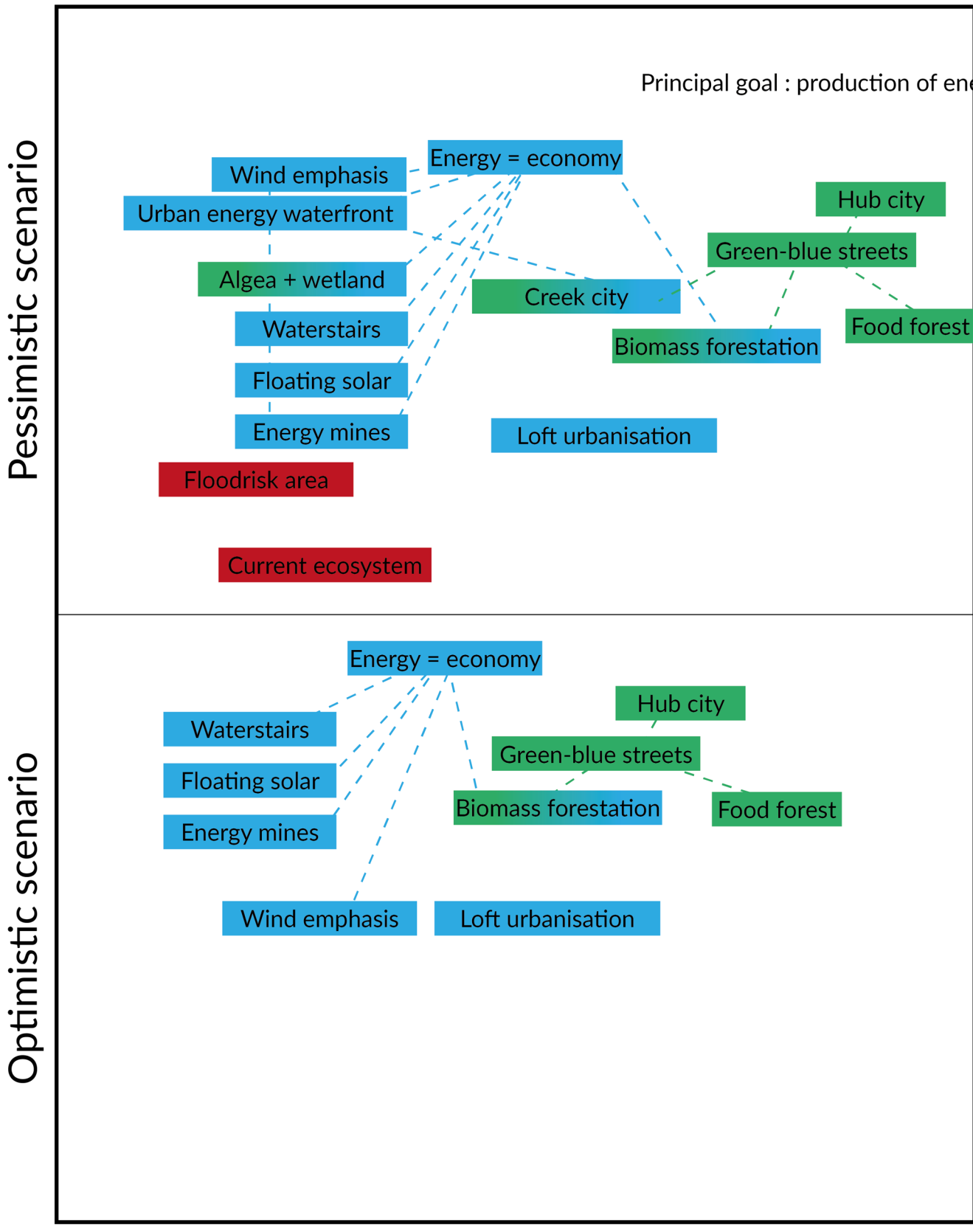
5 Regulations: land use plans have to be adapted, to cope with the growing flood risk. Subsidies for companies exploiting these algea production sites.

Industrial area

Concept for energy landscapes
Energy landscape connection
Concept for mix

Food forest
Creek city

Current state



Strategic component
Concept for climate adaptation
Climate adaptation connection

Floodrisk area
Wind emphasis

Principle for further development

Strenghtened public transport system

Further development

ergy

Buffer capcity for water retention

Buffer capacity implemented in and on infra-structural networks, since there is inadequate open space

