Last night I was lying in bed of my airbnb appartment
trying to get some sleep and to digest dinner
and the fact that an astronaut drank
730 liters of his own urine and sweat
so we learned yesterday from Ms. Paradiso.
(a little more information than we needed)
But prior to consumption by said brave astronaut
I am sure the urine as well as the sweat had been treated

but the reason I could not sleep was the fact that
I had no idea what
methanogenic fermentation nor
hydrothermophilic dialysis is.
In reality I can’t even pronounce it properly
So I looked it up on Wikipedia
and that made things worse
because that didn’t help at all

But I was ok with that because the moral of the story is that

I was staying in a huge appartment with amazing views on the lake

booked on Airbnb

at half the price of the nearby hotel

and the realization that you really don’t need to understand disruptive technologies in order to use them

and this is what this presentation is about

Space Technology empowers the Transition to a Circular Economy

8-jun-16

MELiSSA Space research Consortium

IPStar BV Technology Transfer Partner

the challenge

A journey to Mars or a lunar base requires:

- the use of a (closed) regenerative life support system
- that allows for **sophisticated recycling** of waste such **as biomass** (plant residu), grey water, feces, urine and CO_2 for
- controlled (autonomous) **ultra-efficient water, oxygen and food production**

THE MELiSSA PROGRAM

MELiSSA was initiated to design, develop and build a closed life support system for long term manned space missions

- MELiSSA = Micro-Ecological Life Support System Alternative
- MELiSSA is growing. We now have 14 organizations (universities, companies and CRO's)
- approx. 100 scientists + support staff
- large number of subcontractors

14 MELiSSA PARTNERS

ESA

7 universities:

University Guelph, Canada,

University Ghent, Belgium

University Mons, Belgium

University Blaise Pascal, France

University Barcelona, Spain

University Lausanne, Switzerland

University Napoli, Italy

2 Institutes:

SCK-CEN, Belgium

VITO, Belgium

3 companies:

IPSTAR BV, The Netherlands

Sherpa Engineering S.A., France

EnginSoft S.p.a., Italy

1 foundation:

The MELiSSA Foundation, Belgium

IPStar

the huge array of technology challenges in space are identical to the 'big' problems on earth:

WATER

WASTE

CIRCULARITY IS PART OF THE SOLUTION

FOOD

ENERGY

IPStar

- IPStar was founded in 2005 to look after technology transfer opportunities
- IPStar is member of the MELiSSA consortium which brings a priviliged position
  - access to all know-how and technology developed over decades
  - 2 x per year MELiSSA meeting
  - frequent contacts with members and ESA
  - use of facilities ESA (meeting / conference rooms and labs)

VISION & MISSION

VISION

In order to achieve sustainable growth for an increasing world population a balanced and equal distribution of resources is a necessity. Circular economic models are a powerful platform to empower this objective.

MISSION

Cyclical Life support technologies designed for long term human space missions present highly efficient and robust solutions that accelerate the transition to a circular economy.

CURRENT PROJECTS

Biobased and *circular* economic models in the following sectors:

Agro & Food

Life sciences & Health

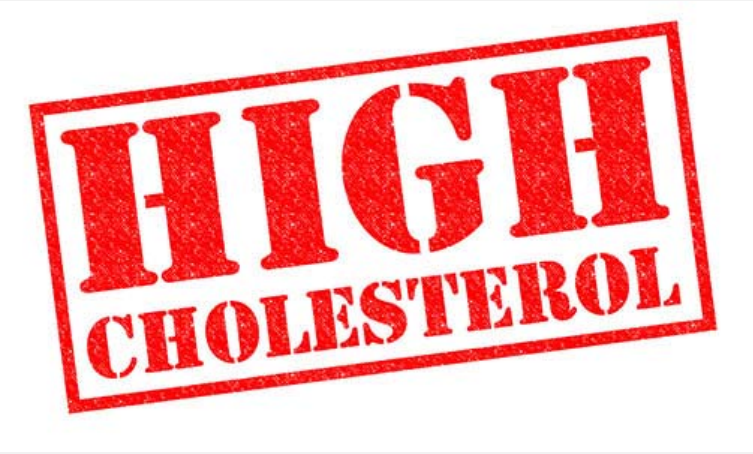
Water & Waste

CURRENT PROJECTS

Life sciences & health

EZCOL BV

- micro organism rhodospirillum rubrum
- decrease of the 'bad' LDL-cholesterol up to 50 %
- ezCOL owner of patent since 2007
- completion of current research phase (Q4 2015)



