SUBR:IM Conference

March 29th 2006

Mechanical Engineering Building, Imperial College, London

Programme

09.15 Registration and Coffee

09.45 David Lerner, University of Sheffield, Consortium Director
Welcome and Introduction to SUBR:IM

10.00 Tim Dixon (Oxford Brookes), Joe Doak (University of Reading)
Developer and Investor Responses to Sustainable Urban Regeneration:
Does Practice Make Perfect

10.30 Philip Catney (University of Sheffield)
Navigating the Brownfield Maze: Making Sense of Brownfield Regeneration Policy and Governance

11.00 René van Herwijnen (Forest Research, University of Surrey)
Is it Possible to Remediate Heavy Metal Contaminated Sites with Amended Composts?

11.30 Mike Raco (Kings College London)
Sustainable Brownfield Regeneration: Redrawing the Boundaries of Expertise

12.00 Lunch
Poster Session: Posters from all Consortium Researchers and International Visitors

1.30 Guest Speaker: Professor John Handley OBE (University of Manchester)
Nature and Community in Brownfield Regeneration

2.30 Steven Garvin (Building Research Establishment)
Quality – The First of Last Word

3.00 Kalliope Pediaditi, Walter Wehrmeyer (University of Surrey)
Assessing the Sustainability of Redeveloped Sites in Practice: The RAF Process

3.30 Frans De Leij (University of Surrey)
Charcoal as a Potential Tool for Land and Water Remediation

4.00 Close

SUBR:IM Thames Water VHE VHE CONSTRUCTION plc CL:AIRE

SUBR:IM
SUSTAINABLE URBAN BROWNFIELD REGENERATION: INTEGRATED MANAGEMENT

Welcome and introduction to SUBR:IM

David Lerner (University of Sheffield)

EPSRC Engineering and Physical Sciences Research Council

SUBR:IM

SUSTAINABLE URBAN BROWNFIELD REGENERATION: INTEGRATED MANAGEMENT

Projects within SUBR:IM

- Re-conceptualising brownfields
- Investors
- Development industry
- Governance
- Multi-level decision making
- Property investment
- Metrics
- Technical solutions
- Acid tar lagoons
- Risk reduction with charcoal
- Remediation and greening
- Novel composts
- Climate change
- Quality
- Design for deconstruction
- Wetlands
- Flooding and climate change

SUBR:IM

Facts and figures

- What does SUBR:IM mean?
- Managed from the University of Sheffield
- 17 Projects
- Investigators: 23
- Research staff: 11
- Research students: 11
- Steering group: 16
- Active collaborators: 41

SUBR:IM

Programme of Day

- Morning:
  - Introduction
  - Presentations – Brownfield Issues: practice, policy and technical
- Lunch and Poster Session
- Afternoon
  - Guest speaker: Professor John Handley OBE
  - Presentations: Developing solutions
- Finish 4.00pm

SUBR:IM

SUBR:IM Projects

SUBR:IM

Project E- Robust Technical Solutions

- Investigating the long term performance of stabilisation/solidification methods for remediating contaminated land. It has undertaken a generic assessment of the sustainability of individual remediation methods in the UK and a comparative investigation of their relative sustainability.

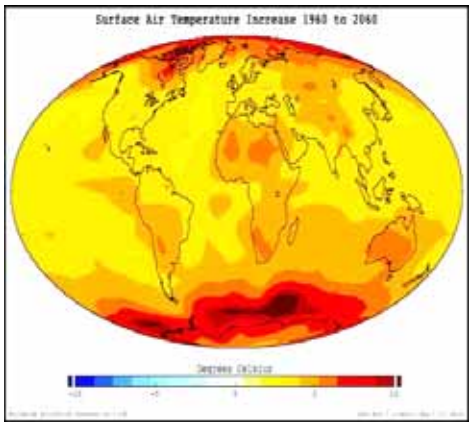
Abir Al –Tabbaa and Michael Harbottle (University of Cambridge)

SUBR:IM

Project I- Impacts of climate change on pollutant linkage

This project:

- quantifies the short- and long-term impacts of climate change on contaminated land and containment systems
- evaluates the effects of climate change on pollutant linkages
- develops adaptation design strategies and examines adaptive response of key brownfield stakeholders

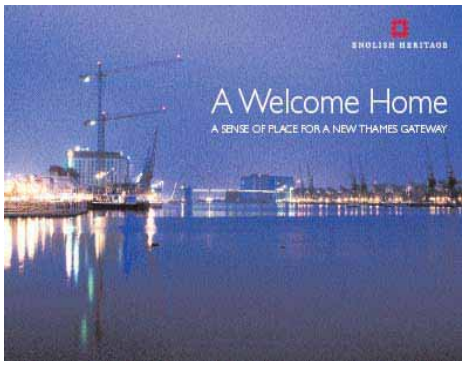


Abir Al –Tabbaa and Sinead Smith (University of Cambridge)

SUBR:IM

Project M: Heritage, Conservation and Sustainable Communities

- Examines the ways in which brownfield sites are understood and defined in the development process
- Assess the role that heritage can play in the regeneration of brownfield sites and the development of sustainable communities
- Explores the significance of conservation to the effectiveness of brownfield regeneration



Mike Raco and Laura Keogh (King's College London)

SUBR:IM

Project N: Design for Deconstruction

• Examines how the design of a building may be altered to maximise the yield of reusable components without adversely affecting the economic viability and practicality of the construction and operational stages of the buildings life cycle.

Buick Davison and Ahsan Khan (University of Sheffield)

SUBR:IM

Project O: Brownfields, Flooding and Climate Change

- Examines whether flood redevelopments can be designed to reduce the impacts of flooding while providing security to occupants and not mobilising contaminants and sediments. Estimate the possible effects of climate change on the above.

David Lerner and Jacqueline Diaz Nieto (University of Sheffield)

SUBR:IM

Project P: Wetland habitat systems on brownfield land

- Assesses the ecological status and functioning of a range of created wetland habitats on brownfield sites in England with a view to evaluating the main factors responsible for their success or failure.

Tom Nisbet, Penny Johnes and Kirsten Wright (Forest Research and University of Reading)

SUBR:IM

(Some) SUBR:IM Outputs

- A broad range of academic and non academic articles and conference papers.
- A SUBR:IM book.
- Submission to the Royal Commission on Environmental Pollution's study on the urban environment.
- Presentation to HM Treasury on economic incentives for brownfield development.
- Patent on charcoal project pending.
- End User Outputs

SUBR:IM

From Problem Spaces to Liveable Places: An Integrated Approach to Sustainable Brownfield Regeneration (Eds. T. Dixon, D. Lerner, & M. Raco

Unique features:

- Comprehensive overview of policy and practice in brownfield regeneration in the UK;
- An integrated, theoretically-grounded approach, which combines science and social science disciplines to highlight best practice;
- Practical examples.
- Suggestions for future trends examined; and research on brownfield regeneration and sustainable communities.
- It will also be supported by a website (www.subrim.org.uk).

SUBR:IM

Chapter	Working Title
Part 1	***Introduction***
Chapter 1	**Introduction**
Chapter 2	**Integrated Brownfield Regeneration; A Theoretical Framework**
Part 2	***Regeneration***
Chapter 3	**Brownfield Regeneration: Problems and Policies**
Chapter 4	**Actor Networks: The Brownfield Merry GoRound**
Chapter 5	**Heroes or Villains?: The Role of the Development Industry in Brownfield Regeneration**
Chapter 6	**Delivering Brownfield Regeneration: Practice Makes Perfect?**
Part 3	***Remediation***
Chapter 7	**Greening Brownfield Land**
Chapter 8	**Novel Special-purpose Composts for Sustainable Remediation**
Chapter 9	**Climate Change, Pollutant Linkage and Brownfield Regeneration**
Chapter 10	**Robust Technical Solutions**
Chapter 11	**The Creature Lurks Within?: Restoring Acid Tar Lagoons**
Part 4	***Problem Spaces to Liveable Spaces: Joined-Up Solutions***
Chapter 12	**Quality in Land Remediation**
Chapter 13	**Metrics for the assessment of the Sustainability of Brownfield Regeneration Projects**
Chapter 14	**The Future: Is Brown the New Green?**

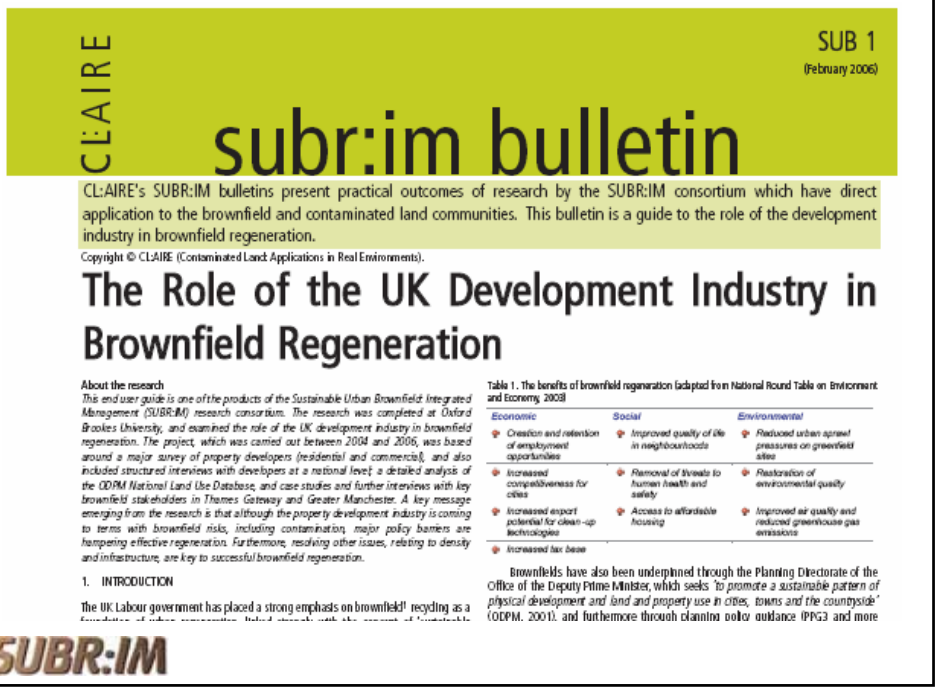
Forthcoming End User Guidance

- SUBR:IM Overview
- Role of the Development Industry in Brownfield Regeneration
- Community Engagement
- Attitudes to sustainability and Monitoring
- RAF Guide
- Policy, Governance and Delivery
- Risk
- Sustainability of Remediation
- Biological Results of Laboratory Work
- Composts
- Greenspace and Brownfield Regeneration (x2)
- Quality Indicators
- Quality Performance
- What are acid tar lagoons and what are the remediation options?
- Climate Change

SUBR:IM

End User Guidance: Issue 1

SUBR:IM



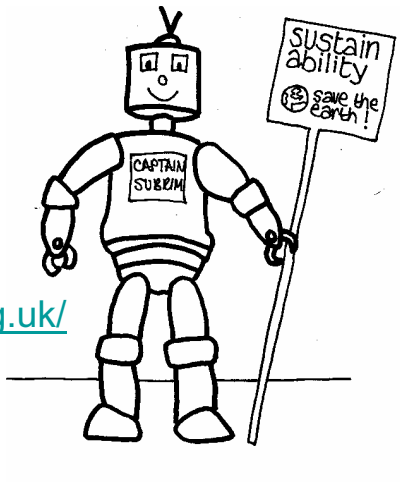
SUBR:IM

More information

Project websites:

www.subrim.org.uk

http://www.acidtarlagoons.org.uk/



SUBR:IM

Developer and Investor Responses to Sustainable Urban Brownfield Regeneration: Does Practice Make Perfect?

Tim Dixon[1] and Joe Doak[2]

[1]Professor of Real Estate, Oxford Brookes University (email: tdixon@brookes.ac.uk)
[2]University of Reading (email: a.j.doak@rdg.ac.uk)

1. INTRODUCTION

The UK Labour government has placed a strong emphasis on brownfield recycling as a foundation of urban regeneration, linked strongly with the concept of 'sustainable development'. This approach highlights the importance of reusing and recycling brownfield land not only to improve urban environments, but also to relieve development pressures in the countryside. The twin policy mantras of *'sustainable development'* and *'brownfield regeneration'* have therefore dominated the debate on urban redevelopment in recent years.

Traditionally, regeneration in the UK has been characterised by area-based initiatives driven largely by the property development industry, but often in close partnership with the public sector. The redevelopment of brownfield sites has been seen as a 'good' thing, by preventing urban sprawl, keeping cities compact and reducing out-migration. This has led to a marrying of the brownfield and sustainability concepts to underpin a vision of *'sustainable brownfield regeneration'*.

However, how sustainable is such redevelopment, and how is the development industry responding to the challenges of sustainability in brownfield regeneration? Despite the emergence of the strong policy emphasis on sustainability, previous research, for example, has shown that the property and construction industries have been slow to react to the challenges of sustainable development. Some argue that this is partly due to the fact that sustainability remains a 'contested' concept, and currently lacks the mechanisms or metrics to be fully operationalised. However, there has been little research so far which has sought to analyse how the UK property development and investment industry is responding to the challenge of integrating sustainability within brownfield regeneration projects.

This paper examines the concept of 'sustainable urban brownfield regeneration', exploring its meaning, and briefly setting it in the context of emerging policy themes in the UK. Data and information sources are analysed to characterise two major sub-regions, where EPSRC SUBR:IM research is being conducted: Thames Gateway, and Greater Manchester. In particular, the National Land Use Database is used to highlight and contrast major differences between the nature of brownfield land, and its development in these two areas. The nature and role of the development and investment industry is examined to highlight the extent to which the industry is engaging with the sustainability agenda on specific sites in these two sub-regions. The implications for the structure of the industry and its network relationships, together with impacts on policy and practice, are also explored, through the development of a best practice developers' checklist.

2. THE NATURE AND CHALLENGE OF SUSTAINABLE BROWNFIELD REGENERATION

Within the UK, the role of brownfield regeneration continues to be important and has been given a new resonance because of the focus of government policy on sustainable communities. Williams and Dair (2005) highlight the evolution of brownfield policy in England. This first found a focus through Planning for the Communities of the Future (DETR, 1998), and was further developed through the Government's Urban White Paper (DETR, 2000: 29), which stated that it aimed to:

'… accommodate the new homes we need … through a strategy that uses the available land, including, in particular, brownfield land and existing buildings in urban areas.'

Brownfields have also been underpinned through the Planning Directorate of the Office of the Deputy Prime Minister, which seeks *'to promote a sustainable pattern of physical development and land and property use in cities, towns and the countryside'* (ODPM, 2001), and furthermore through planning policy guidance (PPG3 and more recently PPS3), which has also reinforced the message on brownfield recycling, together with the key quality of life indicator, relating to land re-use (H25).

As a result of the emergence of the sustainable development and brownfield regeneration agendas in the UK, there has been increased debate over the concept of 'sustainable brownfield regeneration'. Inevitably this concept is founded on the three pillars model of sustainable development. RESCUE (2003) provide a helpful EU-wide definition of 'sustainable brownfield regeneration' in this respect, which sets brownfields within a 'triple bottom line' framework:

'The management, rehabilitation and return to beneficial use of brownfields in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations in environmentally sensitive, economically viable, institutionally robust and socially acceptable ways within the particular regional context.'

Similarly, Williams and Dair (2005) suggest a sustainable brownfield development is:

'A development that has been produced in a sustainable way (e.g. in terms of design, construction and participation processes) and enables people and organisations involved in the end use of the site to act in a sustainable way.'

But Pahlen and Franz (2005) also highlight the fact that sustainability is neither static in time nor implies a fixed spatial perspective, in that it has to balance short and long term effects over generations, and also has political, administrative and functional impacts at a local, regional, national and global level.

However, it is a widely held view that the property and construction industry has been slow to react to the challenges of sustainability. A workshop for the DTI (Davis Langdon Consultancy, 2003) highlighted key findings from the Sustainable Construction Taskforce (2001) Report, and found that although the social and environmental benefits of sustainability had been highlighted, not enough had been done to demonstrate the economic benefits, especially from the property investment point of view. Moreover, many initiatives had focused on 'pushing through' sustainable development, although the 'pull through' by property investors is currently limited. This was highlighted as a 'circle of blame', whereby investors claim they would fund more sustainable developments if the market asked for them, but constructors say they are not asked to build sustainable developments. This also poses issues for the way in which networks of investors and developers operate in the brownfield arena, and how they approach brownfield regeneration.

3. NETWORK RELATIONS[1]

Work on investor strategies and approaches to brownfield regeneration have raised the important role of (financial) risk in structuring the flow of funds into property development (Adair et al. 1998 and 2002). Brownfield sites (at least in certain areas) are seen as risky because of low economic demand, uncertain ground conditions, ongoing environmental or safety issues and uncertain and time-consuming planning processes. However, for investors willing to take and manage those risks, the evidence suggests that returns in regeneration areas can out-perform the sector benchmarks. Indeed this has been responded to by the creation of a select band of urban regeneration investment funds such as Igloo Regeneration and the English Cities Fund. However, this still leaves the overwhelming majority of investment funds steering clear of brownfield redevelopment areas because of these perceived (and indeed real) risks.

Research at the University of Ulster (Adair et al. 2006) has led them to propose that there is a need to develop new investment vehicles to draw institutional investors into the brownfield redevelopment process. Although this addresses an obvious 'strategic gap' in the process, it is interesting that the research by ourselves (and also confirmed by Adair and his colleagues) reveals that investment fund managers do not particularly differentiate between brownfield and non-brownfield assets but treat each according to its merits (in relation to portfolio strategies). Indeed, investors have placed funds into brownfield redevelopment sites and we have been interested to explore the networking processes through which that has occurred. Initial findings from the University of Reading's SUBR:IM research suggest that:

- investors are drawn into brownfield projects through developers (or others) who operate as 'network builders';
- these network-builders will have a clear (if evolving) vision of how the site/area could be redeveloped;

[1] *The material in this section is based on the SUBR:IM project at The University of Reading on 'Property Investment and Brownfield Development'.*

- investors often have limited or weak ties with other actors in the process, but have usually been involved with the developers in previous projects or through other contacts and have confidence in the judgment and abilities of the network builder;
- without this form of personal trust and networking, the normal investment criteria (operationalised in investment strategies, allocation rules, appraisal software, reporting requirements, etc.) will tend to emphasise the inherent risks involved and exclude these schemes from serious consideration (if they're considered at all);
- certain developers and investors have worked together on a number of projects together and have begun to form themselves into a 'brownfield development network', which is developing experience and expertise in this area of practice and is reaping significant financial returns; and
- this network is consolidated through ongoing joint-working, personal friendships and social gatherings as well as joint-memberships of organizations and attendance at regeneration conferences and workshops.

These kinds of findings place some emphasis on the 'soft infrastructure' of investment processes in which personal inter-relationships and actor-networking are important determinants of the direction and scale of financial investment into brownfield regeneration areas. They sit alongside (and within) the more technical and strategic requirements for appropriate investment vehicles and the economic and legal drivers for increasing the flow of money into such redevelopments.

4. THE ROLE OF THE DEVELOPMENT INDUSTRY: CASE STUDY SUB-REGIONS[2]

The Thames Gateway and Greater Manchester have provided the SUBR:IM research consortium with a rich laboratory for scientists and social scientists to study examples of best practice brownfield regeneration on a number of sites, and to highlight those elements which work and those which are not so successful.

Thames Gateway is perhaps the most ambitious regeneration programme undertaken in the UK. Set to deliver 120,000 new homes by 2016, with associated jobs and infrastructure, the development is a key part of the government's Sustainable Communities Plan. As one of three of our case study examples in Thames Gateway, Barking Reach, with its site conditions and related problems (for example overhead pylons and layered peat) but with huge potential for growth, is the largest brownfield regeneration project in Europe (350ha).

Within Greater Manchester, both Manchester and Salford have also received increased government and media attention as a result of the Northern Way and the Sustainable Communities agenda. Furthermore, the existence of a Housing Market Renewal Pathfinder in Salford makes the locality a pertinent one to study. With three case studies located in close proximity to the city centre, these areas face many challenges. For example, the site for New Islington, part of English Partnership's Millennium Community portfolio, has suffered greatly from a lack of connectivity with the city centre and other growth areas, as well as issues of contamination related to Manchester's industrial past.

