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Comparative overview of lighting credits from WELL environmental assessment method

VERÓNICA, RUIZ[1]; ROBERTO, RODRIGUEZ[1]; ANDREA, PATTINI[1]

[1] Instituto de Ambiente, Hábitat y Energía – INAHE - CONICET- Mendoza, Argentina.

ABSTRACT: Beyond an energy-centric perspective, Building Environmental Assessment Methods (BEAM) may contribute to the achievement of healthier indoor built environments, allowing building sustainability to reach its full potential as a public health transformation tool. The objective of this paper is to characterize WELL V2 by means of two-stage heuristic analysis method (i.e. based on expert criteria): (i) a qualitative screening based on seven dimensions of analysis and (ii) a 0-100 quantitative assessment of nine dimensions of analysis. Our first stage results showed that WELL fulfilled all of the proposed criteria for other more established BEAM. Stage two results showed an overall score of 68, below LEED and BREEAM scores from the literature, and above CASBEE, HK-BEAM, and GREENSTAR. In terms of applicability, WELL lacks of lifecycle related criteria. WELL V2 showed a good comparative performance among BEAMs, placing it as a seminal method for the creation of new and more suitable wellbeing and health labelling systems, mimicking the role BREEAM played at the end of the 20th century.

KEYWORDS: Integrative Lighting, Environmental Assessment Method, Overview

1. INTRODUCTION

Some of the greatest challenges that humanity is facing today are environmental degradation, overuse of limited resources, and climate change [1].

Potential consequences for life on our planet are driving a paradigm shift regarding how we live, work, and consume, demanding actions to prevent and mitigate damage and promoting sustainable development. The response to this challenge from a built environment perspective was green building design. In the 1990s, the Building Research Establishment Environmental Assessment Method (BREEAM) from England was the first initiative to establish an objective and comprehensive method to simultaneously evaluate a wide range of environmental considerations in relation to explicit criteria and summarize them in a label as a global measurement of environmental performance. The objective of Building Environmental Assessment Methods (BEAM) was to promote a change in the construction industry, encouraging the development of sustainable constructions and to transform the market, which would see an increase in the real value of buildings with certified better environmental attributes [2].

Initially, these methods were conceived as voluntary in their application. With several countries selecting or developing their own BEAM, the authority is gradually adopting these tools to establish minimum legal requirements for environmental performance. Beyond a reduction in energy use and a higher market value, BEAM´s main strength may be the achievement of healthier indoor built environments, allowing building sustainability reach its full potential as a tool for transformation of public health [3].

Within the BEAM Building Environmental Assessment Methods, a new tool called WELL was created in 2014. It aims to asses interior spaces from a more comprehensive view, taking into account well-being and health of the occupants.

There are ten concepts (i.e. dimensions of analysis) in WELL v2: air, water, food, light, movement, thermal comfort, sound, materials, mind, and community. Each one of them intends to address specific aspects concerning health and well-being of community members. Its latest version added a new concept, called Innovation, so that projects can earn additional points for this item. Each WELL concept consists of features with distinct health intents (i.e. goal). Features are either preconditions or optimizations. All preconditions – including all parts within them – are mandatory for certification, while Optimizations are optional pathways for projects to meet certification requirements. Project teams may select which optimizations to pursue and which parts to focus on within each optimization.

WELL v2 operates on a points-based system. In the WELL universe, each concept has a different incidence in the total. Each of the concepts is given a particular valuation. All optimizations are weighted with varying point values. The maximum point value of a feature is determined by the sum of its parts. A part is weighted by its potential for impact, defined as the extent to which a feature addresses a specific health and well-being concern or opportunity for health promotion, and the potential impact of the intervention (table 1).

Table 1:
WELL v2 concepts, preconditions, optimizations and score.

Concepts	Preconditions	Optimizations	Score
AIR	4	10	18
WATER	3	6	14
NOURISHMENT	2	12	16
LIGHT	2	7	18
MOVEMENT	2	9	21
THERMAL CONFORT	1	8	16
SOUND	1	8	18
MATERIALS	3	9	18
MIND	2	9	19
COMMUNITY	4	14	39
INNOVATION	0	6	28

Projects must achieve all preconditions, as well as a certain number of points towards different levels of WELL Certification. Table 2 shows thresholds to achieve Bronze, Silver, Gold, and Platinum categories. The difference in score between one category and another is 10 points, except for Platinum, which requires 20 points.

Table 2:
WELL v2 scores and categories.

Total points achieved	Minimum points per concept	Level of certification
40 pts	0 pts	WELL Bronze
50 pts	1 pts	WELL Silver
60 pts	2 pts	WELL Gold
80 pts	3 pts	WELL Platinum

This article will analyze the WELL methodology to determine if it can be considered as other widely known and installed systems such as LEED, BREEAM, CASBEE.

