Network Footprinting - a holistic approach to assess environmental impacts

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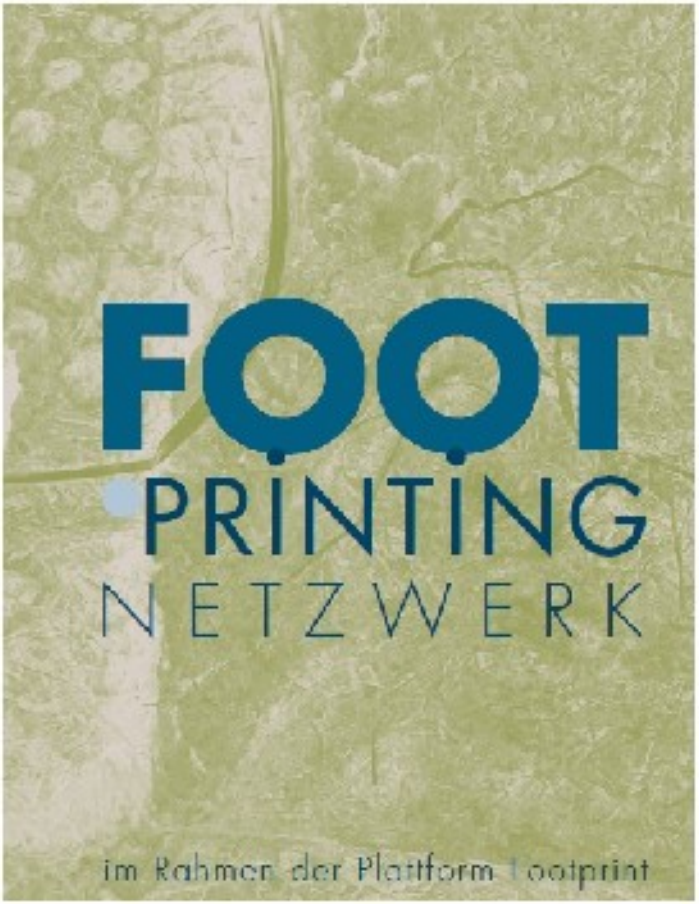
Netzwerk Footprinting

The Netzwerk (network) Footprinting aims to improve theory and practice of footprinting and to provide progress towards

***suitable sustainability metrics* that will allow comparability on a global basis.**

The Netzwerk Footprinting was established in 2010 by convening leading research and consultancy-institutions (mostly from Austria) to share a research agenda within the NGO “Plattform Footprint”.

Netzwerk Footprinting



The challenge:

Measuring the human impact on Ecosystem Earth

footprint consult

SERI

FiBL

IÖW

denkstatt
sustainable thinking

plenum

umweltbundesamt

social ecology vienna

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Netzwerk Footprinting

Definition of terms:

*In this paper, we use the **term footprinting** for all kinds of attempts that assign an objective (at least verifiable) value to environmental impacts and resources/ energy consumption for the production and use of products and services along their whole lifecycle.*

This includes dealing with existing and forthcoming metrics, understanding their interrelations and improving the practical applications.

Assessing the impact of products

Members of the Network have worked with a variety of metrics including

+ Carbonfootprint
+ Ecological Footprint
+ Waterfootprint
+ EMAS and ISO approaches to LCAs
+ SERI-Set of Indicators
+ Buwal eco-impact-points

towards a „resource economy“

You can‘t manage what you can‘t measure

We strongly believe managing sustainability in “Spaceship Earth“ will require suitable metrics to measure the multiple dimensions of ecological sustainability.

We see the ability to allocate footprints to products and services as a necessary, though not sufficient, building block for **futureproof economic activities.**

cf. **Resource Economy**

Challenges for LCA /Footprinting

Our goal:

