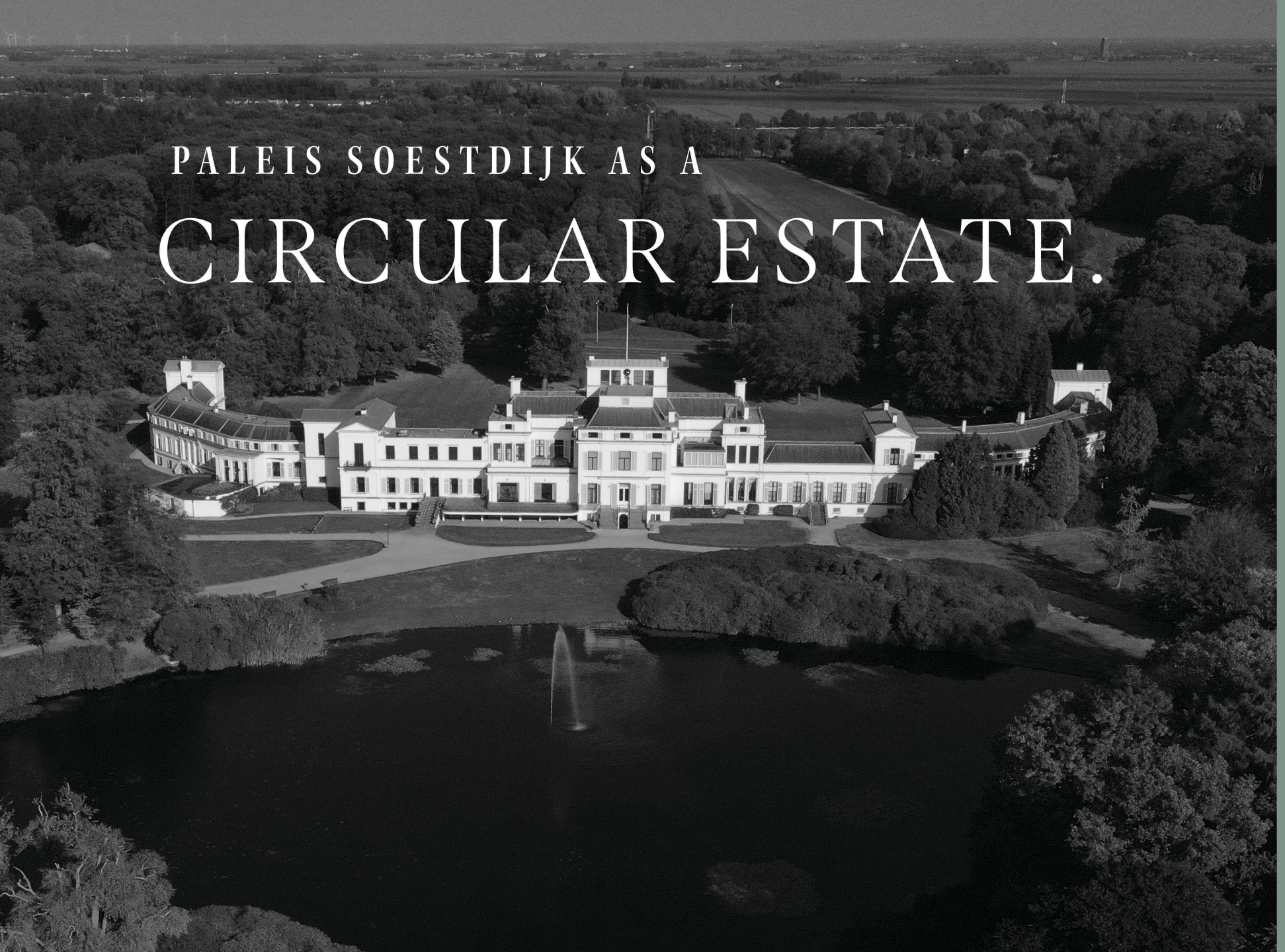


PALEIS SOESTDIJK AS A CIRCULAR ESTATE.

P5

P5 Presentation
Date: 26/08/2021

Julia Kapinga
4342550

Supervisors:
Andy van den Dobbelsteen
Nico Tillie

Board of examiners:
Stefan van der Spek

Knowledge gap

Connecting biomass streams on a landscape level, creating a mutual beneficial relationship between nature and humankind

Problem statement

1. Dependency on outside sources
2. Large producer of biomass waste, not utilising the opportunities

Central question:

How can the cycles of food production and biomass be connected on the estate as part of a wider perspective to create a circular Paleis Soestdijk?

Objective

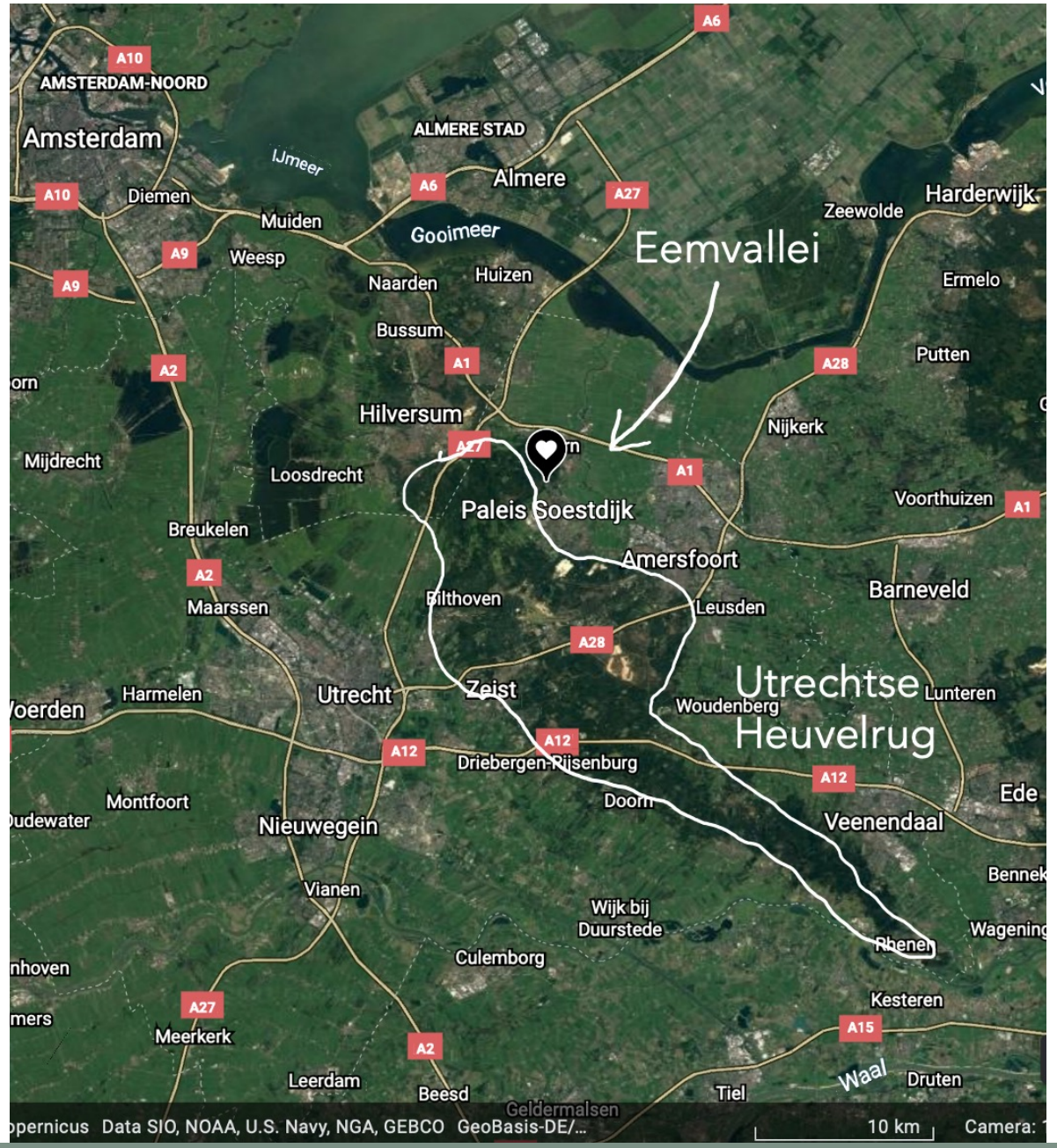
From waste-producing and outdated estate, to circular, autarkic and innovative estate. An estate that educates, inspires and involves its visitors, on a location with an immensely large and special history.

Design Themes:

Biomass	Central is the solving of the different biomass streams on the estate, in other words: closing the biomass cycle locally.
Water	Solving also the last biomass (waste) stream: wastewater.
Food	In order to fully close the cycle, food production is necessary.

Location.


Leeuwarden
Groningen
Alkmaar
Zwolle
Amsterdam
Den Haag
Paleis Soestdijk
Rotterdam
Arnhem
Eindhoven
Essen
Dortmu
Antwerpen
Düsseldorf
Brugge
Gent
Keulen
Brussel
Bonn
Aken
Luik
Bergen
België
90 km


A6
A10
AMSTERDAM-NOORD
Amsterdam
ALMERE STAD
IJmeer
Almere
Harderwijk
Zeewolde
Diemen
Muiden
Gooimeer
Eemvallei
Weesp
Naarden
Huizen
Ermelo
Bussum
Putten
Hilversum
Nijkerk
Mijdrecht
Loosdrecht
Voorthuizen
Paleis Soestdijk
Breukelen
Amersfoort
Maarssen
Bilthoven
Leusden
Barneveld
Harmelen
Utrecht
Zeist
Woudenberg
Utrechtse Heuvelrug
Lunteren
Driebergen-Rijsenburg
Montfoort
Doorn
Ede
Nieuwegein
Veenendaal
Vianen
Wijk bij Duurstede
Culemborg
Kesteren
Meerkerk
Leerdam
Beesd
Tiel
Waal
Druten
Geldermalsen
10 km

