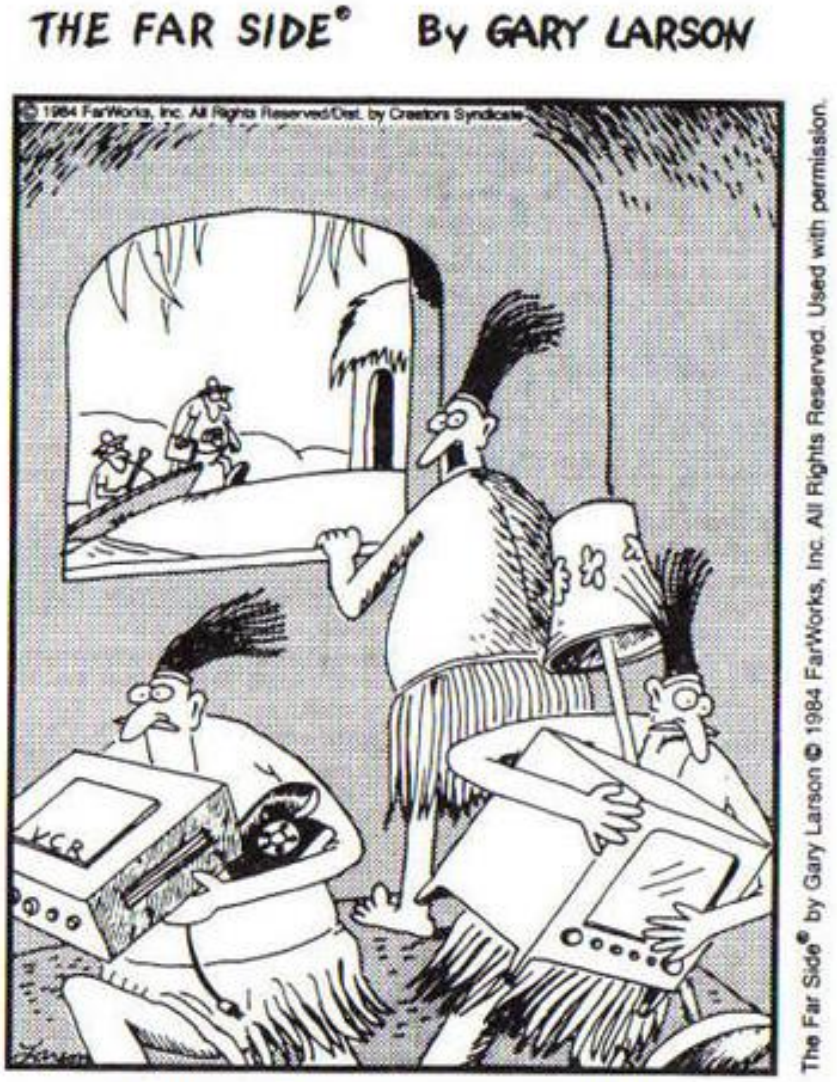


Watch out! The students who analyse local rural systems are coming!

The sustainability of Local Rural Systems

Willi Haas

Simron Jit Singh

SS 2014

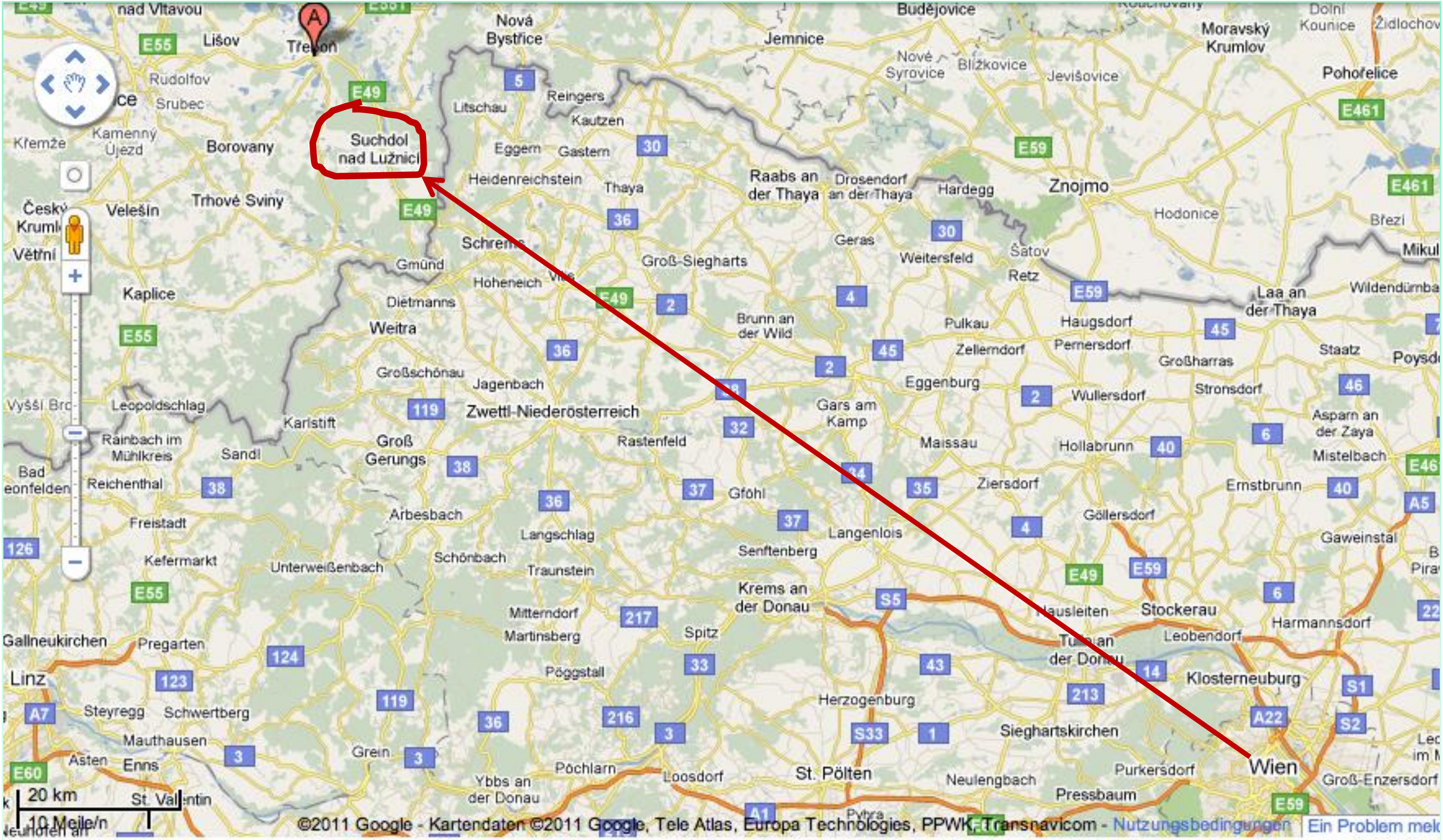
social ecology vienna iff
ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

In this seminar

We will try to get an understanding of the notion of “sustainability” in the context of local socio-ecological systems by focusing on biophysical variables (materials, energy, time, land) – conceptual, methodological and analytical.

We do this by a combination of (a) preparatory reading, (b) scientific inputs (c) field work in working groups, (d) group presentations, and (e) written assignment to be handed in after the seminar – as a group!

Activities (b) to (d) are done in an excursion to the Czech Republic between 13-17 May, in the village of Klikov (Trebonsko Biosphere Reserve).


Suchdol
nad Lužnicí
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Trhové Sviny
Kaplice
Český Krumlov
Velešín
Litschau
Reingers
Kautzen
Eggern
Gastern
Heidenreichstein
Thaya
Raabs an der Thaya
Drosendorf an der Thaya
Hardegg
Znojmo
Hodonice
Gmünd
Groß-Siegharts
Weitersfeld
Retz
Laa an der Thaya
Dietmanns
Weitra
Brunn an der Wild
Pulkau
Haugsdorf
Zellerndorf
Großschönau
Jagenbach
Eggenburg
Wullersdorf
Zwettl-Niederösterreich
Karlstift
Groß Gerungs
Rastenfeld
Gars am Kamp
Maissau
Hollabrunn
Mistelbach
Leopoldschlag
Freistadt
Arbesbach
Gföhl
Ziersdorf
Ernstbrunn
Langenlois
Göllersdorf
Gaweinstal
Unterweißenbach
Schönbach
Traunstein
Senftenberg
Krems an der Donau
Stockerau
Harmannsdorf
Gallneukirchen
Pregarten
Mitterndorf
Martinsberg
Spitz
Tulln an der Donau
Leobendorf
Klosterneuburg
Linz
Pöggstall
Herzogenburg
Sieghartskirchen
Steyregg
Schwertberg
Mauthausen
Enns
Grein
Ybbs an der Donau
Pöchlarn
Loosdorf
St. Pölten
Neulengbach
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Wien
Groß-Enzersdorf
20 km
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This seminar collaborates with 1) the University of South Bohemia in České Budějovice (1-2 tutors and 3 students) and with 2) Masaryk University in Brno (1 tutor and 5 students). Both will also help us as translators in the field.