Comprehensive Ecoindicator Systems

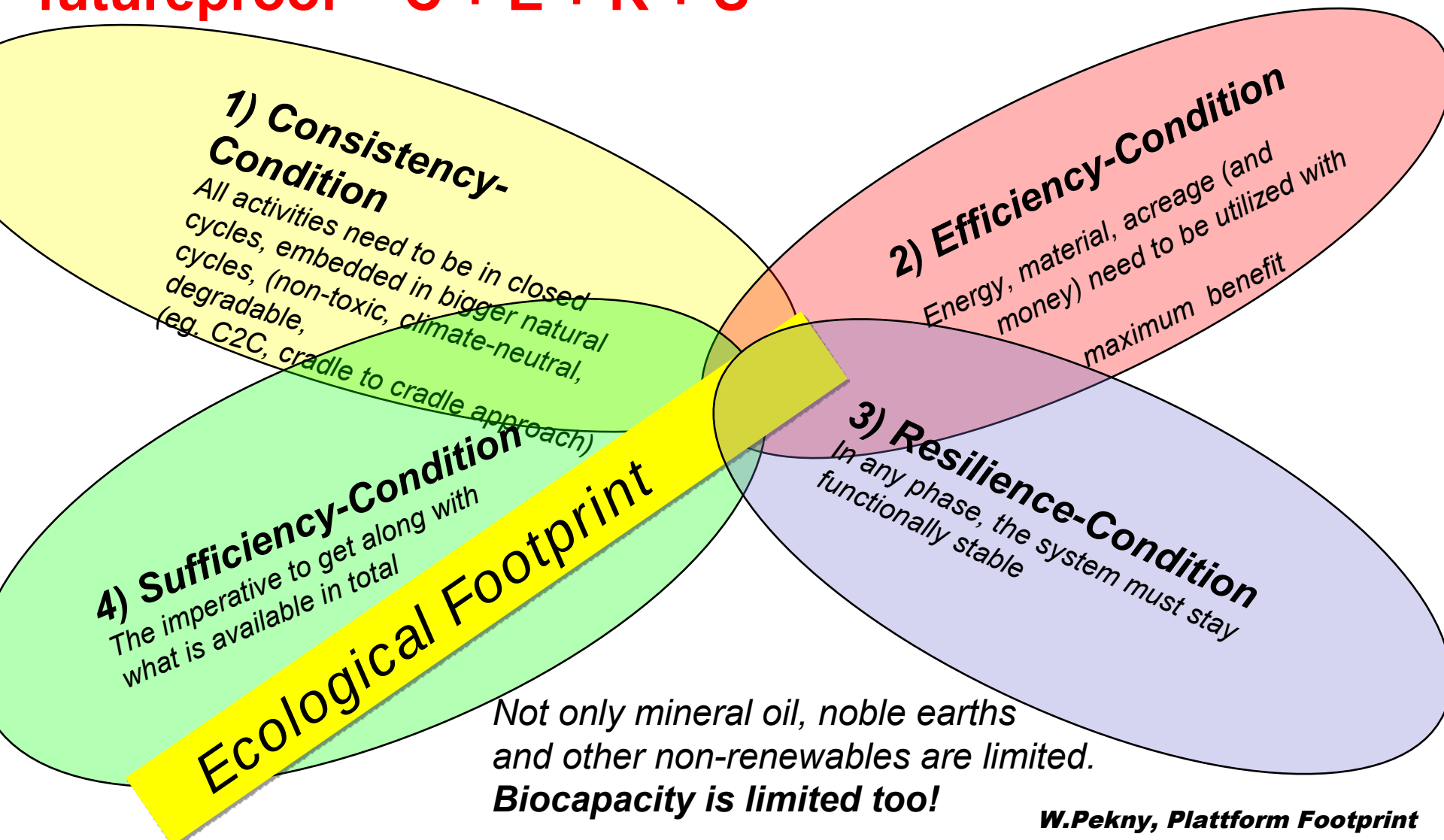
- ✓ understandable for consumers
- ✓ useful for regulatory politics
- ✓ reproducible and scientifically verifiable
- ✓ affordable for the business community

This Ecoindicator-System + Social Criteria + Societal Criteria (global fairness) ➔ Sustainability Indicators

Economic criteria are the result rather than the pre-requisite of sustainability!

Understanding the multidimensionality of ecological sustainability

futureproof = C + E + R + S



Not only mineral oil, noble earths and other non-renewables are limited.
Biocapacity is limited too!

W.Pekny, Plattform Footprint

Understanding ecological sustainability

The most effective approach is not a maximum of one of the aspects but the optimum of all.

The central question for fully mature economies:

<u>When is enough enough?</u>

Not addressable with efficiency alone!

Footprinting for products

There are no futureproof products per se

+ sensible judgments need to consider a combination of LCA with the mode of a product's use and its ultimate purpose

(the fifth energy-saving flat-screen per household is certainly no better than a one-and-only tube-TV)

the first hydro-electric dam in a region might be a blessing, the 20th in the same region an ecological disaster.

It requires a lot of global common sense with the certifier to induce sustainability effects and not to surrender to the rebound effect.

Labeling carbonfootprint of inflight-menues is gross deception!

Labeling-ethics need to go way beyond today's CSR–standards

➔ **CSR 2.0**

Refining our kowledge on environmental impacts of consumption and production

- Going beyond EPDs (environmental product declarations)
  (→ understanding the specific **impact on Ecosystem Earth)**

- The shortfalls of current approaches
  (e.g. GHG-Protocol, PAS 2050, ISO, Environmental Footprint)

- The shortfalls of currently discussed PCRs
  (current product category rules are often too narrow)

Footprinting for products

Why comprehensive EPDs and labeling?

… not to shift responsibility to the consumer!

Knowing the true environmental costs will

+ help informed choices by customers
+ allow benchmarking between products/sectors,
+ allow to introduce purposeful regulatory policies (the base for taxes and levies)
+ introduce (personal) allowances and global caps

Ultimate vision:

global per capita tradable resource allowances

Footprinting for products – central questions

+ What is the **metric for physical „impact“ …**
  … of a product?
  … of a service?

