Examination P5. 27.06.2019

Chairs & Mentors

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Climate Design and Sustainability - Dr. D. Peck

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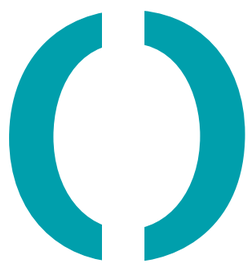
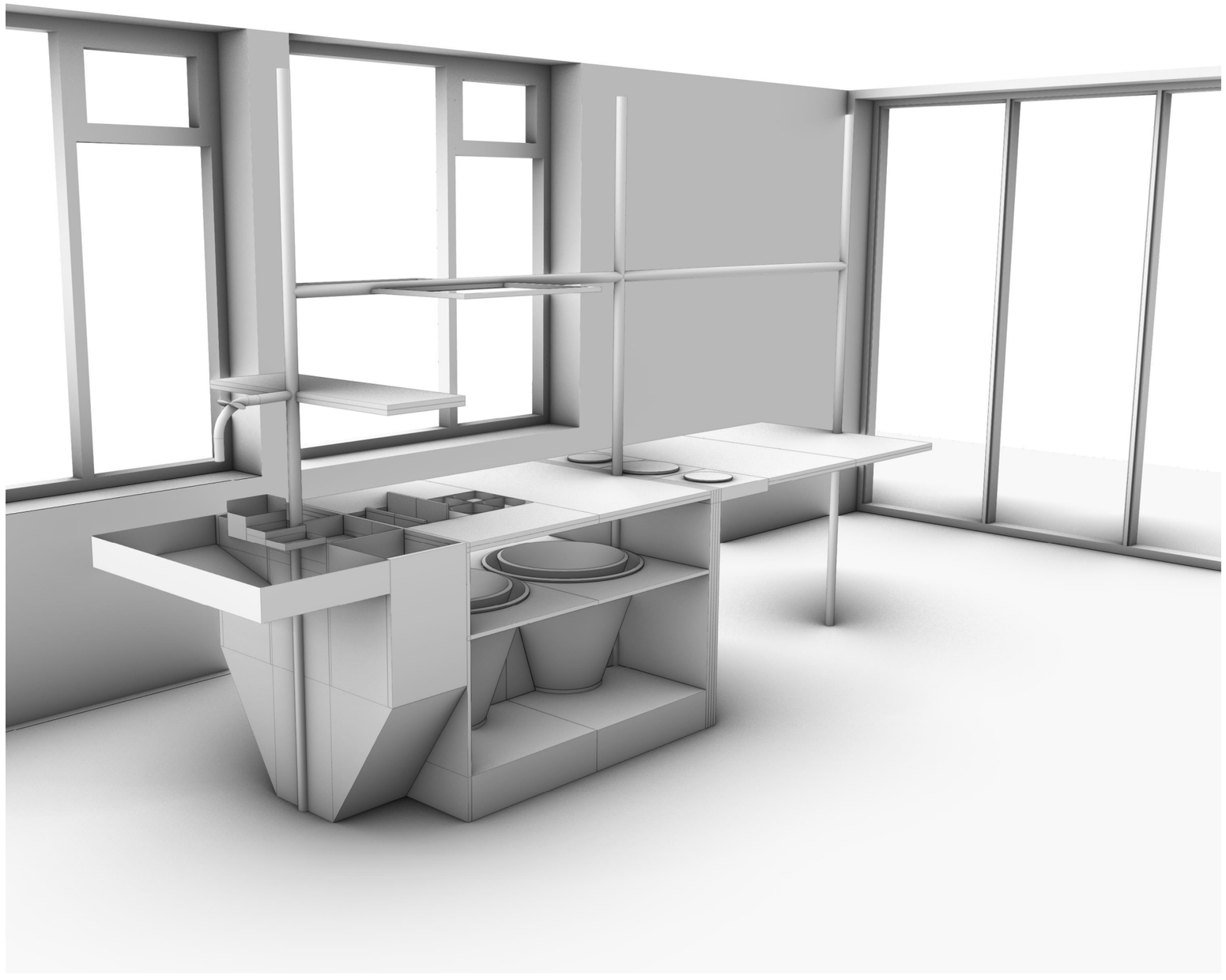




Circular Collaborative Kitchen 0

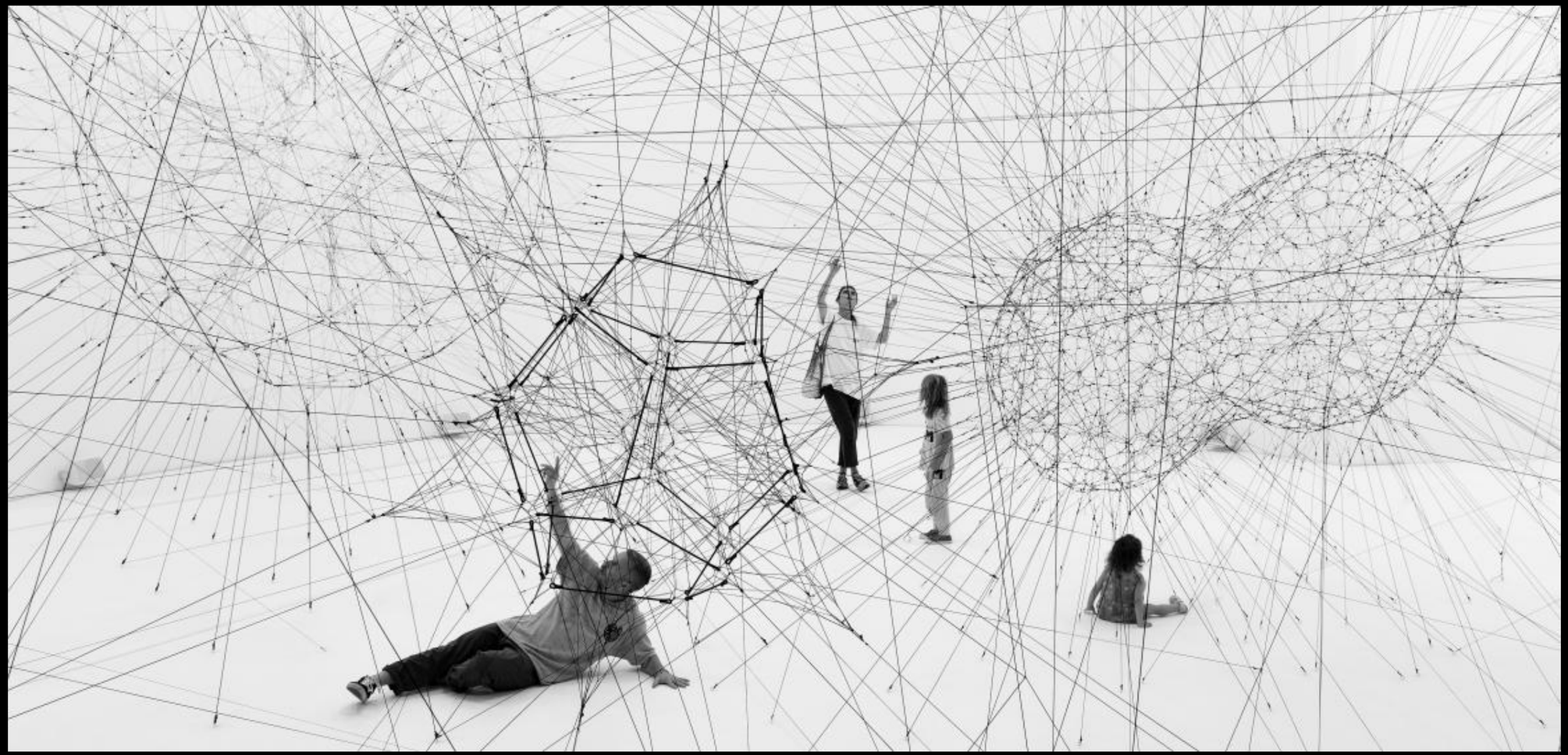


Fig.0 - Exhibition ON AIR. Tomas Saraceno (2018)

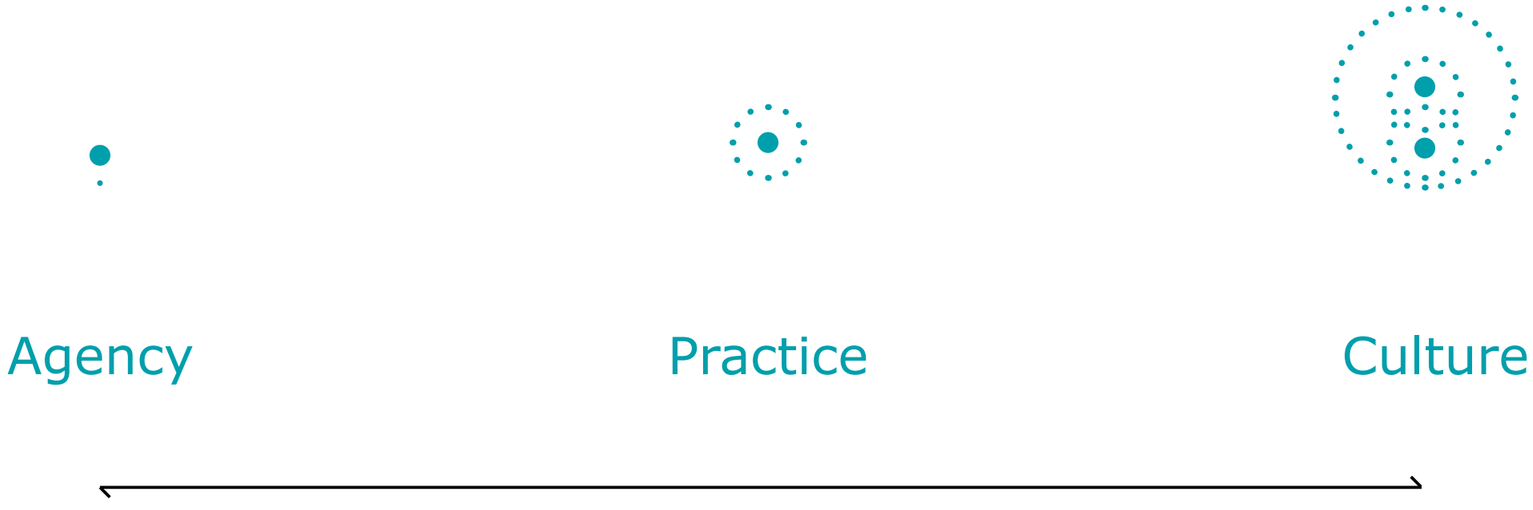
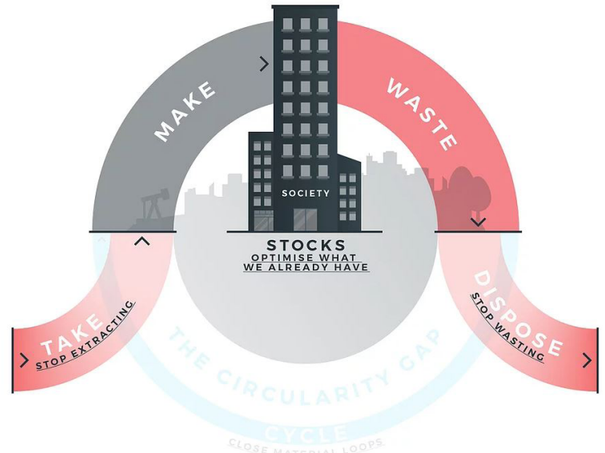


Fig. 1 - Hunter gatherers from the Ju/'hoansi tribe in the Namibian Bush. Source: Stephan C. Schuster. (2010).
Fig. 2 - Wired representation of India's rapid, chaotic urbanization. Source: Wired (2016).
Fig. 3 - Light - City - Planet - Network - Science Fiction. Source: Vadim Sadovski.

Code as mediator

Fig. 4 - Brad Pomeroy & Judy Kirplich (1981) Wave of the Future. Analog to digital transition

Fig.5 - Exhibition ON AIR. Source: Tomas Saraceno (2018)



66% urban population

70% urban CO_2 emissions

2.2 billion tonnes
p/year in 2025

2050 double
resource extraction

90 billion tonnes of material
consumption in 2050

Fig.6 - The circular economy in cities. World Resources Institute (2018).

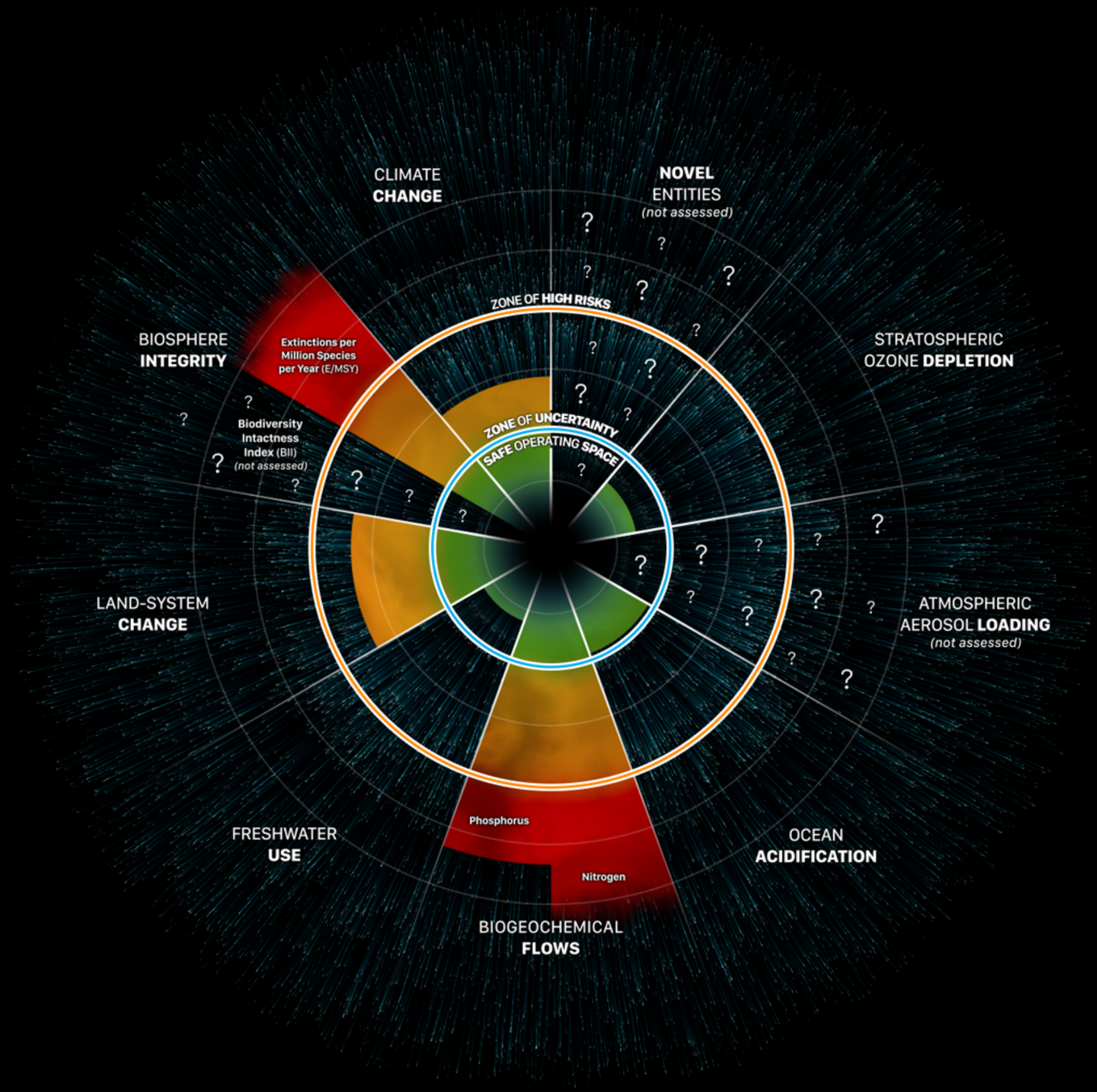


Fig.7 - Planetary Boundaries concept identifies nine global priorities relating to human-induced changes to the environment.
Source: Stockholm Resilience Center. (2015).

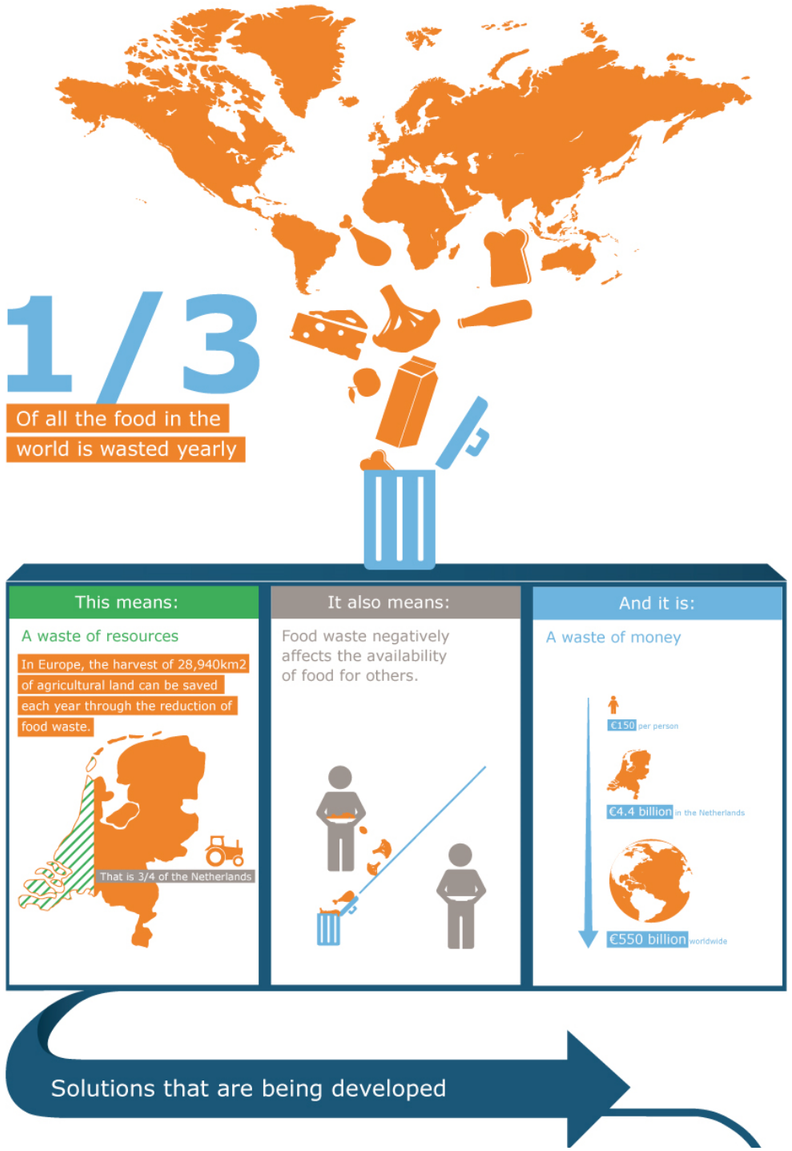
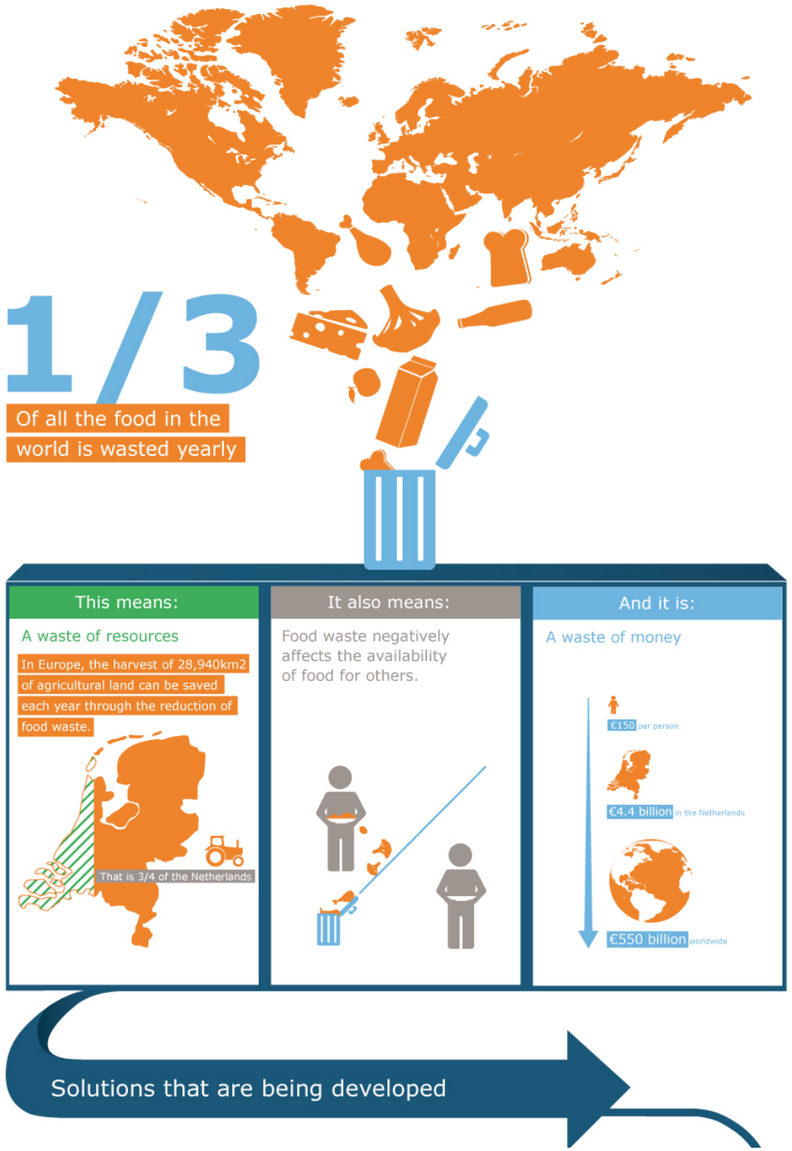


Fig. 8 - Food waste: towards half as much. *Source: Wageningen University & Research (2019).*



33 % of total wastage is act of developed countries consumers!

