# Measuring Wellness Design

## Supporting Human and Environmental Health

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# 01 Wellness Evolution

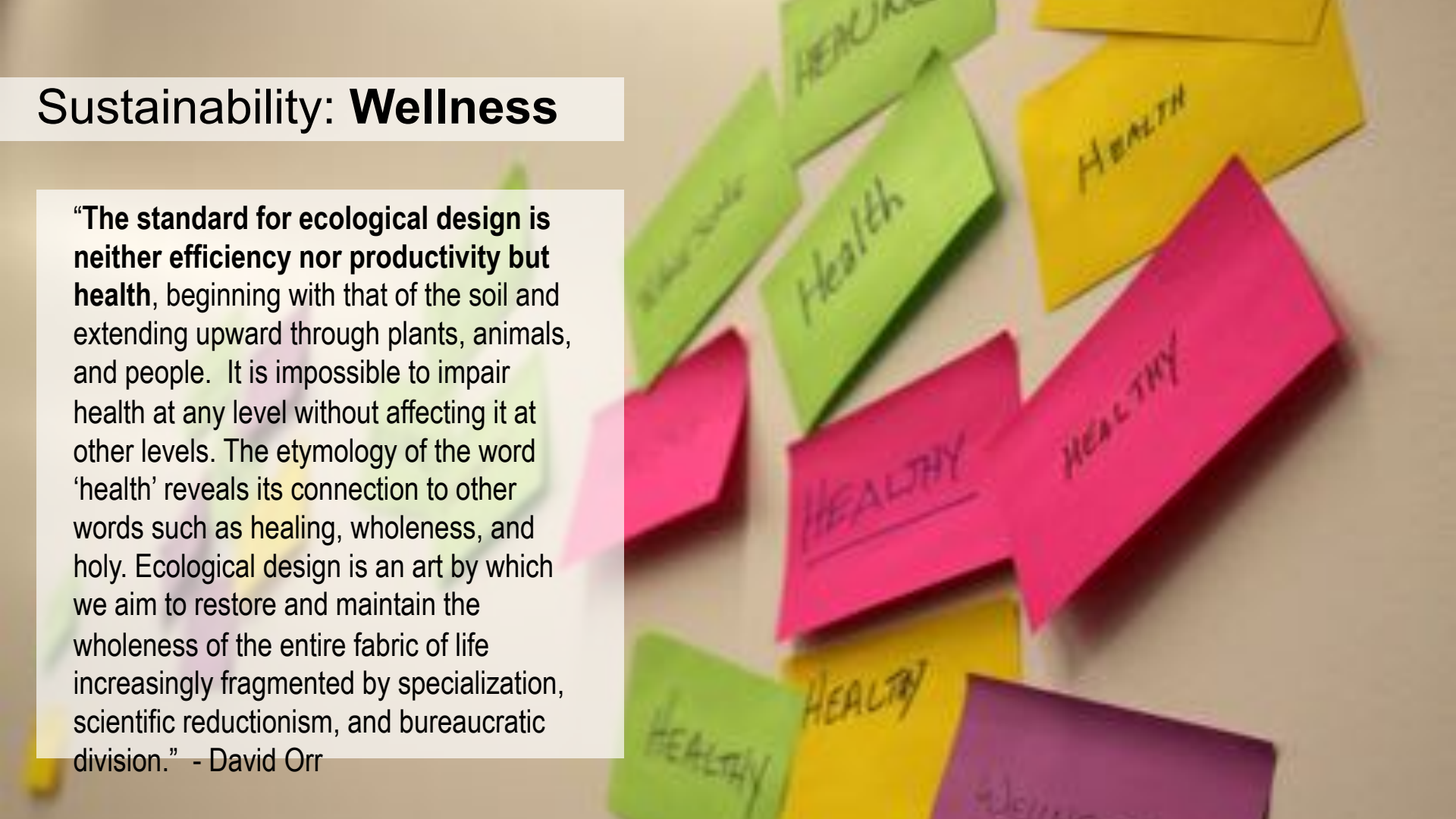
# Sustainability: **Future**

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

- Brundtland Commission, 1987

# Sustainability: **Wellness**

"**The standard for ecological design is neither efficiency nor productivity but health**, beginning with that of the soil and extending upward through plants, animals, and people. It is impossible to impair health at any level without affecting it at other levels. The etymology of the word 'health' reveals its connection to other words such as healing, wholeness, and holy. Ecological design is an art by which we aim to restore and maintain the wholeness of the entire fabric of life increasingly fragmented by specialization, scientific reductionism, and bureaucratic division." - David Orr



# Understand Where We Come From

Each physical environment has microbiomes in it, that vary depending on where we live.

We are just beginning to understand how our bodies have different microbiomes and how they influence our health.

*Aaron Bernstein MD, MPH, Harvard School of Public Health*

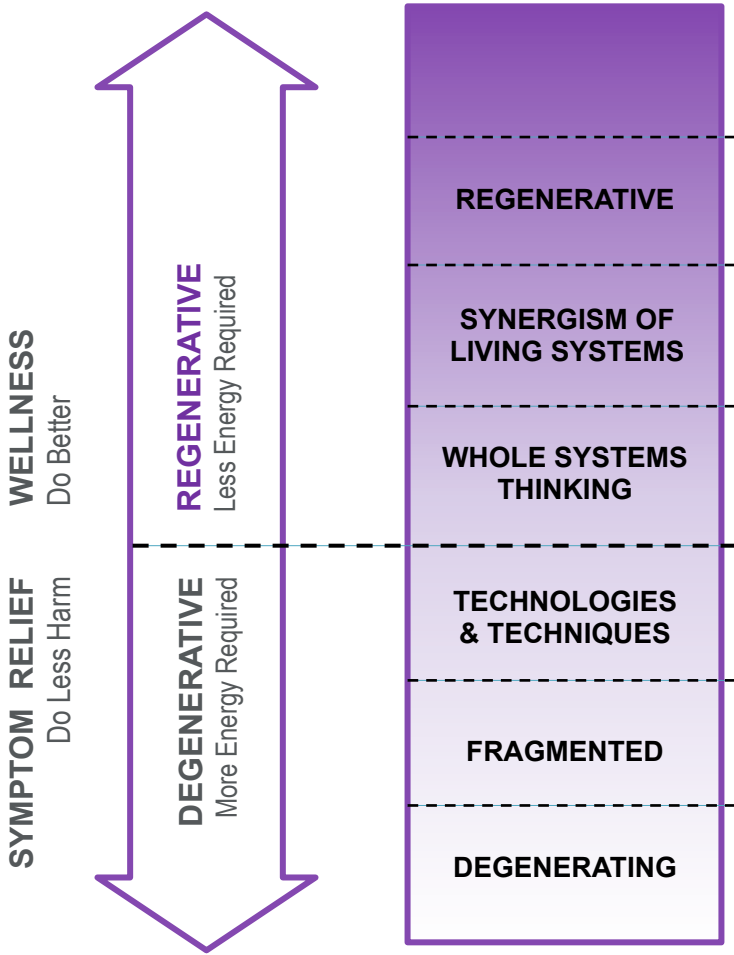
# Health is Not Static

*"Health varies for every individual depending on the circumstances…depends on ability to adapt to one's environment."* George Canguilhem

*"We propose the formulation of health as the ability to adapt and to self-manage."*

*Huber M. Knottenerus JA, Green LA, et al. How Should we Define Health? British Medical Journal. 2011*

