By VanderWolf Images

By VanderWolf Images

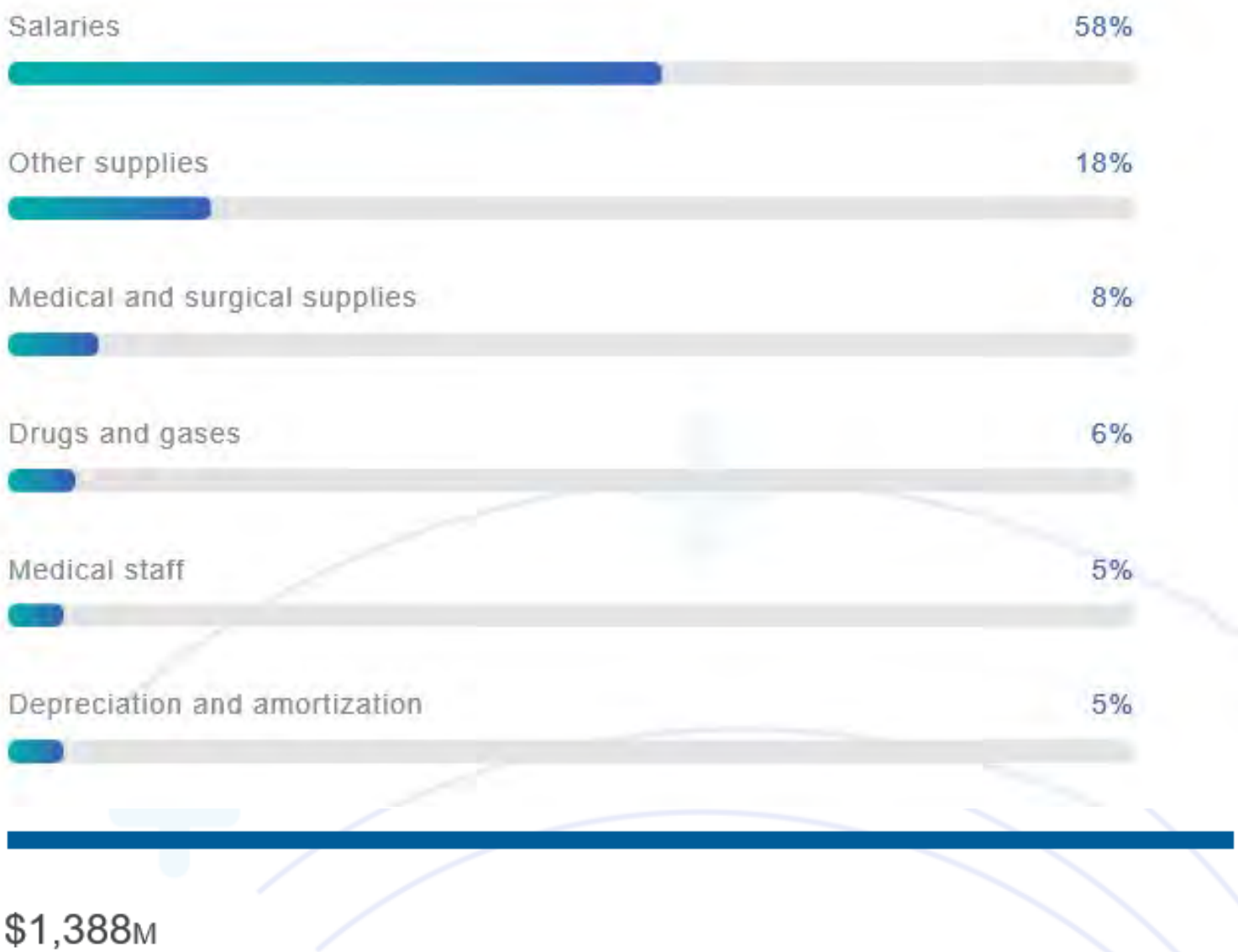

4,600
By VanderWolf Images

$1.3B Total Operating Budget

$819M on Staff

$182M on Supplies and Drugs

$2M energy savings



STAFF HEALTH & PRODUCTIVITY

2-3 day decrease in sick leave down from 14 days

1% more productive

$15.4M

PATIENT HEALTH & PRODUCTIVITY

1 day decrease in LOS

22% fewer pain killers

21% decrease in medication costs

$56M

SOIL BUILDING AND CARBON SINKS TO COMBAT FLOODING

SUPPORT AND RESILIENCE OF DISADVANTAGED COMMUNITIES

www. abcnews.com

REDUCTION IN DISEASE + DEATH

10 less heart attacks

15 less strokes

30 less cases of asthma in children

…….5 less deaths

Design to Improve the Human Condition……

LIFE

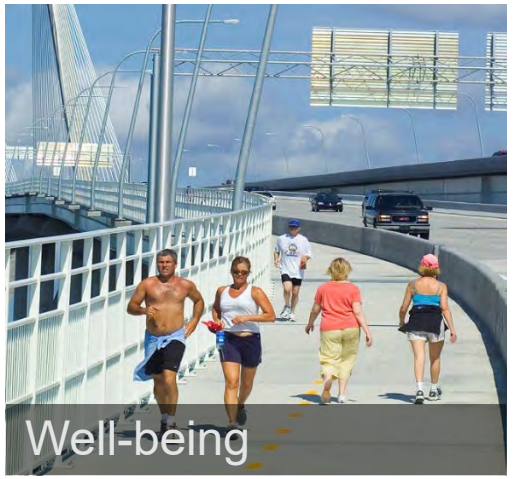
Food


Water

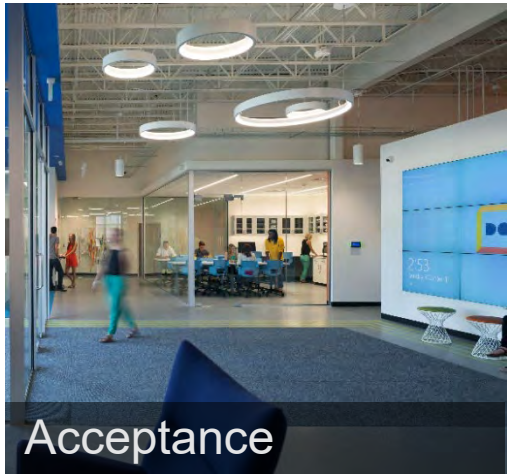

Shelter


Safety


Security


Well-being

Belonging

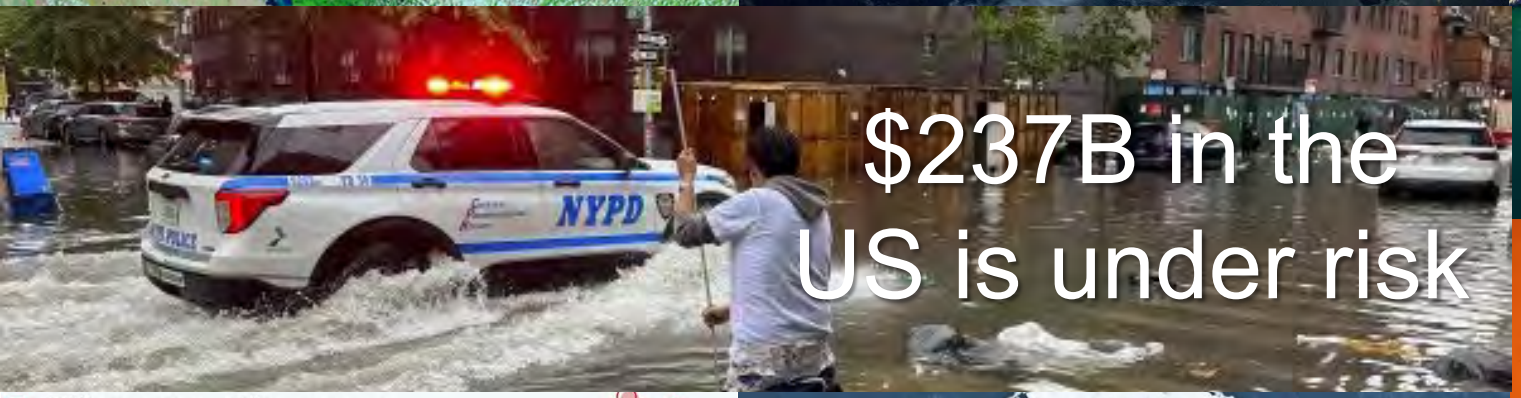

Acceptance


Value

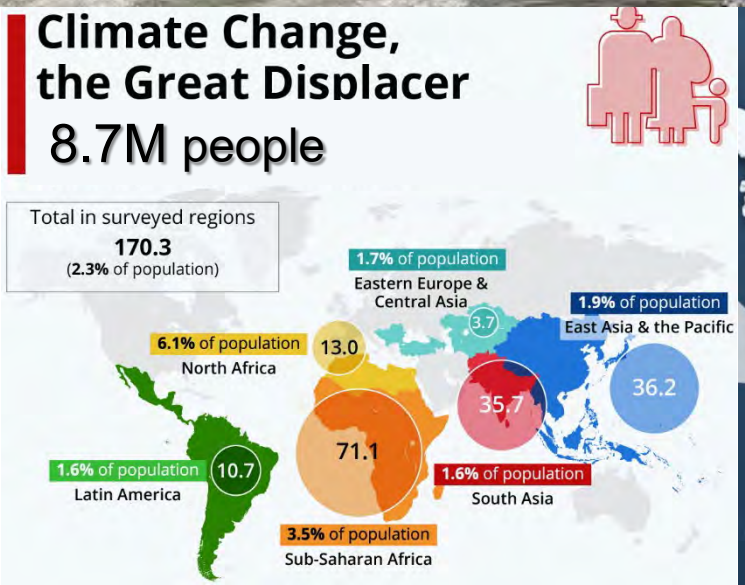
5000 DEAD
1200 children
in Libya

Insurance
stoppage in
Florida

Colorado
Yangtze
Rhine
Po
Loire
Danube
Mississippi



$237B in the
US is under risk

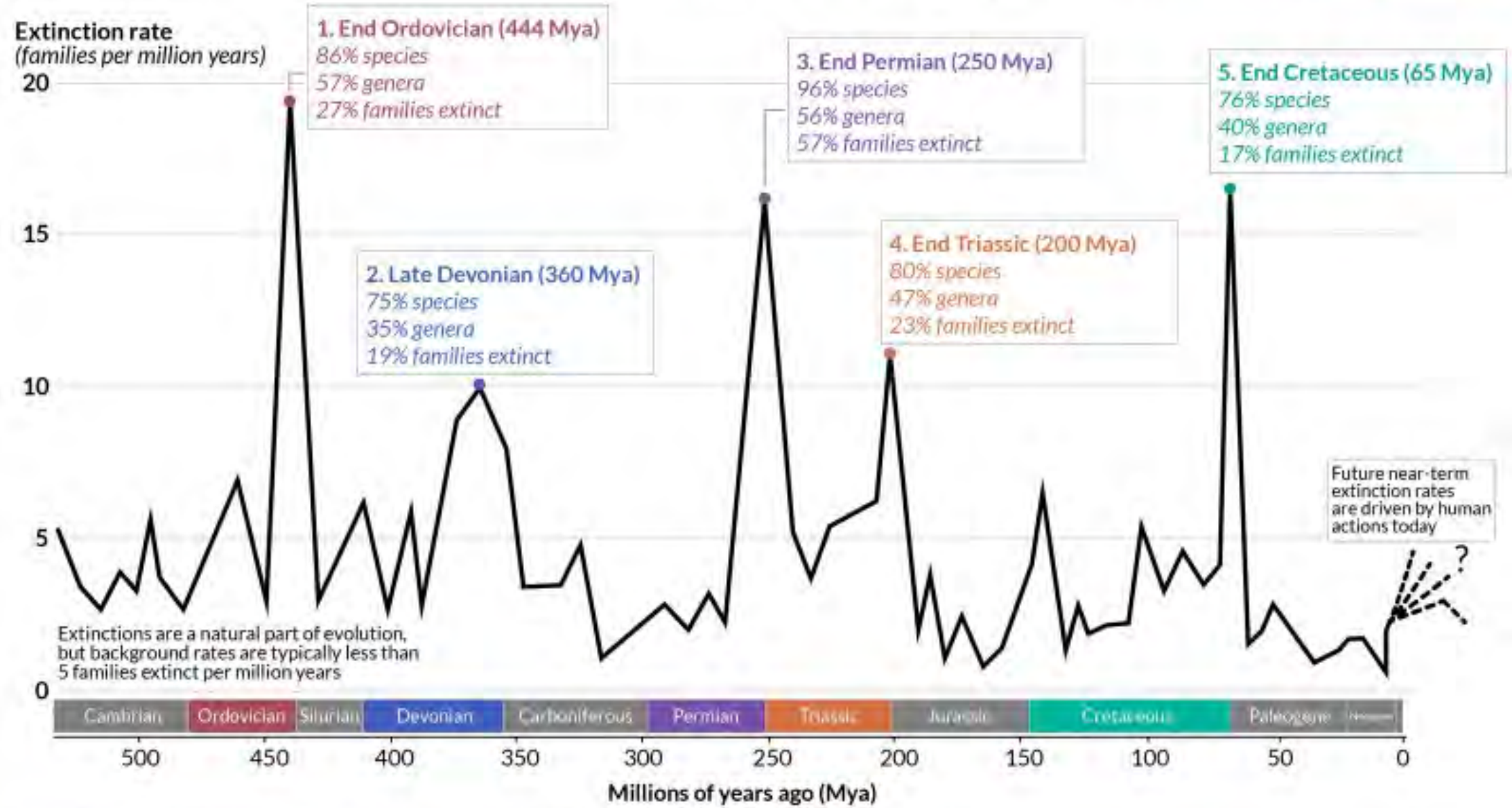


Canada, Spain,
Portugal, South
Korea, Australia,
Italy, Hawaii

‘Big Five’ Mass Extinctions in Earth’s History

A mass extinction is defined by the loss of at least 75% of species within a short period of time (geologically, this is around 2 million years).

Our World in Data



Sources: Barnosky et al. (2011); Howard Hughes Medical Institute; McCallum (2015); Vertebrate biodiversity losses point to a sixth mass extinction

“Nothing has more strength than dire necessity”.

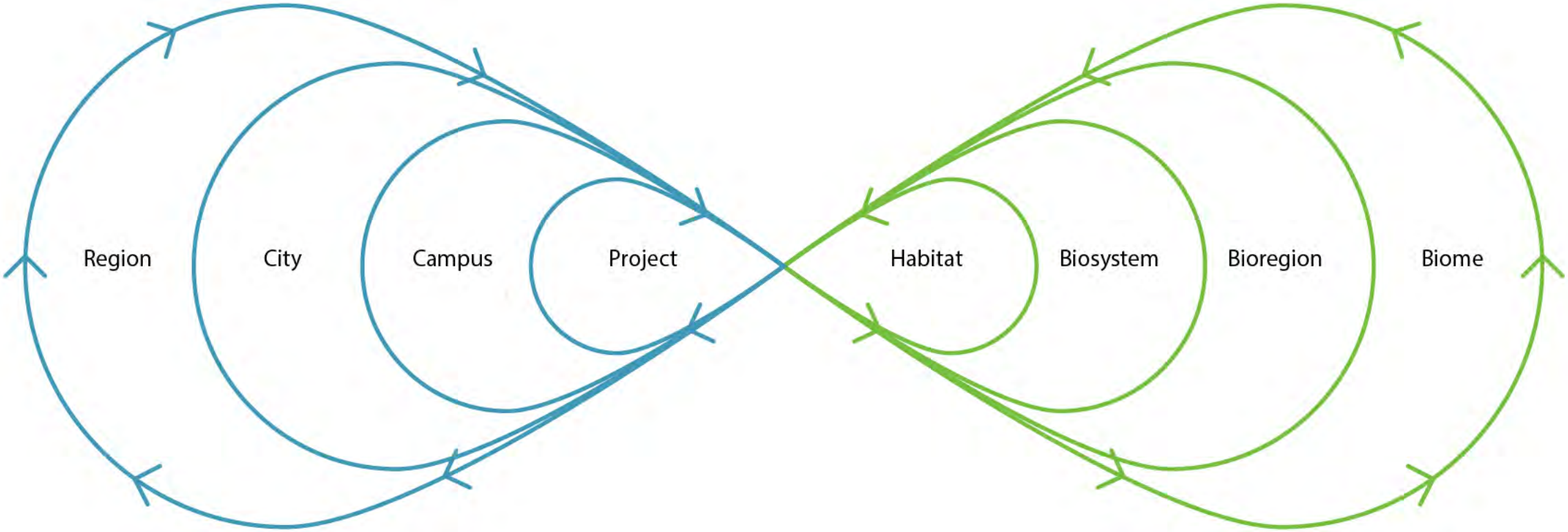
- Euripides

“The project is not the project.

The project is the SYSTEM.”

-Bill Reed
Regenesis

Broader Interconnected Systems

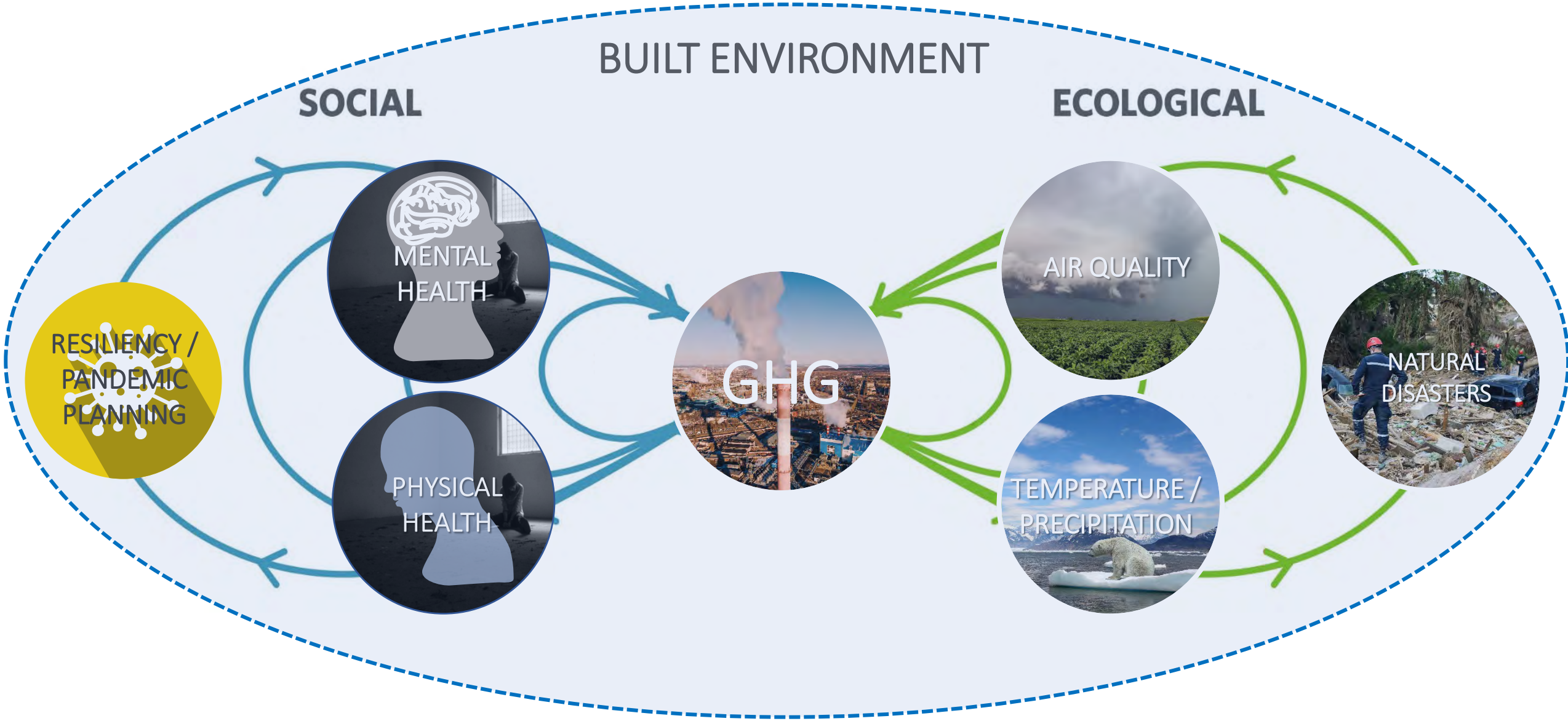


Community	Health	Carbon	Water	Air	Biodiversity	Nutrients

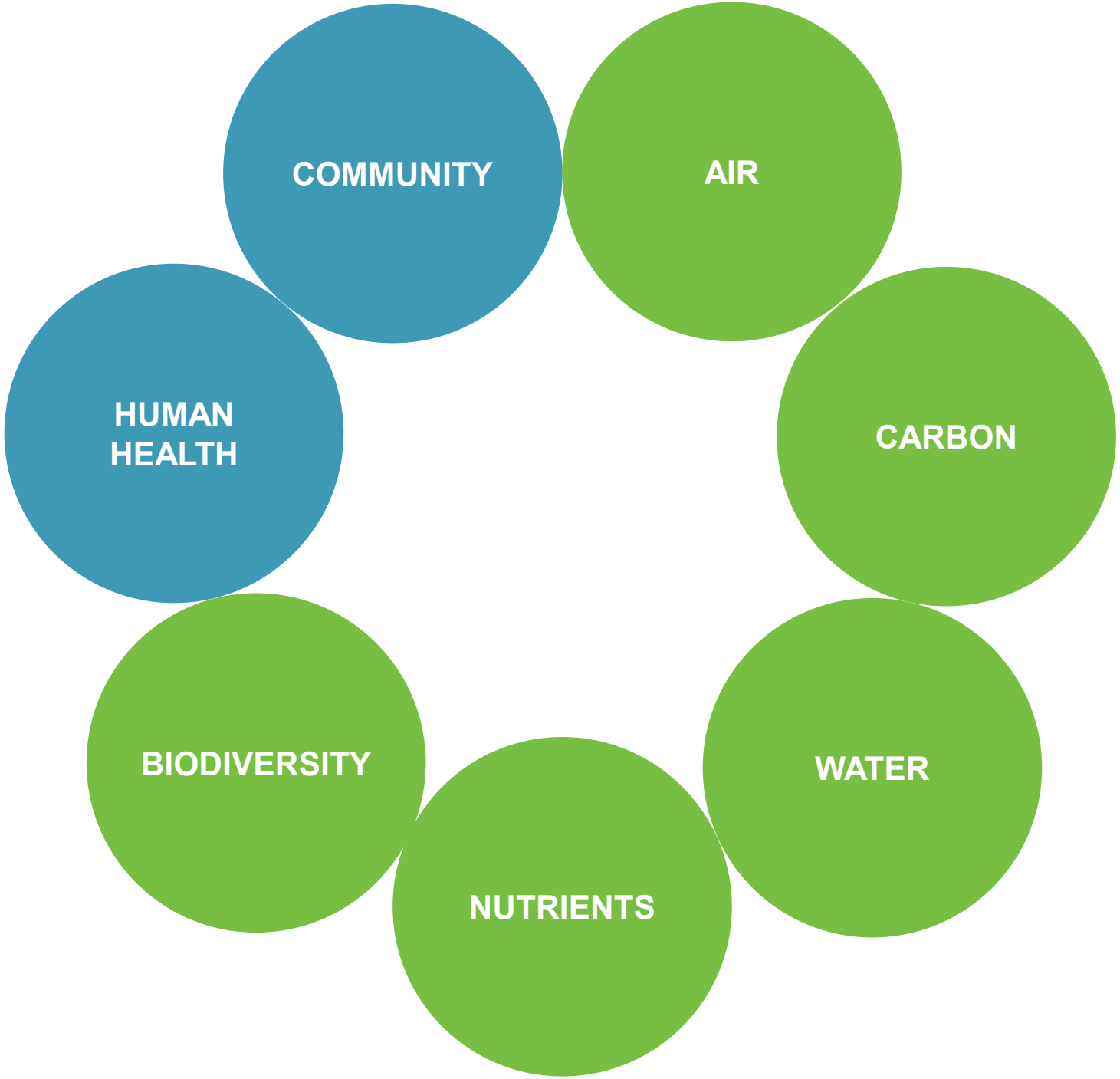
SOCIAL — ECOLOGICAL

INTERCONNECTED AND NESTED SYSTEMS:

Greater Whole

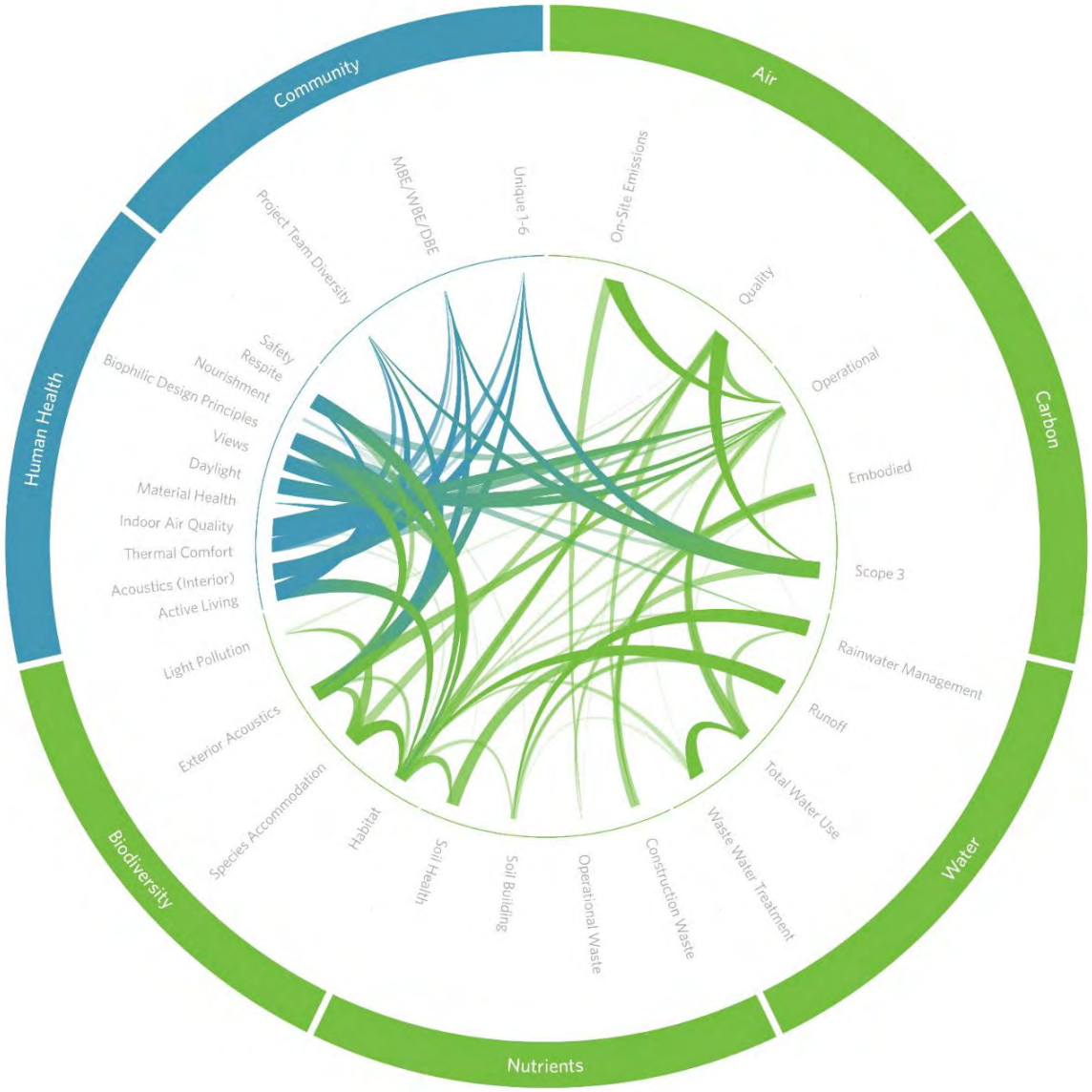


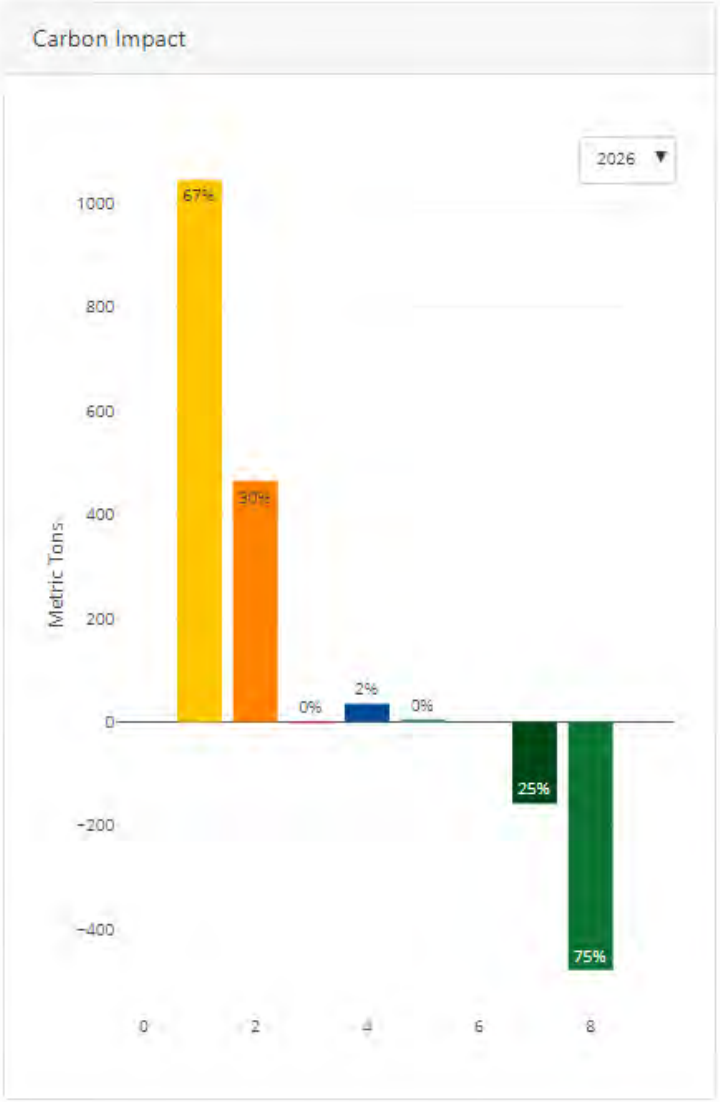
Health care climate risks adapted from WHO climate resilience report

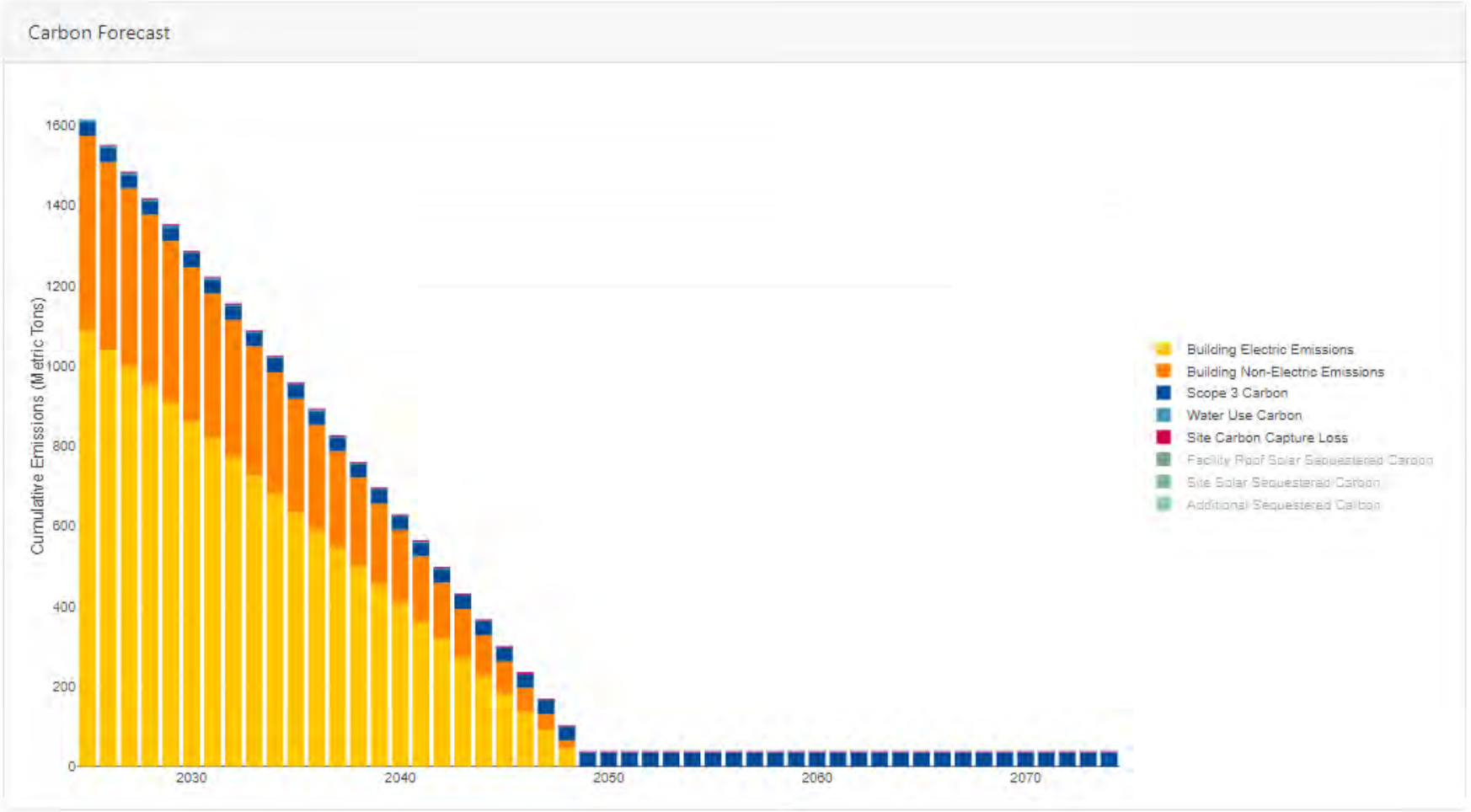

COMMUNITY
AIR
HUMAN HEALTH
CARBON
BIODIVERSITY
WATER
NUTRIENTS

Nested System Connections

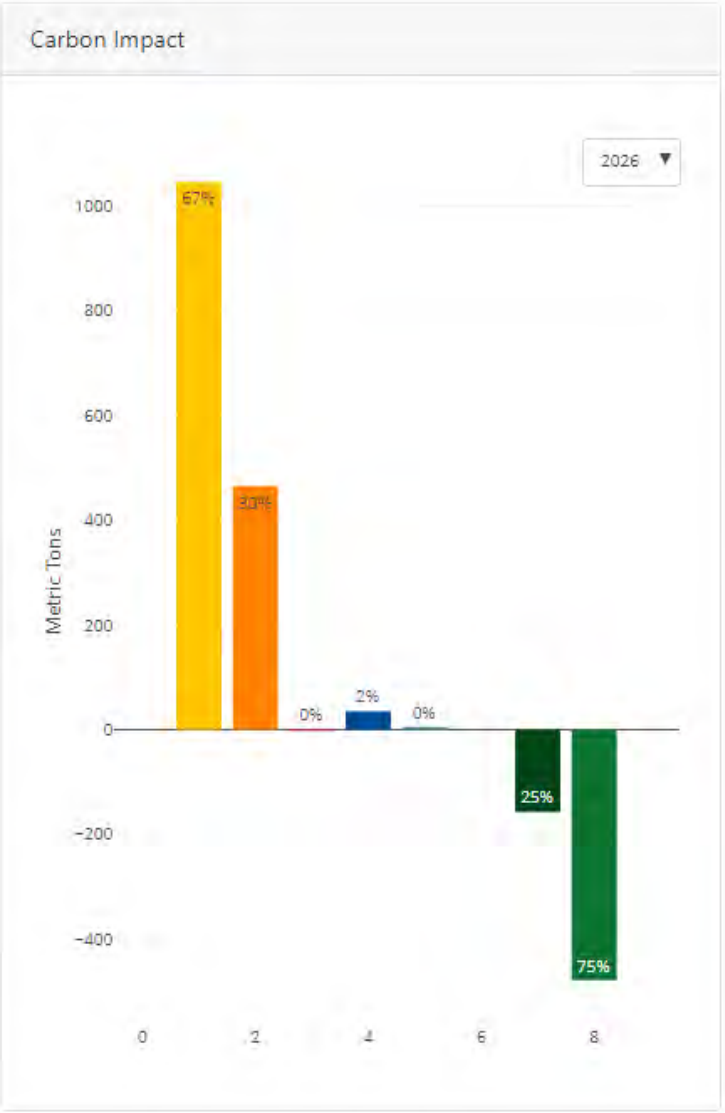
Understanding these relationships allows for the generation of value across scales and systems

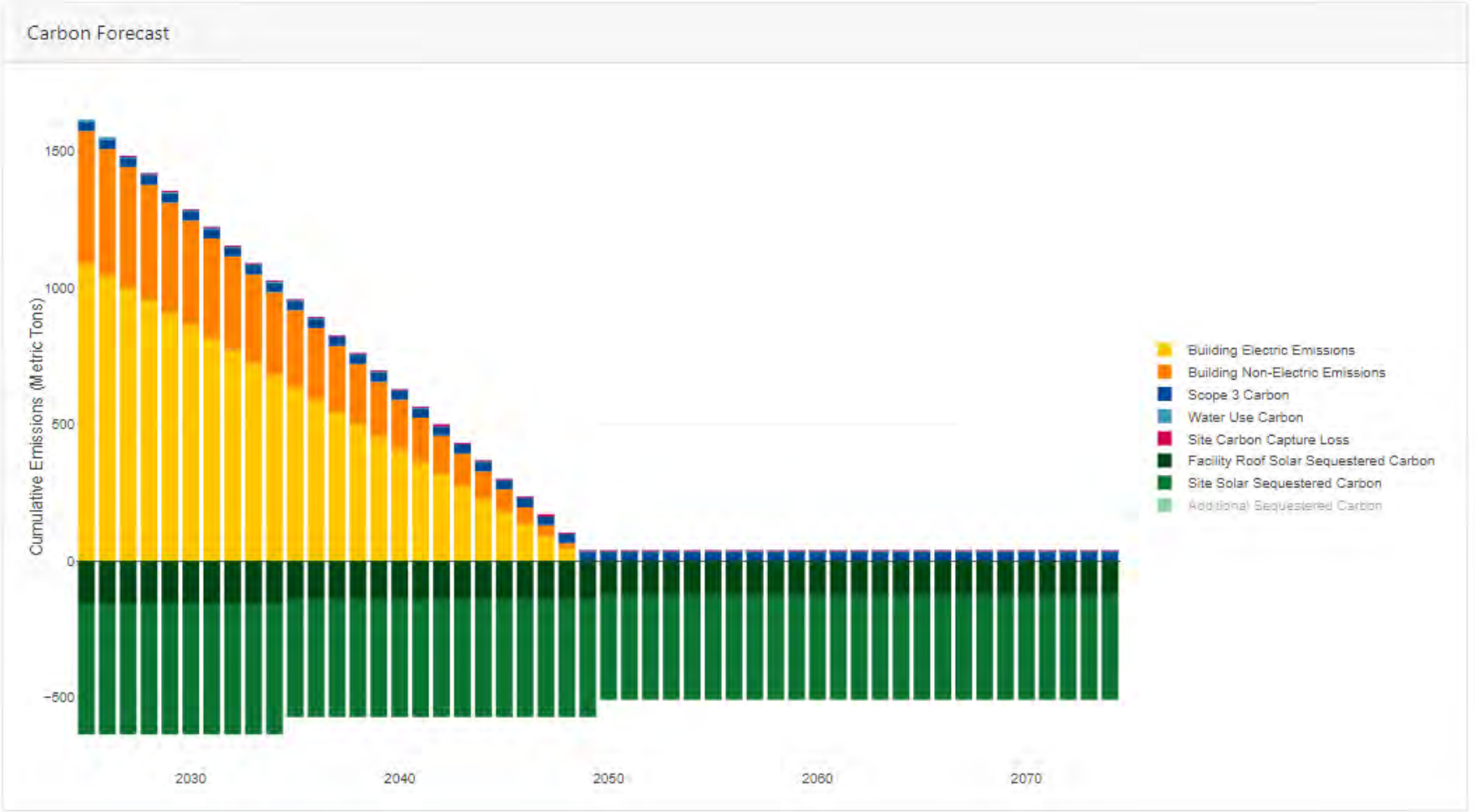






OPERATIONAL CARBON (water included) – low energy building



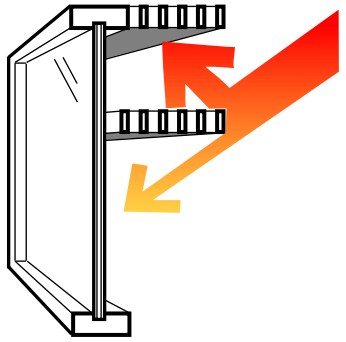


OPERATIONAL CARBON BUDGET – Not enough to offset on-site with a 50% EUI reduction