Historic timeline

Cornelis de Graeff
1637

Willem III & Mary Stuart
1674

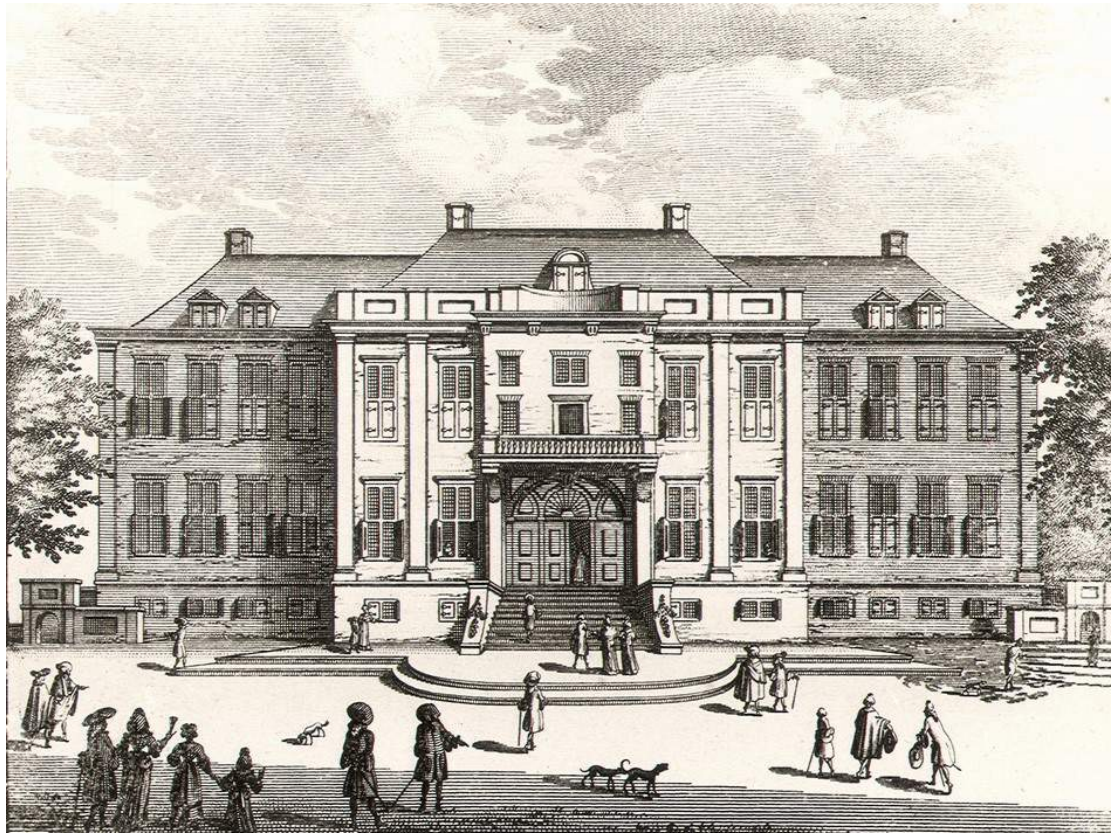
Willem II & Anna Paulowna
1815

Juliana & Bernhard
1937

Historic timeline

Cornelis de Graeff
1637

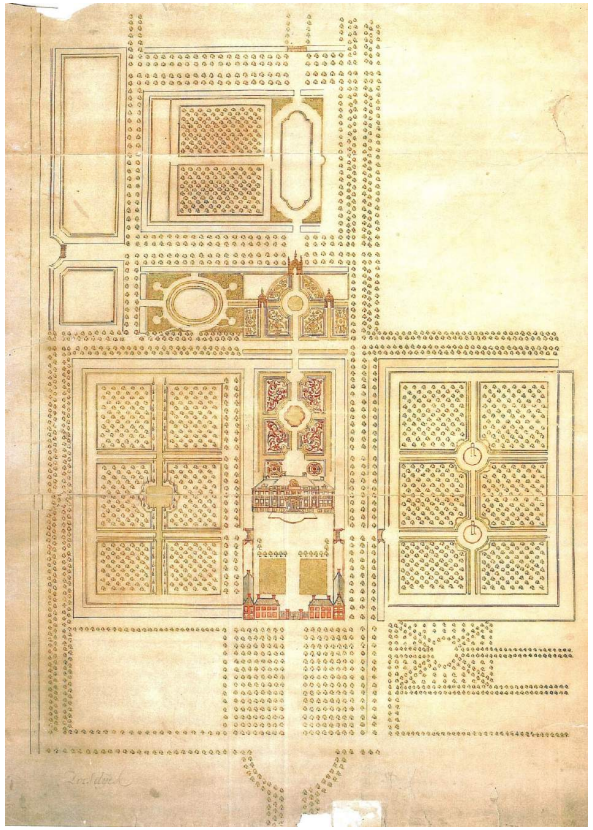
Willem III & Mary Stuart
1674



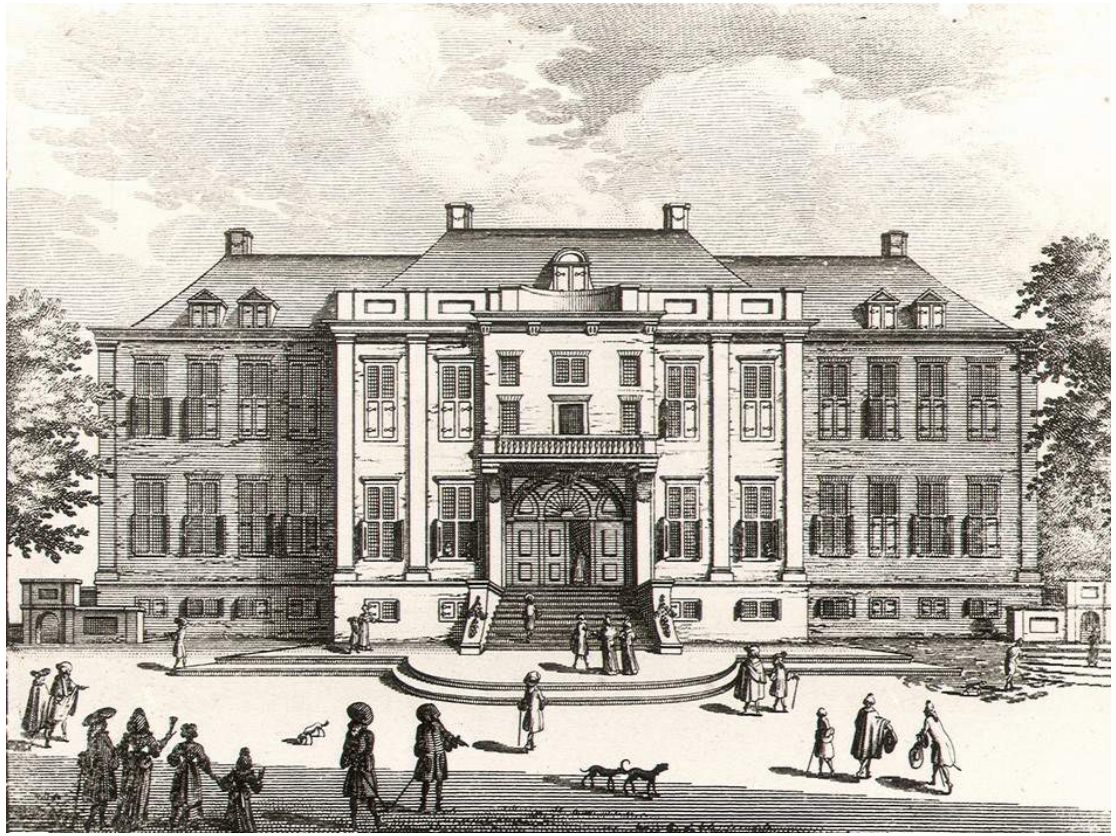
Willem II & Anna Paulowna
1815

Juliana & Bernhard
1937

Historic timeline



Cornelis de Graeff
1637



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1937

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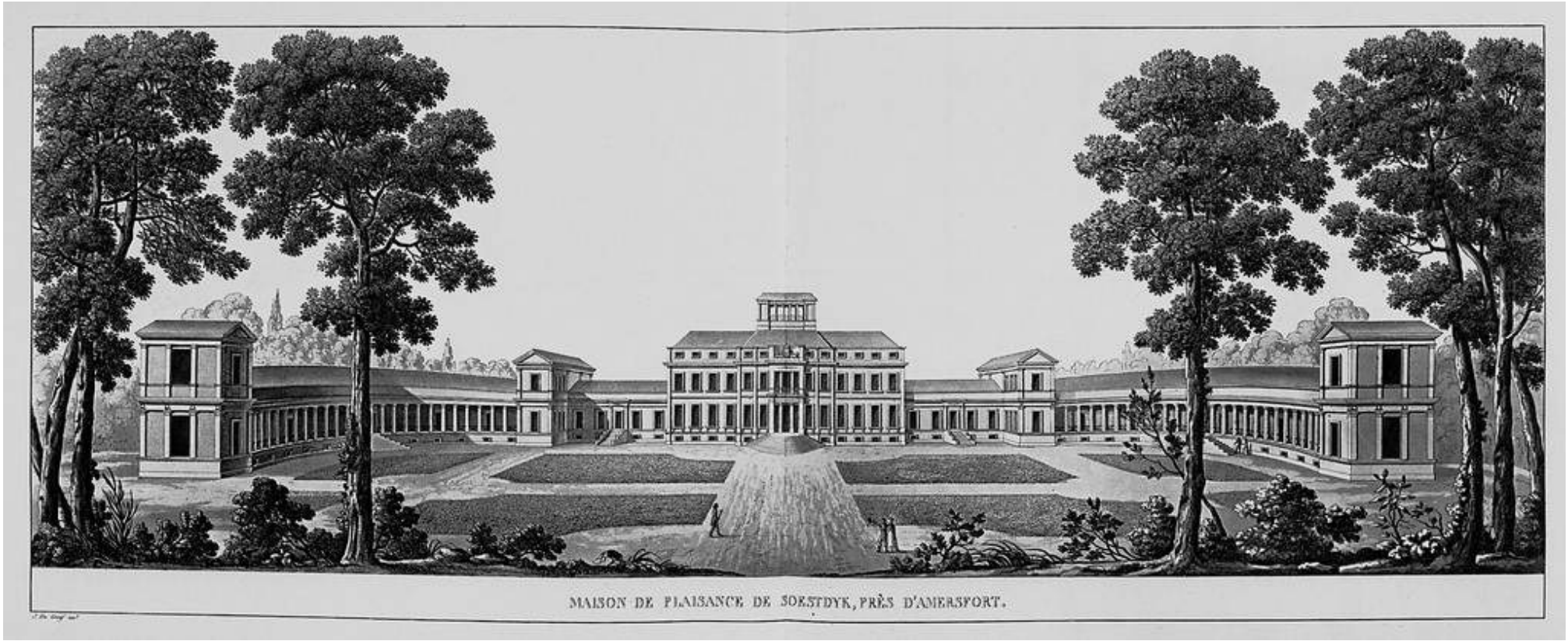

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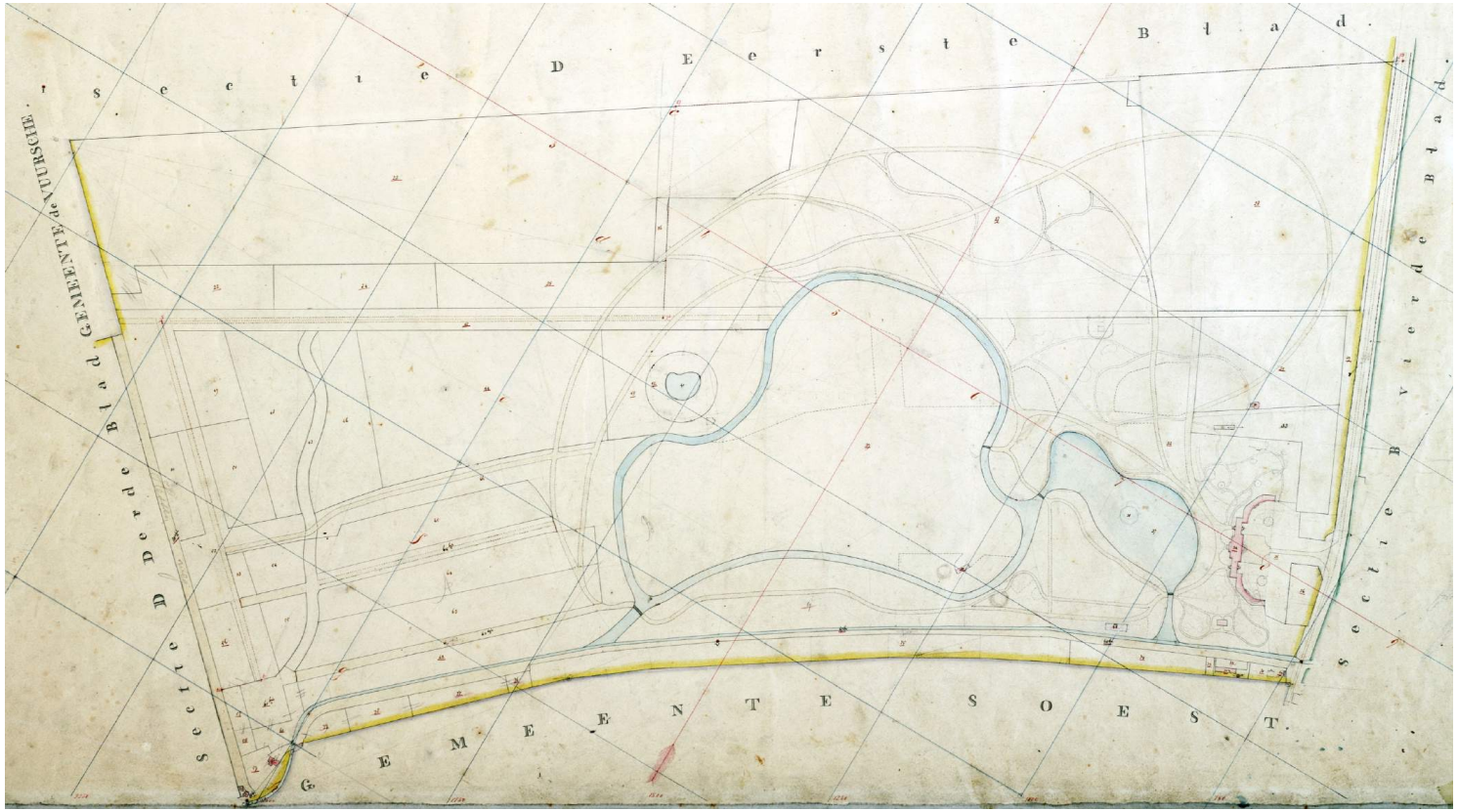

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Historic timeline

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Willem III & Mary Stuart
1674

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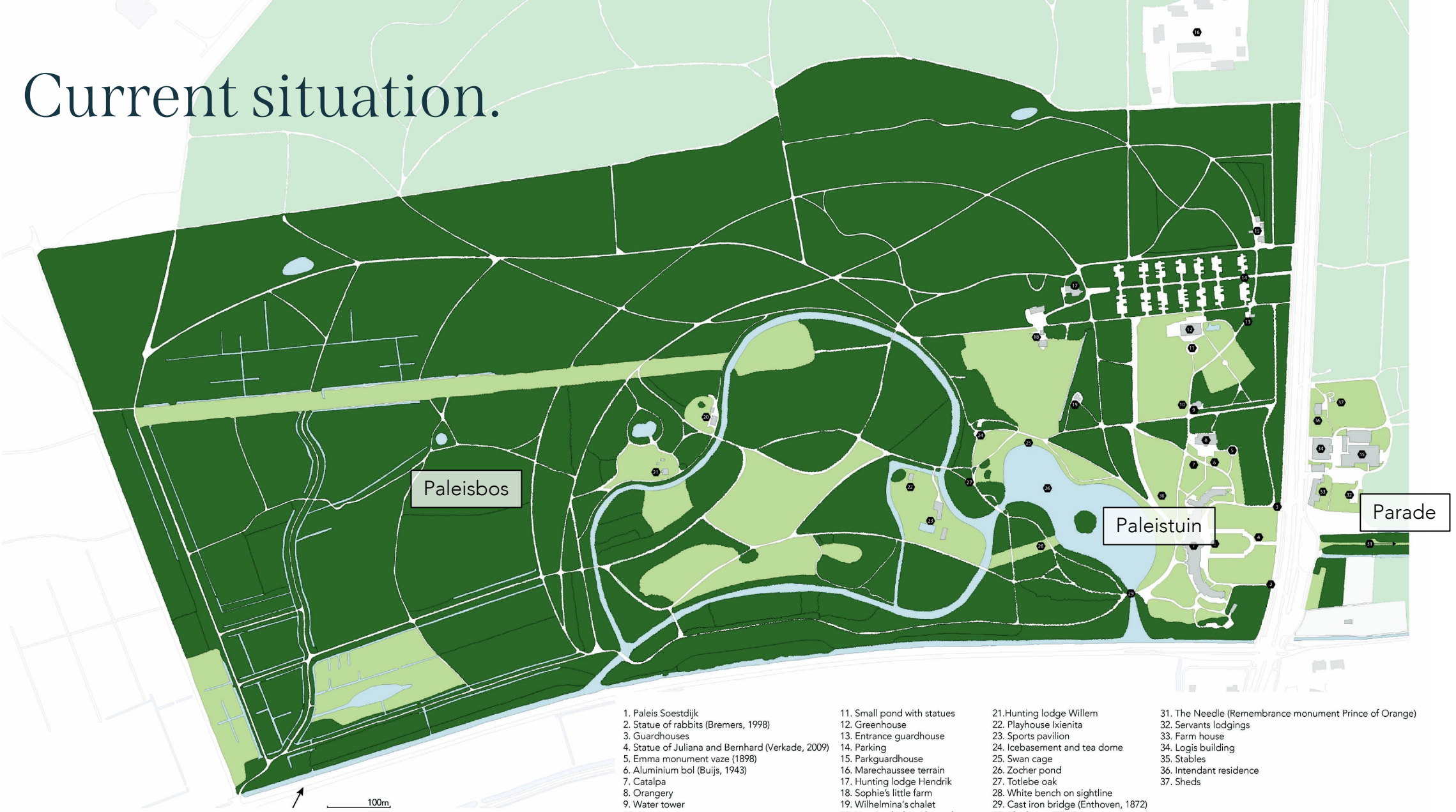
1937

New plans for Soestdijk

Current situation.