2. METHOD

We carried out a two-stage overall assessment: First, a qualitative screening based on Fowler & Rauch exclusion criteria [4] that organizes, concentrates and sequentially filters the existing information on classification systems in seven dimensions: Applicability, Development, Usability, System Maturity, Technical Content, Measurability & Verification, and Communicability. Secondly, a quantitative assessment based on [5], where a 0 to 100 score is obtained from the following dimensions: Popularity and Influence, Availability, Methodology, Applicability, Data Collecting Process, Accuracy and Verification, User-friendliness, Development, and Results Presentation. The core of both stages is heuristics, an assessment approach widely used in the field of human factors and ergonomics. A heuristic evaluation verifies whether a set of desirable principles (i.e. heuristics) are met according to the expert criteria of the evaluator.

Heuristic evaluation is the most commonly used usability inspection method. It became popular in the early 1990s because of its speed, cheapness, and ease of implementation. It could be performed by only 4–5 evaluators who, managing a limited set of principles to detect a high proportion of usability problems. In other words, each evaluator inspects the designed system or artefact alone and judges its compliance according to a set of usability principles. Heuristic evaluations can be implemented quickly and conveniently through a competent pool of evaluators and the most well-known heuristic principles are the 10 ones developed by Nielsen (1992) [6].

In this paper, our sources were WELL experts and the official WELL technical documentation.

3. RESULTS

Table 3 shows stage one results of the following dimensions of analysis:

Applicability. This criterion encompasses two aspects: (i) Type of Projects, e.g. New Construction, Major Renovations, Tenant Build-Out (leases), and Operations & Maintenance; (ii) Type of Buildings, e.g. Office Buildings, Courthouses, and Border Stations. WELL complies with this dimension.

Development, including: (i) System Management, which identifies the involvement level in the development, funding, and management of the rating system by Government, Private Industry, Non-Governmental Organizations, and others; (ii) Development Approach, which Identifies if the system was developed using a consensus-based approach, life cycle analysis, expert opinion approach, or other.

Table 3:
Stage one qualitative screening.

Dimension	Criteria met	Assessment
Applicability	(2/2)	Designed for indoor spaces, it adapts to different kind of projects.
Development	(4/6)	Development included different actors and scientific and technical knowledge
Usability	(3/3)	Cost, ease of use, and online assistance are identified
System Maturity	(3/3)	Available information on system age, number of buildings, and stability is enough
Technical Content	(3/3)	Its ten modules are relevant and comprehensive
Measurability & Verification	(5/5)	System based on performance. Each project is assessed in field.
Communicability	(3/3)	Results are measurable, comparable, and identifiable in ten offline modules.

In WELL, the participants are private, scientific, and others, without government intervention. It is based on expert consensus. As a drawback, it lacks of life cycle analysis.

Usability. This dimension summarizes data related to: (i) Cost of using a system, including cost for use or rating system materials, cost of project registration, fees associated with certification, and time typically needed to complete an application. (ii) Ease of Use: Complexity of the tools and technical knowledge needed to complete rating system process, especially for the optimization of energy use, environmentally preferable products use, and indoor environmental quality enhancement. (iii) Product support: Availability and responsiveness of direct requests for assistance, availability of training, and usability of information available on the website, through case studies, documented inquiries, and frequently asked questions.

WELL has product support: availability and responsiveness of direct requests for assistance, availability of training and usability of the information available on the website, through case studies, documented queries and FAQs.

System Maturity: It is analyzed from three points of view: (i) System Age: Identify when the rating system was developed, first used, first available for public use, and when the most recent revision was completed. (ii) Number of Buildings: Identify the number of buildings participating in the rating system and the number of buildings that have completed the process for denotation as a green building. (iii) Stability of system: Identify the processes that allow for full implementation of a rating system, including development, testing, and review process, systems for upgrades, process for modifications, and the expected frequency of modifications.

WELL could be evaluated in all of these terms, giving results like the other certification systems evaluated by Fowler & Rauch. Updated information on this is available on the official WELL website. Such as age of the system, square meters and certified buildings among various inputs regarding this topic.

Technical Content: Where a sustainable building design guide is identified. Having a detailed review of how the rating system addresses the key features of sustainable design, optimization of energy use, use of environmentally preferable products, and improvement of indoor environmental quality (IEQ). There are ten concepts in WELL v2, these lead to a study of the points mentioned in technical content, such as efficient use of water, indoor air quality, measurement and review.

Measurability & Verification: This section discusses about standardization, quantification, verification process, and documentation.

WELL is a performance based system and each project is verified by on-site testing of the building which makes the system measurable and verifiable. Within all categories, there are items and each one has a number of points to achieve. Projects seeking WELL certification can earn points based on performance results for various policies, design and operational strategies and can achieve one of four levels of certification: Bronze, Silver, Gold or Platinum.

