



Reconnecting Buildings with the Natural World Through a Design Innovation Metric

Naturising Outside-In

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Images as credited

1. Merging art with Nature: A vertical garden by Patrick Blanc, Melbourne Central (Photo: D. Trainham).

The composition of modern commercial and public buildings consists of a mixture of materials, including concrete, glass, steel, and petroleum-based compounds. Emphasis on how green a building is with respect to its overall impact on the environment has emerged as a factor in the viability of new construction as well as redevelopment. Aspects of green building, such as energy costs and ecological impact, are now taken into account through Leadership in Energy and Environmental Design (LEED) and similar programmes. These programmes are used to foster sustainability and innovation in building design but the connection to the natural world is still largely absent from discussion. That connection has been lost in many cities and a culture of apathy towards Nature has arisen as a result. Reconnecting buildings to the natural world through design innovation by what is termed “naturising” can elicit a positive change in attitudes and the creation of buildings that are not only desirable to occupy but also economically, ecologically, and socially sustainable.

This article aims to identify failings that exist with “green buildings”, where, despite their commendable attributes of minimising their environmental footprints, they tend to shield their inhabitants from Nature and natural processes. The first section therefore reviews the literature on connecting people to Nature and its personal and wider benefits whilst the second section examines a range of local contemporary buildings in Melbourne, some with green ratings, to see how they measure up from this perspective. To foster design innovation, a naturising metric is then created and applied to a selection of LEED-certified buildings in America and Australia as a proof-of-concept.

Literature Review

Backgrounding the Nature disconnect issue

As members of an urban society, a large portion of our days as well as our lifetimes will be spent “indoors”. Two issues arise from increasing urbanisation and the amount of time spent in buildings: the quality of the built environment and our connection to Nature (Berry, 2009) (Washington 2012). Even if the built environment is of high quality and incorporates many aspects of green and sustainable design, it invariably remains separated from the natural world. In his book *Biophilia*, E.O. Wilson (1984) examines the affinity of human beings with the natural world. That affinity seems lost in many modern build-

ings where their occupants are sheltered from that world by glass and concrete.

Operational costs have been traditionally focused on economic aspects rather than social and environmental ones. And having been identified as major sources of Green House Gas emissions (GHG), buildings can account for as much as 40 percent of energy consumption (Chen 2009). So-called green buildings as determined by rating schemes, such as LEED and Green Star, are a popular response to lessening that burden in both commercial and domestic parts of the modern economy. They may also aim to: save water; use non-toxic fittings or elements, even natural materials such as stone or timbers; have flow-through ventilation; and generally consider the comfort and health of their inhabitants. But is this sufficient to working towards a greater sustainability in a city context?

Can gardens and other cultivated landscapes provide a connection with Nature?

Historically, aesthetic philosophers have depicted the garden as an uneasy mixture between Nature and art. Still others have viewed the wilderness as an imperfection. Italian renaissance designers for example placed their formal, manicured gardens on hilltops overlooking great landscapes to induce a heightened sense of the crudeness of uncultivated Nature. The contemporary view is rather that the garden exemplifies the co-dependence of human creative activity and Nature (Cooper 2006), and is able to exploit the physical and perceptual changes induced by the seasons. Japanese gardens, for example with chimes amidst bamboo, form a connection with the wind as a force of Nature. Cooper likewise records that gardens depend on the cooperation of Nature—of the effects of light or sudden showers (2006, 153). To become sensitive to its mysterious power, he finds that nothing gigantic needs to be experienced—a cypress tree or the moon reflected on one’s pond could suffice (2006, 148). Day (2008) makes similar claims for still and moving water.