1. Paleis Soestdijk
2. Statue of rabbits (Bremers, 1998)
3. Guardhouses
4. Statue of Juliana and Bernhard (Verkade, 2009)
5. Emma monument vaze (1898)
6. Aluminium bol (Buijs, 1943)
7. Catalpa
8. Orangery
9. Water tower
10. Dog graves
11. Small pond with statues
12. Greenhouse
13. Entrance guardhouse
14. Parking
15. Parkguardhouse
16. Marechaussee terrain
17. Hunting lodge Hendrik
18. Sophie's little farm
19. Wilhelmina's chalet
20. Hunting lodge Alexander
21. Hunting lodge Willem
22. Playhouse Ixienita
23. Sports pavilion
24. Icebasement and tea dome
25. Swan cage
26. Zocher pond
27. Totlebe oak
28. White bench on sightline
29. Cast iron bridge (Enthoven, 1872)
30. Elephants (1976)
31. The Needle (Remembrance monument Prince of Orange)
32. Servants lodgings
33. Farm house
34. Logis building
35. Stables
36. Intendant residence
37. Sheds

Juliana & Bernhard in front of Paleis Soestdijk

Backside of the Palace and reflection in the pond

Orangery

Greenhouse and Water Ornament

The Circular plan

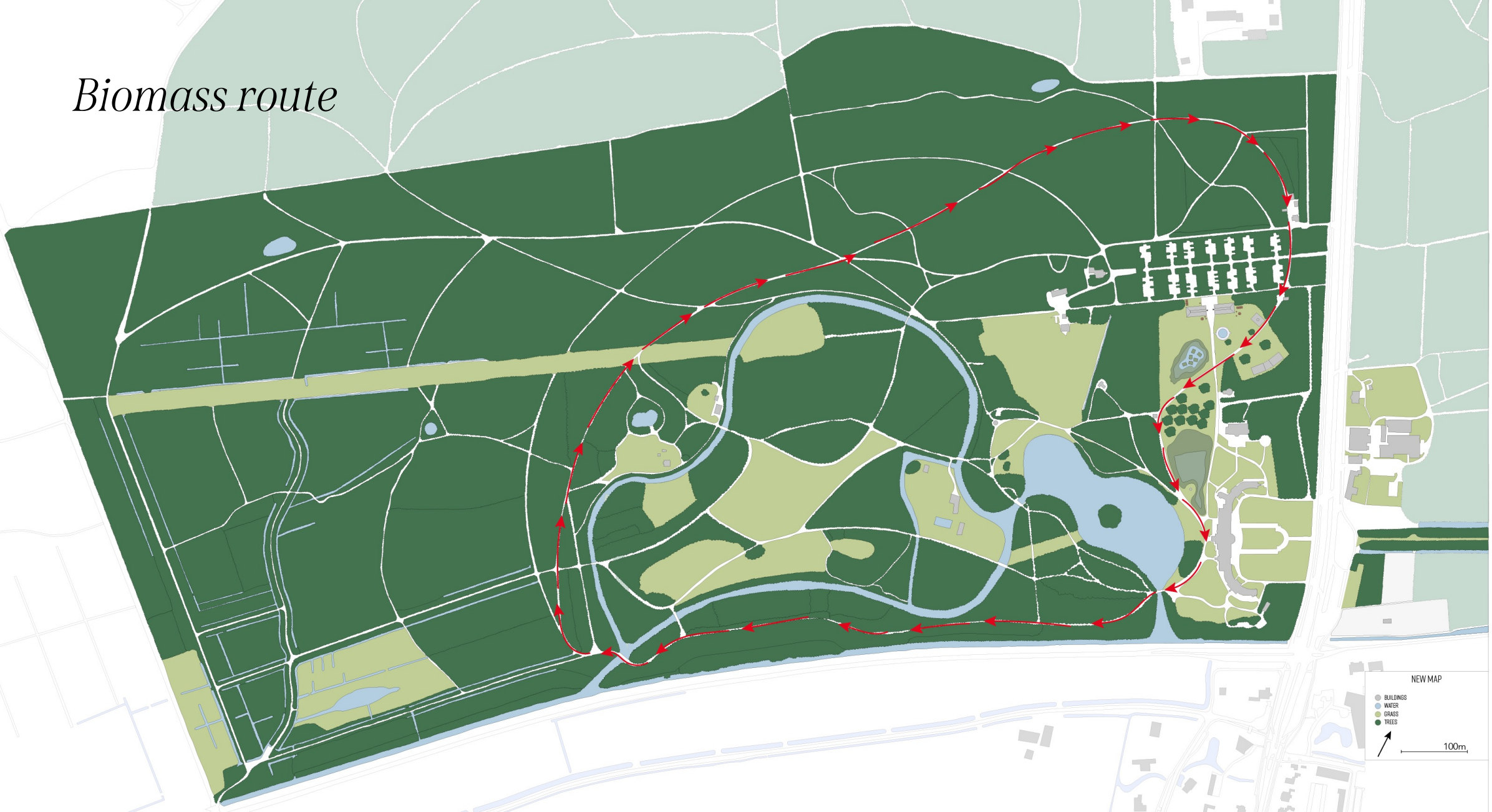
New entrance + sightline

New entrance + sightline

New entrance + sightline

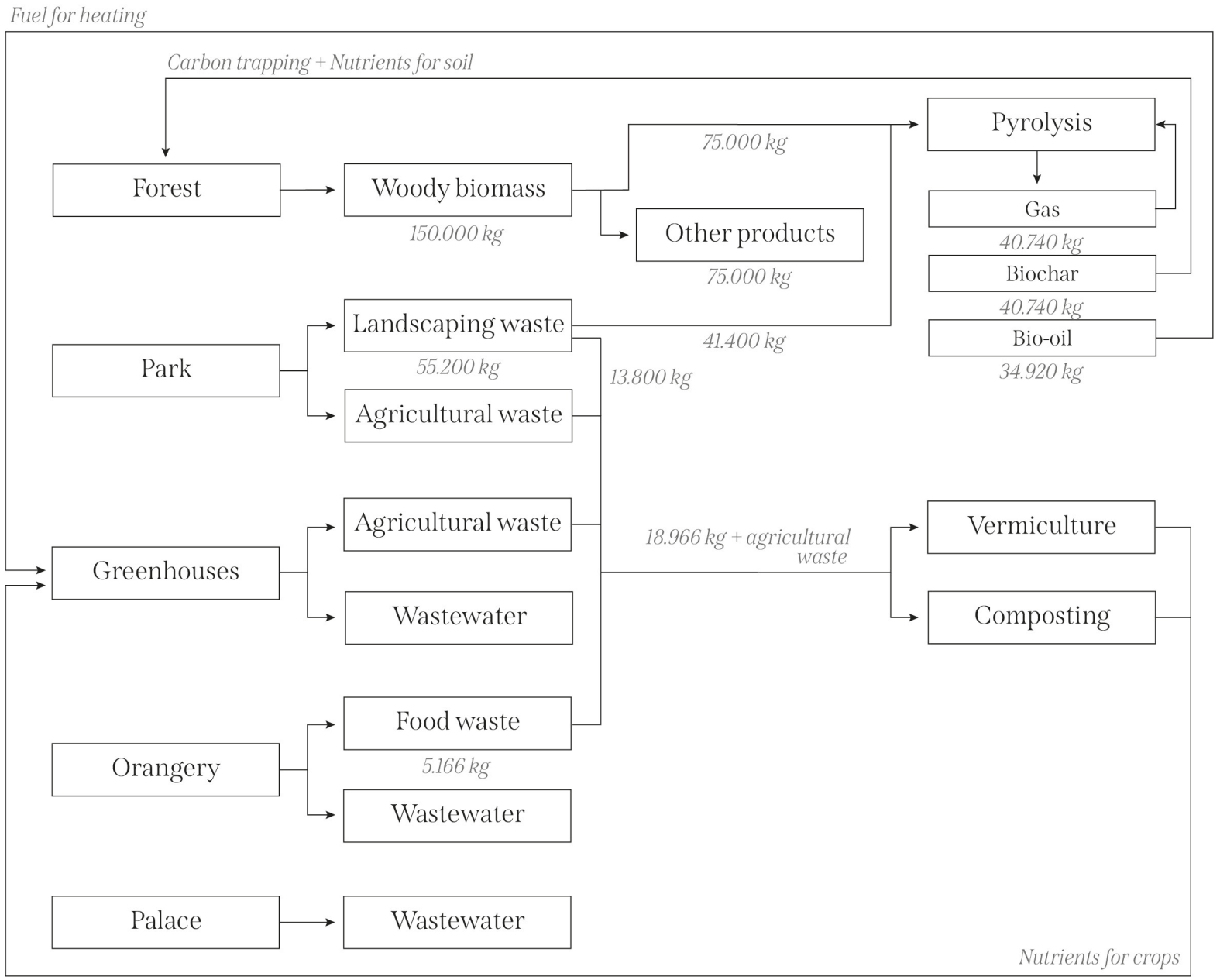
The return of Zocher's path

Biomass route

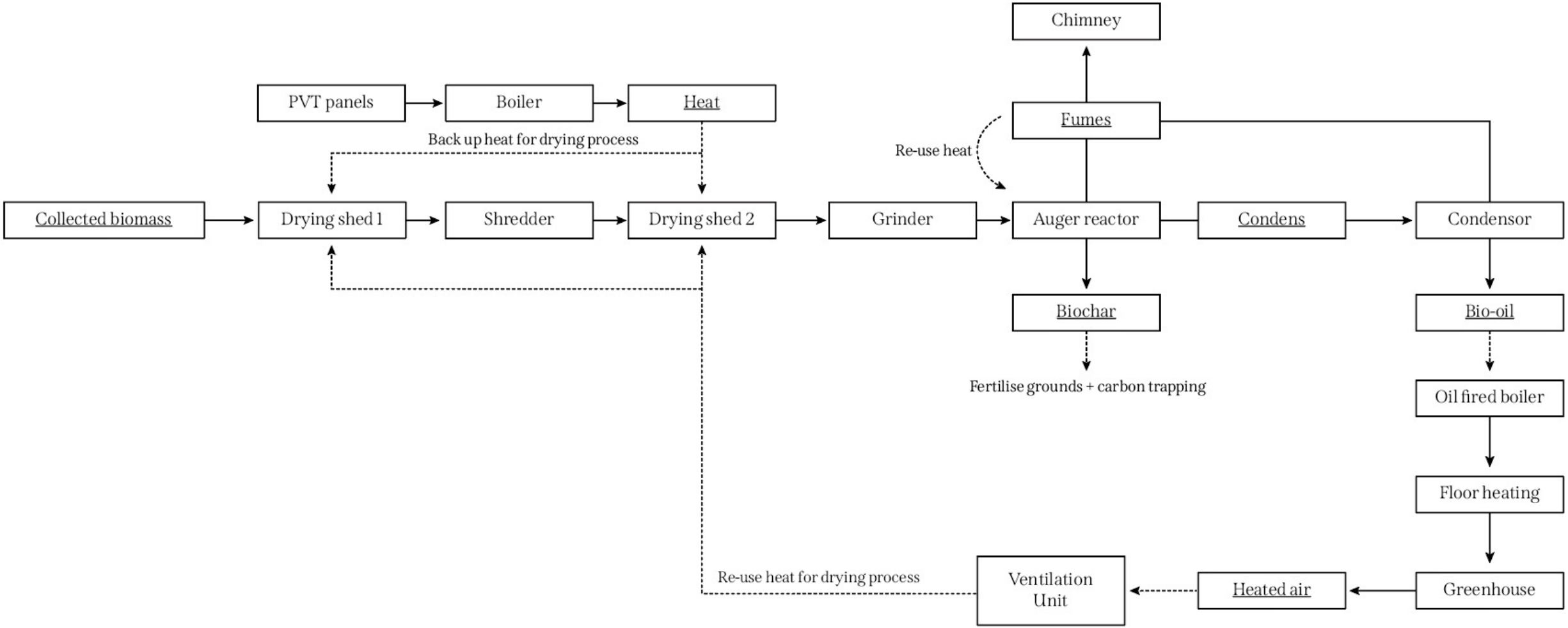


The Biomass plan

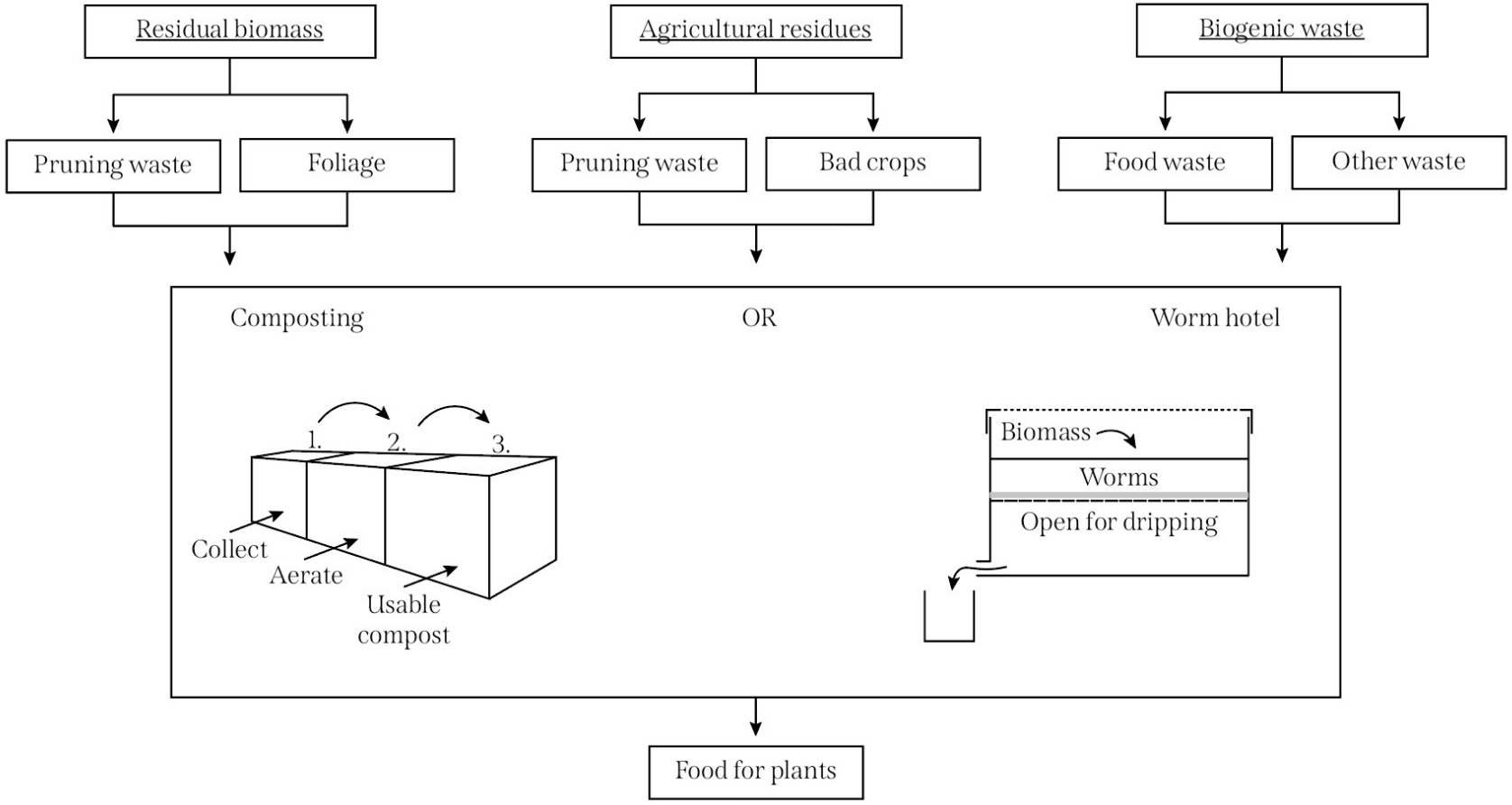
Biomass.