Pathway to Decarbonization

Manage Peak Solar Load

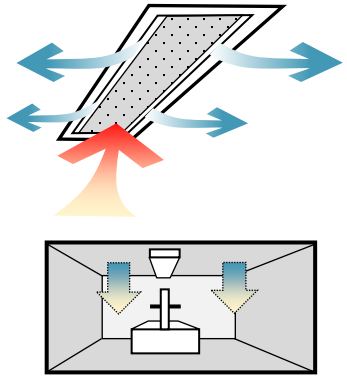
EXTERIOR SOLAR CONTROLS



MAX 2 W/SF PEAK SOLAR LOAD AT PERIMETER ROOMS

De-couple Comfort Delivery

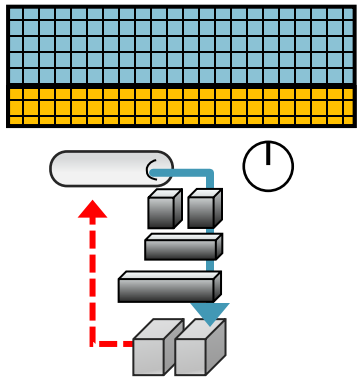
SENSIBLE + DOAS



REDUCE UNOCCUP'D ENERGY

Manage Air Temp Zones & Process Heat

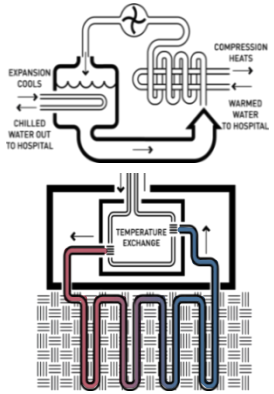
FLOOR PLAN ZONING



PROCESS HEAT REJECTION

Adopt Heat Pumps w/ No Combustion

HEAT RECOVERY CHILLER



GROUND SOURCE HEAT PUMP

Install Renewables to Offset

SOLAR PHOTOVOLTAIC ARRAY

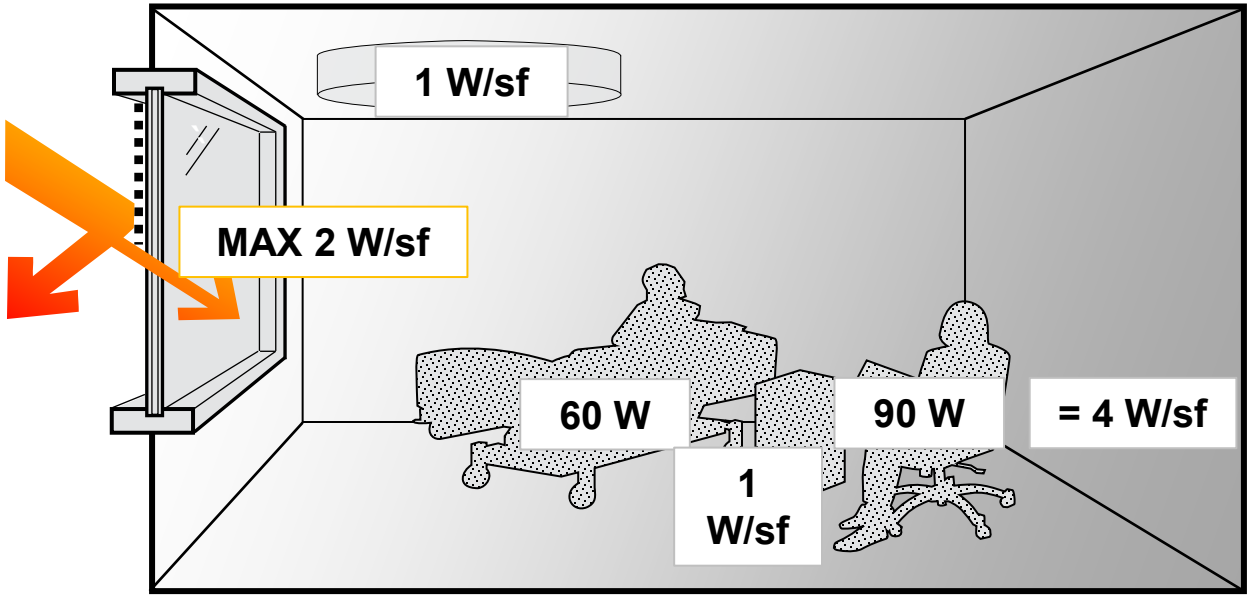
PRIORITIES FOR PATIENT COMFORT

Comfort Parameters

- **Thermal Perception**
  - Radiation
  - Convection
  - Evaporation
  - Conduction
- **Visual Perception**
  - Glare
  - Illumination
  - Connection to Nature
- **Acoustical Perception**
  - Alarms
  - Noise
- **Air Quality**
  - Smell
  - CO2
  - Freshness
- **Mental State**
  - Confusion/Clarity
  - Loneliness/ Companionship
  - Optimism/Pessimism
  - Physical Discomfort/Pain Management

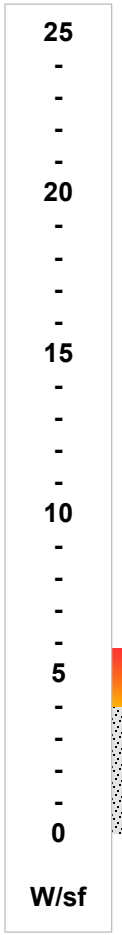
PATIENT ROOM COMFORT

Relationship Of Peak Solar Load & Comfort Delivery



Building Skin, Users / Equipment and Lighting drive Cooling Load and Capacity

BASELINE COOLING LOAD DRIVERS



Variable Air Volume/ Constant Air Volume
but embeds **Reheat** @ ~45% Energy Costs

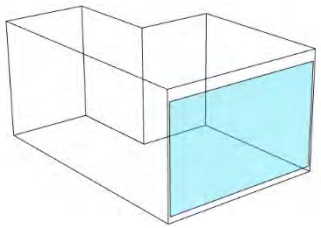
Alternative Mechanical systems (DV, ACB)

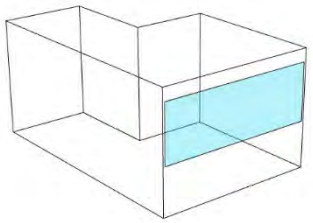
Maximum Solar Peak (2 W/sf)

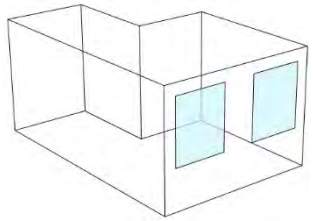
Users, Lighting and Equipment

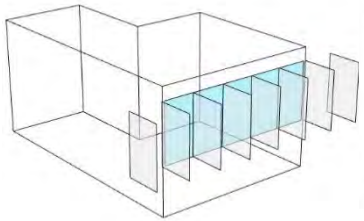
To maximize flexibility, stay below System capacity limits

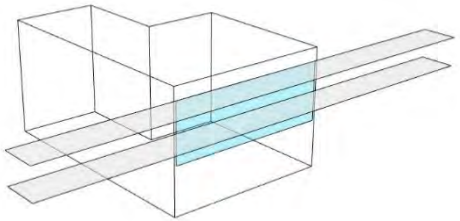
PEAK SOLAR LOAD,
SW PATIENT ROOM

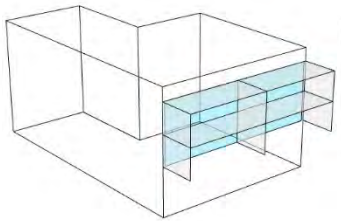

70% WWR

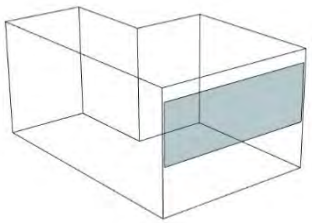

40% WWR

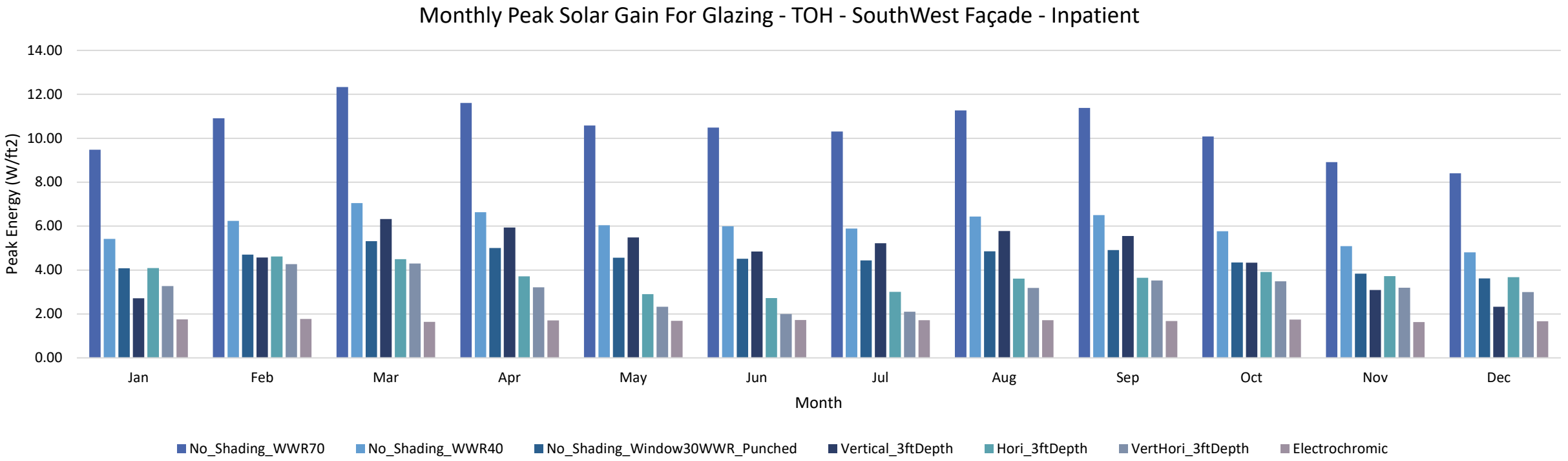

30% WWR Punched


3’ Vert


3’ Hori


3’ Vert 3’ Hori


Electrochromic

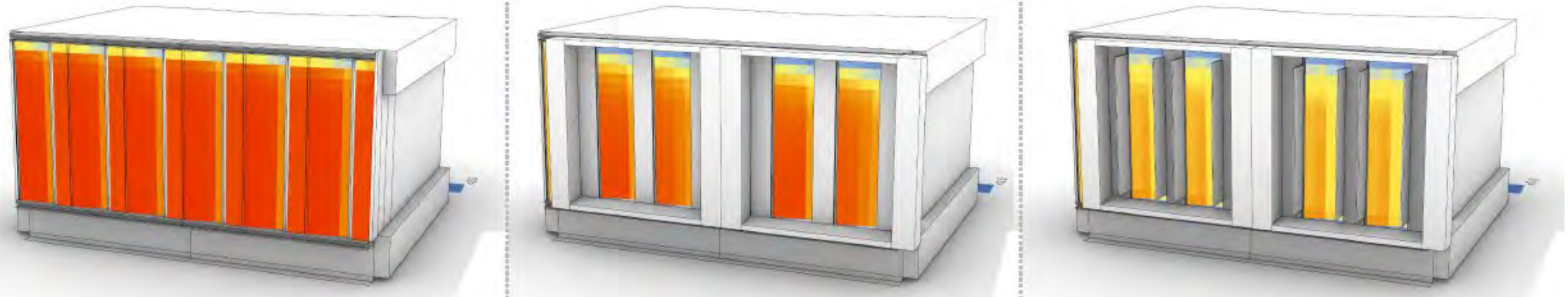


Total Solar Radiation on Glass

204 kBTU/sf

117 kBTU/sf

84 kBTU/sf

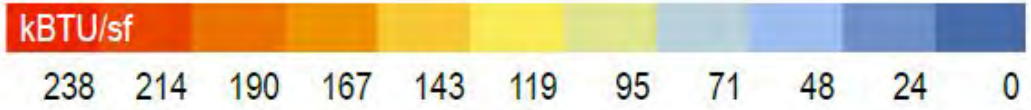


Iteration 1

Iteration 2

Iteration 3

Higher values of total solar radiation may have more impact on cooling loads



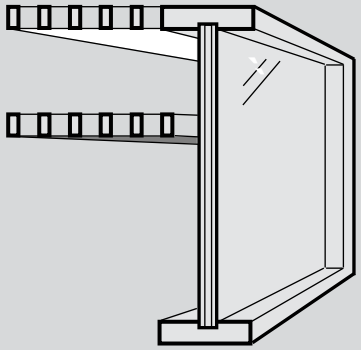
Lower values of total solar radiation may have less impact on cooling loads

ENERGY REDUCTION

Façade Systems

CURRENT PRACTICES

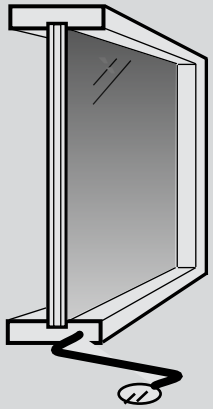
HORIZONTAL SHADING



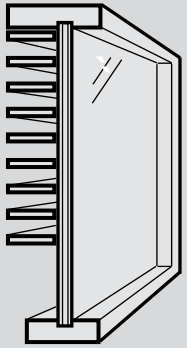
OPTIONS TO CONSIDER

OPERABLE WINDOWS

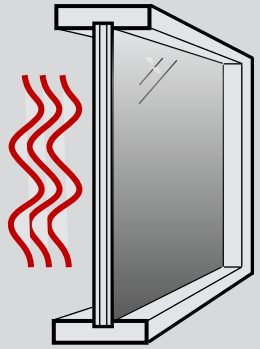
ELECTRO CHROMIC



OPERABLE LOUVERS



THERMO CHROMIC

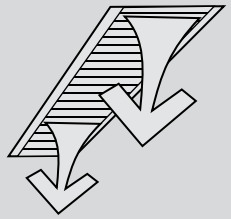


ENERGY REDUCTION

Comfort Delivery Systems

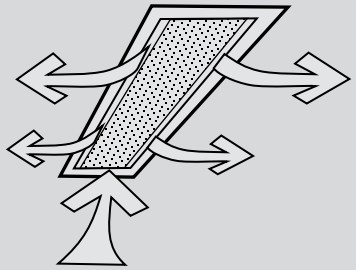
CURRENT PRACTICES

VARIABLE AIR VOLUME (VAV) @ 6 ACH

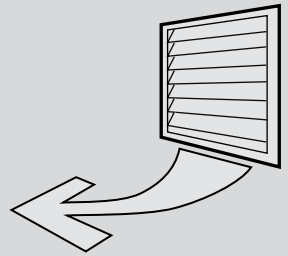


OPTIONS TO CONSIDER

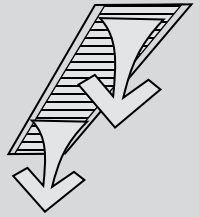
ACTIVE CHILLED BEAMS (ACB)



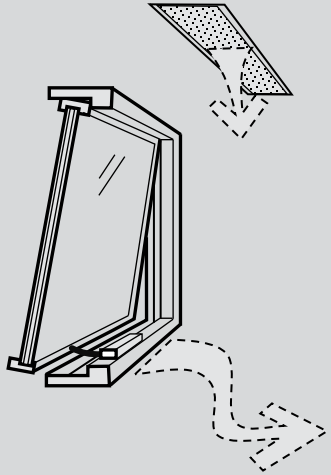
DISPLACEMENT VENTILATION (DV)

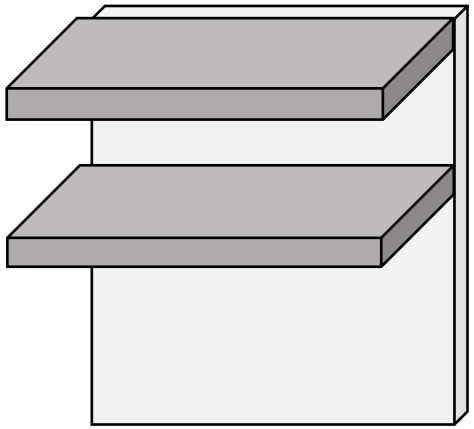


VARIABLE AIR VOLUME WITH LARGER DUCTS, ZONED PER EXPOSURE



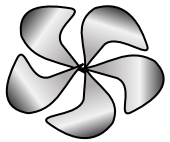
MIXED MODE VENTILATION



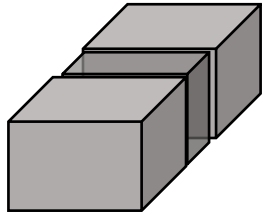


Windows w/shading

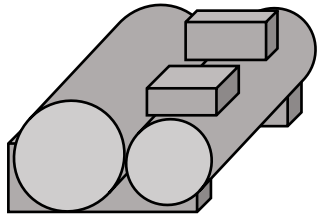
Ducts



Fans

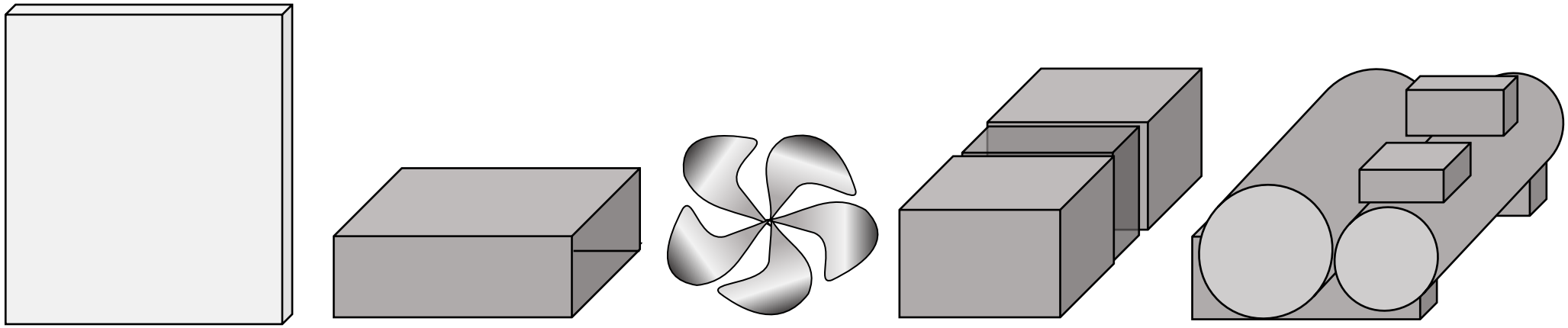


Air Handlers



Chillers

$3/SFD

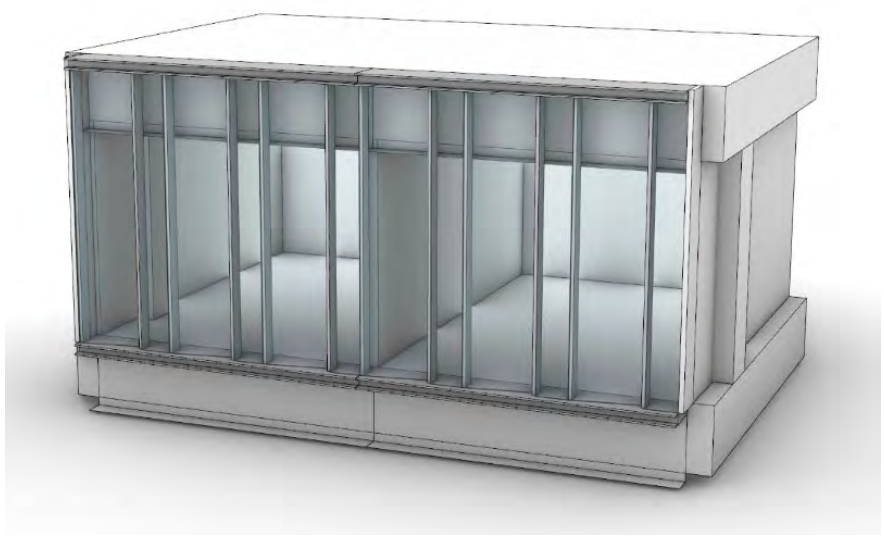


Windows (No Shade) Ducts Fans Air Handlers Chillers

$9/SFD

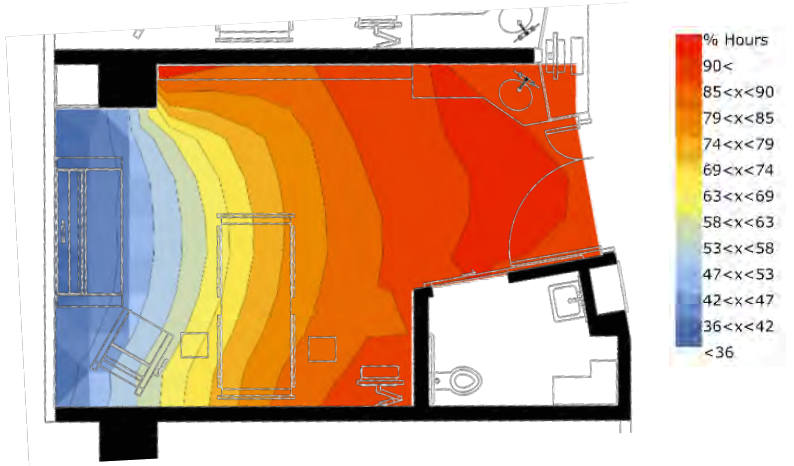
Solar shading can save up to $6/SF

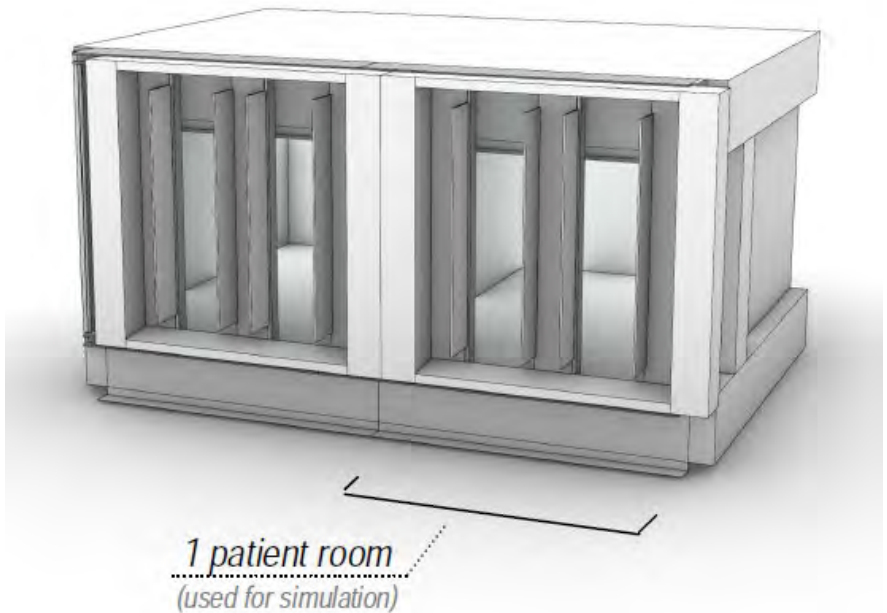
GLARE + THERMAL COMFORT



Direct sunlight hours on patient's bed: 1123 hrs/ year

UDI: 64% **ASE:33%**





Direct sunlight hours on patient's bed: 171 hrs/ year

UDI: 83% **ASE:8%**

HUMBER RIVER HOSPITAL

Humber River Hospital *Toronto, Canada 2015 (Climate Zone 6)*	
Canadian Healthcare	
Project Type	Acute Care Hospital
Project Area	1,800,000 sf
Energy Intensity Designed vs Current	145 -> 107 Kbtu/sf/yr
% below 2007 ASHRAE Baseline	40%
Utility Incentives	$2.4 Million
Annual Savings	$3 Million (Canadian)

BUILDING SKIN

- Dynamic Glazing in Patient Rooms using View Glass (26,000 sf)

LIGHTING

- Efficient Lighting, LED's

COMFORT DELIVERY

- Reduced ventilation velocities
- Increased duct sizing for low pressure ductwork

BUILDING PLANT

- 100% Outdoor air
- Waste Heat recovery
- Heat Recovery Chillers and Efficient Boilers

CONTROLS

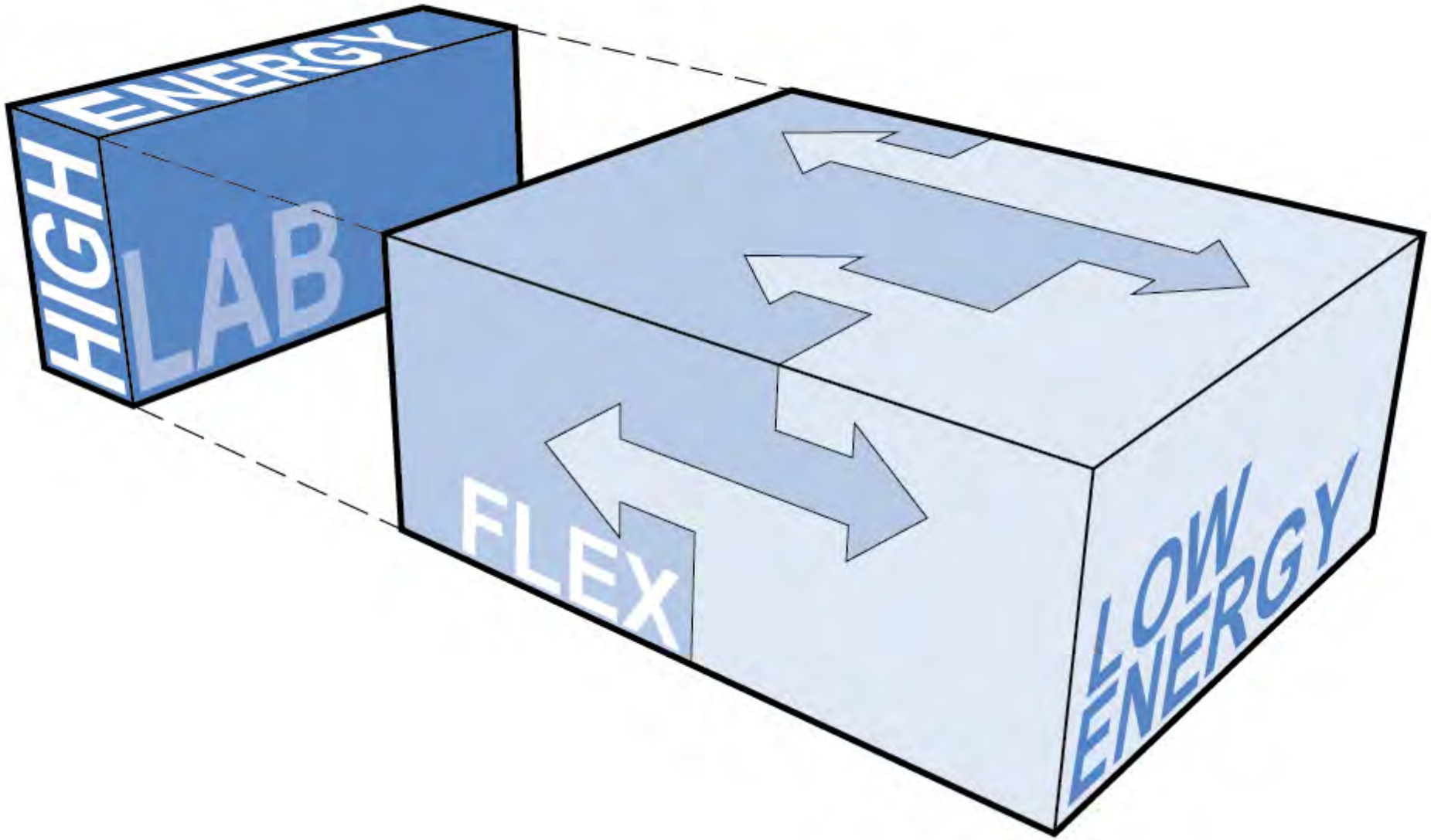
- Daylighting controls
- Optimized control of mech.

USERS

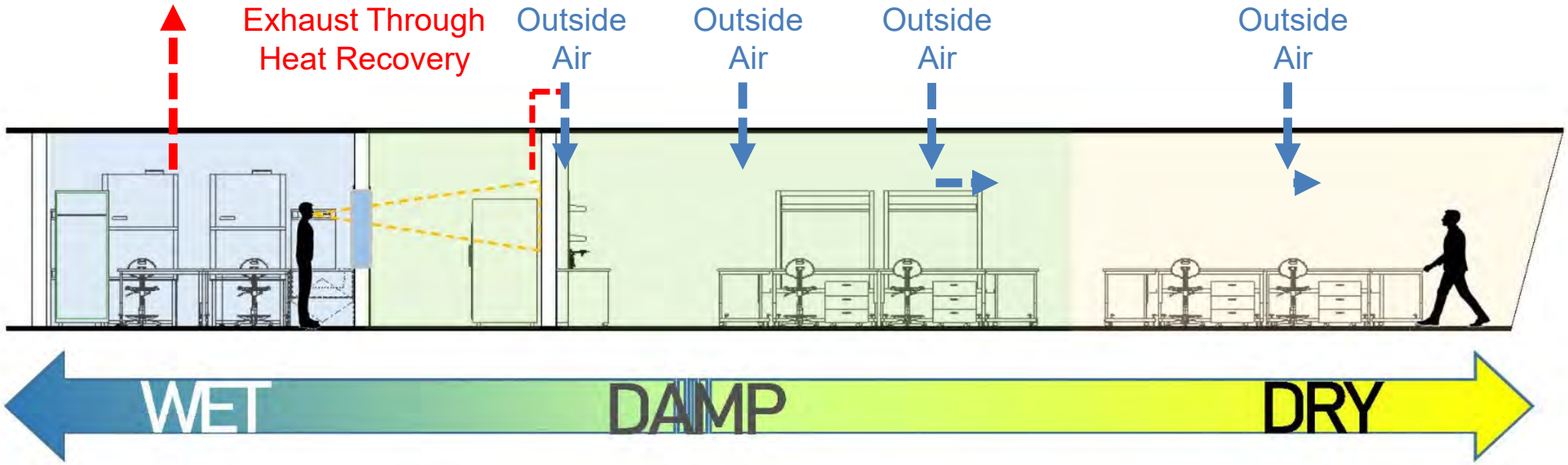
- Occupancy based Lighting Systems


MAYO KELLEN

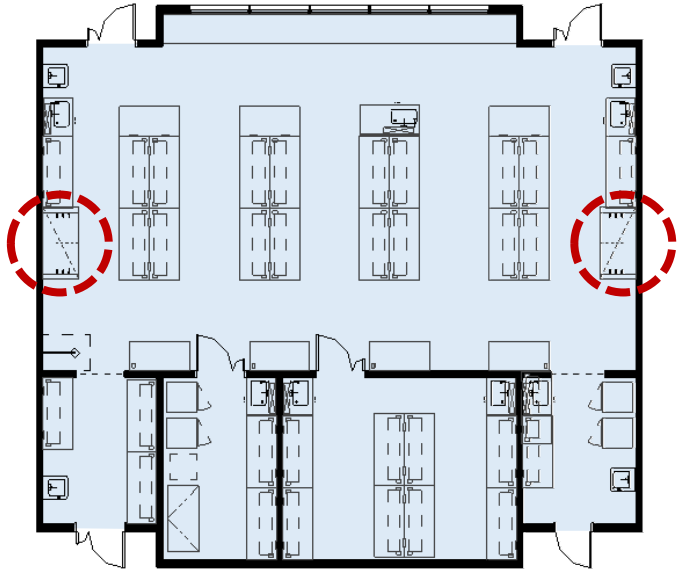
Risk-based Zoning



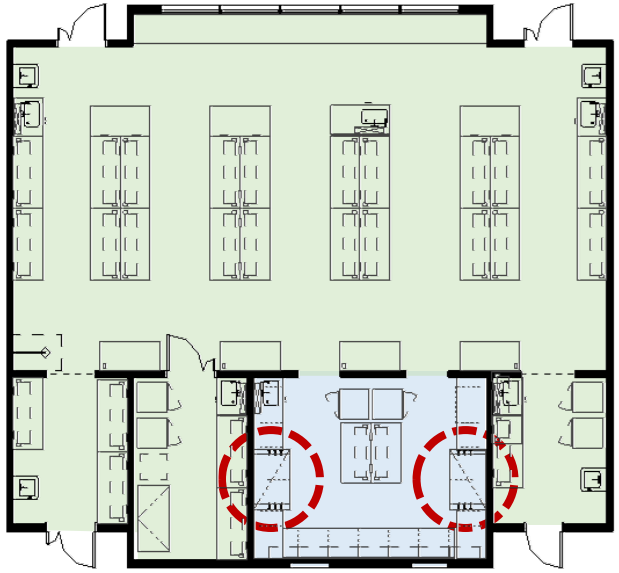
Lowered Risk…. and Carbon



Lowered Risk…. and Carbon

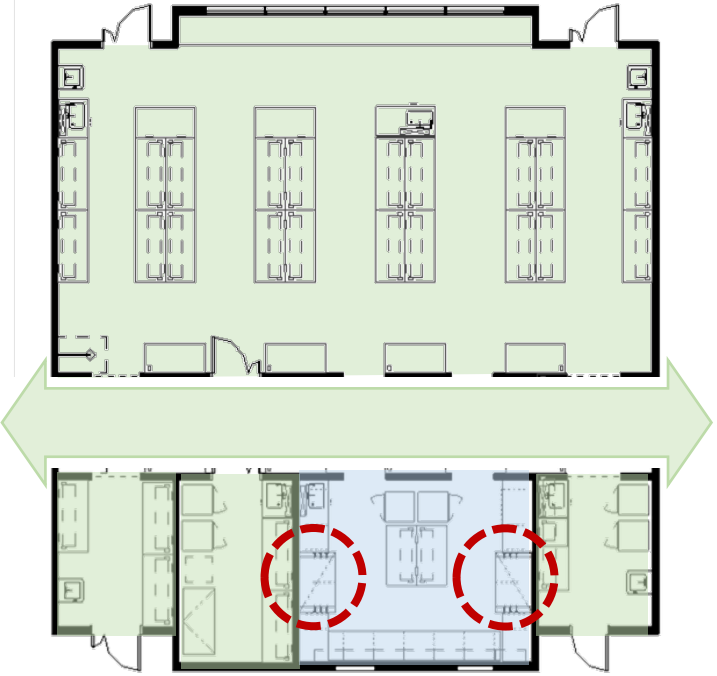


6-12 ACH

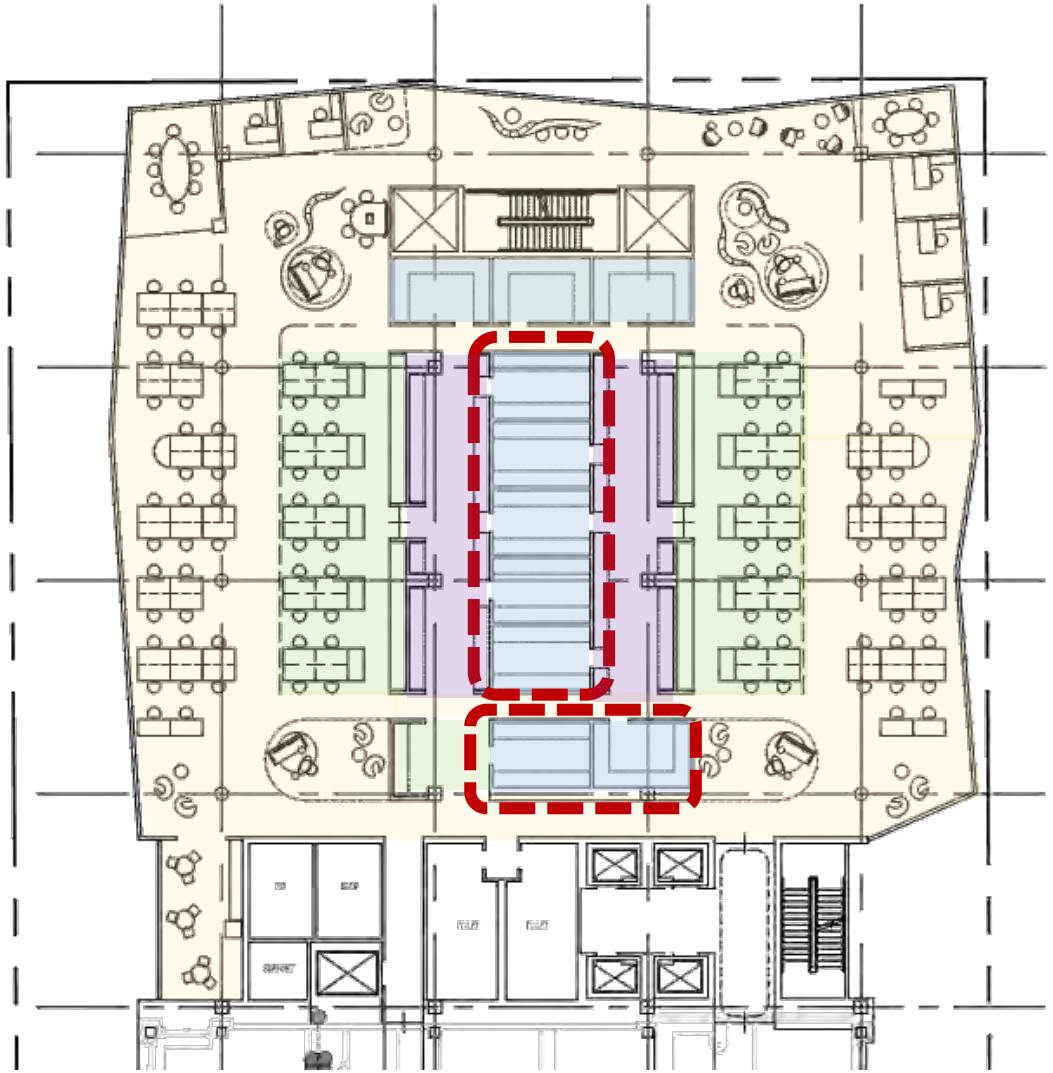


2-4 ACH

By relocating FH's to an alcove, the risk to general lab users reduces significantly. The main lab can be "downgraded" to a "damp" lab since not as much risk, energy or utilities will be needed.



By relocating the FH alcove from the lab to an access corridor transport of chemicals and chemical waste through the open lab is also eliminated.