~ 50 kg/year edible food wasted in dutch households

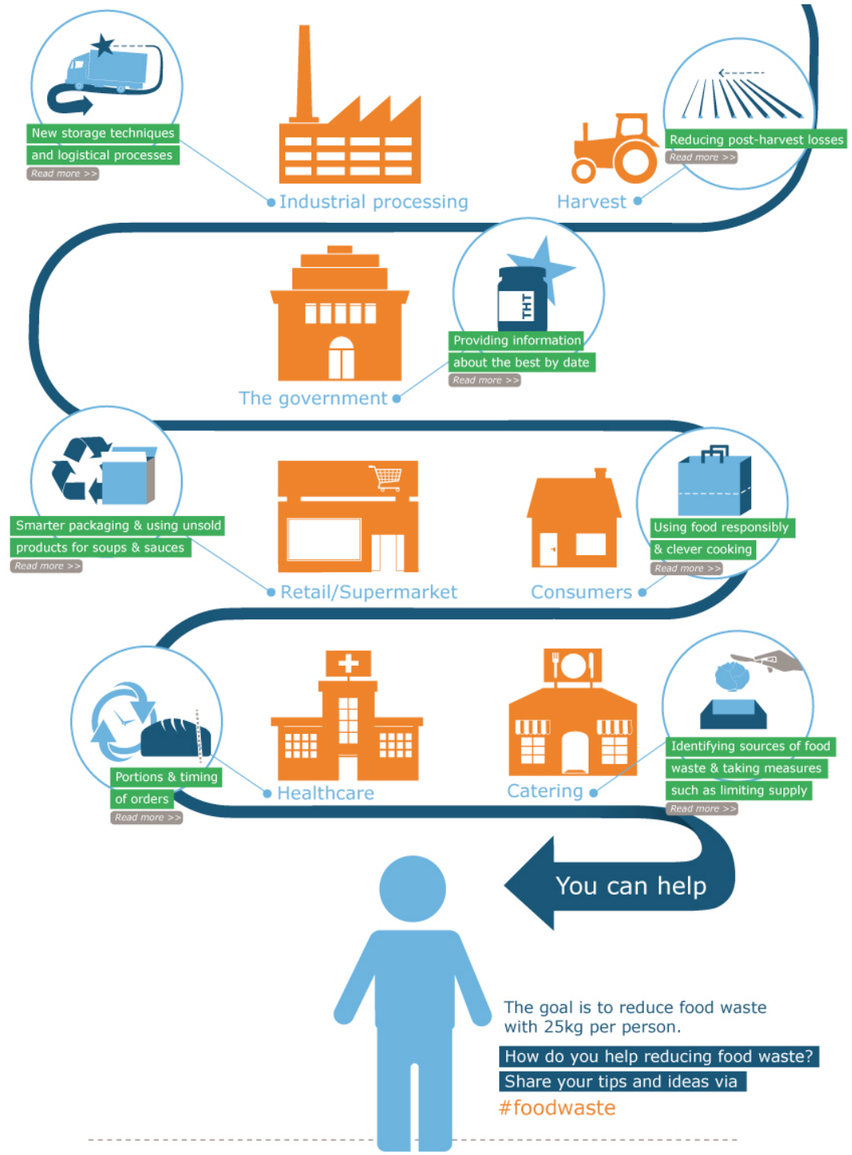


Fig. 9 - Food waste: towards half as much. *Source: Wageningen University & Research (2019).*

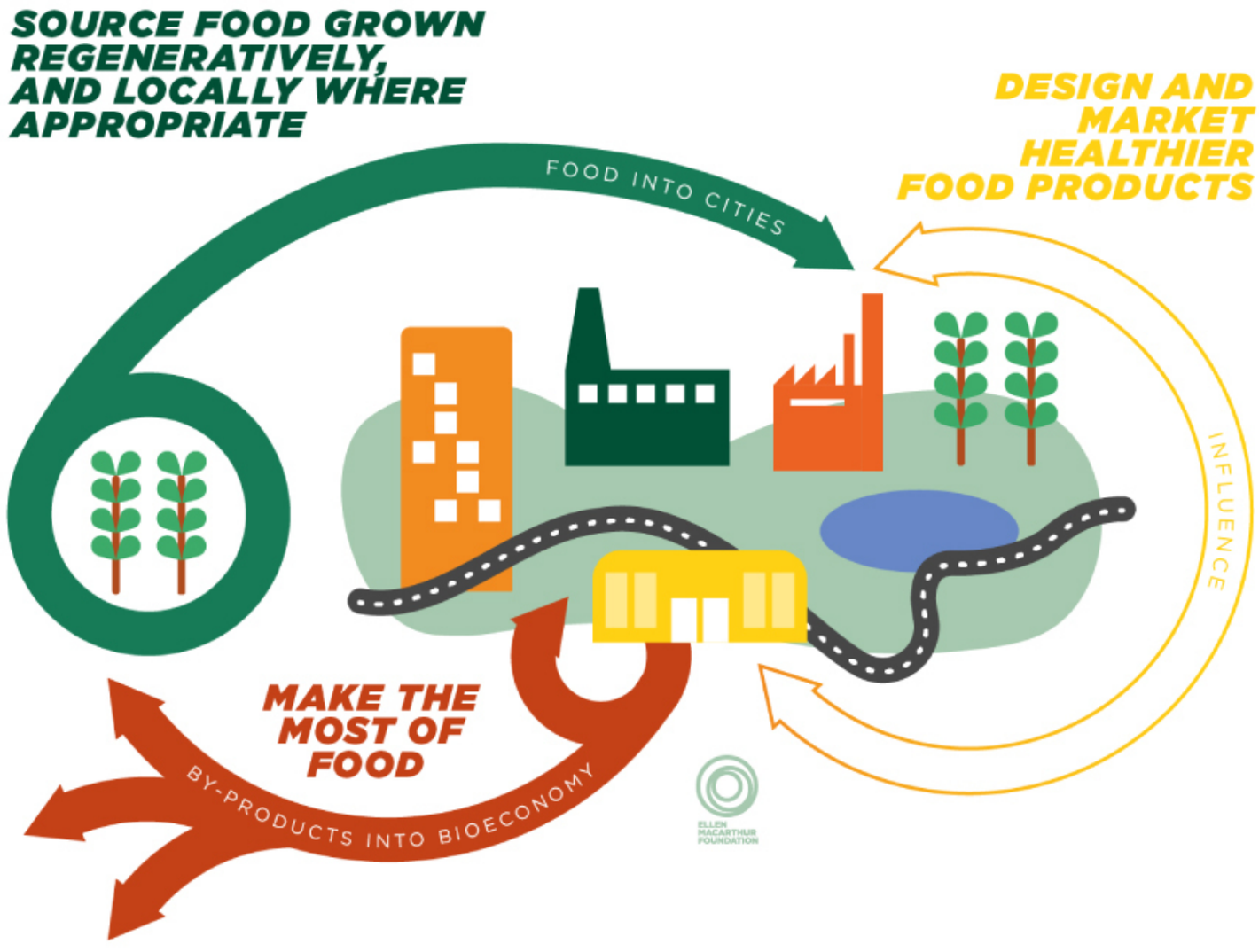


Fig. 10 - Cities and Circular economy for food representation. *Source: Ellen MacArthur Foundation (2019).*

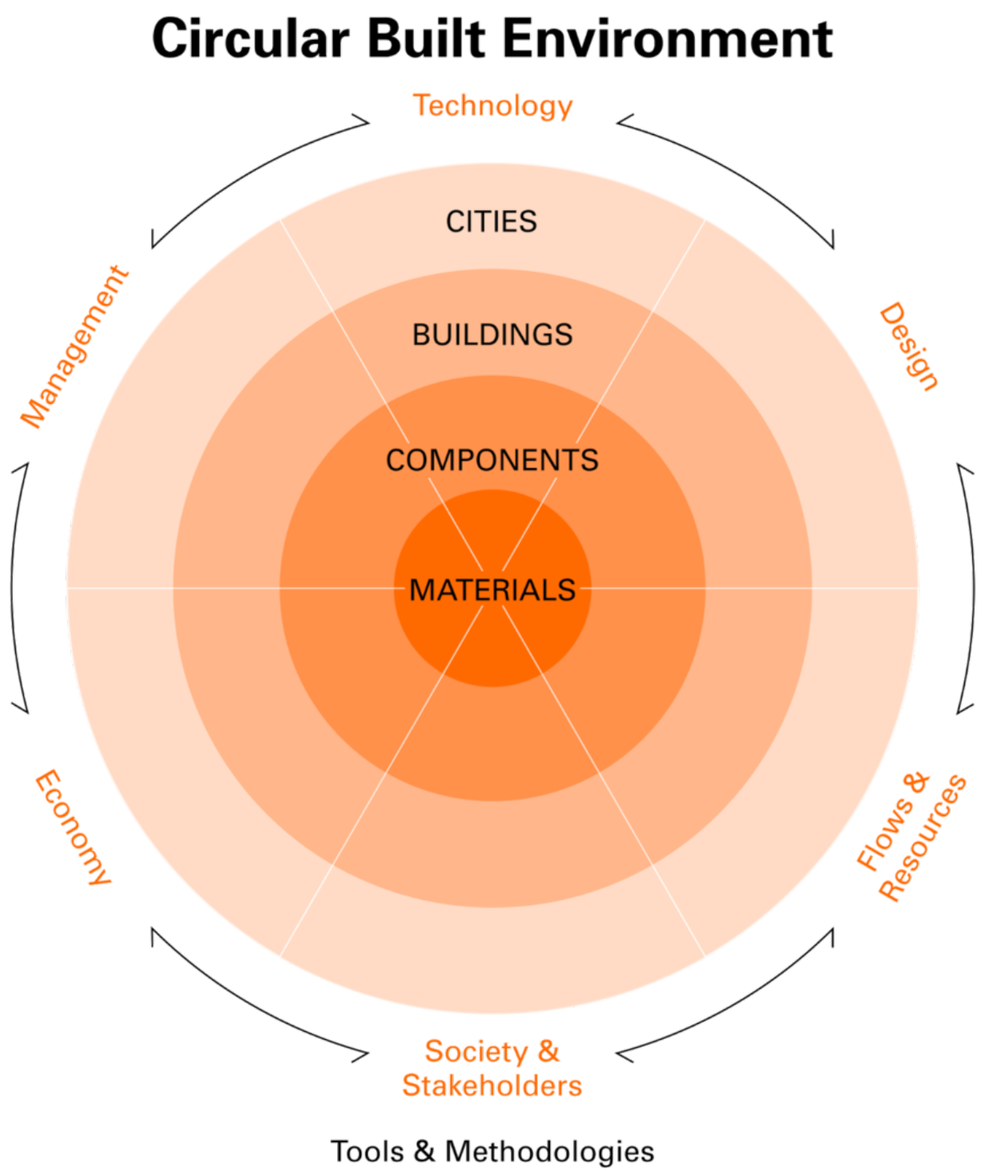
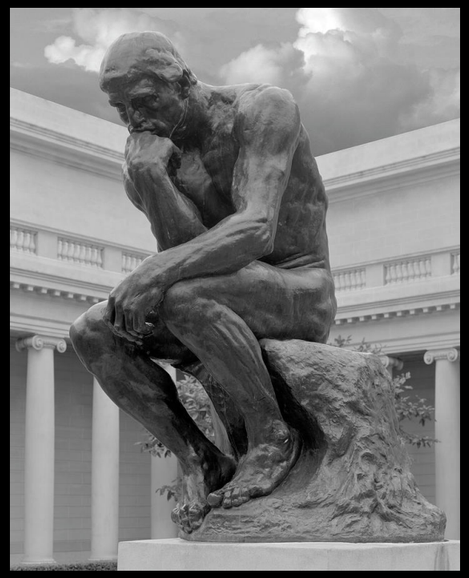


Fig. 11 - Transdisciplinarity of circularity in the built environment. *Source: TU Delft (2019).*

Linear?

Fig. 12 - Experiment Kitchen. Source: Subject ID 1



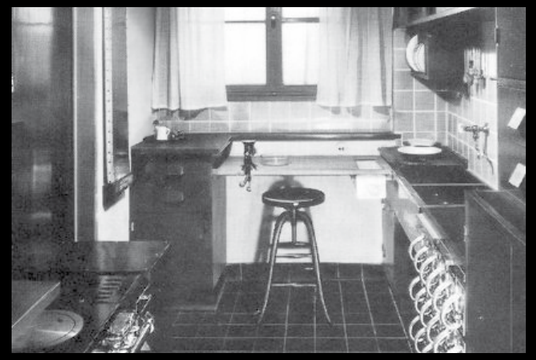
How can built environments promote circular collaborative behavior?

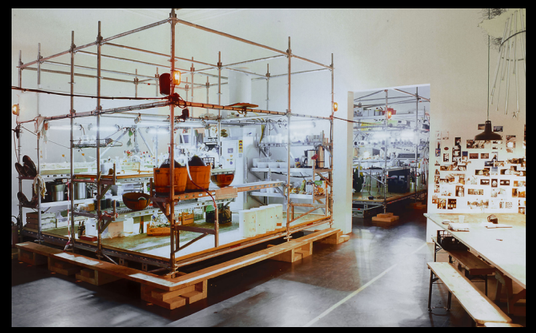
Fig. 13 - Kathy Anselmo. Auguste Rodin. Tthe thinker. Bronze sculpture. Source: Pixels

Circular Codes

PRACTICE-OBJECT-ORIENTED COMPUTATIONAL DESIGN .CC

Methodology for Collaborative Domestic Circular Environments





Circular Codes .cc

Conceptual Goal

performance

less time & effort

mindful *actions*

technological integration

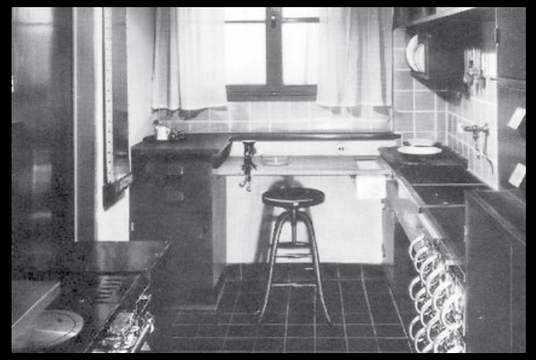
inspire & play

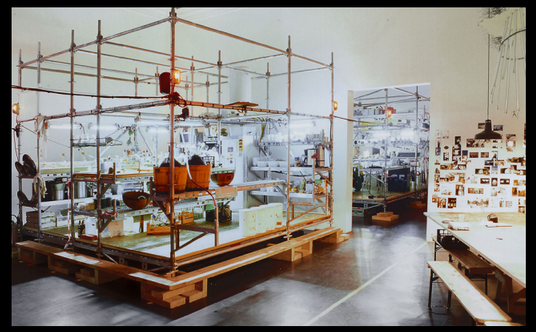
lively experience

collaborative

dynamic

Fig. 14 - Comparison diagram

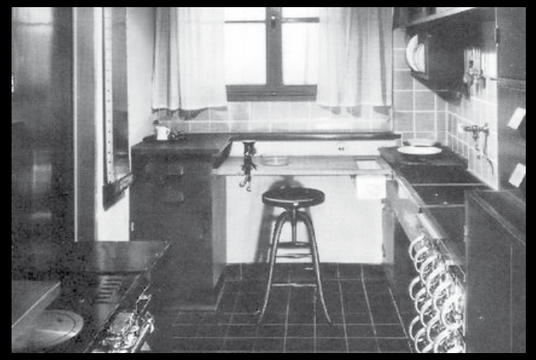




Circular Codes .cc

Conceptual Goal	*Architectural Expression*
performance *less time & effort*	*compact space* ergonomic *design* *wall centered*
mindful *actions* *technological integration*	*humanistic, engaging* *wall centered*
inspire & play	*adaptability, simplicity,* minimalism *wall + island centered*
lively experience *collaborative* dynamic	*temporary scaffold-structure* *open & flexible configuration* boundary + island *centered*

Fig. 14 - Comparison diagram



Conceptual Goal	*Architectural Expression*	*Circular Design Correlation?*
performance *less time & effort*	*compact space* ergonomic *design* *wall centered*	*experimental application* *of materials & technology*
mindful *actions* *technological integration*	*humanistic, engaging* *wall centered*	*mechanical separation of* *water-streams* *compost press "puck" device* *integrated mini-garden*
inspire & play	*adaptability, simplicity,* minimalism *wall + island centered*	*components for system change*
lively experience *collaborative* dynamic	*temporary scaffold-structure* *open & flexible configuration* boundary + island *centered*	*components for system change*

Fig. 14 - Comparison diagram

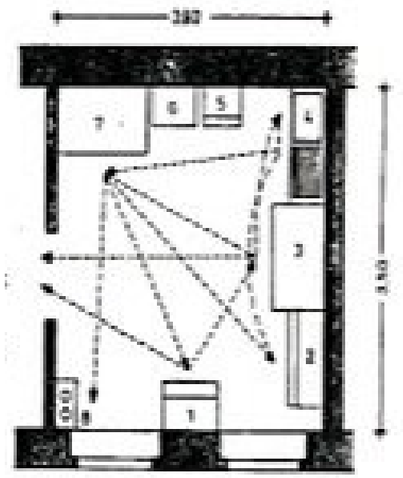
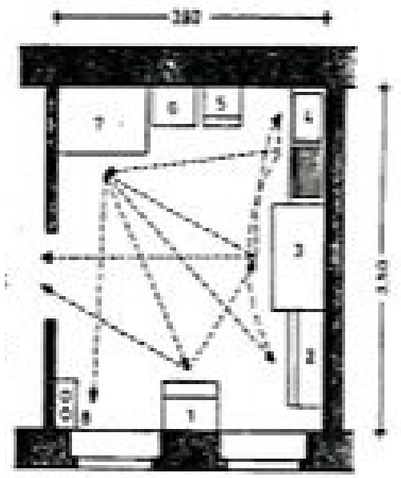


Fig. 15 - View into the Frankfurter Kitchen by Margarete Schütte-Lihotzky *Source: Deutsches Kunstarchiv, Nürnberg (2011).*
Fig. 16 - Movement analysis comparison: 1927 Traditional vs Frankfurter Kitchen *Source: Museum der Dinge (2011).*



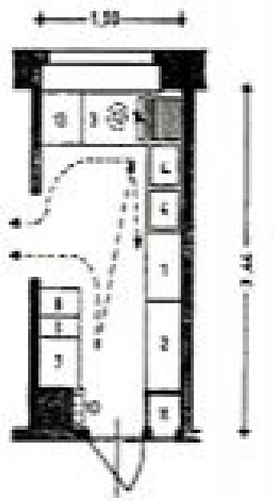
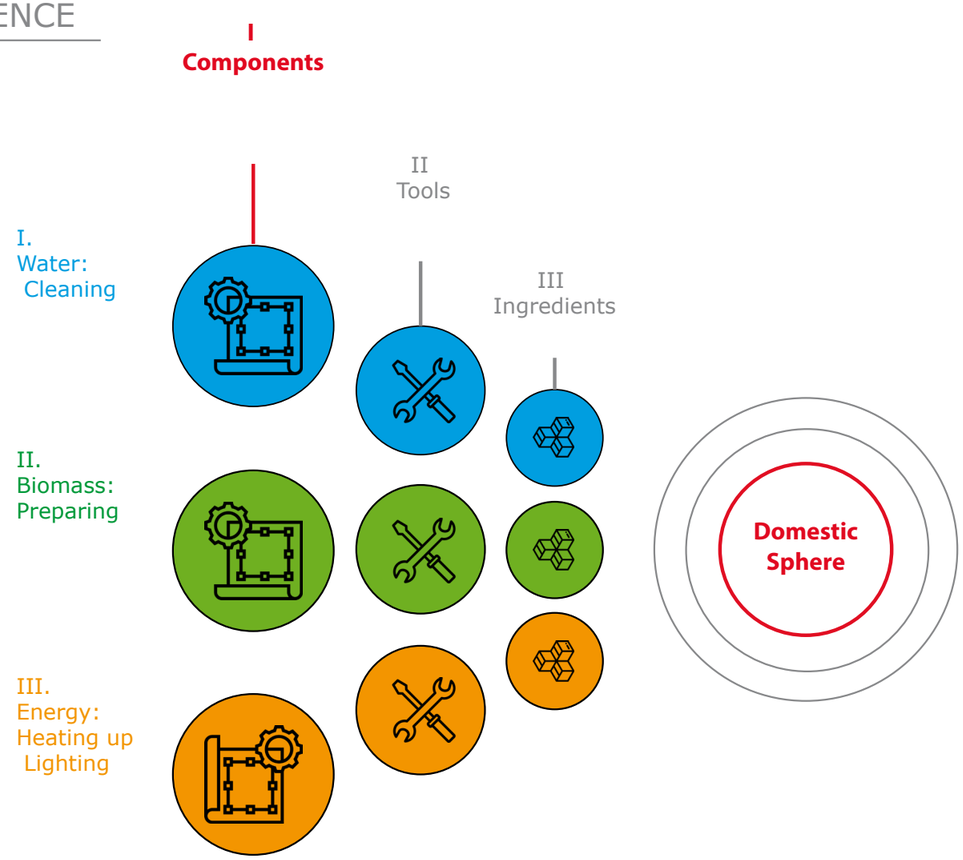
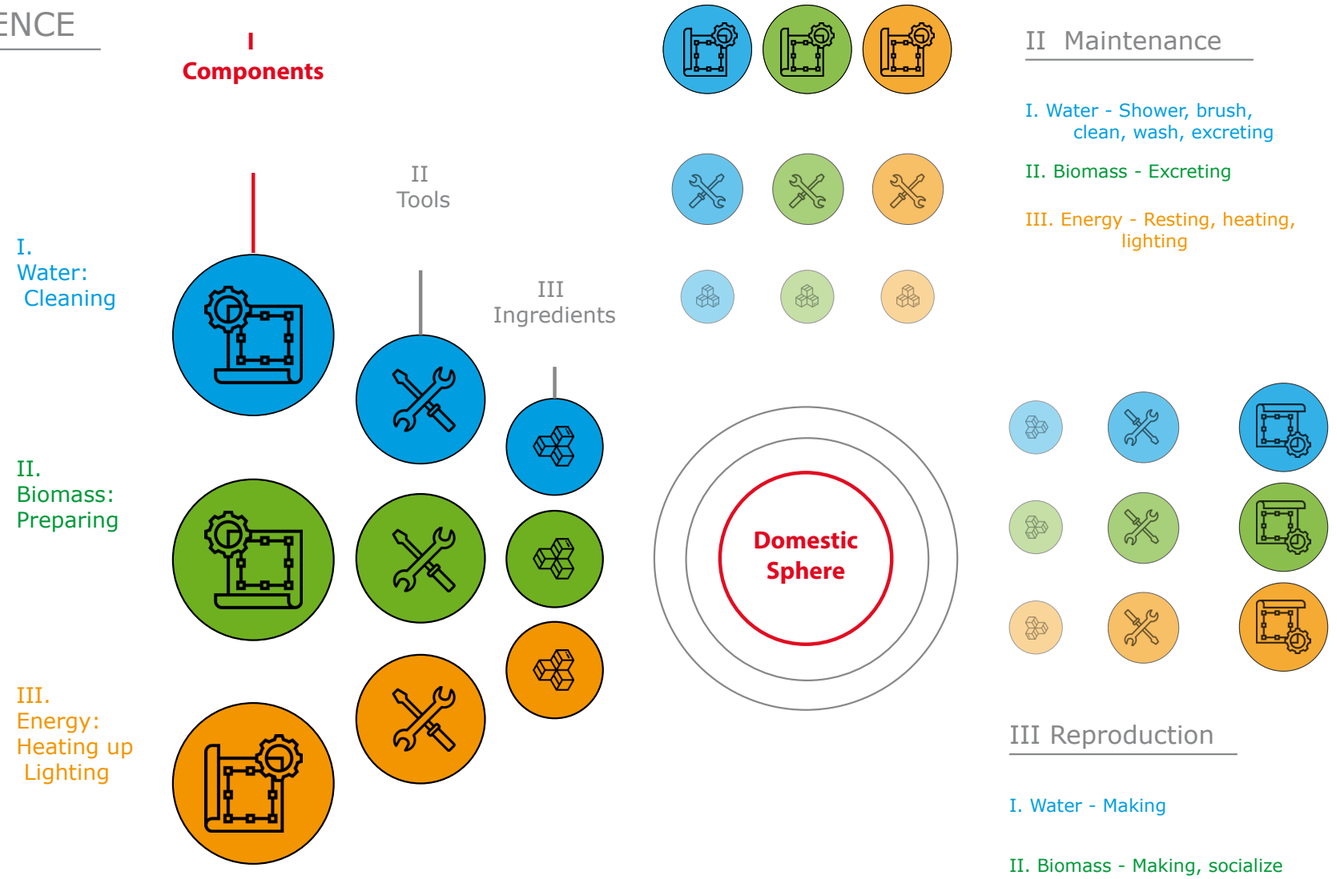


