Can Buildings Function like Forests?

Nature as a model for Positive Performance

ReBuild Conference 2022

BIOMIMICRY 3.8

BIOMIMICRY 3.8

Where does 3.8 come from? It's a reference to life's…

- 3.8 billion years on Earth
- 3.8 billion years of evolutionary testing
- 3.8 billion years of free R&D!

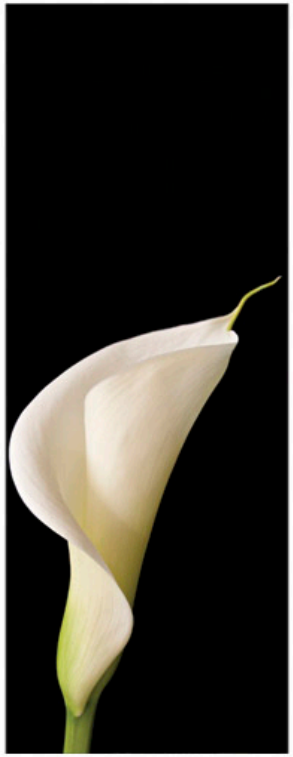
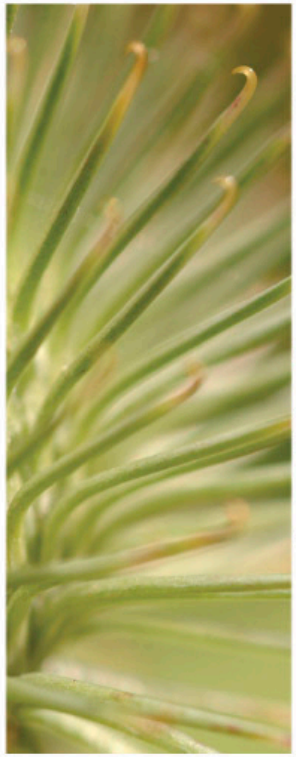
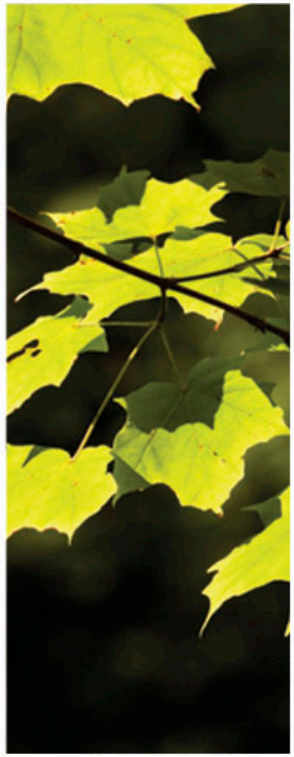
Since 1998, we've worked with 150+ clients

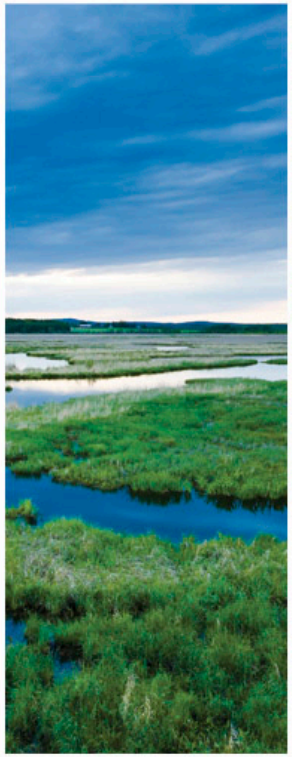
Whether it's creating a green replacement for polyurethane or a factory that functions like a forest, we have collaborated with innovation teams and individuals at companies in over 25 industries to help them achieve competitive advantages through biomimicry.

Nature as model, measure, and mentor

Biomimicry is a new way of viewing and valuing nature, based not on what we can extract from the natural world, but on what we can learn from it.

function as a bridge between biology and solutions




form process system

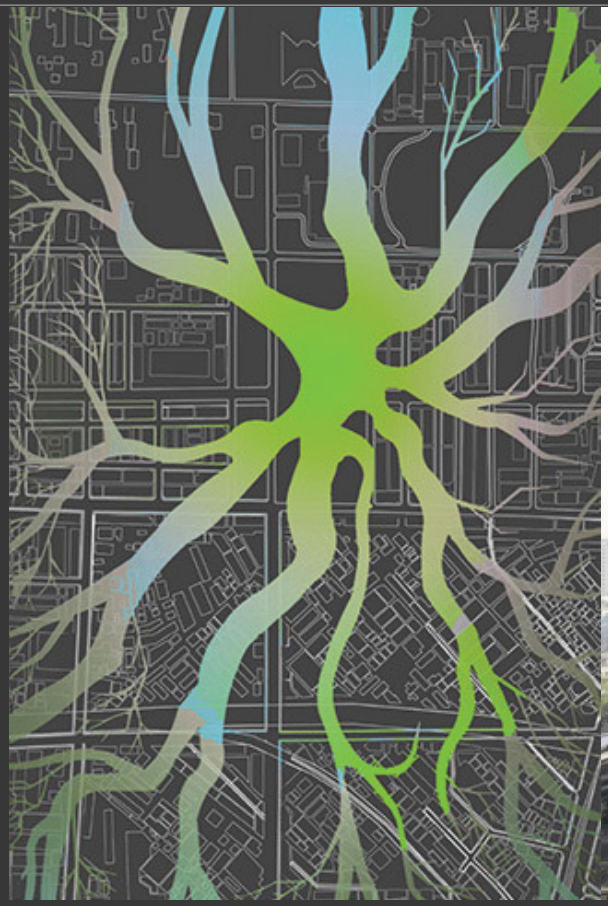
Image: © ICD/ITKE University of Stuttgart

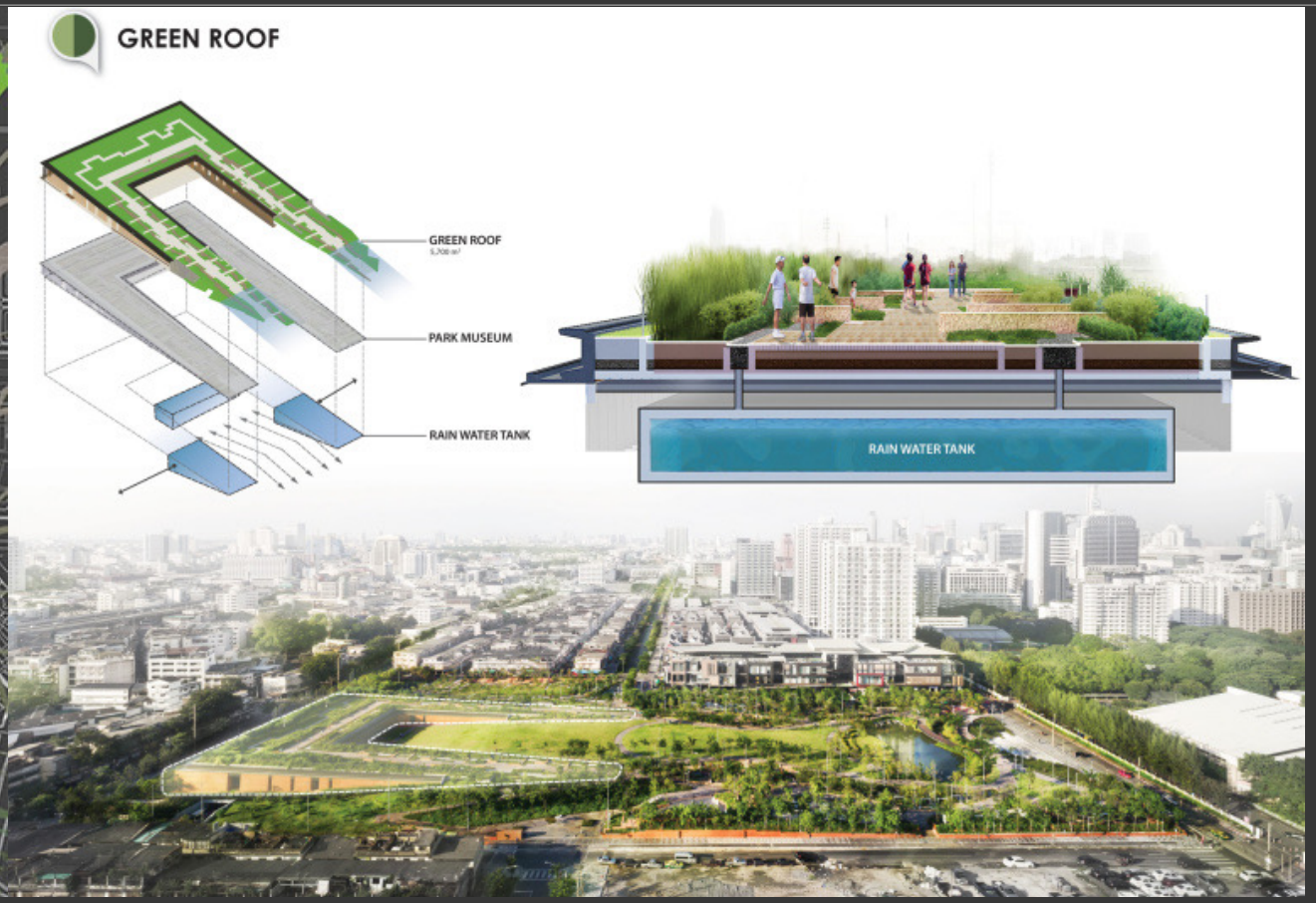
University of Stuttgart, Germany

ICD-ITKE Research Pavilion

City of Melbourne

Council House 2 (CH2)





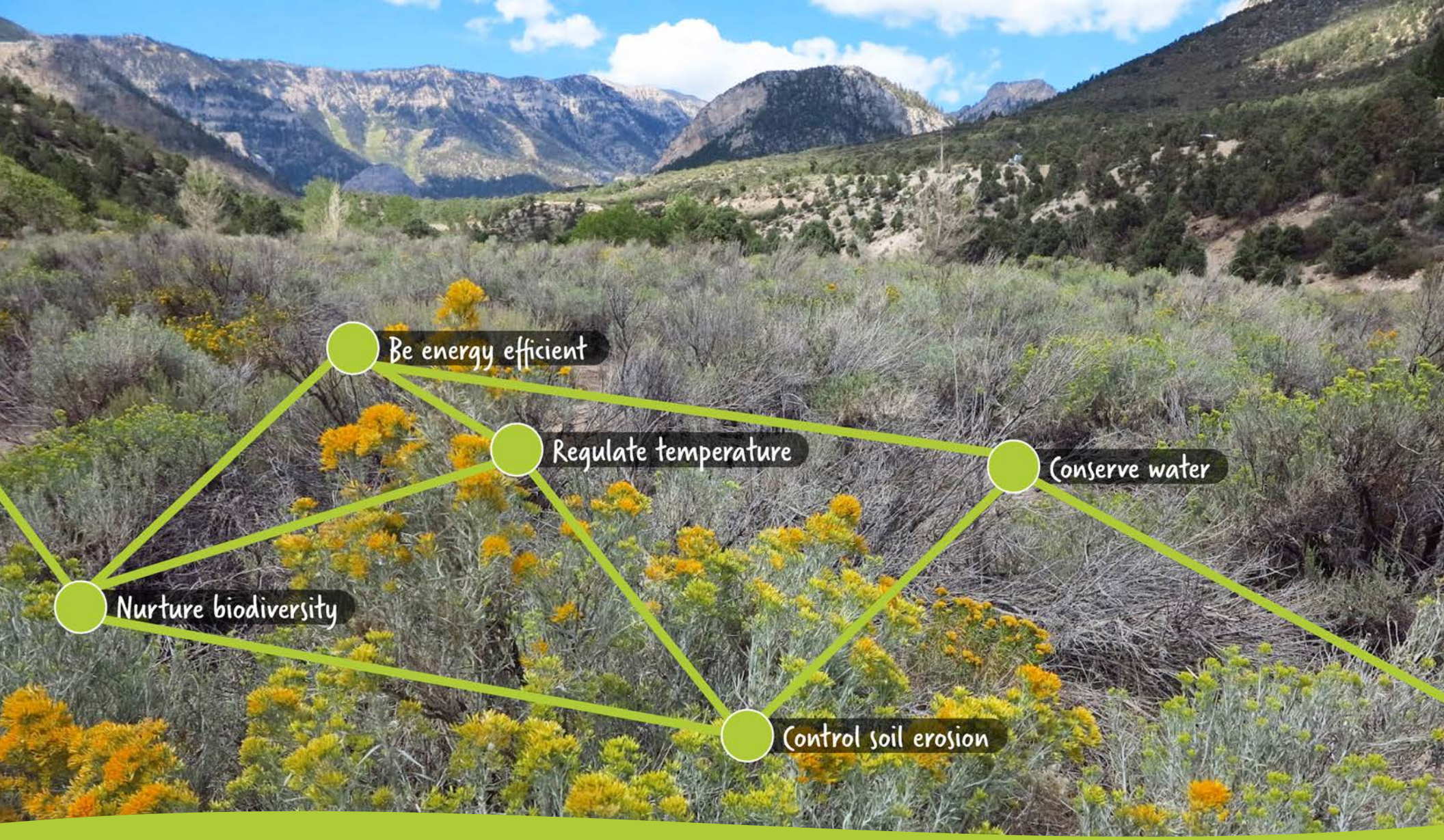
Land Process Design

Chulalongkorn Centennial Park, Thailand


Can a building
function
like a forest?

"When the forest and the city are functionally indistinguishable, then we know we've reached success.