Communicability: Clarity, versatility, comparability, and results usability are evaluated in this area.

WELL presents its well-defined results in ten measurable concepts, which allows them to be perfectly identifiable, measurable, and comparable with others. They are not available online, they must be requested. They are clear to be integrated, and they are susceptible to normalization in order to make comparisons between different types of buildings, stay, years, or different characteristics of sustainable design. The results allow the usability of the rating system documentation to communicate the achievements of the construction project.

Our results show that WELL fulfilled all of the proposed criteria as well as other more established BEAM [3]. Having successfully pass this screening stage, we proceeded to stage two. To perform a quantitative evaluation based on the criteria proposed by Nguyen & Altman (2011), where nine aspects are evaluated, and each one has an assigned score, adding up to 100 points. Table 4 shows stage two quantitative results based on [5] assessment method.

Popularity and influence, we rated WELL 8 out of 10. This aspect includes parameters such as being well known, importance, number of cities or countries where it is applied and its versatility. WELL gives a similar evaluation to older systems.

Availability, obtaining a score of 7 out of 10, WELL obtained the same results as more established systems, evaluating aspects such as costs, ease of access to information, availability of information.

Methodology, reached 9 points of 15, based on *how* are the methodological aspects to apply the scores, quantitative and qualitative evaluations, efficiency of the methods used, scoring levels, life cycle analysis. Here there are points such as life cycle that are not evaluated in WELL, which determined a lower score.

Applicability, we assigned 7 points on this dimension, resulting in a poor performance on this specific item because we identified two issues. On the one hand, the lack of life cycle analysis, and on the other hand, aspects that have to do with the economic part, social aspects, quality of life, the latter being addressed by WELL.

Data Collecting Process scored 9 out of 10. In relation to data collection, including data gatherers, formatting, and information presentation, among others, WELL has clearly defined and organized these procedures. Therefore, it achieves a good performance.

Accuracy and Verification, scored 8 out of 10 considering data collection and evaluation, and the training of WELL experts. WELL trains professionals for these tasks and once they submit their assessments, audits are carried out. This contributes to reliable assessments.

User-friendliness, WELL got the highest score in terms of availability and responsiveness of direct request for assistance, questions, registration of queries, available courses, training sessions, clarity of instructions. Being at the level of more established BEAMs such as LEED.

Development, scored 7 out of 10, taking into account the maturity of the system and its upgrades. The relative youth of WELL and the lack of a future life cycle assessment perspective, led to a lower performance in this item.

Results Presentation, scored 3 out of 5. This item takes into account the system´s reachable levels, the clarity of their descriptive information and whether it can be compared with other systems or not. Since WELL is targeted to occupant´s well-being, it cannot be compared to other BEAMs, which are aimed to energy performance assessment.

Table 4:
Stage 2 WELL quantitative results

Categories	LEED	CASBEE	WELL
Popularity and Influence (10 p)	10	6	8
Availability (10 p)	7	7	7
Methodology (15 p)	10	13	9
Applicability (20 p)	13	11.5	7
Data Collecting Process (10 p)	7	6	9
Accuracy and Verification (10 p)	7	9	8
User-friendliness (10 p)	10	6	10
Development (10 p)	8	7	7
Results Presentation (5 p)	3	4	3
Final Score (100)	75	58	68

Table 4 also shows, for the sake of comparison, LEED and CASBEE results from [5]. The former presented the highest (75 points) scores while the latter showed the lowest (58 points) scores. Our results place WELL between CASBEE and LEED, and according to [5], below BREEAM (75 points), and above HK-BEAM (66 points), and GREEN STAR (60 points). The worst WELL performing dimension in relation to other BEAM was Applicability, probably because WELL does not consider the whole lifecycle of the building.

4. CONCLUSION

We carried out a two stage comprehensive characterization of WELL V2 rating system based on two previously published papers [4,5]. Our results showed that a non-energy based BEAM such as WELL can be assessed using the same criteria of other well established BEAM. It met Fowler & Rauch inclusion criteria and hence it was eligible for a quantitative assessment [5], where it achieved a score of 68 points.

Its performance was among other more consolidated and updated BEAMs, such as LEED, CASBEE, or GREEN STAR. This not only positions WELL as a proper BEAM but also it can be

considered a seminal method for the creation of new and more suitable wellbeing and health labelling systems, correlating the role BREEAM played at the end of the XX century. As a drawback, both [4] and [5], and ourselves in this exploratory analysis, performed a sole-expert heuristic assessment. It is recommended to perform such methodology in groups of experts, to reach a consensual homogeneous result.

