ZeroWIN - Towards Zero Waste in Industrial Networks

Circular Economy & Industrial Networks

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Circular Economy & Industrial Networks
ZeroWIN Dissemination Event
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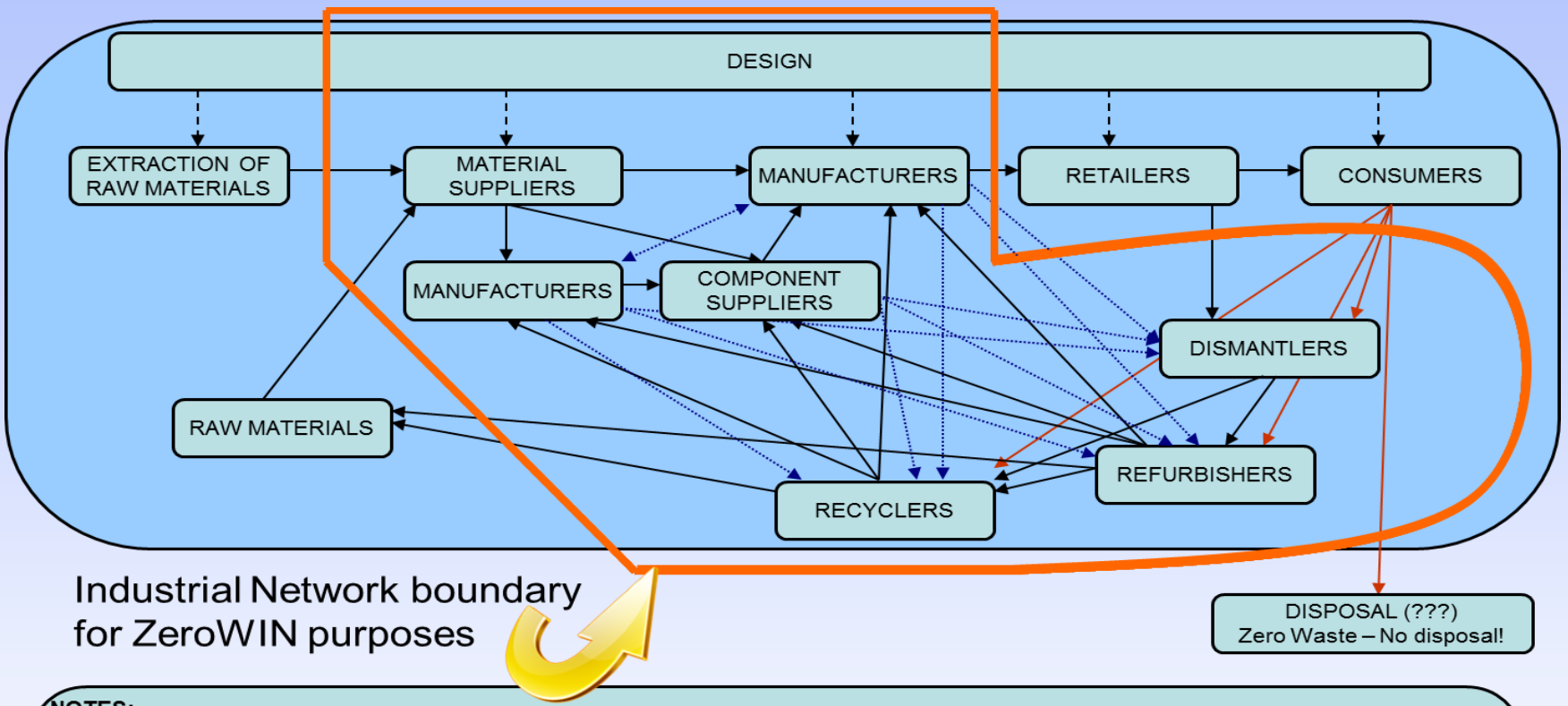
Content

- Defining an industrial network
- General approach building an industrial network
- ZeroWIN industrial networks
- Results achieved
- Lessons learned

Industrial Networks (IN)

- No universal definition of an IN
- IN depend on a number of factors including:
  - Ad hoc purpose of industries in the network and nearby
  - Local natural conditions: opportunities and constraints (e.g. proximity to water supply);
  - Economic valuation of location; affected by other factors, including local infrastructure, proximity to skilled labour, transport links, distance to markets and materials suppliers
  - Ethos and drive of key entrepreneurs in the network
  - Influence of political will; via taxes levied and the environmental standards enforced.
- IN is a network of industrial companies (minimum three entities), which cooperate with each other on the basis of resources exchange

ZeroWIN Scope and Boundary



NOTES:

- The diagram represents a network of potentially diverse industries working together in symbiosis.
- The transport associated with material, product and waste flows are implied within the arrows.
- 'Manufacturers' is taken to include construction activities (something is produced).
- 'Dismantlers' is taken to include Materials Recycling Facilities, demolition activities and automotive dismantling activities.
- 'Refurbishers' is taken to include remanufacture, re-use and repair activities.
- 'Manufacturers' appears twice, to represent those that make individual/basic products and those that integrate materials, components and other products to create more complex products or services, for example construction sites and the automotive industry.
- Manufacturers produce final products but they also create waste materials/sub-products that shall be considered (blue dotted arrows).
- IPR/take-back scheme flows are not indicated to avoid confusion, but they are expected.
- Red arrows indicate downstream, post-consumer flows.

