# Exploring the co-benefits of urban green infrastructure improvements for businesses and workers wellbeing

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# Abstract

Explorations of the benefits for businesses in terms of customer experience or improvements in staff wellbeing from installing and retro-fitting green infrastructure (GI) in a European city context has been lacking.

This paper reports on a two year longitudinal mixed methods study in a district of central London evaluating the changes resulting from the installation of a mixture of greening schemes for different types of business sectors and their staff members.

Business managers, particularly from retail and leisure sectors, perceived increases in customer footfall and sales in relation to the improvements.

Providing accessible green space in office settings led to improvements in morale, team interaction and workplace satisfaction amongst staff members able to access the improvements.

Increased GI was seen as improving uptake of company environmental policies such as energy saving or recycling amongst staff by their managers.

Impacts of neighbourhood GI schemes on staff wellbeing were mixed with increased greening leading to improved self-reported workplace happiness and greater interaction with nature spaces but not changes in overall measurements of staff wellbeing.

Overall the findings indicate that GI could represent a worthwhile investment for UK and European businesses through these combinations of direct and indirect returns adding to the known environmental benefits improving urban green spaces can provide.

# Introduction

The major policy drivers for installing green infrastructure (GI) have been their direct and indirect environmental benefits including reduced flooding and improved water quality (Liu *et al.* 2014); air quality gains (Litschke and Kuttler 2008; Nowak 2006); urban heat islands reductions; enhanced biodiversity; and increased CO2 absorption (Center for Neighborhood Technology 2010). Investment in these environmental benefits have been promoted as providing economic savings through reduced flood frequency and impact; lower infrastructure requirements; and reduced energy demand (e.g. for cooling) (Center for Neighborhood Technology 2010; European Commission DG Environment News Alert Service 2012).

However, what has been less well considered is whether there is a business rationale for public realm and premises improvements incorporating more Green Infrastructure (GI) into our cities. Do such urban enhancements bring commercial returns including wellbeing improvement for staff in addition to environmental gains (Natural England 2009)?

This paper seeks to answer these key questions by drawing on the findings from a longitudinal evaluation of the business and well-being impacts of small scale GI improvements undertaken in the Victoria Business Improvement District (BID) in London. The evaluation sought to assess whether there were any identifiable direct economic returns for businesses. Secondly, it hoped to determine whether there were any improvements in workers wellbeing from the psychological restorative effects of greening (Berto 2005; Kjellgren and Buhrkall 2010; Loder 2014).

Our assessment focused on a defined set of small space GI installations within the existing inner city fabric and central business district. These GI installations resulted primarily from a special initiative by the Victoria BID to introduce more greening into the local area as a means of enhancing the public realm and addressing environmental issues of concern such as surface water flooding. We included publically accessible or visible green walls, green roofs, street trees and micro-parks together with schemes only accessible to business staff, as well as micro-greening such as planters and hanging baskets.

# Green infrastructure: business and well-being benefits

Natural England’s definition of GI includes established and new green spaces intermixed within the built environment. These green spaces should occur across a range of scales and include areas accessible to local communities (Natural England 2009; Naumann *et al.* 2011).

For businesses, published assessments have concentrated upon four key areas of benefits from incorporating greenery into premises: Firstly, GI has been promoted to developers as a means of reducing development costs and increasing schemes’ planning and public approval (Werner 2001). GI integration into new buildings can help with the marketing of premises, and encourage inward investment (Penny 2009; United States Environmental Protection Agency, 2014). Secondly, the increase in property value or rental income that can be achieved by adding vegetation has been highlighted to landlords (Clements *et al*. 2013; Werner 2001). The potential for neighbourhood regeneration and price uplift has also been considered (Landscape Institute 2011). Thirdly, for retailers, benefits from increased sense of place and consumer footfall have been stressed (Joye *et al*. 2010; Werner 2001; Wolf 2006; 2013). US consumers, for example, have shown preferences for shopping in more heavily tree planted cityscapes (Werner 2001; Wolf 2005). Finally, the potential psychological benefits for workers of greener working environments have been promoted as contributing to higher quality staff recruitment and retention alongside greater workplace productivity (Natural Economy Northwest 2010; Natural England 2009) thus suggesting that there may also be well-being benefits. Despite these possible investment returns the reluctance of businesses to integrate vegetation into commercial districts has been a hindrance to the expansion of GI (Joye et al. 2010). This may be due to a lack of European specific case studies or the sparsity of robust evidence underpinning the business benefits (Sunderland 2012b; Sunderland 2012a).