CONFLICT OF INTEREST STATEMENT

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

REFERENCES

1. Stern N (2006). Stern Review on the Economics of Climate Change. London: HM Treasury
2. Cole J, Howard N, Ikaga T & Nibel S (2005). Building Environmental Assessment Tools: current and future roles. In World Sustainable Building Conference (pp. 27-9).
3. Cedeño-Laurent JG, Williams A, MacNaughton P, Cao X, Eitland E, Spengler J, & Allen J (2018). Building Evidence for Health: Green Buildings, Current Science, and Future Challenges. Annual review of public health, 39, 291-308.
4.Fowler KM, Rauch EM (2006). Sustainable Building Rating Systems Summary. Pacific Northwest National Laboratory - U.S. Department of Energy.
5.Nguyen BK & Altan H (2011). Comparative review of five sustainable rating systems. Procedia Engineering, 21, 376-386.
6.Yasemin Afacan & Cidgem Erbug (2008). An interdisciplinary heuristic evaluation method for universal building design.
7.WELL https://v2.wellcertified.com/v/en/concepts

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Will Cities Survive?

The changing needs in residential design post-pandemic

HEBA ELSHARKAWY [1] HAITHAM RASHED [2]

[1] Department of Architecture and Landscape, Kingston School of Art, Kingston University, London, UK
[2] Department of Architectural Engineering, University of Prince Mugrin, Medinah, Saudi Arabia

ABSTRACT: As people's needs from their homes have changed due to COVID-19 pandemic, the design of homes will also have to change for the future. Flexible and adaptable spaces have become more important. There has also been a shift from apartments to houses as people sought to move away from constrained dwellings to larger (and sometimes cheaper) homes out in the suburbs. The importance of mental health and general well-being also emerged as the effects of isolation were experienced. This study seeks to explore how people's lifestyles and needs may have changed after the pandemic and how this change could bear impact on future design and master planning of residential buildings and new developments. The research adopts a mixed method design, based on a questionnaire survey, to gain more insight into occupants' experiences with their homes, behaviours and needs post pandemic. The case study is the first phase of a new residential development in Kent, UK. Survey results show that 77% of respondents started working from home due to lockdown, with 37% of them making changes to their internal home layouts. Changes made were mainly for work/study space, and/or exercising space/ gym equipment. Further results and analysis are hereby discussed.
KEYWORDS: Residential design, Post-pandemic, Wellbeing, Outdoor spaces, Lifestyle

1. INTRODUCTION

In 2019-2020, the world was hit by the global pandemic of COVID-19 disease, which has had detrimental health, social and economic impacts on all nations. In mitigating the spread and impacts of the pandemic, new norms and lifestyles evolved; such as social distancing, and self-isolation which led to minimal human physical interaction. With people confined in their homes, and new lifestyles developing, their spatial needs changed where, flexible and adaptable spaces have become more necessary [1, 2]. The need for more space also became more essential, where a notable shift from apartments to houses became more evident as people sought to move to larger homes, with more private outdoor space in the suburban areas. Houses also offered more privacy and health risk control, compared to apartment blocks [3].

As people have become more confined to their homes, going outside became more important to their mental health. The use of open spaces and affiliation with nature helped people maintain their health and wellbeing and proved to be especially beneficial in mental and cognitive development of children during lockdown [4]. A survey in several countries indicated that frequent park visits improve the quality of life and helps reduce health-related issues [6]. Views of greenery and the clear sky are also very effective in restoring the sense of self-esteem, as shown in a recent study [7]. Ensuring open spaces are large enough and varied to accommodate social distancing measures as well as users' needs when designed in the future will be vital [5]. This study seeks to explore how people's lifestyles, needs and preferences may have changed as a result of COVID-19 pandemic and how this change could bear impact on future design of residential buildings and master planning of new developments. The paper starts with the research context and background, followed by the research methodology, results and discussion, and ends with some reflections for future research.

2. LITERATURE REVIEW

The COVID-19 pandemic led to the generation of the social distancing measures, or the 'new normal'. This meant physical isolation, and minimal social interaction, leading to almost full reliance on virtual communication methods [8], including virtual meetings and social media platforms. People of all ages felt mandated to get more used to living in virtual worlds, within the confined spaces of their homes. Furthermore, adaptability and flexibility within domestic spaces to allow for the abrupt changes in daily routines and lifestyles; including working and studying from home became key for the then unprecedented times. More focus shifted towards maintaining one self's health (physical and mental) and wellbeing by spending more time in outdoor spaces, gardens and parks, often referred to as restorative environmental design [3]. There has also been evidence of shifts towards sustainable lifestyles and pro-environmental behaviour [9].

2.1 Post-pandemic changes to homes

As people became more confined to their homes for long durations; many opted to (re)create spaces to