Fig. 15 - View into the Frankfurter Kitchen by Margarete Schütte-Lihotzky *Source: Deutsches Kunstarchiv, Nürnberg (2011).*
Fig. 16 - Movement analysis comparison: 1927 Traditional vs Frankfurter Kitchen *Source: Museum der Dinge (2011).*

I SUBSISTENCE



I SUBSISTENCE



II Maintenance

I. Water - Shower, brush, clean, wash, excreting

II. Biomass - Excreting

III. Energy - Resting, heating, lighting

III Reproduction

I. Water - Making

II. Biomass - Making, socialize

III. Energy - Making, socialize, lighting

Subject

Netherlands, Tillburg

Student Msc. Building Technology

25 years of age

Food preference:
Mediterranean, Thai

Ingredient Choice:

1 Onion,

1 Leek,

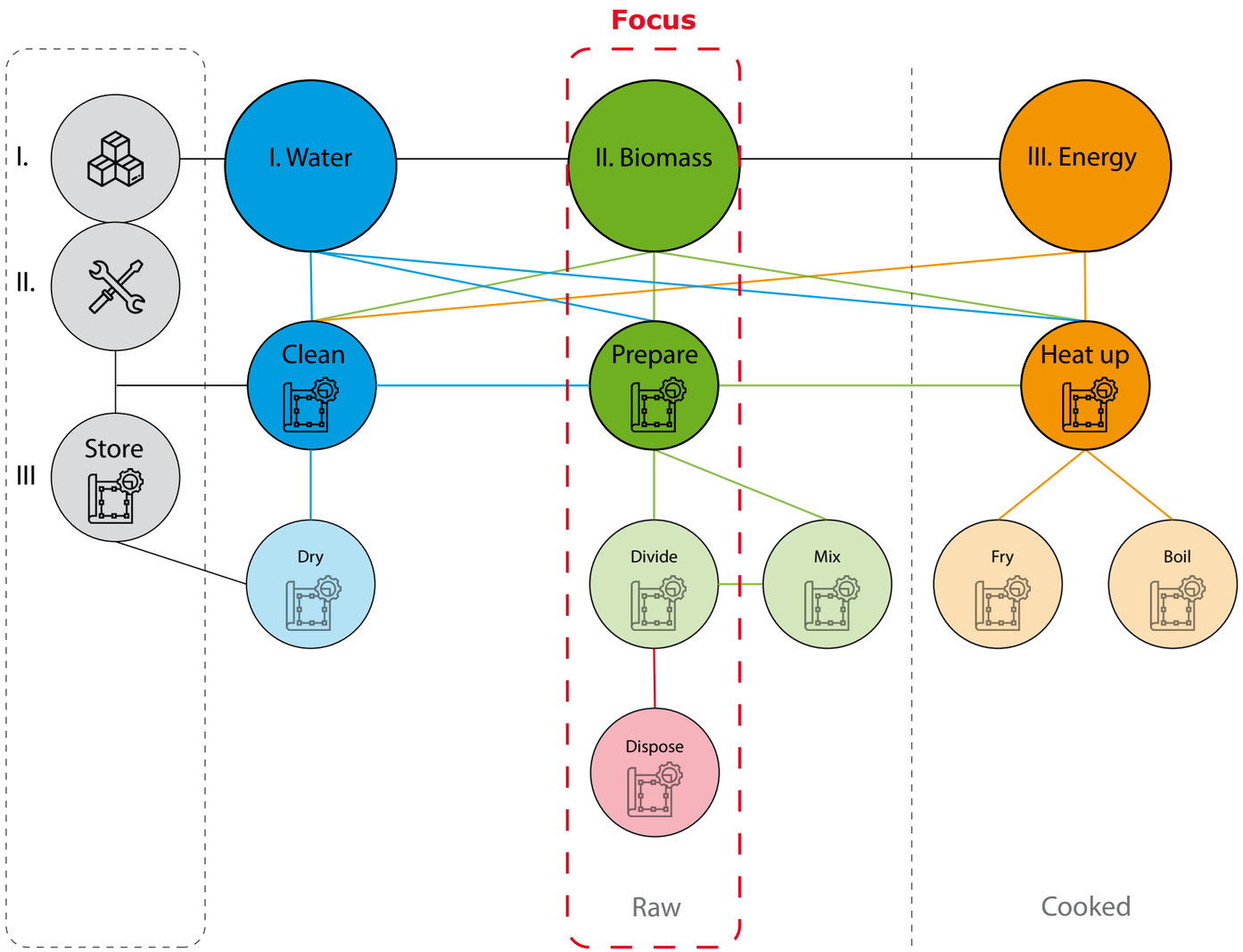
1 Carrot,

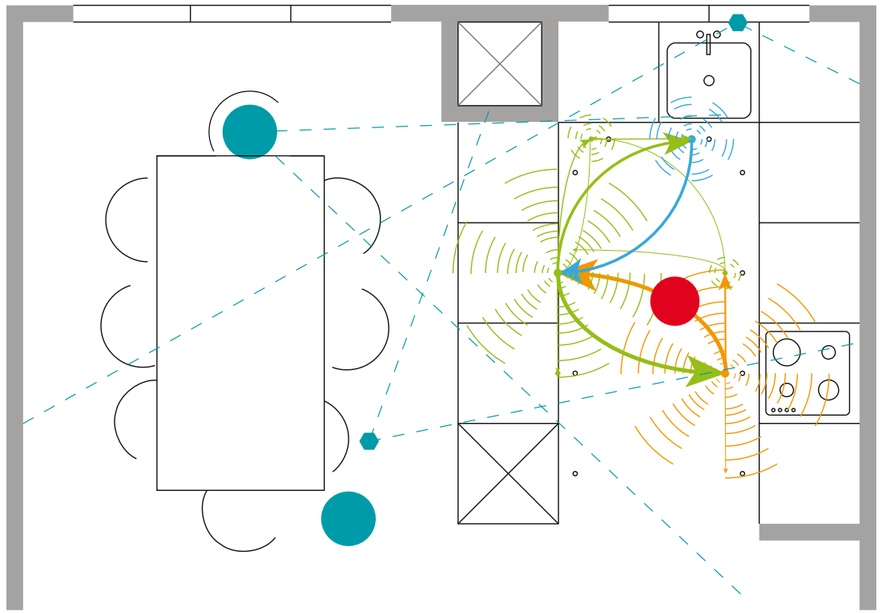
1 White Cabbage,

4 Eggs,

10 Potatoes,

1 Sesame pack


Focus
I.
II.
III
Store
I. Water
II. Biomass
III. Energy
Clean
Prepare
Heat up
Dry
Divide
Mix
Fry
Boil
Dispose
Raw
Cooked



Circular Agents

Designer
Cameraman

A0 Get
A1 Sharpen
A2 Get
A3 Clean
A4 Divide
A5 Heat up
A6 Break
A7 Get
A8 Mix
A9 Mix

A10 Get
A11 Divide
A13 Dispose
A13 Clean
A14 Divide
A15 Clean
A16 Divide
A17 Get
A18 Divide
A19 Dispose

A20 Clean
A21 Divide
A22 Clean
A23 Divide
A24 Take out
A25 Get
A26 Get
A27 Mix
A28 Dispose
A29 Get

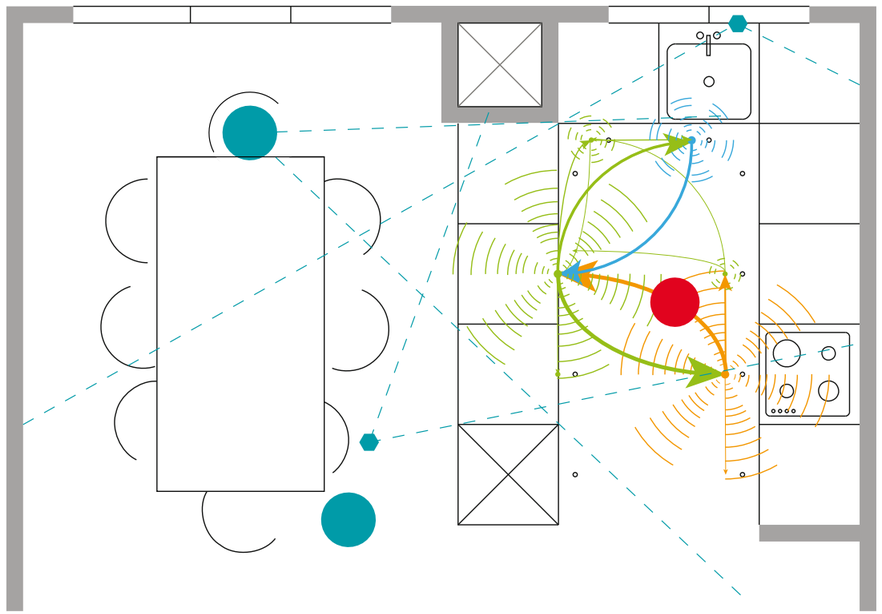
A30 Mix
A31 Divide
A32 Mix
A33 Get
A34 Mix
A35 Get
A36 Mix
A37 Take out
A38 Serve

Water

Biomass

Energy

Step 1: Practice-oriented design deconstruction - Motion analysis

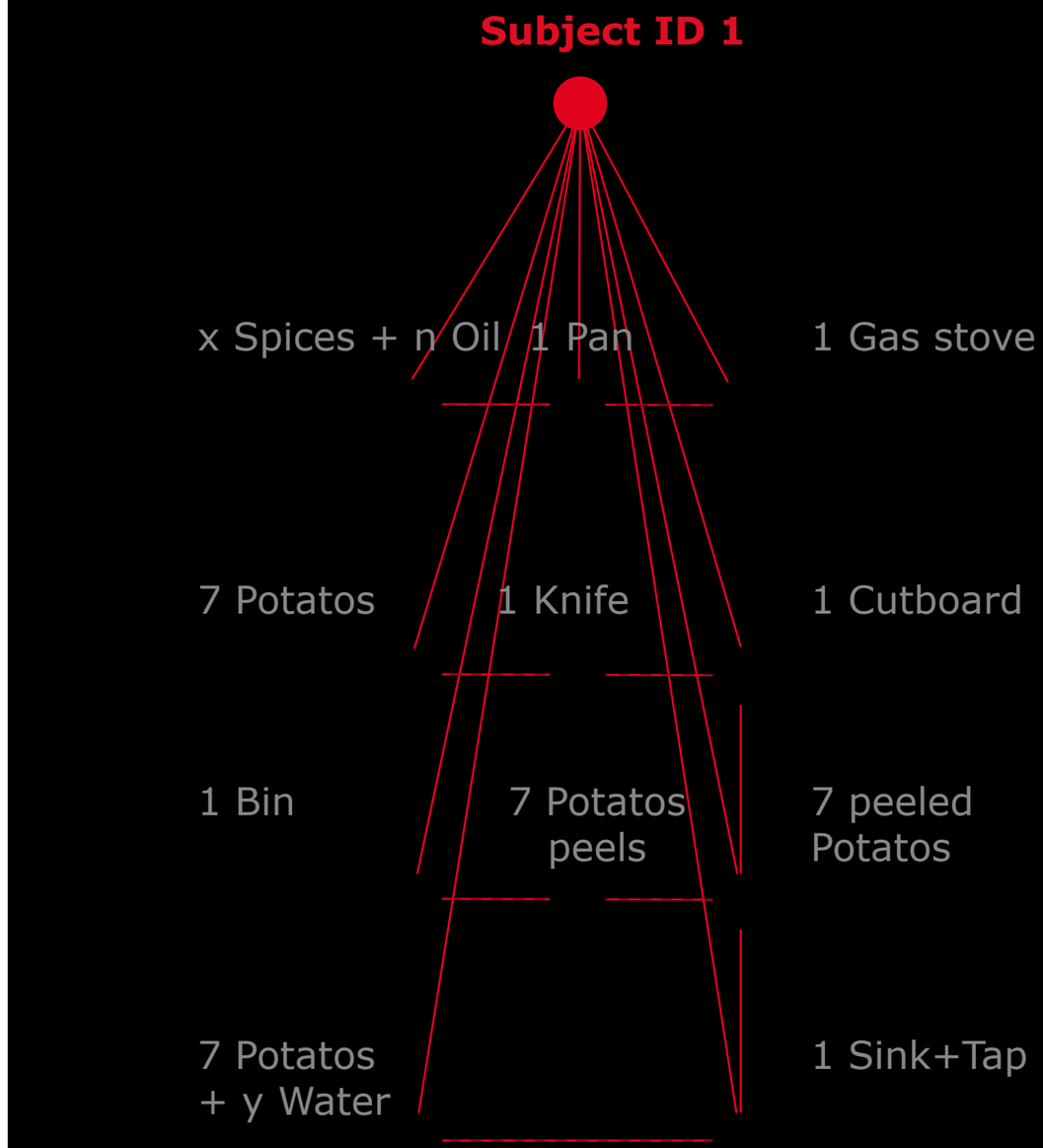


A0 Get
A1 Sharpen
A2 Get
A3 Clean
A4 Divide
A5 Heat up
A6 Break
A7 Get
A8 Mix
A9 Mix

A10 Get
A11 Divide
A13 Dispose
A13 Clean
A14 Divide
A15 Clean
A16 Divide
A17 Get
A18 Divide
A19 Dispose

A20 Clean
A21 Divide
A22 Clean
A23 Divide
A24 Take out
A25 Get
A26 Get
A27 Mix
A28 Dispose
A29 Get

A30 Mix
A31 Divide
A32 Mix
A33 Get
A34 Mix
A35 Get
A36 Mix
A37 Take out
A38 Serve



Step 1: Practice-oriented design deconstruction - Motion analysis

Water

Biomass

Energy

I Reduce

II Reuse

III Recycle

3 Pillars of Circular Design

5 Circular Design Strategies Framework

		I Reduce	II Reuse	III Recycle
A10	Get	2. Long distance		
A11	Divide	2. 2 cutboards on counter Measure inconvenience	5. Resharp knife	
A12	Dispose	2. Long distance Manual effort	1. Separation of bio-waste	1. No bio-waste recycling system
A13	Clean	2. Long distance Cutboard - Sink	3. No separation or direct reuse	3. No recycling system