Fuel for heating
Carbon trapping + Nutrients for soil
Forest
Woody biomass
150.000 kg
75.000 kg
Other products
75.000 kg
Pyrolysis
Gas
40.740 kg
Biochar
40.740 kg
Bio-oil
34.920 kg
Park
Landscaping waste
55.200 kg
41.400 kg
13.800 kg
Agricultural waste
Greenhouses
Agricultural waste
Wastewater
18.966 kg + agricultural waste
Vermiculture
Composting
Orangery
Food waste
5.166 kg
Wastewater
Palace
Wastewater
Nutrients for crops

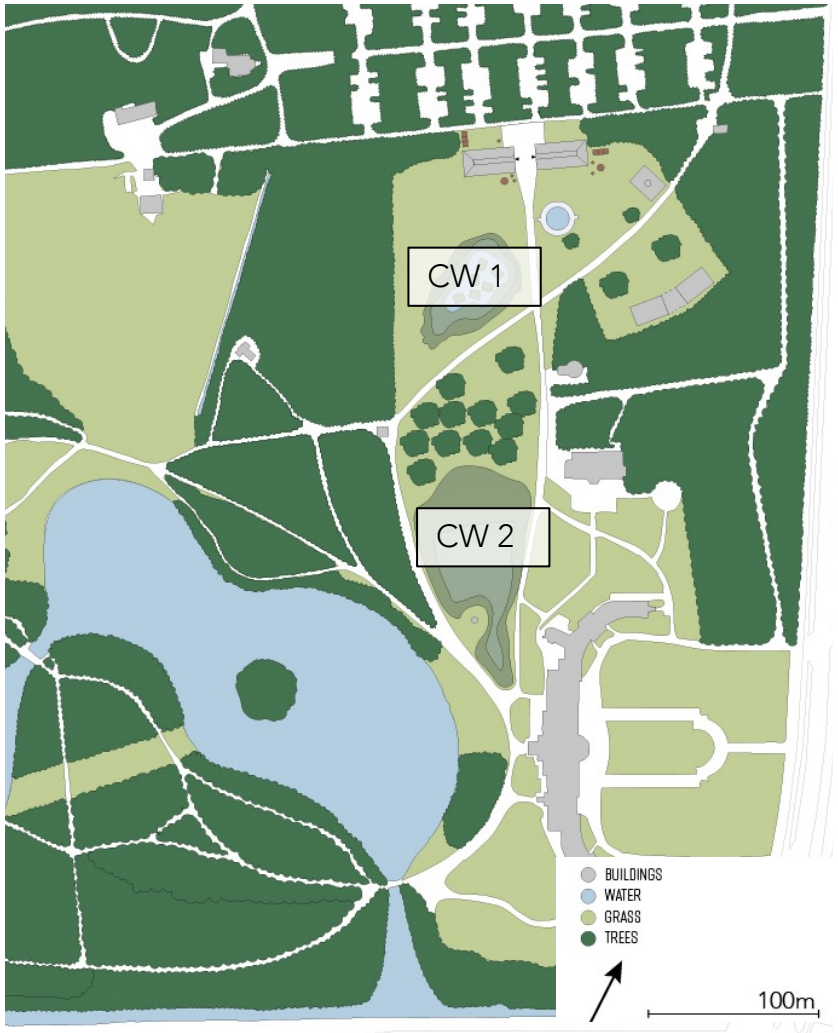
Pyrolysis.

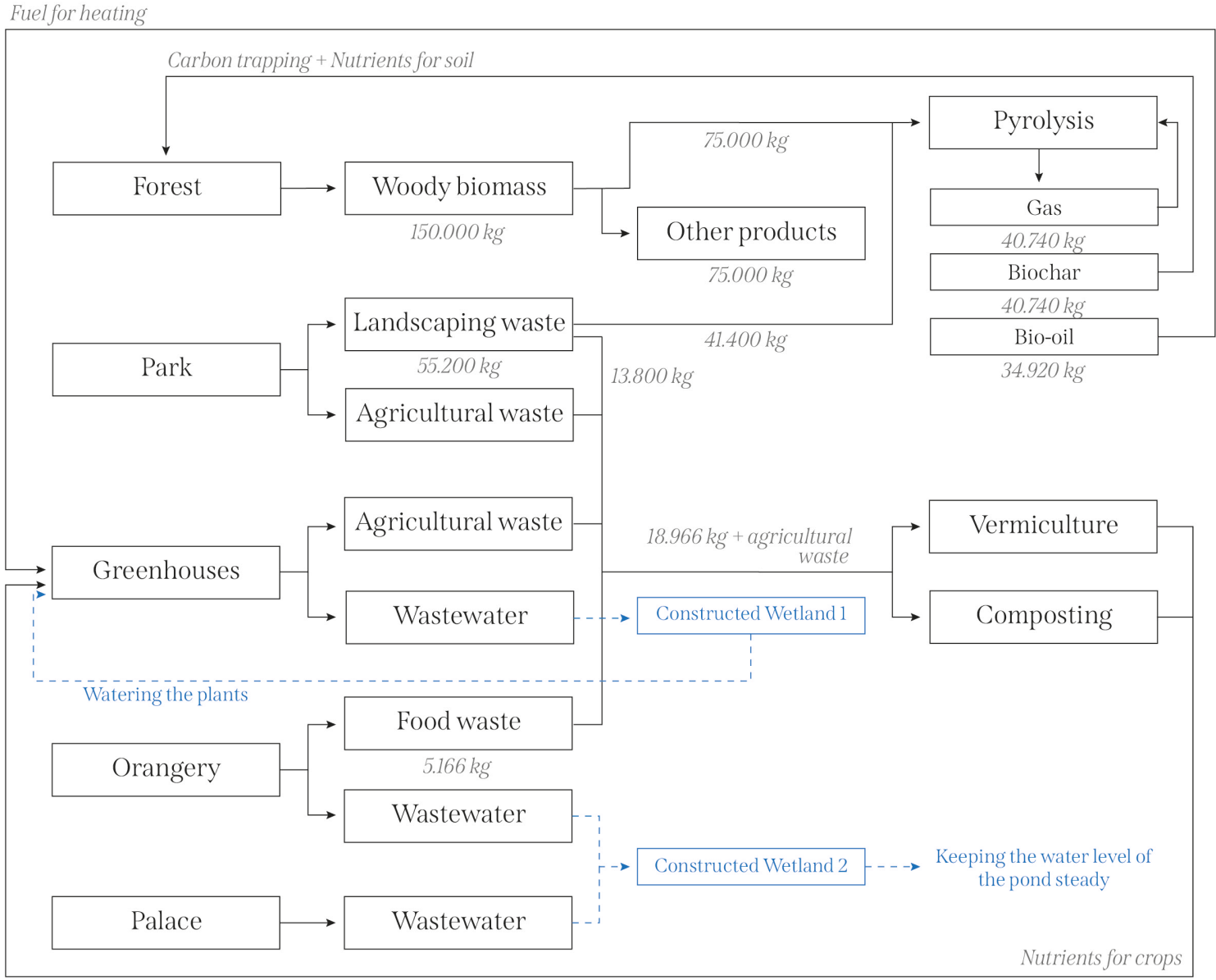

Chimney
PVT panels
Boiler
Heat
Fumes
Back up heat for drying process
Re-use heat
Collected biomass
Drying shed 1
Shredder
Drying shed 2
Grinder
Auger reactor
Condens
Condensor
Biochar
Bio-oil
Fertilise grounds + carbon trapping
Oil fired boiler
Floor heating
Re-use heat for drying process
Ventilation Unit
Heated air
Greenhouse

Biological conversion.

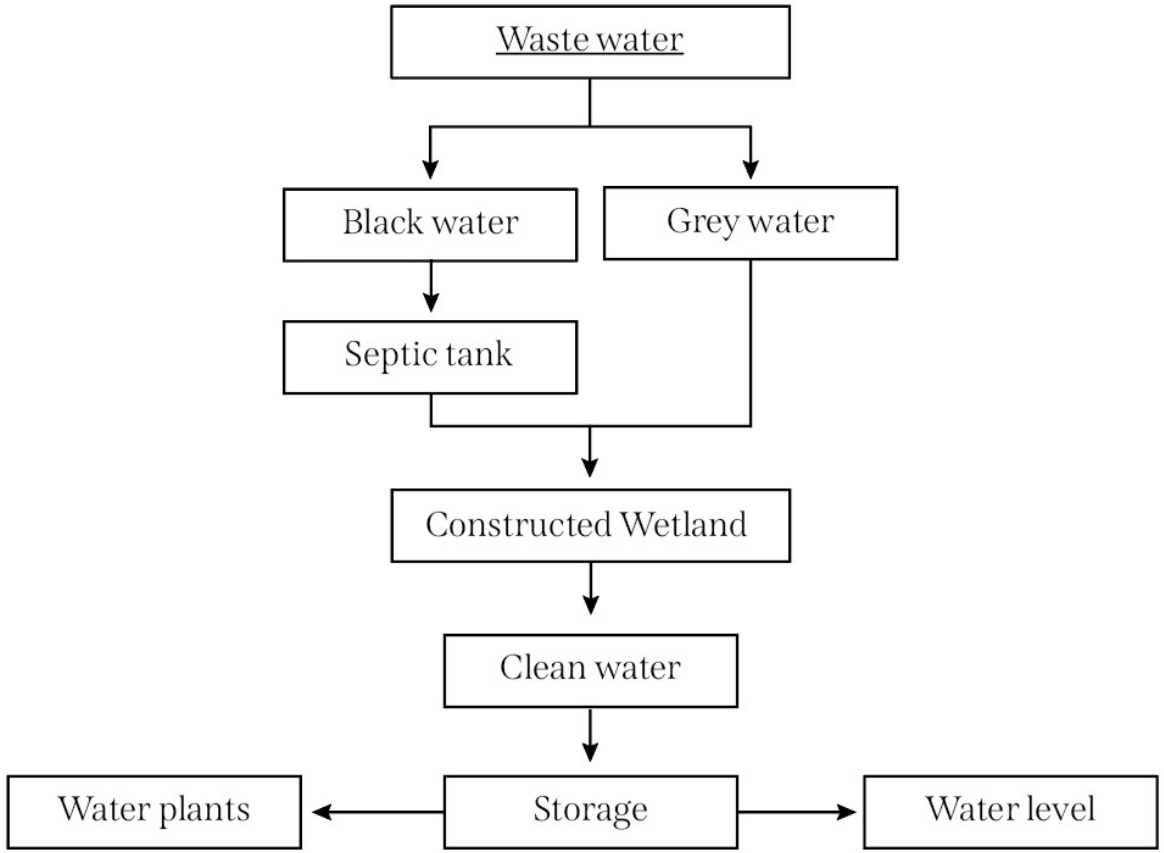


The Wastewater plan



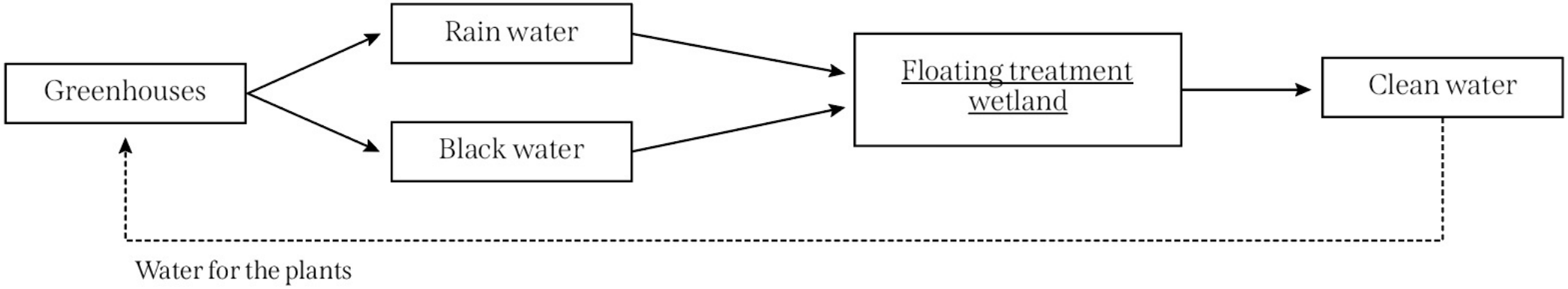


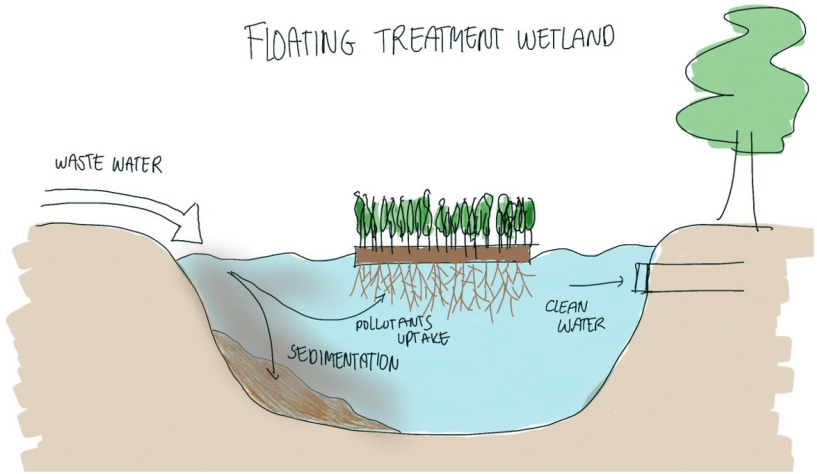
Wastewater.