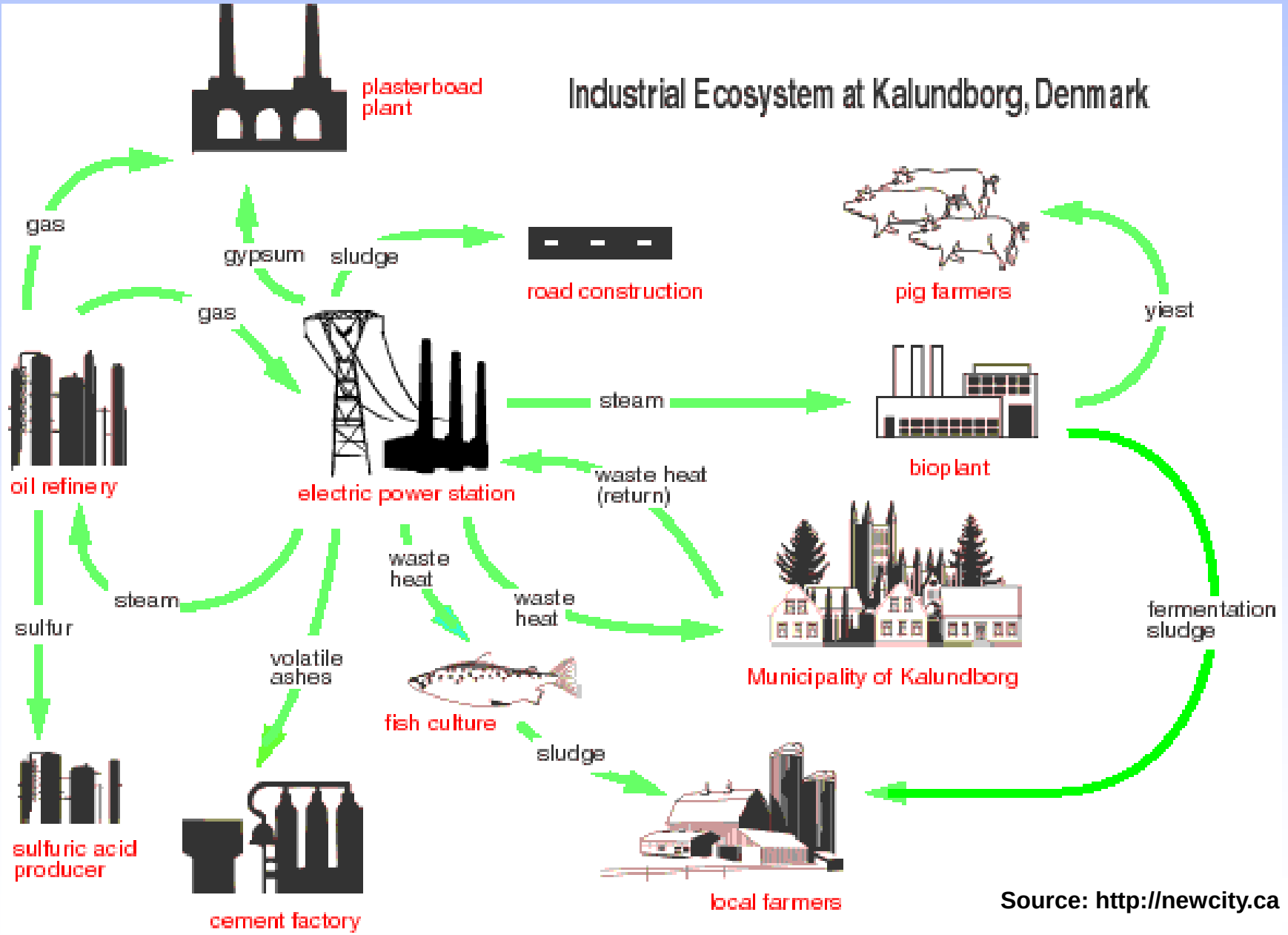
ZeroWIN Industrial Networks

- CS1: prototype of a D4R laptop
- CS2: prototype of a D4R photovoltaic system
- CS3: regional ReUse network for ICT products around Berlin
- CS4 & CS5: new construction projects in the UK and Portugal
- CS6: the refurbishment and new construction projects in Germany
- CS7 & CS8: demolition projects of End-of-Life buildings in UK and Portugal
- CS9: the automotive case study in Germany
- CS10: Business to Business (B2B) EEE Industrial Network

ZeroWIN Case studies – concept development

Resource exchange based on a “by-product” concept

Industrial Symbiosis in Kalundborg, Denmark



Source: http://newcity.ca

Objectives of ZeroWIN industrial networks

WP3
Waste Prevention
Methodologies
and Strategies

WP4
Analysis of
system tools

WP5
Production
model

WP2
IPR & Reuse

WP8 Policy
analysis

WP1
ZeroWIN
Vision

WP6A
ZeroWIN Case
Studies concepts

WP9 Dissemination

WP7 Quantitative assessmet

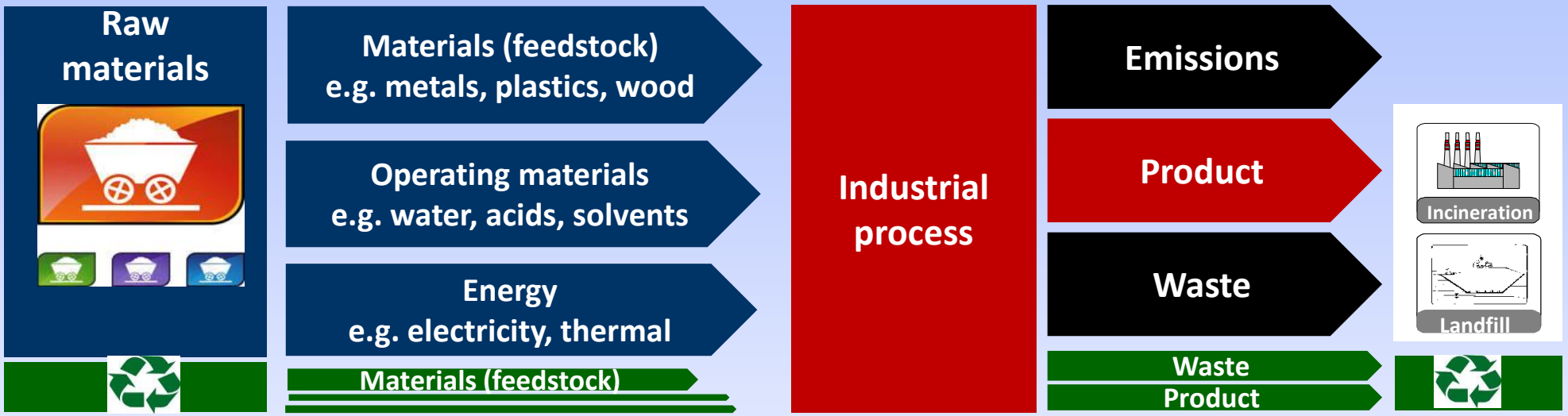
WP6B Concepts verification & implementation