1. Circular Supplies

2. Resource Conservation

3. Multiple Cycles

4. Systems Change

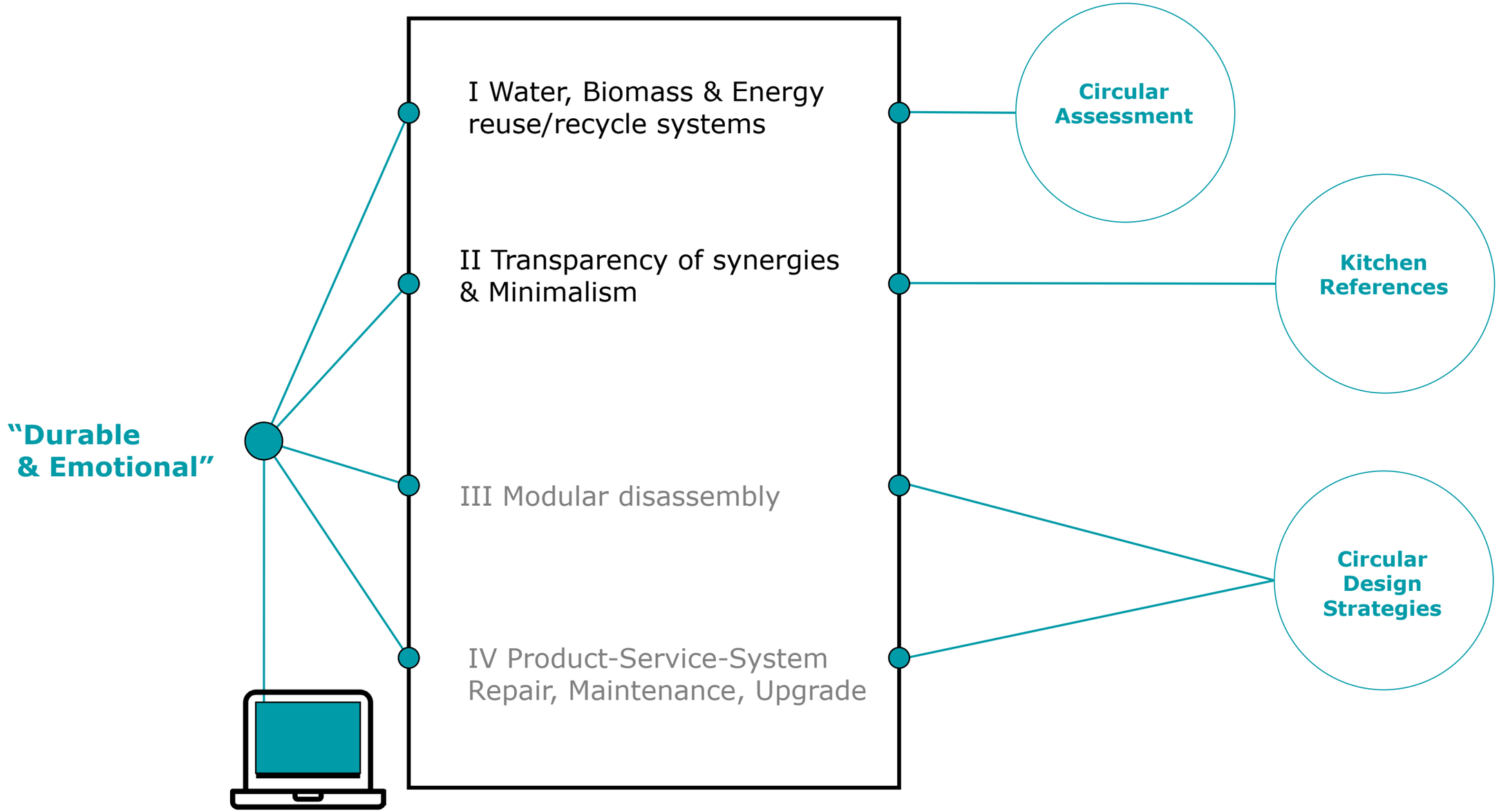
5. Longer life use

2. Convenience & short distances

1. 3. Integrate circular systems

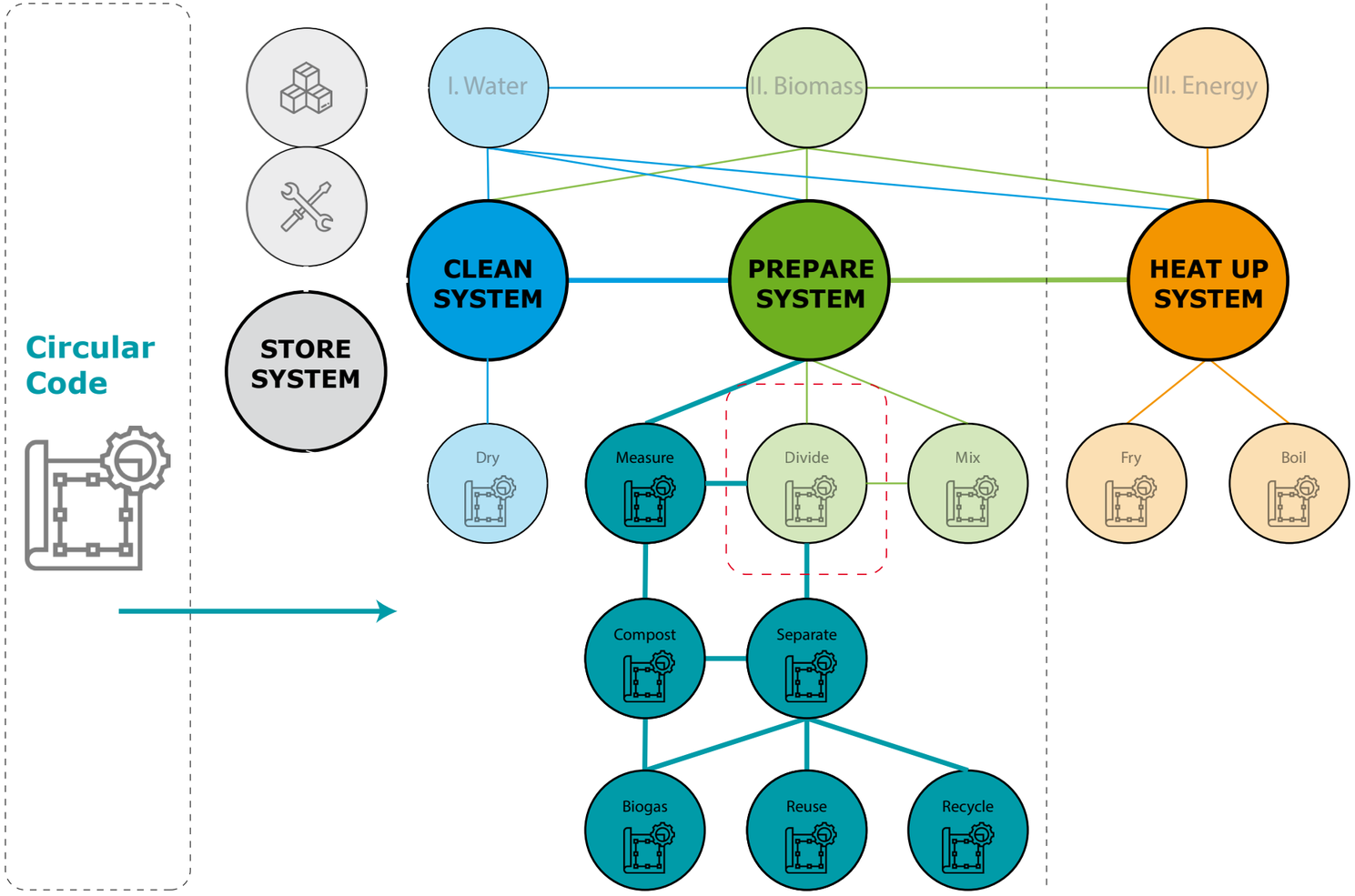
Conclusions

Step 2 & 3: Circular Assessment

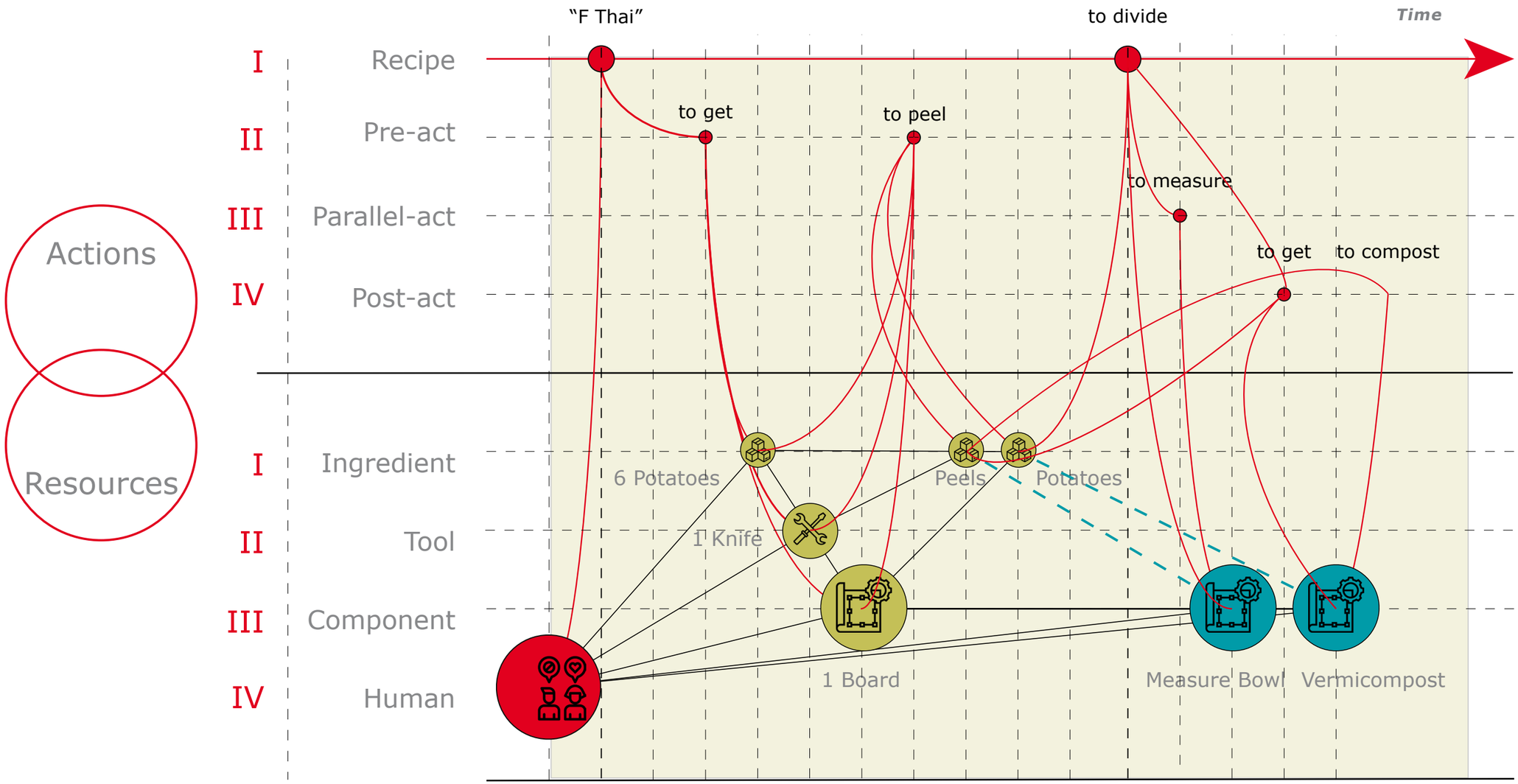

I Water, Biomass & Energy
reuse/recycle systems
II Transparency of synergies
& Minimalism
III Modular disassembly
IV Product-Service-System
Repair, Maintenance, Upgrade
"Durable
& Emotional"
Circular
Assessment
Kitchen
References
Circular
Design
Strategies

I SUBSISTENCE

I Component Systems



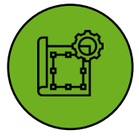
Biomass Division



Identification of intervention frame

Step 5: Object-Oriented Parametric Reconstruction

Component Parameters



Temperature

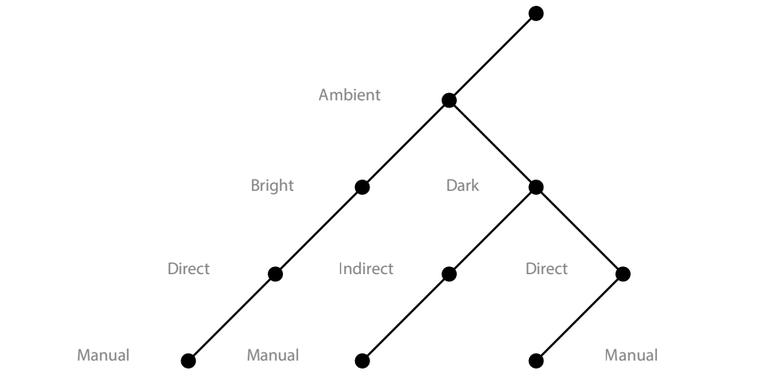
Light

Airflow

Operation

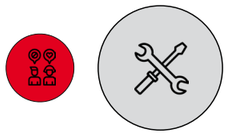
Circular Coded

PREPARE SYSTEM



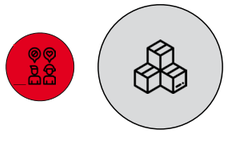
SEED DRY NET
DIVISION BOARD
VERMICOMPOST
SEPARATION PACKAGE
LEAFS / PAPER BOX
MIXING BOWL
BIOGAS BOWL
MEASURE BOWL

Tool /Ingredient Parameters



Type	Most manual
Relation	
Quantity	z
Set ID	2

Practice Data



Type	All	All	Most of all	All packaged
Relation				
Temperature				
Light				
Airflow				
Quantity	f	f	f	f
Set ID	5	5	5	5

Component Parameters

Temperature

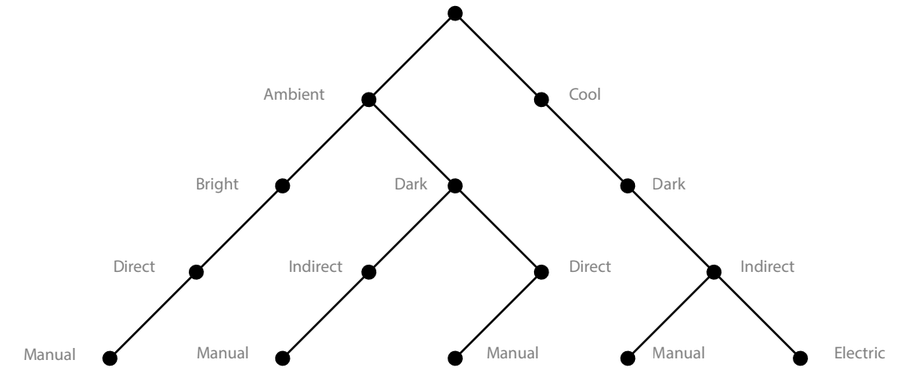
Light

Airflow

Operation

Circular Coded

STORE SYSTEM



SHELF A
DRYING SHELF
DRYING BOX
HOOK A

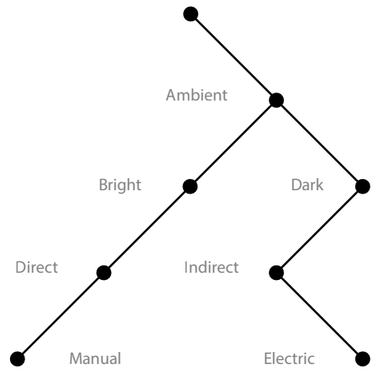
BOX
BAG A

SHELF B
HOOK B

ZEER-POT

FRIDGE

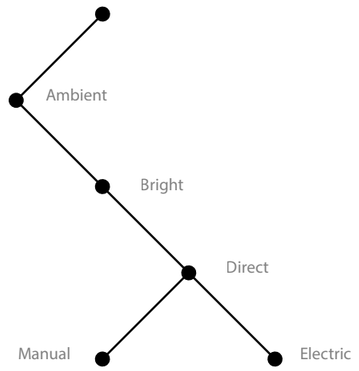
CLEAN SYSTEM



WASHSINK

DISHWASHER

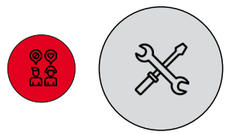
HEAT UP SYSTEM



BIOGAS HEATER

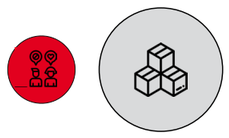
ELECTRIC HEATER

Tool /Ingredient Parameters



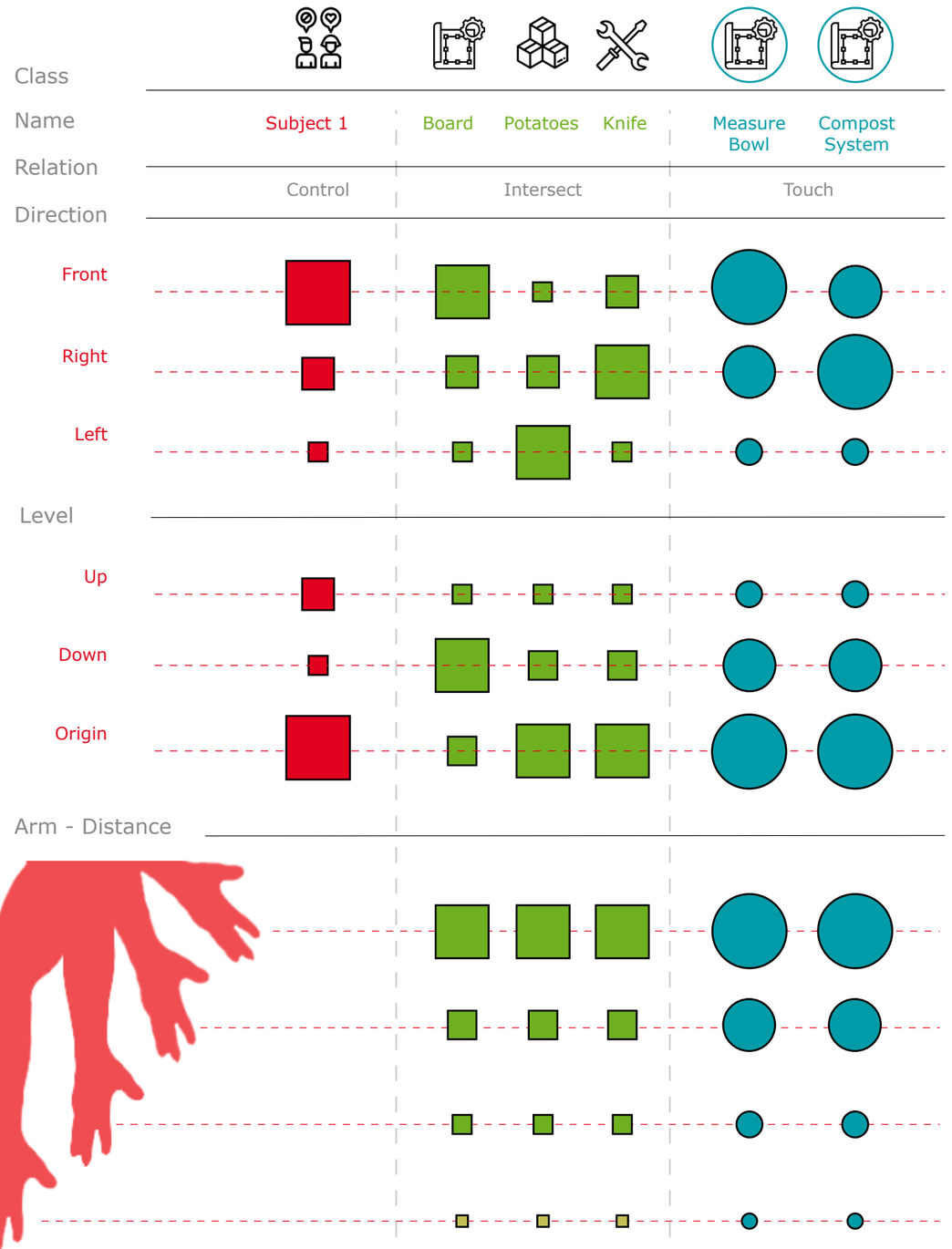
Type	All manual & electric	-	Small manual & electric	-		All manual	Most manual	All heat	All heat
Relation									
Quantity	x		y			z	u	v	v
Set ID	1		2			2	3	4	4

Practice Data



Type	ABD	ADI	ADD	CDI	CDI	All		All	All
Relation									
Temperature	Ambient	Ambient	Ambient	Cool	Cool				
Light	Bright	Dark	Dark	Dark	Dark				
Airflow	Direct	Indirect	Direct	Indirect	Indirect				
Quantity	a	b	c	d	e	f		f	f
Set ID	3	2	3	4	4	5		5	5

Step 6: Object-Oriented Parametric Systems



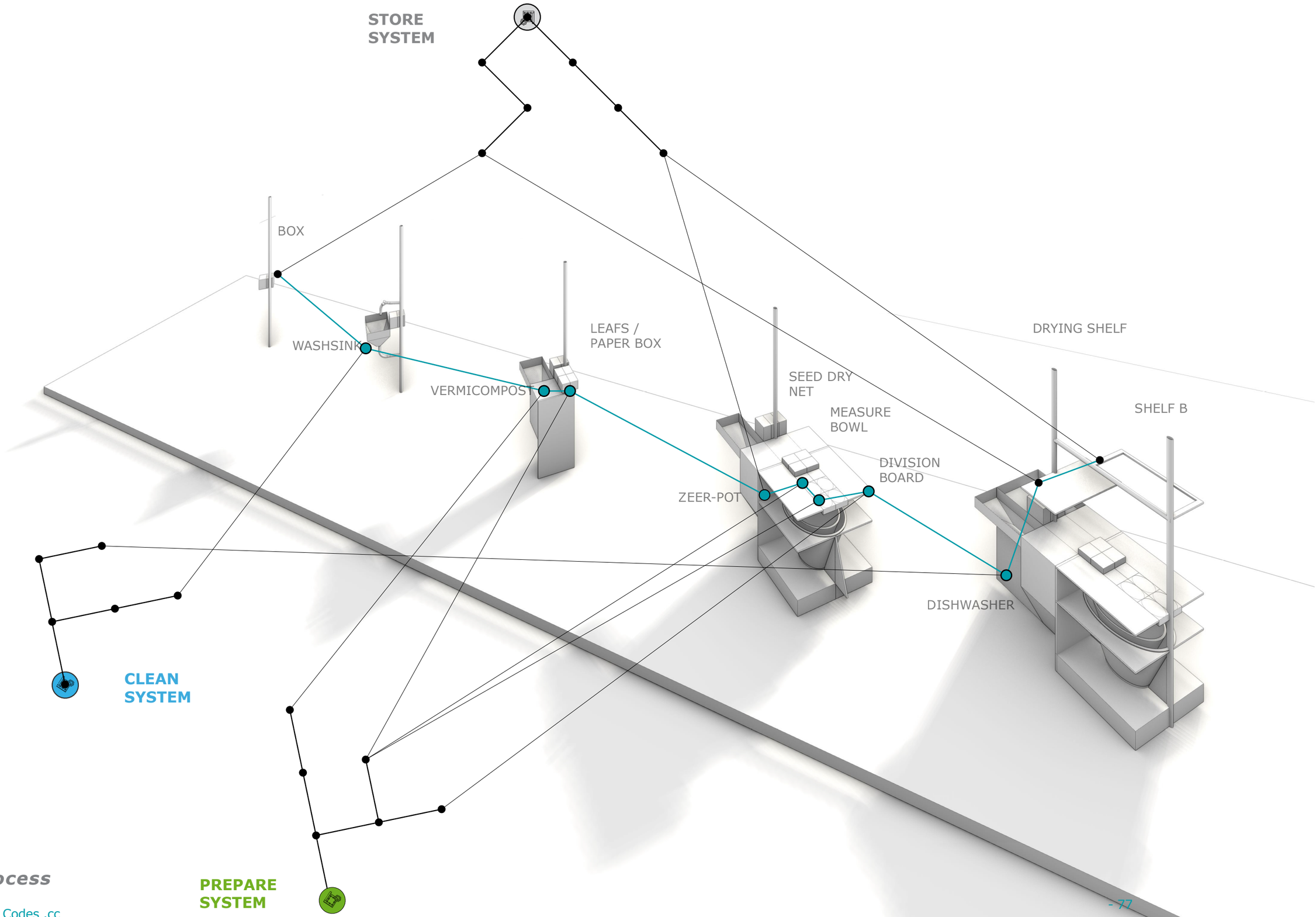
Ergonomics of practice objects

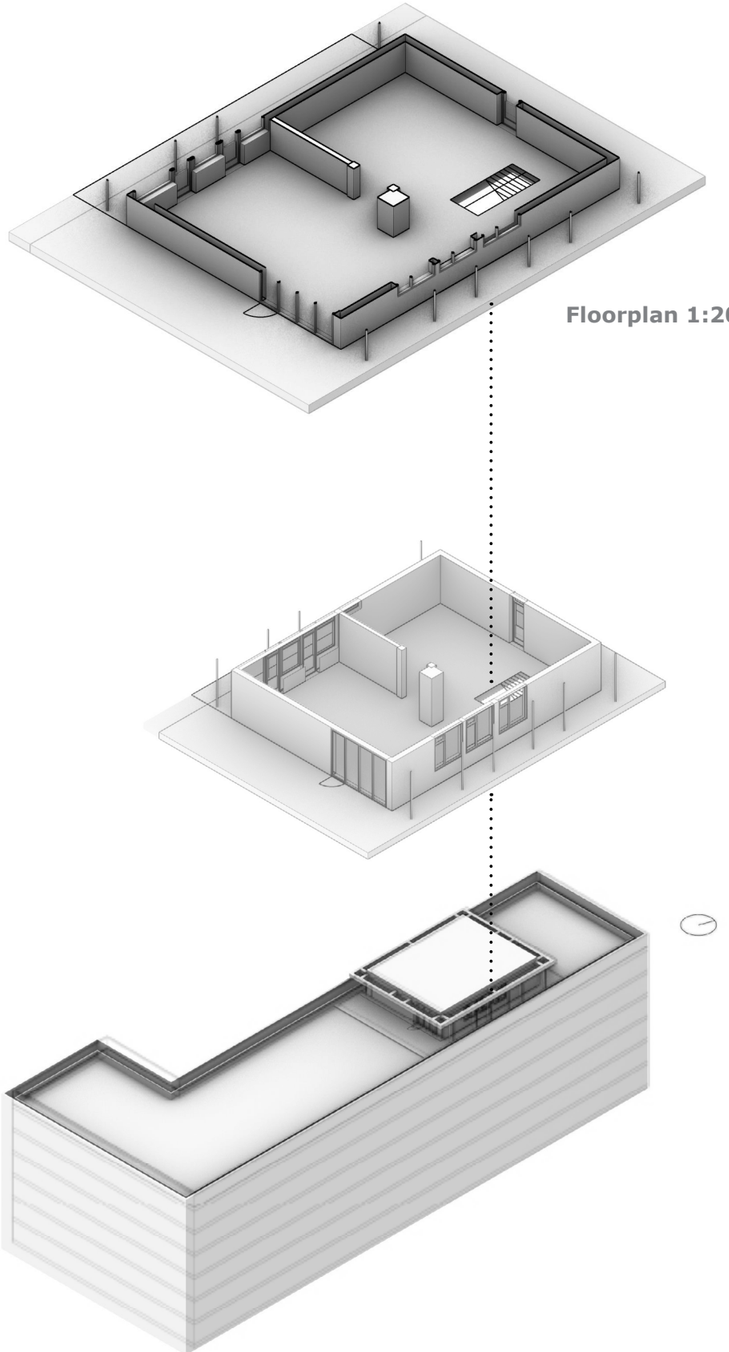
+

2 Component Circular Code

=

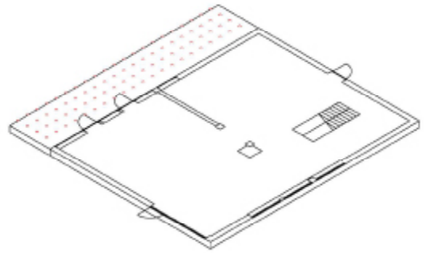
Convenient position of CC components


STORE
SYSTEM
BOX
WASHSINK
LEAFS /
PAPER BOX
VERMICOMPOST
SEED DRY
NET
MEASURE
BOWL
DIVISION
BOARD
ZEER-POT
DRYING SHELF
SHELF B
DISHWASHER
CLEAN
SYSTEM
PREPARE
SYSTEM