In 2003, there were some 3,600 hectares of previously developed land (PDL) stock in Thames Gateway (TG), and 2,625 hectares in Greater Manchester (GM) (see Appendix A). A significantly higher amount of PDL in GM is derelict/vacant (73%), compared with TG (41%). This is mainly in private ownership in both areas, although a substantial amount of ownership is unknown in GM, and dereliction is characterised by larger sites in TG (4.8ha) than GM (3.0ha). Dereliction is also more widespread in GM, where 'medium term' dereliction is also an issue. In relative land area terms, in GM on average some 1.5% of the total land area is derelict or vacant PDL (1915ha in total); in TG 0.85% of the total land cover is derelict or vacant (1479ha in total). For England as a whole, the proportion is 0.3% (39,710ha). At a local authority level in Dartford, Newham and Barking within TG, and Manchester, Salford and Bolton within GM, dereliction and vacancy are particularly important issues.

[2] *The material in sections 4 to 6 is based on the SUBR:IM project at Oxford Brookes on the 'Role of the Development industry in Brownfield Regeneration'.*

5. IMPLICATIONS FOR SUSTAINABLE BROWNFIELD REGENERATION

Based on more than 50 interviews with key stakeholders, research now based at Oxford Brookes examined six sites[3] in these two sub-regions, and reveals some important implications for sustainable brownfield regeneration within the three pillars of sustainability.

5.1 Environmental issues

Although contamination was still seen as an important challenge in both sub-regions, it was not the single most important issue. More important were infrastructure, density, and governance issues. However, there was a view from the interviewees that contamination and waste legislation and guidance should be streamlined and rationalised, and that a single remediation permit system should be developed. Soil Guideline Values also need to be reviewed, to ensure a sensible balance is created between safety and risk to public health. Not surprisingly, we also found that developers tend to be cost driven, when it comes to remediation, although the case studies revealed several instances of innovative *in situ* techniques and a belief that 'soil hospitals' would become more common. Generally, larger developers tend to have more expertise than smaller developers in cleaning-up contaminated sites.

Although there is a trend towards *in situ* methods driven by the EU Landfill Directive, stabilisation and solidification methods can still present regulatory problems because of their complex nature. The Environment Agency and UK government therefore have a key role to play in helping develop realistic risk guidelines for cleanup.

Our case studies also suggested that with limited gap funding now available, further public sector funding, and improved grant regimes will be needed for 'hardcore' sites, if regeneration in these localities is to continue.

5.2 Economic issues

The research showed that there is a clear need for government and related agencies to ensure infrastructure is in place prior to development. In the absence of full government funding/support, this may mean the introduction of a planning gain supplement (or equivalent) is inevitable. Already a number of local developer tax schemes exist, such as the Milton Keynes' 'roof tax'. Further local schemes are likely, and English Partnerships can play a key role here in providing local infrastructure and serviced sites. Local authorities may also have to 'sacrifice' land value on some sites to create the necessary education and health infrastructures required for communities.

Creating a new image and brand was seen as a way of creating 'confidence' in an area to overcome perceived 'stigma'. However, this can create problems for local communities, as projects become victims of their own success and local people are priced out of the market, unless a sufficient amount of affordable housing is provided. In London there is currently a target set of 50% for affordability, although this may, conversely, create issues for developer confidence in the Thames Gateway, given the level of current residential values. It was also clear that there was an over-emphasis on flats at the expense of housing in both sub-regions (in 2004/05 some 46% of new dwellings in the UK were flats), and in some cases there was evidence of buy-to-let tipping the balance away from a suitable housing/tenure mix.

The research showed that area-based initiatives, based solely around property development, were more likely to fail in their aims, and so strong underpinning and support for people-based initiatives are needed to enable local people and businesses to thrive and flourish. This means regeneration must also be based around jobs and re-skilling, as well as housing provision.

5.3 Social issues

There is a need for a rationalisation of governance in the Thames Gateway. Clearer designation of responsibilities is required at national, regional and local levels, and although this is less of a problem in Greater Manchester, even here clearer designation of responsibilities is required, given the existence, for example, of two URCs. At a national level, transport, environment and regeneration are currently undertaken by three separate departments (DfT, DEFRA, and ODPM)

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[3] *The sites are New Islington, Higher Broughton and Hulme in Greater Manchester, and Barking Reach, Gascoigne Estate and South Dagenham (West) in the Thames Gateway.*

with fiscal arrangements being handled by two others (DTI and Treasury), which can lead to a lack of 'joining up' at national, regional and sub-regional level. Continuing planning delays and bureaucracy were also seen as key challenges by a number of stakeholders.

Our research also indicated that joint venture schemes are perceived as being generally successful. In both sub-regions, good examples of such schemes exist (for example, Barking Riverside and South Dagenham West), but there needs to be a balance between strong leadership and collaborative working to ensure success, and a fair risk/reward trade-off for those involved.

As far as community engagement and development are concerned, active dialogue with key elements in the community are needed. Several developers had used 'eco days' or 'green days' to highlight the benefits of sustainable communities. But education is key to highlighting the benefits of Combined Heat and Power (CHP), energy saving and the benefits of green construction. Community Trusts may also become more common for community-based projects, founded on successful experiences in Thames Gateway.

There is also a major challenge for those involved in the sustainable development agenda to more closely define what 'sustainable communities' really comprise. Although ODPM have produced a definition, it was noticeable that stakeholders had developed an array of terminology (for example, 'liveability' and 'neighbourhoods of choice') to contextualise what they were trying to achieve. It is likely that those developers with a strong Corporate Social Responsibility agenda are more likely to be fully committed to the sustainable communities agenda.

6. A CHECKLIST FOR DEVELOPERS – 'PUSHING THE BOUNDARIES'?

Clearly, valuable lessons can be learned from the experience on these sites. Appendix B provides a summary of key points developers need to bear in mind when approaching brownfield development, and although this is not intended to be prescriptive, we believe it can provide a useful tool for those seeking to develop in ways which really do provide for sustainable end products. In this sense the research is intended to help refine and complement existing 'sustainability checklists' such as the one produced by SEEDA. Indeed SUBR:IM work based at the University of Surrey is developing a framework for assessing sustainability across the brownfield lifecycle.

Developers and investors are coming to terms with brownfields, and there is evidence of the emergence of networks and supporting financial vehicles to reduce risk. However, it is also clear that the projects that developers are engaging with today are complex, have long lifecycles, and involve peoples' homes, jobs and future lives. A key challenge will be to incorporate innovative and sustainable products and designs throughout the brownfield lifecycle from cleanup through to development and construction in order to provide truly sustainable communities. As one of our community representative interviewees put it:

'I worry really what we are creating – it's almost like scientists really: testing out design, testing out living materials and new products. But we're testing out on peoples' lives really, I think, and I just worry that we are creating … a new area, that in 20 to 30 years we are going to knock… down again because it wasn't sustainable now. But I also think, on the other side, that it's important to test out new ideas and push the boundaries.'

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Appendices

Appendix A: Comparison of Previously Developed Land in Thames Gateway and Greater Manchester (based on NLUD data, 2003)

Characteristic	Thames Gateway	Greater Manchester
Amount of brownfield (PDL)	3600ha	2625ha
Average size of PDL site	3.75ha	1.82ha
PDL in private ownership	76%	53%
Derelict/vacant PDL	1479ha	1915ha
Derelict/vacant PDL as % of all PDL	41%	73%
Derelict/vacant ownership (private as % total)	79% / 76%	50% / 50%
Derelict/vacant ownership (Unknown ownership as % total in each category)	4% / 3%	26% / 10%
Derelict PDL as % of all PDL	12%	46%
Average size of derelict PDL	4.8ha	3.0ha
Derelict/vacant since 1998 (% of all derelict/vacant)	33%	40%
% of new dwellings built on PDL	81%	84%

Note that this analysis is based on raw NLUD data and excludes sites 'with redevelopment potential that have not yet been allocated for planning'.

Appendix B: Developer's checklist (adapted from Dixon et al, 2006)

Stakeholder	Key roles/ responsibilities	Comments
Environmental	• Use sustainable remediation techniques	• Engage with community and other stakeholders during and after cleanup
	• Incorporate sustainable construction methods and high standards of design	• Driven by policy and guidance, design codes may be appropriate.
Social	• Engage with community at an early stage of development	• A need to be proactive in design options • 'Eco Days' and 'Green Days' can help educate general public • Overseas visits with community representatives • Promote risk transparency in clean-up (warranties on sale)
	• Focus on partnering and engaging with other stakeholders	• Joint Ventures and PPP-based schemes can offer advantages but require leadership and vision
Economic	• Promote a strong 'brand/image' for the project	• Sensitivity required because of the richness and diversity in the community
	• Incorporate a balance/mix of tenures and house types	• Affordable housing is key, and gated communities can create social exclusion • Mix of density, house and tenure type is vital
	• Focus on sustainable communities which provide 'liveability'	• Engagement with stakeholders to provide homes, where people want them, close to jobs and other services
All	• Measure sustainability proactively across the project lifecycle	• Need to be consistent and to attempt to measure relevant sustainability components

SUBR:IM SUSTAINABLE URBAN BROWNFIELD REGENERATION: INTEGRATED MANAGEMENT

Developer and Investor Responses to Sustainable Urban Brownfield Regeneration: Does Practice Make Perfect?

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Joe Doak (University of Reading)
(email: a.j.doak@rdg.ac.uk)

OXFORD BROOKES UNIVERSITY The University of Reading

Format of Presentation

- How the research fits together
- What is sustainable brownfield regeneration?
- Development industry responses - results
- Network relations (investors) - results
- What lessons can be learned?
- The future

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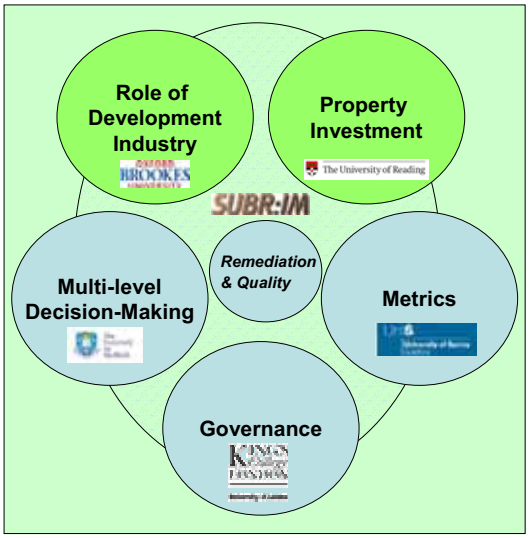
The Research Linkages



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What is sustainable urban brownfield regeneration?

- ***'The management, rehabilitation and return to beneficial use of brownfields in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations in environmentally sensitive, economically viable, institutionally robust and socially acceptable ways within the particular regional context.' (RESCUE)***

- ***'A development that has been produced in a sustainable way (e.g. in terms of design, construction and participation processes) and enables people and organisations involved in the end use of the site to act in a sustainable way.' (Dair and Williams)***

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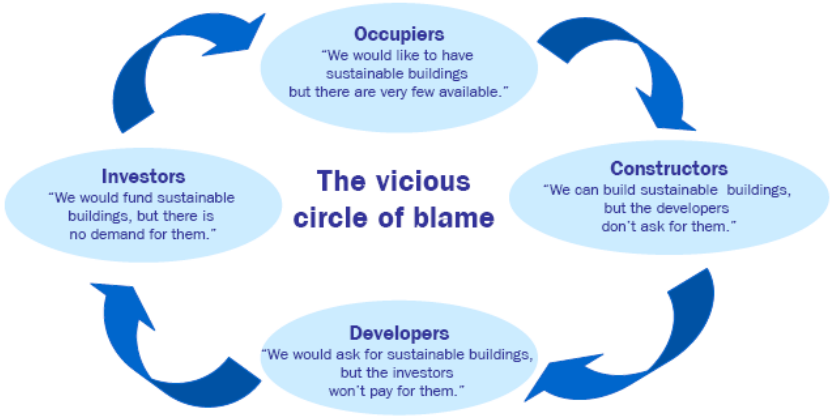
A key barrier: the 'Circle of Blame'



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SUBR:IM SUSTAINABLE URBAN BROWNFIELD REGENERATION: INTEGRATED MANAGEMENT

Development Industry Responses - Results

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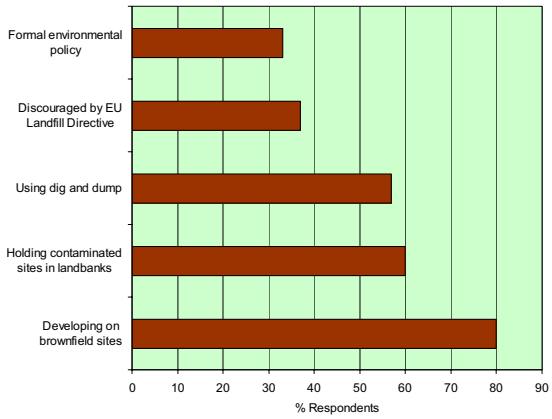
Developer survey

- Developers coming to terms with brownfield?
- Gov't policy a key driver (esp PPG3 and other PPSs)
- Contamination still a risk and smaller housebuilders less likely to undertake development
- Technical information deficit
- S106 and planning conditions just as important as Part IIA EPA 1990
- EU Landfill Directive-adds to costs
- 'Lip service' paid to 'sustainability' !



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Location of case studies

Thames Gateway

Greater Manchester

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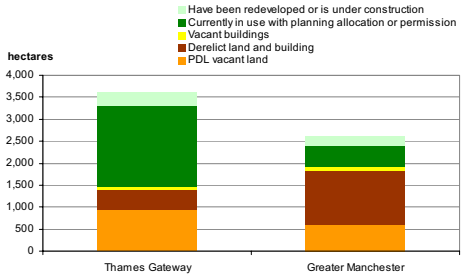
Brownfield: Type (NLUD, 2003)

- More brownfield in TG than GM
- Sites are bigger (3.75ha ; 1.82ha)
- Greater proportion and amount of derelict/vacant land in GM than TG
- Longer-term dereliction in GM
- H25 Indicator– 81% in TG and 84% in GM



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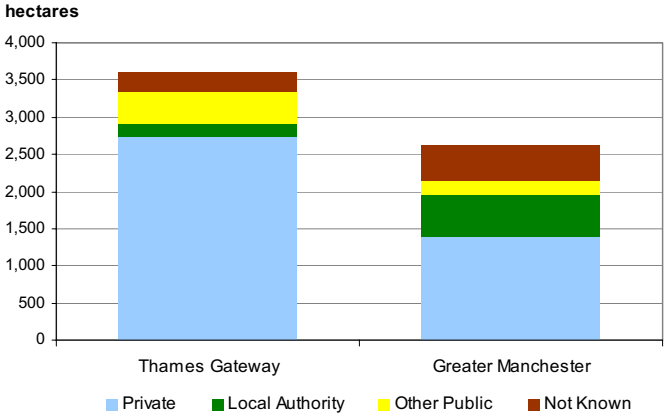
Brownfield: Ownership (NLUD, 2003)



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New Islington, Manchester (newislington.co.uk)

- Millennium Community (one of 7)
- Mixed use
- 1400 homes
- 12.5ha site
- Depopulation and council housing
- Contamination from industry
- Focus on environmental design (CHP)
- Partners: English Partnerships, Manchester City Council, Urban Splash and Manchester Methodist Housing Group.

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Barking Riverside, Barking (barkingriverside.co.uk)

- Largest brownfield site in UK, 200ha
- Dereliction and contamination (plus pylons!!)
- Site conditions (layered peat)
- Mixed tenure housing for 26,000 people
- New transport links (DLR) and planned TG transits
- Barking Riverside (EP and Bellway)

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What do the case studies tell us?

- **Environmental**
  - Contamination not THE main issue

    More important are:
    - Infrastructure
    - Density
    - Affordability
- **Economic**
  - Strong image/brand are important in building confidence
  - Area-based initiatives will fail without people-based inputs!
- **Social**
  - Joint Venture (PPP) schemes are successful - strong leadership
  - What are sustainable communities, really??
  - Governance
  - Planning delays/bureaucracy

"Fat cat developer..." *"Red tape planner..."*

?

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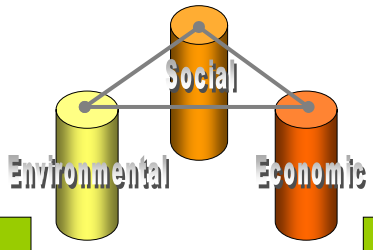
Developers' checklist: 'best practice'

✓ Community engagement
✓ Partnering (JVs/PPPs)



✓ Sustainable remediation
✓ Sustainable construction

✓ Brand/image
✓ Balanced housing mix
✓ Liveability/jobs

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Network relations

- Existing research on brownfield investment (Ulster): perceived risks and need for new investment vehicles?
- Yes, but our research also suggests importance of 'softer' networking relations and processes in the financing of brownfield regeneration projects….

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Network Processes

- Based around case studies, investor interviews and study of network relations,
  - Investors drawn-in by 'network builders' (often developers): past working and building of trust
  - Investor have weak links with other actors ('strength of weak ties'?)
  - Emergence of fledgling but profitable 'brownfield development network'
  - Network consolidation via projects, but also personal ties, gatherings, joint-memberships and events

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Implications of the Network Perspective

- Place emphasis on the 'soft infrastructure' of investment and decision-making processes in brownfield regeneration
- Sits along side (within?) the more technical and organisational requirements for effective investment
- Suggests approaches which explicitly considers, tweaks and 'manages' these networks

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Possible policy refinements…a look ahead!

- Raising the brownfield target to 80%?
- Clearer definition of a 'sustainable community'?
- Taxation? Development gains or VAT?
- Improved grants for sustainable construction and costly cleanup?
- Improved planning system and guidance (e.g. for flooding and housing mix) ?
- Integrated remediation permits and simplified review of new remediation techniques?
- Integrated governance in Thames Gateway and nationally?
- Explicit development and expansion of the emergent 'brownfield development network'

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A warning: transient or sustainable communities??

'I worry really what we are creating – it's almost like scientists really: testing out design, testing out living materials and new products. But we're testing out on peoples' lives really, I think, and I just worry that we are creating … a new area, that in 20 to 30 years we are going to knock… down again because it wasn't sustainable now. But I also think, on the other side, that it's important to test out new ideas and push the boundaries.'

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Navigating the Brownfield Maze: Making Sense of Brownfield Regeneration Policy and Governance

Philip Catney[1], John Henneberry[1], and Tim Dixon[2]

[1]*Department of Town and Regional Planning, University of Sheffield, UK*
[2]*Department of Real Estate and Construction, Oxford Brookes University, UK*

INTRODUCTION

The effective implementation of sustainable brownfield regeneration is contingent upon the character of governance structures and the way that these engage with the development process. The paper explores this relationship through an examination of experience in the Thames Gateway. We then present a 'map' of institutional structures which highlight the congested institutional arrangements to deal with this policy. From the 'inside' these arrangements may appear to be a flexible and effective means of addressing complex problems. However, from the 'outside' the picture may be rather different. In order to capture this, the paper presents the perspective of one particular group: private developers. By examining a case study in Thames Gateway, the paper asks what they make of this governance structure and how it affects their activities. In conclusion, we examine two potential ways in which government can design a system of governance which produces effective regeneration: policy mapping and weaving.

GOVERNANCE, POLICY DESIGN AND LOCAL PRACTICE

In theory, governments endeavour to make the policy process better by making it more rational and, by implication, simpler. However, in practice, this is not generally the case. Policy problems are generally complex, multi-dimensional. They defy 'simple' policy remedies and do not match the functional structures of urban governance. It is vanishingly rare for one organisation to be responsible for dealing with one problem using one policy. Hence, governing environments are generally complex, institutionally congested, and multi-layered.

Newspapers and commentators have suggested that this complexity has arisen from the 'hyperactivity' tendency at the heart of government. Government is said to create discrete policies to deal with small parts of a broader issue without due regard to existing policies and institutions. It is, in effect, chasing problems: creating ad hoc policy responses to problems as they arise, rather than having any clear long-term plan. Individual initiatives on their own can be useful in creating a focus for policy actors. However, the creation of a panoply of tenuously connected initiatives in a loose and fragmented governance structure can create considerable problems for policy implementers. As will be discussed below, in order to cope with the complexity of a policy issue such as brownfield redevelopment, government has created a burgeoning regulatory maze which has become unwieldy and, at times, incoherent. Wherever this maze has come from, its effects on those charged with working with government policy can be profound.

GOVERNANCE IN THE THAMES GATEWAY

Due to extensive housing shortages in the South East of England in recent decades, policy makers have become increasingly interested in recycling brownfield land in the Thames Gateway. The government has sought to address this complex issue through the development of a variety of policies, single-purpose bodies, development strategies and plans. With the proliferation of these initiatives, a complex maze of policy structures and regimes has been densely layered upon on another, creating policy and regulatory congestion. This may undermine the effective delivery of brownfield regeneration by, a) 'bounding' the knowledge of policy implementers with regard to the precise relationships between policies, actors and development processes, b) creating delays in the regulatory system through changing plans and technical guidance, c) undermining 'leadership' in the gateway, and d) promoting instability in development processes.