Wet - Enclosed Spaces

Fume Hoods, Tissue Culture, Histology, Microscopy, Isotope

Pushing the Envelope:

Active Chilled Beams

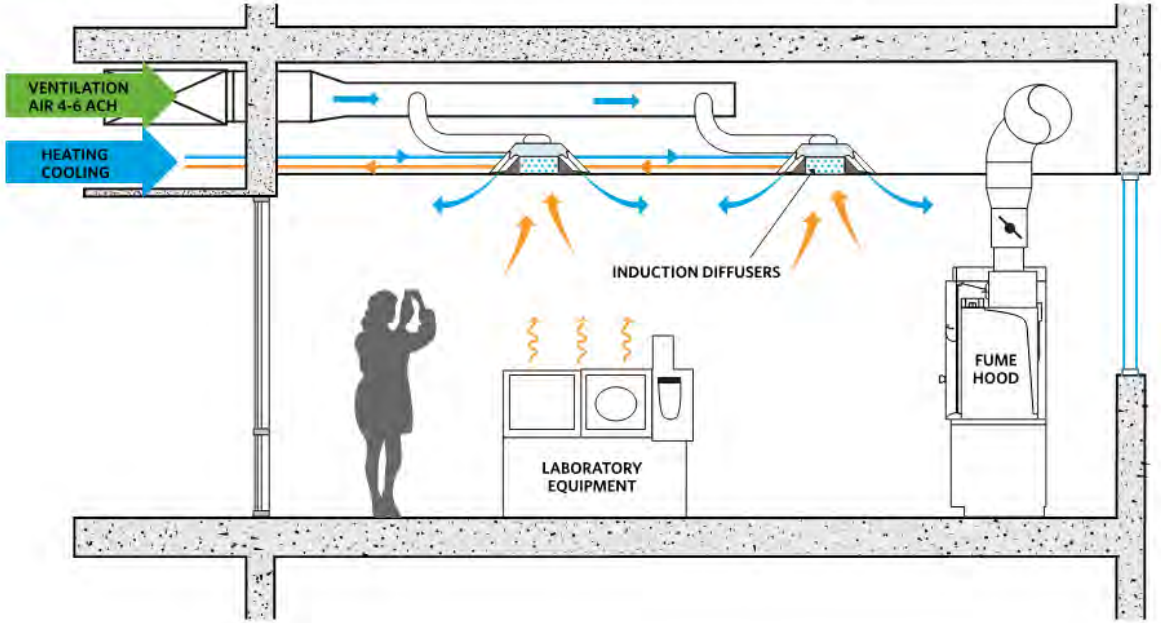
Dedicated Chilled Water loop for process loads

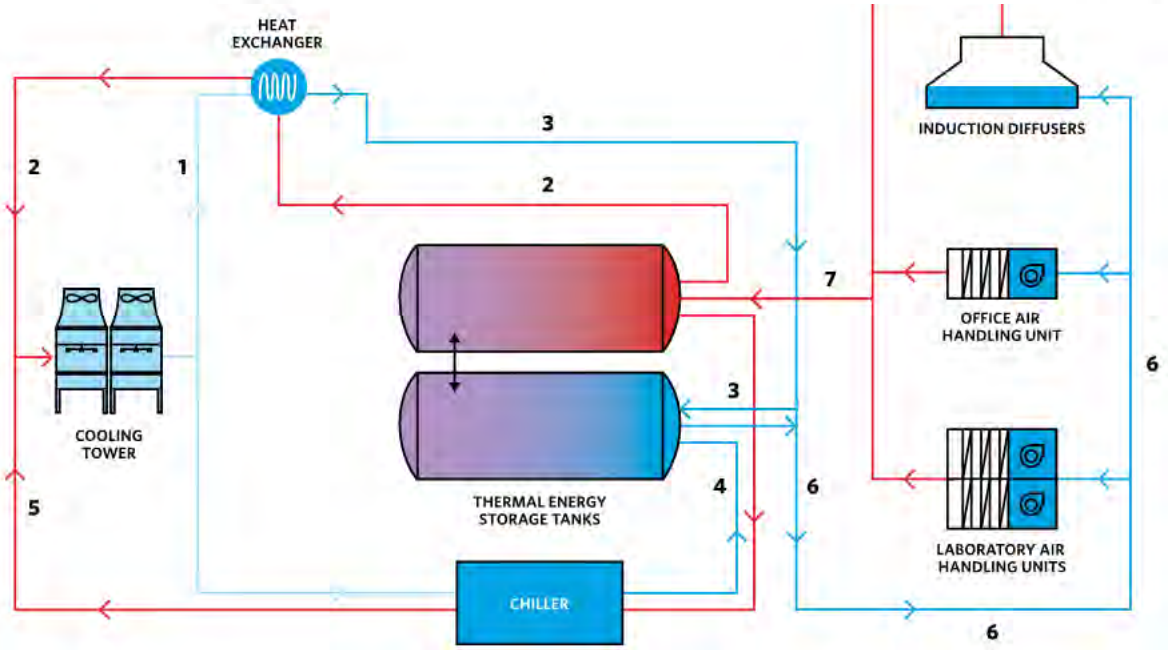
Heat Recovery Chiller

- Dependent on simultaneous heating and cooling demand

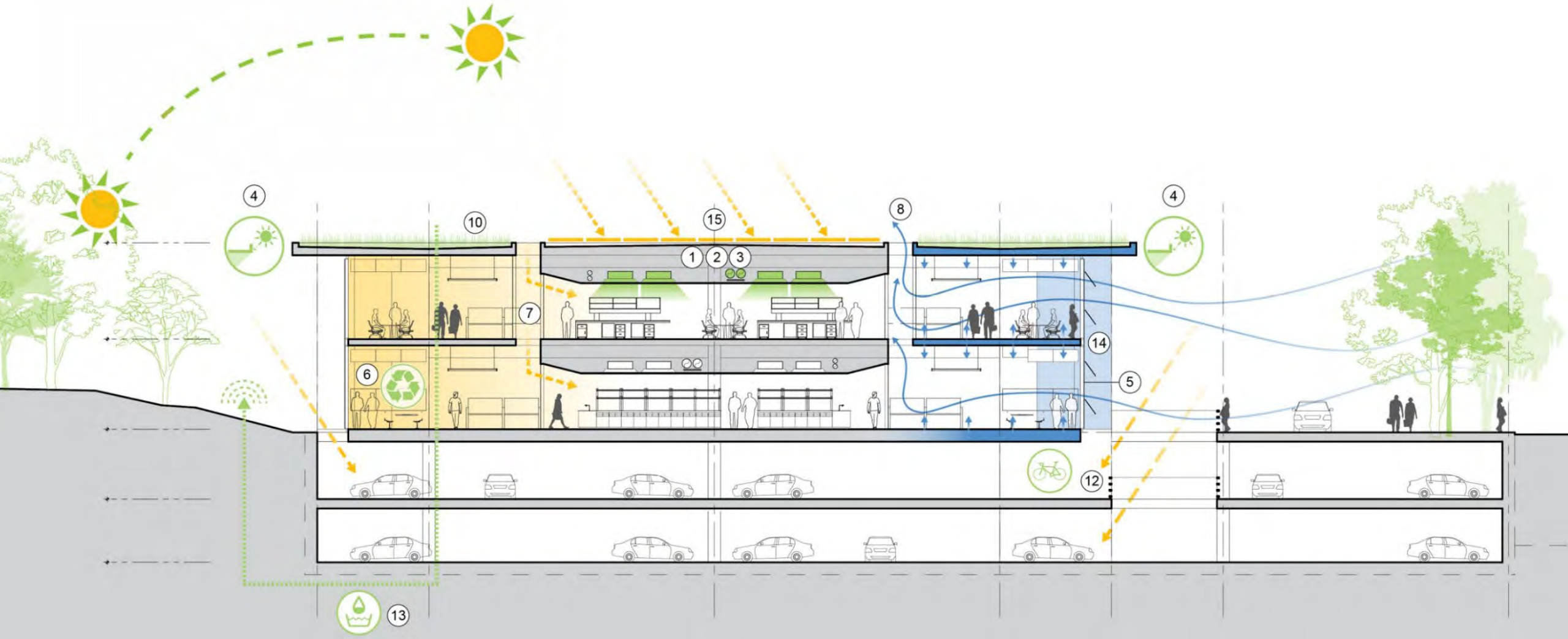
Thermal Energy Storage

- Thermal energy storage tanks can be charged at night when temps allow for free cooling, can discharge during the day during peak electricity periods to reduce chiller electrical consumption



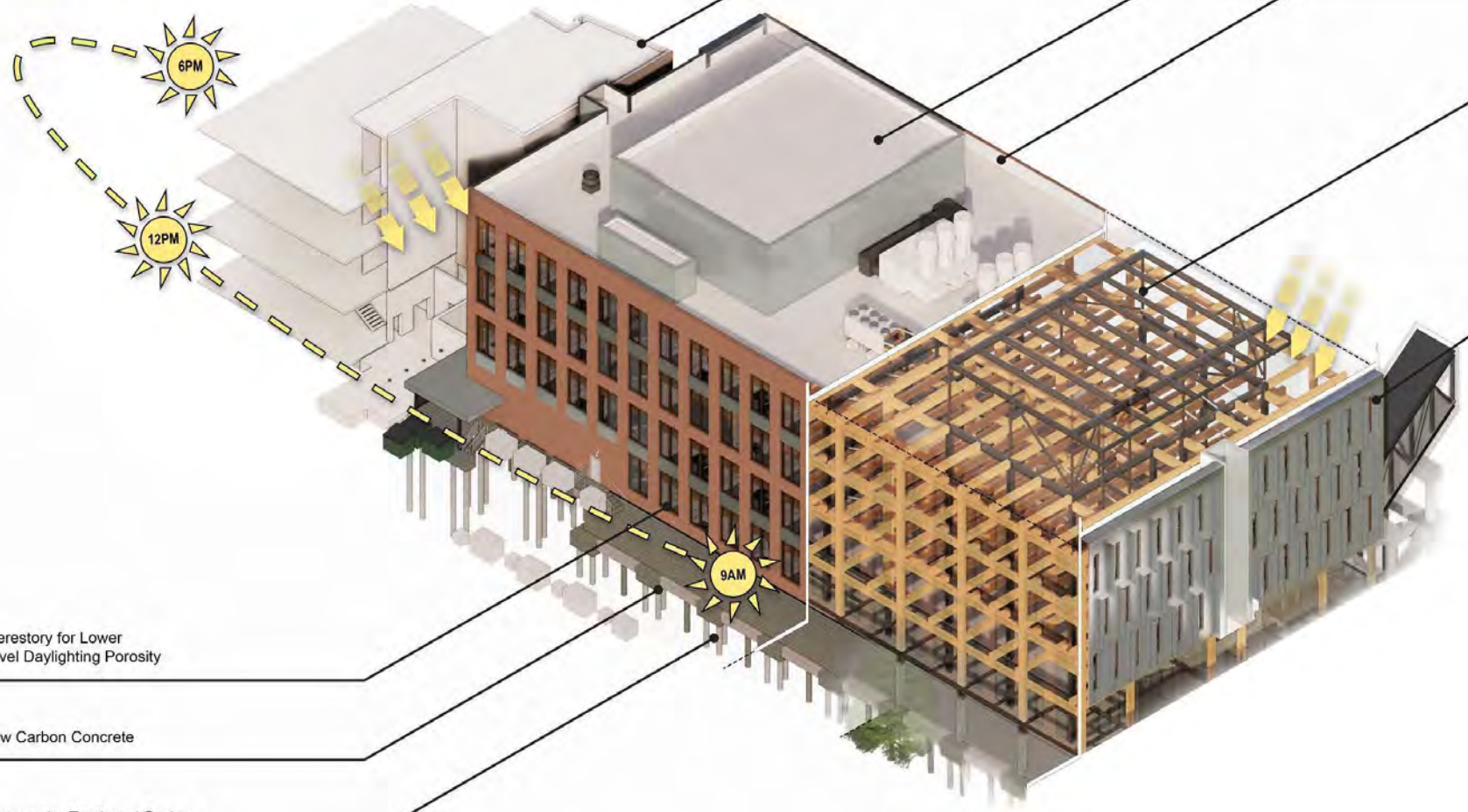


Naturally Ventilated Lab Building



WSU USDA

Sustainability



Minimal Change in Vogel Building

Future PV Ready Roof

Air Pollution
Source Separation

Low Carbon Timber Construction

Louvers
for Sunlight Control

Clerestory for Lower
Level Daylighting Porosity

Low Carbon Concrete

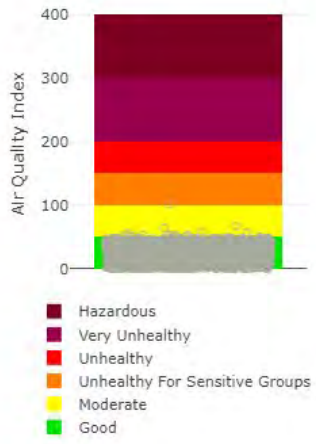
Stormwater Treatment System

Site Indicators and Nested Connections

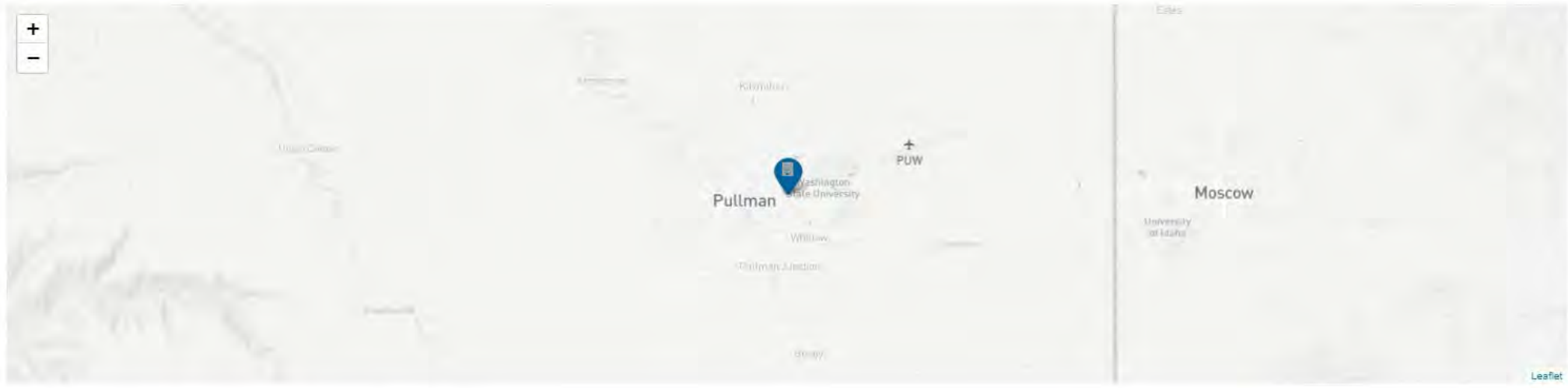
Air Quality / Community Health / Social Equity

Daily AQI

Air Quality Index



Air Quality Monitor Map



US Environmental Protection Agency. Air Quality System Data Mart Tables of Daily AQI available via https://www.epa.gov/airdata. Accessed September 03, 2020.

PM 2.5 = 92nd percentile

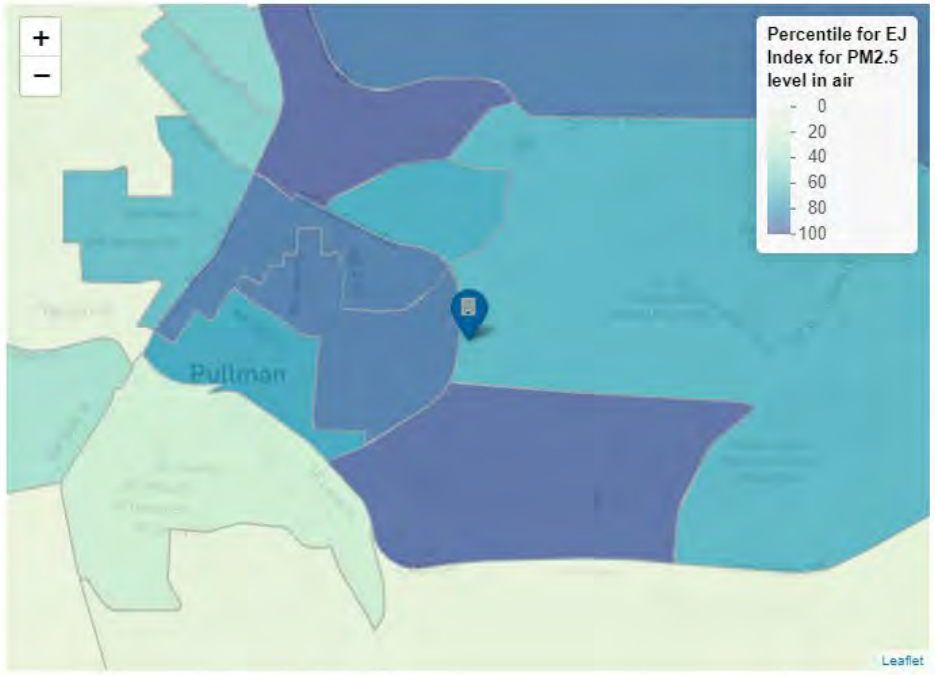
Resiliency and Climate Risk | Air | Biodiversity | Carbon | Nutrients | Water | Community | Human Health | Noise

Air Quality | EJ Index | Source Emissions

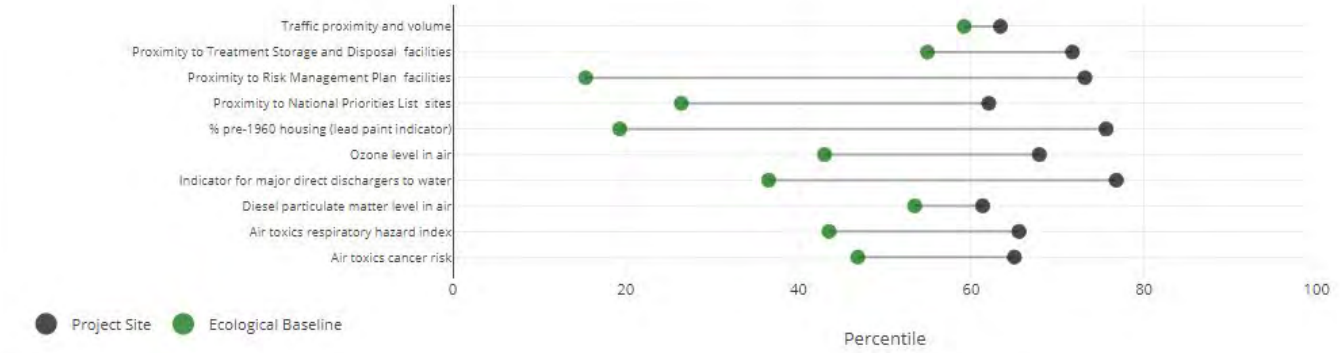
EJ Index

Percentile for EJ Index for PM2.5 level in air

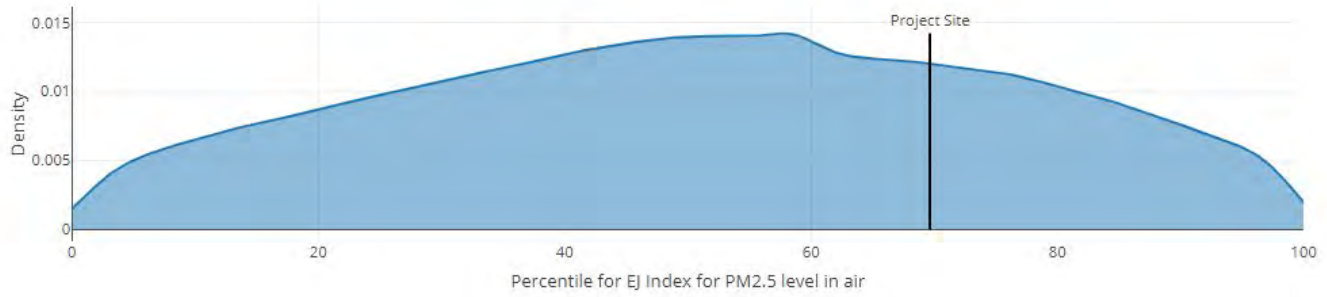
EJSCREEN Index Map



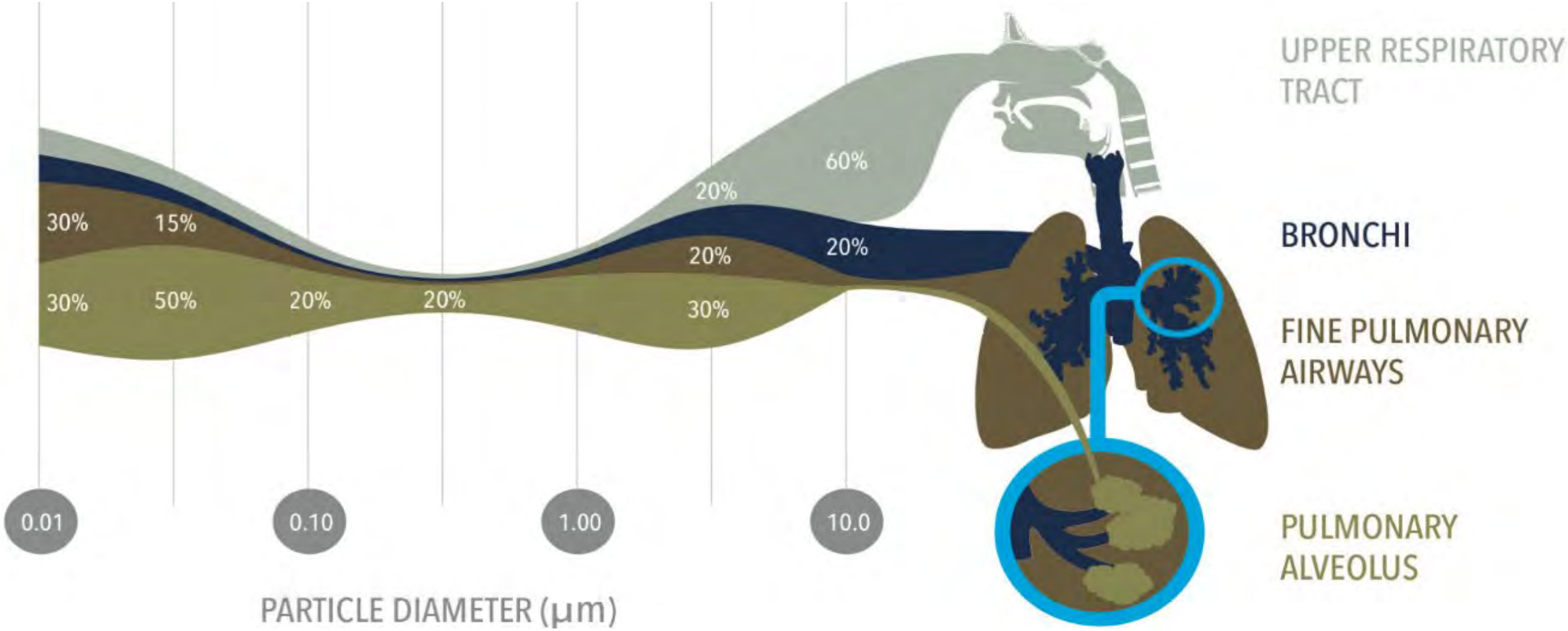
EJ Index Summary



EJ Index Distribution



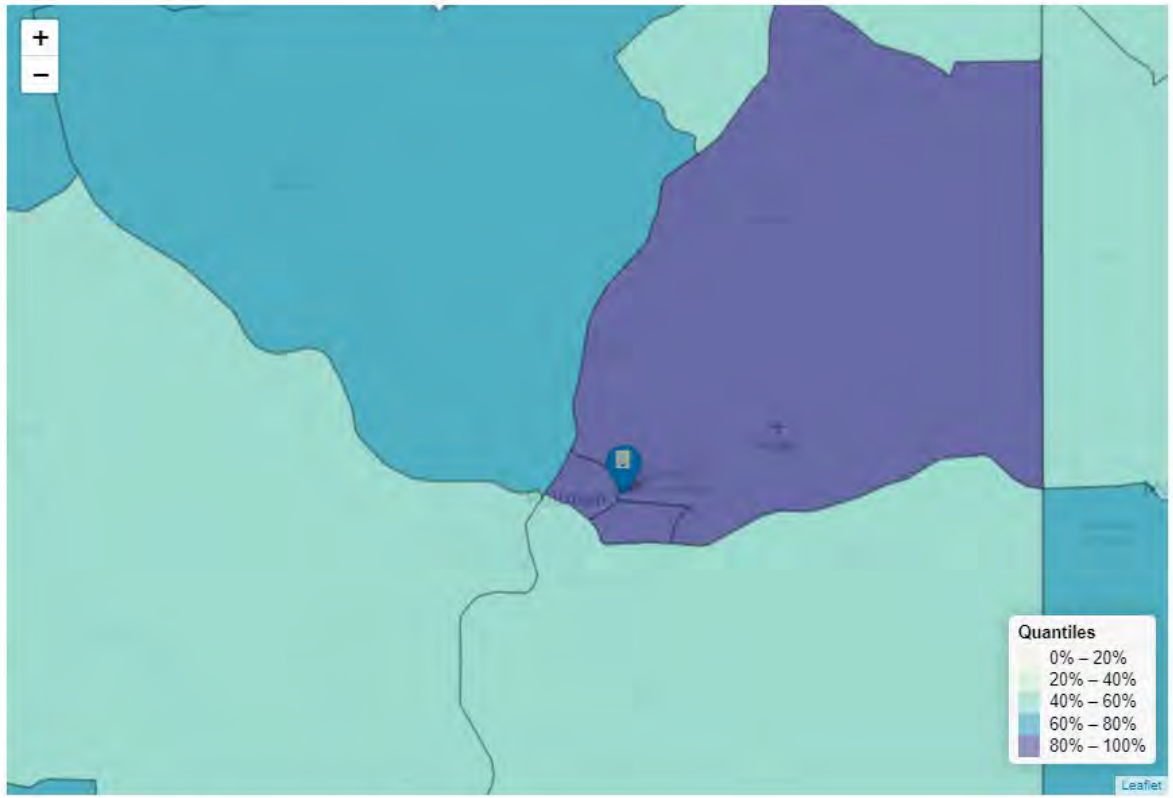
US Environmental Protection Agency. EJSCREEN available via https://www.epa.gov/ejscreen. Accessed March 17, 2021.


30%
15%
30%
50%
20%
20%
20%
20%
30%
60%
0.01
0.10
1.00
10.0
PARTICLE DIAMETER (µm)
UPPER RESPIRATORY TRACT
BRONCHI
FINE PULMONARY AIRWAYS
PULMONARY ALVEOLUS

Health Context

Asthma (87-98%)

Census Tract Map



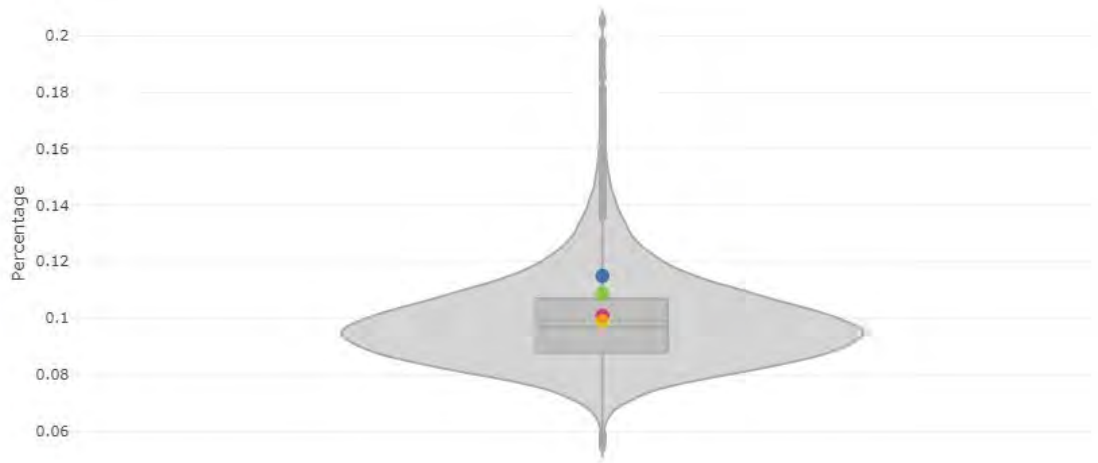
Health Metric

Current Asthma

Benchmark

The **project site** is in the **87th** percentile. It is **6%** above **county** average, **14%** above the **state** average, and **16%** above the **national** average.

Distribution



PLACES. Local Data for Better Health, Census Tract Data 2020. available via https://chronicdata.cdc.gov/500-Cities-Places/PLACES-Local-Data-for-Better-Health-Census-Tract-D/cwsq-ngmh. Accessed April 16, 2021.

Health Context

Physical Inactivity (3-8th percentile)

Census Tract Map

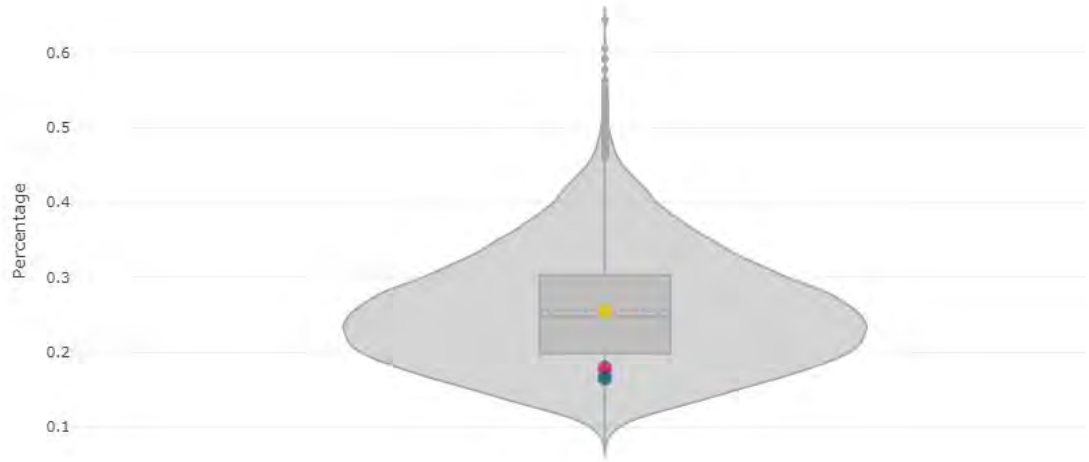
Health Metric

Physical Inactivity

Benchmark

The **project site** is in the **12th** percentile. It is **3%** below **county** average, **8%** below the **state** average, and **35%** below the **national** average.

Distribution

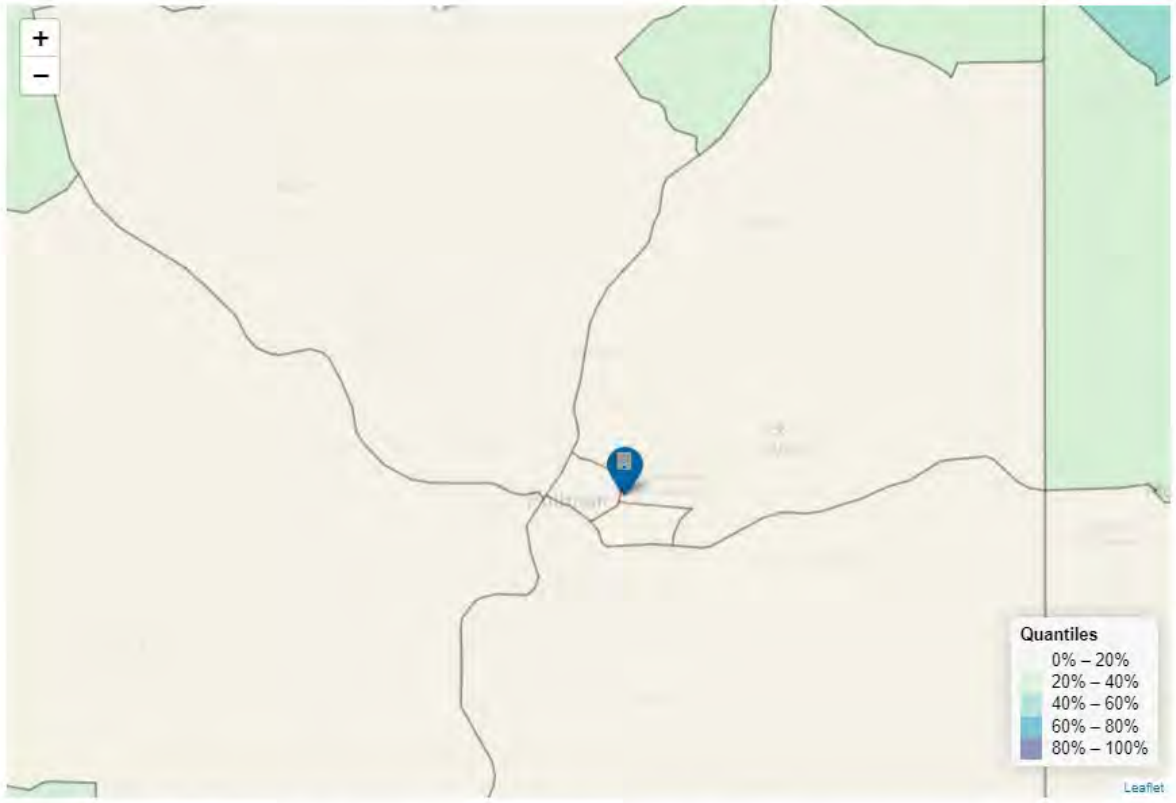


PLACES. Local Data for Better Health, Census Tract Data 2020. available via https://chronicdata.cdc.gov/500-Cities-Places/PLACES-Local-Data-for-Better-Health-Census-Tract-D/cwsq-ngmh. Accessed April 16, 2021.

Health Context

Obesity (8-14th percentile)

Census Tract Map



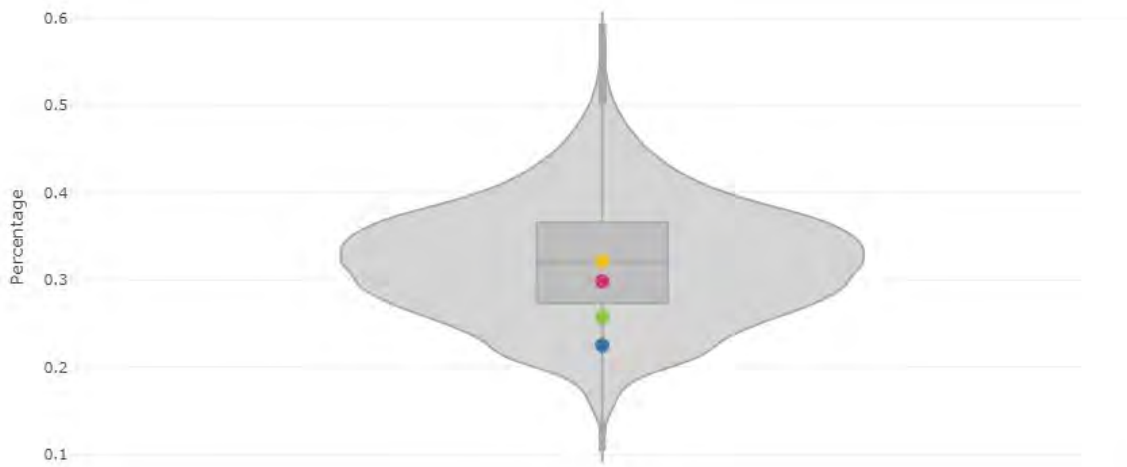
Health Metric

Obesity

Benchmark

The **project site** is in the **8th** percentile. It is **13%** below **county** average, **25%** below the **state** average, and **30%** below the **national** average.

Distribution

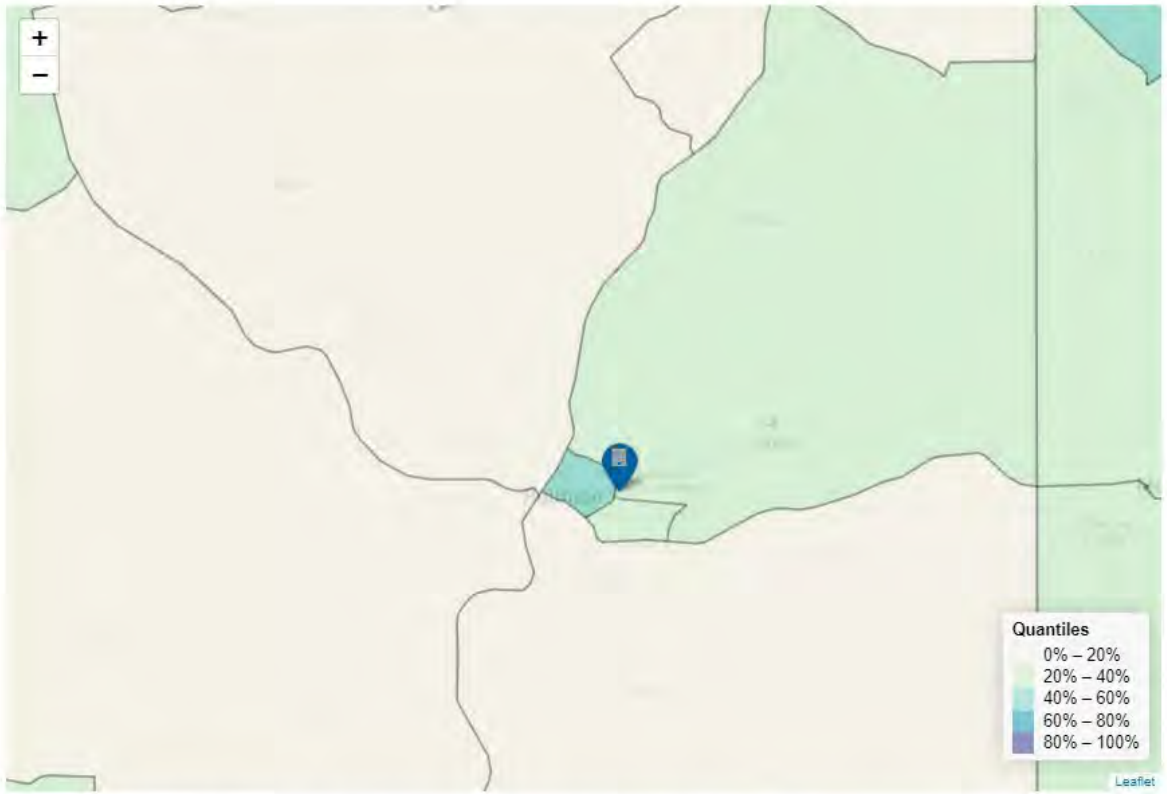


PLACES. Local Data for Better Health, Census Tract Data 2020. available via https://chronicdata.cdc.gov/500-Cities-Places/PLACES-Local-Data-for-Better-Health-Census-Tract-D/cwsq-ngmh. Accessed April 16, 2021.

Health Context

Smoking (7-29th percentile)

Census Tract Map



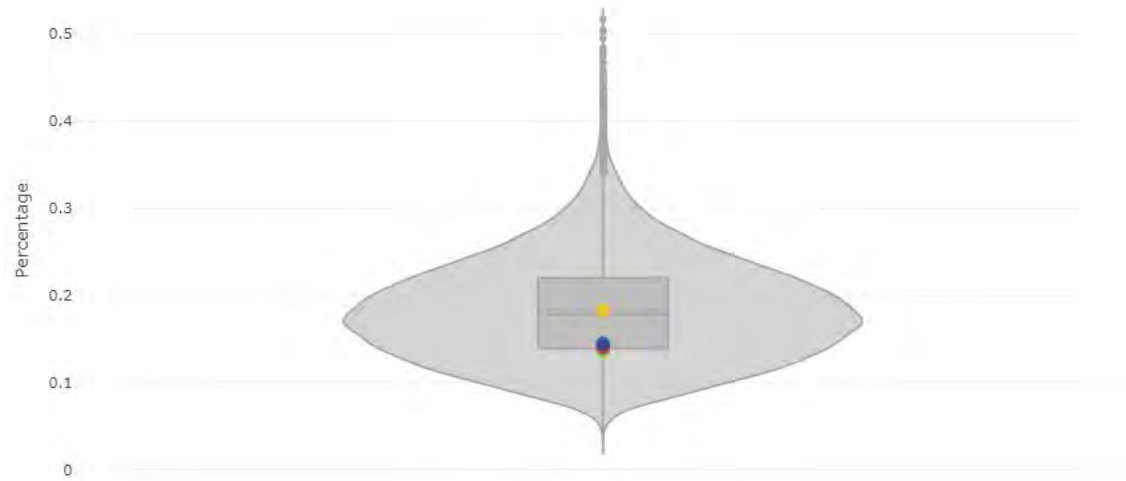
Health Metric

Current Smoking

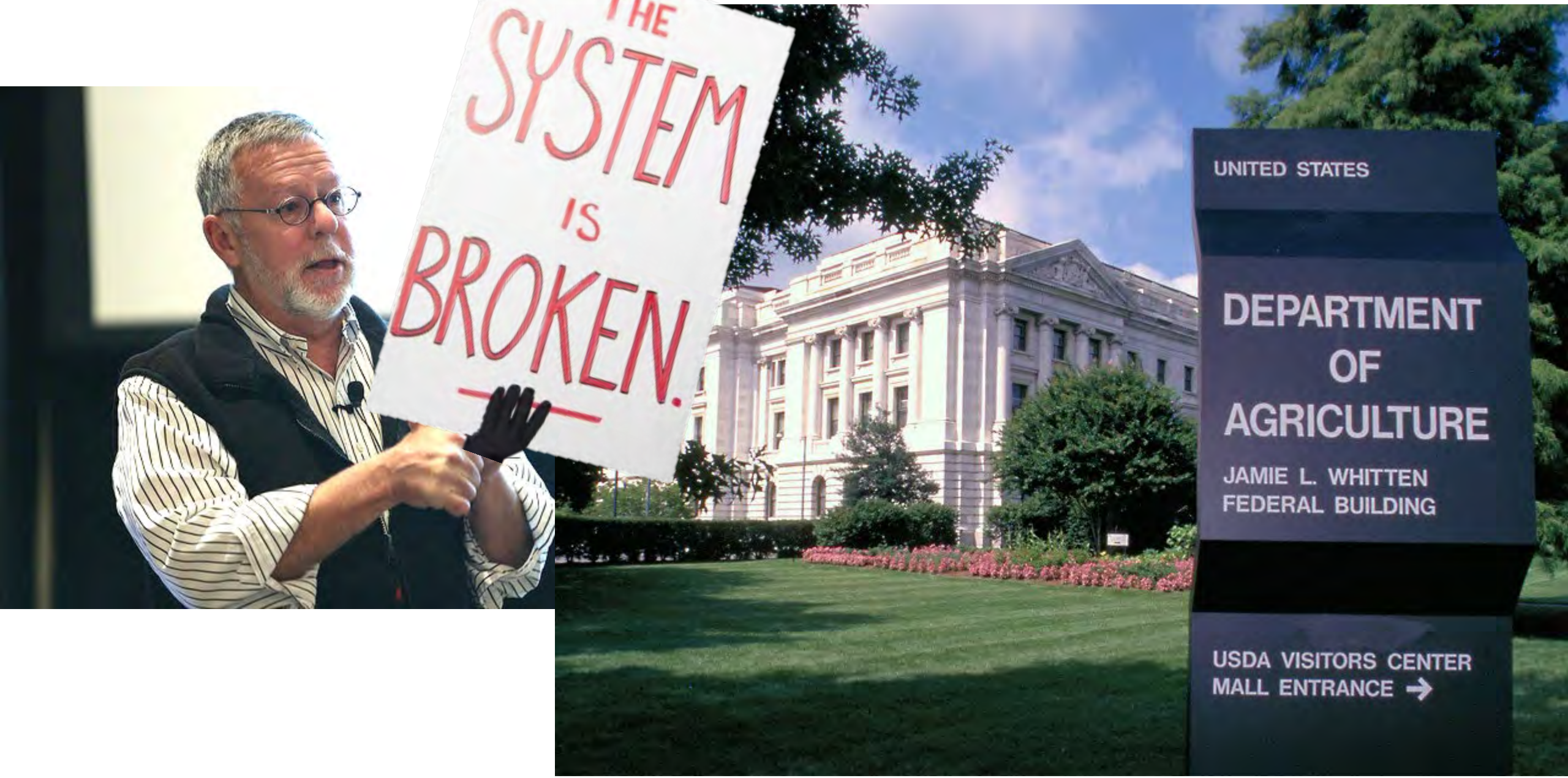
Benchmark

The **project site** is in the **28th** percentile. It is **7%** above **county** average, **3%** above the **state** average, and **21%** below the **national** average.

Distribution



PLACES. Local Data for Better Health, Census Tract Data 2020. available via https://chronicdata.cdc.gov/500-Cities-Places/PLACES-Local-Data-for-Better-Health-Census-Tract-D/cwsq-ngmh. Accessed April 16, 2021.


