



LEUPHANA
UNIVERSITÄT LÜNEBURG

Sustainability on Campus

Overview, Implementation and Outlook



EUROPÄISCHE UNION
Europäischer Fonds für
regionale Entwicklung

Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages



■ Sustainability: The triple bottomline concept



“Meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

– Washington State Department of Ecology



■ Sustainability on Campus:





■ Implementation: Milestones at the Leuphana University

Year	
1996	Foundation of the interdisciplinary department „Environmental Science“
1997	Joining the “University Network for Sustainability”, COPERNIKUS Campus
1999	Founding of the senate commission “Agenda 21”
1999	Project “Agenda 21 and University of Lueneburg” (1999 - 2001)
2000	Implementation of the EMAS management and reporting scheme Staff (1 Pers. 50%), guidelines, 2 year reporting cycle (ISO 14001)
2001	Research and development project “Sustainable University“ (2004 - 2007)





■ Implementation: Milestones at the Leuphana University

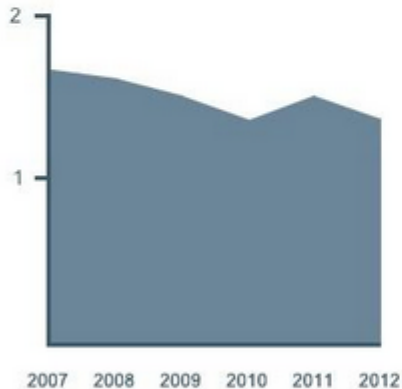
Year	
2005	Bestowal of the UNESCO Chair “Higher Education for Sustainable Development”
2006	Decision of the senate for a „humanistic, sustainable and action-oriented“ university for the 21 st century
2007	Definition of the goal: climate neutral university
2007	First overall sustainability report “Steps to the future”
2008	Emphasis on sustainability research as one of four initiatives
2010	Foundation of the Faculty Sustainability



■ Sustainability: Manage and Measure

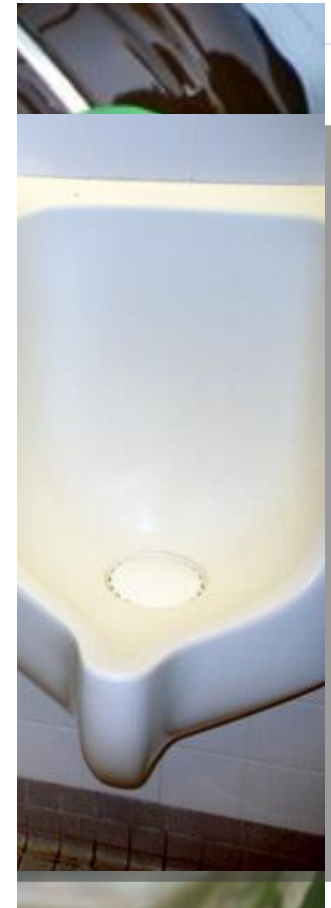
ENERGY & EMISSIONS

In 2010, UBC committed to bold greenhouse gas (GHG) emission reduction targets—33 per cent by 2015, 67 per cent by 2020, and 100 per cent by 2050, compared to 2007 levels. We're investing in large-scale energy retrofits, alternative energy systems, and engagement strategies to meet these ambitious climate goals.