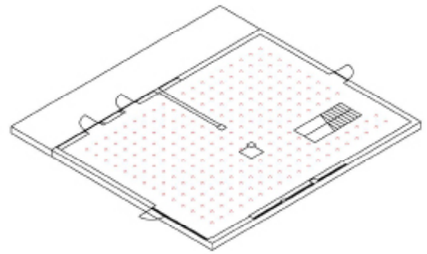


Floorplan 1:200

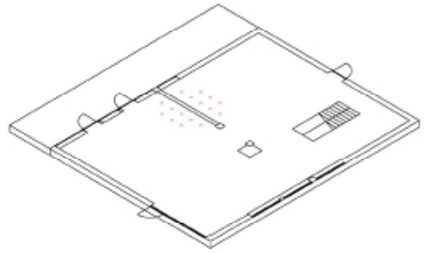
Extension Space Grid



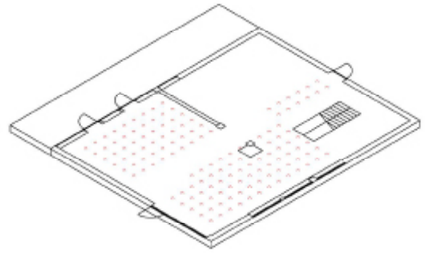
Interior Grid



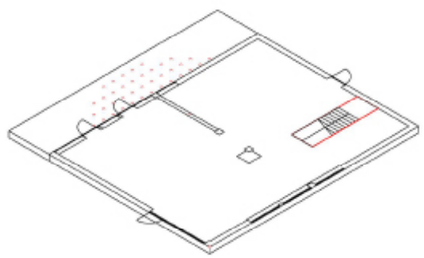
Interior Water



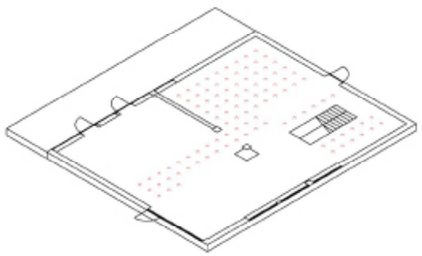
Bright Light



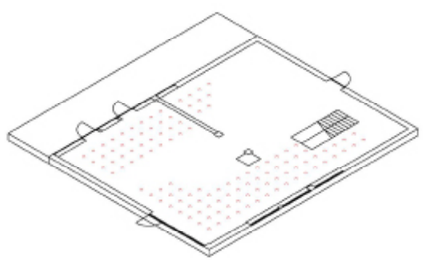
Extension Water



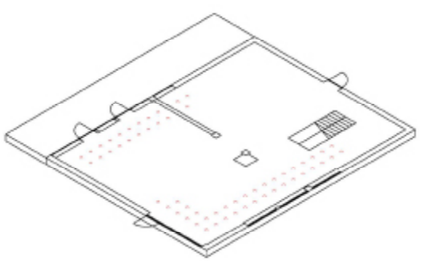
Ambient Light



6 unit Opening Distance



3 unit Opening Distancet



Dakakker 3D Reconstruction - Field Division

I. Water II. Biomass III. Energy

GEOMETRY

Position PARAMETERS

Points Environment

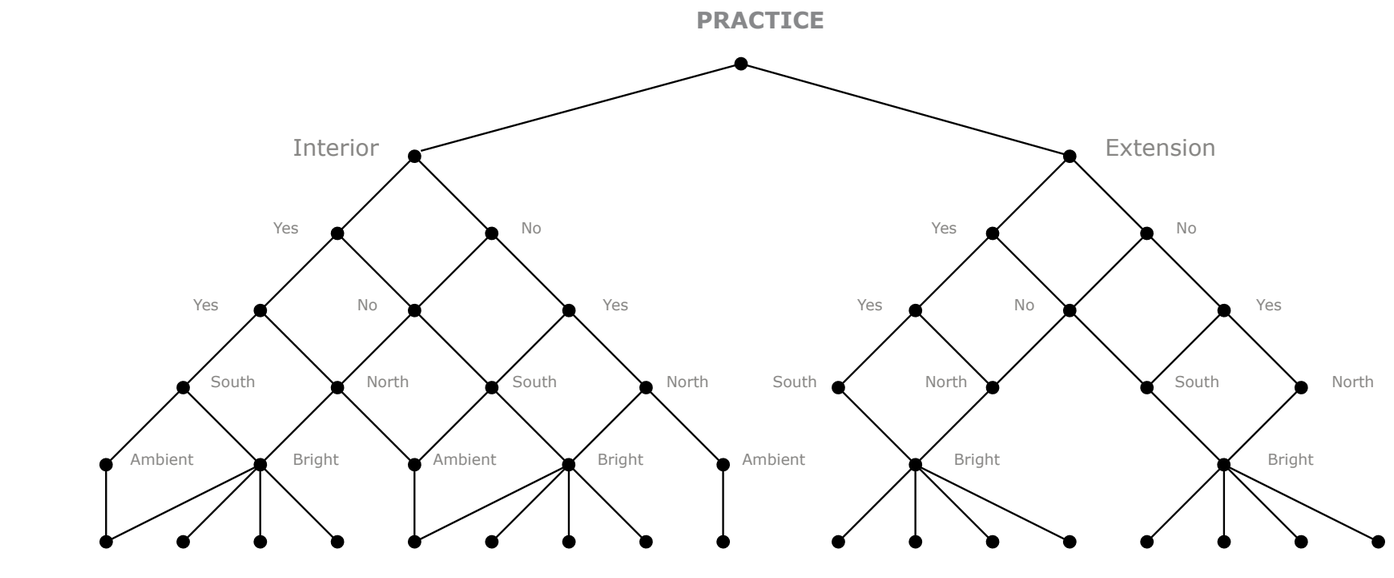
Extrusion height Privacy

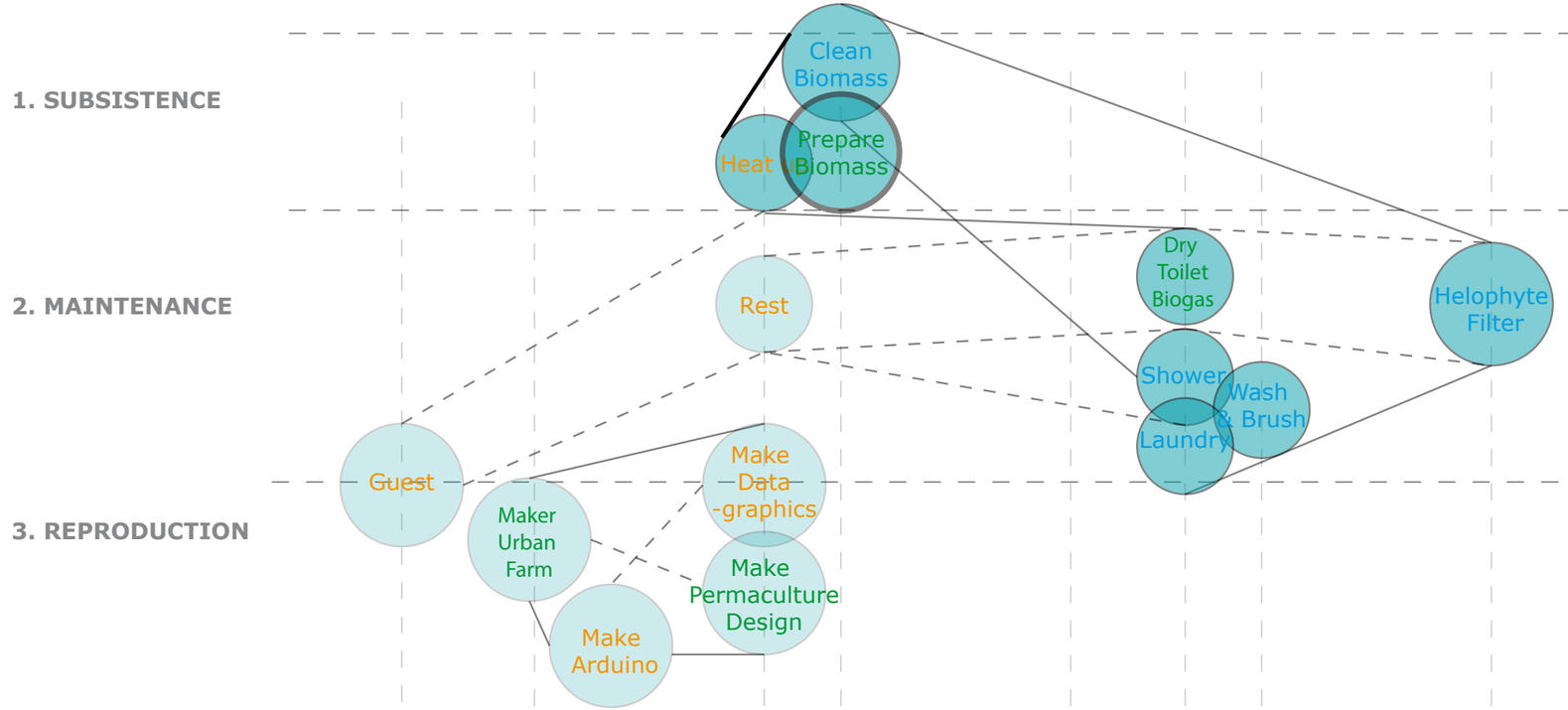
Points Water

Points Orientation

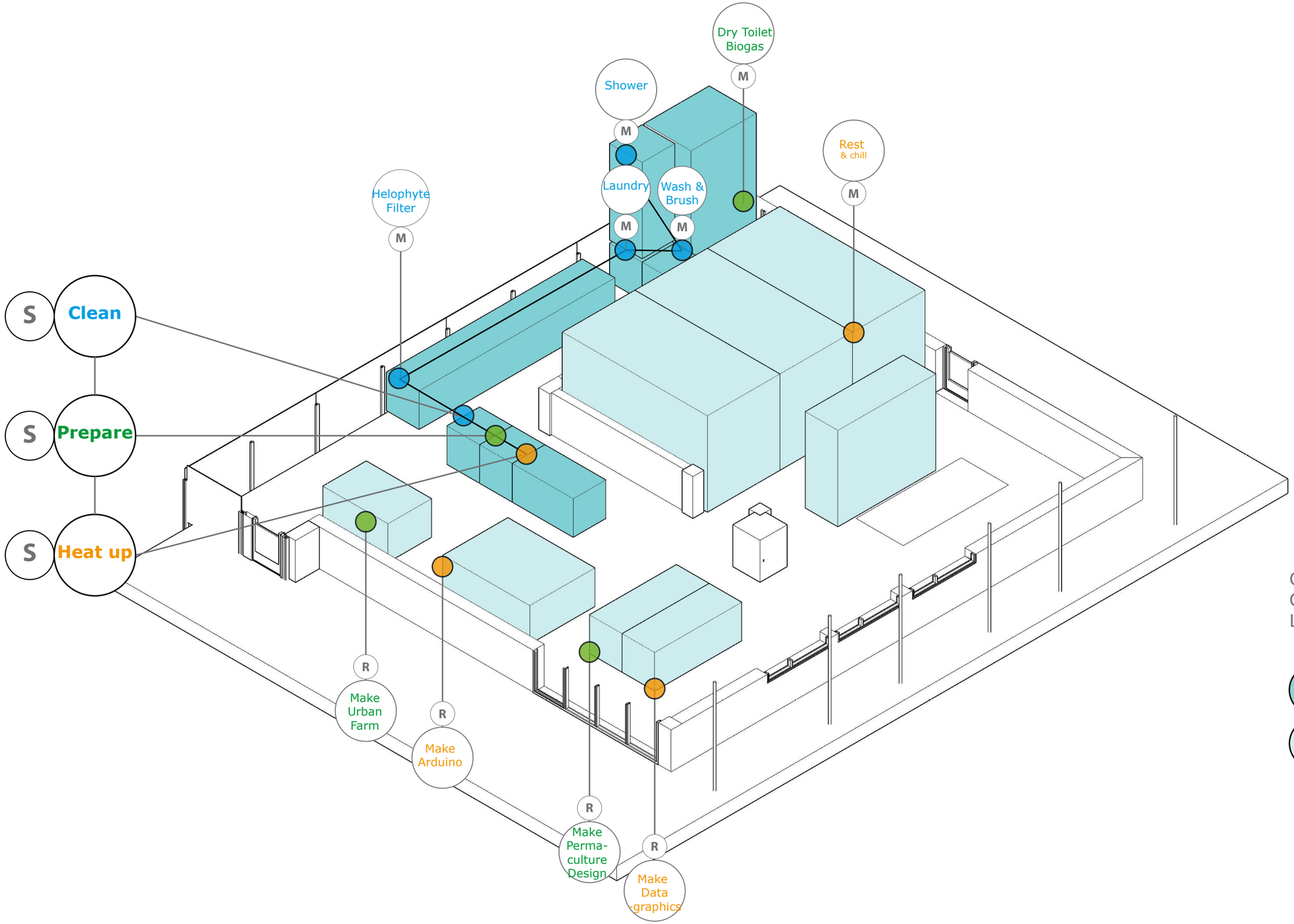
Points Light

Window distance





Variation 1 - Position of component-clusters

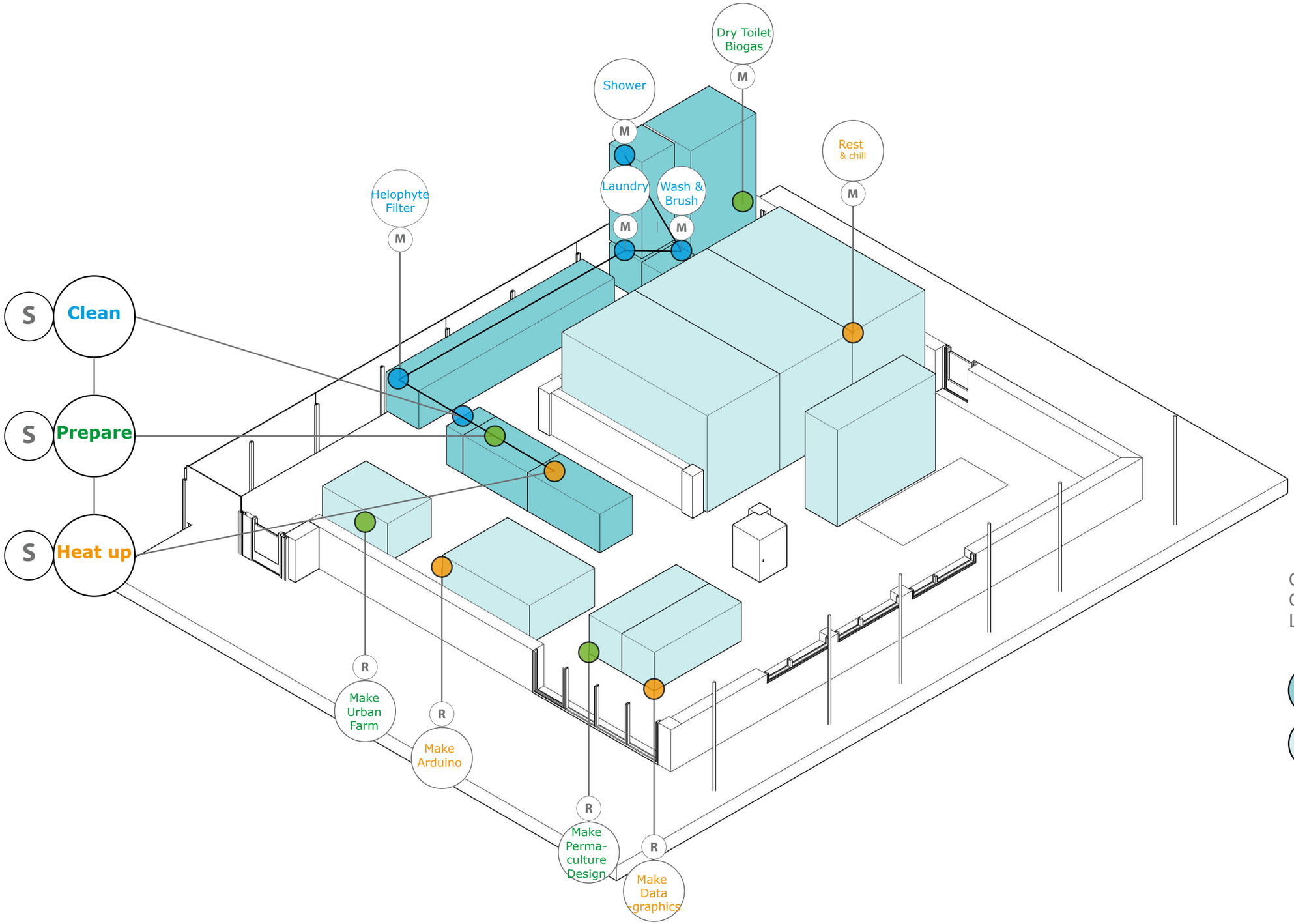


Circular
Component
Level

CC II Reuse Recycle Systems
Disassembly

CC I Disassembly

Variation 1 - Circularity Level

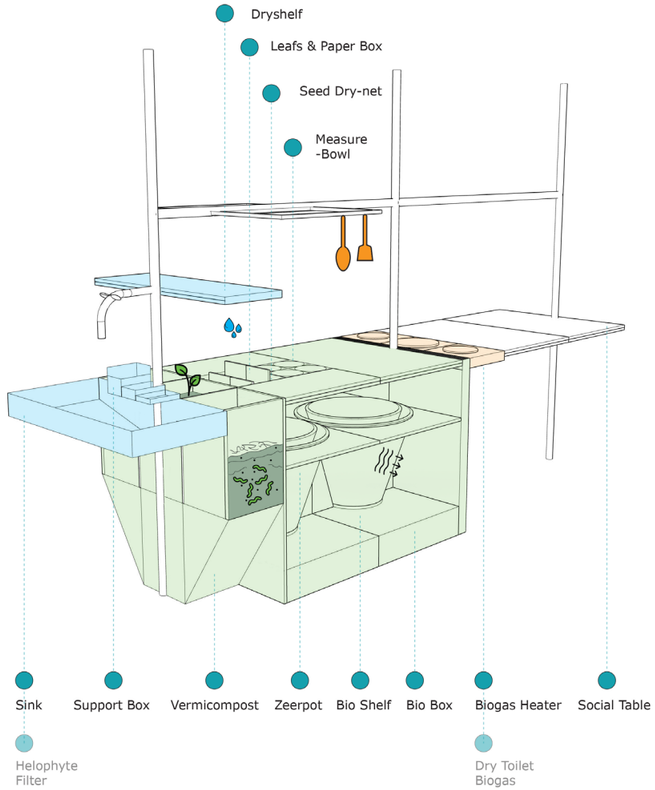


Circular
Component
Level

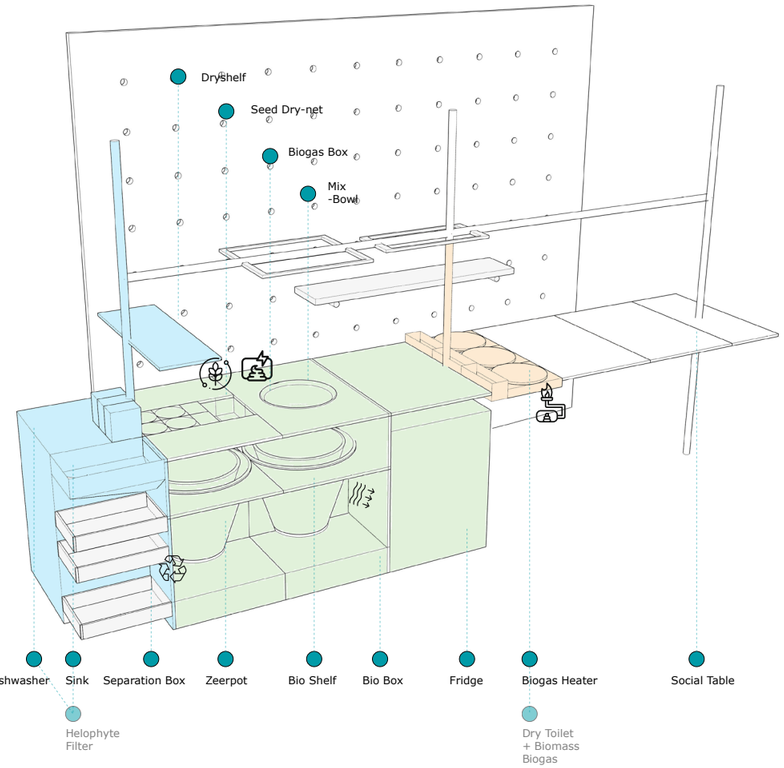
CC II Reuse Recycle Systems
Disassembly

CC I Disassembly

Variation of component-clusters



K0



K1

Cost

less expensive

more expensive

Material cost

smaller = less material objects

larger = more material objects

Energy demand

no electrical appliances

2 electrical appliances

Reuse- Recycle system

vermicompost

biogas box

Lifestyle rigor

advanced circular lifestyle

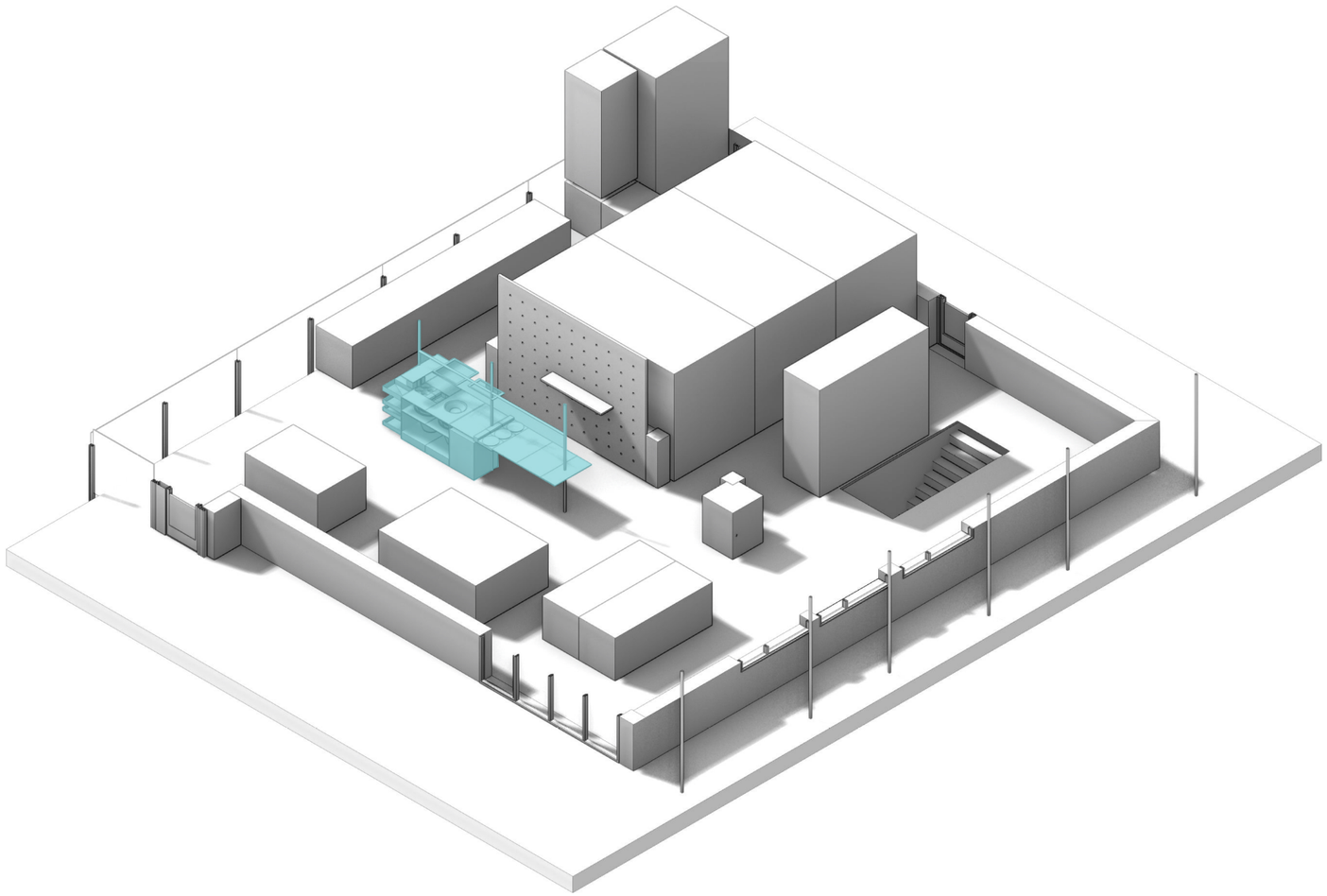
intermediate circular lifestyle

Collaboration

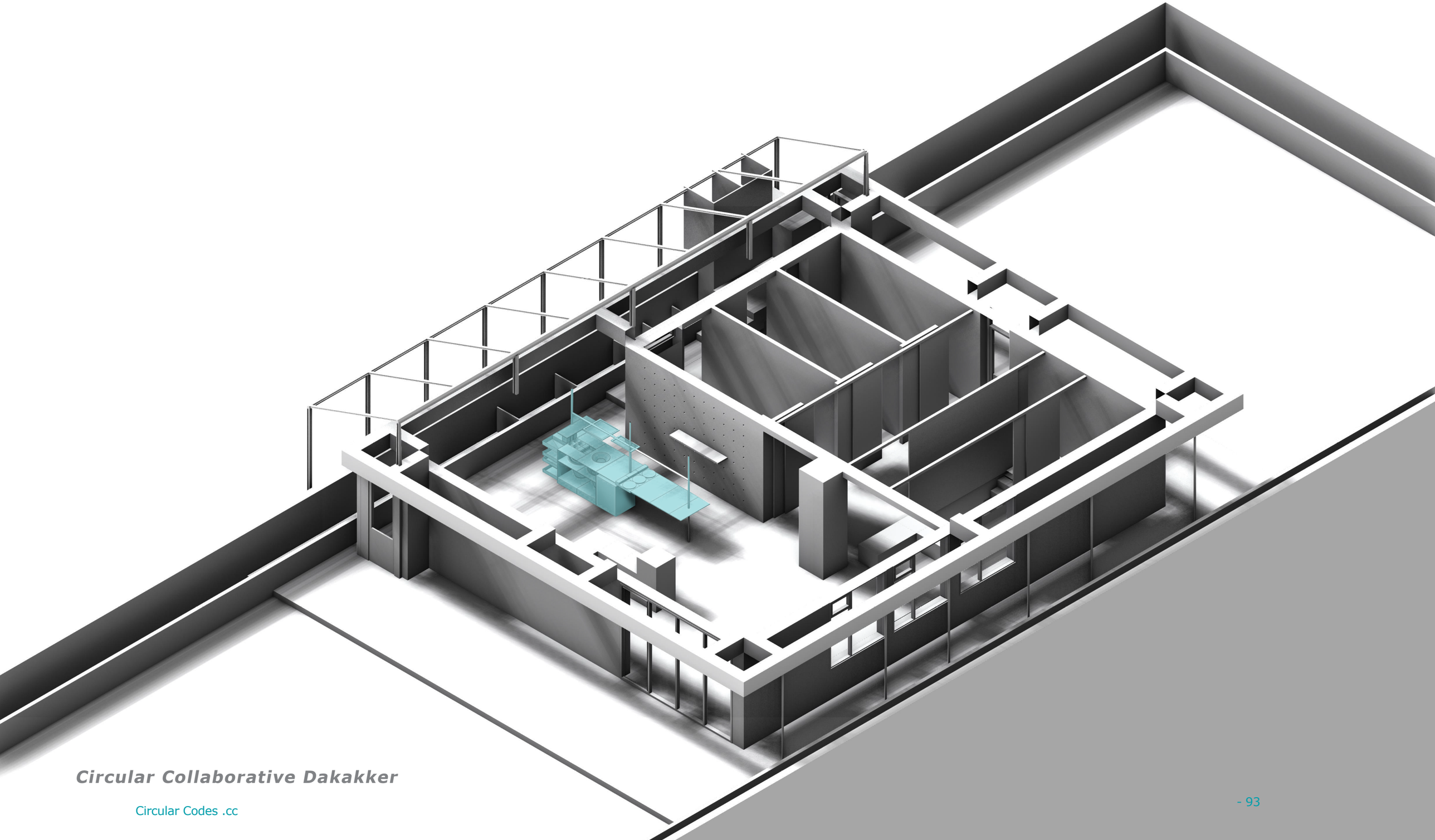
less execution area

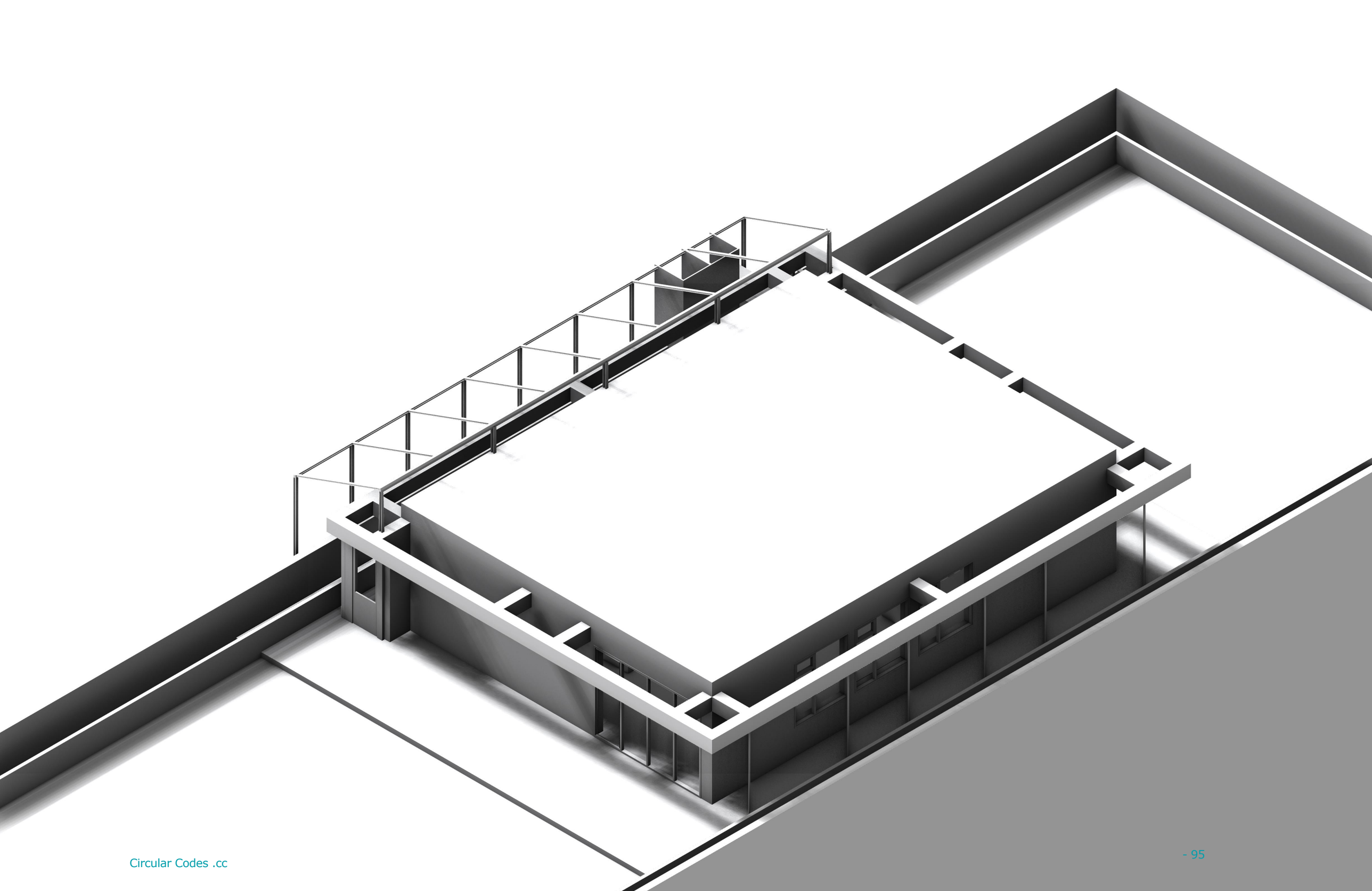
more execution area

Comparison



V1 - K1 Selection 1:100

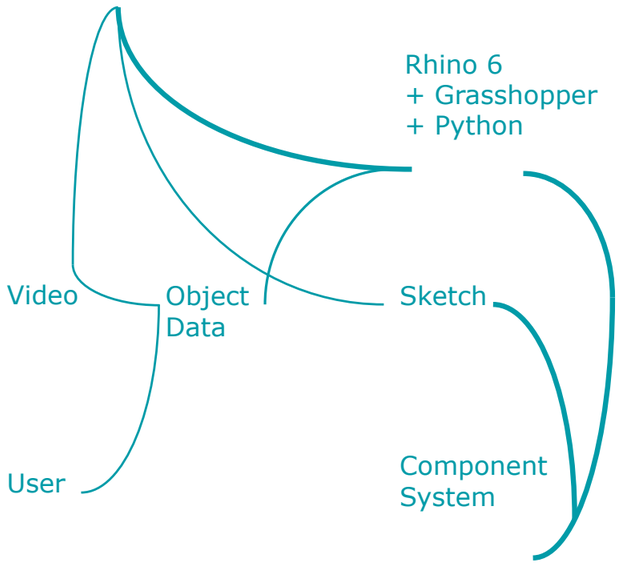




Circular Codes Methodology

Computational Workflow

Practice Designer



Step

0

DAF

Domestic Action Framework

PSOD

Practice Set-up, Observation & Documentation

1

POD D

Practice-Oriented Design Deconstruction

2-4

COD A

Circular-Oriented Design Analysis

5-6

OOD PR

Object-Oriented Design Parametric Reconstruction

7