THE
SYSTEM
IS
BROKEN.
UNITED STATES
DEPARTMENT
OF
AGRICULTURE
JAMIE L. WHITTEN
FEDERAL BUILDING
USDA VISITORS CENTER
MALL ENTRANCE

Historic and Current Tribes:

Nez Perce, Palouse, and Walla Walla

Related Curriculum at Northwest Indian College

- Native Environmental Science

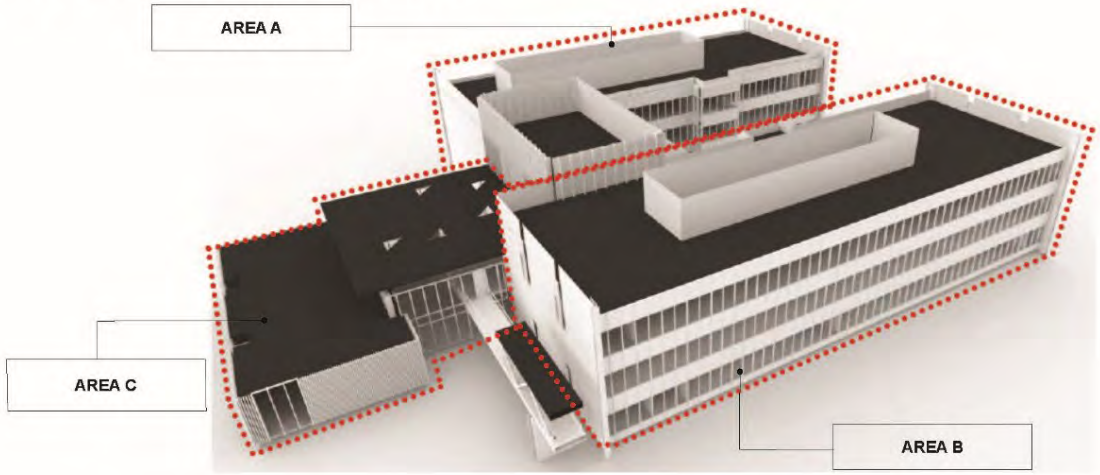
Climate Adaptation, Loss of Biodiversity and Crops

- An increase in wildfire intensity and severity
- An increase in the number and distribution of invasive/destructive plant and insect species
- Loss of productivity in key timber species
- Higher summer water temperatures, and a decrease in water quality
- A change in habitat types for fish and wildlife
- Negative impact to non-irrigated farmland, from drier conditions in summer

SOCIAL CONTEXT – “Advance Placed Based Education and Outreach”

OCSD :: DAYLIGHT ANALYSIS

Daylight analysis of regularly occupied spaces in areas A, B and C.



SHADING OPTION 1

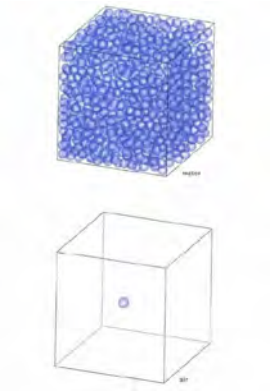
SHADING OPTION 2

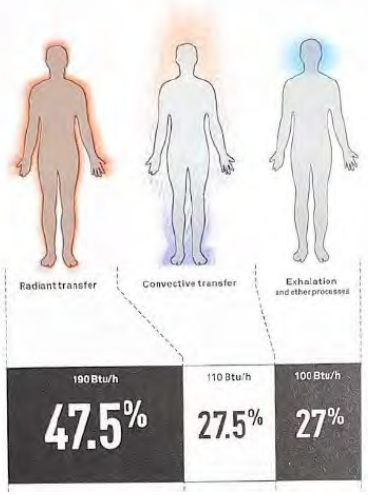
SHADING OPTION 3

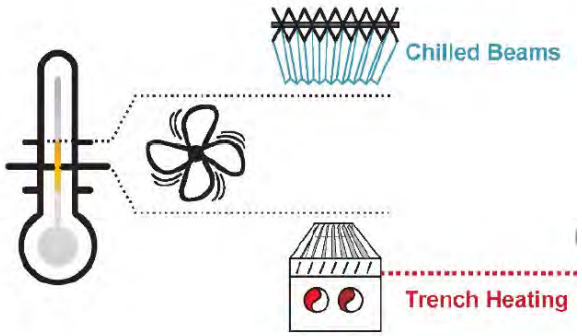
67.77 %
UDI

66.34 %
sDA

9.98 %
ASE




Radiant transfer
Convective transfer
Exhalation and other processes
190 Btu/h
47.5%
110 Btu/h
27.5%
100 Btu/h
27%


Chilled Beams
Trench Heating


1
2
3
4
5
6
9
10
NORTH

13%

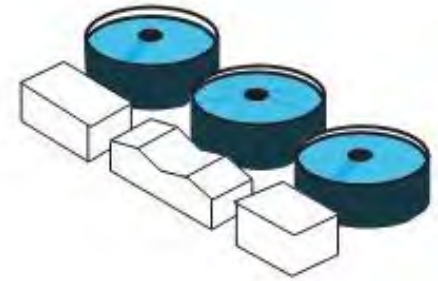
17%

29.7
KBTU/SF/YR
Design EUI

-1.5
KBTU/SF/YR
Design Net EUI

New HQ Parking

72%



Plant

New HQ

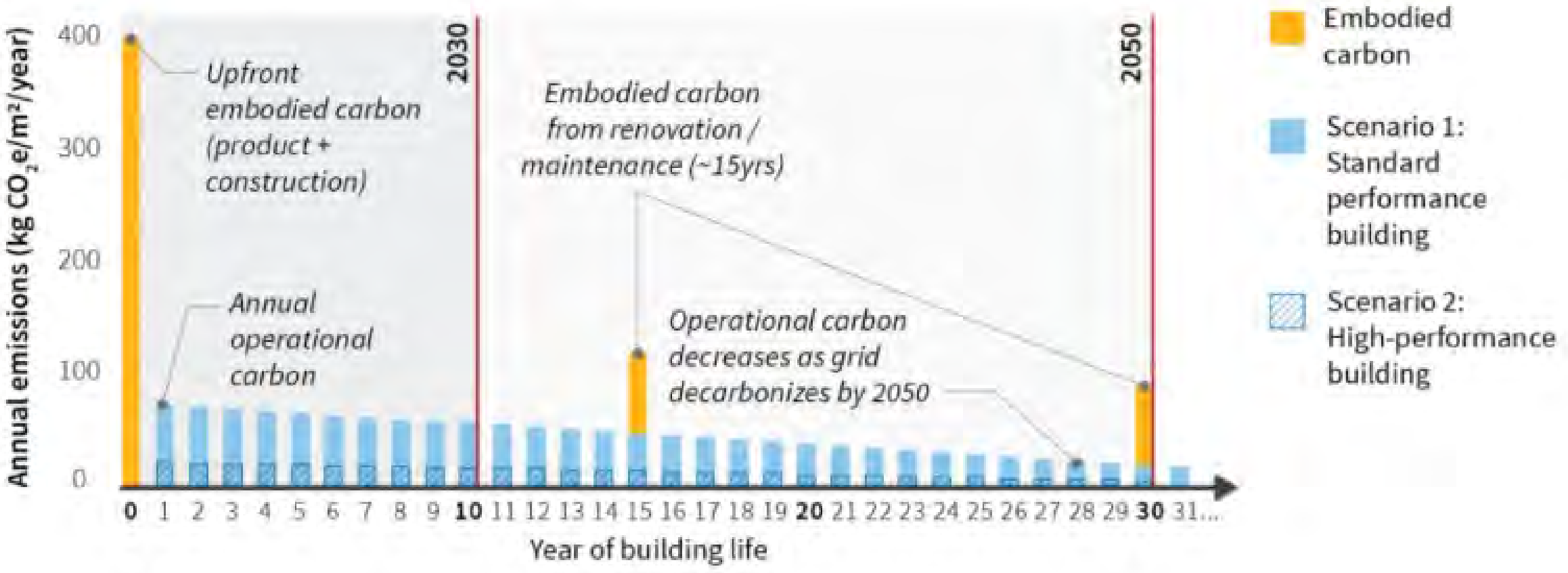
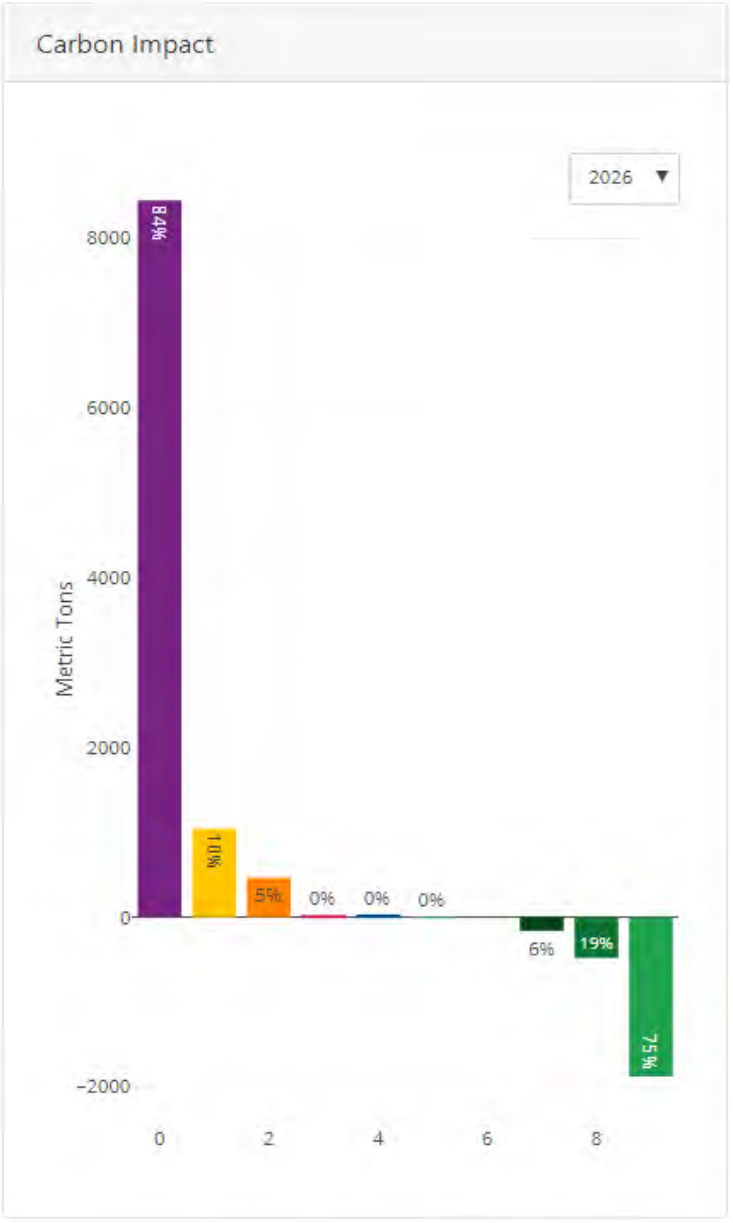
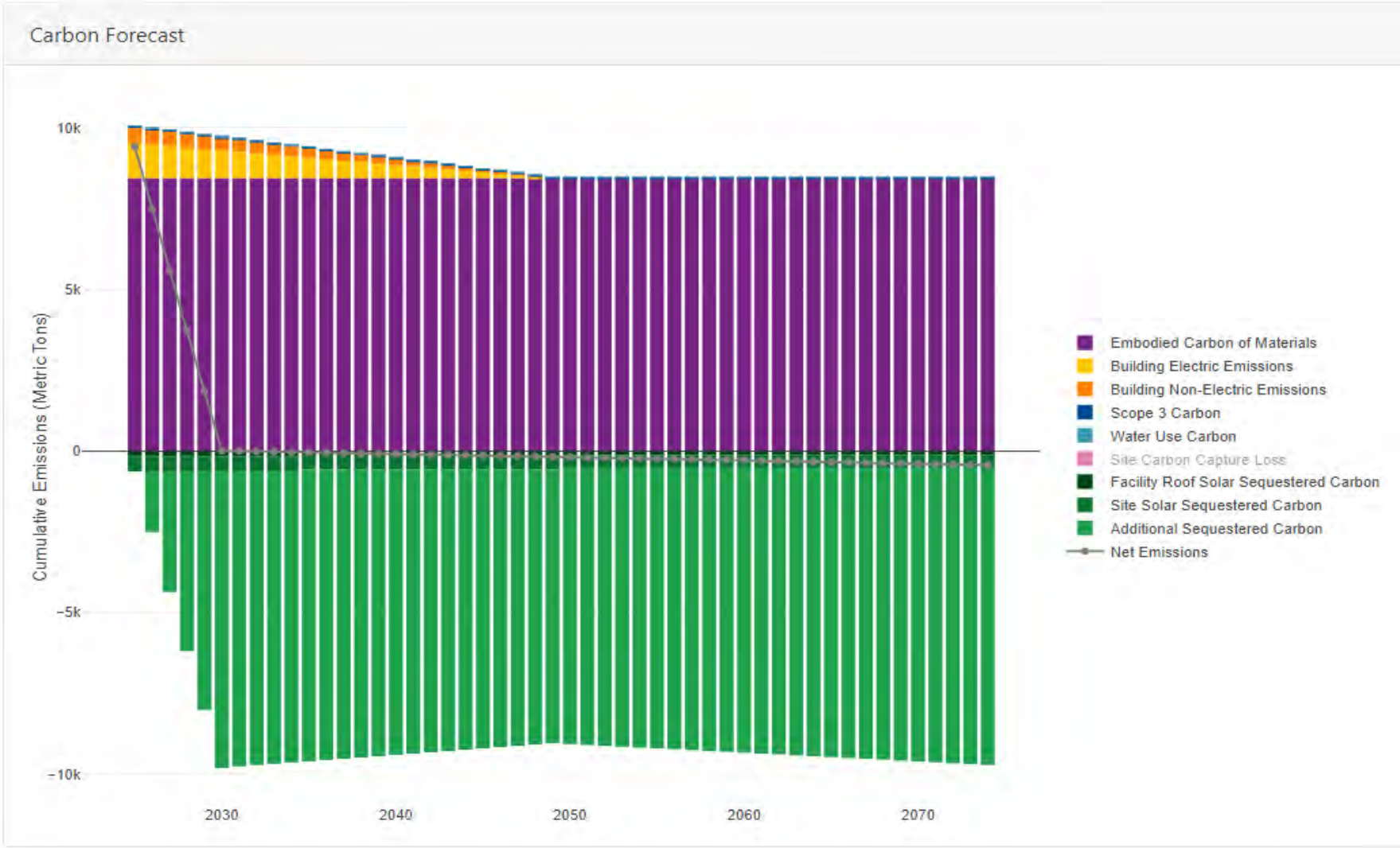
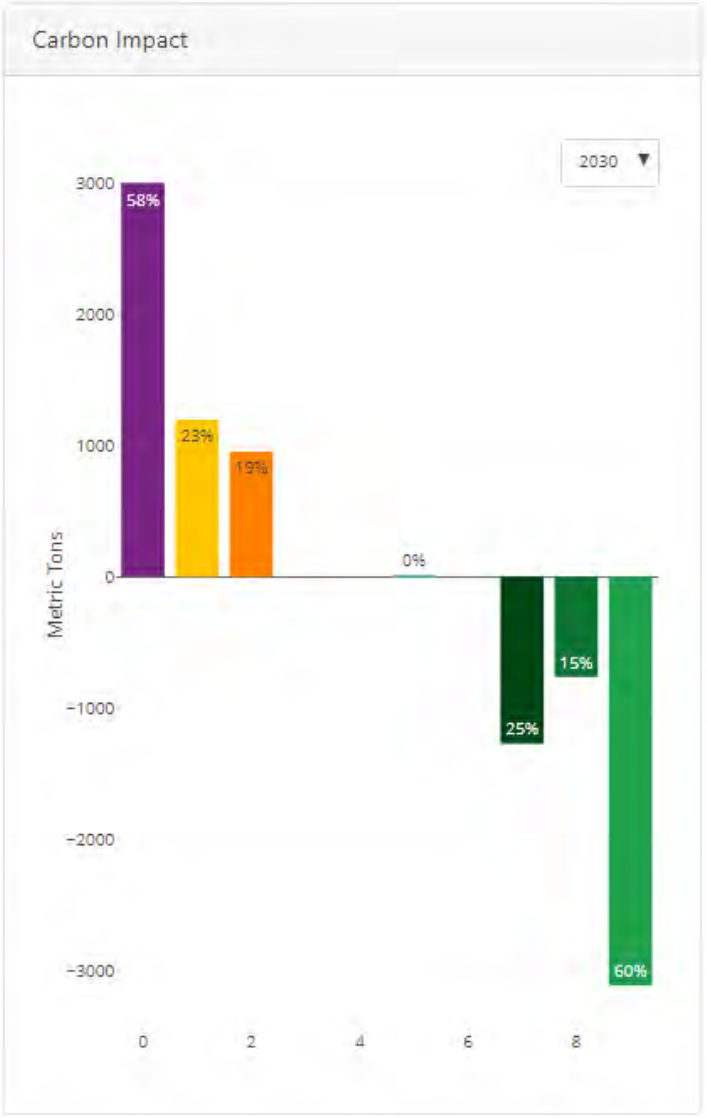


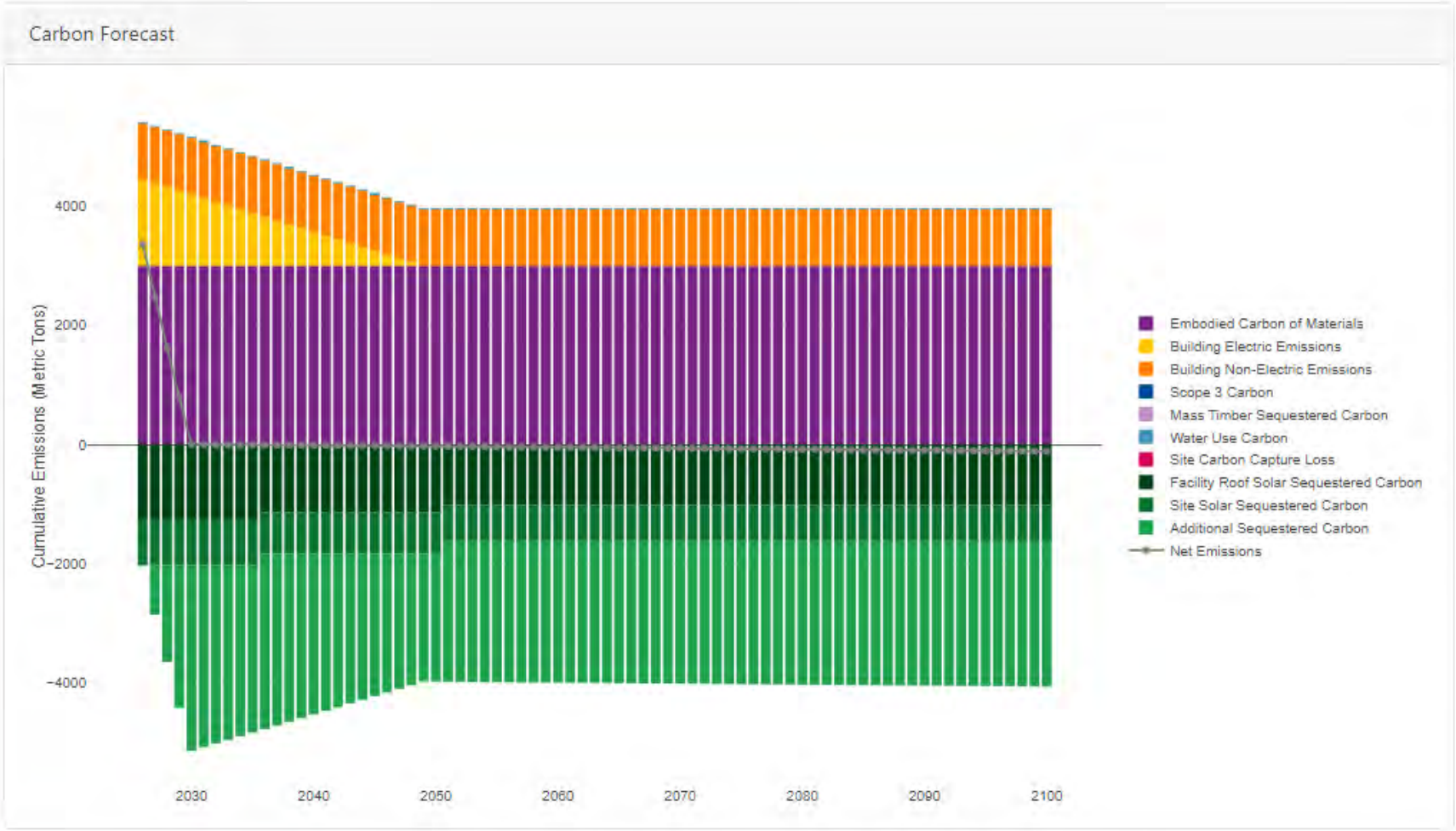
Figure 2: Relative impact of embodied carbon of a new building from 2020-2050. Data Sources: *Embodied Carbon Benchmark Study* and *Commercial Buildings Energy Consumption Survey (CBECS),* assuming a medium-sized commercial office building. Assumes a gradual grid decarbonization to zero by 2050.



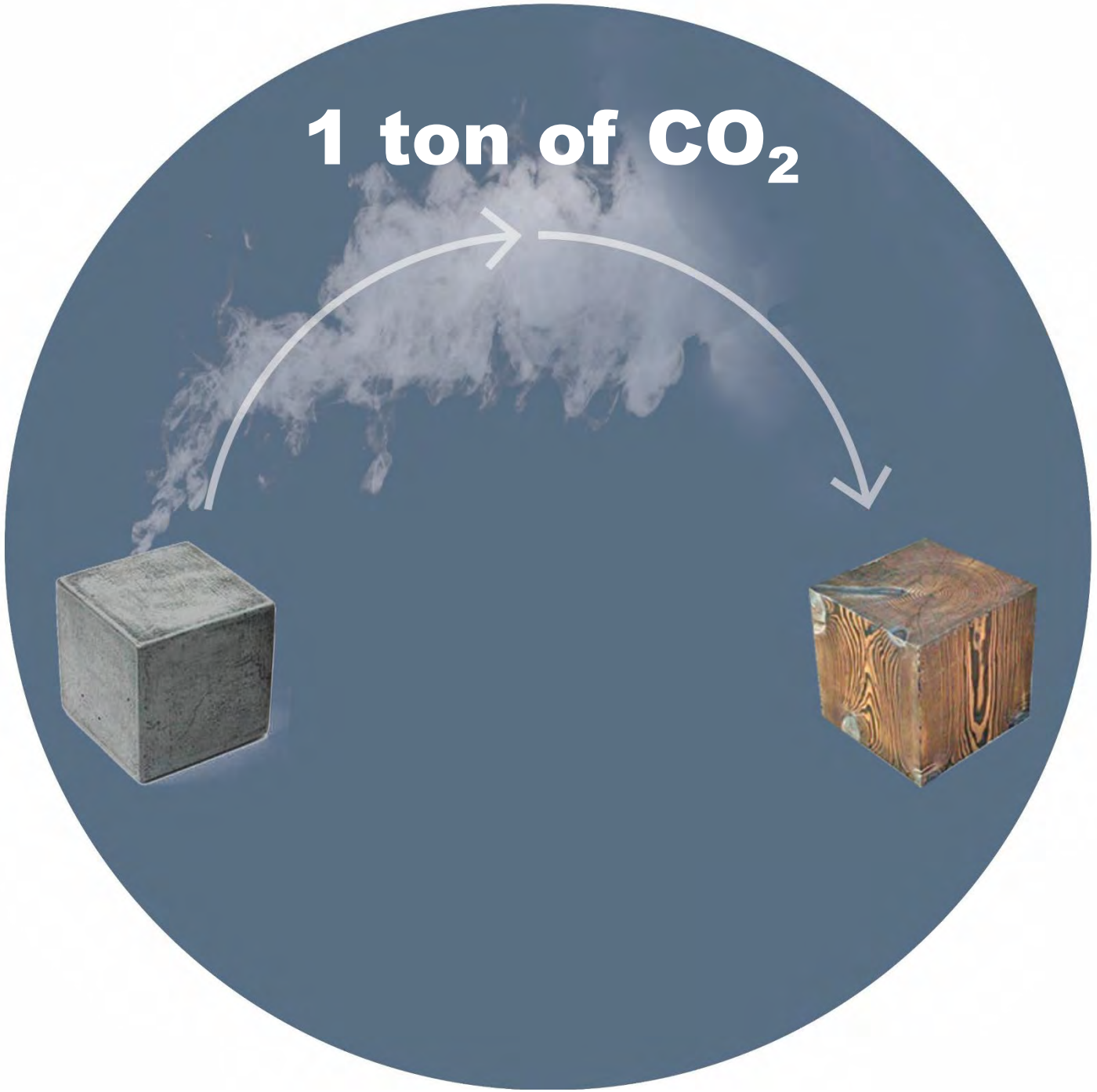


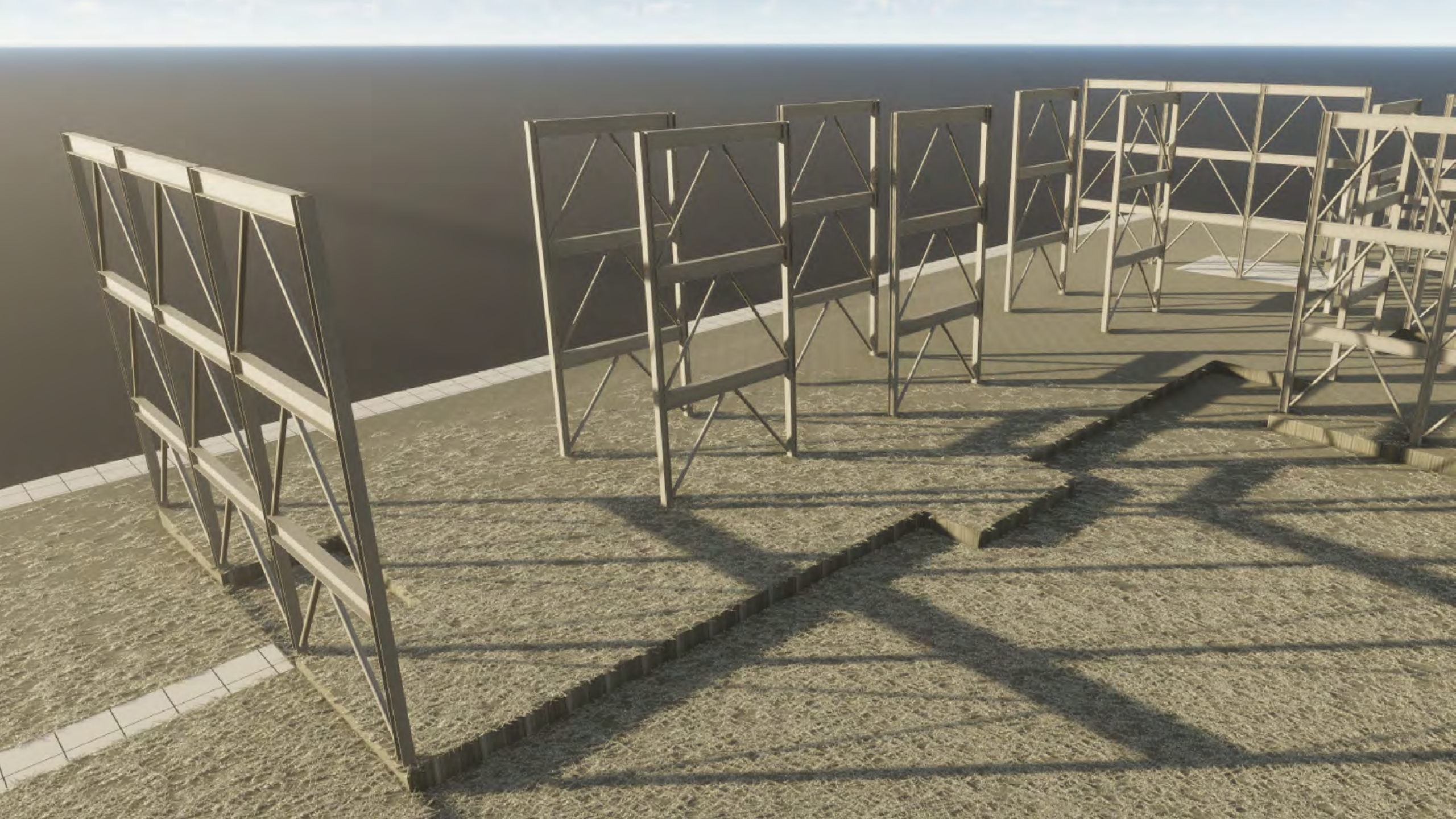
EMBODIED CARBON – 10-15X Operational for a low energy building

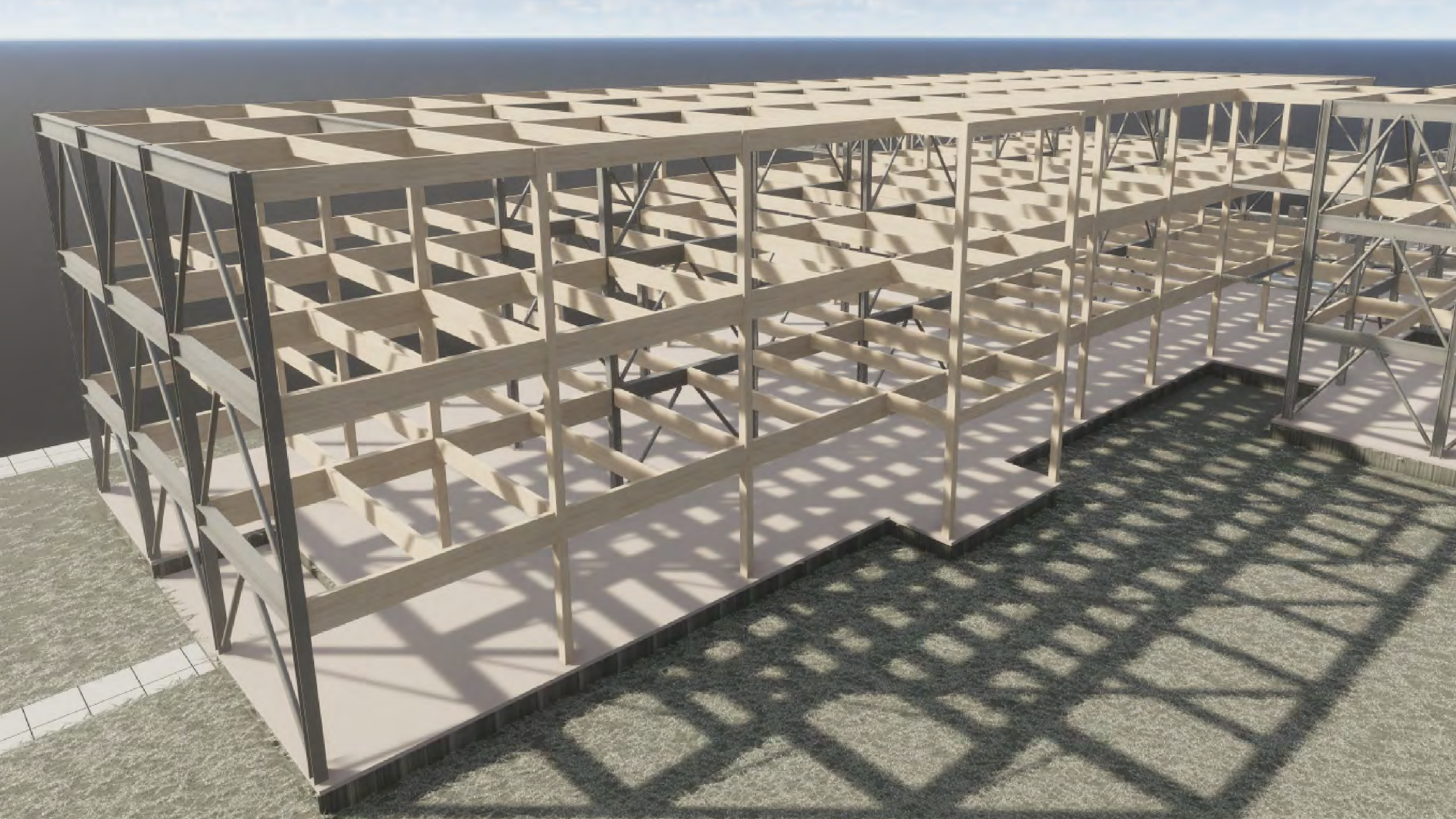


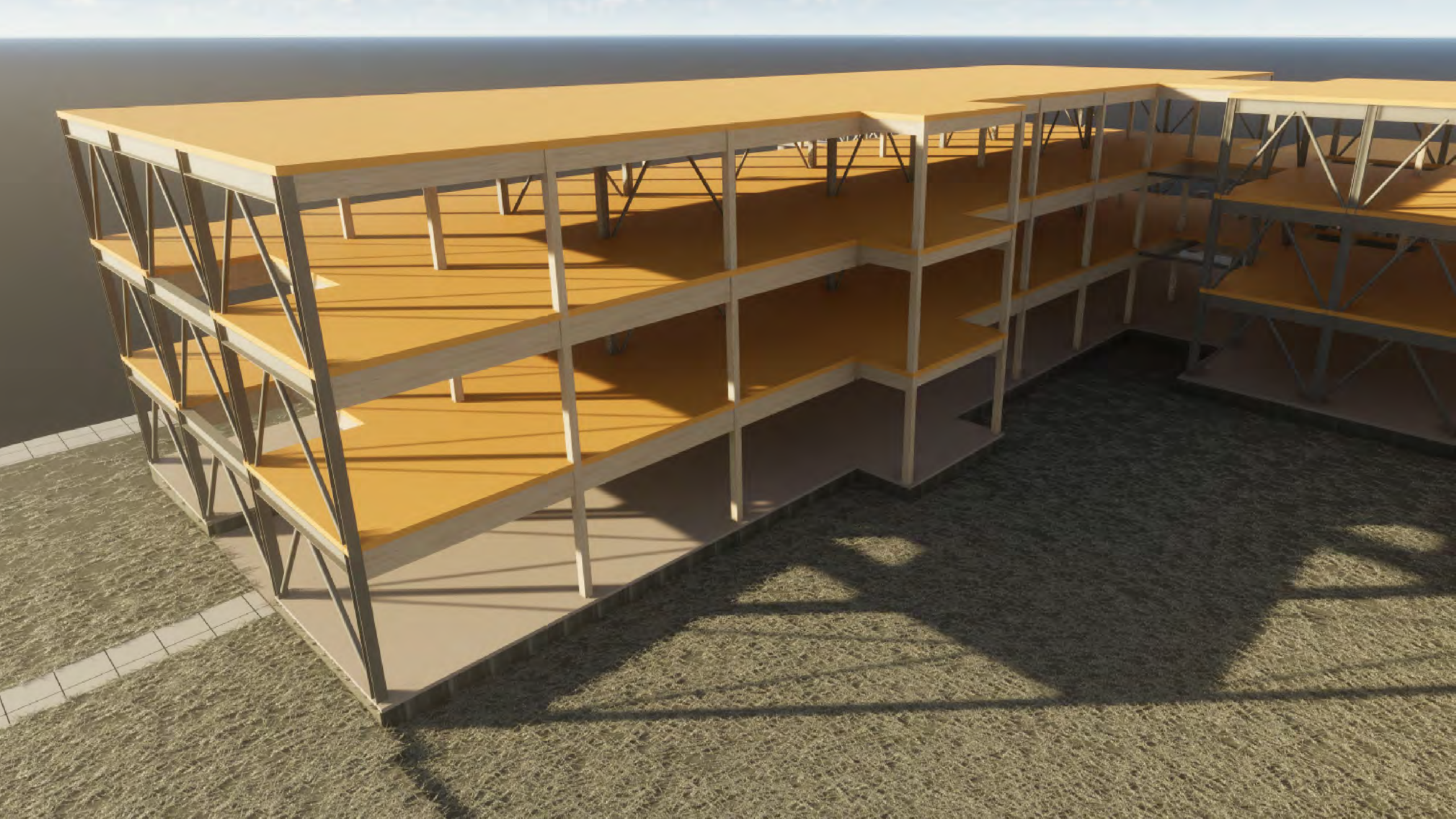


EMBODIED CARBON – 2-4X Operational for a high energy building


1 ton of CO_2

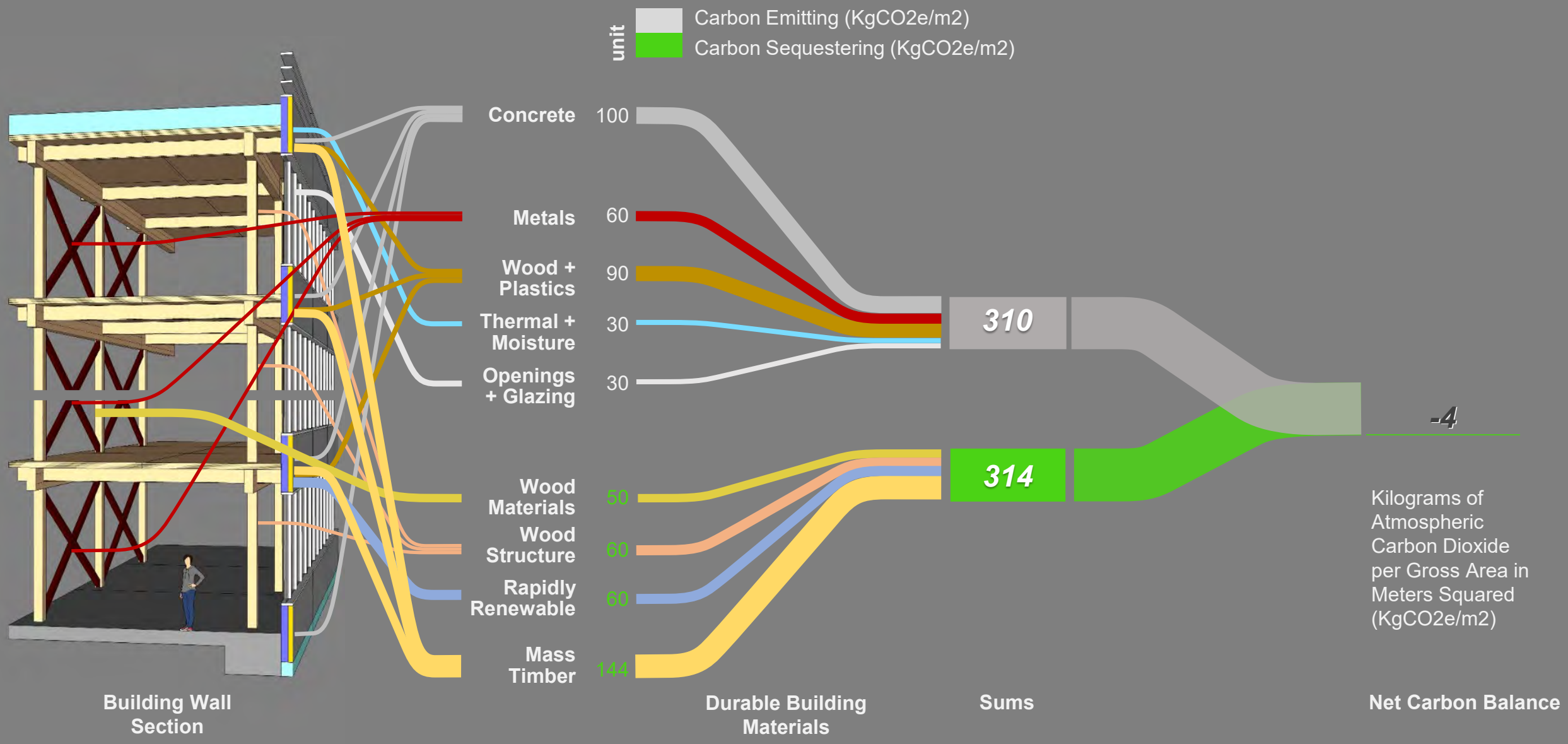






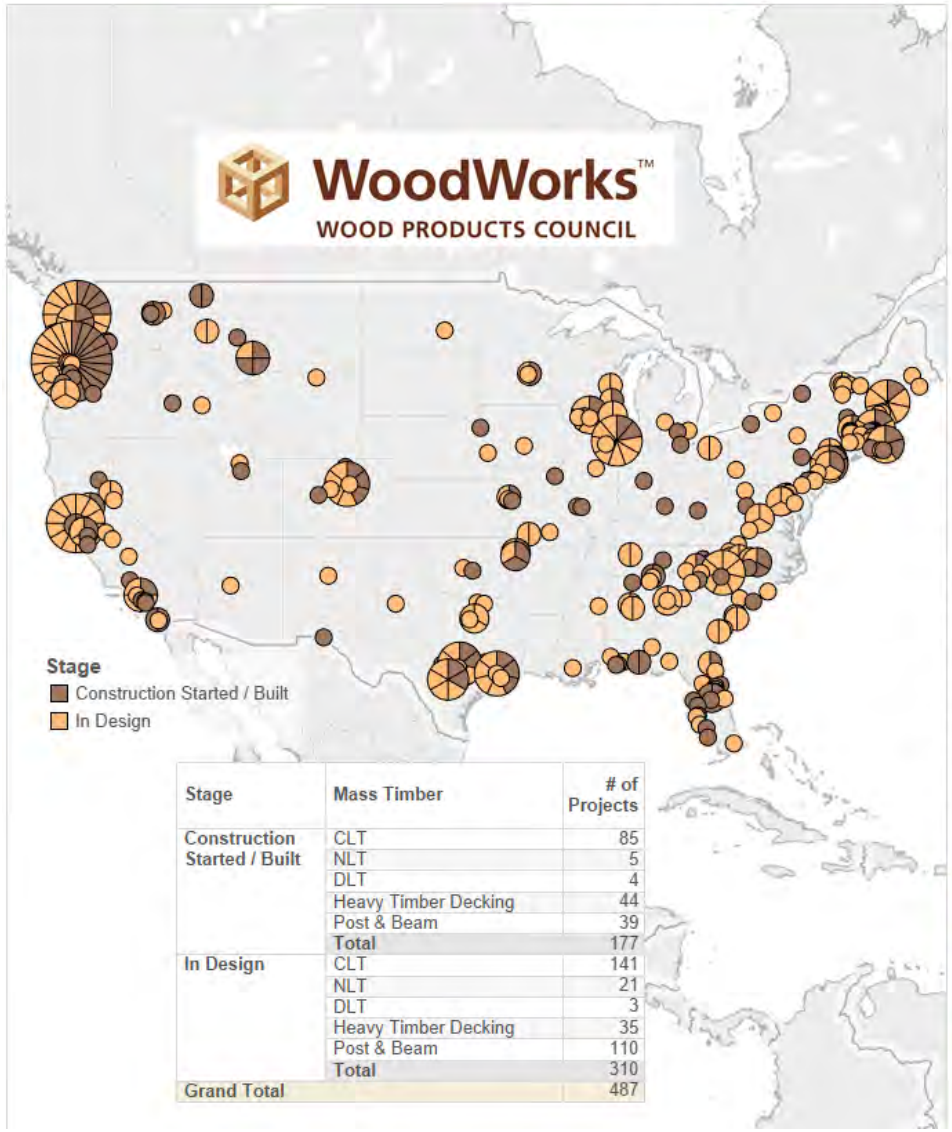

Orange County Sa tion District

CARBON BALANCE GOAL (SCHEDULE A1-A5 + D)



