landscape & ecology

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introduction

research question

What are the effects of green spaces on deprived neighbourhoods and how can we design landscape and ecology to benefit them?

research aim

The focus of this paper is to identify and understand if and how landscape and ecology have positive and/or negative impacts on deprived neighbourhoods and how we can design them to generate benefits for deprived communities. To do this, this paper will define what makes a neighbourhood be classed as 'deprived', and then go on to use literature to discover the benefit and drawbacks green spaces can have on them. Using this and analysis of exemplar case studies, a set of design principles for how to design landscape and ecology to benefit deprived neighbourhoods will be formed.

research objectives

1. To define what constitutes a 'deprived neighbourhood'.
2. To undertake a literature review to discover the benefits and drawbacks of green spaces felt by derived neighbourhoods.
3. To form a conceptual framework that uses exemplar case studies to identify the key elements to designing landscape and ecology that benefits deprived neighbourhoods.
4. To use the literature review and case study analysis to form a set of design principles for designing landscape and ecology that generates benefits for deprived neighbourhoods.

defining deprivation

The definition of deprivation is based on 'Peter Townsend's pivotal analysis of poverty and deprivation' (Tower Hamlets, 2015, p. 5) which stated:

> ***'Individuals, families and groups can be said to be in poverty if they lack the resources to obtain the types of diet, participate in the activities and have the living conditions and amenities which are customary, or at least widely encouraged or approved in the societies to which they belong'***

(Townsend, 1979, cited in Tower Hamlets, 2015, p. 5)

However, Townsend also addresses that there is a difference between 'poverty and deprivation', as deprivation is a wider concept (Tower Hamlets, 2015, p. 5). Using this thinking, the Index of Multiple Deprivation (IMD), provides the best measure of deprivation as it combines 37 indicators, with each indicator having a varied influence on the final outcome, as shown in Figure 1. As CABE SPACE (2010, p. 8) notes, it 'combine[s] several indicators, covering a range of economic, social and housing issues, into a single deprivation score'. This gives a clearer picture of the causes of deprivation in a neighbourhood, especially for this research question, which could seek to remedy deprivation through landscape and ecology.

Based on an analysis of Deprivation in Tower Hamlets, a neighbourhood will be classed as deprived if it sits amongst the 20% most deprived neighbourhoods in England, for the purpose of this paper. South Poplar lies within this category.

Figure 1: Influence of 37 indicators on the IMD. (Tower Hamlets, 2015).

literature review

Introduction
There has been much research into the effects of green space, whether that be for urban contexts, related to health, or based on the accessibility. This literature review seeks to join up these research papers to identify inequalities in green space provision, and the benefits and drawbacks attached to them.

Inequalities in the provision of green space
There is a recognised link in the literature between socioeconomic inequalities and the 'unequal distribution of healthy environments' (Jarvis, et al., 2020, p. 2). Research by CABE SPACE (2010, p. 10) found that urban areas with ethnically diverse communities typically have less local green space, which is of poorer quality. They noted that deprived communities 'receive a far worse provision of parks and green spaces than their affluent neighbours', a trend that McIntyre (et al., 2008, cited in CABE SPACE, 2010, p. 10) reiterated in Glasgow discovering that wealthier communities had greater access to green space and recreational facilities compared to poorer communities.

The Urban Parks Forum notes that public parks can help to reduce inequalities in deprived areas and strengthen the sense of community (Tibbatts, 2002, p. 6). However, it is important to consider what green space is provided, as increased accessibility and quality of park space does not necessarily link to nature exposure and recreational spaces, which much of the literature highlights as key to health benefits (Jarvis, et al., 2020, p. 2).

Access and use of green space
The consensus of access and use of green spaces in deprived neighbourhoods between literature is not joined up. Research by Jones (et al., 2009) saw no evidence that access to green space is poorer in deprived neighbourhoods, but instead, there is a perceived lack of access, noting that 'residents from more deprived areas were much more likely to report access as difficult'.

To further this, CABE SPACE (2010, p. 38) found that 'less than 1 per cent of those living in social housing … reported using the green spaces in the housing estate they lived in'. This again ties in with research by Jarvis (et al., 2020) which highlighted that the presence and accessibility of green space do not always link to natural exposure which generates benefits for health.

A detailed report by Friends of the Earth, 2020, analysed how to eliminate green space deprivation in England. By classing neighbourhoods A – E (D and E being the most deprived neighbourhoods) they were able to determine that E-rated areas (9.6million residents) lacked the most green space (de Zylva, et al., 2020, p. 38). Concerning Tower Hamlets, one of the most divergent councils in terms of income, out of 32 neighbourhoods, 30 are class D and E (de Zylva, et al., 2020, p. 41).