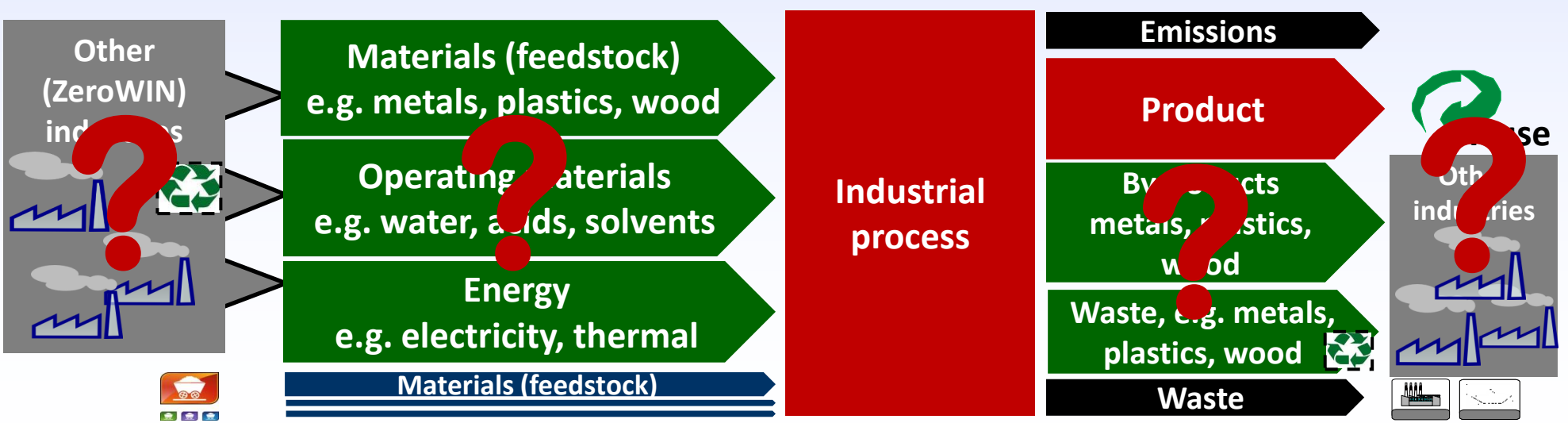


Transformation of the industry

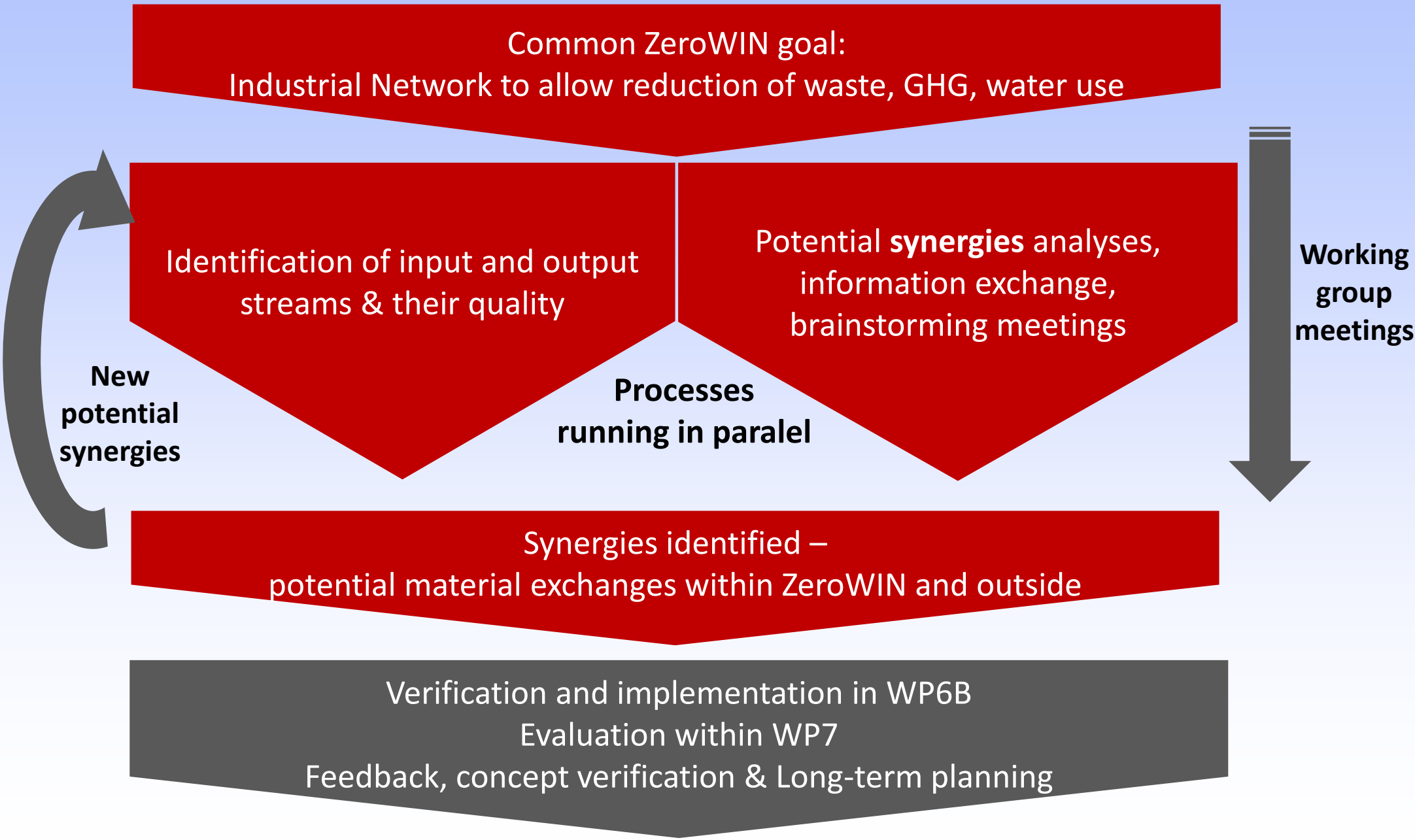
Current resource balance



ZeroWIN case studies



ZeroWIN network development

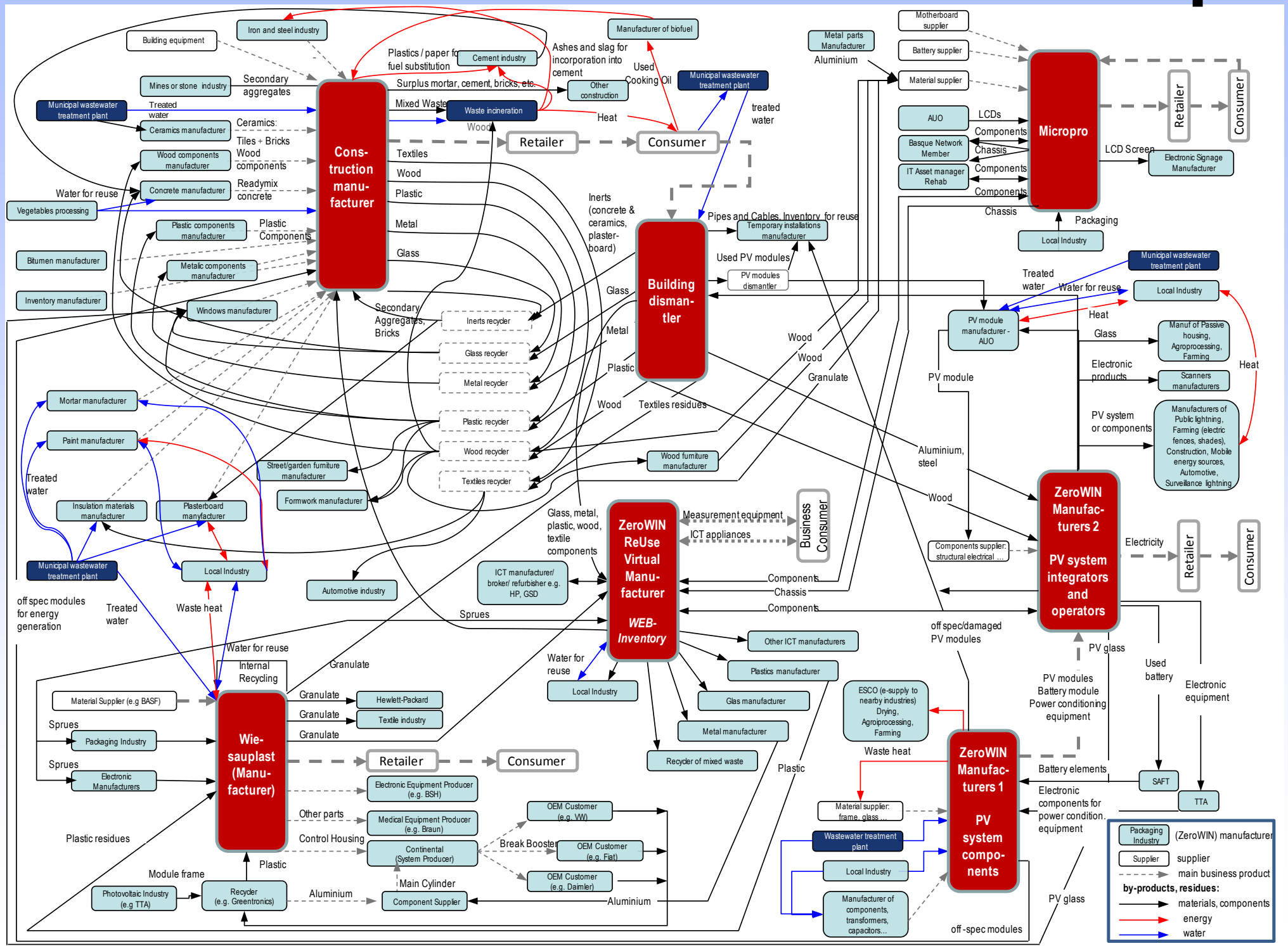


Identyfying industrial networks

- **Identification of industries in the region (proximity)**
  - Regional industrial databases
  - Use of existing business asscociations
  - Regional industrial networking workshops
  - Data from municipal authorities e.g. waste generation,
    waste management plans
- **Waste Exchange sites**
- **Industrial Symbioses databases, e.g.**
  - Global Synergy Database Centre for Sustainable Resource
  - The National Industrial Symbiosis Programme (UK)

