



# **Reconciling LEED with Salutogenic Affordances in Long Term Care Environments for the Aged:**

## **A Call for More Inclusive Assessment Metrics**

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# Design For Health: Sustainable Approaches to Therapeutic Architecture

*Architectural Design* 2017

Guest Edited by Terri Peters

Featuring 16 essays by :

Penoyre Prasad

Montgomery Sisam

C.F. Møller

Arup

Mass Design Group

and others





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Terri Peters

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**Healthy Patient Rooms in Hospitals**  
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**Counterpoint**  
Title to come  
Author

**Corrections**

# SOCIALLY INCLUSIVE DESIGN IN DENMARK

## THE MATURING LANDSCAPE



Third Age  
 © Terri Peters

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Designing and retrofitting buildings and cities for an aging population is an urgent global concern. The demand for specialized healthcare facilities, assisted housing and other age-related environments continues to grow as baby boomers enter their retirement years. According to the World Health Organization (WHO), between 2000 and 2050 the proportion of the world's population over 60 years of age will double from about 11 per cent to 22 per cent.<sup>1</sup> This represents a significant and unprecedented demographic shift. For example, the 'youngest' aged 50 to 67, of course will not have unique needs and desires, but they will have some specific requirements of their buildings and cities that they will not have had earlier in life. These could be relating to healthcare, urban mobility, and opportunities to remain, or begin being, active to continue good health. Access to fitness, leisure and community services, sustainable shopping and local business, and appropriate transport all must be considered from their point of view.

Due to the latest science, medicine and health developments, we can assume that this generation will live even longer than previous generations. They will also be in better health as they age, with most positioning to age in place<sup>2</sup> rather than move into separate institutions.<sup>3</sup> This means that existing buildings and cities must be adapted to continue to work for them as they enter their retirement years. The WHO also reports that by 2050 the number of people aged 60 and older will have quadrupled, meaning there will be almost 400 million people aged 60 years or older making up the 'largest' age group (aged 70 to 80) and 'widest' (aged 80 to 90).<sup>4</sup> For the first time ever, the majority of world-aged adults will have living parents. These children will have a

With a tradition of social inclusion and innovative contemporary design, Denmark leads the way internationally in its architectural provision for an older population. Architect, author and researcher Terri Peters highlights some pioneering housing schemes in Denmark that use architecture to reduce the stigma of old age in the creation of environments that are socially 'desirable' or desirable – breaking away from the isolated environment of the 'nursing home' – and that employ science and technology to positive effect, as a means of promoting building and health.



high regard in all aspects of society as consumer markets for healthcare, assistive living, leisure and other related services will rise in this huge demographic group. Designers must do more than just accommodate the changing needs of these clients and users. They have an opportunity to design and retrofit buildings and cities that celebrate older age and encourage diverse resident groups, create safe physical and social infrastructures that work together for people of all ages and abilities.

These building schemes largely inherit their buildings designed in the building boom following the Second World War. Numerous built-in many 'features for living' – flexibility, housing and design designed for storage that were intentionally modular, individually supported and individual.<sup>5</sup> Authors Stephen VanDerBrug and David Fine trace the origins of the 'nursing home' institutions that became obsolete in the post-war period and contemplates those in the broader history of health architecture.<sup>6</sup> Nursing homes are often described as having dehumanizing architecture and an unpleasant social environment, and are increasingly avoided. The authors compare abandoned systems approaches and find that in the majority of cases there is no attempt to re-invent the home. We people were being, when they moved to the institution. In contrast to the European and North American examples the authors reflect upon are the contemporary examples found in Sweden, Finland and Denmark. They cite residential environments, such as the progressive Soligården Nursing Home in Falun, Denmark, completed in 2003 by Peter Overgaard Sørensen, which they note influenced the design in many other countries and provided developments in the US by more than 20 years.<sup>7</sup>

# Salutogenic Design



# Sustainable Design



CERTIFIED  
40-49 Points

CERTIFIED  
50-59 Points

CERTIFIED  
60-69 Points

CERTIFIED  
80+ Points



**More holistic**



# Measuring?



# Pilot Study

- architecture professional literature
- design awards
- online resources for example details from clients and care provider organization,
- emails and Skype calls with firms



Building 1



Building 2



Building 3



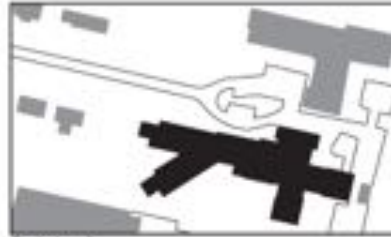
Building 4



Building 5

# Pilot Study

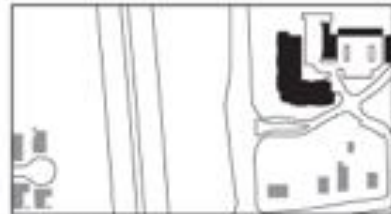
- Suburban and urban
- Located in North America
- Range of heights, 1-7 levels,
- Completed projects
- Range of sizes from 20-416 beds



