

SITE COMMISSIONING

CONFIRMING LANDSCAPE PERFORMANCE

AT A NATIONAL SCALE



RESEARCH QUESTION: The Site Commissioning White Paper—authored by landscape architects and published in 2017 by the U.S. General Services Administration (GSA)—is the first study to investigate whether performance verification can be applied to the landscape at a national scale.



SITE COMMISSIONING WHITE PAPER

U.S. GENERAL SERVICES ADMINISTRATION
PUBLIC BUILDINGS SERVICE
OFFICE OF THE CHIEF ARCHITECT

JULY 2017



SITE

EVERYTHING
OUTSIDE THE
BUILDING SKIN

com·mis·sion·ing
/kə'miSHən, iNG/ 🔍

PROCESS IN WHICH PERFORMANCE
STANDARDS ARE ESTABLISHED
& THEN FIELD-VERIFIED OVER TIME

PUBLICLY ACCESSIBLE:

https://www.gsa.gov/cdnstatic/2017-10-12_SiteCommissioning_Spread.pdf



BORN OF NECESSITY: Conventional development practice presupposes that constructed landscapes function as intended, which can perpetuate ineffective and inefficient design. Site commissioning offers a new land development model in which environmental, social, and financial performance is tested and proven, rather than assumed.

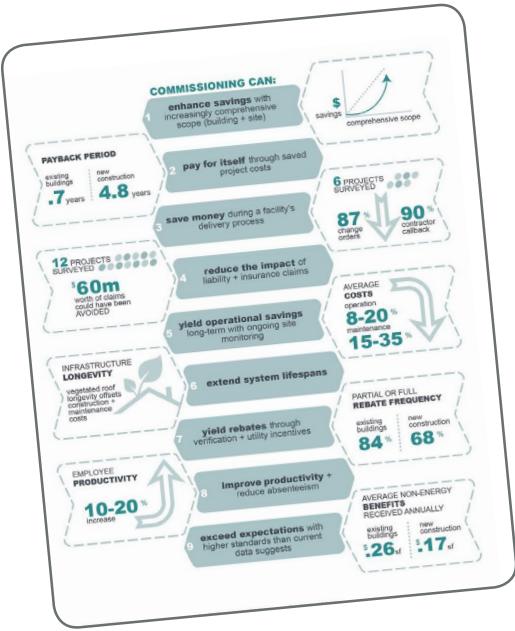
“

[Commissioning's greatest benefit is] the ability to **verify performance**, inform future practice, and help owners/operators to make real-time adjustments. It also serves the field as a whole as a **tool of market transformation.**”

*Maribeth Delorenzo, Deputy Director,
Urban Sustainability Administration, Department
of Energy + Environment*



PARADIGM SHIFT: The paper assesses the feasibility of site commissioning and then proposes a policy framework. This paper demonstrates how landscape architects can help shape federal policy that shifts the land development paradigm and enhances our profession's criticality.



CASE STUDY 5

PROJECT: THE CLARK ART INSTITUTE
LOCATION: MASSACHUSETTS, MA
PERFORMANCE GOAL: LEED ENHANCED CX
PERFORMANCE AWARD: LEED GOLD CERTIFICATION & ASSET MANAGEMENT

CX AGENT: ARAMARK, ENGINEERING & ASSET MANAGEMENT WHICH RECEIVED LEED GOLD CERTIFICATION & ASSET MANAGEMENT IN 2016.

DESIGNER: TANZI ANDO ARCHITECTS / GENSLER / REED HILLERSON

The Clark Art Institute deployed one of the first formal site commissioning processes in the U.S. during its 19-acre expansion campus renovation. Clark's 19-acre visitor center and conference center with an underground exhibition and conference center with an underground parking garage, parking, restaurants, and amenities—which received LEED Gold certification in 2016. As such, the building campus-wide commissioning and management strategy at the Clark Center is a comprehensive management strategy for the building systems fully integrated with the surrounding site through a one-acre tiered irrigation system that banks water and runoff feed the reflecting pool which in turn supplies the site's irrigation system. Much building plumbing, and cooling tower systems.