Partners:

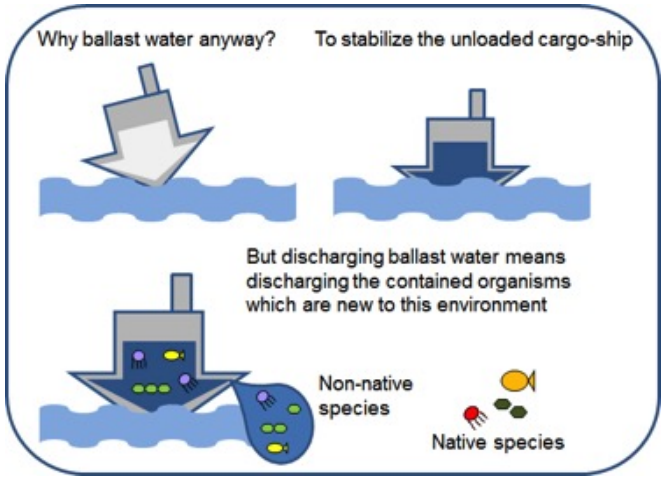
- SCK*CEN
- Umons

- Unilever / University Maastricht

CURRENT PROJECTS

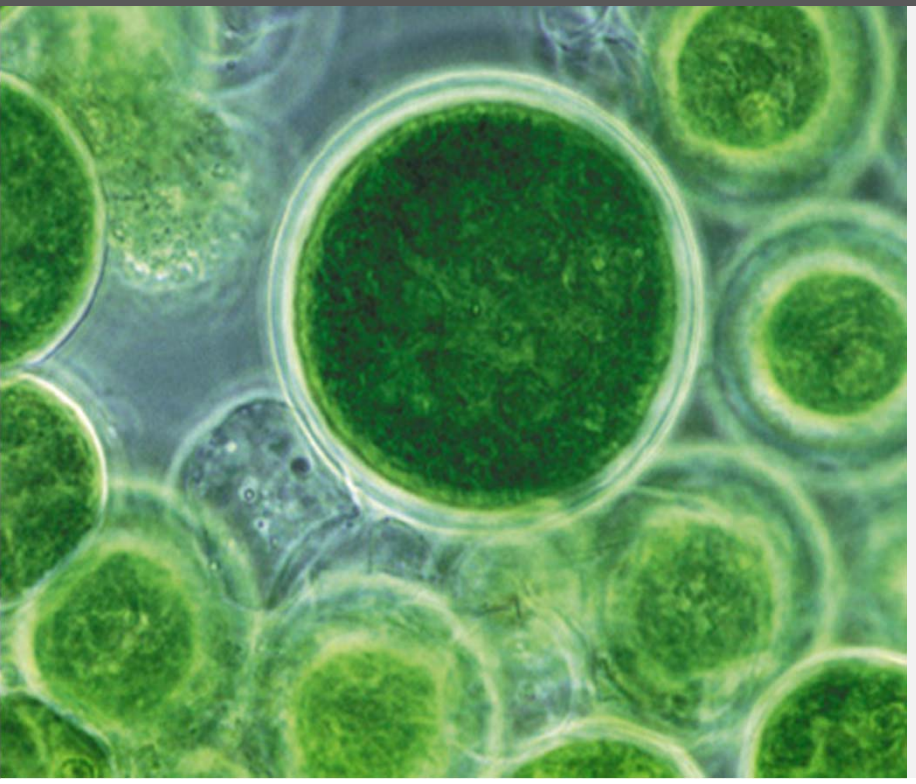
NautiSAN

- Ballast Water is used in thousands of ships and vessels for stability and maneuverability
- in 2014 IMO enforces the treatment of ballast water
- represents large market: approx. 70.000 require a ballast water treatment system
- MELiSSA technology excellent starting point to develop a BWTS