# Sustainability is Not Static







**REGENERATIVE**
*Humans participating as nature. Co-evolution of the whole system. Biomimicry, Biophilic Design*

**RECONCILIATORY**
*Humans are an integral part of nature.*

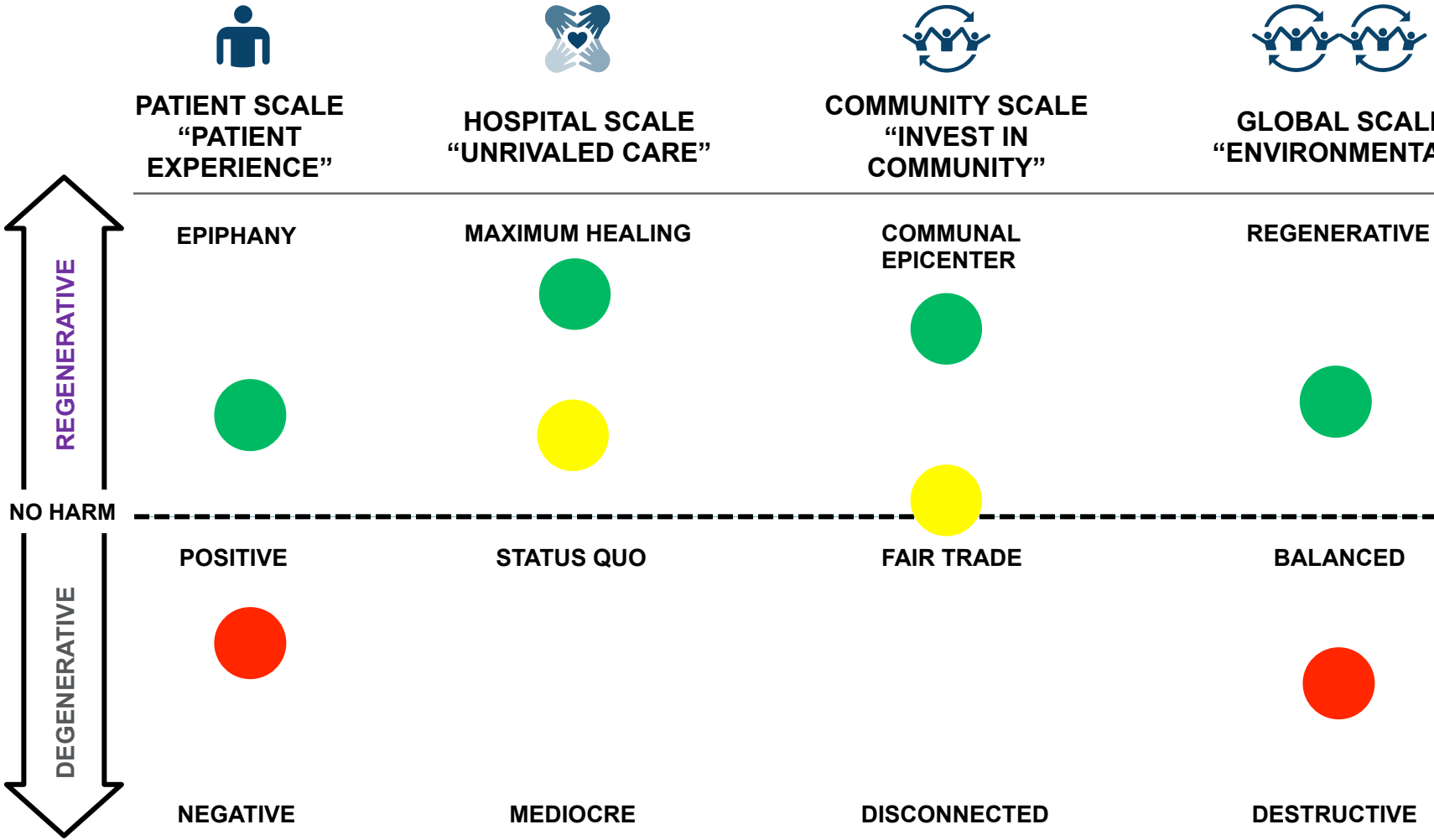
**RESTORATIVE**
*Humans assisting the evolution of sub systems. Net Positive*

**SUSTAINABLE**
*Natural Ecological Footprint, Living Building Challenge, Net Zero, **Well Building**, etc.*

**GREEN**
*Relative Improvement, Energy Star, LEED, BREEAM, Green Globes, SITES, Envision, etc.*

**CONVENTIONAL**
*Decreasing of resources, self-destructive.*

*Inspired by Eco Design Architects & Bill Reed*


PATIENT SCALE
“PATIENT EXPERIENCE”
HOSPITAL SCALE
“UNRIVALED CARE”
COMMUNITY SCALE
“INVEST IN COMMUNITY”
GLOBAL SCALE
“ENVIRONMENTAL”
REGENERATIVE
EPIPHANY
MAXIMUM HEALING
COMMUNAL EPICENTER
REGENERATIVE
NO HARM
POSITIVE
STATUS QUO
FAIR TRADE
BALANCED
DEGENERATIVE
NEGATIVE
MEDIOCRE
DISCONNECTED
DESTRUCTIVE

# Biophilic Design

Translate human biological science with nature into compelling sensory engaging architecture to promote wellness

*Bridgepoint Active Healthcare, Toronto*

# **Nature in Space:** Visual Connection with Nature

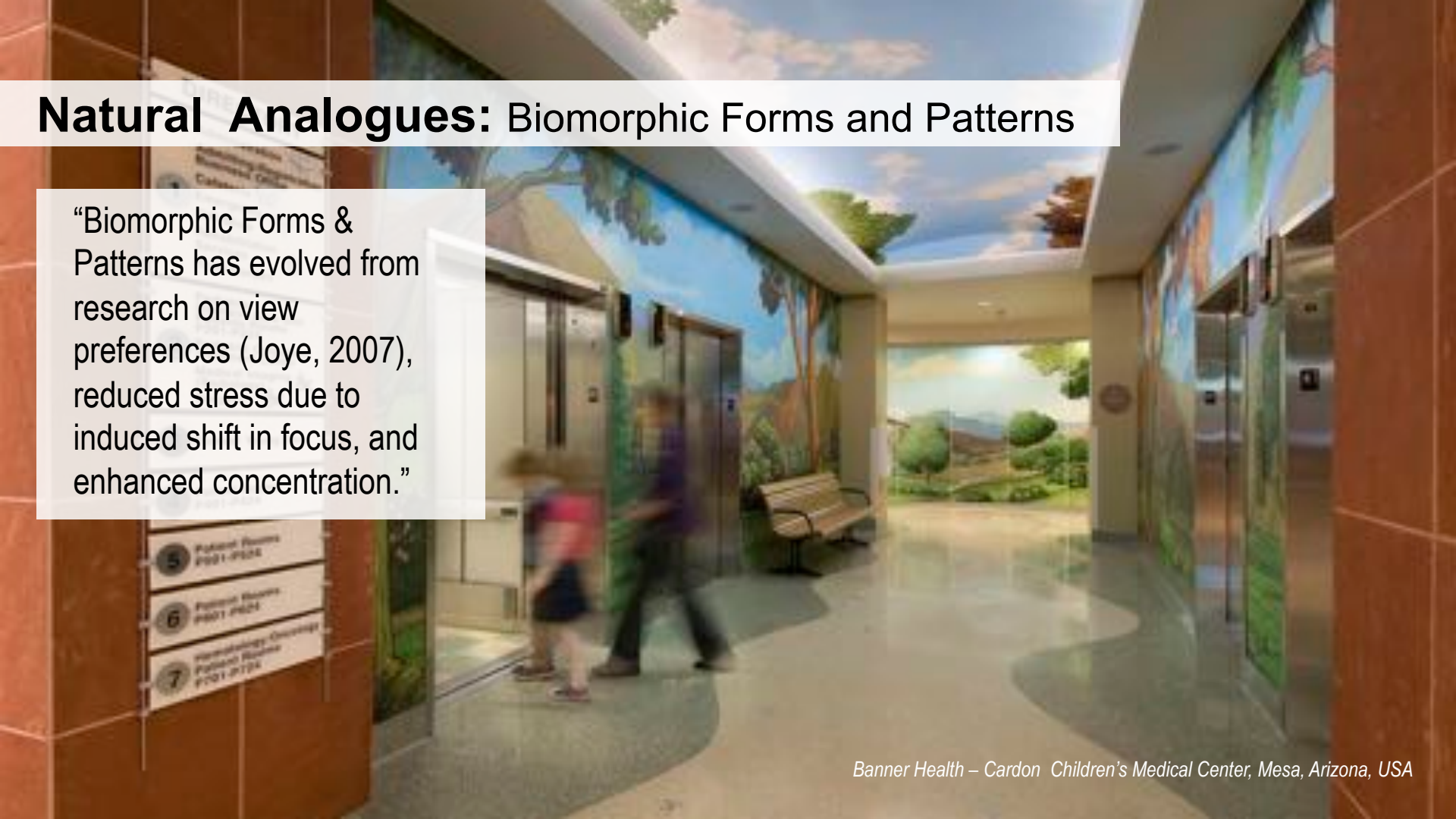
"Patients who have a view of green space have lower levels of stress and anxiety and recover more quickly."