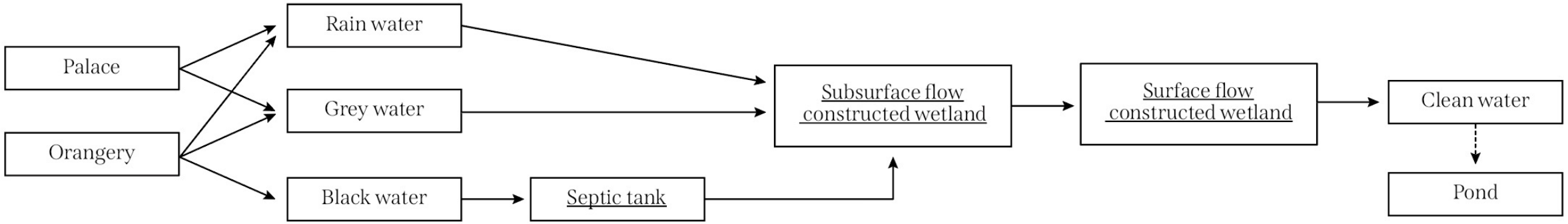
Type of wastewater	Location	Amount (L)
Rain water	Roof palace	1300000
	Roof orangery	214500
	Roof greenhouses	585000
	Roof pyrolysis	41600
	Roof drying sheds	260000
	Total:	2401100
Grey water	Sinks orangery	1600000
Black water	Toilets in orangery	2920000
	Wastewater from greenhouses	18270
	Total:	2938270

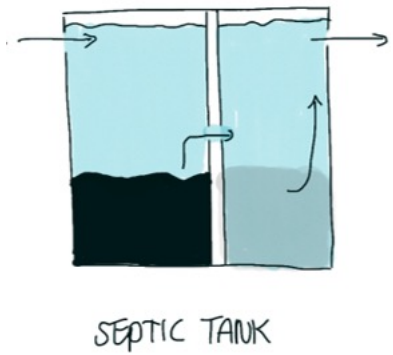
Constructed wetland 1.

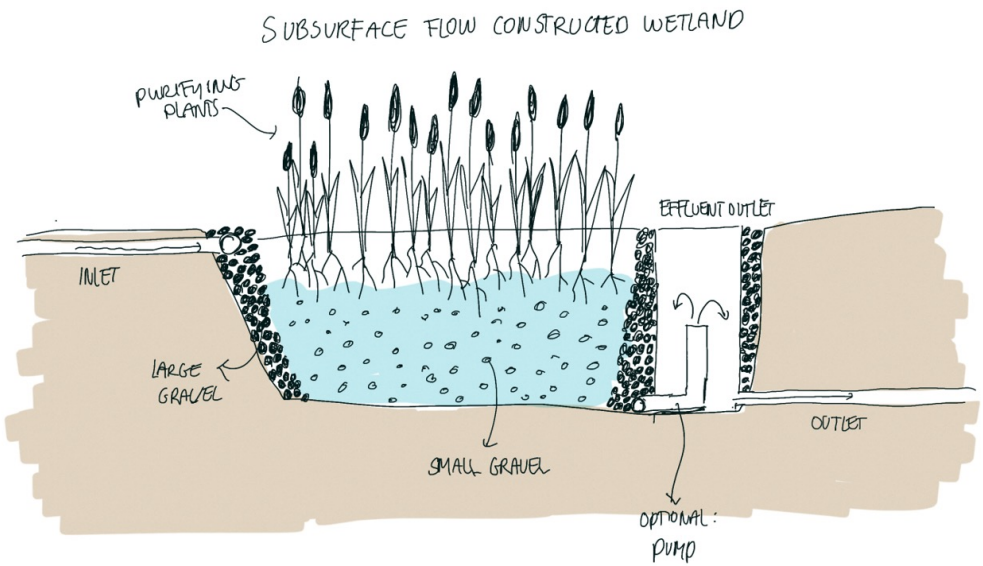


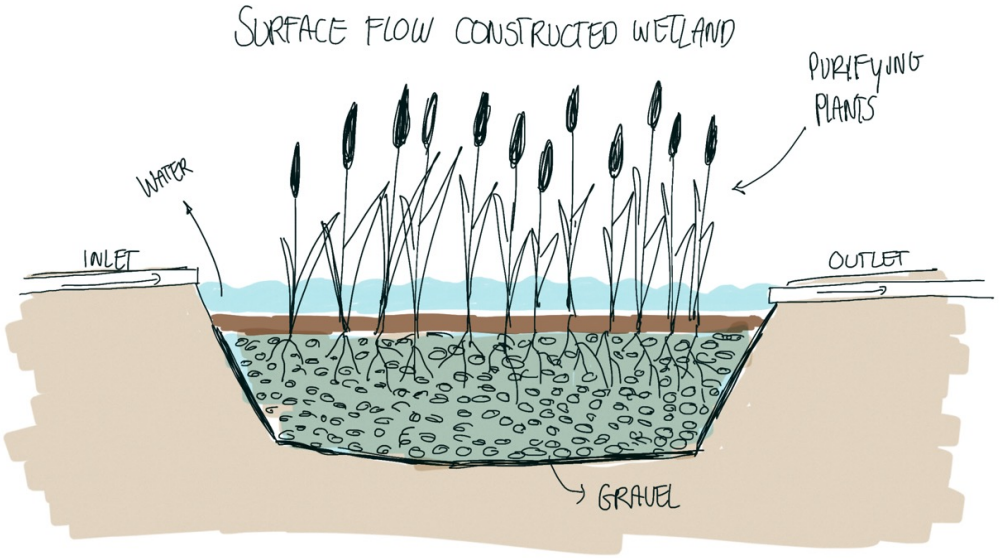


Constructed wetland 2.