CURRENT PROJECTS

photo bioreactors



- new type of highly efficient high yield photobioreactor to produce different types of algae
- Produces 10-20 x more biomass than conventional reactors
- IPStar is contracted for commercial evaluation and tech transfer
- Applications include: feed, food, pharma, pigments et cetera

Partners:

- UBP
- Uni of Nantes

CURRENT PROJECTS

Amsterdam ArenA

- research urine collection as a nutrient source to fertilize the grass in soccer stadium Amsterdam ArenA
- completed first phase of study MELiSSA Urine Treatment Unit as base technology

Partners:

- UGent
- HAS Uni applied sciences
- Amsterdam Arena

PROJECTS current and under preparation

NuMoSa

Mobile sanitation unit: 40 ft container that provides sanitation, water and potentially food

Partners:

- HAS University of Applied Sciences
- UGent
- NuMoSa BV
- (BIC Incubator)

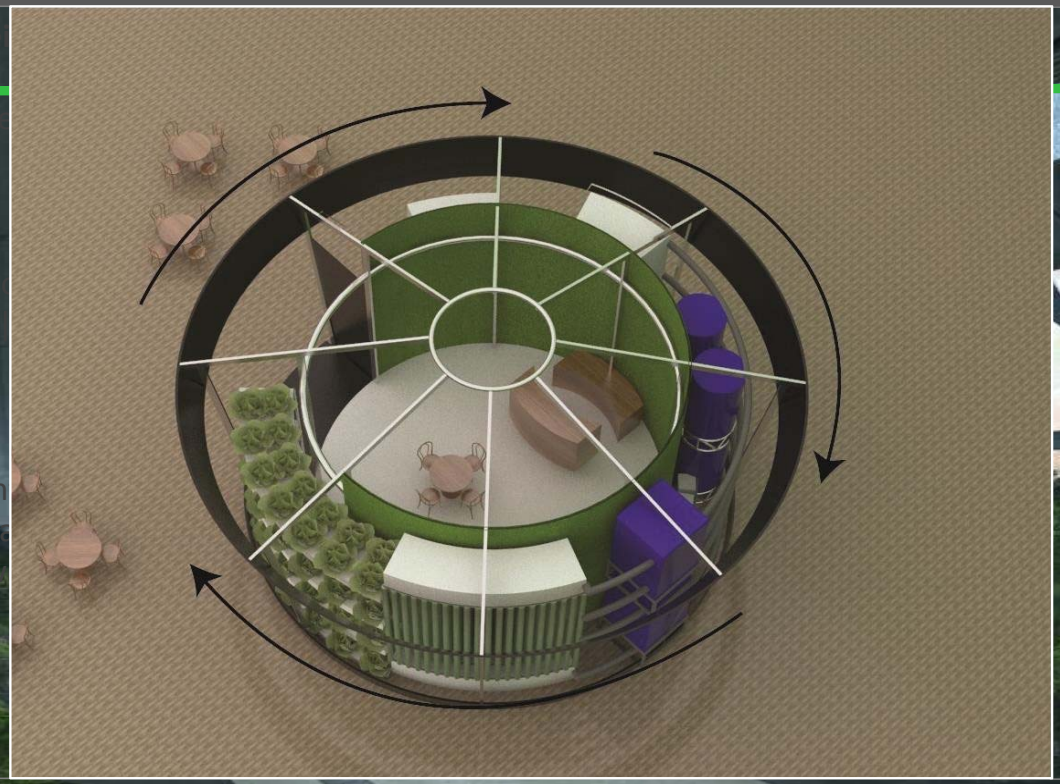
SEMiLLA - Circular Demo, Business and Experience Hub