OOD PAS

Object-Oriented Design Parametric Analysis & Systems

AGAIN?

CC Eco-system

Synthesis
Practice Comparison

Experiment

Pilot Application

Result 0 in n

Case Study

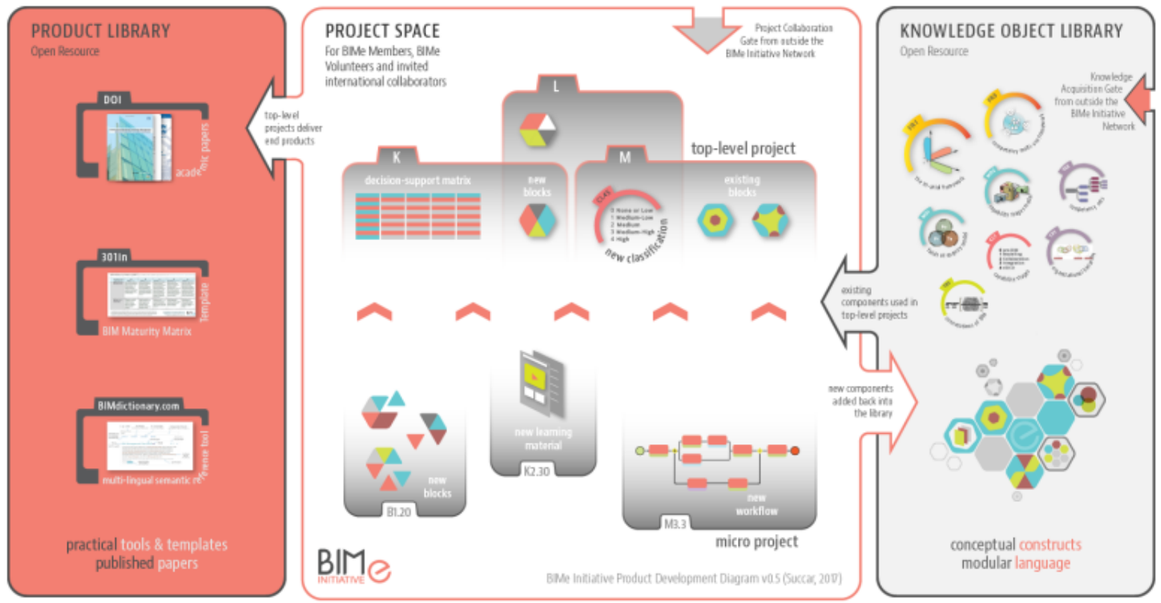
Application 1. Parametric and Algorithmic Architectural Design

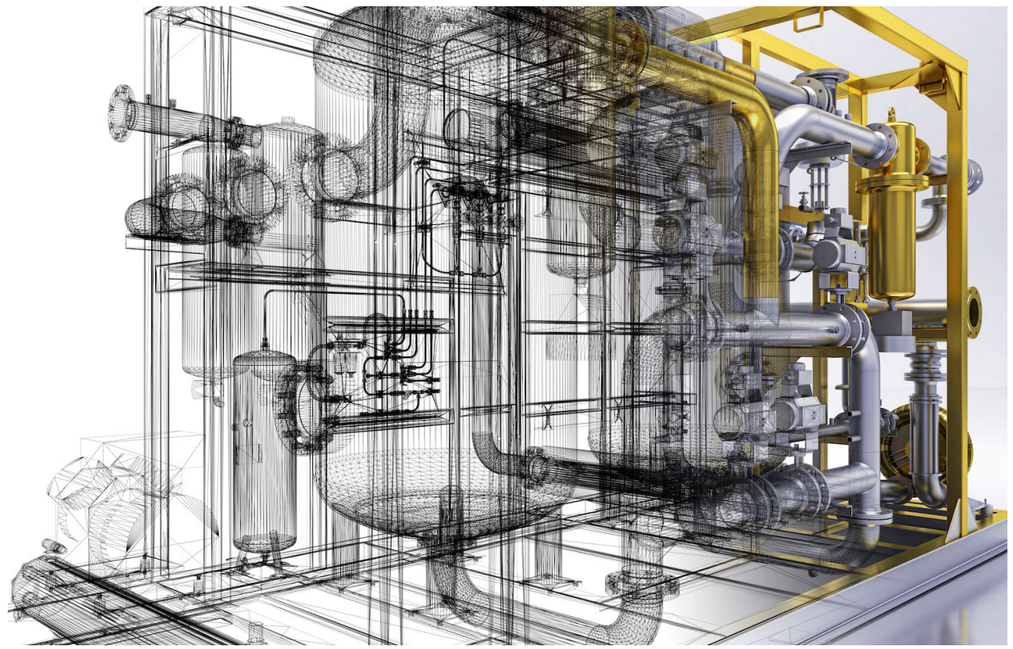
Deconstruction & composition

Create & explore restriction matrices

Generate repetition & transformation

Fig.13-14 - Landesgartenschau Exhibition Hall. Robotically Fabricated Lightweight Timber Shell
Source: Institut for Computational Design and Construction (2014).





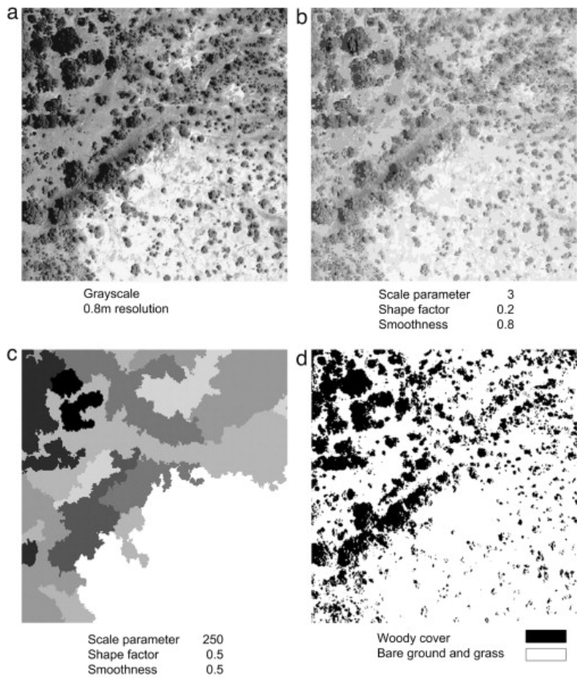
Application 2. Management, Regulation and Simulation integrated BIM

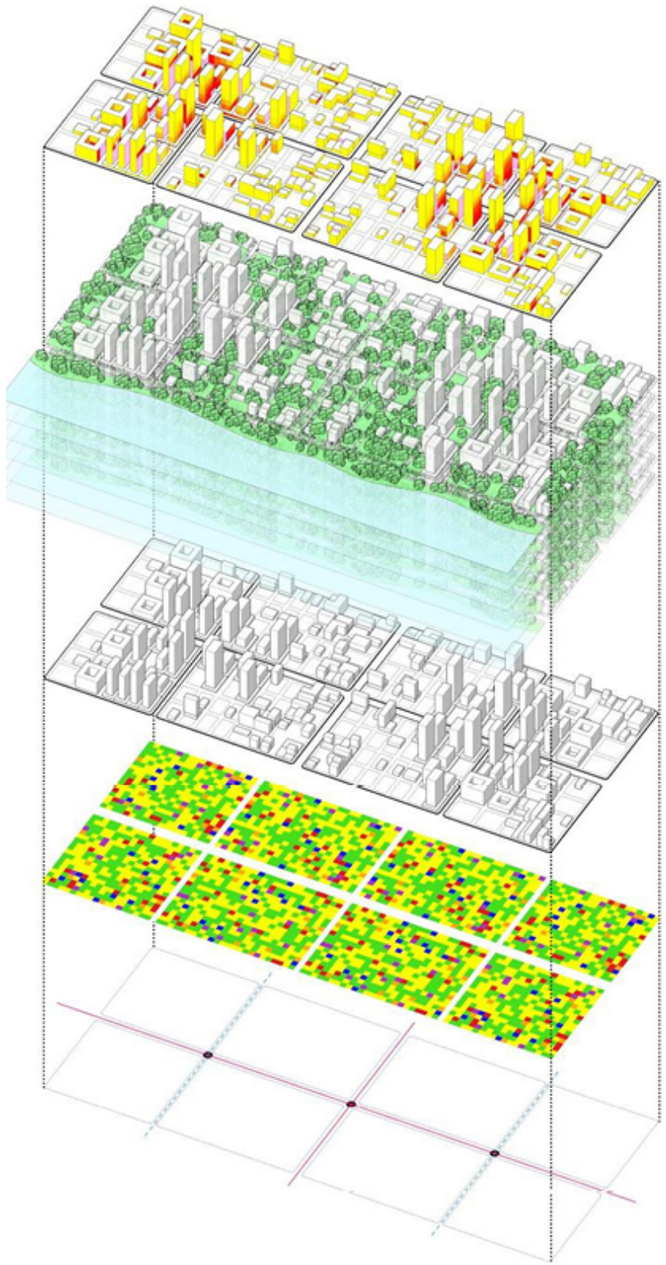
Digital collaborative platform

Legislative sustainable development

Physical performance

Fig.15 - BIM digital design & construction. *Source: Memoori Smart Building Research (2018).*
Fig.16 - Building information modelling framework: object-based. *Source: Bilal Succar (2017).*



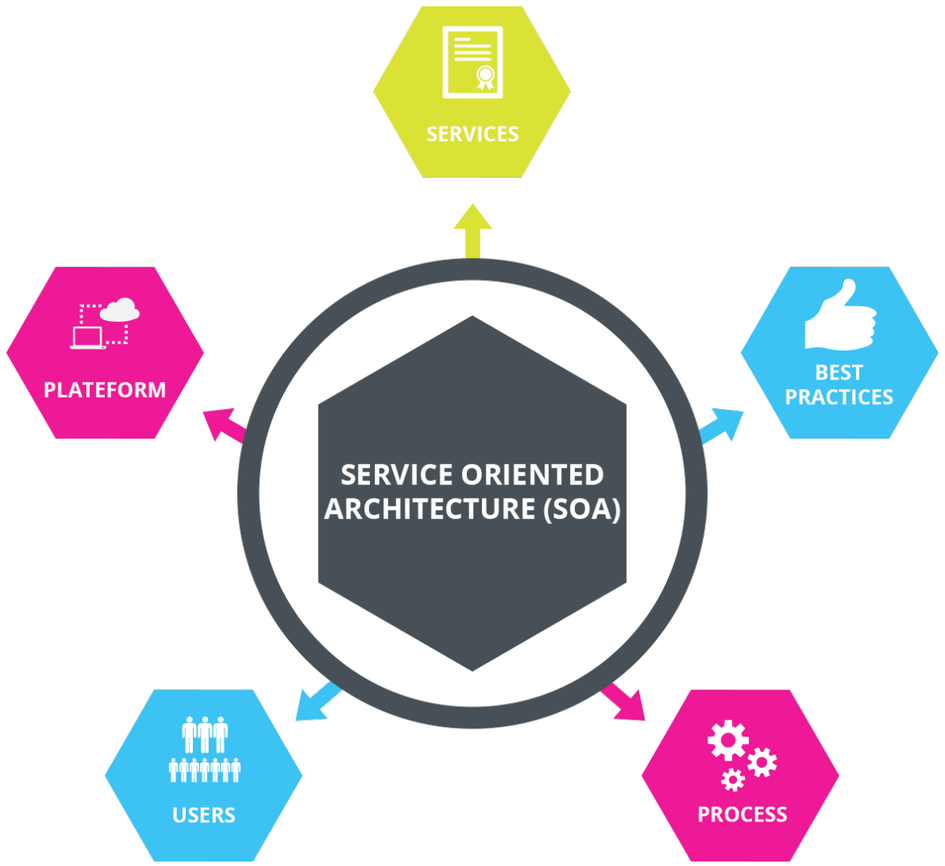


Application 3. Urban Planning, Monitor and Analysis

Image classification

Spatio-temporal data modelling

Fig.17 - Object-based landscape image analysis. *Source: Blaschke T. (2010).*
Fig.18 - Smart-City: Computational Urban Design and Analysis. *Source: Kohn Pedersen Fox Associates. (2019).*



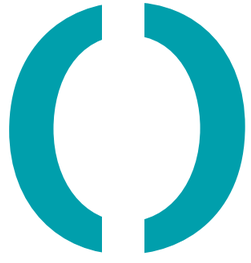
OOP Extension: Service Oriented Architecture

Business & service processes

Interoperability & automation

Fig.17 - Object-based landscape image analysis *Source: Software Development Community (2019).*
*S*Fig.18 - Smart-City: Computational Urban Design and Analysis *Source: Kohn Pedersen Fox Associates. (2019).*

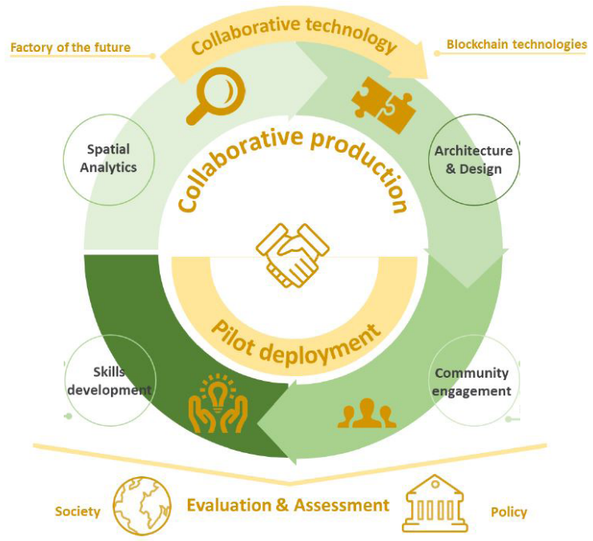
Circular Collaborative Kitchen 1



Lifestyle & Environment!

Thank you!

.CC Lifestyle & Environment!



ELLEN MACARTHUR FOUNDATION
FOOD INITIATIVE

European Commission
HORIZON 2020

Fig.17 - POP - Machina: Collaborative production for the circular economy; a community approach. Source: TU Delft

Circular design experts?

Community design experts?

Digital design experts?