Greenhouse gas emissions per student

1.42 tCO₂e/FTE in 2012



of



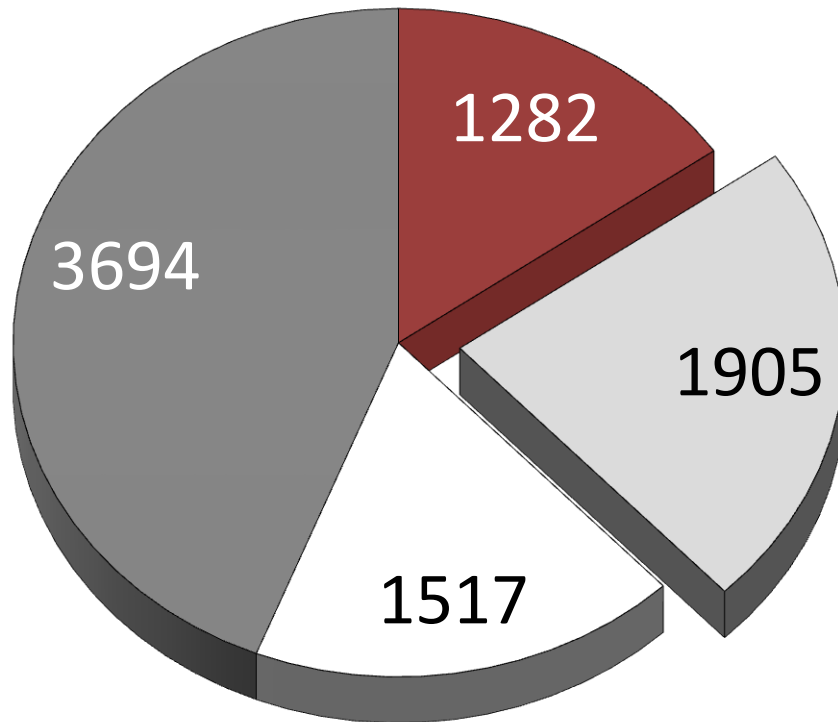
■ Emissions: Zero Carbon?

CO ₂ -Reduction	Timeframe	Action
3.5 t	per year	New lighting system in the gym
22 t	per year	Photovoltaics on the roof of the gym
1500 g	per kWh food	Green Canteen (organic, vegetarian food)
?		Climate-neutral mail (GoGreen)
?	per year	New efficient lighting system in the library
22 t	per year	Refurbished local heating network (2010)
?	per year	Use of biogas for heating of the Volgershall car
3.3 t	per year	Photovoltaics on the roof of building 9
19.5 t	per year	Optimization of the lighting scheme in the library
21 t	per year	Optimization of the cleaning scheme in the library
90 t	WS 06/07	„dont waste energy“ campaign
6.6 t	WS 04/05	„Energy Trophy“ campaign
10 t	per year	Heat savings between christmas and new year
4.4 t	WS 01	Campaign in one building
21 t	per year	Technical optimization in building 14





■ Emissions: Zero Carbon?



Leuphana ~ 10^0 MW el.

Datacenter, large RI ~ 10^2 MW el.

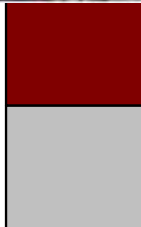
Industry up to 10^3 MW el.

- Heat
- Electricity (renewable)
- Business Trips
- Commuter Traffic

Leuphana University, t CO₂
6 GWh/a th.; 2.5 GWh/a el.
1100 Staff members
8000 Students



