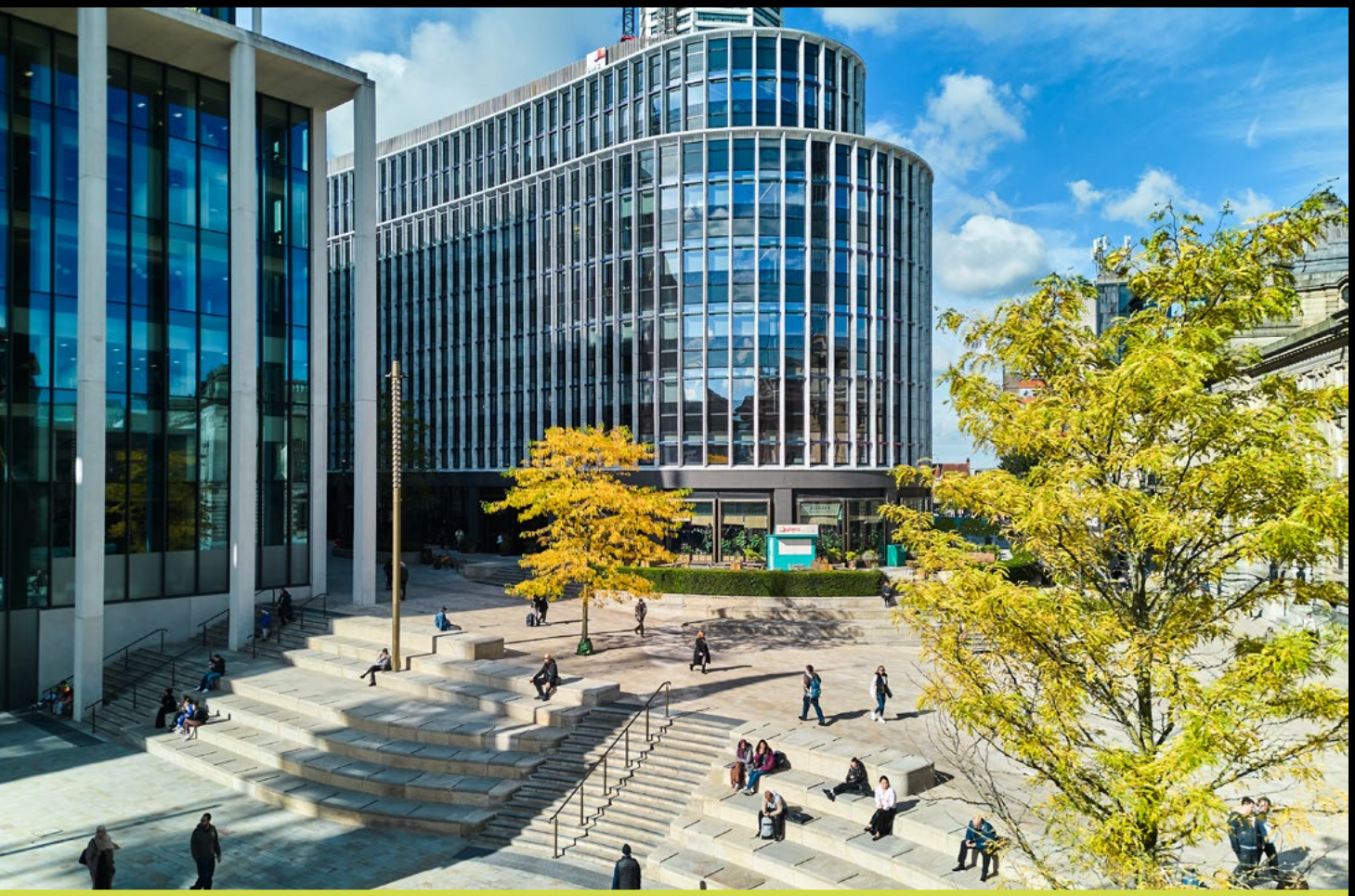

Paradise, Birmingham: Health Impact Appraisal of Redevelopment Proposals

SEPTEMBER 2025

TRUUD

UKPRP Prevention Research Partnership
Joint action for a healthier, fairer future

Local authority partners

GMCA Greater Manchester Combined Authority

Bristol City Council

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About this Report

This report summarises the approaches, data, results and recommendations in relation to health impact based on the appraisal of the development proposals for the Paradise regeneration site in Birmingham, as proposed by the investor Federated Hermes, in 2024. It is distinct from formal Health Impact Assessment (HIA) used for example by planning authorities, though it covers much of the same area of interest. Significantly, it provides additional monetised (quantitative) data not typically provided in a traditional HIA, which our research has found to be required to allow investment actors to engage ambitiously with management strategies leading to positive urban population health outcomes.
This report aims to explore how health outcomes such as cancers, diabetes, respiratory illness and mental ill health might be affected under the plans, compared to alternative development scenarios for the area. The purpose of this report is to help the team explore with real estate investors how to improve methods to consider health impacts in decision-making for urban development schemes. This work forms part of the five-year TRUUD research initiative to 'Tackle Root causes upstream of Unhealthy Urban Development' (www.truud.ac.uk) (Black et al., 2022).

The project team from TRUUD comprises Eleanor Eaton[1], Nalumino Akakandelwa[2], Kathy Pain[3], Oliver Tannor[4]

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Source: Adobe Stock (Daniel Cocks/Wirestock Creators)

Executive summary

Paradise Birmingham is a regenerative project made up of ten newly designed buildings and three new squares. The master plan is driven by the desire to revitalise an underused part of the city to increase the public realm and reconnect Birmingham's municipal heart.

This report is a Health Impact Appraisal (HIA) of the site. It presents a holistic assessment of the present-day environmental conditions of the site, how these conditions will change because of the proposed redevelopment and its potential impact on the health of residents within the proximity of the site. The report also evaluates the benefits of developing the site according to the minimum local policy requirements and additionally proposes ideal scenario measures that can be taken to attain optimum health outcomes. It models the societal cost of changes to health attributable to the environmental conditions under each of these scenarios.

Population and demographic data were obtained from the Office for National Statistics (ONS) (Office for National Statistics, 2021), and Birmingham City Council website (Birmingham City Council, 2017). Baseline environmental conditions of the site were obtained via site visits and mapping tools and the Environmental Impact Assessment (EIA) report by Drivers Jonas Deloitte (2012). Local Planning documents such as the Birmingham Development Plan (2019) and the sustainability statement provided data on present day conditions of the site. Future plans for the site were obtained from the Phase 3 Strategic Social Value Action Plan (2024). To get an insight into Federated Hermes' plans for the site, and to check assumptions for scenario development, team meetings with the Federated Hermes team were organised. The data were analysed using the HAUS valuation model in Excel to determine the societal value of changes to health attributable to the urban environment.

We modelled for the following scenarios

A: Baseline: (Predevelopment conditions)

B: Comparator (Local Plan)

C: Phase 2 completion

D: Phase 3 completion

E: Ideal

Source: Adobe Stock (MrMicah)

The results indicated that:

- The Birmingham Development Plan could benefit residents in and around the Paradise site by around £19 million and commuters by £4.3 million over 25 years, by addressing hazards and promoting active lifestyles, compared to the conditions present in the baseline.
- Additional benefits could apply to pedestrians and cyclists, though these have not been monetised due to lack of data.
- Federated Hermes plans through Phase 2 meet or exceed expected benefits, adding £25.7 million for residents and £6.45 million for commuters through improved walkability and security compared to the baseline. This represents around £6.68 million in averted health costs for residents beyond Local Plan aspirations (around 35% more value).
- Phase 3 further boosts health through new green spaces, potentially adding £11 million on top of Phase 2, including £8.86 million for residents, bringing the scheme's total value to £43 million over 25 years, 85% over the Local Plan scenario.
- The ideal scenario suggests additional improvements, such as more green spaces and pollution mitigation, but these are outside the current project's scope.
- Uncertainties in the model exist, especially around exposure levels and environmental impact magnitudes; a more detailed study could reduce these uncertainties.

1.0 **Introduction**

There is broad real estate industry agreement that environmental, social and governance (ESG) measures of the ethical and sustainable impact of an investment is the foundation for future effective real estate action to address pressing sustainable development challenges. But building upon previous real estate research at the University of Reading, interviews conducted in the UKPRP funded 'Tackling Root Causes Upstream of Unhealthy Urban Development' (TRUUD) consortium project found that while the industry wants to adopt ESG practices in everyday investment decision-making and reporting, quantification is a barrier.

Social impacts of investment activity are less easily quantified than environmental impacts, such as carbon emissions from the building process and property use, a lack of reliable data is preventing the industry from advancing. There is a significant gap in social impact data when it comes to human health and well-being. These factors are essential for society to lead active and productive lives and to reduce the increasing social and health costs that businesses and governments face.

Collaboration with Federated Hermes Ltd, the UK business of Federated Hermes Inc., a global leader in active, responsible investment management, with US$839.8 Billion in assets under management as of March 31, 2025 , in the TRUUD project, demonstrates for the first time, that monetised health evidence offers a means to measure the association between responsible real estate asset management and social value-added. Uniquely, the collaboration focuses on urban sites suffering from obsolescence in densely populated cities with societal health and well-being spatial disparities. Applying innovative modelling developed by economists at the University of Bath, shows how sustainable development concerns and financial performance can be aligned.

This report begins to identify the monetary value that the real estate and investment industry can bring to aligning relationships between urban community health and wellness and investor and public sector sustainable development priorities. This evidence has potential to inform investment appraisal not only, as in this collaboration, at a granular city level but strategy to mitigate risks and leverage opportunities to add value across diversified UK and international asset portfolios. It demonstrates that the real estate sector not only attracts international investment capital to cities but, through responsible management, can also direct capital flows to provide the urban settings for healthy, productive human lives and urban economic and cultural vibrancy, to address spatial inequity.