"Improvement in mood for depressed patients with associated reduction in length of hospital stay when exposed to morning light."

*Bridgepoint Active Healthcare, Toronto*

# **Natural Analogues:** Biomorphic Forms and Patterns

"Biomorphic Forms & Patterns has evolved from research on view preferences (Joye, 2007), reduced stress due to induced shift in focus, and enhanced concentration."



*Banner Health – Cardon Children's Medical Center, Mesa, Arizona, USA*

# **Nature of the Space:** Prospect

"Seeing and understanding the processes of nature and can create a perceptual shift in what's being seen and experienced and enhance positive health responses."

*Bridgepoint Active Healthcare, Toronto*

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# The Building as a System (LEED)


Collaborate + Integrate

Location + Transportation

Sustainable Environment

Energy

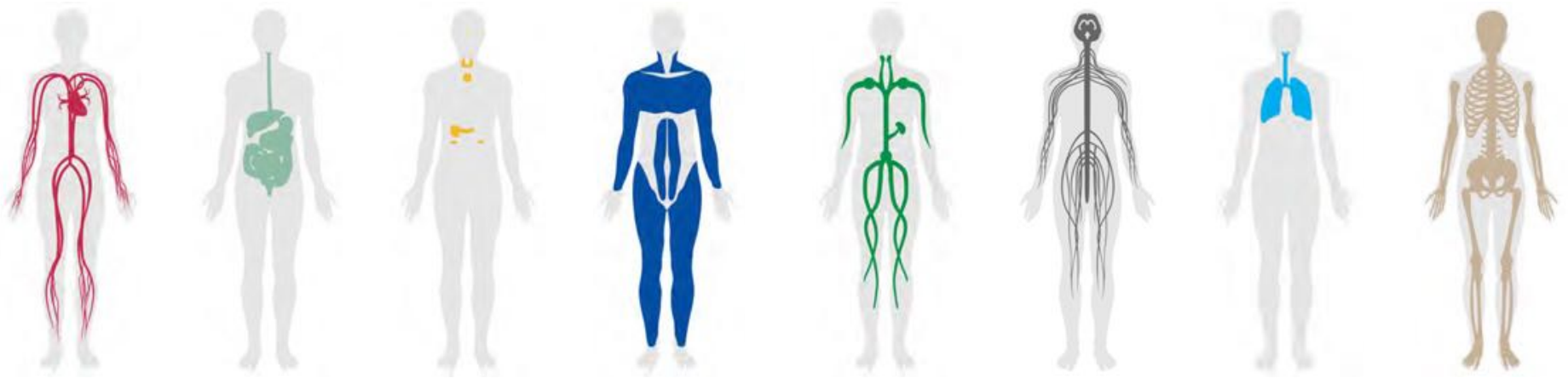
Water

Materials

Indoor Environmental Quality

Innovation

# The Body as a System (WELL Building)



**83%**
Feel more productive

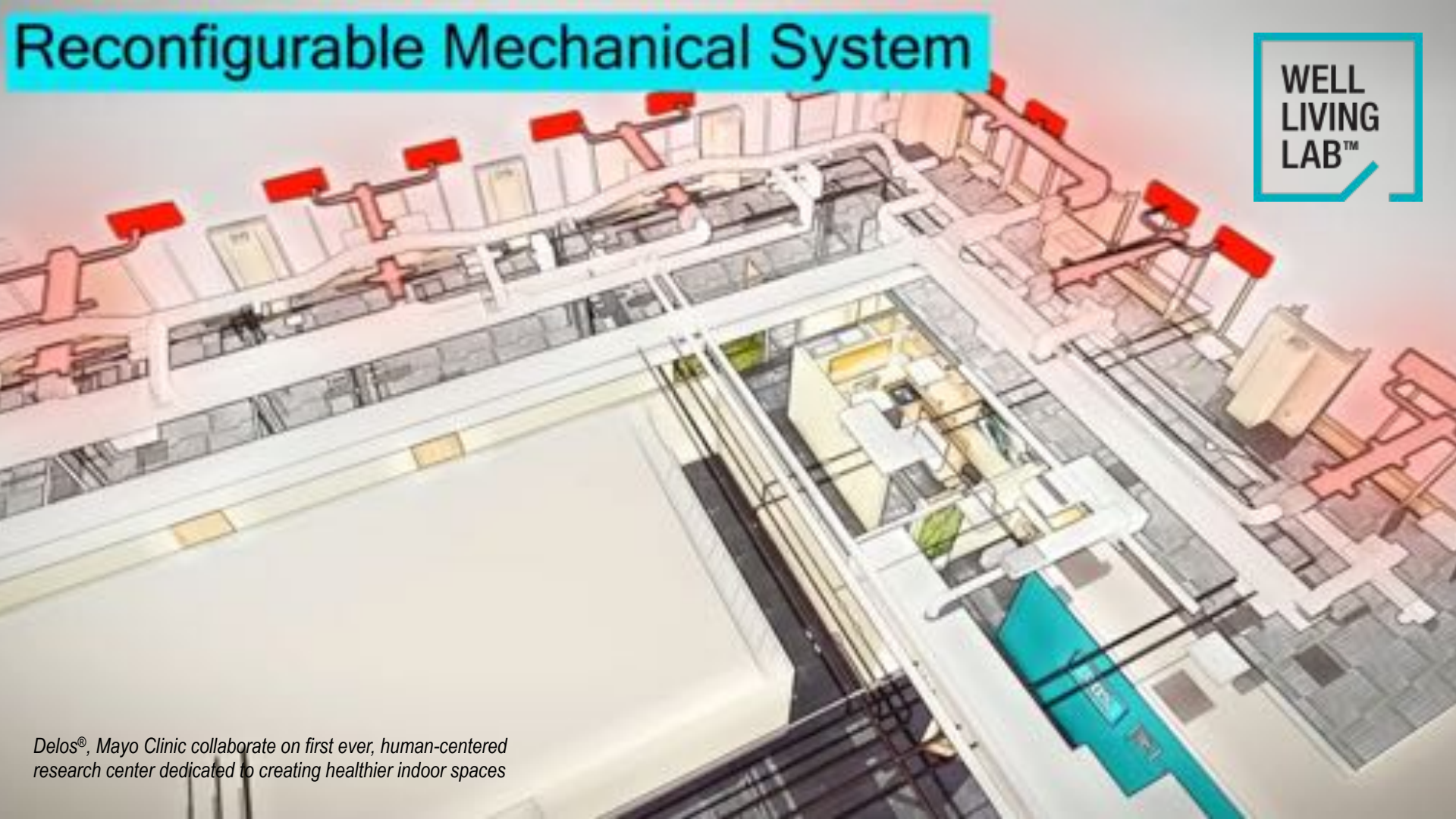
**100%**
Said that clients are interested in their new way of working

**92%**
Said that the new space has created a positive effect on their health and wellbeing

**94%**
Said that the new space has a positive impact on their business performance

**93%**
Said that they are able to more easily collaborate with others

# Reconfigurable Mechanical System




*Delos®, Mayo Clinic collaborate on first ever, human-centered research center dedicated to creating healthier indoor spaces*


# Designing a Building Fitbit

Edge in Amsterdam starts with a smartphone app developed with the building's main tenant, consulting firm Deloitte, packed with some 28,000 sensors

*© Bloomberg*
*bloomberg.com/features/2015-the-edge-the-worlds-greenest-building*

