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The Case for Good Design:
Workplaces

<A guide for government>

"We cannot afford not to invest in good design. Good design is not just about the aesthetic improvement of our environment, it is as much about improved quality of life, equality of opportunity and economic growth."

Sir Stuart Lipton

Project: South East Water Headquarters
Architect: BVN
Landscape Architects: TCL
Photographer: Diana Snape

This is an extract of one chapter from the OVGA publication 'The Case for Good Design'.

Executive summary

"A great building must begin with the unmeasurable, must go through measurable means when it is being designed and in the end must be unmeasurable."

Louis Kahn, Architect 1901-74

Our everyday lives are touched by the places that surround us. The qualities of these places – our buildings, streets and parks – informs our interactions, understandings, wellbeing and memories. A review of research exploring healthcare, education, workplaces, housing, justice, urban design and transport projects demonstrates that good design enables people, places and the environment to thrive.

WHAT IS GOOD DESIGN?
'What is good design? It's a seemingly simple question that's surprisingly difficult to answer. The more you think about it, the more complex the question becomes. Not only does "good design" mean different things to different people, it also changes at different times and in different contexts.'[1]

Good design comes in many forms and is defined by much more than how something looks. It refines the purpose and aspiration of a project, improves how it works, creates additional benefits and elevates how people feel and behave in the final outcome. Good design creates inspiring places and greater, lasting financial value. And of course, good design also looks and feels good.

MEASURING THE IMPACT OF DESIGN
There is extensive academic and scientific research that explores the benefits of well-designed places, and the effect of poor design on our lives. This research demonstrates that good design has far-reaching benefits, such as supporting health and wellbeing, improving environmental quality and improving productivity. As links between design and neuroscience, health and human behaviour continue to emerge, it is important that this evidence-base informs decision making about the shape, nature and function of our cities, buildings and landscapes.

MAKING THE CASE

It has been demonstrated that 'Good design does not cost more when measured across the lifetime of the building or place.'[2] Investments in the design of our built environment have a lasting legacy on their place and the people who visit. Yet design is often considered a superficial afterthought.

Good design may cost more in the short term, but this investment is generally paid off over the lifetime of the building or place. Construction costs are typically 2–3 per cent of the whole-life costs, while operating costs are estimated to be 85 per cent. In comparison, design costs are small, between 0.3–0.5 per cent, yet they can significantly affect the function of a project across its lifespan, and the operating costs associated with this.[3]

The research demonstrates a host of benefits of good design, including:

well-designed hospitals help patients heal faster, support staff performance, recruitment and retention, and reduce operating costs

well-designed schools improve student performance, and support staff performance, recruitment and retention

well-designed police stations, courts and prisons help foster fairness and reduce recidivism in our justice system

well-designed workplaces support productivity

well-designed housing creates a greater sense of community and reduces ongoing costs

well-designed urban spaces improve wellbeing and social connectedness

well-designed transport systems boost productivity, reduce congestion and pollution

This report is an overview of the research on the impact of the design of our surroundings. It is hoped that the findings generate conversations about the importance of embedding design quality in every stage of a project's lifecycle and inform decision-making about our built environment. It may also encourage others to share the evidence they have uncovered and influence researchers to investigate gaps.

Supported by this evolving evidence, quality design is at the heart of a successful place – it is not an optional extra. Quality design ensures a positive legacy to become the heritage of the future.

Workplaces

We spend an enormous amount of our time in workplaces. Evidence shows that good design can contribute to a more productive workplace for employers and a better experience for those of us who work in them. Good design brings different building and functional elements together to make a cohesive environment. It does not mean just doing one thing well, such as using quality materials or ergonomic furniture, but rather it is about getting everything right, from the fundamentals to the finishes.

The design of workplaces affects staff wellbeing, health and performance. Given that staff costs typically account for 90 per cent of business operating costs, improvements in staff productivity, including reducing absenteeism, retaining staff, as well as fostering staff creativity can contribute to significant financial savings.[121]

Research demonstrates that key elements of good design can improve workplaces in terms of staff performance, and those of a building more widely – in terms of energy use and financial return. Studies have investigated how a range of design attributes, including natural and artificial light levels, air quality, thermal comfort, layout, access to nature, views, colour, and noise, affect staff engagement, performance, productivity and satisfaction.[122] Researchers have also investigated the effect of sustainable buildings on productivity and health.

MEASURING GOOD DESIGN

The impact of design can be measured using a range of business metrics including staff absenteeism, staff turnover, revenue, as well as complaints. Perceptions of workplaces can also provide a measure of the impact of good design, including attitudes to health, wellbeing, and productivity. The environmental conditions of workplaces such as temperature, air quality and light levels can be measured to assess the impact on health and wellbeing of staff.[123]

CREATING THE BUSINESS CASE

Businesses want engaged staff who take fewer days off. Increased business performance is one of the key benefits of good design in workplaces – it increases staff productivity and reduces absenteeism, which is a major cost to business. Staff turnover can also be reduced through well-designed workplaces – there is an enormous cost in training and getting staff familiar with any organisation's systems and ways of working. One study has shown that better-designed work environments reduce staff turnover from 25 per cent to 11 per cent.[124]

Good and sustainable design saves money. Research into green buildings demonstrates well-designed sustainable buildings have lower long-term operating costs.[125] Research shows that better-designed sustainable offices have higher rental returns and asset values,[126] as the market factors in the financial benefits of these improved performance buildings. Making better-designed workplaces works for all parties – workers, employers and building owners – who all see increases in either the quality of their experience while at work, or in greater financial return.

