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BEYOND SUSTAINABILITY:

SHIFT FROM BUILDINGS TOWARDS HUMAN

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ABSTRACT

Sustainability is defined as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Contemporary, sustainable development has been considered in many different aspects, such as waste and recycling, energy efficiency, water consumption, building design, emission, indoor environmental quality, alternative transport, landscaping, and management, which are commonly measured using sustainability rating systems. All these criteria are focused on the performance of the buildings. New movements in sustainability have been developed gradually through the last decade that look beyond building performance efficiency towards social and human elements. For instances, concepts of net positive approach shifts the focus to the support of social and economic sustainability, and regenerative design approach aims to re-create the evolution of human in future. In practice, the Living Building Challenge aims to advance measures of sustainability to include human health and happiness, equity and beauty elements. The WELL building standard focus on the human potential through the building. These concepts and practices all have a common vision is to emphasize the importance of human within the built environment. The aim of this paper is to explore these evolving sustainability concepts and practices that shifted from buildings towards human. Analysis of these human elements provides insights for a 'true' sustainable building in future.

Keywords: sustainability, human, Living Building Challenge, WELL building standard

INTRODUCTION

To design and build a new high performance green building, many sustainable features are incorporated in modern buildings. However, researchers discovered that building features alone are not enough to promote persistent performance of sustainable buildings. To realise the potential of sustainable building design, organisations need to be willing to fundamentally shift towards the social and human elements of building users. Sustainability performance needs to be true to who the building users are and authentically reflect how they use their building every day. Traditional architecture features and rating systems are not sufficient to provide effective sustainable buildings while a number of social and human elements that are often overlooked. This article is focused on the social and human elements of building users. First, evolving sustainability concepts that shifted from buildings towards human are explored. Secondly, the WELL building standard version 1 established in 2016 are explained how the seven concepts of human health and well-being comprised 100 features are developed. Finally, this article demonstrates how the preconditions and optimizations of these well-being features are formed the framework of the WELL scoring method.

SUSTAINABILITY

The original concept of 'Green building' raised with the oil crisis in 1973, the Americans began to question about whether it needs to be independently reliant upon fossil fuels for energy. To achieve energy savings, one option would be a passive solution such as the use of reflective roofing material and the environmentally beneficial siting of buildings; whereas the other options concerned in developing technological solutions, such as the use of triple-glazed windows (Building design and construction, 2006). The concept of Green Buildings emphasizes "the increasing efficiency with which buildings and their sites use water, energy and material; and reducing building impacts of human health and the environment, through better siting, design, construction, operation, maintenance and removal throughout the complete life cycle" (Office of Federal Environmental Executive, 2003). For the last three decades, much research has been done on energy commissioning processes, such as the use of solar panels, prefabricated efficient wall systems, water reclamation systems, modular construction units, and direct usage of light through windows in order to decrease day-time energy consumption (Building design and construction, 2006). However, there are not many researches available to date that studies the interactions with natural and man-made environments.

It has been identified that the current sea level rise is due partly to human-induced global warming (Bindoff et al., 2007). The importance of tackling climate change and reducing green house gas emission has been recognized by many people in the world. The concept of Green Buildings has been extended on a larger scale, focused on "Sustainability" or "Sustainable Development". According to the World Commission on Environment and Development (WCED), it is defined as "*forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs*" (Brundtland, 1987). The sustainable development concept includes many areas such as Waste and recycling, Energy, Water, Building Design, Emission, Indoor Environmental Quality (IEQ), Alternative Transport, Landscaping, and about everything that revolves around human activity, and aims to eliminate negative environmental impact while continuing to be completely ecologically sustainable, through skillful and sensitive design (McLennan, 2004). Sustainable Development also implies an improvement in the quality of human life through education, justice, community participation, and recreation (Australian Government, 2009).