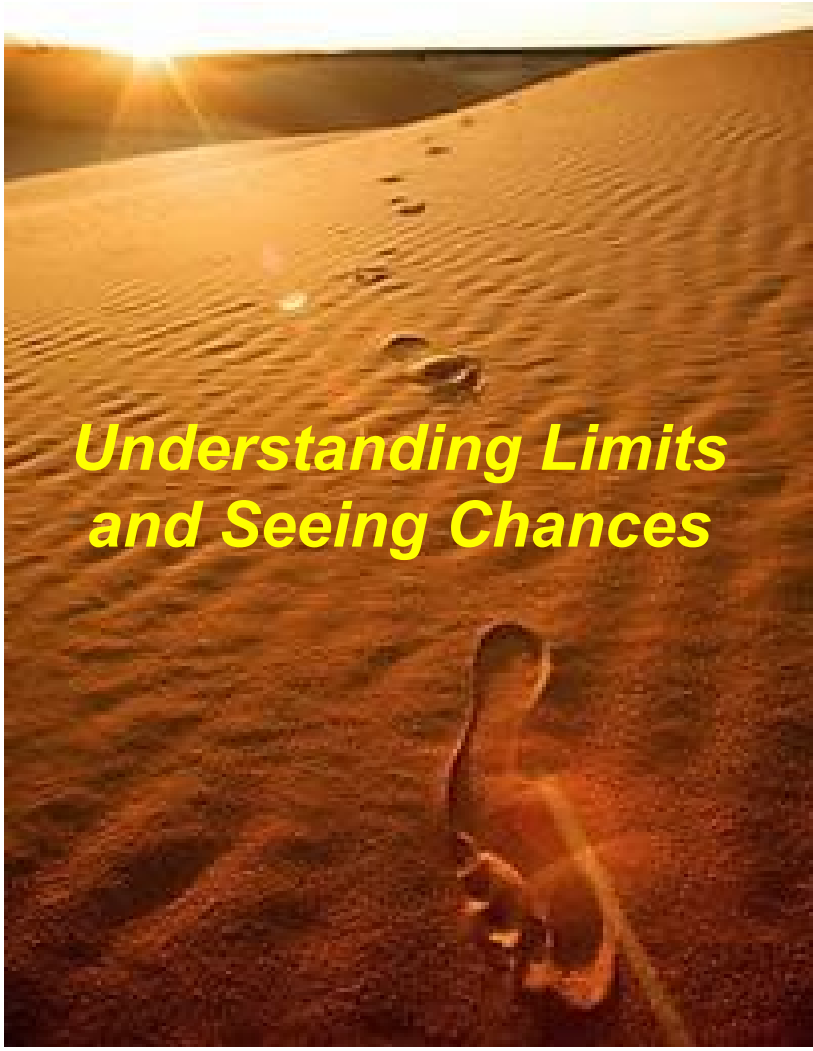
+ **system-boundaries and allocation principles:**
  a uniform approach **is key to comparability!**

+ Making results **comprehendible and useful**
  per year, per lifetime, per kg, per MJ?

Recognising ecological and physical limits

Current concepts to measure ecological limits

- Ecological Footprint
- HANPP
- Ecological Rucksack
- (Product) Carbon Footprint
- SERI-Set
- MIPS
- Emergy
- Waterfootprint
- Weighted Material Footprint
- (Entropy)
- Sustainable Process Index
- Environmental Footprint



Challenges with LCAs / Footprinting

Measuring and labeling “environmental impacts” of products is a young „science“, still featuring little transparency, limited scrutiny and lots of hidden agendas.

Our goals:

- Overcome the NDA-dilemmas to allow scientific scrutiny

- Open, „wiki“-like database for specific footprints of raw-materials, processes and basic services. → conflict with commercial databases ? (e.g. ecoinvent 2.0)

- Biggest possible system boundaries

  full process, ILUC, long term effects, human power

Challenges with LCAs / Footprinting

Our goals (cont.)

- An (EU-wide) open and independent compilation of all (physical) primary data.

  Should be in a way suitable for whatever aggregation and display formats chosen.

  In principle, similar to GEMIS, but multi-dimensional and invariant to display-metrics! (Who pays?) *(see also paper Hellmut Körber)*

- Wide and general PCRs to allow functional comparison ("travel" instead of "air-travel")

Main differences to current approaches

ISO, GHG protocol, PAS 2050	Archetype for holistic system boundaries
Central question: How can specific parameters be minimized?	Central question: How can we reduce global overshoot and support a “one-planet living”
pragmatic system boundaries	vision-driven system boundaries
Industry/market oriented	Information/consumer -oriented
LCA-based	system-oriented, uses LCAs
bottom-up	bottom-up and top-down
policy derived “limits”	intrinsic global limits
Suitable for relative comparison of products or branches (benchmarking)	allows global and trans-sectoral comparison

More Information

How to do it ?

Join our Workshop

FOOT PRINTING NETZWERK

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Footprint for products and services

The footprint of consumption

Assigning well defined values to the environmental impacts and resources/ energy consumption for the production, use and disposal/reuse of products and services along their whole lifecycle.

a large variety of possible “eco-indicators”

To complete the picture, we need to know the total impact of the producing/providing organization.

(including overheads etc.)