As with many building types, bad design comes at a cost. For workplaces, this can be a very direct financial cost, as staff wellbeing is directly linked with performance and attendance. Larger corporations, in particular, have led innovation in redefining the workplace, as their internal research has demonstrated the benefits of better designed spaces.

Project: Barwon Water Headquarters
Architect: GHD Woodhead
Photographer: Trevor Mein

STAFF TURNOVER REDUCED

from 25% to 11% through better designed workplaces.[127]

GREEN BUILDINGS 'OUTPERFORM' CONVENTIONAL BUILDINGS.

Benefits of good design

There is strong evidence that good design of workplace facilities offers many benefits, including:

increased productivity

attracting and retaining staff

reduced absenteeism

improved health

improved sustainability

reduced whole-of-life cost

improved organisational outcomes.

Increased light
IMPROVES PRODUCTIVITY 20%. [128]

Increased daylight
REDUCES ABSENTEEISM BY 15%. [129]

Impact of good design – key findings

SUSTAINABILITY

Much of the research and analysis on green buildings focuses on workplaces, particularly office buildings. Organisations have studied the benefits of green buildings, and found that good design reduces not only long-term energy use, but also all the costs a building generates over time. These studies make the strong argument that good design costs a tiny percentage of the eventual cost of a facility and its operations. An investment in good design now saves money in better staff productivity over the long term – and on-going staffing costs can be massive compared with one-off building costs.

LIGHT

Access to good levels of light increases performance. Higher illuminance levels are associated with an increase in productivity of up to 20 per cent.[130] Studies show that daylight in the workplace is associated with a 15 per cent reduction in absenteeism.[131] Good light cannot be easily retrofitted, so getting daylight into workspaces should be considered when a building is being designed.

ACOUSTICS

Good acoustics are critical in workplaces, particularly in open-plan environments. Good design strategies can mediate noise, along with the selection of suitable materials and furniture. Data suggests that some noise is useful, but too much can reduce performance.[132] Ensuring the right level of noise in a workplace is a balancing act, and this is backed up by several studies. Too much noise can be distracting, while some 'buzz' can help a work environment.[133] Noise can be generated by other workers, but also by mechanical systems such as ventilation, particularly in the highly and centrally serviced building types that are common for office buildings. One study showed that eliminating low-frequency noise from the ventilation system increased performance by 8 per cent.[134] The use of absorbing surfaces in workplaces can help mute distracting sounds – but overdoing it can close people off too much from each other. Good design can help satisfy what appear to be opposing needs by balancing different elements.

Air quality

Good air quality can increase productivity by a remarkable 20 per cent.[136] The problem is that the quality of air suffered greatly with the advent of building-wide heating and cooling systems in the mid-20th century, and this is still the default way of doing things. This actively prevents users from controlling, and 'owning' their direct environment. Newer, smarter systems have improved this situation, but often these are still technology-led solutions that workers have no control over, or involvement with. A new office workplace building with openable windows is a rarity, unfortunately – and despite its simplicity, this is actually hard to do well. The concept of personal control over environment is paramount, even if this is perceptual.[137]

Project: Medibank Place
Architect: Hassell
Photographer: Earl Carter

GOOD AIR QUALITY INCREASES PRODUCTIVITY 20%.[135]

Interaction

Bringing people together needs to be done in a way that encourages interaction. It is suggested that 80 per cent of the most valuable interactions are informal, such as meeting in the hallway or kitchen.[138]

At a direct level, we also need to be relatively close to each other – if we are more than 50 metres away from co-workers, we tend to interact with them less,[139] so proximity and 'connectedness' is a spatial idea as much as it is a digital one.

Design for physical activity

Providing secure bicycle parking and showers has a positive effect on workers' decisions to cycle to work.[141] The location and design of stairs and corridors can also encourage physical activity as well as social interaction.

STAIRS ARE MORE LIKELY TO BE USED

when visible from the building entrance.[140]

Furniture and layout

There is emerging evidence that layout can influence the extent of sedentary behaviour, which is a health risk. A study found that office workers who had greater visibility of their co-workers and connectivity with other parts of the building, including between floors, took more frequent breaks from sitting.[142]

SOUTH EAST WATER

Architect: BVN
Landscape Architect: Taylor Cullity Lethlean
Year: 2015
Cost: $70 million

By bringing together 700 staff previously dispersed across three locations, South East Water's purpose-built headquarters is anticipated to generate $20 million in operational savings to the organisation.[143] The consolidation of the separate offices at Frankston helped to reduce floor space by 20 per cent. South East Water recognised the role of workplace location and experience as a targeted way to attract talent to the organisation.[144] A generous verandah wraps along the ground level of the building with cafes and retail premises activating the Kananook Creek. A terraced landscape beside the waterway, with public seating, fig trees and grassed areas, contributes to the public realm, creating a revitalised place for people to walk and sit.

