Datacenters verweven in circulaire gebiedsontwikkeling

Stijn de Kruijf

Merging of Data centres in Circular Area Developments

Royal HaskoningDHV

Leading international engineering and project management consultancy company

- Expertise and experience of 6,500 colleagues in over 150 countries
- Top 50 independently owned engineering companies worldwide
- Leadership in sustainability and innovation
- Turnover € 650 million

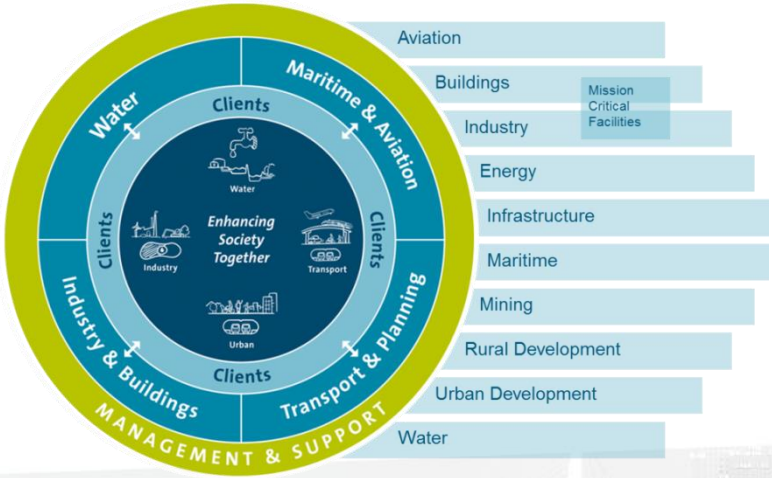
Stijn de Kruijf MSc

42 years

Royal HaskoningDHV since 1997

Mission Critical Design Engineer

Data Centre Facilities



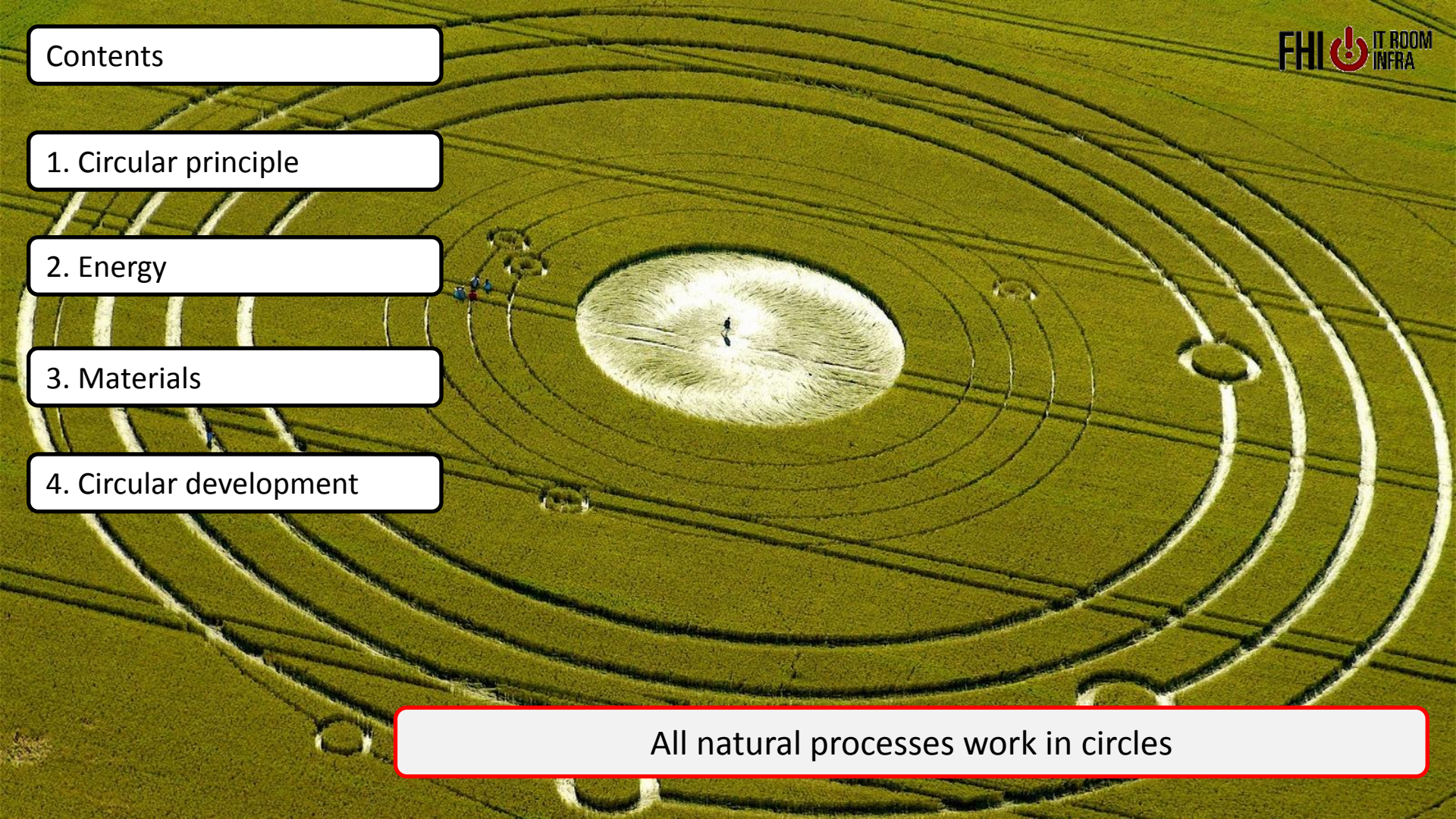
Contents

1. Circular principle

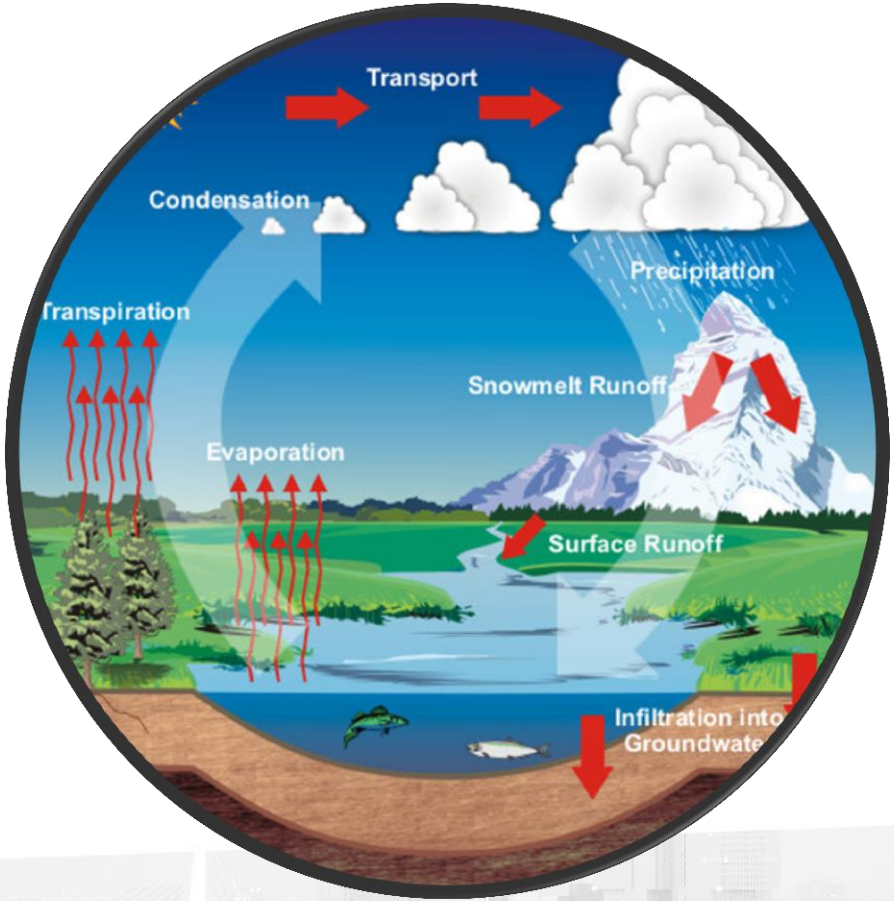
2. Energy

3. Materials

4. Circular development

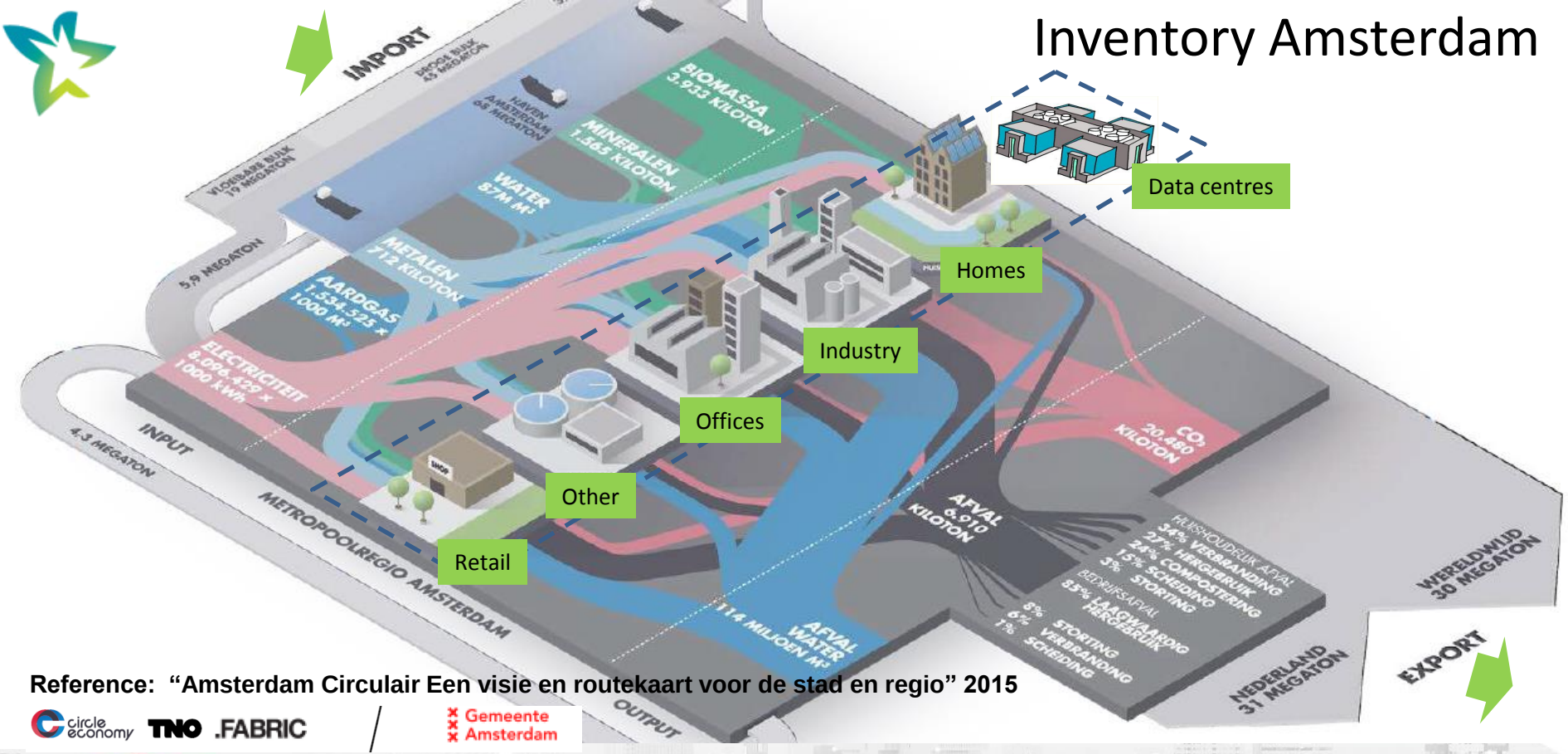


All natural processes work in circles



Learning from nature