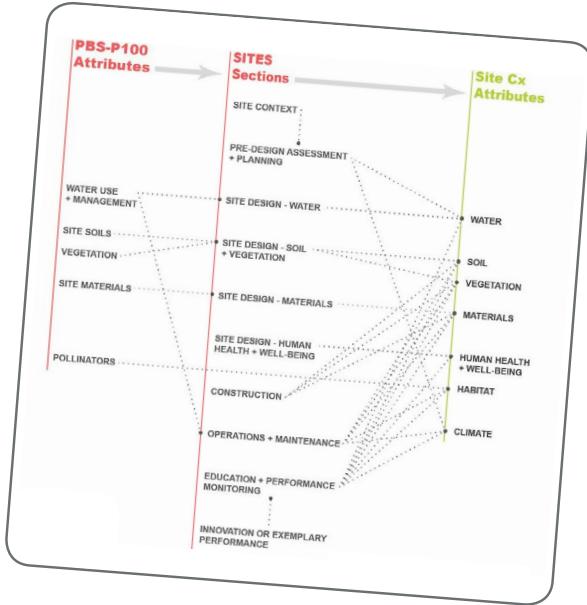
LEED 2.2 Enhanced Commissioning requires verification of building system performance, but since verification of building system performance, but since commissioning became standard, the building and site systems were fully integrated.

Performance Outcomes: 1) To meet the university's research goals and SITE-certification performance monitoring requirements, university and design lead personnel initiated a robust, two-year monitoring program. The design and academic researchers conducted monitoring site visits and data collection annually to collect certain data, while relying upon commercially available equipment and software for other data types. Monitoring and transpiration soil moisture, soil infiltration, vegetation biology, moisture, pH, organic matter, plants (vigor, species, viability), and human use (occupancy behavior).

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Performance Outcomes: 1) 3x more rainwater managed than regulatory models predicted, due to soil storage capacity and plant transpiration; 2) Irrigation programming error detected and resolved.