Further insights stem from oriental garden designers such as Ji Cheng who in his three-part volume *The Craft of Gardens* of 1634 noted that a pool should occupy three-tenths of any garden, with covered walkways to facilitate quiet contemplation. Scale is important in the creation of a restful garden, and a balance of one-

third active—that is planted—space and two-thirds passive and unplanted is often considered optimal for engendering a sense of calm (Forsyth 2011). Similarly, Iyer (2011) refers to his colleague Nicholas Carr’s observation that, after spending time in quiet rural settings, subjects “exhibit greater attentiveness, stronger memory, and generally improved cognition. Their brains become both calmer and sharper”.

Vegetated surrounds of buildings usually do not aim to copy pure forms of Nature. They can, for instance, comprise assemblages of plants drawn from different parts of the world (i.e., exotics), which in turn can be inhabited by exotic as well as local fauna, such as Indian Myna birds and local brush tail possums respectively. (Interestingly, both of these species are regarded as nuisances in Australia.) Even areas exclusively landscaped with native plants may have mixes of species drawn from different regions, such as the use of Western Australian gum trees amid Eastern Australian shrubs. Equally, suburban lots more often than not have one-of-each tree-and-shrub cultures selected for their ornamental value but still attracting native birds.

These artificial environments are capable of providing a “connection” albeit not as profound as faithful reproductions of bushland, swamps, waterfalls, and so on. Within buildings, features like vertical gardens attempt to create a semblance of the natural world; however, in execution these features evoke a more artistic quality (Fig. 1). Of course buildings and their landscaping (if applicable) do not exist in isolation but form part of an urban mosaic commonly called the built environment (Chambers 2011). As we will see later, these wider landscapes suitably clothed in greenery can be “borrowed” to enhance the connection.

Lastly, linkages with Nature have been cast in botanic rather than zoological terms largely because plants either singularly or together are attractors of and form habitats for insects, birds, and animals—which is not to say that things like edifices of buildings cannot become roosting places.

The big picture: a Nature-sensitised cohort is key to saving global biodiversity

There is a tendency to lose sight of the fact that achieving a sustainable planet is just as dependent on maintaining species diversity as on mitigating GHGs—a major aim of green buildings (Hooper et al 2012). Well-functioning Nature provides a wide range of free ecologi-

cal services critical to civilisation (Living Planet Report 2012).

More idealised is the call by Martin Dixon, the author of a recent United Nations report on global biodiversity, for “a sea-change in human thinking and attitudes towards Nature: not as something to be vanquished, conquered, but rather something to be cherished and lived within” (Ki-moon 2010), adding that in future, “communities should be paid for conserving nature rather than using it; companies be given stricter limits on what they can take from the environment and fined or taxed more to limit over-exploitation; and businesses and national governments asked to publish accounts for their use of natural and human capital alongside their financial results” (Jowit 2010).

Clearly, gaining the support of governments and businesses for measures like these will require a far greater public empathy with the natural world than is now the case.

Various writers too, such as David W. Orr (2004), Adina Allen (2010), and Richard Louv (2008) who coined the term Nature Deficit Disorder, have expressed concern over the fact that the young—the future occupiers of buildings—have a fraying intimacy at the local scale while remaining aware of global threats to the environment. Interestingly, references to Nature in children’s books have declined by 50 percent since 1960 (Williams Jr. et al 2012).