Business-Footprint

Assessing the footprint of organisations

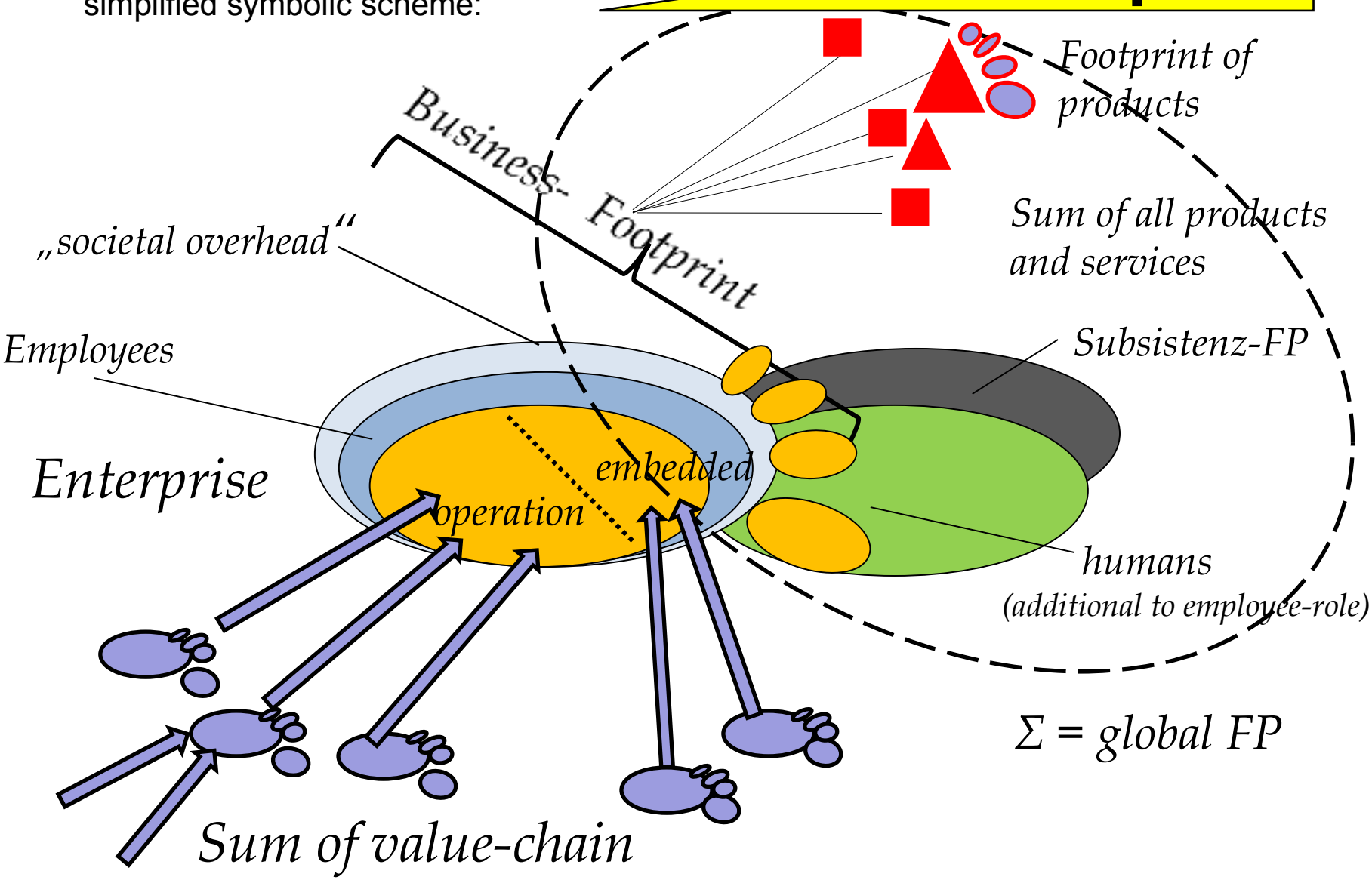
In a consumption-based approach, the footprint of an enterprise equals its total contribution to the consumption-footprint of those consuming products and services of this enterprise.

The total impact of an organization (including overheads etc.) needs to be completely allocated to its final products/services brought to market. (including waste and un-sold products) There must be no unallocated footprint left!

In calculating the total global footprint, business footprints and consumption footprints can not be added!

Business-Footprint

simplified symbolic scheme:

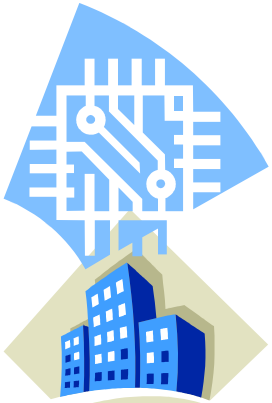


Methodisches Konzept *Plattform Footprint, SERI, 2009*

Business Footprinting

sphere of accountability

Value chain



(eg. Hardware, Software, Buildings, cabel, etc.)

business area

Electricity
Heating
Flights und
Travel

Products
Services
By-products

waste, water
atmos. discharge,
GHG

EMPLOYEES

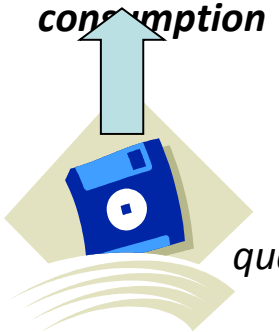
Externe Aktivitäten

(e.g. travel of employees and customers)

sphere of responsibility
(GHG protocol scope 3)