02

# Wellness Cost Benefits

United Technologies

#THECOGFXSTUDY

# THE IMPACT OF GREEN BUILDINGS ON COGNITIVE FUNCTION

## IMPROVED PRODUCTIVITY QUANTIFIED


thecogfxstudy.naturalleader.com

# 7 U.S. CITIES SELECTED

## IN VARIOUS CLIMATE ZONES

# DOUBLING THE VENTILATION

FOR **IMPROVED PRODUCTIVITY** COSTS BETWEEN

## $14-40 / 🧍 / YEAR

IN ALL CLIMATE ZONES INVESTIGATED

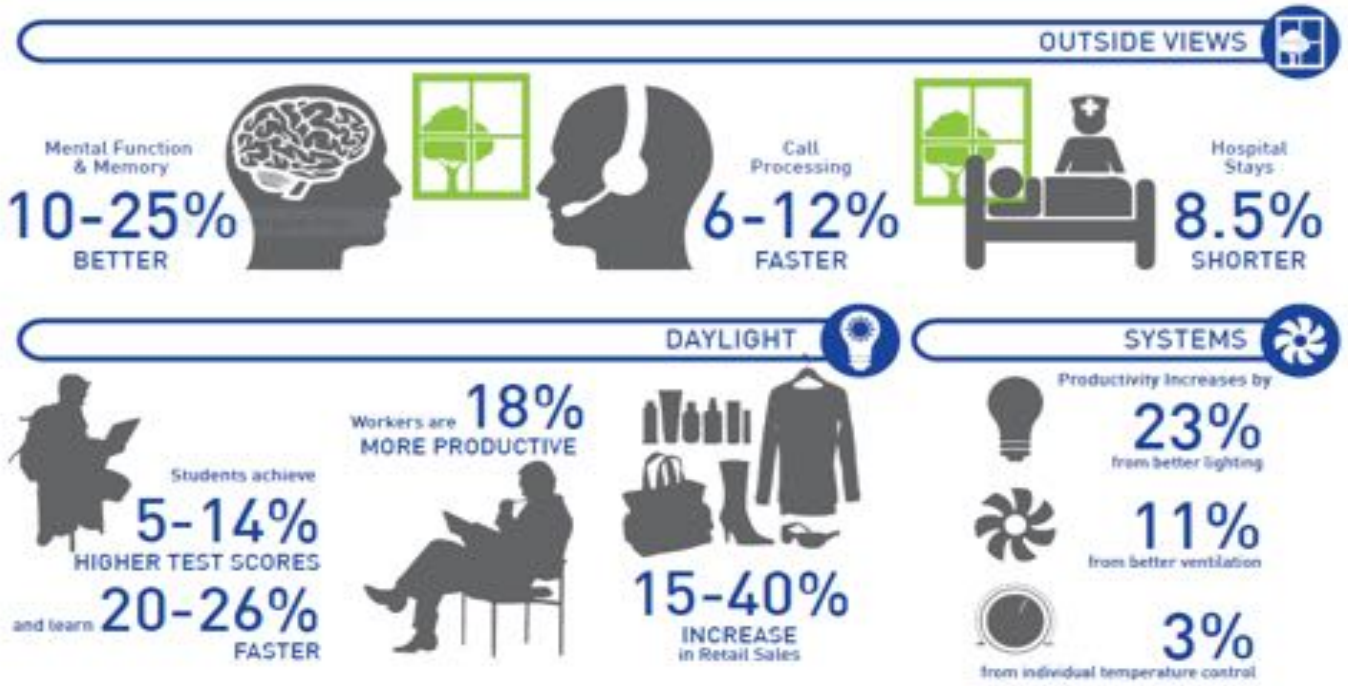

*thecogfxstudy.naturalleader.com*

WHEN **VENTILATION** IS **INCREASED** FROM

**20** CFM PER **PERSON**

**40** CFM PER **PERSON**

# Carnegie Mellon Center for Building Performance and Diagnostics (CBPD)



## Cost per employee per year

1450 Employees

$121,700 *(Includes Salaries, benefits, healthcare and training costs)*

## Potential Impact

3-23% increase in productivity

# $5.3M – 40.5M per year

**$338,000 per year - Total Utility Bills estimate**

- Wellness
- Community Development
- Emissions
- Energy
- Life-Cycle Costs
- Mobility
- Risks & Safety
- Waste
- Water


**Key Performance Indicators**

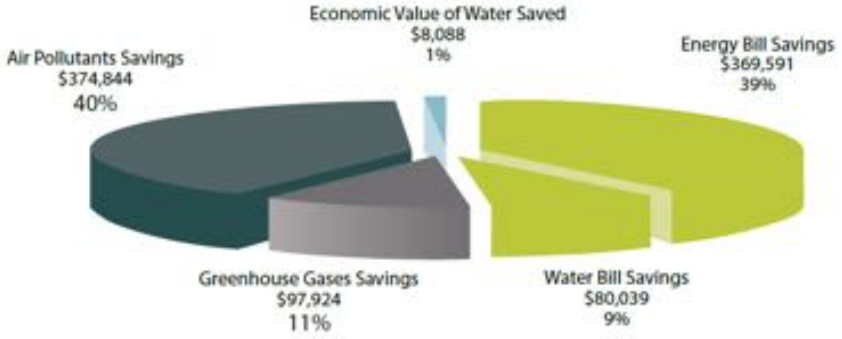
**Economic Values**

Evidence and Data → SROI Process → TBL Decision Support

Ft. Belvoir Hospital, VA

# *Client & Community* ***stormwater infrastructure***

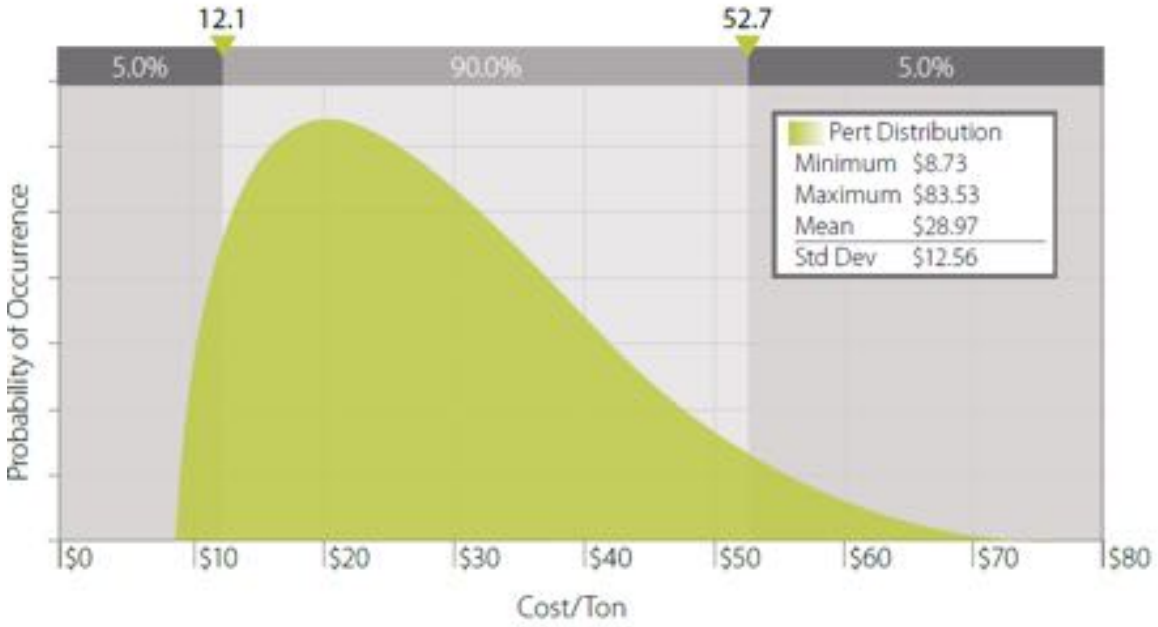
*impacts related to utilities and ecosystem health*




| Metrics | FROI | SROI |
|---|---|---|
| Annual Value of Benefits | $554,870 | $1,284,097 |
| Net Present Value | $4,353,935 | $15,773,620 |
| Return on Investment | 15.9% | 39.3% |
| Discounted Payback Period | 12.9 | 4.6 |
| Internal Rate of Return | 14.2% | 31.0% |
| Benefit to Cost Ration | 2.0 | 4.7 |