Emissions: Mobility



Car



Train



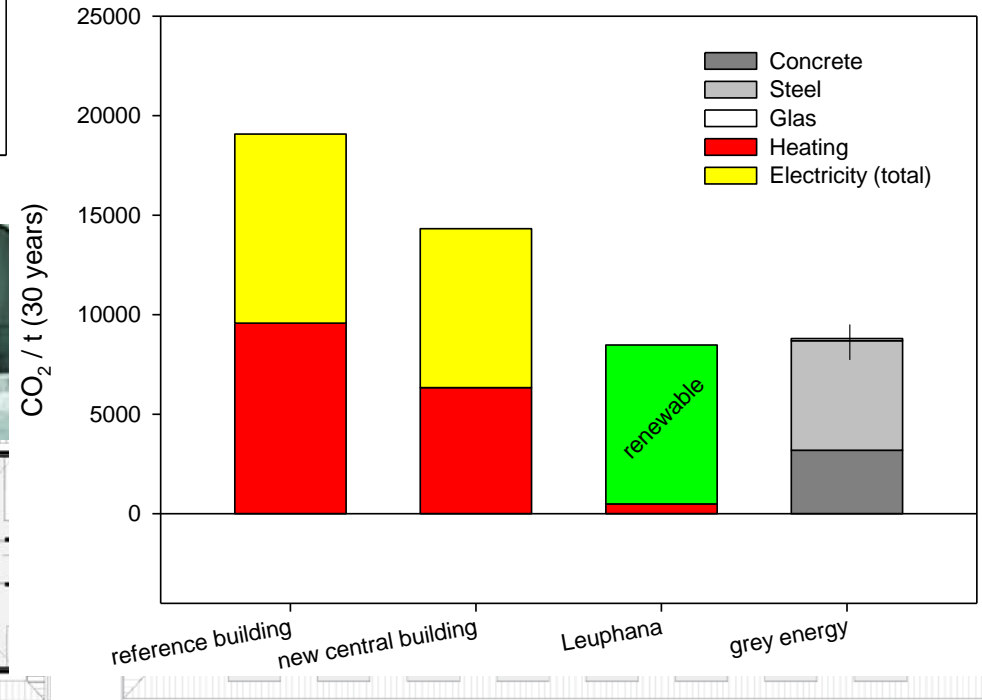
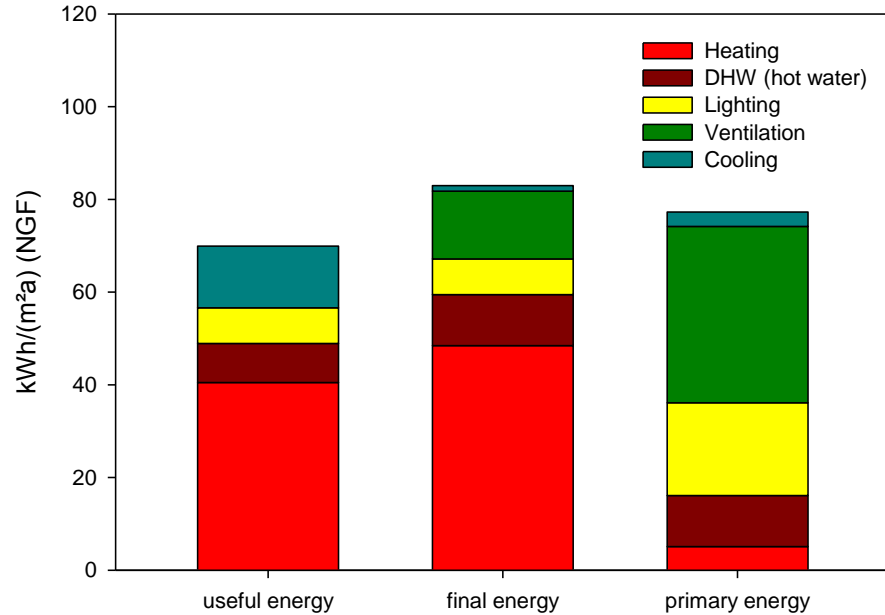
Leuphana University, t CO₂

1100 Staff members

8000 Students



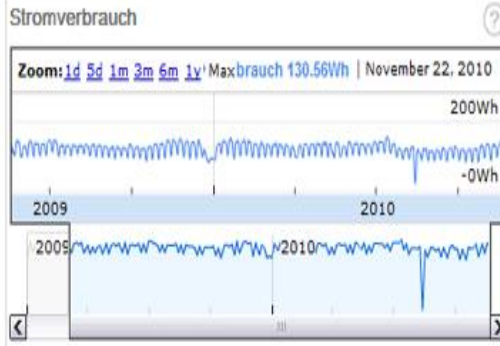
New buildings offer significant opportunities for energy efficiency. Building Enabling social aspects for 40% overall energy savings (primary energy) in existing buildings at lower cost. Further measures can be financed using the savings.