The Food production plan

The Food production plan

Forest:
Agroforestry

Park:
Agricultural field

The Greenhouses

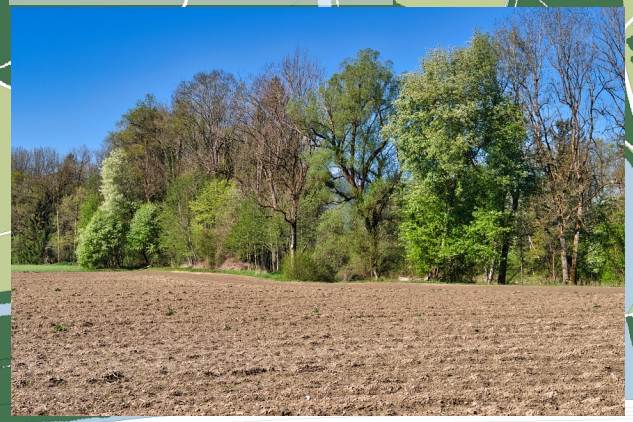
Orchard

NEW MAP
BUILDINGS
WATER
GRASS
TREES
100m

The Food production plan

Forest:
Agroforestry

Park:
Agricultural field



The Greenhouses

Orchard

NEW MAP
BUILDINGS
WATER
GRASS
TREES
100m

The Food production plan

Forest:
Agroforestry

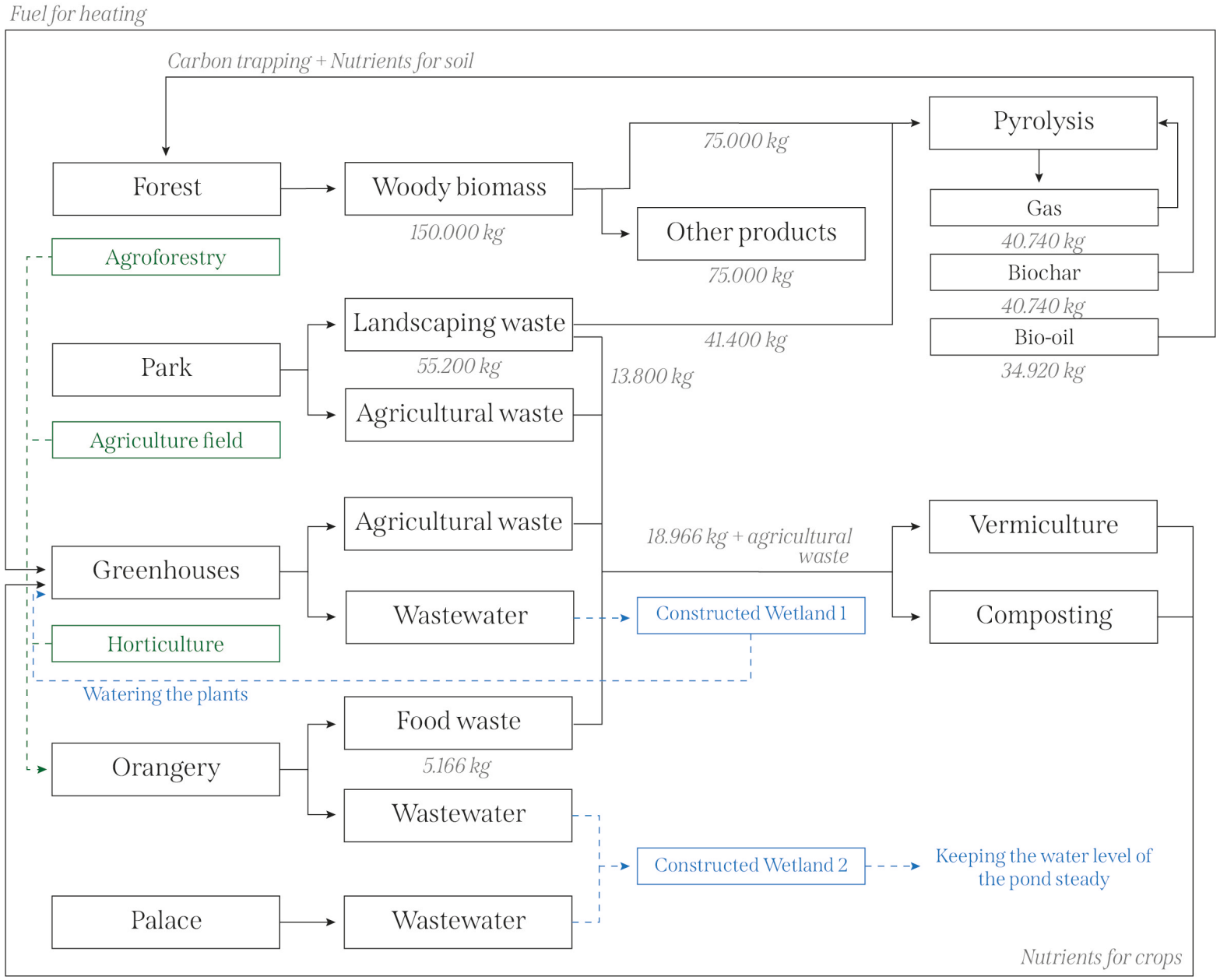
Park:
Agricultural field

The Greenhouses

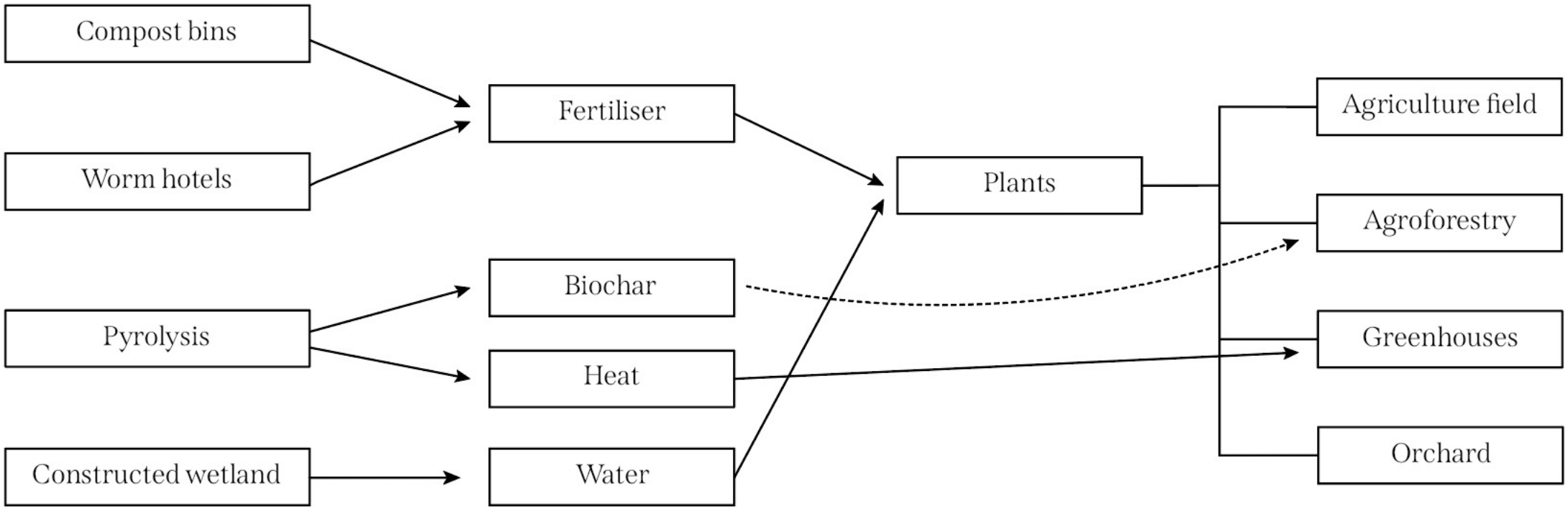
Orchard

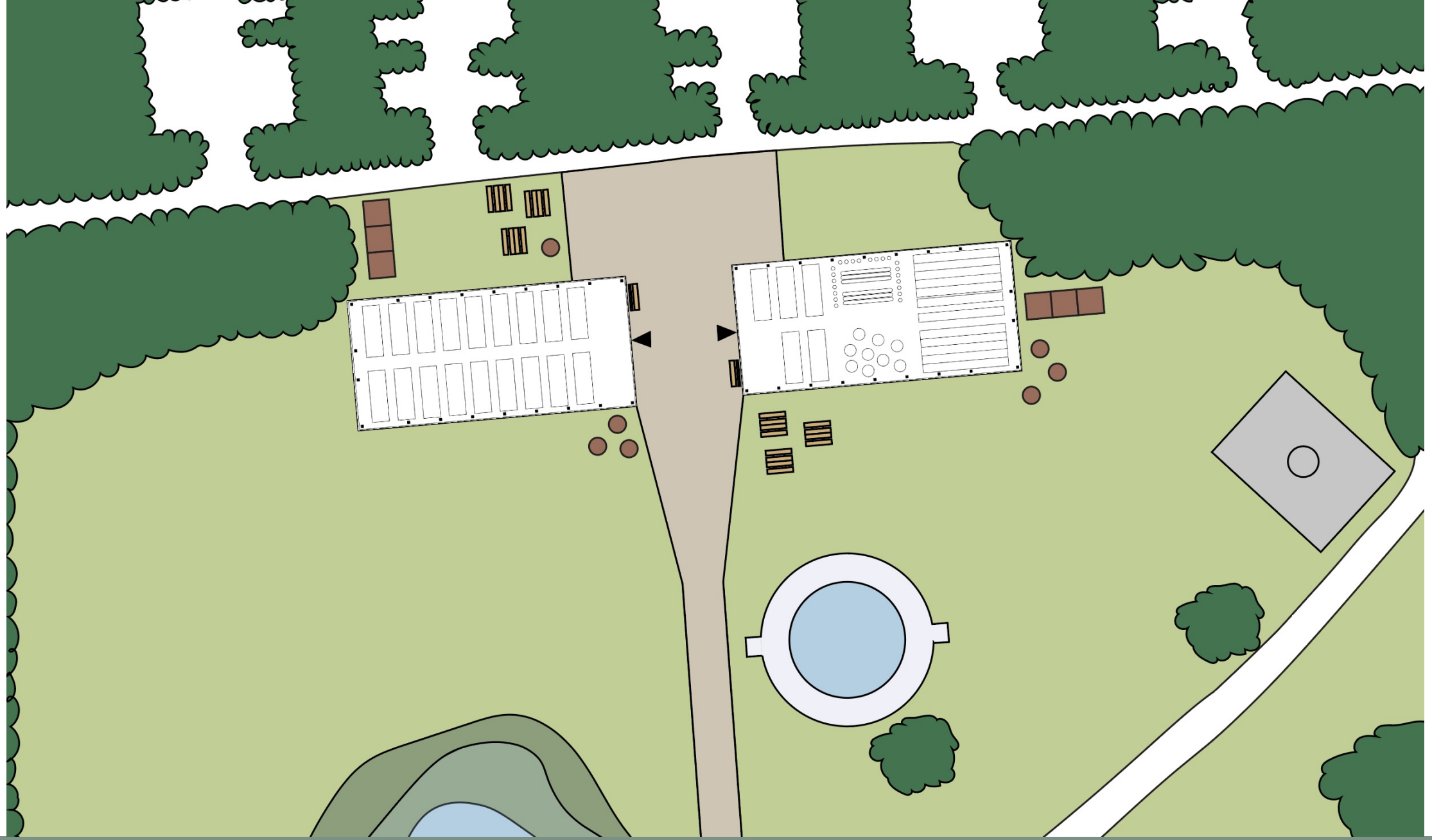
NEW MAP
BUILDINGS
WATER
GRASS
TREES
100m

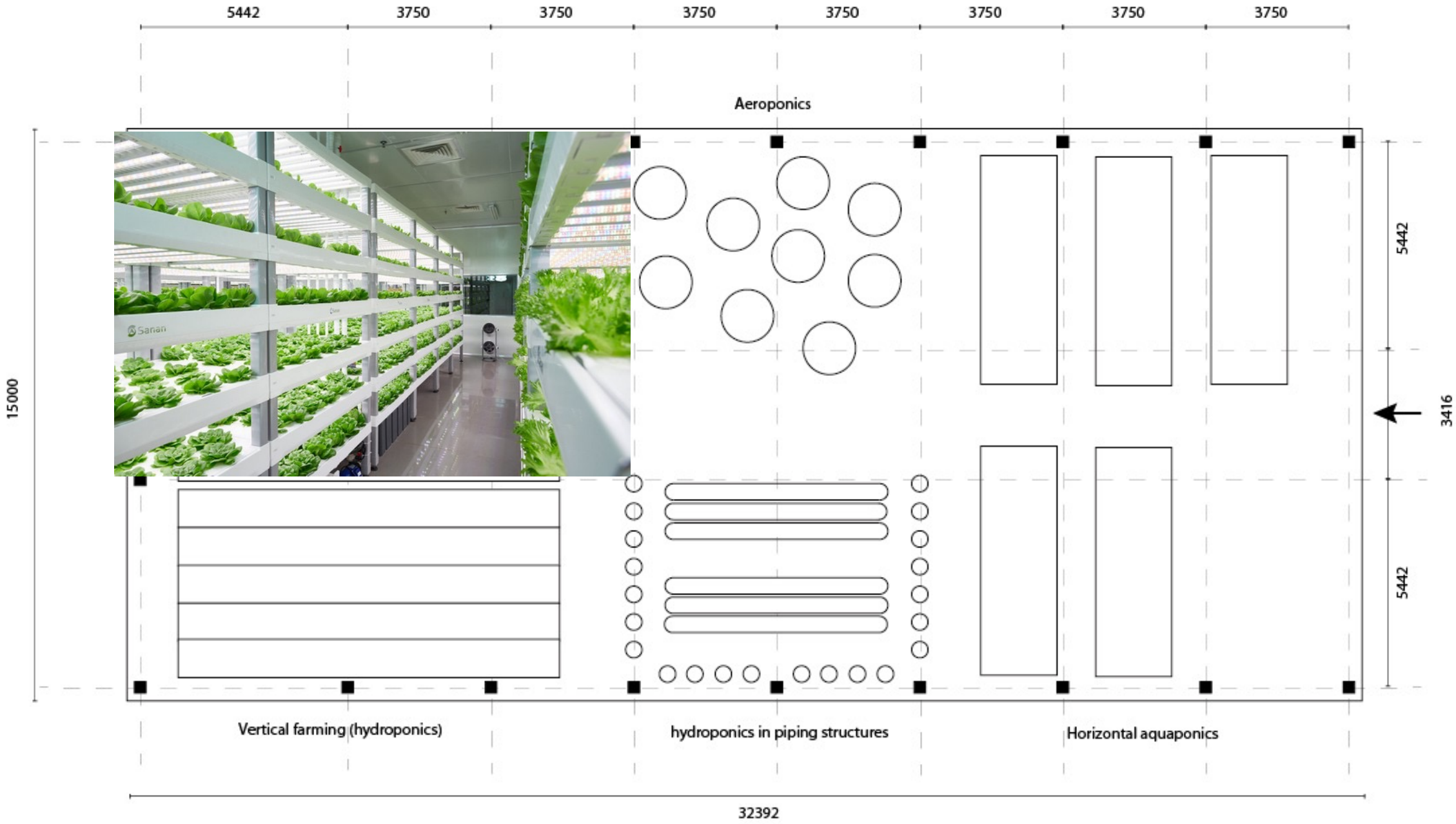
Food Production



Food production



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3750
3750
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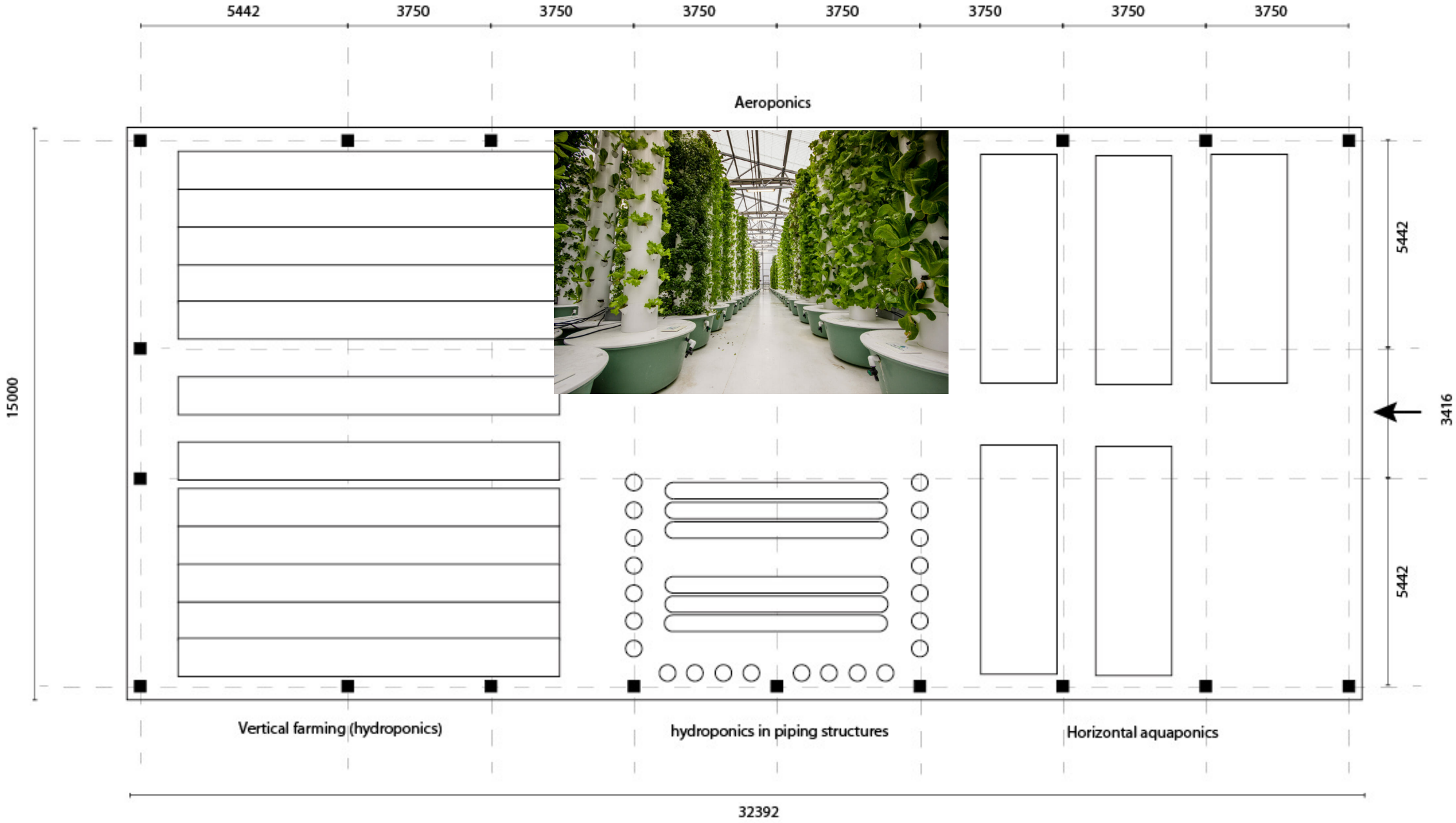
Aeroponics
15000
5442
3416
5442
Vertical farming (hydroponics)
hydroponics in piping structures
Horizontal aquaponics
32392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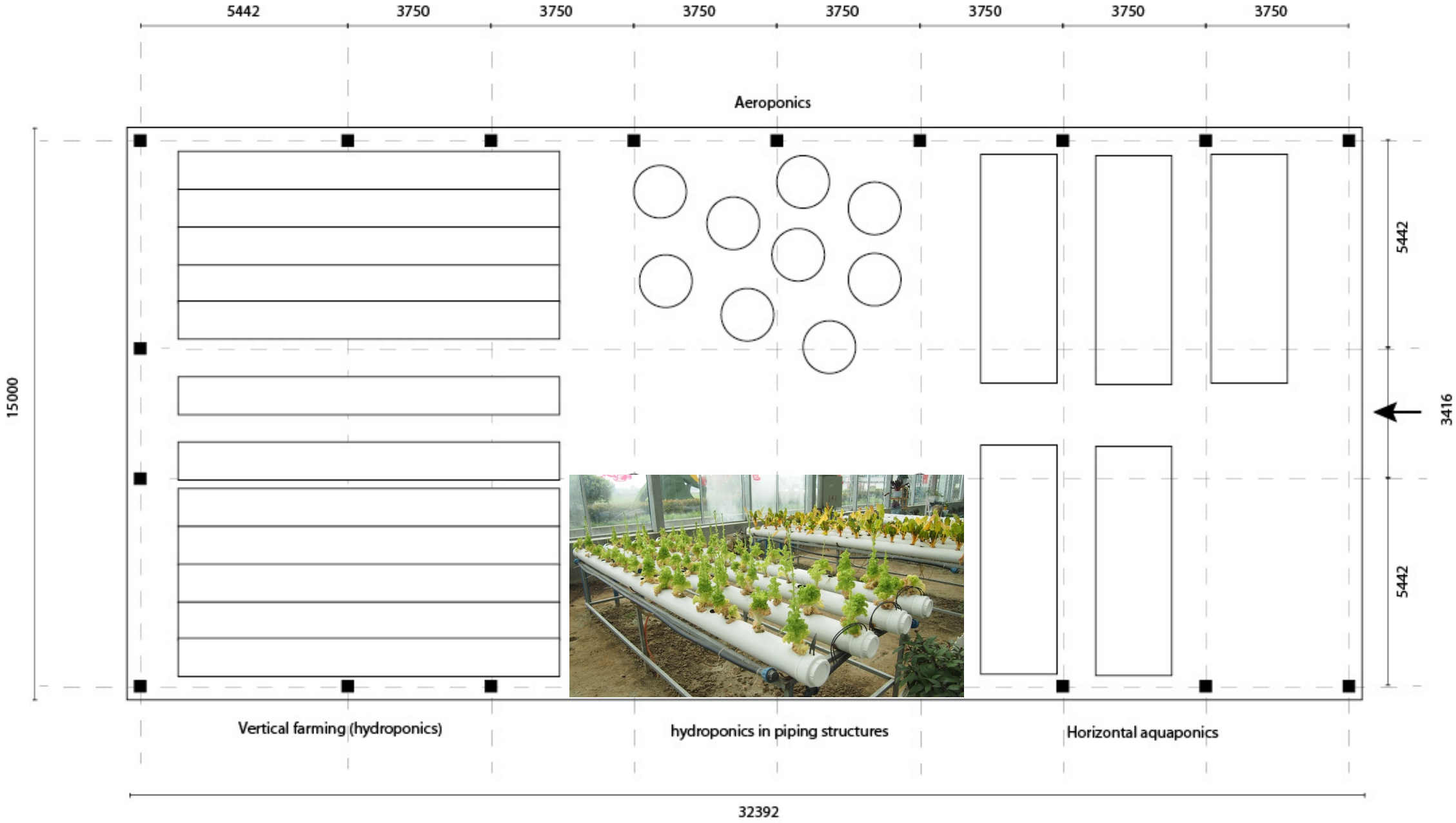
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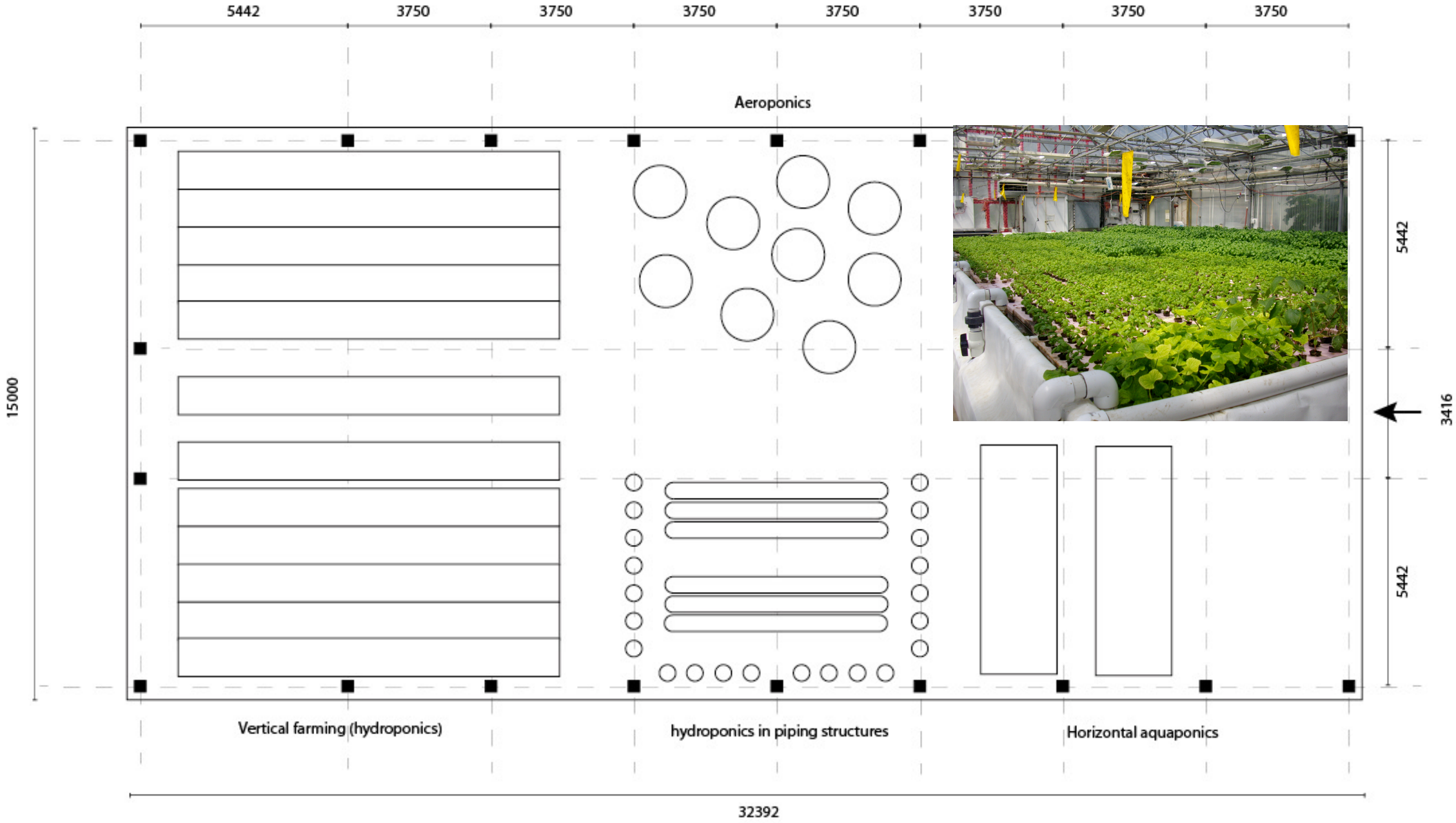
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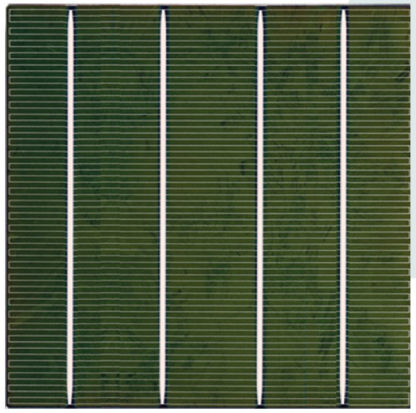
Facade design.