Project: South East Water Headquarters
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Sustainability

The building has revitalised a prime site in Frankston's CBD, which was previously occupied by a council owned car park, alongside the Kananook Creek and a short walk from Frankston Station and the beach. The project included the rejuvenation of the foreshore along the Creek, with an improved public promenade, landscaping and activation. Surveys of staff before and after the move highlights the impact of the design, with 85 per cent of employees feeling the new building provides a connection between work and the outdoor environment, compared with 32 per cent in the old buildings.[145]

The project achieved 5 Star Green Star Office Design. Rainwater is captured, stored and used for flushing toilets and irrigating the site's gardens. The main internal staircase, visible through windows on the western façade, connects the different floors, and shares views of the Bay with all staff, encouraging them to use the stairs. The configuration of the internal spaces enables potential flexibility to adapt to changing needs over time.

Light and views

Windows along the western side of the building provide views of Port Phillip Bay and bring natural light into the building. Small breakout spaces and meeting rooms are located adjacent to the windows, with those on the western side featuring timber panelling to help block the summer sun. A series of cascading atriums create a sense of openness and the ability to see others working in other parts of the building.

Interaction and collaboration

The integration of different aspects of the business into one location has enabled greater collaboration between teams.[146] The building features open-plan offices, with a diversity of meeting rooms and generous kitchens, intended to encourage interaction and collaboration. The rooftop terrace features furniture and barbeques, which offer a space for staff events and relaxation.

Project: South East Water Headquarters
Architect: BVN
Landscape Architects: TCL
Photographer: John Gollings

References

1   Rawsthorn A 2009, 'Defining good or bad design', The New York Times, 31 January, <https://dealbook.nytimes.com/2009/01/31/defining-good-or-bad-design/>.
2   Commission for Architecture and the Built Environment 2002, The value of good design, CABE, London.
3   National Audit Office 2004, Getting value for money from construction projects through design.
4   MUF Architecture cited in Commission for Architecture and the Built Environment 2003, Radical improvements in hospital design: healthy hospitals campaign report, CABE, London.
5   Ulrich RS, Zimring C, Joseph A, Quan X and Choudhary R 2004, The role of the physical environment in the hospital of the 21st century: a once-in-a-lifetime opportunity, Center for Health Design, Concord CA.
6   Ibid.; Sadler BL, Leonard BL, Guenther R, Hamilton DK, Hessler FA, Merrit C and Parker D 2011, 'Fable Hospital 2.0: the business case for building better health care facilities', Good health care by design, vol. 41, no. 1, pp. 13–23; Ulrich RS, Zimring C, Zhu X, DuBose J, Seo HB, Choi YS, Quan X and Joseph A 2008, 'A review of the research literature on evidence-based healthcare design,' Health Environments Research and Design Journal, vol. 1, no. 3.
7   Ulrich RS et al. 2004, op. cit.; Sadler BL et al. 2011, op. cit.
8   CAB/ICM 2003, 'Attitudes towards hospitals', cited in CABE, Buildings and spaces: why design matters and CABE, Radical improvements in hospital design.
9   Ulrich RS et al. 2004, op. cit.
10 Sadler BL et al. 2011, op. cit.
11 Ulrich RS et al. 2004, op. cit.
12 Sadler BL et al. 2011, op. cit.
13 Ibid.
14 Lawson B, Phiri M and Wells-Thorpe J 2003, 'The architectural healthcare environment and its effects on patient health outcomes: a report on an NHS Estates Funded Research Project'. Note: This research did not identify or quantify specific design variables; Lawson B 2002, 'Healing architecture', The Architectural Review, vol. 211, no. 1261, p. 72–75.
15 Ibid.
16 Lawson B, Phiri M and Wells-Thorpe J 2003, op. cit.
17 Ibid.
18 Ampt A et al. 2007, 'A comparison of self-reported and observational work sampling techniques for measuring time in nursing tasks', Journal of Health Services Research and Policy, vol. 12, no. 1, pp. 18–24; Joseph A 2006, 'The role of the physical and social environment in promoting health, safety and effectiveness in healthcare workplace', issue paper no. 3, Centre for Health Design.
19 PricewaterhouseCoopers with the University of Sheffield and Queen Margaret University College Edinburgh 2004, The role of hospital design in the recruitment, retention and performance of NHS nurses in England.
20 Ibid.
21 Burgio L, Engel A, Hawkins K, McCorick and Scheve A 1990, 'A descriptive analysis of nursing staff behaviors in a teaching nursing home: differences among NAs, LPNs and RNs', The Gerontologist, vol. 30, pp. 107–12, cited in Joseph A 2006, op. cit.
22 Ulrich RS et al. 2004, op. cit.
23 Ibid.
24 Ibid.
25 Ulrich RS 1984, 'View through a window may influence recovery from surgery', Science, New Series, vol. 224, no. 4647, pp. 420–21.
26 Ulrich RS et al. 2004, op. cit.
27 Ulrich RS 1984, op. cit.
28 Ibid.
29 Cooper-Marcus C and Barnes M 1995, Gardens in healthcare facilities: uses, therapeutic benefits, and design recommendations, Center for Health Design, Martinez, CA.
30 Whitehouse S, Varni JW, Seid M, Cooper-Marcus C, Ensberg MJ, Jacobs JR et al. 2001, 'Evaluating a children's hospital garden environment: utilization and consumer satisfaction', Journal of Environmental Psychology, vol. 21, no. 3, pp. 301–14.
31 Cooper-Marcus C and Barnes M 1995, op. cit.
32 Beauchemin K and Hays P 1996, 'Sunny hospital rooms expedite recovery from severe and refractory depressions', Journal of Affective Disorders, vol. 40, pp. 49–51; Beauchemin K and Hays P 1998, 'Dying in the dark: sunshine, gender and outcomes in myocardial infarction', Journal of the Royal Society of Medicine, vol. 91, pp. 352–54.
33 Beauchemin K and Hays P 1996, op. cit.
34 Walch JM et al. 2005, 'The effect of sunlight on postoperative analgesic medication use: a prospective study of patients undergoing spinal surgery', Psychosomatic Medicine, vol. 67, no. 1, pp. 156–63.
35 Ibid.
36 Ulrich RS et al. 2004, op. cit.
37 Ibid.
38 Ibid.
39 Teltsch DY et al. 2011, 'Infection acquisition following intensive care unit room privatization', Arc Intern Med, vol. 171, no. 1.
40 Yamaguchi Y 2015, 'Better healing from better hospital design', Harvard Business Review, 5 October, <https://hbr.org/2015/10/better-healing-from-better-hospital-design>.