Our study concentrated on evaluating wellbeing changes as these captured a more comprehensive response to nature in commercial settings. Although a contested concept (Dodge *et a*l. 2012; Spence *et al*. 2011) wellbeing has been described by the UK Office of National Statistics (ONS) as being … *“about ‘how we are doing’ as individuals, communities and as a nation and how sustainable this is for the future”* (conference presentation 2014). Wellbeing can be split into three domains captured in the time series data collected by the UK ONS (Spence *et al*. 2011; Office for National Statistics 2011):

1. Evaluative (or life satisfaction)
2. Hedonic (feelings of happiness, sadness etc.)
3. Eudemonic (sense of purpose and meaning of life)

(The New Economics Foundation 2012a)

Wellbeing has been taken up by policymakers as a means of overcoming deficits in other metrics such as GDP which have been characterised as measuring everything *short* of what makes life worthwhile (Michaelson *et al*. 2009).

Access to green space has been associated with a number of aspects of wellbeing (Annerstedt and Währborg, 2011; Kjellgren and Buhrkall 2010). Green environments have been characterised as having therapeutic properties that can restore health and wellbeing (Rose 2012). Recent evidence indicates that mixed and more naturally vegetated spaces have greater restorative potential than highly managed planting (Loder 2014; Seresinhe *et al*. 2015). For example in residential areas GI has been advocated as a means of improving the psychological conditions for urban residents (Krekel *et al*. 2016). UK guidance also suggests that GI may help alleviate stress amongst city residents (Natural England 2009). Access to communal greenery has been promoted for community cohesion (Falk and Carley 2012; National Housing Federation 2011). Green space has been championed as building a sense of place (Landscape Institute 2011). Mature trees around housing have been shown to reduce urban crime rates (Donovan and Prestemon 2010; Troy *et al* 2012; Wolfe and Mennis 2012). However in complex inner cities physical infrastructure may impede benefits from greenery by reducing their aesthetic impacts (Seresinhe *et al.* 2015). The indirect benefits of GI have also been considered with increases in staff physical activity associated with health care savings ((Vandermeulen *et al.* 2011) ).