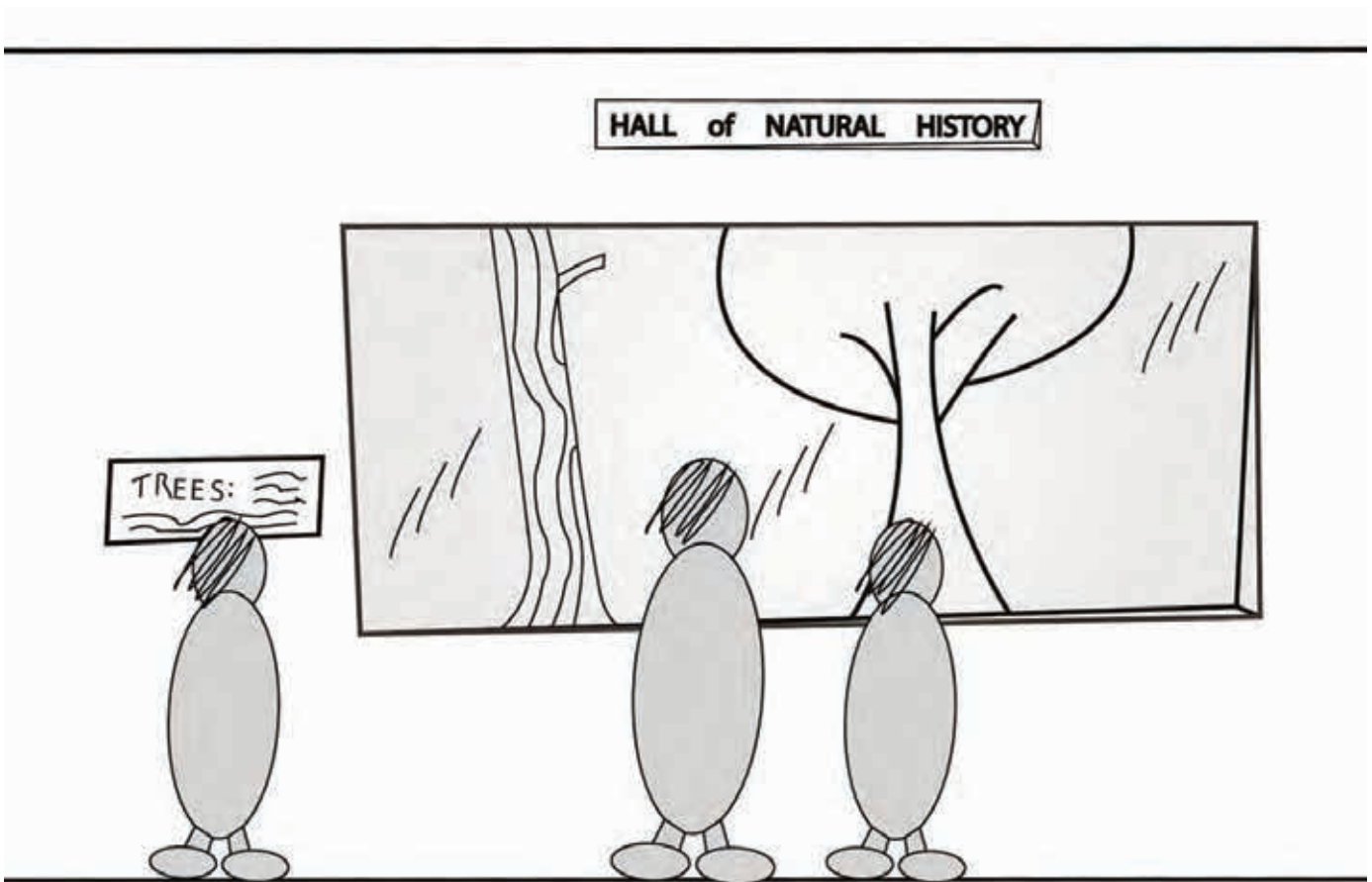
Excessive technology dependency can also be an issue: Lanier (2010) has stated that what is communicated between people online eventually becomes their “truth”. This is a short step to a situation where the natural world is considered non-mainstream, exceeded by the goings-on in virtual space (Fisher 2011).

We have yet to examine what should rank as a connection or an enhanced connection with the natural world through design innovation. For the most part this does not entail immersing buildings in rainforests, near wetlands, or at the base of waterfalls. What role can proxy environments play in meeting this need?

Hough’s (1995) historic call to reconnect cities to Nature recognised that this can apply on many fronts, especially projects for rewilding rivers, swamps, and parklands in their midst—commenting on “a landscape that people have forgotten and yet is incredibly rich, diverse, and supports all manners of wildlife” (Davis 2011). Hough dismisses ever-manicured landscapes in making that reconnection,

3. Feeling you’re in the forest?
Treetops Room, Melbourne Museum
(Photo: D. Trainham).

4. “Bare-scape”: An atrium in a
remodelled department store,
Melbourne (Photo: D. Trainham).