SEMiLLA

CIRCULAR BUSINESS & EXPERIENCE CENTER

SEMiLLA - Circular Demo, Business and Experience Hub

Proposed functions with cross overs



- **MELiSSA DEMO | Pavilion**
- standalone mobile MELiSSA unit
- Designed to demonstrate the working of the MELiSSA system
- Flexible for placing **at any location**
- **scientifically and politically correct**
- **Design and function** can be **tailored to the** location/building

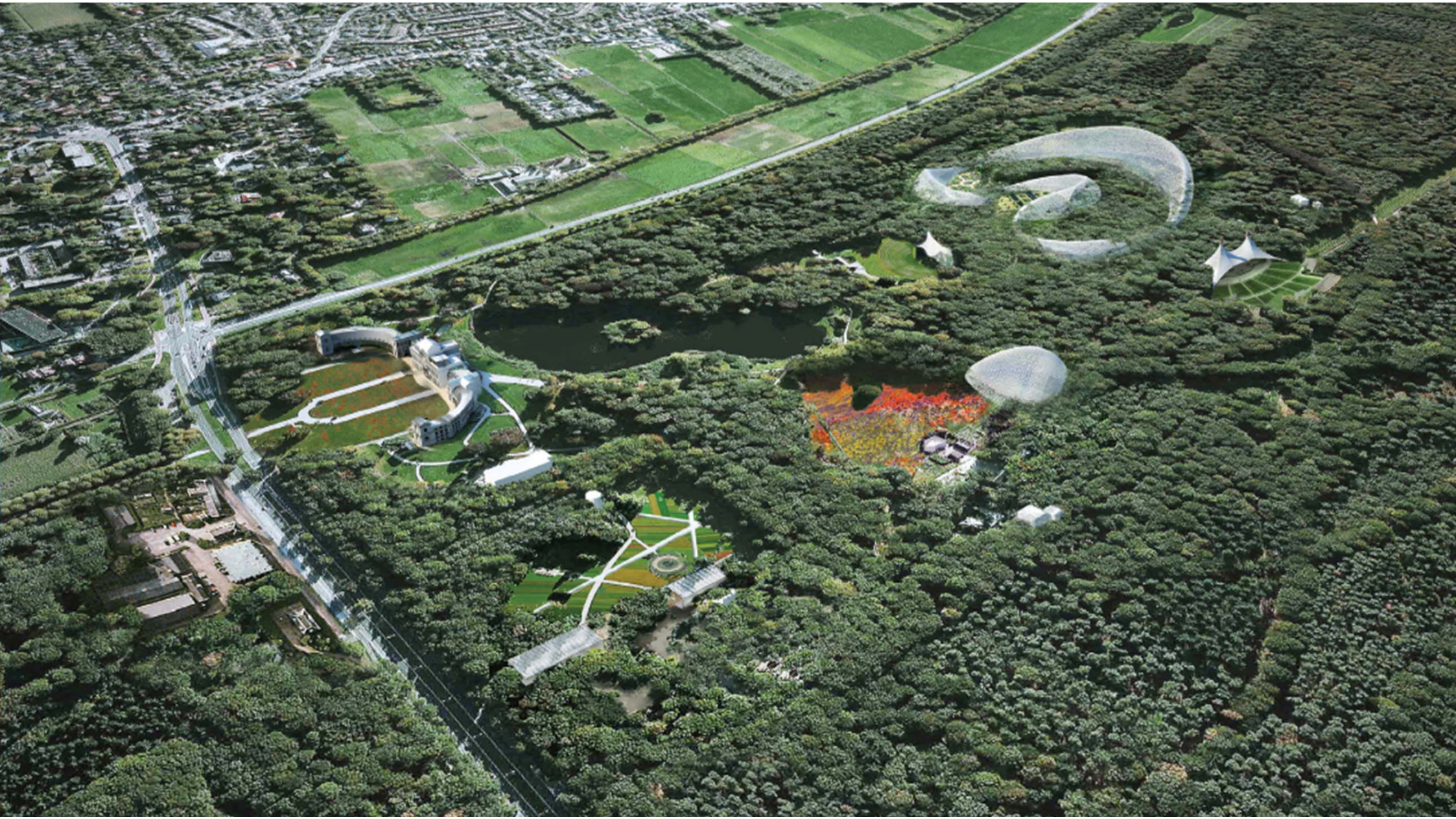
© Roland Berger

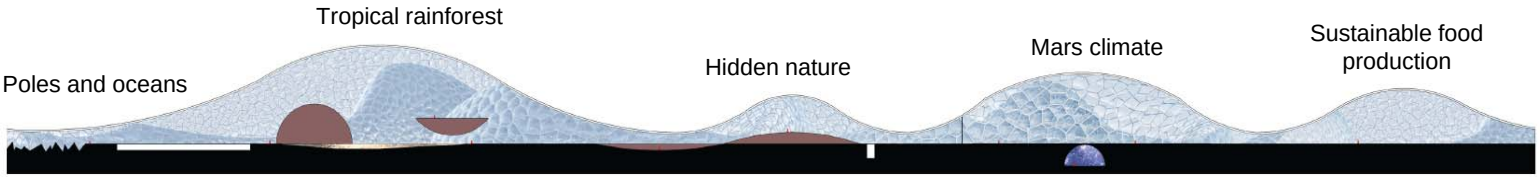
SEMiLLA - Circular Demo, Business and Experience Hub

- The MELiSSA technology will be the driving and unifying factor
