

An aerial photograph of a city landscape. A large, winding waterway, possibly a canal or river, flows through the center. To the left, there is a large green area that appears to be a golf course. The surrounding urban area is densely packed with buildings and roads. The text is overlaid on the image in a white, bold, sans-serif font.

Green Infrastructure for Climate Change Adaptation

Green infrastructure – an emergent concept of potential relevance to climate change adaptation

**John Handley and Susannah Gill
CURE, 23rd February 2005**

Europe

- Landscape planners in continental Europe have long recognised the functional role of urban greenspace
 - e.g. Stuttgart



Europe

- The City of Stockholm is currently developing a sub-regional plan 'Green Map' for its 'blue-green infrastructure'



Stockholm's green wedges ('...öken' = wedge)
Grey = developed areas (including parks and small natural areas)

North America

What is the Green Infrastructure?

- *Green Infrastructure is the Nation's natural life support system – a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America's communities and people.*
 - The Conservation Fund & USDA Forest Services, <http://www.greeninfrastructure.net/>

North America

Why the Green Infrastructure?

- *A city, county or state would never build a road, water and electrical system piece by piece, with no advanced planning or coordination between different system components and jurisdictions... We should plan, design and invest in our Green Infrastructure following the same principles and approaches that are used for built infrastructure.*
 - The Conservation Fund & USDA Forest Services, <http://www.greeninfrastructure.net/>

North America

- Green Infrastructure: principles for planning, design and implementation
 1. Protect green infrastructure before development
 2. Engage a diverse group of stakeholders
 3. Linkage is key
 4. Work at different scales across boundaries
 5. Use sound science
 6. Fund up-front as a public investment
 7. Green infrastructure benefits all
 8. Make green infrastructure the framework for conservation and development

– The Conservation Fund & USDA Forest Services,
<http://www.greeninfrastructure.net/>

Recent progress in the UK

- Natural Assets and Opportunities – a framework for developing green infrastructure in Northamptonshire, English Nature, 2003
- A joint statement on the need for ‘Green Infrastructure’ in the Milton Keynes and South Midlands Growth area, English Nature, Oct 2003
 - In response to Sub-Regional strategy
- Greening the Gateway – a greenspace strategy for Thames Gateway, ODPM, Jan 2004
- Biodiversity by Design, URBED for TCPA, Sept 2004
- Green Infrastructure Planning in the North West seminar, St Helens, 20th Jan 2005

Green Infrastructure – ‘TCPA definition’

- *Green Infrastructure is the sub-regional network of protected sites, nature reserves, greenspaces, and greenway linkages. The linkages include river corridors and flood plains, migration routes and features of the landscape, which are of importance as wildlife corridors.*

