

Low carbon scenario critical issues: Environment

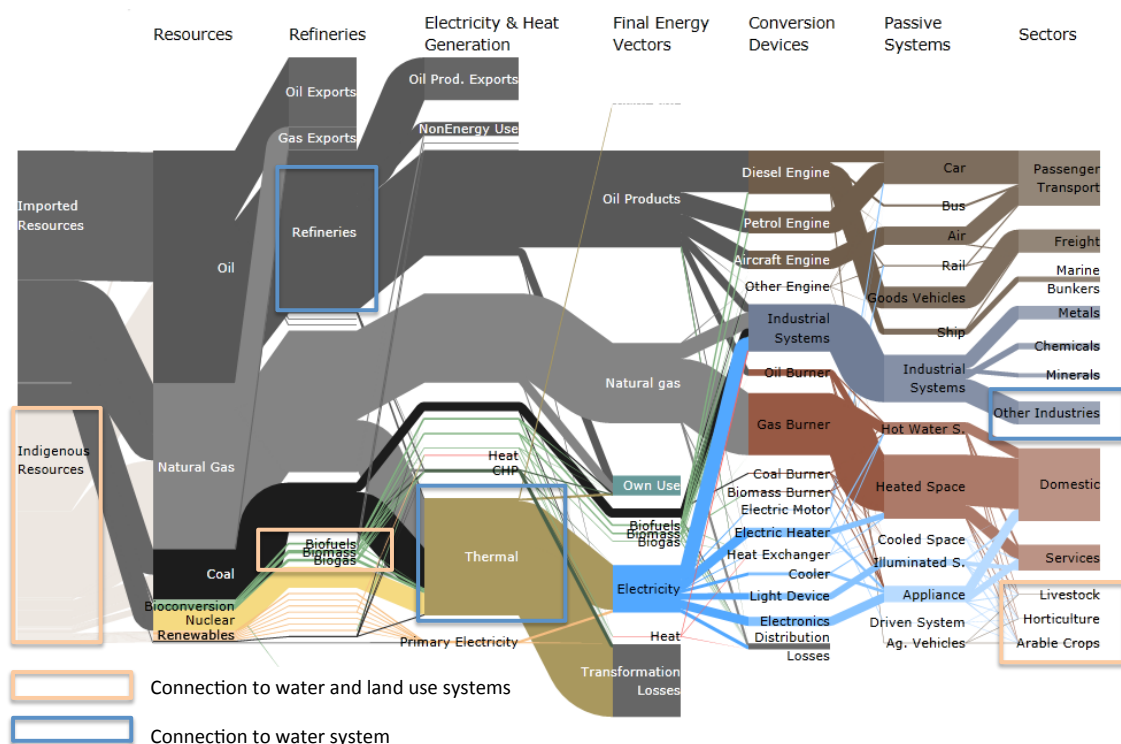
Julian Allwood,
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Keith Richards, Richard Fenner and Richard McMahon
University of Cambridge



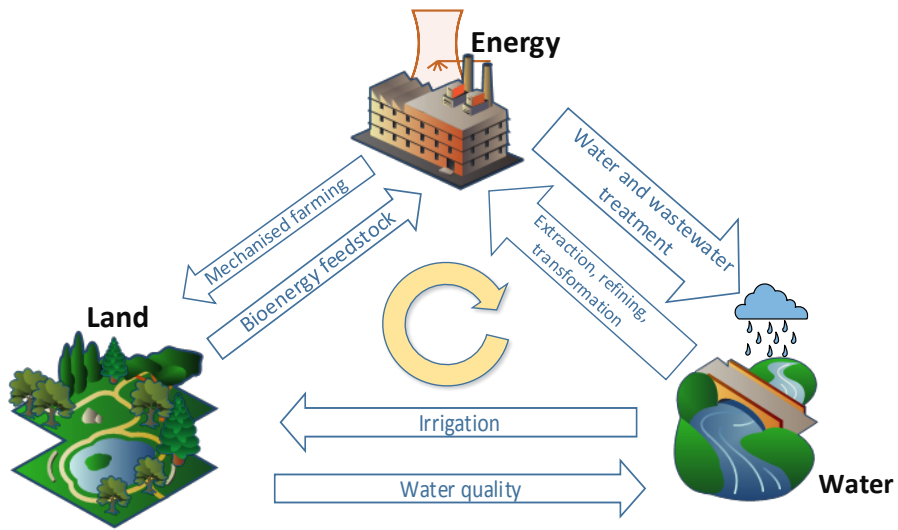
WholeSEM annual Conference 2014
London, 8th July 2014



