



Urban Forestry and Climate Change

Prof. Dr. Cecil C. Konijnendijk

Danish Centre for Forest, Landscape and Planning

University of Copenhagen





Outline

- Urbanisation and introducing urban forestry
- Urban forests are impacted by climate change
- Urban forestry and mitigation
- Urban forestry and adaptation
- Urban forestry and climate change: the wider agenda
- What cities can do
















Cities and climate change

- Cities are major emitters of greenhouse gases
- Cities are highly vulnerable to impacts of climate change
 - Droughts, heat waves, flooding, pollution, ...
- Cities have become active in mitigation, but less so in terms of adaptation
- Time to put in place adaptive measures, e.g. In terms of rethinking urban design and management
- Important role for green space





“Playing Field” of Urban Forestry

	The Urban Forest		
	Individual trees	Tree groups and small woods (e.g. in parks)	Urban & peri-urban woodlands
Functions, policies, planning, and design			
Technical activities, including selection and establishment			
Management			

Modified from Konijnendijk & Randrup (2002) *Urb. For. & Urb. Green.* 1:1-4.

Credits: Thomas Randrup







Urban forests: affected by climate change

- Changes in temperatures, drought, wind, etc.
- Impacts on growing conditions, species choice
- Extreme weather conditions, hurricanes, flooding
- Expected increases in (invasive) pests and diseases
- Urban-wildland interface: more frequent fires

Wikimedia Commons





Urban forests and climate change mitigation (1)

- Do urban forests sequester carbon?
- YES, see various studies:
 - United States: 93 kg C/yr for large, healthy trees – 1 kg C/yr for small trees (Nowak 1994, 2006)
 - Beijing urban forest: 0.2 million tons of C stored by 2.4 million trees (Yang et al. 2004)
- BUT, direct contributions are still relatively small:
 - Considering present emission trading etc.: only few, specially designed urban tree projects are cost effective (McHale et al. 2007)
 - Sequestration by urban forests minor in comparison to GHG emissions from urban areas





Urban forests and climate change mitigation (2)

- Some of the problems with urban trees and carbon sequestration:
 - Low survival rates of urban trees; many stresses
 - Not many large trees (short life span)
 - Dead/removed trees: within 1 year, up to 80% of carbon is released (McPherson & Simpson 2000)
 - High costs of urban tree planting and management (while carbon credits still have a low value)
- ... But also some opportunities
 - E.g. tree planting and greening campaigns, afforestation policies





Urban forestry and climate change adaptation(1)

- Lower temperatures ('urban heat island') through shading, evapo-transpiration
- Reduce flooding
- Reduce air pollution
- Buffering of extreme winds





Urban forestry and climate change adaptation (2)

- Moderation of urban micro-climates (e.g. Eliasson et al., 2007; Shashua-Bar et al., 2009)
 - Shading, evapo-transpiration, etc.
 - Comfort and recreational use
 - Trees as cost-effective cooling mechanism
- Reducing energy needs for cooling and heating (e.g. Nowak 1993, McPherson 1998)
 - Trees close to buildings: shading, reducing wind
 - Cooling effects and air conditioning



Adaptation Strategies for Climate Change in the Urban Environment (ASCCUE)

Consortium members: CURE (University of Manchester), CRiBE (Cardiff University),
DCEE (University of Southampton), OCSD (Oxford Brookes University)