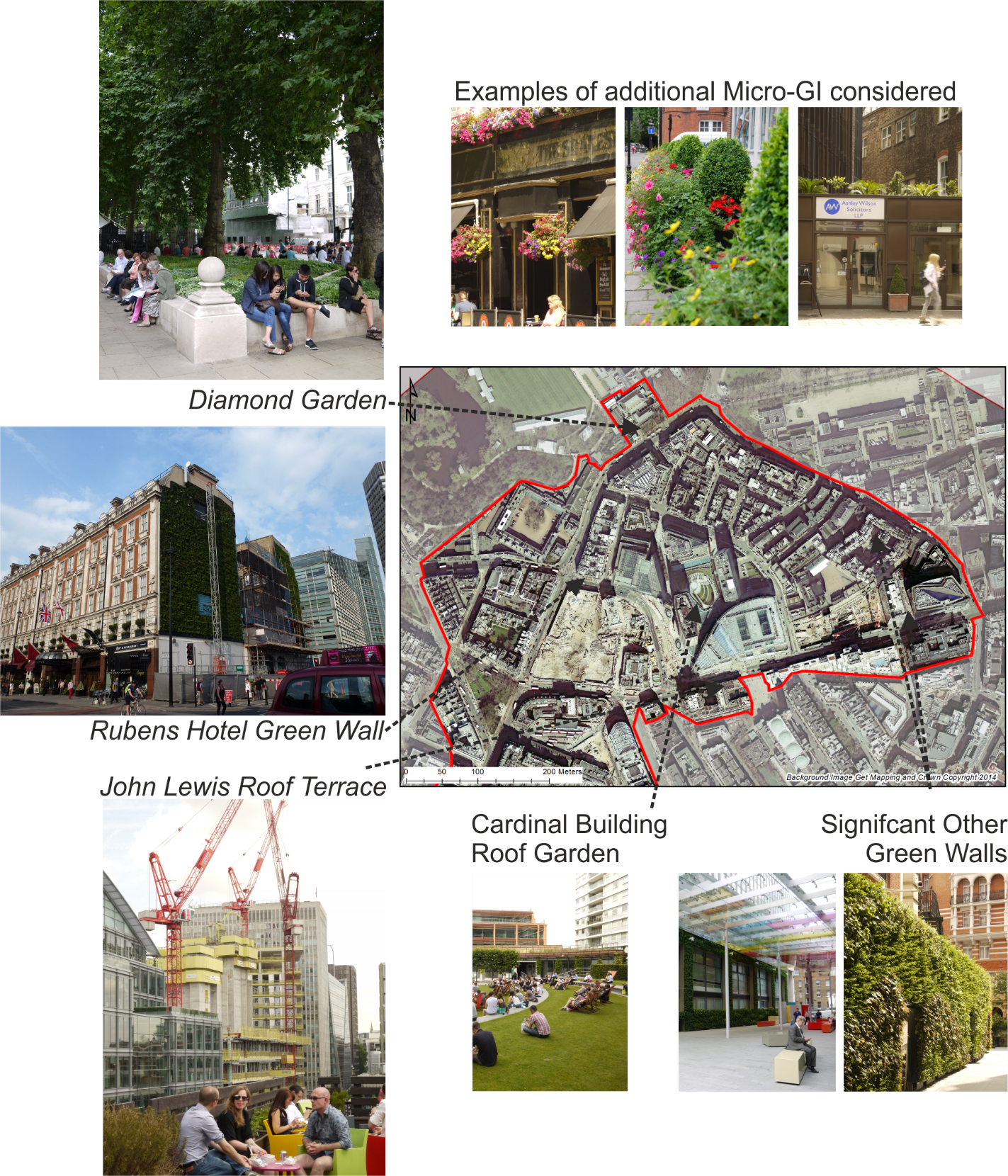
Existing evidence therefore suggests that there are commercial benefits to be had from incorporating more GI in the urban environment. There is also an emerging body of knowledge which highlights the individual and community well-being benefits that GI may encourage. The key contribution of this study is to bring these two strands together by exploring how GI may contribute to both business and employee well-being benefits and how these factors are linked. Furthermore this study is relatively novel in adopting a longitudinal approach and measuring well-being pre and post intervention in a European urban setting.

# Methods

Victoria is one of London's busiest transport hubs with a main rail terminus, bus and underground stations. Approximately 350,000 passengers pass through the district each working day (Land Use Consultants and Green Roof Consultancy 2010). The area is home to a number of government departments, property companies and retail stores. The dense urban infrastructure and poor drainage has led to regular flooding, prompting the local Business Improvement District (BID) to develop a programme of green infrastructure development.

BIDs are organisations funded by a levy on local businesses and tasked with delivering activities relevant to business interests (Shared Intelligence and Association of Town and City Management 2013). The location and extent of the Victoria BID’s operations can be seen in figure 1.

Prior to the start of the evaluation in spring 2012 the BID had completed an audit of potential locations for GI (Land Use Consultants and Green Roof Consultancy 2010) and this led to the programme of greening covered by this study. In 2012 the only significant GI scheme in the BID area was the publically accessible roof garden on the Victoria Street Cardinal Place shopping centre. During the two year period of the evaluation the location and nature of GI schemes evolved to include: a significant number of new green walls (some installed with BID support but some independently); new street trees (33 in total); a public garden; and portable pop-up parks. The new static GI initiatives can be seen in figure 1. In addition greening with planters and hanging baskets also became more prevalent.

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***Figure 1: Victoria BID GI schemes locations (including the three cases studies evaluated – (italicised text) and types of green infrastructure evaluated across the study area.***

Mixed methods were used to assess the impact of the increasing GI: Two online surveys of workers wellbeing and workers pro-environmental behaviour as well as semi-structured interviews with business managers were undertaken at the baseline stage in 2012 (Q1 and 2) and at the follow-up stage in 2014 (Q1 and 2). In addition detailed case studies for three of the schemes initiated by Victoria BID were undertaken in 2014.