~ Janine Benyus, Author of *Biomimicry: Innovation Inspired by Nature*, Co-founder of Biomimicry 3.8



ECOSYSTEMS ARE GENEROUS

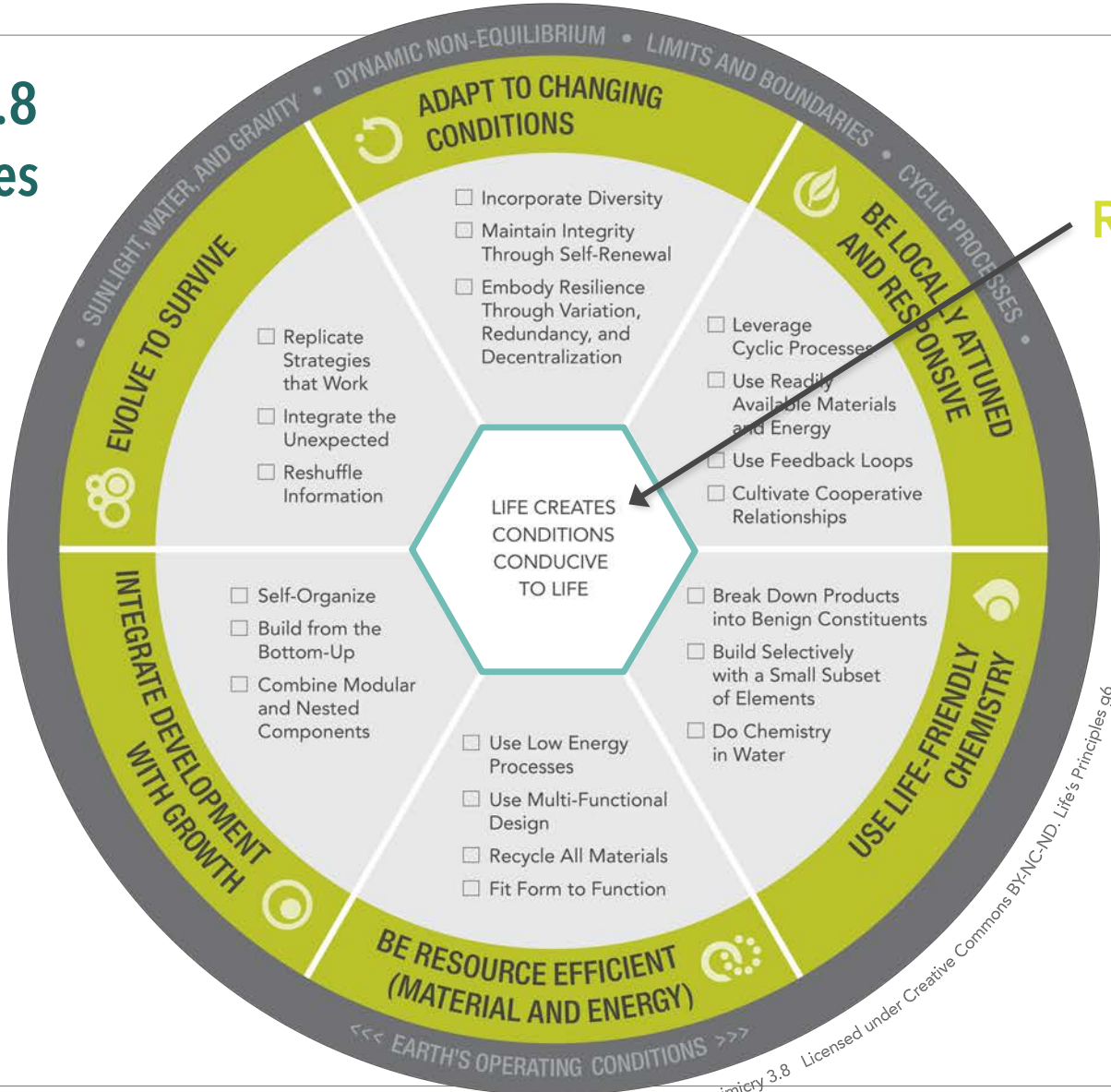
FACILITIES CAN BE TOO

Both Infrastructure and Ecostructure
would contribute services


with multiple benefits from every design


BENCHMARK
ECOSYSTEM METRICS
DESIGN GENEROUSLY
NATURE'S GUIDANCE
1
2
3
4
IDENTIFY
local context and conditions of place and/or site
QUANTIFY
baseline performance and targets based on local reference ecosystems
CREATE
design guidelines and strategies to emulate ecosystem peformance metrics
IMPLEMENT
strategies to move toward positive performance

Biomimicry 3.8
Life's Principles



Regenerative

A quantifiable and defensible approach to “positive”

A locally relevant and scalable framework

Programmatic approach, aligns w/ existing goals

Improve biodiversity, planet and public health

Become a welcome neighbor

Engage employees, improve performance and retention

Positive Performance Methodology

BIOMIMICRY 3.8

esg

h+k

JACOBS

Working together with industry leaders to
further support data, design, and implementation.

FACITILIES

Exterior and Interiors

OPERATIONS

Products, Process, Supply Chain

STRATEGY

Mindset Transformation

Multiple entry points and ability to scale

A holistic data driven and science-based approach to regenerative


BENCHMARK
ECOSYSTEM METRICS
DESIGN GENEROUSLY
NATURE'S GUIDANCE
1
2
3
4
IDENTIFY
local context and
conditions of place
and/or site

1 Identify What Matters

Study the local, healthy ecosystems near the project site. Understand stakeholder needs: nature, community, and client (business). Align needs by prioritizing the vital ecosystem services for the project.

These vital ecosystem services include:

- Carbon sequestration
- Biodiversity support
- Air filtration
- Water storage
- Nutrient cycling

Nature of Place (NoP)

NoP is the foundation for the Positive Performance methodology

- Scoping to understand site context
- Where we are in the world
- What makes this place unique
- Who lives here (species assemblages)
- What matters to this place and why (community and ecological perspective)

NoP outcomes

- Identifies functional needs: function is the bridge to using biological intel
- Informs what we measure to quantify positive
- What we should be aiming for to function like the wildlands next door
- What benefits we need to deliver to be a welcome neighbor

How can your company become a welcome neighbor?

+ Cycle Nutrients

+ Sequester Carbon

+ Create Connections

+ Create Healthy Soils and Food

+ Purify Air

+ Support Biodiversity

+ Improve Stormwater Management

Functional needs identified based on contextual data (Example)

Soil health - soil salinity (driven by groundwater withdrawal), organic content, and soil biodiversity

Biodiversity - pollination, pest control (focus on habitats that support pollinators and pest regulating species (primarily birds)

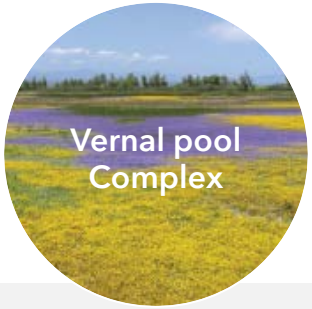
Water quantity and quality - stormwater runoff management, groundwater recharge, water use and water quality

Air quality - nitrogen removal opportunities (and controlling emissions)

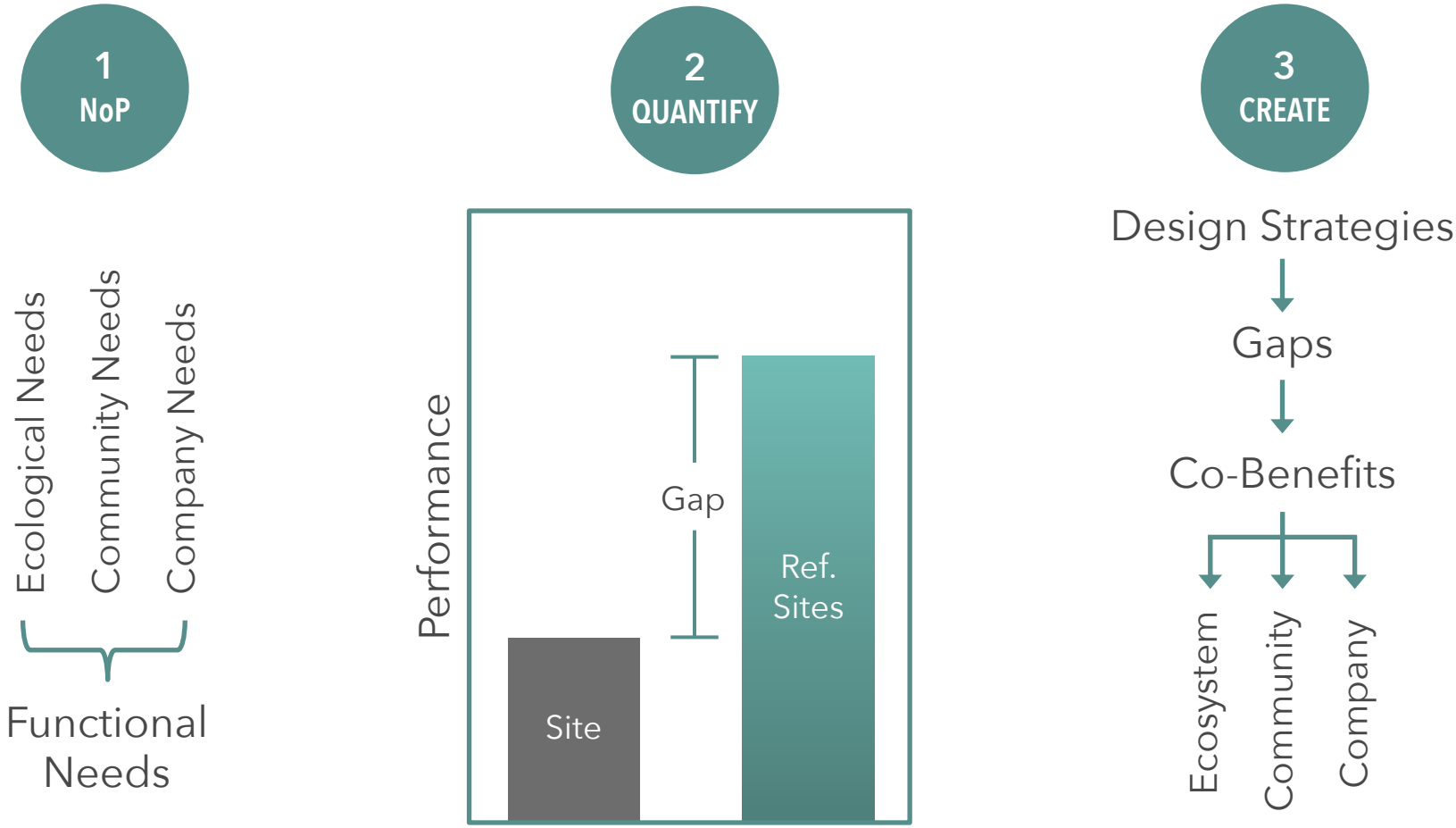
Aesthetics - the visual blight created by generic urban forms is particularly impactful in this flat open landscape

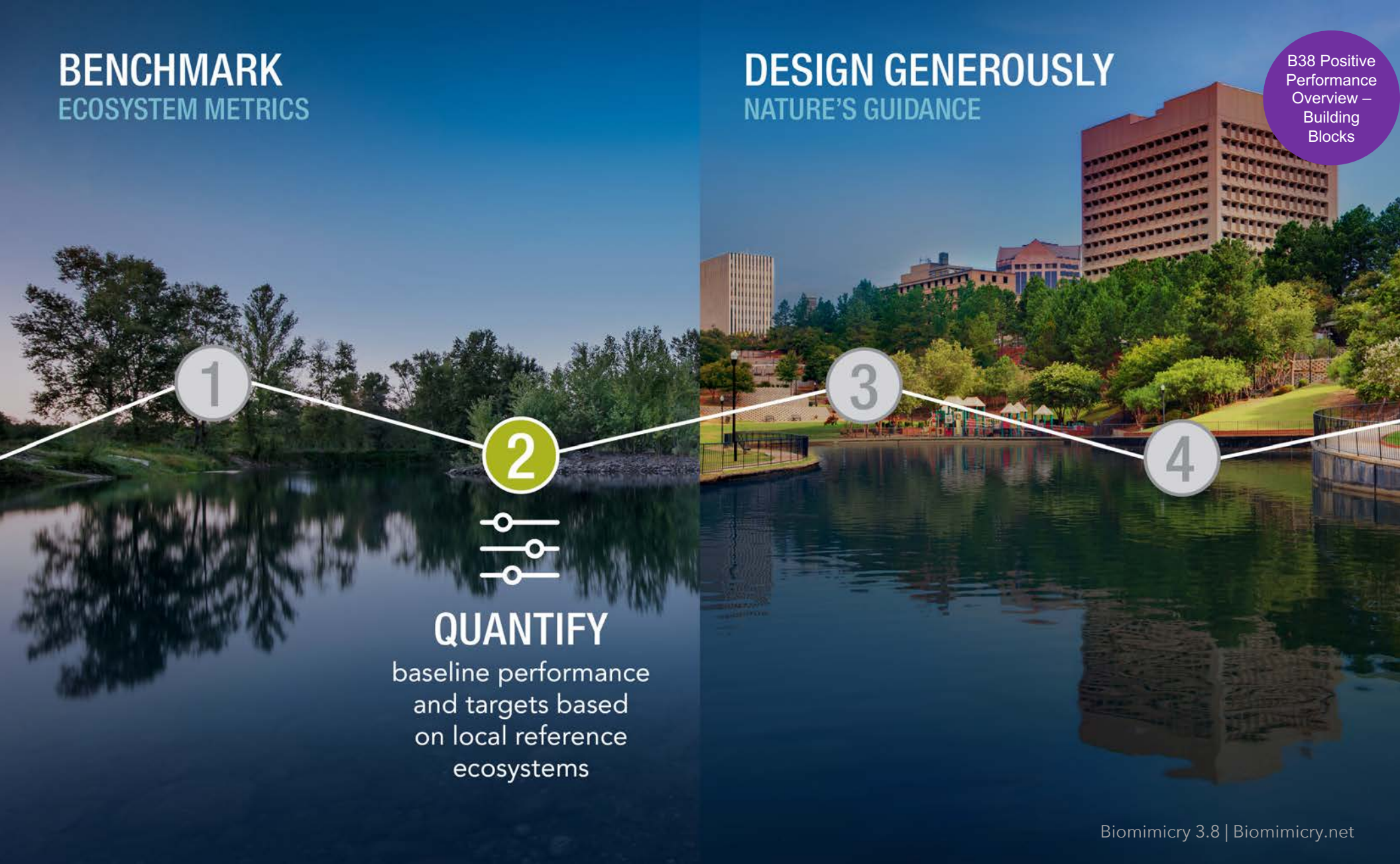
Sense of place - the agricultural nature of the surrounding land use is in stark contrast to the site

