

1 Continuing Education Credit

Advancing Health Equity and Environmental Performance through Design

A Holistic Framework for
Healthy Buildings

Perkins&Will

Presenters



Yanel de Angel

FAIA, LEED AP BD+C, RELi,
LFA

Principal, Managing
Director



Patrick Cunningham

AIA, LEED AP BD+C, LFA,
Principal, Design Director



Erika Eitland

MPH, ScD
Senior Associate, Director
– Human Experience
Research



Tyler Hinckley

AIA, LEED AP BD+C, RELi,
LFA
Senior Associate, Senior
Regenerative Design
Advisor

Course Description

This session introduces a **holistic framework for advancing health equity and environmental performance** through design. Based on **regenerative design philosophy's principles** this holistic framework for healthy buildings considers the entire project delivery arc and identifies **key mind shifts** for a productive process. This session will offer an opportunity for participants to reflect on the knowledge gained so far and gaps to strengthen, which could be in any category: energy and carbon, water, design and beauty, biophilic design, materials, health, place or theory.

This session also explores how to introduce a **methodology that scales from macro to micro, integrating health, safety and welfare (HSW) principles** in every phase of the process. At a macro level, it considers **public health** community indicators / determinants and how to equitably solve those and improve the physical, emotional, and social well-being of occupants and users. At a micro level, it considers the choices made during the design process from **healthy material** selections with **low embodied carbon** to strategies to reduce **operational carbon**, integrate **renewable energy**, and achieve **Zero Net Energy (ZNE)** targets.

Learning Objectives

Explore a holistic framework for advancing health equity and environmental performance through design.

Identify the public health community indicators / determinants and identify strategies to equitably design to improve health conditions for users and the community.

Consider design choices to elevate the human experience and well-being of occupants through healthy material selection and biophilic moments.

Prioritize strategies that would yield operational carbon and energy reductions to achieve Zero Net Energy (ZNE) and when in the process these strategic decision matter the most.

1 HSW Continuing Education Credit per Session

Three sessions curated as a sequel but can stand alone.

**Join us for
session 2 and 3!**

Session 1

**Advancing Health Equity and
Environmental Performance
through Design: A Holistic
Framework for Healthy Buildings**

Session 2

**Integrating Health Equity in the
Design Process: Let's PRECEDE**

Session 3

**Achieving High Performance in
Public Buildings: Design for Zero
Net Energy, Low Carbon, and
Material Health**

Tell us about yourself.

Join [menti.com](https://www.menti.com)

Use Code: 6729 1116



*Grab your phone or
use your computer*

Join at [menti.com](#) | use code **6729 1116**

Mentimeter

On a good day, what is your functional role?

All responses to your question will be shown here

Each response can be up to 200 characters long

Turn on voting to let participants vote for their favorites

👍

👤



Menti

DSB - Session 1



Choose a slide to present





Menti

DSB - Session 1



Choose a slide to present



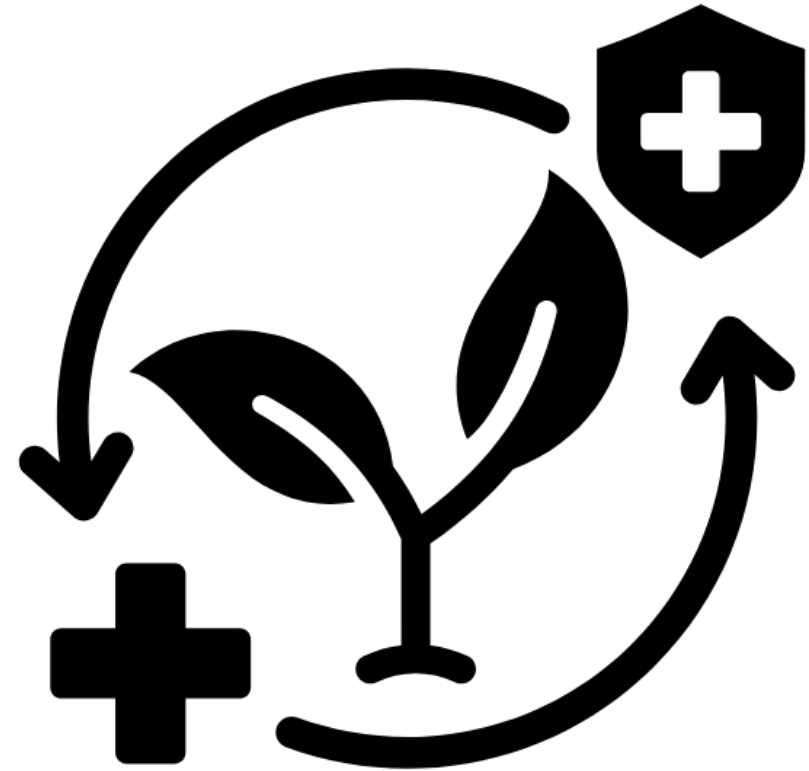
Agenda

Holistic Framework: From Macro to Micro

Human Health and Equity

Embodied and Operational Carbon

Biophilia and Material Health



Holistic Framework:

Macro to Micro

Regenerative Design
Principles

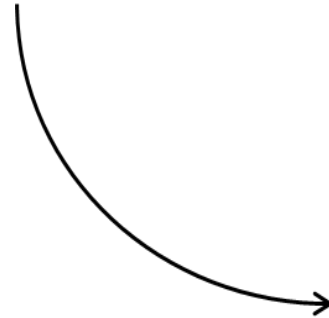
Mind Shifts

Project Arc Process

Regenerative design is a **holistic, systems-based approach** to design that aims to reconnect humans and nature through the continuous renewal of socio-ecological systems, **moving beyond sustainability to achieve net-positive impacts.**

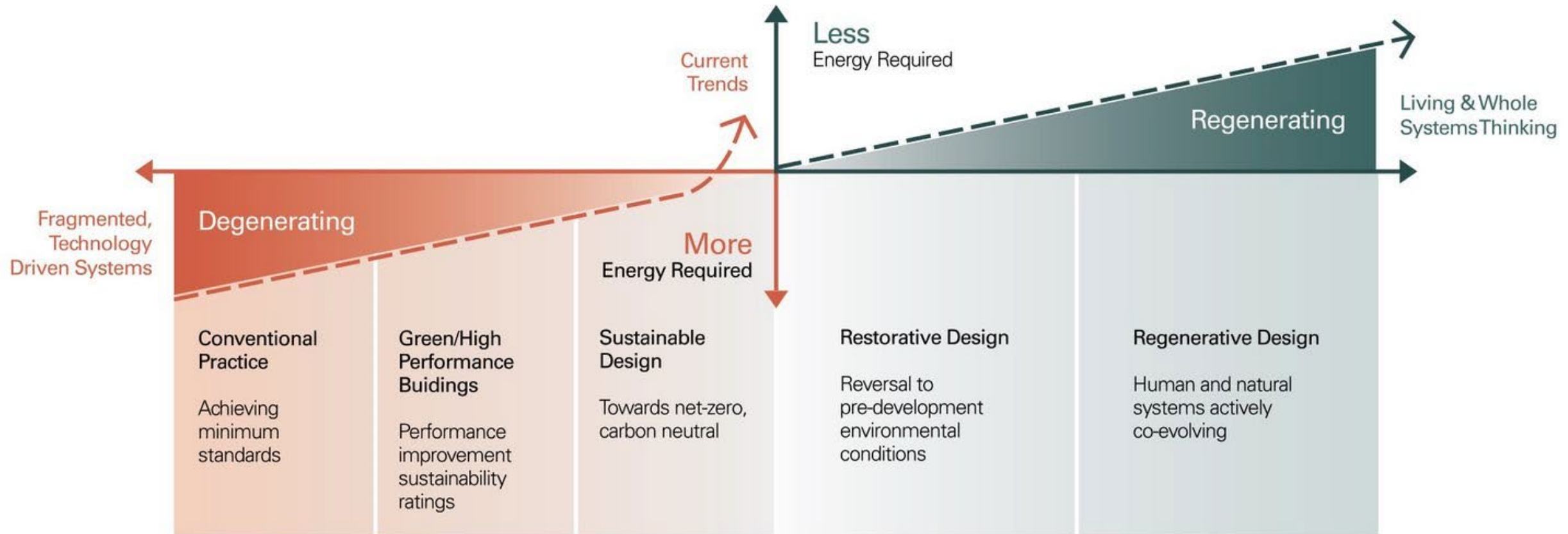
It seeks to **restore, repair, and sustain life** by creating systems that actively improve the **health of ecosystems and communities**, rather than just minimizing harm.

Regenerative Design is in service to life, all of life.



- **Designers as healers of the planet**
- **Designers as agents of regeneration**
- **Every time you are to do something, you have an opportunity to engage with life.**

Industry Shift



"Range of sustainability approaches" (Developed from Bill Reed, 2007)

Regenerative Design has 5 Principles.

Life regenerates.

**Only life
regenerates.**

Life inter-relates.

**Life is about
interrelationships.**

Life is whole.

**Every place is
unique, alive and
whole.**

Life has patterns.

**Working with whole
systems requires an
understanding of
patterns.**

We are life.

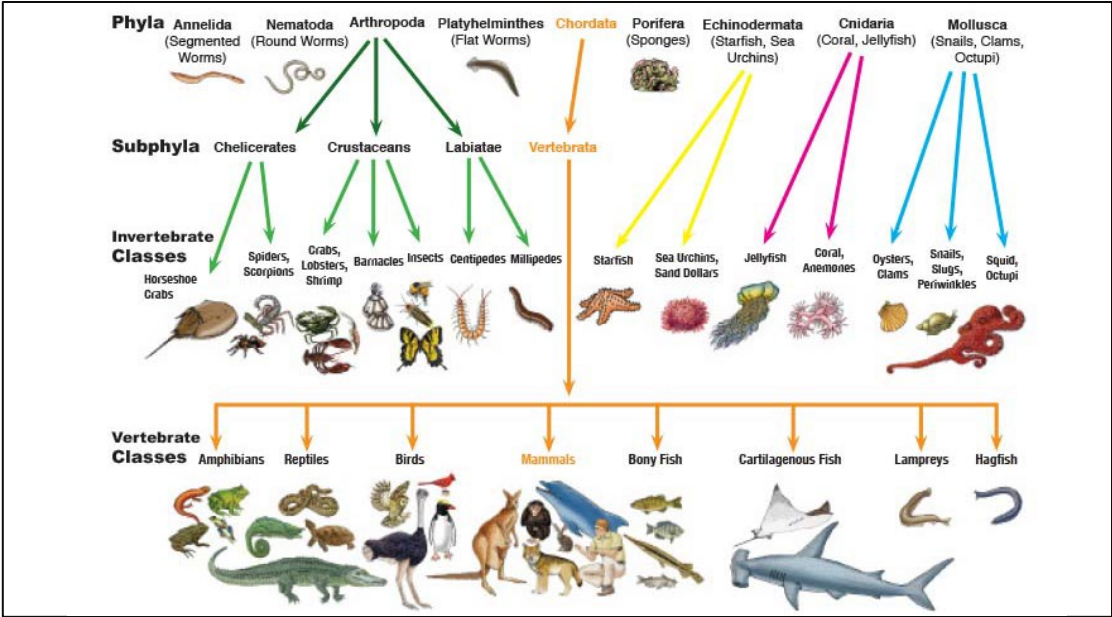
We are nature.

Holistic Framework: Macro to Micro

Key mind shifts frame a new perspective to depart from.