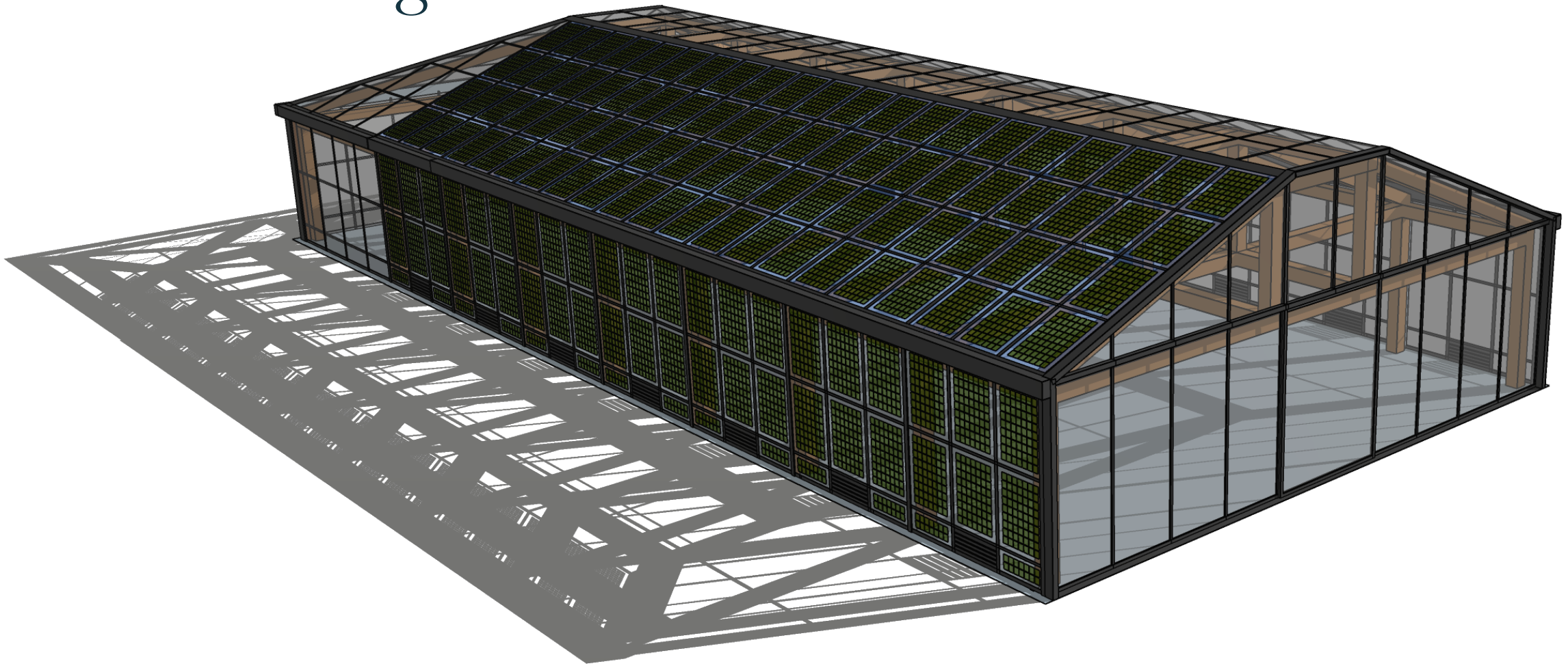
Endless
Pines

Power per cell (Wp): **3,93 - 4,16**
Average power (Wp per m^2): **129**
Max. power (Wp per m^2): **149**

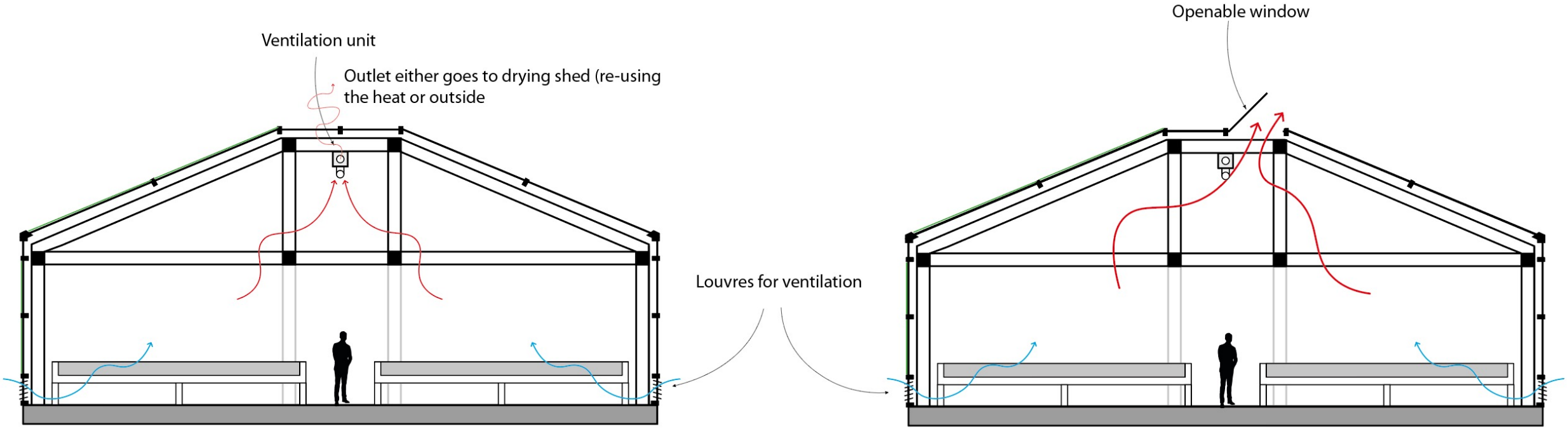
	Amount	Unit
Surface area facade	500	m2
Power production per m2	129	WP/m2
Power production	64500	WP
Conversion to kWh	56760	kWh

	Amount	Unit
Ventilation	17600	kWh
Lighting	15360	kWh
Total electricity demand	32960	kWh

Facade design.



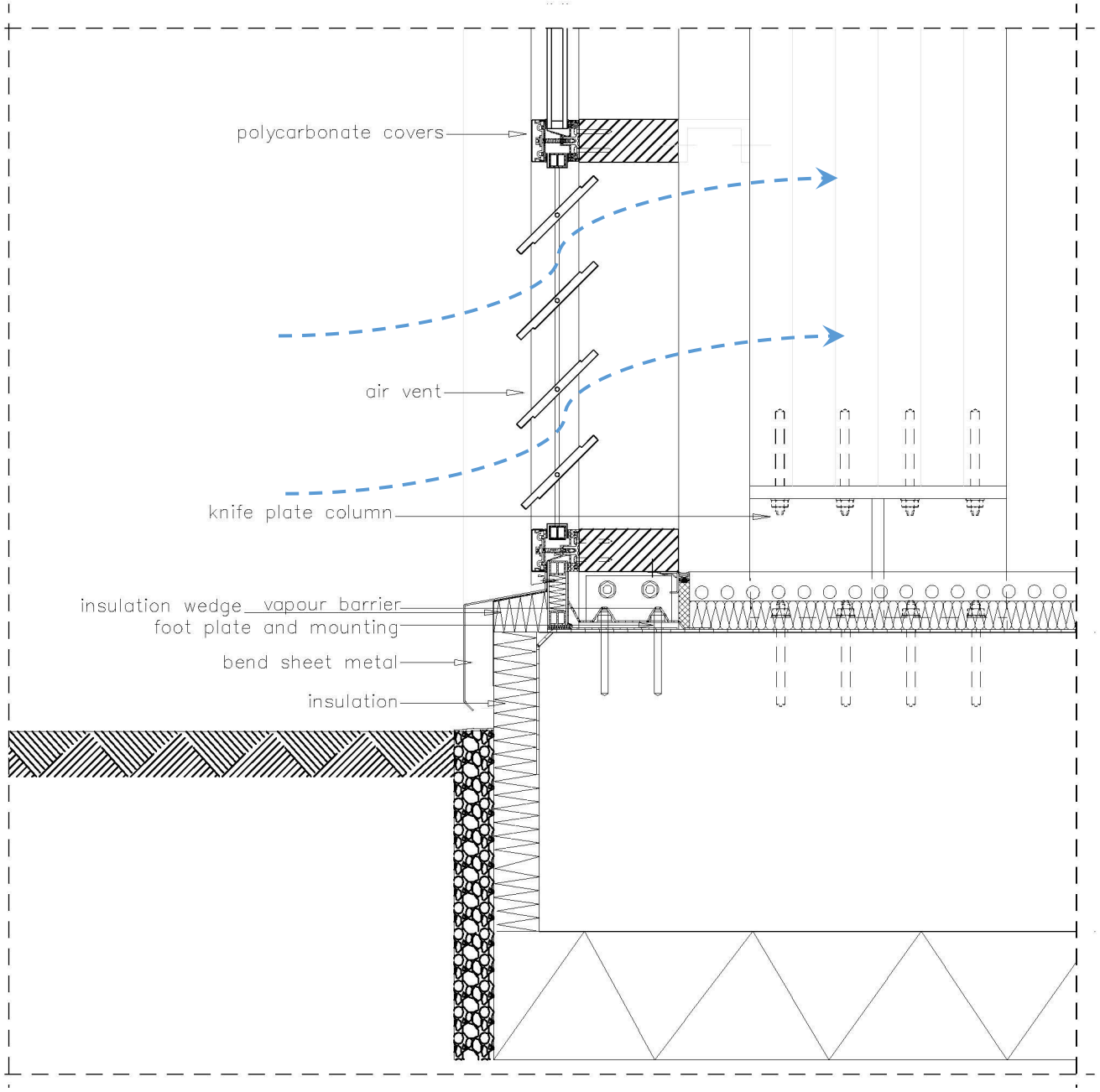
Ventilation.