Kathy Pain,
University of Reading Professor of Real Estate Development,
TRUUD Real Estate Investment Intervention Lead

1.1 About Paradise Birmingham

Paradise Birmingham is a 7 Hectare redevelopment site located between the business districts in Colmore Row, the shopping districts of the Bull Ring, and the entertainment and leisure districts of Centenary Square, Broad Street and Brindley Place in Birmingham city centre. As of 2012, the site comprised a mix of buildings such as office blocks, the old city library, the Birmingham Conservatoire, historic structures such as the town hall and city museum, and a public open space containing the Joseph Chamberlain memorial. Some of the major traffic routes in central Birmingham cross the site, thus making it a key means of connectivity between the two areas of the city. Despite its frequent use by thousands of pedestrians, it had poor permeability due to its narrow routes and unsafe underpasses with stairs and level changes.

Given its urban status, the number of residents within the site boundary was low but adjoining neighbourhoods like Ladywood have a higher concentration of homes. As of 2012, the site had just a little over a thousand people using it as a place of work and approximately 1 million people used it monthly as a commuting route, shopping and leisure destination. The Paradise Masterplan which was awarded the Masterplan of the Year at the AJ Architecture Awards 2022 is made up of ten newly designed buildings and three new squares that provide iconic public space (Howells, 2022). The master plan is driven by the desire to revitalise an underused part of the city to increase public use and reconnect Birmingham's municipal heart. Design codes applied included the materiality of individual buildings as well as shared civic space that improves permeability, and routes and brings in vistas (Howells, 2022).

The development will be completed in three phases. Phase One, completed in 2020 has delivered two new office buildings (15,9780 sq.m One Chamberlain Square and 17,000 sq.m Two Chamberlain Square) overlooking a revitalised Chamberlain Square. The second phase is underway and has already seen the completion of the 26,010 sq.m One Centenary Way in 2023. The Octagon, a 370-unit residential tower, Three Chamberlain Square 17,560 sq.m office building a 198-bedroom hotel and a new public realm – Ratcliff Square - are expected to be completed by 2025 (Paradise Circus General Partner Limited, 2024).

Figure 1: Paradise Masterplan

Source: Paradise Circus General Partner Limited (2024)

Initial master plan comprised a contemporary office-led, mixed-use development of up to 167,239 sq.m (1.8 million sq. ft) NIA delivering:

- £1.2bn GDV
- 120,770 sq.m Grade A Offices, in up to 8 new buildings
- 11,150sq.m retail and leisure space
- 4* hotel with up to 200 bedrooms
- Ground floor level shops, bars, cafes, and restaurants
- 330 car parking spaces
- A new residential block of c.370 homes
- Three new public squares

Phase 3, currently under development, is expected to bring about a renewed focus on the social and economic impact that underlines the site as a place that is for, and about people. It will deliver 64,855 sq.m in five new office buildings and ground floor retail, a new public realm and completing improvements for connectivity and public space to the city. This orientation seeks to contribute to the local council's ambitions for the city to revitalise underutilised city space by creating high-quality paid jobs alongside improving the public realm and connectivity of the city. The overall goal is to create a development that leads to a positive impact on local communities and the environment. Proposals were made to alter the initial Phase 3 design which included altering the buildings in Phase 3 to adapt and respond to the new Octagon residential tower, reducing the amount of car parking space, increasing the amount of retail and leisure space, and making changes to the massing of the final two major commercial buildings (Paradise Circus General Partner Limited, 2022).

1.2 Research Questions

This research aims to provide insights on health for the Paradise, Birmingham scheme by modelling the health impacts of the environment of the site. To achieve this, the following research questions arise:

- How did baseline conditions before building works began affect the health of people living near or using the site?
- Has the site delivered quantifiable benefits to people from, for instance, public realm improvements?
- What will the full effect of the site be at Phase 2 and after Phase 3 implementation?
- What elements of these effects could be regarded as additional beyond the ambitions of the local plan?

2.0 **Methods**

2.1 Overview of the TRUUD Project

2.1.1 Project Goal and Rationale

TRUUD (Tackling Root causes upstream of Unhealthy Urban Development) is a 5-year research project that intends to change the way urban decisions are made to prevent non-communicable diseases. The project seeks to understand how prevention of non-communicable diseases, such as cancers, diabetes, respiratory illness and mental ill health might be more fully considered in decision-making for new urban environments. With funding from the UK Prevention Research Partnership, it seeks to tackle root causes upstream of unhealthy urban development (Black et al., 2022). The project brings together researchers across five universities, with expertise in public health, urban development, economics, policy studies, management/business studies, systems engineering, and public engagement (Black et.al, 2022).

2.1.2 The HAUS Model

To assist stakeholders, including planners, investors, and developers, in understanding the health effects of urban development, the Health Appraisal of Urban Systems Model (HAUS) aims to measure and value the health consequences of various aspects of the urban environment (Eaton, Hunt and Black, 2023). Internal building conditions, the environment, transportation, socioeconomic considerations, climate change, and community infrastructure are all covered in the model. The environmental characteristics of a place and its limits, the local population's health and demography, and data from economic and medical research are all considered when modelling the impacts. Attributable changes in disease cases, premature deaths, and life years lost are estimated. The value of the societal cost of the disease is then modelled. Results are aggregated in terms of categories of environmental change, consistent with the commonly used HUDU rapid health impact assessment tool (NHS London Healthy Urban Development Unit, 2017).

2.2 Assumptions about the population

The 2021 Census reveals that 1,700 individuals reside in Birmingham's Lower Super Output Area (LSOA) 138D, which encompasses the vicinity of the proposed redevelopment site. This population is characterized by a comparatively younger demographic with a higher proportion of renters than the UK average, alongside relatively good health indicators (Birmingham City Council, 2023). Socioeconomic data from the Index of Multiple Deprivation (IMD) places the area within the 7th Decile for deprivation as of 2011, reflecting moderate levels of deprivation, in contrast to the neighbouring area of Ladywood, which falls within the 2nd Decile. Physical activity levels in Birmingham as of 2022/23 are notably lower than the national average, with 60.4% of residents meeting active lifestyle criteria compared to 67.1% for England, while the prevalence of physical inactivity in adults is also comparatively higher at 28.9% versus the national rate of 22.9% (OHID, 2024).

Projected demographic and economic changes following the site's redevelopment anticipate substantial shifts in residential and employment patterns. An estimated 550 new residents are expected to inhabit the site post-development, with a projected local population of approximately 5,000 within a 300-meter radius. Employment opportunities are also expected to increase significantly; baseline figures of 1,059 jobs on-site in 2012 are projected to rise by an additional 8,839 positions directly on-site by the completion of Phase 3, with a further 2,544 roles likely created indirectly off-site (Drivers Jonas Deloitte, 2012). Approximately one million pedestrians currently transit the site each month, underscoring the site's potential as a hub of daily foot traffic, although data on cyclist usage remains unavailable. In future assessments, differentiating between commuters and recreational site users will be crucial for evaluating the full impact of redevelopment.

2.3 Scenario Development

We developed a series of scenarios in consultation with the team at Federated Hermes. Below are the five scenarios under which the health impacts were modelled:

A: Baseline: Pre-development conditions

B: Comparator (Local Plan)

C: Federated Hermes Phase 2 completion

D: Federated Hermes Phase 3 completion

E: Ideal

To model the health impact, we assumed the resident population within the site boundary to be 0 at baseline and 550 in future, while the total resident population within the 300m buffer of the site boundary is assumed to be 5,000 and 5,550 at baseline and in the future respectively. The non-residential users of the site who will use it for work were assumed to be 1,059 and 9,898 at baseline and in the future respectively. The site was also assumed to accommodate 1 million pedestrian/ cycle commuters per month throughout the baseline as well as in the future. The expected lifetime of the project for modelling was assumed to be 25 years. The Lower Super Output Area (LSOA) or areas in which the site is located Birmingham LSOA 138D C (Office for National Statistics, 2021)

Scenario A: Baseline

This scenario replicates conditions as they were in 2012; before work began on redeveloping the site.

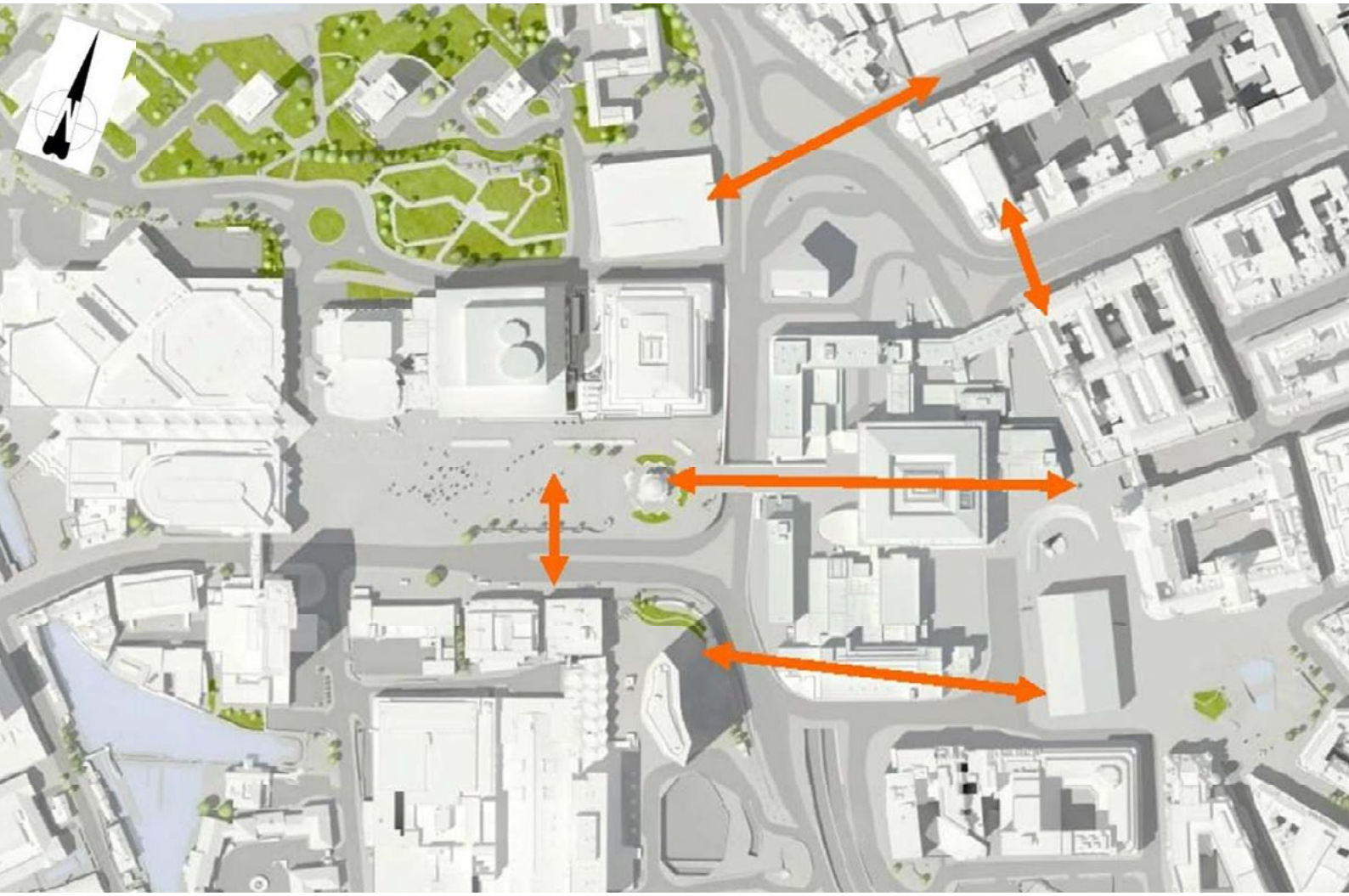
Figure 2: Paradise Circus Location plan and site boundary, 2012