– URBED, 2004

Benefits of Green Infrastructure

- Ecological services
- Quality of life
- Economic well being

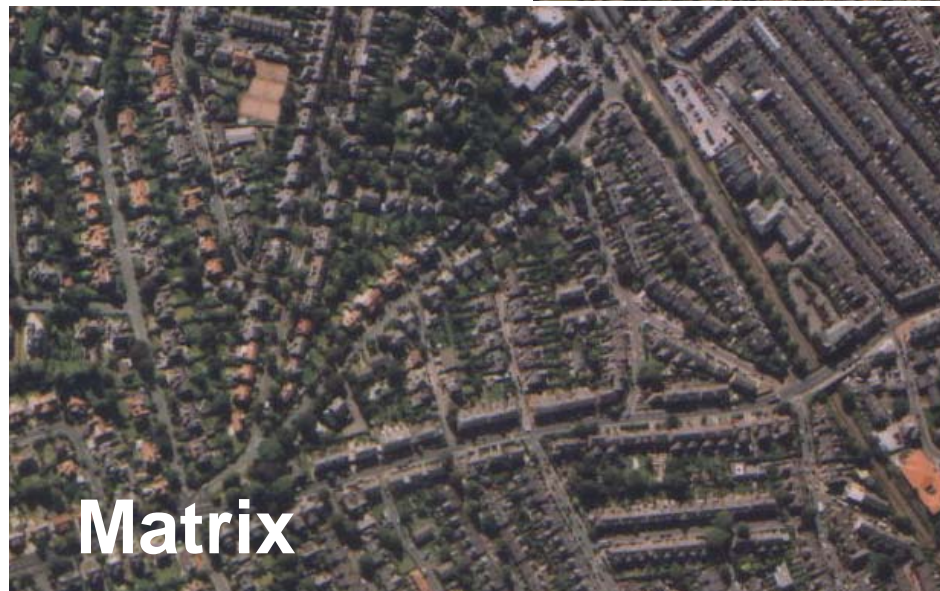
Ecological services

- Carbon sink
- Pollution control
- Air conditioning
- Microclimate control
- Flood prevention

Implications for ASCCUE (1)

- Ground green infrastructure activities in sound science and land-use planning theory.
 - The Conservation Fund & USDA Forest Services Principle 5, <http://www.greeninfrastructure.net/>