- Platform for MELiSSA to showcase its unique relevance for the circular economy
- SEMiLLA will be open to 'external' technology
- Increase interaction between MELiSSA - outside world
- boost reversed tech transfer earth → Space
- generate revenues that benefit MELiSSA and non MELiSSA research

SEMiLLA - Circular Demo, Business and Experience Hub

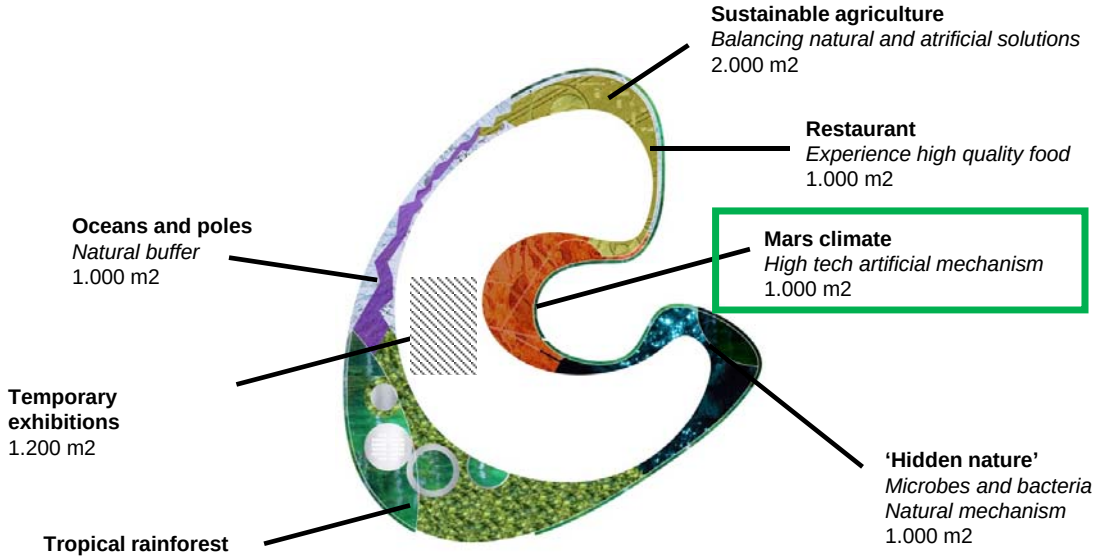
- a circular hotspot: urban planning, (space) technology and design
- a fablab for energy, water and food management of the future
- a meeting place for entrepreneurs, education and science, governments and society





Great stories to tell !!