Source: Glen Howells Architects, (2012)

Permeability and Pedestrian Environment

As of 2012, the site had low permeability due to major roads surrounding most of the site, which hinders routes. The site area had poor quality routes which are not deemed to be of an optimal standard for walking. The pedestrian subways to the north at Great Charles Street and Easy Row, and south of Fletchers Walk were unattractive for pedestrians. The site also had some narrow pedestrian routes, such as the key route connecting the site with Centenary Square and Broad Street. Approximately 13 million pedestrians travel through Paradise each year and, due to the narrowing of the entrances / exits to Paradise Forum, the pedestrian environment is often congested (Drivers Jonas Deloitte, 2012).

Figure 3: Existing pedestrian routes around Paradise Circus (2012)



Source: Drivers Jonas Deloitte, (2012)

Existing Cycle Facilities

Adjacent to the site to the west in Centenary Square lies the National Cycle Route 5. There was an existing surfaced cycle route to the east of the site towards Victoria Square, which connected with the local road network to strategic transport links, such as New Street Rail Station as well as Snow Hill Rail and Birmingham Coach Stations. There were no cycle routes within the site, so cyclists passing through it were required to dismount (Drivers Jonas Deloitte, 2012).

Public Transport

Paradise Circus Queensway is a key public transport node for Birmingham, both in terms of buses travelling through and the number of stops in the vicinity. There are ten bus stop zones on and surrounding the Site (Drivers Jonas Deloitte, 2012).

Existing Road Personal Injury Collisions and Safety

Data regarding Personal Injury Collisions (PICs), formerly known as Personal Injury Accidents (PIAs), was obtained from Birmingham City Council for the five years spanning from August 1, 2006, to July 31, 2011. The Transport Assessment provides a summary of these collisions, detailing their locations and characteristics. From a total of 116 PICs recorded on the assessed road network, the findings suggest that a significant number of these incidents may have resulted from factors unrelated to the road layout (Drivers Jonas Deloitte, 2012). Statistics on road casualties showed that drivers and passengers in cars and taxis accounted for 63% while pedestrian casualties made up 19% of total road casualties in Birmingham between 2000 and 2015 (Birmingham City Council, 2016). Between 2010 and 2011, there was a 12% increase in casualties relating to roads (Department for Transport, 2011).

Air Quality

Birmingham is one of the cities with the highest air pollution concentrations in the UK (Kalisa et al., 2018). In 2010, particulate matter, PM2.5, accounted for 520 deaths in the city, while nitrogen dioxide (NO_2) resulted in 371 deaths in 2011. Other pollutants like nitrogen oxides (NO_X) and nitrogen dioxide (NO_2) contribute to the high pollution levels, with concentrations recorded as high as 90.0 µg/m³ for NO_X and 44.7 µg/m³ for NO_2 in certain areas (OpenAI, 2024). 2010 background pollutant concentrations at the development site, measured in µg/m³, are presented in Appendix 1. Concentrations for particulate matter PM_{10} are below the annual mean national objectives (40µg/m^3) but are above for NO_2 (40µg/m^3) (Drivers Jonas Deloitte, 2012).

Noise

Baseline noise surveys carried out at the site as part of the Environmental Impact Assessment in consultation with BCC, from 16 to 20 April 2012, showed that the noise climate across the site was from road traffic. Ambient sound pressure (LAeq) levels ranged from 66 - 72db, with a lower level of 59db measured at Congreve Passage in the daytime, 58 - 61db in the evening and LA90 levels at sensitive receptor locations ranging from 50 - 55db at night. There are variations from location to location within the area for noise levels in general as shown in

Appendix 2. At Baskerville House, only daytime noise level is recorded, with no data for evening or nighttime as the receptor is not considered sensitive during those periods. At UCB and Congreve Passage, only daytime measurements were considered, and for Town Hall, day and evening with no nighttime data (Drivers Jonas Deloitte, 2012).

Fear of Crime

It is unclear how people perceived fear of crime in the area in 2012. However, photographs from the Birmingham Mail website before demolition, Figure 3 above, indicate areas of the site which were of poor quality and potentially unsafe walking environments, especially after dark:

Figure 4: The soon-to-be-demolished Paradise Circus in Birmingham City Centre.

Source: Birmingham Mail, (2016)

Green and Blue Spaces and NDVI

Birmingham scores relatively low for Normalized Difference Vegetation Index (NDVI) compared to other UK urban centres, with a score of 0.03, compared to Bristol (0.13) and Newcastle (0.05), but scores better than Manchester (0.02) and Liverpool (0.01) (Robinson et al., 2022) .

The site is relatively poorly served in terms of access to green spaces, with small pockets of poor-quality green space within the site. Although there are public open spaces within and adjacent to the site, such as Chamberlain Square, Centenary Square and Victoria Square, there are no large accessible green spaces within 1km of the site. In terms of greenness, the site is 65 to 70% manmade (Natural England, 2021). The closest large open green spaces are at the Jewellery Quarter (3.2Ha) and Edgbaston Reservoir (around 4Ha), both over 1km as the crow flies. Nearby or within 300m are a small park to the rear of Centenary Square (City Centre Gardens 0.44Ha), and the park adjacent to Colmore Row (Cathedral Square 1.34 Ha). In terms of access to blue space, there are small fountains within the site and in Victoria Square just next to the site, and it is a short walk to Birmingham's extensive canal network (Natural England, 2021).

Tree cover

Tree cover on site is limited with around 43 trees altogether and these are concentrated to the north of the site between Paradise Circus and Summer Row, and near the Town Hall (Drivers Jonas Deloitte, 2012).

Overheating risk

The LSOA is in the highest area of heat vulnerability risk, requiring major mitigation measures for heat resilience (Ferranti et al., 2023).

Food environment

There are many small supermarkets nearby, and large supermarkets within a 15 to 20-minute walk. Given its city centre location, there are an expected high number of cafes, bars and takeaways nearby.

Scenario B: Comparator (Local Plan Minimum)

This scenario provides a notional baseline for the purposes of assessing the additionality or material benefit which the Federated Hermes plans for the site brings, compared to what might otherwise have occurred. Assumptions are derived by estimating the type of minimum standards which any developer would have to comply with. The scenario considers that the development would meet the minimum requirements set for such developments by the Birmingham Development Plan (Birmingham City Council, 2017).

Key assumptions

The coordinated approach by Federated Hermes helped to unlock funding for interventions such as the demolition of the old library building, the relocation of the Conservatoire building and significant changes to transport infrastructure around the site boundary. In the comparator scenario, we assume a more piecemeal approach would not have allowed for the release of this funding. Therefore, in this scenario, the Old Library building would have remained in situ, albeit redeveloped in some way. No change is made to the layout or quality of transport infrastructure around the site. The Conservatoire is relocated but with a less co-ordinated approach.

Summary of changes

> **"The redevelopment of the Paradise Circus site will require new public spaces, improved pedestrian connections including to the Jewellery Quarter, active frontages, restoration of key views and the enhancement to the setting of listed buildings. The extension of the metro line and other improvements to connectivity within the area will be supported. The redesign of Centenary Square will need to provide improved public transport accessibility and a significantly enhanced pedestrian environment alongside a useable event space"**
>
> **(Birmingham City Council, 2017, pp.37)**

Green infrastructure

We assume the development would integrate green infrastructure as part of the design process to encourage urban greening. Where feasible, viable and sustainable, this would include accessible green roofs and/or walls to aid cooling, particularly in the city centre, add insulation and promote sustainable drainage (Birmingham City Council, 2017). To promote tree coverage in and around the site, we assume new trees would be planted to add to the existing (Birmingham City Council, 2013).

Overheating risk

The City Centre can be up to 5°C hotter at night than the surrounding rural areas due to its dense population (Ferranti et al., 2023). We assume the design and development of the site would lead to a reduction in overheating and mitigate reliance on air conditioning systems (Birmingham City Council, 2017).

Air pollution

Given the role Carbon Dioxide (CO_2) emissions play in outdoor air pollution, the local plan target is to attain a 60% reduction in CO_2 (Birmingham City Council, 2017).