The role of a facilitator

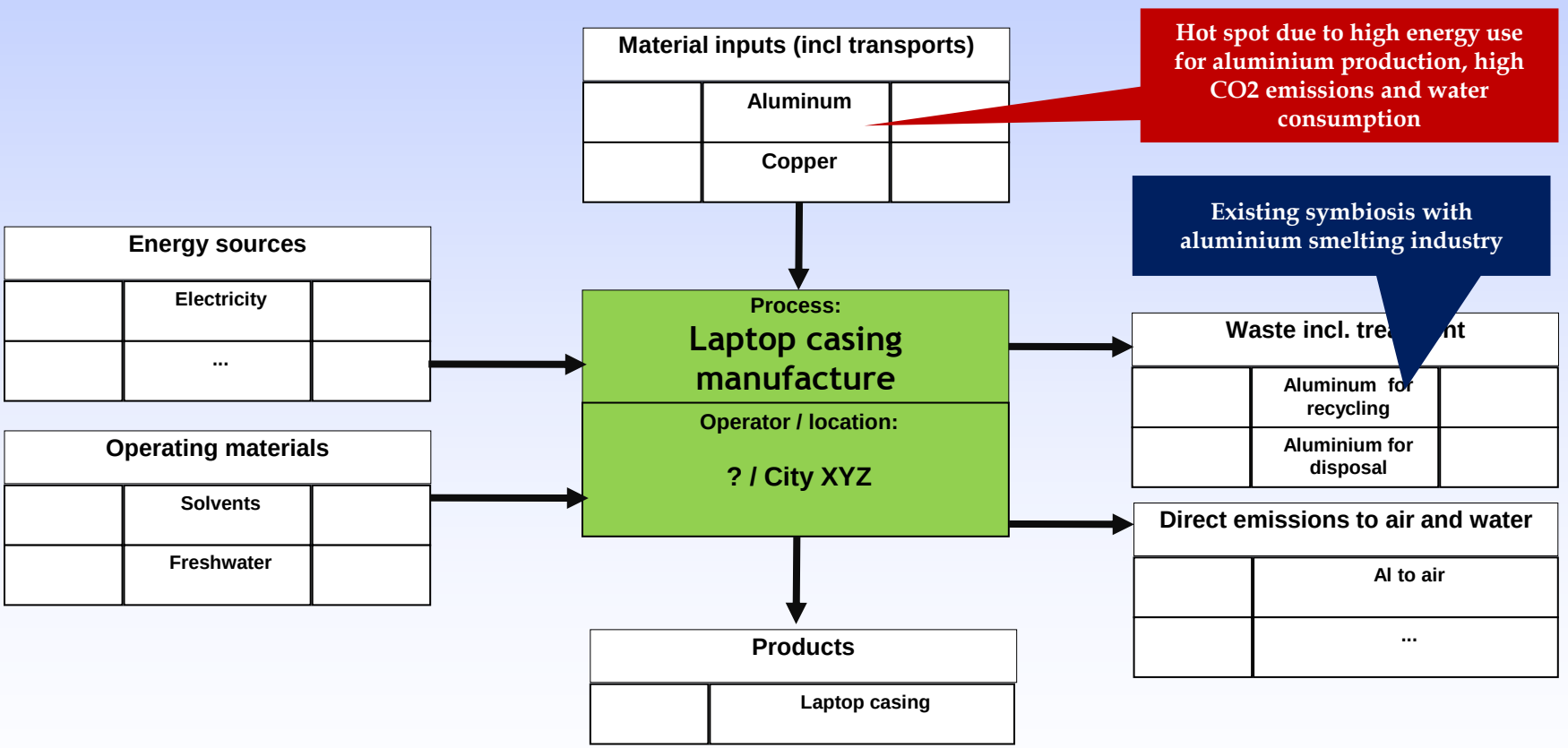
ZeroWIN Industrial Network concept



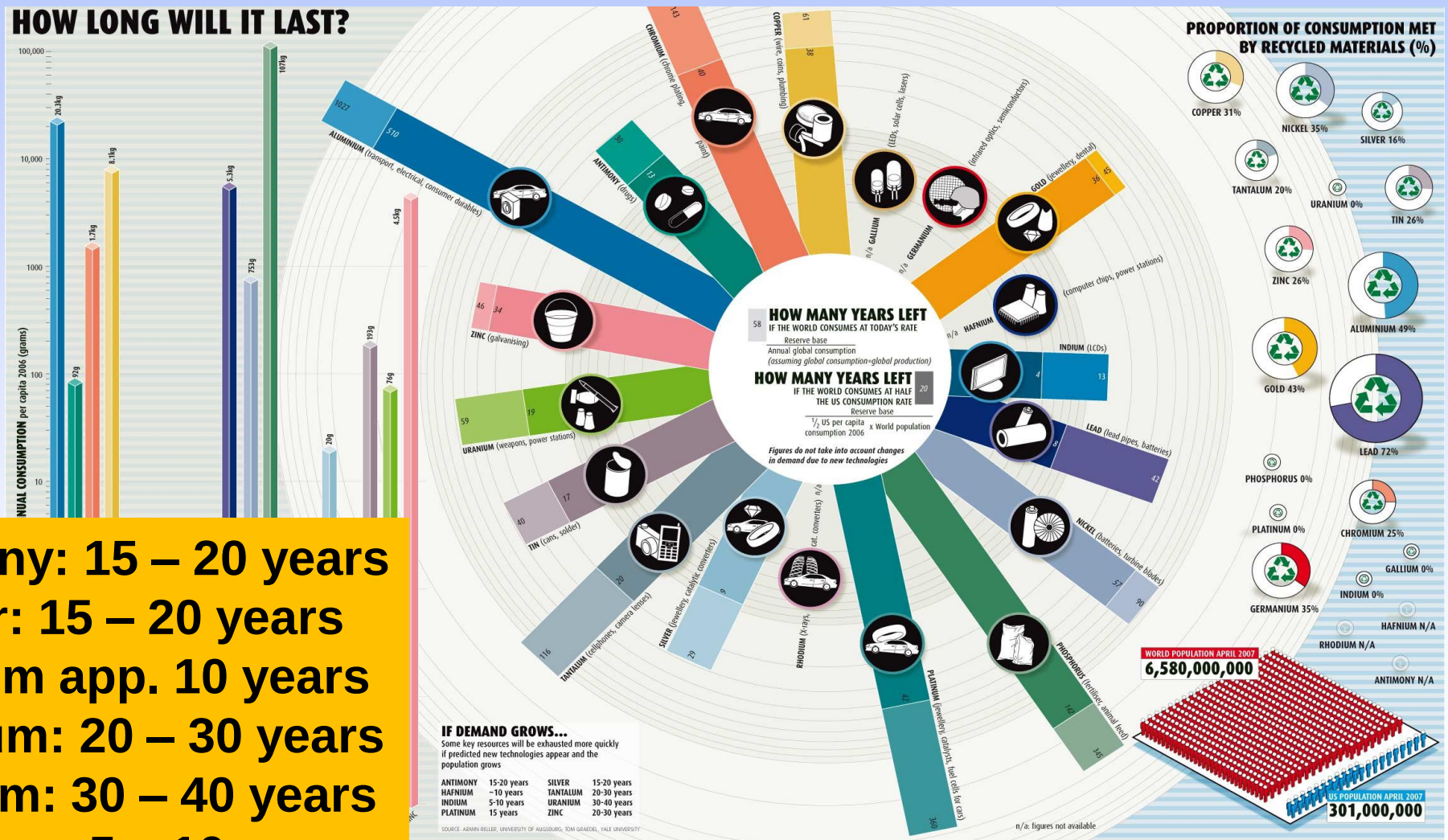
Which materials matters … towards environmental targets

Baseline scenario

Environmental hot spots



Eliminating resources which are running out



- **Antimony: 15 – 20 years**
- **Silver: 15 – 20 years**
- **Hafinum app. 10 years**
- **Tantalum: 20 – 30 years**
- **Uranium: 30 – 40 years**
- **Platinum: 5 – 10 years**
- **Zinc:: 20 – 30 years**

Source: David Cohen
NewScientist.com news service, 23 May 2007

Screening tools for materials

e.g. materials intensity index, embidied energy database

material	specification	Material intensity [t/t] / Materialintensität [t/t] abiotic material	biotic material	water	air	moved soil	
Metals / Metalle							
aluminum Aluminium	primary primär	37.00		1047.7	10.870		Europe
	secondary sekundär	0.85		30.7	0.948		Europe
	wrought alloy Knetlegierung	35.28		996.8	10.374		Europe
	cast alloy Gusslegierung	8.11		234.1	2.932		Europe
	average Durchschnitt	18.98		539.2	5.909		Europe
lead Blei	**estimated** **abgeschätzt**	15.60					World
ferrochromium Ferrochrom	low carbon, 60% Cr niedriggekohlt 60% Cr	21.58		504.9	5.075		World
	high carbon, 75% Cr hochgekohlt, 75% Cr	13.54		221.4	2.300		World
ferro manganese Ferromangan	high carbon, 75% Mn hochgekohlt, 75% Mn	16.69		193.8	2.231		World
ferro molybdenum Ferromolybdän	**estimated** **abgeschätzt**	748.00		1286.0	9.500		World
ferro nickel Ferronickel	25% Ni 25% Ni	60.33		615.9	9.726		World
gold Gold	**estimated** **abgeschätzt**	540,000.00					World
copper Kupfer	50% primary, 50% secondary 50%primär; 50% sekundär	179.07		236.39	1.16		World
	secondary sekundär	2.38		85.5	1.319		World
	primary primär	348.47		367.2	1.603		World

Material intensity of material, fuels, transport

Construction Case Studies

Practical Demonstrator 6

Refurbishment of Deutsche Bank´s Head Office & New Construction Schwabinger Tor

Efficient Construction Logistics

- Selecting downstream companies using residues from construction process as raw material for their own production
- Residues separation already on construction site into several material fractions
- Optimizing transportation of building materials to and residual materials from installation point on-site
- Just-In-Time delivery

Optimizing an efficient logistical supply chain of both delivery and disposal to establish and **support efficient structure of an Industrial Network**

LEED Platin (USA) **DGNB Gold (DE)** **Logistics Service Award 2010**

Practical Demonstrator 6

Refurbishment of Deutsche Bank´s Head Office & New Construction Schwabinger Tor

- Responsible: **bauserve GmbH**
- Project I: **“Refurbishment of the Deutsche Bank´s Head Office”**

- Construction activity	extensive reconstruction of commercial building (height 155m)
- **Floors**	3 basement floors 4 elevated ground floors 34 upper floors in west tower 36 upper floors in east tower
- Floor area	gross floor area: 120.000 m²

- Project II: **“New Construction Schwabinger Tor”**

- Construction activity	New construction of commercial and residential buildings
- Primary use	Office - number of jobs: 500 Living - number of apartments: 270 5* hotel - number of rooms: 320
- Floor area	gross floor area (total): 90.000m² (30% commercial, 30% residential, 40% hotel)