41 Ibid.
42 Ibid.
43 Ibid.
44 Ibid.
45 Ulrich RS et al. 2004, op. cit.
46 Guenther R and Vittori G 2013, Sustainable healthcare architecture, John Wiley and Sons, New Jersey.
47 Ibid.
48 Ibid.
49 Ibid.
50 Ibid.
51 Ibid.
52 Ibid.
53 Ibid.
54 Ibid.
55 Bates Smart nd, 'The Royal Children's Hospital Architecture', <https://www.batessmart.com/bates-smart/projects/sectors/health/the-new-royal-childrens-hospital-architecture/>.
56 Ibid.
57 Guenther R and Vittori G 2013, op. cit.
58 Ibid.
59 Ibid.
60 Ibid.
61 Ibid.
62 Ibid.
63 Barrett P et al. 2013. 'A holistic, multi-level analysis identifying the impact of classroom design on pupils' learning', Building and Environment, vol. 59, pp. 685–7.
64 Ibid.; Barrett P et al. 2015a, Clever classrooms: summary report of the HEAD Project, University of Salford, <http://www.salford.ac.uk/cleverclassrooms/1503-Salford-Uni-Report-DIGITAL.pdf>; Barrett P et al. 2015b 'The impact of classroom design on pupils' learning: final results of a holistic, multi-level analysis', Building and Environment, vol. 89, p. 128.
65 Barrett P et al. 2013, op. cit.
66 Barrett P et al. 2015a, op. cit.; Barrett P et al. 2015b, op. cit.
67 Martin K et al. 2012, 'School and individual-level characteristics are associated with children's moderate to vigorous-intensity physical activity during school recess', Australian and New Zealand Journal of Public Health, vol. 36, no. 5, pp. 469–77.
68 Haug E et al. 2008, 'Physical environmental characteristics and individual interests as correlates of physical activity in Norwegian secondary schools: the health behaviour in school-aged children study', International Journal of Behavioural Nutrition and Physical Activity, vol. 5, p. 47.
69 Martin K et al. 2012, op. cit.
70 Ibid.
71 Haug E et al. 2008, op. cit.
72 Heschong Mahone Group 1999, Daylighting in schools: an investigation into the relationship between daylighting and human performance, Pacific Gas and Electric Company, on behalf of the California Board for Energy Efficiency Third Party Program.
73 Barrett P et al. 2015b, op. cit.
74 Heschong Mahone Group 1999, op. cit.
75 Ibid.
76 Ibid.
77 Barrett P et al. 2015a, op. cit.
78 Tezuka Architects 2017, 'Fuji Kindergarten', Moriyama RAIC International Prize, <http://moriyama.raic.org/sites/default/files/fuji_kindergarten.pdf>; Tezuka T 2014, 'The best kindergarten you've ever seen', TED, <https://www.ted.com/talks/takaharu_tezuka_the_best_kindergarten_you_ve_ever_seen/transcript>
79 Bronzaft A 1981, 'The effect of a noise abatement program on reading ability', Journal of Environmental Psychology, vol. 1, no. 3, p. 219.
80 Shield BM and Dockrell JE 2004, 'External and internal noise surveys of London primary schools', Journal of the Acoustical Society of America.
81 Heschong Mahone Group 1999, op cit.
82 Barrett P et al. 2015b, op. cit.
83 Heschong Mahone Group 1999, op cit.
84 Barrett P et al. 2015b, op. cit.
85 Ibid.
86 Ibid.
87 Castellucci HI, Arezes PM, Molenbroek JFM, de Bruin R and Viviani C 2016, 'The influence of school furniture on students' performance and physical responses: results of a systematic review', Ergonomics, DOI: 10.1080/00140139.2016.1170889.
88 Commission for Architecture and the Built Environment 2005, Design with distinction: the value of good building design in higher education, CABE, London
89 Commission for Architecture and the Built Environment 2005, op. cit.
90 Rudd P, Reed F and Smith P 2008, The effects of the school environment on young people's attitudes to education and learning, National Foundation for Educational Research.
91 Kwan-Lamar Blount-Hill 2017, 'Psychology of space: enhancing legitimacy through open, transparent, and inclusive facilities for police and the public', Police Chief Magazine.
92 Millie A 2012, 'Police stations, architecture and public reassurance', British Journal of Criminology, vol. 52, no. 6.