Complexity in the Gateway: Mapping the Congestion (Without a Charge)

Figure 1 presents a map of the institutional architecture that affects the development of brownfield sites in East London. This map illustrates the complexity of organisational relations involved in delivering brownfield regeneration.

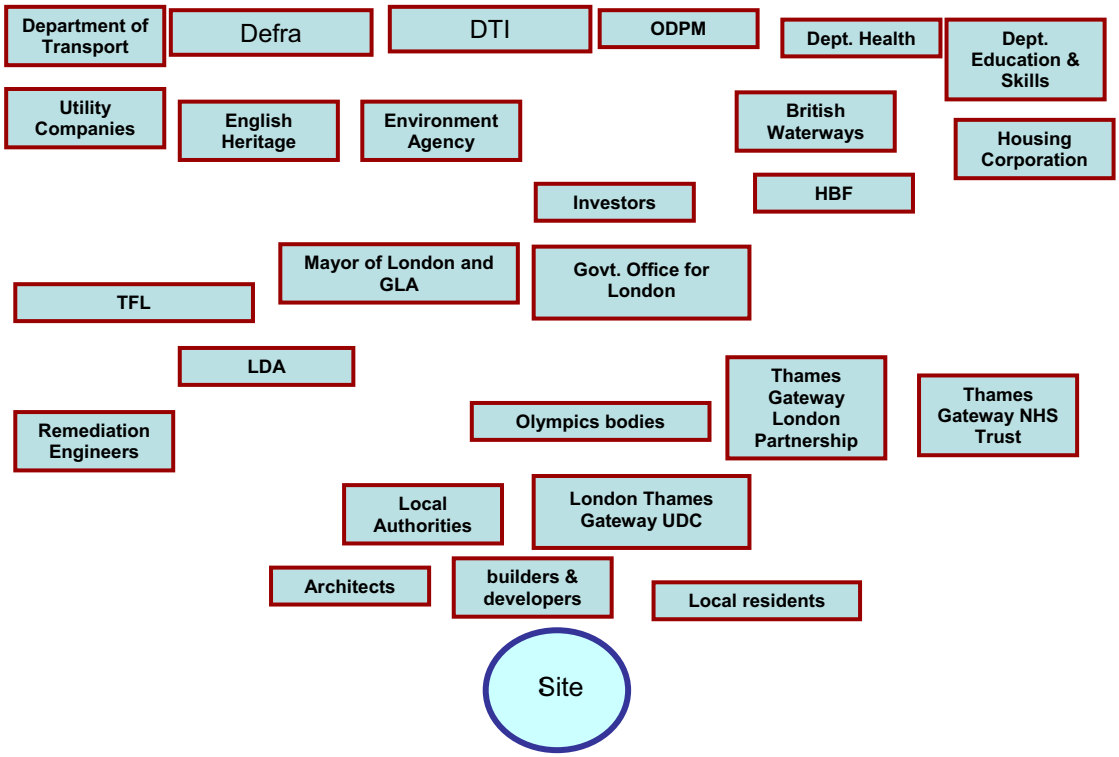

Figure 1: Institutional Congestion in the Thames Gateway

From the above map, we can see the 'top heavy' nature of the distribution of institutions. Many of the institutions are national, or are proxies of national government. However, there is also a considerable number of 'regional' level institutions with specific policy and regulatory responsibilities and competencies. The organisations at this level, such as the Mayor of London and the GLA, have considerable influence over the particular development. However, the Mayor and the GLA are not lone figures at this level; the government has established non-departmental public bodies (NDPB) such as the Thames Gateway London Partnership and the various organisations involved in preparing London for the Olympics in 2012. Each of these organisations has its own agenda and plans for redeveloping brownfield land in the Gateway. This can cause considerable confusion and require extensive negotiations on the part of the developer which ultimately slow the pace of development (see below).

Developer perceptions – brownfield governance and regulation in Thames Gateway and Greater Manchester[1]

In order to understand how this particular design of governance has impacted on the specific process and practices of actors in the Thames Gateway, we present research from Dixon *et al* (2006) who conducted in depth research on the role of the development industry in brownfield regeneration on a number of sites in the Thames Gateway and Greater Manchester. Among other findings, this research revealed that policy barriers were a greater hindrance to brownfield regeneration than was contamination. In order to highlight the particular importance that governance arrangements make to development processes, we present the perspectives of developers in both these areas.

[1] This section is based on interview material from Dixon et al (2006)

Thames Gateway

The interviews from this research suggested that in the Thames Gateway the plethora of agencies operating at a number of different levels had distinct effects on development processes. From central government there has been considerable activity through target-setting, funding and the creation of partnerships for regeneration schemes. This includes the involvement of the London Thames Gateway Development Corporation (UDC) co-ordinating planning applications. At a regional level, the case study sites were part of the London Riverside plan, and so the Mayor of London and its agencies have been overseeing the master plan and planning process. Public bodies have established partnerships with developers/investors, which have also allowed developers to undertake large-scale regeneration schemes, such as Barking Riverside.

The top heavy nature of the institutional and policy map shown in Figure 1 demonstrates some of the *'regional target and regulation v local delivery'* tensions. The central and regional levels are not simply involved in target setting, but in a good deal of delivery as well. In addition, while central and regional government targets have been important in stimulating development, they have not been underpinned at a more 'local' level, through the provision of transport infrastructure for the regeneration sites.

Similarly, the central design of the system of governance has resulted in a dramatic increase in the number of stakeholders involved in the Thames Gateway. This has also created a duplication of roles in planning processes and highlights the lack of clear leadership. Interviewees stressed the need for greater 'joining up' and 'weaving' of planning policy at national, regional and local levels of government to plug the gaps between policies and agencies and to curtail initiatives that are superfluous or duplicate activities. In particular, interviewees suggested that the role of agencies needed close monitoring. The Environment Agency was identified as suffering from under-funding. In addition, it was noted that the advice given to developers differed considerably between national and regional levels and within the regional offices. Hence, there was a sense that achieving policy coherence within the multi-level nature of the policy environment in the Thames Gateway was as much an *intra*-organisational challenge as it was an *inter*-organisational one.

One stakeholder involved as a practitioner summed up the administrative barriers surrounding the South Dagenham West scheme:

'Bureaucracy is the only main barrier. It goes between different agencies responsible for each of [the type of] public infrastructure – each of the bodies is independent. There is a difference between the aspirations of the Borough and the GLA, and all of this just takes a long time to resolve itself.'

A developer on the Barking Riverside development echoed these concerns and suggested that this conflict was evidenced by differing perceptions as to the future of site between local authority and developer, and more recently the Mayor and English Partnerships:

'There {have} been administrative barriers in terms of planning process as a whole, and different agendas have been attached to [Barking Riverside] site. Because of its size and the strategic importance of the location, the various agencies working in the Thames Gateway have all seen the site delivering different things…the members [of LBBD] at that time… saw it very much as being an extension to Dagenham, Heathway, low density, suburban development… only had four thousand units on the site… we came in with another Master Plan for six thousand units in addition to the nine hundred then we now moving to ten thousand eight hundred...you've then got the Mayor overlaying on top of that now, who sees this as being a strategic site for delivering affordable housing, and also would like to see this as a front runner in his sustainability…you've got the Urban Development Corporation whose vision has not quite clearly emerged… then you've had all sorts of other sort of ripples underneath that of the Thames Gate, part of Thames Gateway and the Thames Gateway Partnership…this area definitely suffers from a plethora of public agencies who all have different agendas

The different aspirations between the various layers of governance (currently involving the local authority, public bodies, and Government Office for region, as well as the future involvement of UDCs) may create a lengthy process before a planning application can be submitted. As stated above, any policy weaving by government in the Thames Gateway would need to take into account the conflicting interests, values and beliefs of the various organisations operating there.

One way of re-organising the system of governance in the Gateway would be to reduce the role of central government in orchestrating the governance system. This proposal had the support of some practitioners who voiced the need for government to streamline and improve brownfield regulations, particularly those relating to remediation. For example, the introduction of a Single Remediation Permit; streamlining licensing and permits for remediation; and providing a clear definition of 'waste'.

One developer stated that at policy level, there is a need for a more integrated approach:

'Sometimes things do not square with what is trying to be achieved. [For instance] the Environmental Protection laws are being increased in terms of the level, which is right, but that naturally could act as a brake on development of the Thames Gateway. [To take another example] we have the Olympic Games that will regenerate the whole area, but naturally that will be a huge drain on construction skill, and at the same time we are looking for more houses to build.'

Interviews in the Thames Gateway suggested that developers/investors 'suffered' from a duplication/overlap of the roles of authorised stakeholders involved in planning and policy. This has led to delays in the planning application process, lack of clear guidance on dealing with contamination, and a lack of commitment in the provision of infrastructure (i.e. *who is going to provide what is needed?*). One practitioner summarised the general state of stakeholder engagement during the planning process:

'There is not a clear chain of command from the ODPM down to who is meant to be doing what, who is driving what process, and the different stakeholders do not know between themselves what is meant to be happening.'

The stakeholders interviewed expressed the importance of an integrated approach to speed up the development process. This particularly referred to government departments as they need to work in harmony rather than concentrating on their own parts, or as one practitioner suggested: *'joined up thinking'.*

Greater Manchester

In Greater Manchester, where the Manchester 'model' of regeneration has been in operation since the Hulme project, governance at a local level is less problematic, although the presence of two URCs in the sub-region may create tensions. Here, the relationship between local authorities is a key issue, and the complexities of Compulsory Purchase Order (CPO) procedures were seen as important in New Islington and Higher Broughton.

On the New Islington site, one regeneration interviewee stated that:

'No it doesn't function well…EP (English Partnerships) reports to the ODPM, RDAs report to DTI…and there are inefficient workings between all these groups.

In relation to the wider structures of governance in the Greater Manchester area, one local authority officer stated:

'I think it would be fair to say that over the last two to three years our relationships at a sub-regional level have improved and have strengthened and there's probably been more recognition by our sub-regional partners and the local authorities of the role that Manchester plays in a sub-regional context, but in terms of what we've been doing prior to that, it's almost been despite what our neighbouring authorities have wanted.'

Another local authority officer stated:

'We certainly don't have the multiplicity of structures [as in the Thames Gateway], but if you look at Manchester and Salford, you've got two URCs within 3 miles of each other, you know if you were really pulling back the lens and looking at that more strategically, you say "That's a bit stupid, isn't it".'

CONCLUSION

Policy coherence can be defined as the capacity to produce an 'overall state of mutual consistency among different policies' (OECD, 1996: 8). Coherence between policies and institutions within a particular area is crucial if outcomes mutually desired by actors are to be achieved. Indeed, with so many organisations and institutions involved in policy areas, the ability of any one actor to achieve its desired outcome is constrained by its reliance upon other bodies involved in policy delivery.

Yet, the phases of institutional and policy development that the government has pursued has undermined the coherence of policy. It has created specific policy initiatives to deal with specific issues as they have arisen. Often these initiatives have been based on sound logic. However, the cumulative effect of these initiatives has been to create a congested and multi-layered system of governance. One key issue posed by this congestion is the question of leadership in the gateway. Recently ODPM, in response to a perceived 'leadership vacuum', has announced that it would appoint a new chief executive for the Thames Gateway. Yet, as Regeneration & Renewal note (2006): 'The specific responsibilities of the appointee have yet to be decided and it is unclear which of the Gateway delivery bodies he or she will be chief executive of.' Without a clear design on the future direction of Gateway, there is every chance that the coordination and coherence problems will continue.

How can the coherence problems in the Gateway be dealt with? Parsons (2004: 44) suggests that there are two ways to build policy capacity and coherence; these are mapping and weaving. We explore these in turn.

Mapping

One of the key problems that faces individuals and organisations charged with working along the grain of policy is that their knowledge of the environment in which they operate is bounded. They understand little about how different policies and regulatory bodies relate to one another and how they are brought together at the local level (see above). One proposal that has been put forward to combat this is that government could adopt the role of policy cartographers, plotting the course for 'good' implementation. For example, government could create a sequential process for developers in particular places so that they know what organisations they need to work with to create an effective brownfield development. This would have the benefit of enabling government to more closely monitor the impact of policies at the local level (and by implication to evaluate their utility more accurately). This could help government to avoid creating new policies that are not needed or that would clash with existing policies or (development) processes.

Weaving

Government might augment policy mapping by using its structural position to 'weave' policy together. Weaving entails 'integrating competing and opposing forms of knowledge and coordinating the multiplicity of organisations and interests to form a coherent policy fabric' (Parsons, 2004: 44). Government's role is to draw together the loose threads of knowledge that exist in the wider governance environment to produce a policy that integrates the fullest possible range of interests, values and beliefs.

Mapping and weaving may be superficially appealing but they are also problematic. They demand considerable learning capabilities of the centre to monitor and identify (a) the large number of policies and institutions, (b) the discrete interaction between policies (e.g. between the Part IIa system and the wider brownfield development process), and (c) the impact of these on the specific nature of local development processes. Indeed, experience suggests that government finds it difficult enough to monitor its own policies without embracing those of others.

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SUBR:IM SUSTAINABLE URBAN BROWNFIELD REGENERATION: INTEGRATED MANAGEMENT

Navigating the Brownfield Maze: Making Sense of Brownfield Regeneration Policy and Governance

Philip Catney, John Henneberry & Tim Dixon (University of Sheffield and Oxford Brookes University)

The Thames Gateway

- Variety of policies, single-purpose bodies, development strategies and plans have been created.
- Resulted in growing institutional and policy complexity.
- 'Hyperactivity' tendency at the heart of government - Ad hoc policy-making. Limited long-term policy planning.
- Individual initiatives on their own can be useful in creating a focus for policy actors.
- However, tenuously connected initiatives in a loose and fragmented governance structure can create considerable problems for policy implementers.

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Complex Policy Environments

May undermine the effective delivery of brownfield regeneration by:

a) 'bounding' the knowledge of policy implementers with regard to the precise relationships between policies, actors and development processes,

b) creating delays in the regulatory system through changing plans and technical guidance,

c) undermining 'leadership' in the gateway, and

d) promoting instability in development processes.

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Case Study Site: Barking Riverside

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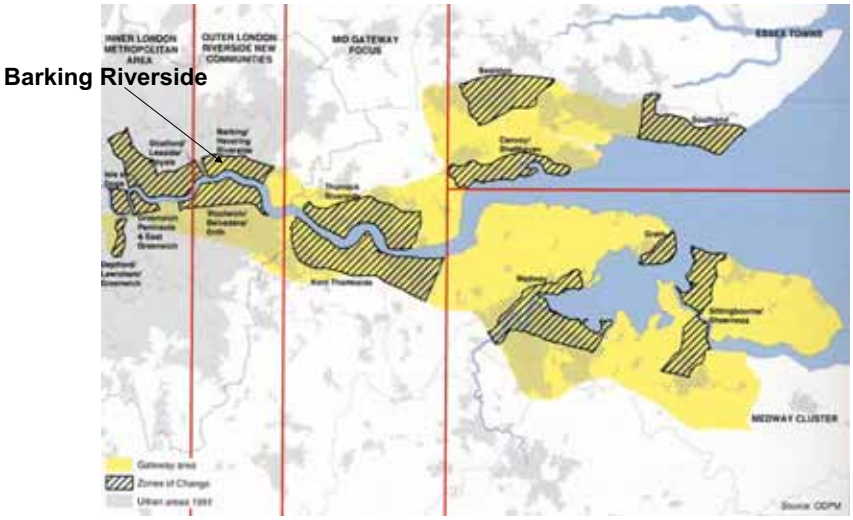
The Thames Gateway



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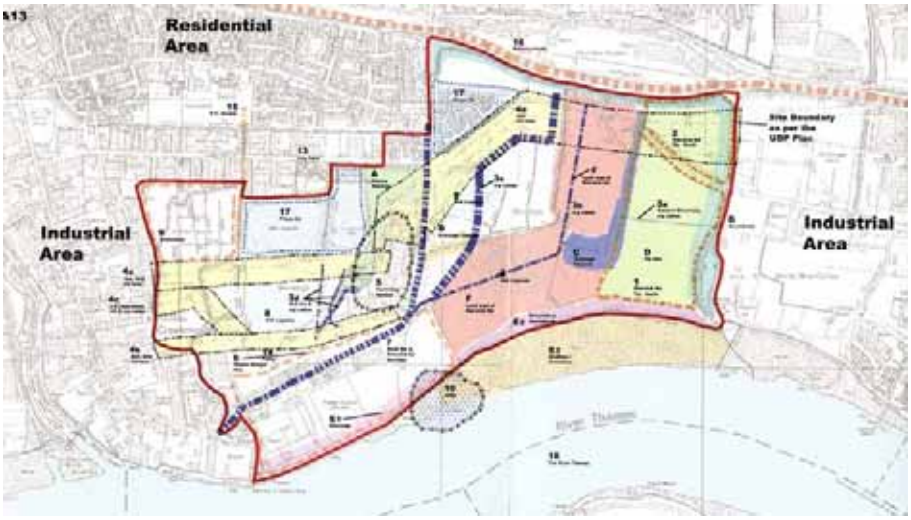
Barking Riverside



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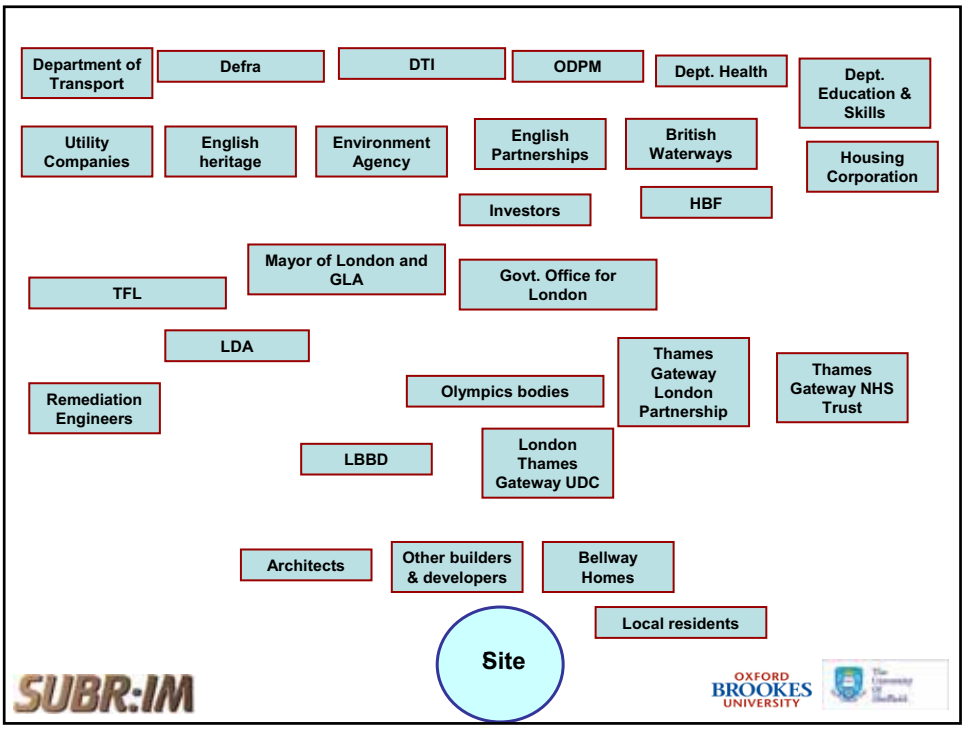