Animal Kingdom diagram



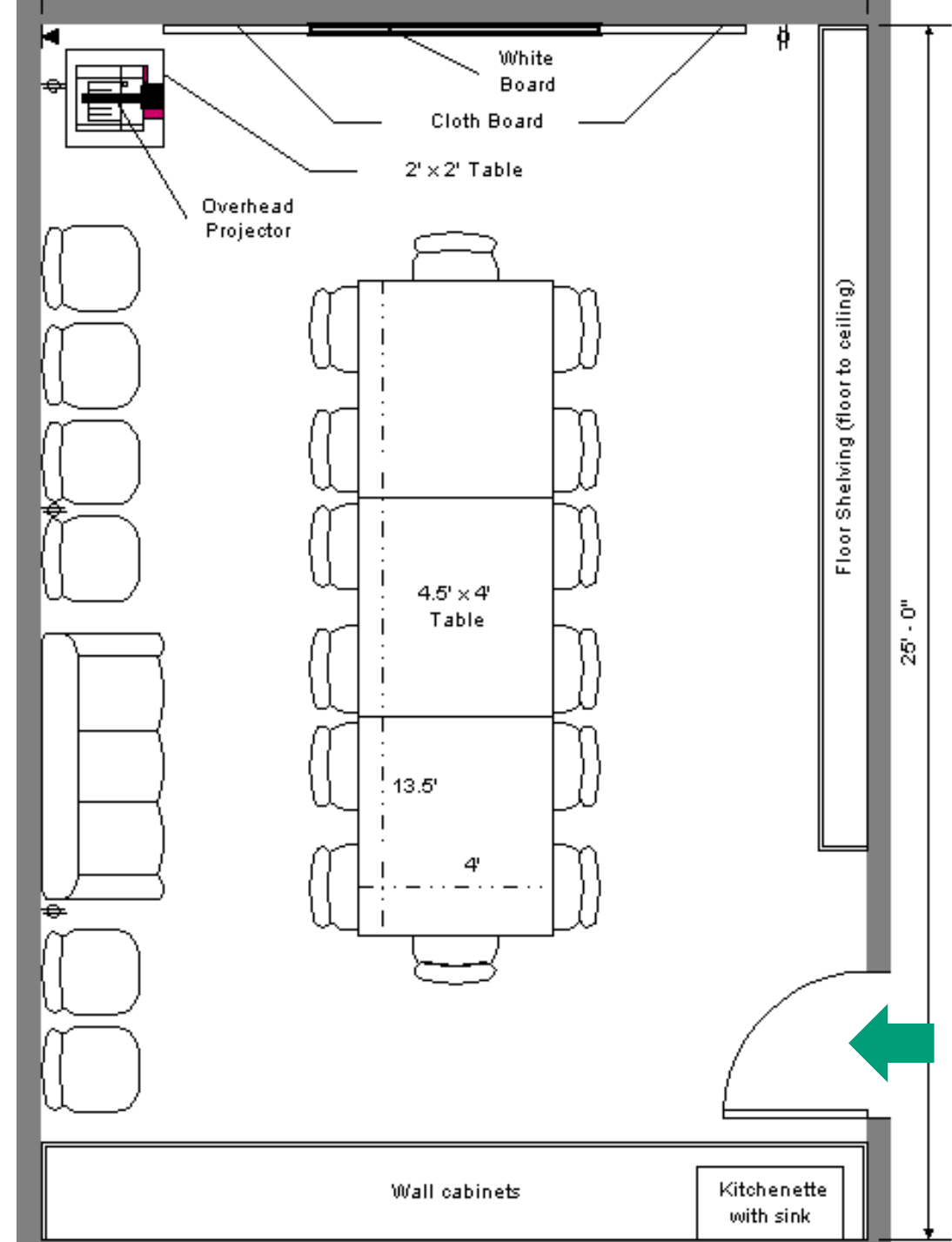
Categorizing species

Holistic Framework: Macro to Micro

Listen to Communities

Who are the people at the table?

→
Participants



Holistic Framework: Macro to Micro

Listen to Context

Who is “the client” with no voice at the table?



Woodpeckers.



Holistic Framework: Macro to Micro

Climate Grief

The ability to sit with joy and grief and not be slaves to either.

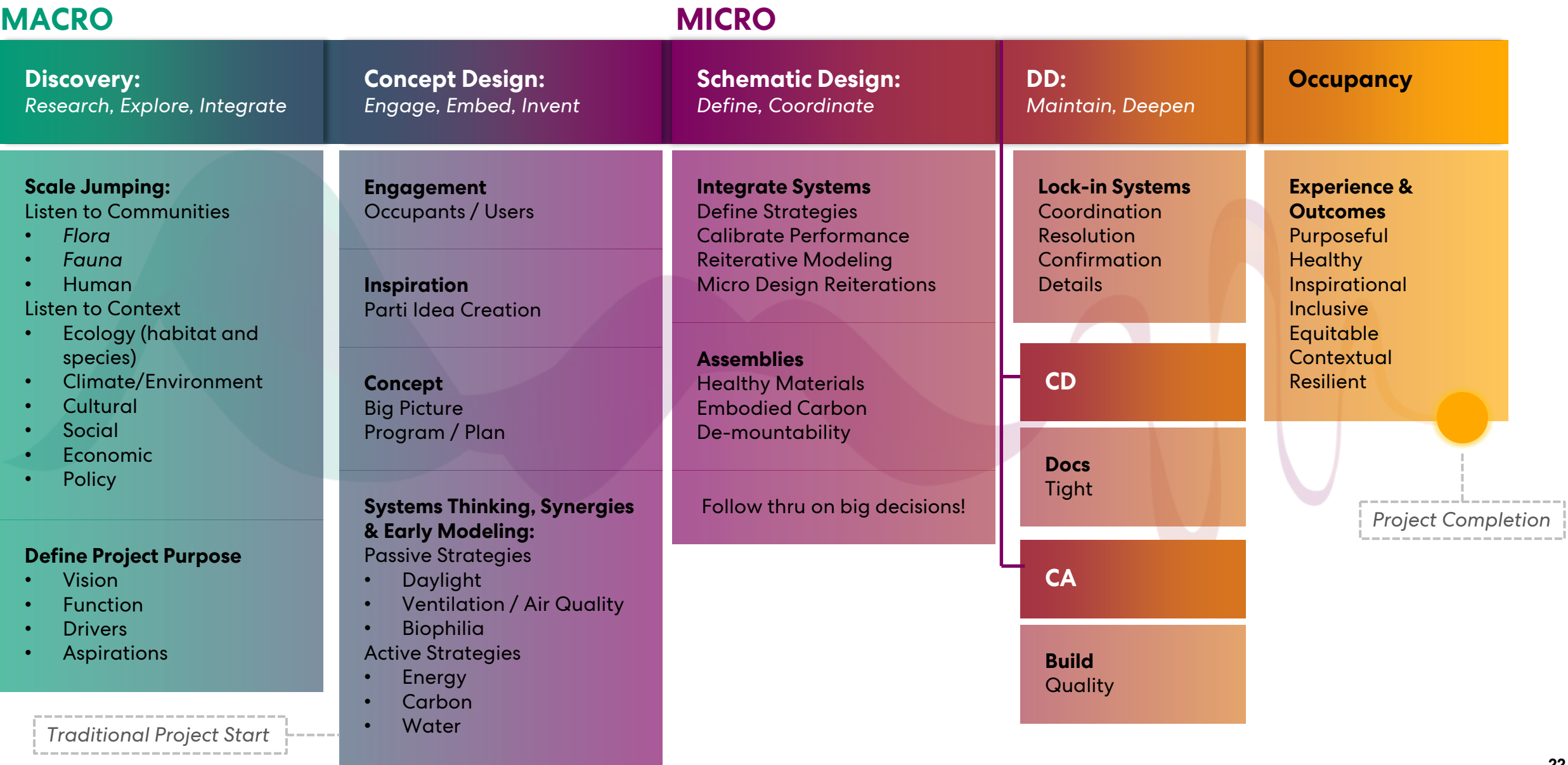
- Jason McLennan, Perkins&Will
Chief Sustainability Officer

Sitting side by side, facing forward and looking into the future.



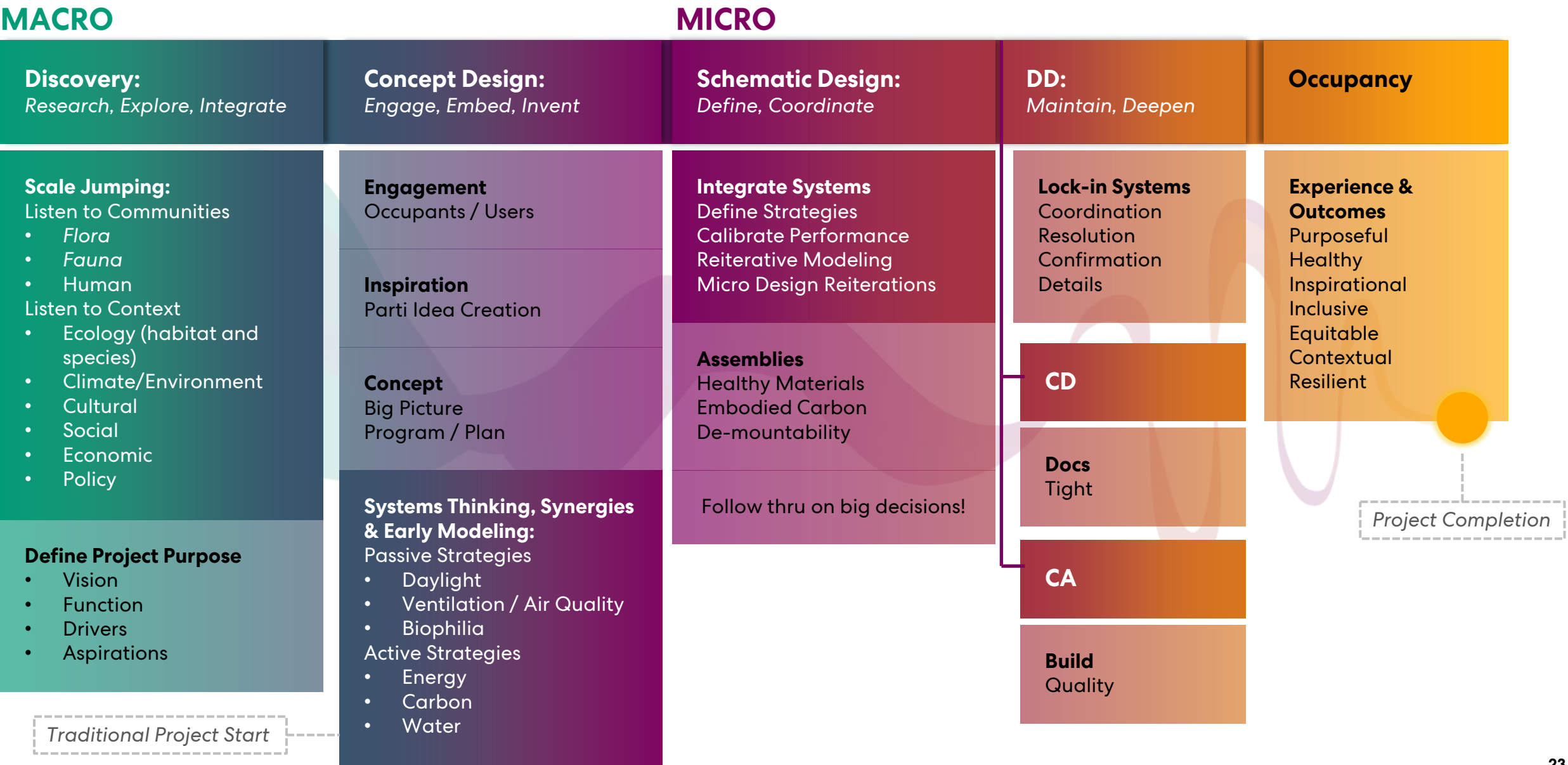
Macro to Micro to Occupancy



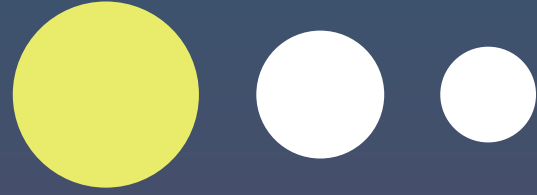


MICRO

Regenerative Design Process: A Framework



Macro



Integrating Health Equity into Regenerative Design

Health Indicators

Health Determinants

Health-Focuses Strategies

Macro:



"The physician must be able to tell the antecedents, know the present, and foretell the future — must mediate these things, and have two special objects in view with regard to disease, namely, to do good or to do no harm."

- Of The Epidemics, Hippocrates

Aphorismi
HIPPOCRATIS.
Græce & Latine:
JUXTA
Optimam Editionem
THEODORI JANSSONII ab
Almeloveen, Med. Doct.
Amstelædami impressam, Anno 1685.

In usum JUVENTUTIS studiosæ.



EDINBURGI:
In Ædibus R. FLEMING, Sumptibus JOANNIS
PATON Bibliopole in Area Parliamentaria.

M. DCC. XXVI.

Macro:



"The **designer** must be able to **learn from precedents**, know the present, and foretell the future — must mediate these things, and have two special objects in view with regard to **people**, namely, to do good or to do no harm."