Goal & Approach

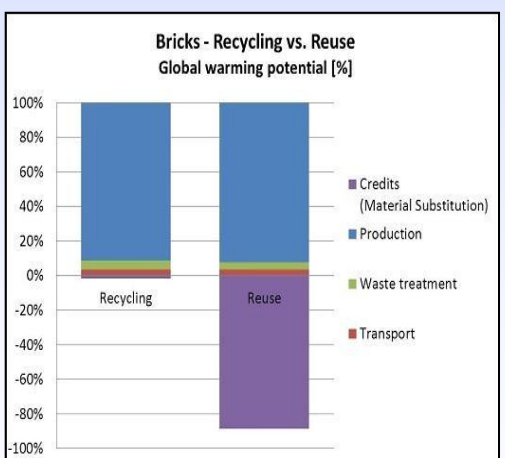
- **Optimizing logistical supply chain** of both delivery and disposal to **establish and support** efficient structure of an **industrial network**
- **Innovative actions** within case study 6:

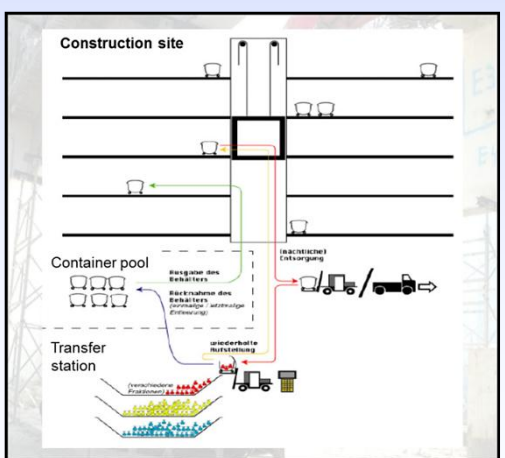
A-1: Selecting **downstream companies using residues from construction process** as raw material for their own production

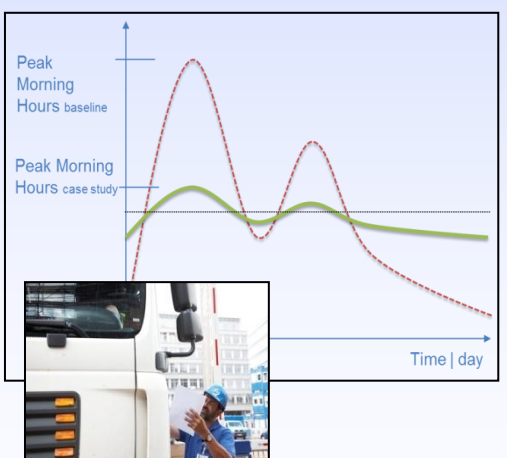
A-2: **Residues separation already on construction site** into several material fractions (using RFID technology)

A-3: **Optimizing transportation** of building materials **to and** residual materials **from installation point on site**