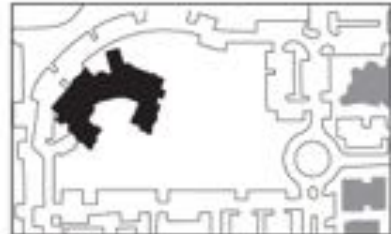
Building 6



Building 7



Building 8



Building 9



Building 10



# Pilot Study

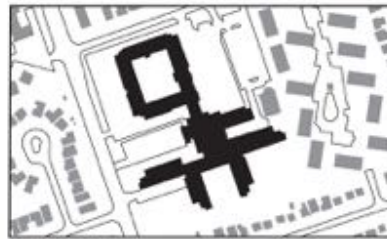
Four types evaluated:

Independent living facilities

Assisted Living (AL),

LTC skilled nursing facilities (LTCF),

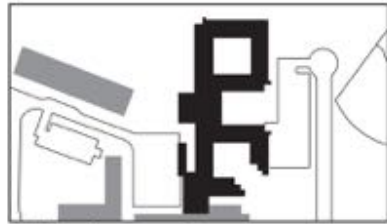
Comprehensive LTC aging in place (LTC/AIP)



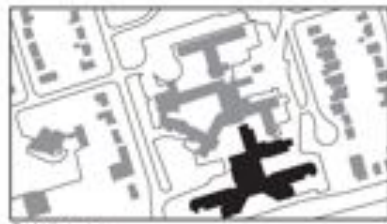
Building 16



Building 17



Building 18  
Building 13



Building 14

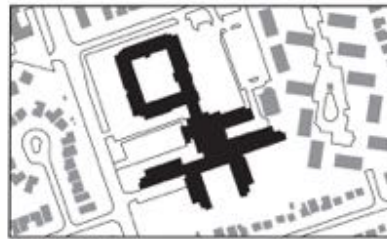


Building 15



# Pilot Study

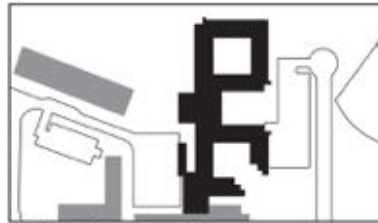
- LEED Certified
- has an available LEED scorecard
- Plans and sections available
- Enough information available about the project



Building 16



Building 17



Building 18



# Methods

- Qualitative and Quantitative
  - facility's pre-existing, quantified **LEED score**
  - **Salutogenic-Biophilic Attributes** in two main areas and scales:
    1. Site- Building Envelope Attributes
    2. Residential Unit Attributes,
  - Plan-section analysis of **architectural features** including drawings, photographs, video, written information
  - Each scored by a team of five judges based on group consensus. Images projected onto large format monitor and four 2-3 hour sessions required to evaluate all 18 buildings to create a **composite score** for the newly-created, quantified, S-B rating

# LEED Project Database

The screenshot displays the LEED Project Database website. At the top left is the USGBC logo. The navigation menu includes 'LEED', 'Credentials', and 'Membership'. A secondary menu contains 'Store', 'Resources', 'Education', 'Directory', 'Articles', 'Donate', and 'Account'. A search icon is located in the top right corner.

Below the navigation, there are tabs for 'Organizations', 'People', and 'Projects', with 'Projects' being the active tab. A 'SMART FILTERS' button is positioned above a search bar containing the text 'Search projects'. Below the search bar, there are radio buttons for 'Match all results' (selected) and 'Match any results'. A filter dropdown menu is open, showing 'Name' and 'contains' with an empty input field. 'Clear filters' and 'APPLY' buttons are located to the right of the filter menu.

The search results section shows '102,810 results'. Below this, there are sorting and view options: 'Sort Updated' and 'View #'. A 'SIGN IN TO DOWNLOAD' button and an 'Export results (XLS)' link are also present.