Mobility transition

Strenghtened public transport system

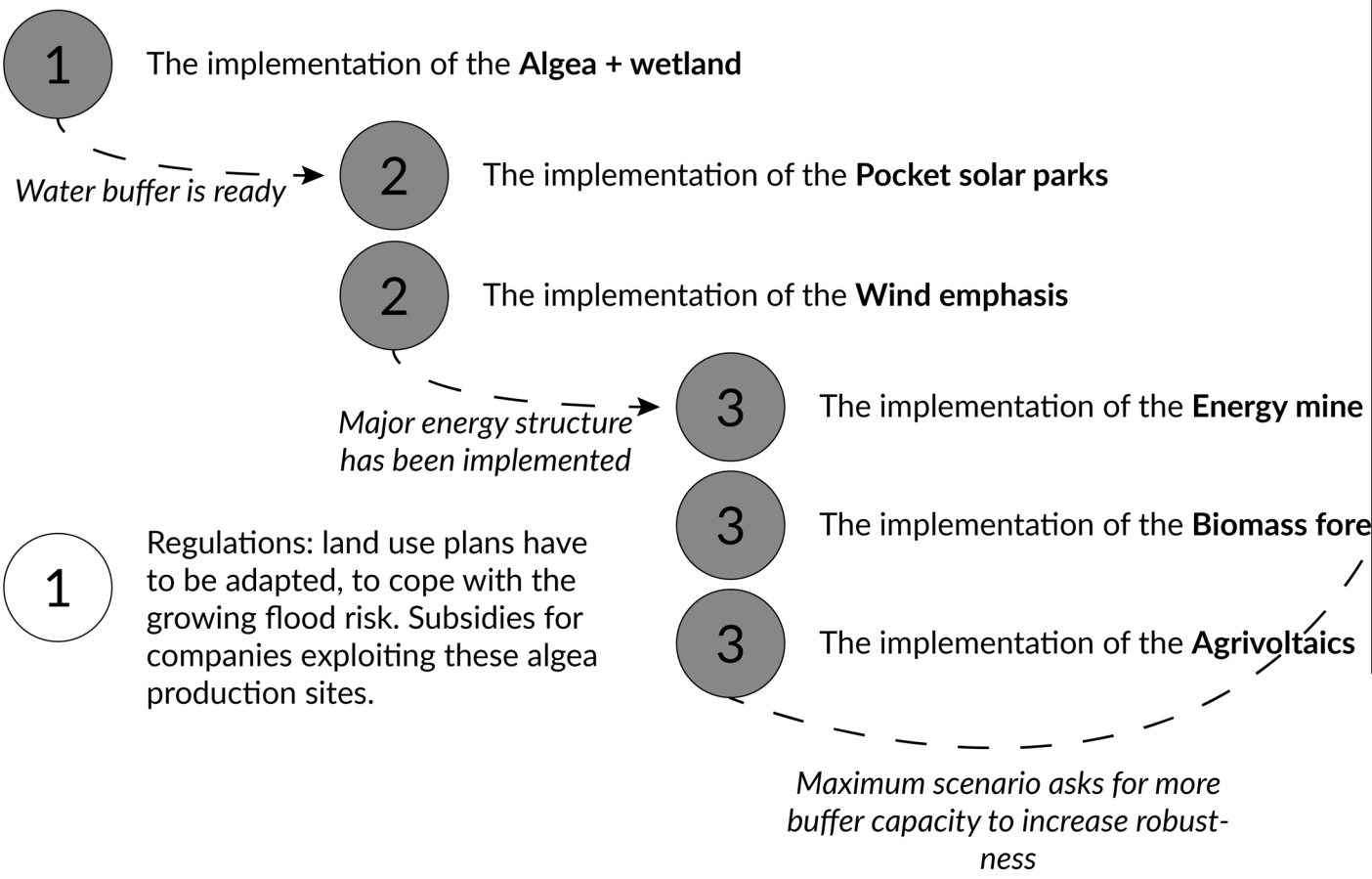
This transition, from a car-oriented mobility system to a shared mobility system takes the longest to implement. Parking rules have to be changed, residents are allocated a spot in these hubs with extra space for visitors. Land use rules have to be changed as well, with the implementation of hubs when densifying. Furthermore, public transport should be intensified and connected to these hubs.

Ecosystem defines locations for further development

The network of ecosystem defines where new developments can take place, based on the characteristics of the ecosystem

Riverbank / Wetland | Energy valley

Optimistic scenario



1

Regulations: land use plans have to be adapted, to cope with the growing flood risk. Subsidies for companies exploiting these algea production sites.

2

Subsidies: for farmers to implement pocket solar parks and wind emphasis on their land.
Regulation: once accepted pocket solar parks and wind emphasis can be transformed to pessimistic scenario once required.

3

Subsidies: for farmers to agrivoltaics and forestation on their land. For owners of r transform these to energy mines.
Regulation: The land use plans are adapte that land owners have to transform their use.