A-4: **Just-In-Time delivery**

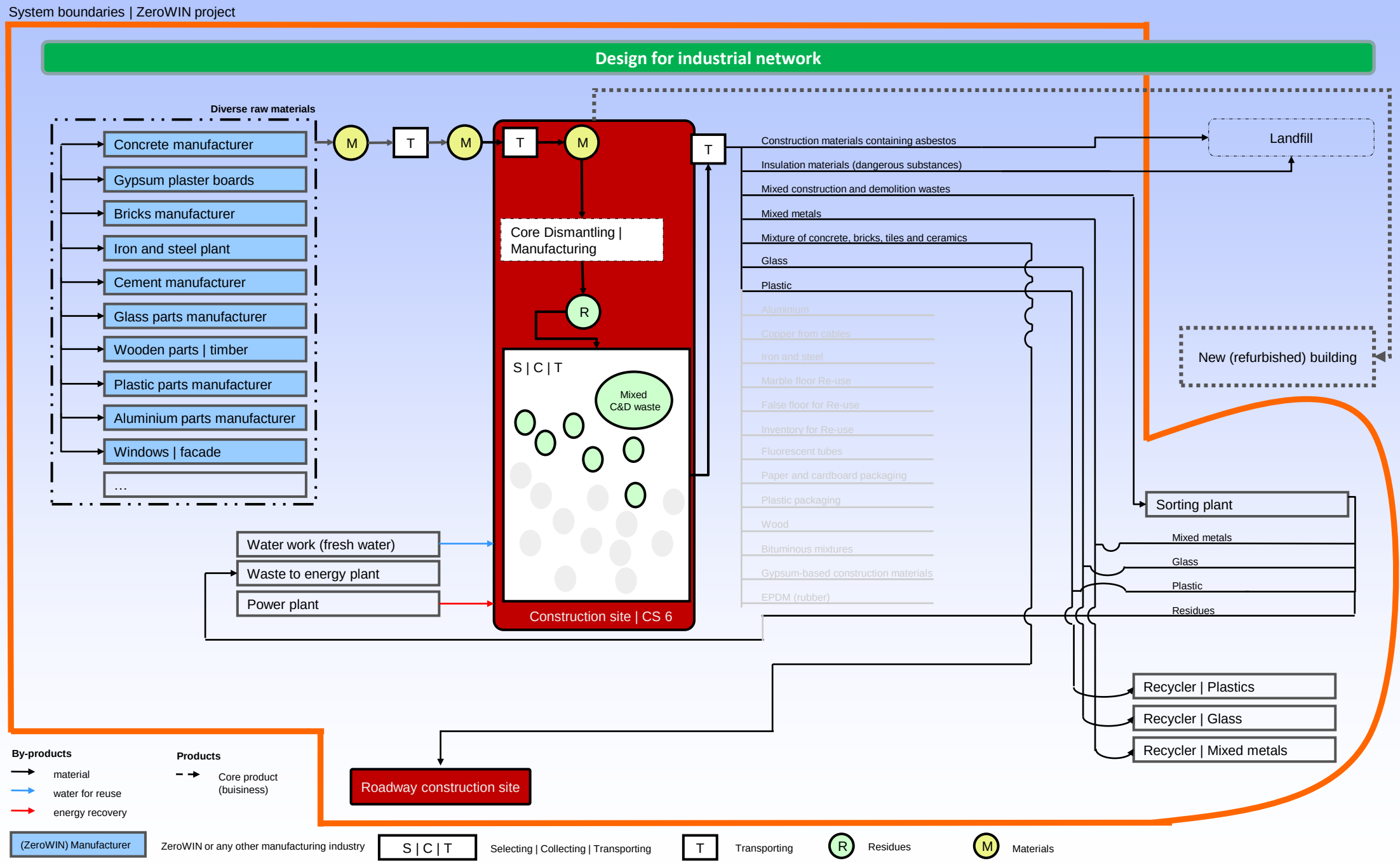




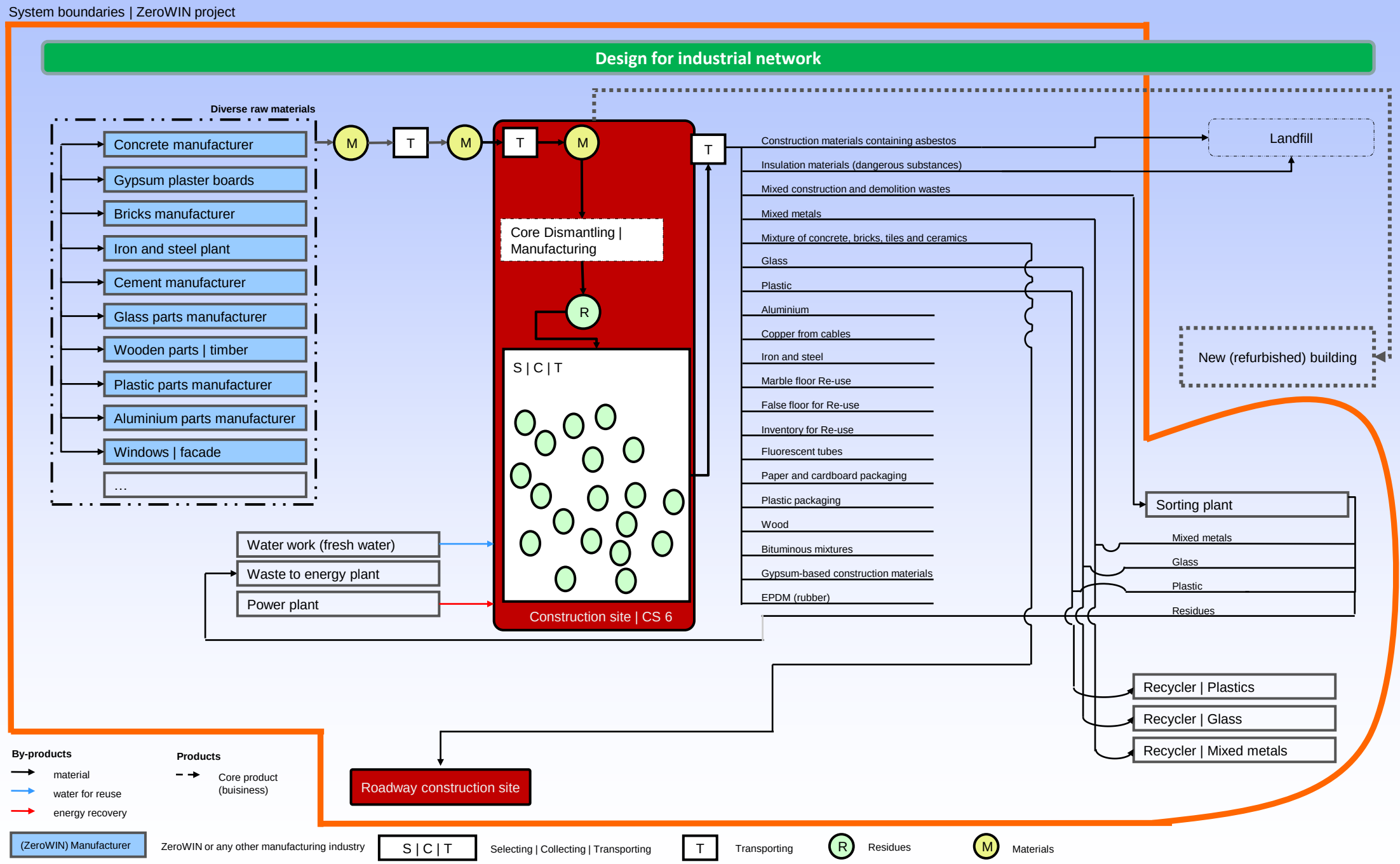


Reduction of GHG | Re-use and recycling of waste | Reduction of fresh water use