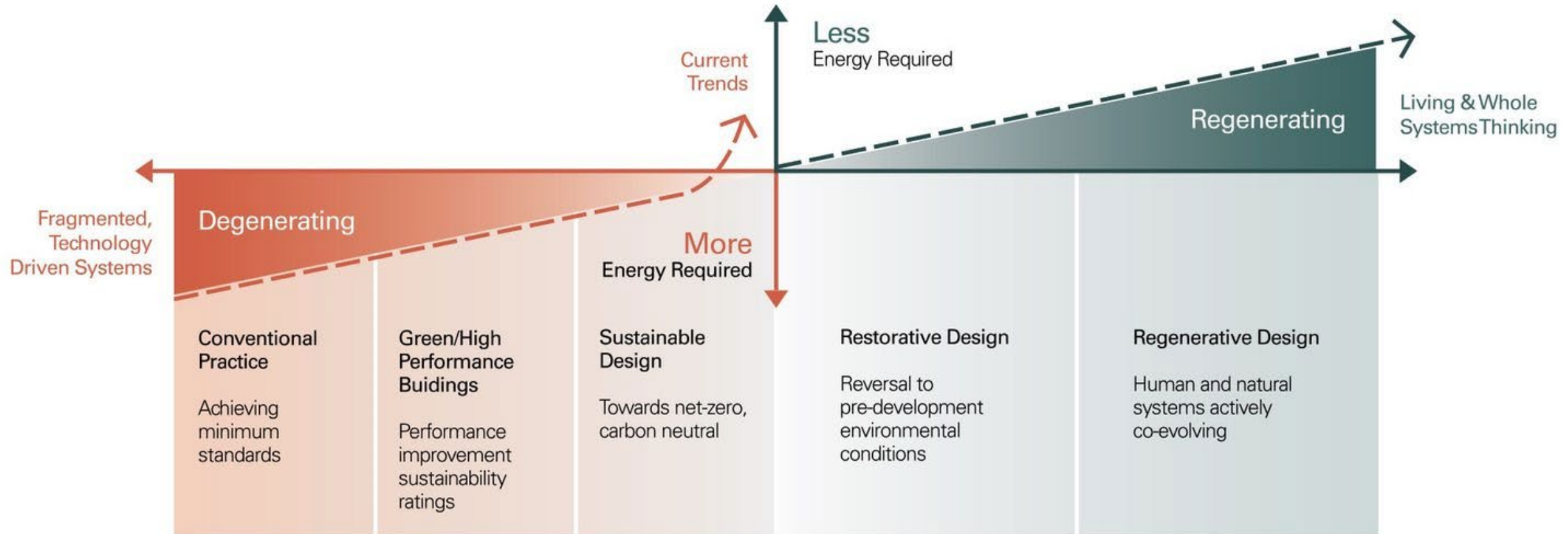
- Of The Epidemics, Hippocrates (REVISED)



Macro:



Regenerative Design



“Range of sustainability approaches” (Developed from Bill Reed, 2007)

Macro: ● ● ●

Walkability makes us human.

Hadar, Ethiopia

'Lucy': First bipedal hominin found

3.2 million years old



Macro: ● ● ●

And access to...



...Nature



...Clean Air



...Clean Water



...Natural Materials



...Sense of Community



...Healthy Food



...Circadian Light

Macro: ● ● ●

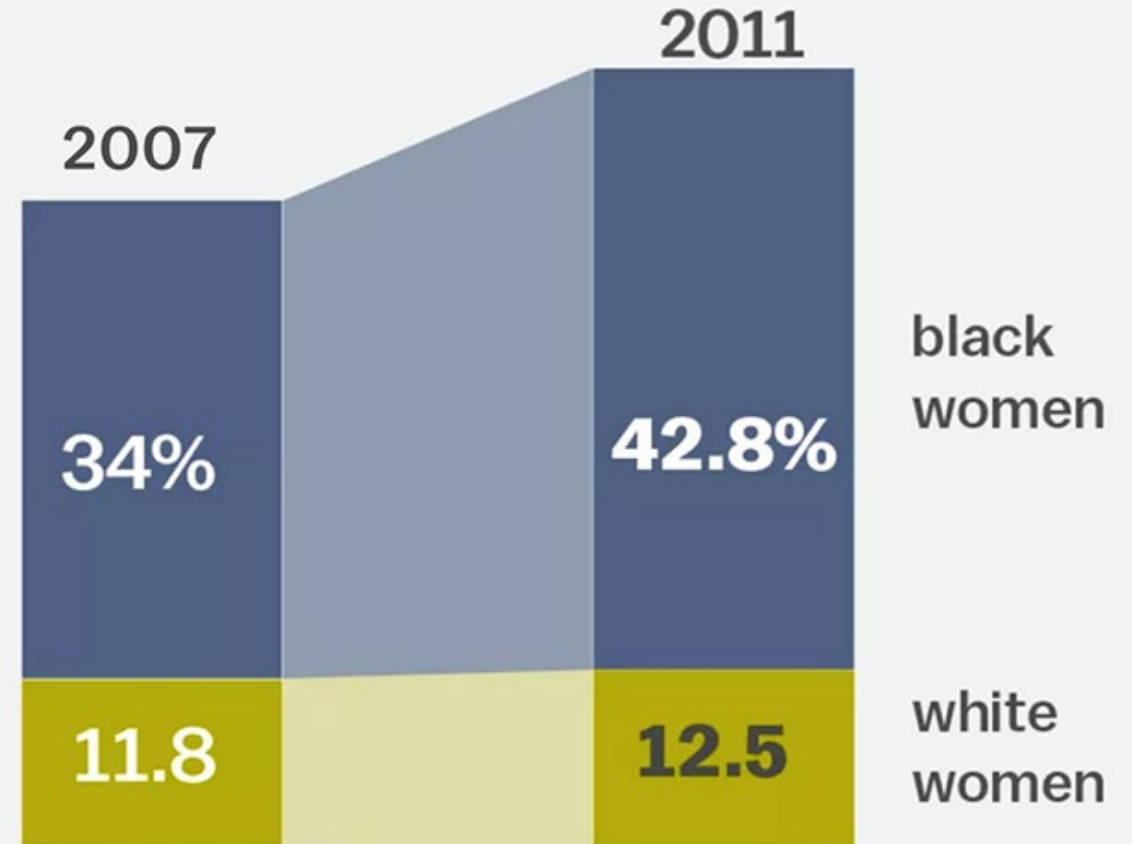
Health Disparities Require A Tailored Healthy Design Response.

Health disparities are **preventable** differences in the burden of disease, injury, violence, or opportunities (CDC Adolescent and School Health, 2024).

...Closely linked with social, political, economic, and environmental disadvantage (National Cancer Institute, 2025).

America's black-white maternal mortality gap is widening

Percentage of pregnancy-related deaths by race



SOURCE: CDC Pregnancy Mortality Surveillance System
CREDIT: Sarah Frostenson

Macro:

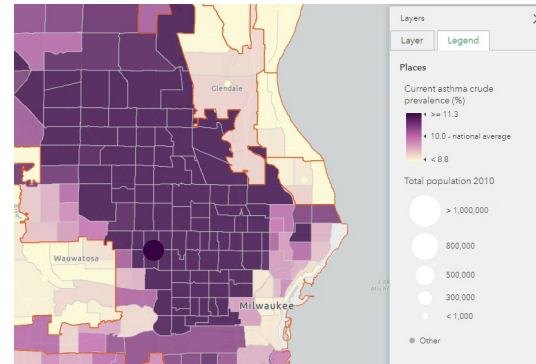


Data exists. Barriers Persist.



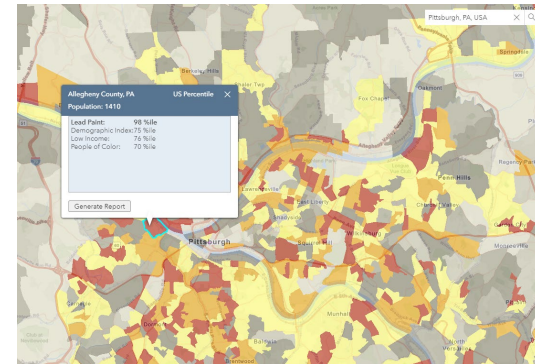
City Health Dashboard

- 500 of U.S. cities
- Comparative statistics to national average



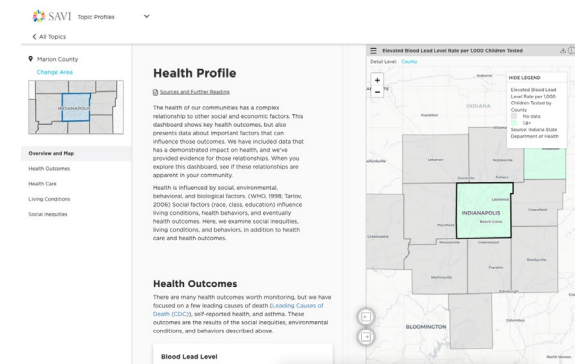
CDC Places

- Provides data on preventative healthcare
- Does not provide information on environmental exposures



EPA EJScreen

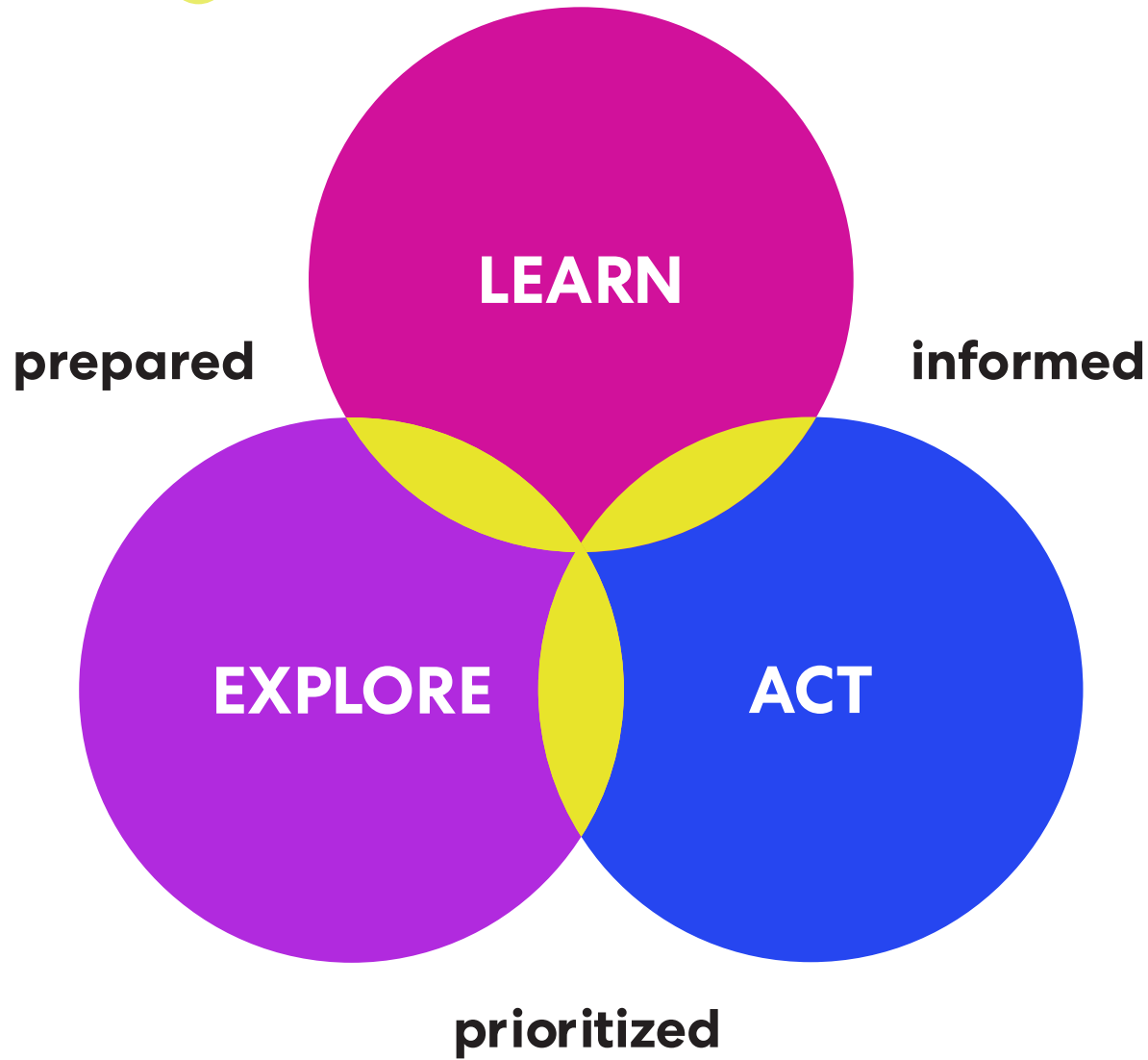
- Educate users on how to interpret the results
- Do not educate users on the significance of these health outcomes



SAVI Dashboard

- Provides a diverse set of health, access, and community indicators
- Provides useful context to indicator significance
- Only provides data for the Indianapolis Metro Area

Macro:



LEARN.