- **Waste processing**
- **Water recycling**
- **Air recycling**
- **Food production & preparation**
- **Chemical & microbial safety**
- **System tools**



Soestdijk Eden Project

Consortium partners:

- Foundation Eden Soestdijk
- RoyalHaskoning DHV
- Eden Project
- Mecanoo Architects
- Kossmann De Jong
- IPStar BV

Objectives

- redevelopment into international hub for sustainability, science, eco-art, biodiversity and CE
- exhibition centre & business venue
- biodome, resources, demo, mars-habitat
- biobased restaurants
- autarkic hotel & conference centre

MELiSSA incubator Malaga (Spain)

Partners:

- University of Malaga
- IPStar BV
- Parque technologico de Malaga

Objectives

- create MELiSSA incubator
- Lectorate CE
- promote CE studies & startups

MELiSSA incubator Noordwijk (Netherlands)

Partners:

- ESA BIC
- IPStar BV
- 12 incubators across Europe

Objectives

- international dissemination MELiSSA tech
- BIC network as basis for network SEMiLLA Hubs
- create business and startups related to CE

MELiSSA Center of Expertise CE
‘s-Hertogenbosch & Venlo (Netherlands)

Partners:

- HAS University of Applied Sciences
- AVANS
- KW1C
- Helicon
- Agrifood capital
- Grow campus
- IPStar BV

Objectives

- create centre of expertise CE
- lectorate CE
- platform for valorization
- CE study: technology, management studies, communication, finance et cetera.

RegenVillages – Almere (Netherlands)

Partners:

- RegenVillages (USA/NL)
- Stanford University (USA)
- city of Almere
- IPStar BV