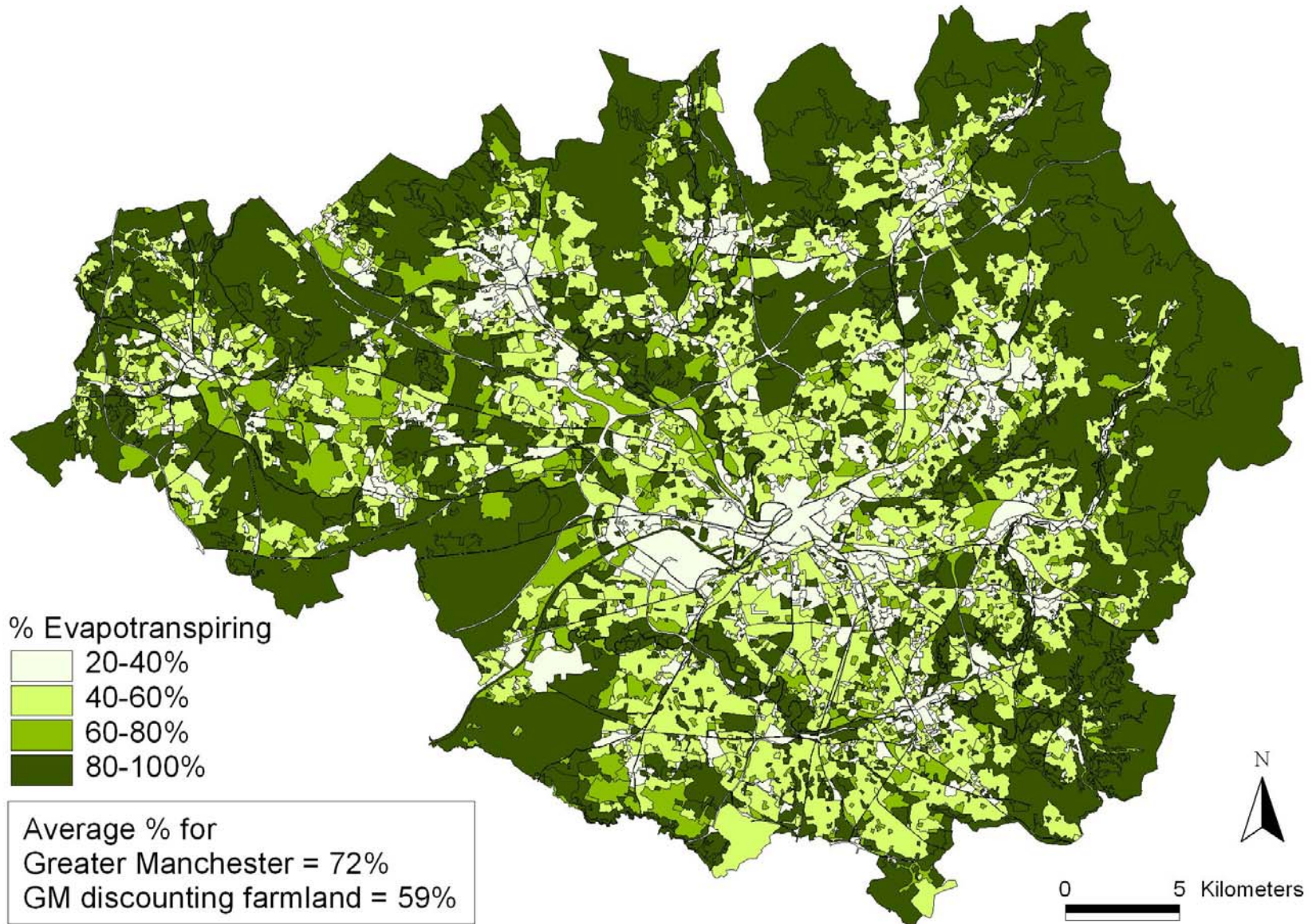
Landscape Ecology of the City



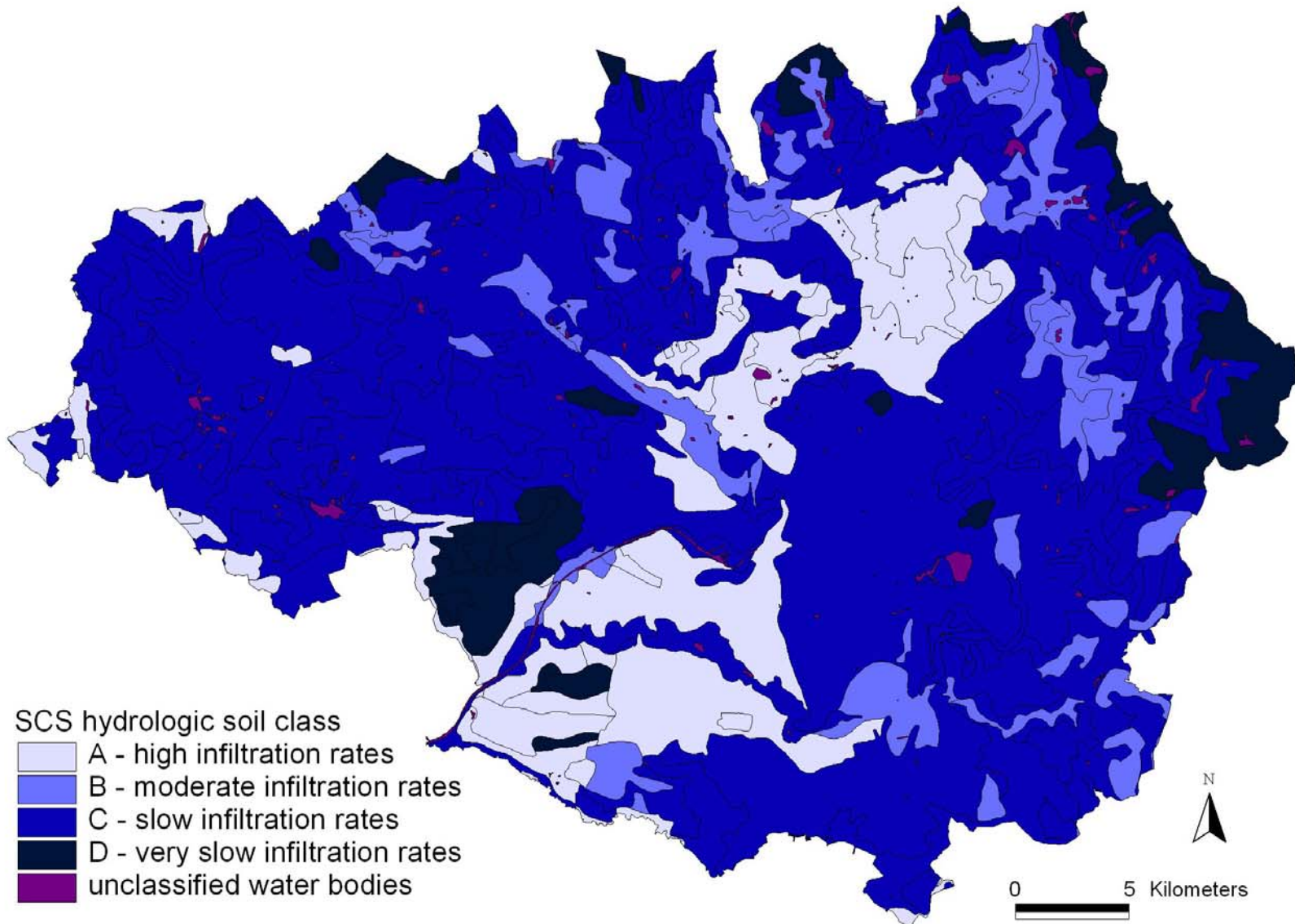
Climatic adaptation via the green infrastructure