SUSTAINABILITY RATING SYSTEMS IN AUSTRALIA

Australia's National Strategy for Ecologically Sustainable Development 1992 (NSESD) defines ecologically sustainable development (ESD) as "*using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*" (Australian Government, 2009). Draft Sustainable Building Design Guidelines were produced for external commentary in April 2007. All States in Australia require newly designed homes to meet minimum thermal performance standards, i.e., to reduce the amount of fossil fuels burned to produce energy for homes, thereby reducing Australia's greenhouse gas emissions. All dwellings must achieve a 4-5 star thermal performance standards, which is regulated by the Building Code of Australia (BCA), with the exception in the state of New South Wales (NSW). In NSW, the Building Sustainability Index (BASIX) overrides the BCA requirements and sets the required levels of environmental performance in a number of areas including energy, water and thermal performance. Under BASIX, a new home must be designed to use 40% less water and 40% less energy than existing similar types of buildings in order to receive development approval (Department of Planning, 2009).

In Australia, Green Star is a national environmental rating system established by The Green Building Council of Australia (GBCA) for office buildings. The tool rates a building in relation to its management, the health and wellbeing of its occupants, accessibility to public transport, water use, energy consumption, the embodied energy of its materials, land use and pollution (GBCA, 2014). Green Star rating tools use Stars to rate performance, where 4 Star Green Star Certified Rating signifies 'Best Practice'; 5 Star Green Star Certified Rating signifies 'Australian Excellence' and 6 Star Green Star Certified Rating signifies 'World Leadership'. Table 1 shows the Green Star rating system. The Melbourne Convention Centre has been rated Australia's first six-star convention centre in Australia (Smith, 2009).

Table 1: Green Star Rating in Australia (GBCA, 2014)

Rating	Score	Description
4 Star Green Star	**45-59**	Signifies best practice in environmentally sustainable design and construction
5 Star Green Star	**60-74**	Signifies "Australian excellence" in environmentally sustainable design and construction
6 Star Green Star	**75-100**	Signifies "world leadership" in environmentally sustainable design and construction

The National Australian Built Environment Rating System (NABERS) is another indicator that measures an existing building's environmental performance during operation. NABERS rates a building on the basis of its measured operational impacts in categories such as energy, water, waste and indoor environment (NABERS, 2012).

SUSTAINABILITY – HUMAN CONTENTS

To design and build high performance green buildings, researchers discovered that building features alone are not enough to promote persistent performance of sustainable buildings (Buchanan, 2016). Treating sustainability as a problem that can be solved using expertise, rating tools and building features are not sufficient, because a number of social and human elements that are often overlooked. New movements in sustainability have been developed gradually through the last decade that look beyond building performance efficiency towards social and human elements. For instances, concepts of net positive approach (Doelle & Sinclair, 2006) shifts the focus to the support of social and economic sustainability, and regenerative design approach (Lyle, 1994) aims to re-create the evolution of human in future sustainable development.

In the modern urbanised societies, people spend 90% of their time indoor. Indoor built environment have a unique ability to positively or negatively influence on human health. An important investigation on impact of green buildings on cognitive function found that carbon dioxide, ventilation and volatile organic compounds of the indoor built environment have significant impacts on human performance (Allen et al., 2016). As 90% of most organisations' operating budget spend on their staff, obviously human capital is far more expensive than building costs. It is time to rethink how to value property.

The "Living Building Challenge" is an international sustainable building certification program created in 2006 by the non-profit International Living Future Institute (ILFI). It is pioneered to consider the important aspects of social and human elements of building users rather than just the physical architecture. It promotes advanced measurement of sustainability in the built environment to include human health and happiness, equity and beauty elements. Living Building Challenge comprises seven performance areas: Site, Water, Energy, Health, Materials, Equity and Beauty that have been subdivided into a total of 20 imperatives as shown in Table 2 (ILFI, 2016).

The Living Building Challenge provides the most rigorous performance standard for the built environment. It promotes creation of building projects that operate as cleanly, beautifully and efficiently as nature's architecture. Projects must meet a series of ambitious performance requirements over a minimum of 12 months of continuous occupancy.