Noise

Noise is a highly prioritised pollutant for the Birmingham area. The desirable target of the BCC for the local area is a reduction in urban noise. The development of the site is therefore expected to use measures and technology that reduce noise. For instance, waste management, and travel around the site are expected to be designed in a way that reduces noise pollution (Birmingham City Council, 2017). However, the major source of noise pollution for this site is from the main roads surrounding it. In this scenario, these will not be affected, so noise levels are not expected to change significantly.

Scenario C: Phase Two Completion

This scenario assumes that all features up to the end of Phase 2 have been completed in accordance with the Masterplan. The scenario assumes that the development will create a new vibrant commercial-led mixed-use development that offers up to 170,012 sq.m Gross Internal Area of new floorspace in bespoke buildings to include offices (B1a, now *E(c)* use), ancillary retail and leisure uses (A1-A5, now *E(a, b)*, D1 & D2, now *E(d)*), together with a hotel of up to 250 bedrooms. The proposals will place strong emphasis on the delivery of high-quality public realm through the creation of a series of new streets and spaces, which will greatly improve pedestrian linkages between the City Core and 'Westside', home to the International Convention Centre (ICC), Brindley place and the National Indoor Arena (NIA) (Drivers Jonas Deloitte, 2012). The assumption is that there will be demolition of all the existing buildings on site except the Grade II Listed Joseph Chamberlain Memorial. Our modelling is also based on the assumption that the proposed development seeks to enhance its setting, as well as that of several other heritage assets located immediately adjacent to it (Drivers Jonas Deloitte, 2012). We assumed that the following achievements have been made to date (September 2023).

Our assumption also recognises that two ongoing projects on the site which include the Octagon, a 49 storey Build to Rent residential tower providing 370 new homes, and Three Chamberlain Square, a 17,560 sq.m NIA net zero carbon, BREEAM Outstanding commercial office building at the south of the site. Alongside Three Chamberlain Square, a 198-room 4-Star plus boutique hotel is planned to commence construction in 2025, along with further public realm including Ratcliff Square, Ratcliff Passage and Western Terrace (Howells, 2022).

Summary of Paradise Birmingham Phase 2 Development

- 58,990 sq.m Grade A Office space
  - » One Chamberlain Square 15,9780 sq.m
  - » Two Chamberlain Square 17,000 sq.m and
  - » One Centenary Way 26,010 sq.m 100% commercial office space let in Phase 1
  - » 14,400sq.m to PWC,
  - » 3,715 sq.m to DLA Piper,
  - » 1,670 sq.m to Knights and other lettings to Mazars, AtkinsRealis, MEPC and flex office provider Cubo.
  - » 60% office space within One Centenary Way let at practical completion, to Goldman Sachs (8,175 sq.m), Arup (6,419 sq.m) and JLL (1,300 sq.m) with a further letting to Mills & Reeves (2,790 sq.m)
- 4,830 sq.m Retail / Restaurant space
- Let to Dishoom, Alberts Schloss, Rosa's Thai Café, F1 Arcade, Big Mamma, Cow & Sow and Yorks
- Approx. 7,000 sq.m redeveloped public realm with a focus on high quality streets and squares for all to use
- 300 space car parks added
- Conservation and restoration of part of the listed façade of the Birmingham Museum and Art Gallery and refurbishment and reinstatement of historic statues
- Realignment of entire gyratory road network surrounding the site including preparatory works for the Midland Metro Centenary Square extension.
- Across the various construction contracts at Paradise 84 apprenticeships have been established to date, 270 people within 10 miles have been employed, representing 43.67% of the workforce and 7 local people who were long-term unemployed have been given full time jobs. £25.27m has been spent within the local supply chain.

Fear of Crime

The development will result in active frontages and a high level of natural surveillance which has the potential to reduce crime in the area. Due to the high-quality urban environment that the regeneration of the site will provide, there is the likelihood of an improvement in the sense of place and community at the local level. This could result in an indirect positive impact on crime but this may be minor.

Air Quality

We assume that annual mean NO_2 concentrations will be above the national objective value (40µg/m^3) at all receptors in all scenarios. PM10 concentrations are forecast to be below the national objective value (40µg/m3) at all receptors in all scenarios, and daily PM10 concentrations are not predicted to exceed the daily objective of 50µg/m3 on any day at all receptors in all scenarios (Drivers Jonas Deloitte, 2012). The sensitivity of the site to these is moderate due to its location, within the Birmingham Air Quality Management Areas for NO_2, and any activity that will result in increased exposure of the population to NO2 is expected to be avoided as part of the development process (Drivers Jonas Deloitte, 2012).

It is predicted that air quality will improve for the area to the east of the site due to the realignment of Paradise Circus. All the predicted NO_2 concentrations for the assessed scenarios were predicted to be above the annual mean objective, and therefore a minor adverse impact is expected. However, all PM10 predicted concentrations are well below the annual mean objective and the impact of changes in PM10 is negligible. The overall impact on air quality is therefore expected to be minor adverse (Appendix 1, Appendix 3, Appendix 4). It is assumed therefore, that there will be no change to PM10 levels on site, but that NO_2 levels might increase at Centenary Square and Summer Hill Street. This is important for modelling, as the residential accommodation in the Octagon Tower is located near to Summer Hill Street.

Noise

The Environmental Impact Assessment (EIA) (Drivers Jonas Deloitte 2012), estimates noise level change at 11 of the 14 links is less than 1dB, making it imperceptible. Therefore, the impact from traffic changes on these links is negligible. The Paradise Circus Queensway, next to Town Hall link, is to be removed as part of the scheme, and therefore a direct comparison of Background Noise Level (BNL) change cannot be made. However, this will result in a reduced traffic noise level at buildings in the area, such as the Town Hall, and residential and commercial buildings on Paradise Street to the south of the site to a lesser extent. Traffic flows on the Paradise Circus - Broad Street and Cambridge Street link are predicted to increase, as traffic is diverted onto it following the closure of the link next to the Town Hall. The associated BNL change is predicted to be +2dB; this is considered to have a minor adverse impact but is rated as a not significant effect (Drivers Jonas Deloitte, 2012).

Overheating

No change is expected to occur to heat risk as mitigating factors, such as green space, blue space, tree cover, and overshadowing are likely to remain the same.

Green Spaces

The development will replace existing green spaces with superior new ones, removing 43 individual trees and six clusters. Tree planting is proposed as a mitigation measure. The final development will have up to 50 standard trees. The tree stock will mature, resulting in minimal impact on the site (Drivers Jonas Deloitte, 2012).

Scenario D: Phase Three Completion

Phase 3 will be the final phase of the development, planned to commence in 2024 and complete by 2030. This will bring forward a further 42,750 to 51,100 sq.m of office, retail and leisure accommodation across three new buildings, and considerable new public realm centred on Congreve Square to the north of the site (Paradise Circus General Partner Limited, 2022). This is assumed to be a new green space of approximately 0.3 Ha. (Federated Hermes, 2022). Phase 3 will be the largest phase in terms of commercial development and demonstrates economic value for money with the increase in land value generated, creation of jobs through the delivery and attracting job-creating organisations, crime reduction in improvements in public realm and amenity value through the redevelopment of brownfield land.

Phase 3 will make further significant enhancements to improve the overall environmental quality and pedestrian connectivity of the surrounding area. Links to the residential area of City Centre Gardens and Ladywood will be provided which do not currently exist. The planning permission has been changed to reflect changes in demand over the period since the outline planning permission was secured in 2013 and to reflect Birmingham strategic policy documents such as the release of the Birmingham City Council Transport strategy in 2021 and the Future City Plan in 2022 setting out principles in creating green spaces for all and discouraging the use of the private vehicle in the city centre.

Phase 3 Strategic Social Value Action Plan proposes to deliver the following:

- Building HI c.23,225 sq.m
- Building B c. 28,800 sq.m
- New public square with a focus on soft landscaping (Additional green space in park to north of site approximately 0.3 Ha. max), plus additional public open space around Octagon, creation of a new public space to provide a connection to Jewellery Quarter and public realm to link in with the 370-unit residential tower being delivered in Phase 2 (The Octagon).
- New permanent estate service yard and basement areas – this facilitates servicing for all buildings to be done 'underground' to free up public realm space for pedestrians and cyclists and be vehicle free.
- Social Value Action Plan which by the completion of the infrastructure works (not including the commercial building plots) will deliver £3.02m of social value impact and £18.75m of local economic impact through
    - » 30 FTE jobs within 10 miles,
    - » 12 FTE jobs for disadvantaged people,
    - » 40 weeks of meaningful work experience placements,
    - » 300 hours of advice and educational volunteering and
    - » 180 weeks of apprenticeship training.

Scenario E: Ideal

This scenario tests measures outside the current project scope for maximum potential health effects. It is not intended to reflect any measure currently planned by the landowner, but is intended instead to serve as a comparator to inform understanding about further methods to improve health. We do not comment on the cost or viability of these measures.

Key features of this scenario might include:

- Additional green space to tackle deficit in this area
- Additional street trees/ green infrastructure, including improved biodiversity and NDVI
- Downgrade of major roads, leading to air and noise pollution reductions

2.4 Data Sources

Data were obtained from multiple sources. Population and demographic data were obtained from ONS, and Birmingham City Council website. Baseline environmental conditions of the site were obtained via site visits and mapping tools and the EIA report by Drivers Jonas Deloitte (2012). Local Planning documents such as the Birmingham Development Plan (2019) and the sustainability statement provided data on present day conditions of the site. Future for the site data were obtained from the Phase 3 Strategic Social Value Action Plan (2024). To get an insight into Federated Hermes' plans for the site, and to develop assumptions for each scenario, team meetings with Federated Hermes team were organised.