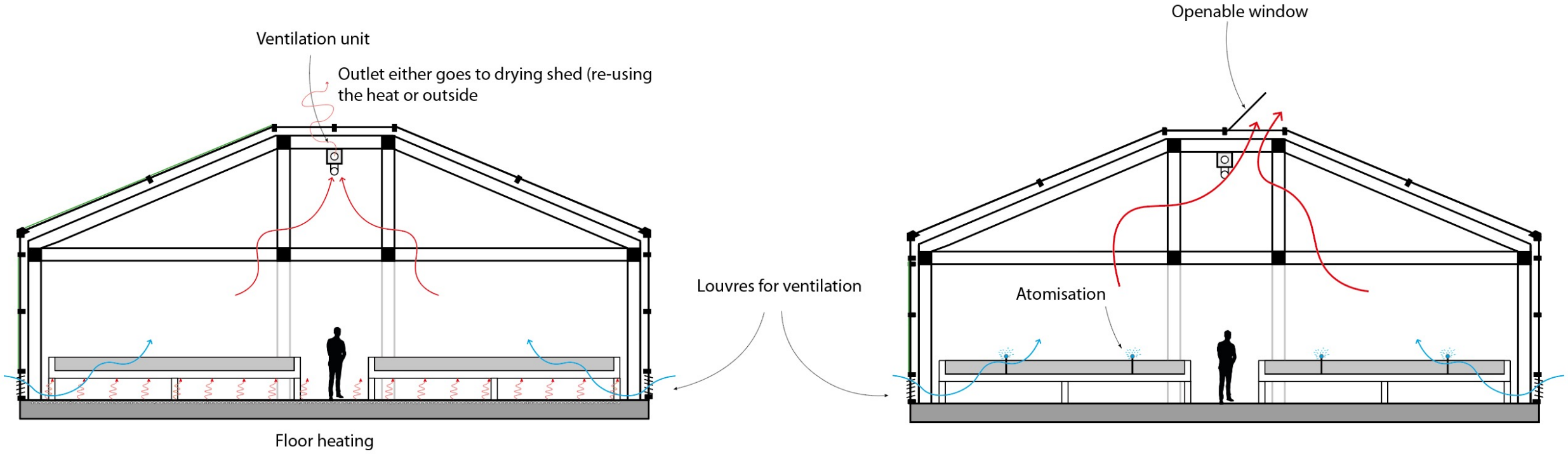
Normal situation

Hot summer situation

Detail 1:5.


polycarbonate covers
air vent
knife plate column
insulation wedge
vapour barrier
foot plate and mounting
bend sheet metal
insulation

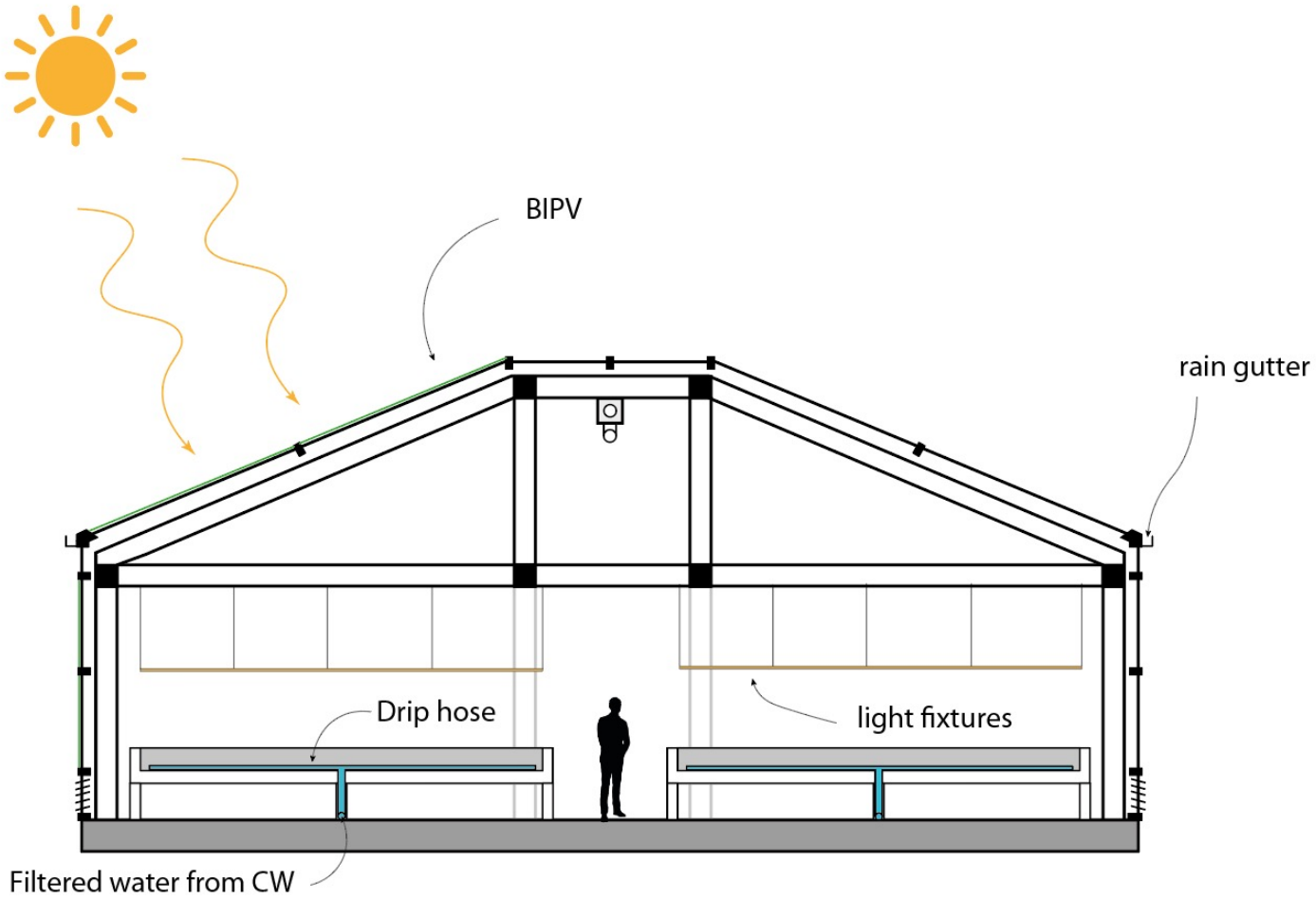
Heating & cooling.



Normal situation

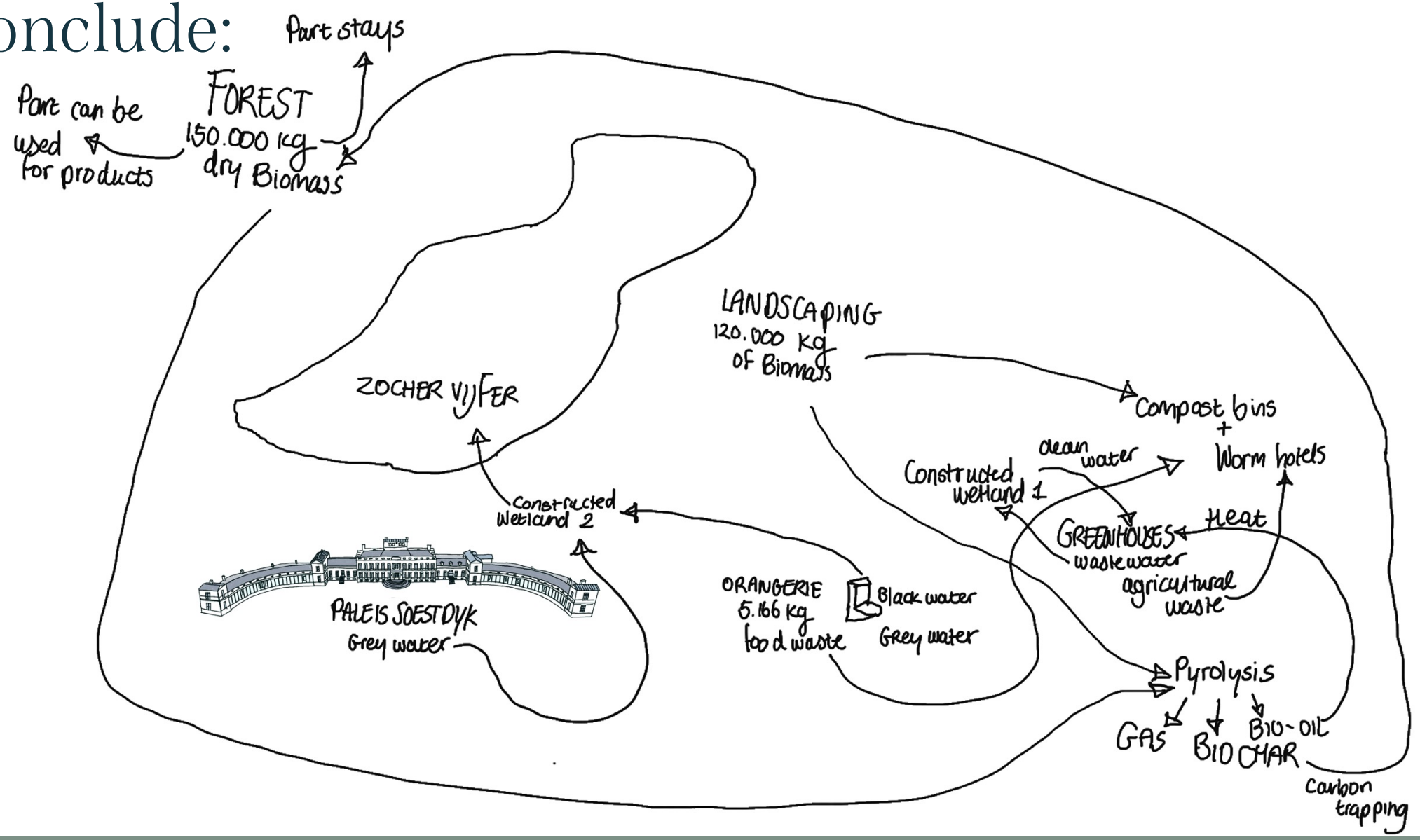
Hot summer situation

Light & water.

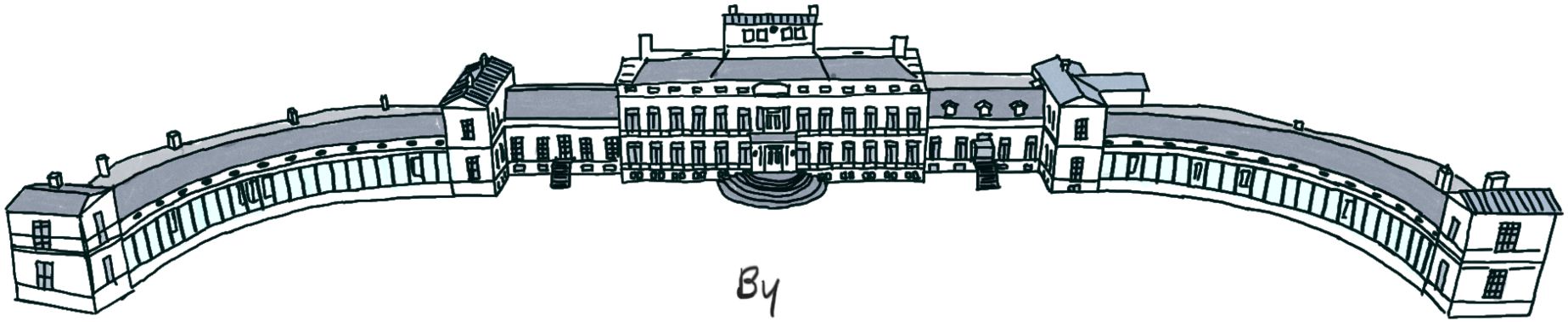


	Amount	Unit
LED fixtures	32	W/fixture
Amount	0,2	Fixture/m2
Effective surface plants	600	m2
Electric power	3,84	kWe
Effective usage per year	4000	h
Power consumption	15360	kWh

To conclude:


Part stays
Part can be used for products
FOREST
150.000 kg dry Biomass
ZOCHER VIJVER
LANDSCAPING
120.000 kg of Biomass
Compost bins
+
Worm hotels
clean water
Constructed wetland 1
Constructed wetland 2
GREENHOUSES
heat
wastewater
agricultural waste
PALEIS SOESTDIJK
Grey water
ORANGERIE
5.166 kg food waste
Black water
Grey water
Pyrolysis
GAS
BIO-OIL
BIOCHAR
carbon trapping

Paleis Soestdijk
as a circular estate



By

Julia Kapinga