An understanding of context helps inform design (Example)

				
ECOLOGICAL PRIORITIES	Water regulation	Phytoremediation	Pollutant mitigation	Nutrient cycling
FUNCTIONAL NEEDS	• Stormwater management • Slowing run-off	• Erosion control • Surface-water storage	• Air nitrogen removal • Air temperature regulation	• Soil health • Slowing run-off
CHAMPION ADAPTERS	• Tadpole Shrimp • Fairy Shrimp	• Cattails • Willows	• Valley Oak • Western Sycamore	• California Ground Squirrels • Burrowing Owl

From functional needs to Positive Performance



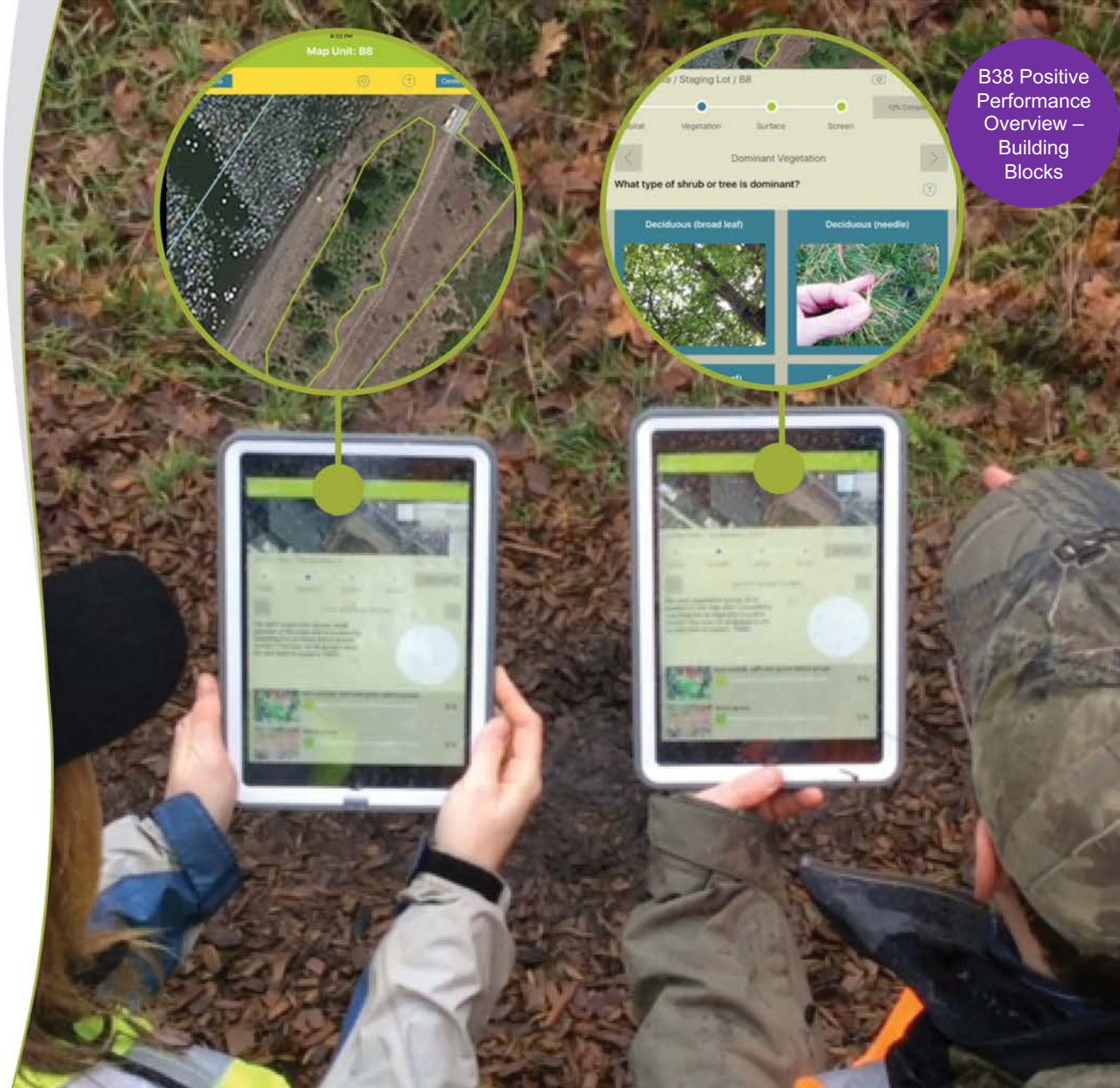

BENCHMARK
ECOSYSTEM METRICS
DESIGN GENEROUSLY
NATURE'S GUIDANCE
B38 Positive Performance Overview – Building Blocks
1
2
3
4
QUANTIFY
baseline performance and targets based on local reference ecosystems

2 Quantify Objectives

Quantify ecosystem services for the built environment project site and reference ecosystem.

Conduct a gap analysis to identify opportunities for improvement. Set Ecological Performance Standards (EPS) as goals, for example:

- Improve water filtration by 20%
- Increase the amount of cycled nutrients by 30%
- Double carbon uptake
- Eliminate heat waves in the summer months



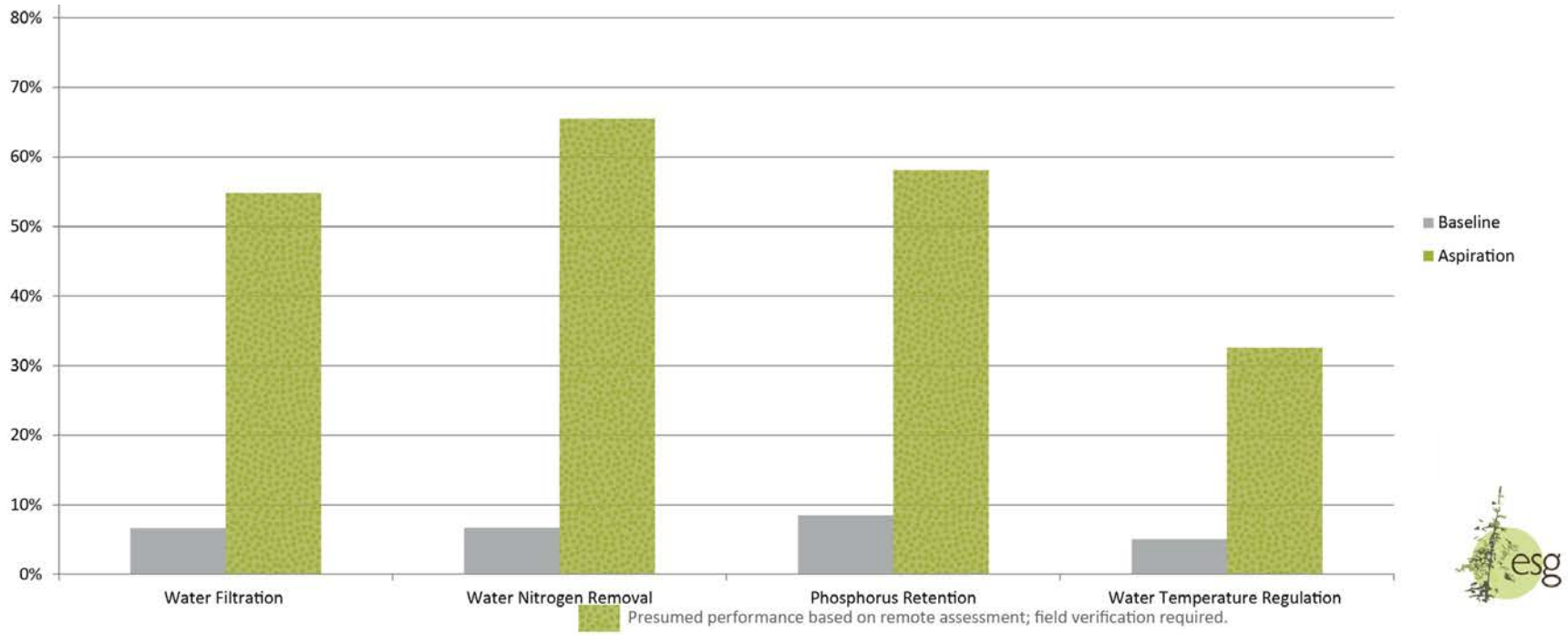
B38 Positive Performance Overview – Building Blocks

Performance categories and KPIs (Example chart)

Performance Category		Key Performance Indicators	
Biodiversity	Biodiversity supports important ecosystem services (e.g. native pollinators support urban agriculture). Different species contribute to ecological processes and create important functional redundancies for resilient ecological systems	• Species Support (Small mammal, Large mammal, Reptile, Amphibian/ turtle, Insect/invertebrate, Raptor, Songbird, Bat, Resident fish, Food chain)	• Biodiversity and Pollinator Support • Natural Plant Succession
Carbon	The ability of a site to remove greenhouse gases and carbon from the atmosphere, while also storing carbon in vegetation, soil, and building materials	• Carbon Sequestration	• Carbon Uptake
Soil	The ability of a site to promote and maintain healthy soils in support of water quality, erosion regulation, healthy habitats and biodiversity	• Soil Retention • Erosion Regulation	• Soil Quality
Health + Wellbeing	Critical elements for creating positive human experiences that help reduce stress, encourage outdoor activities, create a healthy environment, and provide numerous mental and physical health benefits	• Air Temperature Regulation • Passive Recreation • Noise Screening • Visual Screening	• Atmospheric Cleansing • Air Particulate Removal • Air Nitrogen Removal
Water Quality	The ability of a site to maintain or improve local or regional water quality conditions	• Water Filtration • Water Nitrogen Removal • Phosphorus Retention	• Water Temperature Regulation
Stormwater Management	The ability of a site to reduce stormwater contributions that heighten regional flooding concerns, while also offsetting water scarcity issues	• Interception • Evaporation • Infiltration	• Storage Capacity (Below Ground) • Water Quantity Control

Gap analysis: Water Quality (Example of subset outputs)

High runoff rates, combined with a lack of pervious surfaces, depressional areas, and significant vegetation capable of providing a filtering function result in poor site performance for the suite of water quality KPIs evaluated for the site. Compared to the reference sites, the property largely falls short of making a positive contribution to water quality in the watershed. Interventions targeted at water quality, such as bioswales, that have the potential to provide co-benefits that address multiple objectives (e.g., biodiversity and health and welfare), should be emphasized.

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peformance metrics

3a Create Solutions

Create nature-inspired design interventions to improve the baseline ecosystem performance on the ESGs. The design interventions are biomimetic; how local organisms survive and thrive guide the creativity process, as well as the decisions as to which design interventions are the most relevant for the project.

These solutions can be created for:

- Commercial and residential sites
- New and existing facilities, buildings, and large-scale developments
- Industrial parks

Subset of customized interventions for site functional needs (Example)

Pervious Pavement

COMPANY GOALS
Soil & Habitat | Water | Materia

SITE FUNCTIONAL NEED: PERFOR...
Soil | Water Cycle

SITE FUNCTIONAL NEED: KPIS
Infiltration | Storage Capacity

TYPE
Bio-inspired

BIO-INTEL
Chimney crayfish

BIO-INTEL DESCRIPTION (FROM BI...
Chimney crayfish are ecosystem ...

BIO-INTEL DESIGN PRINCIPLES AN...
Provide a direct pathway for wat...

DESCRIPTION
In service to more naturally mimicking the natural water hydrograph of the site requires that hardscapes be part of the ...

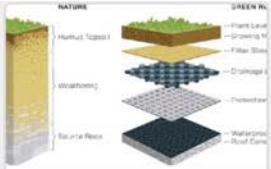
APPLICATION & DESIGN CONSIDER...
Employ pervious pavement to any surface walkways or parking areas. Utilize grass block pavers to green the previous pavers and...

POSITIVE IMPACT
Pervious surfaces provide water quality and quantity control benefits. They provide the ability for necessary parking hardscape...

PRODUCTS
Porous Pave | PaveDrain

REFERENCE IMAGES

RESOURCES



Green Roof

COMPANY GOALS
Atmosphere | Carbon | Soil & H

SITE FUNCTIONAL NEED: PERFOR...
Air Quality | Carbon & Climate

SITE FUNCTIONAL NEED: KPIS
Visual Screening | Vegetation S

TYPE
Bio-inspired

BIO-INTEL
Soil horizons

BIO-INTEL DESCRIPTION (FROM BI...
A soil horizon is a layer parallel t...

BIO-INTEL DESIGN PRINCIPLES AN...
Provide structure and nutrients f...

DESCRIPTION
A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing mediu...

APPLICATION & DESIGN CONSIDER...
Any overhead surface on-site including roofs and overhead canopies.
...