Industrial Network - CS6 (business as usual)



Proposed ZeroWIN Industrial Network demostrated in CS6



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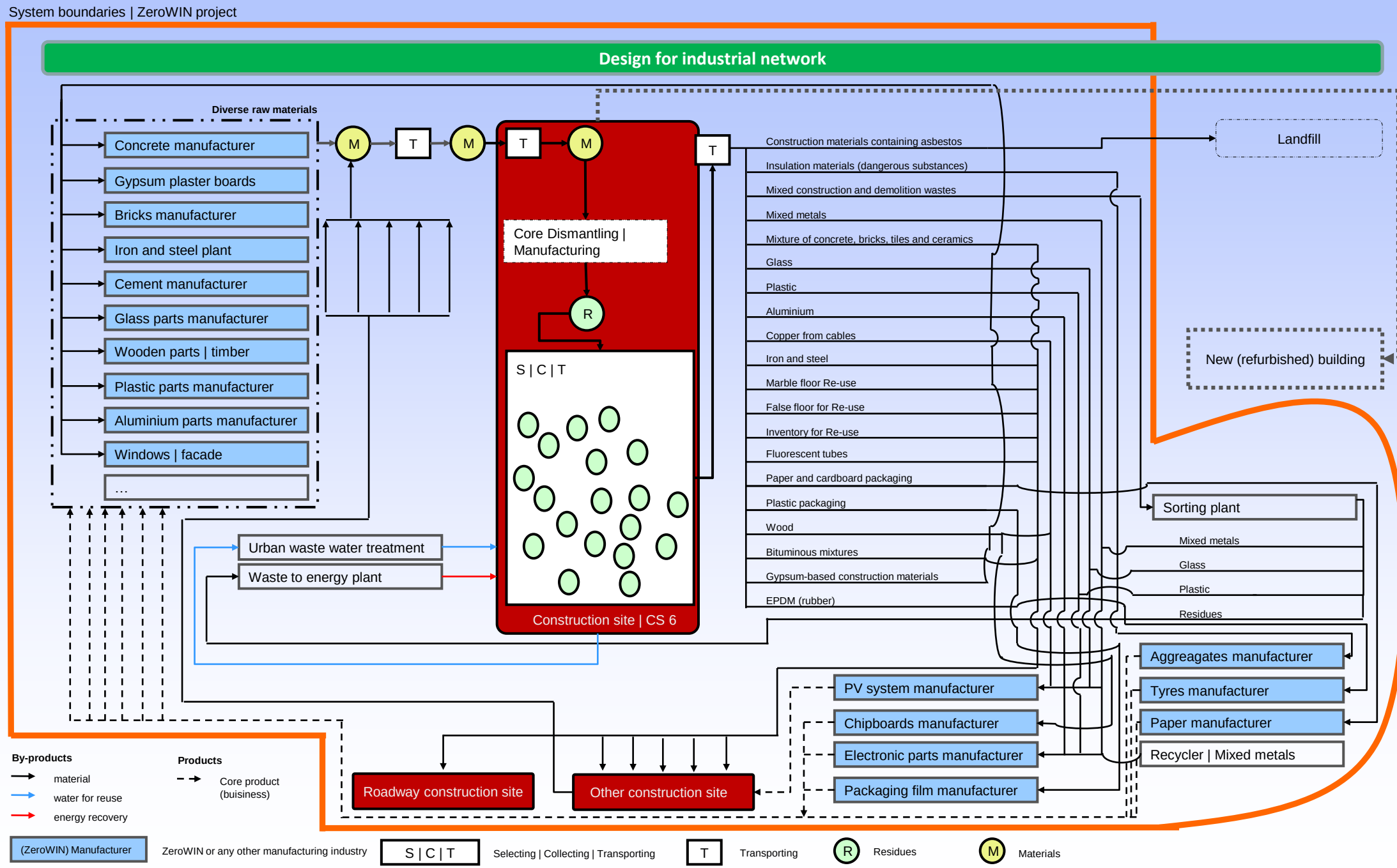