The surveys were incentivised through a £150 shopping vouchers prize draw and participation promoted at project events, via leaflets, newsletters, social media and via direct emails from the BID to businesses in the area. Due to the rapidly changing nature of the workforce recruiting a representative panel of respondents for both survey points was not feasible and the study had to rely on a convenience sampling method as a result. The baseline and follow-up survey participants therefore represented independent and different sized samples of the local working population. Individual workers were free to participate in both surveys although the degree of participant overlap was not captured as it was not required for our analysis.

The ‘Victoria Workers Wellbeing Survey’ was based upon New Economics Foundation indicators (The New Economics Foundation 2011; 2012a; b) which incorporate the three dimension of wellbeing and have been applied in multiple NEF case studies (Abdallah et al 2008; Hiscock et al 2016)). It included two questions linked to wellbeing at work; two on resilience and self-esteem; two questions identifying supportive relationships; two questions on emotional wellbeing; three linked trust and belonging; and three identifying positive functioning. Three of these mapped directly onto the Office of National Statistics census questions allowing comparison. Sixty-nine people from 20 businesses participated in the 2012 baseline survey and 86 people from 21 businesses in the follow-up 2014 survey.

The survey of ‘Workers Pro-Environmental Behaviour’ was designed to measure employees’ environmental awareness, pro-environmental behaviour, shopping patterns and views on Victoria’s green spaces. Likert scale questions allowed people to self-rate their actions. The 2012 baseline survey was completed by 153 respondents and the 2014 survey by 140.

Interviews with managers (or suitable representatives) from a diverse selection of businesses (in terms of size and sector) (see table 1 below) were designed to capture business views on the BID’s environmental initiatives in addition to perceptions of GI’s impact on customer footfall and sales, staff recruitment and retention, staff wellbeing and business image. A total of 60 business interviews were held (28 in 2012 and 32 in 2014 of which 16 were repeat interviews).

The evaluation assessed changes in survey responses and opinions of key stakeholders between the baseline stage in 2012 and the follow-up stage in 2014. The gender profiles of respondents was similar for both dates (within 5%) with a slight increase (10%) in the proportion of younger people (16 to 40 years) undertaking the survey in 2014. The online surveys were analysed for longitudinal changes with Mann-Witney U tests used to determine differences in population responses across the time-series.

|  |  |  |
| --- | --- | --- |
|  | **Number of Interviews** | |
| **Business Type** | **2012** | **2014** |
| Independent small or micro business | 12 | 9 |
| Social enterprise | 0 | 1 |
| Branch stores or franchises | 11 | 14 |
| Large corporate enterprises and partnerships | 5 | 7 |
| **Total** | **28** | **32** |

***Table 1. Number and type of businesses represented in interview data***

Three schemes (highlighted on figure 1 and listed in table 2) representing a cross-section of types and scale of GI were investigated in detail as case studies.

|  |  |  |
| --- | --- | --- |
| **Case** | **Nature of GI development** | **Number of interviews** |
| Diamond Garden (beside Buckingham Palace) | Redevelopment of an existing small green space | 3 |
| Roof terrace at John Lewis’s Head Office | Retrofitted small space developed specifically for office workers use | 17 |
| Green wall on the Rubens at the Palace Hotel | Green wall; the biggest GI initiative in Victoria and the largest green wall in London. | 3 |

***Table 2. Number of interviews for each case studies***

The case studies were evaluated through semi-structured interviews with business managers, GI developers and installers, BID staff and office workers. For the roof-terrace development, perceived benefits were identified through in situ semi-structured interviews with fifteen staff members during summer 2014.

The business and case study interview recordings were transcribed and analysed using a mixture of themes identified for the interview checklists and others that emerged during the course of the interviews. These were further analysed using a grounded theory approach (Strauss and Corbin 1990) to extract the key themes.

# Results

## 4.1 GI and perceived business benefits

Key themes that emerged from the interview data were as follows.