The results are displayed in a grid of three project cards. Each card features a photograph of a building and text indicating the project name and certification date:

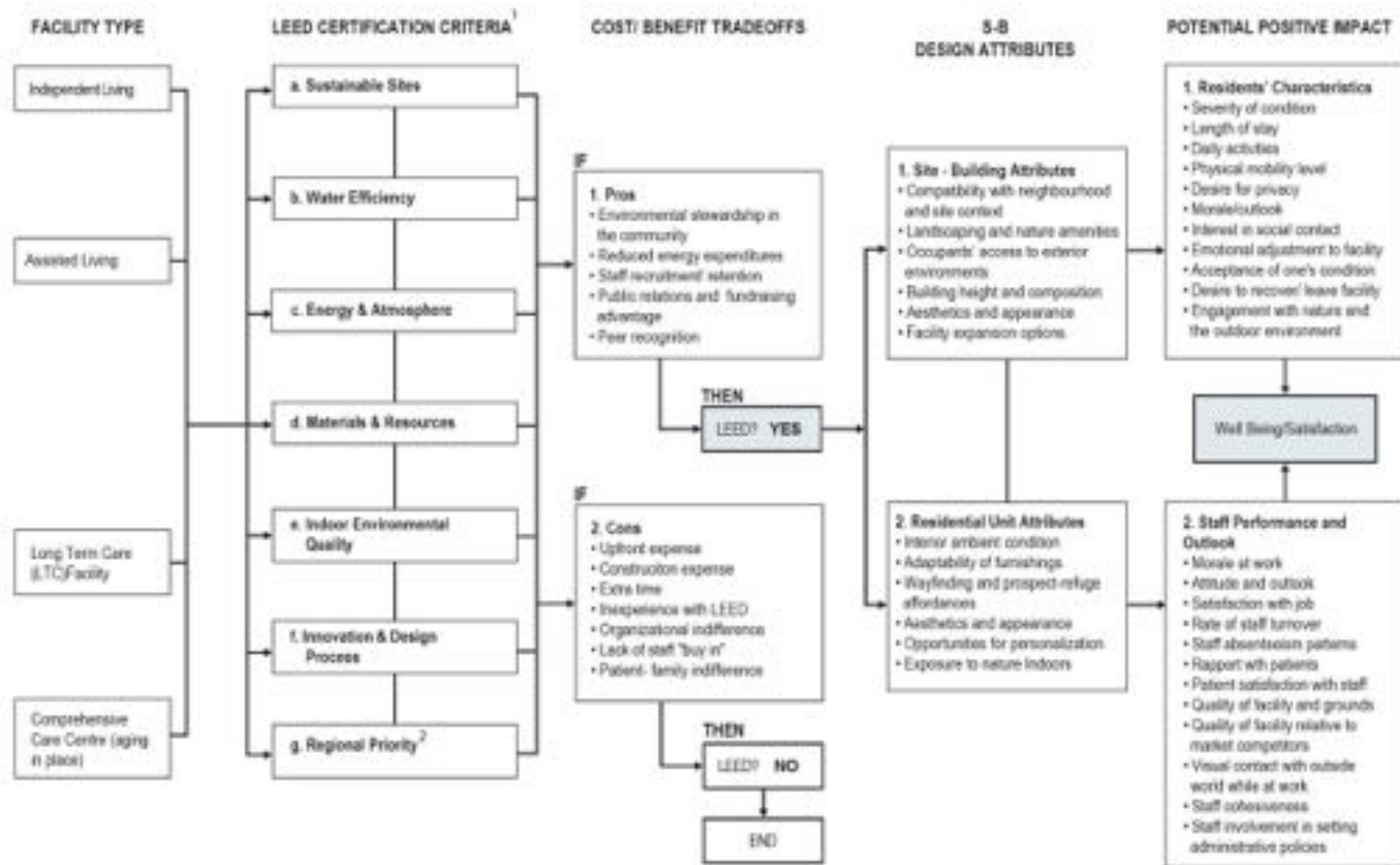
- Card 1: LEED v4 v3 - LEED 2009 Certified on Feb 02, 2012
- Card 2: LEED ID+C Retail v3 - LEED 2009 Certified on Jul 02, 2014
- Card 3: LEED BD+C Core and Shell v3 - LEED 2009 Certified on Feb 02, 2012

# LEED Scorecard

Initials of project name  
 City and state  
 Reference number  
 Date certified  
 Level of award