Educate **designers, clients, students, and community stakeholders** on the role of public health in design

EXPLORE.

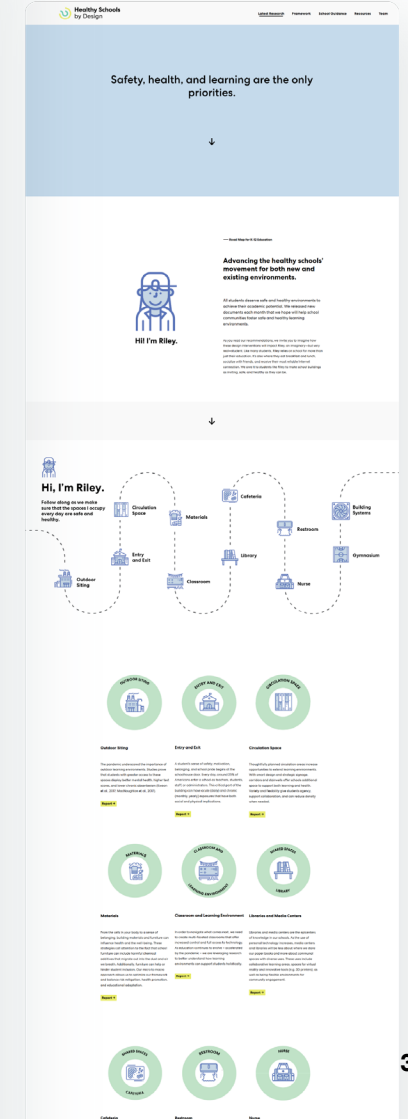
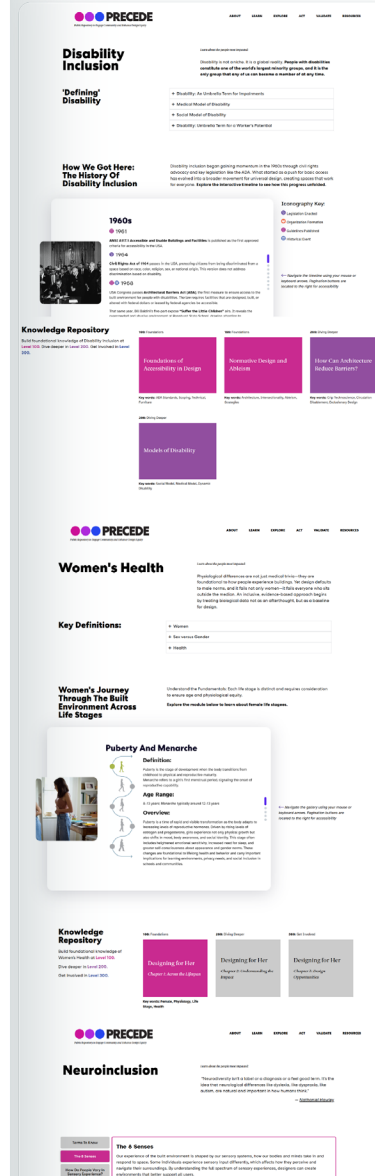
Summarize and quantify **demographic and health indicators** for any location in the United States

ACT.

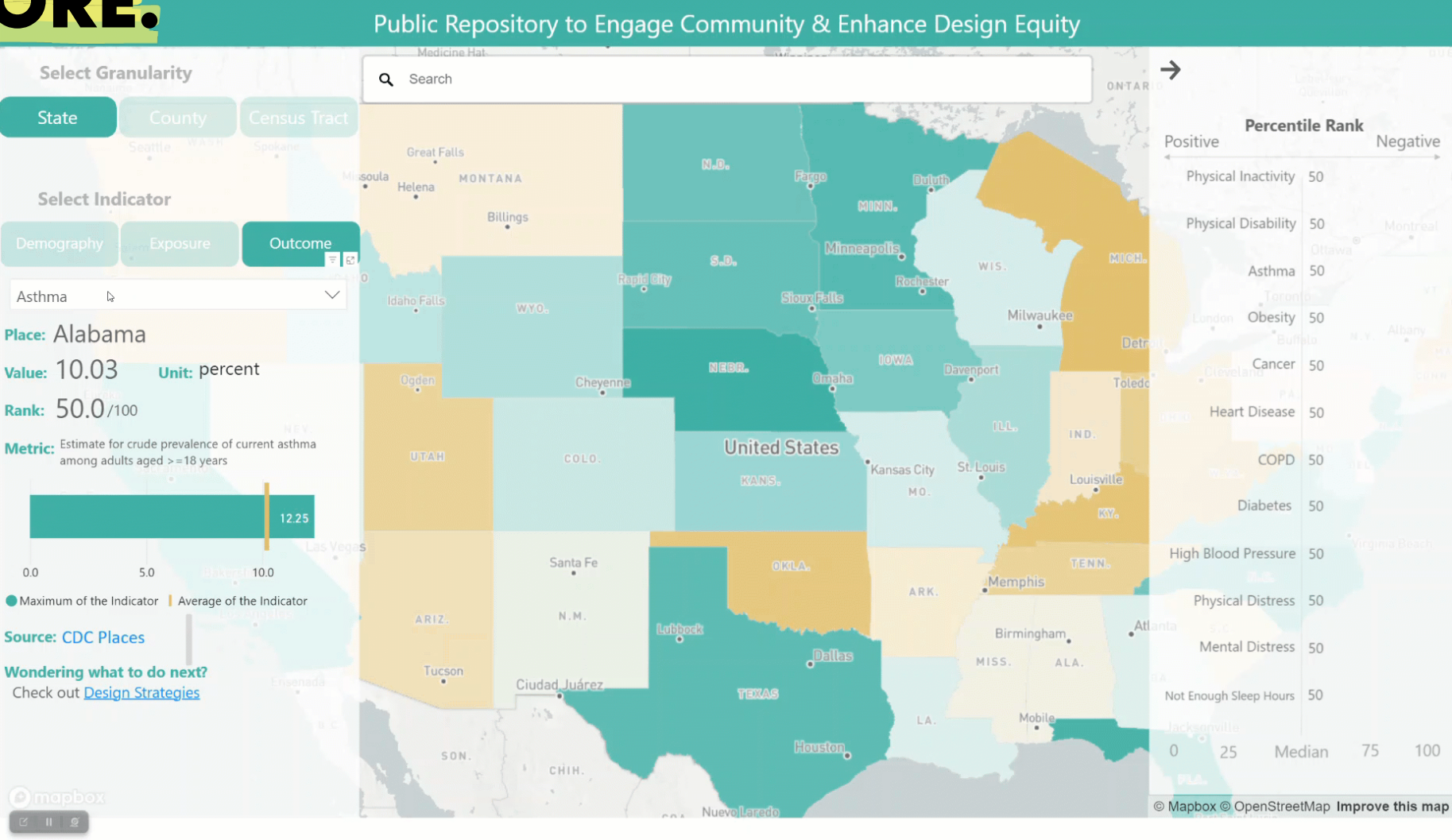
Provide **design recommendations** that respond to public health priorities

precede.perkinswill.com

A **living** resource dedicated to uncovering the **impactful** ways design intersects with: **Place, People & Practice**



EXPLORE.



**ACT.**

Public Repository to Engage Community and Enhance Design Equity

1. Pick Exposures & Outcomes from the "Explore" Phase

- ☐ Air Quality & Pollutants
- ☐ Cancer
- ☐ Cardiovascular Health (Coronary Heart Disease)
- ☐ Diabetes
- ☐ Drought
- ☐ Extreme Heat
- ☐ Flooding (Coastal or River)
- ☐ Frequent Mental Distress
- ☐ Frequent Physical Distress
- ☐ Greenness (NDVI, Park Access)
- ☐ High Blood Pressure
- ☐ Noise Pollution
- ☐ Not Enough Sleep Hours
- ☐ Obesity
- ☐ Physical Inactivity
- ☐ Respiratory Health (Asthma, COPD)
- ☐ Traffic Proximity

2. Select the Project Scale

- ☐ Building
- ☐ Interior
- ☐ Operations
- ☐ Policy
- ☐ Site
- ☐ Urban Realm

3. Determine Design Recommendations

For viewing of the PRECEDE Strategies and Design recommendations, please start with Step 1 and make your selection(s)

4. Get More Information

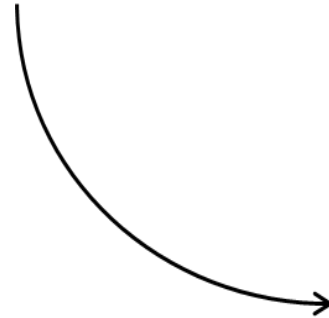
Perkins&Will





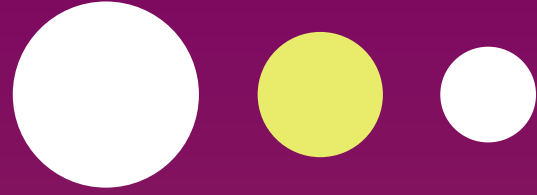
Until Session 2

How can you embed health equity into your design practice?



- **Check out PRECEDE!** precede.perkinswill.com
- **Think about health as a journey not a destination.**
- **Reconnect people with our evolutionary desire for clean, natural environments.**

Micro



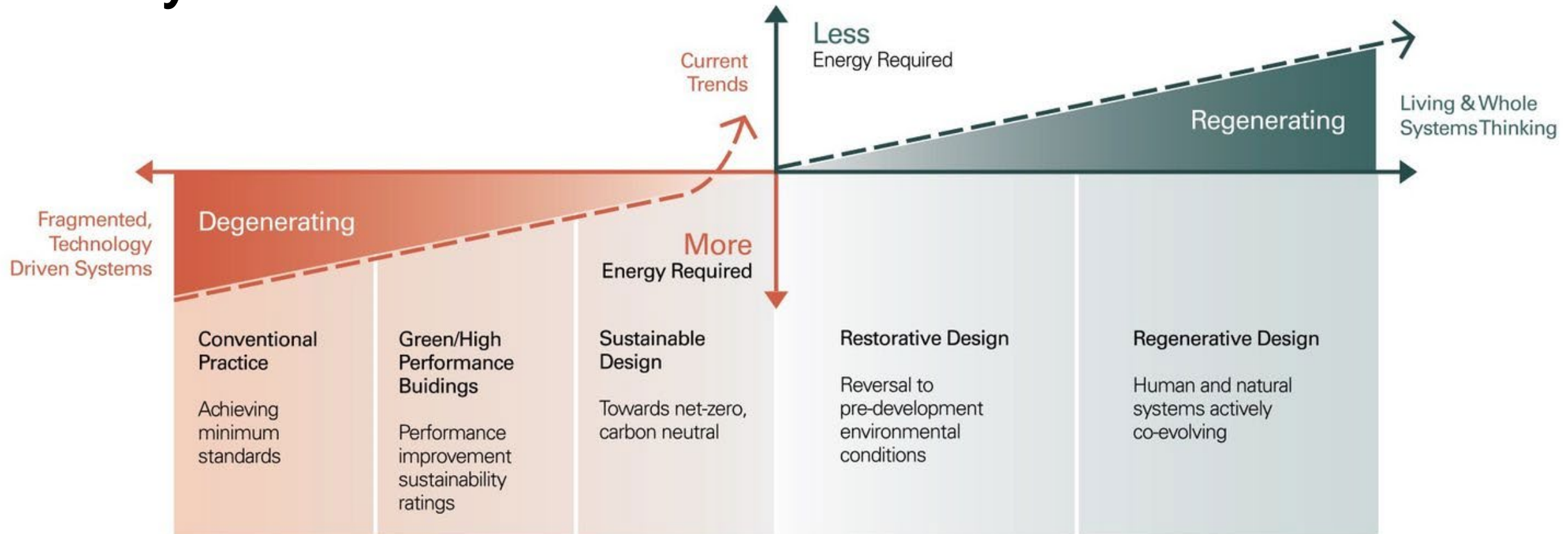
Operational Carbon & Energy

Operational Carbon

Zero Net Energy Design Process

Making the Case

Industry Shift



“Range of sustainability approaches” (Developed from Bill Reed, 2007)

How can we significantly reduce our lifecycle carbon footprint?