What do we want to achieve today?

- Intro to the course
- Intro of participants
- Clarify logistical issues for the block in Czech: location, travel, accommodation, meals, costs, etc. (Jitka, Eva)
- Intro to characteristics of Czech Republic and Czech history with focus on rural areas, including some corner stones on today's political system (Jitka, Eva)
- Very briefly, introduce four social ecology concepts that capture society-nature interactions using a few examples. These we will use conceptually for understanding the local level during the block seminar. They are:
  a) social metabolism,
  b) sociometabolic regimes and transitions,
  c) colonization of natural processes,
  d) human time use

(Willi)

A round of introduction

(name, study programme, motivation for this seminar)

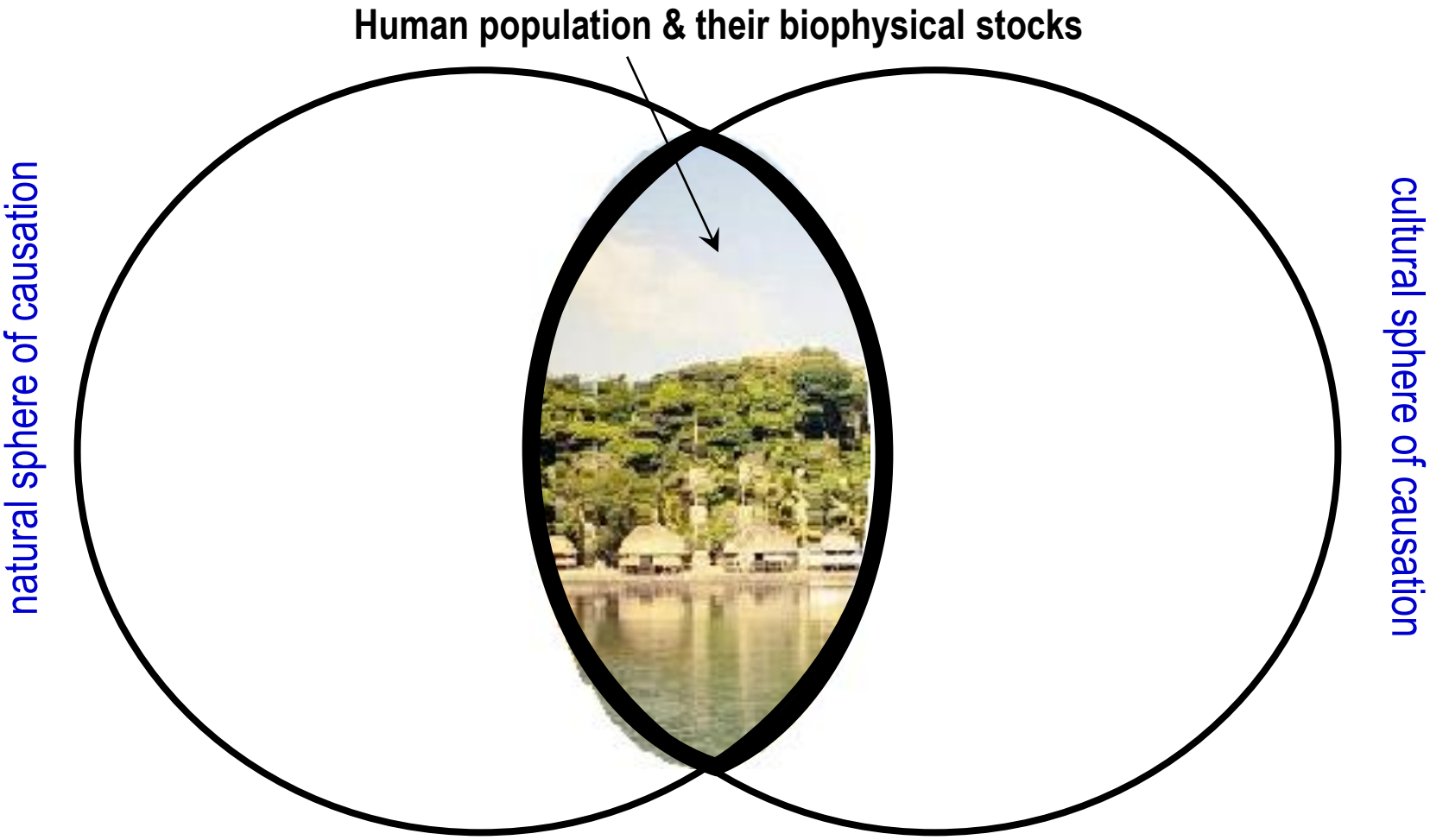
Please fill up the excel sheet with your details, as well as on the printed form!

The environmental problems (some would say crisis) we face today are a consequence of the ways global society interacts with nature

1. Conceptualising society-nature interactions (social metabolism)

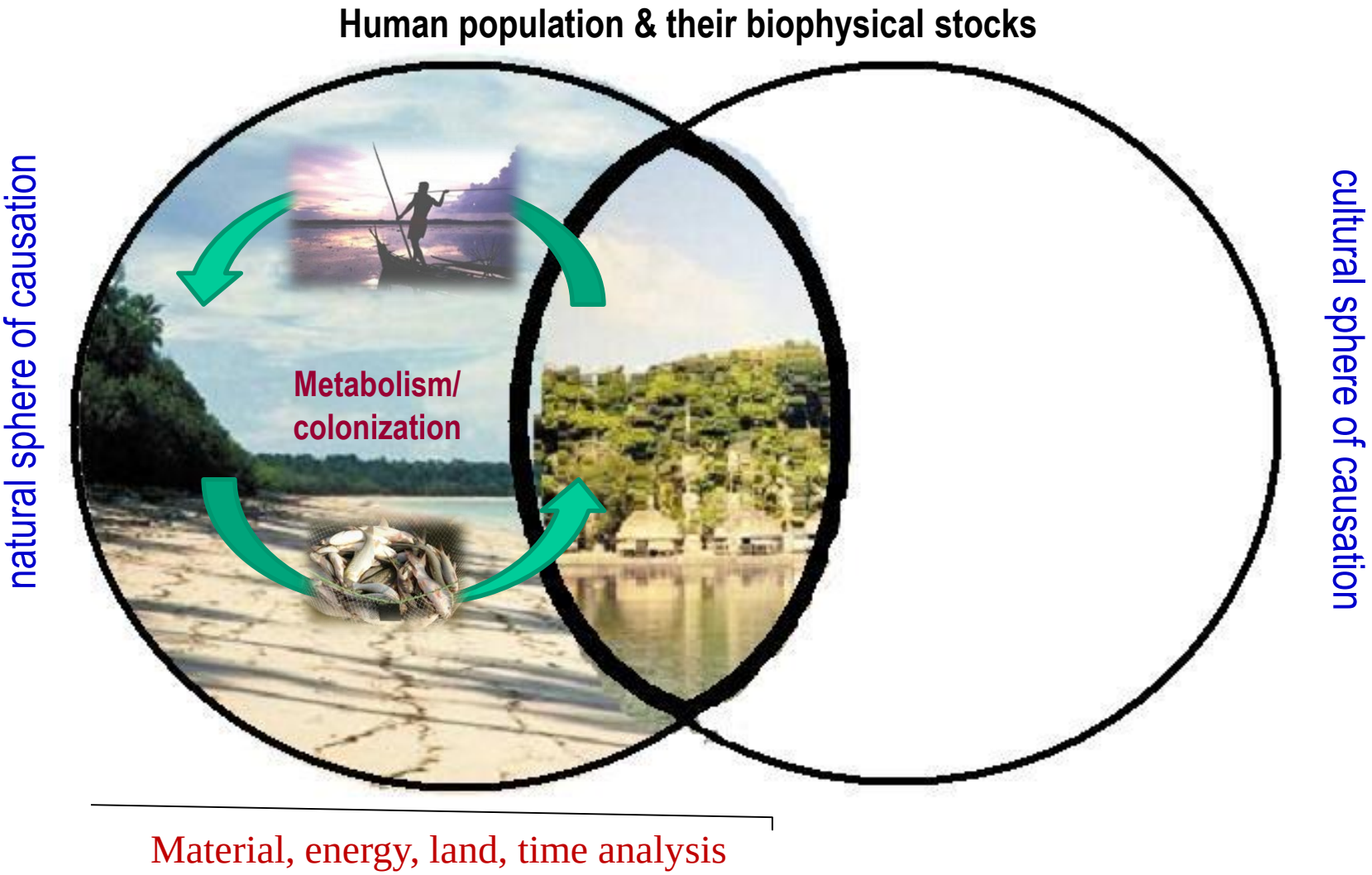
“Society as hybrid between material and symbolic worlds”