Inventory Amsterdam



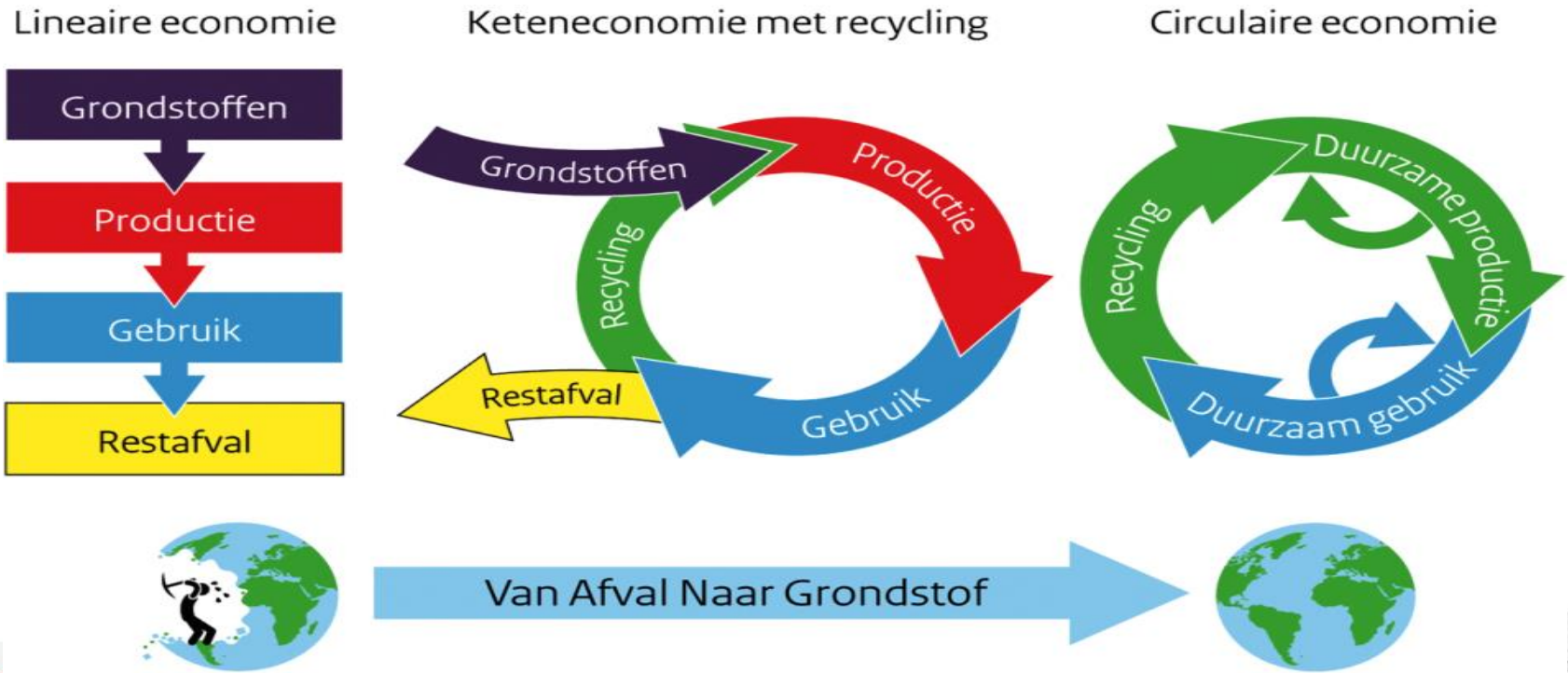
Reference: "Amsterdam Circulair Een visie en routekaart voor de stad en regio" 2015

circle economy TNO .FABRIC / Gemeente Amsterdam

IT ROOM INFRA

Conclusion: Bulk processes Amsterdam region are linear

From linear to circular



Closing chains

Data centres make it possible…..

Connected Plane
40 TB per day (0.1% transmitted)

Connected Factory
1 PB per day (0.2% transmitted)

Public Safety
50 PB per day (<0.1% transmitted)

Weather Sensors
10 MB per day (5% transmitted)

Intelligent Building
250 GB per day (1% transmitted)

Smart Hospital
3 TB per day (0.1% transmitted)

Smart Car
50 GB per day (0.1% transmitted)

Smart Grid
5 GB per day (1% transmitted)

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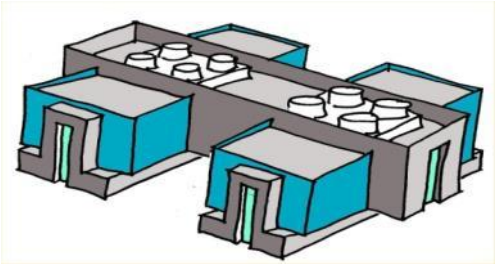
Source: Cisco Global Cloud Index, 2014–2019