Benefits of green space
Much of the literature understands that the 'provision of public parks helps to reduce inequalities, poor health and social exclusion', with Tibbatts (2002, p. 5) even highlighting this benefit for deprived neighbourhoods, which also experience reduced social tensions as a result. Furthermore, Mitchell & Popham (2007, p. 683) discovered this association between green space and health, but learnt the 'level of urbanity and income deprivation' influences the strength of this association, with dense urban, low-income areas, receiving fewer health benefits.

Improvements to air quality is a widely recognised benefit of green space, giving 'respite from air and noise pollution', whilst also 'locally mitigating the urban heat island effect through shade provision and evapotranspirative cooling' (Mears, et al., 2021, p. 2). It is recognised that dense, car-reliant communities typically suffer from poorer air quality, 'heat-related stress and health effects', and so green spaces help to alleviate this (de Zylva, et al., 2020, p. 21).

Alongside physical health benefits, there is also an identified link between green space and better mental and general wellbeing. WHO (2021, cited in CABE SPACE, 2010, p. 8) defines wellbeing as:

> ***'health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity'***,

This is especially important in terms of perception of green space quality and accessibility, as the public is more likely to then visit the green spaces and

natural environments to reap the benefits. Research by CABE SPACE (2010, p. 16) analysed 50 projects to understand how communities use green space. The study found that the green spaces 'improved mental health and opportunity for relaxation', 'improved physical health and motivation' and reduced anti-social behaviour.

A study by Friends of the Earth summarised the key benefits that access to nature can provide, such as 'healthy childhood development', 'reduced health-related costs to society', 'social cohesion', reduced flood risk, 'boosting wild animal and plant species', reduced crime, and boosting overall quality of life (CABE SPACE, 2010, pp. 16 - 17). Tibbatts (2002, p. 5) highlighted that social exclusion is reduced in deprived neighbourhoods, building 'social ties and sense of community' (CABE SPACE, 2010, p. 13). One reason for this, as Montgomery (2015, p. 111 - 113) indicates, is that green spaces provide hubs for social activity and reduce crime. Montgomery's (2015, p. 112) work with the BMW Guggenheim Lab also identified behavioural changes associated with a lack of green space, observing that 'nature deprivation … left people feeling more raw and aggressive'. CABE SPACE (2010, p. 13, 16) builds on this, indicating that the presence of nature lowers crime and agression, from a study in Chicago.

Among these benefits, there is also expanding literature on the economic savings green space can generate for health and wellbeing, and its influence on the NHS.

Drawbacks of green space

Whilst deprived can communities' benefit from green spaces, as identified, manicured grass, fertilised, and over-cared for gardens could cause environmental harm to the local wildlife and biodiversity. A study by Czimczik (cited in Bhanoo, 2010) found that many manicured green spaces emit more carbon dioxide than they absorb due to the use of lawnmowers, fertilisers and pest killers.

Conclusion

This literature review has identified that deprived communities generally have less access to green spaces, and the spaces they do have is often of poorer quality, with a greater sense of lack of safety. However, when presented with appropriate natural environments, these communities strengthen, experience social cohesion, improve physical and mental health, as well as bolstering local biodiversity, improve air quality and contribute to a reduction in the heat stress, which often negatively impacts deprived urban communities.

This review shows that green space should be implemented in deprived neighbourhoods as a way of building social ties, and improving local safety and environmental quality.

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framework

The literature review raised the key issues around accessibility and quality of green spaces for deprived neighbourhoods, as well as the benefits that can be generated from the provision, engagement and exposure with the natural environment.

Using this as a basis, the following framework has been formed to analyse exemplar case studies, which will help to develop a set of design principles for designing landscape and ecology that creates benefits for deprived communities.

case studies

1. Queen Elizabeth Olympic Park, Stratford
2. Rotterdam Sterker Door (Onwards Stronger)
3. Tees Heritage Park

Economic opportunities

Analysis of case studies should aim to discover any economic opportunities associated with landscape and ecology design, such as increased property values.

Accessibility and connectivity

Analysis of case studies should seek to identify how the design has improved accessibility and connectivity to the wider area, particularly connecting deprived communities and/or areas which lack green spaces.

Societal benefits

Analysis of case studies should seek to uncover any social benefits created with the provision of different green spaces, such as improved health.

Enhanced green network and biodiversity

Analysis of case studies should look to learn how the designers have built on existing biodiversity and green/blue networks and the types of green spaces that contribute to this.