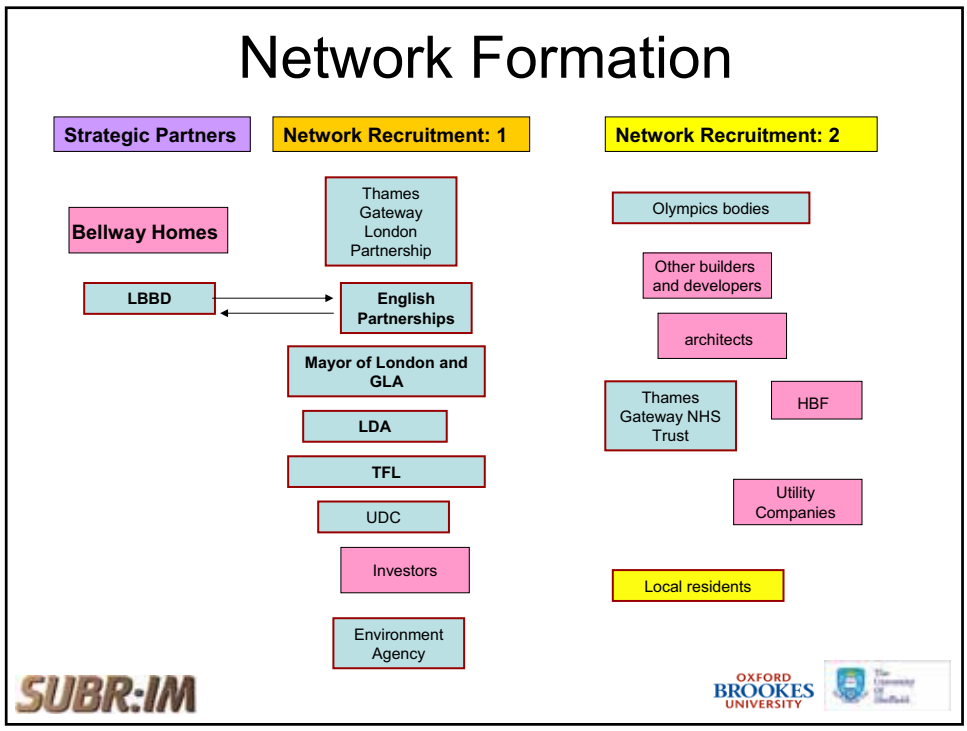
Network Formation
Strategic Partners
Network Recruitment: 1
Network Recruitment: 2
Bellway Homes
Thames Gateway London Partnership
LBBD
English Partnerships
Mayor of London and GLA
LDA
TFL
UDC
Investors
Environment Agency
Olympics bodies
Other builders and developers
architects
Thames Gateway NHS Trust
HBF
Utility Companies
Local residents
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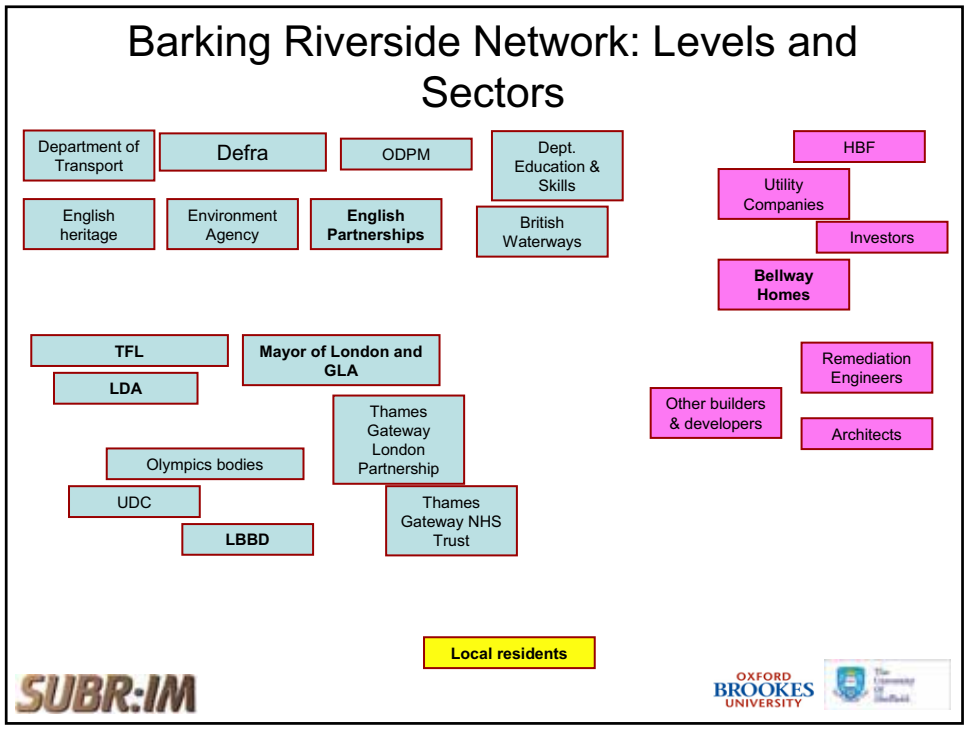
Barking Riverside Network: Levels and Sectors
Department of Transport
Defra
ODPM
Dept. Education & Skills
English heritage
Environment Agency
English Partnerships
British Waterways
HBF
Utility Companies
Investors
Bellway Homes
TFL
Mayor of London and GLA
LDA
Thames Gateway London Partnership
Olympics bodies
UDC
LBBD
Thames Gateway NHS Trust
Remediation Engineers
Other builders & developers
Architects
Local residents
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The Developer's Perspective

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'Bureaucracy is the only main barrier. It goes between different agencies responsible for each of [the type of] public infrastructure – each of the bodies is independent. There is a difference between the aspirations of the Borough and the GLA, and all of this just takes a long time to resolve itself.'

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'There is not a clear chain of command from the ODPM down to who is meant to be doing what, who is driving what process, and the different stakeholders do not know between themselves what is meant to be happening.'

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Confusion in the Gateway

'[M]embers [of LBBD] at that time… saw it very much as being an extension to Dagenham … low density, suburban development… only had four thousand units on the site… we came in with another Master Plan for six thousand units in addition to the nine hundred then we now moving to ten thousand eight hundred...you've then got the Mayor overlaying on top of that now, who sees this as being a strategic site for delivering affordable housing, and also would like to see this as a front runner in his sustainability…you've got the Urban Development Corporation whose vision has not quite clearly emerged… then you've had all sorts of other sort of ripples underneath that of the Thames Gate, part of Thames Gateway and the Thames Gateway Partnership…this area definitely suffers from a plethora of public agencies who all have different agendas

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More Integration!

'Sometimes things do not square with what is trying to be achieved. [For instance] the Environmental Protection laws are being increased in terms of the level, which is right, but that naturally could act as a brake on development of the Thames Gateway. [To take another example] we have the Olympic Games that will regenerate the whole area, but naturally that will be a huge drain on construction skill, and at the same time we are looking for more houses to build.'

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Mapping

Government could:

- adopt the role of policy cartographers, plotting the course for 'good' implementation.
- create a sequential process for developers in particular places so that they know what organisations they need to work with to create an effective brownfield development.

This could help to:

- closely monitor the impact of policies at the local level (and evaluate their utility more accurately).
- avoid creating new policies that are not needed or that would clash with existing policies or (development) processes.

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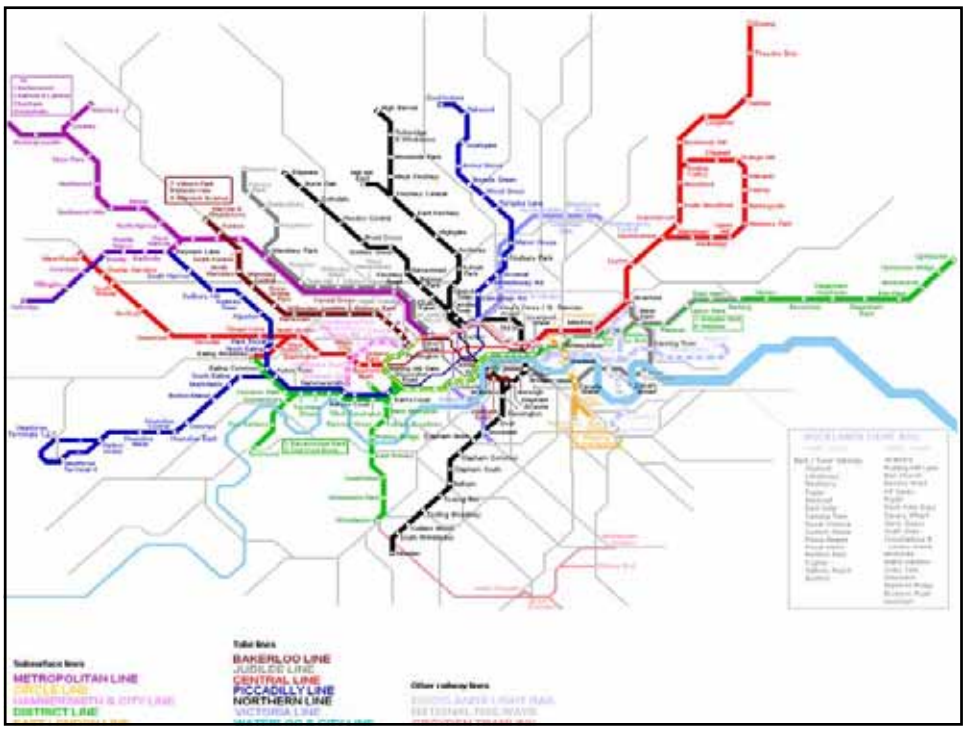
METROPOLITAN LINE
DISTRICT LINE
BAKERLOO LINE
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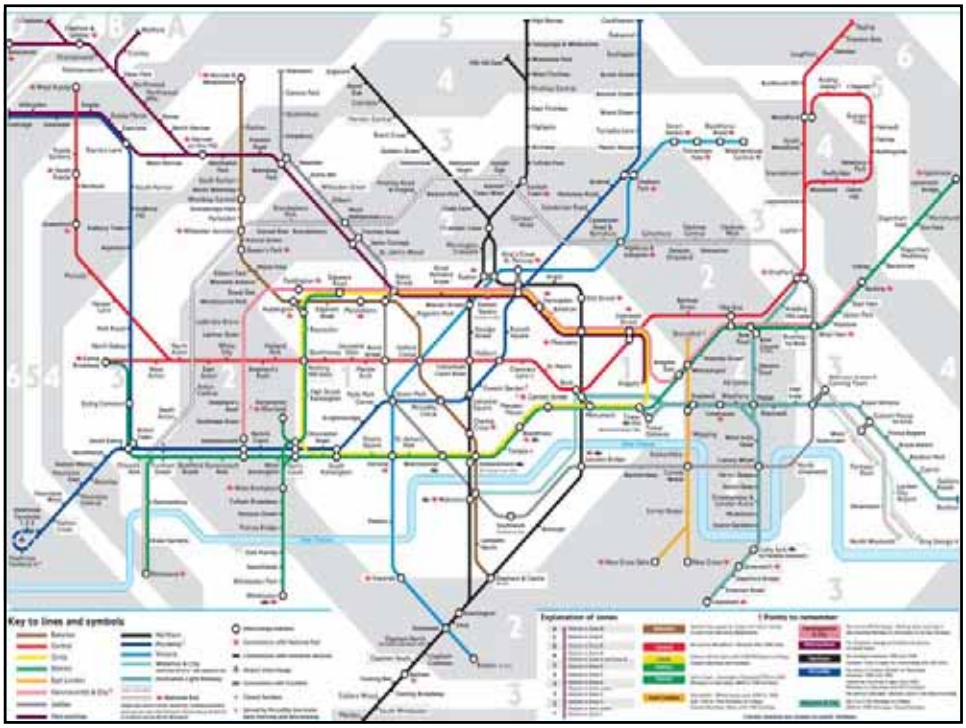
CENTRAL LINE
PICCADILLY LINE
NORTHERN LINE
VICTORIA LINE


Key to lines and symbols

Weaving

- Government could 'weave' policy together.
- Weaving entails 'integrating competing and opposing forms of knowledge and coordinating the multiplicity of organisations and interests to form a coherent policy fabric.'
- Government's role is to draw together the loose threads of knowledge that exist in the wider governance environment to produce a policy that integrates the fullest possible range of interests, values and beliefs.

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Limits to Mapping and Weaving

Demand considerable learning capabilities of the centre to monitor and identify:

(a) the large number of policies and institutions,

(b) the discrete interaction between policies (e.g. between the Part IIa system and the wider brownfield development process), and

(c) the impact of these on the specific nature of local development processes.

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The Eternal Truths of Governing

'Suppose the following to be the state of affairs on board a ship...The captain is larger and stronger than any of the crew, but a bit deaf and short-sighted, and doesn't know much about navigation. The crew are quarrelling with each other about how to navigate the ship, each thinking he ought to be at the helm; they know no navigation and cannot say that anyone ever taught it them, or that they spent any time studying it; indeed they say it can't be taught and are ready to murder any one who says it can.

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The Eternal Truths of Governing (cont.)

They have no idea that the true navigator must study the seasons of the year, the sky, the stars, the winds and other professional subjects, if he is really fit to control a ship; and they think that it's quite impossible to acquire professional skill in navigation (quite apart from whether they want it exercised) and that there is no such thing as an art of navigation. In these circumstances aren't the sailors on any ship bound to regard the true navigator as a gossip and a star-gazer, of no use to them at all?'

(**Plato**, *The Republic*)

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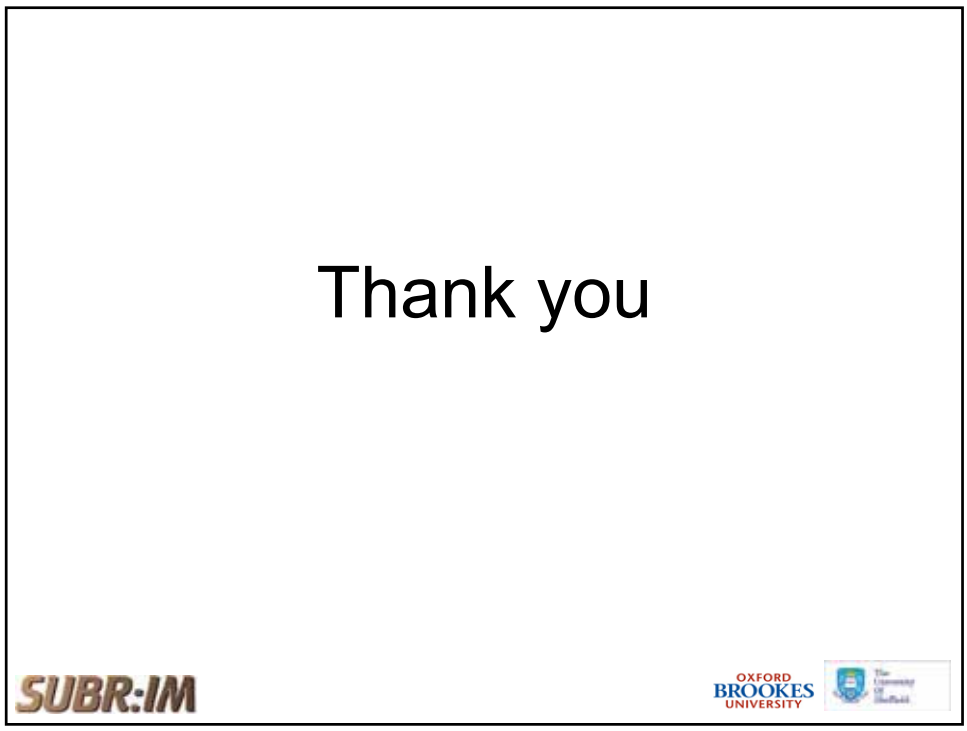
Thank you
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How to Remediate Heavy Metal Contaminated Sites with Amended Composts

René van Herwijnen[1,2,3], Vishnu Priya Gadepalle[1], Tony R. Hutchings[3], Abir Al-Tabbaa[2], Andy J. Moffat[3], Mike L. Johns[2], Sabeha K. Ouki[1]

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ABSTRACT

Modern planning policies recognise that the provision of greenspace such as parkland and community woodland offer multifunctional environmental and social benefits which can contribute strongly to the sustainability of towns and cities. A challenge to such development is that the soils of many former industrial sites often contain elevated concentrations of contaminants, including heavy metals. The bioavailability of heavy metals should be reduced to break the pollutant-receptor pathway prior to establishment of vegetation to create green space.

Compost is often proposed as a suitable material for the remediation of contaminated brownfield sites, vitalising the soil and also for its reported immobilisation of heavy metals. Through immobilisation, the contaminant receptor linkage pathway will be broken and the toxicity of the soil will be reduced. In addition to composts, some inorganic amendments are known for their immobilising effect on heavy metals and therefore may be suitable for soil remediation. In our research we have examined the usage of composts enriched with inorganic materials to increase the immobilising behaviour of the composts.

Tests with compost only showed contradictory effects on the immobilisation of heavy metals between different kinds of composts. One compost immobilised heavy metals in a contaminated soil while another mobilised them. In addition, our results showed that the best metal immobilising compost was not always the best to improve plant growth. On the basis of these results we have tested a mixed compost made of composted sewage sludge and greenwaste compost enriched with iron oxide or zeolite. Initial results show that growth of rye-grass on contaminated soil amended with compost enriched with zeolite or iron oxide performs slightly better than on soil amended with compost or inorganic amendment separately. These results will be complemented with leachability and toxicity tests to create a picture of the possibilities of enriched composts for remediation purposes.

INTRODUCTION

Most large cities in the UK have to deal with brownfield sites within their boundaries. Redevelopment of these sites would prevent greenfield development and so protect greenfield land. The Environment Agency has estimated that around 20,000 contaminated sites in England and Wales may need treatment (Environment Agency, 2004). The costs of treatment of these sites can be made more bearable if their remediation is combined with redevelopment. Nevertheless developers continue to choose greenfield land rather than brownfield land because of the high costs of the remediation of contaminated land (Environment Agency, 2004). This, and the recent increase in landfill costs for contaminated soils has created a market for low cost alternative remediation techniques. One redevelopment option for a brownfield site is its transformation into green spaces in the urban environment. For example, the Land Restoration Trust is planning to manage 10,000 hectares of previously restored derelict and under-used land for public benefit within 10 years (www.landrestorationtrust.org.uk). Similarly, the Newlands project, developed by the Northwest Development Agency and the Forestry Commission, has a budget of £23 million to transform 435 ha of under-used and derelict land into community parks and woodland (Forestry Commission, 2004).

Many urban brownfield sites have heavy metal concentrations that significantly exceed the levels that are generally stated as environmentally acceptable and therefore form a potential health risk

for humans, animals and plants. The threat of heavy metals to the environment can be reduced by fixation in the soil itself, so lowering the bioavailability and risk of further mobility. So far a considerable amount of research has been performed on the addition of compost or certain types of minerals to immobilise heavy metals. Soil remediation by the addition of compost alone however, will have a temporal effect because when the compost degrades, the metals will return to their original availability to plants and animals. At the same time addition of minerals alone will not improve the biological quality of the soil or support plant growth. The combination of the two materials could be optimised to provide a long term immobilisation of the metals and also improve biological quality of the soil. By using waste produced materials (waste compost) and cheap minerals (zeolites, bentonites or iron oxide) the method to be developed may offer a low cost, sustainable solution for the remediation and establishment of greenspace on contaminated brownfields. Likewise, because the technology occurs *in situ* and does not involve any thermal treatment, both fuel and money can be saved on transport of the soil, a fact contributing to the sustainability of the solution.

SUBR:IM work package K has the objective to develop a remediation method that aims at four goals: 1. reduced leaching of heavy metals; 2. reduced uptake of heavy metals by plants; 3. improved soil conditions for plant growth; 4. sustainable for a long period.

RESEARCH TECHNIQUES

The main experimental methods used are leaching tests and nursery trials.

Leaching tests have been adopted into standard procedures to test the environmental impact of a polluted soil. The most common compliance leaching tests are agitated batch extraction tests including the UK National Rivers Authority leaching test (Lewin et al., 1994) which is now superseded by the recent EU test series (BSI, 2002). During batch tests, 100 grams of soil is agitated on a bottle roller with 1 litre of carbonated water, with a pH between 5 and 7, for 24 hours after which equilibrium is assumed to have be established. The leachate concentration is then used as a measure of the bioavailable fraction of the heavy metals and can be compared to the maximum acceptable levels of groundwater concentrations for metals. Batch leaching tests have been used to show a strong binding of metals to compost (Grimes et al., 1999) and also to test the immobilising effect of several cement-based soil additives (Al-Tabbaa and Boes, 2002).

The nursery trials have been performed with two plant species, namely perennial rye-grass (*Lolium perenne*) and poplar (*Populus trichocarpa* variety Fritzi-Pauley), that are known as metal accumulators (Aten and Gupta, 1996; Hao et al., 2003; Larsen et al., 2004; Laureysens et al., 2004). We have chosen these species so as to thoroughly test the ability of the novel composts at increasing metal fixation in the soil and hence a reduction in bioavailability indicated by a lower metal uptake by the plants. Secondly we will test whether there is a significant reduction in phytotoxicological impact of the polluted soil and a subsequent increase in the health and growth performance of the plants.

Soil amendments and soils

The materials used in the experiments were composted garden green waste (GW-compost), composted sewage sludge (S-compost), a combination of the two composts (GWS-compost), zeolite and iron oxide. Both minerals, zeolite and iron oxide, are known for their metal binding capacity.

The soils on which the soil amendments were tested were sampled at three locations: 1. a former zinc factory near Avonmouth with high levels of zinc, cadmium and lead; 2. arsenic-containing mine spoils from the Tamar valley, Cornwall; 3. soil treated with sewage sludge over a period of 10 years with elevated levels of zinc and copper.