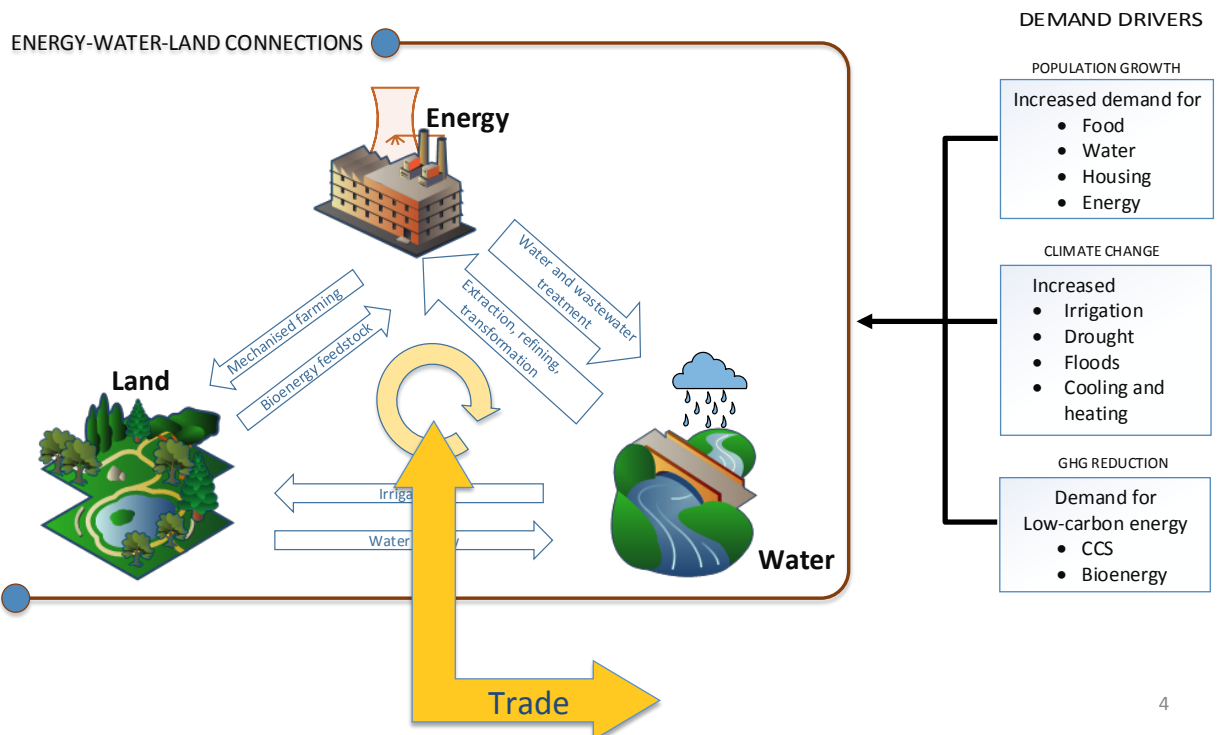
UK energy system – 2010



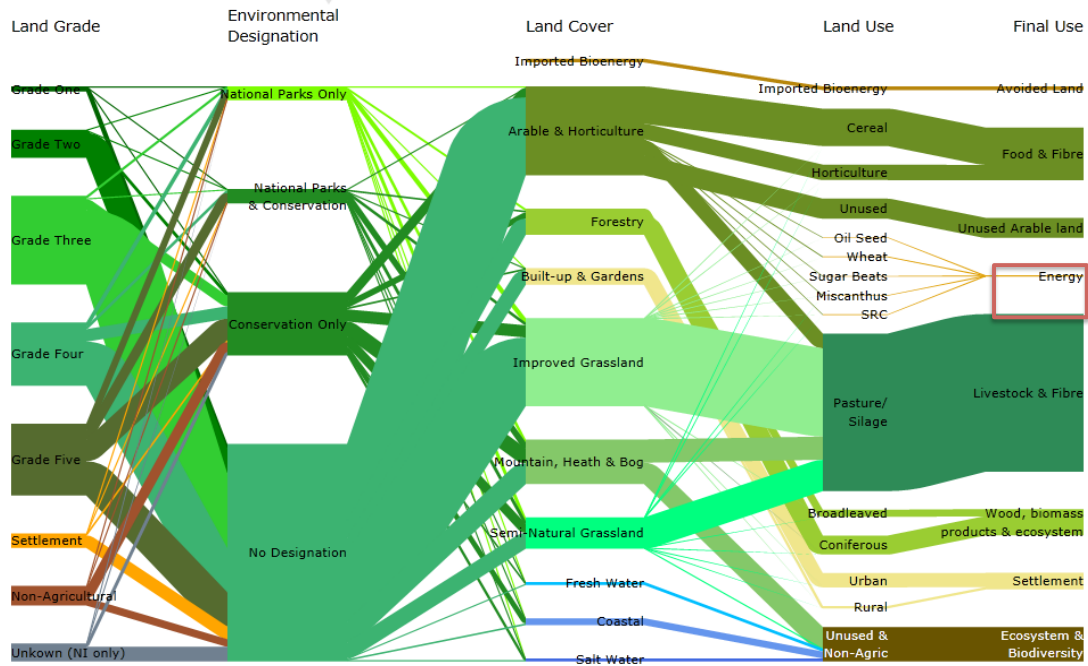
System of systems



System of systems



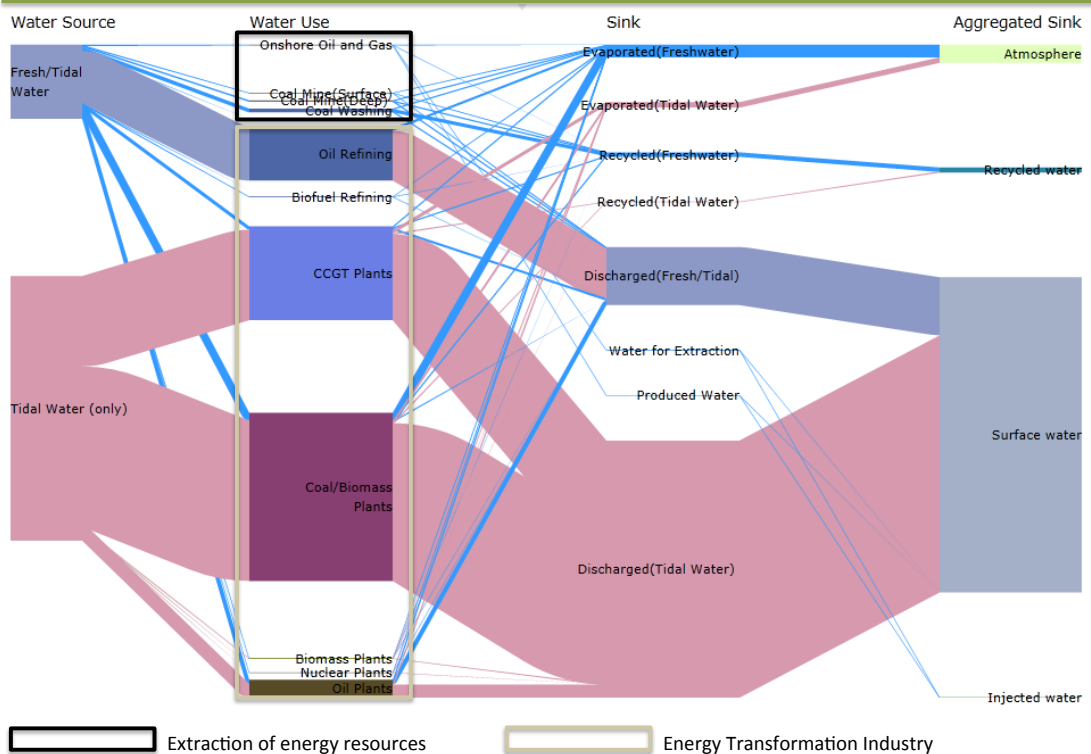
UK land use – 2010