Table 2: Living Building Challenge 7 Petals and 20 Imperatives (ILFI, 2016)

Site	**Water**	**Energy**	**Health**	**Materials**	**Equity**	**Beauty**
Limits to Growth	Net Positive Water	Net Positive Energy	Civilized environment	Red List	Human Scale + Humane Places	Beauty + Spirit
Urban Agriculture			Healthy Interior Environment	Embodied Carbon Footprint	Universal Access to Nature & Place	Inspiration + Education
Habitat Exchange			Biophilic Environment	Responsible Industry	Equitable Investment	
Human-Powered Living				Living Economy Sourcing	JUST Organizations	
				Net Positive Waste		

WELL BUILDING STANDARD

International WELL Building Institute (IWBI) was established in 2013. Its mission is to improve human health and well-being through the built environment. Buildings should be developed with health and wellness at the center of design. To realize this vision, IWBI administers the WELL Building Standard (2016) that focus on the human potentials through the building. These concepts and practices all have a common vision is to emphasize the importance of human within the built environment.

WELL is grounded in a body of medical research that explores the connection between the buildings and the health & wellness impacts on occupants. It helps to create built environments that improve the nutrition, fitness, mood, sleep patterns, and performance of occupants. Environment interact with personal, genetic and behavioural factors to shape the overall health and well-being. WELL is an integrated approach that reinvents the built environment around its occupants, transforming the places that people live, work and learn into systems intended to promote and improve human health and well-being.

The WELL Building Standard v1.0 was launched in October 2014. It is a performance-based system for measuring, certifying, and monitoring features of the built environment that impact human health and wellbeing. It provides measurable value to the health, wellbeing and happiness of building occupants. WELL is a comprehensive approach to human health and wellness related to the built environment, addressing the elements of the built environment through seven concepts that totally comprised of 100 features: Air (29), Water (8), Nourishment (15), Light (11), Fitness (8), Comfort (12) and Mind (17). In addition, it embraces creative thinking and allow up to 5 features in an Innovation concept.

Every feature is intended to address specific aspects of occupant's health, comfort or knowledge. Each feature is divided into parts for a specific building type. This means that depending on the building type (e.g., New and Existing Interiors or Core and Shell), only certain parts of a given feature may be applicable. Within each part are one or more requirements, which dictate specific parameters or metrics to be met. In order for a project to receive credit for a particular feature, all of its applicable component parts specifications must be satisfied. Features can be:

- Performance-based standards that allow flexibility in how a project meets acceptable quantified thresholds
- Prescriptive standards that require specific technologies, design strategies or protocols to be implemented

WELL features may be categorized as preconditions or optimizations. Preconditions are necessary for all levels of WELL Certification. These features represent the core of the WELL Building Standard. Preconditions is the foundation for wellness in the built environment, and all applicable Preconditions must be met for certification to be awarded. Optimizations are not required to achieve Silver level certification, but create a flexible pathway towards Gold and Platinum level certification as shown in Table 3.

Table 3: Preconditions and Optimizations of WELL's Scoring Method (IWBI, 2016)

PROJECT TYPE	PRE-CONDITIONS	OPTIMIZATIONS	TOTAL
New and Existing Buildings	41	59	100
New and Existing Interiors	36	62	98
Core and Shell	26	28	54

The WELL scoring method is based on concept-by-concept analysis, it is used initially to ensure that all Preconditions per Concept are met. Final WELL Score is calculated based on the total Preconditions and Optimizations achieved across the board (not as a function of averaging independent Concept scores). Concept scores and the overall WELL score are calculated as follows for the number of WELL features applicable to a specific typology:

FAIL: If (PA/TP) < 1 Then **WS = (PA/TP) x 5**

PASS: If (PA/TP) = 1 Then **WS = 5 + (OA/TO) x 5**

(rounded down to nearest whole number)

Where as

- Total Preconditions = TP
- Preconditions Achieved = PA
- Total Optimizations = TO
- Optimizations Achieved = OA
- Wellness Score = WS
- Innovation Features not included in TO, though achieving them will increase OA

While Score less than 5 would denote failure to meet the Preconditions in that Concept and thus failure for overall certification or compliance. There are three certifications from the WELL Scores:

Silver scores (5 – 6) mean that all compulsory Precondition features have been met in the Concept.