Image credit: Andropogon Associates



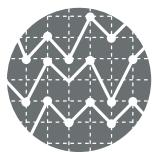
LITERATURE REVIEW

CASE STUDIES

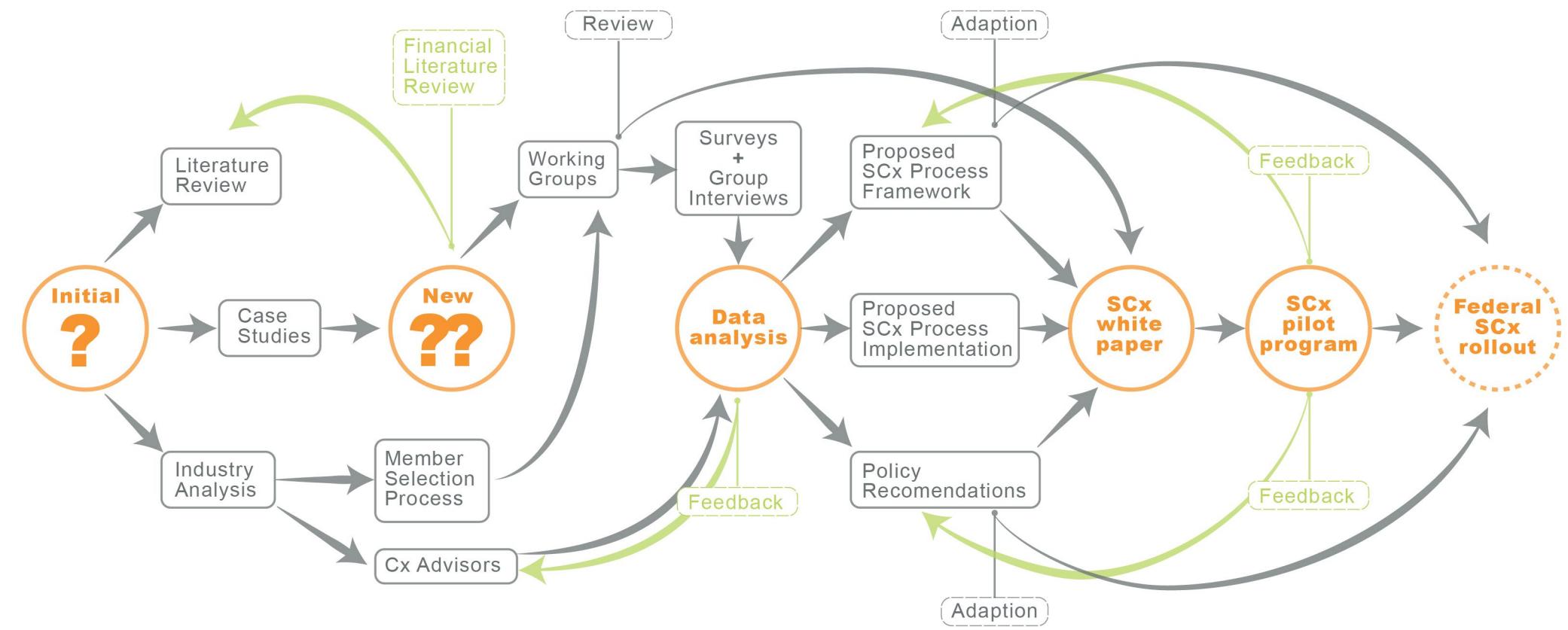
INDUSTRY ANALYSIS



more
?
?
?
than answers



PRELIMINARY INVESTIGATION: Initial research methods consisted of: 1) A literature review (of building commissioning, site monitoring, sustainability rating systems); 2) Industry assessment (of performance trends and the current commissioning gap); and 3) Case studies. Afterward, the research team needed more information.



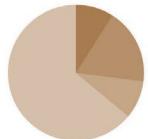
ITERATIVE RESEARCH PROCESS: To gain sufficient evidence for assessing the feasibility of this relatively unexplored subject matter, the study left its linear research approach and adopted a unique, iterative research process. Sub-research questions and new methods of inquiry developed throughout the investigation.

7 WORKING GROUPS



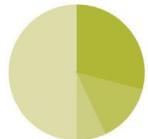
WATER

- 30% governmental organization
- 8% non-governmental organization
- 23% academic institution
- 39% professional company



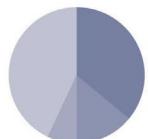
SOIL

- 9% governmental organization
- 18% non-governmental organization
- 9% academic institution
- 64% professional company



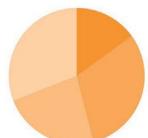
VEGETATION

- 29% governmental organization
- 14% non-governmental organization
- 7% academic institution
- 50% professional company



MATERIALS

- 36% governmental organization
- 14% non-governmental organization
- 7% academic institution
- 43% professional company



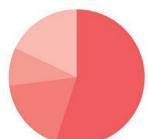
HABITAT

- 15% governmental organization
- 31% non-governmental organization
- 23% academic institution
- 31% professional company



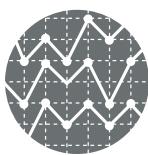
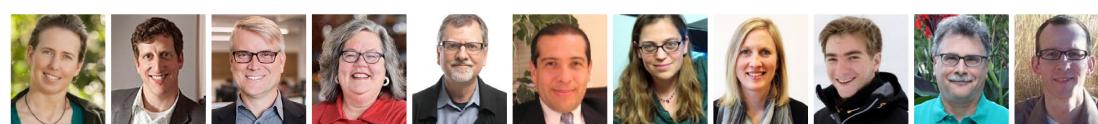
HUMAN HEALTH + WELL BEING

- 33% governmental organization
- 33% non-governmental organization
- 17% academic institution
- 17% professional company



CLIMATE

- 55% governmental organization
- 18% non-governmental organization
- 9% academic institution
- 18% professional company