Informatikzentrum NIZ + BS4



Name: Informatikzentrum NIZ+BS4
Straße: Mühlenpfordtstraße 23
PLZ: 38106
Ort: Braunschweig
Kontaktperson: Hanna Soldaty
Telefon: +49 (0) 531 - 391 3591

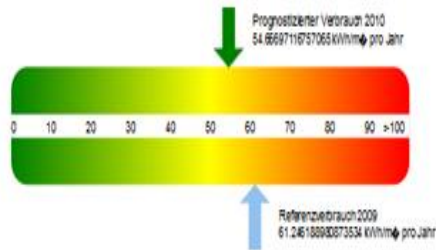


Einsparprognose 2010

↓ 115.24 MWh/a

Mehrverbrauch/Einsparung

Geld CO2 **Energie**



rBruner83

RYAN BRUNER

Member of the [The Flying Mongooses](#)

- ACTIVITY
- AWARDS
- OPPOSITION**
- INFO

YOUR STATS



AVERAGE



BEST MEMBER



COMPARISON TYPES

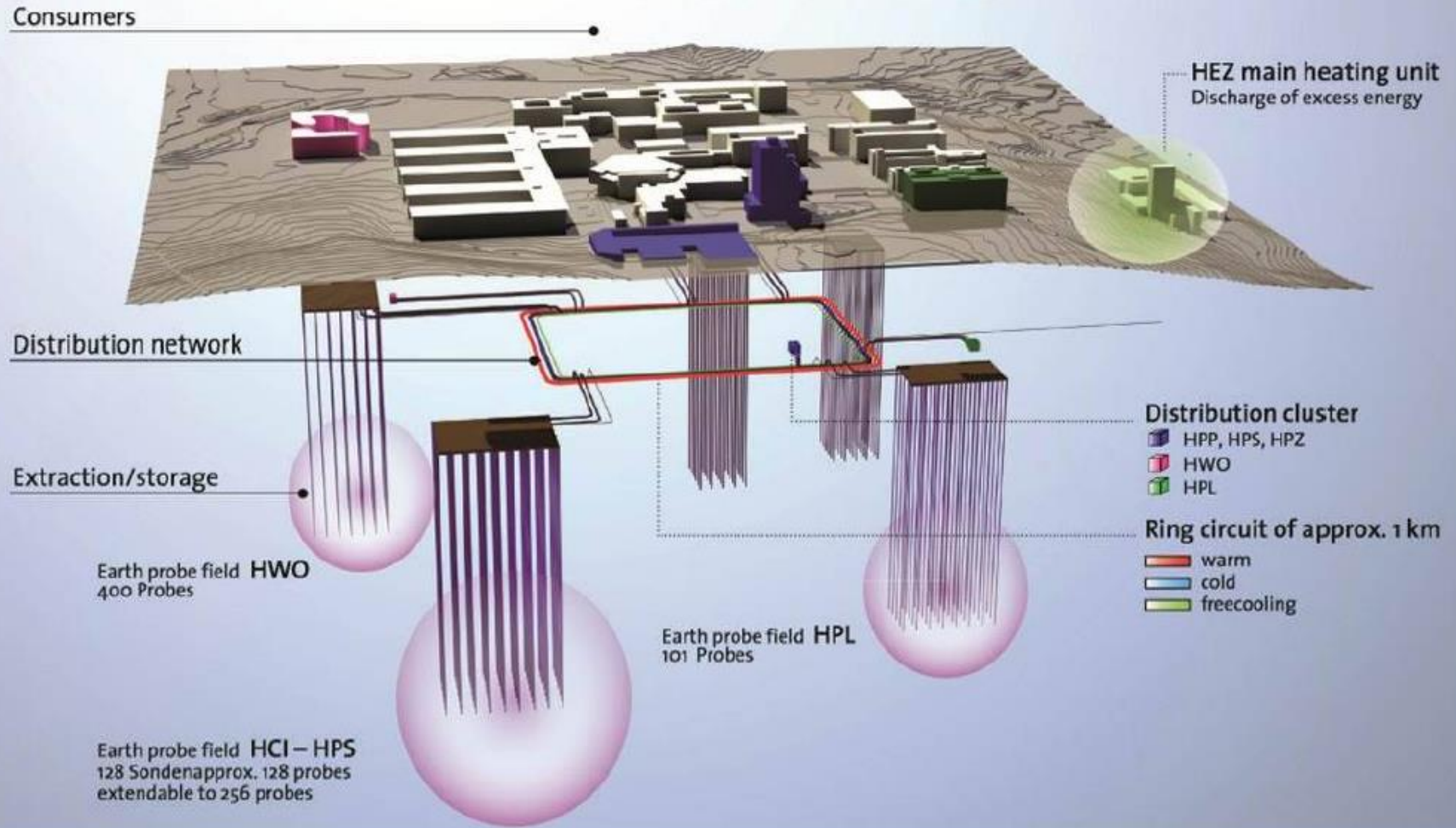


MENU



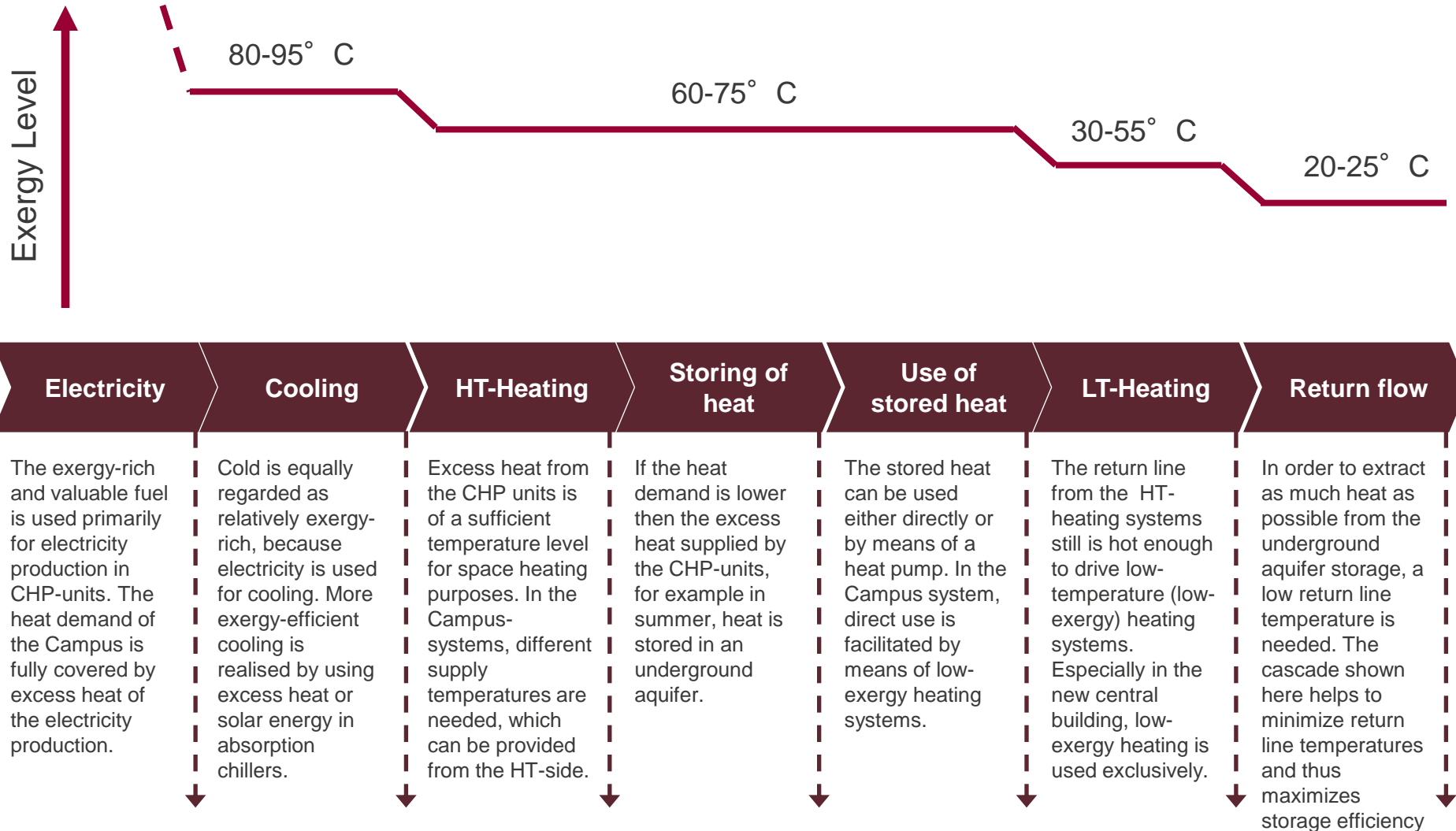
■ Cooling waste energy, cogeneration, thermal storage and free cooling (+ solar...)