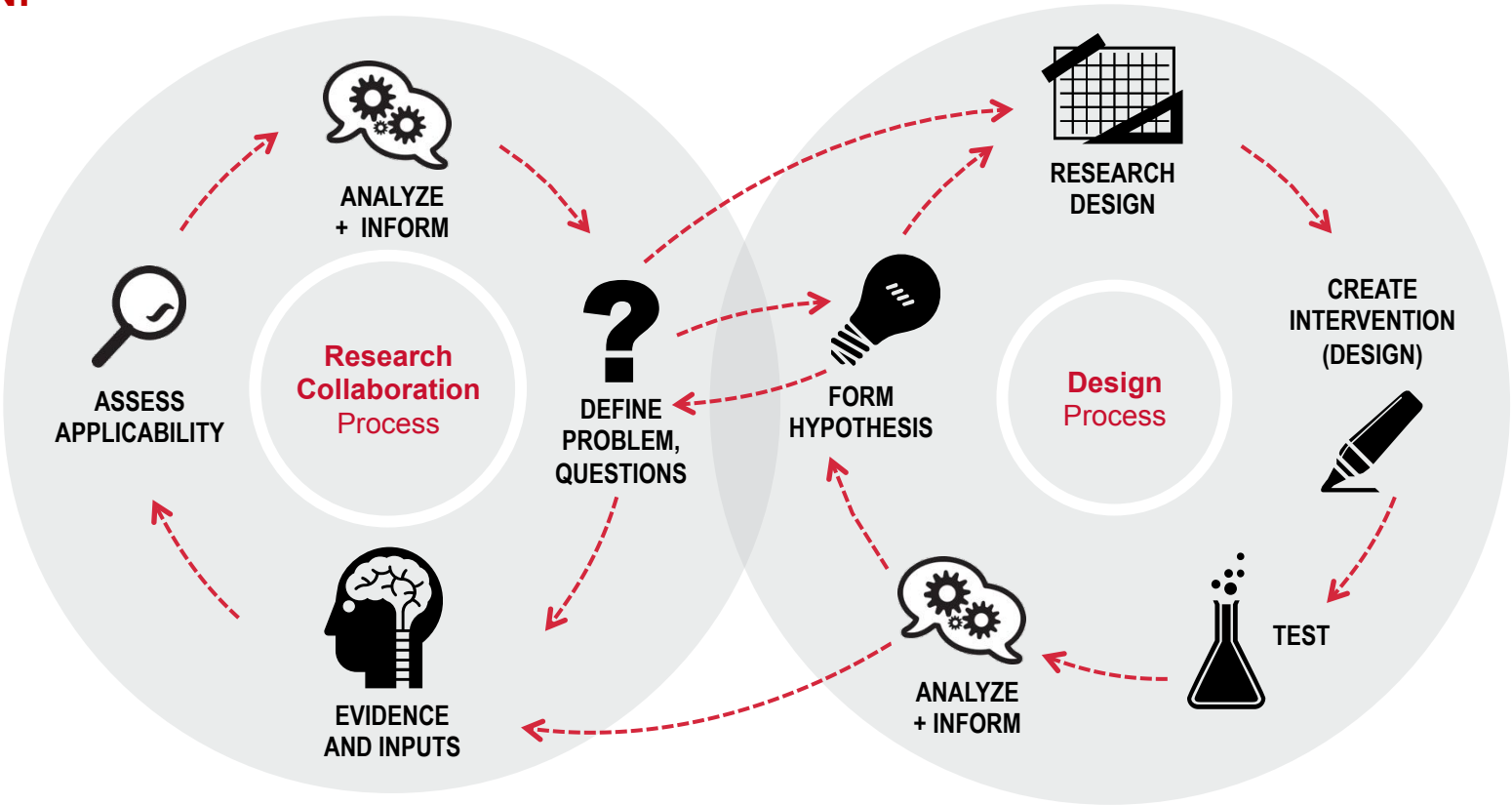
# Example Factor: **Probability distribution value of a Ton of CO2**

- Reviewed over **150 studies** on Social Cost of Carbon since 1991
- Impacts cover damage to multiple sectors: agriculture, human health, flood damage on property, and ecosystem services
- Range of values accounts for uncertainty in studies and assumptions



# Research Leads the Way

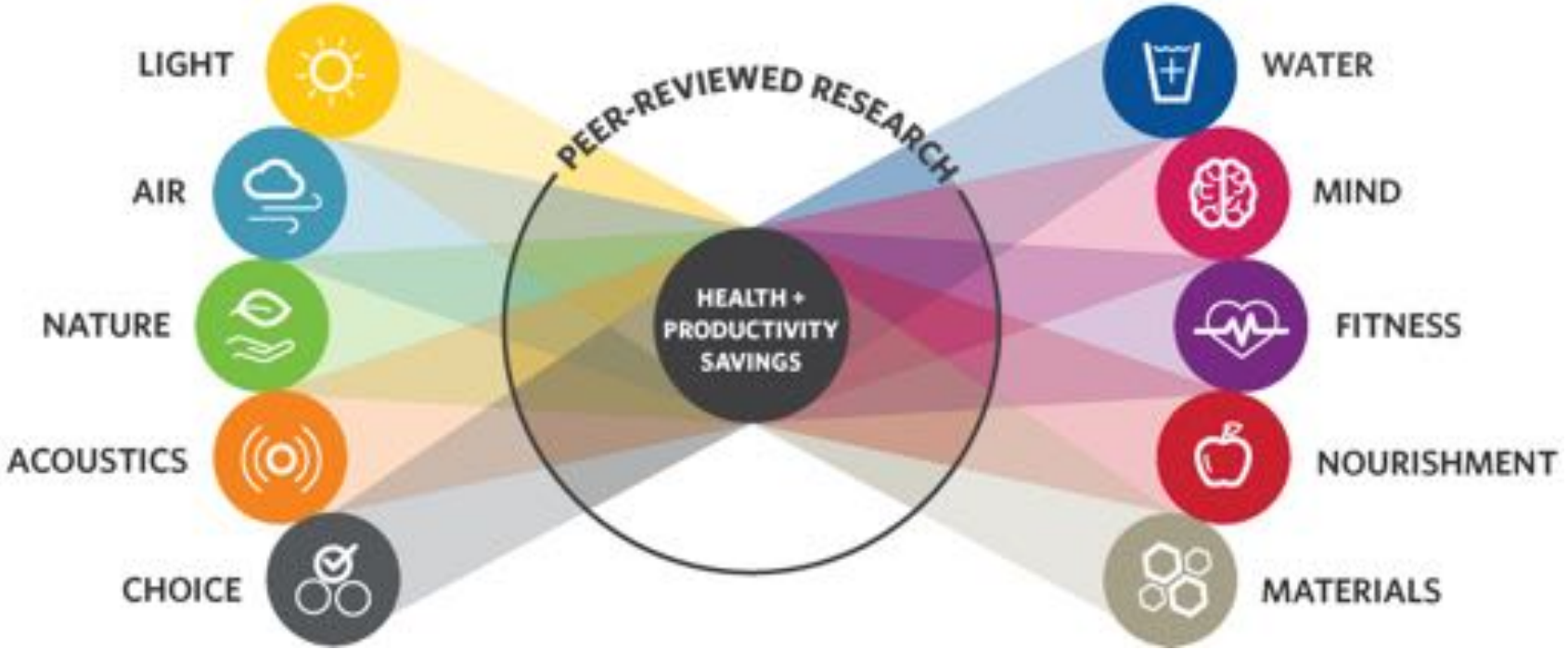
**VISION:**



# 03 Health and Wellness Tool


Nature
Acoustics
Choice
Air
Design
Vital
Signs
Water
Light
Mind
Nourishment
Materials
Fitness