Sources: Land grades (Natural England, JHI)
Environmental designation, Land cover–LCM2007, Land use (CEH, DEFRA)

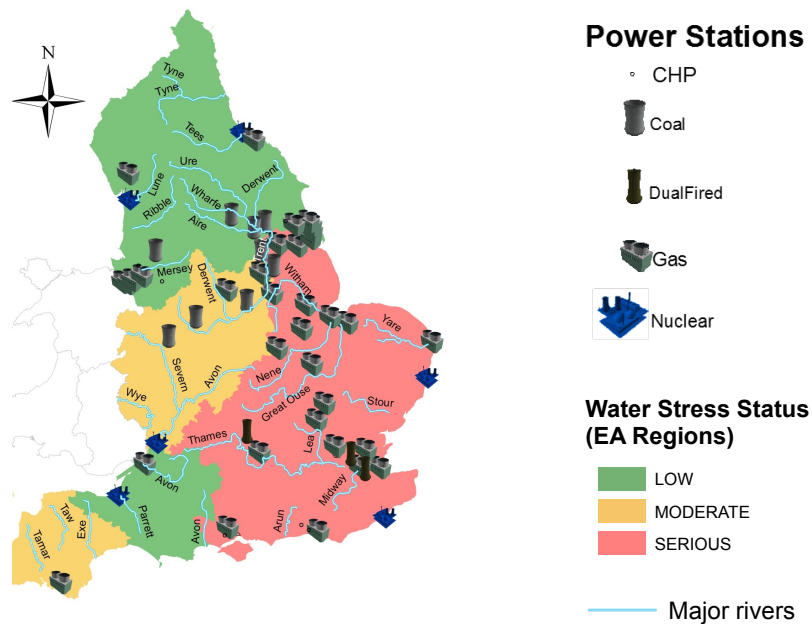
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UK water for energy – 2010