Attracting customers/novelty: The 2012 baseline interviews revealed a considerable degree of scepticism from businesses regarding the perceived business benefits of GI. However following the installation of the GI schemes attitudes began to change and by the time the 2014 follow-up interviews it was apparent that managers were more aware of the link between GI and retail sales. Retail businesses observed that improvements attracted more customers and enhanced visitors experience, “…the more green space the better as then people stay in the area longer” (property developer). This was particularly the case for those organisations located adjacent to major GI schemes such as the Rubens wall. The wall encouraged visitors to stop and take pictures, lingering longer nearby, increasing the likelihood that they would visit shops and cafes. “The wall looks nice... They see it from far away and follow the road around and come closer - brings them nearer to our shop” (retail outlet). Similarly, businesses in the Cardinal Place centre reported increased customer numbers during the summer as people utilised the green roof.

The Rubens hotel business rationale for undertaking the green wall scheme was to improve the building and wider neighbourhood aesthetics. The manager described this as providing a ‘soft business enhancement’ rather than a direct impact on turnover. However, the hotel was maximising the direct benefits by serving green wall themed afternoon teas and cocktails. Feedback from guests indicated that they appreciated the wall and saw it as landmark to locate the hotel, perhaps encouraging repeat custom.

The views of Cardinal Place businesses were more nuanced (reflecting the increased longevity of the 2006 roof terrace scheme) with perceived benefits varying seasonally and dependent upon business type and location. Cafes and restaurants benefited from increased customers in the summer as people brought food to eat out on the green roof, while the florist thought that GI made people more aware of natural products and this encouraged them to buy flowers and plants. Conversely, a jeweller in the building felt that the green space took business away in the summer as people preferred the roof garden to shopping.

*Improved business image/reinforcing business’s pro environmental policies:* Non-retail operations saw the key benefits of GI as enhancing company image and that of the local area as well as reinforcing business environmental policies. The local estate agent felt that GI increases would have a positive impact on house prices, whilst other businesses indicated that more greenery provided an attractive contrast to the ongoing building developments in the area.

GI improvements made to premises were also felt to benefit staff and thus promote a positive image of the company as a caring employer. The John Lewis roof garden for example, was designed primarily for the benefit of its 3,000 staff. The Head of Facilities for John Lewis, who was also a member of the BID board, felt that even schemes that might be minimal in terms of actual change (small scale tree planting, green walls etc.) had the potential to improve workers’ enjoyment of the area, but more importantly helped educate people on links to wider environmental concerns. The staff also made connections to these company goals and the need for greening in relation to offsetting carbon footprints and improving air quality. This was supported by the Rubens Manager who felt the green wall and associated direct environmental benefits (energy and water saving) were acting as a constant positive reminder to staff of the company’s environmental policies. This was resulting in direct business benefits by encouraging best practices, for example, staff remembering to switch off air conditioners located in vacated rooms.

However attitudes towards the impact of GI on staff recruitment showed little change between the 2012 and 2014 survey periods. Businesses interviewed acknowledged that people like to work in more attractive places and that interviewees would take note of the environment and this might be a factor in their decision to accept job offers. However, it was felt that those looking for work would be more interested in direct employment benefits.

## 4.2 Link between green space and wellbeing at work

The relatively low number of responses for the workers’ wellbeing surveys (2012 n=69; 2014 n=86) and inability to survey the same respondents across the 2 year time span meant that proving statistically significant differences was generally not possible (at p .05). The results presented below provide an indication of trends rather than robust evidence of change.

For employees, having green spaces nearby the workplace was valued by 87% of respondents (summing top two classes from Q1) (see table 3). There was a 16% increase in those rating it ‘very important’ between 2012 to 2014, indicating its increasing relevance to staff.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q1. “Thinking of where you work, how important is it to have parks, commons or other green spaces nearly?”** | 5 – Not at all important | 4 | 3 | 2 | 1 – Very Important |
| **2012** | 1% | 7% | 4% | 45% | 41% |
| **2014** | 2% | 3% | 7% | 30% | 57% |
| **Q2. “Do you feel happier working in an environment with more greenspaces”** |  |  |  |  |  |
| **2012** | 0% | 1% | 10% | 32% | 54% |
| **2014** | 0% | 1% | 13% | 19% | 67% |

***Table 3. Change in importance of green spaces in working environments to employees***

The use of this green space appeared to increase between 2012 and 2014. The majority (72%) of workers surveyed in 2014 visited green space near to their work once or more per week. This was an increase of 5% from 2012 (significant at p=0.1).