Pessimistic scenario

1 Converting the **Algea + wetland** to pessimistic scenario

2 Converting the **Pocket solar parks** to pessimistic scenario

2 Converting the **Wind emphasis** to pessimistic scenario

Buffer capacity is expanded, floating solar can now be implemented

station

4 The implementation of the **Floating solar**

Imbed and further prepare area for water

5 The implementation of the **Tidal park**

Surrounding area is prepared for water

6 The implementation of the **Water stairs**

biomass
mines, to

ed, so
land

4 Regulation: land use allows for implementation of floating solar, subsidies for exploting companies

5 Regulation: ground level has to be changed, to become a tidal park. Land use plans is changed as well.

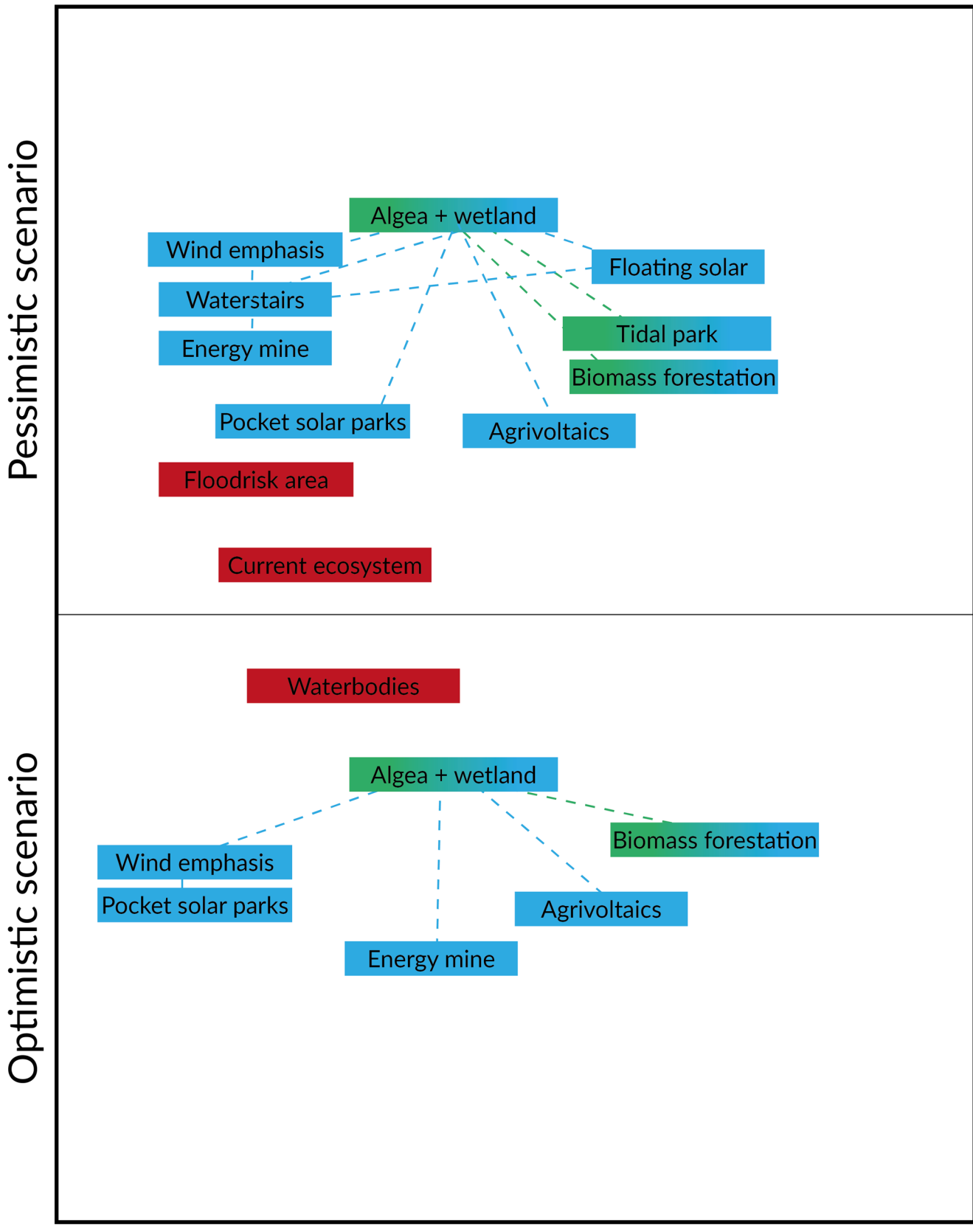
6 Subsidies: for landowners with major hight difference to implement waterstairs, this will be connected to the energy network. Regulations: can be transformed to pessimistic scenario, if this is required.

Riverbank / wetland

Concept for energy landscapes
Energy landscape connection
Concept for mix

Food forest
Creek city

Current state



Strategic component
Concept for climate adaptation
Climate adaptation connection

Floodrisk area
Wind emphasis

Principle for further development

Strenghtened public transport system

Further development

Buffer capacity for water retention

Buffer capacity implemented in the area guides the development

Connectivity to energy network

Only if this is the case, can the goal of optimal energy production be realised