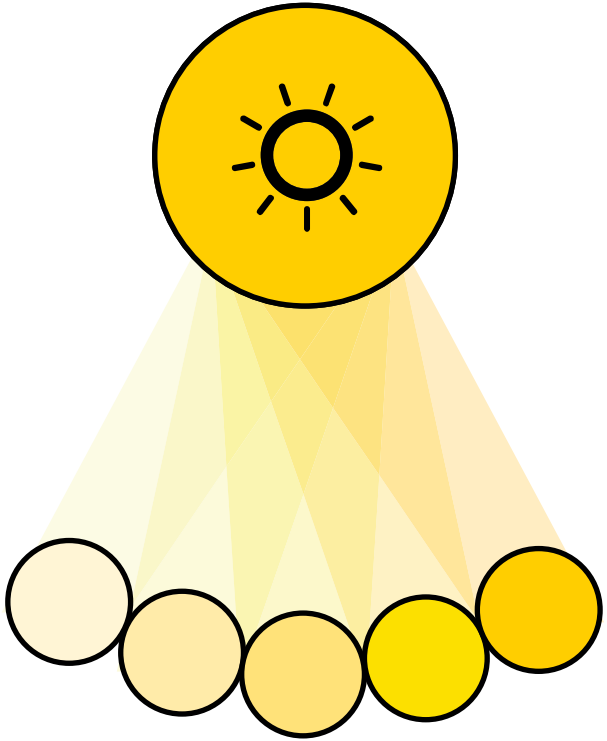
# Wellness Tool Reveals Connections



# 04 Light

# Wellness Tool Strategies

## LIGHT



**Daylight/View and Inpatient Recovery**

- Patients assigned to rooms with a window view of a natural setting had shorter postoperative stays. (Ulrich, 1984)
- Inpatients with eastern windows had shorter hospital stays than those with western windows. (Benedetti, 2001)

**Daylight Exposure and Productivity**

- Among students, those with daylight exposure had higher math and reading test scores. (Heschong, 2002)

**Daylight Exposure and Stress**

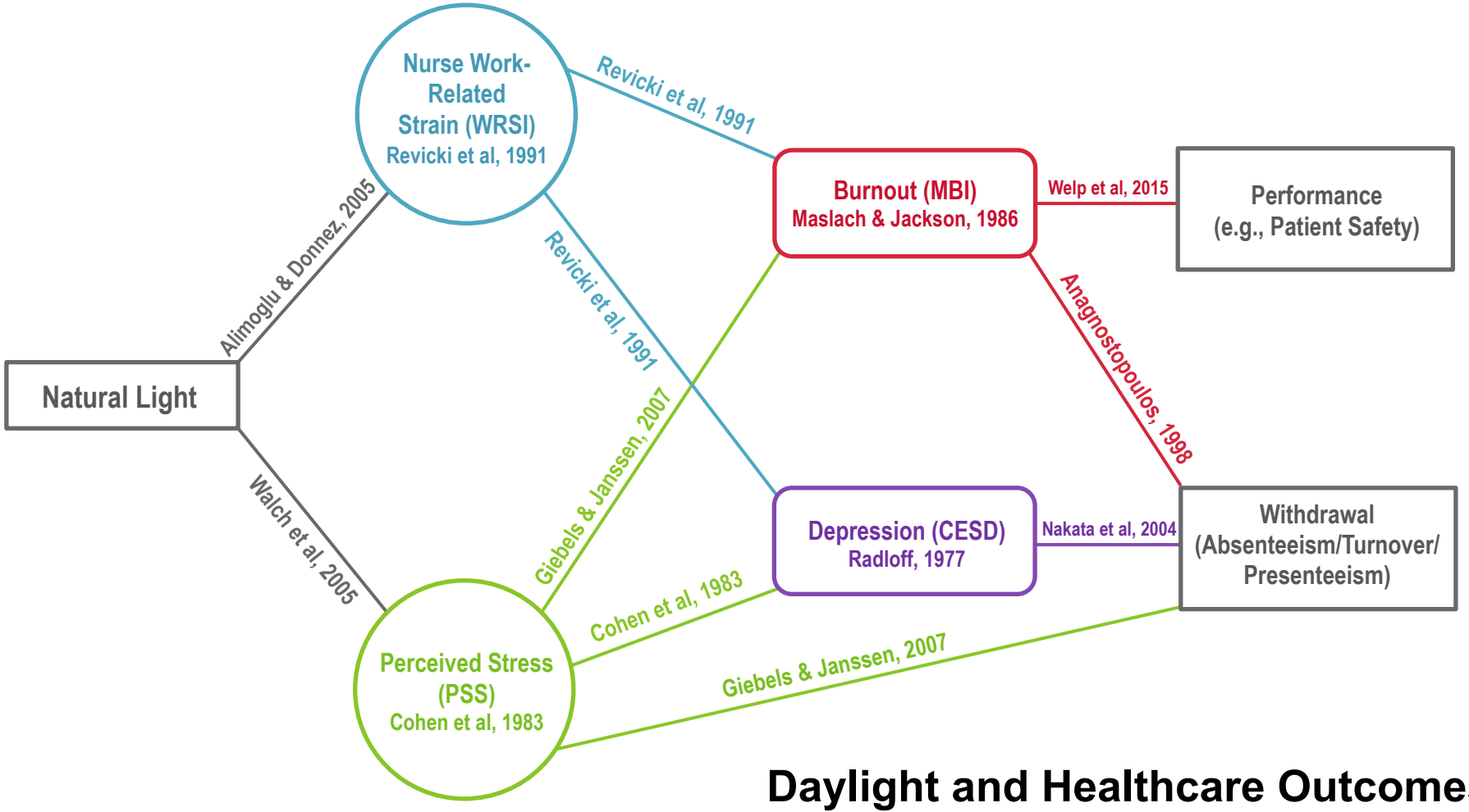
- Among inpatients, more daylight exposure had lower stress levels based upon the PSS Scale. (Walch et. al, 2005)
- Among nurses, those with more than 3 hours of daylight exposure pre shift, experiences lower work related stressed based on WRSI scale. (Alimoglu & Donmez 2005)

**Daylight Exposure and Circadian Alignment**

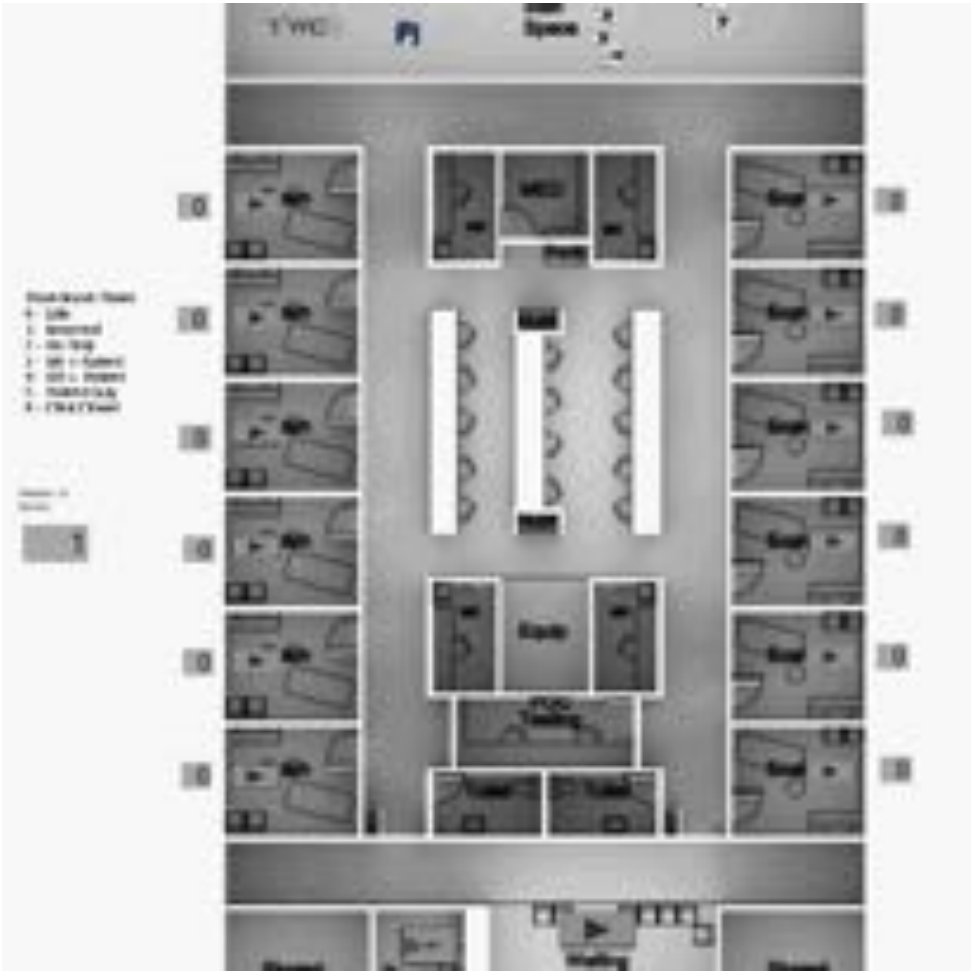
- Among nurses, those working in an environment with windows experienced a positive effect on circadian rhythms (as suggested by body temperature) and reduced morning sleepiness. (Zadeh et. al, 2014)

