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The (missing) rurban Link – towards resilient and sustainable rural-urban systems

Environmental accounting of…

…sustainable (urban) development

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Researcher in landscape architecture and urban planning

- PhD from Uppsala university 2008, Applied Environmental Impact Assessment
- Interdisciplinary background in sustainable development; geography and systems ecology – environmental accounting

Department of urban and rural development (Stad och Land)

Various aspects of sustainable urban-rural development:

- Landscape architecture (and spatial/urban planning)
- Rural development
- Environmental communication
- Agrarian history

Ongoing work

Systems landscapes: a critical systems approach to urban sustainability (**SysLa**) Formas, 2016-2018, www.slu.se/systemlandskap

SYSLAB: a virtual SYStemsLAndscapeLABoratory
Vinnova, SLU Holding etc, 2014- www.slu.se/systemanalys

Green Innovation Park: Innovation, entrepreneurship and campus development for a sustainable future
http://greeninnovationpark.se/

Central concepts

A system is a group of parts which are connected and work together…

Resilient and Sustainable Rurban Systems

… structures, processes, functions, and relations in urban and rural landscapes support each other – intentional and ***mutually reinforcing*** (“smart”) connections at multiple scales

Central concepts

***System(s) landscapes* –** theoretical frame where we study urban areas as…

…embedded sub-systems with both direct and indirect linkages to bio-physical and socio-economic resources and processes at multiple scales

- "societal metabolism"
- holistic systems thinking

Central concepts

Emergy

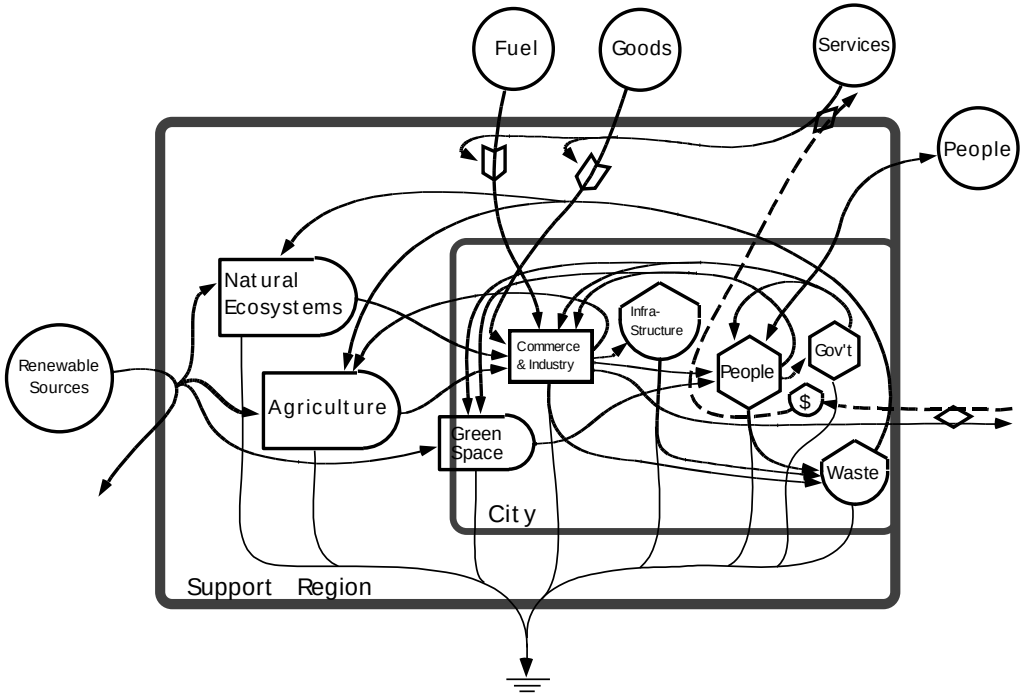
The sum of all different forms of energy used up directly and indirectly to make a product or service

- Sometimes called Energy Memory = Emergy
- Expressed in energy of the same FORM … usually solar energy (equivalents)
- Units = Solar Emergy Joules = sej

Emergy enables comparison of "apples and pears" – to identify what really matters for sustainability

Challenge:

Get from scientific versions…



Note	Item	Unit	Data (units/yr)	Unit Solar Emergy (SeJ/unit)	Solar Emergy (E13 SeJ/yr)	Em$ Value (2000 $/yr)
RENEWABLE RESOURCES						
1	Sun	J	4,71E+13	1	4,71	25,48
2	Rain	J	5,38E+10	3,02E+04	163	881
3	Estuarine waters	J	1,98E+11	2,59E+04	514	2779
	Sum of free inputs (direct sun omitted)				676	3661
PURCHASED INPUTS						
4	Fuel	J	1,16E+11	1,11E+05	1284	6946
5	Feed	J	3,10E+11	2,20E+05	6826	36940
6	Labour	J	3,35E+09	4,40E+06	1477	7991
7	Lime	g	2,00E+06	1,68E+09	336	1818
8	Nitrogen	g N	1,67E+05	7,04E+09	117	635
9	Machinery	g	1,53E+04	1,13E+10	17	93
10	Phosphate	g P	3,33E+03	3,36E+10	11	61
11	Shrimp post larvae	ind	3,00E+05	1,75E+11	5242	28364
12	Services	$	2,26E+04	1,85E+12	4171	22572
	Sum of purchased inputs				19482	105419
	Total emergy				20158	109080
TRANSFORMITIES, Calculated						
13	Yield, ha/yr	$	12758	**1,58E+13**	SeJ/$	
		J	2,49E+10	**8,11E+06**	SeJ/J	

Note	Name of Index	Expression	Quantity
INDICES, calculated			
14	Investment ratio	F/R	29
15	Yield Ratio	Y/F	1,03
16	Emergy exchange ratio	Y/$ * (SeJ/$)	6,28E+24
17	% Renewable	R/(R+N)	19
18	Empower Density	SeJ/ha/yr	2,0E+17
19	Environmental loading ratio	(F+N)/R	33,8
20	Emergy sustainability index	EYR/ELR	0,03

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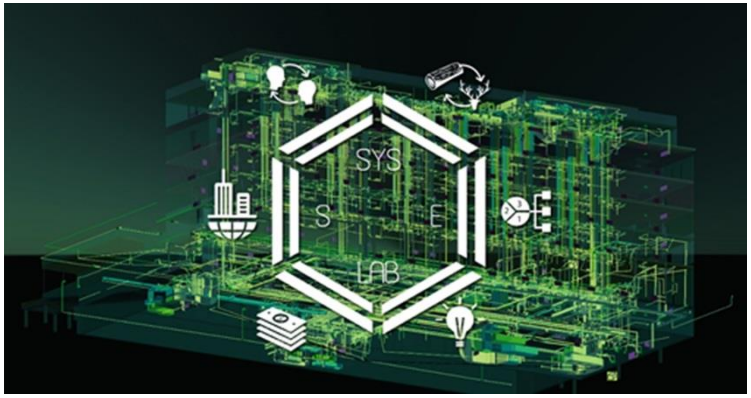
…to something that anyone can understand and make use of

”How can we know how sustainable our cities are when we don´t know what it means, and don´t have the tools to asses it?”

Ingolf Schädler, Deputy director general for innovation
JPI Urban Europe, Brussels, October 2015

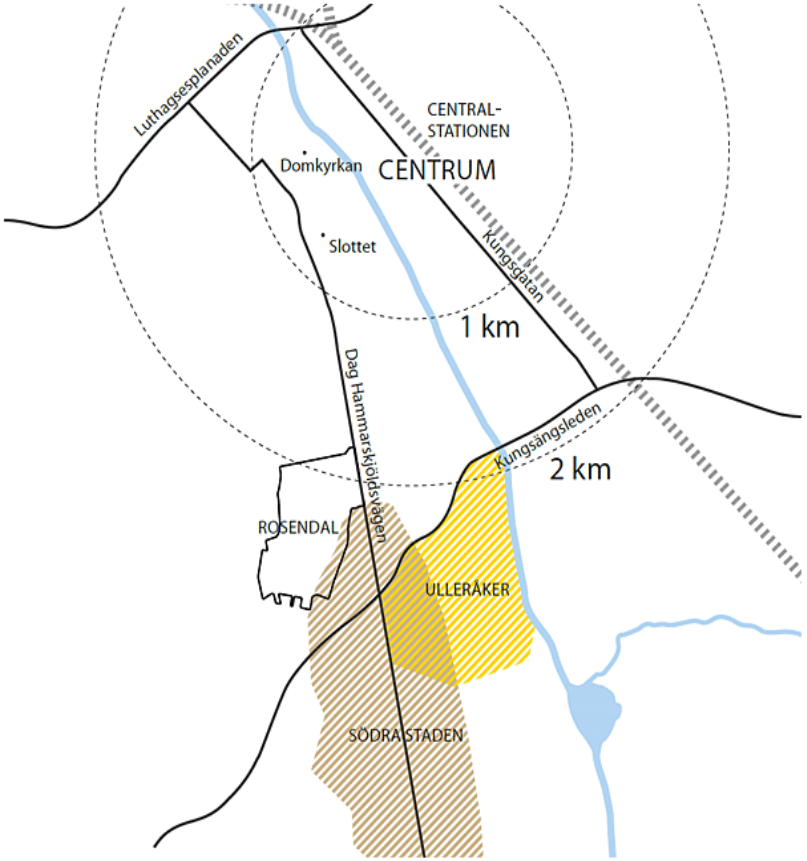
Emergy enables comparison of “apples and pears” – to identify what really matters for sustainability