POSITIVE IMPACT
Green roofs cool the ambient air, providing thermal comfort. Green roofs also help to manage stormwater, intercepting and ...

PRODUCTS
LiveRoof

REFERENCE IMAGES

RESOURCES

Carbon-Sequestering Con...

COMPANY GOALS
Carbon | Materials | Atmosphe

SITE FUNCTIONAL NEED: PERFOR...
Carbon & Climate | Health & We

SITE FUNCTIONAL NEED: KPIS
Carbon Sequestration

TYPE
Bio-inspired

BIO-INTEL
Atmospheric Carbon-based mater

BIO-INTEL DESCRIPTION (FROM BI...
Plants utilize water, carbon dioxi...

BIO-INTEL DESIGN PRINCIPLES AN...
Incorporate materials into surfac...

DESCRIPTION
Replace traditional concrete with concrete products that incorporate waste carbon dioxide (CO_2) gas as a feedstock into th...

APPLICATION & DESIGN CONSIDER...
Specify CO_2 mineralization as part of a low embodied carbon concrete spec. Mix designs can be adjusted to include an optimized...

POSITIVE IMPACT
Reducing the **carbon** footprint on-site by utilizing concrete products wherein CO2 is mineralized and permanently embedded in the ...

PRODUCTS
CarbonCure

REFERENCE IMAGES

RESOURCES

Floating Wetlands

COMPANY GOALS
Water | Soil & Habitat | Health

SITE FUNCTIONAL NEED: PERFOR...
Water Quality | Biodiversity | C

SITE FUNCTIONAL NEED: KPIS
Vegetation Support | Carbon Se

TYPE
Bio-inspired

BIO-INTEL
Fens

BIO-INTEL DESCRIPTION (FROM BI...
Found in Michigan, fens are a ty...

BIO-INTEL DESIGN PRINCIPLES AN...
Create vegetative layers on satur...

DESCRIPTION
Floating wetlands are made with an internal structure, consisting of buoyant material and a matrix of fibers, that is planted with native...

APPLICATION & DESIGN CONSIDER...
Resilience Gateway ponds:
The size and content of floating islands can be designed to fit specific needs in water bodies ...

POSITIVE IMPACT
The microbes that attach to the underside of floating islands improve water quality and provide habitat for aquatic life, while the ...

PRODUCTS
BioHaven

REFERENCE IMAGES

RESOURCES

Natural Pest Removal

COMPANY GOALS
Health & Well Being | Soil & Hab

SITE FUNCTIONAL NEED: PERFOR...
Biodiversity | Health & Well Bein

SITE FUNCTIONAL NEED: KPIS
Visual Screening | Biodiversity S

TYPE
Nature-based

BIO-INTEL
Biocontrol Agent - Dragonflies

BIO-INTEL DESCRIPTION (FROM BI...
In the biological world, natural pr...

BIO-INTEL DESIGN PRINCIPLES AN...
Adopt integrated pest managem...

DESCRIPTION
Inevitably where you have water bodies you have mosquitoes. The intention here is to build self-regulating pest control systems ...

APPLICATION & DESIGN CONSIDER...
Near water bodies, create habitat for natural biological control agents, like dragonflies. There are a number of native plants that wi...

POSITIVE IMPACT
Shifting to natural biological control systems support biodiversity, allowing the plant communities and the beneficial ...

PRODUCTS

REFERENCE IMAGES

RESOURCES

Filter Strips

COMPANY GOALS
Water | Soil & Habitat | Carbon

SITE FUNCTIONAL NEED: PERFOR...
Water Cycle | Water Quality | B

SITE FUNCTIONAL NEED: KPIS
Vegetation Support | Evaporatio

TYPE
Bio-inspired

BIO-INTEL
Wetlands

BIO-INTEL DESCRIPTION (FROM BI...
Wetlands are one of the most pr...

BIO-INTEL DESIGN PRINCIPLES AN...
Improve water quality by using a ...

DESCRIPTION
Filter strips contain dense herbaceous vegetation such as grass, trees, or shrubs, located along an impervious surface, tha...

APPLICATION & DESIGN CONSIDER...
Employ filter strips along all surface parking areas on site. Filter strips are most effective on slopes of 5% or less. Steeper ...

POSITIVE IMPACT
Slow and filter sheet runoff and remove contaminants, providing pretreatment before the water reaches water management ...

PRODUCTS

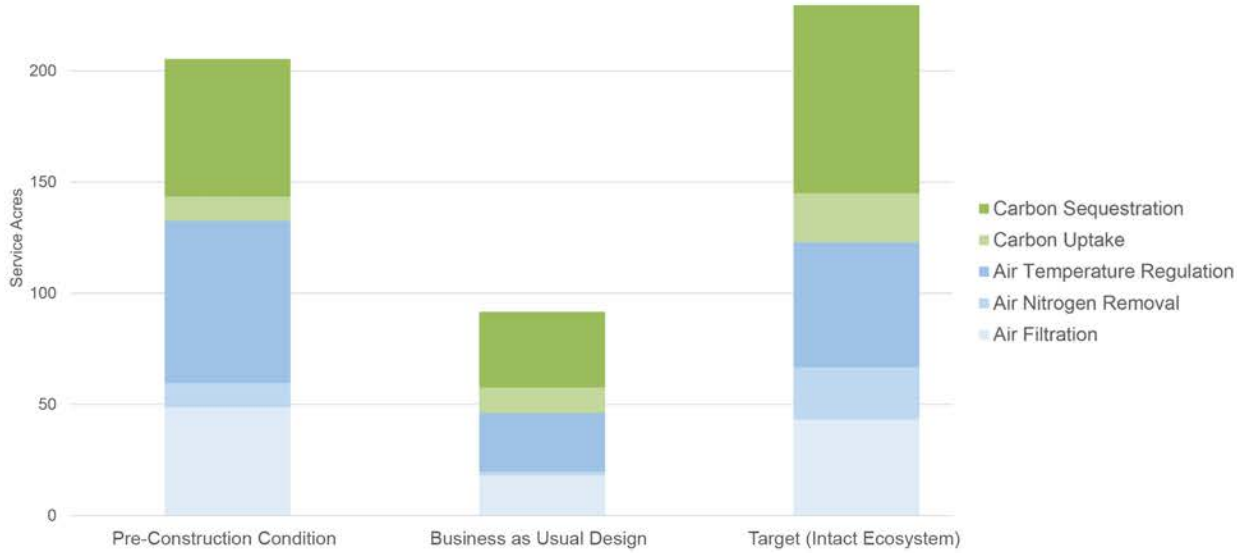
REFERENCE IMAGES

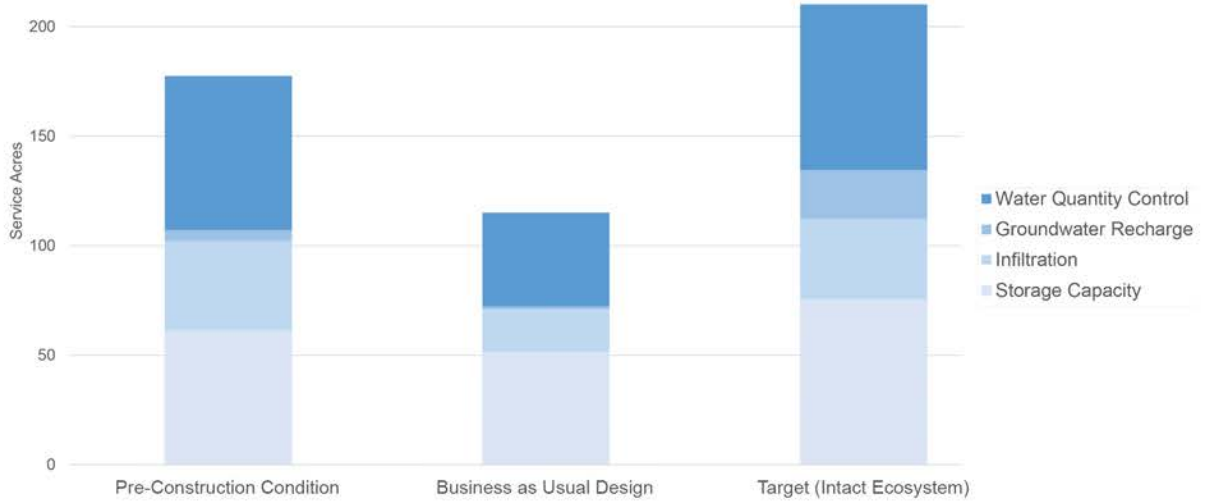
RESOURCES


7AZB

3b Solutions Modeling

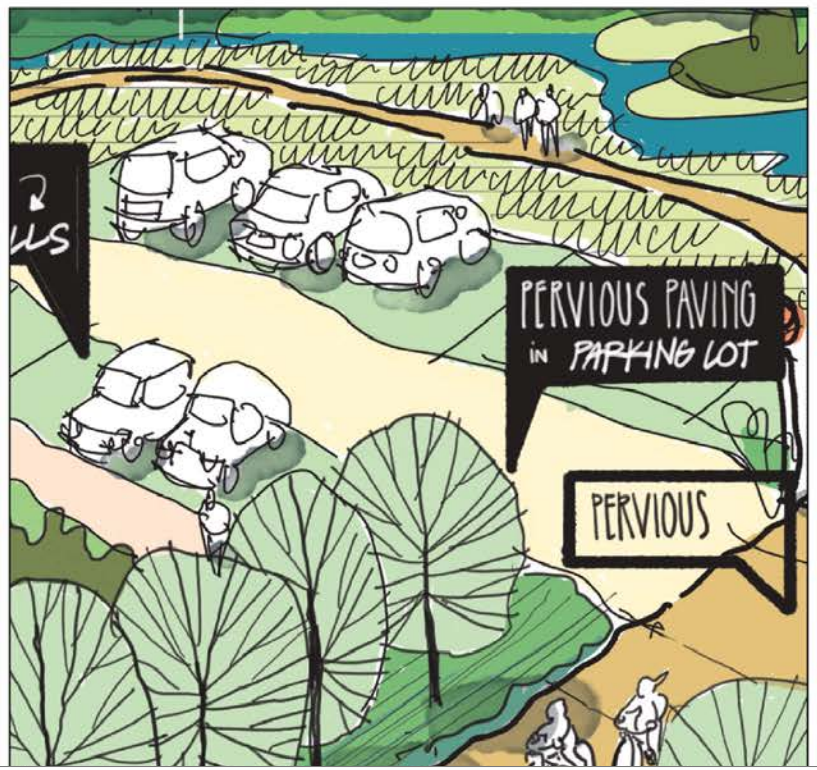
Model performance to inform client's investment decisions. Models illustrate the contribution of each design intervention to improved performance toward ESGs. Measuring performance over time illustrates progress, increasing employee engagement and motivation for the Positive journey.

