



Projects for integrating

- waste treatment
- bio fuels production
- sustainable food production
- carbon sequestration

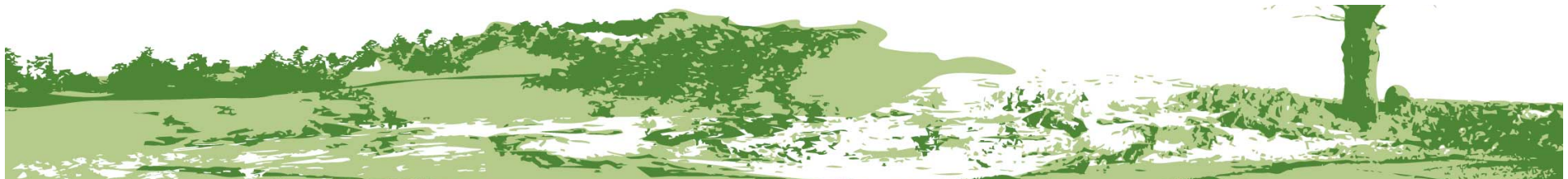
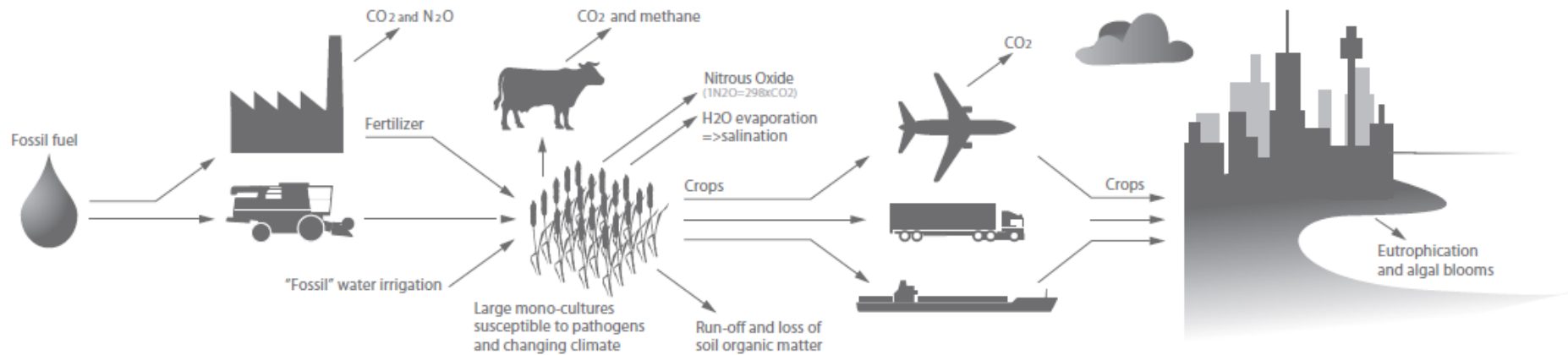
Ketil Stoknes Project leader R&D www.lindum.no Sept 2011



– for miljøets skyld • for the environment

The challenge

INDUSTRIAL AGRICULTURE OPEN SYSTEMS OF LINEAR FLOW OF ENERGY AND MATERIALS





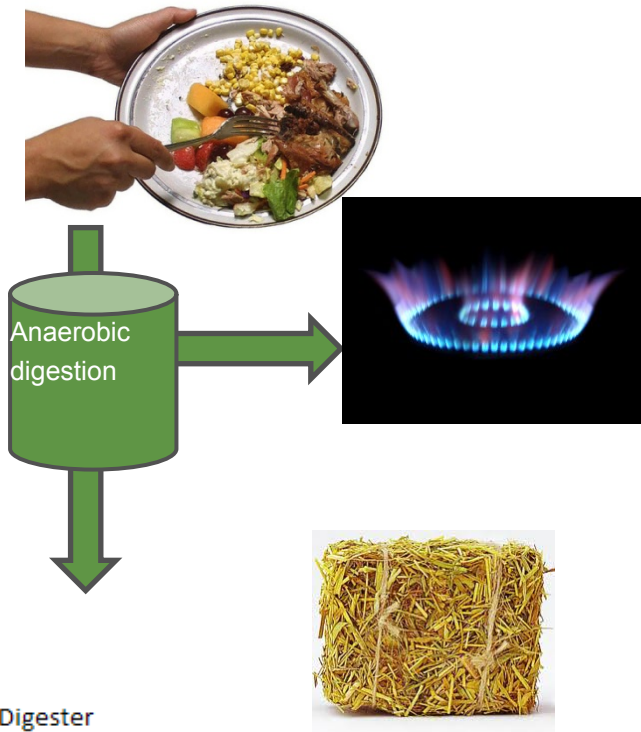
Three solutions from Lindum research:

1. Mushroom cultivation as an example of Food2Waste2Food
2. Carbon *negative* hydrogen fuel
3. Closing the cycles (integration)





1. From food waste to biogas, mushrooms and compost



Ordinary Button mushroom

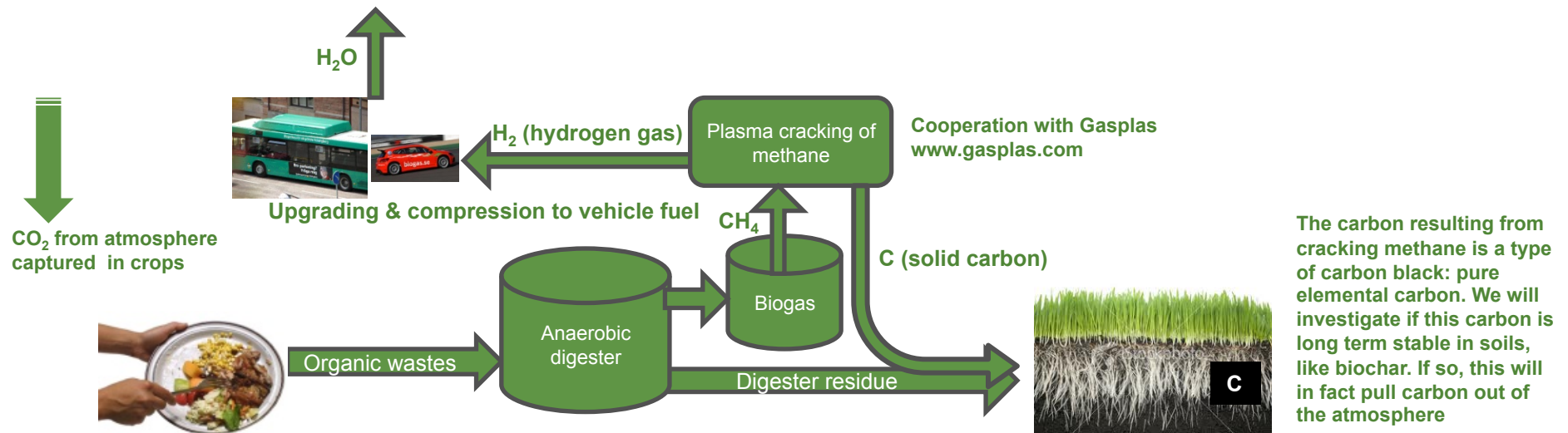
Medicinal gourmet "Brazilian" mushroom *Agaricus subrufescens* for tropical and greenhouse growing under plants



Digester residue	(dry matter)	Straw	Gypsum		substrate	(dry matter)	Button mushroom	price			
1000	300	+ 300	+ 18	10 days composting	1125	450	439	18	↑ 7898	Compost/ fertiliser/ soil conditioner	
kg	kg	kg	kg		kg	kg dry	kg	NOK/kg			
								or "Brazilian mushroom" <i>Agaricus subrufescens</i>	price		
								225	200	45000	400
								kg	NOK/kg	NOK	kg