- 
- What?
 - How?
 - Who?

**We can't change
what we don't measure.**

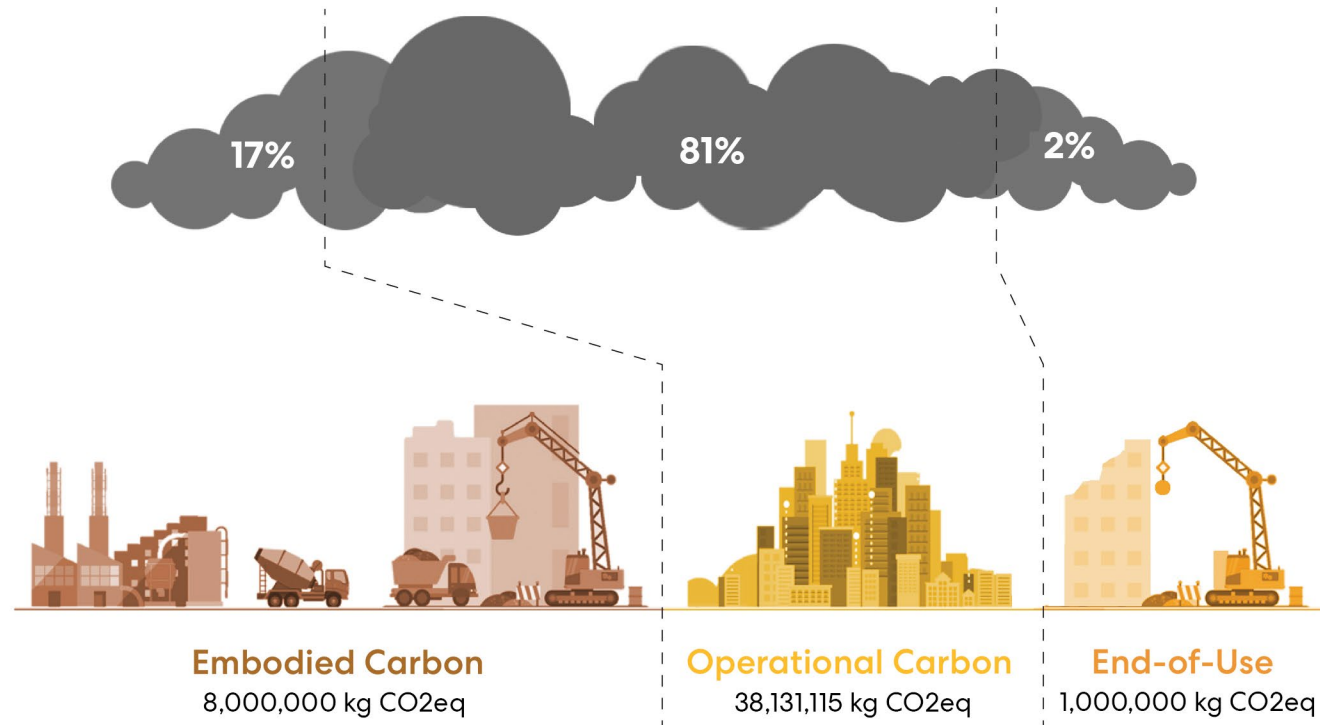
Micro: ● ● ●

What is operational Carbon?



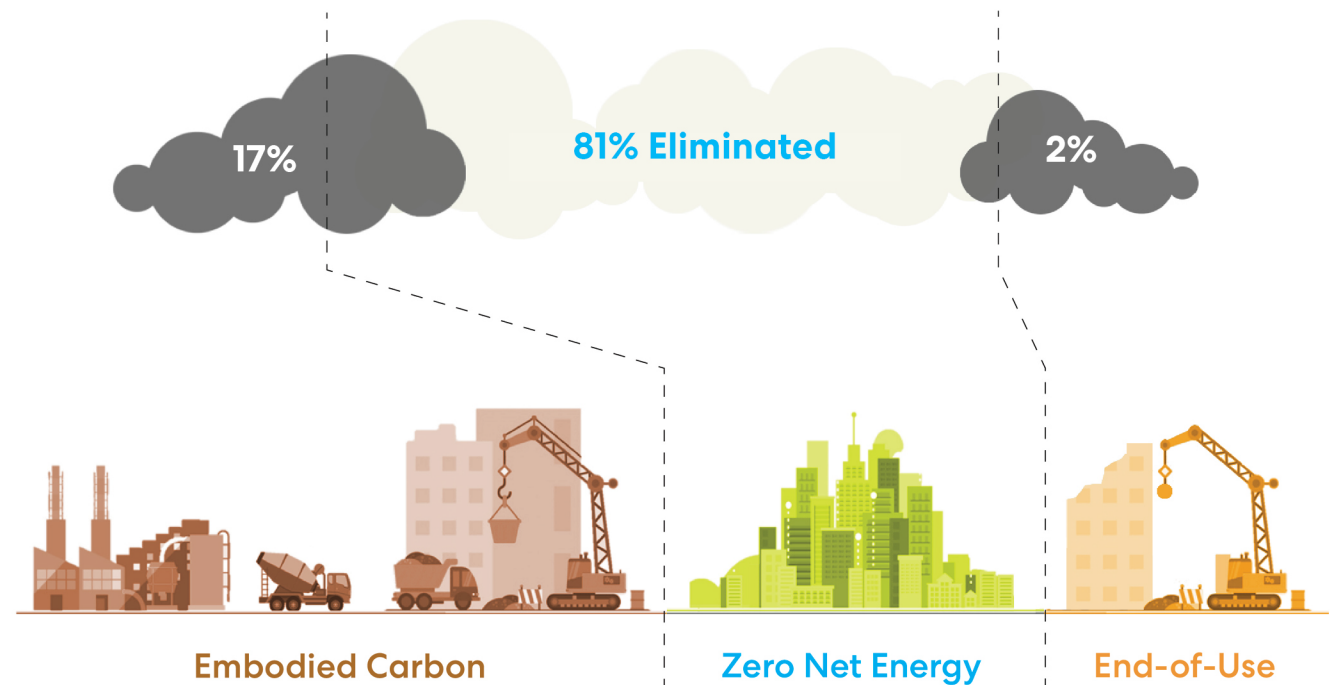
Micro: ● ● ●

What is operational Carbon?



*Baseline Lifecycle Breakdown for a 200,000 sf school in ASHRAE climate zone 5a - 50yrs

How do we get to a budget of ZERO?



Product

- **A1** Extraction
- **A2** Transportation
- **A3** Manufacturing

Construction

- **A4** Transportation to site
- **A5** Construction Installation

Material Use

- **B1** Use
- **B2** Maintenance
- **B3** Repair
- **B4** Replacement
- **B5** Refurbishment

Systems Operation

- **B6** Operational Energy
- **B7** Operational Water

End-of-life

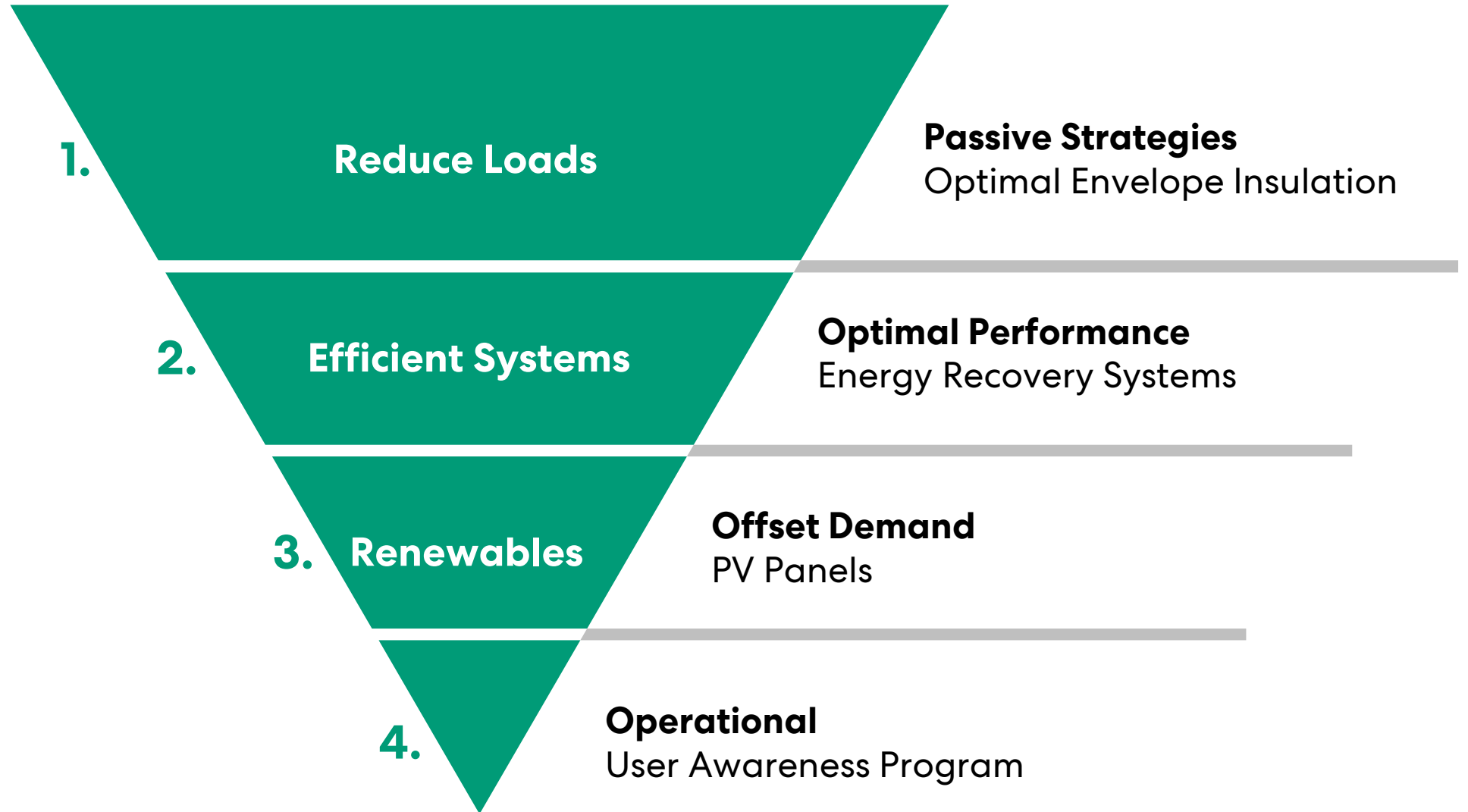
- **C1** Demolition
- **C2** Trans. to disposal
- **C3** Waste processing
- **C4** Disposal

Recovery

- **D1** Reuse
- **D2** Recycling
- **D3** Energy Recovery

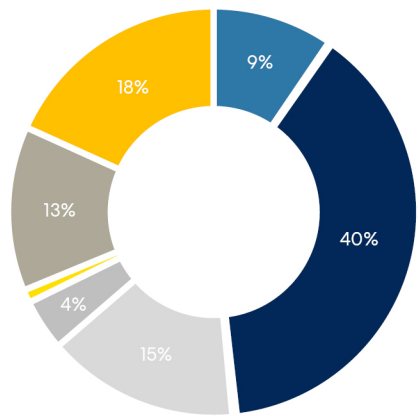
Micro: ● ● ●

How do we get to a budget of ZERO?



How do we build measurement into the process?