	Corridor	Patch	Matrix
Flood storage	● ● ●	● ●	●
Infiltration capacity	●	● ●	● ● ●
Evaporative cooling	●	● ● ●	● ●
Shading	●	● ●	● ● ●

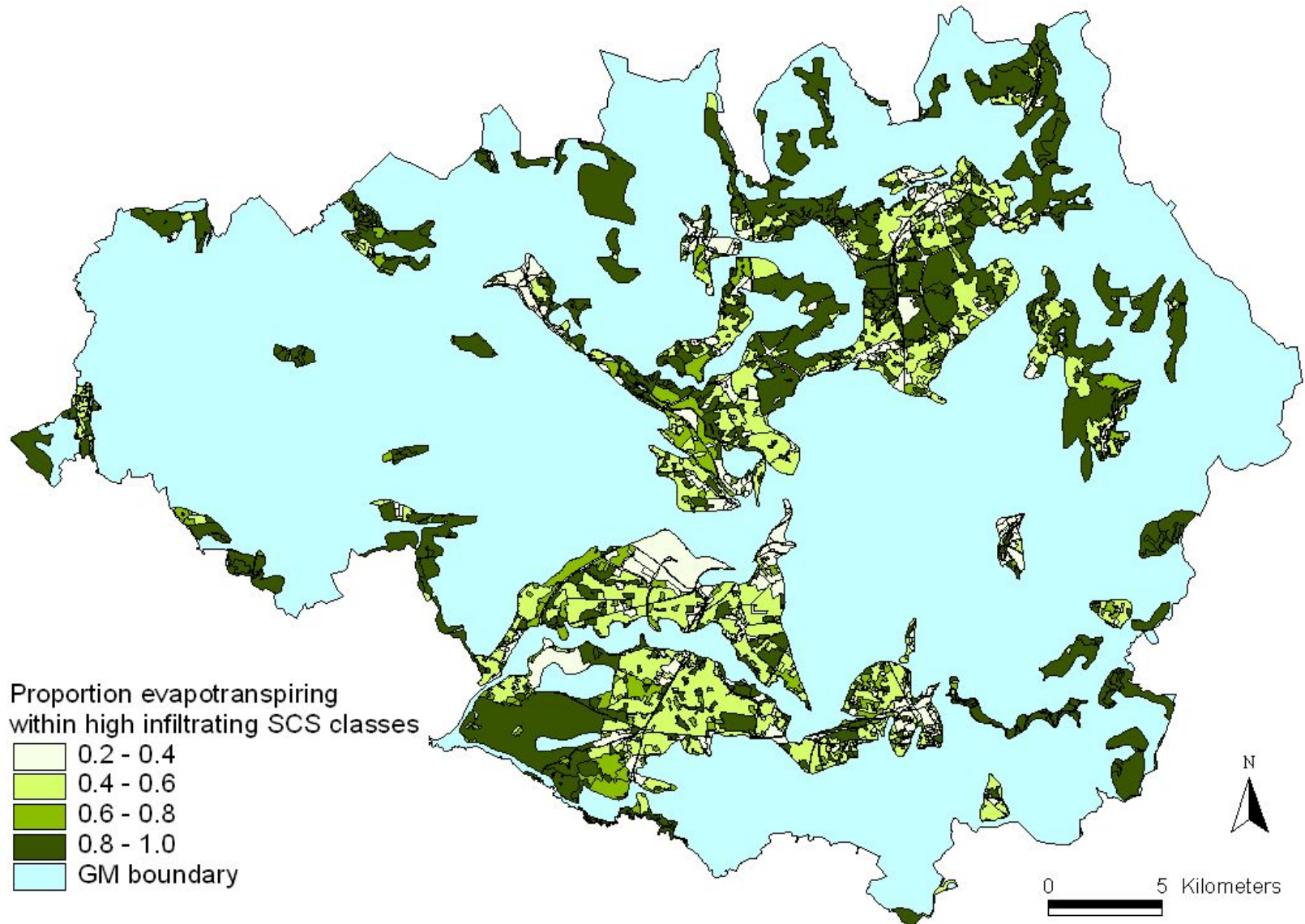