Source: Adobe Stock (Stock87)

3.0 **RESULTS**

3.1 Summary of results

Our results are modelled for a period of 25 years following the development of the site for all scenarios. This is done on the assumption that residents within the site boundary and 300m away from it are 550 and 1000 in number respectively. We also modelled based on 10,000 commuters to the site. The assumption is that all the 550 residents will live in the Octagon, the block of accommodation to the North of the site.

We estimate that changes to the site might be as follows:

Table 1 : Summary of value of changes to health across all populations (NPV £m)

Population	N	Baseline	Comparator	Phase 2	Phase 3	Ideal
Within Site Boundary	550	20.20	17.30	16.64	12.11	3.43
External to site boundary	5,000	8.42	-7.70	-13.72	-18.06	-18.06
Commuters	10,000	0.00	-4.30	-6.45	-8.60	-8.60

Table 2: Net change from baseline (£m)

Population	N	Baseline	Comparator	Phase 2	Phase 3	Ideal
Within Site Boundary	550	-	-2.90	-3.56	-8.09	-16.77
External to site boundary	5,000	-	-16.12	-22.14	-26.48	-26.48
Commuters	10,000	-	-4.30	-6.45	-8.60	-8.60

Benefits estimated over 25 years (Negative values indicate reductions in health costs, positive values indicate potential additional health costs) Values in £2024 Million, NPV (Net present value of health changes) adjusted for 1.5% discount rate

3.2 Residents within the site boundary

Baseline

Results indicate that significant hazards to health would exist in this location if the development had proceeded with conditions as at 2016. The largest risks are from noise pollution and poor air quality which might be expected given the location of the site being adjacent to main roads in the centre of the city. Over 25 years, the cost of increased health risks related to these risks may be £11.4 million and £8.9 million respectively. The total estimated cost of air quality, noise and proximity to main roads may be £22 million (range £17 million to £38 million). High levels of noise are expected to affect older adults, especially relating to functional loss and activity, and depression. In all adults, noise may result in increased risk of premature mortality. Children are affected too; elevated noise may increase risk of emotional problems and conduct disorders in children. The costliest effect is a risk of sleep disturbance, which might affect up to one fifth of residents. This could be mitigated through building design.

Air pollution affects serious long term health conditions in adults such as cancer, diabetes, Parkinson's disease, and premature mortality (premature deaths may be increased by around a third due to air pollution). One of the largest impacts here is on risk of diabetes. Air pollution also affects children, resulting in asthma and other respiratory outcomes, and increased mortality risk as well. The largest risk here is regular ear infections in infants. Other costs include poor accessibility of the site (£1.37 million), and crime/ safety issues (£1.11 million). The only positive benefit of the site when left under this scenario of conditions in the baseline relates to access to healthy food (-£270,000); this relates to the availability of specialist food stores nearby.

Overall, the total impact on health of the environment would be emphatically negative under these conditions. The total NPV of impacts to health are estimated at £20.2 million over 25 years (range £14.4 million to £46.3 million) as shown in Table 3 below.

Table 3: Value of health impacts - baseline with low and high ranges for residents within site boundary (£' million)

Environmental Category	Midpoint	Low	High
Access to open space and nature	0.00	0.00	0.00
Air quality, noise and neighbourhood amenity	21.99	16.69	38.06
Accessibility and active travel	1.37	0.13	16.82
Crime reduction and community safety	1.11	0.75	1.19
Access to healthy food	-0.27	-0.20	-0.36
Climate change	0.34	0.16	0.57
TOTAL	24.54	17.54	56.28
NPV of TOTAL	**20.20**	**14.44**	**46.32**

Benefits estimated over 25 years, population 550; (Negative values indicate reductions in health costs, positive values indicate potential additional health costs); Values in £2024 Million, NPV (Net present value of health changes) adjusted for 1.5% discount rate

Scenario B: Comparator (Local Plan)

The comparator scenario would be a more realistic representation of development on site, given detailed ambitions in the Development Plan for the area. Therefore, this acts as a second baseline for our calculations.

In this scenario, we see the effect of regeneration of the area, changes to major road infrastructure, and the removal of derelict buildings and poor-quality public realm. Air quality and noise risks are unchanged, but this scenario reveals a much healthier environment. The removal of the road, with its high traffic volumes, may lead to reduction in risk of Road Traffic Accident (RTA) injuries for children: over 25 years this could be a saving of around 21 incidents of injury or death related to road traffic. The value of this could be a saving of £1.36 million; however, we have not modelled for risks to adults, so this may be a conservative estimate.

Improvements to underused and poor- quality public spaces reduce perceived risk of crime: this is expected to prevent many of the health effects seen in the baseline. Positive perceptions of the neighbourhood are expected to reduce risk of obesity by around 15%, whereas improved safety may encourage activity in women particularly, and protect against risk of poor mental wellbeing for all adults. Risks are not completely minimised but are reduced. By encouraging people to be active in their environment, these improvements may also reduce risks of poor general health and functional loss, although these have not been monetised here.

Compared to the baseline scenario, the total estimated savings in health costs might be £2.9 million (Range: £1.2 million to £17.7 million) over 25 years just for these 550 residents alone. The large range of uncertainty relates to changes in road safety, reflecting uncertainties around how it is possible to standardise road safety interventions given highly specific geographical, social and behavioural conditions.

Scenario C: Federated Hermes' Proposals – Phase 2

The proposals set out in Phase 2 achieve the positive benefits of the comparator scenario, and bring with them additional benefits. We anticipate that additional security measures in the proposals mitigate any lingering perceptions of poor safety, so that health risks, such as lack of activity due to fear of crime, are minimised. Walkability is also improved beyond the comparator scenario, further reducing diabetes, obesity, poor mental health, and premature mortality. This relates to new at grade crossings and improved permeability which enhance the walking environment for the site. Together, the additional improvements bring an estimated £0.66 million in benefits, which takes the total estimated health benefit of the proposals under Phase 2 to £3.56 million (range £1.6 million to £19.3 million) NPV over 25 years, compared to the baseline.

Scenario D: Federated Hermes' Proposals – Phase 3

Phase 3 brings further health benefits, with changes to walkability and heat risk (through additional mitigation schemes for residents). However, the key benefit of this scenario is the introduction of a new green space, in an area which has very limited access to any green areas. This green space may help to mitigate underlying risks of obesity in children (-19%) and diabetes in adults (-24%), possibly through encouraging activity through regular use of the park.

The contribution of the green space to improving the overall greenness of the area may also help to prevent again cancer risk, specifically mouth and throat cancers (-2%). The combined health savings related to this green space, just for our 550 residents alone, could be in the region of £4.9 million (range: £2.4 million to 16.7 million). The range of uncertainty is largest for diabetes effects. The total estimated health benefit of the proposals under Phase 3 is £8.09 million (range £3.8 million to 34.6 million) NPV over 25 years, compared to the baseline.

Scenario E: Ideal

The ideal scenario presents the value of further additional measures which could be made to improve health for the area. These do not comment on the viability or plausibility of the intervention. However, we present some examples of these in Table 4 below.

Table 4: Ideal Scenario – Estimated value of health impacts and compared to Phase 3 (£ million)

Category	Specific Environmental Change	Value £*	Difference From Phase 3*
Access to open space and nature		**-11.58**	**-6.70**
Green space	IQR improvement in NDVI across site	-11.58	-6.70
Air quality, noise and neighbourhood amenity		**18.30**	**-3.69**
Air quality	10% reduction in exposure to NO2	8.01	-0.89
Noise	10% reduction in exposure due to mitigation via building design	10.28	-1.14
Proximity to main road	Downgrade of major road near homes	-	-1.66
Accessibility and active travel		**-2.48**	**-0.16**
Cycling infrastructure	New cycle paths through site	-0.16	-0.16
TOTAL		**4.17**	**-10.55**
NPV of TOTAL		**3.43**	**-8.68**

* Ideal Scenario - Value of change from baseline over 25 years

The threshold for NDVI improvements in the ideal scenario is very high: this would represent greening of the whole site area to a high level of biodiversity, beyond what is already planned. However, if this was reached, this could have a relatively large impact on premature mortality, which drives the high value of this item. The relatively low value of new cycling infrastructure reflects low cycling activity in the city. These values only relate to benefits for residents: the additional benefits of these changes to residents outside the site boundary should also be considered.

Baseline impacts and future scenarios compared (Residents within site boundary)

Air quality remains the greatest influence on health cost within the site boundary at £22 million over all but the ideal scenario. Though the consequence of this is a persistent overall health cost, the development of the site reduces the impact from £20 million (NPV) at baseline to £12 million by the completion of Phase 3. Compared to the baseline, this represents a net reduction in health costs of £3.5 million at Local Plan scenario through £4.3 million at Phase 2 to £9.8 million by the end of Phase 3.