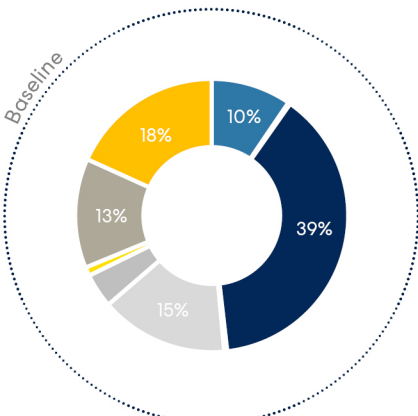
LEED V4
ASHRAE 90.1



Baseline
EUI - 54.3

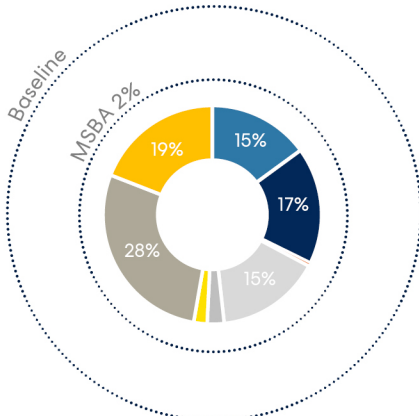
- Heating
- Cooling
- Lighting
- Plug-Loads
- Pumps
- Fans

2% State Incentive
20% Improvement over IECC
2018 / ASHRAE 90.1



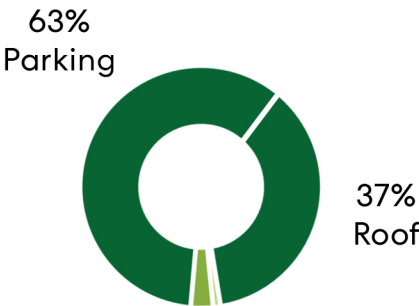
35% Reduction
EUI - 35.3

All Electric Design
Geo Exchange/VRF Hybrid



54 % Reduction
EUI - 25.2

Photovoltaic Panel Generation



100 % Offset
Annual Yr 1 Production: 1,791,684 kWh

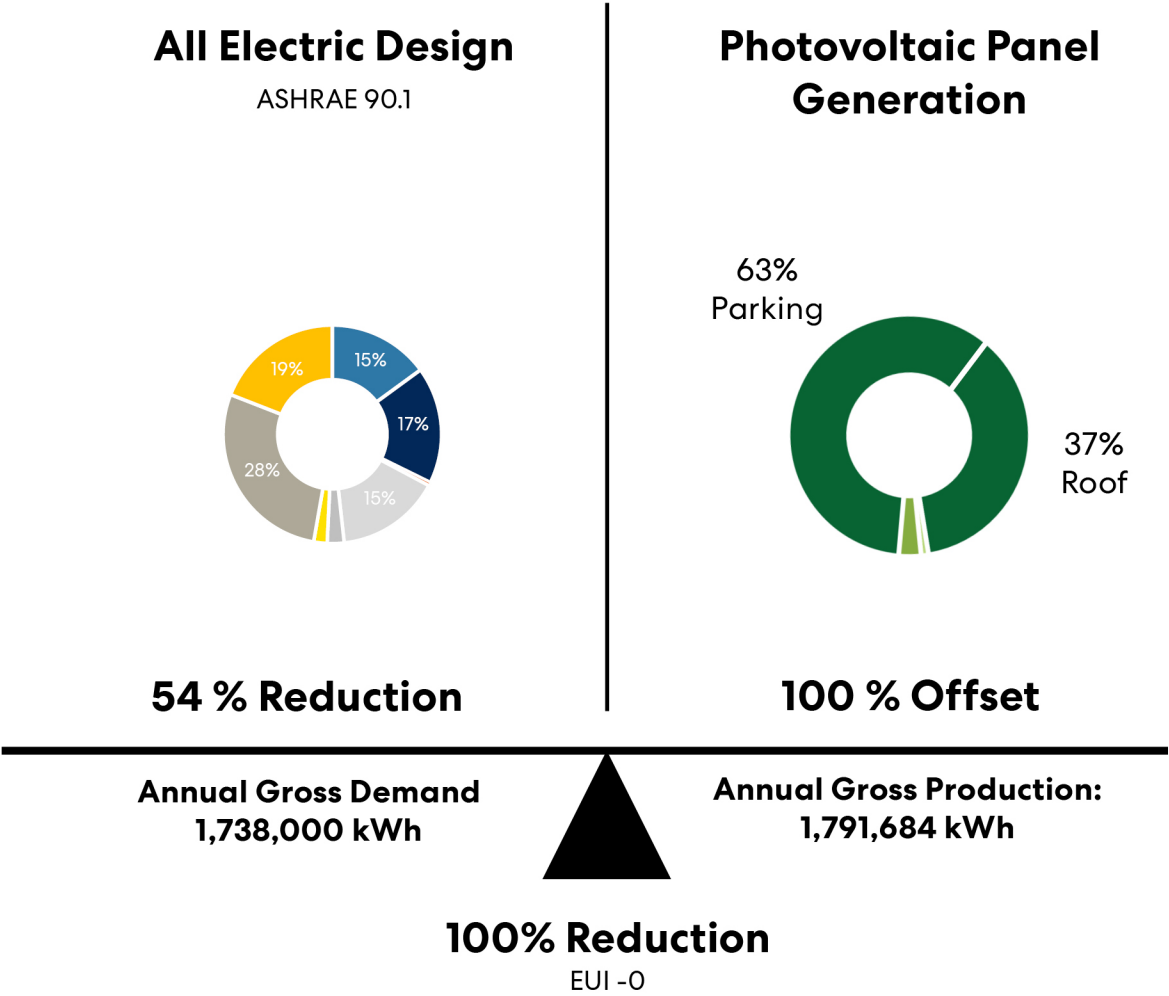
- Year 1 Electric Load
1,738,000 kWh
- Degradation: .45%/yr
- Surplus: 3%/yr

Micro: 

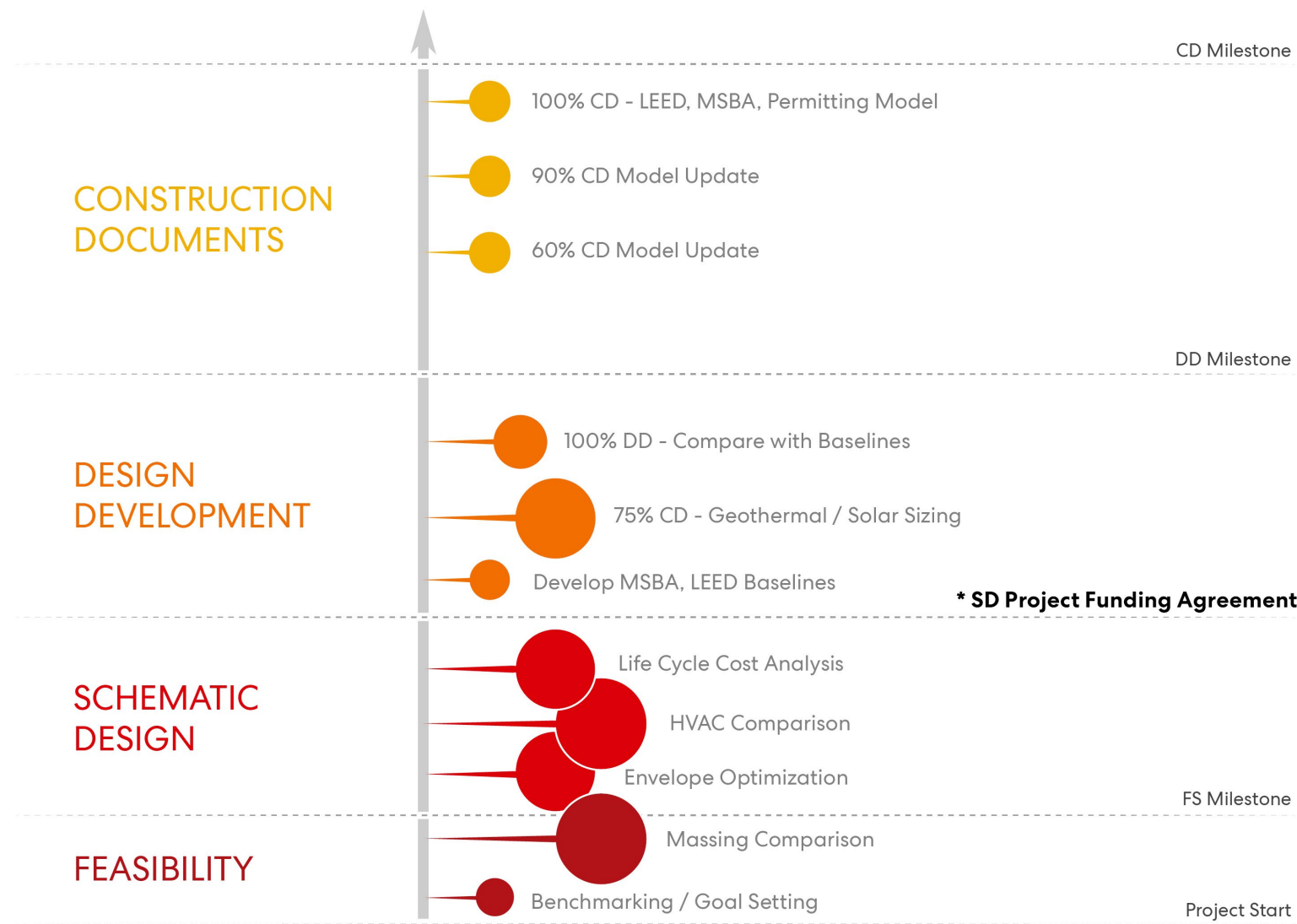
How do we build measurement into the process?



Net Zero Energy!

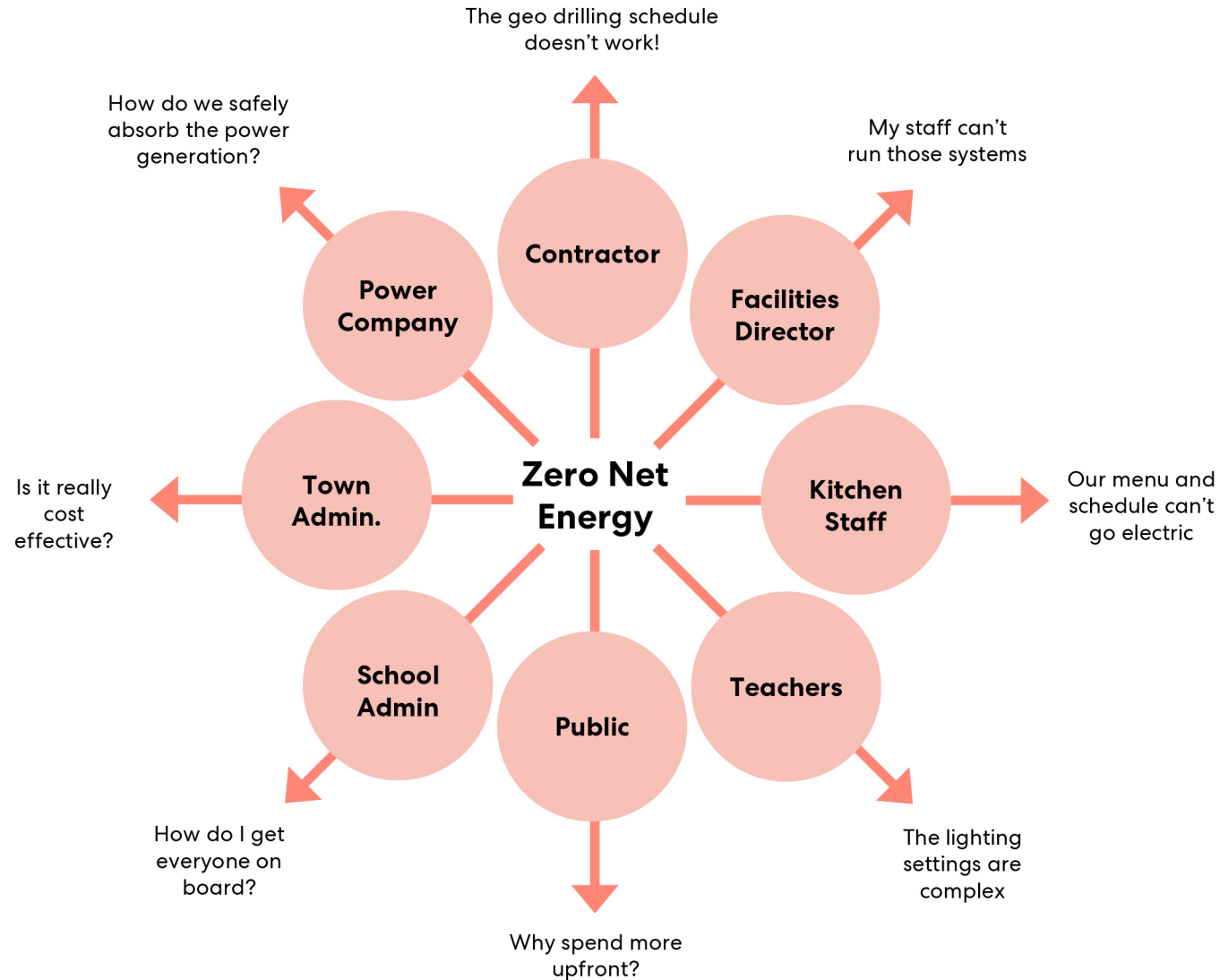


How do we build measurement into the process?