EPSRC

Engineering and Physical Sciences
Research Council



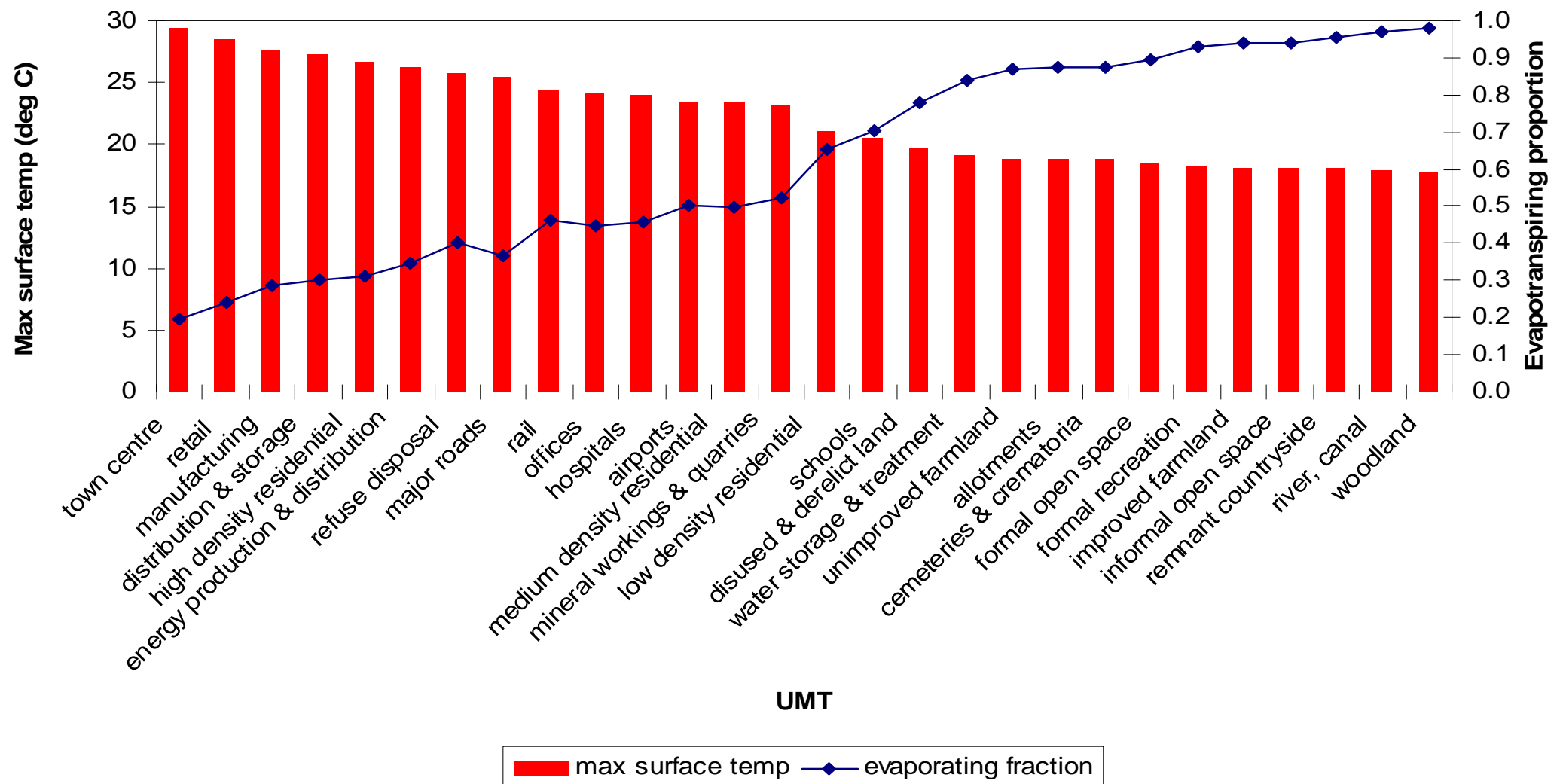
UK Climate
Impacts Programme

Building Knowledge for a Changing Climate



1961-1990 Surface Temperatures (Greater Manchester)

Time of max temp
15:42
15:30
15:00
15:00
15:12
14:48
13:12
15:00
13:18
14:36
14:36
14:18
14:30
13:12
13:54
13:48
13:18
13:18
13:06
13:18
13:18
13:18
13:12
13:12
13:12
13:06
13:06
13:06





Urban forestry and climate change: the wider agenda

- Urban forests have important educational functions
 - Raising public awareness
 - Learning how to deal with climate change
- Urban forests have important symbolic functions
 - Mitigation at people's doorstep, where most emissions occur
 - Facilitating local action, acting as a 'flagship'
 - Action in the centre of power and the political debate





What cities can do

- Include urban forestry in climate mitigation and adaptation strategies:
 - Part of climate change strategies
 - Rethinking urban design and management
- Make climate agenda a part of green space management
- Use urban forests as test and demonstration areas
- Apply urban forestry for awareness raising about climate change mitigation and adaptation