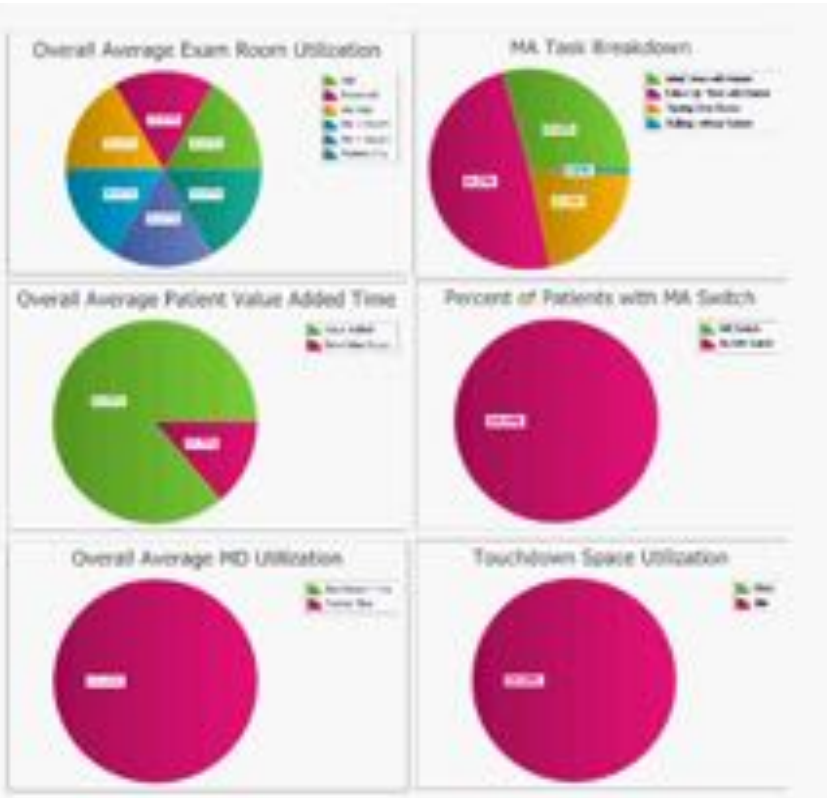
**Daylight Exposure and Sleep**

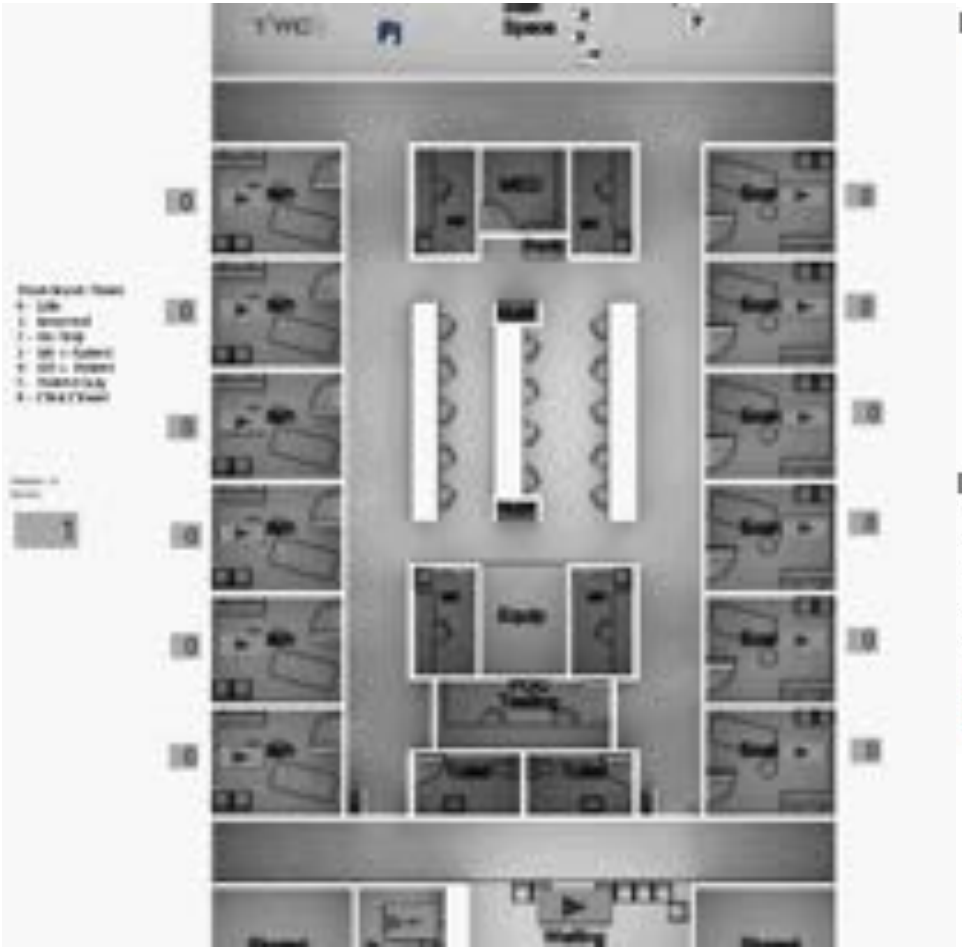
- Workers in windowless environments reported poorer overall sleep quality based upon the Pittsburgh Sleep Quality Index as compared to those with windows. (Boubekri et. al, 2014)




# Daylight and Healthcare Outcomes


1 WC


Overall Average Exam Room Utilization
MA Task Breakdown
Overall Average Patient Value Added Time
Percent of Patients with MA Switch
Overall Average MD Utilization
Touchdown Space Utilization