~500 Mass Timber Projects

Mass Timber Projects In Design and Constructed in the US (December 2018)



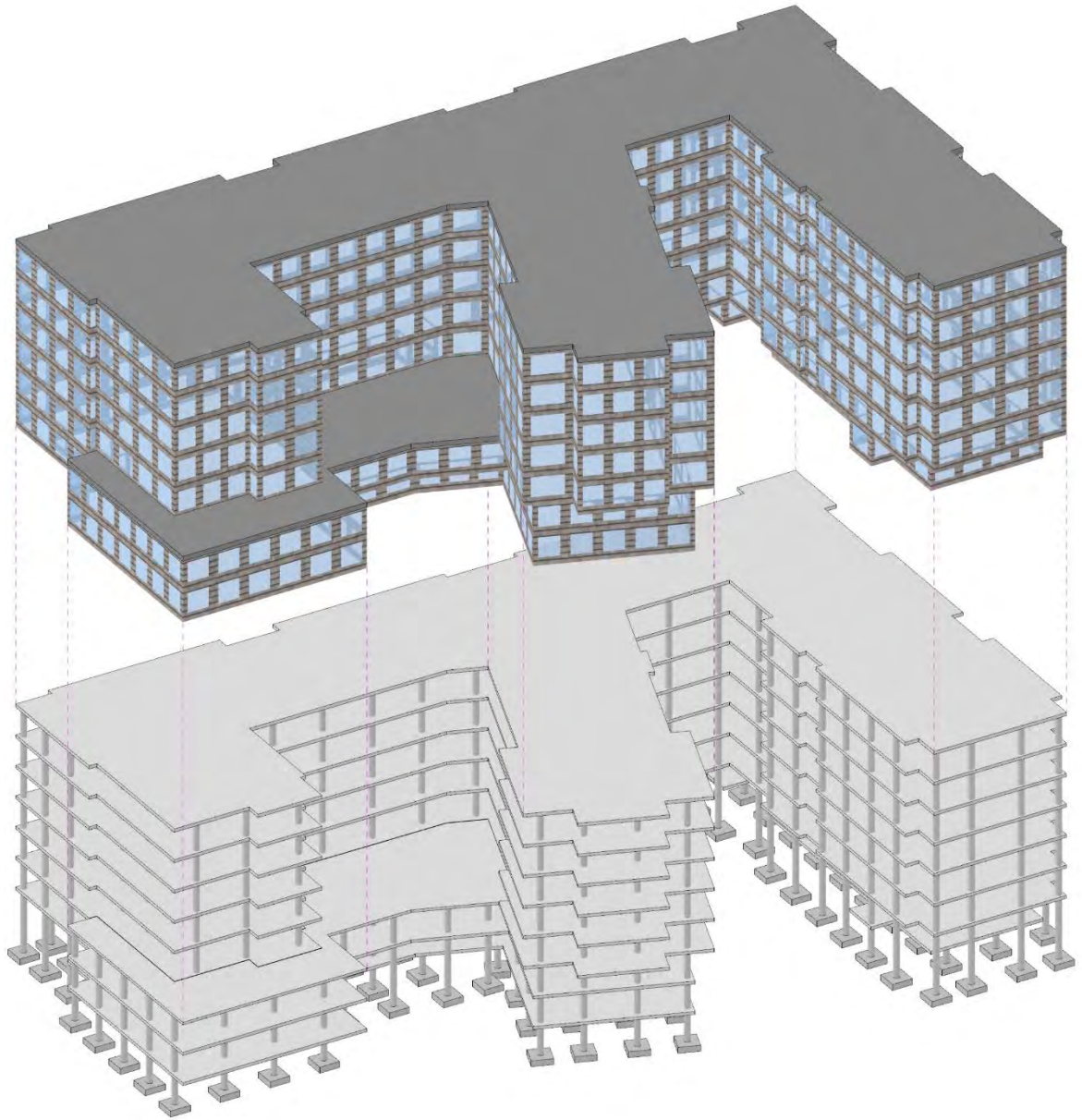
Stage	Mass Timber	# of Projects
Construction Started / Built	CLT	85
	NLT	5
	DLT	4
	Heavy Timber Decking	44
	Post & Beam	39
	Total	177
In Design	CLT	141
	NLT	21
	DLT	3
	Heavy Timber Decking	35
	Post & Beam	110
	Total	310
Grand Total		487

State	Stage	
AL	Construction Started / Built	2
	In Design	6
AR	Construction Started / Built	3
	In Design	3
AZ	In Design	1
CA	Construction Started / Built	26
	In Design	40
CO	Construction Started / Built	9
	In Design	7
CT	Construction Started / Built	3
	In Design	5
DC	Construction Started / Built	2
	In Design	1
DE	In Design	1
FL	Construction Started / Built	15
	In Design	13
GA	In Design	11
HI	In Design	1
IA	In Design	1
ID	Construction Started / Built	1
	In Design	2
IL	Construction Started / Built	4
	In Design	10
IN	Construction Started / Built	1
KS	In Design	1
KY	Construction Started / Built	1
LA	In Design	1
MA	Construction Started / Built	15
	In Design	21
MD	Construction Started / Built	1
	In Design	6
ME	Construction Started / Built	1
	In Design	9
MI	Construction Started / Built	1
	In Design	2
MN	Construction Started / Built	1
	In Design	2
MO	Construction Started / Built	4
	In Design	4

State	Stage	
MS	In Design	1
MT	Construction Started / Built	6
	In Design	3
NC	Construction Started / Built	10
	In Design	22
ND	In Design	1
NE	Construction Started / Built	1
	In Design	1
NH	In Design	1
NJ	In Design	3
NM	In Design	1
NY	Construction Started / Built	5
	In Design	10
OH	Construction Started / Built	1
	In Design	3
OK	Construction Started / Built	1
	In Design	1
OR	Construction Started / Built	16
	In Design	20
PA	Construction Started / Built	2
	In Design	2
RI	Construction Started / Built	1
	In Design	1
SC	Construction Started / Built	5
	In Design	7
TN	Construction Started / Built	3
	In Design	2
TX	Construction Started / Built	12
	In Design	29
UT	Construction Started / Built	1
	In Design	1
VA	Construction Started / Built	1
	In Design	9
VT	Construction Started / Built	1
	In Design	7
WA	Construction Started / Built	17
	In Design	23
WI	Construction Started / Built	2
	In Design	13
WV	Construction Started / Built	2
WY	In Design	1

Considering mass timber for a project? Ask us anything.

For free project support, contact:
help@woodworks.org
woodworks.org/project-assistance



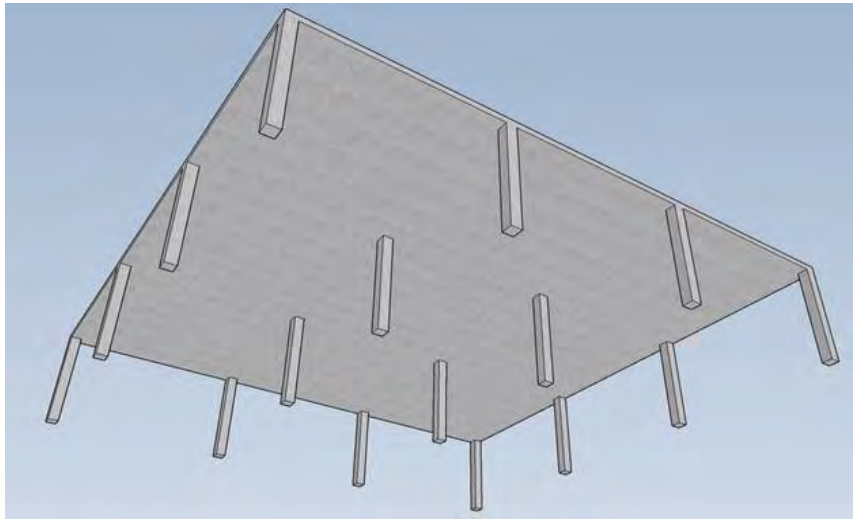
REFERENCE BUILDING

(A) STEEL

INFINITY STRUCTURAL SYSTEM

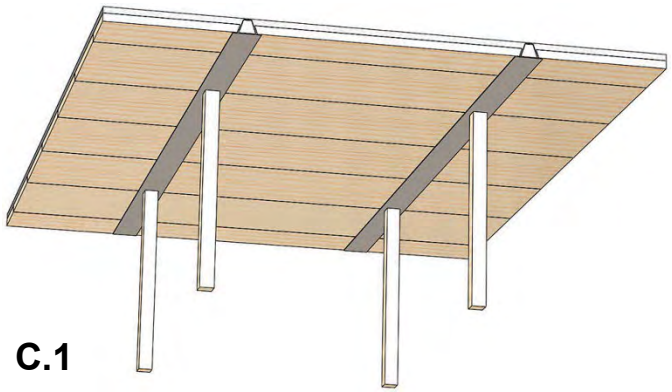
(B) CONCRETE

FLAT SLAB



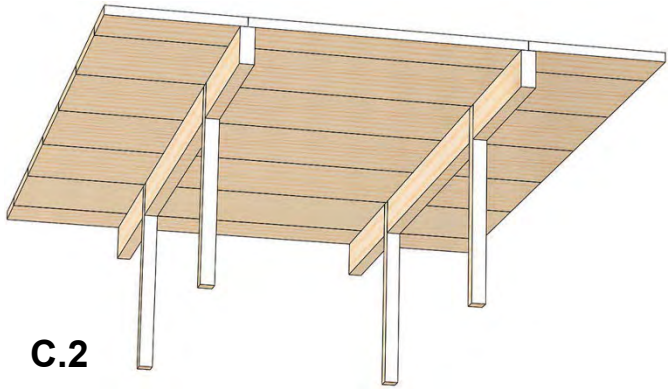
(C) MASS TIMBER

DELTA BEAM



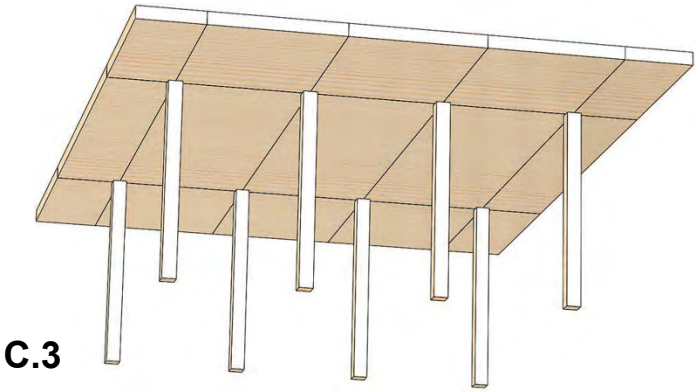
C.1

GLULAM BEAMS

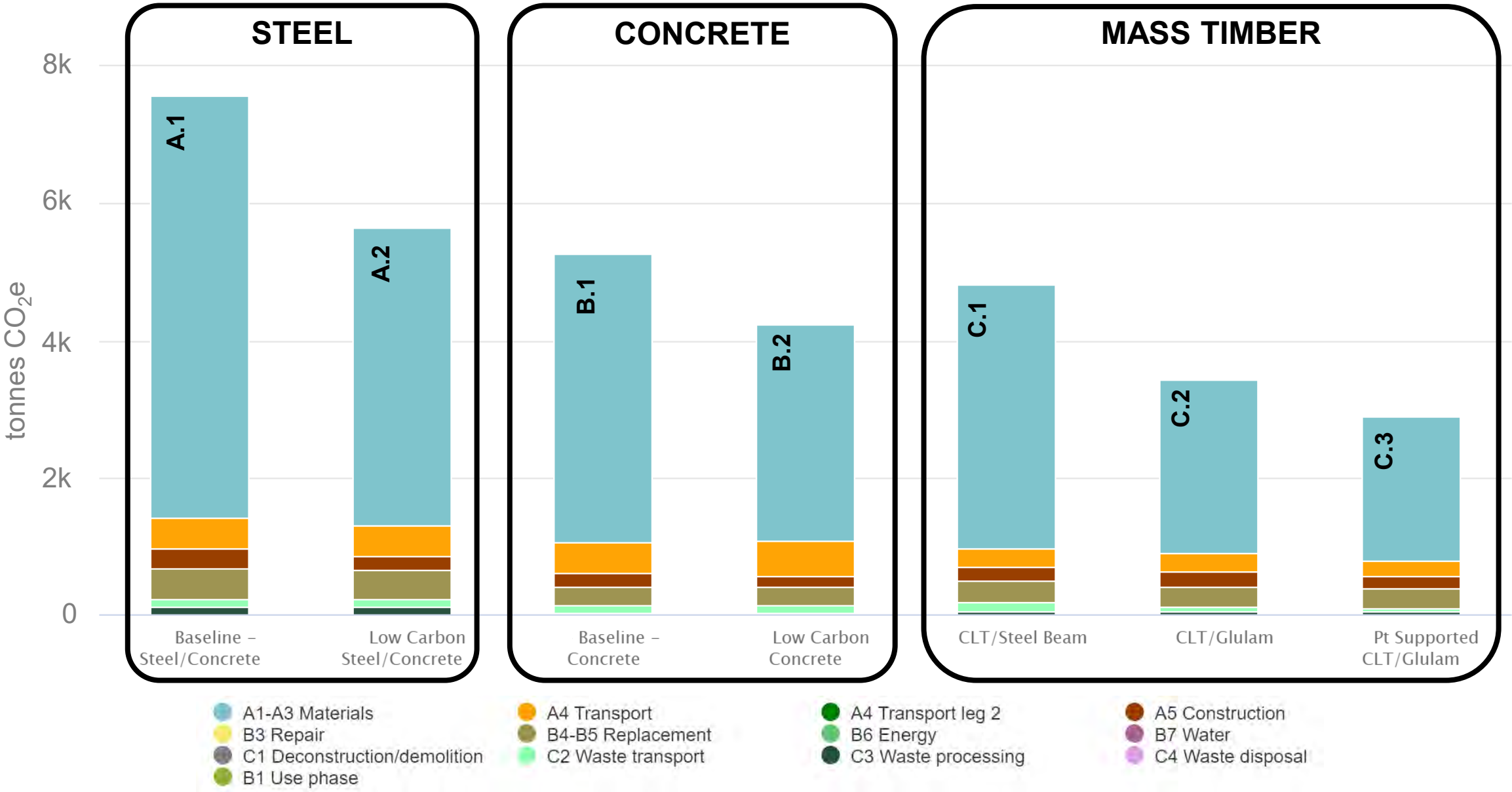


C.2

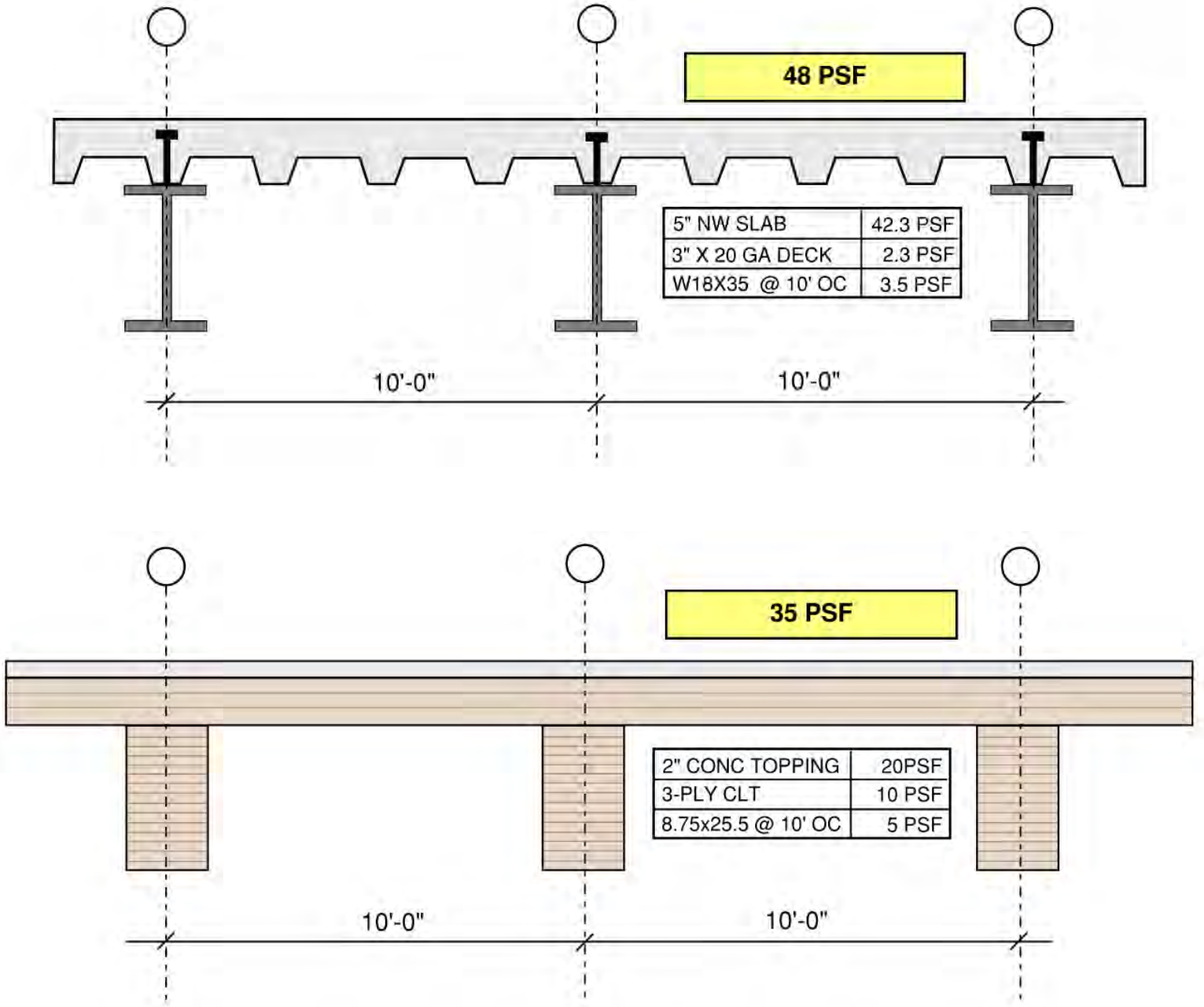
POINT SUPPORTED CLT



C.3



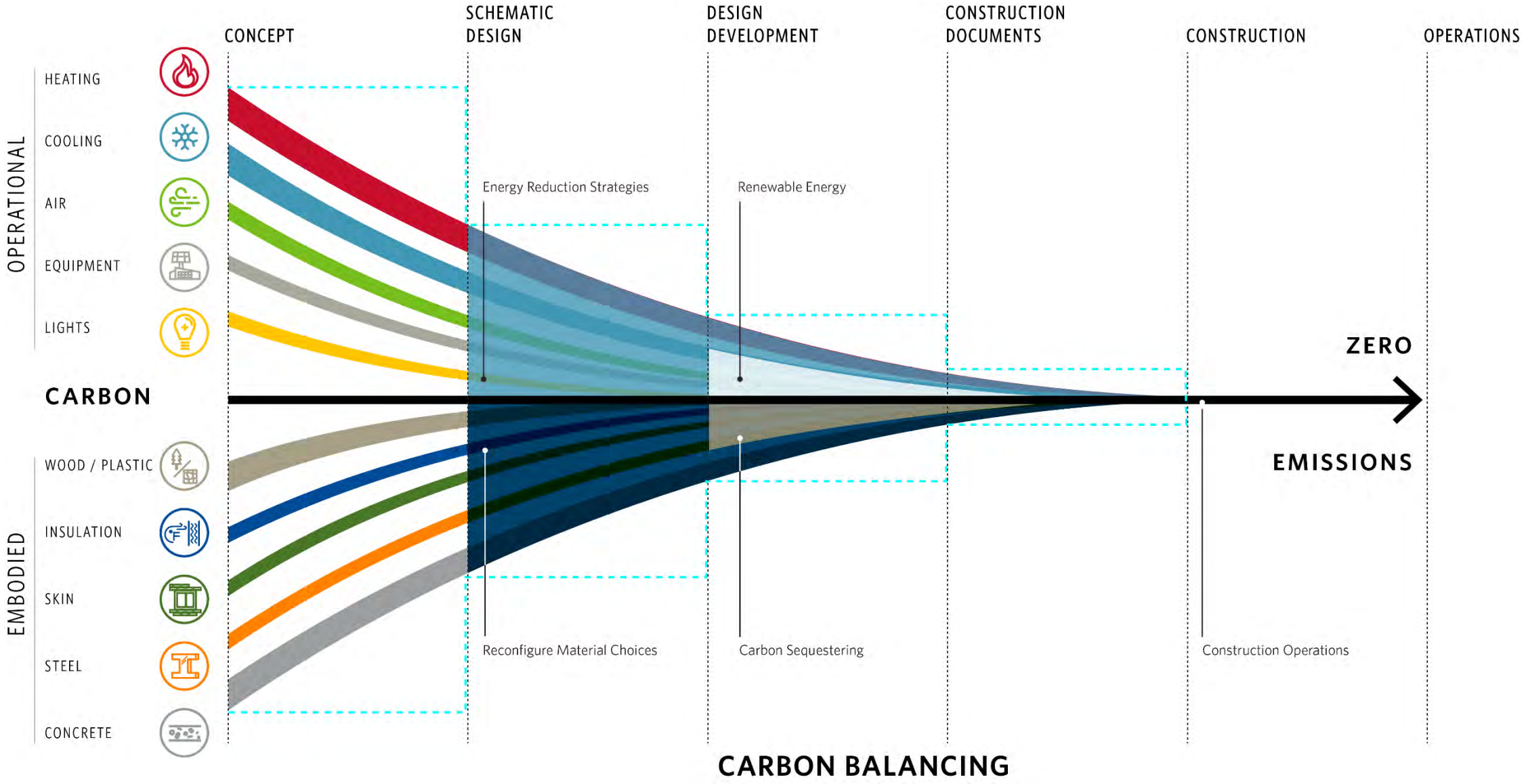
60% Carbon Savings


48 PSF
5" NW SLAB 42.3 PSF
3" X 20 GA DECK 2.3 PSF
W18X35 @ 10' OC 3.5 PSF
10'-0"
10'-0"
35 PSF
2" CONC TOPPING 20PSF
3-PLY CLT 10 PSF
8.75x25.5 @ 10' OC 5 PSF
10'-0"
10'-0"

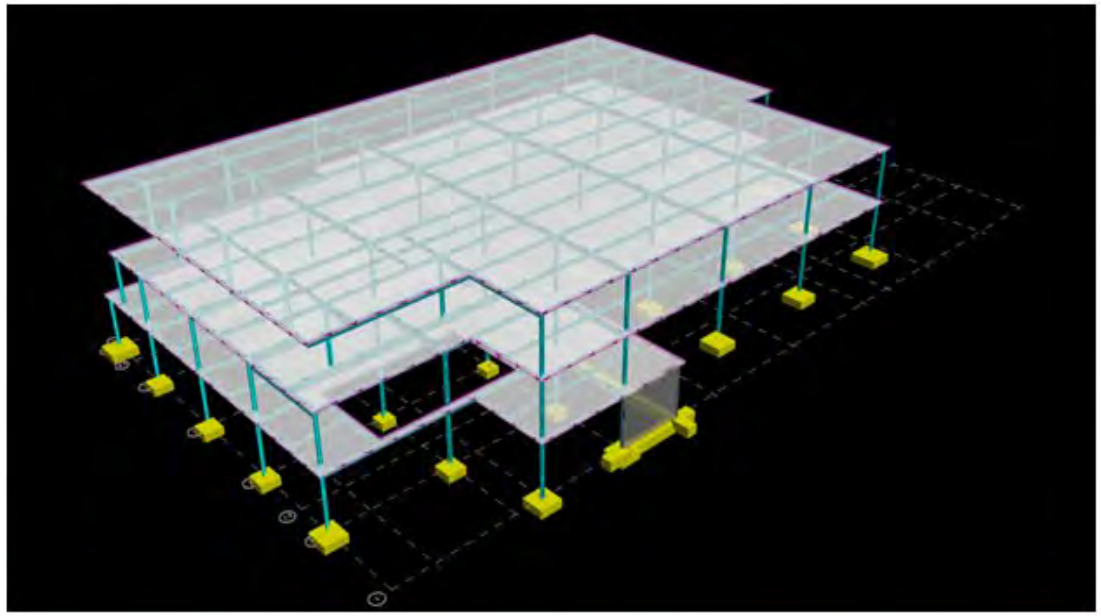
STRUCTURAL SYSTEM COST COMPARISON – BUSINESS HUB

Item	Mass Timber Structure	Steel Structure
Structural Costs	$2.9M	$2.9M
Foundation Changes (additional piles)	+$125K	
Foundation Changes (Weight difference of structure)		+$125K
concrete slab topping	+175K	+$310K
Pour stop + membrane	+80K	
Intumescent paint + fire proofing		+130K
Drywall column wraps		+200K
Ceilings and Bulkheads		+350K
Temporary protective measures	+85K	
Schedule Impact		+225K
TOTAL	**$3.36M**	**$3.84M**

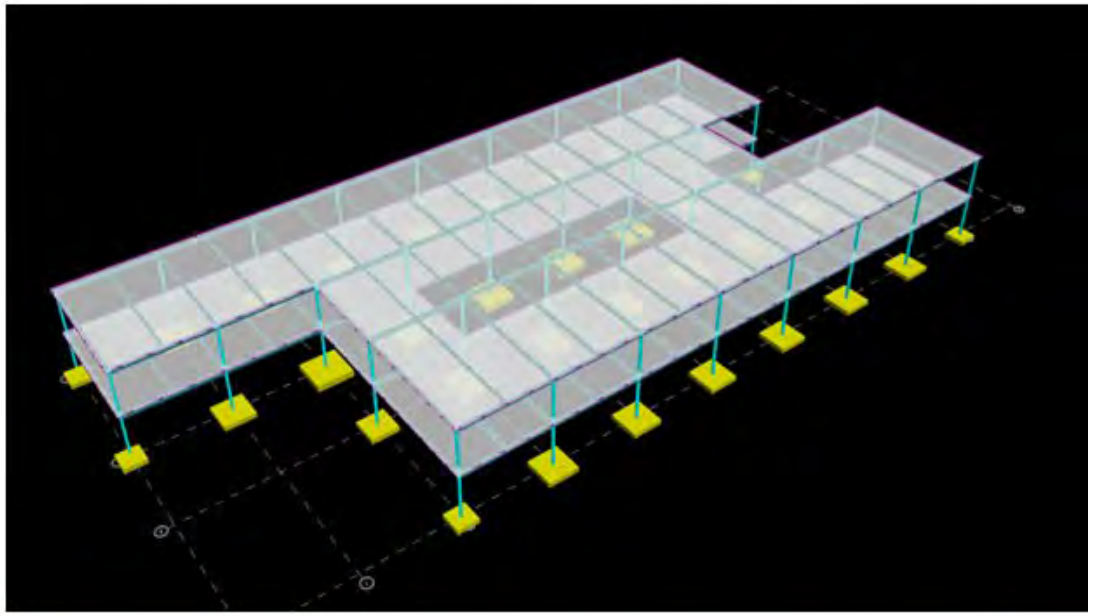
Carbon Balanced Building



SIMPLIFIED CONSTRUCTION

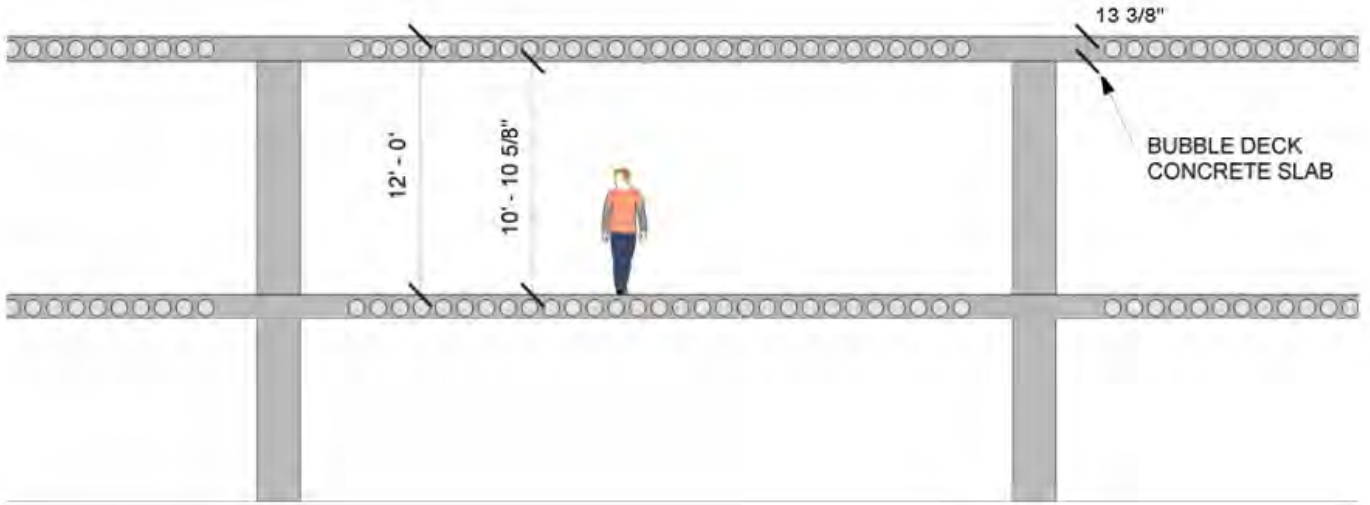


Number of Columns	Number of Beams	Number of Footings	Steel Tonnage
46	245	39	±110

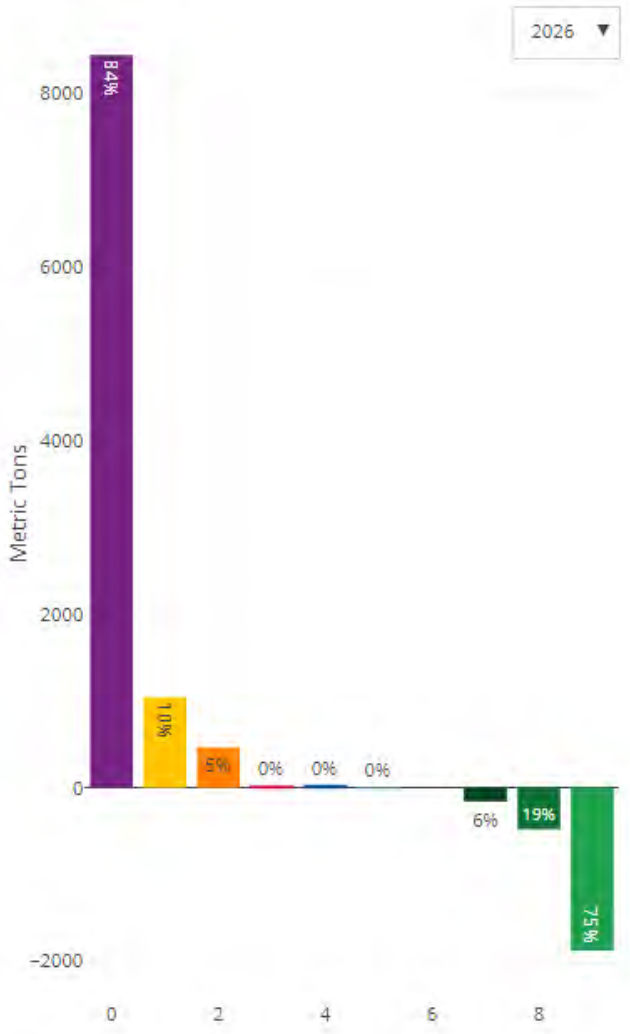


Number of Columns	Number of Beams	Number of Footings	Steel Tonnage
34	141	34	±120

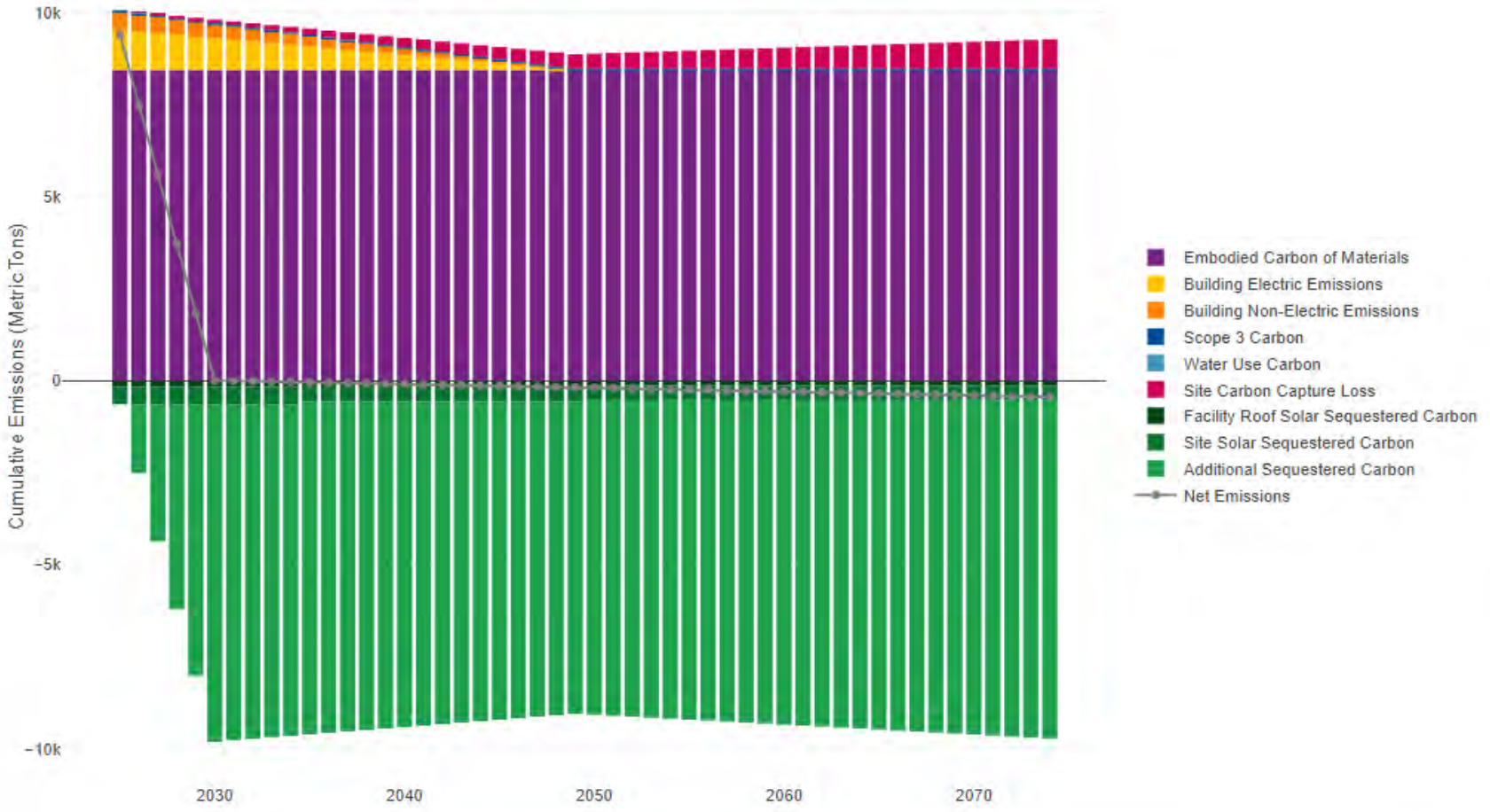
BMS Jump Business Center,
Bothell, WA


13 3/8"
12' - 0'
10' - 10 5/8"
BUBBLE DECK
CONCRETE SLAB

Carbon Impact

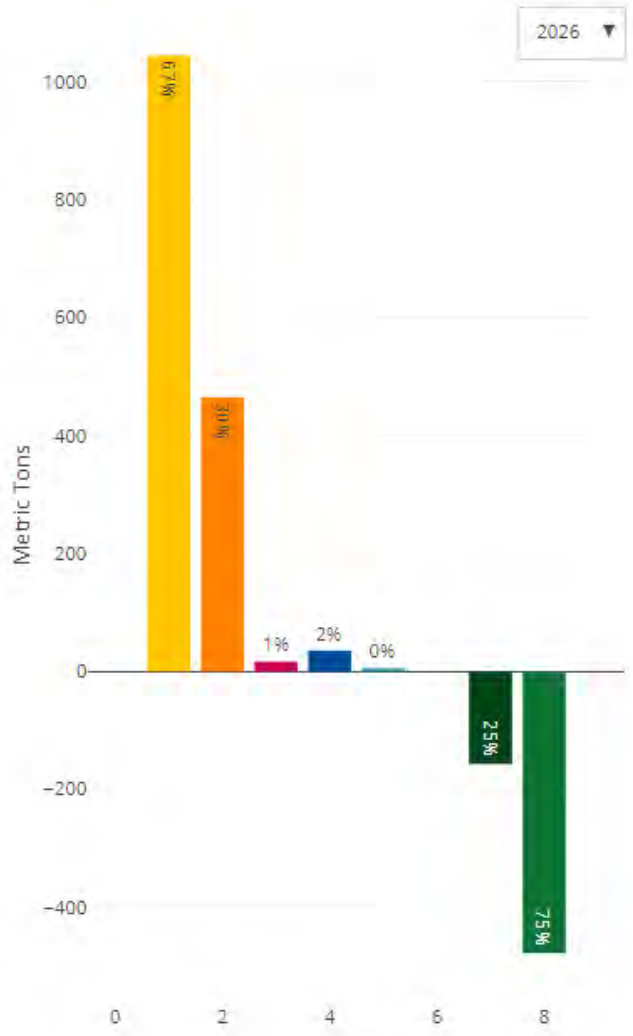


Carbon Forecast

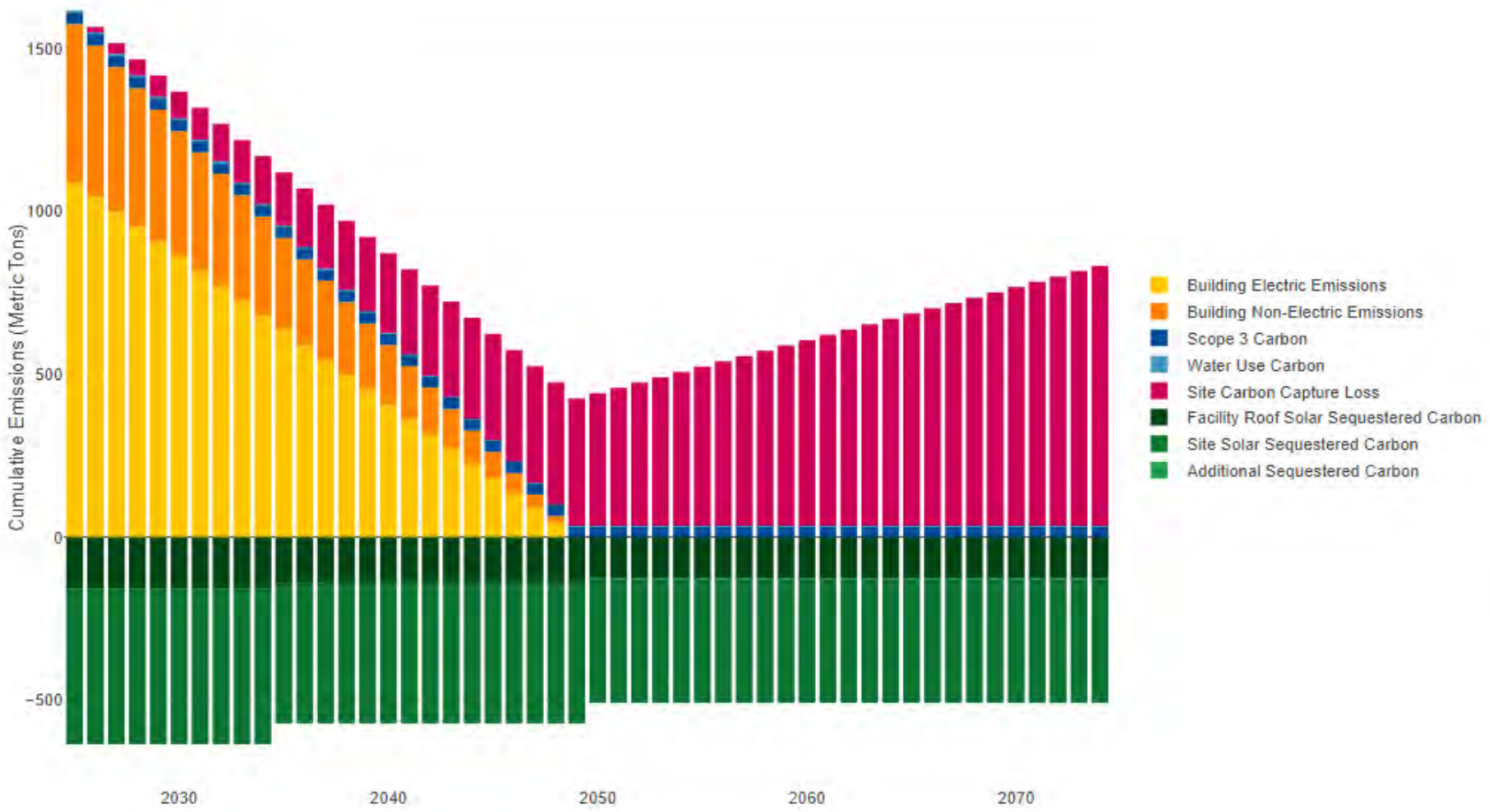


BIOMASS CARBON STOCK

Carbon Impact



Carbon Forecast



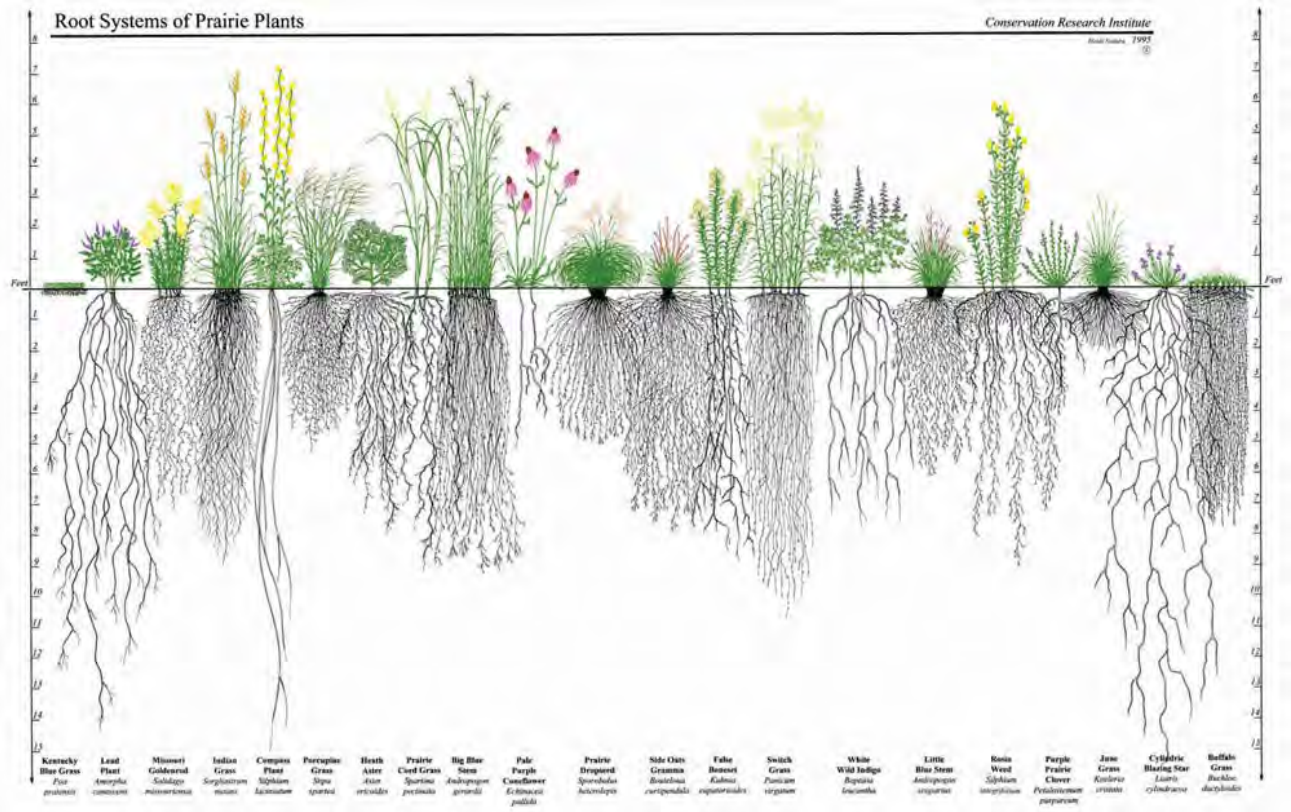
BIOMASS CARBON STOCK

Diagram of Carbon Stocks

Biomass Carbon Stock = C Above Ground + Carbon Below Ground

Soil Organic Carbon Stock = Soil Organic Matter x 0.55 (CF from SOM to SOC)