GM Proportion Evapotranspiring



GM Soil Infiltration



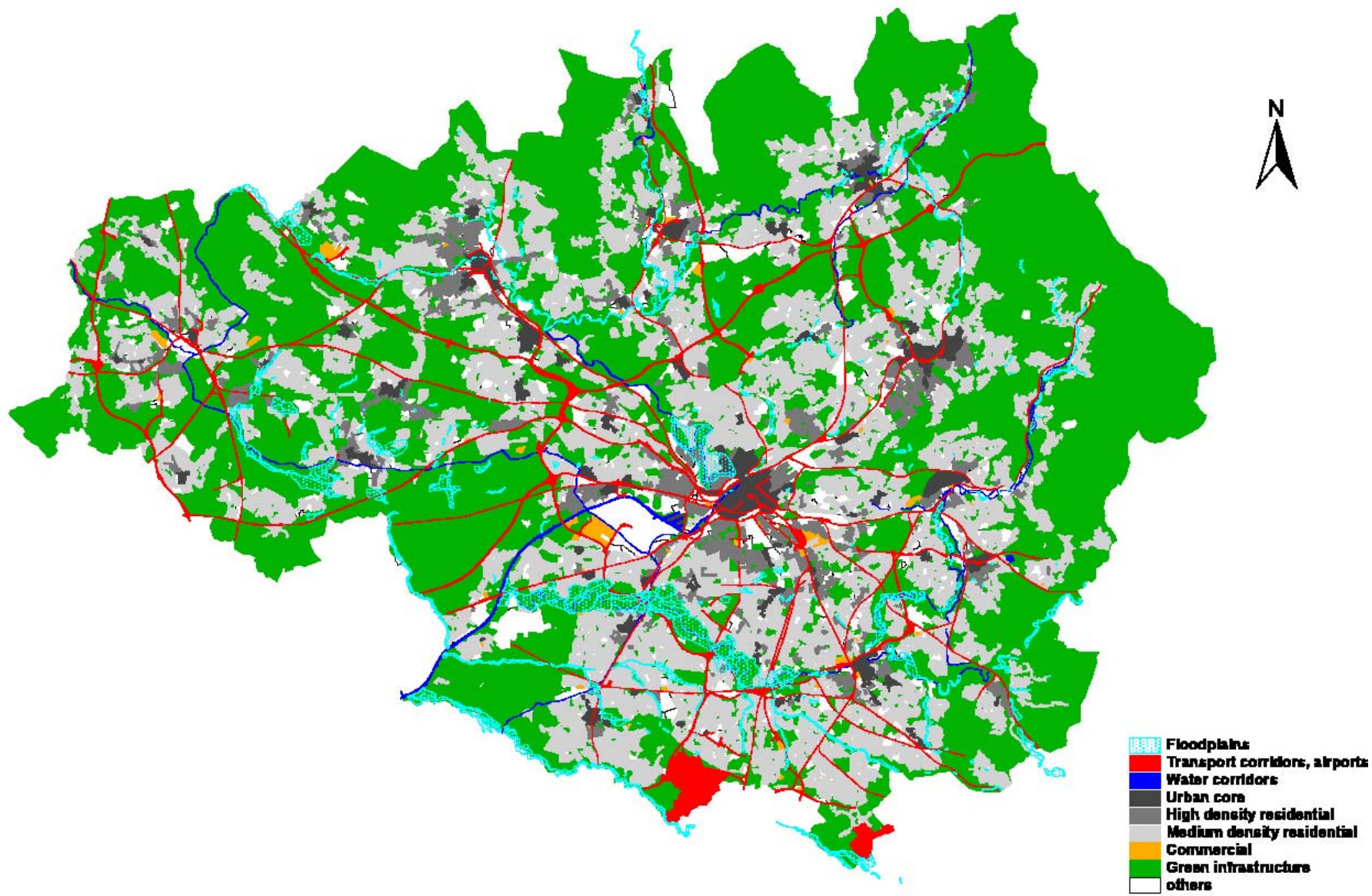
Evapotranspiring Proportions on High Infiltration Soils