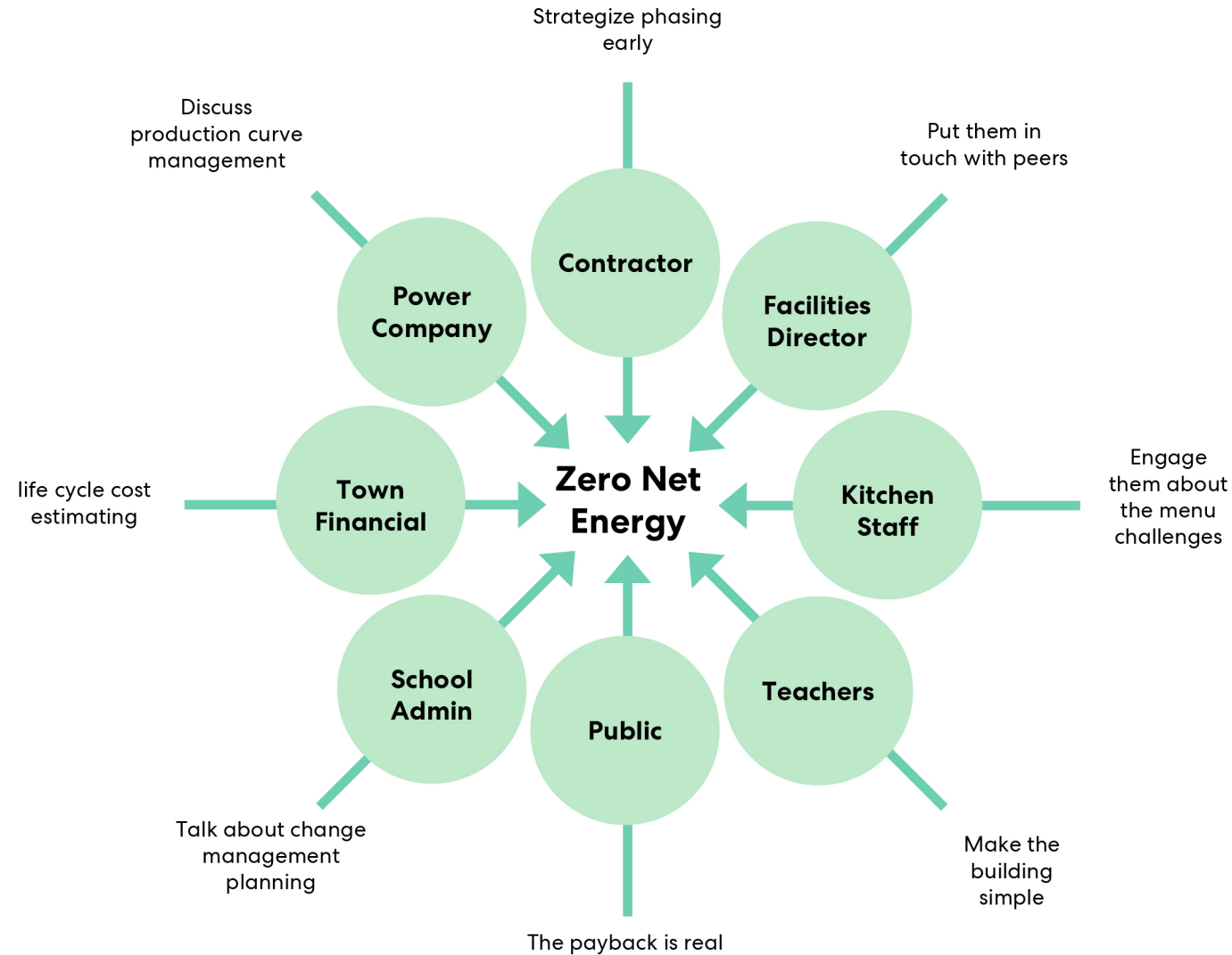
Micro: ● ● ●

Who is part of the conversation?



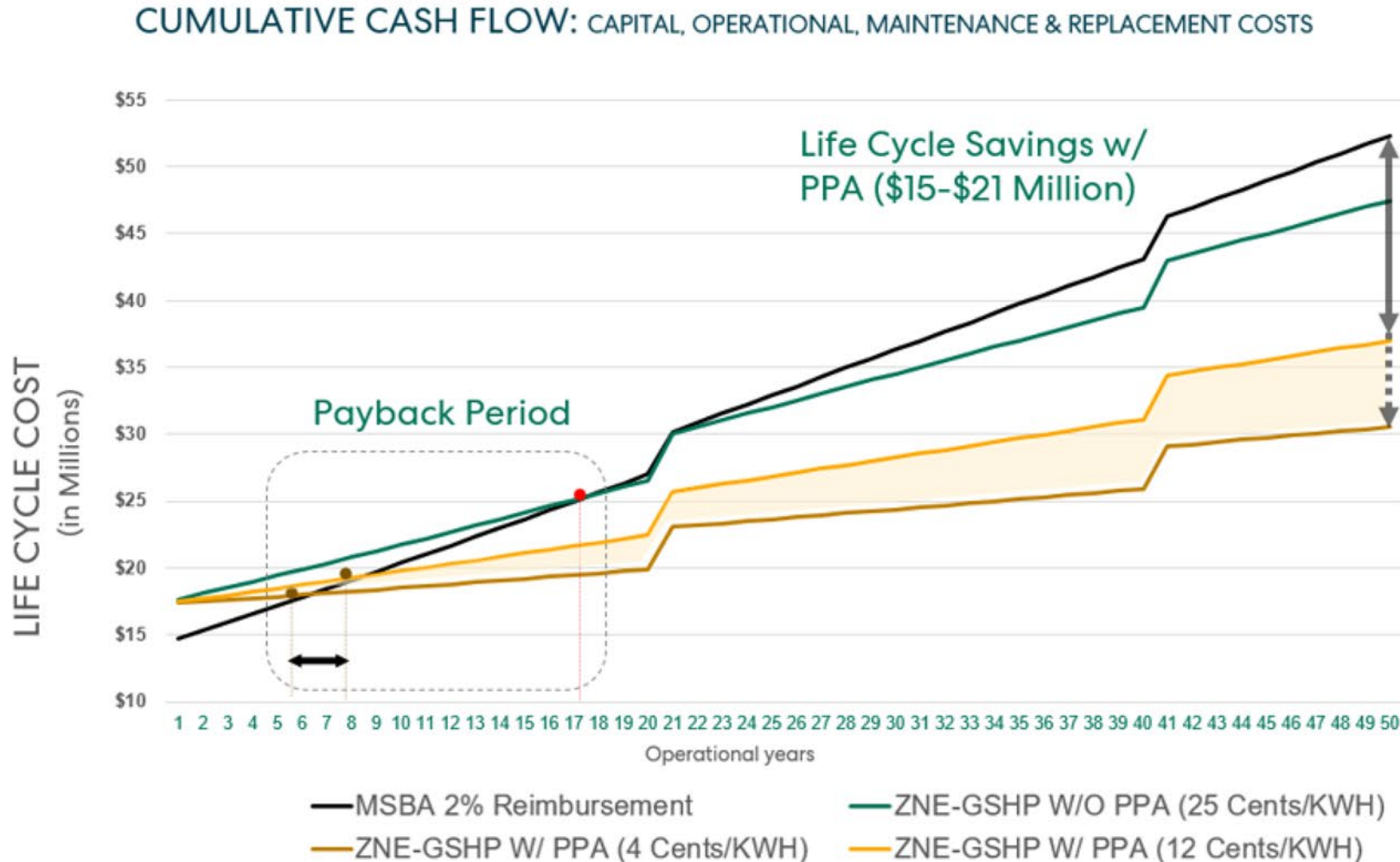
Micro: ● ● ●

Who is part of the conversation?



Micro: ● ● ●

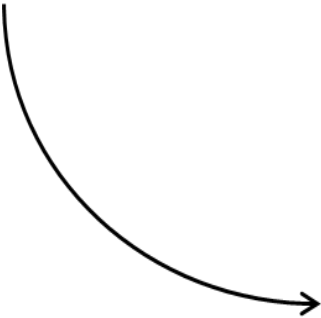
How do we make the financial case?



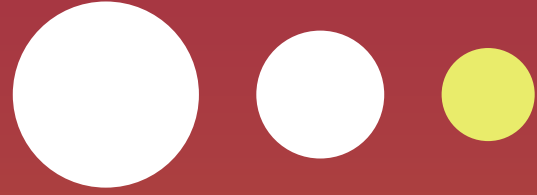
ASSUMPTIONS:

- Blended Electric Rate - \$.25/kwh (conservative estimate based on existing utility bill from the school)
- FEMP rates for discount and inflation
- Study period 50 years
- Replacement costs estimated at year 20 and 40 of operation
- Includes Mass save incentives and 2% Additional Reimbursement in the initial cost

How can you significantly reduce energy demands?

- 
- **Measure your operational carbon budget early.**
 - **Ratchet down the energy budget.**
 - **Know who spends it and engage them!**

Micro



Biophilia & Material Health

Biophilic Principles

Material Health

Embodied Carbon

“Biophilic design is not about greening our buildings or simply increasing their aesthetic appeal through inserting trees and shrubs.

Much more, it is about humanity’s place in nature, and the natural world’s place in human society...”

Kellert and Heerwagen, 2008



VanDusen Botanical Garden Visitor Centre, Perkins&Will

4
Micro:



Biophilic Design Approaches

What is humanity's place in nature and what is nature's place in our society?

- Nature in the space
- Natural analogues
- Nature of the space

Micro: ● ● ●

Biophilic Design Approaches

Terrapin Bright Green's 14 Patterns of Biophilic Design



Nature in the Space

- **Visual connection w/nature**
- Non-visual connection w/nature
- Non-rhythmic sensory stimuli
- Thermal and airflow variability
- Presence of water
- Dynamic and diffuse light
- Connection with natural systems



Natural Analogues

- **Biomorphic forms and patterns**
- Material connection with nature
- Complexity and order



Nature of the Space

- Prospect
- Refuge
- Mystery
- **Risk / Peril**

Micro: ● ● ●

Material Health

We need to understand materials enough to know when it matters.

Depending on the material, the problem might be operational vs embodied carbon.

The right material for the right place.

- Need
- Purpose
- Function
- Chemical Composition
- Simplify to save materials
- Consider modularity
- Another way

Building Ease is a new tool for healthy material selection.

<https://buildingease.com/>

→
Material Selection



Material Health Lessons

**The right material in
the right place.**

Understand materials.

Track for signal issues.

**Chase issues from
material to assembly.**

Northeastern University Multi-Purpose Athletic Facility

Boston, Massachusetts

Building Size: 310,000 SF

Program types:

- Multi-purpose arena
- Fitness and multi-purpose recreation
- Basketball practice facility

Seating capacity:

- Hockey : 4,050
- Basketball: 5,300
- Graduation: 5,630

Certification (pursuing):

- Living Building Challenge CORE / ILFI Zero Carbon

Sustainability / Resilience:

- Rainwater reuse
- Green roof
- Lower carbon footprint
- Materials free of harmful chemicals

Energy:

- All-electric building (fossil fuel free)
- (46) 800 ft deep geo-exchange wells
- Rooftop 570kw solar PV array

**Project design to goals*



Biophilia Workshop Agenda

Wednesday May 29, 2024

Morning Session

9am – 11am

216-101 Large Conference Room

Design Team invited participants:

Joanna Jenkins
Tyler Hinckley
Laura Duenas
Chris Karlson
Vita Wang
Secil Yakin
Josh Rathbun
Alec Zebrowski
Bryan Schabel
Mayur Patel
Amina Helstern
Faith Nguyen
Sarah Brophy
Troy Depeiza
Lynne Gieseke
Shira Davis

NU invited participants:

Carla Morelli
Ji-Hye Ham
Simon Foisey
Leah Bamberger
Jacob Glikel
Torrey Spies
Stephen Schnieder
Cassandra McKenzie
Mark Bontempo
Jim Brand
Amy Pace

5 minutes-

Welcome & Introduction

15 minutes-

Warm up exercise

20 minutes-

Intro to Biophilia

20 minutes-

Framework

5 minutes-

Idea Generators

25 minutes-

Break Out Groups

25 minutes-

Reconvene + Discuss

5 minutes-

Conclusions

Breakout Groups

Brainstorming Ideas

- RISK/PERIL NATURE OF THE SPACE
- INTEGRATE VINES/PLANTINGS INTO ROOFTOP GUARDRAIL
 - ↳ FILTER LIGHT
 - ↳ FILTER VIEWS
 - BALCONY VIEWS W/IN ARENA
 - ↳ LOOKING DOWN FROM ABOVE
 - COMPRESSION/EXPANSION
 - ↳ ENTRY STAIR
 - MYSTERY
 - ↳ APPROACH UP STAIR INTO ARENA "REVEAL"
 - ↳ MATERIALITY, TACTILITY
 - REFUGE
 - ↳ EVEN MORE IMPORTANT IN CONTRAST TO SCALE AND ACTIVITY OF ARENA