93 Missingham G et al. 2002, Architectural psychology and courts buildings, State Government of Western Australia, Perth.
94 Ibid.
95 Fairweather L 2000, 'Psychological effects of the prison environment', in Fairweather L and McConville S, Prison architecture: policy, design and experience, Architectural Press, New York.
96 James E 2013, 'Bastoy: the Norwegian prison that works', The Guardian, 4 September, <https://www.theguardian.com/society/2013/sep/04/bastoy-norwegian-prison-works>.
97 Armstrong S 2014, 'Scotland's newest prison is another nod to Scandinavia', The Conversation, 10 March.
98 McKimmie BM, Hays JM and Tait D 2016, 'Just spaces: does courtroom design affect how the defendant is perceived?' Psychiatry, Psychology and Law, vol. 23, no. 6, pp. 885–92.
99 Ibid.
100 Australian Institute of Criminology 2007, Practices, policies and procedures that influence juror satisfaction in Australia: report to the Criminology Research Council July 2007 (funded by CRC Grant C01/06-07), Research and Public Policy Series, no. 87.
101 Ibid.
102 Ibid.
103 Jewkes and Moran 2014, 'Bad design breeds violence in sterile megaprisons', The Conversation, 31 January.
104 Matter Architecture 2017, 'Wellbeing in prison design: a guide', <http://www.matterarchitecture.uk/wp-content/uploads/2018/01/421-op-02_MatterDesignGuide.pdf>.
106 Ibid.
107 Ibid.
108 Ibid.
109 Ibid.
110 Fairweather L 2000, op. cit. p. 42.
111 Ibid.
112 Matter Architecture 2017, op. cit.
113 Ibid.
114 Nadkarni N, Hasback PH, Thys T, Gaines Crockett E and Schnacker L 2017, 'Impacts of nature imagery on people in severely nature-deprived environments,' The Ecological Society of America: Frontiers in Ecology, vol. 15, no. 7, p. 395.
115 Matter Architecture 2017, op. cit.
116 Ibid.
117 Ibid.
118 Ibid.
119 Benko J 2015, 'The radical humaneness of Norway's Halden Prison', The New York Times, 26 March, <https://www.nytimes.com/2015/03/29/magazine/the-radical-humaneness-of-norways-halden-prison.html>.
120 Sentencing Advisory Council 2018, 'Released prisoners returning to prison', <https://www.sentencingcouncil.vic.gov.au/statistics/sentencing-statistics/released-prisoners-returning-to-prison>.
121 World Green Building Council 2014, Health, wellbeing and productivity in offices: the next chapter for green building, World Green Building Council 2014, London.
122 Heart Foundation 2018, 'Buildings', Healthy active by design website, <http://www.healthyactivebydesign.com.au/design-features/buildings>.
123 World Green Building Council 2014, op. cit.
124 Commission for Architecture and Built Environment and British Council for Offices 2005, The impact of office design on business performance, CABE, London.
125 'Green Building Council of Australia 2013, 'Green Star Performance Business Case,' <https://www.gbca.org.au/uploads/149/33685/Green_Star_Performance_Business_Case.pdf?_ga=2.75891920.432616039.1546228213-964595233.1546228213>.
126 Property Council of Australia 1999, The design dividend, PCA, Canberra; Eichholtz, Kok and Quigley 2013, 'Sustainability and the dynamics of green building', The Review of Economics and Statistics.
127 Commission for Architecture and Built Environment and British Council for Offices 2005, op. cit.
128 Oseland N 2001, 'To what extent does workplace design and management affect productivity?', <www.officeproductivity.co.uk>.
129 Thayer B 1995, 'Daylighting and Productivity at Lockheed', Solar Today, vol. 9, pp.26–29.
130 Oseland, N. 2001. 'To what extent does workplace design and management affect productivity?' www.officeproductivity.co.uk.
131 Thayer B 1995, 'Daylighting and Productivity at Lockheed', Solar Today, vol. 9, pp.26–29.
132 Commission for Architecture and Built Environment and British Council for Offices 2005, op. cit.
133 Ibid.
134 Ibid.
135 Ibid.
136 Ibid.
137 Leaman A and Bordass B 2000, 'Productivity in buildings: The 'killer' variables,' Building Research and Information.
138 Ward V and Holtham C 2000, 'The role of private and public spaces in knowledge management,' Presented at Knowledge Management: Concepts and Controversies Conference, 10-11 February, University of Warwick.
139 Commission for Architecture and Built Environment and British Council for Offices 2005, op. cit.