Total Land Cover Carbon Stock = Biomass Carbon Stock + Soil Organic Carbon Stock



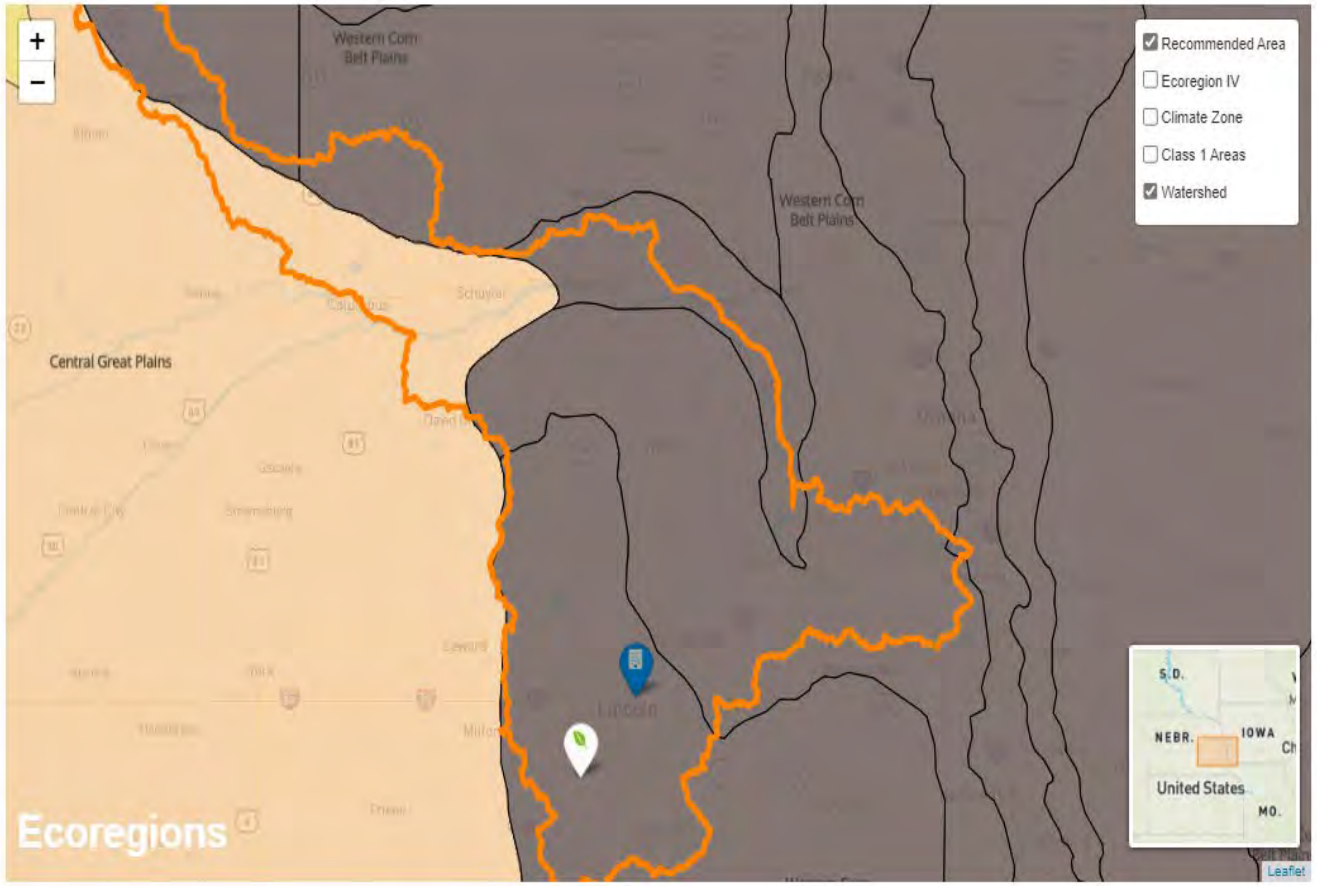
NCRRPA

VIEW FROM NORTH

Ecological Baseline and Regenerative Identity

Discover, don't decide

Ecological Baseline



1. US Environmental Protection Agency. Ecoregions available via https://www.epa.gov/eco-research/ecoregions. Accessed September 03, 2020.

Ecoregions

Ecoregion I
Great Plains

Ecoregion II
Temperate Prairies

Ecoregion III
Western Corn Belt Plains

Ecoregion IV
Loess and Glacial Drift Hills

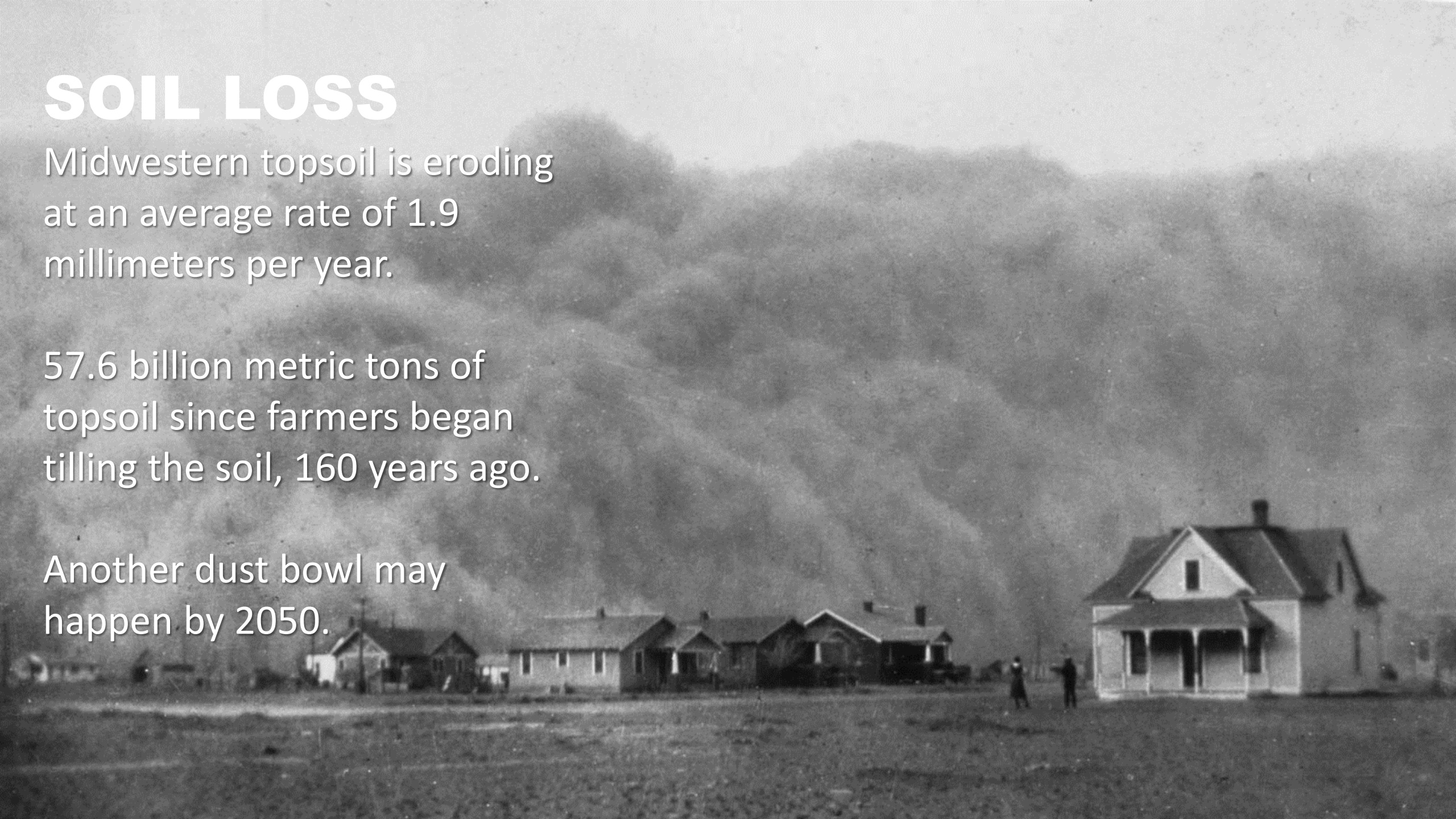
Watershed
Lower Platte

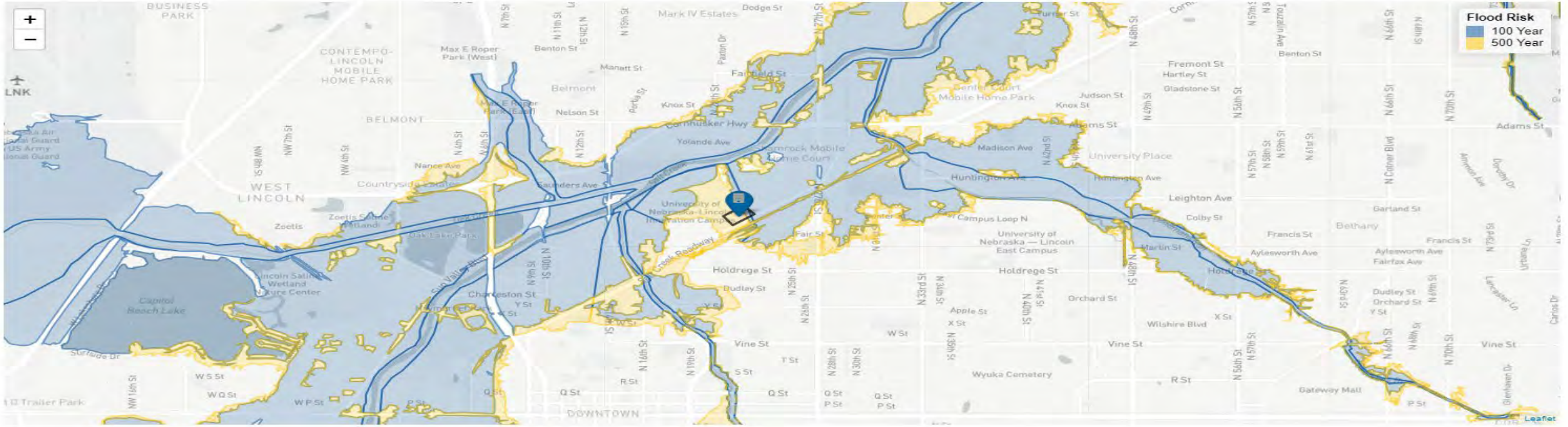
SOIL LOSS

Midwestern topsoil is eroding at an average rate of 1.9 millimeters per year.

57.6 billion metric tons of topsoil since farmers began tilling the soil, 160 years ago.

Another dust bowl may happen by 2050.

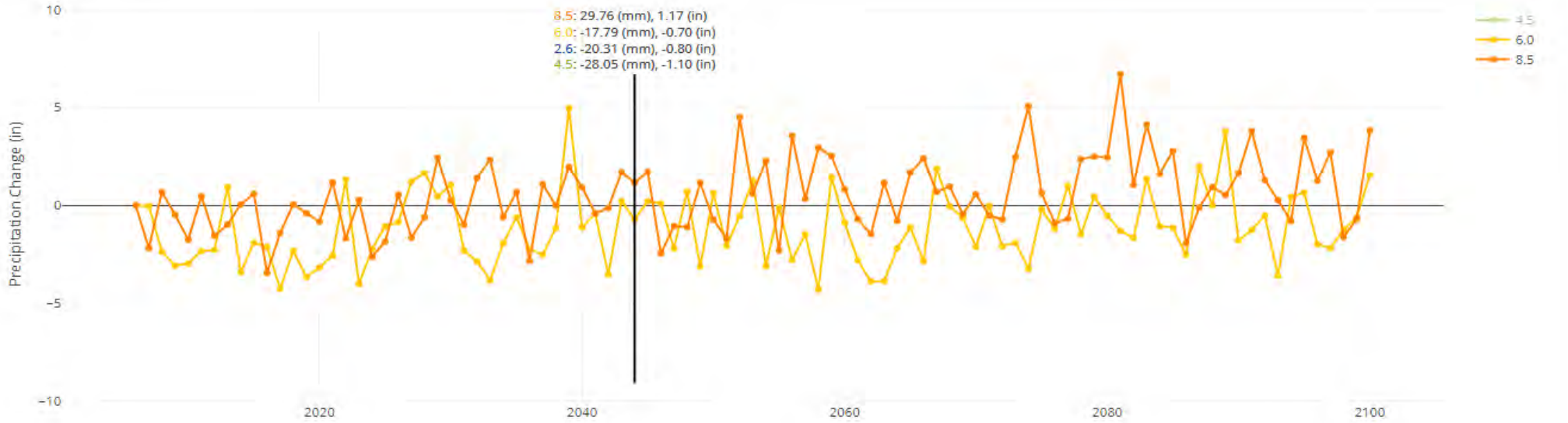




Representative Concentration Pathway

- 4.5 (Emissions peak around 2040, then decline)
- 6.0 (Emissions peak around 2080, then decline)
- 8.5 (Emissions continue to rise through 2100)

Climate Time Series



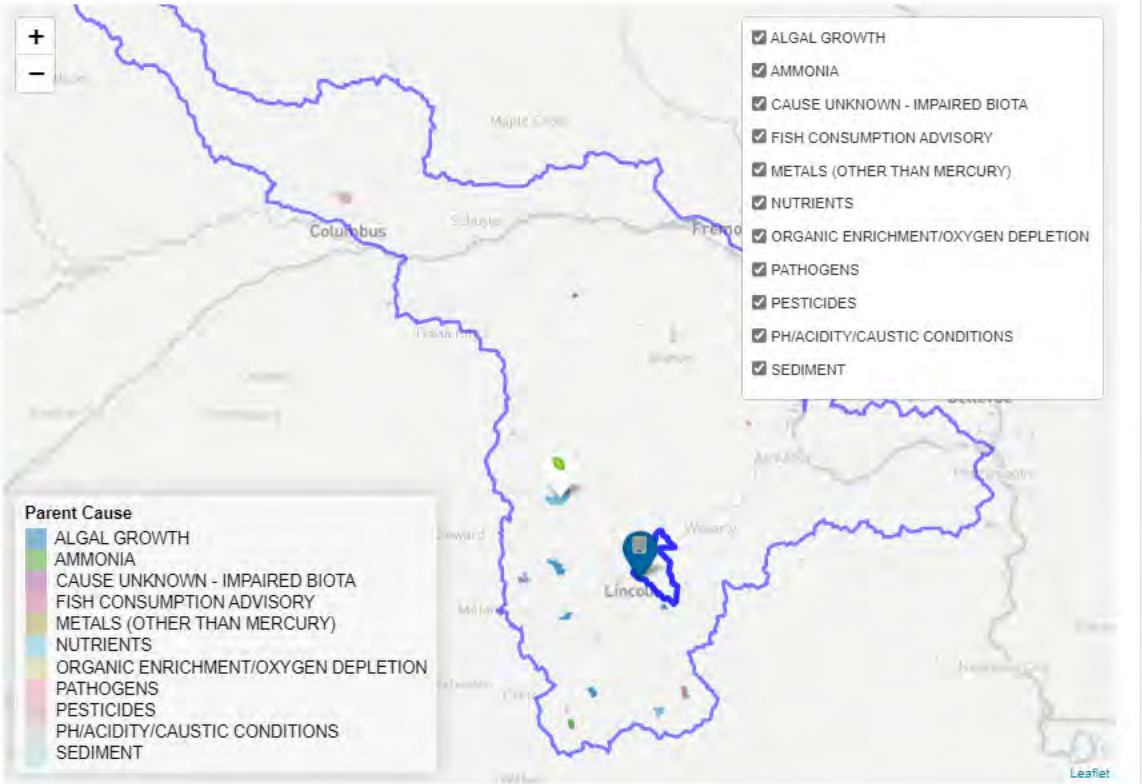
Flash Flooding

Resiliency and Climate Risk | Air | Biodiversity | Carbon | Nutrients | Water | Community | Human Health | Noise

Water Use | Water Indicators

Water Indicator
- Impaired Waters
- Water Risk (2019)
- Future Water Risk
- Flood Hazard
- EJSCREEN

Impaired Water Map



Site Discharge to Impaired Waters

	Receiving Water Name	Impaired Waters Causes
1	Unidentified	AMMONIA, BIOLOGICAL INTEGRITY, CHLORIDE, CONDUCTIVITY, FISH CONSUMPTION ADVISORY
2	Deadmans Run	None
3	Oak Creek	CHLORIDE, FISH CONSUMPTION ADVISORY

An 1861 account of Salt Creek noted its salinity, the smell of which he described as akin to "the morning breezes at the ocean beach." Cox also reported that "elk and antelope were plentiful," and that the river was "wonderfully supplied with fish."

Salt Creek was channelized in an effort to reduce flooding in the city, which causes the stream to discharge water at a much faster rate. The change of flow combined with the dumping of treated sewage and urban runoff create a stream that is essentially devoid of life after it leaves the city of Lincoln.

ECOLOGICAL CONTEXT – Salt Creek Water Shed

Resiliency and Climate Risk | Air | Biodiversity | Carbon | Nutrients | Water | Community | Human Health | Noise

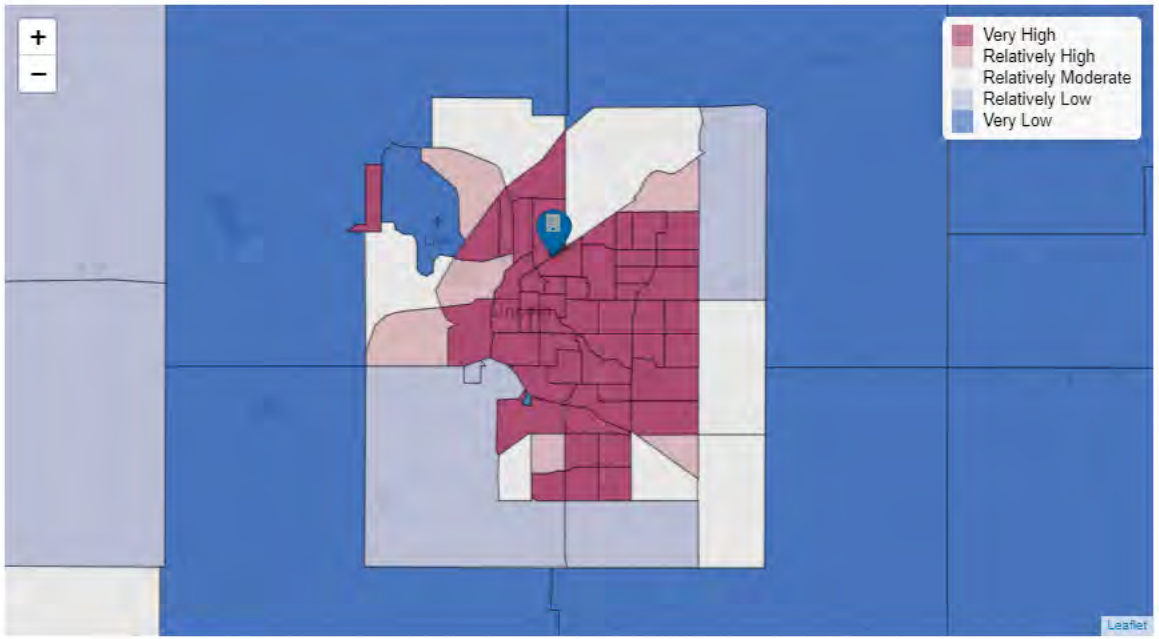
Climate Change | Global Tide Surge | FEMA National Risk Index

National Risk Index Metric

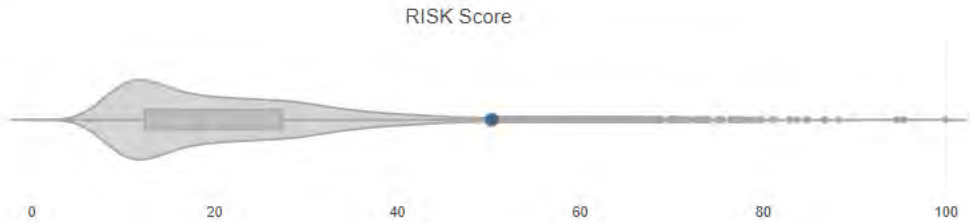
Risk Index

The **project site** Census Tracts have a score of **50.3**. It is in the **87th** percentile for the state and in the **99th** percentile for the nation.

NRI Map



NRI Distribution



Hazard	Annual Frequency	Expected Annual Loss
Lightning	61.9	1,633
Hail	23.6	22,868
Strong Wind	15.7	22,652
Drought	15.2	43.9
Tornado	9.66	96,635,398
Winter Weather	2.88	73,305
Heat Wave	2.06	2,094
Riverine Flooding	1.41	251,389
Ice Storm	1.13	135,104
Cold Wave	0.329	447
Landslide	0.02	0
Earthquake	0.0000922	954
Wildfire	6.83e-7	0

Annual Frequency is imputed for some cases where no events were recorded.

Copy | CSV | Excel

SOCIAL CONTEXT – CLIMATE RISK AND VUNERABILITY

Regenerative Correlations

HABITAT AND RUNOFF

SAME

Establishing Native vegetation will regenerate the watercycle by reducing runoff, cooling runoff temperature, and by evapotranspiration.

ADD TAG

PROXIMATE Watershed

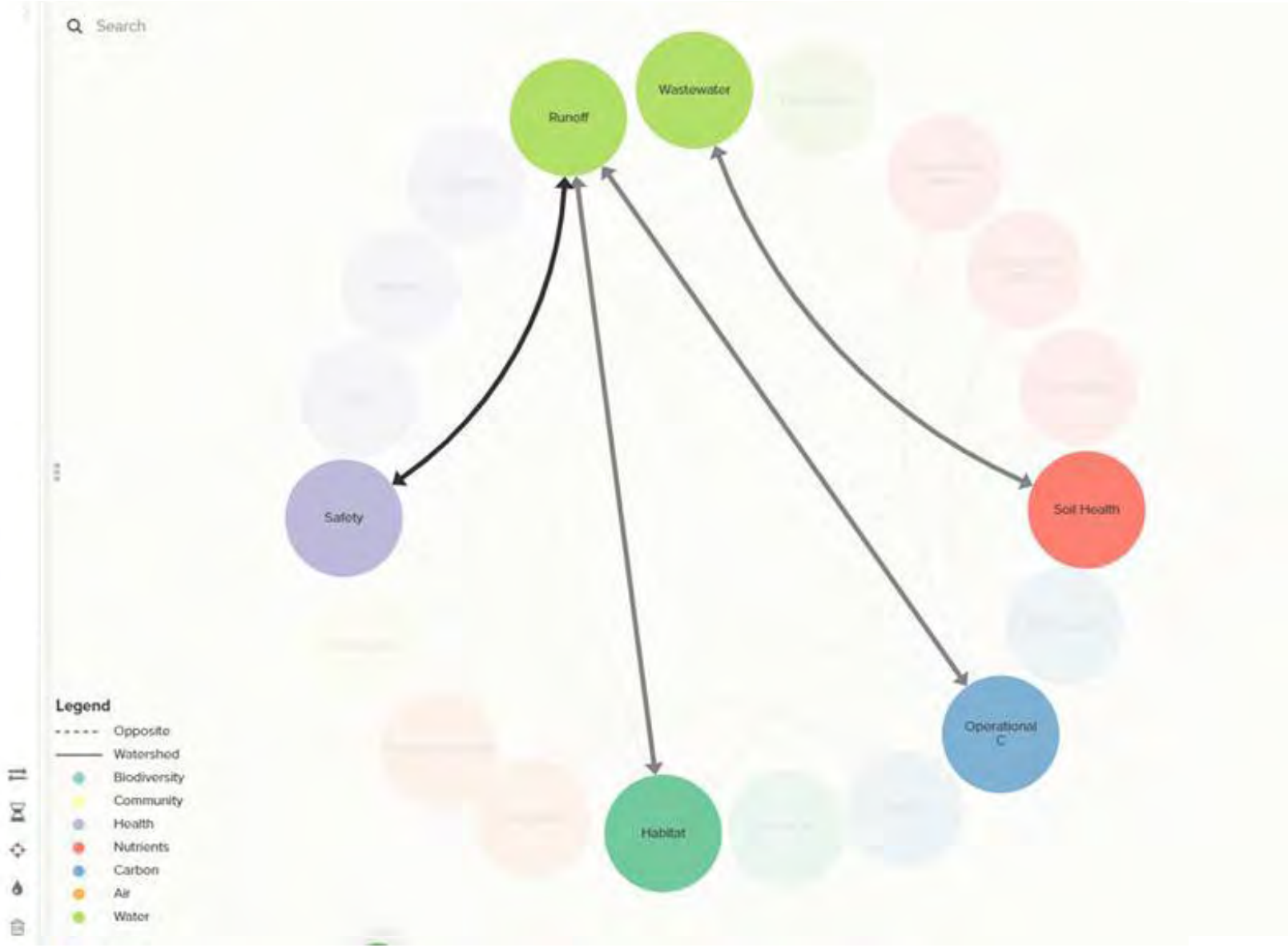
WHOLE River Basin

+ New field

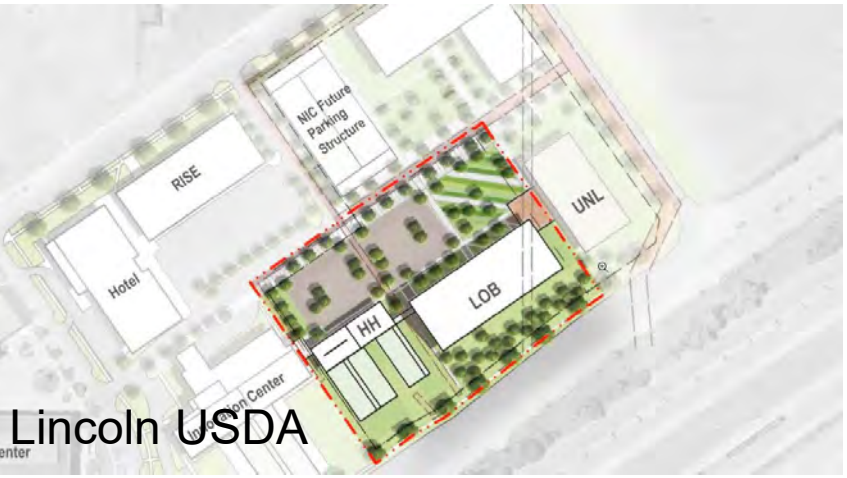
SAFETY AND RUNOFF

ADD CONNECTION TYPE

Bioretention or bioswale areas can serve as snow and ice storage during harsher winter months. This provides increased safety for students and staff using impervious surfaces while also allowing the snow to melt into the stormwater feature, recharging groundwater.



Regenerative Identity – "What the project is a part of"



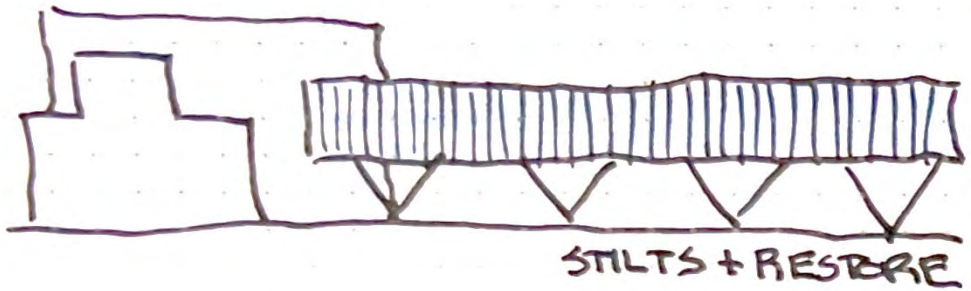
An INTERTWINED SYSTEM of research and academics which has a DEEP IMPACT on the DAMAGED NESTED ECOLOGICAL AND SOCIAL SYSTEMS in which it exists.

A history of MECHANICAL SOLUTIONS AND DEGRADATION to provide nourishment.

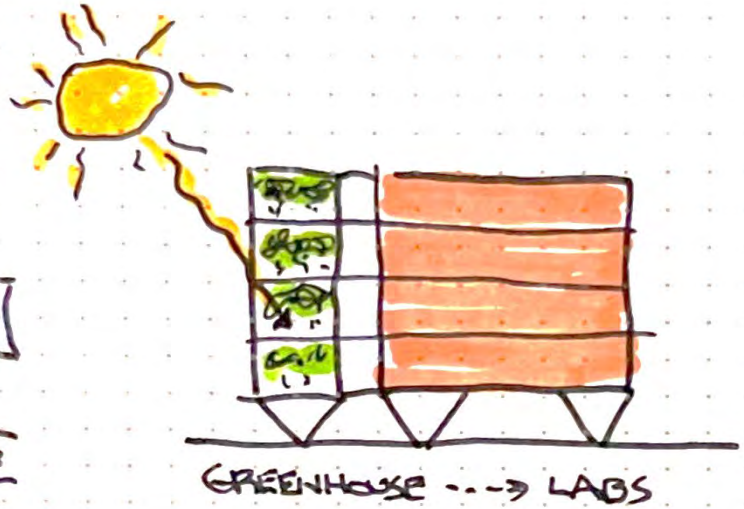
Regenerative Vocation – "What the project should and could do"

EMPOWERING / UNLOCKING / HONORING the "abilities" of soil and use the POWER OF PLANTS to support the NOURISHMENT AND WELL-BEING OF ALL PEOPLE.

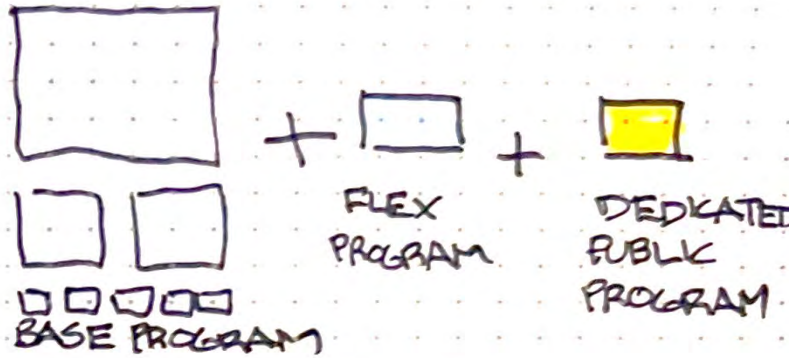
USDA SUSTAINABLE CONCEPTS



① ZERO IMPACT TO THE LAND - REGENERATE SALT MARSH

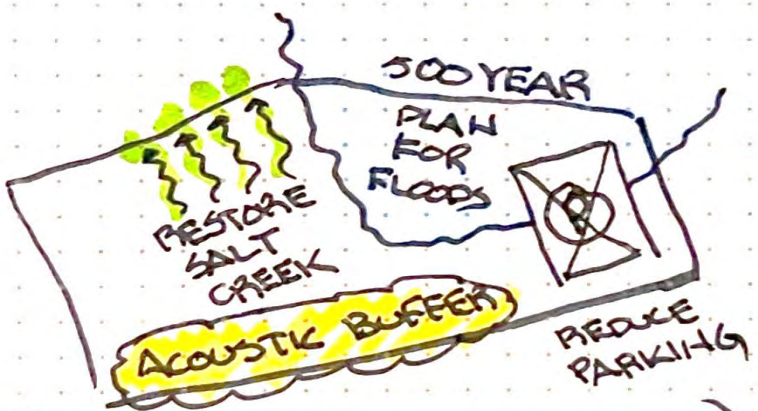


② BUFFER LABS WITH GREENHOUSE "GREENHOUSE AS THE FACADE." - "PLANT-BASED BUILDING"

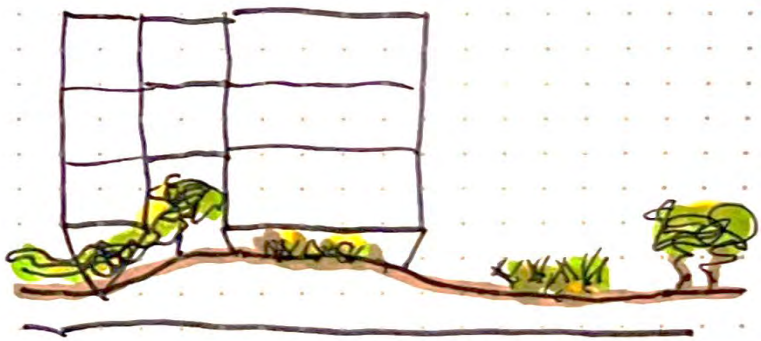


③ ENGAGE THE COMMUNITY

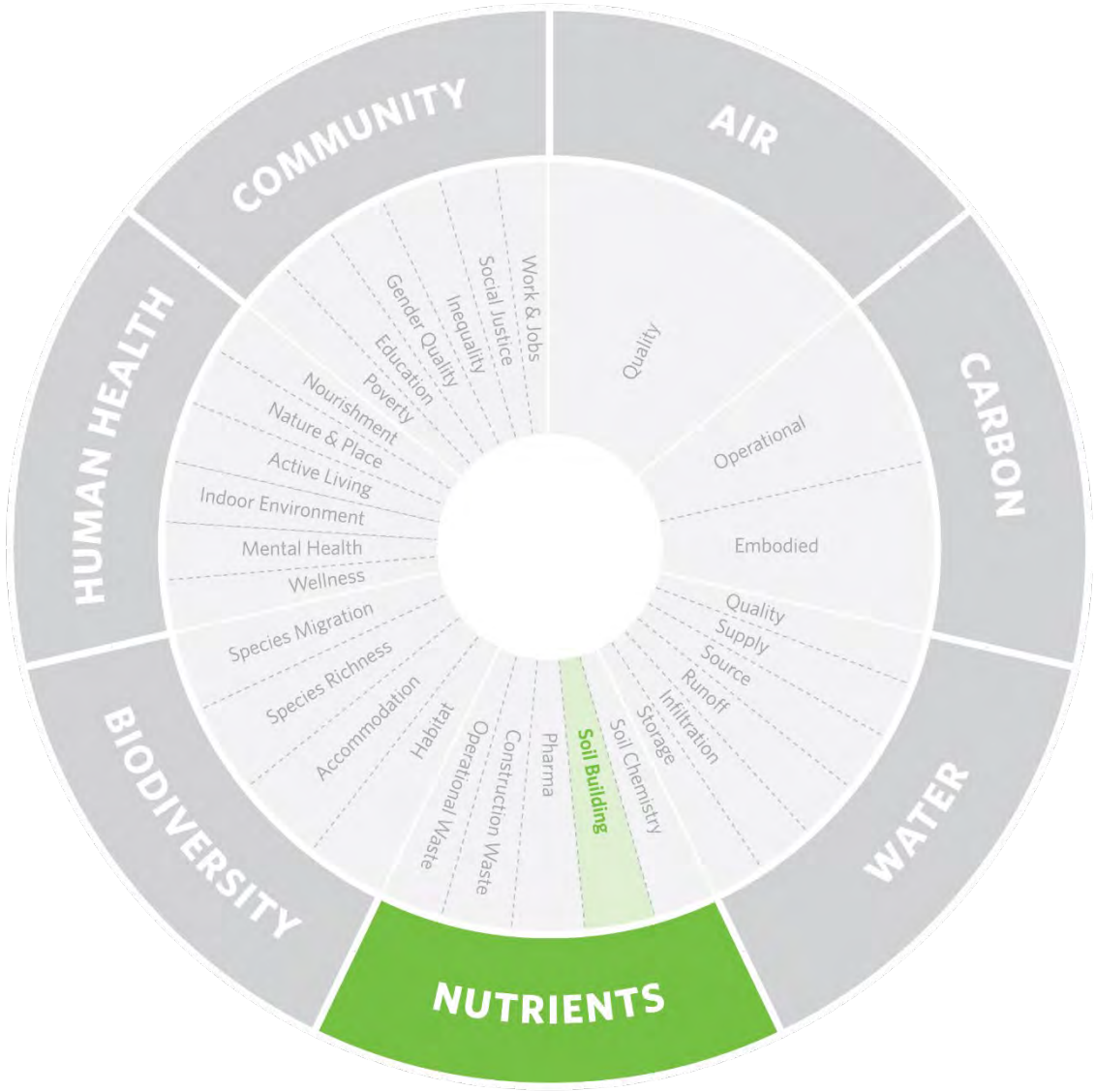
④ DRY/DAMP/WET WITH PROTECTED HIGH INTENSITY LABS

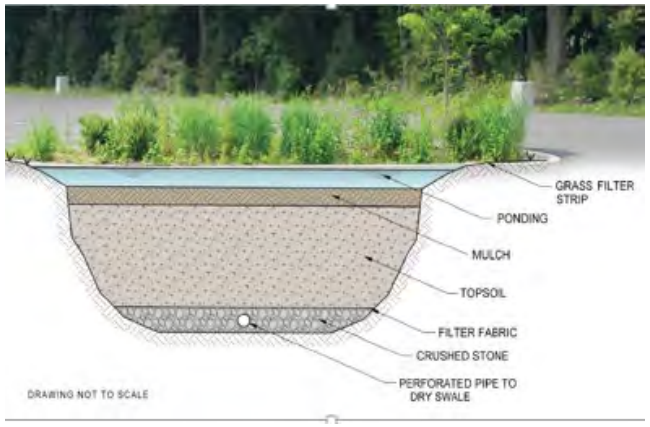


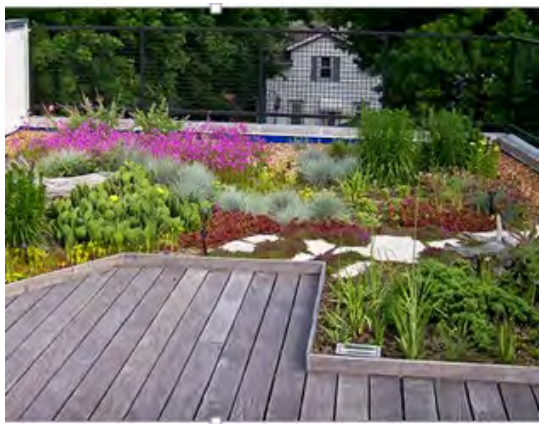
⑤ INFLUENCE THE MASTER PLAN



⑥ "NATURAL MEETS MACHINE" "BRING THE OUTSIDE IN"