Conceptualizing society-nature interactions



Fischer-Kowalski & Weisz, 1999

Conceptualizing society-nature interactions



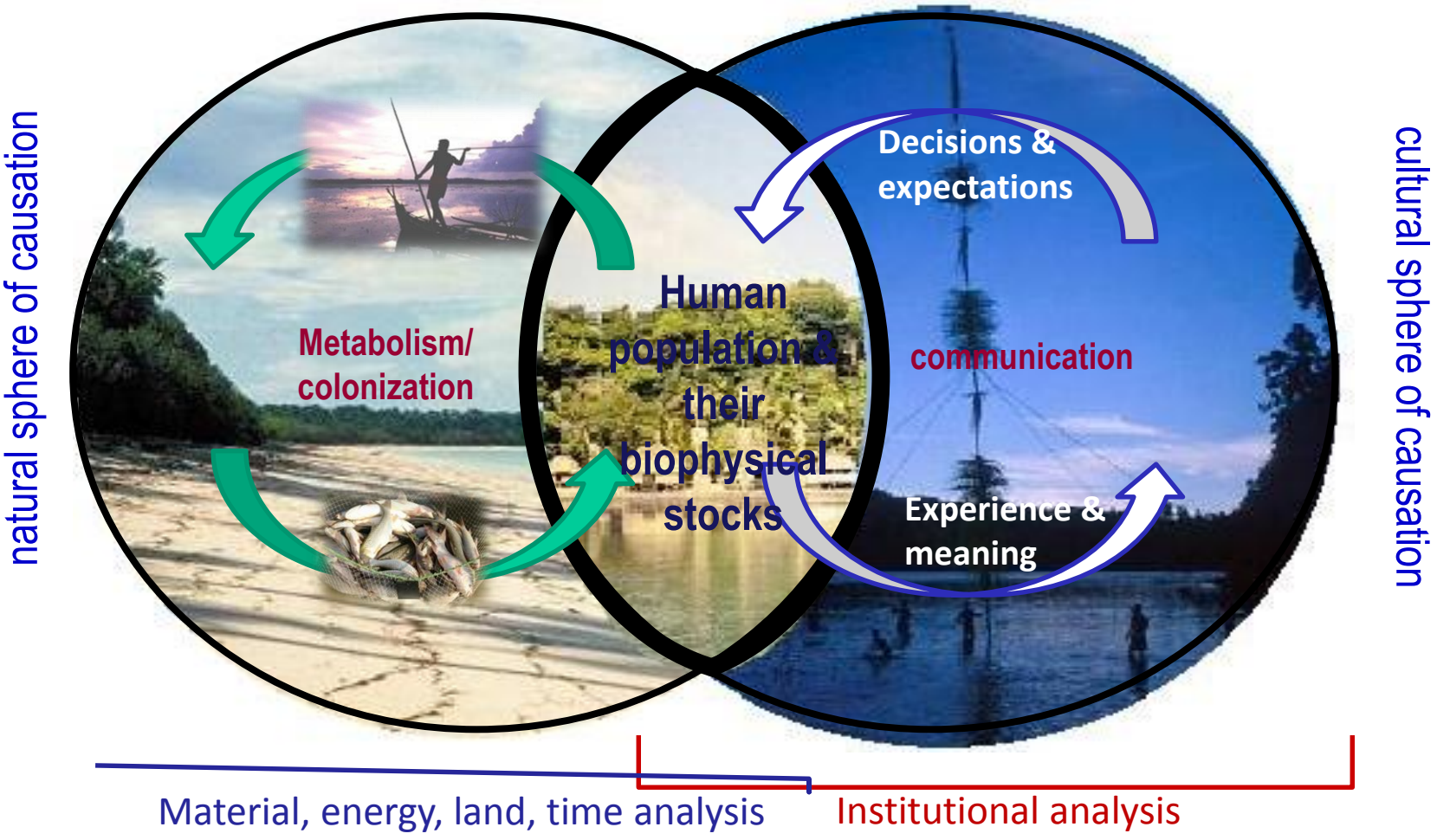
Fischer-Kowalski & Weisz, 1999

“Society’s metabolism” means…

…that societies organize (similar to organisms) material and energy flows with their natural environment;

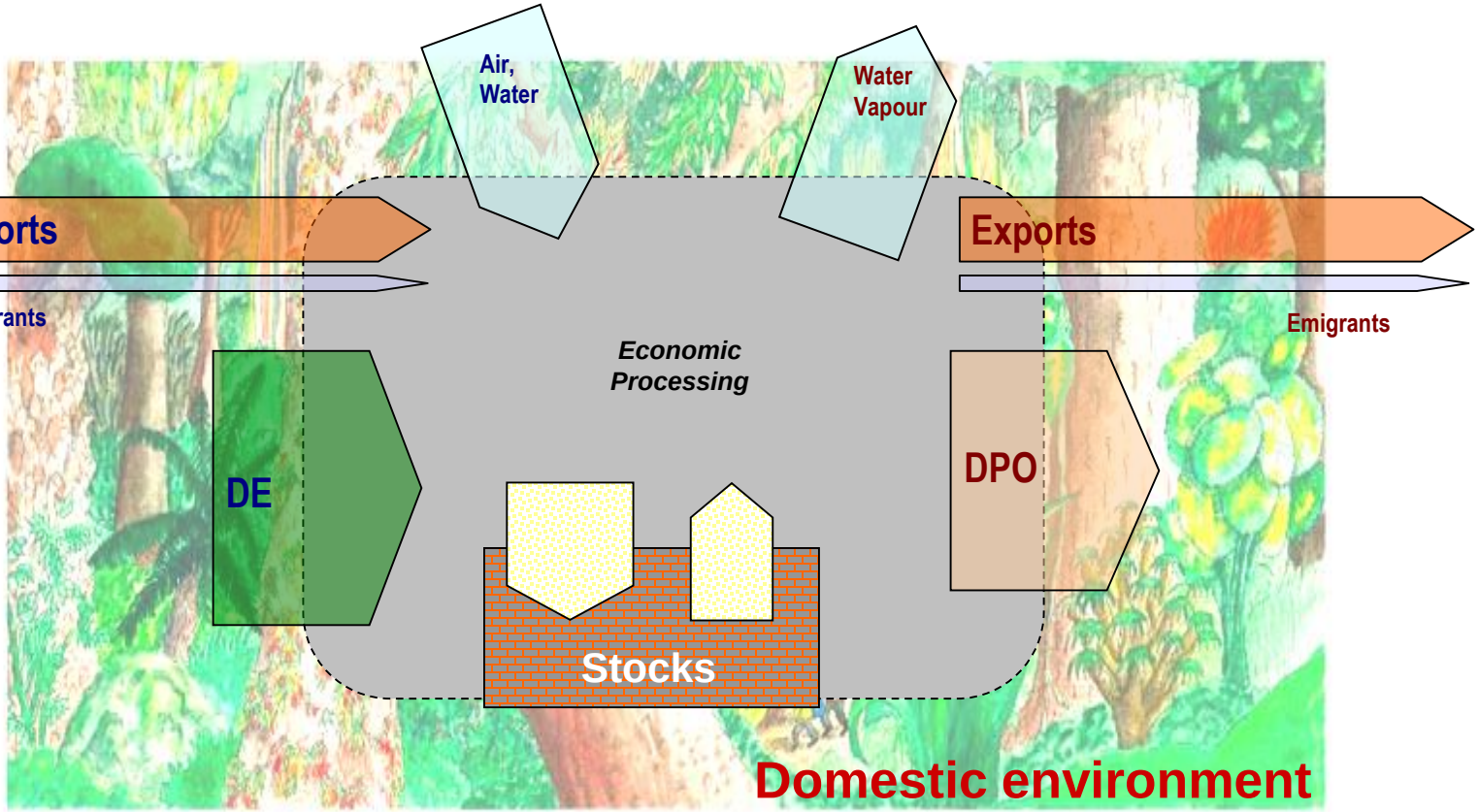
…they extract primary resources and use them for food, machines, buildings, infrastructure, heating and many other products and finally return them, with more or less delay, in the form of wastes and emissions to their environments.

Conceptualizing society-nature interactions



Fischer-Kowalski & Weisz, 1999

Operationalizing Social Metabolism:
Material & Energy Flow Accounting (MEFA)



DMC,
DE,
Im / Ex,
MI / MP
PTB,
RME, etc.