Table 5: Baseline impacts and future scenarios compared (Residents within site boundary)

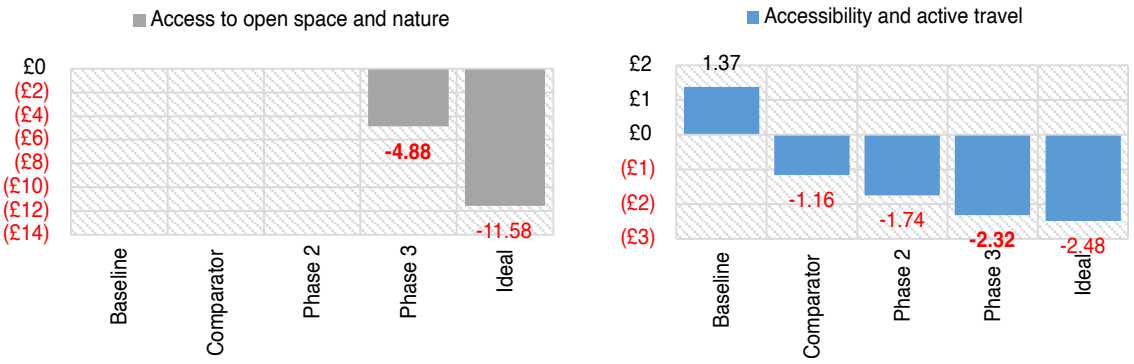
Environmental Category	Baseline	Comparator	Phase 2	Phase 3	Ideal
Access to open space and nature	0.00	0.00	0.00	-4.88	-11.58
Air quality, noise and neighbourhood amenity	21.99	21.99	21.99	21.99	18.30
Accessibility and active travel	1.37	-1.16	-1.74	-2.32	-2.48
Crime reduction and community safety	1.11	0.11	-0.11	-0.11	-0.11
Access to healthy food	-0.27	-0.27	-0.27	-0.27	-0.27
Climate change	0.34	0.34	0.34	0.31	0.31
TOTAL	24.54	21.02	20.21	14.72	4.17
NPV of TOTAL	**20.20**	**17.30**	**16.64**	**12.11**	**3.43**
CHANGE FROM BASELINE	**-**	**-3.52**	**-4.33**	**-9.82**	**-20.38**

Benefits estimated over 25 years, population 550 within site boundary; (Negative values indicate reductions in health costs, positive values indicate potential additional health costs); Values in £2024 Million, NPV (Net present value of health changes) adjusted for 1.5% discount rate

Value of health impacts of access to open spaces and active travel

At completion of Phase 2, there were neither health costs nor benefits associated with access to open spaces and nature as was the case at baseline and Local Plan scenarios. However, Phase 3 delivered health benefits estimated at just under £5 million. Regarding active travel, baseline conditions generated £1.4 million in associated health costs (Figure 5). Paradise Birmingham development under Local Plan scenario would achieve around £1.2 million in associated health benefits. Phases 2 and 3 of the Federated Hermes plans enhanced related health benefits to £1.7 million and £2.2 million respectively, just shy of the ideal scenario.

Figure 5: Value of health impacts of access to open spaces and active travel - all scenarios compared (£'million)

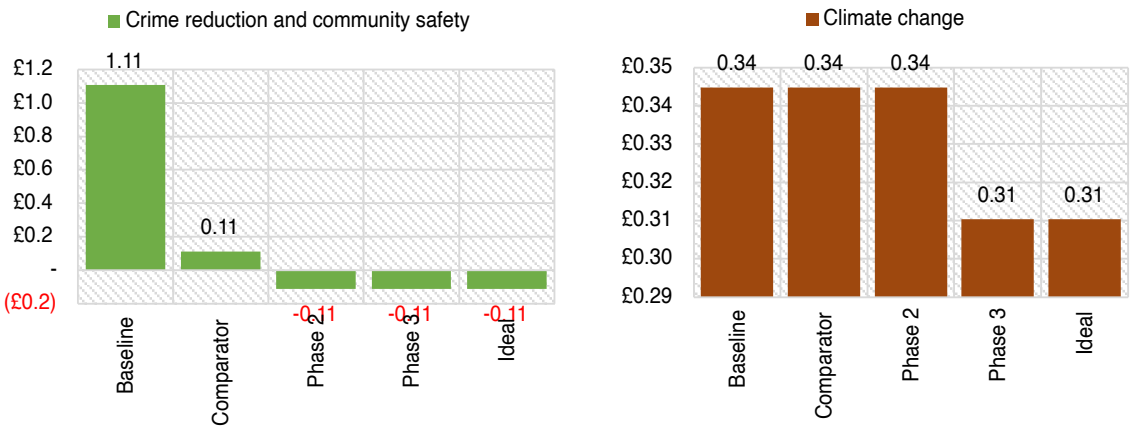


Value of health impacts of crime reduction and climate change concerns

Both the baseline and Local Plan scenarios had health costs associated with crime, and climate change concerns to residents within the site boundary. At completion of Phase 2, the development generated net health benefits valued at around £110,000, being the level achievable under Phase 3 and ideal scenarios (Figure 6 below). The health cost related to climate change being the same level at completion of Phase 2 as under baseline and Local plan scenarios would marginally be reduced from £340,000 to £310,000 in Phase 3 remaining the same under the ideal scenario. Paradise Birmingham development under Local Plan scenario would achieve around £1.2 million in associated health benefits. Phases 2 and 3 of the Federated Hermes plans enhanced related health benefits to £1.7 million and £2.2 million respectively, just shy of the ideal scenario.

The site delivered £270,000 in health benefits associated with access to healthy food at baseline conditions, the same being the expected value under all scenarios. Despite these health benefits, the site is prone to £22 million in health costs related to air quality, which could be reduced only to £18 million in the ideal (Table 5 above). The health implication is, therefore, that though there seems to be a net health benefit over the baseline conditions, health costs to residents within the site boundary remain significantly high at £12 million by Phase 3 of the development of Paradise Birmingham. The intervention on air quality, noise and neighbourhood amenities is, however, outside the scope of the site development.

Figure 6: Value of health impacts of crime reduction and climate change concerns - all scenarios compared (£'million)



Value of health impacts - all scenarios compared

Considering what is within its scope, the development of Paradise Birmingham, overall, delivers health benefits to residents within the boundary to the tune of about £4.3 million at Phase 2 and is enhanced to just under £10 million at Phase 3 completion though there is scope to double the benefits under ideal conditions.

Net value of changes to health all scenarios compared to baseline

As shown in Table 6 below, the health impact of Paradise Birmingham development on residents within the site boundary primarily comes through its contribution to the enhancement of health benefits associated with active travel and crime reduction under Local Plans. The site development's focus on delivering social value in Phase 3 is demonstrated generating health benefits through access to open space, and climate change estimated at nearly £5 million and £30,000 respectively.

Table 6: Net value of changes to health compared to baseline (£ million)

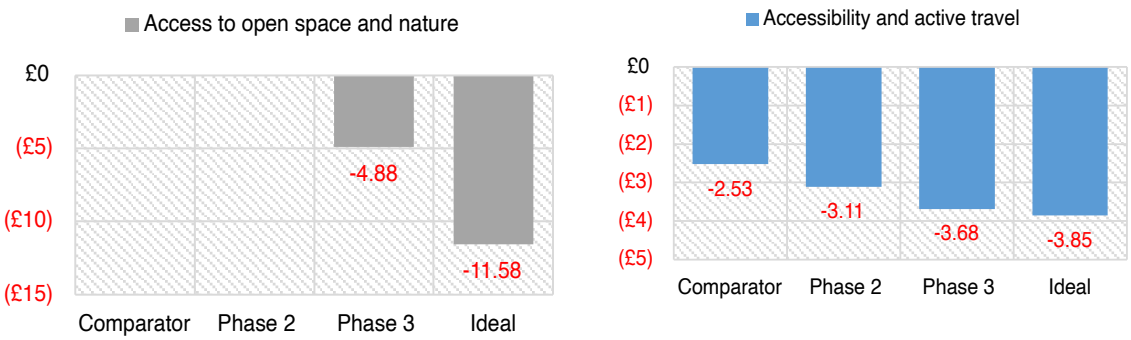
Environmental Category	Comparator	Phase 2	Phase 3	Ideal
Access to open space and nature	0.00	0.00	-4.88	-11.58
Air quality, noise and neighbourhood amenity	0.00	0.00	0.00	-3.69
Accessibility and active travel	-2.53	-3.11	-3.68	-3.85
Crime reduction and community safety	-1.00	-1.22	-1.22	-1.22
Access to healthy food	0.00	0.00	0.00	0.00
Climate change	0.00	0.00	-0.03	-0.03
TOTAL	-3.52	-4.33	-9.82	-20.38
NPV of TOTAL	**-2.90**	**-3.56**	**-8.09**	**-16.77**

Benefits estimated over 25 years, population 550 residents within site boundary
Values in £2024 Million, NPV (Net present value of health changes) adjusted for 1.5% discount rate

Net value of changes to health – access to open space, and active travel compared to baseline within Boundary

Access to open spaces, and active travel provide additional health benefits over the baseline at Phase 2 and 3, with scope for further enhancement (Figure 7 below). £4.9 million in net health benefits associated with access to open spaces achieved at Phase 3 of the development is largely an outcome of the development objective to focus on delivering social value at that stage of development through enhanced public realm. Active travel related health savings, too, increase from £3.1 million in Phase 2 to under £3.7 million by completion of Phase 3 compared to £2.5 million expected under the Local Plan scenario.

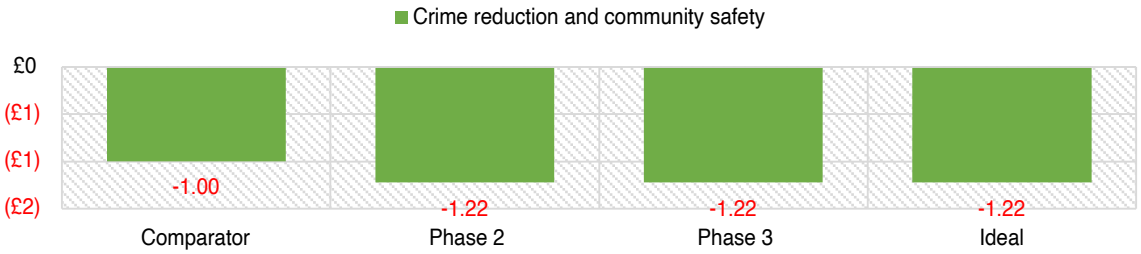
Figure 7: Net value of changes to health – access to open space, and active travel compared to baseline within Boundary (£' million)



Net value of changes to health – crime reduction compared to baseline within Boundary

The development of Paradise maximised the health benefits related to reduction in crime and community safety concerns at the completion of Phase 2 (Figure 8 below) delivering to residents within the site boundary an additional £220,000 in health savings over the Comparator.

Figure 8: Net value of changes to health – crime reduction compared to baseline within Boundary (£' million)



In these respects, the development of Paradise Birmingham delivers beyond Local Plans delivering combined net present values of £3.6 million at Phase 2 and £8.1 million at Phase 3 in net health benefits to residents withing the site boundary compared to £2.9 million under Local Plans.