References

140 Nicoll G 2007, 'Spatial measures associated with stair use', Am J Health Promot, vol. 21, no. 4 (suppl), pp. 346–52.

141 Heart Foundation 2018, op. cit.

142 Ibid.

143 Archello nd, 'South East Water,' <https://archello.com/project/south-east-water>

144 Coster S 2017, 'South East Water,' Architecture Australia, vol. 106, no. 4, pp. 88–95.

145 Bleby M 2016, 'Filling Frankston: South East Water pumps innovation outside Melbourne,' Australian Financial Review, 23 August, <https://www.afr.com/real-estate/commercial/development/filling-frankston-south-east-water-pumps-innovation-outside-melbourne-20160815-gqsqm9>

146 Ibid.

147 Office of the United Nations High Commissioner for Human Rights nd, The right to adequate housing, fact sheet no. 1/rev 1, UN, Geneva.

148 OECD 2011, 'How's life? Measuring well-being', <http://www.oecdilibrary.org/docserver/download/3011061e.pdf>

149 Roys M, Davidson M, Nicol S, Ormandy D and Ambrose P 2010, The real cost of poor housing, BRE Trust report FB23, BRE Press, London.

150 Commission for Architecture and Built Environment 2010, Improving the quality of new housing: technical background paper, CABE, London.

151 Roys M et al. 2010, op. cit.

152 Nichol et al. 2015, 'The cost of poor housing to the NHS – Briefing paper', <https://www.bre.co.uk/filelibrary/pdf/87741-Cost-of-Poor-Housing-Briefing-Paper-v3.pdf>

153 Building Research Establishment 2011, The health costs of cold dwellings, client report ED 2792 commissioned by the Chartered Institute of Environmental Health, <https://www.foe.co.uk/sites/default/files/downloads/warm_homes_nhs_costs>

154 Brown MJ and Jacobs DE 2011, 'Residential light and risk for depression and falls: results from the LARES study of eight European cities', Public Health Rep. vol. 126, no. 1 (suppl), pp. 131–40.

155 Giles-Corti B, Kleeman A, Foster S 2015, Better apartments: what does the evidence tell us about the impact on health and wellbeing? The University of Melbourne, Melbourne.

156 Brown MJ and Jacobs DE 2011, op. cit.

157 Hobday R 2010, 'Designing houses for health: a review', cited in Giles-Corti B, Kleeman A, Foster S 2015, op. cit.

158 Ibid.

159 Kennedy R, Buys L et al. 2015, 'Residents' experiences of privacy and comfort in multi-storey apartment dwellings in subtropical Brisbane', Sustainability, vol. 7, no. 6, pp. 7441–61, cited in Giles-Corti B, Kleeman A, Foster S 2015, op. cit.

160 Roberts N 2015, 'Australian houses are just glorified tents in winter', The Age, 8 June, <https://www.theage.com.au/opinion/australian-houses-are-just-glorified-tents-in-winter-20150608-ghj2ox.html>.

161 Roys M et al. 2010, op. cit.

162 Roberts N 2015, op. cit.

163 Lloyd E, McCormack C, McKeever M, and Syme M 2008, 'The effect of improving the thermal quality of cold housing on blood pressure and general health: a research note', J Epidemiol Community Health, vol. 62, no. 9, pp.793–7.

164 Greenland J, Szokolay SV and Royal Australian Institute of Architects 1985, Passive solar design in Australia, RAIA Education Division, Red Hill, ACT.

165 Australian Government 2013, 'Passive design', Your home website, <http://www.yourhome.gov.au/passive-design>.

166 Department of Environment, Water, Heritage and the Arts 2007, Energy efficiency rating and house price in the ACT, Australian Government, Canberra.

167 Planet Ark 2011, Climbing Trees: Getting Aussie Kids Back Outdoors, <https://treeday.planetark.org/documents/doc-534-climbing-trees-research-report-2011-07-13-final.pdf>

168 Bourassa S, Hoesli M and Sun J 2004, 'What's in a view?' Environment and Planning A, vol. 36, pp. 1427–50.

169 Orban E, McDonald K, Sutcliffe R, Hoffman B, Fuks K, Dragano N, Viehmann A, Erbel K, Pundt N and Moebus S 2016, 'Residential road traffic noise and high depressive symptoms after five years of follow-up: results from the Heinz Nixdorf Recall Study', Environmental Health Per. Vol 124, no. 5, pp. 578-585.

170 European Commission 2015, 'Noise Impacts on Health', Science for Environment Policy, issue 47, <http://ec.europa.eu/environment/integration/research/newsalert/pdf/47si.pdf>

171 Orban E et al. 2016, op. cit.

172 Livable Housing Australia 2012, Livable Housing Design Guidelines.

173 Murray S 2008, rehousing, RMIT Publishing, Melbourne.

174 Casteel C and Peek-Asa C 2000, 'Effectiveness of Crime Prevention Through Environmental Design (CPTED) in Reducing Robberies', American Journal of Preventative Medicine, vol. 18, pp. 99-115.