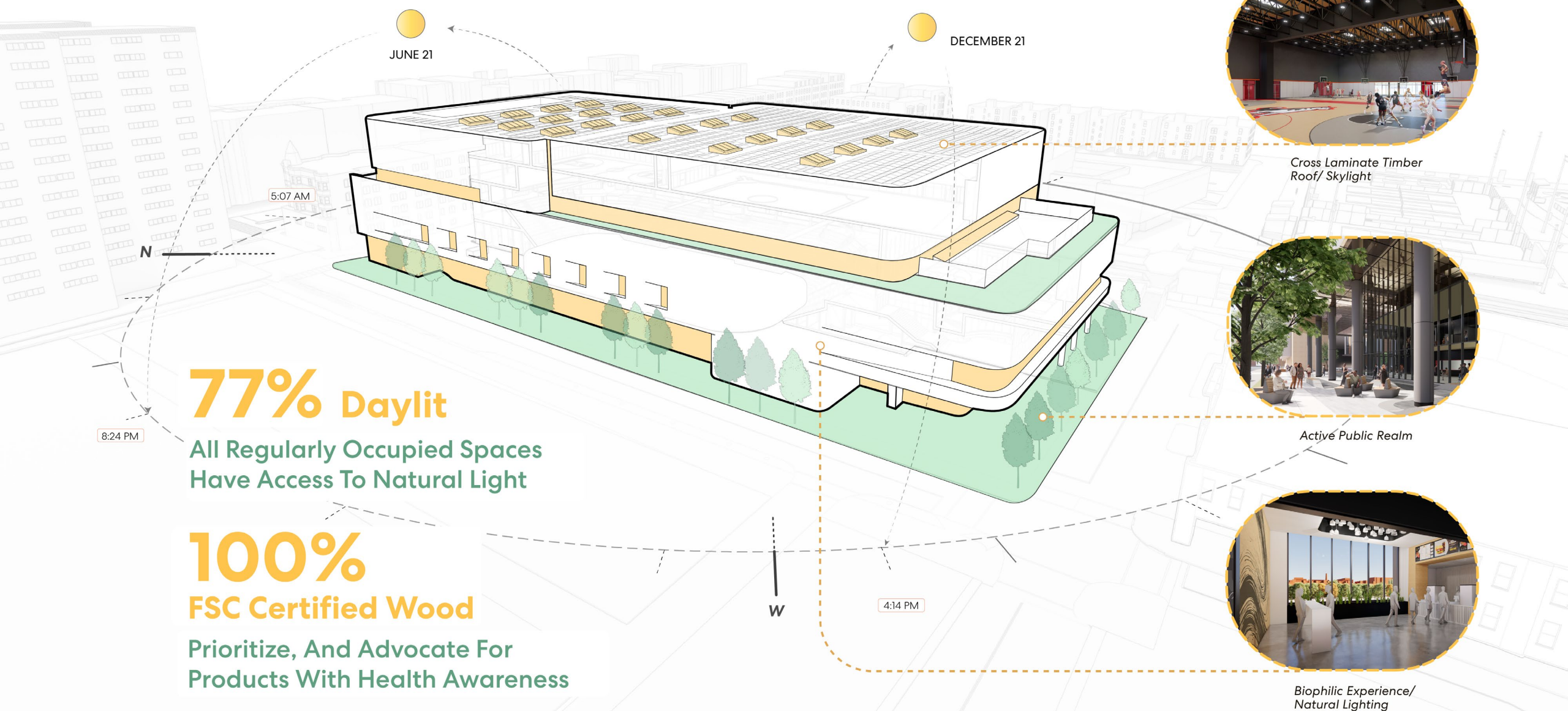
- REFUGE
- ↳ LOCKER ROOM AS PLACE OF RETREAT/PRIVATE RECOVERY
- WIDE RANGE OF ACTIVITIES
- REFUGE
- ↳ ACOUSTIC ESCAPE?

- TREES ALONG STREETS
- DIFFUSED LIGHT → PRISMATIC SKYLIGHTS
- WATER → COLLECTION CISTERN
- LIVING GREEN ROOF → LANDSCAPE → HERB/VEGETABLE PLANTERS
- NATURAL VENTILATION?
- OPERABLE WINDOWS/SKYLIGHTS?
- REAL GREEN/LIVING WALL → FEATURE WALL & LOOPY ART → JOINT → ASSOCIATION TO NATURE
- WATER FREEZE/THAW CYCLE → HOW TO EXPRESS IN BUILDING → WATER FEATURE IN LIVING WALL? STAIRS
- INTERIOR LIGHT THING NEED MORE LIGHT

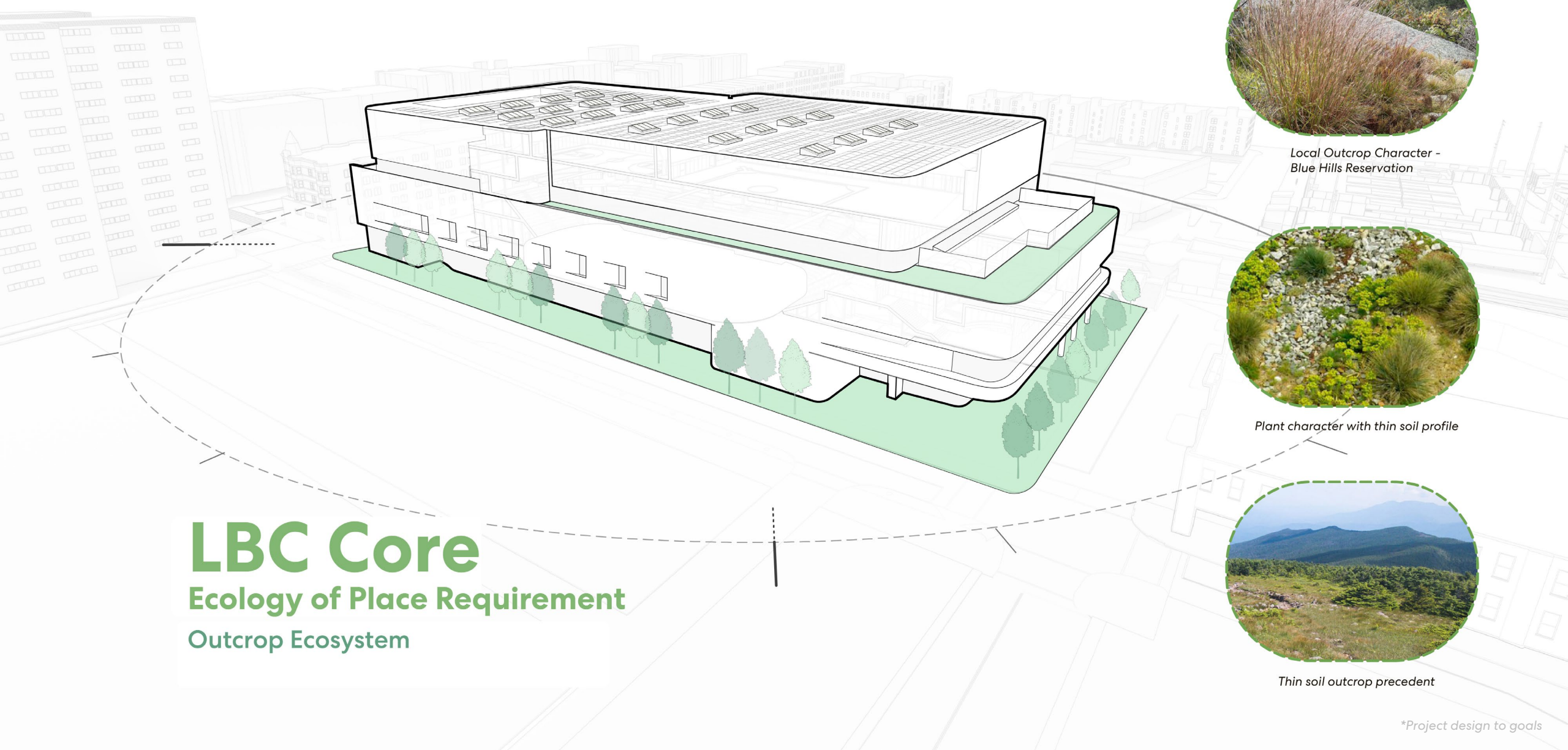
- NATURAL ANALOGUES
- Organic form to walls/ceilings in the "POE" → cascade
 - Light feature that pulls you in → Firefly paths
 - HEAR/SEE/SMELL WATER?
- Prospect
- Looking out → Root terrace → INTO ARENA
- Refuge
- Confined spaces → How do you balance volume? complexity & order

- NATURAL ANALOGUES
- Trees in the space
 - Emulate the feelings of playing hockey outdoors - back to nature
 - History of hockey → outdoors
 - Journey of hockey as a sport
 - Rounded shapes & forms
 - Is there a way to show making the ice
 - Layers of ice + (wood) for Bball
- Truss space: order lighting highlight wood decking
- Structure can relate to order
 - Opportunity for trees within building → height - along St. Basil's facade
- how does fitness relate to nature?
- urban campus → creating oasis & respite from hustle of life, active but promotes wellness
- hockey originally played on a pond ↓ emulate this history
- refuge from city/industry/transit noise
- Reuse of current arena's wood
- athlete/fitness recovery
- outdoor rec → yoga/workout/1
- sheltered outdoor space - unique on campus
- allows students to rest, fuel, interact
- local materials → stone & wood → how can we bring more texture?
- smaller interstitial spaces → not just for physical but mental well being
- design for the everyday user not just the games (intermittent)

Health & Well-being



Ecology



Local Outcrop Character -
Blue Hills Reservation



Plant character with thin soil profile



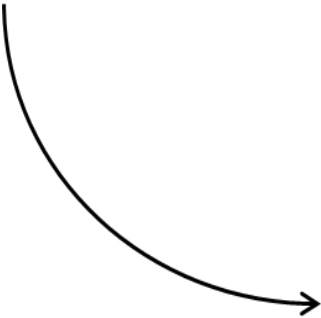
Thin soil outcrop precedent

LBC Core
Ecology of Place Requirement
Outcrop Ecosystem

*Project design to goals

Biophilic Design Approaches

How can you understand your place in nature and nature's place in our society?



- **Biophilic Design Charrettes**
- **Integrate natural materials**
- **Think holistically about your impact**

Discussion



Advancing Health Equity and Environmental Performance through Design: A Holistic Framework for Healthy Buildings

Questions and Answers for Session 1 - 9.3.2025

- 1. Shall we make embodied carbon and emissions calculation (LCA) requirement in the early phase of the design?**

Early LCA, even as a rough calculation, is good to set the dialogue about reductions. Since it is early and not all materials are decided (particularly for interiors), a reiterative approach is best. Often, the operational emissions can be model as scenarios for different systems. This allows early decisions for minimizing impact.

- 2. An old saying: The greenest building is the building that is already built. Given full lifecycle carbon. Is this still true in your opinion? What are the factors to consider?**

Evaluating reuse is always step 1, If a deep energy retrofit to meet current code is part of the scope a building reuse will always yield a smaller lifecycle footprint. Existing buildings of a certain vintage are often full of chemicals of concern. We have a whole generation of post baby-boom buildings coming to the end of their life that need careful evaluation to make sure we are not perpetuating exposure to toxicants.

- 3. Would the biophilia charette be integrated with others? Please advise on phasing of charette/ engagement given other charette topics?**

We find the Biophilic Design Charrette has more impact if it is early in the design process during the SD phase.

And yes, it most certainly integrates with other topics and charrettes! I think that is our primary message, that each of these topics relate to each other as a system.

- 4. In the public design arena, how can we encourage use, reuse, and adaptive reuse of existing buildings and structures rather than demolition and rebuild?**

We must always consider existing resources. We like to think on a spectrum of Adaptive Reuse all the way to Transformation to understand the opportunity.

- 5. I am looking for resources on the relationship of neuroplasticity and the built environment. Need actual data from scientific experiments. Thank you**

I would start with an analysis of the existing literature, but I don't have any specific literature to offer. Sorry!