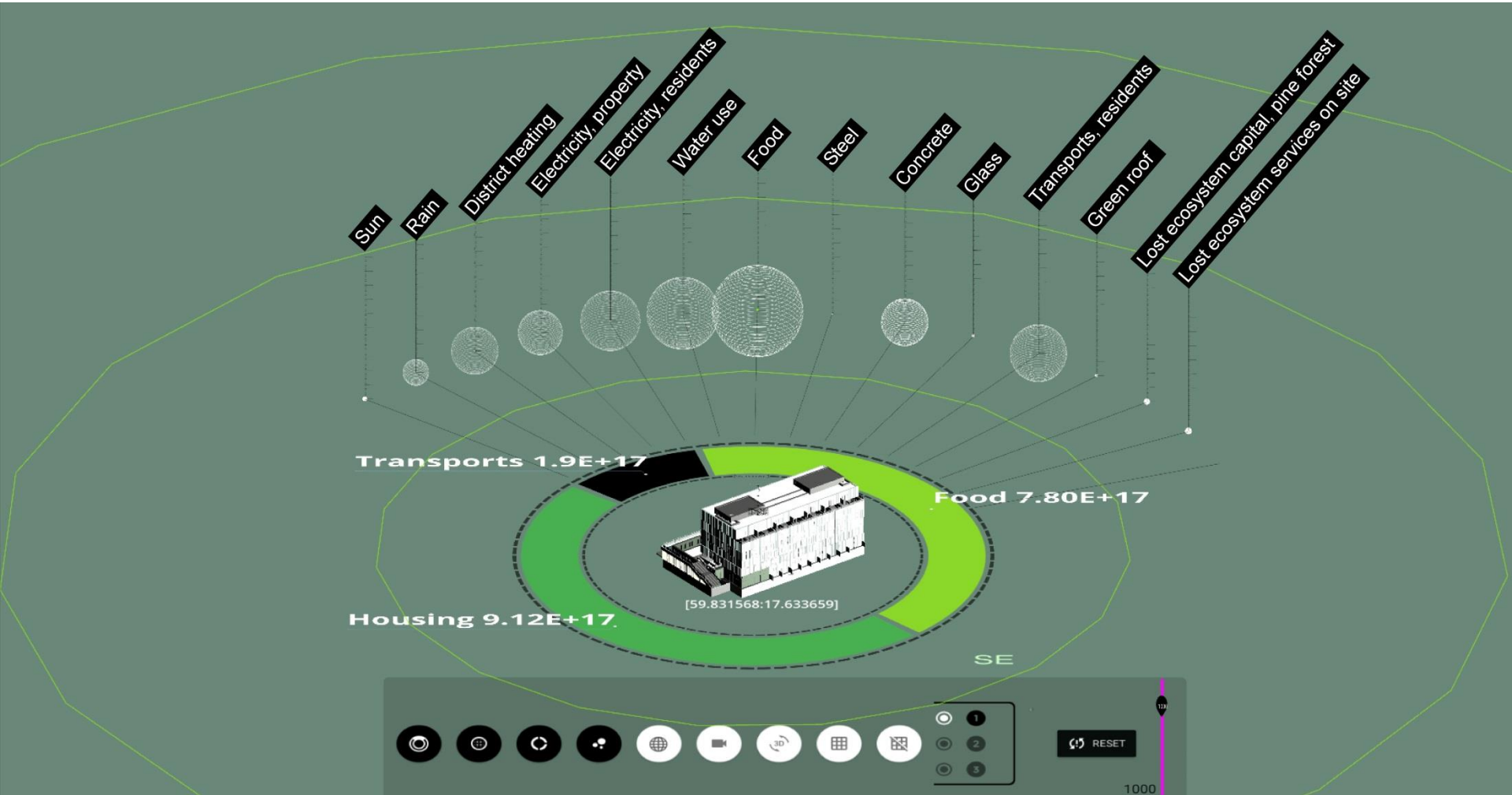


SYSLAB: a virtual SYStemsLAndscapeLABoratory

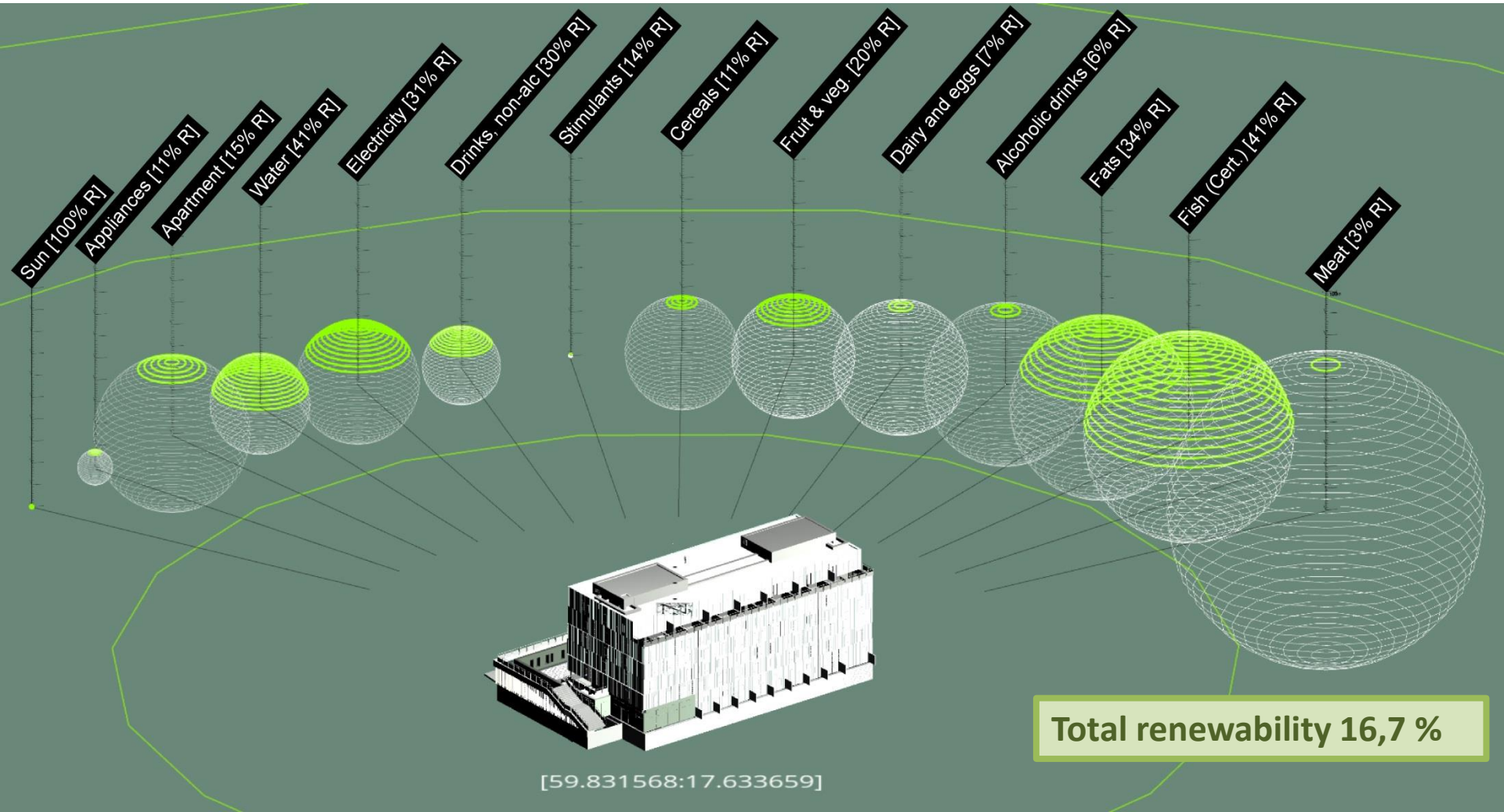
Examples from emergy based research and innovation

First trial case: Smaragden, Rosendal




Sun
Rain
District heating
Electricity, property
Electricity, residents
Water use
Food
Steel
Concrete
Glass
Transports, residents
Green roof
Lost ecosystem capital, pine forest
Lost ecosystem services on site
Transports 1.9E+17
Food 7.80E+17
Housing 9.12E+17
[59.831568:17.633659]
SE
RESET
1000

SYSLAB SYSTEMLANDSKAPSLABORATORIUM



Total renewability 16,7 %

Conclusions/highlights

- The contribution (resource support) by rural areas to urban areas is substantial
- Renewability/sustainability of urban systems is primarily dependent on activities outside of the urban area (of influence?)
- Food is a concrete example at the intersection of the urban and the rural (interdependency)– potential for integrated development and policy

How do we create rurban relations that simultaneously enhance rural and urban systems (reciprocity)?

Examples of other projects with urban-rural perspectives:

- CityLands – reciprocal co-evolution for urban and rural areas
- Regional Food Supply Strategies
- Local food systems – perspectives of Swedish municipalities
- Urban Agriculture
- Crowd Funding (urban dwellers invest in rural business)
- Migration and integration with global rural-urban connections

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Thank you for your attention!

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