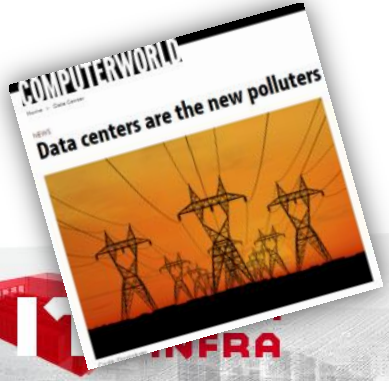
….but are big consumers…

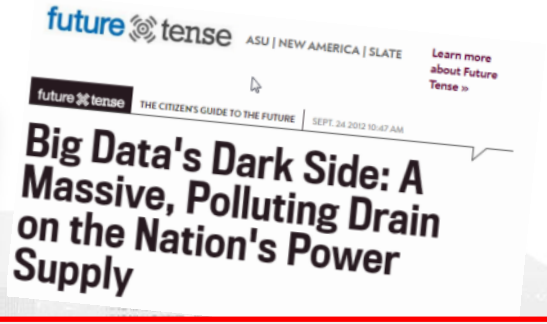


Electricity

Data centre

Waste heat





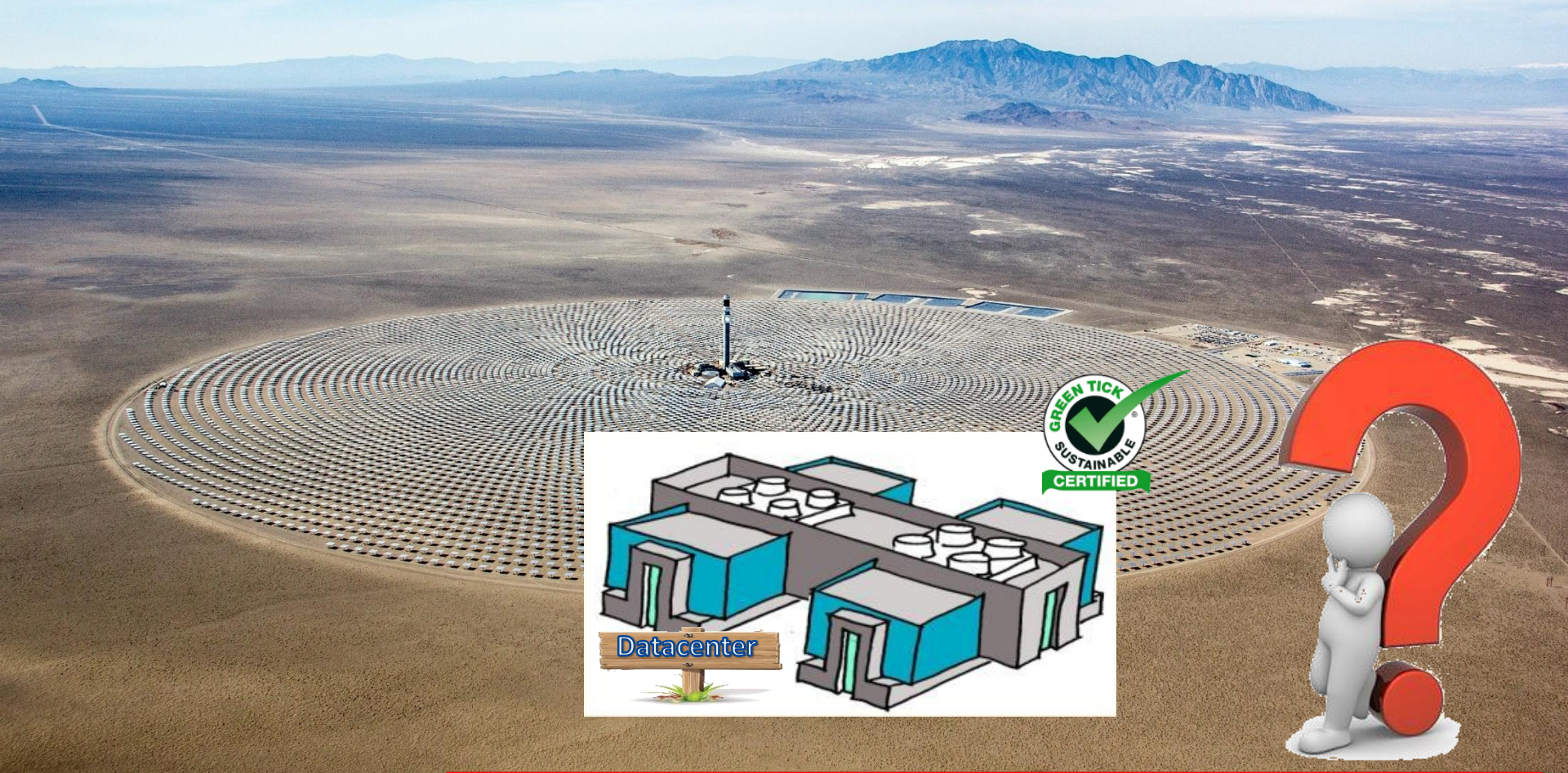
Linear energy flow

Energy:
Enough potential sustainable energy

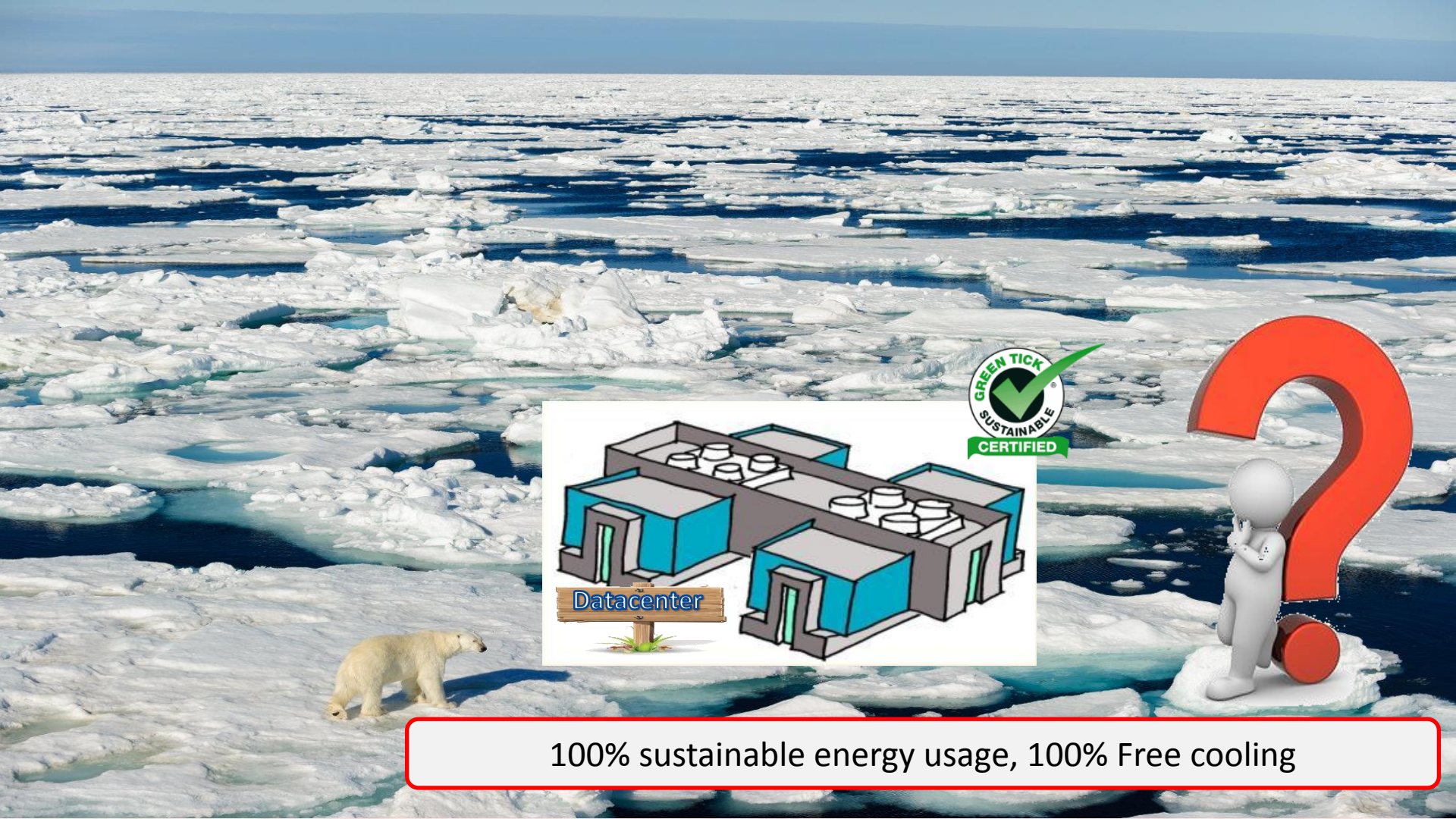
The SUN delivers 10.000 times the energy we need