Practical Demonstrator 6

Refurbishment of Deutsche Bank´s Head Office & New Construction Schwabinger Tor

Main Results

- At least 70% overall reuse and recycling? ✓
- At least 30% greenhouse gas emissions reduction? ✓
- At least 75% fresh water use reduction? ✗

➡ **Achieved ZeroWIN aim to meet 2 out of the 3 targets**

Also:

- Increased resource efficiency by 43% in project I and 68% in project II
- Efficient construction logistics saves energy, resources and costs

How to make the concept work

„The key is: quality in = quality out”

(WRAP, PAS 104)

Depending on the quality of secondary material – different applications possible

e.g. WOOD from construction, possible applications:

- **Reuse** – e.g. for another construction project, for other construction purposes (e.g. hut in the garden, playing devices)
- **Recycling** – e.g. for OSB or MDF panels
- **Recovery** – energy recovery (e.g. in a cement kiln)

Quality of output – need for quality norms

Collector

Producer

Processor

- **AI:** natural wood, just mechanical treated

Quality NORM for reuse

Reuse Construction industry

- **AII:** processed wood without PVC compounds

Quality NORM panel industry

Recycling Panel industry

- **AIII:** processed wood with PVC compounds

Quality NORM for RDF in cement industry

Energy recovery

- **AIV:** wood containing hazardous substances

Disposal

Further challenges of forming an industrial network

Logistics

- Development of infrastructure
- Storage facilities (logistics) of items for reuse and recycling
- Markets needed for recovered secondary materials to ensure a high level of recovery

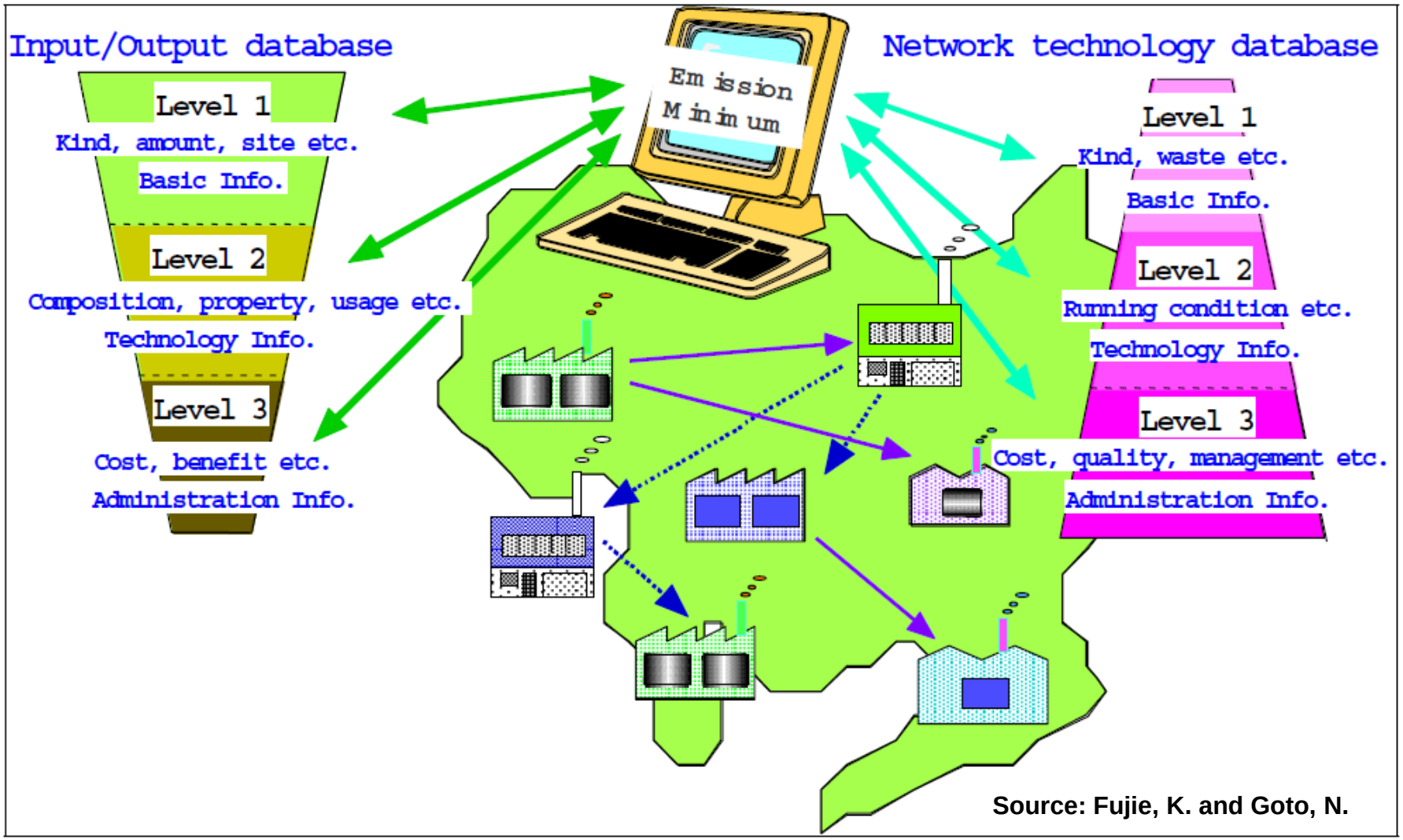
Matching supply and demand

- Development of information channels for matching supply and demand for secondary materials

Conclusions

- Resource exchange within IN is powerful way to boost material efficiency and reduce environmental impact
- ZeroWIN CS demonstrated large potential to improve industrial practices, related to resource efficiency
- Development towards higher efficiency is hampered by a number of technical, organizational and economic barriers - can be overcome
- Sustainable reuse of resources, material recycling and recovery requires separate collection and certain infrastructure, which needs to be developed, including storage places
- Many initiatives hindered by higher costs relating to use of primary resources

Paradigm shift to a global industrial network!



Source: Fujie, K. and Goto, N.

Time for Europe !

Thank you for your attention

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