Product use

economic life-time energy, paper-consumption



qualität of code

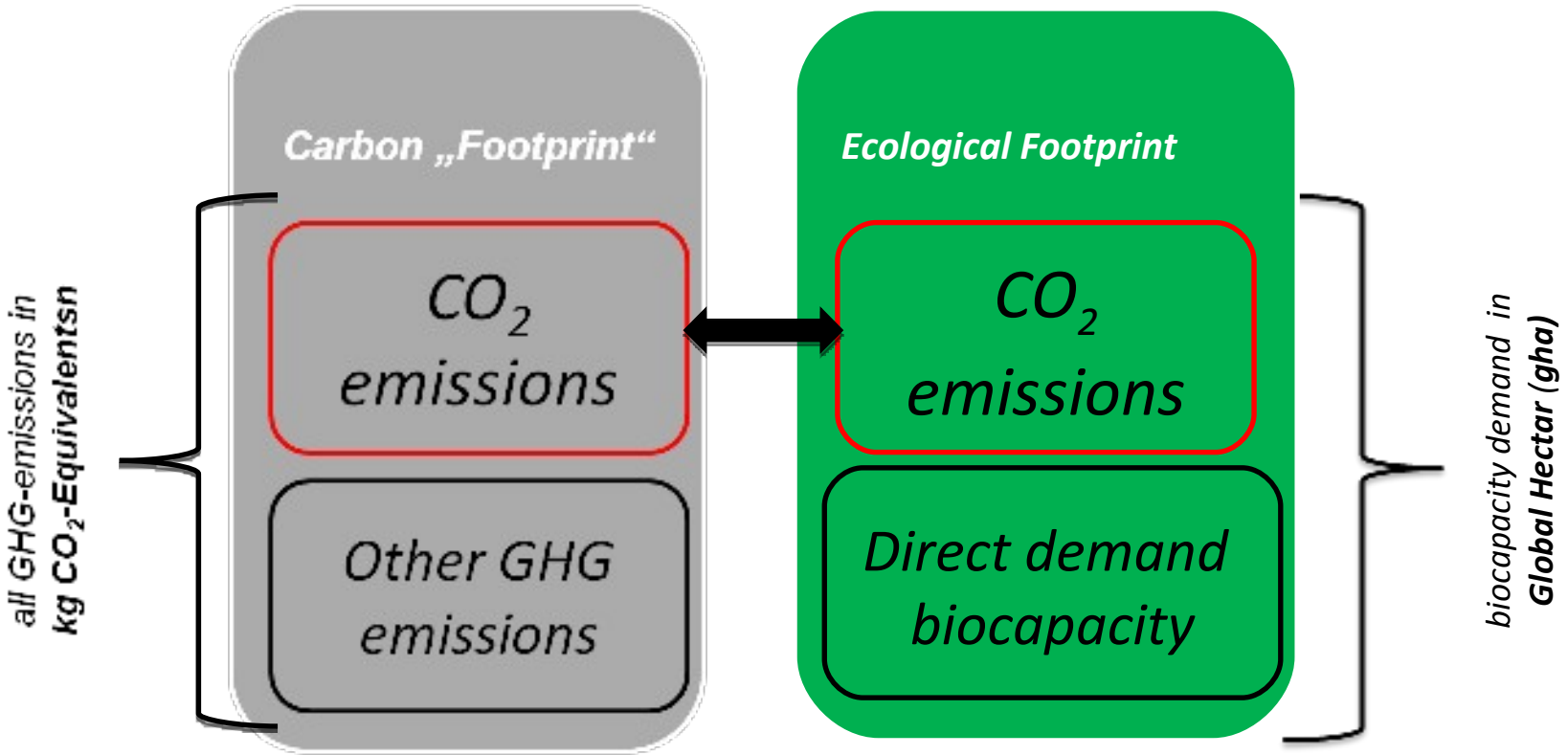
Infrastructure requirements

"Internet" server-farms, trans-atlantic cabels, maintainance

sphere of influence

Carbonfootprint - Ecological Footprint

Carbon“footprint“ = GHG -rucksack



Simplified relations of EF und CF

Challenges with LCAs / Footprinting

1.System-Boundaries (ideal)

1.0) general:

+ consumer-principle instead or territorial principle

1.1) process-related

+ embedded footprints in buildings and machinery, vehicle stock/car pool included
+ travel of employees and customers
+ human power included
+ specific electricity-mix (requires a general “dummy-mix”)

Challenges with LCAs / Footprinting

1.System-Boundaries:

1.2) spatial

+ full inclusion of LULUC and ILUC

—

1.3) time-wise

+ seek longest conceivable perspective

Examples „the footprint of tobacco-smoking, of nuclear power ….?

—

1.4) model-wise

+ measuring what is - or what should be?

e.g. occupancy rate with train-travel is highly context sensitive

+ the footprint of “TV-commercials” ??

Challenges with LCAs / Footprinting

2. Allocation

+ of by-products

by commercial value, weight, exergy …?

+ assumptions of total lifetime ?

+ depreciation of capital investments over lifetime?

versus full effects now!

+ compensations

carbon credits

recycling credits (C2C)

+ time- and context related shift of allocation-mode

(eg. for CHP after saturation of heat market, highly subsidized PV

Indicator matrix for product footprints

indicator assessed / system boundaries	employee activties	capital goods	raw materials	manufacture	distribution / retail	consumer use	end-of-life
ecological footprint							
carbon footprint							
water footprint							
Material Footprint							
Environmental Footprint							

W. Pekny, Plattform Footprint

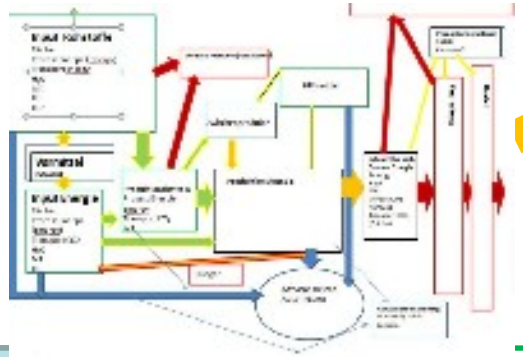
beyond PCRs

+ Seeking one unique approach to product rules
built on the biggest possible concept for system boundaries

+ The **subset of specific category rules** for industrial sectors and product groups should relate to the general scheme, but highlight (and not alleviate) hot spots of the specific sector!

+ About 50 archetypical branch-schemes should be sufficient to allow to integrate any (limited) LCA in the bigger scheme. Much simpler than CPC (Central Product Classification)

Footprint of products - symbolic



Input raw-materials

By-productss (aallocation!)