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England – electricity and water



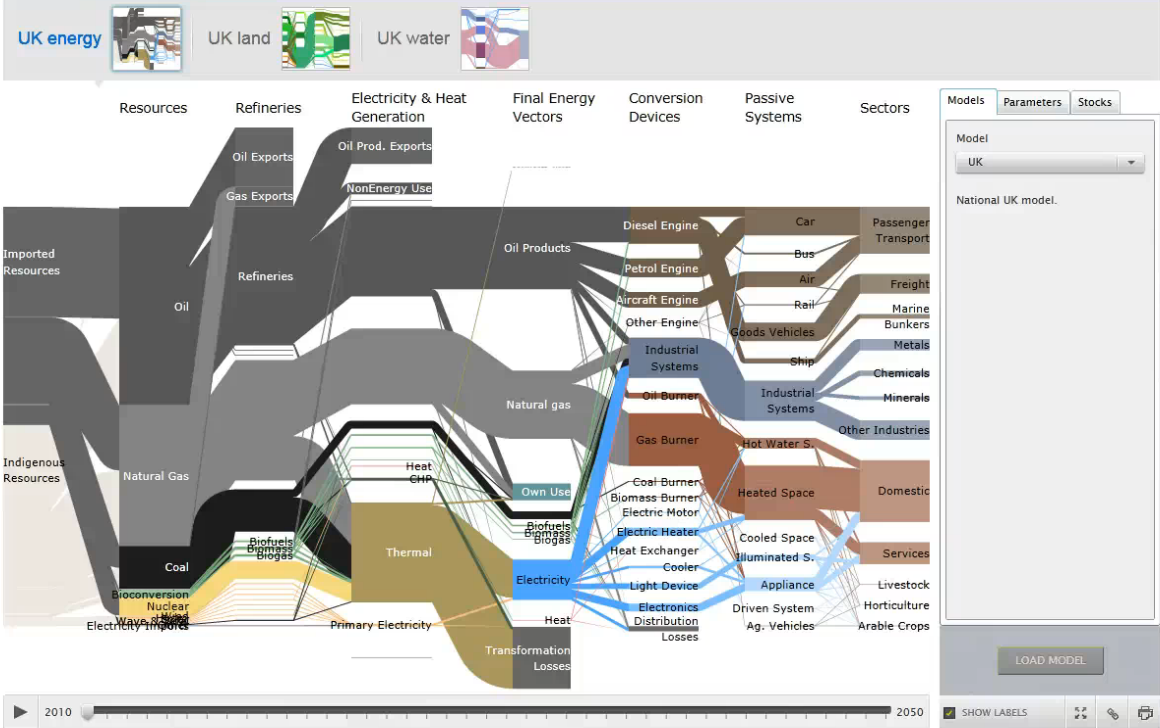
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UK – case study on resource coupling

Energy pathways (Carbon Plan, 2011)

- Land-use test-scenarios
- Water for energy test-scenarios
 - Progress-as-usual (PAU)
 - High Coastal
 - Integrated CCS
 - High Inland

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Preliminary conclusions

Pathways	Land Scenarios						Water Scenarios			
	PAU (Yield)		Low Yield Improvement		High Yield Improvement		PAU	High Coastal	High Inland	Integrated CCS
	PAU	50/50	PAU	50/50	PAU	50/50				
Core Market	High	Medium	Medium high	Low	Medium	Low	Low	Low	High (614% higher)	Low
Higher Renew.	Low	Low	Low	Low	Low	Low	Low	Low	High (286% higher)	Low
Higher Nuclear	High	High	High	High	High	Medium high	Low	Low	High (1516% higher)	Low
Higher CCS	High	Medium	Medium high	Low	Medium	Low	Medium high	Low	High (374% higher)	Medium

Land		Water	
Low	Maximum of land for energy crops equal or less than Unused Arable	Low	Up to 2010 abstraction
Medium	Up to 17% of UK land area	Medium	Up to 100% higher than 2010 abstraction
High	Above 17% UK land area	High	More than 100% higher than 2010 abstraction
Medium high	Close to limit value between medium and high impact.		

Resource stress and WholeSEM

Resource stress may constrain deployment of energy policies

Next steps:

- Developing the model: other water, regions, GHGs, trade, materials
- Integrating resource stress-testing into energy policy through coupling with WholeSEM models and ESME, UKERC, CCC, National Grid etc. scenarios
- Developing our own physically based scenarios for integrated resource systems