RESULTS/DISCUSSION

The current results from our research show that there is a large variability in effects between different composts. Figure 1 shows the leaching results for soil from Avonmouth treated with different levels of GW-compost or S-compost. From this figure it can be observed that while GW-

compost reduces the amount of zinc, S-compost increases the leaching. This means that S-compost added to this soil increases the risk for potential receptors rather than reduce it. Additional leaching tests with a range of composts including GW-compost, S-compost, coir compost, spent mushroom compost, and LimeX70 showed that spent mushroom compost and LimeX70 also have a potential to increase the leaching of some heavy metals from contaminated soils, despite their high pH.

It is, however, not the case that the increased leaching of metals caused by S-compost automatically involved a higher uptake of these metals. Figure 2 shows the uptake of cadmium and zinc into the leaves of poplar and rye-grass growing on Avonmouth soil treated with GW-compost or S-compost. For rye-grass can be seen that S-compost was more efficient than GW-compost in reducing metal uptake into the leaves. For poplar, however, S-compost increased the uptake. It was also observed that GW-compost increased the uptake of cadmium while this compost reduced the leachable fraction of this metal. Tests with other soils have shown that these patterns can differ for different soils. Actual leaching and metal uptake depends on compost type, soil type and the level of contamination.

Improvement of growth by compost amendment also differs between composts and soil. On highly contaminated soils like those from Avonmouth and Tamar valley, which lacked any growth, compost addition significantly improved growth. Plants growing on soils with lower contaminant levels usually did not show improved growth after compost addition and there have even been a few cases of reduced growth performance. Compost addition should be limited on these soil types.

One of the remaining questions is whether there is an advantage of applying compost in combination with zeolite or iron oxide. Experiments to answer this question are still being performed but some initial results indicate a positive answer. It was observed that rye-grass growing on arsenic contaminated soil amended with GWS-compost was much healthier if this compost is used in combination with iron-oxide than on its own (Figure 3). Similarly, rye-grass growing on S-compost amended soil performed better if the compost was amended with zeolite than without. This was probably caused by a better balancing of nutrients (Leggo and Ledesert, 2001) than by immobilisation of metals. Whether the metals are more tightly bound in the soil by combined use of compost with zeolite or iron-oxide cannot be stated yet, and more and different experiments are necessary to determine this.

CONCLUSIONS

The original purpose of this project was to deliver a recipe for a mineral-amended compost that can be used on a variety of metal contaminated sites. However, because of the large differences between composts and soils, each compost to be used for a specific soil should be tested with the soil before applying in the field. This testing should consist of both leaching tests and bioassays to ensure reduced leaching to ground water as well as reduced plant uptake. Results of tests on combined use of compost with minerals like zeolite and iron oxide are promising for improved plants performance. More results on the effect of the minerals on plant uptake and leaching are to come and more tests on the sustainability of the method will be performed.

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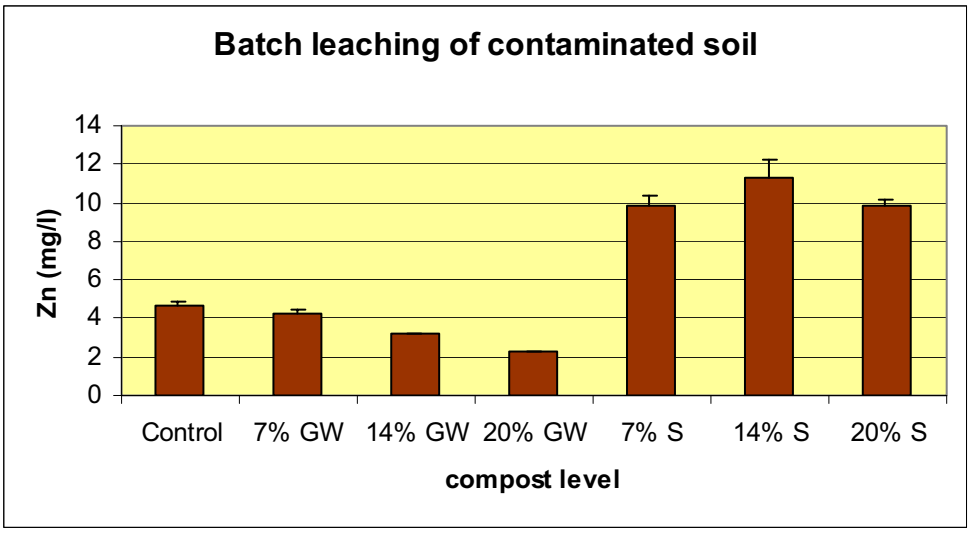

Figure 1. Leaching of zinc from highly contaminated soil treated with composted garden greenwaste (GW) or composted sewage sludge (S). Error bars indicate the standard error., n=2.

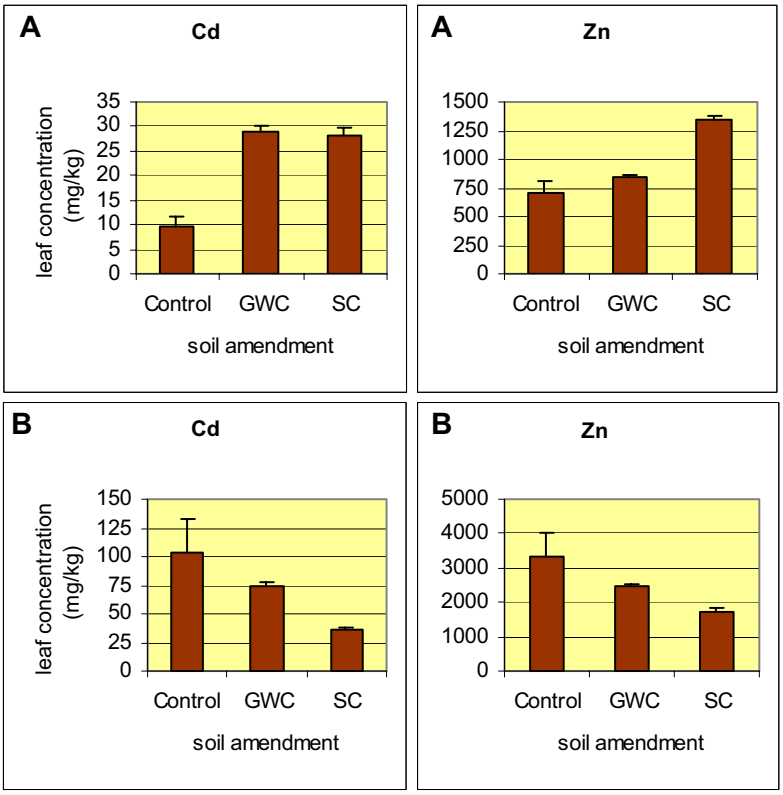

Figure 2. Uptake of cadmium and zinc in the leaves of poplar (A) and rye-grass (B) growing on highly contaminated soil treated with composted green waste or composted sewage sludge. Error bars indicate the standard error, n=3.

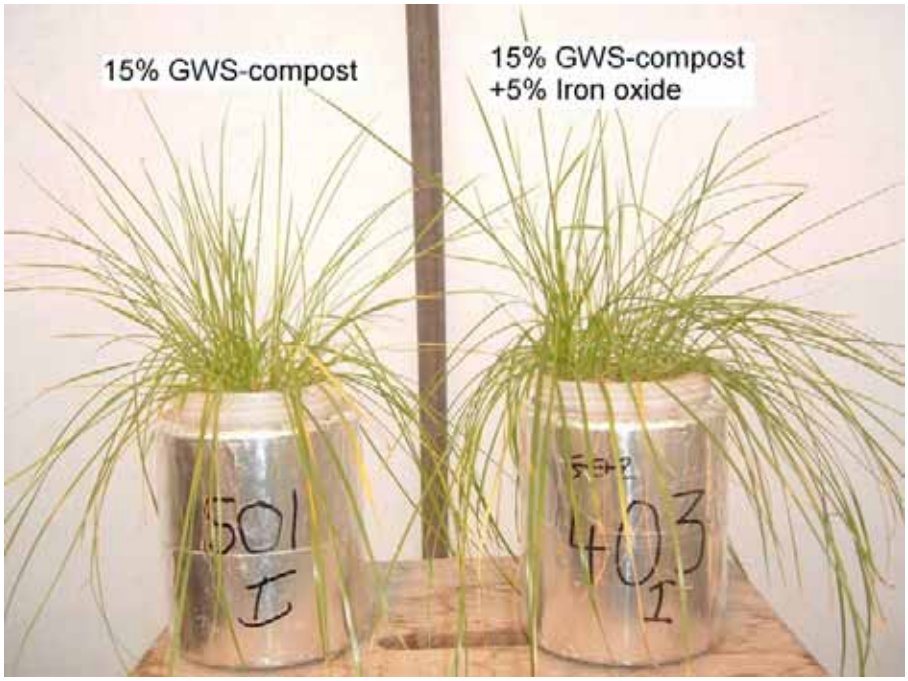

Figure 3. Rye-grass growing on soil highly contaminated with arsenic amended with compost, or compost amended with iron-oxide.

SUBR:IM SUSTAINABLE URBAN BROWNFIELD REGENERATION: INTEGRATED MANAGEMENT

How to remediate heavy metal contaminated sites with amended composts

René van Herwijnen

UNIVERSITY OF CAMBRIDGE UniS University of Surrey Forest Research An agency of the Forestry Commission

Presentation overview

-Introduction
-Goals of our research
-Research techniques
-Used materials
-Results
-General conclusions
-Additional research into mechanisms
-Acknowledgements

SUBR:IM 2

Why urban greening?

Environmental benefits:

e.g. heat island reduction, atmospheric pollutant interception, urban biodiversity

evapotranspiration

rainfall interception

Public benefits:

e.g. economic regeneration, landscape improvement, sport/recreation, provision of shade

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3

Problems for greening

-20,000 sites in England and Wales need treatment
-Wide range of contamination
- -Heavy metals
- -Organics like solvents, PAH, PCB's
- -Explosives
- -Asbestos
- -etc.

-Threat for groundwater, population, vegetation
-High costs for remediation

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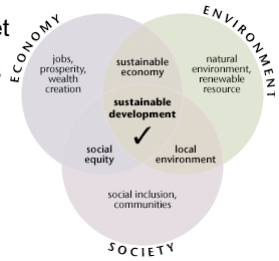
Sustainable greening

Land reclamation/remediation demands acceptable budget

Greening solution demands acceptable maintenance/management budget



Vegetation has normal life 'expectancy'

Vegetation helps pollution control

Vegetation deliver other environmental benefits

Greenspace valued by community

Greenspace poses no danger to community

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Remediation of heavy metals

Immobilisation of heavy metals in soil by soil amendments
- -breaking the contaminant receptor linkage
- -reduces toxicity of the soil
- -protect groundwater

Compost:
- -potentially immobilises metals
- -revitalises the soil for plant growth

Minerals:
- -potentially increase the immobilising effect
- -potentially balances the nutrients from the compost
- -Improve sustainability

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Goals

1. Reduced leaching

2. Reduced uptake of metals by plants

3. Improved soil conditions (better plant performance)

4. Sustainable for long period

Subgoals:
-Low cost
-Utilisation of waste materials

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Research techniques:

Leaching

-standard test (BSI En 12457: Part 2)
-(treated)soil mixed with water (pH 5.6) at 1:10 ratio
-agitated for 24 hours
-water filtered and analysed

Test compares treated and untreated soil and indicates the efficiency of the amendment

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Research techniques:

Nursery trial

-grow plants in amended soil (ryegrass and poplar)
-monitor growth (produced biomass)
-analysis of metal uptake

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Tested soil

Avonmouth

Former zinc factory

Arsenic	20-200 mg/kg
Cadmium	10-200 mg/kg
Copper	45-220 mg/kg
Lead	315-16 000 mg/kg
Zinc	1000-10 000 mg/kg

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Tested soils

Kellham bridge

Sewage sludge disposal

Arsenic	3 mg/kg
Cadmium	0.5 mg/kg
Copper	170 mg/kg
Lead	180 mg/kg
Zinc	260 mg/kg

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Tested soils

Tamar valley

Mine spoils

Arsenic	35000 mg/kg
Cadmium	800 mg/kg
Copper	1600 mg/kg
Lead	190 mg/kg
Zinc	50 mg/kg

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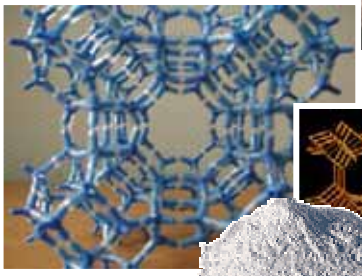
Used materials

Compost -composted garden greenwaste
-composted sewage sludge
-combination of both

Minerals: -zeolite
-clay
-iron oxide



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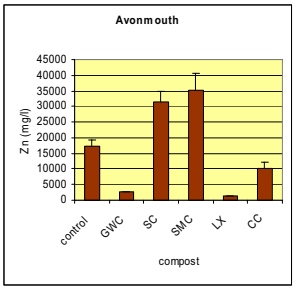
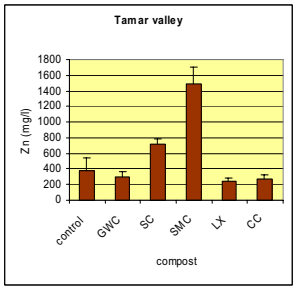
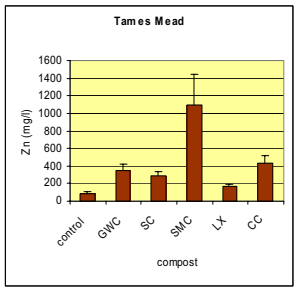
Results

Different leaching effects for Zinc between composts and soils







GWC = Green waste compost
SC = Composted sewage sludge
SMC = Spent mushroom compost
LX = LymeX70 (sugar refining residue)
CC = Coir compost (coconut husk)
error bar = standard deviation

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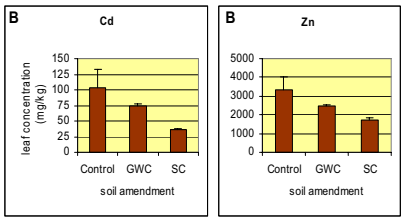
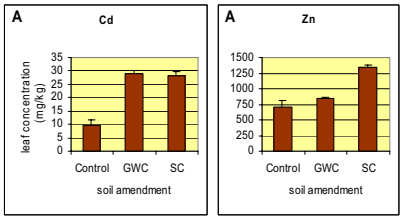
Results

Metal uptake in ryegrass leaves on Avonmouth soil



Metal uptake in poplar leaves on Avonmouth soil



GWC = Green waste compost
SC = Composted sewage sludge
error bar = standard deviation

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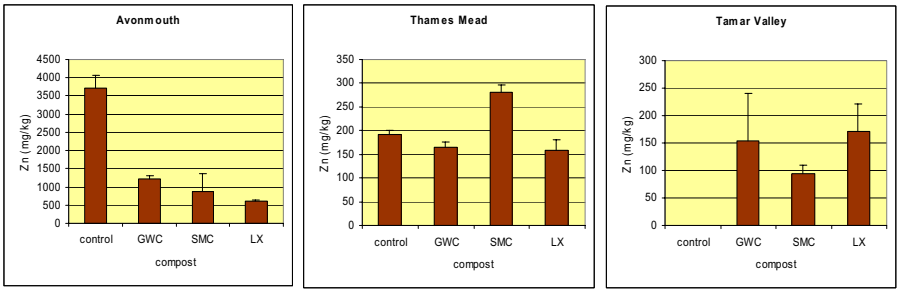
Results

Differences between soils on zinc uptake by cress



GWC = Green waste compost
SMC = Spent mushroom compost
LX = LymeX70 (sugar refining residue)

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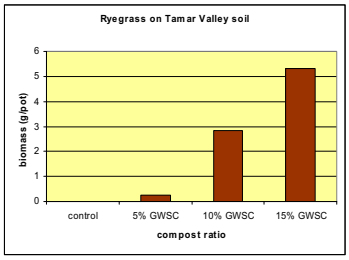
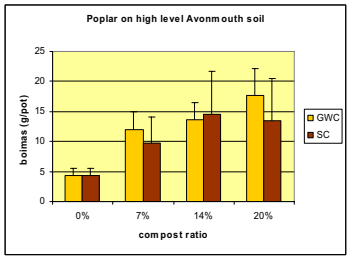
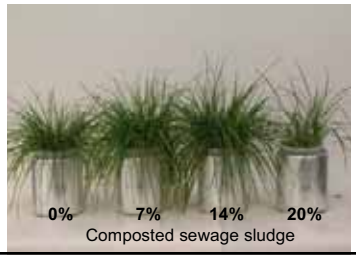
Results

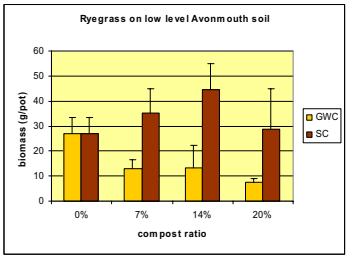
Influence of compost on growth





GWSC = Green waste + Sewage sludge compost





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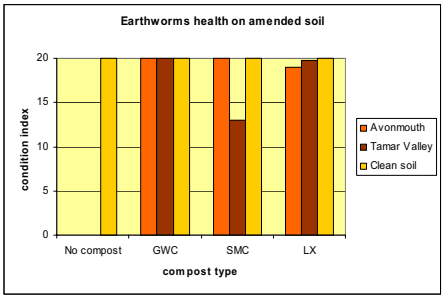
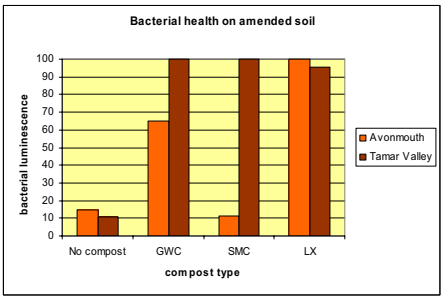
Results

Influence of compost on soil toxicity



GWC = Green waste compost
SMC = Spent mushroom compost
LX = LymeX70 (sugar refining residue)



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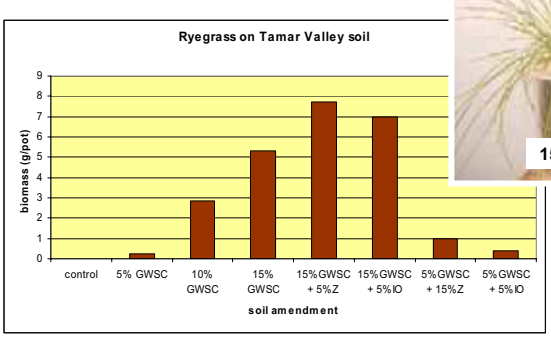
Results

Combinations of compost with minerals



GWSC = Green waste +
Sewage sludge compost

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Conclusion

-There is no “general” best compost for every kind of soil

-Before application of soil amendment: testing, testing, testing
- -leaching
- -plant uptake and performance
- -toxicity

-Preliminary positive effects for minerals

-To be done:
- -more data on higher mineral ratios
- -tests on sustainability
- -field trial

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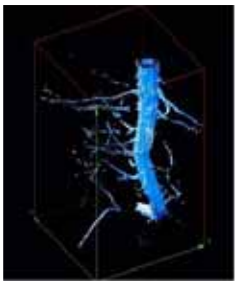
Research into Mechanisms

MRI (Magnetic Resonance Imaging)
for plant processes



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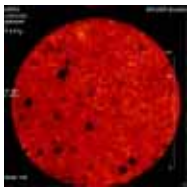
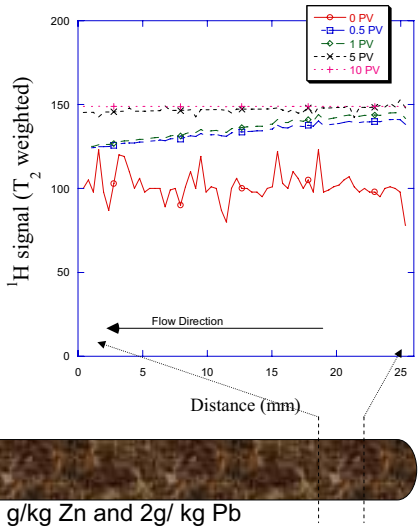
Research into Mechanisms

MRI (Magnetic Resonance Imaging)
for soil processes





Sand + 10 g/kg Zn and 2g/ kg Pb

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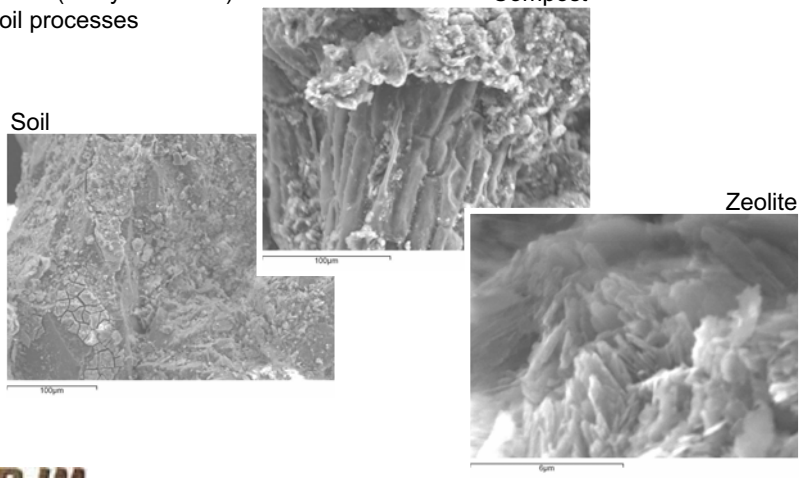
Research into Mechanisms

SEM (scanning electron microscopy)
and XRD (X-ray difraction)
for soil processes

Compost

Soil

Zeolite



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Acknowledgements

PI's:
Sabeha Ouki (Surrey), Tony Hutchings (Forest Research),
Abir Al-Tabbaa (Cambridge), Mike Johns (Cambridge),
Andy Moffat (Forrest Research)

Students:
Priya Gadepalle (Surrey, PhD), Wohid Noman (Surrey, MSc),
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Sustainable Brownfield Regeneration: Redrawing the Boundaries of Expertise

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INTRODUCTION

In order to enhance the 'sustainability' of brownfield urban regeneration it is increasingly argued that there needs to be a wholesale re-drawing of the boundaries of expertise. The original objectives of the sustainable development discourses included the idea that powers and responsibilities should be devolved away from professionals, bureaucrats, engineers, and scientists and given to empowered 'lay' communities. In turn this delegation of responsibilities would require communities to develop their own understandings of how social and technical processes operate in order for their inclusion to be effective. They should be able to identify particular problems and play a central role in developing practical, and workable solutions. This shift in thinking reflects wider trends within the social sciences and public policy spheres more broadly in which there has been a greater questioning of traditional models of expertise. Some writers talk of a new era of *post-modernism* where 'certainties' and faith in science and technology have given way to a new era of uncertainty and the celebration of multiple truths and forms of knowledge.