By-products (allocation!)

packaging
paper
plastics

Auxillary materials

Intermediate products

Auxil. inputs
(Stocks)

Production-chain A
Process Energy
Emergy
Transport CO_2
employees

Production-chain B
Prozess Energiy
Emergy
Transport CO_2
employees

Input Energy
Acerage
Prozess Energy
(Emergy)
Transport CO2
H_2O
employees
LULUC

Transport

Finalising

Transport

Retail

Transport

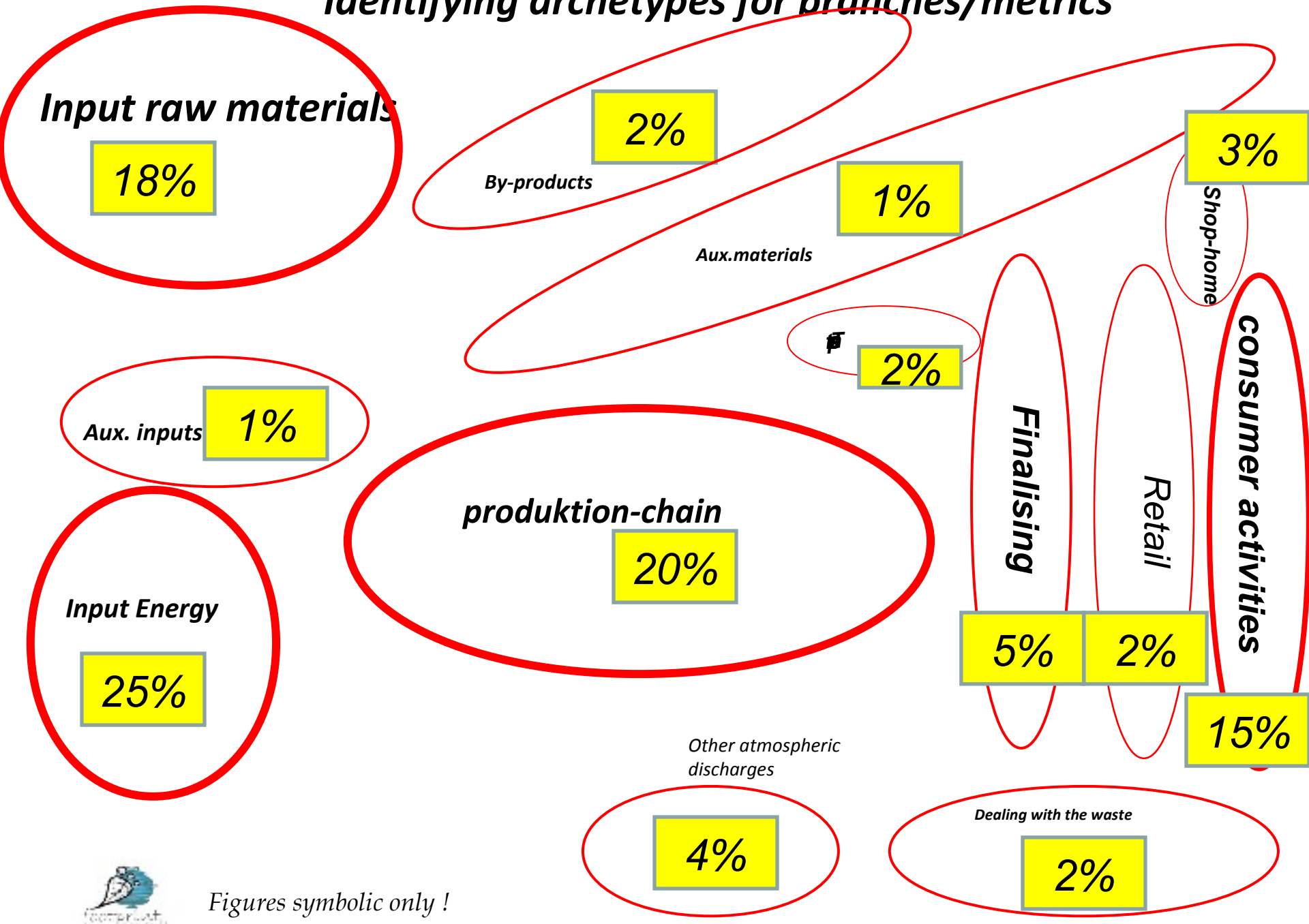
Consumer activities

Other atmospheric discharge

waste water
water quality
energy

waste
waste treatment
Recycling
Re-use

Identifying archetypes for branches/metrics



Figures symbolic only !