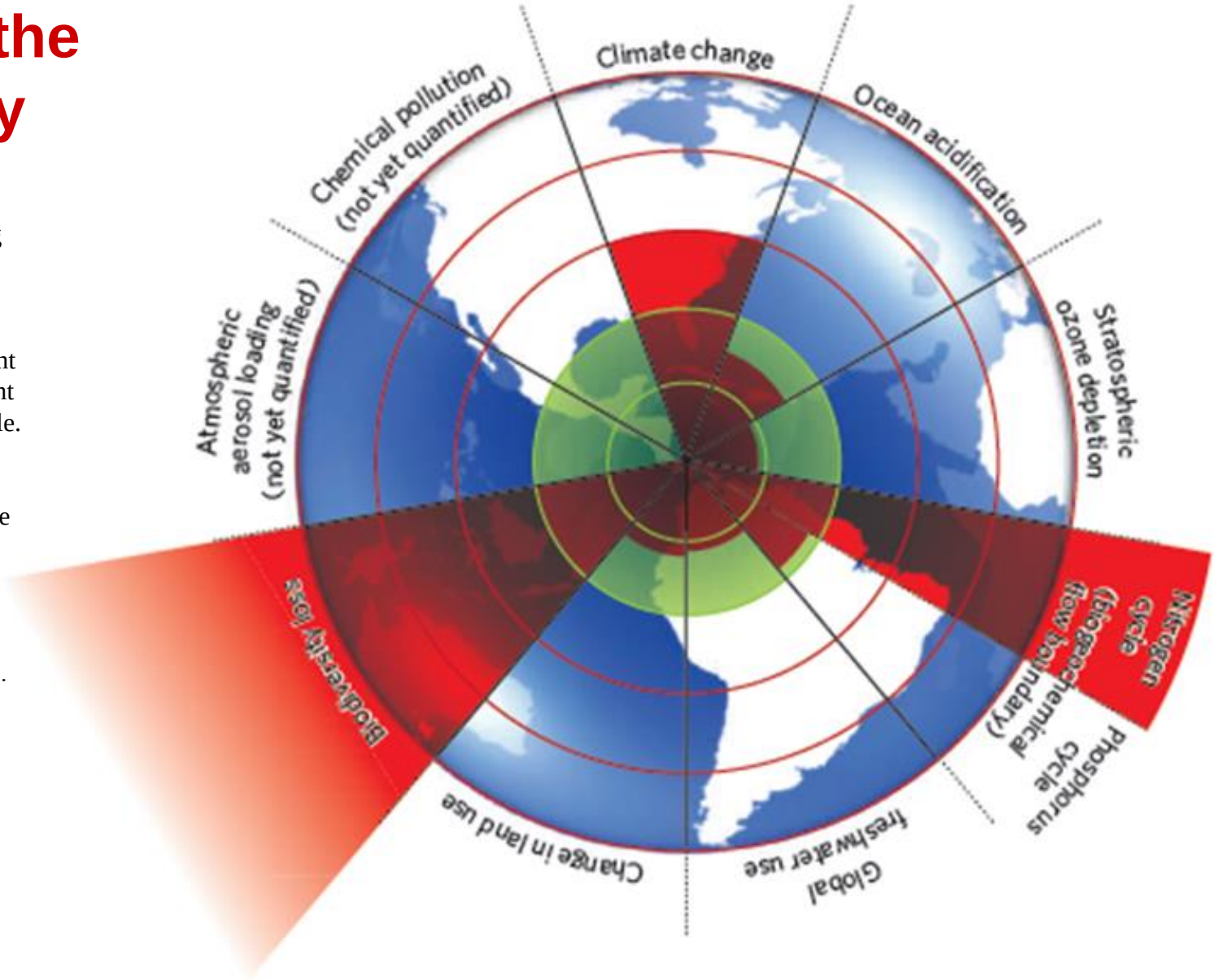
For national level studies, standard accounting guidelines and recommended databases exist for most countries

Why analyse material and energy flows?

- Materials and energy are biophysical categories necessary for human survival and reproduction
- They are finite both in terms of availability and productivity *(source function of nature)*
- Patterns of material and energy use (in both quantitative and qualitative terms) affect the future survival of humans and other species *(sink function of nature – living space)*
- The world is presently experiencing an unprecedented environment crisis due to the ways we consume our resources (materials, energy, land) causing sustainability problems on the input side (scarcity) and the output side (pollution)
- This has also had social consequences in terms of resource distributional conflicts and environmental justice

Beyond the boundary

The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded. Source: Rockström et al. 2009: p.472



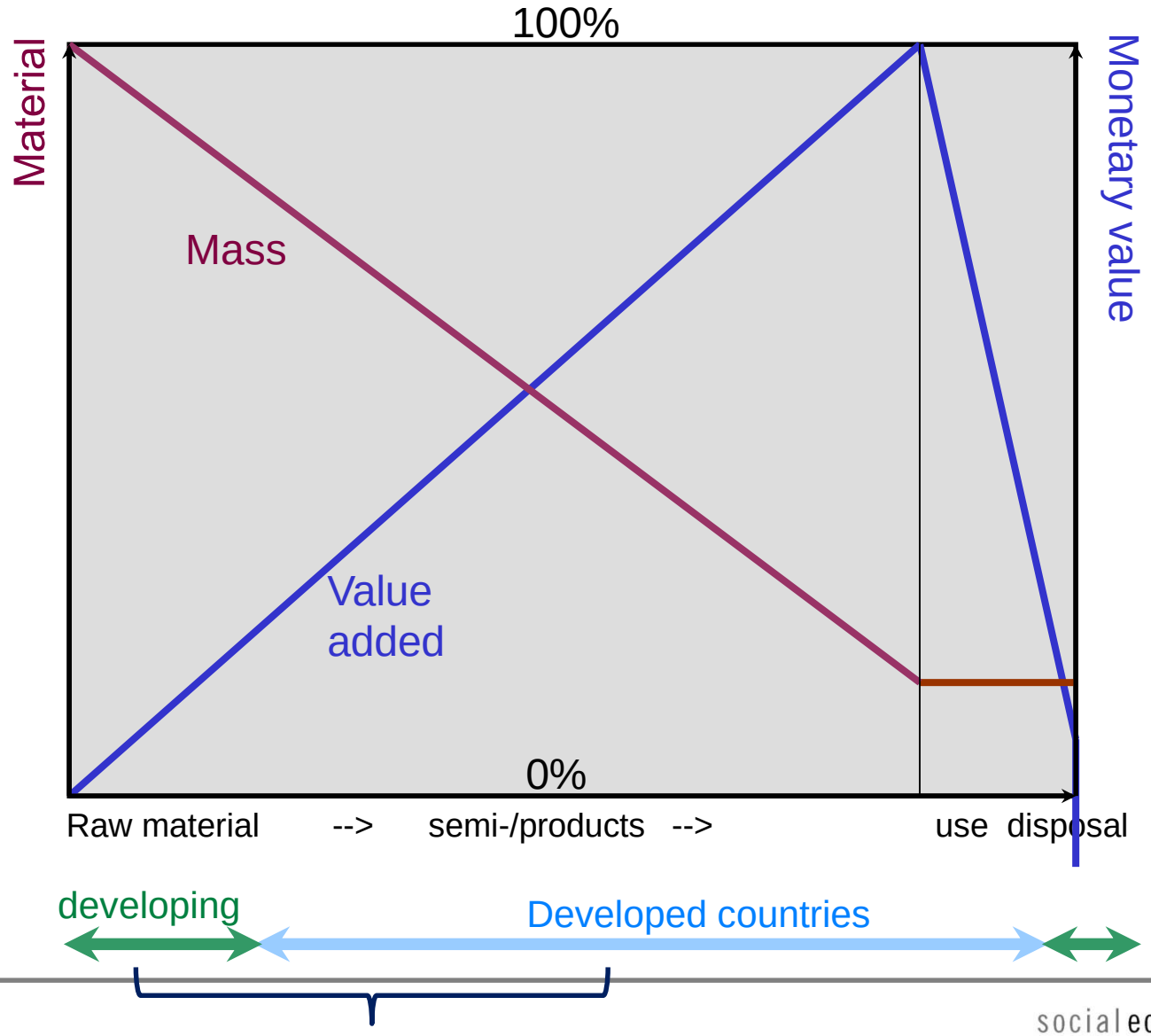
Source: Rockström et al. 2009

Material and Energy Flow Analysis - MEFA

MEFA is a method that allows to:

- Analyze the quantity and quality of resources extracted from nature and their passing through processing, transport, final consumption and disposal
- Analyze the spatial dimension of material flows (where extraction, production, consumption and disposal takes place)
- Interpret the impact of these flows within sustainability sciences, ecological economics, industrial ecology and social ecology
- Relate these flows to development concerns (ecological unequal exchange, uneven development, distributional conflicts, embedded power relations (political ecology)