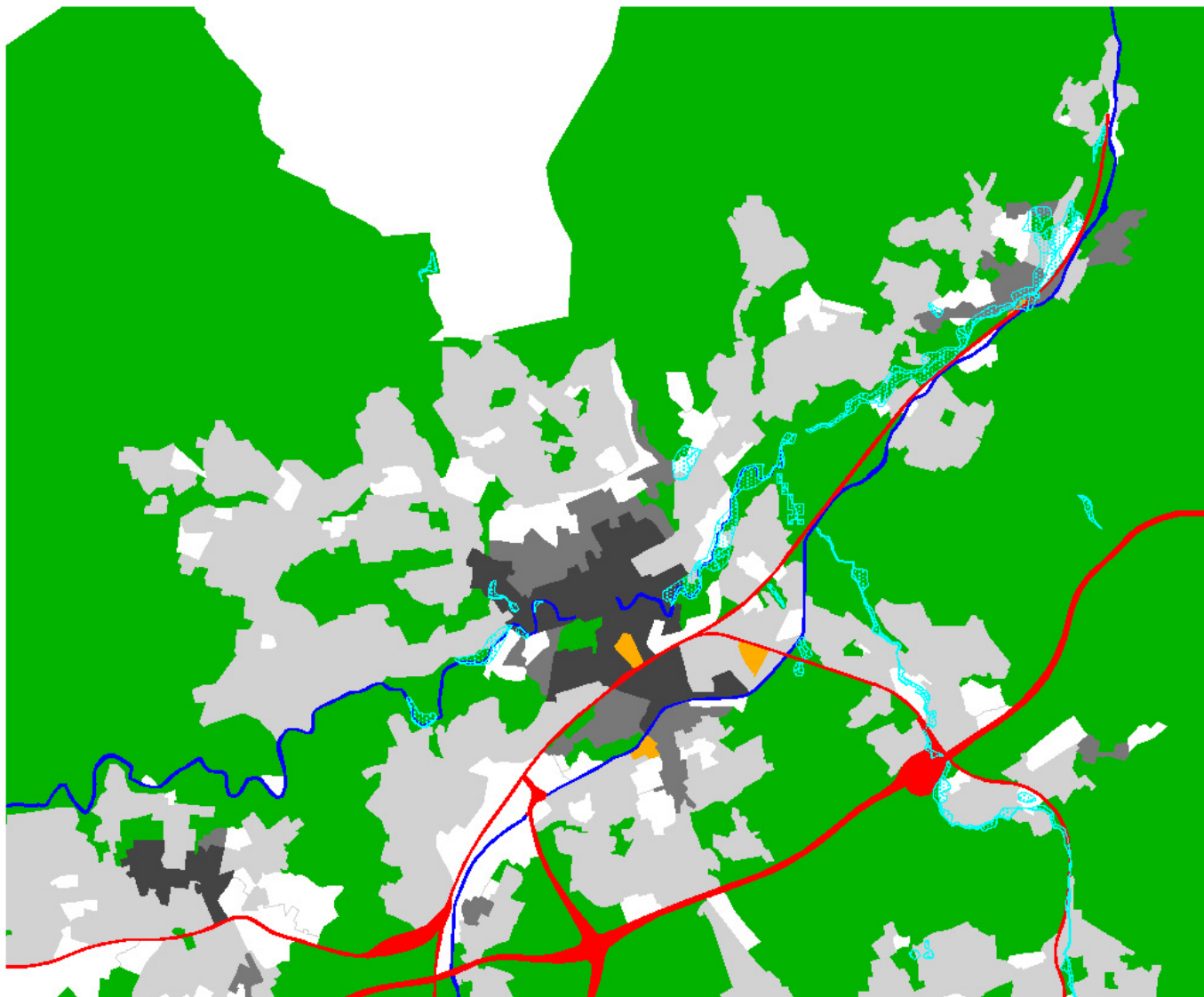
Implications for ASCCUE (2)