But not:  
 Size  
 Architects  
 Photos  
 Drawings  
 Site plan  
 description

0010167953, St. Augustine, FL		FDVA Nursing Home		GOLD, AWARDED MAR 2011	
LEED BD+C: New Construction (v2.2)					
<b>SUSTAINABLE SITES</b>	AWARDED: 8 / 14	<b>MATERIAL &amp; RESOURCES</b>	CONTINUED		
SSc1 Site selection	0 / 1	MRc3.2 Materials reuse - 10%	0 / 1		
SSc2 Site selection - bicycle accessibility	0 / 1	MRc4.1 Recycled content - 10% (post-consumer + 1/2 pre-consumer)	1 / 1		
SSc3 Brownfield redevelopment	0 / 1	MRc4.2 Recycled content - 20% (post-consumer + 1/2 pre-consumer)	0 / 1		
SSc4.1 Alternative transportation - public transportation access	0 / 1	MRc5.1 Regional materials - 10% extracted, processed and manufactured regionally	1 / 1		
SSc4.2 Alternative transportation - bicycle storage and changing rooms	1 / 1	MRc5.2 Regional materials - 20% extracted, processed and manufactured regionally	1 / 1		
SSc4.3 Alternative transportation - low emitting and fuel efficient vehicles	1 / 1	MRc6 Rapidly renewable materials	1 / 1		
SSc4.4 Alternative transportation - parking capacity	1 / 1	MRc7 Certified wood	1 / 1		
SSc5.1 Site development - protect or restore habitat	0 / 1				
SSc5.2 Site development - maximize open space	1 / 1	<b>INDOOR ENVIRONMENTAL QUALITY</b>	AWARDED: 13 / 15		
SSc6.1 Stormwater design - quantity control	1 / 1	EQc1 Outdoor air delivery monitoring	1 / 1		
SSc6.2 Stormwater design - quality control	1 / 1	EQc2 Increased ventilation	1 / 1		
SSc7.1 Heat island effect - non-roof	0 / 1	EQc3.1 Construction IAQ Mgmt plan - during construction	1 / 1		
SSc7.2 Heat island effect - roof	1 / 1	EQc3.2 Construction IAQ Mgmt plan - before occupancy	1 / 1		
SSc8 Light pollution reduction	1 / 1	EQc4.1 Low-emitting materials - adhesives and sealants	1 / 1		
		EQc4.2 Low-emitting materials - paints and coatings	1 / 1		
<b>WATER EFFICIENCY</b>	AWARDED: 3 / 5	EQc4.3 Low-emitting materials - carpet systems	1 / 1		
WEc1.1 Water efficient landscaping - reduce by 50%	1 / 1	EQc4.4 Low-emitting materials - composite wood and agrifiber products	1 / 1		
WEc1.2 Water efficient landscaping - no potable water use or no irrigation	0 / 1	EQc5 Indoor chemical and pollutant source control	1 / 1		
WEc2 Innovative wastewater technologies	0 / 1	EQc6.1 Controllability of systems - lighting	1 / 1		
WEc3.1 Water use reduction - 20% reduction	1 / 1	EQc6.2 Controllability of systems - thermal comfort	1 / 1		
WEc3.2 Water use reduction - 30% reduction	1 / 1	EQc7.1 Thermal comfort - design	1 / 1		
		EQc7.2 Thermal comfort - verification	1 / 1		
<b>ENERGY &amp; ATMOSPHERE</b>	AWARDED: 5 / 17	EQc8.1 Daylight and views - daylight 75% of spaces	0 / 1		
EAc1 Optimize energy performance	4 / 10	EQc8.2 Daylight and views - views for 90% of spaces	0 / 1		
EAc2 On-site renewable energy	0 / 3				
EAc3 Enhanced commissioning	0 / 1	<b>INNOVATION</b>	AWARDED: 5 / 5		
EAc4 Enhanced refrigerant Mgmt	1 / 1	Idc1 Innovation in design	4 / 4		
EAc5 Measurement and verification	0 / 1	Idc2 LEED Accredited Professional	1 / 1		
EAc6 Green power	0 / 1				
		<b>TOTAL</b>	40 / 69		
<b>MATERIAL &amp; RESOURCES</b>	AWARDED: 6 / 13				
MRc1.1 Building reuse - maintain 75% of existing walls, floors & roof	0 / 1				
MRc1.2 Building reuse - maintain 95% of existing walls, floors & roof	0 / 1				
MRc1.3 Building reuse - maintain 50% of interior non-structural elements	0 / 1				
MRc2.1 Construction waste Mgmt - divert 50% from disposal	1 / 1				
MRc2.2 Construction waste Mgmt - divert 75% from disposal	0 / 1				
MRc3.1 Materials reuse - 5%	0 / 1				