However, the practical barriers involved in implementing these new agendas are significant. For at the same time as the propagation of 'local knowledge' has become a sustainable development priority, many forms of technical knowledge have, ironically, become more complex and esoteric. In some ways, as Giddens (1991) reminds us, the power of *expert systems*, that is experts working together in an organised way, have become more pervasive as technologies become increasingly complicated and beyond the remit of lay communities. Some also argue that there now exists a wider distrust of scientists and scientific knowledge as high profile cases, such as BSE or global warming, have demonstrated that there are obvious limits to scientific understanding. Whilst this may act as a spur to community empowerment, it may also undermine the position of experts to such an extent that their roles and knowledge become undervalued.

This short paper explores some of these themes in relation to the government's sustainable communities and brownfield regeneration agendas. It begins by examining the discourse of the sustainable community before moving on to a discussion of expert-lay knowledge in the development process and the example of Salford Quays.

WHAT IS A SUSTAINABLE COMMUNITY?

The core features of a sustainable community (SC) and an unsustainable community are outlined in Table 1. Within a SC community expert-lay relationships are to be redefined so that the latter become more active in shaping the contours of local governance and develop new relationships with planners and others to develop more effective and efficient policy measures. As the Egan Review (ODPM, 2004) points out SC can only be delivered if professionals adopt new ways of interactive working and delegate appropriate powers and resources to locals and their knowledge.

Table 1: The Central Features of Sustainable and Unsustainable Communities

Criteria	A Sustainable Community	An Unsustainable Community
Economic Growth	Flourishing economic base; built on long term commitments; stable; and inclusive of broad range of workers.	Domination by dependent forms of development; lack of employment opportunities; vulnerable; insecure, short-term; and divisive.
Citizenship	Active citizens and communities; long-term community stewardship; effective political engagement; healthy voluntary sector and strong social capital.	Passive and dependent citizens and communities; lack of community engagement or ownership; low levels of voluntary activity and/or social capital.
Governance	Representative, accountable governance systems; balance of strategic, top down visionary politics and bottom up emphasis on inclusion,	Closed, unaccountable systems of governance; over-reliance on passive, representative forms of democracy; lack of visionary politics; parochialism.
Community Characteristics	Broad range of skills within workforce; ethnically and socially diverse; mixture of socio-economic types of inhabitants; balanced community; well-populated neighbourhoods.	Absence of skills within workforce; ill-balanced communities of place; high levels of (physical) separation between groups; lack of diversity; formal and informal segregation; lack of population.
Urban Design	Diverse architecture; accessible public spaces; higher urban densities; provision of broad range of amenities; buildings that cater for a range of needs; 'self-contained' communities; the creation of 'place'.	Uniform, zoned, architecture; closed, gated and inaccessible public spaces; absence of community facilities; urban sprawl; 'placeless' suburban development.
Environmental Dimensions	Re-use of brownfield sites; minimisation of transport journeys; good quality public transport	Expansion into greenfield sites; maximisation of transport journeys; car dependence and the absence of public transport
Quality of Life	Attractive environments; high quality of life; strong pull for a range of social groups.	Low quality of life; strong push for a range of social groups.
Identity, Belonging and Safety	Sense of community identity and belonging; tolerance, respect and engagement between people of diverse backgrounds; low levels of crime and anti-social behaviour.	Lack of local associational culture and ownership of public space; intolerant and divided local politics; high levels of crime, disorder and fear.

(Source: adapted from ODPM, 2003)

However, building-up the relationships between 'experts' and lay communities is fraught with difficulties. There are often very different perspectives over the visions and priorities of brownfield development and how it should proceed. There are particular difficulties over the following:

1. *Development time-scales:* Sustainability places a new emphasis on the *longer term* implications of actions taken in the present for citizens and communities of the future. As such it draws attention not only to questions of how development should be implemented but also *when* particular objectives should be prioritised and at what point(s) in the development process. The whole concept of sustainability requires new forms of imagined trust in which new timescales are established through which the 'benefits' of development projects are to be delivered. Communities can no longer expect or demand that their immediate needs should be prioritised. Instead, those needs have to be understood as part of a longer-term agenda of change so that 'practices and institutions based on promise allow for the securing of a future event in the present' (Adam, 1994: p.139). In practice the emergence of the sustainability discourse raises the possibility of a new *politics of time* in which the coming into being of particular types of (urban) space becomes an explicitly politicised and power-infused process. Experts and development interests may have particular perspectives on what they define as a sustainable time period whereas others may have more immediate needs.

2. *Definitions of Risk:* Authors such as Alan Irwin (1995) have identified the different conceptions of risk that exist in urban areas between 'experts' and 'lay' communities. Risks and the acceptance of risks are defined by particular contexts. The evidence shows that they often feel *less* at risk than the official definitions applied by experts. This partly results from the convoluted processes through which sites are labelled 'contaminated' in the first place and the loosely defined nature of the term. At the same time other social aspects of a site, such as its associations with crime, may be uppermost in the minds of local people, rather than the physical dangers that scientists may highlight. Often there can be a real sense in which experts become frustrated with what they see as the lack of knowledge on the part of lay communities and lay communities become frustrated with the narrowness of experts' perspectives.
3. *Brownfields, Heritage and Place:* At the same time as experts may see brownfields as a problem to be addressed, tackled, and made safe, the wider meanings associated with brownfields vary significantly from place to place and for different groups. They can be, at the same time, empty places ripe for development and sites that play an important role in people's perception of their local areas. Similar points have recently been made by English Heritage, for example, in its criticisms of the SCs plan and its simple, top-down definitions of areas such as the Thames Gateway which has been labelled a problem place when, in reality, sites within it possess enormous cultural and historic value. The Environment Agency has also been critical of the plans for their failure to address issues of urban biodiversity and the role of brownfields in providing habitats for urban wildlife.
4. *Openness to Alternative Perspectives?* One of the recurring problems with expert-lay relationships is that people do not approach subjects as 'blank slates'. All citizens and communities approach topics from perspectives forged from their own experiences. People often feel they know in advance what their views are about particular topics, before they hear the 'evidence'. This lack of openness may be a real barrier to a more inclusive set of lay-expert relationships. In the same way the assumptions, perceptions, and priorities of development may be odds with wider community needs and there may be little ground for interests to adapt their perspectives.

The remainder of the paper uses the example of Salford Quays in Greater Manchester to illustrate some of these wider points.

THE SALFORD QUAYS DEVELOPMENT

The redevelopment of Salford Quays (SQ) has been one of the highest-profile examples of urban regeneration in the UK. The SQ project emerged in a context of development and decline in an area whose fortunes have always been closely tied to its docks. Until the late 1960s Salford Docks had a successful history as an inland port following the opening of the Manchester Ship Canal in 1894. Local industry thrived and communities of workers migrated into the area, attracted by the availability of work and the unusual stability of local dock labour. However, by the early 1970s changing shipping technology and trade patterns saw activity in the docks decline. Their eventual closure in 1982 symbolised the wider process of de-industrialisation that was affecting Greater Manchester and other industrial cities and the area became blighted by high levels of unemployment. In the neighbouring area of Ordsall, which had supplied many of the dock workers, unemployment was registered at 32% in 1985 compared to 15% in Greater Manchester. Social problems increased and Salford became a classic example of a deprived inner urban area with relatively high rates of crime, drug-abuse, and (selective) out-migration. In the case of Ordsall these culminated in a series of riots in the summer of 1992.

The visible extent of decline in Salford made it a target for policy-makers from the mid 1970s onwards. In 1978, for example, parts of Manchester and Salford were designated under the Inner Areas Act and in 1981 a significant portion of what was to become Salford Quays (as well as land in Trafford Park) became an Enterprise Zone for a ten year period. In 1983 Salford City Council (SCC) purchased the dock site and associated land (a site of 37ha.) from the Manchester Ship Canal Company and even at this early stage the idea of a water-based development, influenced by North America ideas, emerged on to the agenda. The subsequent redevelopment of SQ required a large input of up-front finance. The bulk of this funding was provided by central government with a £25million rolling grant from 1985 -1990/1 from the Derelict Land Grant. This was used for land and water clearance and remediation. Money also came from the Urban Programme for the provision of infrastructure, landscaping and roads. SCC were so successful in putting together development bids that in the period 1985-2002, £145million in public funds were

sunk into Salford Quays, including a £65million National Lottery Grant for the Lowry – a performance arts theatre and gallery.

The role of experts has been critical to the shaping of development agendas in the area:

Policy-makers, planners and specialist consultants: In SQ these actors have set out local development visions and used their resources and technical knowledge of the planning process to implement the strategies. As our research indicated policy-making in Salford during the 1980s and into the 1990s was dominated by a relatively small group of local political actors and their technical staff. The focus at the outset was primarily on encouraging 'confidence' within the development community in order to kick-start development. There was less concern with 'sustainability' issues and a greater emphasis on mixing communities by encouraging the in-migration of middle class residents.

Developers and investors: the resources and visions of investors have, of course, been critical to the development. Their relationship with local communities and the locality in general has been complex. On the one hand, they are focused on making a profit in the short term and in Salford Quays a number of developers approached the area in this way. However, building a sense of place was also important for longer term investors and those in the property industry for whom returns depended on the longer term attractiveness of the area. Some developers and investors have therefore developed more open and transparent development agendas, involving discussions with local actors/communities.

Scientists, Technicians and Engineers: the role of scientists in turning SQ from a brownfield problem into a flagship development site has been considerable. Technologies, such as water aeration, have been developed in the area to enable it to be become an investment space. In SQ the technical input of scientists has been more concerned with the early stabilisation of markets to attract investment, rather than any wider community need.

Other State Officers: a range of other experts have also been called upon to help deliver local regeneration. The actions of the Police, for example, have become essential to the success or otherwise of the developments. Similarly, others such as those working for RDAs, the area's museums, and other social services all have critical roles to play in shaping the contours of subsequent rounds of development and expansion.

The research examined the relationships between these groups, their development agendas, and local communities. It identified the following findings:

Community Perspectives: there were two principal community groups in SQ – existing residents in Ordsall and the new communities of in-migrants who had purchased accommodation in the SQ developments. In general there were two main criticisms: first, little had been done to consult existing residents on the plans for SQs and as a consequence there was little in the way of community 'ownership' of the development. This failure to consult had generated local scepticism over the objectives of the redevelopment. Second, the new in-migrants also felt that little was being done to canvass their perspectives on the area and their needs. There was a sense that the development had thus far failed to develop much of a 'sense of place' as this had not been a development priority for any of the experts involved in drawing up and implementing the plans. Rather than creating a sustainable community in the sense outlined in Table 1 the developments had thus far generated a large amount of property-led development but had done little in the way of creating active and inclusive communities.

Engagement with Planners and Developers: The mechanisms through which local people could influence the actions of experts (and could find out about the projects that were going on around them) were in the main absent and little was being done to rectify this – despite the new sustainability rhetoric. There had been little attempt to explain to local residents what the main contours of development were and what it was seeking to achieve. The research found that locals had many fears about the development – some of which were corroborated by the research interviews, others of which were not. There was little awareness of how decisions had been made, who was making them, and what influence local action could have. For example, in Ordsall many respondents feared that the process of development encroachment would lead to the longer term destruction of their communities and their forcible exclusion. Little effort had been made to address this fear, a process that in itself reinforced the perception.

Engagement with Scientists and Development Experts: The links between these experts and local communities however, were very weakly developed. Scientists were employed for a particular purpose and they carried out their task efficiently and without much recourse to wider concerns or issues about what should be done in the area.

The Politics of Redevelopment: whatever the wider concern with building sustainable places, the politics of redevelopment in sites such as SQ always required decisions to be made over who benefits from development, at what stage in the process, and with what socio-economic impacts. Consequently, the research indicated that the politics of time should be enhanced and made more explicit i.e. debates concerning the phasing of development and when different groups can expect to experience the benefits of a redevelopment. The idea of a win-win development that characterised much of the hyperbole surrounding SQ exemplifies how this process may take place in practice.

CONCLUSIONS

The discourse of sustainability brings the promise of new, more open and accountable relationships between experts and lay communities. It is premised on a 'breaking open' of decision-making making them more inclusive and effective. However, our research has found that at present these relationships are characterised by widespread mis-understandings and differences of opinion. In SQ there have been few mechanisms established to assist in the process. What is required is a greater emphasis on politics and engagement, with all participants aware of the role that their knowledge plays in the development process and what the implications of their decisions are.

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SUBR:IM SUSTAINABLE URBAN BROWNFIELD REGENERATION: INTEGRATED MANAGEMENT

Sustainable Brownfield Regeneration: Redrawing the Boundaries of Expertise

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Geography, King's College London
&
Steven Henderson
Geography, University of Reading

Introduction

- The 'sustainable expert'
- Expert-lay relationships in brownfield regeneration
- The power of experts
- The new sustainability agendas
- The regeneration of Salford Quays, Greater Manchester

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Experts and Expertise

- Experts have been a central feature of **modernity**
- The growth of 'expert systems'
- The **post-modern** critique of expertise
- The new focus on multiple sources of knowledge
- The rise of sustainability

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What is a Sustainable Community?

- Active, inclusive and safe
- Well governed
- Environmentally sensitive
- Well designed and built
- Well connected
- Thriving and diverse economy
- Well served
- Fair for everyone

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Sustainable Expertise?

- The listening expert
- Community stewardship
- The Egan Review – skills for a sustainable community
- What role for experts?
- Technology, expert-systems and power

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The Regeneration of Salford Quays

- The decline of Salford Docks
- New visions, new developments
- A 'successful', 'sustainable' urban regeneration project
- 200 businesses, 200,000 sq feet office space
- 10,000 jobs

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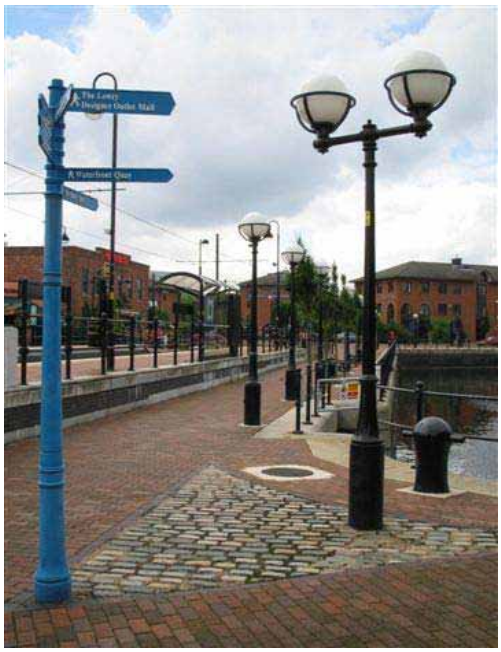

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Expert-lay Relationships in Salford Quays

- Experts:
- Policy-makers and planners
- Developers/investors
- Scientists/technicians
- Other professionals (e.g. the police)

- Lay Communities:
- Existing residents (in Ordsall area)
- New in-migrants (in Salford Quays)

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Expert-lay Relationships in Salford Quays

- Politics of time ie. when different groups can expect their needs to be addressed
- Lack of awareness over development plans
- Project-based scientific work in SQ
- Us and them mentalities

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Expert-lay Relationships in Salford Quays - Conclusions

- Moving forward:

- New focus on explicit politics of development
- Public engagement strategies
- Setting broader development visions and priorities

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Assessing the Sustainability of Redeveloped Sites in Practice: The RAF process

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ABSTRACT

This paper describes the Redevelopment Assessment Framework (RAF) designed to assess and monitor the long term sustainability of brownfield redevelopment projects. It begins by summarising the results of a review of existing sustainability assessment literature and interviews with practitioners and agency representatives, confirming that there are currently no tools directly applicable to Brownfield redevelopment projects, especially not one which evaluates the sustainability of development projects throughout their land use life-cycle. The characteristics of the RAF are then outlined and each stage of the process explained. The framework has been implemented in a pilot case study which is briefly described before the paper evaluates the model's usability and effect based on feedback from pilot study participants. To conclude, the benefits of the RAF are summarised and recommendations are made with regard to its potential for wider application in the future and its ability to change current sustainability measurement practice.

INTRODUCTION

The paper summarises a review of existing theory and practice in the use of sustainability indicators for brownfield regeneration, highlighting the shortcomings of existing tools and pointing to areas where new approaches are needed. Based on this, the paper outlines the features of the new Redevelopment Assessment Framework (RAF), followed by a description of a pilot case where the RAF was implemented. The final section of the paper provides a brief overview of how participants of that pilot case evaluated the RAF process in practice and concludes by considering the future potential of the RAF and the actions necessary for its nationwide adoption.

BACKGROUND: THE LIMITATIONS OF EXISTING SUSTAINABILITY ASSESSMENT TOOLS

A review of current theory and practice regarding the use of sustainability indicators was carried out, which involved both a review of existing literature and interviews with relevant stakeholders (e.g. developers, LA officers, consultants, indicator tool developers) involved in, and thus experienced with, the brownfield regeneration process. The theoretical review concluded that despite the plethora of existing sustainability assessment and monitoring tools, there are none directly applicable to brownfield redevelopment projects, and in particular there is a lack of indicators to assess the sustainability of reclamation processes. In addition there are no tools capable of assessing the sustainability of a redevelopment project throughout its life-cycle (meaning from its conception and design to construction and its operation) (Pediaditi et al. 2005). Most tools that do exist focus on building performance and environmental issues either during construction or in the future land use and thus fail to consider the site holistically across its life-cycle and to evaluate the wider implications and socio-economic effects of a development. Risk communication and participation in decision making is paramount with regard to the acceptability and sustainability of brownfield redevelopment projects (Pediaditi et al. 2005a). Additionally, existing sustainability tools tend to have top down pre-determined indicators which result in limited ownership by users and fail to involve the public who will be affected by the development proposals.

Interviews with stakeholders as well as a survey of 987 developers[1] revealed low levels of use (and knowledge) of existing sustainability indicator tools. Main reasons for this were lack of time, resources and expertise. Interviewees also noted the general lack of a structured process to carry out sustainability assessments, even when making development control and planning application decisions. All interviewees identified the general problems of communication between, and even within, the development industry and the public sector, and described how lack of communication often leads to extended project expenditure as well as delays. Many commented on the lack of integration of indicator tools with the planning and development process. Developers interviewed

[1] The survey had a 9.5% response rate and was conducted in conjunction with Reading University.

were not opposed to sustainability assessment and monitoring in principle, and many welcomed the idea on the basis that it would provide a structured level playing field for the assessment of planning applications. Additionally, LA officers pointed out that their powers to require or undertake such assessments would be limited and sporadic without their integration into existing planning processes.