- Design green infrastructure systems that function at different scales, across political boundaries, and through diverse landscapes.
 - The Conservation Fund & USDA Forest Services Principle 4, <http://www.greeninfrastructure.net/>

GM Strategic Framework



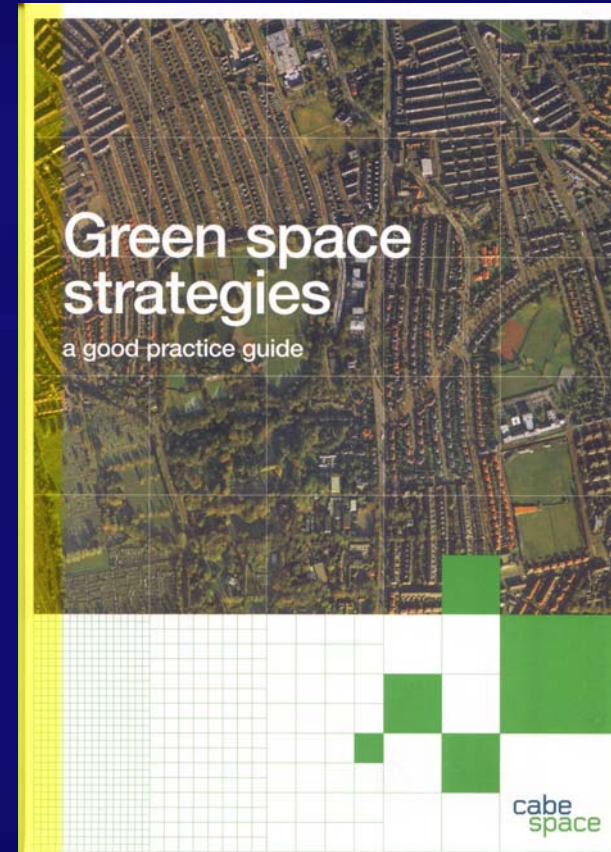
The Landscape Scale



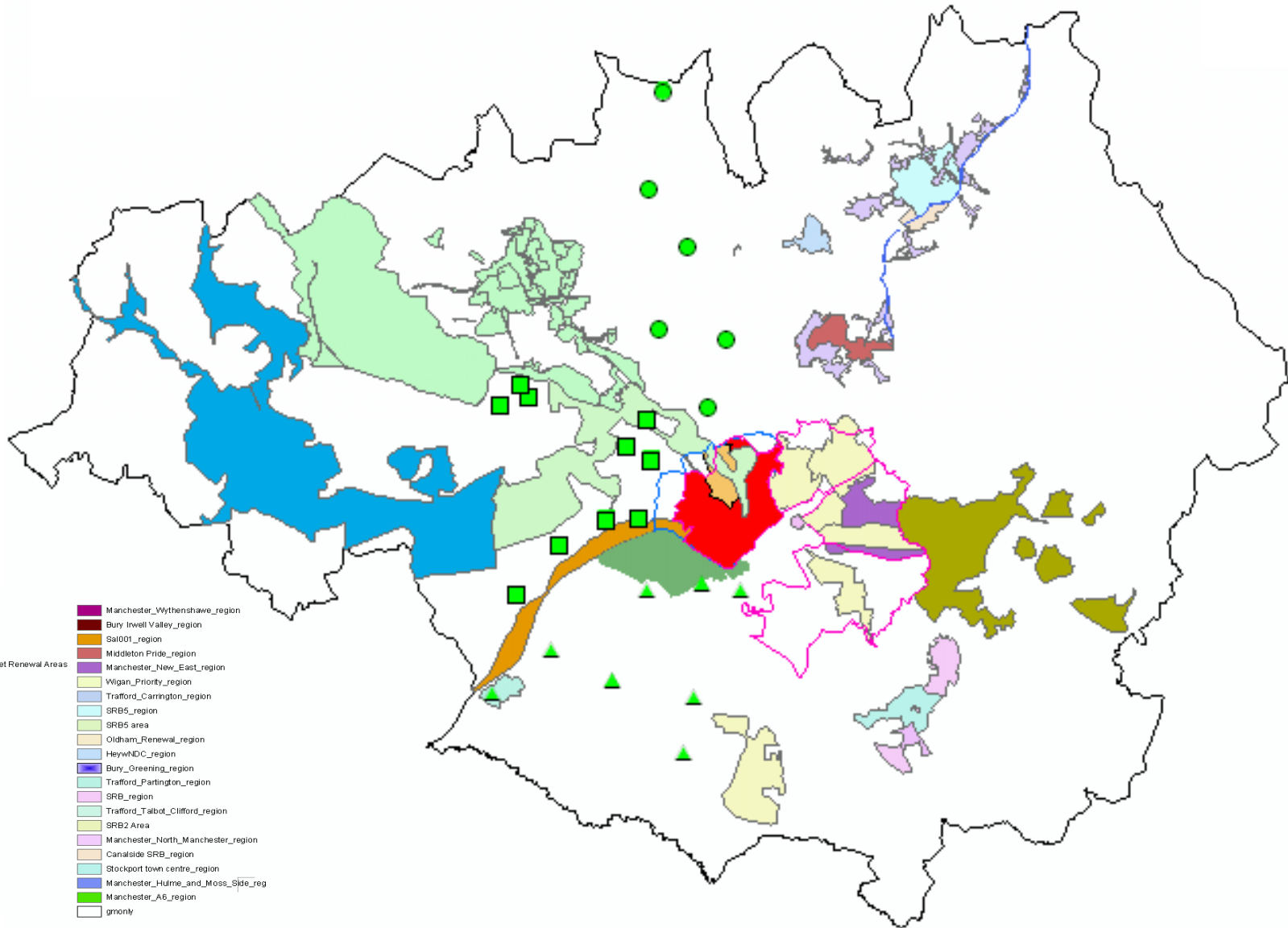
- Floodplains
- Transport corridors, airports
- Water corridors
- Urban core
- High density residential
- Medium density residential
- Commercial
- Green Infrastructure
- others