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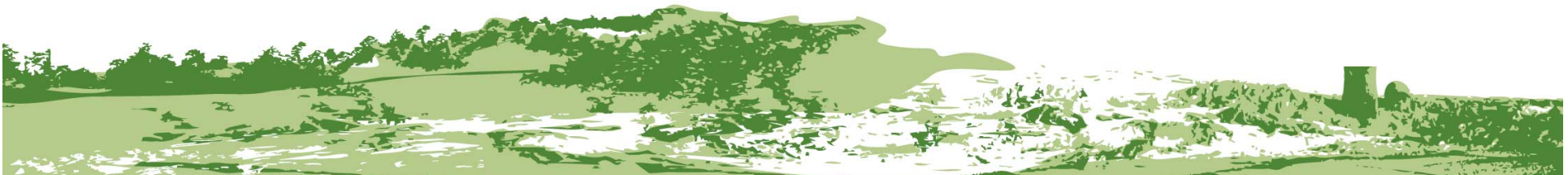
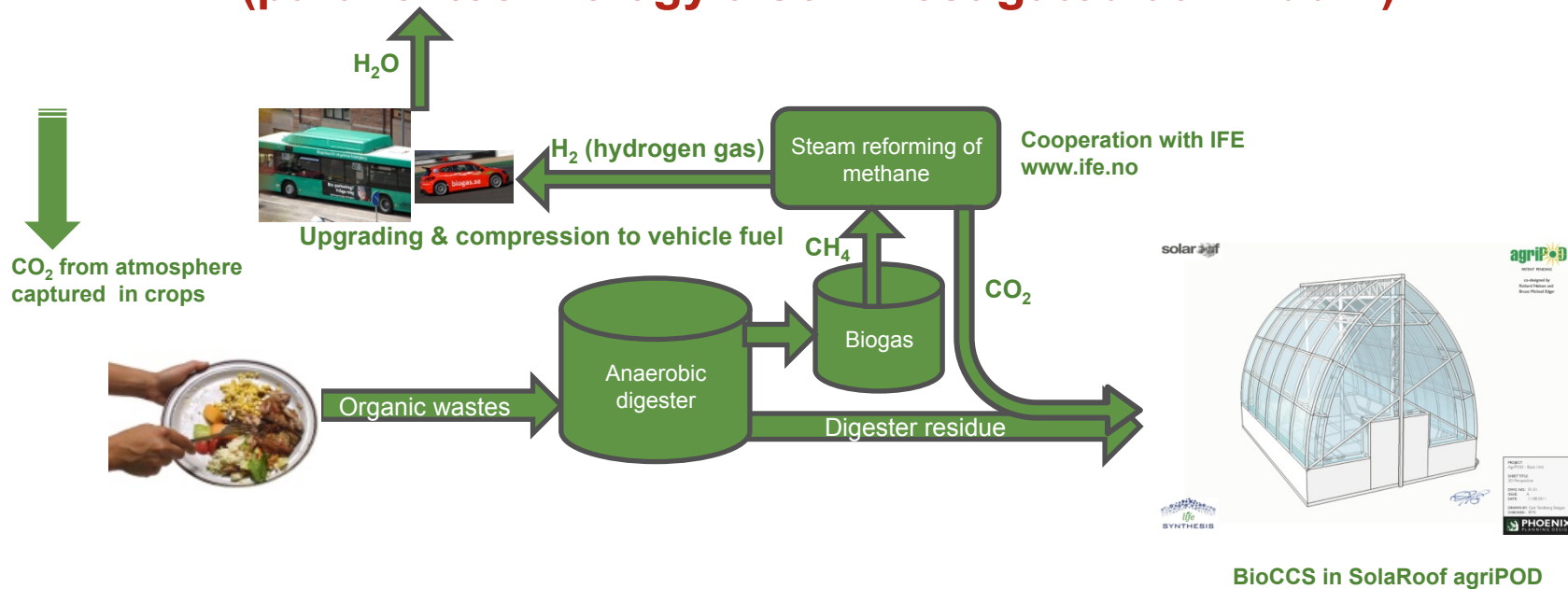
2. Carbon *negative* hydrogen fuel value chain