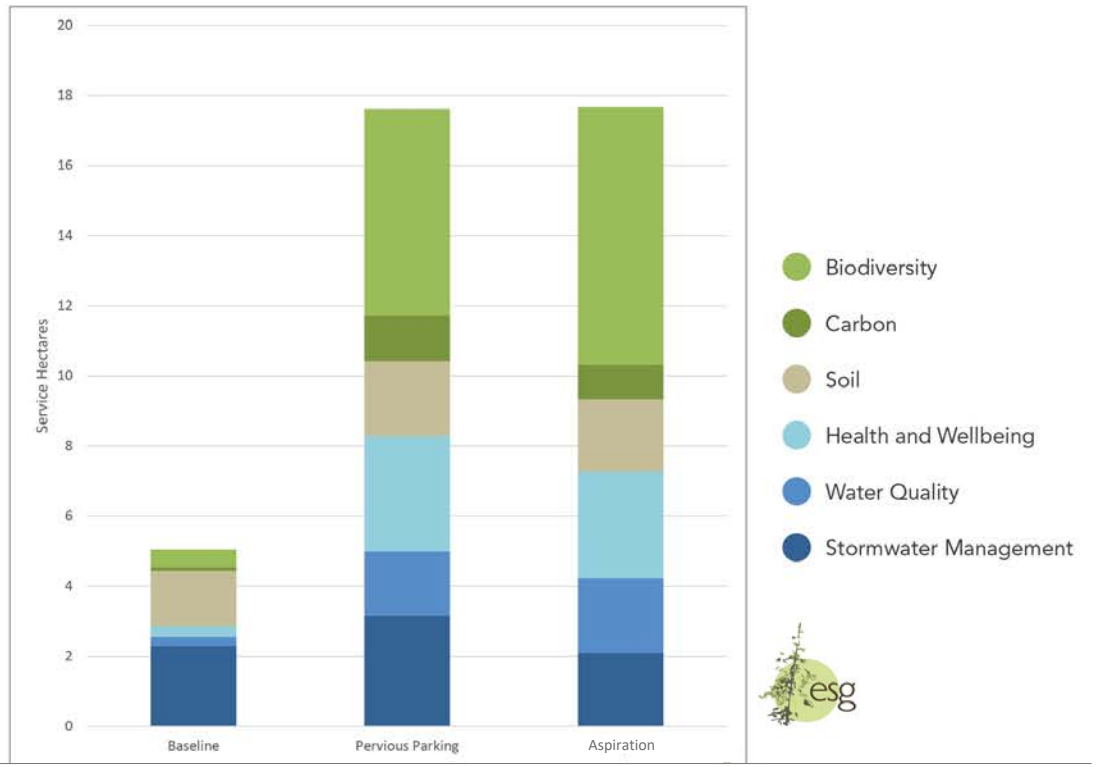




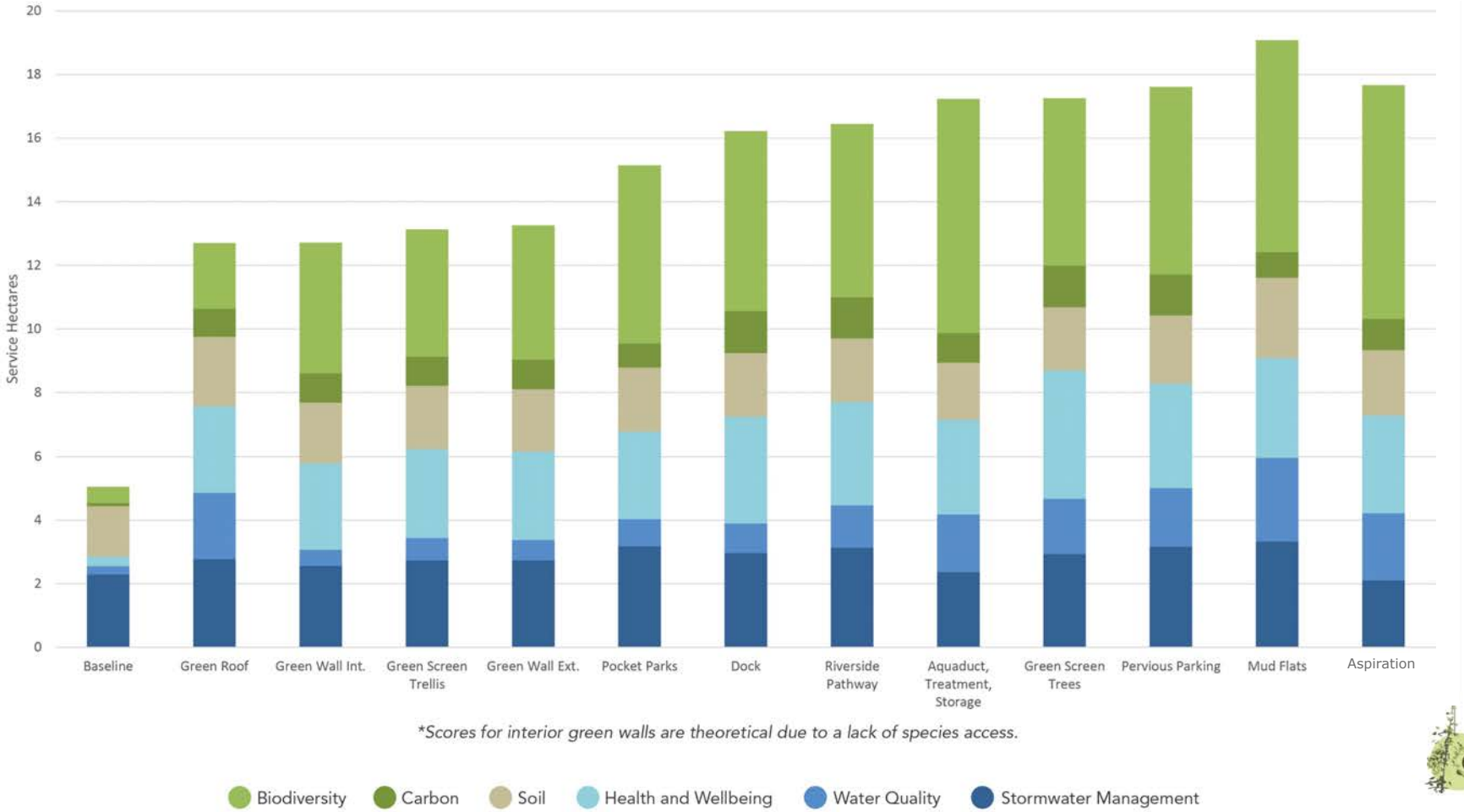
Performance modeling: Pervious Parking (Example of intervention quantification)

The pervious parking design largely exceeds target performance on a per-hectare basis for everything except water quality and biodiversity support. Given the intended functionality of this area (vehicle parking), this performance is remarkably strong, while still allowing for the intended use. The incorporation of pervious surfaces and high basal cover for herbs, shrubs, and trees, combine to drive high levels of performance across the KPI categories.

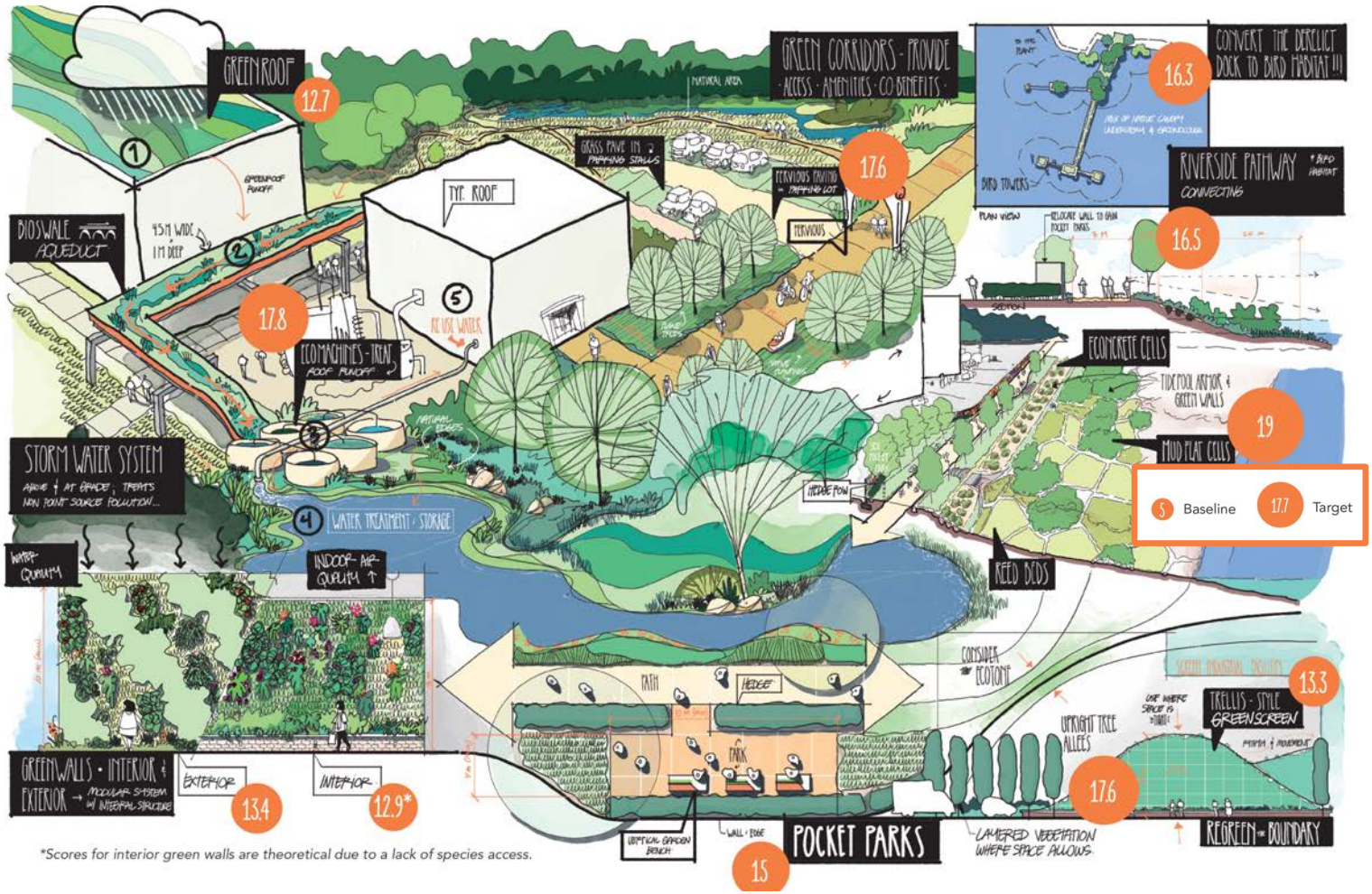




Stacked ecosystem service benefits by intervention (Example chart)



Intervention ranking: sum of stacked benefits (Example visual)



Financial evaluation (Example type 1)

C. PARKING STRUCTURE ANALYSIS

Intent

To meet the sustainability goals and objectives for the site, a parking scenario study was conducted to compare three parking options: Standard Parking, Low Impact Development (LID) Parking, and a combination of LID Parking and Sustainable Structured Parking. The study compares non-financial and financial aspects of these options, and concluded that an LID approach incorporating permeable pavement and oak woodland forest for all parking is recommended. Contrary to common perceptions, LID parking costs less per space than standard asphalt parking due to reduced or eliminated investment in gray infrastructure.

Standard Parking

LID Surface Parking

Sustainable Structured Parking

Table C.1: Parking Options Overview

	Standard Parking	LID Full Surface Parking	LID + Sustainable Structured Parking
Main Components	Standard Asphalt	Permeable Pavement; Oak Woodland Forest	Permeable Pavement; Oak Woodland Forest Sustainable Structured Parking
Total Spaces	2507 Phase 1 (2021-2030): 900 Phase 2 (2029-2035): 250 Phase 3+ (2032-2038): 1,357	2507 Phase 1 (2021-2030): 900 Phase 2 (2029-2035): 250 Phase 3+ (2032-2038): 1,357	2507 Phase 1 (2021-2030): 900 Phase 2 (2029-2035): 250 Phase 3+ (2032-2038): 1,357 Sustainable Structured Parking (800 Spaces) comes in at 2+ Phase
Sustainability Co-Benefits	• Flexibility for future land use options • Lowered embodied carbon than structured parking • Co-located solar canopy (~10 acres)	• Retains, infiltrates and treats stormwater • Minimizes stormwater runoff • Flexibility for future land use options • Provides ecosystem services that increase over time • Lower heat island effect • Lowered embodied carbon than structured parking • Co-located solar canopy (~10 acres)	• Retains, infiltrates and treats stormwater • Minimizes stormwater runoff • Frees up land as parking demand drops • Provides ecosystem services that increase over time • Lowest heat island effect • Lowest land area consumption • Co-located solar canopy (~13 acres) • Structure can be converted to building use as parking demand decreases
Negatives/ Risks	• Creates largest impervious area • Low landscape and ecosystem services value • Higher cost per space than LID parking • Highest heat island effect • Highest nonpoint source pollution runoff • Highest stormwater runoff	• Consumes more land area than LID+Sustainable Structured Parking	• Highest capital investment • Permanence/longer lifecycle of structure • Less flexibility for future land use • Higher embodied carbon • Changes in technology and modes of transport • Potential for stranded CAPEX

C. Parking Structure Analysis (Continued)

Financial Evaluation

Table C.2: Financial Comparison (Preliminary Rough Order of Magnitude Estimate)

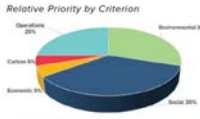
	Standard Parking	LID Full Surface Parking	LID + Sustainable Structured Parking
Total Project Cost (NPV)	($24.2)M	($22.1)M	($38.9)M
Cost Elements	• Standard asphalt pavement • Baseline tree & vegetation • Parking space reconversion • Annual O&M • Repave/replace • Solar canopy (assumes PPA)	• Permeable pavement • Tree & vegetation as green infrastructure • Parking space reconversion • Annual O&M • Repave/replace • Solar canopy (assumes PPA)	• Permeable pavement • Parking structure • Tree & landscaping as green infrastructure • Parking space reconversion • Annual O&M • Repave/replace • Solar canopy (assumes PPA)

Non-Financial Evaluation

Criteria

The non-financial evaluation criteria include Social, Environmental, Operations, Carbon, and Economics components. The below graphic lists the considerations and scoring weights for each criterion.

Relative Priority by Criterion



Social:
- Biophilia
- Technology adaptation for increased parking user experience
- Safety, comfort, and convenience
- User experience
- Community engagement

Weight: 35%

Environmental:
- Efficiencies in use of energy, water, and materials
- Pollution prevention (NPS)
- Waste Management
- Air Quality
- Biodiversity
- Ability to respond to projected heat island effect and drought
- Land efficiency and preservation

Weight: 30%

Operations:
- Maintainability
- Business continuity
- Flexibility
- Adaptability
- Future-proofing
- Durability
- Buildability
- Return on perception

Weight: 25%

Carbon:
- Impacts on carbon footprint

Weight: 5%

Economic:
- Benefits to local community economics
- Benefits to employees

Weight: 5%

C. Parking Structure Analysis (Continued)

Scoring

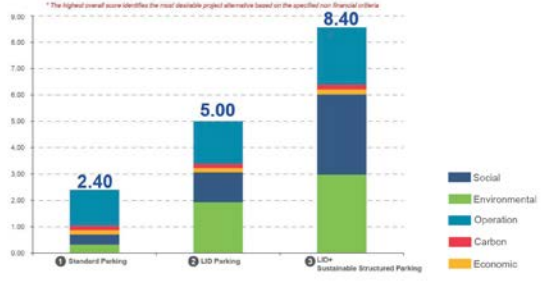
Table C.3 indicates non-financial evaluation scoring based on subject matter experts' review. The scores, which are either low (1), medium (5), or high (9), are combined with the weighting factors to provide the overall performance score for each option. Standard Parking has the lowest score and is not recommended. In contrast, the LID Parking + Sustainable Structured Parking approach generates the highest non-financial scores, but it also requires the highest financial investment. LID parking presents the lowest cost and a medium level of non-financial benefits and is therefore the parking recommendation at this time. As the site develops, consider the potential for Sustainable Structured Parking in later phases to consolidate parking and free up land for additional program uses. It is recommended that the client complete a comprehensive LCCA to guide decision-making on the Sustainable Structured Parking.