2

Could it come to this?
(Illustration: D. Trainham)



Desirable as these improvements may be, in their specialisation they have had the effect of making the scoring and total ratings less and less fathomable to the public, if not to building operators and owners.

as did Spirn (1983), even valuing the randomness of a recolonising Nature on abandoned sites and areas devastated by catastrophe (Bradshaw 2000). Unfortunately, many cities don't have anything out of the ordinary in geophysical features to capitalise on in forging linkages to Nature—either because they never had them in the first place or what they had have long since been lost to development pressures. Melbourne, Australia, which leveled its wooded hills, channeled its river, and filled in its swamp, is a case in point (Boyce 2011).

Until recently, the drive to green cities and encourage green building was mainly focused on minimising their environmental footprint whilst enhancing amenity, for instance in Vancouver's Ecodensity project (City of Vancouver 2008).

However, there has been a turn around of late marked by London's Tree Strategy (City of London 2011) and a rising number of retrofit projects, such as the High Line in New York, the Seattle Waterfront redevelopment, and the covering of a highway in Madrid with a five-kilometre-long linear park that won it a European Green Cities Award.

These spaces comprise refuges for city workers but single sites are where they spend much of their days, and it's equally important to bring some of those qualities even at a reduced scale to them where they can form a vegetative mosaic.

Design Innovation
Bridging the Nature-divide with Public and Commercial Buildings:
Design Issues

A key design consideration should be to reduce the buffering from outside and features of the natural world by making visual linkages with items like trees, birds, and other species, even extending to the neighbourhood scale (Kellert et al 2009) (Fig. 3).

Green buildings would be thus provided with an opportunity to round out their environmental credentials via elements of the natural world, potentially making their occupants more aware of life forms other than their own, their dependency on them for free ecological services, and their place in the richness of our own lives and that of the planet. There are three aspects in need of consideration.

First, the *interior*. There may be opportunities to incorporate wall gardens (Fig. 2), trailing plant-clothed atriums, and so on, as well as provide uninterrupted views of a landscape or simply trees. Glass and colour treatment can also play a role. Even in new buildings, the prevailing mindset of the designers remains firmly rooted in the

physical realm—polymers, glass, metals, masonry, and concrete—even when light-bearing designs, such as atriums, provide an opportunity to clothe them in trailing plants as in the work of Patrick Blanc in Bangkok (2008). In stark contrast, a recently remodelled department store in central Melbourne that features a large atrium allowing soft natural light to permeate through the building remains devoid of vegetation (Fig. 4).

Second, the *exterior*. Where there is space for setback, an immediate landscape of trees and other plantings can be integrated into the overall design of the building. A more radical approach is to design the green space first, calling in the landscape gardeners, then fitting the buildings into a setting that has water, shade, space for major trees, animals, insects such as butterflies, birds, connections to road plantings, and so on. If there is elevation, there may be the prospect of capturing a longer range treed view or of distant hills. Immediate exteriors can also have water or vegetative themes, as with the Horizontal Skyscraper in Shenzhen. In essence, to establish a greater connectivity with Nature, the site on which the building is located should dictate the design so as to maximise a connection with the natural world. One model is the ACROS building in Fukuoka, Japan, which has a face comprised of garden terraces containing about 35,000 plants of 76 different species merging into a park below. Another model is the forested skyscraper, Bosco Verticale, now under construction in Milan (Boeri 2012).

Third, *retrofits*. There can be opportunities during a building remodelling or deep energy retrofits to capitalise on natural elements such as existing street trees. These include: strategically replacing windows (in Japanese landscape parlance this is referred to as *shakei*, or "borrowed landscape"); introducing vegetation within structures with things like atriums and wall gardens holding cascading plants previously mentioned; and installing large LCD screens conveying natural environment ambiances, although it may appear to be an inappropriate substitute for the real thing, as in "Uncanny Valley" (Sofge 2010; Mori 1970).