The surveys also revealed a self-reported link between green-spaces in and around the workplace and happiness (see table 3). At both survey dates a total of 86% of participants felt that having workplace green spaces made them feel happier (summing top 2 classes from Q2 responses), increasing by 13% between the two survey dates (p=0.05).

Responses to the question “How do the improvements make you feel about the area?” provided an insight into the connection between GI and workers’ wellbeing. Comments covered a range of considerations that link to wellbeing (particularly Hedonic but also Eudemonic) including:

* **Environmental -** “*Much better environment to work in”.*
* **Aesthetic -** *“Makes an otherwise urban environment appear more appealing”*
* **Emotional wellbeing –** *“Makes you feel good, happier, less stressed”. “Great antidote to the hustle and bustle of working in a busy and congested area”.*
* **Environmental Awareness –** *“Makes you think more about the environment”*

Business managers interviewed at both time points also acknowledged the contribution of accessible and visible GI to staff wellbeing, with one business highlighting the importance of the Rubens wall since *“…if you don’t have time to go to the park – the park can come to you”.*

The case studies illustrated how GI initiatives might also act to boost staff morale and motivation. The manager at the Rubens believed staff had benefitted directly from the excitement from installing the wall giving them pride in the organisation. The staff at John Lewis felt that roof terrace enhanced their individual wellbeing, morale and the perception it gave that the organisation valued them. The employees identified additional co-benefits from improved opportunities to interact with colleagues (including across teams) in a relaxed setting and the importance of private greenspace away from other users (especially tourists). Similarly the Diamond Garden was used by the staff from the Palace during their breaks, who welcomed the area of calm and beauty it provided in an otherwise heavily trafficked thoroughfare.

Despite these positive reflections the online survey indicated a decline in reported wellbeing (see table 4 and 5). This decline was marginal as reflected in the difference in the summed wellbeing scores and has not been tested for any statistical significance of difference. A number of intervening variables may have contributed to this decline as discussed below.

Individual questions from Satisfying Life, Emotional Wellbeing and Resilience & Self Esteem components equate to questions in the national wellbeing datatsets. Comparing the Victoria data to national ONS information for London for equivalent dates (see table 5 below), the participants from Victoria score marginally higher in two comparable aspects of wellbeing (‘Happiness’ and ‘Life Satisfaction’) but significantly lower for the assessment of ‘Worthwhile Life’. This difference in worthwhile-ness possibly reflects people responding based specifically on their workplace feelings rather than their life overall which is the information emerging from the ONS data (Office for National Statistics 2014).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Satisfying Life | Vitality | Positive Functioning | Trust and Belonging | Emotional Wellbeing | Supportive Relationships | Resilience & Self Esteem | Wellbeing @ Work | SUM |
| **2014** | 6.9 | 6.9 | 7.3 | 6.8 | 7.1 | 7.7 | 4.8 | 5.8 | 53.4 |
| **2012** | 7.0 | 7.1 | 7.4 | 6.9 | 7.6 | 7.7 | 5.1 | 6.1 | 54.9 |

***Table 4. Wellbeing dimension scores for the two survey dates (on a scale of 0 to 10, where 0 is “not at all” and 10 is “completely”)***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | ONS 2011/12 | ONS 2012/13 | Change in ONS Scores | Victoria  2012 | Victoria  2014 | Change  In Victoria Scores |
| Life Satisfaction | 7.26 | 7.25 | -0.01 | 7.55 | 7.49 | -0.06 |
| Worthwhile Life | 7.56 | 7.51 | -0.04 | 5.03 | 4.88 | -0.15 |
| Happiness | 7.21 | 7.19 | -0.02 | 7.84 | 7.53 | -0.31 |

***Table 5: Comparison of changes in wellbeing scores (on a scale of 0 to 10, where 0 is “not at all” and 10 is “completely”) between Victoria Workers Wellbeing Survey results and Office of National Statistics (ONS) Wellbeing Survey data for London***

# Discussion

Proving direct causal links between small changes in infrastructure and shifts in customer footfall, workers’ attitudes, behaviour and wellbeing is clearly problematic. In terms of attributing causality (Hill 1965) the ‘experiment’ evaluated here was neither contained nor controlled. A number of confounding factors could account for any of the changes in wellbeing, behaviour or business performance including the underlying state of the economy. Whilst acknowledging this, the findings do provide some indication of a link between GI and business performance.