Gold scores (7 – 8)

Platinum scores (9 – 10)

Until 2016, there are 238 office buildings registered with WELL, of which 25 projects in Australia. WELL Building Standard v1 has already identified similarities with LEED v4 in particular related to air quality and daylighting. Also it has outlined mapping with Living Building Challenge (LBC) to promote both environmental and personal sustainability. In future, WELL will form partnerships with LEED in USA, BREEAM in UK and Green Stars in Australia in order to work together to optimize building performance for human health and sustainable built environment.

CONCLUSION

In modern urbanised societies, people spend more than 90% of their time indoors. In an office environment, 90% of the operational cost is for the people inside the buildings. It is vital to better understand the effects that indoor environments are having on building occupants. Corporations and the real estate industry are increasingly looking at how the built environment impacts human health as well as sustainability. WELL building standard version 1 is pioneered to provide a systematic and measurable value to the health, wellbeing and happiness of building occupants. Its seven concepts and one hundred features of health elements of the built environment provide a ground-breaking scoring method for health and well-being of building users that based on preconditions and optimizations of wellbeing features. In future, WELL is aimed to align with major sustainability rating systems, including LEED in USA, BREEAM in UK and Green Stars in Australia to optimize building performance for human health and the sustainable built environment.

REFERENCE

Allen, J.G., MacNaughton, P., Satish, U., Santanam, S., Vallarino, J. & Spengler, J.D. (2016). Associations of cognitive function scores with carbon dioxide, ventilation and volatile organic compound exposures in office workers: a controlled exposure study of green and conventional office environments. *Environmental Health Perspectives* 124(6):805-812, doi:10.1289/ehp.1510037.

Australian Government (2009) *Ecologically Sustainable Development***.** Accessed on 02 Dec 2009 at http://www.environment.gov.au/esd/#history.

Brundtland, G.H. (1987) *Report of the World Commission on Environment and Development.* United Nations, General Assembly Resolution 42/187, 11 December 1987.

Buchanan, A. (2016) Sustainability inside and out: shifting the mindset of building users. *The Fifth Estate*, 12 Sep 2016. Retrieved from http://www.thefifthestate.com.au/.

Building Design and Construction (2006) *White paper on Sustainability*, page 4, November.

Department of Planning (2009) *The BASIX*. New South Wales Government, Australia. Accessed on 02 March 2009 at http://www.basix.nsw.gov.au/information/index.jsp.

Doelle, M. & Sinclair, A.J. (2006) Time for a new approach to public participation in Environmental Assessment: promoting cooperation and consensus for sustainability. *Environmental Impact Assessment Review*, 26(2) 185-205, doi:10.1016/j.eiar.2005.07.013.

Green Building Council of Australia (2014) *What is Green Star?* Accessed on 02 Jun 2014 at http://www.gbca.org.au/green-star/green-star-overview/.

International Living Future Institute (2016) *Living Building Challenge, 3.1*: *A Visionary Path to a Regenerative Future.*

International WELL Building Institute (2016) *WELL Building Standard, Version 1*. Delos Living LLC.

Lyle, J.T. (1994) *Regenerative design for sustainable development*. New York: John Wiley & Sons.

McLennan, J.F. (2004) *The Philosophy of Sustainable Design*. Kansas City, Missouri, Ecotone Publishing.

Bindoff, N.L.; Willebrand, J.; Artale, V.; Cazenave, A.; Gregory, J.; Gulev, S.; … Unnikrishnan, A.S. (2007) Observations: Oceanic Climate Change and Sea Level. In: Solomon, S.; Qin, D.; Manning, M.; Marquis, M.; Averyt, K.; Tignor, M.M.B.; Miller, H.L.; Chen, Z. (eds) *Climate Change 2007: The Physical Science Basis. Contribution of Working Group First to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* pp385-432. Cambridge: Cambridge University Press.

National Australian Built Environment Rating System (2012) *What is NABERS?* Accessed on 15 March 2012 at http://www.nabers.com.au/.

Office of Federal Environmental Executive (2003) *The Federal Commitment to Green Building: Experiences and Expectations*, 18 September 2003.

Smith, K.(2009) *Melbourne Conference Centre project: WSP Lincolne Scott designs six star Melbourne Convention Centre*. Building Sustainable Design. Accessed on 02 Dec 2009 at http://www.bsdlive.co.uk/story.asp?storycode=3151049.

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