Problem shifting via international division of labor



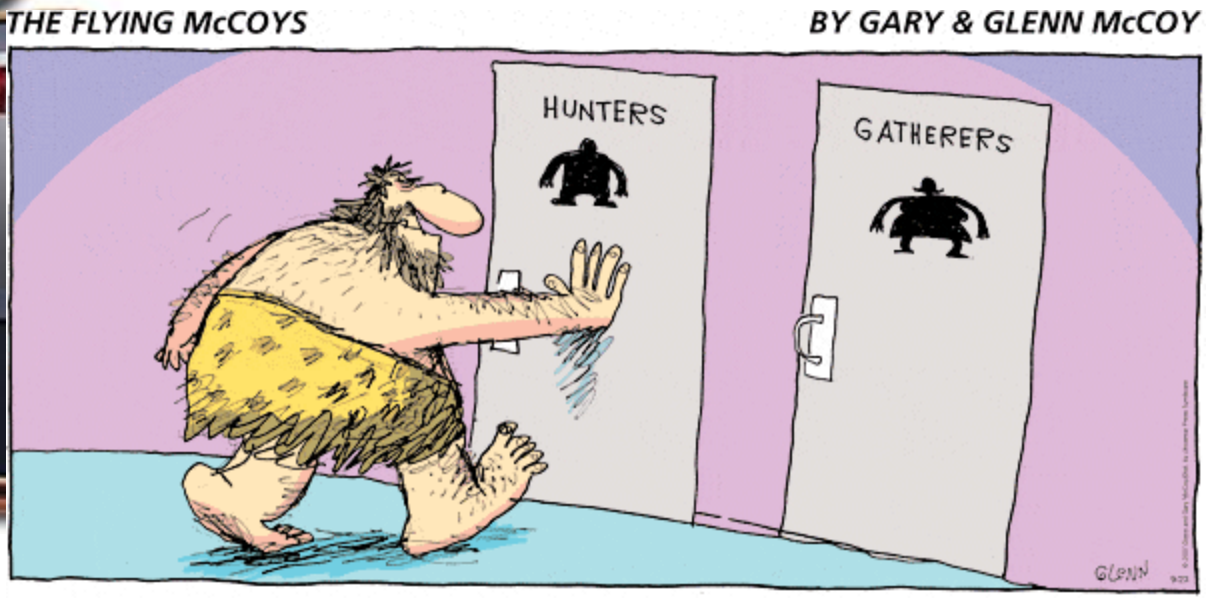
Unequal exchange; Environmental justice

The quantity and quality of material and energy throughput is influenced by…

(1) The size of human and livestock population, and man-made artifacts that need to be reproduced

(2) The productive / exploitative technology (incl. transport and services)

(3) Affluence, lifestyle and consumption patterns



Concept 2: Sociometabolic regimes and transitions

Theory of sociometabolic regimes

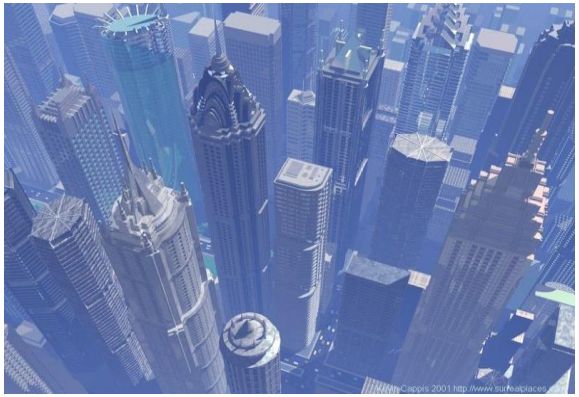
The theory of sociometabolic regimes (Sieferle) claims that, in world history, certain modes of human production can be broadly distinguished by the way they utilize and thereby modify nature.

Key constraint: energy system (sources of energy and main technologies of energy conversion).

Result: characteristic metabolic profile (range of materials and energy use per capita)

Slide courtesy: Fischer-Kowalski and colleagues

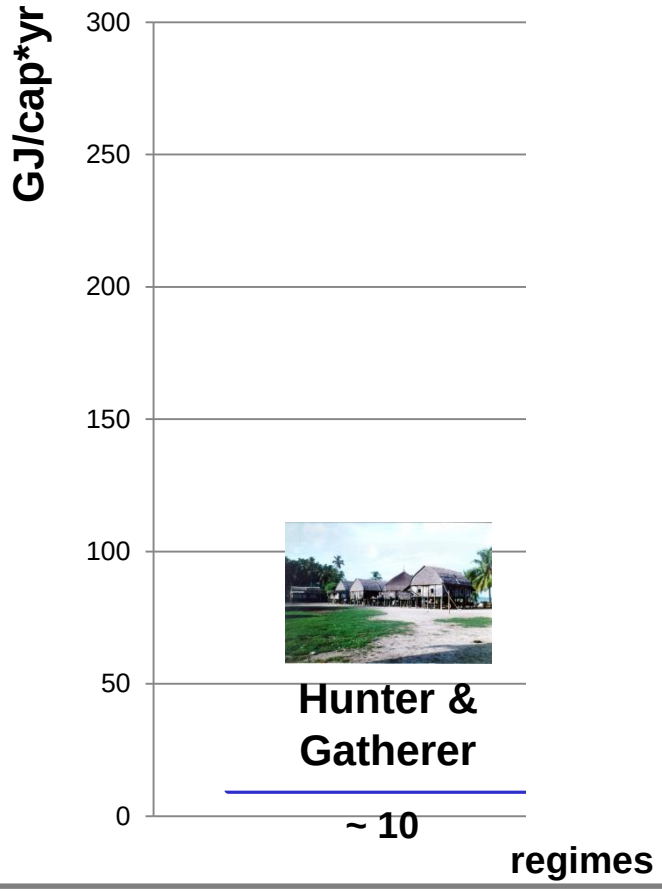
‚Socio-ecolgical regimes' in human history

hunter and gatherer society	agrarian society	industrial society
		
1t biomass (food, wood) <0,1t minerals (stones, metals)	4t biomass (food, fodder, wood) 0,2-2t minerals (stones, metals)	5t biomass (food, fodder, wood) 5t fossil fuel energy carriers 8t construction minerals 2t metals 20t total DMC/cap*yr

Material metabolism in t/cap*yr

Source: SEC database

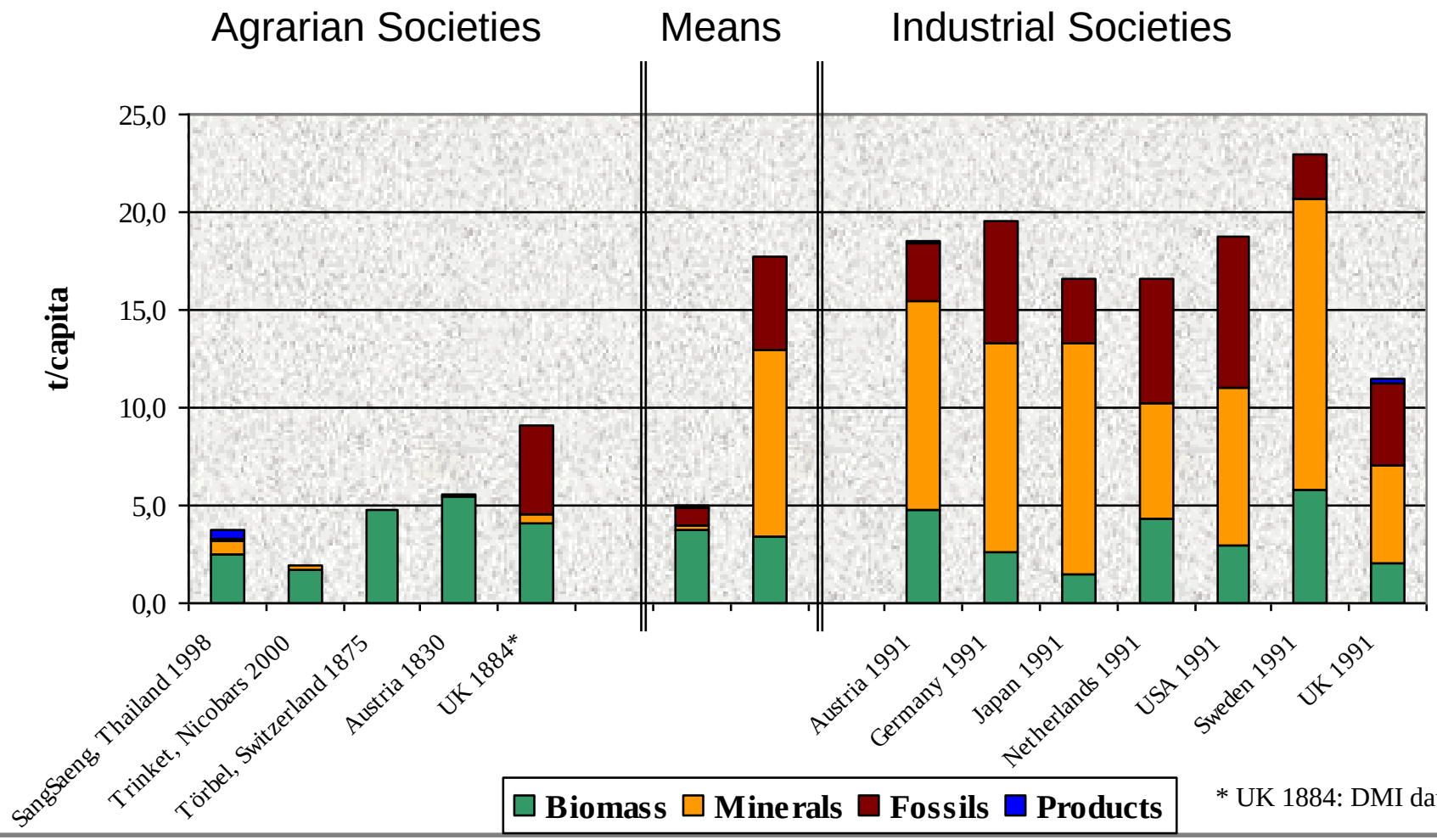
Energy consumption per capita depends on socio-ecological regime