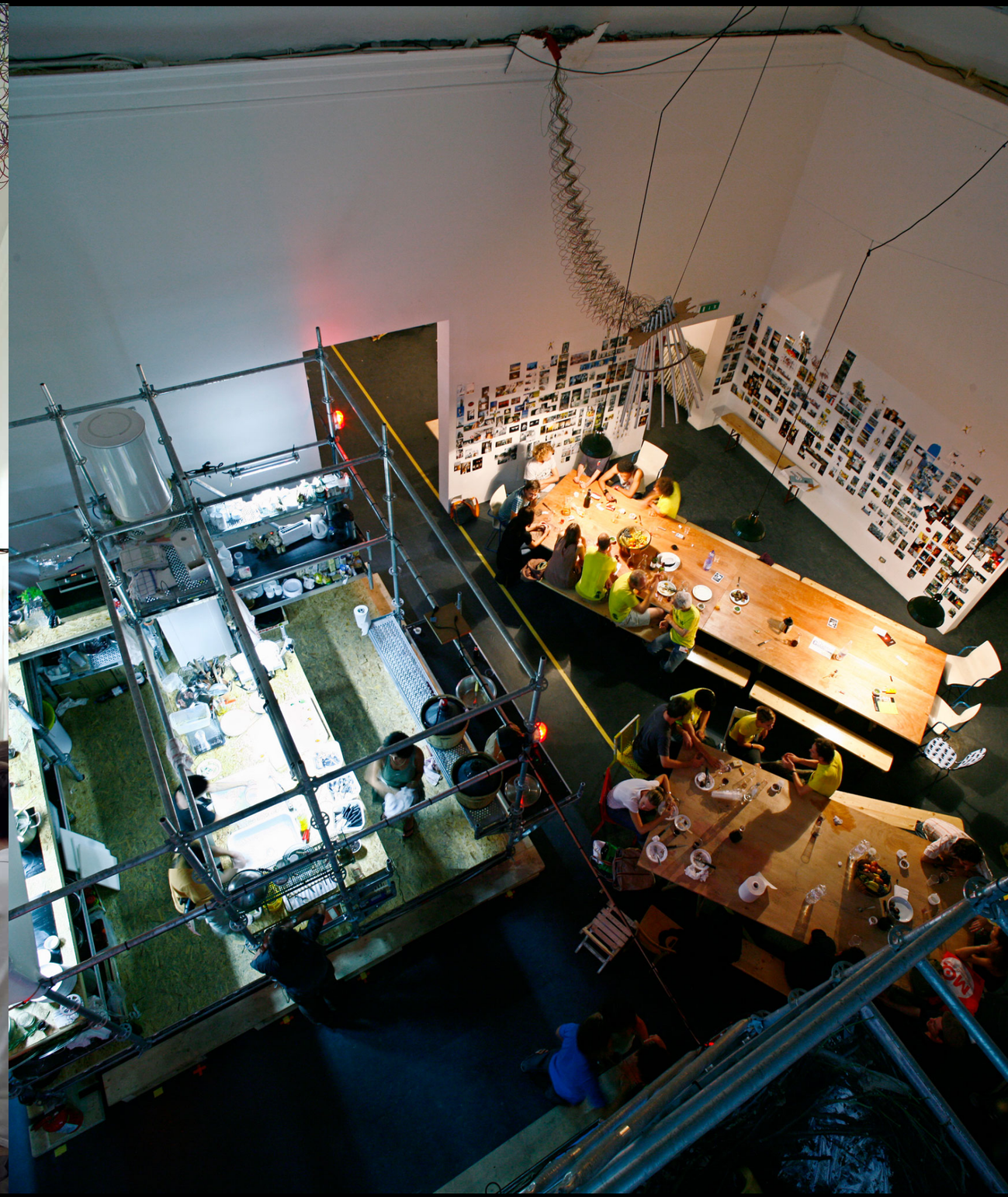


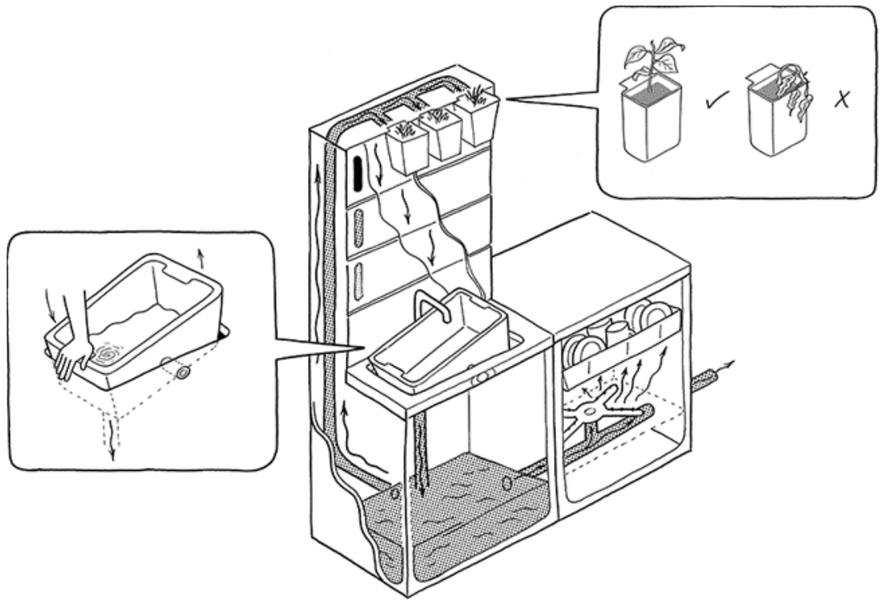
Fig.18 & 19 - METAville Kitchen French pavilion - 10th Venice Architecture Biennale 2006
Source: EXYZT (2006). https://www.constructlab.net/projects/metavilla/

How can object-oriented programming enable practice-oriented design for circular collaborative domestic environments?

1. What are object oriented programming applications in architectural design?

2. How can the principles of circularity be applied to object oriented programming in practice-oriented domestic design?

3. How expandable is this application for the built environment?



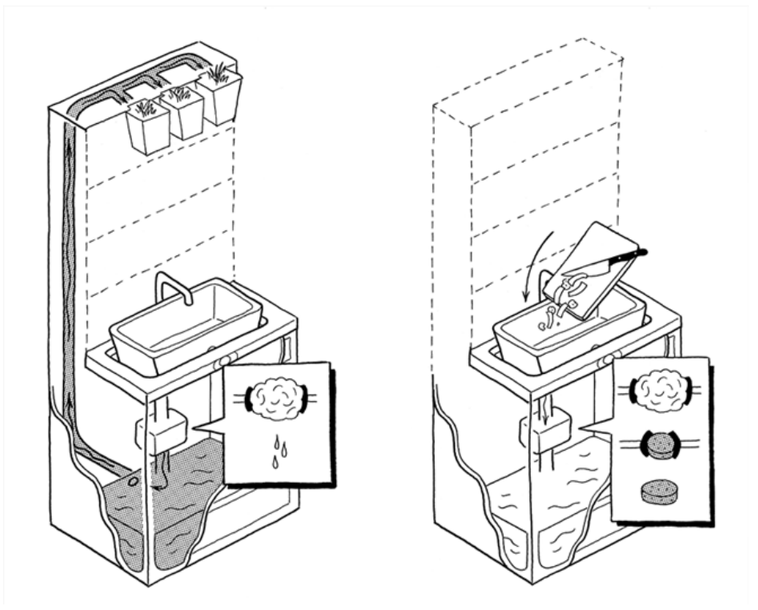
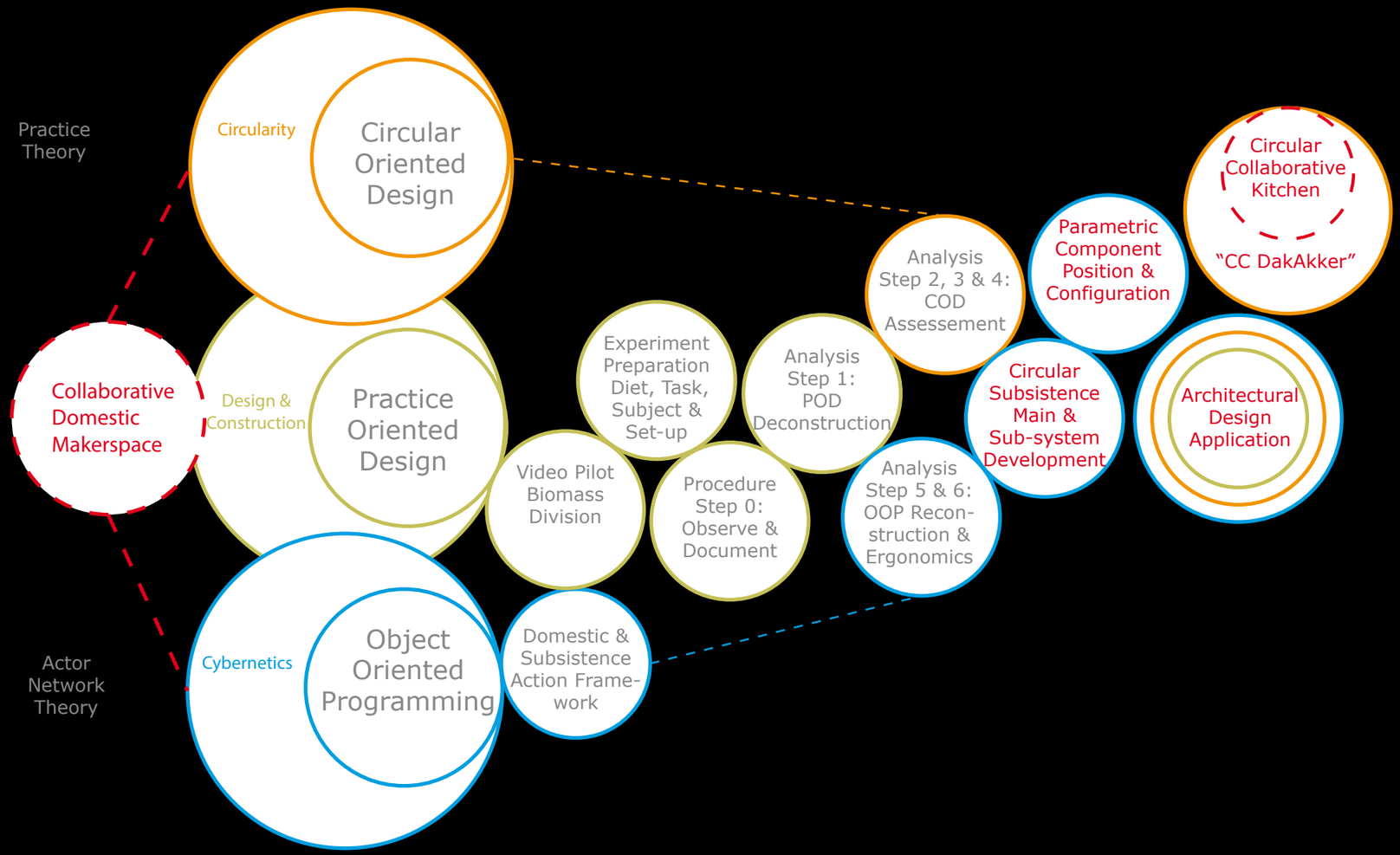
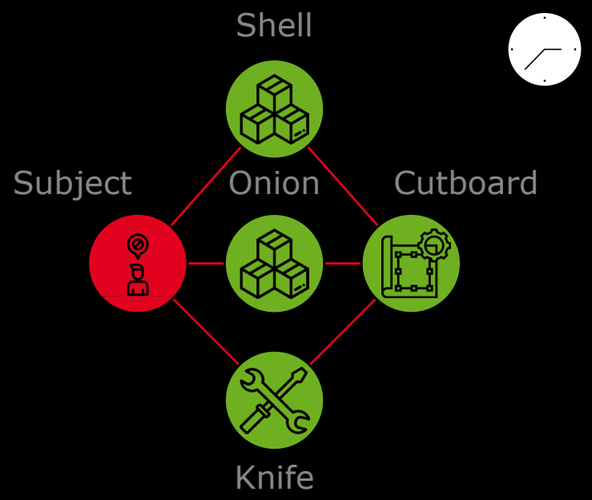


Fig. 23 & 24 IKEA Kitchen 2025 exposed: Grey-, Black-water & Compost concept
Source: Kimberley Mok (2015). https://thenewstack.io/ikeas-concept-kitchen-of-2025-it-cooks-interacts-and-composts/

Fig. 25 & 26 Ideo Office test kitchen: Counters with stool-island and pegboard details
Source: IDEO (2017). https://www.ideo.com/blog/4-ideas-to-steal-from-ideos-test-kitchen


Practice Theory
Circularity
Circular Oriented Design
Collaborative Domestic Makerspace
Design & Construction
Practice Oriented Design
Experiment Preparation Diet, Task, Subject & Set-up
Analysis Step 1: POD Deconstruction
Video Pilot Biomass Division
Procedure Step 0: Observe & Document
Analysis Step 2, 3 & 4: COD Assessement
Analysis Step 5 & 6: OOP Recon-struction & Ergonomics
Parametric Component Position & Configuration
Circular Subsistence Main & Sub-system Development
Circular Collaborative Kitchen
"CC DakAkker"
Architectural Design Application
Actor Network Theory
Cybernetics
Object Oriented Programming
Domestic & Subsistence Action Frame-work



Pilot: self-video record

GoPro 6 + Head-set-gear

Human head perspective

Objective

Test set-up & result

Test workflow & objects extraction

Experiment Preparations - Pilot

Dutch Wheel of Five - Reduced Environmental Impact

Food group	Subgroup	Foods in subgroup	Supermarket Classificati 07.02.2019		
			Jumbo	Albert Heijn	Lidl
Vegetables	Onion family	Onions, garlic and leek	0, 2, 0	0, 1, 0	0, 1, 0
	Stalk v	Celery and fennel	1, 1	1, 1	3, 1
	Root and tuberous v	Radish, carrot, beets, celeriac, salsify, patatoes	0, 0, 0, 1, 2, 0	0, 0, 0, 0, 2, 0	0, 0, 0, 0, 2, 0
	Leafy vegetables	Spinach, chard, endive, Belgian endive, lettuces, turnip greens, purslane, gai choi, Tahitia	1, 4, 0, 4, 4, 4, 4	, 0, 4, 0, 4, 4, 4, 4	0, 4, 0, 4, 0, 4, 4
	Cabbages	Kale, red cabbage, white cabbage, green cabbage, sauerkraut, savoy cabbage, Turnip	3, 0, 0, 4, 4, 4, 4	1, 0, 1, 0, 1, 0, 0	3, 0, 0, 4, 4, 0, 4
	Fresh legumes	Garden peas, broad beans	3, 2	2, 2	0, 2
	Fruiting vegetables	Tomato, cucumber	0, 0	0, 0	0, 0
Fruit	Fruit	Pear, Apple Apricot Plum Grapes Grapefruit Banana	0, 0, 4, 4, 1, 4, 2	0, 0, 4, 2, 2, 2, 2	0, 0, 4, 2, 4, 1, 2
Bread	Whole wheat bread		0	0	0
Grain products	Oatmeal		1	1	1
	Whole wheat pasta		1	1	1
Egg	Chicken eggs		0	0	0
Pulses	Lentils		3	3	1
	Chick peas		3	3	1
	Other beans and peas	White beans, brown beans, marrowfat peas, green peas	3, 3, 3, 3	3, 3, 3, 3	3, 3, 4, 3
Nuts & seeds	Seeds	Pumpkin, sesame, linseed, sunflower	3, 3, 3, 3	3, 3, 3, 3	4, 4, 4, 4
	Walnuts		3	3	1
	Peanuts		3	3	1
Milk & products	Skimmed milk		0	0	0
	Semi-skimmed milk		0	0	0
	Fermented milk products	Buttermilk, Low-fat yoghurt	0, 0	0, 1	0, 1
Cheese	Fresh cow's milk cheeses	Cottage cheese, Low-fat fresh cheese, Mozzarella	0, 0, 1	0, 1, 1	1, 0, 1
	Rambol		1	4	4
	Fresh goat's cheese		1	0	0
Fats and oils	Low-fat margarine		0	3	1
	Liquid margarine		3	3	4
	Soybean oil		4	4	4
Drinks	Tap water		0	0	0
	Tea		3	3	3
	Coffee		2	2	2
Fish & Meat	EXCLUDED				

Circular Diet

Celery	Garden Peas
Kale	Lentils
Onions	Chick peas
Leek	White beans
Radish	Brown beans
Carrot	Marrowfat peas
Beets	Green peas
Celeriac	Pumpkin seeds
Endive	Sesame seeds
Lettuces	Linseed seeds
Purslane	Sunflower seeds
Red Cabbage	Walnuts
White Cabbage	Peanuts
Green Cabbage	Chicken eggs
Savoy Cabbage	(Semi)skimmed Milk
Turnip	Low fat Yogurt
Tomato	Low-fat fresh cheese
Cucumber	Buttermilk
Pear	Cottage cheese
Apple	Fresh goat's cheese
Whole wheat bread	Low-fat margarine
Patatoes	Liquid margarine
Tap Water	Tea

Origin	Location
0	Netherlands
1	Europe
2	Inter-continental
3	Unclear
4	Unavailable

Based on sources: Netherlands Nutrition Center (2017) and Van de Kamp M. E. Et al (2017). Healthy diets with reduced environmental impact? The greenhouse gas emissions of various diets adhering to the Dutch food based dietary guidelines. Journal of Food Research International. Centre for Nutrition, Prevention and Health Services, National Institute for Public Health and the Environment (RIVM)

Task

Meal: portion for 4 persons

Minimum: 6 ingredients

Formality: sign consent form

Subject Information

Origin: Netherlands, Tillburg

TU Delft student: Msc. Building Technology

Age: 25 years

Food preference: Mediterranean, Thai

Ingredient Choice:

1 Onion, 1 Leek, 1 Carrot, 1 White Cabbage, 4 Eggs, 10 Potatoes, 1 Sesame pack

Step 0: Set-up, Documentation, Observation

Equipment & Support:

Go-Pro 6 Head-set gear

Panasonic GH5 with tripod

DJI Osmo - window/car attachment

Camera-man

Computational and manual notes

Limitations:

Documentation included externalities:

Contextual social interactions, music, roommates

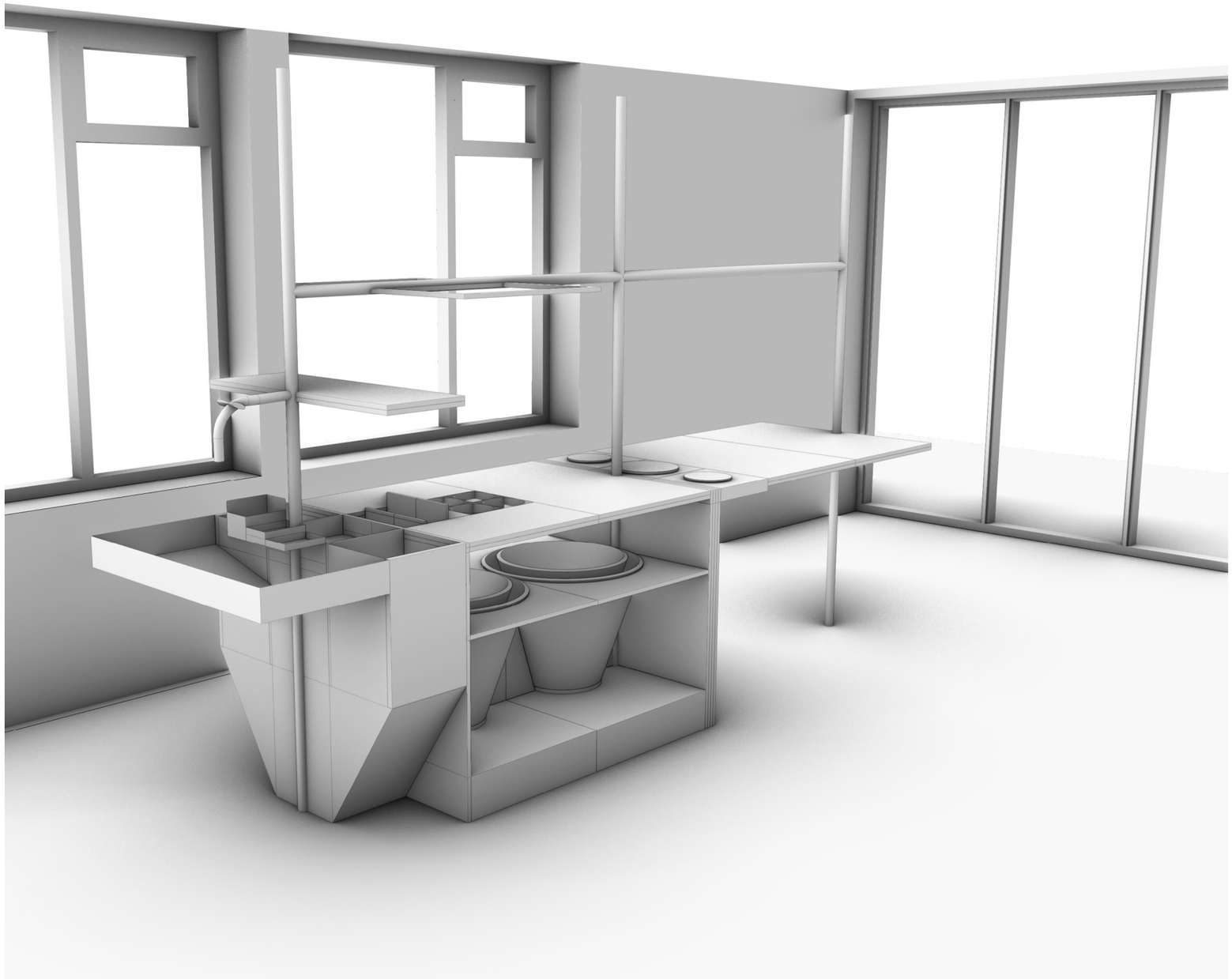
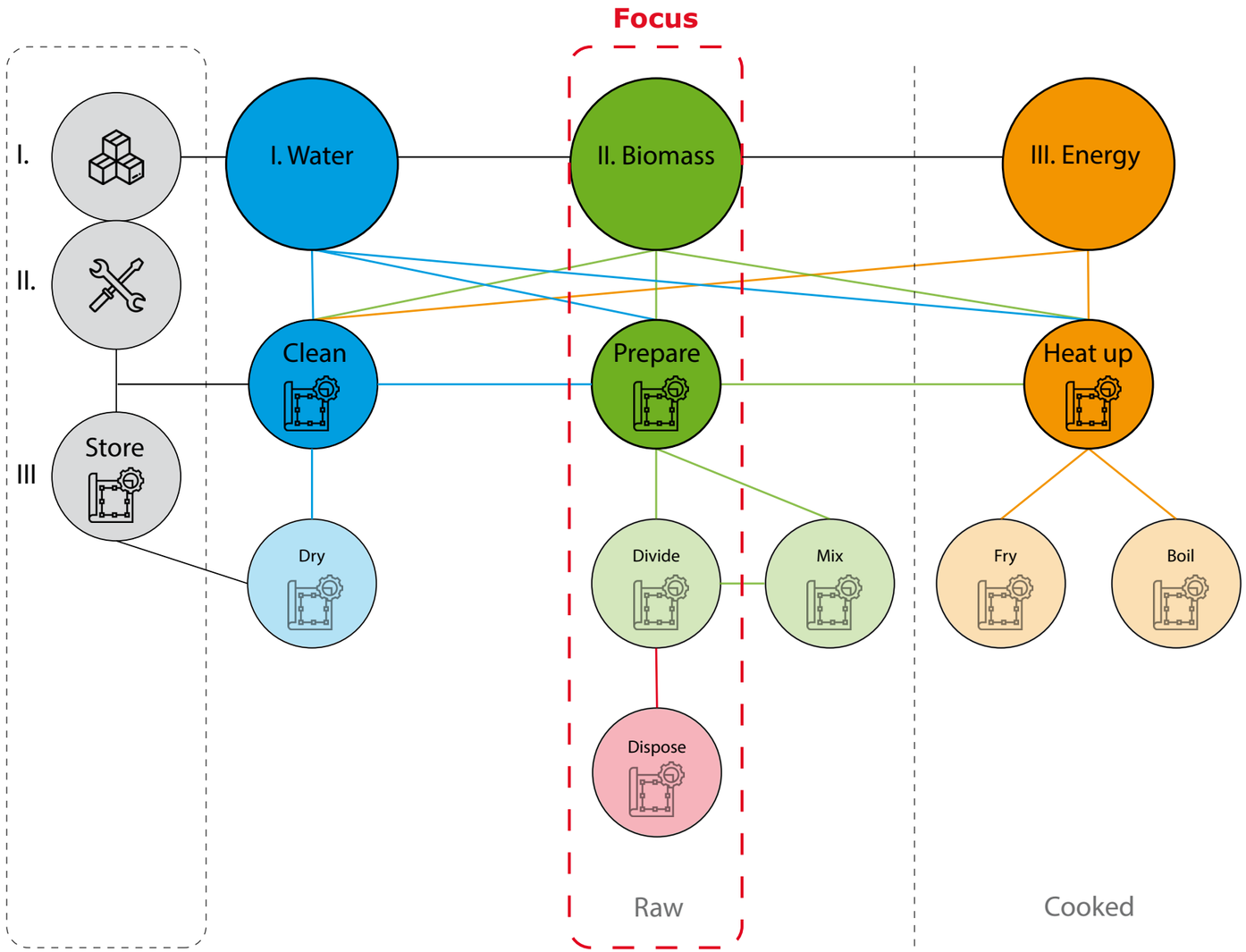
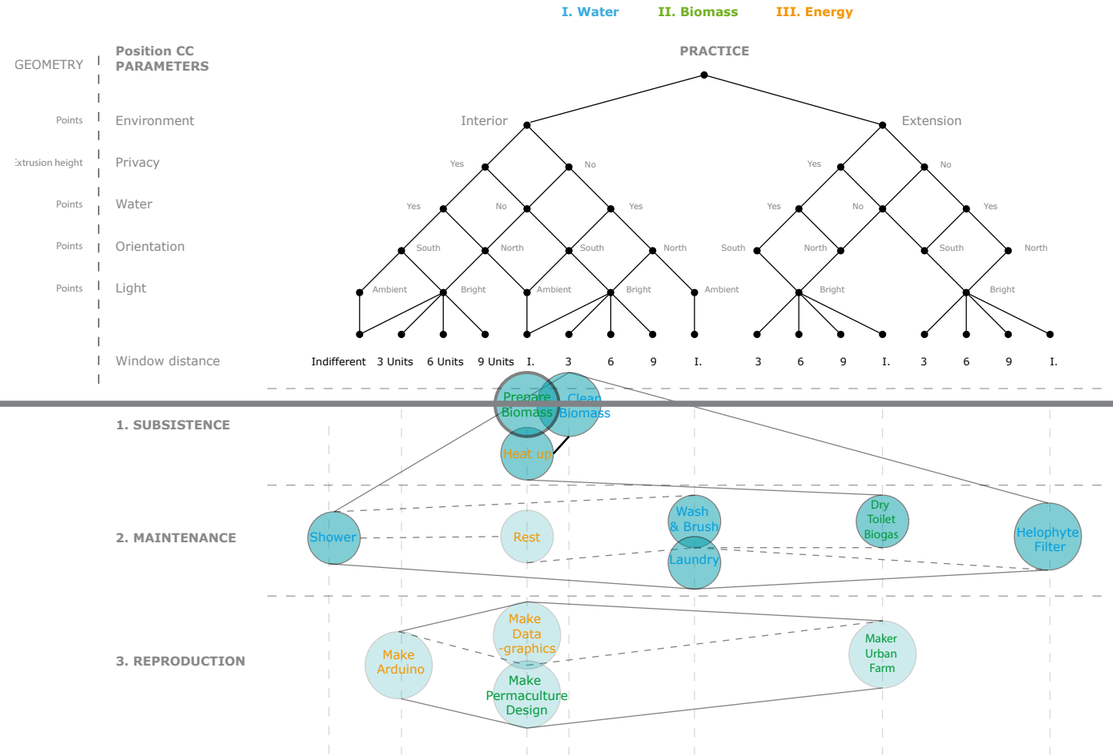
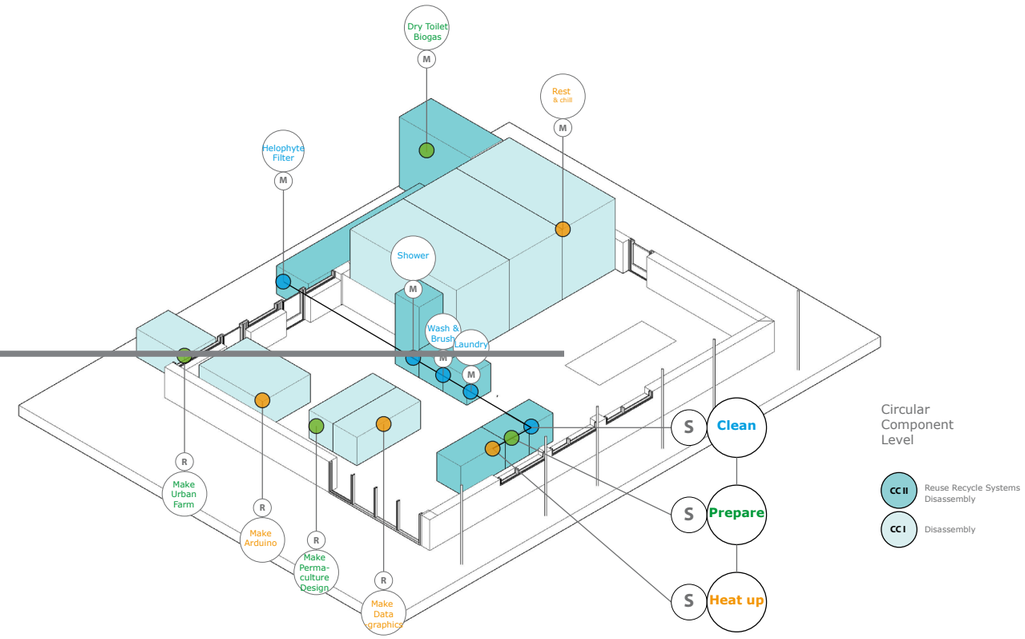


Fig. 10 Circular Division Practice


Focus
I.
II.
III
I. Water
II. Biomass
III. Energy
Clean
Prepare
Heat up
Store
Dry
Divide
Mix
Fry
Boil
Dispose
Raw
Cooked

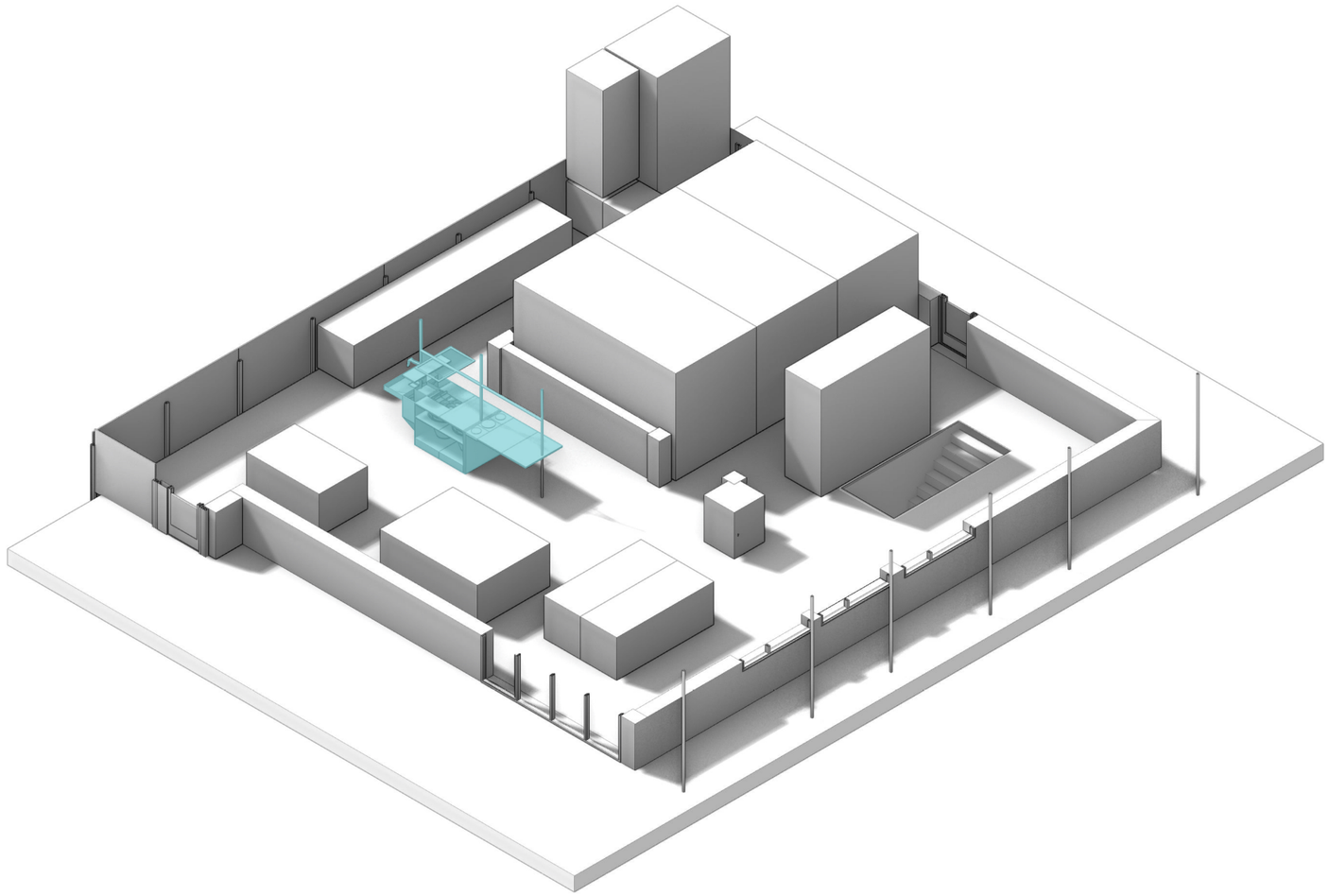


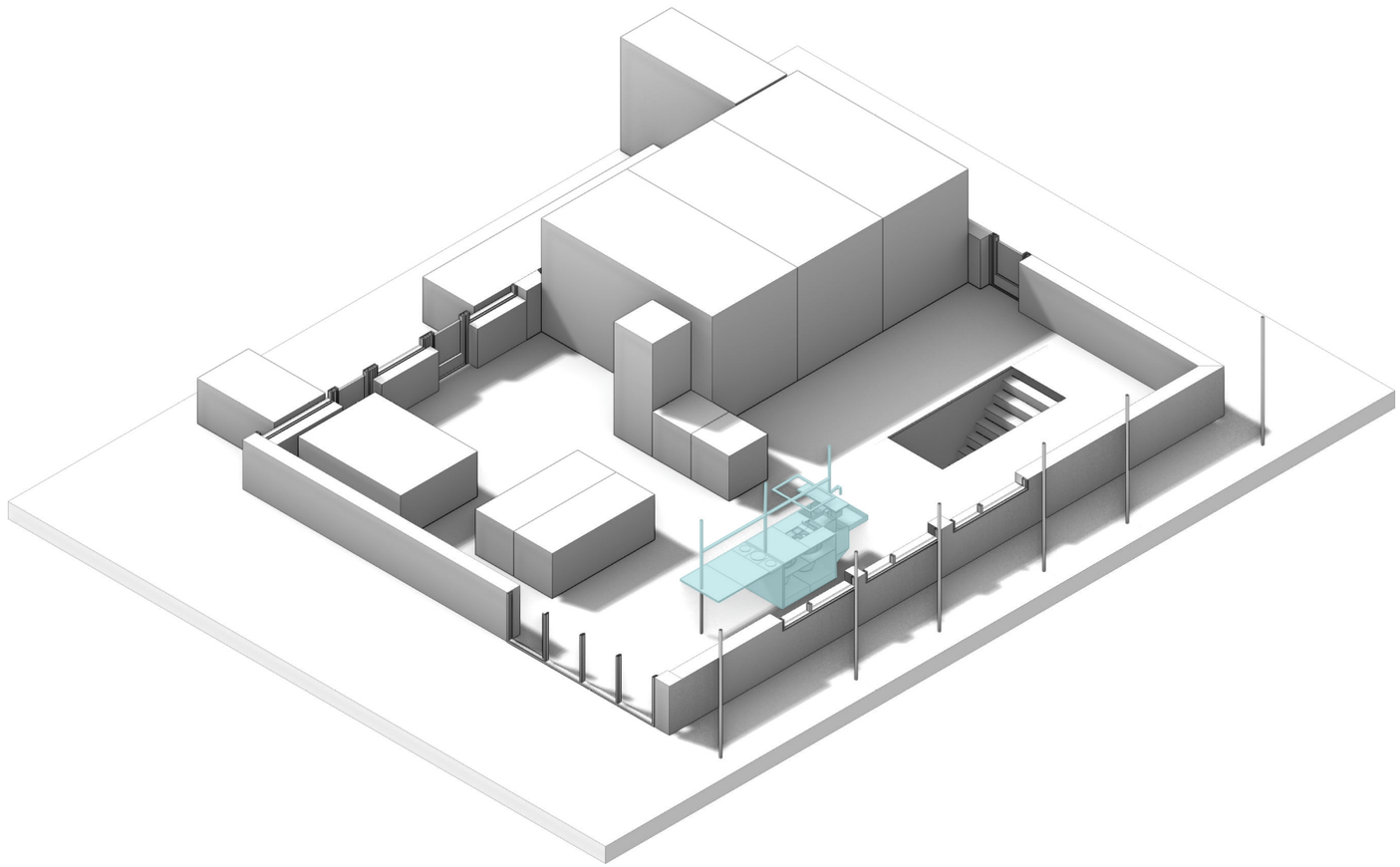


P5 Timeline

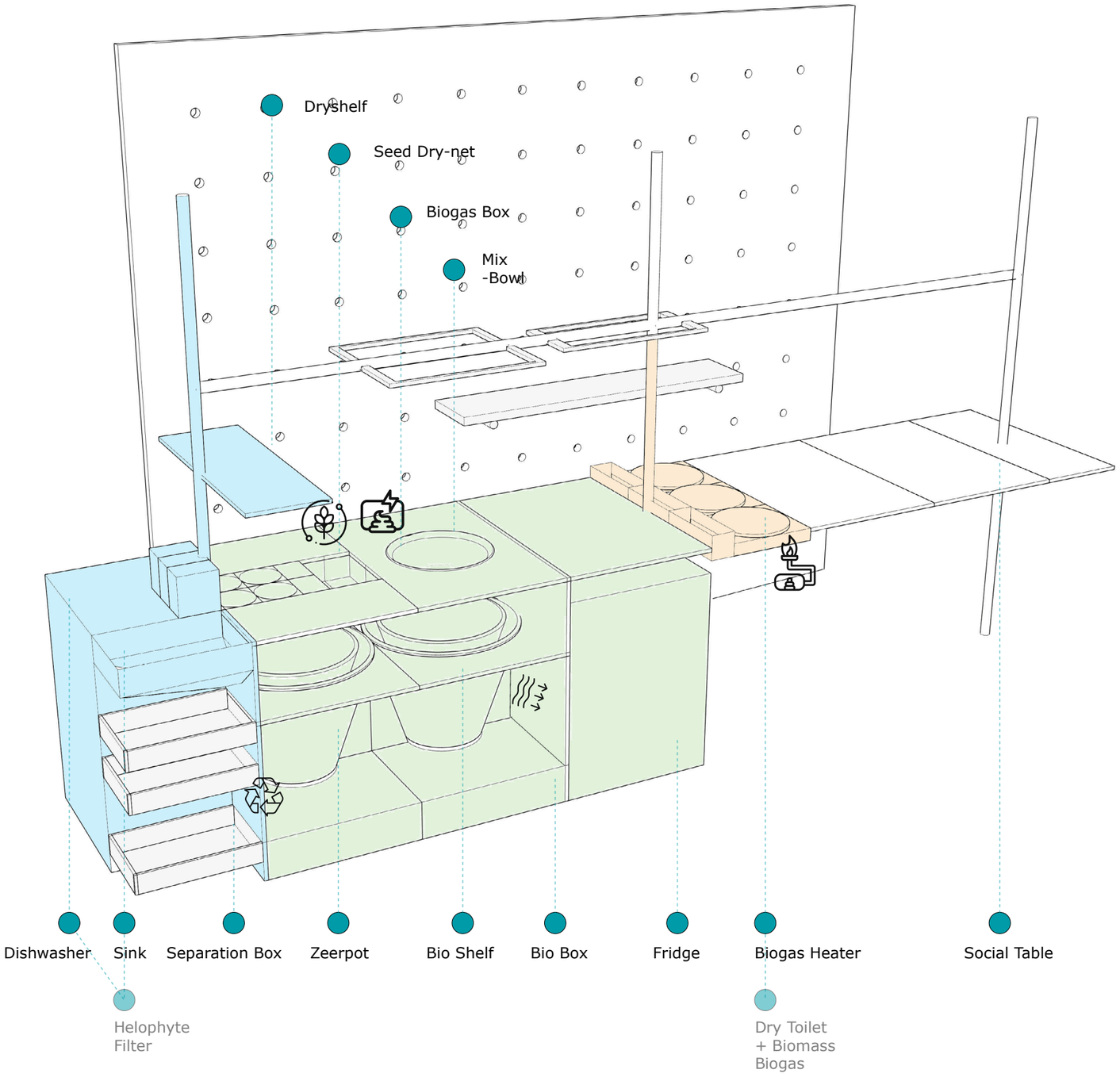
Circular Components Position

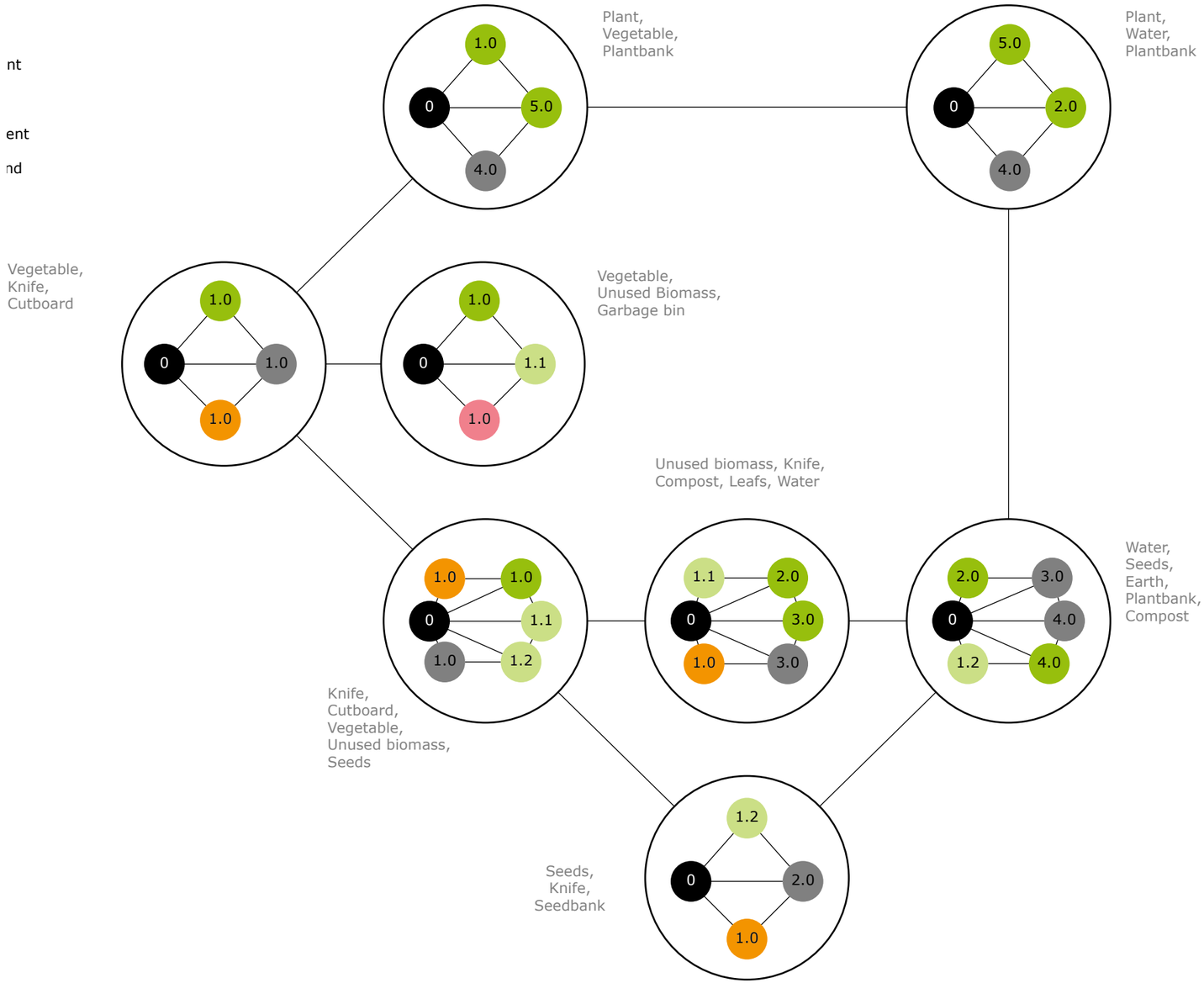
Fig.27 - METAville Kitchen French pavilion - 10th Venice Architecture Biennale 2006
Source: 1024 (2006). https://www.1024architecture.net/?portfolio=metavilla





Variation 0 - Kitchen 0


Dryshelf
Seed Dry-net
Biogas Box
Mix
-Bowl
Dishwasher
Sink
Separation Box
Zeerpot
Bio Shelf
Bio Box
Fridge
Biogas Heater
Social Table
Helophyte
Filter
Dry Toilet
+ Biomass
Biogas


nt
ent
nd
Plant,
Vegetable,
Plantbank
Plant,
Water,
Plantbank
Vegetable,
Knife,
Cutboard
Vegetable,
Unused Biomass,
Garbage bin
Unused biomass, Knife,
Compost, Leafs, Water
Water,
Seeds,
Earth,
Plantbank,
Compost
Knife,
Cutboard,
Vegetable,
Unused biomass,
Seeds
Seeds,
Knife,
Seedbank

Questions

Malatras A., Asgari A, Baugé T., Irons M., (2008) "A service-oriented architecture for building services integration", Journal of Facilities Management, Vol. 6 Issue: 2, pp.132-151, https://doi.org/10.1108/14725960810872659

A Mashee, Housein & Malthus, Tim. (2019). Object-oriented Image Analysis for Monitoring Urban Expansion in the City of Riyadh, Saudi Arabia.

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Note: This is still a work in progress version, some images and diagrams are still missing, as respective figure numbers, labels and references. That is include in P5.