Table C.3: Non-Financial Evaluation Scoring

	Social	Environmental	Operations	Carbon	Economic
Note Performance: use this section to rate the performance of the project alternatives against specified non-financial criteria					
Standard Parking	1	1	5	5	5
LID Parking	5	5	5	5	5
LID+Sustainable Structured Parking	9	9	9	1	1
Weighted Score and Results: this section applies the user-specified weights and develops the overall Non-Financial Score for each project alternative					
Priority Weighting:	35.0%	30.0%	25.0%	5.0%	5.0%
Standard Parking	0.35	0.30	1.25	0.25	0.25
LID Parking	1.75	1.50	1.25	0.25	0.25
LID+Sustainable Structured Parking	3.15	2.70	2.25	0.25	0.25

	Total Score	% of High
Standard Parking	2.40	28%
LID Parking	5.00	59%
LID+Sustainable Structured Parking	8.40	NA

Figure C.1: Comparison of Total Weighted Score by Criterion



Note: These outputs are rough order of magnitude (ROM) estimates.

Financial evaluation (Example type 2)

Business Case Evaluation

The Business Case Evaluation demonstrates the use of Financial and Non-Financial factors in analyzing proposed design solutions to meet Positive Performance goals.* For this Framework Application, the evaluation assesses the following design strategies for demonstration purposes:

- Filter strips & bioswales
- Permeable paving
- Micro-bioretention areas

Using ROM costs and quantities** this analysis demonstrates how financial and non financial costs and benefits can be used t compare three design scenarios:

1. **Business as Usual** – the continuation of Status Quo campus/ site/facility operations.
2. **Master Plan** – project plans in development without intervention of Positive Performance solutions.
3. **Positive Performance Solutions** – design strategies developed using the Sustainability Framework.

Financial Analysis: The Financial Analysis focuses on comparing the three scenarios with the inputs indicated below:

- Initial Capital Investment (CAPEX)
- Annual Operating and Maintenance (O&M/OPEX)
- Net Present Value (NPV)
- Equivalent Annual Cost

Each scenario assumes a 20-year life cycle. For demonstration purposes, the Positive Performance solution assumes a higher Initial Capital Investment than the other two scenarios (for example, increased "new" technology costs and potential limited accessibility of materials or experienced workforce). However, it is expected that the Positive Performance strategies would have lower OPEX than

	Scenario 1: Business As Usual	Scenario 2: Master Plan	Scenario 3: Positive Performance
Capital Investment	$1,671,000	$2,115,000	$3,079,000
Annual O&M	$107,000	$56,000	$56,000
NPV	($2,287,000)	($2,673,000)	
Equivalent Annual Cost	($251,000)	($293,000)	

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Positive Design Strategies

The Solution: Green Ribbon

Create a **seamless "Green Ribbon"** throughout the site and building to improve **health and wellbeing** of employees and surrounding ecosystems.

The table to the right summarizes the proposed strategies detailed on the following pages. These focus primarily on site, landscape, and building and material recommendations.

Summary of Strategies

NOTE: This table is intended to help prioritize decision-making. It is recommended that multiple complementary strategies be implemented as part of a systems-approach (rather than isolated strategies) in order to maximize Positive Performance co-benefits site-wide.

CORPORATE GOALS	STRATEGIES	SCALE OF APPLICATION	INVESTMENT*	INFLUENCE**	TIMELINE ***
	Filter strips & bioswales & micro-bioretention areas	Site	$		
	Permeable paving	Site	$$		
	Bioactive walls	Site, Building	$$		
	Fluid interior/exterior workspaces	Building & Materials	$$$		
	Spaces and zones inspired by seasonal leaf color changes	Building & Materials	$		
	Natural materials such as mass timber	Building & Materials	$$		
	Living Machine	Building & Materials	$$		
	Phytoremediation wall	Building & Materials	$$		
	Energy efficiency	Building & Materials	$$		
	Renewable energy	Building & Materials	$$$		

***Investment:** Level of combined capital and operational costs (CAPEX, OPEX)
$ Low $$ Medium $$$ High

****Influence:** Contribution to overall Positive Performance aspirations
Low Medium High

*****Timeline:** Decision-making urgency required to incorporate strategy into design
Immediate (next few months) Near-Term (within one year) Long-Term (beyond one year)

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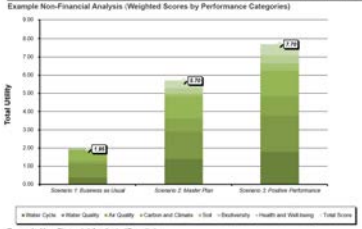
Business Case Evaluation

Non-Financial Analysis: The Non-Financial Analysis focuses on comparing the three scenarios in terms of their impact on achieving the Positive Performance aspirations. The performance of each design strategy is rated on a scale of 0-10 in terms of impact, and each of the performance categories is assigned a weighting specific to the project's priorities. The example non-financial analysis is shown in the table and chart to the right.

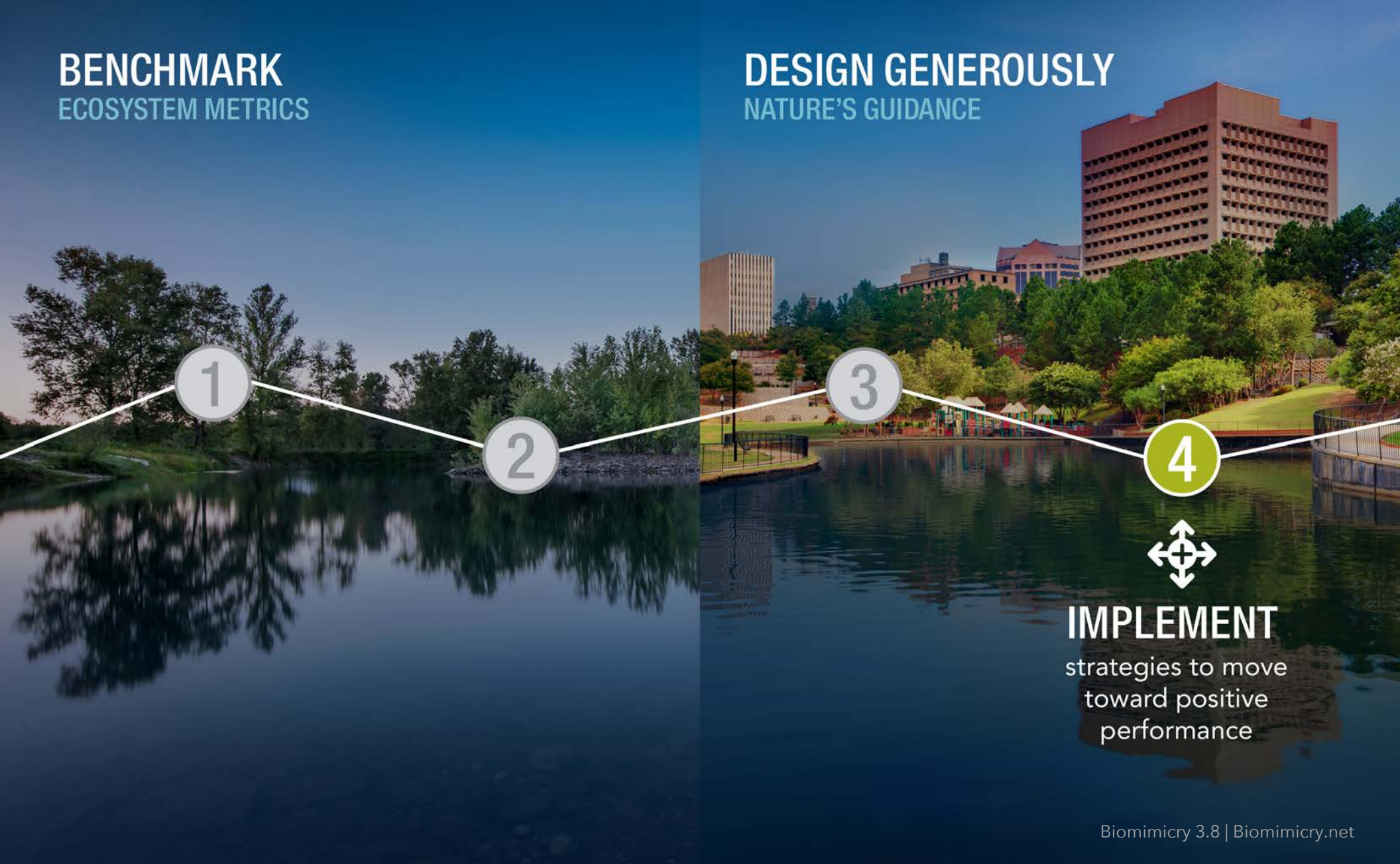
The Business Case evaluation in this case concludes that the Scenario 3 Positive Performance solution set is the recommended choice. Although the equivalent annual costs are higher (see Example Financial Analysis table), Scenario 3 significantly outperforms the Business as Usual and Master Plan scenarios in terms of Non-Financial benefits of improved Ecosystem Services performance. The other aspects of Triple Bottom Line (Social and Economic) co-benefits were not modeled in this exercise (e.g., cost savings from improved retention, performance, and health savings) and are anticipated to be higher as well thus further reinforcing the business case for Positive Performance solution application.

Example Non-Financial Analysis (Weighted Scores by Performance Categories)



Example Non-Financial Analysis (Results)

Note: These outputs are rough order of magnitude (ROM) estimates.


BENCHMARK
ECOSYSTEM METRICS
DESIGN GENEROUSLY
NATURE'S GUIDANCE
1
2
3
4
IMPLEMENT
strategies to move toward positive performance

4 Implement Solutions

Implement, watch, and celebrate as your facility begins to give back in all the ways a healthy ecosystem would. The ROI of Positive design compounds with gains on:

- Performance efficiencies
- Employee health
- Property value
- Corporate image
- Local vitality
- Existing strategic goals

Implementation | Strategy Integration:

Procurement Plan for Design Services

The Positive Design strategies and KPIs are further developed to define performance targets and support the development of detailed plans, drawings, and programs. The Procurement Plan identifies the qualifications and capabilities required by a design services firm in order to effectively implement the strategies. This will provide the information needed for RFP development as well as a guiding framework for the vetting and selection process.

Construction Management Plan

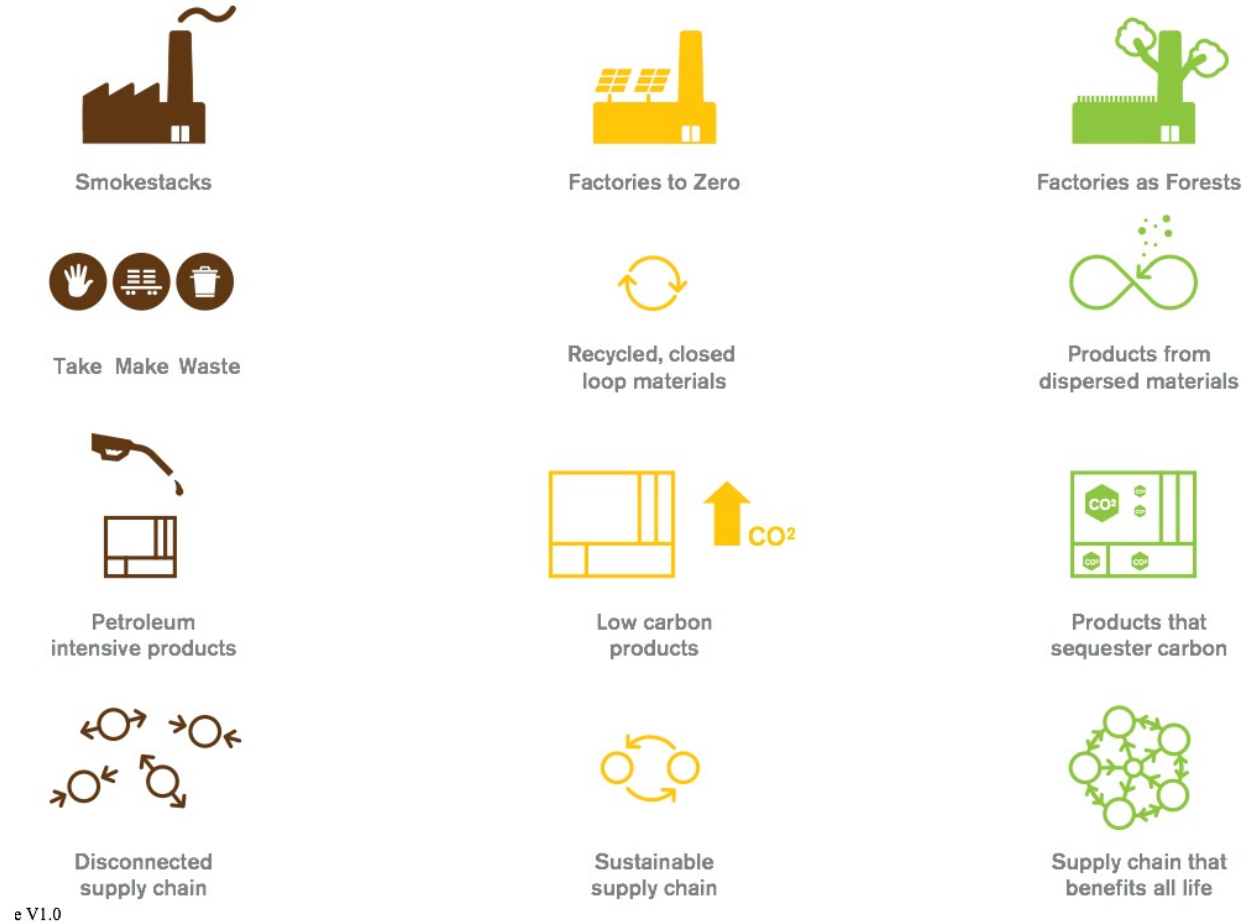
The Construction Management Plan details the primary requirements and risks that the design team and construction team will need to review and manage in the overall construction process. Due to some of the innovative aspects of the design strategies, this is key to ensuring proper installation and commissioning.