Earth probe system in the Science City





Different temperature levels in the energy system allow for optimal heat use and increase thermal storage efficiency.





Exergy efficiency analysis show the advantages of cogeneration + thermal storage due to the minimized use of inefficient peak load heat production

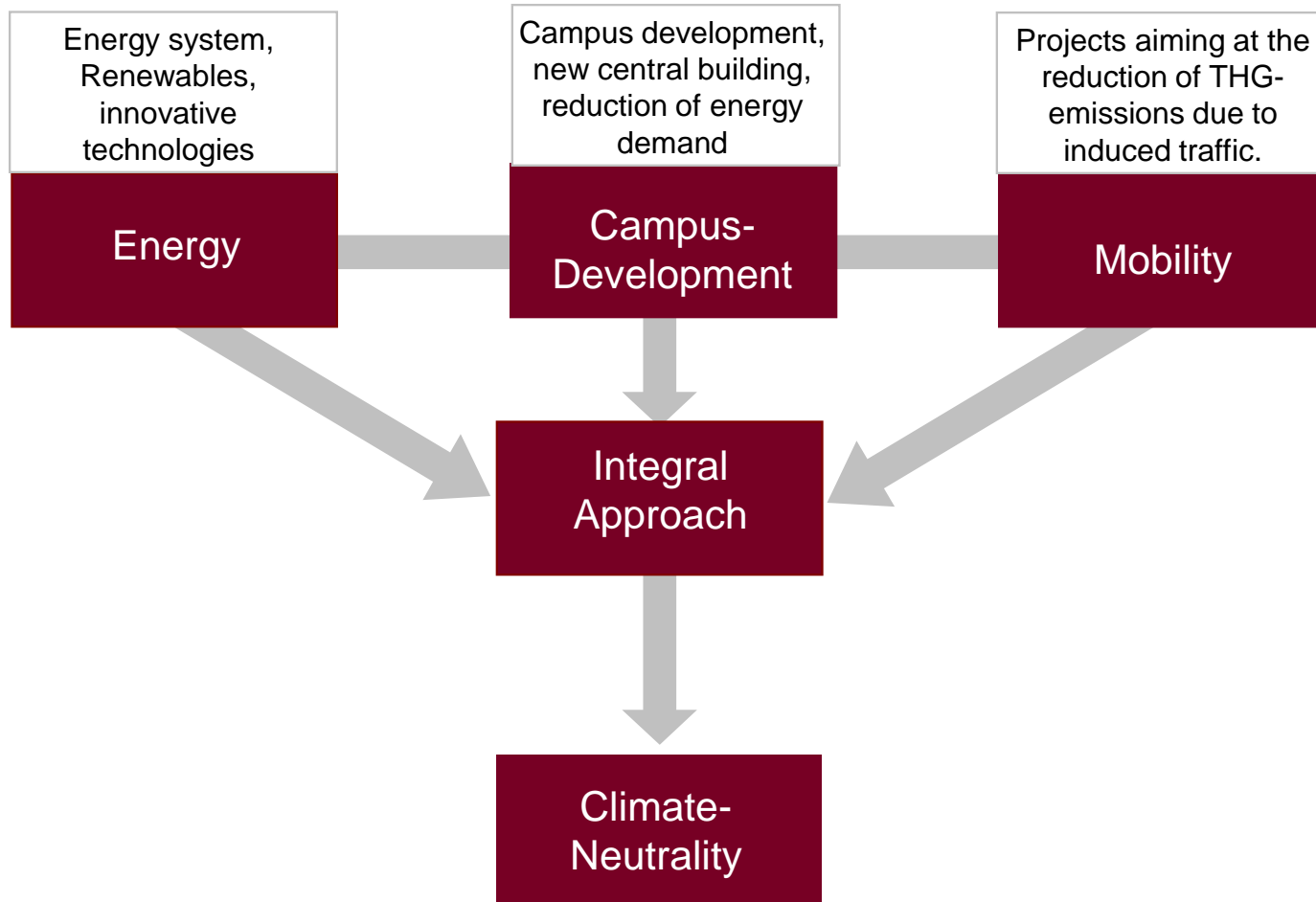
	Exergy eff. η_c	Exergy use
Oil+Gas Boilers	0.03	$0.68 \cdot Q_{\text{Heat}}$
Baseload-CHP	0.49	$0.66 \cdot Q_{\text{Heat}}$
Power-operated CHP with short time storage	0.63	$0.53 \cdot Q_{\text{Heat}}$
CHP with aquifer storage	0.68	$0.52 \cdot Q_{\text{Heat}}$