HEALTH + WELLNESS

PROJECT OVERVIEW AIR SOUND TOUCH COMFORT

Outpatient

PROJECT NAME CLINIC STUDY

PROJECT LOCATION 60607

TOTAL PROJECT AREA 5000 SF

NUMBER OF EMPLOYEES 50

ANNUAL ORGANIZATIONAL COST PER EMPLOYEE 125000

ANNUAL ORGANIZATIONAL COST - $6.25M

LIGHT

% OF OCCUPIED SPACE WITH USEABLE DAYLIGHT LESS THAN 20%

RESULT FROM DAYLIGHTING SIMULATION 7.4

% OF OCCUPIED SPACE WITH USEABLE DAYLIGHT BETWEEN 20% AND 40%

RESULT FROM DAYLIGHTING SIMULATION 0.7

% OF OCCUPIED SPACE WITH USEABLE DAYLIGHT BETWEEN 40% AND 60%

RESULT FROM DAYLIGHTING SIMULATION 1.2

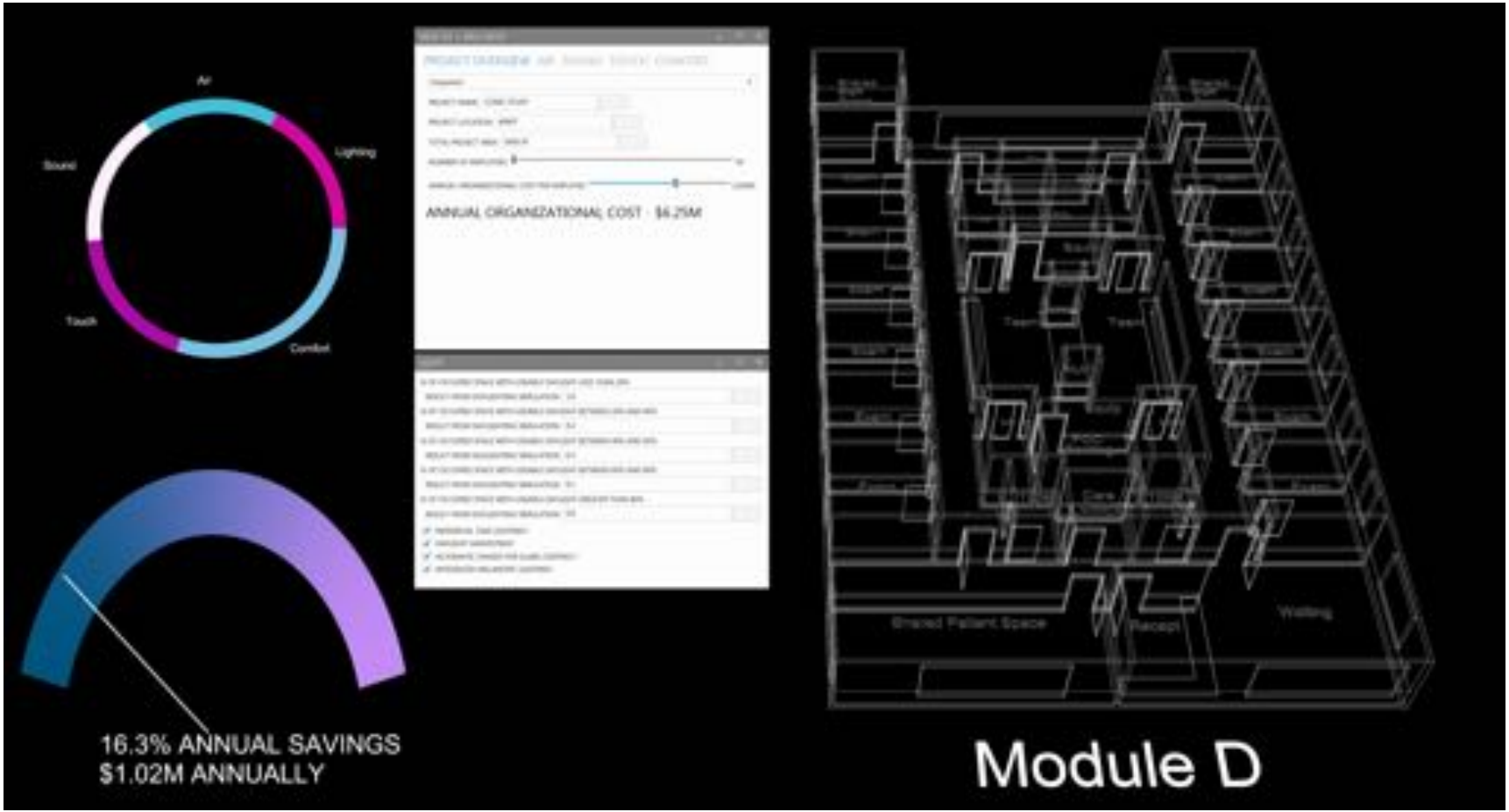
% OF OCCUPIED SPACE WITH USEABLE DAYLIGHT BETWEEN 60% AND 80%

RESULT FROM DAYLIGHTING SIMULATION 0.5

% OF OCCUPIED SPACE WITH USEABLE DAYLIGHT GREATER THAN 80%

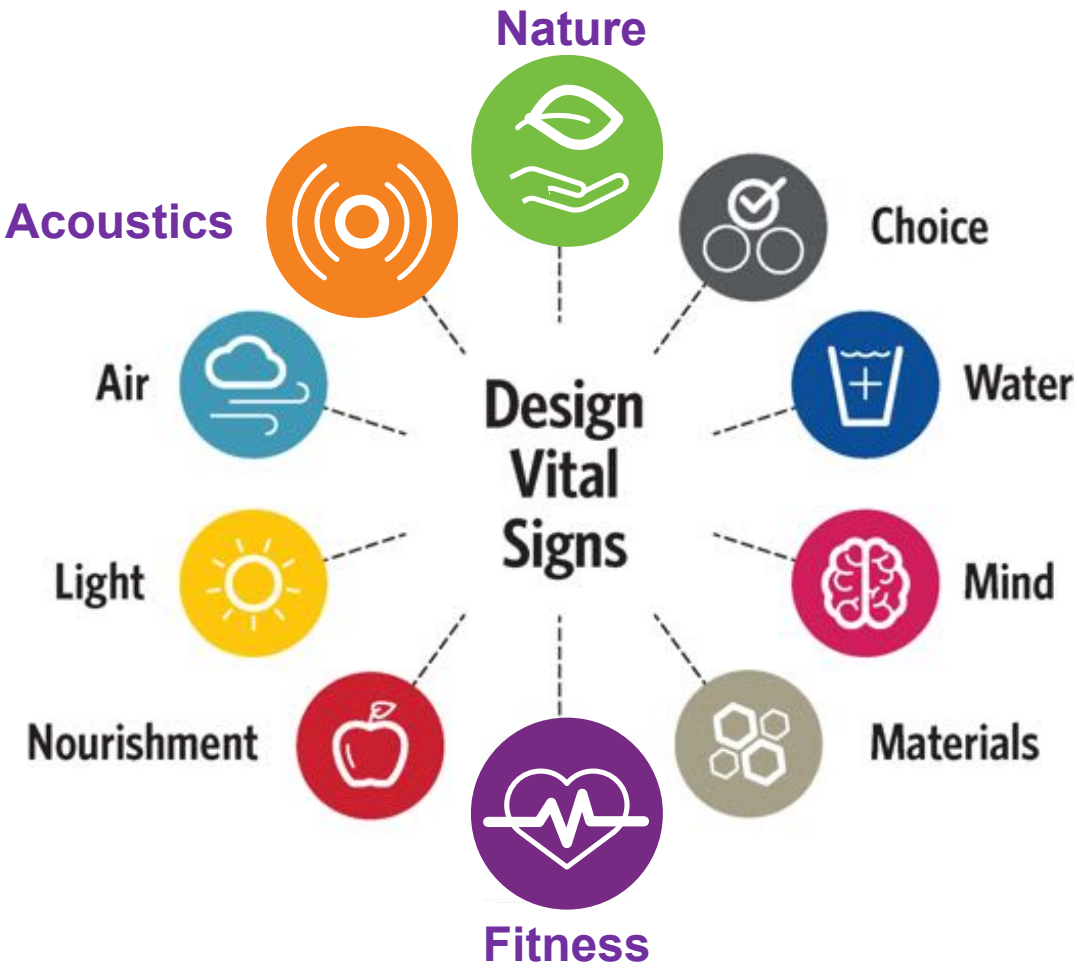
RESULT FROM DAYLIGHTING SIMULATION 0.0

- ✓ INDIVIDUAL TASK LIGHTING?
- ✓ DAYLIGHT HARVESTING?
- ✓ AUTOMATIC SHADES FOR GLARE CONTROL?
- ✓ INTEGRATED MELANOPIC LIGHTING?


Air
Lighting
Sound
Touch
Comfort
ANNUAL ORGANIZATIONAL COST - $6.25M
16.3% ANNUAL SAVINGS
$1.02M ANNUALLY
Shared Patient Space
Reception
Waiting
Module D

05

# Future Phases of the Tool


Nature
Acoustics
Choice
Air
Water
Design
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Signs
Light
Mind
Nourishment
Materials
Fitness

## Light

*Natural Light, Glare Control, Circadian Health, Lumen Showers, Color Quality*

## Air

*Increased Ventilation, Filtration, CO2 and Particulate Levels, Operable Windows*

## Nature

*Dynamic Light & Ventilation, Engaged Sensory Design, Access to Nature*

## Acoustics

*Privacy, Sound Masking, Sound Barriers, Nature Sounds, Reverberation Time*

## Choice

*Individual Controls, Education, Adaptable Spaces, Comfort*

## Water

*Water Quality & Testing, Drinking Water Promotion, Reverse Osmosis Systems*

## Mind

*Wellness Awareness, Workplace Wellness Policy, Beauty Design*

## Materials

*Chemical Health, Health Product Declaration, Material Transparency*

## Fitness

*Interior & Exterior Active Design, Active Furnishings, Incentive Programs*

## Nourishment

*Mindful Eating, Responsible Food Production, Nutritional Information*

*Metro Health Hospital, Wyoming, Michigan, USA*


*Abbott Northwestern Hospital and Children's Hospitals and Clinics of Minnesota, Minneapolis, Minnesota, USA*

Children's Hospital of Soochow University, Suzhou, Jiangsu, China

*Bridgepoint Active Healthcare, Toronto, Canada*

*Aaron Bernstein MD, MPH, Harvard School of Public Health*

# Thank You

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