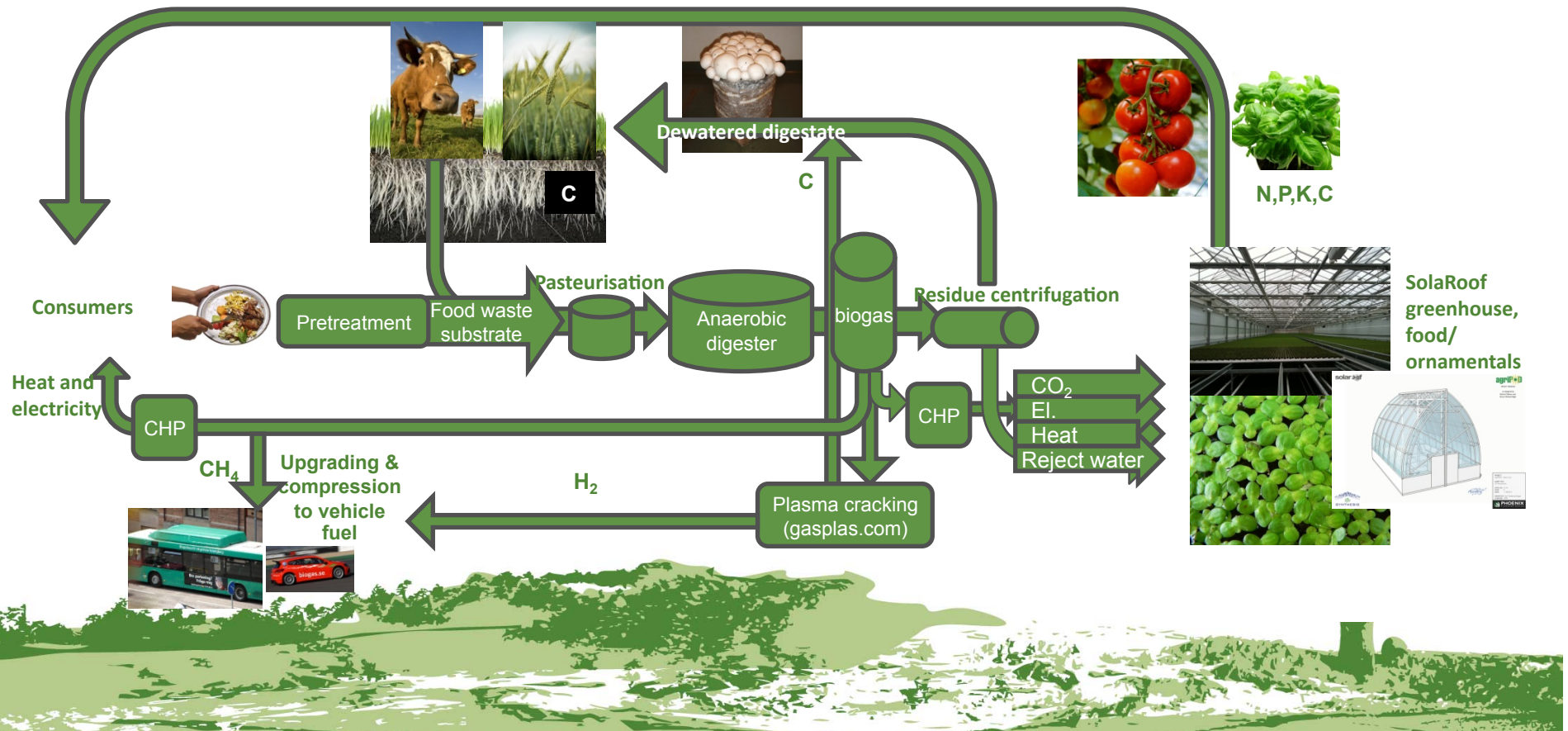
-the more you drive your hydrogen car, the less carbon in the atmosphere



2. Alternative hydrogen fuel value chain (parallel technology also investigated at Lindum)



3. Closing the cycles: integrated waste-to-energy-and-food



3. Closing the cycles: future urban solution?

INTEGRATED CARBON NEUTRAL BIOPRODUCTION ECOSYSTEM