Assessing the impact of products

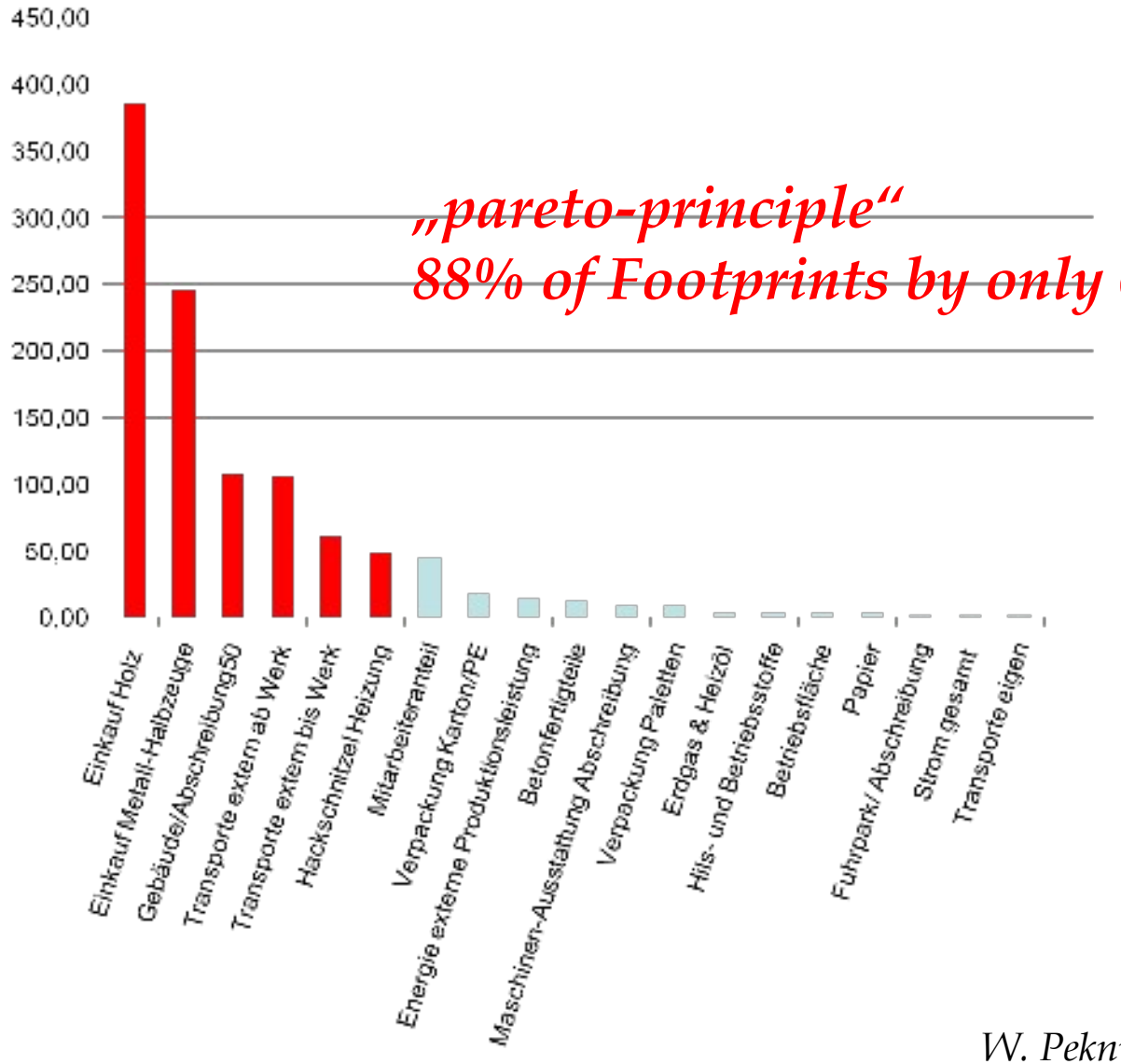
Basic design:

Understand industrial sectors and design a holistic archetype-LCA

In detail, use a modular system, starting, where available, with ISO-norms as a minimum, specifying more details (like GRI, GHG protocol, PAS 2050 ….), adding different metrics, ….

Fit given LCA into the bigger picture and complete bigger picture by amending default values for missing parts.