Solar power: We need area equal to Spain

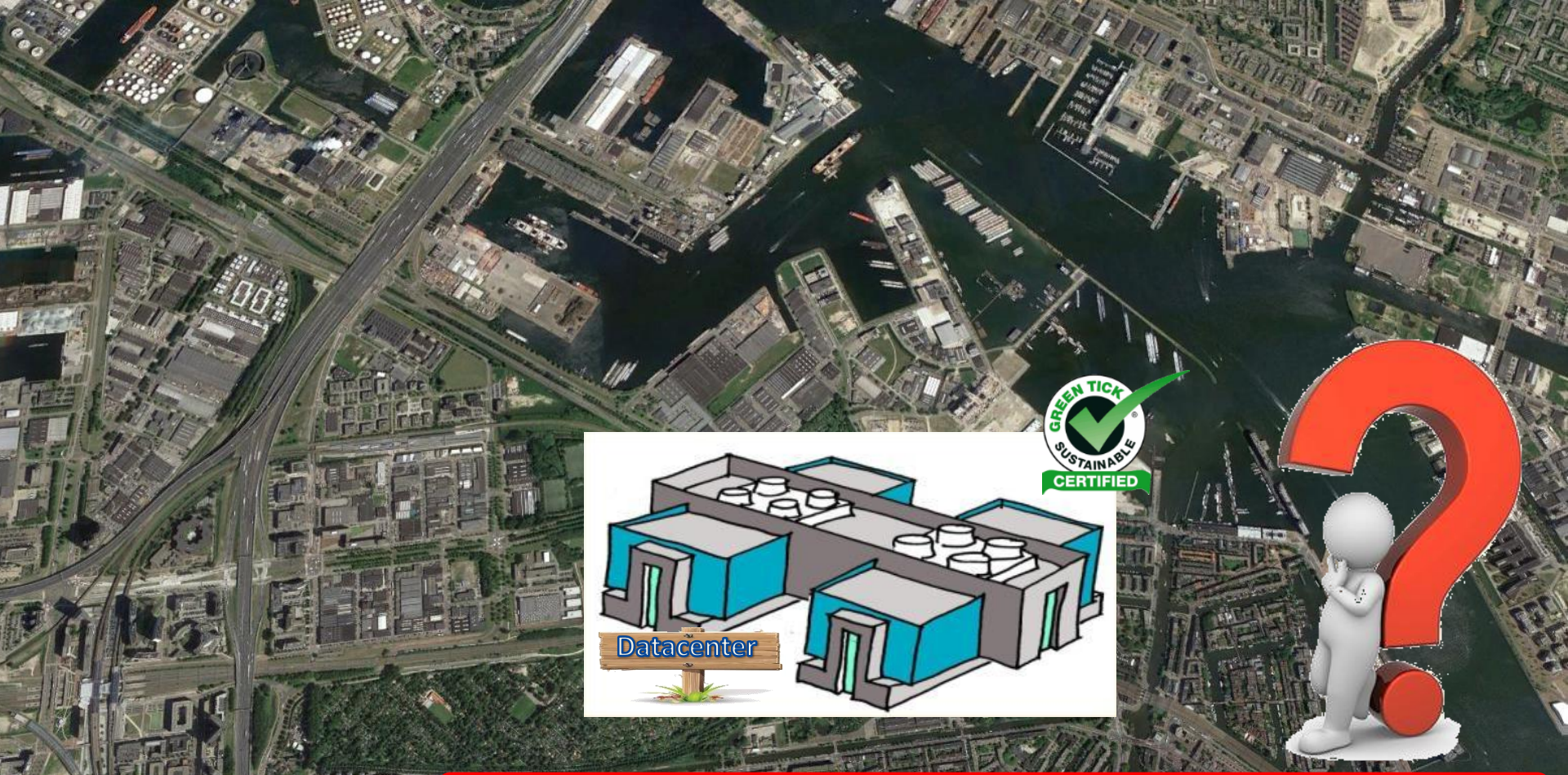
All processes relate to our Sun



100% sustainable energy usage



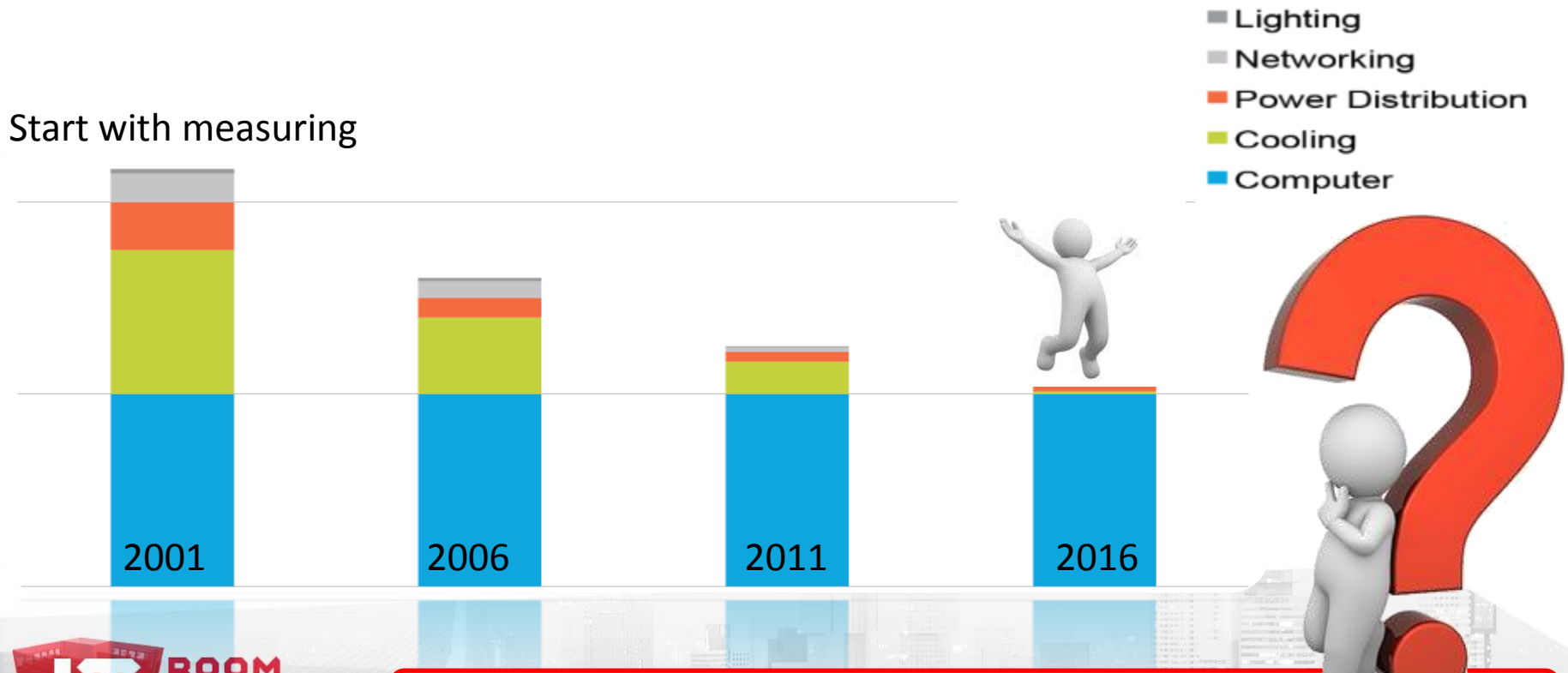
100% sustainable energy usage, 100% Free cooling



100% sustainable energy usage, Circular Economy

Minimizing PUE the ultimate goal?