All plantings however will need upkeep with special attention paid to watering and manicure when located indoors.

Existing green building rating schemes

Building rating systems have existed in one form or another since the 1990s. These systems emerged as a means to initiate change in built form and in how building occupants utilise space. Prior to this buildings were designed around aesthetics and function.



5. The Green Star- and LEED-rated Pixel Building, Melbourne (Photo: D. Trainham).

LEED	Naturised
<p>Scoring Schema (Commercial Interiors v2.0)</p> <ul style="list-style-type: none"> Sustainable Sets 21 pts Water Efficiency 11 pts Energy and Atmosphere 37 pts Materials and Resources 14 pts Indoor Environmental Quality 17 pts <p>Total Base Points 100</p> <ul style="list-style-type: none"> Innovation in Design 6 pts Regional Priority 4 pts <p>Total Possible Points 110</p> <p>Points needed for:</p> <ul style="list-style-type: none"> LEED Certification 40-49 LEED Silver 50-59 LEED Gold 60-79 LEED Platinum >80 	<p>Scoring Schema (Notional)</p> <ul style="list-style-type: none"> Site Landscape (40 pts) <ul style="list-style-type: none"> Grass 8 pts Shrubs 8 pts Trees 16 pts Water 8 pts Shakei (borrowed landscape) (15 pts) <ul style="list-style-type: none"> Parkland 5 pts Sea 5 pts Hills 5 pts Building Treatments (40 pts) <ul style="list-style-type: none"> Roof Garden 8 pts Atrium Cascade 8 pts Wall Garden 16 pts eView Screen 8 pts Community Scale Integration (5 pts) <ul style="list-style-type: none"> Part of Vegetative Mosaic 5 pts <p>Total Possible Points 100</p>
<p>In addition to Commercial Interior there are LEED certification schemes for:</p> <ul style="list-style-type: none"> New Construction (LEED-NC) Existing Building Operations (LEED-EB) Core and Shell Projects (LEED-CS) Homes (LEED-H) Neighbourhood Development (LEED-ND) LEED for Schools LEED for Healthcare 	

A

Comparison of the LEED and Proposed Naturised Rating Schema

Site Landscaping	Building Treatments
<p>Grass</p> <ul style="list-style-type: none"> Extensive cover of site: 6-7 pts Partial cover of site: 3-5 pts Edge cover: 1-2 pts Native grass: +1 pts 	<p>Roof Garden</p> <ul style="list-style-type: none"> Intensive: 6-7 pts Extensive: 3-5 pts Native species: 1-2 pts Public accessibility: +1 pts
<p>Shrubs</p> <ul style="list-style-type: none"> Extensive use: 6-7 pts Selected use: 3-5 pts Scattered use: 1-2 pts Native shrubs: +1 pts 	<p>Atrium Cascade</p> <ul style="list-style-type: none"> Intensive: 6-7 pts Extensive: 3-5 pts Habitat: 1-2 pts Prominence: +1 pts
<p>Trees</p> <ul style="list-style-type: none"> Extensive use: 9-12 pts Partial cover: 5-8 pts Edge cover: 1-4 pts Native trees: +2 pts Use of on-site trees: +2 pts 	<p>Wall Garden</p> <ul style="list-style-type: none"> Intensive: 9-12 pts Extensive: 5-8 pts Size: 1-4 pts Native species: +2 pts Building integration: +2 pts
<p>Water Feature</p> <ul style="list-style-type: none"> Prominence: 1-4 pts Integration: 1-4 pts 	<p>eView Screen</p> <ul style="list-style-type: none"> Prominence: 1-4 pts Building Integration: 1-4 pts
<p>Site Landscaping Total: 40 pts</p>	<p>Building Treatments Total: 40 pts</p>
<p>Shakei (borrowed landscape)</p> <p>Parkland</p> <ul style="list-style-type: none"> Full incorporation of adjacent: 3-5 pts Partial incorporation: 1-2 pts <p>Sea</p> <ul style="list-style-type: none"> Full incorporation of adjacent: 3-5 pts Partial incorporation: 1-2 pts <p>Hills</p> <ul style="list-style-type: none"> Full incorporation of adjacent: 3-5 pts Partial incorporation: 1-2 pts 	<p>Community Scale Integration</p> <ul style="list-style-type: none"> Part of Vegetative Mosaic: 1-5 pts <p>Other comments:</p>
<p>Shakei Total: 15 pts</p>	<p>Total Points Possible: 100 pts</p>