Source: Sieferle et al. 2006, Schandl et al. 2008, SEC database

Human metabolism 3,5 GJ/cap*yr

Metabolic profiles by sociometabolic regimes (DMC/capita)

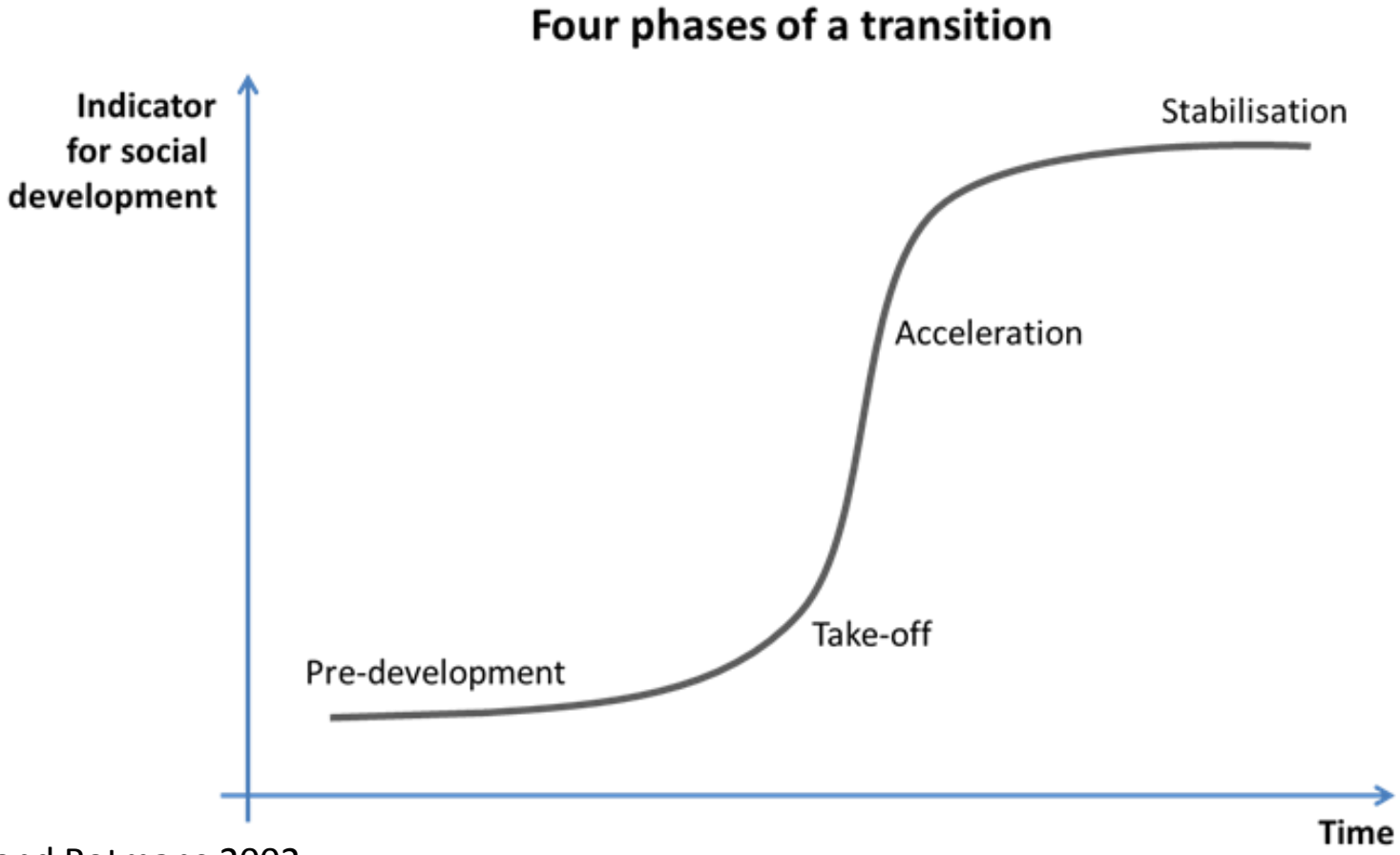


* UK 1884: DMI data

Sociometabolic profiles of key production regimes

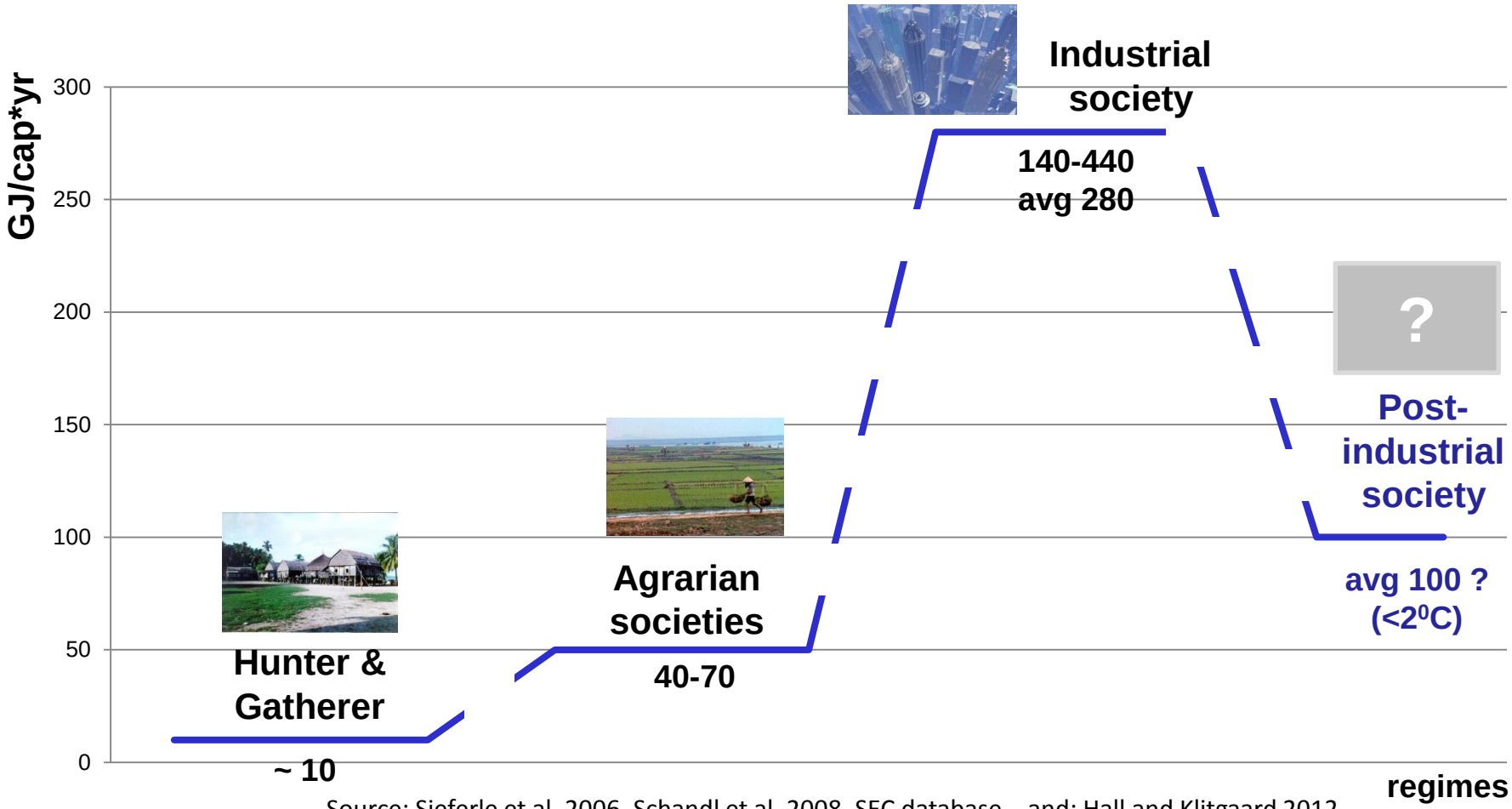
Indicator	Hunt&Gath.	Agrarian	Industrial	Factor
Pop. density [cap/km²]	<4	<40	<400	3-10
Agricultural population [%]	n.a.	>80%	<10%	8-9
Material use – DMC [t/cap/yr]	1-2	3-6	15-25	3-5
Energy use – DEC [GJ/cap/yr]	10-20	40-70	150-400	3-5
Share of biomass [% of DEC]	>99%	>95%	10-30%	3-5
Man-made artefacts – Stocks [t/cap]	<1	2-20	250-400	10-20
Time in economic work [h/adult/day]	1-3	5-6	8-9.5	2-4
Energy use per area [GJ/ha]	<1	<30	<600	10-30
Material use per area [t/ha]	<0.1	<2	<50	10-30