Start with measuring



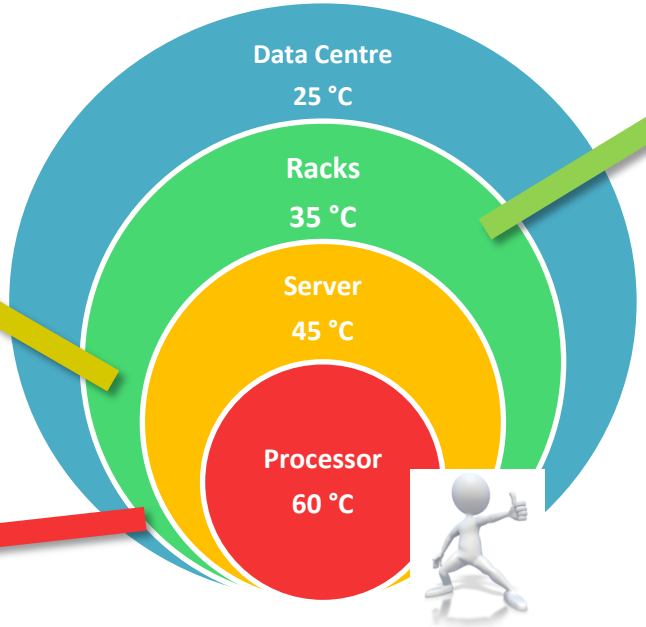
Efficient energy destruction

Or better giving back to the ecosystem

Greenhouse

Industry

Tapwater

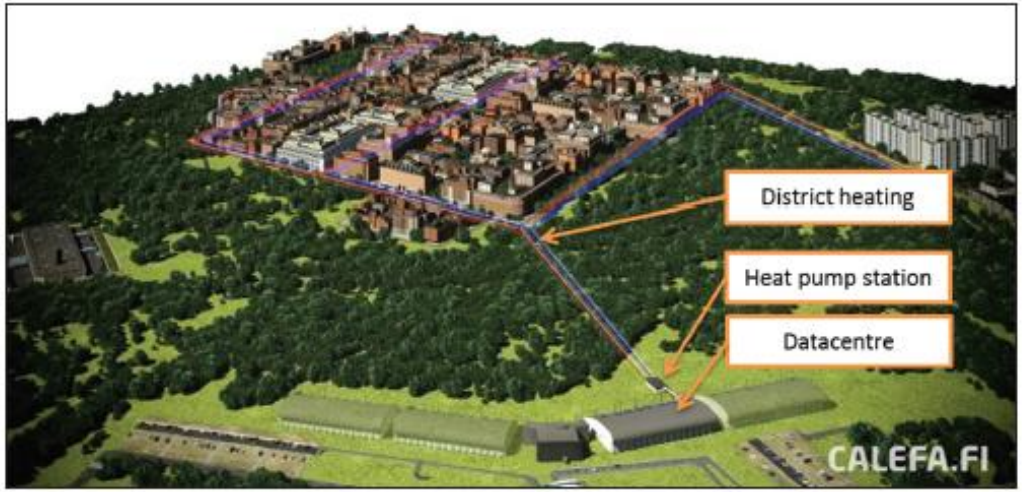


Houses

Pool

Harvest the heat at higher temperature

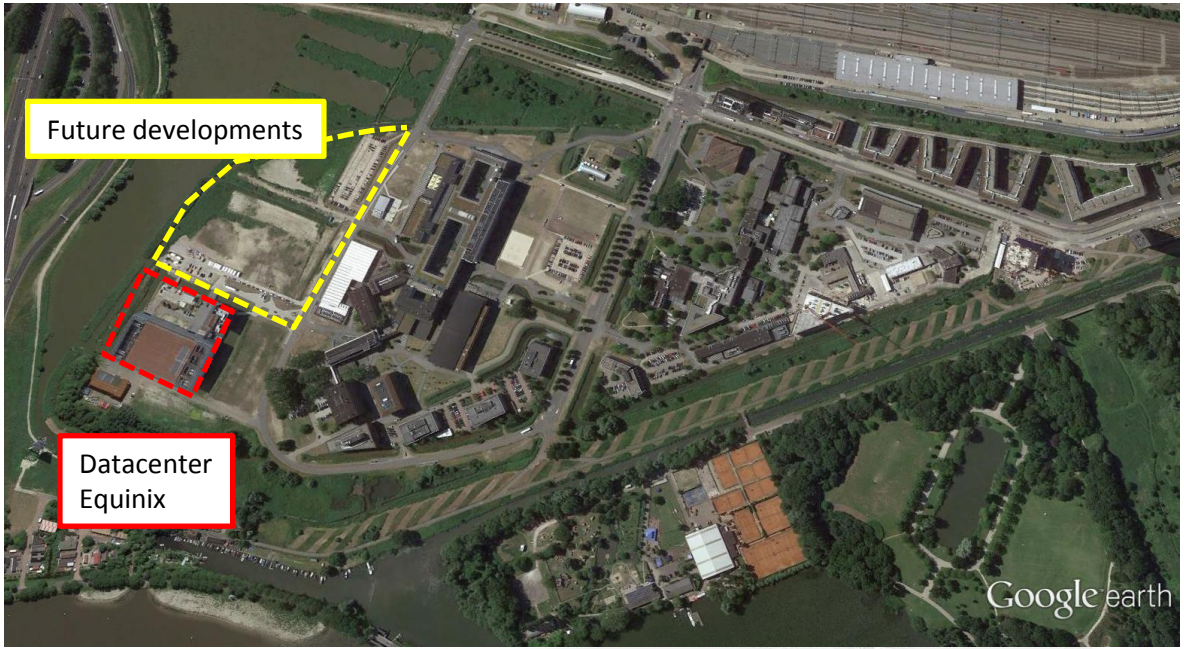
Yandex datacenter (Finland)



Delivering the heat to the district heating network

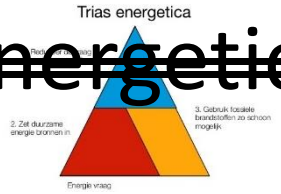
Science Park Amsterdam + Equinix Datacentre

Current:
Data centre regenerates the hot wells of the University of Amsterdam



Municipality and University to area development to opt for neighbours with low temperature heating systems

Trias ~~energetica~~ exergetica?



1. Give back my exergy flow!

2. Adding additional energy to enable re-use possibilities

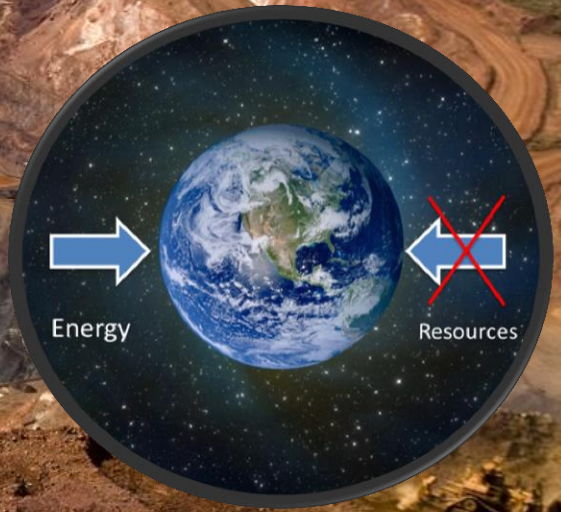
3. Efficient destruction of my exergy output