B

Building Case Studies	Naturising Score
California Academy of Science	49
National Museum of the American Indian	38
Victorian Government Services Building	15
60L Building	10

C

Buildings and Their Naturising Scores

The schemes started out oriented to improving the energy efficiency of buildings and structures but have gradually been broadened to take into account their impact on (other) finite natural resources, such as water, extending to the comfort and health of their inhabitants.

The push for “greener” buildings worldwide has been voluntary and has impacted the way in which many architects and designers think about them. From this perspective several rating systems have emerged to promote green innovation in building. Examples of rating systems include: Green Star (Green Building Council of Australia); Living Building Challenge (International Living Future Institute); and the most prominent, having been developed by the US Green Building Council, Leadership in Energy and environmental Design (LEED).

All have experienced many waves of refinement through life-cycle analysis and other sustainability criteria, applying not only to a widening net of impact variables but also to structure types and a range of dimensions, such as interiors, transport, and other neighbourhood and regional issues. Desirable as these improvements may be, in their specialisation they have had the effect of making the scoring and total ratings less and less fathomable to the public, if not to building operators and owners. They remain largely carbon- or resource-neutral in their scope.

While these schemes are unquestionably valuable in getting property developers to think in sustainable terms, there remains a need for a rethinking of building design in terms of forging a connection with the natural world.

A “naturising” building metric

A similar scheme can be developed for a building’s “naturising” value, as set out in Table A. The scores shown might change with further development of the concept with the weightings to produce a single score open to review. However, these are no more arbitrary than those attached to LEED and its like that have gotten quite complicated in recent times.

At some stage there may be value in having a composite of the two but this would have the effect of lowering the score of some otherwise highly LEED-rated structures that are built to the street side,

such as the Pixel (Fig. 5), which attained a perfect score from Australia’s Green Building Council (2010) and a LEED platinum certification. While lowering LEED scores would create some controversy, it would also foster innovation through continuous improvement in building design. The same can be said of naturising in its own right.

Methods

In Table A a side-by-side summarised comparison of the LEED and naturising schemes is shown. From the table, the total possible score that can be achieved with LEED is 110 points. This reflects the changes made to the LEED methodology since its introduction in 1998. It further demonstrates the need for adaptability in any building methodology.

A building’s naturised score has been configured to have a total possible value of 100 points. This level will be difficult to obtain as the current methodology includes the category of shakei that encompasses three different types of landscape that are unlikely to occur in the same area, as one of the buildings examined in this section will demonstrate.