175 Jacobs J 1961, The death and life of great American cities, Random House, New York, 1961

176 ComSec 2018, 'Australian home size hits 22-year low', Economic Insights, 16 November.

177 Balch O 2016, 'The Commons: could co-housing offer a different kind of great Australian dream', The Guardian, 31 October, <https://www.theguardian.com/sustainable-business/2016/oct/31/the-commons-could-co-housing-offer-a-different-kind-of-great-australian-dream>.

178 Ward M 2015, 'Better together: The Commons', ArchitectureAU, 23 March, <https://architectureau.com/articles/the-commons-1/>.

179 Balch O 2016, op. cit.

180 Places for People 2015, 'City of Melbourne', <https://gehlpeople.com/cases/melbourne-australia/>.

181 Ibid.

182 City of Melbourne 2014, Walking plan, City of Melbourne, Melbourne.

183 Commission for Architecture and the Built Environment 2001, The value of urban design, CABE, London.

184 Takano T, Nakamura K and Watanabe M 2002, 'Urban residential environments and senior citizens longevity in megacity areas: the importance of walkable green spaces', Journal of Epidemiology and Community Health, vol. 12, cited in Commission for Architecture and the Built Environment 2002, The value of public space, CABE, London.

185 Ibid.

186 Gehl J and Gemzøe L 1998, Public spaces, public life, The Royal Danish Academy, Copenhagen.

187 Giles-Corti B, Broomhall M, Knuiman M, Collins C, Douglas K, Ng K, Lange A, Donovan R 2005, 'Increasing walking: how important is distance to attractiveness and size of public open space?' American Journal of Preventive Medicine, vol. 28, no. 2, pp. 169–76.

188 Frank LD, Anderson MA and Schmid TL 2004, 'Obesity relationships with community design, physical activity, and time spent in cars', American Journal of Preventive Medicine, vol 27, no. 2, pp 87–96.

189 Timperio A et al. 2006, 'Personal, family, social, and environmental correlates of active commuting to school', American Journal of Preventive Medicine, vol. 30, no. 1, pp. 45–51.

190 Whyte W 2001, The social life of small urban spaces, Project for Public Spaces, New York.

191 Gehl J and Gemzøe L 1998, op. cit.

192 Whyte W 2001, op. cit.

193 Ibid.

194 Ibid.

195 Ibid.

196 McKay T 1998, 'Empty spaces, dangerous places' ICA Newsletter, vol. 1, no. 3, pp. 2–3, cited in Office of the Victorian Government Architect 2008, Enhancing liveability through good design: a submission to the Victorian Competition and Efficiency Commission 'Inquiry into Enhancing Victoria's Liveability', State Government of Victoria, Melbourne.

197 Ibid.

198 State Library of Victoria 2018, LIBRARIES WORK! The socio-economic value of public libraries to Victorians, SGS Report, Melbourne.

199 Parks Victoria 2017, A guide to Healthy Parks Healthy People, State Government of Victoria, Melbourne.

200 Ibid.

201 Mitchell R and Popham F 2008, 'Effect of exposure to natural environment on health inequalities: an observational population study', The Lancet, vol. 372, cited in Royal Institute of British Architects 2011, Good design: it all adds up, RIBA, London.

202 Mitchell R and Popham F 2008, 'Effect of exposure to natural environment on health inequalities: an observational population study', The Lancet, vol. 372.

203 Arundel J et al 2017, Creating liveable cities in Australia, Centre for Urban Research RMIT University

204 Kelly J-F 2012, Social cities, Grattan Institute, Melbourne.

205 International Transport Forum 2012, Pedestrian safety, urban space and health, OECD Publishing.

206 Ibid.

207 Woodcock J, Edwards P, Tonne C et al. 2009, 'Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport', Lancet, vol. 374, pp. 1930–43, cited in Giles-Corti et al. 2016, 'City planning and population health: a global challenge', The Lancet, vol. 388, no. 10062, pp. 2912–24.

208 Garrett-Peltier H 2011, Pedestrian and bicycle infrastructure: a national study of employment impacts, PERI, <http://www.peri.umass.edu/fileadmin/pdf/published_study/PERI_ABikes_June2011.pdf>.

209 Cortright J 2007, Portland's green dividend, CEOs for Cities, <http://blog.oregonlive.com/commuting/2009/09/pdxgreendividend.pdf>, cited in ARUP 2016, Cities alive: toward a walking world, ARUP.

210 Transport for London 2014, Annual report 2014–15, <http://content.tfl.gov.uk/annual-report-2013-14.pdf>.

211 Committee on Physical Activity, Health, Transportation and Land Use 2005, Does the built environment influence physical activity? Examining the evidence, Transportation Research Board Institute of Medicine of the National Academies, Washington, DC.

212 Heart Foundation 2013, Making the case for investment in street trees and landscaping in urban environments, Heart Foundation, Melbourne.