Placemaking

Analysis of case studies should identify how the design has created a sense of place that the local community can take ownership of, as well as how the design builds social ties.

*Figure 2: Case Study Framework. *pie slice size not representative of importance.*

Queen Elizabeth Olympic Park, Stratford

summary

- Creation of Europe's largest parkland in 150-years.
- Transformed brownfield/industrial land.
- Flat, accessible surfaces.
- Within walking distance to surrounding communities
- Provides active travel options and is located near public transport.
- Variety of diverse landscapes and uses.
- Design that follows the watercourse and topography, connecting with surrounding green spaces
- Formation of a biodiversity action plan

Figure 3: Location of the Queen Elizabeth Olympic Park within Greater London.

introduction

The Queen Elizabeth Olympic Park, Stratford, is one of the largest urban regeneration projects in the UK, delivering a 560acre park (Europe's largest for 150years), around 10,000 new homes across five new neighbourhoods, world-class sporting venues, and approximately 25,000 jobs over the lifetime of the project. It is set, and has, radically transformed the built and natural environments of East London over the last decade. The Olympics were viewed as a success, partly because of the legacy promised. The set-up of the London Legacy Development Corporation and Olympic Delivery Authority promised a vibrant legacy of growth, homes, community, and sustainability to this deprived part of East London.

The Olympic Park site ranks in the 30% most deprived neighbourhoods. Whilst it is still in this bracket, there has been improvements since 2015 (when data was last available). Since 2015, much of the park has matured, and new developments such as International Quarter London have been opening (DLUHC, 2021).

accessibility and connectivity

Formally brownfield/industrial land the development of the Olympic Park has opened up green space for the local and wider area. Residents of Stratford and Hackney can easily access the parkland and marshes through a series of bridges and underpasses. As the site is a strategic location, there are key road and rail lines that would hinder connectivity, yet the development has ensured that adjacent communities have easy access.

The Park Authority claim that the parkland is 'the most accessible in the UK', with 'good step-free access, hard-standing surfaces, [and] regular seating' (LLDC, 2021). A park mobility service also allows everyone access to the park and experience. The park also features multiple cycle hire stations, offering cycling opportunities and supporting wider connectivity and active travel.

The park has regular signage to aid wayfinding. Iconic venues, such as the Lea Valley Velodrome and Here East are positioned at nodes around the park, support legibility.

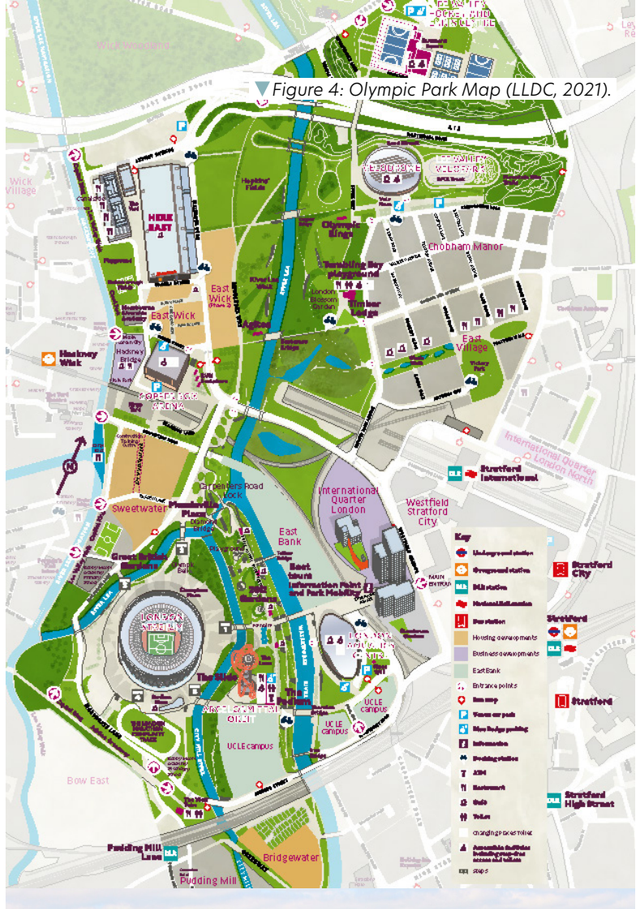


Figure 4: Olympic Park Map (LLDC, 2021).

Figure 5: Velopark (Todisco, 2015).

Figure 6: Accessible pathways (Todisco, 2015).

Figure 7: Variety of plants (Todisco, 2015).

enhanced green network and biodiversity

Around 246ha of land had to be remediated in 3 years from industrial pollution. This significant project converted heavily contaminated soils into one of London's biggest green spaces.