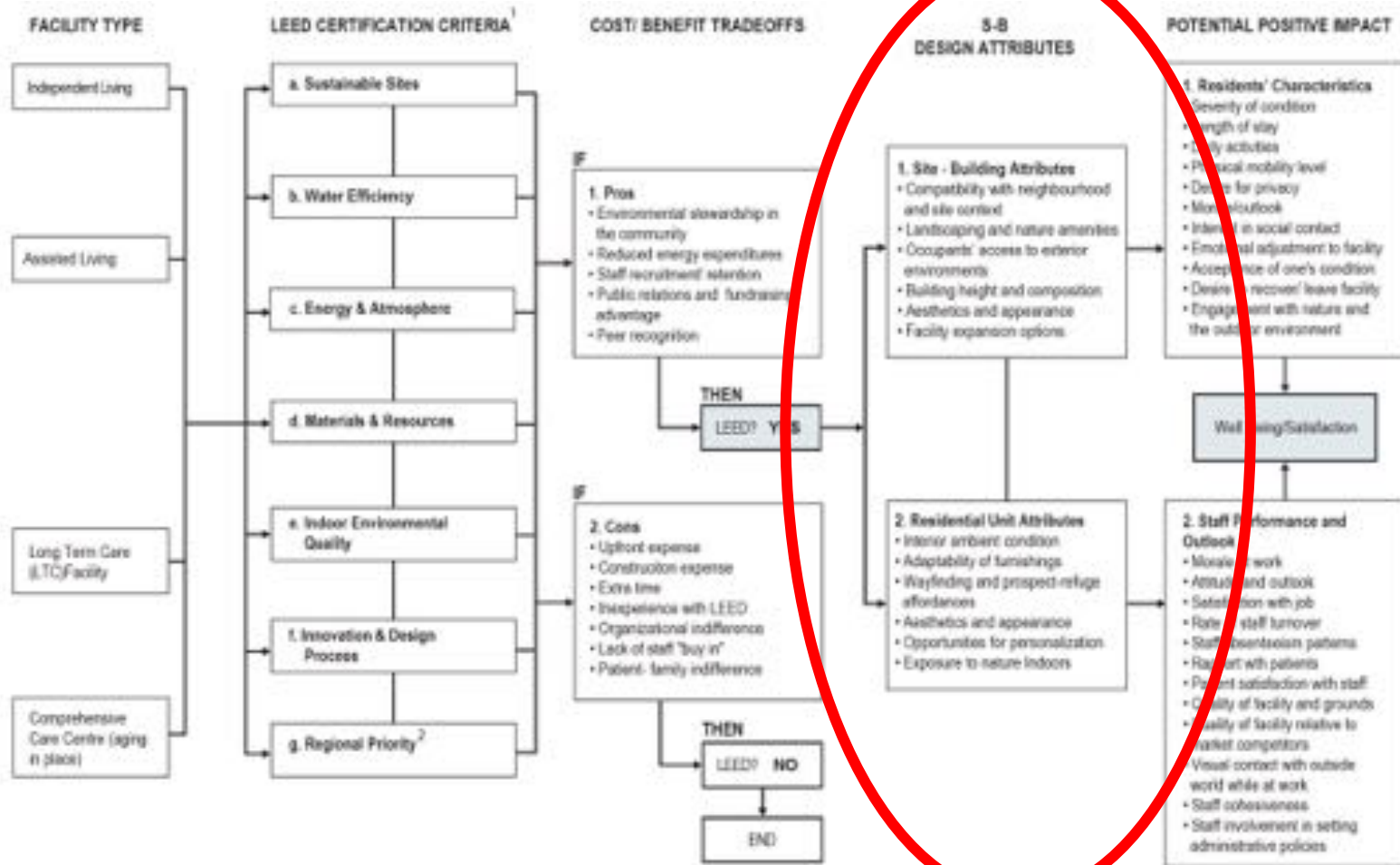


**Relationship Between LEED Certification, Salutogenic-Biophilic Design Attributes and Occupant Well-Being/Satisfaction**

<sup>1</sup>LEED programs currently exist in the areas of health, new construction, renovation and interiors (a seventh category, Reciprocal Priority, constitutes up to 41 points, for a total of 110 maximum points)

<sup>2</sup>LEED version 2009





**Relationship Between LEED Certification, Salutogenic-Biophilic Design Attributes and Occupant Well-Being/Satisfaction**

<sup>1</sup>LEED programs currently exist in the areas of health, new construction, renovation and interiors (a seventh category, Regional Priority, constitutes up to 41 points, for a total of 110 maximum points)