the energy transition: from biomass to fossil fuels



Martens and Rotmans 2002

Energy consumption per capita depends on socio-ecological regime



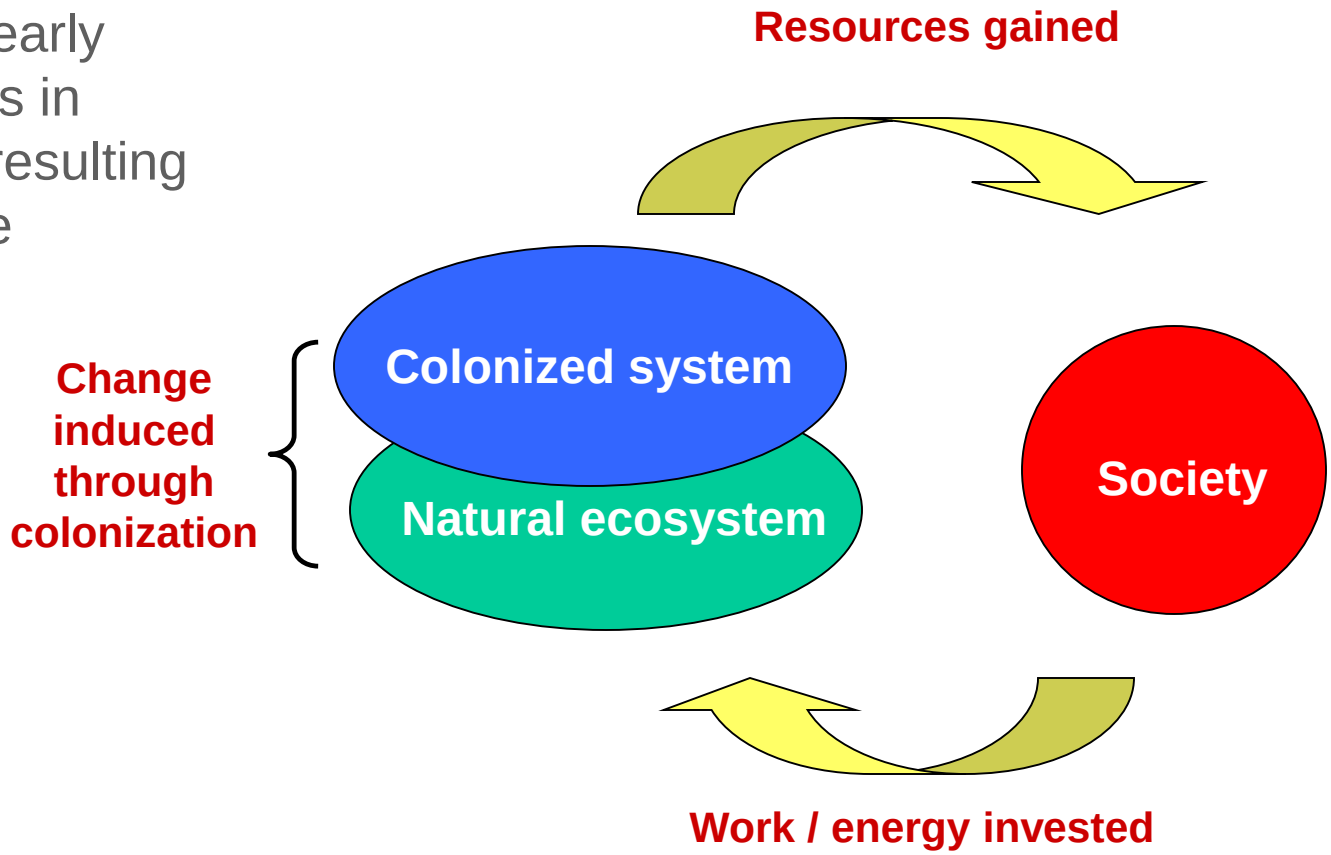
Source: Sieferle et al. 2006, Schandl et al. 2008, SEC database – and: Hall and Klitgaard 2012

How does the metabolism of societies affect land use?

Concept 3: Colonization of natural systems

HANPP: measuring impacts of land use

HANPP measures changes in yearly biomass flows in ecosystems resulting from land use



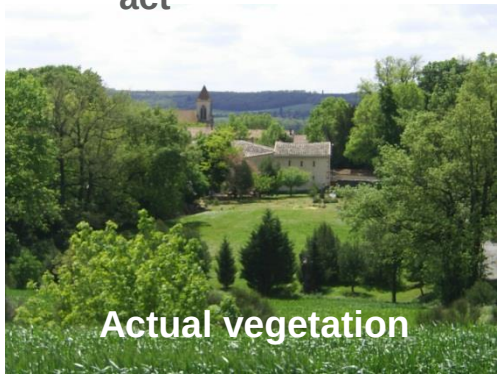
An integrated socio-ecological perspective on global biomass flows: The HANPP approach

NPP_0

Productivity of potential vegetation

(hypothetical vegetation assumed to prevail in the absence of land use; e.g., forests, grasslands, savannahs, deserts, shrubs, etc.

NPP_{act}



Productivity of actual vegetation

(including croplands, grasslands, built-up area, etc.

NPP_t

Energy remaining in the ecosystem after harvest

Productivity change

Harvest (NPPh)

- **Indicator of land-use intensity**
- **‚Pressure' indicator, useful to analyze drivers of land use**

Concept 4:
Functional time use
(a biophysical resource)

Human time and metabolism

Time is considered as a limited biophysical resource; time budgeting is a consequence of the fact that when a person is engaged in one primary activity, it is restricted from doing another primary activity simultaneously

Human time has some interesting features such as:

all human time has to be used somehow; preference for one activity over another is contingent on culturally prescribed means of self maintenance and reproduction;

all human time normally has to be metabolically sustained by the society, as each human lifetime hour, whether “productive” or not, requires a certain metabolic input, or else people starve and die.

disposal over the use of time, own time as well as time of other people, is one major marker of freedom and power.