3.3 Residents living within 300 metres of the site boundary

For this cohort of people, estimated to be around 5,000, it is harder to assume that they are affected by changes in conditions at the Paradise site, as Paradise reflects only part of the land within the area of influence. For example, although there is currently no access to green space within the Paradise boundary, there are small areas of green space within 300m of the site boundary, such as City Centre Gardens and around Birmingham Cathedral. The overall extent of the influence of Paradise on health may therefore be limited and could be context specific. Therefore, we assume, as a conservative measure, that the largest impacts will be on residents' walking environment, and perceptions of crime. This is because in 2016, the baseline year, condition of the Paradise site and poor permeability of the site could have impacted on residents' mental health and their decisions whether to be active. Paradise is assumed to be a primary walking route and a link between communities living around the area and the amenities of the city centre. We model for health effects for this cohort, therefore with the same assumptions on exposure relating to fear of crime and walkability as applied to residents within this boundary.

Table 7: Baseline impacts and future scenarios compared - Residents within 300m of site boundary (£ million)

Environmental Category	Baseline	Comparator	Phase 2	Phase 3	Ideal
Access to open space and nature	0.00	0.00	0.00	0.00	0.00
Air quality, noise and neighbourhood amenity	0.00	0.00	0.00	0.00	0.00
Accessibility and active travel	0.00	-10.53	-15.80	-21.07	-21.07
Crime reduction and community safety	10.23	1.17	-0.87	-0.87	-0.87
Access to healthy food	0.00	0.00	0.00	0.00	0.00
Climate change	0.00	0.00	0.00	0.00	0.00
TOTAL	10.23	-9.36	-16.67	-21.94	-21.94
NPV of TOTAL	**8.42**	**-7.70**	**-13.72**	**-18.06**	**-18.06**

Benefits estimated over 25 years, population 5,000 within 300m of site boundary
Values in £2024 Million, NPV (Net present value of health changes) adjusted for 1.5% discount rate

Results indicate that in the baseline, the cost of poor conditions at Paradise could be around £8.4 million in increased health costs (Table 7 above). These are mitigated largely in the Comparator scenario, where we anticipate the value of health savings could be £16.12 million, compared to the baseline.

Active travel and Crime reduction compared to Baseline within 300m Boundary

Local plan target £10.5 million in health benefits related to accessibility and active travel to residents within 300 metres of the site boundary (Figure 9 below). Federated Hermes delivers enhanced benefits to an estimated £15.8 million at Phase 2 and maximised to £21 million by the completion of Phase 3. Furthermore, while Local Plans reduce health costs associated with crime and community safety concerns from £10 million at baseline to £1.2 million, Paradise development overturns the health costs and delivers a maximised £870,000 worth of health savings at Phase 2.

Figure 9: Baseline impacts and future scenarios – Active travel and Crime reduction compared within 300m of Boundary (£' million)

Net value of changes to health compared to baseline within 300m of Boundary

For Phase 3 of the Federated Hermes proposals, which go further than the comparator, the net total value of health benefits would be £26.5 million, compared to the baseline. However, given uncertainties on the level of influence which Paradise has over this cohort's experience of walkability and fear of crime, a more conservative estimate could be used, such as the low end of the range for this estimation (Table 8).

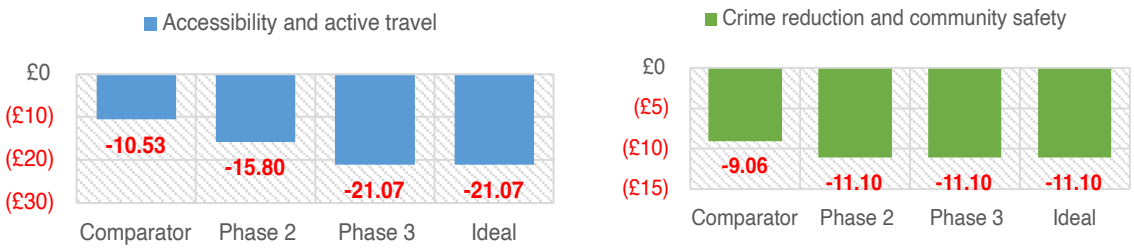
Table 8: Net value of changes to health compared to baseline within 300m of Boundary (£' million)

Environmental Category	Comparator	Phase 2	Phase 3	Ideal
Access to open space and nature	0.00	0.00	0.00	0.00
Air quality, noise and neighbourhood amenity	0.00	0.00	0.00	0.00
Accessibility and active travel	-10.53	-15.80	-21.07	-21.07
Crime reduction and community safety	-9.06	-11.10	-11.10	-11.10
Access to healthy food	0.00	0.00	0.00	0.00
Climate change	0.00	0.00	0.00	0.00
TOTAL	-19.59	-26.90	-32.17	-32.17
NPV of TOTAL	**-16.12**	**-22.14**	**-26.48**	**-26.48**

Benefits estimated over 25 years, population 5,000 within 300m of site boundary
Values in £2024 Million, NPV (Net present value of health changes) adjusted for 1.5% discount rate

In a similar pattern to that for residents on site, net health benefits associated with active travel to residents within 300 metres of the site boundary are enhanced to £15.8 million at Phase 2 and maximised to £21 million at Phase 3 in comparison with the Local Plan target of £10.5 million (Figure 10 below). The development also maximises the net health benefits related to crime reduction at Phase 2 to an estimated £11 million compared to £9 million under Local plan scenario.

Figure 10: Net Value of health impacts – Active travel and Crime reduction compared for each scenario Residents within 300m of site boundary (£'million)



We have not modelled for the effect of introducing new green space for this cohort. The amount of space (0.3 Ha.) is relatively small, so it is not clear if this addition would materially change overall provision of green space or the NDVI index for the area in line with the thresholds for change given in our base studies. Further sensitivity analysis could explore the benefit of the new green space, as a proportion of all green space in influence.

3.4 Non-resident users of the Paradise site

Modelling for this cohort has been a challenge given a lack of data on the health benefits to non-resident populations which could be associated with environmental changes, as well as how to determine the number of regular (rather than one-off or occasional) users of the site. It could be assumed that changes to conditions on site might influence health for some users, but this would be highly uncertain given other influences, such as the conditions at home, or throughout the normal route to work or leisure.

As a conservative estimate, we assume that some health benefits may accrue to those individuals who regularly commute to the site and therefore experience the environmental conditions there daily. There may be some overlap with those living within 300m. For this exercise, we limit results only to those effects which might influence individuals' choices around activity. Given that we estimate around 10,000 people may regularly commute to the site, we estimate that around 28% (2,800) of these are currently inactive. The value of moving these individuals from inactive to active could be £13,174 per individual per year. Modelling for just one change, the effect of improved walkability conditions planned in Phase 3 on adult walking for transport, suggests the value of this element could be £10.4 million over 25 years (NPV £8.6 million), by encouraging around 34 new active people per

year (Table 9 below). This pathway is determined by a study which explored both aesthetic and safety factors influencing walkability ratings which influence a decision to be active (Pikora et al., 2006). However, given the significant uncertainties related to estimating this, this value should be approached with caution. Observing regular commuters on their travel habits and conditions at their residence could provide greater certainty.

Table 9: NPV of attributable changes to health under each scenario and net change from baseline (Rounded to £m)

Population	N	Baseline	Comparator	Phase 2	Phase 3	Ideal
Commuters	10,000	-	-4.30	-6.45	-8.60	-8.60

Benefits estimated over 25 years
Negative values indicate reductions in health costs, positive values indicate potential additional health costs
Values in £2024 Million, NPV (Net present value of health changes) adjusted for 1.5% discount rate

Source: Adobe Stock (Juando González)

4.0 **Discussion**

4.1 Sensitivity and Uncertainties

There are considerable uncertainties within the modelling – changes to health and valuation of these changes are both uncertain in the underlying literature. The range of values therefore can be very large: see Table 3 above and Figure 1 above for estimates of ranges in the baseline values.

The HAUS model assumes that health outcomes from changes to the environment may be equivalent to those observed in published medical studies. However, although impact-pathways have been selected to be as robust as possible for transfer, actual changes to health may be different as the environmental and social context may differ from the original study. HAUS is not an epidemiological model, but instead tries to quantify the value of expected changes to health. However, the site obviously will have other implications for quality of life in the area, including employment opportunities, changes to transport links, and effects on the historic built environment. These impacts cannot be monetised using HAUS.

Paradise Birmingham, prior to its redevelopment, was characterised by poor permeability due to narrow routes and unsafe underpasses. The masterplan aimed at increasing public use and connectivity through the revitalisation of under-used parts of the city. Phases 1 and 2 of Paradise (Scenario 3), which delivered office, retail, residential and hotel accommodation contributed to £25.7 million and £6.45 million in health benefits residents (within 300 metres of, and external to boundary) and commuters respectively over a 25-year period. This represents 1.35 times and 1.5 times excess over the local plan's targets of £19 million and £4.3 million respectively. Regarding health benefits as a result of accessibility and active travel, the site delivered £3.1 million to residents within 300 metres of the boundary, and £15.8 million to residents external to the boundary representing 1.23 times and 1.5 times achievement over the Local Plan targets of £2.53 million and £10.53 million respectively. Health benefits to commuters in this respect could not be monetised due to lack of data.

Phase 3 (Scenario 4) currently under development including additional office and retail space concentrates on socio-economic impact by delivering a new public realm and improvements to connectivity. On completion of Phase 3, Paradise would deliver £34.56 million and £8.6 million, totalling to £43 million, in cumulative health benefits over 25 years to residents and commuters respectively representing 1.82 times and 2.0 times achievement over Local Plans. With respect to active travel, there would be £3.68 million and £21.07 million of health benefits to residents within 300 metres and external to the boundary representing 1.46 times and 2.0 times excess over Local Plans respectively.

