

The nexus between water and energy: some implications

Deborah Marsh

ANU-UTS Climate Energy Water Links Project

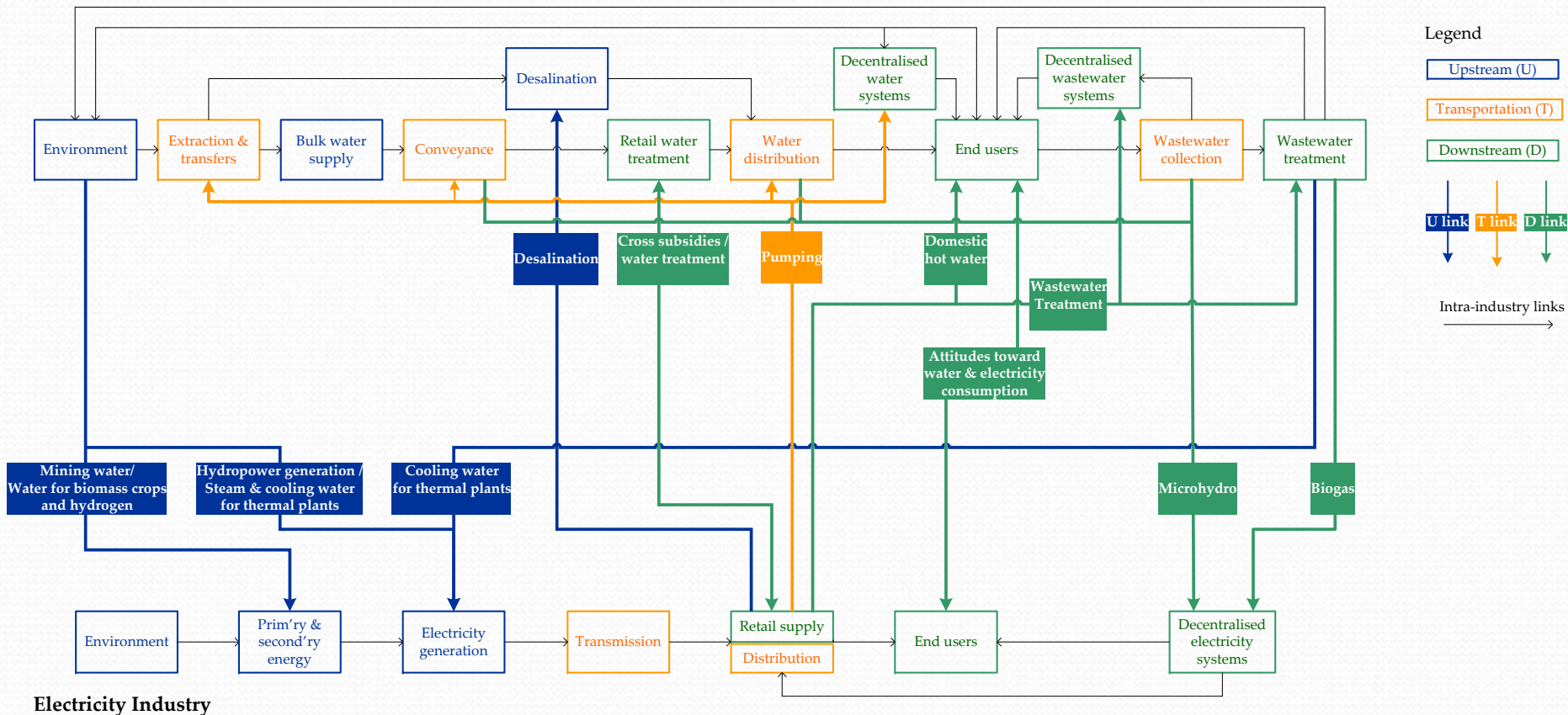
LGSA Water Management Conference
Friday 11 September 2009

Contents

- Defining the water-energy nexus
- Key drivers in recent years
- Implications for the water industry
- Water-energy research

Defining the water-energy nexus

Water Industry



Defining the water-energy nexus

Upstream

- Water for electricity generation
- Electricity for desalination
- Water in mines
- Water for alternative energy (eg hydrogen & biomass)

Defining the water-energy nexus

Transportation

- Groundwater
- Surface water transfers
- Water distribution
- Sewage collection

Defining the water-energy nexus

Downstream

- Water and electricity cross price subsidies
- Water and sewage treatment
- Decentralised systems
- End use behaviour

Key drivers

- Industry reforms and the introduction of markets
- Drought from 2001 to present and future predictions
- Climate change – rainfall, evapotranspiration and temperature

Implications for the water industry

- Non-rainfall dependent water sources
- Decentralised systems
- Electricity price

Implications for the electricity industry

- Loss of generation due to water shortages
- Future investment decisions
- Impact on wholesale and retail prices

Water-energy research activities

- UTS: Long term water-energy scenario modelling
- ANU-UTS Climate Energy Water Links Project