A concept based on borrowing energy instead of consuming

Materials:
Our resources are limited

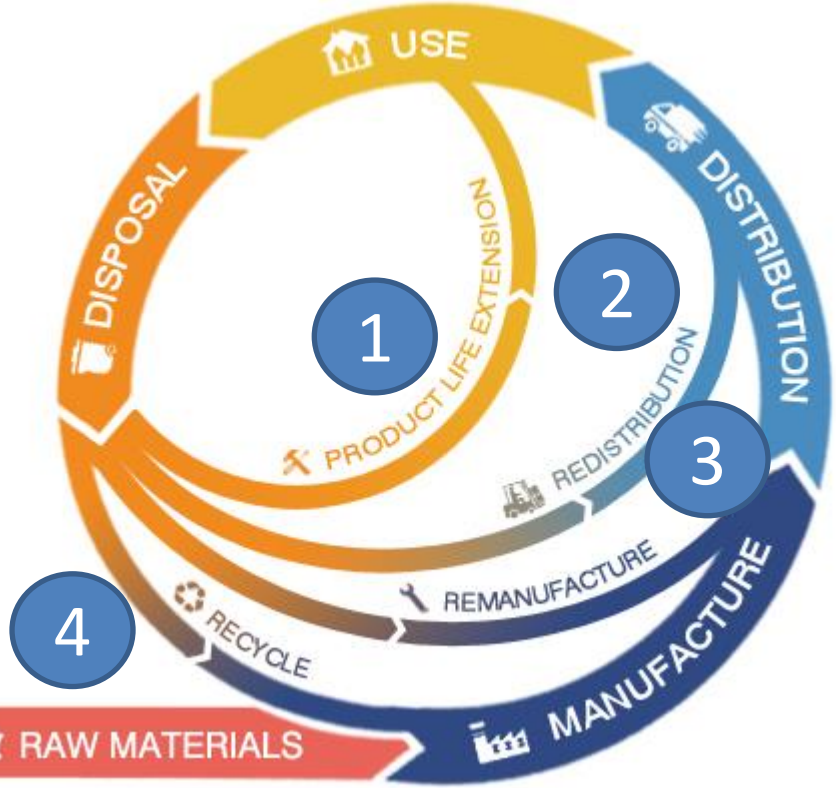
GOOGLE GOES GREENER THAN EVER WITH NEW PROMISES FOR ZERO-WASTE DATA CENTERS

By **Lulu Chang** — September 14, 2016 7:50 PM



We have do work with what we have on earth

Materials Life Cycle



Different ways of closing the ring

DC Materials output ('Waste')

- **IT equipment**
- **Data centre infrastructure**
- **Building**
- Wood
- Metal
- Paper Cardboard
- General waste
- (Chemical waste)

How big is my (waste) output

It starts with measuring

Building

Plan for future destination of building

Battery

Plan for future use

Other ideas and Best Practices

- 2nd life Generator after sustainable rebuild
- Extend lifetime CRAH by replacing fans for efficient fan section
- ….

Plan for future use

Encourage Circular datacenter thinking

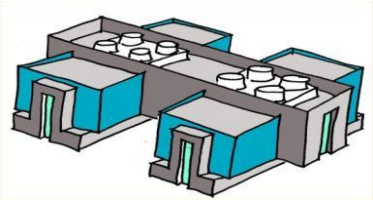
CE-Marktplaats.nl

No Waste!!

Who are possible users of my output?