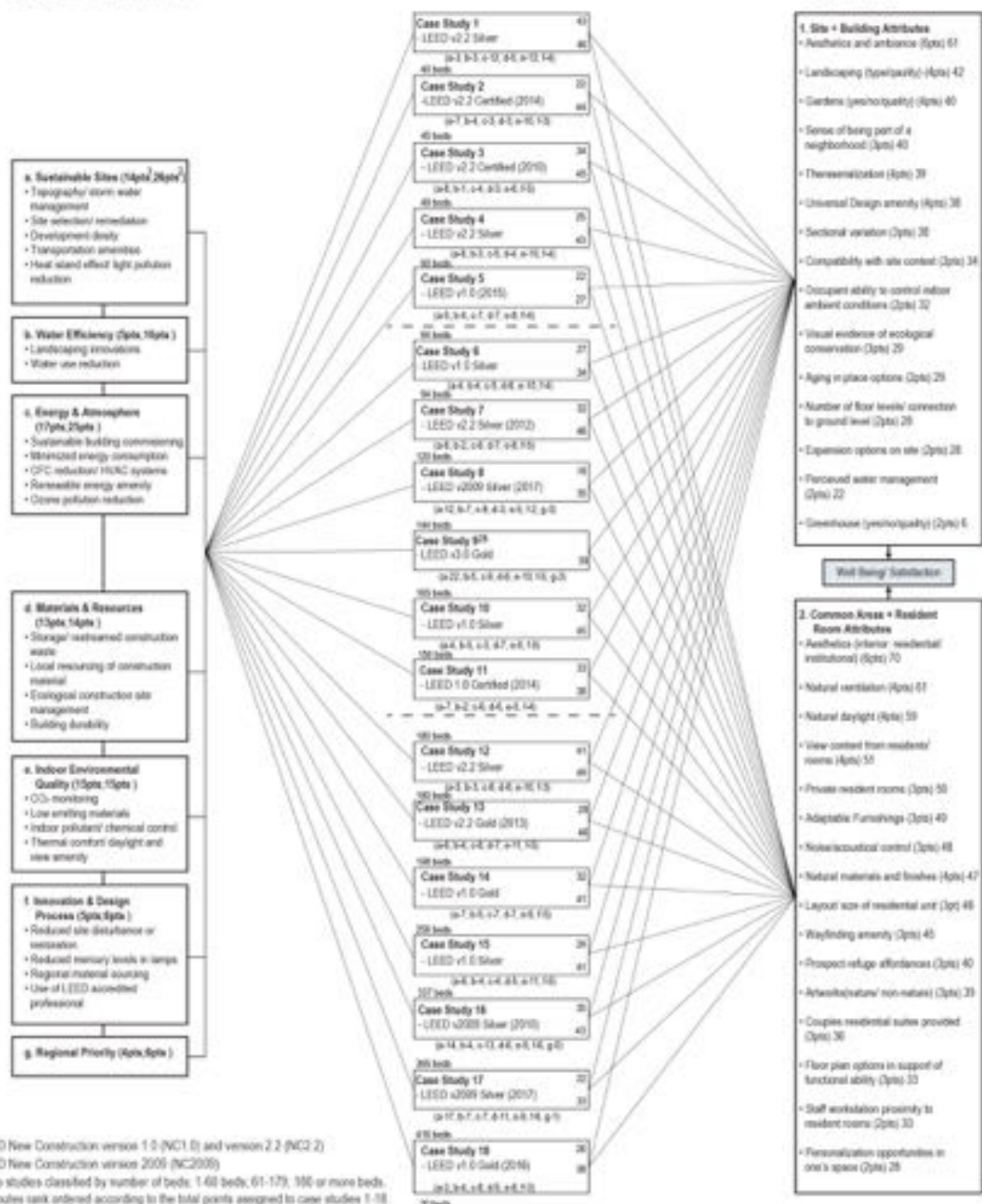
<sup>2</sup>LEED version 2009

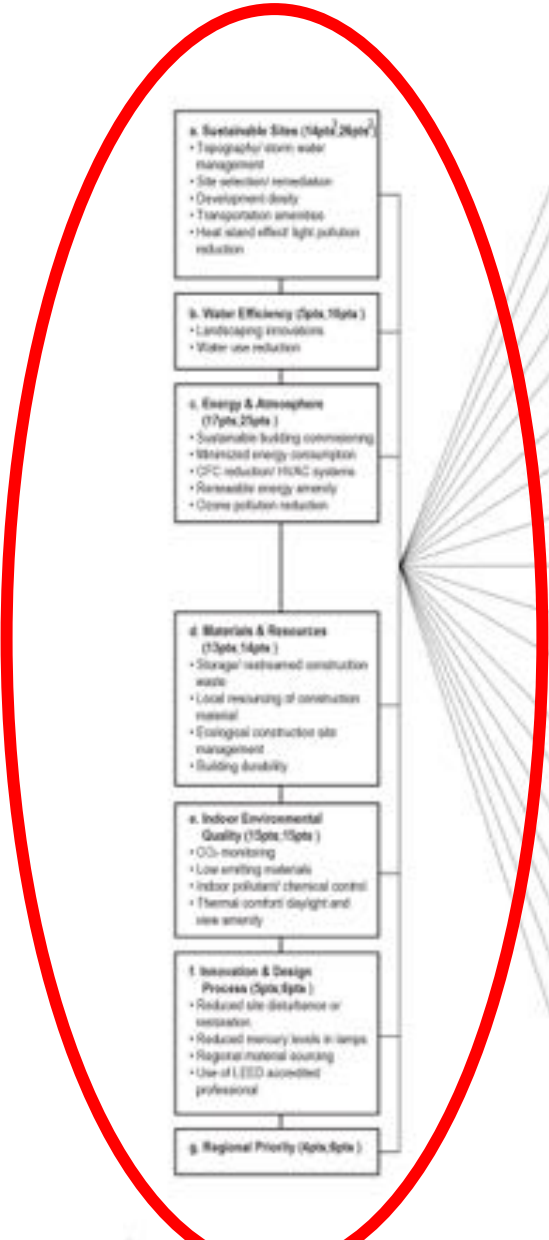
# Salutogenic-Biophilic Score (S-B)

Identified **salutogenic and biophilic design attributes** based on peer-reviewed literature that can contribute to achieving a functionally supportive, aesthetically desirable built outcome in this building type.