How to link social metabolism, time use and labour time – implications for a sustainability transition

First link:
Social metabolism is driven by human production (human labour, working time, reinforced by technology and energy use)

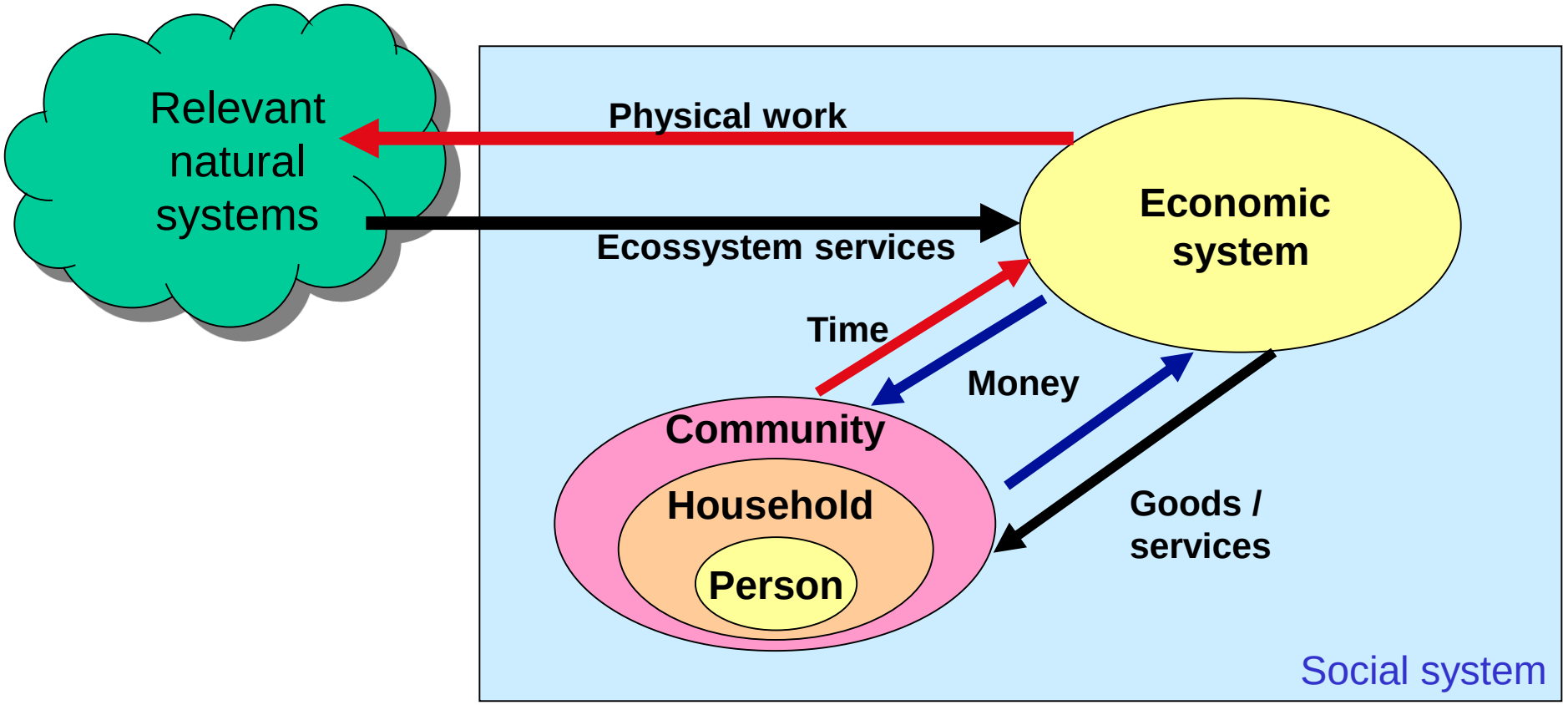
Second link:
Social metabolism is driven by human consumption (demographic growth, life styles, purchasing power)

Feedback:
investment of labour time produces income, and income produces consumption (rebound effect)

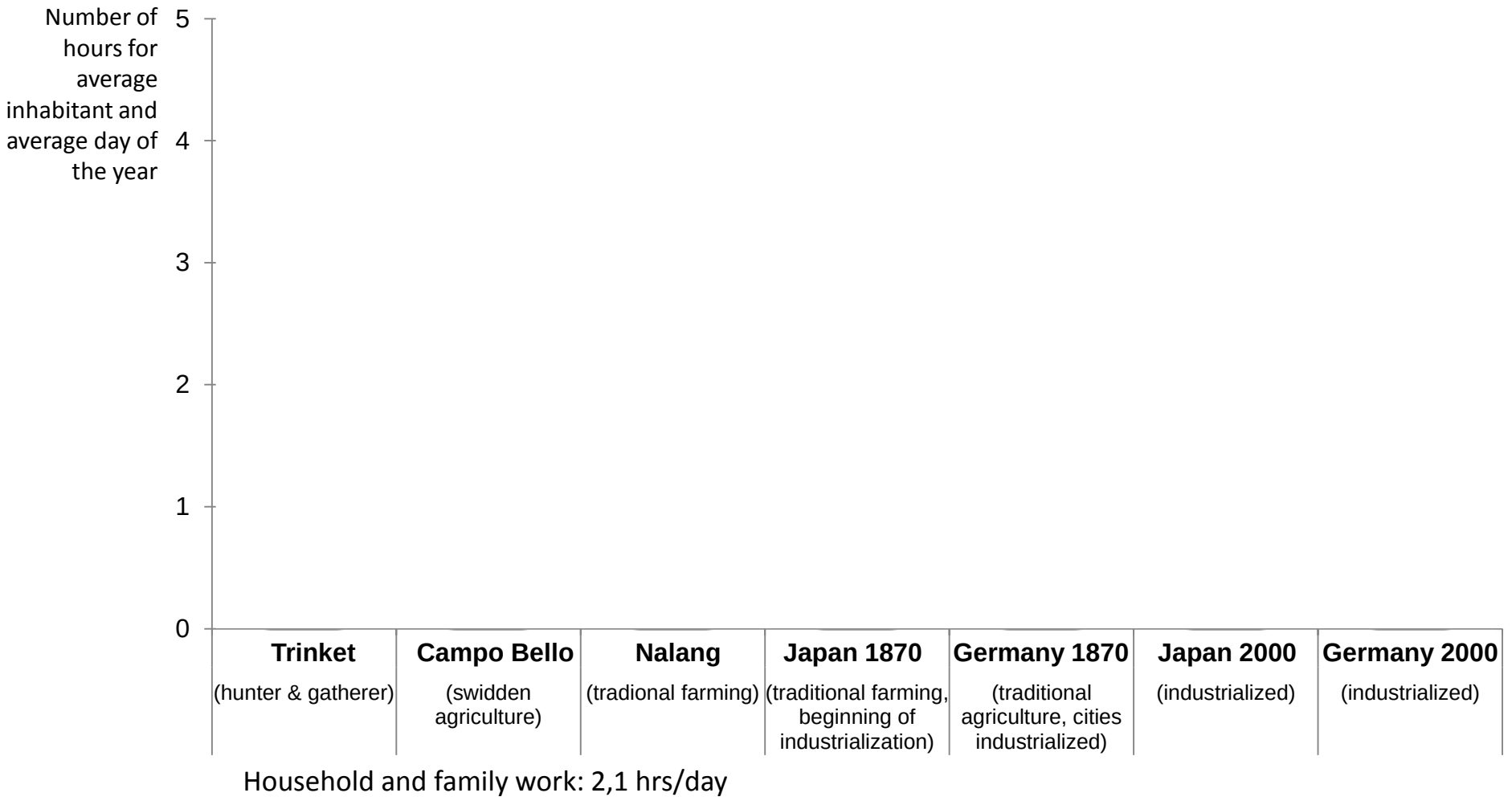
Third link:
Sustainability, in its core, has to do with securing (high quality) human life time in the future. This needs to be achieved with as little resource use and environmental impact as possible.

major transition: time use

Interlinkages within the social system



Labour hours in the economy



Household and family work: 2,1 hrs/day

Sources: Fischer-Kowalski et al. 2011 (for Trinket, Campo Bello and Nalang), Maddison 2001 (for Japan), Clearingstelle Verkehr 2012 (for Germany 2001/02

How do global processes affect the sustainability of local systems and how can we assess them?

Reading

Kušová, (Jan) Těšitel, Bartoš. 2009. **Biosphere reserves as learning sites of sustainable development.** In: Social Development

Chaplin et al. 2004. **Agricultural adjustment and the diversification of farm households and corporate farms in Central Europe.** In: Journal of rural Studies 20, 61-77

Kuskova et al. 2008. **Long term changes in societal metabolism and land use in Czechoslovakia 1830-2000: an energy transition under changing political regimes.** In: Ecological Economics 68 1-2, 394-407

Singh et al. 2010. **Local Studies Manual: A researcher's guide for investigating the social metabolism of local rural systems.** In: Social Ecology Working Paper 120

Fischer-Kowalski et al. 2011. **Sociometabolic transitions in subsistence communities: Boserup revisted in four comparative case studies.** In: Human Ecology Review 18 2

Singh and Haas. Forthcoming. **Analysing the social metabolism of 'local systems': The Nicobar Islands before and in the aftermath of the 2004 tsunami.** In: New book – Social Ecology

Trip Vienna to Suchdol/Klikov/Frantiskov

- Franz Josefs Bahnhof: departure 10:29
- Czeske Velenice 12:51 - 13:19
- Suchdol nad Luznici 13:38
- 20 minutes bicycle trip

- We meet on May 12 at **10:00** to organize tickets: Vienna – Czeske Velonice
- Einfach Raus Radticket costs 44 Euro for up to 5 persons
- Velonice – Suchdol we buy in Velonice (is relatively cheap)