The park provides a variety of biodiverse and recreational green spaces, including:

- London Blossom Garden (33 blossom trees planted to recognise the pandemic, showing that even post-games the parkland is versatile)
- 2012 Gardens (70,000 plants from across the world, showing Earth's climatic zones)
- Great British Gardens (showcasing plants from the British landscape)
- Park Meadows (a biodiverse space of wildflowers along the river)
- Wetlands (which protects over 5,000 homes from flooding, features 300,000 plants, and supports birds, amphibians and waterfowl)
- Mandeville Place (a small orchard designed with schools and local disabled people).

By providing a variety of landscapes, the designers looked to meet the needs of the local community, providing spaces for recreation and relaxation, for example, but also delivering the needs of the natural environment, such as creating 25 wetlands.

A biodiversity action plan ensured the legacy of the games is delivered. This plan totalled 112 acres of the park, including '15 acres of woodlands, hedgerows and wildlife habitats, 4 miles of waterways, and 4,300 new trees' (Todisco, 2015).

To park connects north towards Hackney Marshes and Walthamstow Wetlands to ensure it is fully connected with London's green grid.

Figure 8: River Lea.

Rotterdam Sterker Door

summary

- 8 City-wide projects to transform the urban environment.
- Formation of an attractive business environment.
- Employment and entrepreneurship programs.
- Tackle climate change challenges, such as heat stress.
- New parkland.
- Urban greening.
- Public spaces will multiple uses.
- Green space development creates densification and wider development opportunities.

Figure 9: Location of Rotterdam within The Netherlands.

introduction

Rotterdam, Netherlands, is a city known for its concrete-jungle aesthetics. Following the Coronavirus pandemic, awareness grew about the importance of the natural environment and attractive public spaces.

Rotterdam Sterker Door (Onwards Stronger) is a forward-thinking plan to give the city 'Green Lungs' to not only benefit residents, build the economy, and support the natural environment; but to also increase city resilience by using the environment as a tool to tackle urban problems such as air pollution, flooding, and the urban heat island effect. The city aims to give all citizens access to attractive public places where residents and visitors meet, move, and recreate, as well as to attract business and innovation. Rotterdam plans to achieve this through 8 stand out city projects.

There is no IMD for Rotterdam, but a report by Statistics Netherlands found nine poor neighbourhoods in the city, the third highest out of all Dutch cities (CBS, 2007).

economic opportunities

Sterker Door is set to transform Rotterdam. The city government will pump €279million into the project, creating over 2800 jobs across the 10year lifespan of the project.

The city government hopes that by creating a more attractive and desirable environment, more people will be inclined to live and work in Rotterdam. Furthermore, they hope the green space can create an attractive business climate.

It is noted that the scheme will open up opportunities for development previously not possible, such as through densification, which allows the opportunity for business space creation. Hofbogenpark, which will convert a former viaduct into a roof-park, will convert the arches below into business units.

By increasing resilience through water storage, increased biodiversity, planting, and cycle parking, Rotterdam are making long-term saving costs from the potential threats of climate change.

Figure 10: Park Maashaven (Municipiality of Rotterdam, 2021).

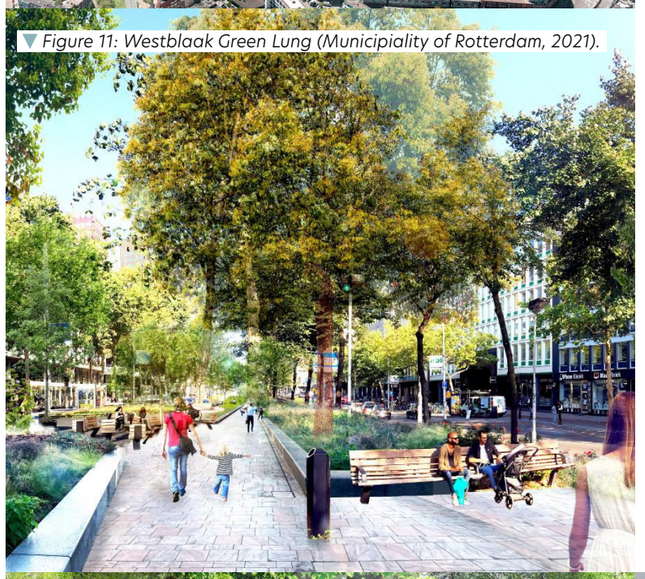


Figure 11: Westblaak Green Lung (Municipiality of Rotterdam, 2021).