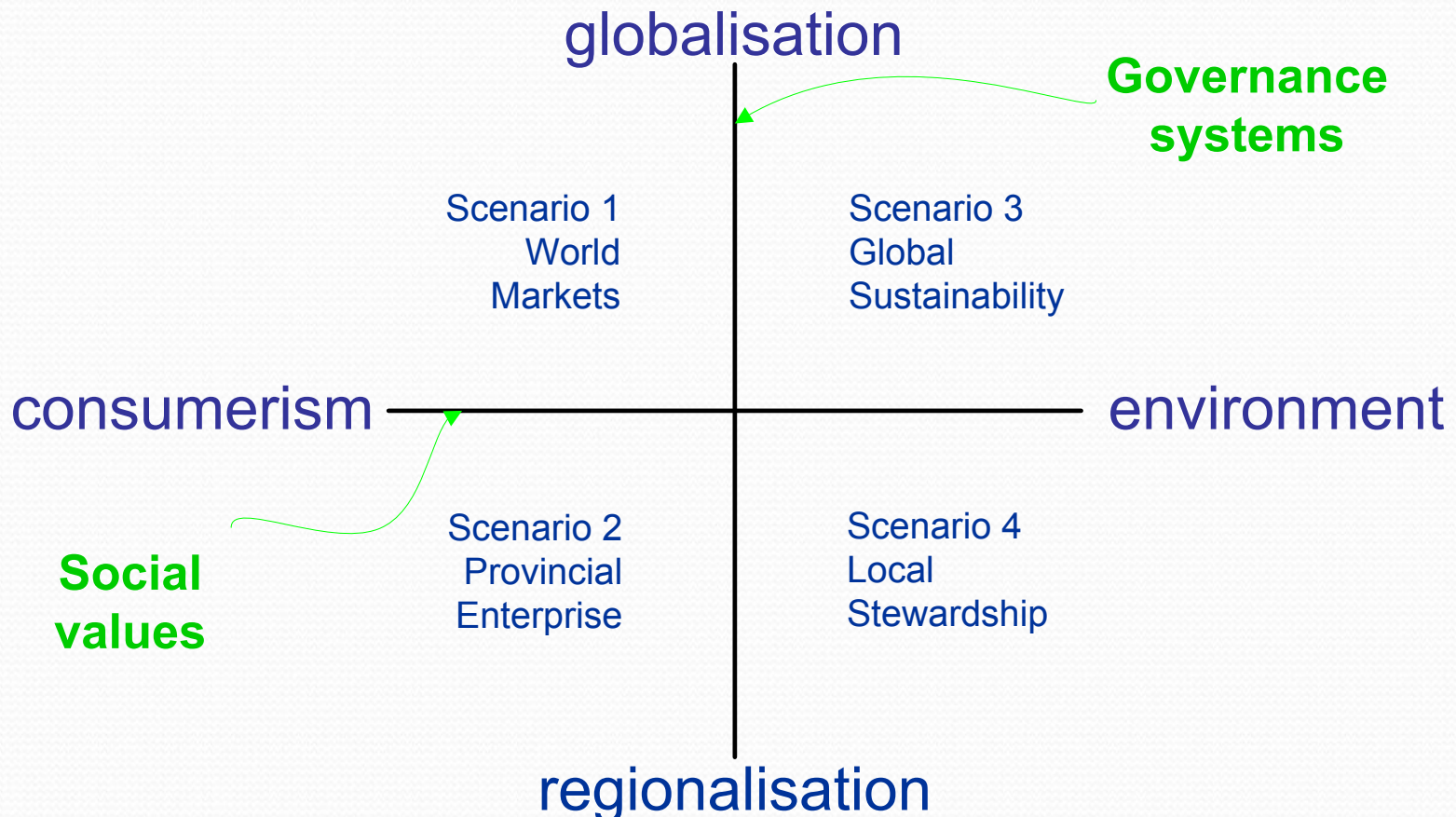
Long term scenario modelling

Variable	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Environmental	Low priority	Regional issues such as drought	Global issues such as climate change	Maximising local resources with minimal impact
Economic	Competitive global markets and low cost technologies	Emphasis on domestic production	Strong international cooperation	Low priority
Technological	High innovation	Low innovation	High innovation	Low innovation
Security of supply	Low priority (open trade)	High priority	Moderate priority	Low priority

Long term scenario modelling

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Electricity				
Coal upgrade	√	√	√	√
Ultra-supercritical	√			
Supercritical		√		
Nuclear		√		
Geothermal			√	
Biomass				√
Combined cycle gas	√	√	√	√
Open cycle gas	√	√	√	√
Wind			√	√
Demand savings	√		√	√
Water				
Water recycling	√	√	√	√
Desalination	√	√	√	
Demand savings	√		√	√

Long term scenario modelling



Long term scenario modelling

Total primary energy* intensity (MJ/ML)

Water sector	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Bulk & retail water	5,808 (10%)	6,257 (18%)	5,494 (4%)	5,301
Existing wastewater	4,293 (10%)	4,604 (18%)	20,103 (6%)	3,914
New wastewater plants	21,097 (12%)	22,362 (18%)	-	18,901
Desalination	619	616	-	

*coal, oil, gas and uranium

ANU-UTS CEW Links Project

- The impact of carbon reduction policies on the CEW system in SE Australia
- Policy Inertia in the CEW system
- Crops and soils in the SE Australian CEW system

Resources

- ANU-UTS Climate Energy Water Links Project
<http://www.water.anu.edu.au/project/index.php>
- National Water Commission and DRET: Water and the electricity generation sector
<http://www.nwc.gov.au/www/html/2417-water-and-electricity-generation---no-18.asp?intSiteID=1>
- Climate change 2009: Faster change and more serious risks, Will Steffen for Department of Climate Change
<http://www.climatechange.gov.au/science/publications/faster-change-more-risks.html>



Thank you

Contact: Deborah.Marsh@uts.edu.au