**1. site and building envelope attributes:** consisting compatibility with the neighborhood and immediate site context, landscape and nature amenities, occupants' access to the exterior, a navigable, acceptable building height scale and spatial composition, aesthetics and appearance, and facility expansion options.

**2. residential unit attributes:** interior ambient conditions, wayfinding amenity, aesthetics and appearance, furnishings, opportunities for personalization, and exposure to nature indoors and views to the outdoors.

<sup>1</sup> LEED New Construction version 1.0 (NC1.0) and version 2.2 (NC2.2)<sup>2</sup> LEED New Construction version 2009 (NC2009)<sup>3</sup> Case studies classified by number of beds: 1-60 beds, 61-179, 180 or more beds<sup>4</sup> Attributes rank ordered according to the total points assigned to case studies 1-18



- h. Sustainable Sites (14pts/24pts)**
  - Topography/ storm water management
  - Site selection/ remediation
  - Development density
  - Transportation amenities
  - Heat island effect/ light pollution reduction
- i. Water Efficiency (5pts/16pts)**
  - Landscaping innovations
  - Water use reduction
- j. Energy & Atmosphere (7pts/24pts)**
  - Sustainable building commissioning
  - Optimized energy consumption
  - OTC reduction/ HUNG systems
  - Renewable energy amenity
  - Green pollution reduction
- k. Materials & Resources (7pts/14pts)**
  - Storage/ reclaimed construction waste
  - Local sourcing of construction material
  - Ecological construction site management
  - Building durability
- l. Indoor Environmental Quality (15pts/11pts)**
  - CO<sub>2</sub> monitoring
  - Low emitting materials
  - Indoor pollutants/ chemical control
  - Thermal comfort/ daylight and view amenity
- m. Innovation & Design Process (5pts/8pts)**
  - Reduced site disturbance or restoration
  - Reduced mercury levels in lamps
  - Regional material sourcing
  - Use of LEED accredited professional
- n. Regional Priority (4pts/8pts)**

<b>Case Study 1</b> LEED v2.2 Silver	41
(p=1, s=1, o=0, g=0, l=0, f=0, 14)	45
40 beds	
<b>Case Study 2</b> LEED v2.2 Certified (2014)	30
(p=1, s=1, o=0, g=0, l=0, f=0, 15)	44
40 beds	
<b>Case Study 3</b> - LEED v2.2 Certified (2010)	34
(p=0, s=1, o=0, g=0, l=0, f=0, 15)	45
40 beds	
<b>Case Study 4</b> - LEED v2.2 Silver	35
(p=0, s=1, o=0, g=0, l=0, f=0, 14)	43
40 beds	
<b>Case Study 5</b> - LEED v1.0 (2015)	22
(p=0, s=0, o=1, g=0, l=0, f=0, 14)	27
40 beds	
<b>Case Study 6</b> LEED v1.0 Silver	27
(p=0, s=0, o=0, g=0, l=0, f=0, 14)	34
40 beds	
<b>Case Study 7</b> - LEED v2.2 Silver (2012)	33
(p=0, s=0, o=0, g=0, l=0, f=0, 15)	46
40 beds	
<b>Case Study 8</b> - LEED v2009 Silver (2017)	16
(p=0, s=0, o=0, g=0, l=0, f=0, 12)	35
40 beds	
<b>Case Study 9<sup>1</sup></b> LEED v3.0 Gold	38
(p=0, s=0, o=0, g=0, l=0, f=0, 15)	38
40 beds	
<b>Case Study 10</b> - LEED v1.0 Silver	32
(p=0, s=0, o=0, g=0, l=0, f=0, 16)	41
40 beds	
<b>Case Study 11</b> - LEED 1.0 Certified (2014)	33
(p=0, s=0, o=0, g=0, l=0, f=0, 14)	38
40 beds	
<b>Case Study 12</b> - LEED v2.2 Silver	41
(p=1, s=1, o=0, g=0, l=0, f=0, 15)	45
40 beds	
<b>Case Study 13</b> - LEED v2.2 Gold (2013)	28
(p=0, s=0, o=0, g=0, l=0, f=0, 15)	40
40 beds	
<b>Case Study 14</b> - LEED v1.0 Gold	33
(p=0, s=0, o=0, g=0, l=0, f=0, 16)	41
40 beds	
<b>Case Study 15</b> - LEED v1.0 Silver	36
(p=0, s=0, o=0, g=0, l=0, f=0, 14)	41
40 beds	
<b>Case Study 16</b> - LEED v2009 Silver (2010)	35
(p=0, s=0, o=0, g=0, l=0, f=0, 14)	43
40 beds	
<b>Case Study 17</b> LEED v2009 Silver (2010)	20
(p=0, s=0, o=0, g=0, l=0, f=0, 14)	33
40 beds	
<b>Case Study 18</b> - LEED v1.0 Gold (2016)	26
(p=0, s=0, o=0, g=0, l=0, f=0, 15)	36
40 beds	