Implications for ASCCUE (3)

- Engage with policies, plans and programmes:
 - Regional Spatial Strategy (NW England)
 - Sub-Regional Strategy (Greater Manchester)
 - Local Development Frameworks (GM Districts)
 - Green Space Strategies (GM Districts)
 - Plans and programmes at the neighbourhood level (GM Initiatives)



GM Development Areas (from TEP)



Legend

- Bury_BIP_point
- ▲ Trafford LSP Neighbourhoods
- Salford LSP Neighbourhoods
- Manchester_Northern_Quarter_region
- City of Manchester and Salford Housing Market Renewal Areas
- Trafford_Ship_Canal_region
- City of Manchester SRB areas
- Trafford_Gorse_Hill_Old_Trafford_region
- Sa002_region
- salford reg park_region
- New Deal
- Trafford_Trafford_Park_region
- LT-7_Rochdale_Canal_region
- Housing Market Renewal Area
- Chapel St Regeneration Area
- Bolton_region
- Shaw Heath renewal_region
- R-11-Greenspace_Corridors_region
- WIG036_region
- Tameside_Priority_SRB_region
- Manchester_City_Centre_region
- EDZ Boundary
- Manchester_Wythenshawe_region
- Bury Inwell Valley_region
- Sa001_region
- Middleton Pride_region
- Manchester_New_East_region
- Wigan_Priority_region
- Trafford_Carrington_region
- SRB5_region
- SRB5 area
- Oldham_Renewal_region
- HeywNDC_region
- Bury_Greening_region
- Trafford_Partington_region
- SRB_region
- Trafford_Talbot_Clifford_region
- SRB2 Area
- Manchester_North_Manchester_region
- Canalside SRB_region
- Stockport town centre_region
- Manchester_Hulme_and_Moss_Side_reg
- Manchester_A6_region
- gmonly

Conclusion

- *What gives the term Green Infrastructure its staying power is its ability to invoke images of planned networks of green spaces that benefit wildlife and people, link urban settings to rural ones and, like other infrastructure, forms an integral part of government budgets and programs.*
 - The Conservation Fund & USDA Forest Services, <http://www.greeninfrastructure.net/>