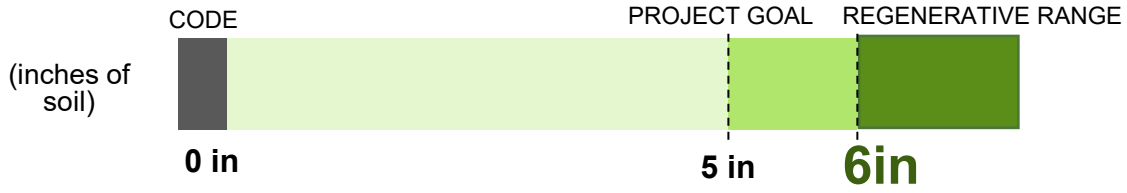


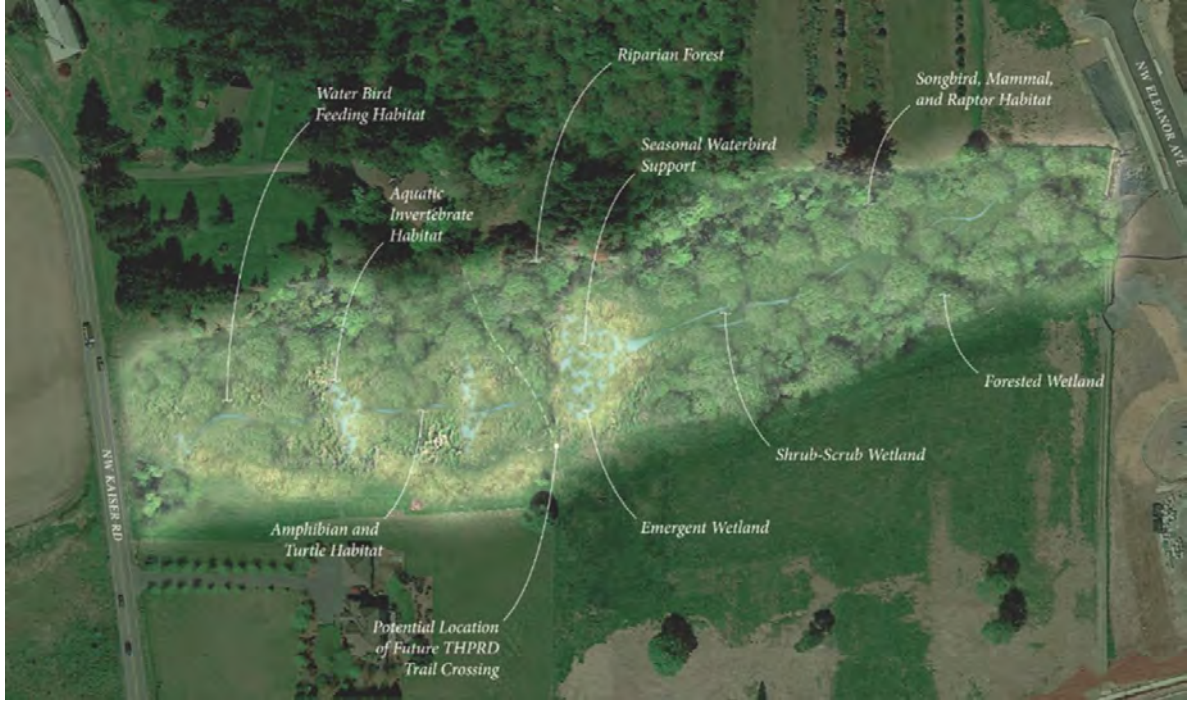


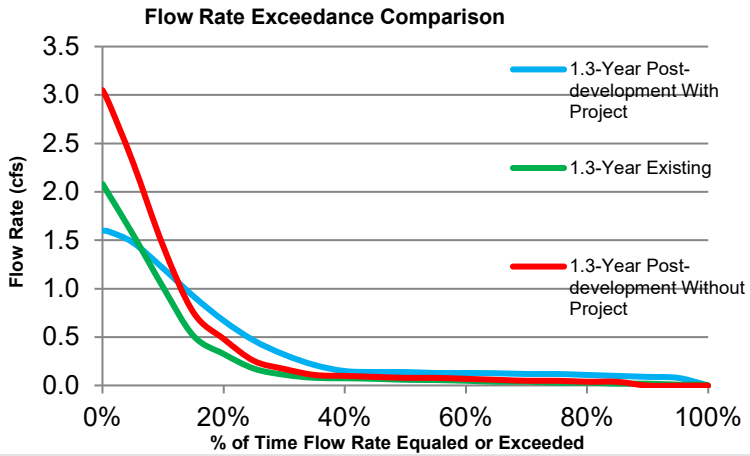


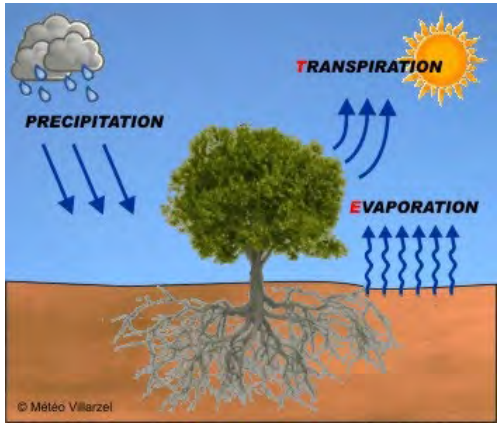
GIS / DATABASE / STANDARD

NUTRIENTS- Top Soil Building



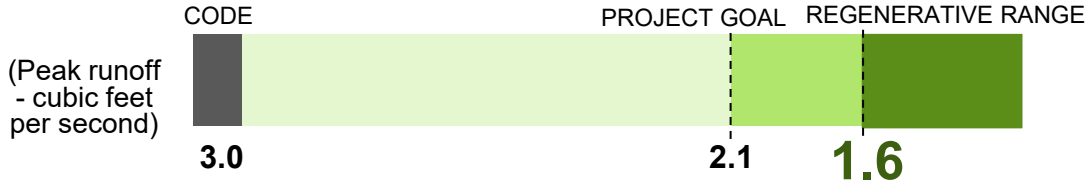






GIS / DATABASE / STANDARD

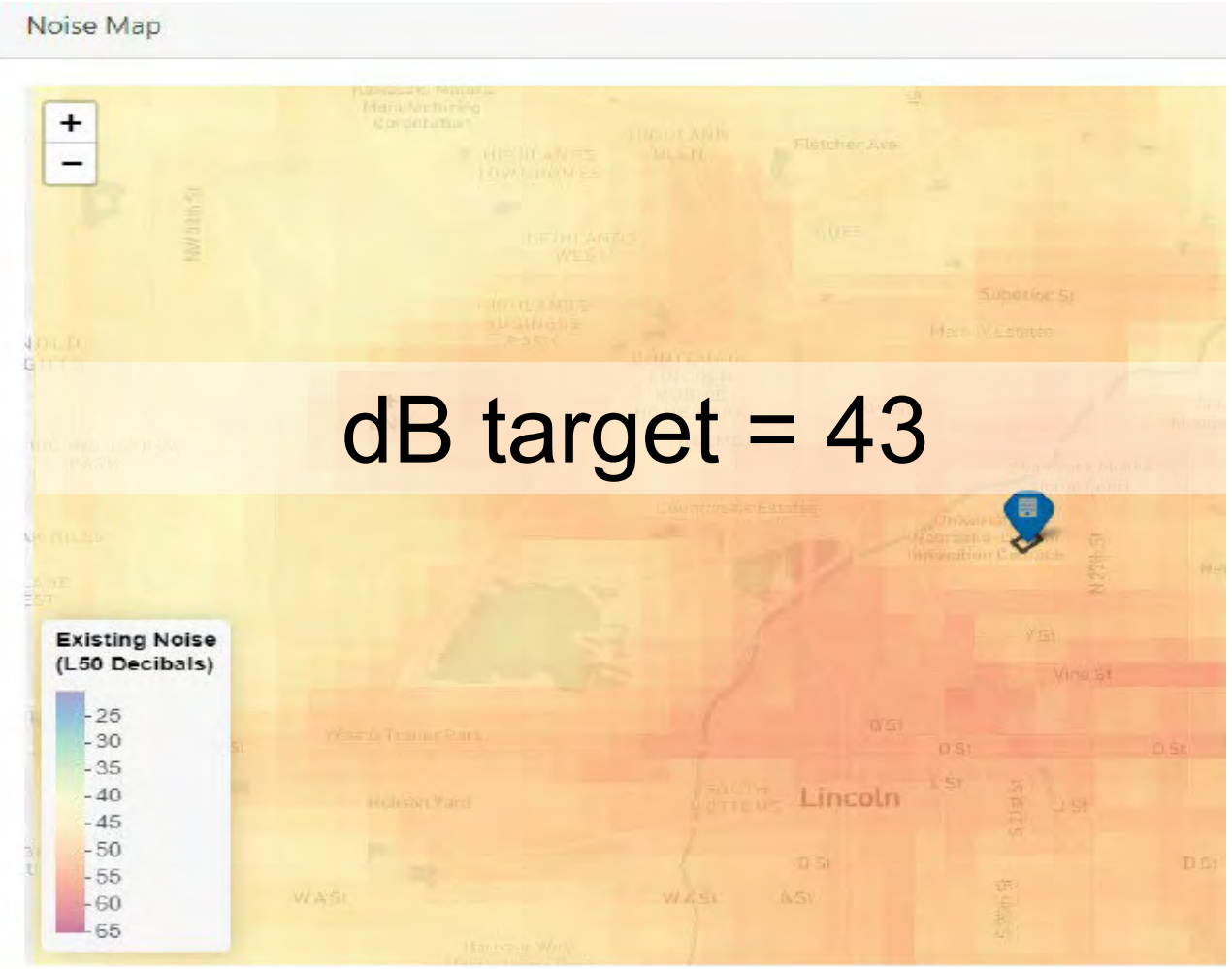
WATER- Runoff

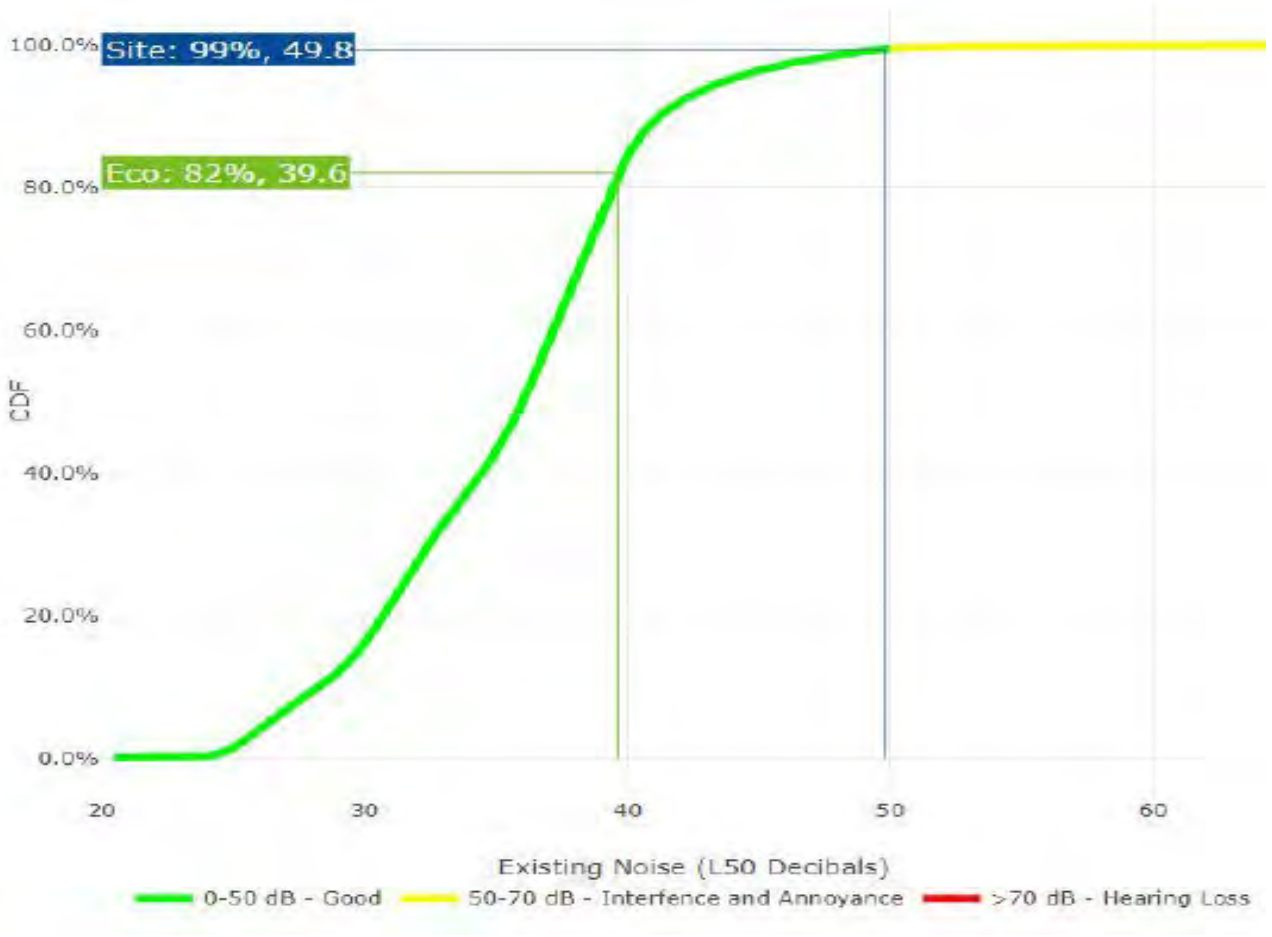


Site Planting Plan

L.O.B.

66% DROP IN PERFORMANCE WHEN EXPOSED TO DISTRACTING NOISE.





Banbury SP. and Berry DC. (1998) Disruption of Office-related Tasks by Speech and Office Noise. British Journal of Psychology 89:3, pp. 499–517.

LOB

Rendering of atrium

LOB

Rendering of breakroom

LOB

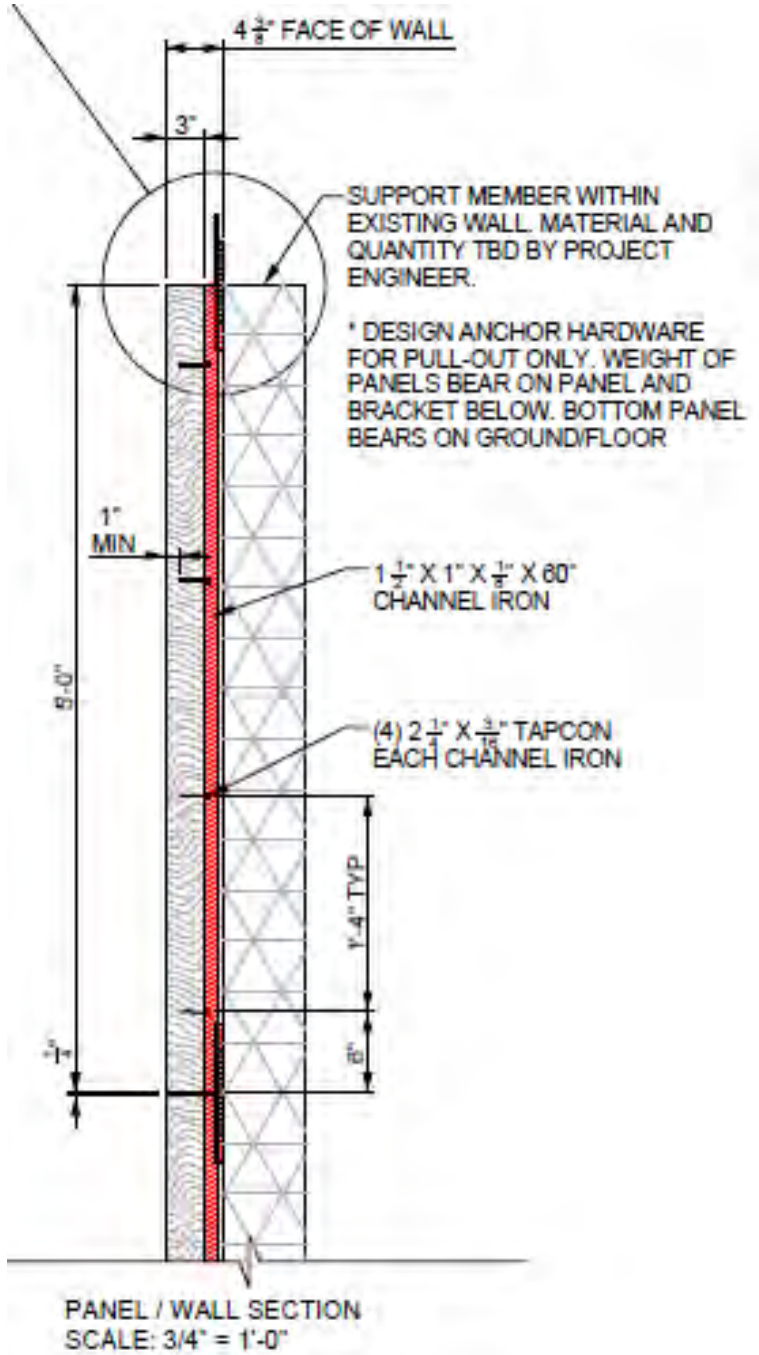
Rendering of collab hub corridor

LOB

Rendering of conference room

LOB

Rendering of lobby



PANEL / WALL SECTION
SCALE: 3/4" = 1'-0"

Effects on Public Health

Air pollution, a preventable risk

SLCPs, particularly O_3 and BC and co-pollutants, which are important parts of PM2.5 air pollution, are harmful to human health. Globally, PM2.5 is the leading environmental cause of poor health and premature death.

PREMATURE DEATHS YEAR 2010

GLOBALLY, **AIR POLLUTION** IS RESPONSIBLE FOR:

- **3,500,000** From **indoor** PM2.5 pollution
- **3,200,000** From **outdoor** PM2.5 polution
- **150,000** From **ozone** pollution

DISEASES DUE TO:

- PM2.5 AIR POLLUTION
- O_3

- Heart attacks
- Strokes, heart disease
- Congestive heart failure
- Lung cancer
- Chronic bronchitis
- Asthma
- Emphysema
- Scarred lung tissue
- Low birth weight

Approximate share of **premature deaths from AIR POLLUTION**

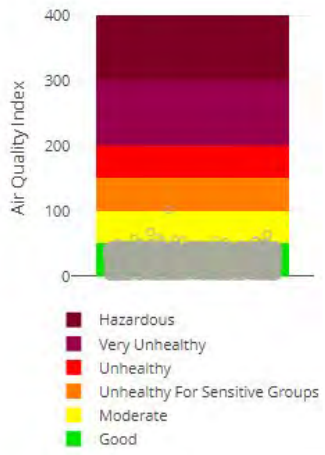
year 2010

Globally, **air pollution** is the **2nd leading risk factor** for the global burden of disease in 2010, behind high blood pressure, and together with **tobacco smoking,** including second hand smoke.

Air Quality Index potentially harmful 21% of the year

Daily AQI

Air Quality Index



Air Quality Monitor Map

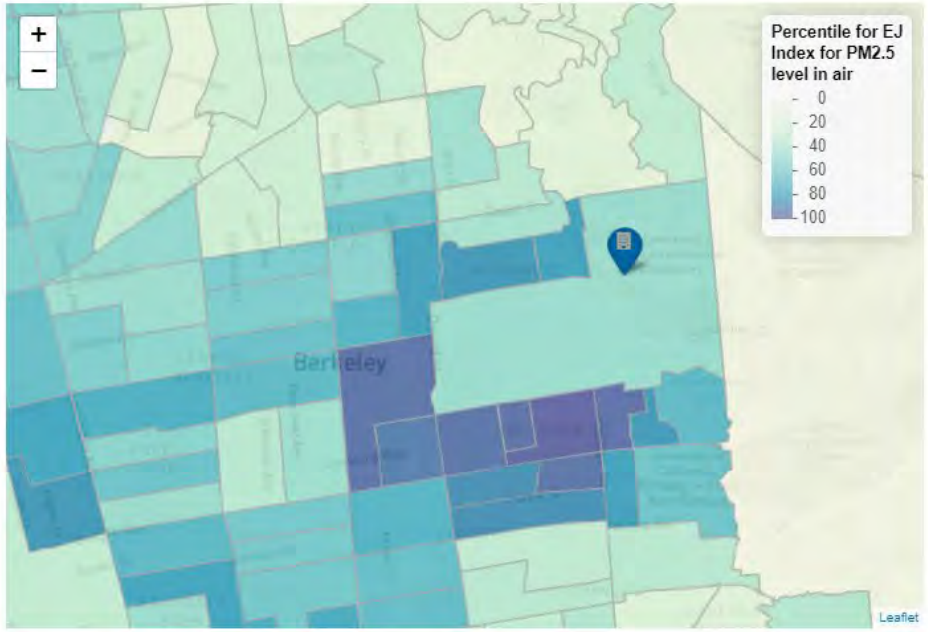
US Environmental Protection Agency. Air Quality System Data Mart Tables of Daily AQI available via https://www.epa.gov/airdata. Accessed September 03, 2020.

PM 2.5 levels 96th -100th percentile

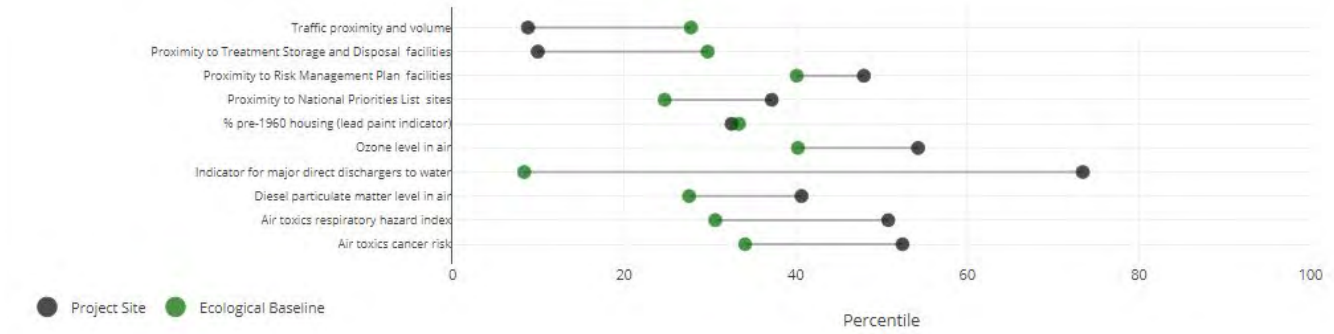
EJ Index

Percentile for EJ Index for PM2.5 level in air

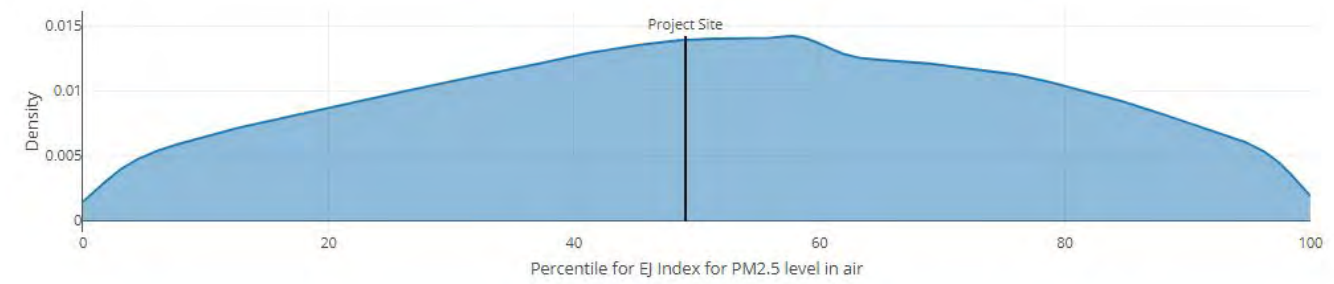
EJSCREEN Index Map



EJ Index Summary



EJ Index Distribution

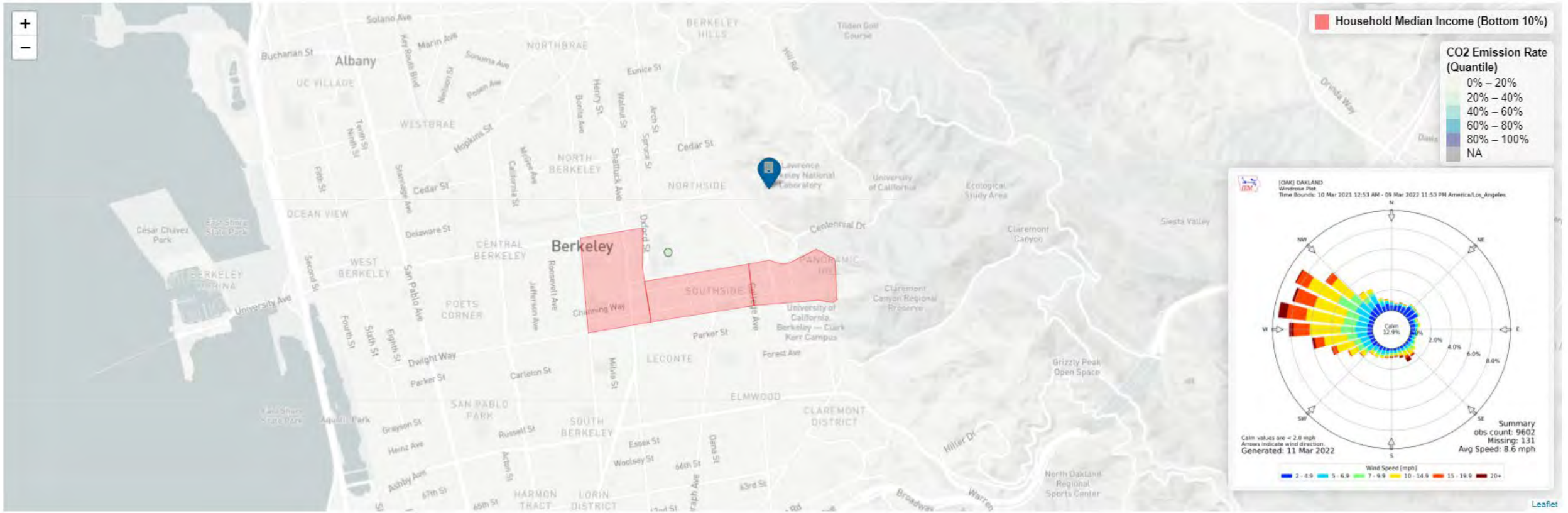


US Environmental Protection Agency. EJSCREEN available via https://www.epa.gov/ejscreen. Accessed March 17, 2021.

Disadvantaged Communities

Down-wind of Campus Cogen Plant

Source Emissions and Prevailing Winds



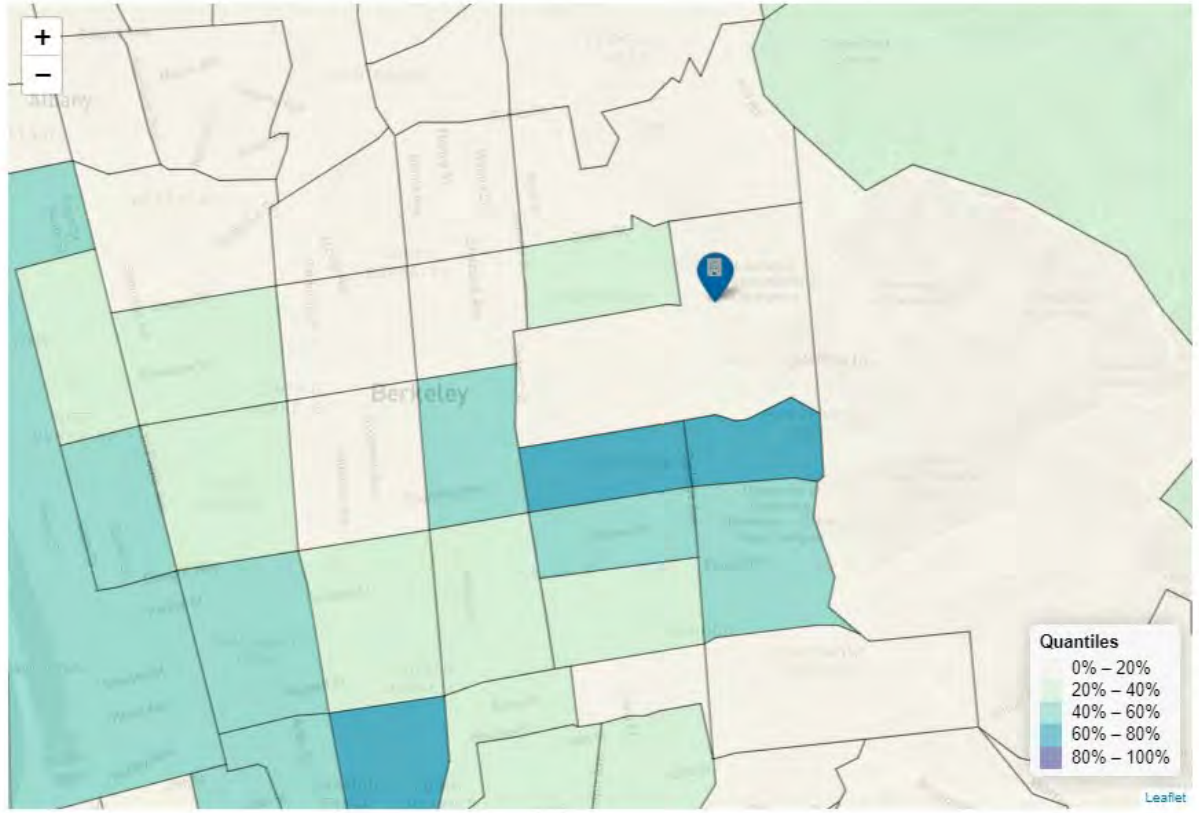
Community Health

79th percentile for Asthma

Children have 3X higher rates than the National Average

Health Outcomes EJSCREEN

Census Tract Map



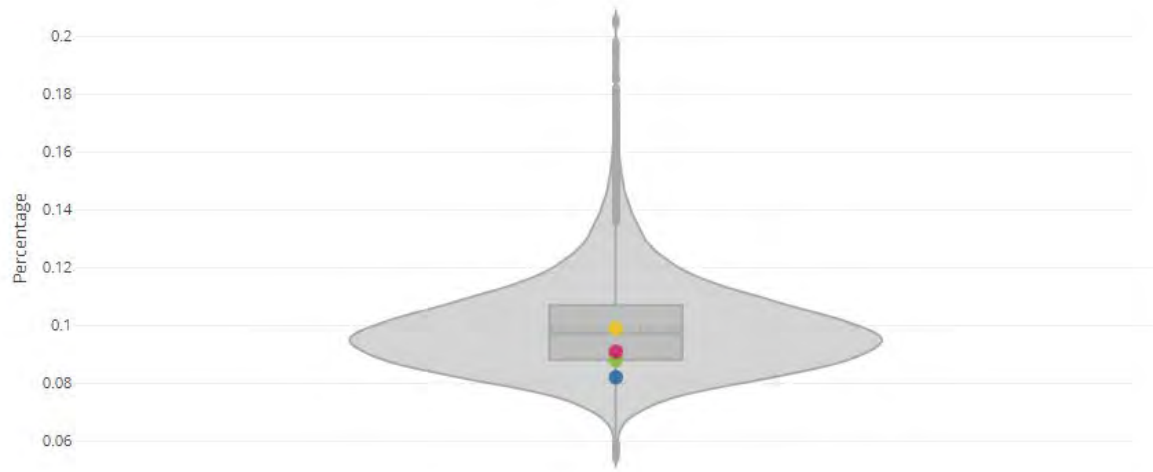
Health Metric

Current Asthma

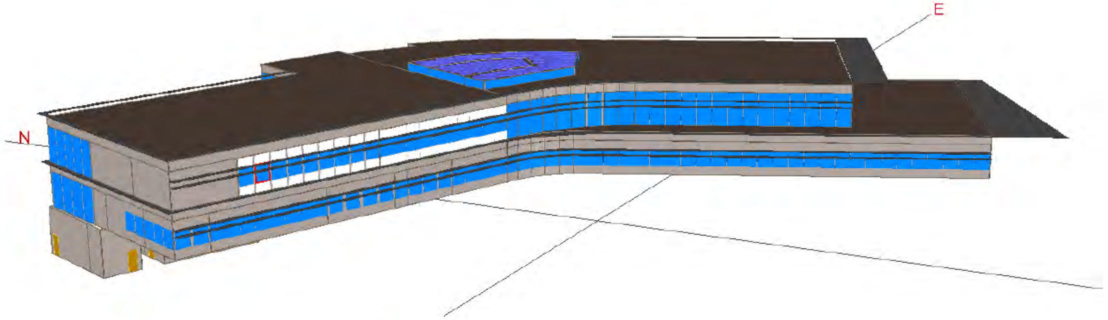
Benchmark

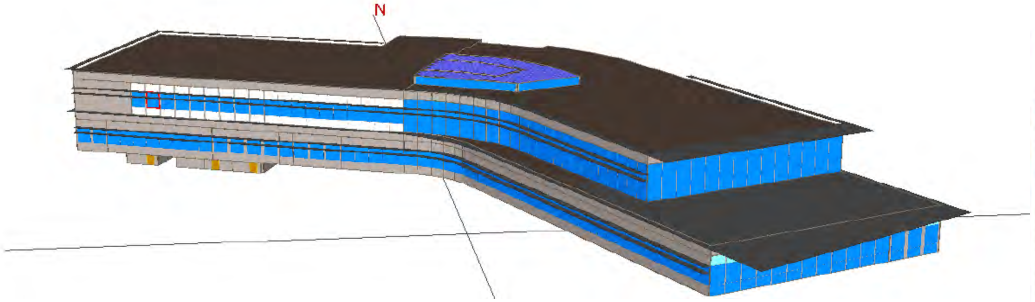
The **project site** is in the **12th** percentile. It is **7%** below **county** average, **10%** below the **state** average, and **17%** below the **national** average.

Distribution



LBNL Welcome Center | Project Spotlight





Benchmark (LBNL)	Predicted EUI (100p Model)	Design Target (50% of Benchmark)	Stretch Target (35% of Benchmark)
96 EUI	54 EUI	48 EUI	34 EUI


Aug 8, 2019, 09:03am EDT

Berkeley's All Electric Building Ordinance Is Good News For Proponents Of Induction Cooking

Mike DeSimone and Jeff Jenssen Contributor
Food & Drink

Aerial view of Berkeley, California from the Berkeley Hills, with University of California, the city ... [+]

Berkeley became the first city in the state of California and the nation to ban installation of natural gas lines in new low-rise buildings. In July, the Berkeley city council unanimously passed an


OPERATIONS

ENVIRONMENTALISTS URGE RESTAURANTS TO ACCEPT ALL-ELECTRIC KITCHENS

An alliance is asking the California Restaurant Association to drop its opposition to a ban on gas-fired equipment and collaborate on an all-electric future.