- 1. Site + Building Attributes**
  - Acoustics and ambience (3pts) 61
  - Landscaping (sustainability) (4pts) 42
  - Gardens (sustainability) (4pts) 40
  - Sense of being part of a neighborhood (3pts) 40
  - Thermalization (4pts) 39
  - Universal Design amenity (4pts) 38
  - Sectional variation (3pts) 38
  - Compatibility with site context (3pts) 34
  - Occupant ability to control indoor ambient conditions (3pts) 32
  - Visual evidence of ecological conservation (3pts) 29
  - Aging in place options (3pts) 29
  - Number of floor levels/ connection to ground level (3pts) 28
  - Expansion options on site (3pts) 28
  - Perceived water management (3pts) 22
  - Greenhouse (sustainability) (2pts) 6
- Well-being Satisfaction
- 2. Common Areas + Resident Room Attributes**
  - Acoustics (interior, residential/ institutional) (5pts) 70
  - Natural ventilation (4pts) 61
  - Natural daylight (4pts) 59
  - View control from residents' rooms (4pts) 55
  - Private resident rooms (3pts) 50
  - Adaptable Furnishings (3pts) 40
  - Noise/occupant control (3pts) 48
  - Natural materials and finishes (4pts) 47
  - Wayfinding amenity (3pts) 46
  - Prospect/refuge affordances (3pts) 40
  - Artworks/nature/ non-nature (3pts) 33
  - Couples residential suites provided (3pts) 36
  - Floor plan options in support of functional ability (3pts) 33
  - Staff workstation proximity to resident rooms (3pts) 33
  - Personalization opportunities in one's space (2pts) 28

<sup>1</sup> LEED New Construction version 2009 (NC2009) and version 2.2 (NC2.2)  
<sup>2</sup> LEED New Construction version 2009 (NC2009)  
<sup>3</sup> Case studies classified by number of beds: 1-60 beds, 61-179, 180 or more beds  
<sup>4</sup> Attributes rank ordered according to the total points assigned to case studies 1-18

# Pilot Study Findings

**LEED certification only somewhat, and inconsistently, correlates with salutogenic design excellence.**

# Pilot Study Findings

**LEED certification only somewhat, and inconsistently, correlates with salutogenic design excellence.**

*How much does faculty size or type matter?*

# Pilot Study Findings

- *The Function of Facility Size*—The size (bed capacity) is related to its total composite score. The largest case studies, i.e. those with 180 or more beds, were most highly scored. These facilities featured the most amenities and tended to have the most expansive sites.
- *So bigger is better?* A large assisted living facility in California (180 beds) with extensively landscaped grounds and courtyard and variety of ‘outdoor rooms,’ varied interior space and room configurations, ceiling heights, and adaptable furnishings.

# Pilot Study Findings

- *The Function of Facility Type:* LTC/aging in place campuses garnered the highest total composite scores, followed by assisted living facilities
- *Freestanding LTC* facilities were by far largest in terms of their bed capacities but these types did not score the highest when considering the buildings by function,
- We found *aging in place* campuses have varied spaces and amenities, they tend to provide a range of both indoor and exterior spaces perhaps more closely attuned to the broader range of functional capabilities of their residents.



# Limitations

- **On-site Post Occupancy Evaluations** needed
- Future studies should include **direct observation**
- while this study provides a useful **introduction to the core issues**, and a platform for further research and applications to professional practice, it is best appreciated as a Pilot Study.

# Recommendations

**For the more effective use of LEED in these building types**

- 1. Establish an Internally Consistent LEED Rating System*
- 2. Interdisciplinary Partnerships and a More Inclusive Rating System*



*Make comparisons easier*

# Recommendations

## **For the Environmental Design Research Community:**

*3. Lobby to Integrate Salutogenic Design in Professional Practice*

*4. Establish a Professional Organization to Further these ideas - devoted to salutogenic and biophilic research and design activities*



*Architectural & Salutogenic Quality is low in LTC*

# Recommendations

## **For Architects and Allied Design and Planning Professionals:**

5. *Work with Clients to Broaden their Vision of Design Excellence*—a need for more holistic and expanded metrics that relate to experiential, everyday, aspects of built environments for healthcare.



*What are the shared goals? What matters?*



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