- baseload plant: 60% CHP heat, 40% boiler, 50m³ water storage
- power-operated plant: 90% CHP heat, 10% boiler, 200 m³ water storage
- CHP with aquifer storage: 100% CHP heat, 60% heat recovery, 33% stored heat

η_c (Biogas) = 0.62 (compare combined cycle plant $\eta_{\text{el.}} = 0.59$ and $\eta_{\text{th.}} = 0.03$)
[Lüking 2011]



■ Integral, campus-wide planning and goal setting



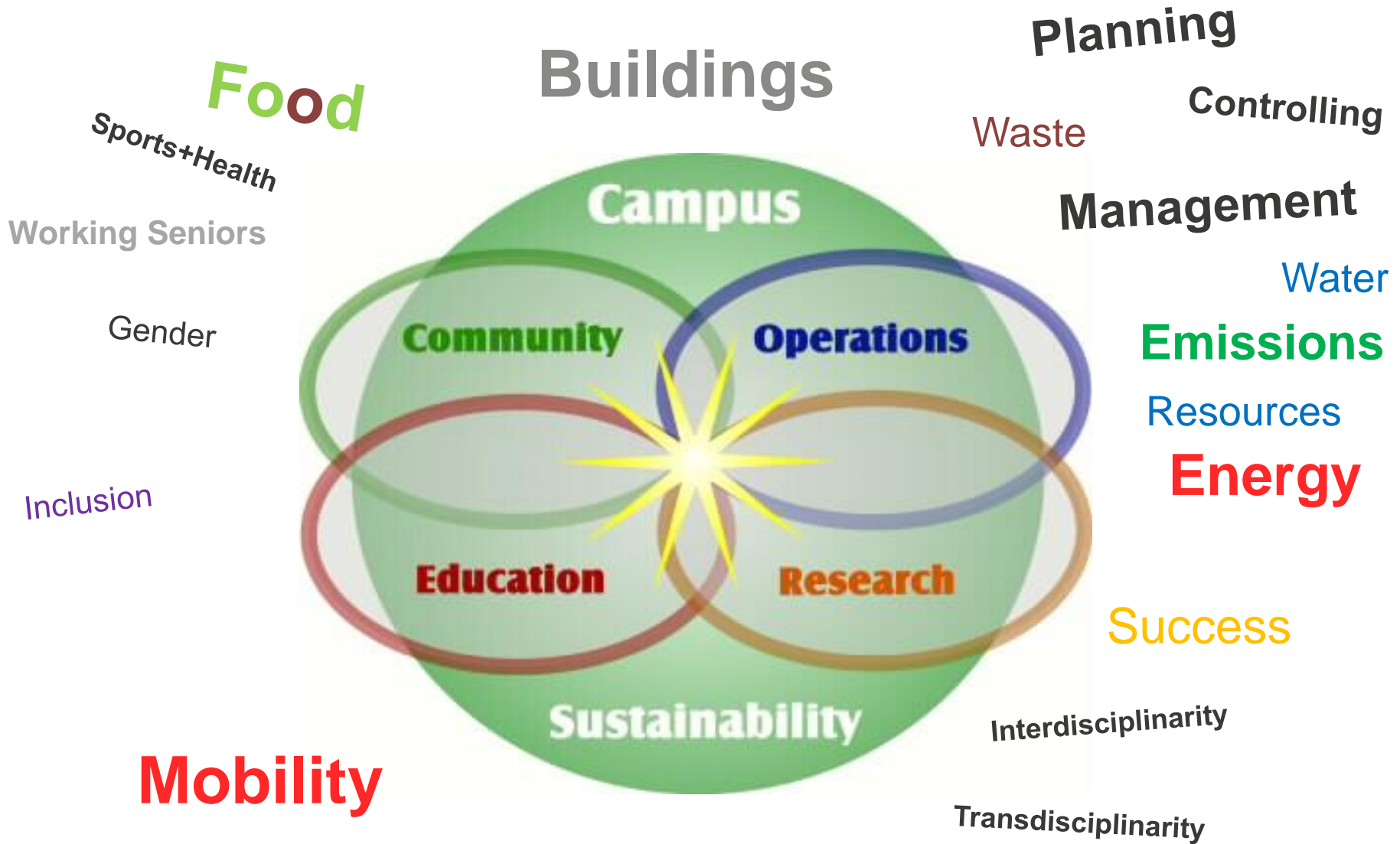


■ **Integral, campus-wide planning and goal setting: Where are we and how far can we go? Setting boundaries...**

Heat Campus + Bockelsberg ca. 12 GWh/a: (17,1 g/kWh)	+ 205 t	Integrate district heating!
Electricity Production CHP and PV ca. 8 GWh/a:		
Electricity Consumption ca. 2,5 GWh/a:	+ 1375 t	
Biogas production:	+ 2000 t	
CO₂-Balance:		- 2820 t
<i>Business trips:</i>	+ 1520 t	What to include?
<i>Grey energy new central building (30 years):</i>	+ 300 t	
<i>Paper 6 Mio. DIN A4 etc...</i>	+ ~ 50 t	
<i>Commuting traffic students+staff:</i>	+ 3695 t	
Reduction Goal:	+ 2745 t	How to count el. peak load shifting?



■ Sustainability on Campus:





- **Why Transformation of Research and Education? Sustaining Success...**
 - **What structures are limiting funding and quality of the research?**
 - **What will we do in the next 10, 15, 20 years?**
 - **What disciplines? Which questions? What is beyond the scope of today?**
 - **Scenarios for sustainable success...**
 - **Interdisciplinarity: Combining strengths in research to answer cross-cutting questions, teach how to solve problems**
 - **Transdisciplinarity: Combining strengths in research to answer questions of today's society, teach methods to manage complexity**
- **Renewing our commitment towards society**



LEUPHANA

UNIVERSITÄT LÜNEBURG



Dr. Oliver Opel, Prof. Dr.-Ing. Wolfgang Ruck, Dipl.-Ing. Karl F. Werner, Dipl.-Uwiss. Irmhild Brüngen