Victoria businesses increasingly recognised the value of GI in terms of attracting customers and maximising spending. The perceived benefits varied by business type and proximity to the GI. Retailers able to make associations between their products and natural environments, or those in the hotel or leisure industry where GI can make their premises distinct or appealing particularly valued GI. In Victoria, hotel businesses have since unilaterally invested in green walls without the BIDs intervention further indicating a recognition in this sector of economic benefits from these investments.

Co-benefits included contributing to corporate social responsibility goals and increased staff environmental awareness. Providing attractive greened working environments also improved staff morale and could provide higher-quality and motivational workplaces increasing staff wellbeing. The John Lewis case study, for example, demonstrated that businesses can benefit from quite modest but well planned and promoted GI improvements. The small rooftop terrace led to increased interaction between the organisation teams; allowed workers to socialise; and provided overspill meeting space.

Despite these qualitative benefits the survey-based wellbeing measures declined. This could be interpreted as showing no beneficial link between GI and workers wellbeing. However there are alternative interpretations. Since the baseline there was a significant increase in the number of construction projects being undertaken in the area. The most major included an 897K square feet scheme opposite the station; refurbishment of Victoria Street buildings; and a major underground upgrade linked to London’s £14.8Bn Cross Rail initiative. Their impact was commented upon across all the surveys and engagement activities where workers highlighted how the GI improvements were relatively minor compared to these major developments. With this level of disruption the drop in workers wellbeing could have been significantly greater than that measured in our surveys. GI improvements may therefore have been acting as positive counterbalance or alternatively, there may be a time lag between schemes and impacts on workplace wellbeing not captured in our repeat survey.

# Conclusion

Evidence from this study suggests significant perceived co-benefits amongst businesses in relation to GI (beyond the environmental) – and awareness of these increasing as more GI was installed with proximity conferring the greatest impacts. The findings link to those hypothesised in the literature but add value in terms of European specific evidence and longitudinal data. Furthermore whilst arguments of the psychological benefits from green space has been made before, this is one of the few studies to demonstrate a specific linkage to business benefits.

With the global growth in urban populations (Cox et al. 2017) and consequent concentration of workplace settings in cities, improving access to greenspace in urban settings is increasingly important for improving the equity of access to natural settings. Evidence indicates that access to green or blue spaces is influenced by wealth (Sander & Zhao 2015). This paper highlights the role that businesses could play in contributing to a global agenda for more equitable access to greenspaces (World Health Organization (WHO) 2016). Greening workplaces could enable employees to access nature based experiences that may not be present in their residential setting.

This papers study suggests that GI represents a worthwhile business investment beyond purely environmental gains. Financial benefits include increased customer footfall and shoppers staying longer. For workers GI may contribute to increases in morale, lead to feeling more respected by their employer, and overall being happier in their workplace. This study highlights that, whilst challenging to isolate in the ‘wicked’ (Brunswicker et al. 2017) environments of cities, more research attempting to quantify the relationships between home and workplace environmental conditions and mental wellbeing are needed. Such studies should focus upon more robustly disentangling the contribution business investment in green infrastructure could have on employee – but also customer or visitor – wellbeing and how this links to their overall health, productivity and consumption habits. Increasing the evidence base for business could deliver improved city planning guidance for our rapidly urbanizing global societies (Kleinert & Horton 2016). Critically, such targeted evidence could also leverage private sector investment in urban improvements by convincing businesses (for their own direct and indirect benefits) to install green infrastructure thereby helping to enhance equitable access to more natural settings in city environments delivering wellbeing benefits for a greater cross-section of urban residents and workers.

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