The review therefore concluded with (a) the need for an effective and practical sustainability assessment framework for brownfield regeneration projects and (b) that such a framework should have these broad functions or design features: A simple, structured, not resource intensive, process is needed which is integrated within existing planning and development processes. It must perform its function, namely to assess and monitor the sustainability of redevelopment projects throughout their life-cycle, thus considering environmental, social and economic factors. The framework must be flexible and allow contextualisation and a participatory approach is needed both to increase communication between stakeholders and to ensure that public perceptions of risk are taken into account. Not much, then.

THE REDEVELOPMENT ASSESSMENT FRAMEWORK (RAF)[2]

The overall aim of the RAF is to inform stakeholders about the sustainability performance of a site across its life-cycle in a way that it is practical and integrated with existing Brownfield Redevelopment Project (BRP) processes. The RAF is a process to facilitate the development of site-specific sustainability indicators in a participatory manner and thus to involve all significant stakeholders in the BRP process. It is directed mainly at large or complex developments, which would require an Environmental Impact Assessment (EIA) or a Statement of Community Involvement and should be started as early on as possible in the design phase of a development. Starting the RAF at the pre-application phase of a development is vital as at this point in the development's life-cycle decisions are made which will affect future sustainability. However, a balance needs to be struck between starting the RAF early and having sufficient clarity and certainty about what the future site and its land use should look like.

Furthermore, in order to ensure long term monitoring is carried out the RAF makes use of S106 agreements and therefore these need to be included in the planning application. As illustrated in Figure 1, the RAF consists of a simple procedure divided into 6 Phases, through which site-specific indicators can be developed and requires the total of 2 half days of participants' time.

Figure 1 shows the first three Phases covering the preparatory stages, to be undertaken by the lead partner, in most cases the developer or hired consultant, and include information gathering and team building to enable the subsequent RAF process. In Phase 1 the lead partner is required to identify all relevant stakeholders involved in the BRP and makes an informed decision based on the significance of each stakeholder to the BRP process as to who to involve in developing the sustainability indicators. There are no definite rules for stakeholder selection[3], some sites require a more complex, diverse or politically sensitive composition than others. However, 12-14 individuals may work best in terms of group dynamics as it permits wider and deeper exploration in the later Phases, but smaller or larger numbers are possible, as appropriate. While some degree of subjectivity is inevitably involved in this identification process, the use of a systematic checklist and a specified agreement protocol for all relevant stakeholders aims to minimise this (See Pediaditi et al. 2006).

To further mitigate against bias, a community survey and possibly wider community consultation is proposed in Phase 2, questioning residents and businesses neighbouring the site about their concerns and aspirations with regard to the proposed development. This information is then used in Phase 4 of the RAF. Such surveys are feasible, as pre application consultation is now required for many developments through the Planning and Compulsory Purchase Act (2004) and the survey can form part of that, thus not resulting in unreasonable expenditure or organisation.

In Phase 2, again the lead partner gathers project and site specific information which is then presented in non-technical form to all relevant stakeholders together with the survey results (i.e. usually mailed out to the identified stakeholders). This enables informed decisions about the impacts of the BRP to be made later in Phase 4, which may be supplemented by context specific information provided by other stakeholders.

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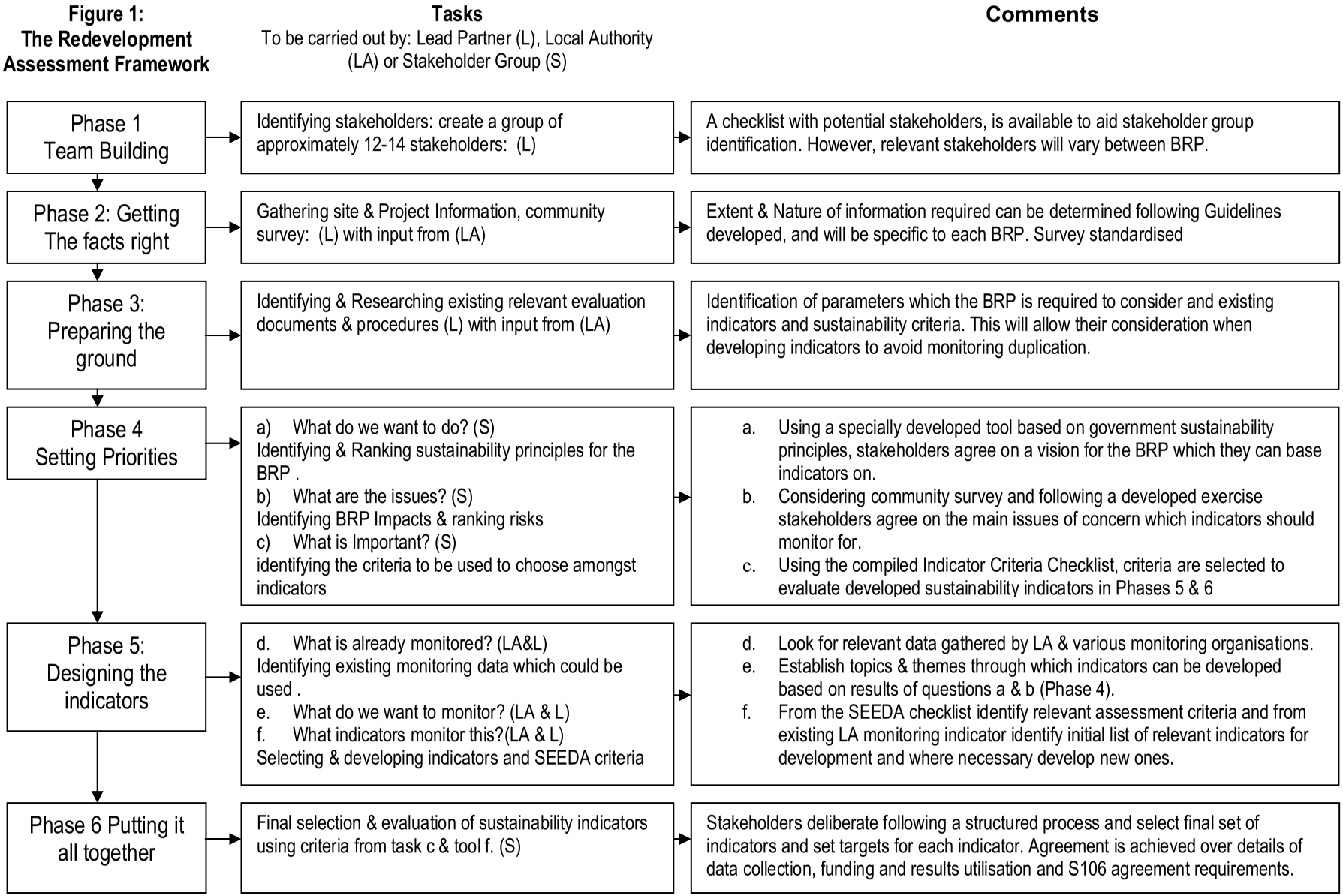
[2] For a more detailed discussion, see also Pediaditi et al (2005)

[3] The stakeholders are representatives, or decision makers actively involved in the BRP, which however, could be argued to limit community involvement.

Figure 1: The Redevelopment Assessment Framework



Many evaluation procedures, frameworks and guidelines exist, which are relevant to a BRP especially in the planning phase of a project. Strategic Environmental Assessment (SEA), Local Development Framework indicators, Community Strategy indicators, LA sustainability checklists, and funders' sustainability criteria are of particular relevance. It is suggested, as a general principle, to prefer using these thus minimising duplication of data collection and reporting. Therefore, in Phase 3, the lead partner needs to consider all existing indicators so that they are either included or the topic they measure is addressed in the RAF. This integrates compulsory or statutory reporting with reporting on issues which may or may not have been ratified using greater community consultation, for example Local Authority sustainability checklists. This also ensures that the chosen indicators in most cases have baselines to enable comparisons of the development's performance. Utilising SEA and community strategy indicators delivers relevance and information feedback to planning policy, a key aspect of the above RAF "design brief".

Phase 4 named 'setting priorities', consists of three separate tasks which can be undertaken in a half-day workshop, and requires the involvement of all stakeholders identified in Phase 1, as well as the consideration of the community survey results. Firstly, stakeholders create their vision of sustainability specific to the site and the affected locality. This involves identifying and prioritising a number of sustainability principles which will guide the subsequent indicator selection in Phases 5 and 6. Secondly, stakeholders need to identify and prioritise the main positive and negative impacts they perceive as a result of the development as a way of integrating risk perceptions into the decision making as well as enabling the development of site specific indicators. Finally, given the absence of a consensus of what makes an ideal indicator (Pinfield, 1996), a collective decision-making process over the criteria which should be used to select the indicators is required, which essentially reflects a consensus on their long-term function (Ukaga, 2001). To support this Phase, an 'Indicator Criteria Checklist' has been developed which stakeholders can use. In this task, decisions are also required on who would fund the monitoring, who would carry it out and how (widely) to publish the results.

Having identified the thematic topics and impact areas for which indicators need to be developed in Phase 4, Phase 5 requires the lead partner and relevant LA representatives (for example policy or development control), to select an initial set of sustainability assessment criteria, preferably from the SEEDA[4] development sustainability checklist as well as from the existing long term indicators identified in Phase 3. The revised SEEDA sustainability checklist is utilised following the review of existing indicator tools, as it is the only one which makes reference to planning policy and which addresses social as well as environmental and economic issues and provides performance benchmarks. Furthermore, it is likely that the SEEDA checklist will be amended and launched throughout the regions and potentially included within regional policy, which would result in its wider UK adoption and planning relevance. As a result of Phase 5 a list of relevant SEEDA sustainability assessment criteria as well as long term monitoring indicators and benchmarks is compiled, to be sent to all participants for consultation.

Phase 6 consists of, at minimum, a second half-day workshop where all stakeholders reconvene to review the identified indicators, to provide the opportunity to make changes and to propose others. The flexibility this workshop provides to the overall indicator selection process helps to promote ownership of the results that may be specific to the context of the specific development. Finally, having assured consensus and adopted a small number of project- and site-specific indicators, and assessment criteria, targets are set with regard to each individual agreed indicator. The agreed indicators, where appropriate, can be introduced in the relevant monitoring sections of the EIA statement. Either way, S106 agreements should be agreed to ensure the RAF and its long-term monitoring will be carried out.

EVALUATING THE RAF AND ITS FUTURE

The RAF process was piloted with the aid of a trained facilitator in a large mixed brownfield redevelopment in the Greater Manchester area consisting of about 520 residential units, a school and some employment units. The site is contaminated as it housed a Paper Mill and it is close to a landfill site under restoration.

The pilot included all 6 Phases and resulted in a S106 agreement enshrining future sustainability monitoring according to the process as agreed. The developer agreed to fund the monitoring but the LA had to identify the consultant to carry out the monitoring and to review the results. As it was

[4] See http://www.sustainability-checklist.co.uk for description of the checklist.

a pilot, questionnaires and interviews were conducted with all participants to allow documentation of the experience and lessons that can be learnt from it.

Overall, participants were very positive about the RAF with the Local Authority stating that they would apply the process for future major applications. The main perceived benefit was the increased communication and collaboration fostered by the process as the RAF allowed an exploration of the development issues in a structured way. This also incorporated community views sourced by the community survey, which, surprisingly, was seen as a major advantage and not, as feared, a significant obstacle as it requires initial additional work. Importantly, LA officers confirmed that the RAF would be compatible with the planning process and the developer and planning consultant considered it a very useful tool for EIA.

Having a facilitator to coordinate the workshops was found to be particularly useful and participants appreciated the use of the SEEDA benchmarks, stating that it was good not to have to reinvent the wheel while introducing flexibility to introduce where needed. This was especially the case regarding the contamination indicators and criteria which were devised specifically for the site based on the site investigation and risk assessment results. In addition, this also embeds the RAF into the decision-making framework: It was found that utilising the SEA and community strategy indicators ensures relevance and information feedback to planning policy, something which currently does not exist and which LA participants found particularly helpful. All stakeholders appreciated having feedback on the development. In particular the policy officer felt that due to the compatibility of developed indicators to existing LA indicators, the results could feed into future policy. All participants stated that the time and resources allocated were reasonable and well spent and that the start of the RAF early in the development decision-making process was appropriate.

All participants thought that it would be useful to see wide adoption of the RAF. They pointed out, however, that the process could only realistically be applied to large scale developments due to the time and resource implications involved. Furthermore, both planning consultants and LA officers stated that in order for the RAF to be widely adopted it would have to be stipulated through government guidance or policy. It was also noted that in developments without public-private venture dimensions there might be little incentive for developers to carry out such a process. Furthermore, the LA participants stated that the RAF would have to be required by all LAs otherwise it could potentially be classified as unreasonable, should the case go to appeal. In addition, even though it worked on this occasion, it is recognised that 2 half-day workshops are not a long time, and that for more complex developments, longer workshops are likely to be beneficial.

To conclude, the RAF is a process which has been designed to enable the functional and relevant use of existing indicators to assess the sustainability of redevelopment projects. Through its application it was proven to be a success, with best practice and planning relevance being designed into the process. Participants identified a number of benefits of the RAF highlighting the greater communication and understanding of the different sustainability issues it provided, and supported wider application of the process. However, it is recognised that despite the compatibility of the RAF to existing BRP and planning processes, it could not work on a voluntary basis. In conclusion, there is a need for, and opportunity to, adopt the RAF through government guidance which would subsequently feed into regional and local planning policies, ensuring its wider adoption.

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Assessing the sustainability of redevelopment projects in practice: the **RAF**

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WPD: METRICS, 29/03/06
2nd SUBR:IM Conference, London

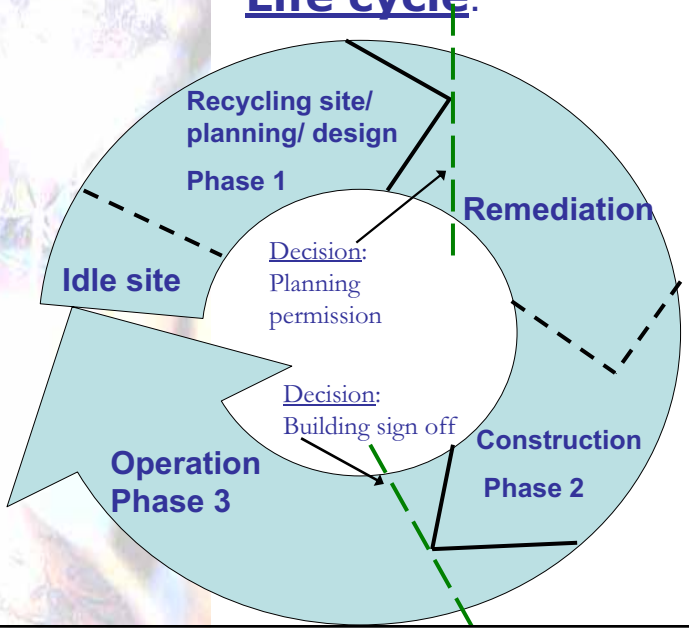
Research Rationale

Growing government pressure for Brownfield redevelopment.

- It is a core government objective to achieve sustainable communities
- It is considered as inherently sustainable
- Many redevelopments are unsustainable

There is a need to monitor the long term sustainability of Brownfield Redevelopment Projects (BRP).

Brownfield Redevelopment Project Life cycle.



What Have we Done and How?

RAF Development Phase

- **Literature Review on**: Risk, Brownfield redevelopment Planning & Regulation processes Sustainability Indicators, Participation
- **BRP Stakeholder Interviews (41 in total)**
- **Developer (10 interviews & Survey of 897 developers)**

RAF Application Phase

Case Study: redevelopment of contaminated site into mixed used including a new school.

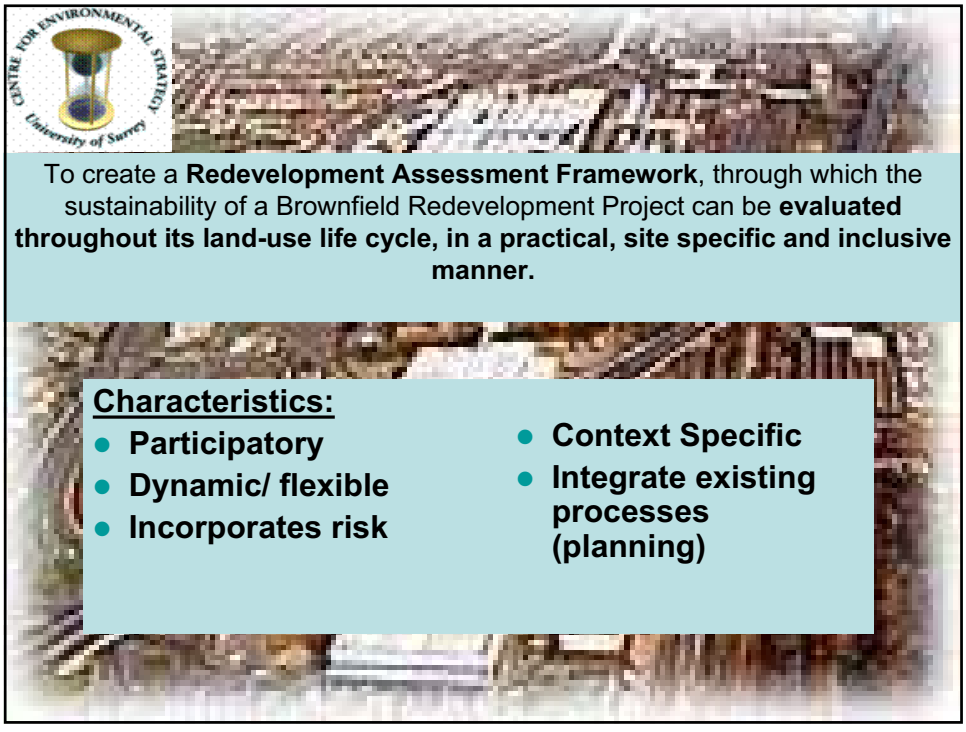
Real life RAF application: Community Surveys, Trial RAF meetings & Workshops, Non-Participant Observation

RAF Refinement & Finalisation Phase

- Evaluation Questionnaires
- Evaluation Interviews.