Figure 12: Prins Alexanderplein (Municipiality of Rotterdam, 2021).

Figure 13: Hofbogenpark (Municipiality of Rotterdam, 2021).

Figure 14: Feyenoord Park (Municipiality of Rotterdam, 2021).

Figure 15: Rijnhaven Park (Municipiality of Rotterdam, 2021).

societal benefits

Many residents of Rotterdam will be gaining green space closer to home, as well as transforming existing urban areas. By doing so, the residents can reap the benefits of green space noted in the literature review.

The new green space will create environmental benefits that in turn benefit residents, such as a reduction in the urban heat island effect creating more liveable environments, reduced risk of flooding, and better air quality. Greening of adjacent streets and roofs of developments will ensure benefits have a wider impact.

Residents will also gain new cultural, education and art facilities, such Riverside Park Feyenoord, which will create recreational opportunities alongside a 3ha waterside park.

Park Maashaven will have significant benefits for the adjacent community, which is notably deprived of green space. A new 7ha park will offer opportunities for relaxation, nature exposure and activity.

Tees Heritage Park

summary

- Community engagement to form identity.
- Involvement of schools with wildlife and landscape design.
- Accessibility and connectivity between disjointed housing estates and separate green spaces.
- Defining the green space boundary.
- Aid wayfinding.
- Restore and promote heritage.

Figure x: Location of Tees Heritage Park within the Tees Valley.

introduction

'A renaissance of the river valley' describes the transformation of the Tees Heritage park from waste dumping grounds and neglected green spaces into a unified park, focused on building identity and restoring heritage (de Zylva, et al., 2020). At a size of 101ha, the Tees Heritage Park has enhanced a river corridor through art and landscaping, defining the parkland, improving accessibility between green spaces and housing, and engaging the community throughout.

Some communities around the park are among the most deprived in England. In the 2010 IMD, out of 326 districts, Stockton-on-Tees has the 47th highest proportion of deprived communities, and nearby Middlesbrough is 1st. Whilst this has not improved much, it can be noted that boroughs adjacent to park experienced less deprivation in 2015 and 2019.

Figure 16: Landscape art designed with schools highlight heritage (FTHP, 2021).

placemaking

To create a clear identity, community involvement was key. Friends of the Tees Heritage Park was set up in 2007, formed of representatives of stakeholder organisations and departments, a multi-disciplinary approach ensured community involved and secures long-term strategy for the park. Engagement with schools includes site visits and wildlife cameras for education and working with artists to form much of the landscape artwork, which is central to marking heritage and forming identity.

Community access way key. The scheme creates a strategic green corridor and accessible pathways within a legally and physically defined parkland. Artist designed signal posts aid wayfinding.

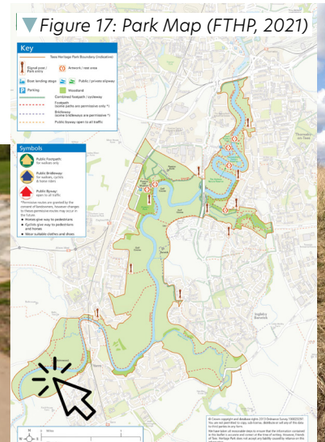


Figure 17: Park Map (FTHP, 2021)

Figure 18: Signal Post (FTHP, 2021)

design principles

1. Accessible and connected spaces.

- Flat, hard paving.
- Active travel options.
- Wayfinding signs.
- Landmarks/art along nodes.

2. Increase natural environments.

- Natural, biodiverse landscapes over manicured gardens.
- Water storage and food production spaces.
- Variety of landscape types, e.g. orchard/ meadow.
- Design that follows watercourse, landscape and heritage.
- Maintenance and management plan.

3. Social cohesion and activities.

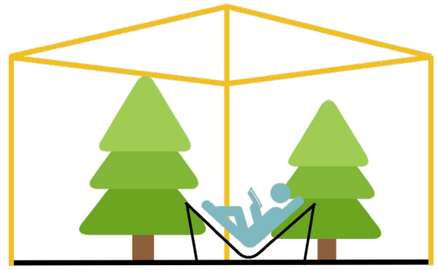
- Space for events
- Spaces to relax
- Activity and recreation.
- Urban greening along adjacent streets creates visual connectedness to green spaces.

4. Supporting economic growth

- Attractive business environment.
- Social entrepreneurship programs.
- Protection from long term climate effects

5. Distinctive environment and identity

- Define various park spaces - signal posts.
- Wayfinding signs.
- Community engagement during design.
- Promote heritage.
- Fully accessible and connected spaces.



Figures 19 - 23: Related Icons

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