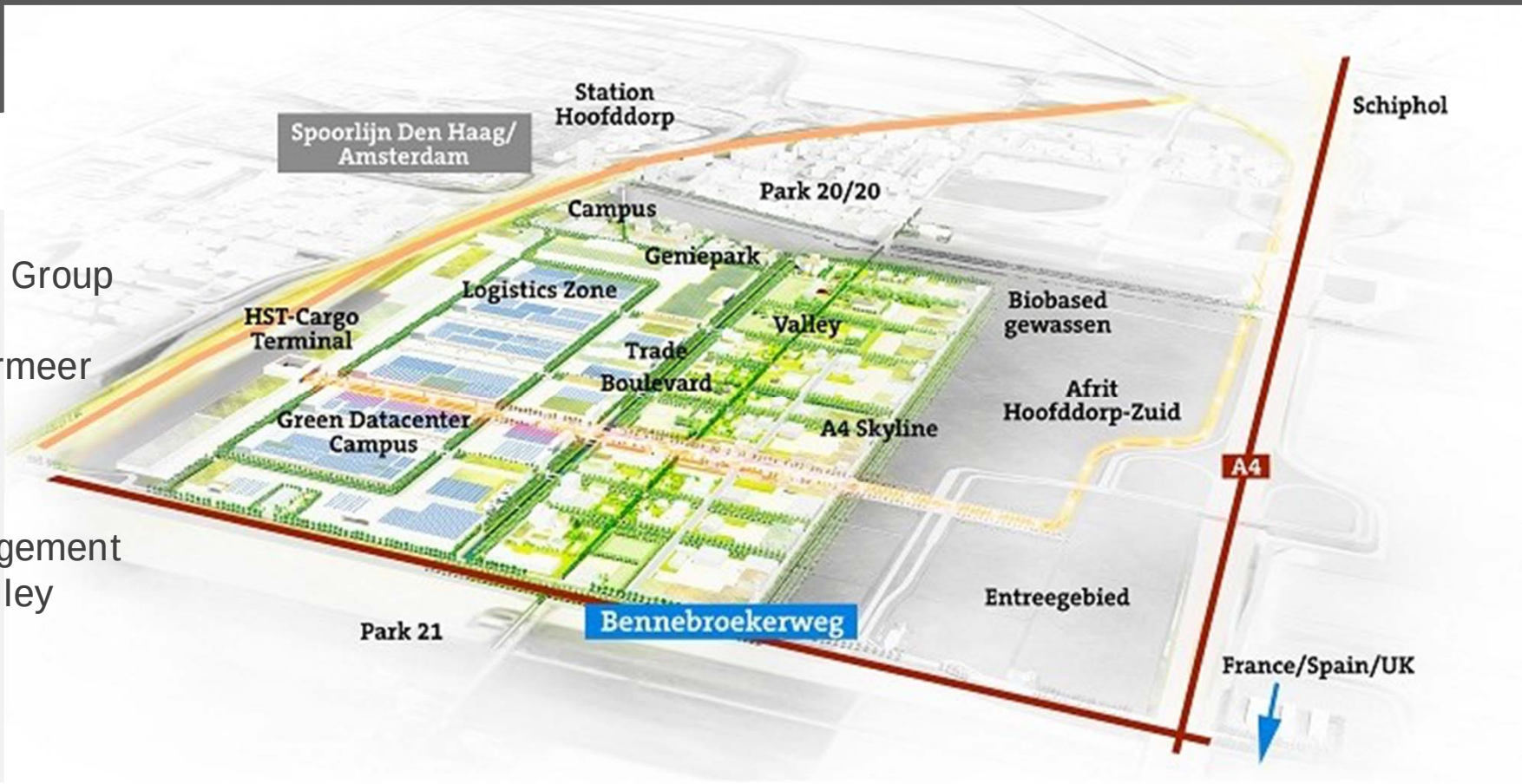
Objectives

- build completely autarkic village
- design blueprint for replication
- for increasing urbanization

The Valley – Schiphol (Netherlands)

Partners:
- Delta Development Group
- SADC
- city of Haarlemmermeer
- IPStar BV

Perspective
- design water management systems for The Valley
- based on MELiSSA
- including recovery nutrients