Raw materials

Input



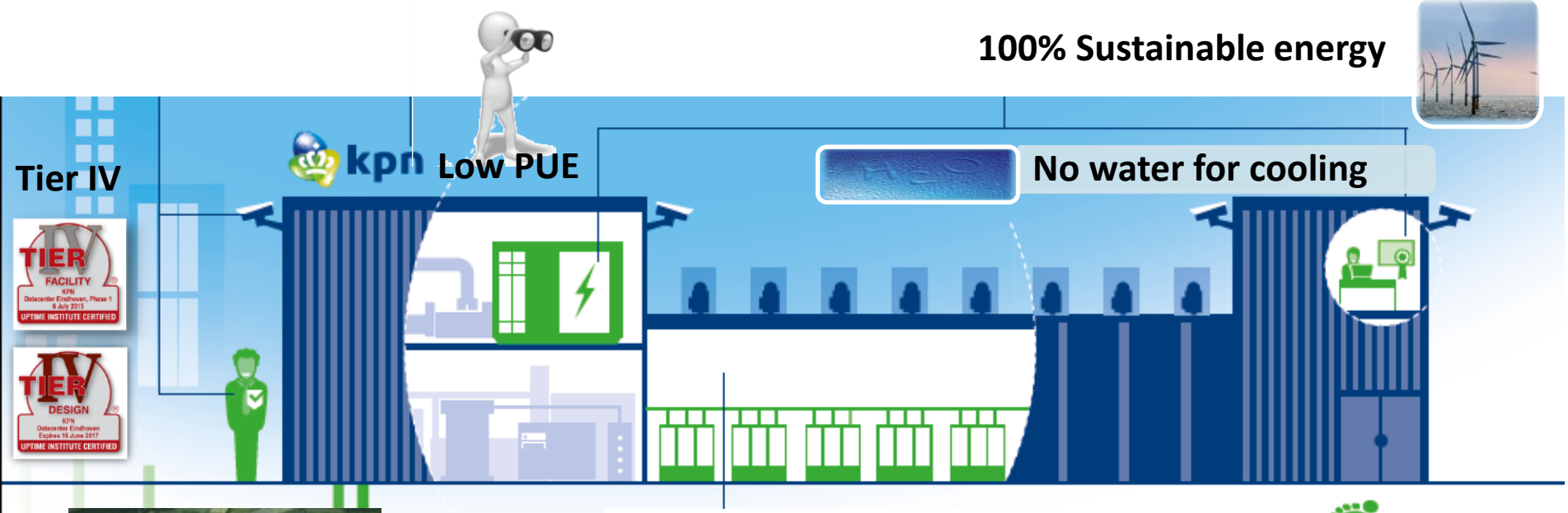
Output

Waste

Data centre

I want to use my materials & systems longer

High Tech Campus Eindhoven + KPN Datacenter



Smart-grid

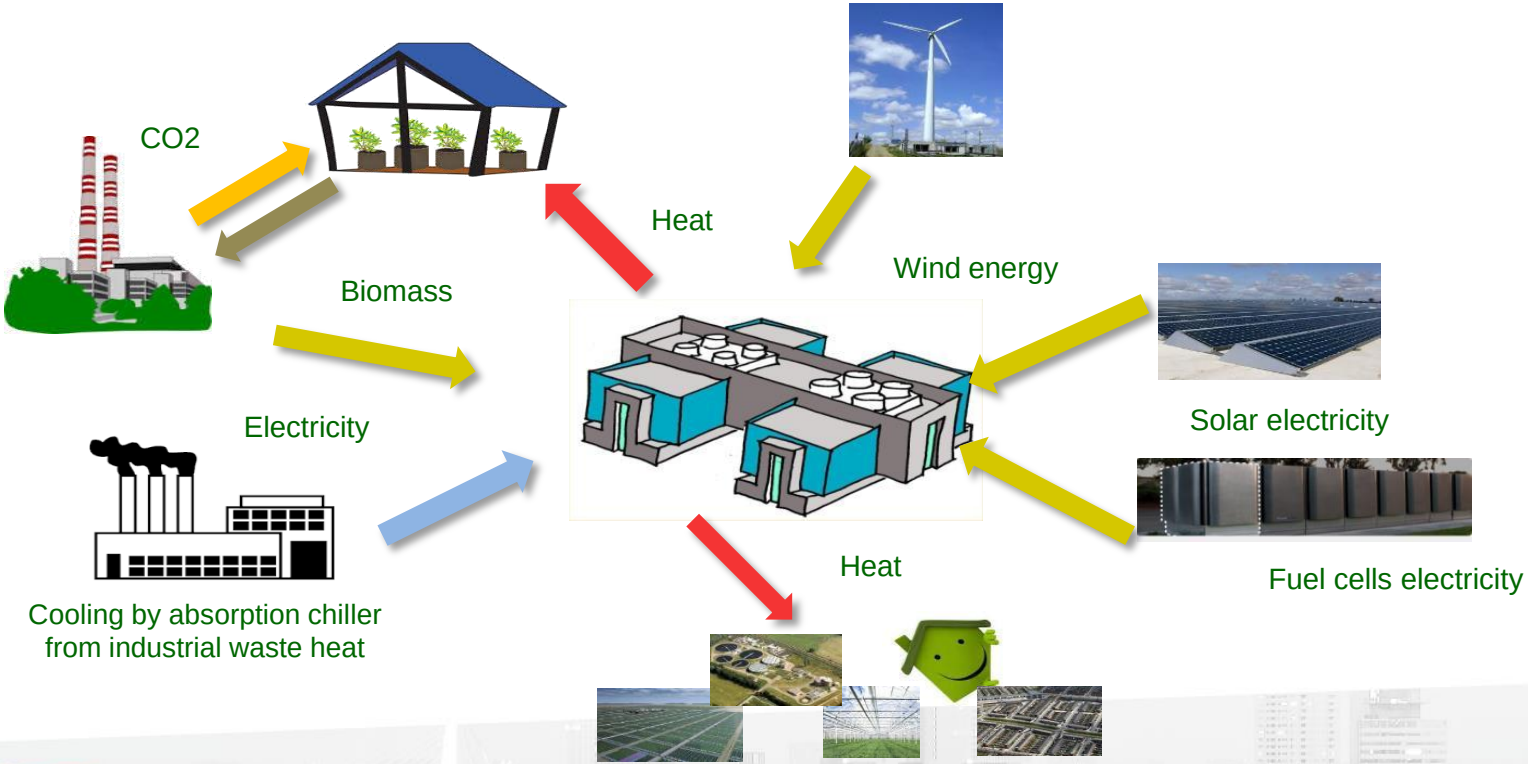
Building
Fit for alternative use

CIRCULAR AREA DEVELOPMENT

Circular area development

- Continuous try, learn, challenge and share experiences:
  - High tech campus Eindhoven
  - Science park Amsterdam
  - Agriport A7
  - Schiphol circular area
  - … and more

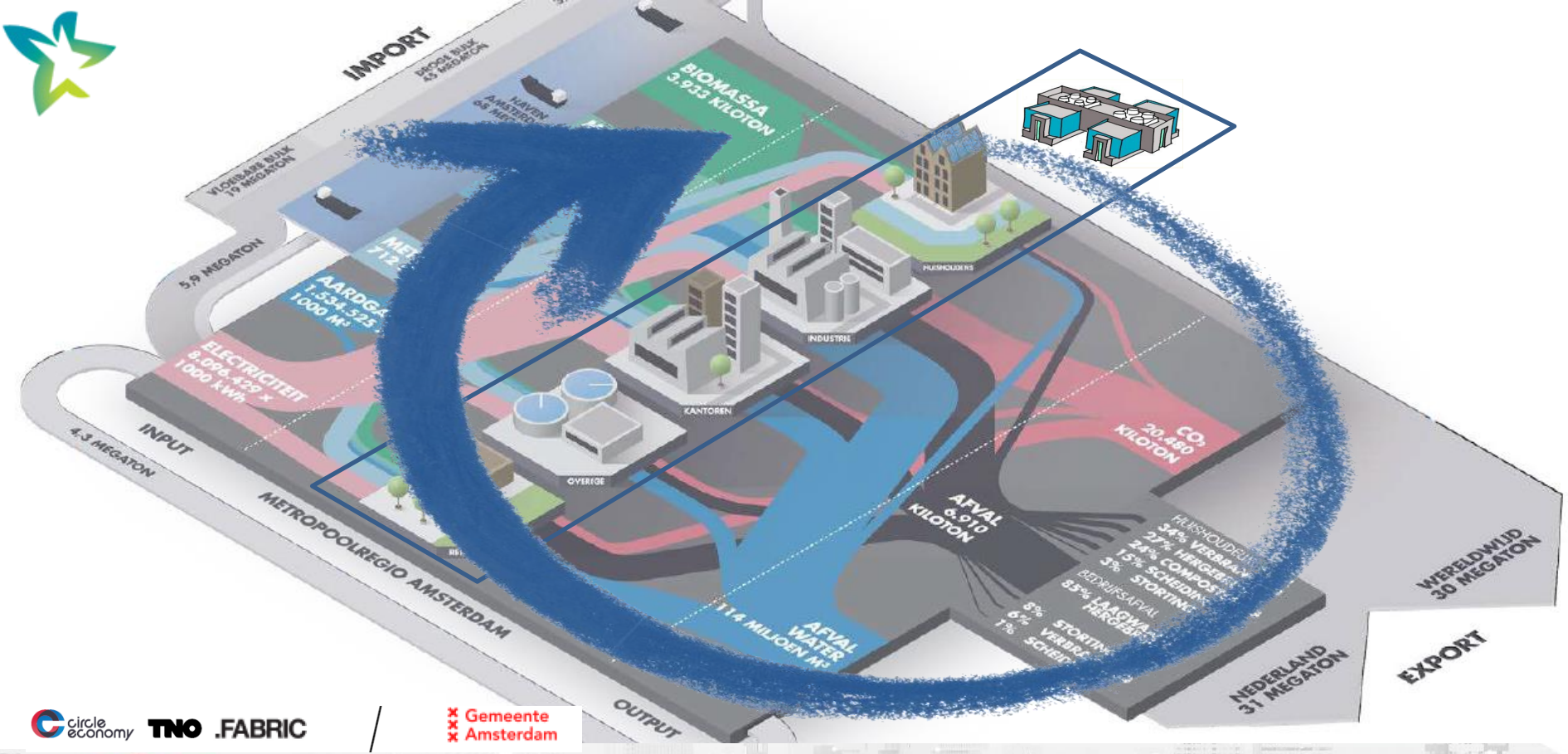
Merging Data centres in circular developments



Mixing business contributes the circular approach

Success factors

- Circular thinking in **Energy & Materials**
- Start with **Measuring and Transparency**
- **Pass through Exergy** > **Energy use & destruction**
- Encourage **circular entrepreneurship**
- **Mixing businesses** in area developments
- Continuous **Try, Learn, Challenge and Share experiences**



circle economy TNO .FABRIC

Gemeente Amsterdam

IT ROOM INFRA

All stakeholders to participate!

Merge every data centre in its ecosystem

We are ready for the challenge
and invite all stakeholders to participate

Time for Discussion

Royal HaskoningDHV
Enhancing Society Together

FHI IT ROOM INFRA

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