By Peter Romeo on Jan. 23, 2020

Photograph: Shutterstock

HDR

Architecture Sustainable Design & Energy Services (SDES) - Proposed Building Heat Gain Summary from Typical Food Prep Equipment, per ASHRAE Fundamentals 2013, Chapter 18

HDR Project Name:	LBNL Welcome Center
HDR Project #:	
Prepared By:	Greenfield
Revision Date:	11.04.2020

Form Revision Level: 04/22/2019 © HDR

Space Name:	Kitchen
Area (sf):	2,272

				Cooking Appliance Input Data				Heat Gain Data						Natural Gas & Electrical Consumption Data													
Equipment #	Equipment Name	Quantity	Electric or Natural Gas	Usage Factor (Fu)*	Hooded	Radiation Factor (Fr)*	Energy Rate (Btu/hr)	Sensible Radiant Hooded Heat Gain (Btu/hr)	Un-Hooded Heat Gain (Btu/hr)**	Sensible Radiant Un Hooded Heat Gain (Btu/hr)**	Un-Hooded Sensible Convective vs. Latent Ratio	Sensible Convective Un-Hooded Heat Gain (Btu/hr)**	Latent Un-Hooded Heat Gain (Btu/hr)**	ASHRAE Gas Usage (Btu/hr)	ASHRAE Elec Usage (W)	Current (Amps) #1	Voltage #1	Phase #1	Current (Amps) #2	Voltage #2	Phase #2	Diversity	Night Operation	Manual Input Elec Usage (W)	Selected Energy Rate Method	Worst Case Elec Usage (W)	Night Operation
2	Soda Box Rack	1	Elec	0.10		0		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	8	120	1				10.00%		96.0	MANUAL	96.0	0.0
3	Walk-In Cooler/Freezer	1	Elec	0.41		0.45		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	10.8	208	1				41.00%	Yes	921.0	MANUAL	921.0	921.0
12	Food Processor	1	Elec	0.10		0		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	15	120	1				10.00%		180.0	MANUAL	180.0	0.0
15	40 Quart Mixer	1	Elec	0.10		0		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	6.4	208	3				10.00%		230.6	MANUAL	230.6	0.0
20	Slicer w/ Stand	1	Elec	0.10		0		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	5.6	120	1				10.00%		67.2	MANUAL	67.2	0.0
26	Ice Machine/Bin	1	Elec	0.41		0.45		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	16	208	1				41.00%	Yes	1,364.5	MANUAL	1,364.5	1,364.5
29	Work Top Refrigerator	2	Elec	0.25		0.25		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	3	120	1				25.00%	Yes	180.0	MANUAL	180.0	180.0
45	Combi-Oven (Lower)	1	Elec	0.10	X	0.15		0.0	NA	NA		NA	NA	NA	0.0	26	480	3				10.00%		2,161.6	MANUAL	2,161.6	0.0
46	Combi-Over (Upper)	1	Elec	0.10	X	0.15		0.0	NA	NA		NA	NA	NA	0.0	26	480	3				10.00%		2,161.6	MANUAL	2,161.6	0.0
47	2-Deck Convection Oven	1	Elec	0.16	X	0.22		0.0	NA	NA		NA	NA	NA	0.0	14	480	3				16.00%		1,862.3	MANUAL	1,862.3	0.0
50	Range/Oven	1	NG	0.85	X	0.11	175,000	16,362.5	NA	NA		NA	NA	148,750.0	NA							85.00%		0.0	MANUAL	0.0	0.0
52	30 Gallon Tilt Skillet	1	Elec	0.10	X	0.04		0.0	NA	NA		NA	NA	NA	0.0	17.3	480	3				10.00%		1,438.3	MANUAL	1,438.3	0.0
54	40 Gallon Tilt Kettle	1	Elec	0.02	X	0.28		0.0	NA	NA		NA	NA	NA	0.0	23.6	480	3				2.00%		392.4	MANUAL	392.4	0.0
56	Open Burner Range	2	NG	1.01	X	0.1	175,000	35,350.0	NA	NA		NA	NA	353,500.0	NA							101.00%		0.0	MANUAL	0.0	0.0
61	Griddle Range/Oven	1	NG	0.23	X	0.18	125,000	5,175.0	NA	NA		NA	NA	28,750.0	NA							23.00%		0.0	MANUAL	0.0	0.0
62	Broiler	1	NG	0.77	X	0.12	90,000	8,316.0	NA	NA		NA	NA	69,300.0	NA							77.00%		0.0	MANUAL	0.0	0.0
63	Fryer/Filter	1	Elec	0.06	X	0.36		0.0	NA	NA		NA	NA	NA	0.0	9	120	1	21	480	3	6.00%		1,112.3	MANUAL	1,112.3	0.0
64	Glass Door Refrigerator	1	Elec	0.25		0.25		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	6.5	120	1				25.00%	Yes	195.0	MANUAL	195.0	195.0
73	U/C Dishmachine	1	Elec	0.27		0.34		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	24.7	208	1				27.00%		1,387.2	MANUAL	1,387.2	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
230	Refrigeration Systems	1	Elec	0.25		0.25		NA	0.0	0.0	100.0%	0.0	0.0	NA	0.0	38	208	3				25.00%	Yes	3,422.5	MANUAL	3,422.5	3,422.5
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0
								NA	0.0	0.0		0.0	0.0	NA	NA							0.00%		0.0		0.0	0.0

Notes:
*Per ASHRAE Fundamentals 2013, ch 18, Tables 5A, 5B, 5C & 5D. **Per ASHRAE Fundamentals 2009, 18.8, 'Unhooded Equipment'

Electric Load Totals

Total Electrical Input	17,172.51	Watts
Total Electrical Input Density	7.56	W/sf
Total Hooded Sensible Radiant Heat Gain	0.00	Btu/hr
Total Un-Hooded Heat Gain	0.00	Btu/hr
Total Un-Hooded Sensible Convective + Latent Heat Gain*	0.00	Btu/hr
Total Un-Hooded Latent Heat Gain*	0.00	Btu/hr
Total Un-Hooded Sensible Radiant Heat Gain*	0.00	Btu/hr

*Per ASHRAE Fundamentals 2009, 18.8, 'Un-hooded Equipment'

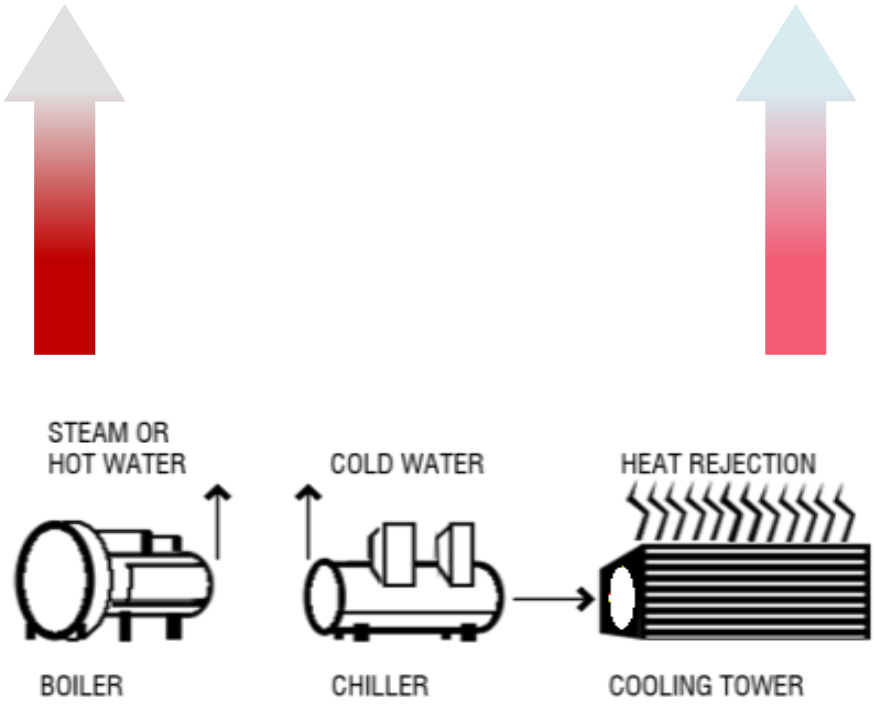
Total Sensible Radiant Heat Gain (hooded + un-hooded)	0.00	Btu/hr
Total Sensible Convective Heat Gain (un-hooded)	0.00	Btu/hr
Total Latent Heat Gain (un-hooded)	0.00	Btu/hr
Total Heat Gain (hooded + un-hooded)	0.00	Btu/hr
Total Sensible Heat Gain (hooded + un-hooded)	0.00	Btu/hr
Total Latent Heat Gain (hooded + un-hooded)	0.00	Btu/hr
Total Heat Gain (hooded + un-hooded)	0.00	Btu/hr
% Sensible of Total (hooded + un-hooded)	0.00%	%
% Latent of Total (hooded + un-hooded)	0.00%	%

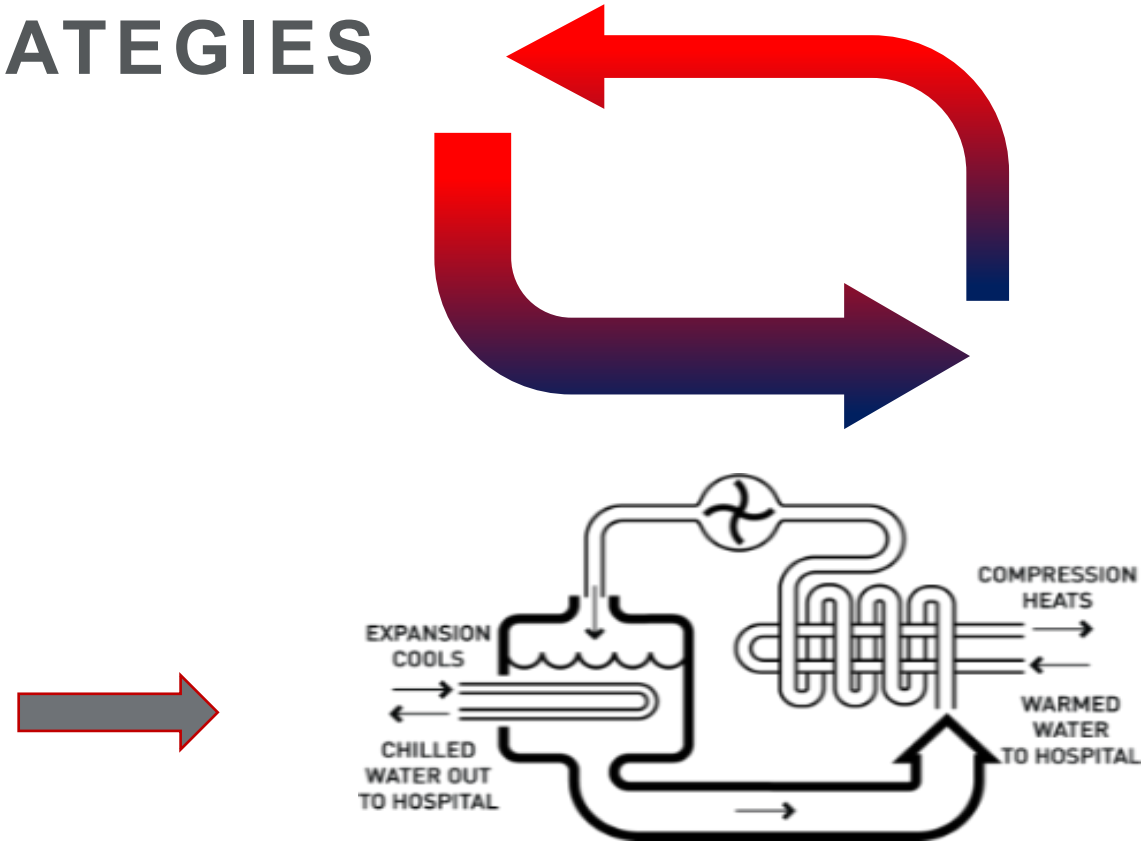
Kitchen/Servery - Monday-Friday Food Preparation ELECTRIC Loads

Schedule Notes:

% Sensible of Total LOAD (hooded + un-hooded)	0.00%	%
% Latent of Total LOAD (hooded + un-hooded)	0.00%	%

ELECTRIFICATION STRATEGIES





Combustion / Evaporation

Resource intensive

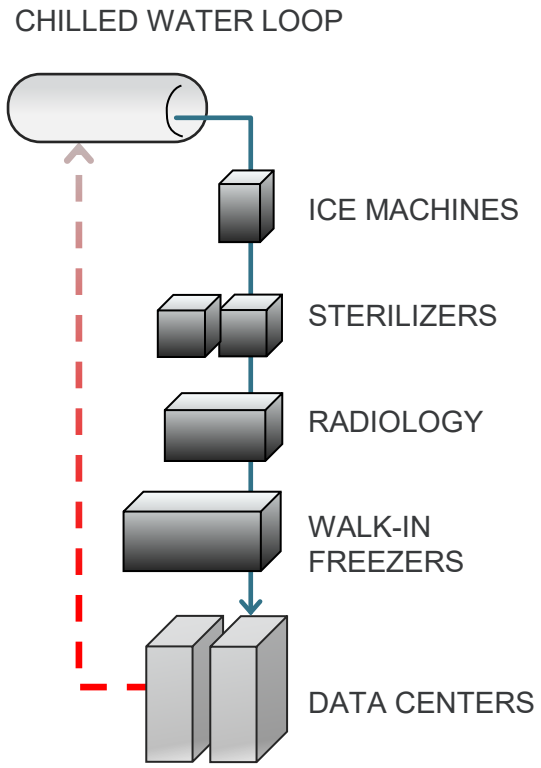
- Creates greenhouse gasses from fossil fuel
- Consumes huge quantities of fresh water
- Pollutes local communities
- Creates risk of legionella

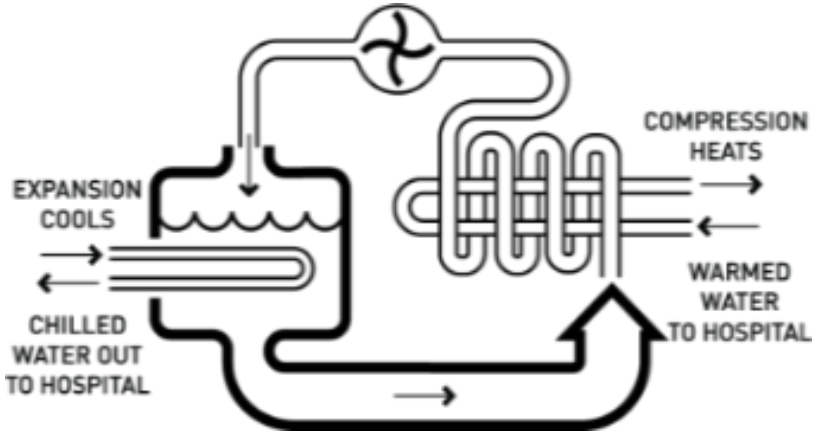
Heat Pumping Technology

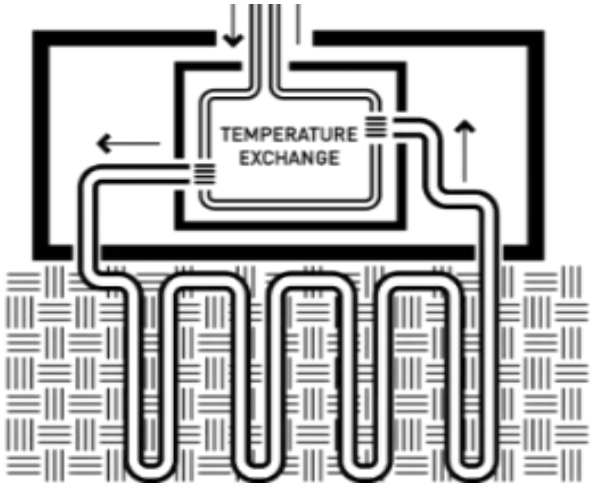
Conserves resources

- High efficiency heating and cooling
- No water consumption
- Requires balanced loads across seasons
- Uses electrical energy

ELECTRIFICATION STRATEGIES







PROCESS LOAD HEAT REJECTION

- Provides winter cooling demand
- Avoids waste heat management

HEAT RECOVERY CHILLERS

- Provides simultaneous thermal resources
- Manages thermal needs for 80-90% of year

GROUND SOURCE HEAT PUMPS

- Meets seasonal extremes
- Stores thermal resources from summer to winter

HDR ZERO ENERGY SOLAR HYDROGEN TOOL | POWER & HYDROGEN CYCLE

Zero Energy Solar Hydrogen Hospital [Omaha, NE]

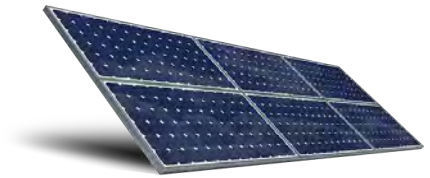
04.21.2023

SOURCES

CONVERSION

STORAGE

DELIVERY



Solar Photovoltaic Array

SunPower SPR-X21-345 COM PV Array | 345 W (DC) peak, Monocrystalline | Quantity: 10442

Annual Solar Generation | 4,951,803 kWh (DC)

Solar PV System Size | 3,602 kW (DC)

Area Weighted Solar Potential | 1,313.08 kWh (AC) / kW (DC)

Solar Variability | 1.97 Avg kWh (monthly) / Min kWh (monthly)

Green Hydrogen Solar Usage Effectiveness [SUE]

1.60

Green Hydrogen Solar-to-Facility Utilization

62.6%

Green Hydrogen Solar-to-Facility Utilization w/o Direct-to-Facility Solar & Direct-to-BESS Solar

31.2%

Annual Green Power Direct-to-Facility | 2,686,779 kWh (DC)

DC-to-AC Inverter

Hydrogen Electrolyzer

NEL Electrolyzer | 300 Nm3/hr rated | Quantity: 4

Annual Green Power Consumption | 2,468,380 kWh (AC)

Annual Hydrogen Generation | 50,422 kg H2

Annual Water Consumption | 504,896 Liters

Hydrogen Compression

350 Bar Hydrogen Compression | 55.29 kg H2/hour | Quantity: 2

Annual Compression Energy | 110,928 kWh (AC)

Annual Green Power Direct-to-Facility | 1,597,181 kWh (DC)

Annual Green Power Direct-to-BESS | 667,844 kWh (DC)

Building Energy Storage System

ST556KWH-250UD Battery Bank | 556 kWh_BOL, 250 Nominal AC Power (kVA) | Quantity: 4

Annual Power Storage | 667,844 kWh (DC)

Hydrogen Storage Tank System

X-STORE 40 ft. | 39,900 Liters H2 rated | Quantity: 23

DC-to-AC Inverter

Annual Power Inversion | 2,265,025 kWh (DC)

Annual Power Inversion | 2,174,424 kWh (AC)

Hydrogen Fuel Cell System

BloomEnergy Hydrogen Energy Server | 300 kW (AC) rated | Quantity: 3

Annual Hydrogen Consumption | 50,314 kg H2

Annual Heat Recovery Potential | 1,796,700 kBTU

Annual Power Generation | 802,457 kWh (AC)

Annual Green Power Delivery | 2,976,880 kWh (AC)

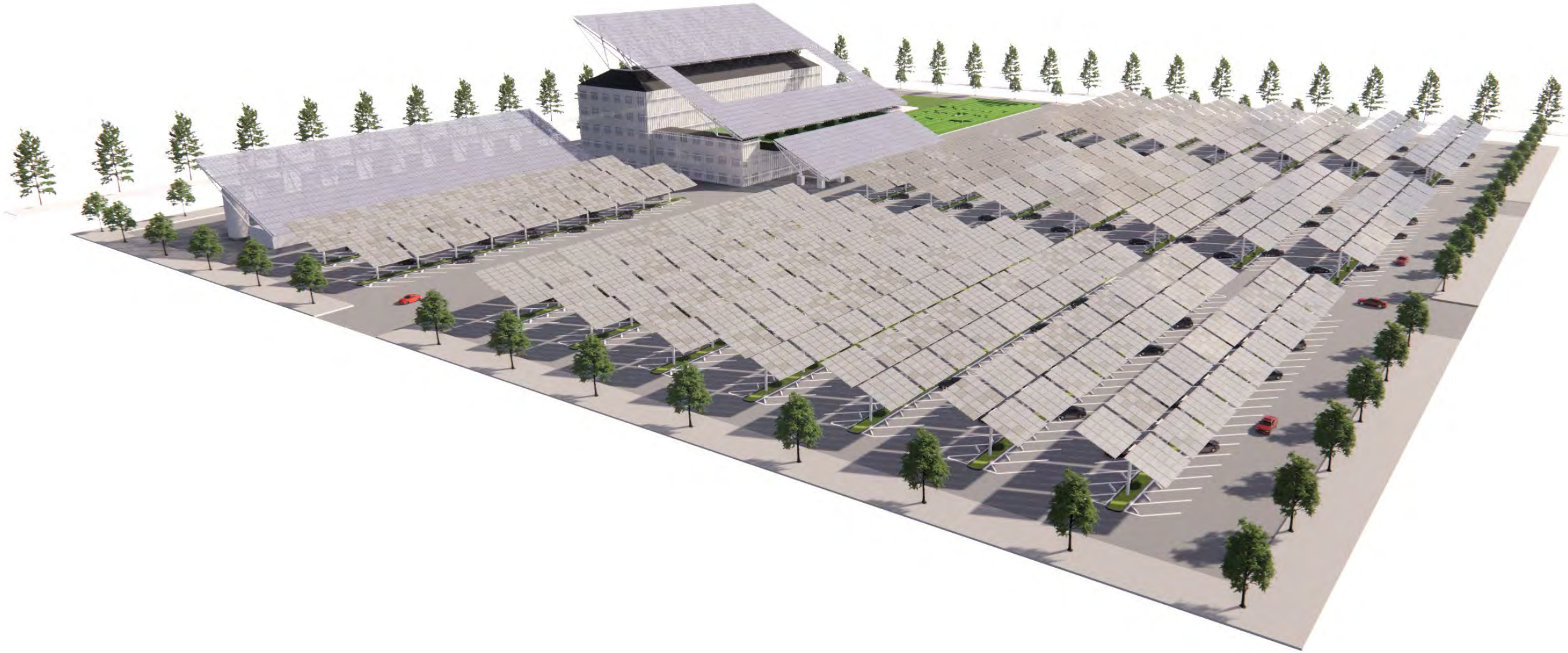
127,000 ft2 Hospital

2,976,880 kWh (AC) Electricity Load

2,150,021 kBTU/year Heating Load

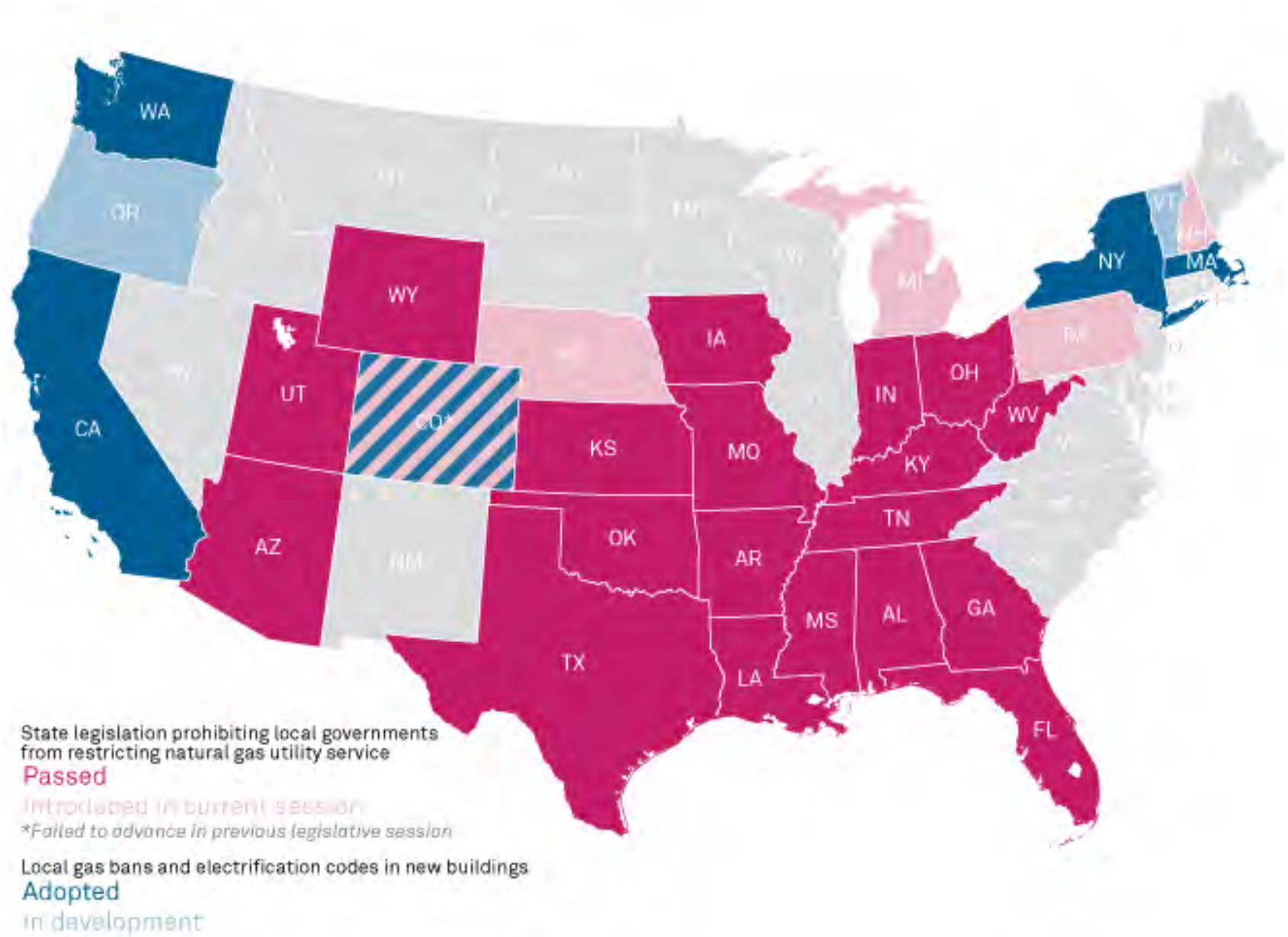
3,465,923 kBTU/year Cooling Load

Vision

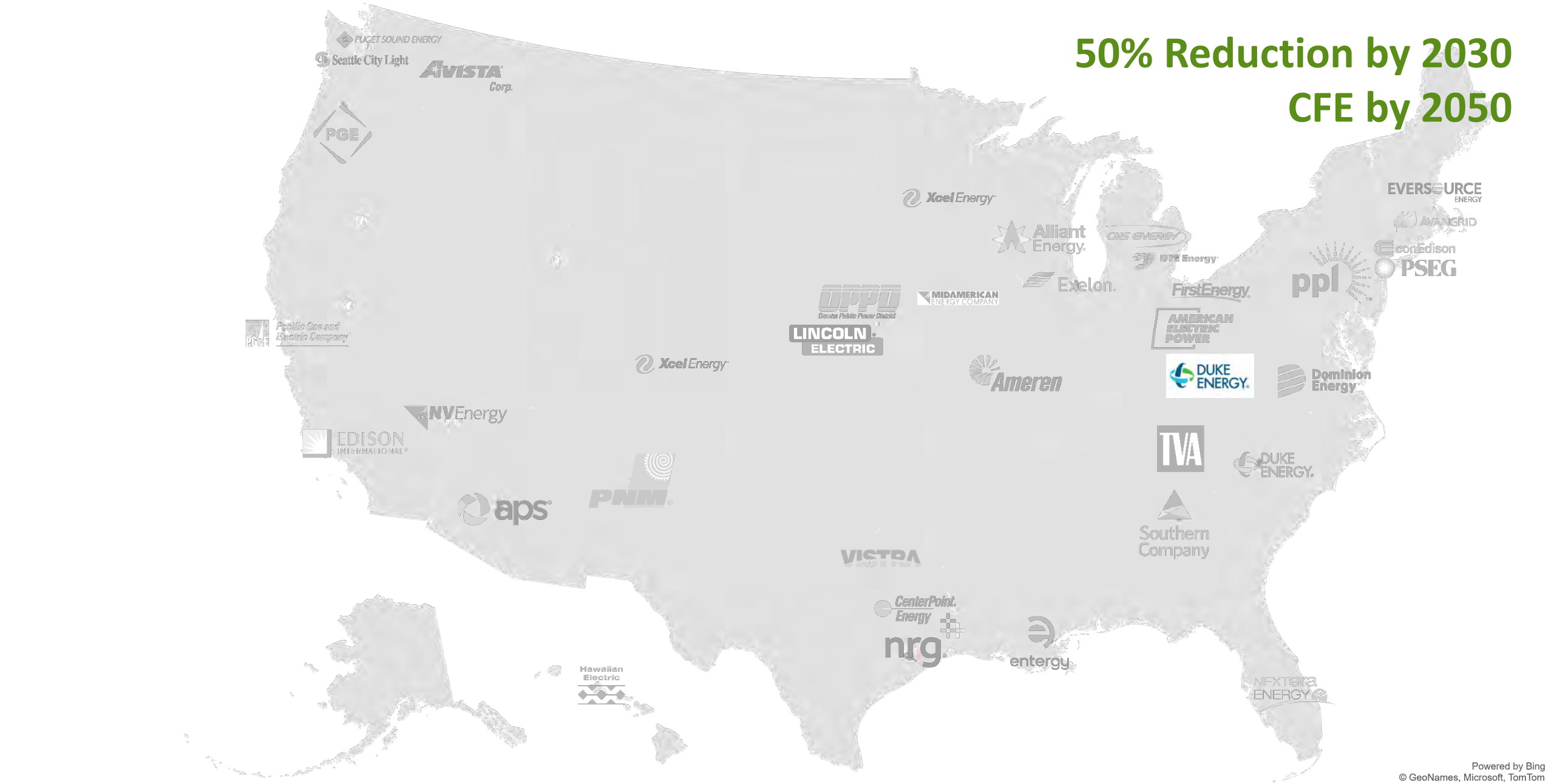


States **ADVANCING** or **PROHIBITING** Building Gas Bans and Electrification Codes

[As of January 2022]



Electric Utility & Power Gen Companies | Carbon Neutrality Target Dates



Equity Engagement

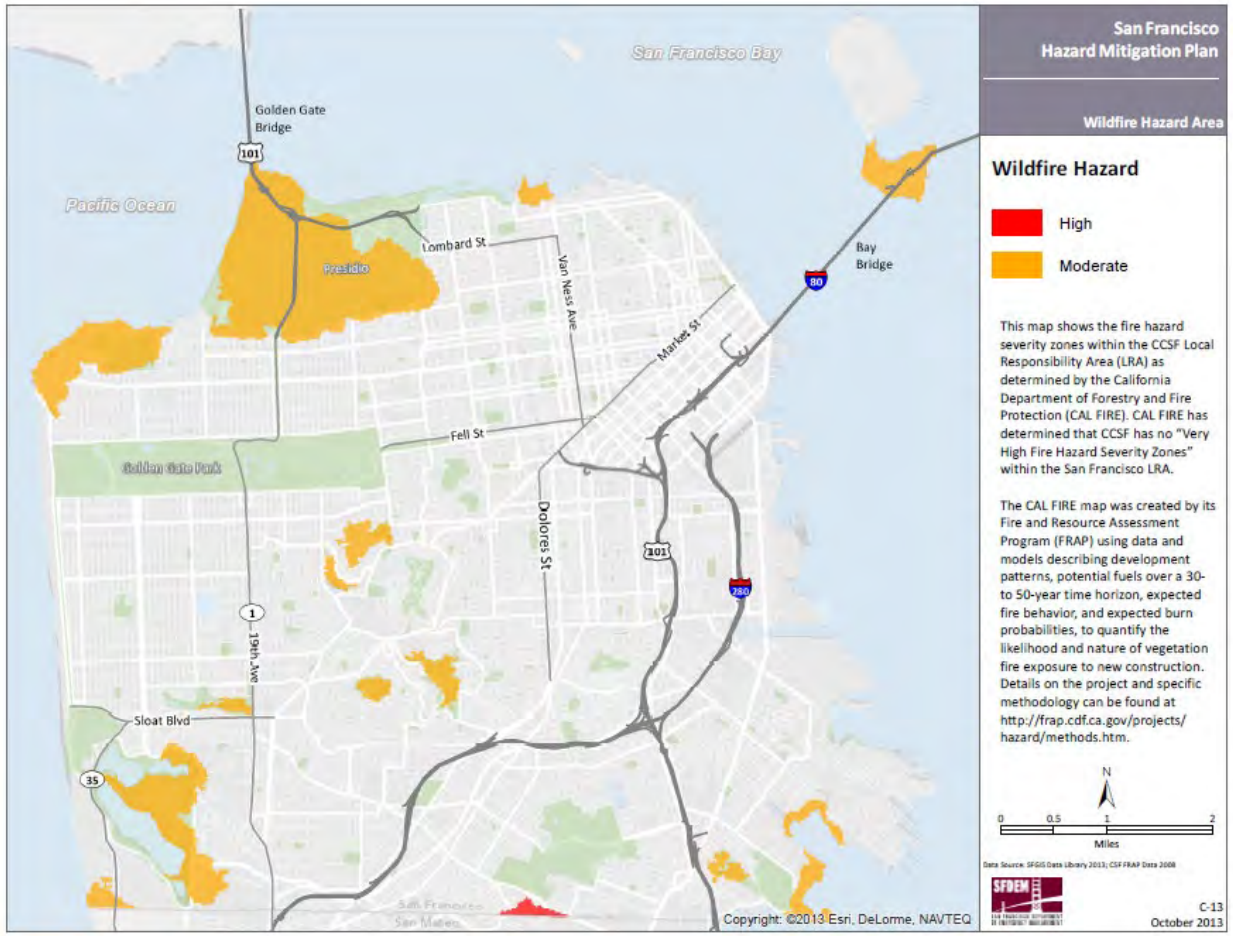
Social Context

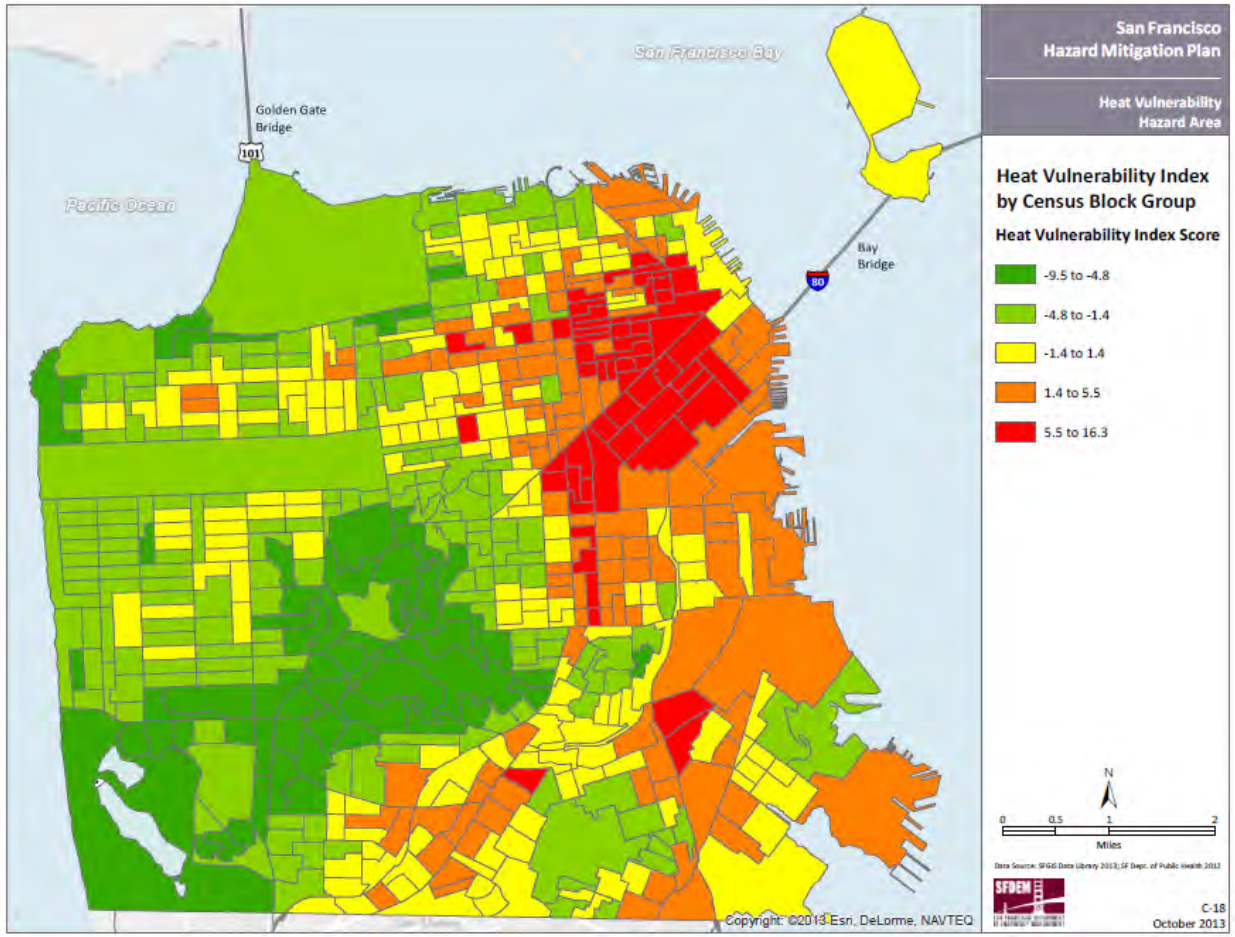
400% increase in disasters in the last 10 years disproportionally impact disadvantaged communities

**FEMA / UN*

Social Context

Natural Disaster and Heat Stress Impacts

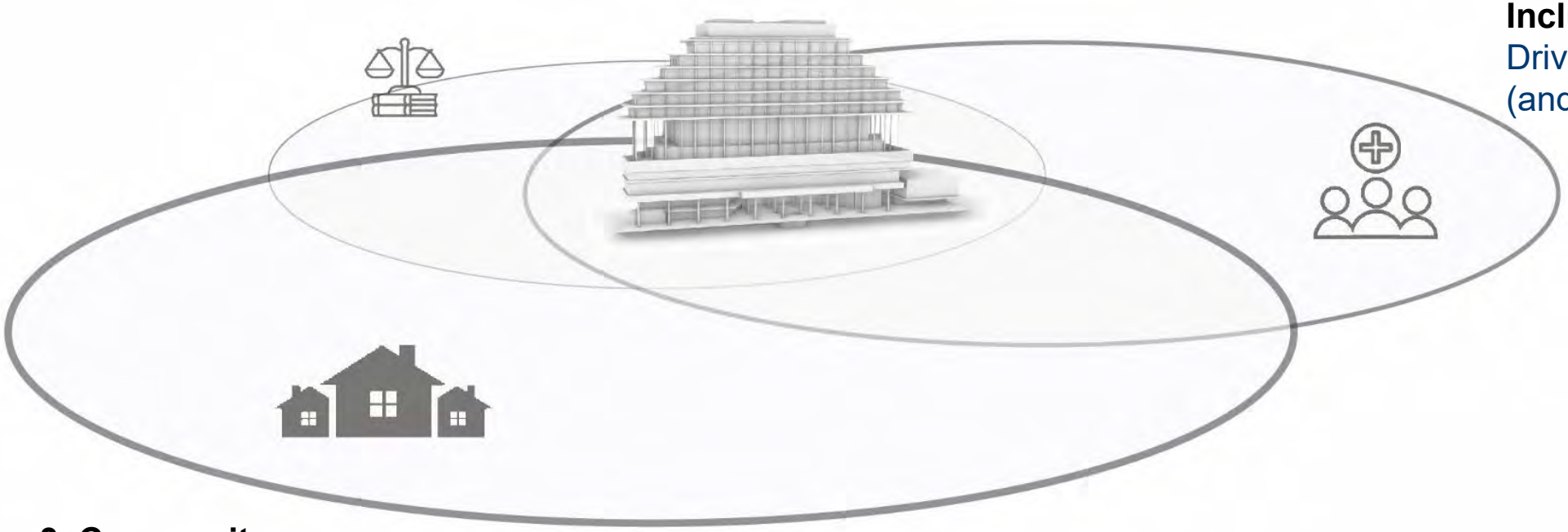




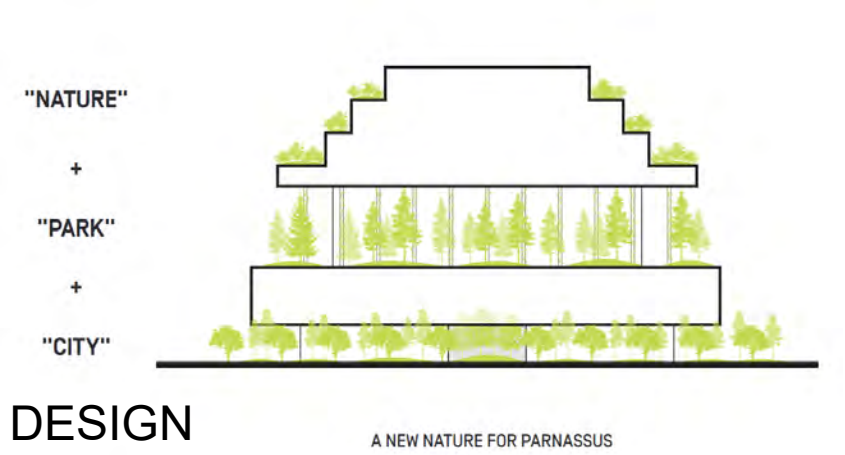
Ongoing Partnerships

1. Entitlements
Drivers: Law and Regs

2. Accessibility and Inclusiveness
Drivers: Policy and Staff (and Law)



3. Community Engagement and Partnerships
Drivers: Local needs and deficits



DESIGN

Design Equity

- Public Access to Nature, Ecosystem Biodiversity
- Scale Reduction
- Additional Services – Daycare, Child Care, Disaster Relief and Heat Island Shelter, Homeless

CONSTRUCTION

Construction Equity

- Local hiring and Business Inclusion
- High School internship program
- Air and Noise Pollution Mitigation

OPERATIONS

Operational Equity

- Local Retail partners
- Job Training and apprenticeships
- Security De-escalation training

Community Equity

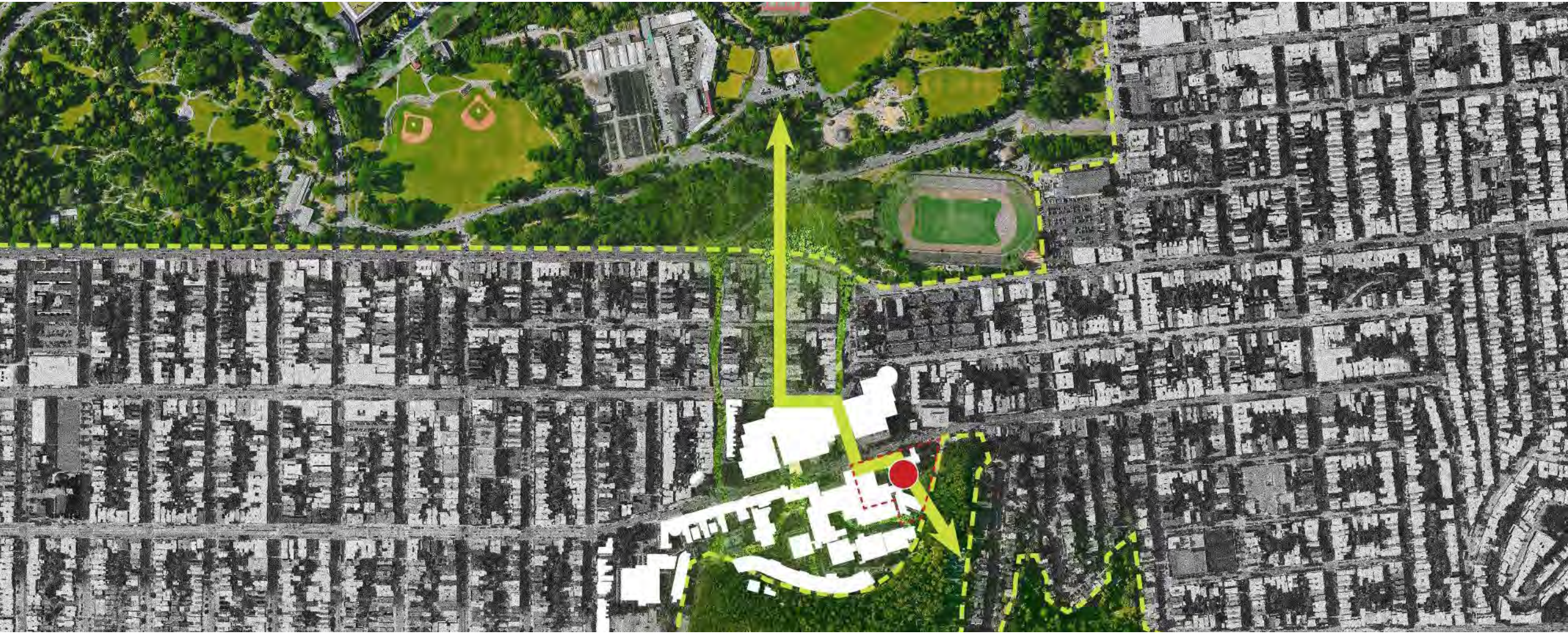
Park to Peak

Park to Peak


HANGERS
CANOPY
CLIMBERS
SMALL TREES
SHRUBS
PERENNIALS &
GROUNDCOVERS
ROOT ZONE
RHIZOSPHERE

Community Equity

Park to Peak



“The project is not the project.

The project is the SYSTEM.”

-Bill Reed
Regenesis

Organizations don’t change… people do.