Barriers to Sustainability Monitoring

Barriers to adoption	Procedural limitations	Tool limitations
•Lack of understanding of sustainability •Lack of market demand •Lack of enforcement/ resources & skills •Too many tools resulting in lack of confidence in them •Build & Forget development culture	•Lack of time •Lack of a structured process to follow •Lack of communication •Lack of ownership of the assessment process •Lack of integration of existing tools with planning processes eg planning application process, EIA, SEA, SA	•Scope of assessments limited to building performance •Scope of assessments mostly covering environmental issues •Lack of context specific assessments •Lack of measurable benchmarks •Output approach to monitoring



To create a **Redevelopment Assessment Framework**, through which the sustainability of a Brownfield Redevelopment Project can be **evaluated throughout its land-use life cycle, in a practical, site specific and inclusive manner.**

Characteristics:

- **Participatory**
- **Dynamic/ flexible**
- **Incorporates risk**
- **Context Specific**
- **Integrate existing processes (planning)**

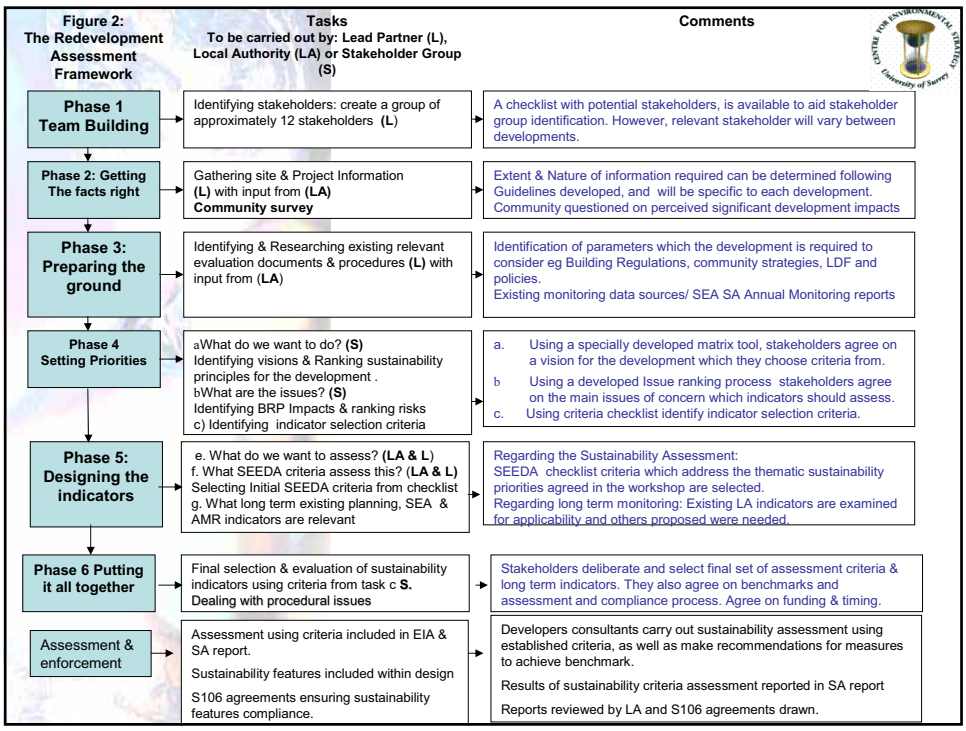


Figure 2: The Redevelopment Assessment Framework	Tasks To be carried out by: Lead Partner (L), Local Authority (LA) or Stakeholder Group (S)	Comments
Phase 1 Team Building	Identifying stakeholders: create a group of approximately 12 stakeholders **(L)**	A checklist with potential stakeholders, is available to aid stakeholder group identification. However, relevant stakeholder will vary between developments.
Phase 2: Getting The facts right	Gathering site & Project Information **(L)** with input from **(LA)** **Community survey**	Extent & Nature of information required can be determined following Guidelines developed, and will be specific to each development. Community questioned on perceived significant development impacts
Phase 3: Preparing the ground	Identifying & Researching existing relevant evaluation documents & procedures **(L)** with input from **(LA)**	Identification of parameters which the development is required to consider eg Building Regulations, community strategies, LDF and policies. Existing monitoring data sources/ SEA SA Annual Monitoring reports
Phase 4 Setting Priorities	a What do we want to do? **(S)** Identifying visions & Ranking sustainability principles for the development . b What are the issues? **(S)** Identifying BRP Impacts & ranking risks c) Identifying indicator selection criteria	a. Using a specially developed matrix tool, stakeholders agree on a vision for the development which they choose criteria from. b Using a developed Issue ranking process stakeholders agree on the main issues of concern which indicators should assess. c. Using criteria checklist identify indicator selection criteria.
Phase 5: Designing the indicators	e. What do we want to assess? **(LA & L)** f. What SEEDA criteria assess this? **(LA & L)** Selecting Initial SEEDA criteria from checklist g. What long term existing planning, SEA & AMR indicators are relevant	Regarding the Sustainability Assessment: SEEDA checklist criteria which address the thematic sustainability priorities agreed in the workshop are selected. Regarding long term monitoring: Existing LA indicators are examined for applicability and others proposed were needed.
Phase 6 Putting it all together	Final selection & evaluation of sustainability indicators using criteria from task c **S.** Dealing with procedural issues	Stakeholders deliberate and select final set of assessment criteria & long term indicators. They also agree on benchmarks and assessment and compliance process. Agree on funding & timing.
Assessment & enforcement	Assessment using criteria included in EIA & SA report. Sustainability features included within design S106 agreements ensuring sustainability features compliance.	Developers consultants carry out sustainability assessment using established criteria, as well as make recommendations for measures to achieve benchmark. Results of sustainability criteria assessment reported in SA report Reports reviewed by LA and S106 agreements drawn.

Going through each phase..

- **Phase 1: Team Building**
  - 12-15 participants (selected by developer and DC officer using stakeholder checklist) ratified by group.
  - Participants, statutory or non statutory consultees (essentially project decision makers).
  - Public representation limited to councillors & area board representatives.

Phase 2: Getting the facts right

- **Task 1: Site & Development information.**
  - Lead partner collects information on the site and development using EIS review checklist.
  - Non- technical summary provided to all participants.
- **Task 2: Community Consultation**
  - Community Survey (obligatory).
  - Additional Community workshops (recommended).
  - This is in line with new Statement of Community Involvement requirements (Planning & Compulsory Purchase Act, 2004).
  - Results summarised in report to participants for consideration.

Phase 3: Preparing the Ground

- Background research into existing indicators and available baseline data. **Creating *a one stop shop* to monitoring**
  - Best Value Performance indicators
  - Community Strategy indicators
  - LDF, Area Action Plan SEA SA and annual monitoring report indicators
  - LA Sustainability checklists
  - Funders monitoring requirements
  - EIA and Sustainability Assessment post monitoring requirements.
  - Other impact assessment requirements eg TIA green

Phase 4: Setting Priorities

- **Half day workshop in 3 sessions with all stakeholders.**
- **Task 1: Developing a sustainability vision for the project. Identify main concerns, benefits.**
- **Task 2: ranking sustainability principles for the area.**
- **Task 3: Identifying criteria for indicator selection using checklist.**
  - **Discussion of management parameters (finance, public access, time scales)**

Phase 5: Designing the indicators

- **Selecting relevant SEEDA checklist criteria** for sustainability assessment of development proposals.
  - Planning relevant benchmarks.
  - Cover social environmental & economic aspects.
  - Consider the development as a whole not only building.
- Identifying and **developing relevant long term indicators** to assess the sustainability of the development during its construction and operation period.
  - List of existing indicators provided for consideration from Phase 3.
  - Some issues of scale and consistency.
- **Case study use:** SEA, SA indicators and baselines and EIA post monitoring requirements.

Phase 6: Putting it all together

- Final Half day workshop (all participants).
- Task 1 Select relevant SEEDA sustainability checklist criteria and agree performance benchmarks.
- Task 2 Design and select long term monitoring indicators and agree benchmarks and baselines.
- Task 3 Logistics, agreeing on:
  - Who pays for monitoring?
  - How will the results be used?
  - Who is going to coordinate the long term monitoring?
  - Public access to results.

What happens next? Assessment and enforcement

- SEEDA selected criteria utilised as part of a **development sustainability assessment** handed in with application or as part of **EIA**.
- Requirements to meet SEEDA benchmarks **included within design statement**, or where relevant identified for inclusion in detailed application.
- Long term monitoring indicators collated if relevant with EIA post monitoring requirements and **S106 agreement created to ensure monitoring is carried out.**

Evaluating the RAF process: results from the case study.

- **Evaluation Methods:**
  - Evaluation Questionnaires after Phase 4 & 6.
  - Non- participant observers attending workshops.
  - Evaluation interviews post RAF completion (15 interviews).

Evaluation results:

Participants were overall very satisfied with the process and felt it had met its objectives. **The participating LA will be using this process for future large applications**.

Commented positively on the **holistic and context specific** nature of selected indicators.

The participatory nature was identified as the main strength with participants stating how the RAF helped **increase understanding and communication** between participants and the sustainability of the development.

Participants valued the way the **RAF process** and the survey 'forced them' to take into **consideration community views**.

Participants emphasised the benefits of having a structured process to decision making.

Evaluation of practical applicability of RAF.

- **Time and timing.**
  - All participants felt time allocated to undertake was reasonable and well spent. Some proposed longer or more workshops.
  - Participants felt the RAF should be done as early as possible in the pre application phase.
  - Participants commented that the RAF has the ability to speed up the planning process itself!
- **Cost.**
  - Estimated at £10.000 if carried out by consultancy.
  - The paying developer did not find the costs unreasonable. **Most RAF requirements used also for other application requirements.**

Compatibility and integration with existing planning processes.

Participants stated that the RAF is:

- A structured process to aid development application decision making.
- A useful tool for developments requiring EIA but should not be limited to these.
- A **useful & transparent** process to integrate *Statements of Community Involvement* into development decision making.
- Compatible to changes in planning and in particular regarding added monitoring requirements.

What lays in store..
The future of the RAF

All participants recommended:

- The RAF should be applied to all large development projects.
  - The need to define large.
- The RAF should be stipulated by government guidance or policy for it to be widely adopted.
- The RAF is compatible to the planning process so there is no reason why it couldn't be proposed by government!

Conclusion...

This research has identified a need, designed a solution, as well as proposed external measures which need to be undertaken to ensure future adoption. The RAF is a product ready for launch, its now up to government and the powers that be..

Thank You!

UniS University of Surrey Guildford

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Charcoal as a Potential Tool for Land and Water Remediation

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INTRODUCTION

Modern estimates suggest that there are an estimated 200,000 – 300,000 ha contaminated land in the UK (Environment Agency), and an estimated 1,400,000 sites in Western Europe that are classed as potentially contaminated (Prokop *et al*., 2000). The UK Government is dedicated to bringing contaminated and brownfield sites back into beneficial use through sustainable development. This is reflected in its policy for developing new housing and business premises with 60 % of new housing to be built on previously developed land by 2008.

Under modern legislation, especially the Environmental Protection Act 1990, contaminated land requires treatment before re-use, in order to break pollution-receptor pathways. Increasingly, it is necessary to consider *in situ* treatment because other legislation, notably the EU Landfill Directive, means that removal of contaminated materials to landfill will only be possible where there is no other practical alternative. Various treatment techniques have been proposed, often involving complex chemical engineering or bioremediation technologies. Such techniques are often energy consuming, and although some have been shown to be successful in meeting clean-up objectives, it is debatable whether these methods are truly sustainable in life cycle analysis terms.

POTENTIAL OF CHARCOAL AS A MEANS TO REMEDIATE CONTAMINATED SOIL

Charcoal has a number of properties that make it a potentially excellent material to be used for the remediation of contaminated soils. These include its ability to:

- adsorb and therefore immobilise a wide range of toxins including heavy metals and hydrocarbons
- improve soil quality, thus enhancing natural attenuation of organic pollutants
- become colonised by a large community of microbes, thus providing a carrier for hydrocarbon degrading microbial communities

Adsorption of pollutants onto charcoal

Besides the fact that charcoal is extremely inert and therefore survives in the environment for thousands of years, it is well known for its ability to adsorb a wide variety of environmental pollutants. The amazing detoxifying power of ordinary charcoal was demonstrated by the pharmacist P.F. Touery in 1831, who demonstrated in front of the French Academy of Medicine, that the intake of 15 grams of strychnine (ten times the lethal dose) and the same amount of ordinary charcoal did not produce any ill effects. In fact charcoal has been shown to be able to adsorb a very wide range of both organic as well as inorganic substances including arsenic, cyanide, malation, parathion, nicotine, phenols, and a wide range of heavy metals. Especially substances that contain aromatic ring structures seem to be adsorbed especially well. Early in the 20th century it was discovered that the adsorbing power of some types of charcoal could be dramatically increased by treating the charcoal with oxidising agents, hot steam and/or high temperatures. This is termed 'activation' and the resulting product is called activated charcoal. Activated charcoal can only be produced from a few selected materials including coconut shells and bone. Activated charcoal viewed with an electron microscope appears to be amorphous and has no obvious macrostructure. Also the activation process of charcoal is relatively expensive. This means that activated charcoal is too expensive to be used on a large scale for land remediation. Nevertheless, the physical adsorbing properties of activated charcoal have been exploited in many applications, including in medicine as detoxification agents and anti-bloating agents, in water filters to remove organic pollutants and toxicants, in air filters to remove odours, and in soil to negate pesticide toxicity. In fact, activated charcoal has superseded the use of ordinary charcoal to the extent that there are not many recent references on the use of ordinary charcoal as an adsorbing agent. The little information that exists, suggests that charcoal produced from hard-woods (deciduous trees) is more adsorbent than charcoal produced from soft woods (Conifers, pine, etc) (Tryon, 1948).

In the first instance we wanted to investigate if readily available wood types that are produced using short rotation coppice, such as sweet chestnut and poplar had potential as an adsorbent for heavy metals. We found that charcoal produced from such wood types was an effective adsorbent of a range of heavy metals, including copper, zinc, lead and cadmium. For example, addition of sweet chestnut charcoal powder into a solution containing 250 ppm $CuS0_4$ resulted in a concentration of around 10,000 ppm Cu in the charcoal (ca 1% of the charcoal weight). Whereas the exact mechanisms of (metal) adsorption onto charcoal surfaces are poorly understood, it is thought that adsorption is governed by a combination of entrapment of molecules in the fine pore structure of the charcoal itself and/or electrostatic forces between negatively charged carboxyl and phosphate groups on the charcoal surface and the metal ions that enter a charcoal particle. Physical adsorption could be enhanced by 100% by charring at higher temperatures, which is likely to have resulted in more micro-pores becoming available for adsorptions. In the case of ordinary wood charcoal chemical adsorption onto negatively charged carboxyl groups seems to be the main mechanism by which metals are adsorbed. We found for wood charcoal that was charred at relatively low temperatures (400^{o}C) that the adsorption was reversible and that acidification to a pH of between 3 and 4 resulted in the release of most of the adsorbed metal ions. Interestingly, we found that activated charcoal with a reputed surface area of up to 1000 m^2 did adsorb only half the amount of metal ions compared to ordinary charcoal produced from either sweet chestnut or popular wood. However, it appears that the selection of the right source materials is crucial to obtain good results; we found that charcoals derived from young stems and branches were superior in their ability to adsorb heavy metals compared to charcoals produced from mature trunk wood. The exact reason why this is so, is not yet clear, but the fact is potentially advantageous in that branches and hedge clippings are currently regarded as invaluable harvest by-products that are chipped and either used as mulch or simply left to rot. Conversion of this cheap source material into charcoal could lead to viable remediation products that can be used as a soil amendment to reduce leaching of water soluble contaminants into surface and ground water. Because charcoal is inert, the bound pollutants are unlikely to be released as a result of the degradation of the charcoal itself, thus providing an effective break of the link between pollution and potential receptors.

The potential of charcoal as a remediation tool is further enhanced by the fact that it adsorbs organic pollutants even stronger than metals. Many organic chemicals of environmental concern are hydrophobic in nature. At most contaminated land sites it is the non-polar species such as chlorinated hydrocarbons, trichlorethylene (TCE), and benzenes, which account for much of the risk to health. Recalcitrant organic compounds bind tightly to the naturally occurring organic matter in soils and aquifers. The addition of carbon through charcoal application is likely to bind such compounds in an almost irreversible form. This means that charcoal has the potential to mop up all available toxicants that are present in soils that are contaminated with a mixture of pollutants.

Potential of charcoal to improve soil conditions

The native Indians of the Amazon basin have used charcoal to improve soil fertility for thousands of years. Soils treated in the distant past with charcoal are known as 'Terra Preta' soils; black earth-like anthropogenic soils with enhanced fertility due to high levels of soil organic matter (SOM) and nutrients such as N, P and Ca (Glaser *et al*., 2000, 2001, 2002). These soils are often more than 2000 years old and are still used by local farmers to produce high yielding crops. The mechanisms by which Terra Preta soils sustain high yielding crops have only recently gained attention.

It is thought that the main reason that explains the high fertility of these otherwise poor soils is due to the addition of charcoal in the past. This hypothesis has been substantiated during experiments where addition of charcoal to a variety of soil types resulted in significant yield increases for a variety of crops in a variety of soil types, but especially highly oxidised ferosols (Reviewed by Glaser *et al*., 2002). Charcoal properties that could explain these effects on soil fertility include:

- Raising of the soil pH by up to 1.2 units which leads to a decrease in aluminium toxicity in acid soils (Sanchez *et al*., 1983)
- Sorption of cations and anions (up to 88 cmol/kg), increasing the soil's cation exchange capacity (CEC) - especially in soils that have low clay percentages and contain little humus (Mbagwu and Piccolo, 1997)
- Formation of organo-mineral complexes (Ma *et al*., 1979)

- The large surface area of charcoal and its fine pore structure might also explain the increased water retention of charcoal amended soils, leading to decreased mineral leaching (Kishimoto and Sugiura, 1985).

Slow oxidation on the edges of the aromatic backbone of charcoal resulting in the formation of carboxylic groups are thought to further enhance the potential of charcoal to form organo-mineral complexes and thus sustain high CEC values (Glaser *et al*., 2001).

Unlike fresh organic matter, charcoal is extremely stable as it resists degradation by microorganisms. As a result charcoal can persist in soil for thousands of years (Evans and O'Connor, 1999). Because the charcoal itself is more or less biologically inert, it could be argued that the physical adsorption of pollutants is limited; once the available binding sites are used up, further adsorption of pollutants will stop. However, charcoal particles will also provide surfaces that can be colonised by bacteria. These bacteria are likely to degrade organic pollutants that are adsorbed onto the charcoal. This means that each charcoal particle will act as a mini-bioreactor in which pollutants are continuously adsorbed and degraded. This would mean that the beneficial properties brought about by charcoal additions are almost permanent. That biological processes associated with charcoal are important is illustrated by the fact that in Brazil, local farmers mine Terra Preta soils, and as long as 20% of the soil is left the soil will regenerate. Whereas the mechanisms responsible for this phenomenon are poorly understood, it points to a range of soil forming biological processes that are mediated by Terra Preta soils in general and by charcoal in particular. Because microbial activity is ultimately responsible for the oxidation of degradable Persistent Organic Pollutants (POPs), it is not unreasonable to predict that charcoal additions to soil will lead to enhanced natural attenuation of organic pollutants at contaminated sites.

Charcoal as a potential bioreactor

Wood charcoal consists of a large number of parallel tubes with a diameter of between 5 and 10 µm, giving an internal surface area of between 4 and 10 m^2/g charcoal. These tubes are interconnected by finer pores giving rise to an interconnecting structure of continuous pores. This large internal area can be colonised by bacteria. Using *Pseudomonas fluorescens* as a model bacterium, we found that sweet chestnut charcoal with an estimated internal surface area of 4 m^2/g charcoal could be colonised by up to 5 x10^9 bacteria per g charcoal. This number only occupies a small percentage (ca 1%) of the colonisable charcoal surface indicating that the total numbers of bacteria per g charcoal could be many times higher. Because there is considerable physical protection within the charcoal, we found that the bacteria that colonised the charcoal were well protected from external stressors such as desiccation, opening up the possibility to use pre-colonised charcoal as a biological remediation product. The fact that ordinary wood charcoal can adsorb large amounts of potentially toxic substances, such as heavy metals, also means that bacteria that grow within a charcoal particle will be protected from metal toxicity, assuming that adsorbed metals become non-bioavailable once adsorbed. Furthermore because the microbial community in the charcoal is present as an established biofilm, biological stress due to competition from indigenous microbes is limited. Furthermore because the pores within the charcoal are too small for protozoan entry, microbes that colonise the internal surfaces of the charcoal are protected from predation, thus ensuring that the microbes will survive into a contaminated environment.

Combining microbial degradation of pollutants with the ability of charcoal to draw in pollutants, creates an *in situ* bioreactor that has proven so far to be effective for the degradation of diesel and PAHs such as phenanthrene and pyrene. In fact using colonised charcoal particles we found that degradation of diesel spills could be enhanced more than 10 fold. The colonisation of charcoal particles can be manipulated to a large extent. Thus a specific community of hydrocarbon degraders can be created within the charcoal particle that suits the specific requirements of an particular contaminated site. We found that the size of the microbial community that can be created onto charcoal was many thousands of times greater than the community of hydrocarbon degraders present in natural soil. Biologically enhanced charcoal can be applied to soil as well as aquatic systems and because the community of microbes within the charcoal can be adapted to degrade any (combination) of degradable hydrocarbons its potential to be applied to contaminated land is considerable. Because the technology relies on the macro-pore structure present in charcoal, cheap charcoals produced from hard woods seem to be ideal, making the technology potentially extremely competitive.

CONCLUSIONS

Charcoal has potentially the following strengths over competing soil and water treatment technologies:

- Charcoal can deal with mixtures of organic and inorganic pollutants: it will effectively adsorb any bio-available or liquid phase pollutant whether organic or inorganic, thus breaking pollutant receptor linkages in the short term.
- Biologically enhanced charcoal increases rate of pollutant degradation: Once adsorbed onto the charcoal, degradable pollutants will be degraded by the bacterial community created within the charcoal. Also, addition of charcoal to soil will create conditions in soil that are more conducive for resident hydrocarbon degraders, leading to more effective bioremediation of the site.

Furthermore charcoal provides:

- A low energy, *in situ* and cost effective remediation technology
- An easily understandable and stakeholder acceptable technology
- A non-destructive technology; the charcoal will restore biological activity instead of destroying it, as is the case with thermal desorption for example.
- A carbon positive technology (charcoal is sequestered carbon)
- A truly sustainable solution acting as a 'life belt' for soil and groundwater remediation through continued contaminant stabilisation or degradation.

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