213 Heart Foundation nd, Healthy active by design, Heart Foundation, Melbourne.

214 Leyden KM 2003, 'Social capital and the built environment: the Importance of walkable neighborhoods', AJPH, vol. 93, no. 9, pp. 1546–51, <http://www.jtc.sala.ubc.ca/reports/leyden.pdf>, cited in ARUP 2016, Cities alive: toward a walking world, ARUP.

215 Leinberger CB and Alfonzon M 2012, 'Walk this way: the economic promise of walkable places in metropolitan Washington DC', Brookings, <https://www.brookings.edu/wp-content/uploads/2016/06/25-walkable-places-leinberger.pdf>.

216 Walkscore nd, Walkability, real estate, and public health data, <https://www.walkscore.com/professional/research.php>, cited in ARUP 2016, Cities alive: toward a walking world, ARUP.

217 Heart Foundation nd, op. cit.

218 Buehler R and Pucher J 2012, 'Walking and cycling in Western Europe and the United States: trends, policies, and lessons', TR News vol. 5, pp. 34–42; Pucher et al. 2003. 'Promoting Safe Walking and cycling to improve public health: lessons from the Netherlands and Germany', American Journal of Public Health, vol.93; Pucher et al. 2010. 'Infrastructure programs and policies to increase cycling', Preventive Medicine, cited in Giles-Corti et al. 2016, op. cit.

219 Kelly J-F 2012, op. cit.

220 Kent J and Thompson S 2014, 'Connecting and strengthening communities in places for health and well-being', Australian Planner, vol. 260–71, cited in Giles-Corti et al. 2016, op. cit.

221 Cozens P 2008, 'New urbanism, crime and the suburbs: a review of the evidence', Urban Policy Res, vol. 26, pp. 429–44, cited in Giles-Corti et al. 2016, op. cit.

222 New Zealand Ministry of the Environment 2005, The value of urban design; Committee for Architecture and the Built Environment 2006, Buildings and spaces: why design matters, CABE, London.

223 Delbosc A and Currie G 2011, 'Transport problems that matter: social and psychological links to transport disadvantage', Journal of Transport Geography vol. 19, no. 1, pp. 170–78, cited in Kelly J-F 2012, op. cit.

224 Merom D et al. 2006, 'Active commuting to school among NSW primary school children: implications for public health', Health & Place vol. 12, no. 4, pp. 678–87.

225 StreetFilms 2010, Revisiting Donald Appleyard's Livable streets, <https://vimeo.com/16399180>, cited in ARUP 2016, op. cit.

226 Kelly J-F 2012, op. cit.

227 Ibid.

228 StreetFilms 2010, op. cit.

229 Frey BS and Stutzer A 2002, 'The economics of happiness', World Economics, vol. 3, no. 1, <https://www.bsfrey.ch/articles/365_02.pdf>, cited in ARUP 2016, op. cit.

230 Gossling S and Choi A 2015, 'Transport transitions in Copenhagen: comparing the cost of cars and bicycles', <http://www.sciencedirect.com/science/article/pii/S0921800915000907#>.

231 Jaffe E 2014a, 'Nicer transit stations attract more riders', City Lab, 31 November, <https://www.citylab.com/transportation/2014/01/nicer-transit-stations-attract-more-riders/8260/>.

232 Jaffe E 2014b, 'A basic shelter can make the wait for the bus feel shorter', City Lab, 18 September, <https://www.citylab.com/solutions/2014/09/a-basic-shelter-can-make-the-wait-for-the-bus-feel-shorter/380297/>.

233 Fan Y, Guthrie A and Levinson D 2016, 'Perception of waiting time at transit stops and stations', Transitway Impacts Research Program Report no. 9, Center for Transportation Studies, University of Minnesota.

234 Jaffe E 2014a, op. cit.

235 ARUP 2016, Cities alive: toward a walking world, ARUP.

236 Gehl J 2010, Cities for people, Island Press, Washington, DC.

237 Ibid.

238 European Commission: Directorate-General for the Environment 2004, 'Reclaiming city streets for people: Chaos or quality of life?', EU, Brussels.

239 City of Copenhagen 2017, 'Copenhagen city of cyclists: The bicycle account 2016,' <http://www.cycling-embassy.dk/wp-content/uploads/2018/02/CPH-Bicycle-Account-2016.pdf>.

240 Ibid.

241 Ibid.

242 Ibid.

243 Ibid.

244 Cathcart-Keays A and Warin T 2016, 'Story of cities #36: How Copenhagen rejected 1960s modernist 'utopia,'' The Guardian, 5 May, <https://www.theguardian.com/cities/2016/may/05/story-cities-copenhagen-denmark-modernist-utopia>

245 Ministry of Foreign Affairs of Denmark, 'A nation of cyclists,' <https://denmark.dk/people-and-culture/biking>.

246 Ibid.

247 Gerdes J 2013, 'Copenhagen's ambitious push to be carbon-neutral by 2025' The Guardian, 13 April, <https://www.theguardian.com/environment/2013/apr/12/copenhagen-push-carbon-neutral-2025>.

248 Metroselskabet, 'New Stations,' <https://intl.m.dk/#!/about+the+metro/metro/expansion/new+stations>.