Overall, Paradise delivers £6.4 million at Phase 2 and £8.66 million at Phase 3 in additional health benefits to residents within 300 metres of, and external to the site boundary, and £2.15 million at both phases to commuters. The cumulative health savings of £25.7 million at Phase 2 and £34.56 million at Phase 3 indicate that Federated Hermes delivers 35% and 82% percent respectively above Local Plans in health benefits associated with its development of Paradise Birmingham largely driven by accessibility and active travel, improved walkability and security. Though health benefits to commuters associated with active travel could not be monetised, cumulative overall health benefits are estimated to be £6.45 million and £8.6 million through improved walkability and security at Phase 2 and 3 representing 50% and 100% respectively over the Local Plans (See Appendix 5).

Air pollution remains a significant hazard to health in all scenarios in this study, except the ideal scenario. Assumptions are derived from the assessment in the Environmental Impact Assessment on expected changes to air quality levels, and assume that any changes to NO2 are not large enough to reach threshold levels for changes to health outcomes. Even in the ideal scenario, the Paradise site may not have the scope to make a material change to air pollution levels for residents outside the site boundary. However, modelling is based on the assumption that there is no increase in air pollution from the site itself, even as the buildings come back into active use. It should be noted that the travel assessment does indicate a small increase in vehicle movements on site.

One major part of the story of Paradise is the significant changes to transport infrastructure, including the downgrade of the main road, and the extension of the Metro tram line. We have considered some aspects of this, such as lower traffic volumes and permeability improvements. However, as noted above, these interventions may have significant health benefits for people travelling through the area. We have not measured these effects in detail here, but further research would be able to explore these. In particular, further data on regular users of routes through the site would enable us to estimate health benefits in more detail.

The expected value of overall health benefits to residents external to boundary at Phases 2 and 3 exceed those anticipated in the Local Plan by 37% and 64% respectively, maximised at the completion of Phase 3.

4.2 Additionality and scope of influence

Our modelling takes into account differences in certainty around exposure for cohorts of people, depending on where they live. However, as noted above, particularly for cohorts outside the site boundary and non-resident users, there are uncertainties about the level of influence which the site has in relation to all other environmental factors.

Modelling also assumes that conditions outside the site are static. However, there are several large regeneration or redevelopment schemes planned for the city centre, which are also likely to affect residents living nearby (Birmingham Development Plan, 2017).

The extent to which changes to health may be additional to others occurring in the area without the redevelopment, may affect the overall value of the Paradise scheme. This should be taken into consideration when applying the values estimated here for any future decision making. As a conservative estimate, the bottom of the range may be used as the most robust indication of the minimum value of health changes.

Conclusion

The redevelopment of the Paradise site is expected to have a transformational effect on the health of those living and working in the area. Before work began in 2016, the current poor condition of the buildings on site, barriers to permeability and poor perceptions of safety within the site constituted significant risks to health, in addition to underlying risks such as air and noise pollution locally.

Redevelopment ambitions for the site set out in the Birmingham Development Plan may have brought around £19 million of benefit to residents and a further £4.3 million at least to commuters over 25 years, by mitigating or eliminating existing hazards and encouraging people to be active. There may also be additional benefits to the large number of pedestrians and cyclists who move through the area regularly, although we have not monetised these benefits due to a lack of data on this group.

The plans set out by Federated Hermes up to the end of Phase 2 achieve or exceed all of the expected benefits in the Birmingham Development Plan, bringing an estimated £9 million in additional benefits through additional walkability and security features. This brings the total expected benefit of the proposals to around £32 million, representing an improvement of around 38% in averted health costs, compared to changes under the Local Plan scenario.

Phase 3 brings further health benefits, especially through the addition of a new green space in an area with almost no provision now. This could bring a further £11 million, on top of the benefits realised in Phase 2. The total value of the scheme at Phase 3 could be estimated at £43 million, representing an improvement of around 85% in averted health costs, compared to changes under the Local Plan scenario.

Our ideal scenario indicates that there are more improvements which could be made to the conditions at Paradise. These include greener spaces, interventions to mitigate the effects of air and noise pollution, and the removal or downgrade of main roads in the area. However, these are outside the current scope of the Paradise project, and we are unable to comment on the viability or feasibility of these interventions.

Modelling of this kind includes significant uncertainties. A particular challenge here was understanding levels of exposure in different populations and estimating the magnitude of impacts of environmental changes given limited information on those populations. A further study would be able to explore in more detail these uncertainties, and perhaps model other effects not considered here.

Contributors

We thank and acknowledge the support of the Federated Hermes team for their invaluable input, feedback and support during the development of alternative scenarios and in the data collection task for this case study.

Disclaimer

This health impact modelling has only been able to monetise some benefits of the proposals to some users of the area, but it may be that these proposals will improve conditions for a much wider group of people within the city of Birmingham.

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Appendix 1: Pollutant Concentration µg/m³

Grid square	Nitrogen Oxides (NO_x)	Nitrogen Dioxide (NO_2)	Particulate Matter (PM_{10})
405500, 287500	76.9	40.3	20.8
406500, 286500	83.3	42.7	21.5
406500, 287500	90.0	44.7	22.9
Birmingham	**90.0**	**44.7**	

Source: Drivers Jonas Deloitte, 2012

Appendix 2: Minimum Noise Levels at site (db)

Noise Type	Sensitive Receptor Location	Daytime	Evening	Night
Ambient LAeq		66 - 72		58 - 61
LA90				50 - 55
	Baskerville House	70	-	-
	Cambrian Hall	70	58	50
	Congreve Passage	65	-	-
	Latham House	72	59	55
	Queens College Chambers	67	59	53
	Summer Row	66	58	51
	Town Hall	67	61	-
	UCB	59	-	-

Source: Drivers Jonas Deloitte, 2012

Appendix 3: Expected Change in NO_2 Annual Mean Concentrations

Receptor	Change (µg/m³)	Relative Change	Impact Descriptor
A (Centenary Square)	0.4	Small Increase	Slight Adverse
B (Proposed Hotel)	-5.0	Large Decrease	Substantial Beneficial
C (Chamberlain Square)	-1.5	Small Decrease	Slight Beneficial
D (Latham House)	-4.4	Large Decrease	Substantial Beneficial
E (Cambrian House)	-0.1	Imperceptible Decrease	Negligible
F (College of Food)	-3.8	Medium Decrease	Moderate Beneficial
G (John Smith House)	-0.2	Imperceptible Decrease	Negligible
H (Summer Hill Street)	0.1	Imperceptible Increase	Negligible

Source: (Drivers Jonas Deloitte, 2012)

Appendix 4: Expected Change in PM_{10} Annual Mean Concentrations

Receptor	Change (µg/m³)	Relative Change	Impact Descriptor
A (Centenary Square)	0.1	Imperceptible Increase	Negligible
B (Proposed Hotel)	-1.1	Small Decrease	Negligible
C (Chamberlain Square)	-0.3	Imperceptible Decrease	Negligible
D (Latham House)	-1.0	Small Decrease	Negligible
E (Cambrian House)	0.0	No Change	Negligible
F (College of Food)	-0.9	Small Decrease	Negligible
G (John Smith House)	-0.1	Imperceptible Decrease	Negligible
H (Summer Hill Street)	0.0	No Change	Negligible

Source: (Drivers Jonas Deloitte, 2012)

Appendix 5: Net value of changes to health compared to baseline

Within Boundary	Net Value over Baseline				Multiple over Local Plans (Comparator)			
Environmental Category	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**
Access to open space and nature	0.00	0.00	-4.88	-11.58	-	-	-4.88*	-11.58*
Air quality, noise and neighbourhood amenity	0.00	0.00	0.00	-3.69	-	-	-	-3.69*
Accessibility and active travel	-2.53	-3.11	-3.68	-3.85	1.00	1.23	1.46	1.52
Crime reduction and community safety	-1.00	-1.22	-1.22	-1.22	1.00	1.23	1.23	1.23
Access to healthy food	0.00	0.00	0.00	0.00	-	-	-	-
Climate change	0.00	0.00	-0.03	-0.03	-	-	-0.03*	-0.03*
TOTAL	**-3.52**	**-4.33**	**-9.82**	**-20.38**	**1.00**	**1.23**	**2.79**	**5.79**
NPV of TOTAL	**-2.90**	**-3.56**	**-8.09**	**-16.77**	**1.00**	**1.23**	**2.79**	**5.79**

External to Boundary	Net Value over Baseline				Multiple over Local Plans (Comparator)			
Environmental Category	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**
Access to open space and nature	0.00	0.00	0.00	0.00	-	-	-	-
Air quality, noise and neighbourhood amenity	0.00	0.00	0.00	0.00	-	-	-	-
Accessibility and active travel	-10.53	-15.80	-21.07	-21.07	1.00	1.50	2.00	2.00
Crime reduction and community safety	-9.06	-11.10	-11.10	-11.10	1.00	1.23	1.23	1.23
Access to healthy food	0.00	0.00	0.00	0.00	-	-	-	-
Climate change	0.00	0.00	0.00	0.00	-	-	-	-
TOTAL	**-19.59**	**-26.90**	**-32.17**	**-32.17**	**1.00**	**1.37**	**1.64**	**1.64**
NPV of TOTAL	**-16.12**	**-22.14**	**-26.48**	**-26.48**	**1.00**	**1.37**	**1.64**	**1.64**

	Net Value over Baseline				Multiple over Local Plans (Comparator)			
Population	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**
Within Site Boundary (550)	-2.90	-3.56	-8.09	-16.77	1.00	1.23	2.79	5.79
External to site boundary (5000)	-16.12	-22.14	-26.48	-26.48	1.00	1.37	1.64	1.64
Commuters (10000)	-4.30	-6.45	-8.60	-8.60	1.00	1.50	2.00	2.00

	Net Value over Baseline				Multiple over Local Plans (Comparator)			
Population	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**	**Comparator**	**Phase 2**	**Phase 3**	**Ideal**
Within + External to site boundary (5500)	-69.37	-124.70	-17.38	-17.38	1.00	1.80	0.25	0.25

where 1 is Comparator Base Multiple * £m NV since base value is 0


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