Operation & Monitoring Plan

The Operation and Monitoring Plan identifies the KPIs, monitoring schedule, and reporting framework to be included in the overall facilities management plan. Working closely with the facilities management team in this regard is critical for the long-term success and ROI for the Positive Design strategies. If agreed upon, monitoring can also be coordinated with third-party certified organizations.

Communication Strategy

The communication strategy will leverage the information collected to understand the "story of place" and the positive design process to craft a narrative that is locally relevant to employees and communities. The narrative will be designed to reconnect people to place and to demonstrate the role of the Company and the pride generated by being a welcome neighbor to all.



Creating a Vision for Positive Across the Company


Collective
Courageousness


In 2019, Biomimicry 3.8 launched Project Positive to
demonstrate companies can
drive innovation, support climate goals,
engage employees and local communities,
using a programmatic, science based, data driven approach
inspired by nature to become Regenerative.

Project Positive is a collaborative of change agents dedicated to:

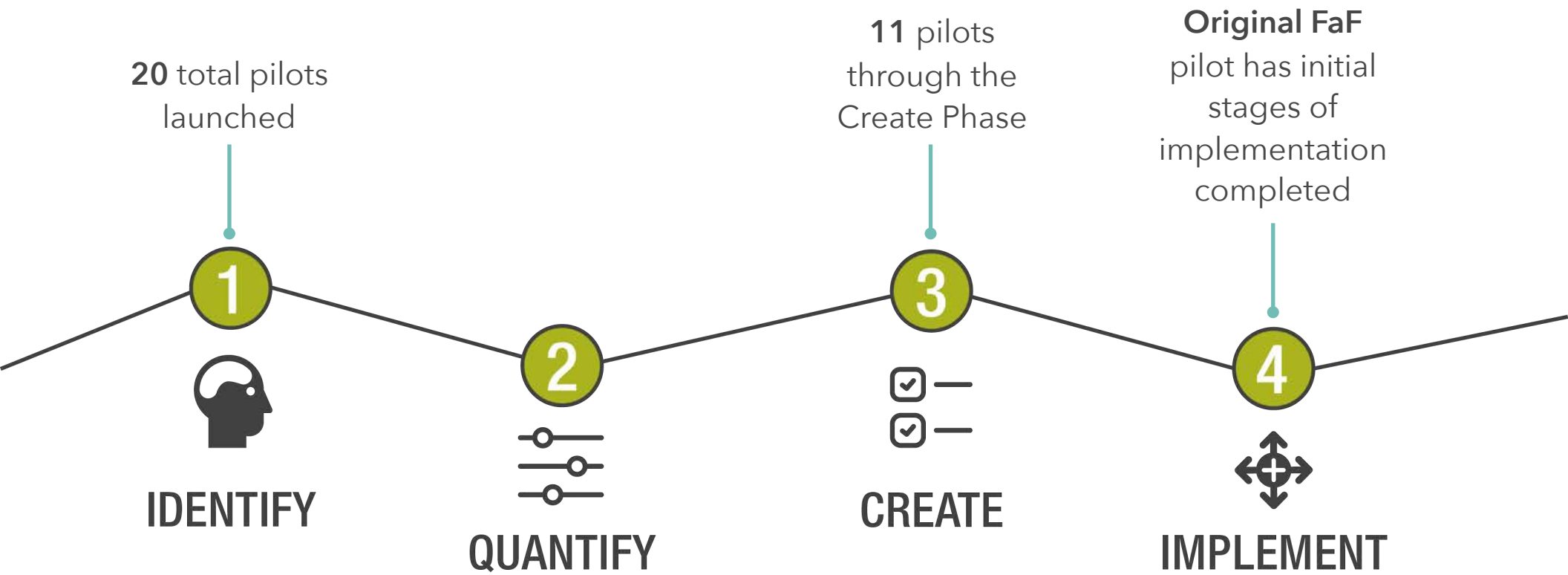
Accelerating success through collaboration and storytelling of the journey

Raising the bar on what acting sustainably means

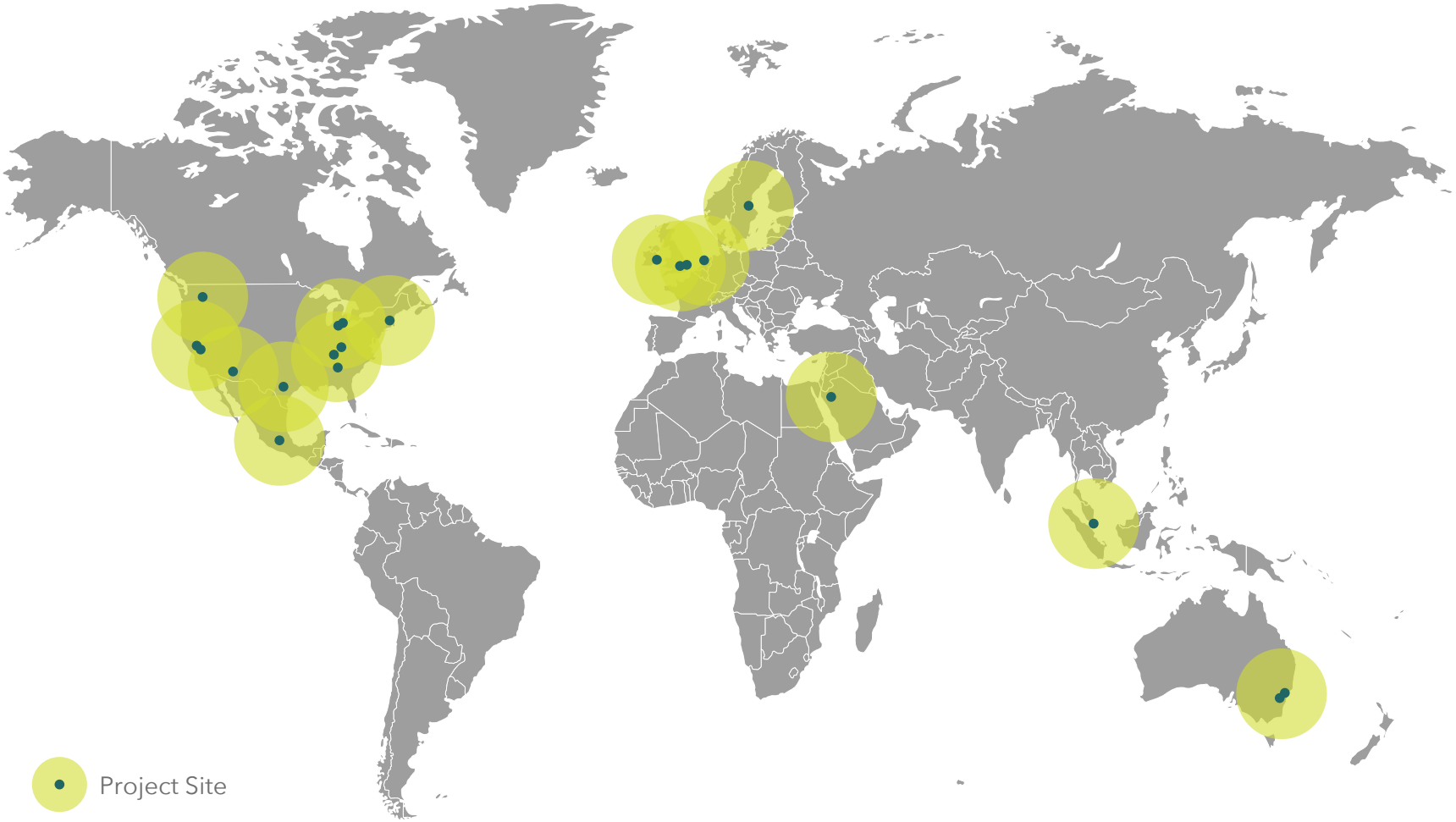
Demonstrating action toward regenerative through the application of Positive Performance