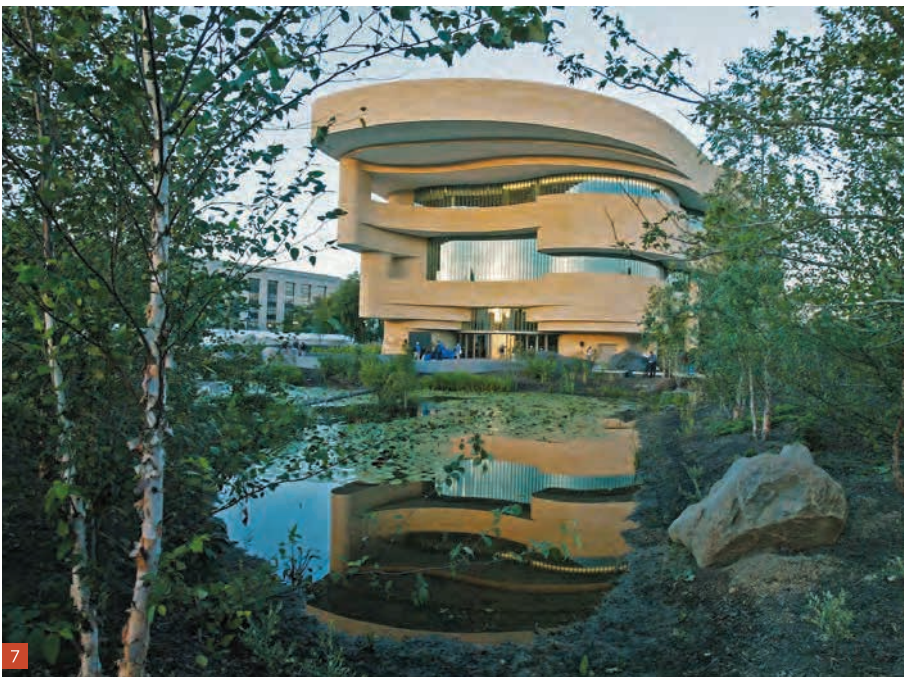
Proof-of-Concept

To demonstrate how scoring a building from a naturising perspective would work, we examine existing structures and provide an overview of the scoring methodology.

Four highly green-rated structures have been selected on two continents (Australia and North America)—namely the California Academy of Sciences, the National Museum of the American Indian, the Victorian Government Services, and 60L Building—to demonstrate how naturising might work. A scorecard, as detailed in Table B, is used to rate them.

The four buildings in this section will demonstrate how naturising scores can be calculated, leading to the ratings shown in Table C, and in turn that there is scope for continuous improvement in the built form.

The long-term implications of the competition for better spaces would be to improve the quality of the built environment, where previously casual users would now desire to live, work, and recreate.



6. California Academy of Sciences, with a Naturising Score of 49 (Photo: California Academy of Sciences).

7. National Museum of the American Indian, with a Naturising Score of 38 (Photo: Alex Wong / Getty Images).

California Academy of Sciences, San Francisco

The California Academy of Sciences (CAS), located in San Francisco's Golden Gate Park opposite the recently rebuilt De Young (Art) Museum, received a naturising score of 49. The extensively remodelled CAS represents a several-hundred-million dollar investment to make it the premiere science museum in western United States (CAS 2012). The museum showcases many energy-saving technologies, leading to a platinum LEED certification in 2008. The building is also heavily naturised, encouraging hands-on learning and interaction with Nature by building patrons. The naturising features leading to a score of 49 include:

- Eight points for several highly prominent water features integrated into the building
- Seven points for shakei for the inclusion of influences of adjacent parkland (4 points) and hill terrain (3 points)
- Seven points for a publically accessible roof garden
- Eight points for a prominent, intensive atrium cascade and twelve points for a wall garden, both of which are incorporated in a rainforest styled habitat
- Five points for eView media encouraging interaction with museum exhibits
- Two points for being part of a vegetative mosaic rather than a formal garden

National Museum of the American Indian, Washington, DC

Located at the national mall in Washington, DC, the National Museum of the American Indian (NMAI) is in a prominent place to showcase green and natural design. A relatively new building (completed in 2004), the NMAI draws upon old traditions (Blue Spruce 2004). The site surrounding the building was designed to incorporate elements from a large variety of habitats where Native Americans traditionally lived (Blue Spruce and Thrasher 2008). Additionally, it was designed to evoke a deep spiritual connection to the land. With these design principles in mind, the NMAI is highly naturised receiving a 38 on the naturising scorecard (Table B). The features that allowed the NMAI to achieve this score are:

- A large landscaped area with several different natural habitats surrounding the museum building with substantive parkland shakei evoking a sense that the NMAI is set within a natural landscape connected to the land
- A significant water feature integrated into the building as well as a naturalistic wetland located nearby

Under the LEED system, the NMAI received a rating of Silver when it was assessed in 2011. Additionally, it should be noted that though the museum site is heavily naturised, the building itself lacks any naturising qualities. The museum is therefore the rare exception in that it is

somewhat sustainable and fairly naturised, leaving many opportunities to improve its characteristics.

Victorian Government Services Building, Dandenong, Melbourne

The Victorian Government Services building, given a naturising score of 15, was completed in 2011. Despite its much publicised green credentials, the structure has minimal naturising elements—these being trailing plants in boxes in the foyer area and a limited roof garden for treating stormwater. It is built at or close to the street line with minimal plantings. In order for the building to receive a higher naturising score, it would need to showcase its natural features. As the building currently presents, there is little to attract people aside from the government offices contained therein. Therefore to incorporate natural features into the building would make it more welcoming to the building users as well as the surrounding community.

60L, Carlton, Melbourne

60L located at 60 Langridge Street, Carlton, inner Melbourne, is inclusive of several elements of the aforementioned naturised schema. These elements include an accessible roof garden and a significant internal water feature, providing building occupants respite while reducing stress and absenteeism (Rostron 1997). In this way 60L is a good example how additional investment in the quality of urban space can promote improved psychological and physical health.

It should be noted that 60L is a redevelopment and not an entirely new construction. This means that some elements of the naturising schema would be difficult to implement. Additionally the building performs poorly in some sustainability criteria such as sewage. This suggests there is room for improvement. In the building's present form it receives a naturised score of 10, but with modest additions 60L could raise this score far higher. The current front façade lacks any greenery making the building blend with its surrounding hard-surfaced urban landscape. Providing some greenery, such as trees and climbing vines, would draw passers-by to some of the unique features of 60L. The building would then score higher in the category of site landscaping.

Showcasing the unique features of an improved 60L to the public would create a market and competitive mentality for creating greener and naturised urban space (Mason 2000).

The Way Forward

Buildings emphasising emissions reduction alone cannot lead to sustainability insofar as our built environment is concerned. In that regard, design aspiration has to reach beyond gaining high LEED ratings. A paradigm shift is needed in our thinking towards reestab-




lishing the connection to the natural world. One way this can be achieved is through the acknowledgement of the contributions of Nature in our daily lives. It is possible to quantify this contribution through measuring the presence of Nature in the built form, as exemplified by the naturising scheme. This will enable more effective post-occupancy evaluation of buildings. A naturising metric could supplement the existing LEED system and eventually be incorporated into future building evaluation methodologies.

Incentives to encourage this more holistic approach are needed, such as a height bonus in planning approval if the design realises a high naturising score.

Making connectivity to the natural world and its trimmings visible can lead to the formation of habits that can be taken throughout life as the positive impacts that our living and interaction with Nature have upon society (Greenberg 2012).



The proposed scheme and subsequent refinements are capable of providing a beacon and valuable benchmark of our progress toward that end. Moreover, naturising buildings can be seen as a sound business practice due to long-term trade-offs in productivity and efficiency, forming a healthier working environment.

This paper has argued that rather than continuing to sequester ourselves from the natural world in our daily lives we should engage with it in a positive way. The reasons are both utilitarian and for the benefits arising from Nature's life-enhancing and health-promoting qualities. The naturising scoring scheme as such aims to encourage city planners, developers, and designers to extend their reach beyond stagnant interiors and begin to reduce the divide between the built and natural environments. 

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8. Victorian Government Services Building, with a Naturising Score of 15 (Photo: D. Trainham).

9. 60L Building, with a Naturising Score of 10 (Photo: D. Trainham).

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