Footprinting of an enterprise

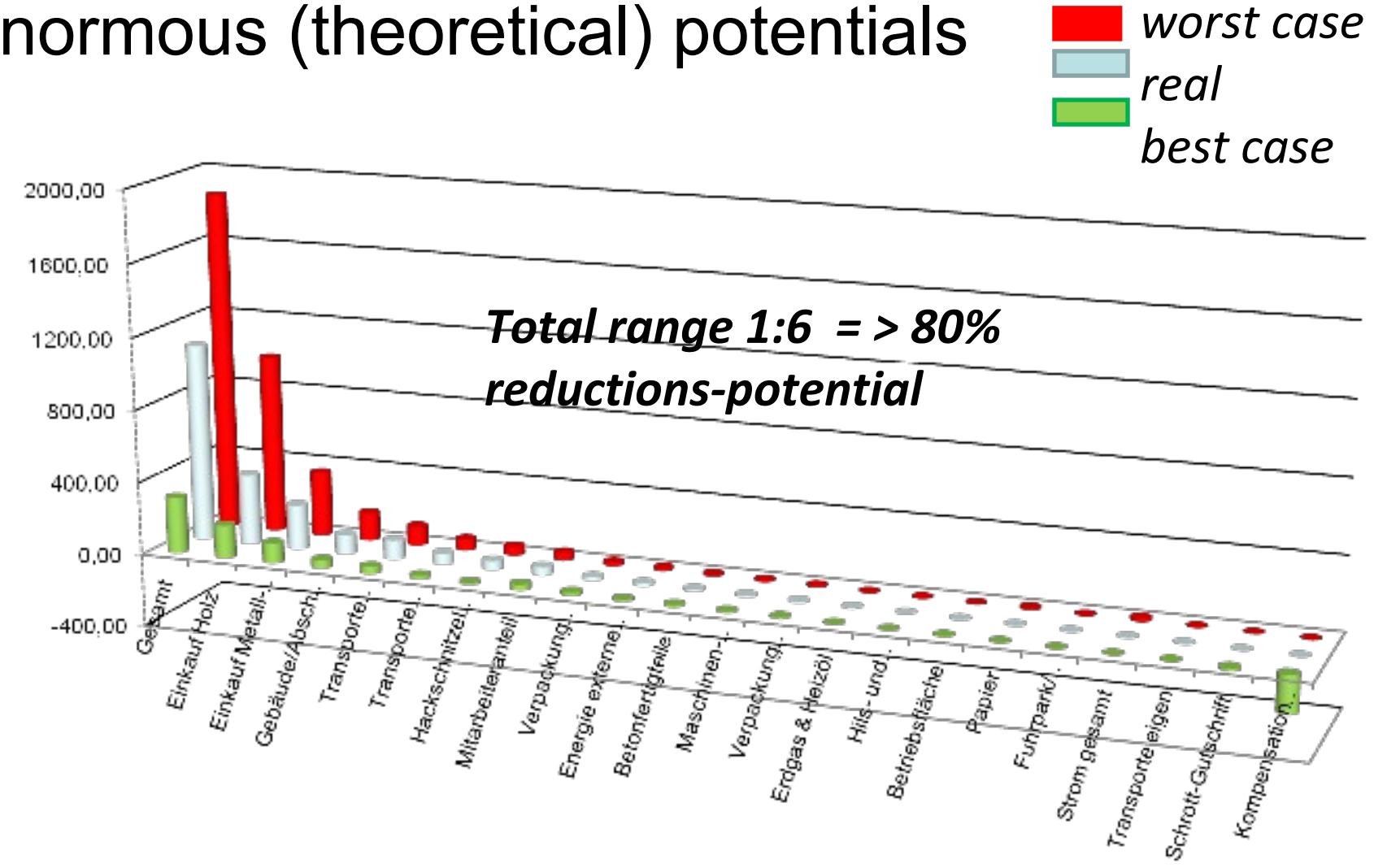


„pareto-principle“
88% of Footprints by only 6 variables

W. Pekny footprint-consult

Footprinting of an enterprise

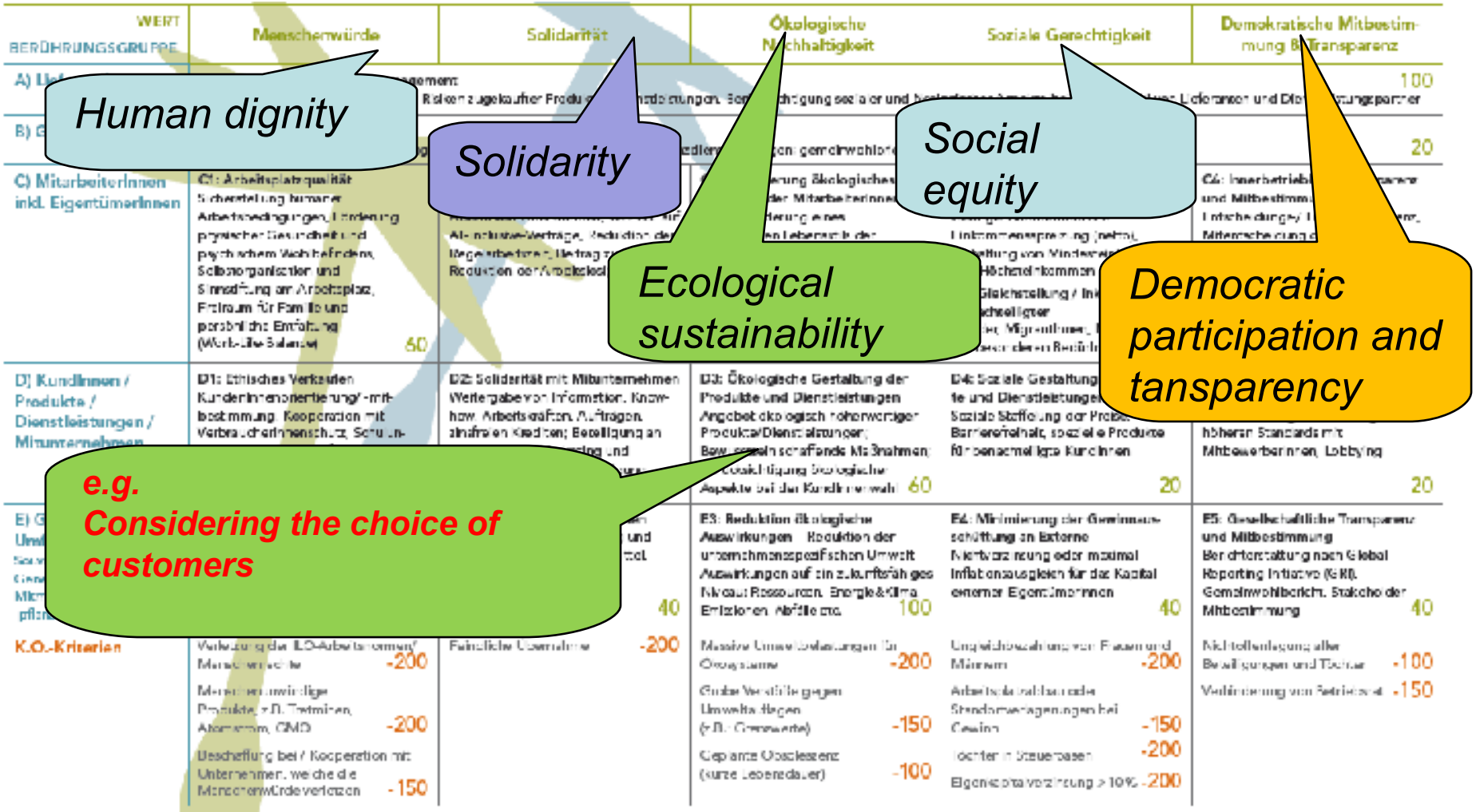
enormous (theoretical) potentials



W. Pekny footprint-consult

Common welfare matrix

The „welfare-economy“ approach seeks a multi perspective view of a business-unit



More Information

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