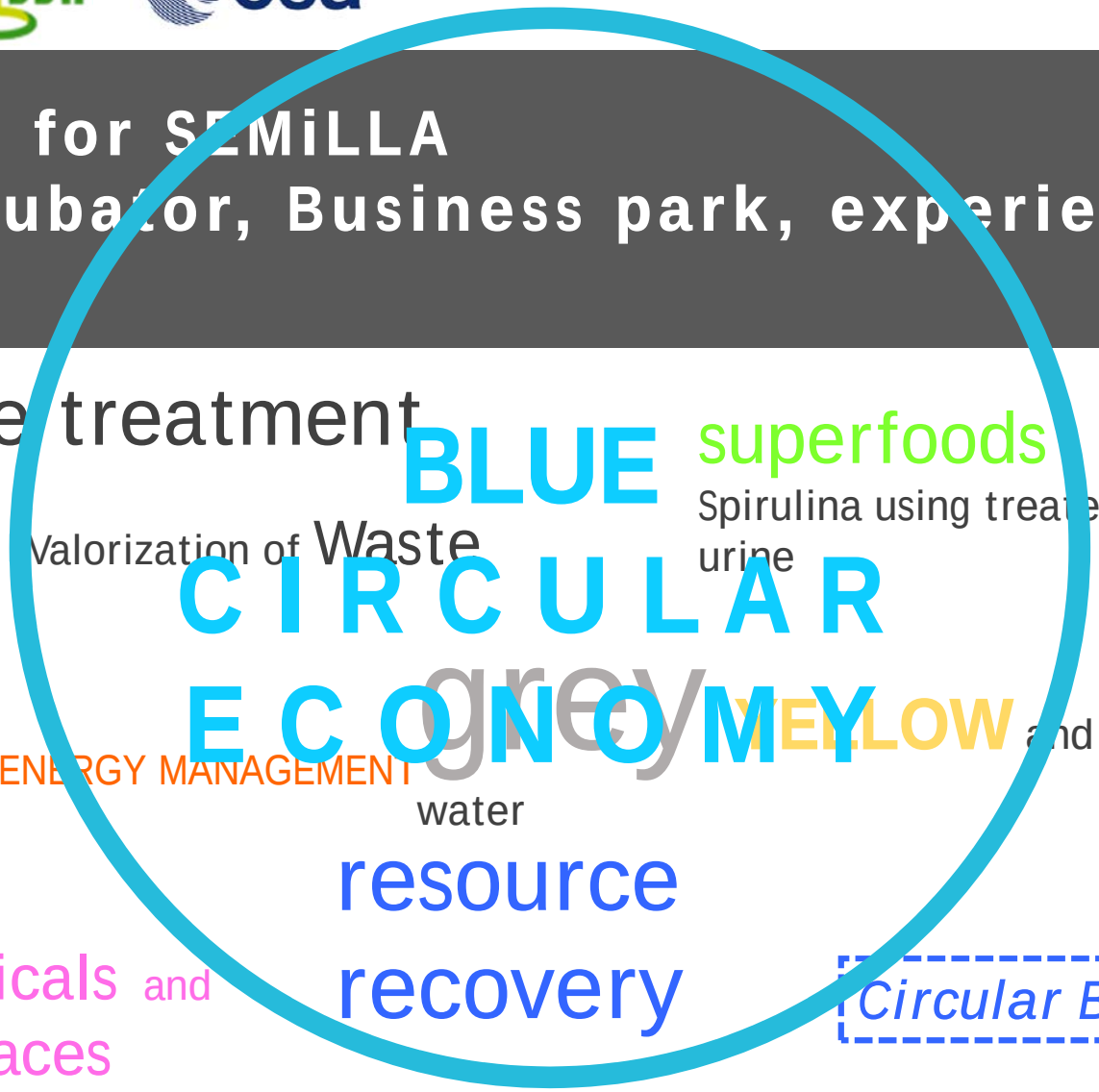


SEMiLLA – FabLab Amsterdam

Partners:
- City of Amsterdam
- IPStar
- Amsterdam Economic Board
- IPStar BV

Objectives
- Create circular economy fablab
- initiate experiments
- attract entrepreurs

Candidates for SEMiLLA
fablab, incubator, Business park, experience hub



manure treatment

BLUE

superfoods

Spirulina using treated urine

INTERNET of things

Valorization of Waste

CIRCULAR

3D printing

grey

ECONOMY

YELLOW and **black**

advanced

Algae

production technology

urban farming

ENERGY MANAGEMENT

water

resource recovery

removal of pharmaceuticals and hormonal traces

Circular Business Models

Network & Partners

MELiSSA Community
ESA
MELiSSA Foundation
City of Noordwijk
City of Amsterdam
City of Athens
City of Barcelona
City of Den Bosch
Circle Economy
Ellen MacArthur Foundation
Metabolic
Witteveen+Bos
Angelo Vermeulen

HAS Uni of Applied Sciences
Koning Willem I College
Water Board Dommel
Water Board Hoogheemraadschap
Waternet
Space Business Park
ESA Incubator
Roland Berger
Groen Agro Control
NedLaw
Susana
Delta Development Group
ZLTO
ESA Space Business Park

Agrifood Capital
Grow Campus
Brightlands / Chemelot
BioTreat Centre (Innovatoren)
Firmus Membranes
Holland Innovative
RVO
ESTEE S.A.
Amsterdam Economic Board
Triarii BV
TNO
Ben van den Burg (TripleP)
AgriLIfe
Tech2Market

We must and we can


So why not JOIN us?
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Circling (or spiralling?) into the future

Thank you

IPStar BV

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