AQUAFIL Ford Google Interface® KOHLER Logoplaste Microsoft

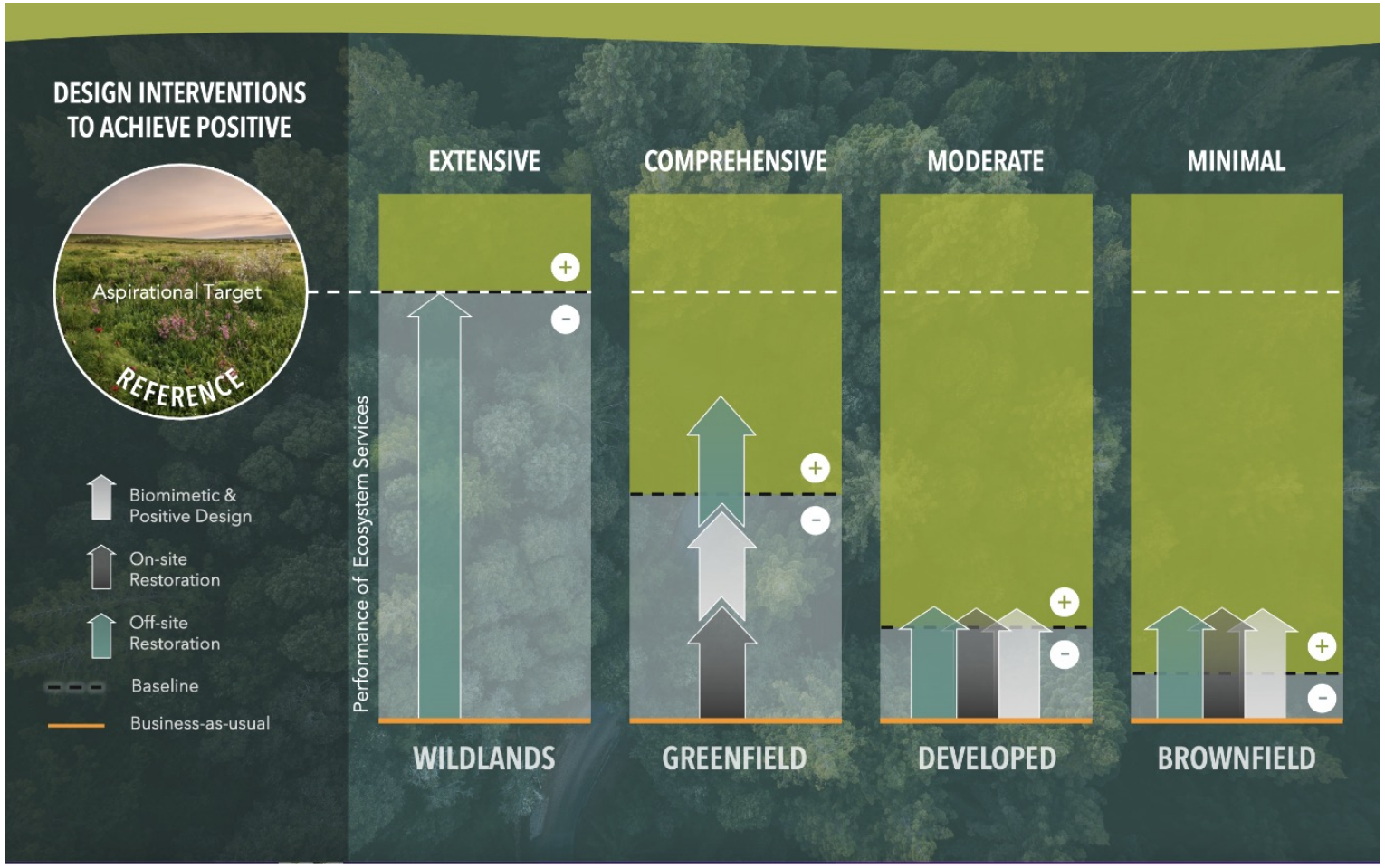
Pilot Projects



Global Reach Scale and Impact



Key Lessons Learned | Site Selection Opportunity



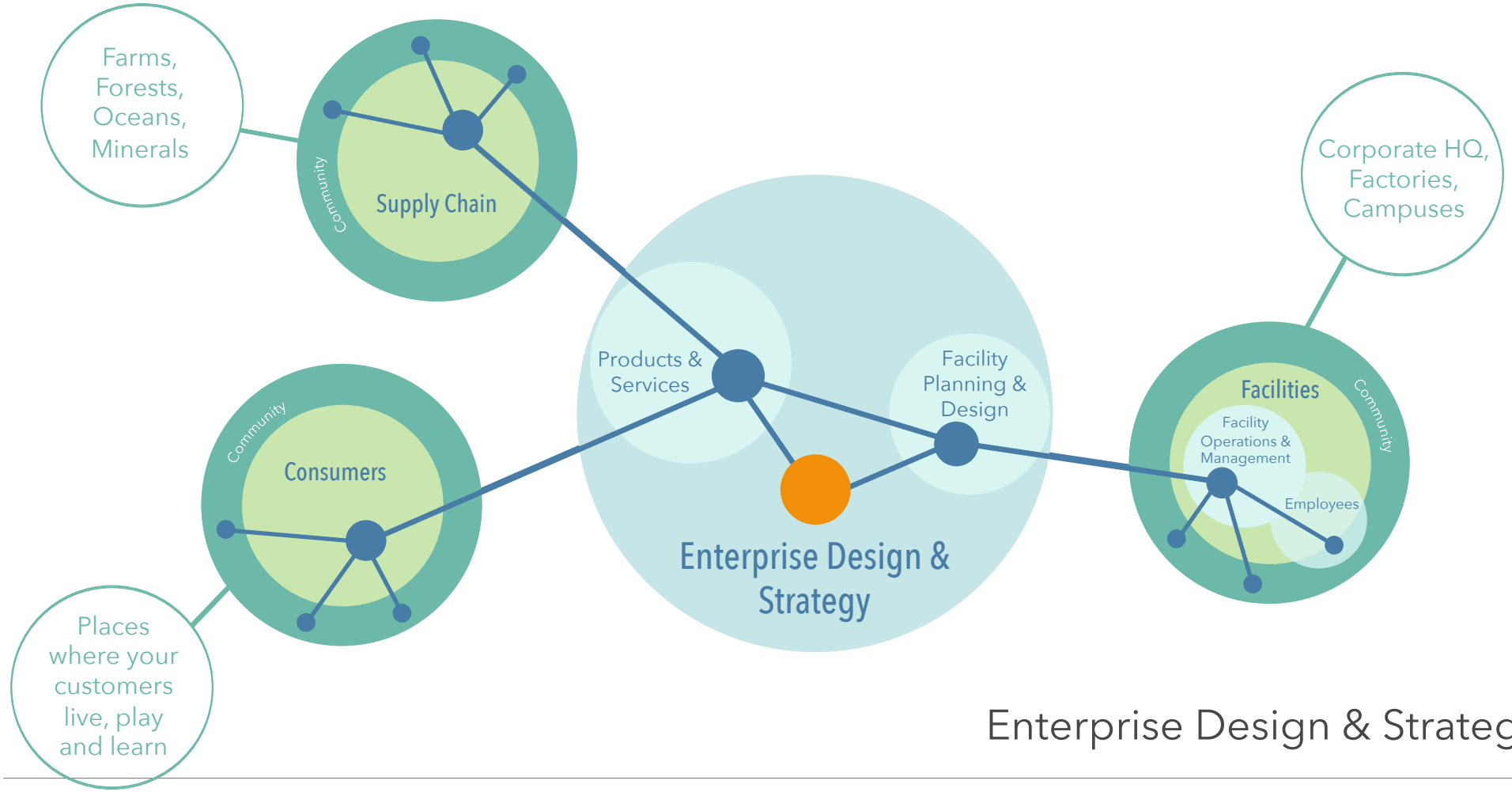
Key Lessons Learned

- Community impact opportunity
- Tangible and visible solutions
- Improves Permitting Process -> Cost Savings
- Importance of Storytelling

Microsoft

Blending datacenters into Wieringermeer nature with biomimicry

Systems Approach to Positive | Facilities as the Entry Point



Enterprise Design & Strategy

POSITIVE DESIGN

Are you/your organization ready?!

SELF-ASSESSMENT

Rank the below statements based on how frequently they are true for your company.

	Never	Rarely	At times	Often	Always
Our facilities incorporate sustainable building strategies, such as green roofs and bioswales for stormwater.	1	2	3	4	5
We regularly engage our company employees in the sustainability strategy and helping them feel that they personally benefit from it is a top priority.	1	2	3	4	5
Our company's sustainability narrative is clear and cohesive with a win-win vision for what's possible.	1	2	3	4	5
Our sustainability goals are transitioning from doing less bad to doing more good.	1	2	3	4	5
Our approach to a sustainability strategy is systemic and works across the supply chain.	1	2	3	4	5
Ambitious, innovative, and thinking long-term are good ways to describe our approach to sustainability.	1	2	3	4	5
Our employees work in spaces that provide elements of biophilic design or access to nature.	1	2	3	4	5
We commonly reference nature and ecosystems as an example of sustainable design that we can/ should emulate.	1	2	3	4	5

Results Key

- **Total score of 7-16:** Numerous opportunities to transition sustainability team's mindset and vision to net positive
- **Total score of 17-26:** Specific opportunities to build on what's working to improve engagement/cohesiveness towards net positive
- **Total score of 27-35:** Team is primed for taking on sustainability goals that match local ecological performance

DISCUSSION QUESTION

Based on your self-assessment above, how would you describe the strength of your company's net positive mindset? What have you done well? Where do you see new opportunity?

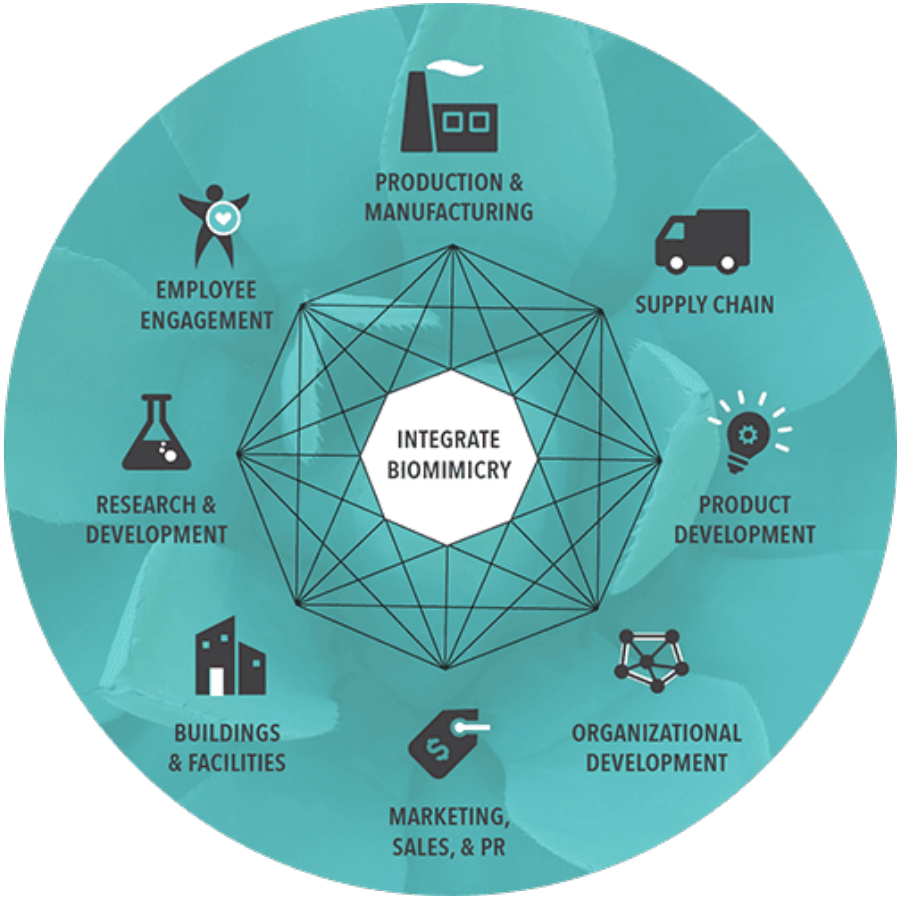
Interested in learning more about developing and measuring your positive impacts please contact us at info@biomimicry.net.

BIOMIMICRY 3.8

Biomimicry.net | 406.543.4108

info@biomimicry.net

Whatever part of the earth you touch, you can heal.

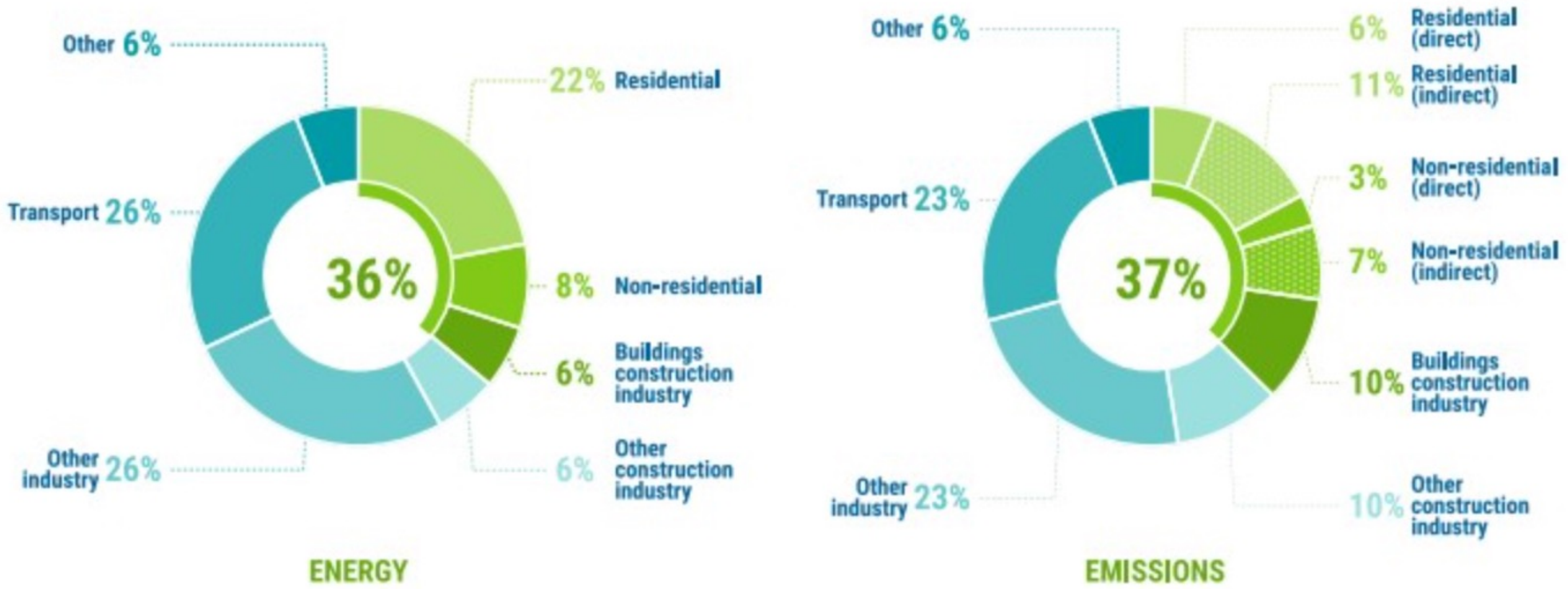


Biomimicry can be leveraged across the organization

Positive: It is a journey, not a destination

Meeting basic needs including provision of necessary resources, energy, and shelter.	Surviving over time long enough to successfully produce offspring (i.e., reproductive age)	Leveraging strategies of surviving and maturing that ensure the well-being of the ecosystem(s) that will care for your offspring.
Standard ESG/sustainability initiatives (Business-as-usual is "dying").	Enduring ESG/sustainability initiatives and business practices with a ripple of positive impact.	Holistic and regenerative ESG/sustainability and business practices designed and executed to ensure whole system thriving over time.

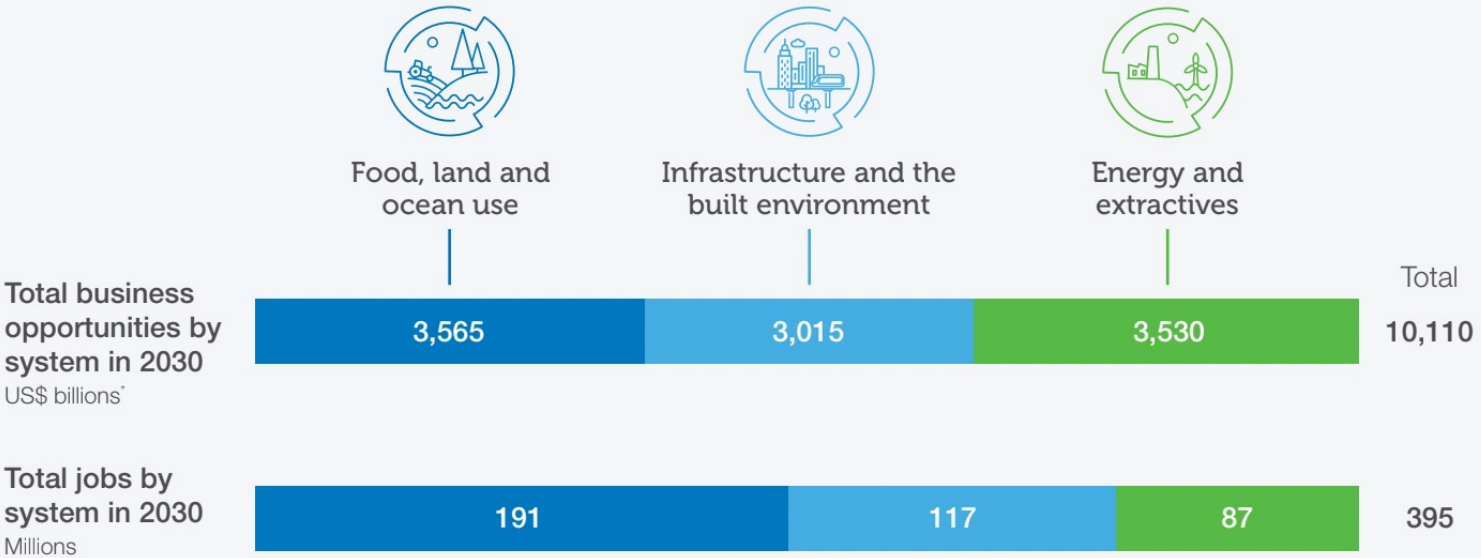
Figure 2. Buildings and construction's share of global final energy and energy-related CO_2 emissions, 2020



The Business Advantages: Economic Value

FIGURE E2

15 transitions in the three socio-economic systems could deliver $10.1 trillion of annual business opportunities and 395 million jobs by 2030



*Based on estimated savings or project market sizing in each area. These represent revenue opportunities that are incremental to business-as-usual scenarios. Where available, the range is estimated based on analysis of multiple sources. Rounded to nearest US$5 billion.

SOURCE: Literature review; Market research; Expert interviews; AlphaBeta analysis