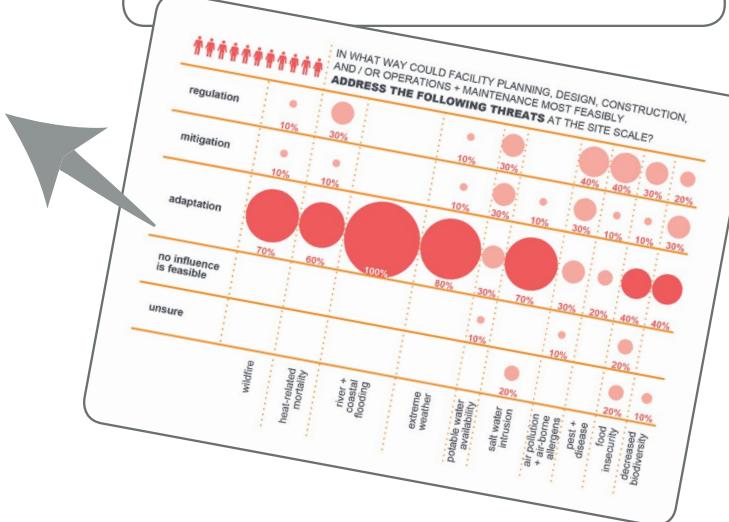
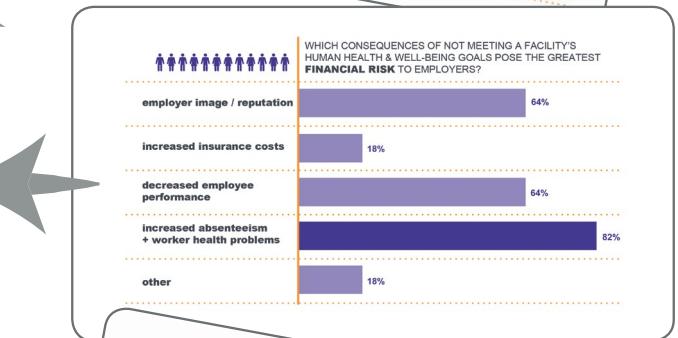
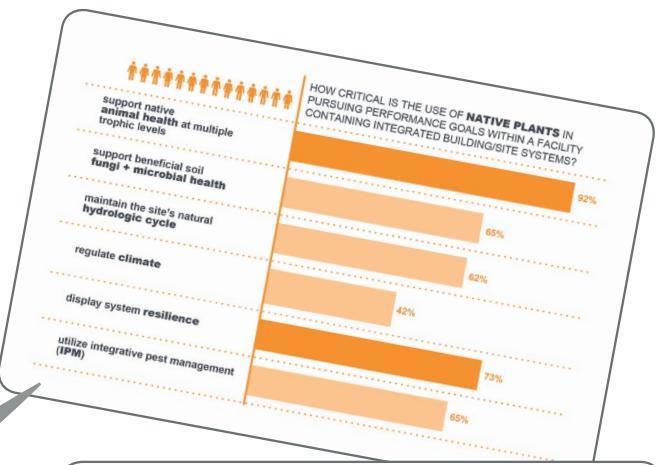
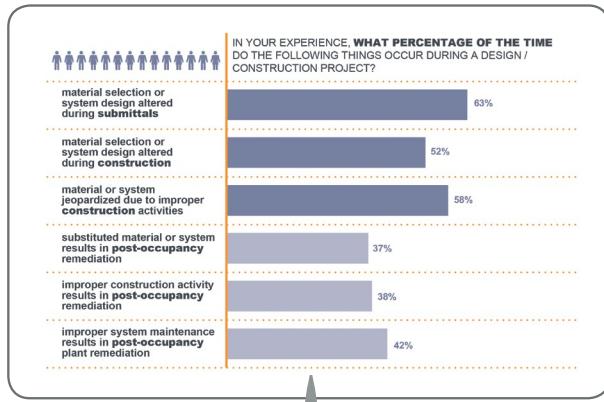
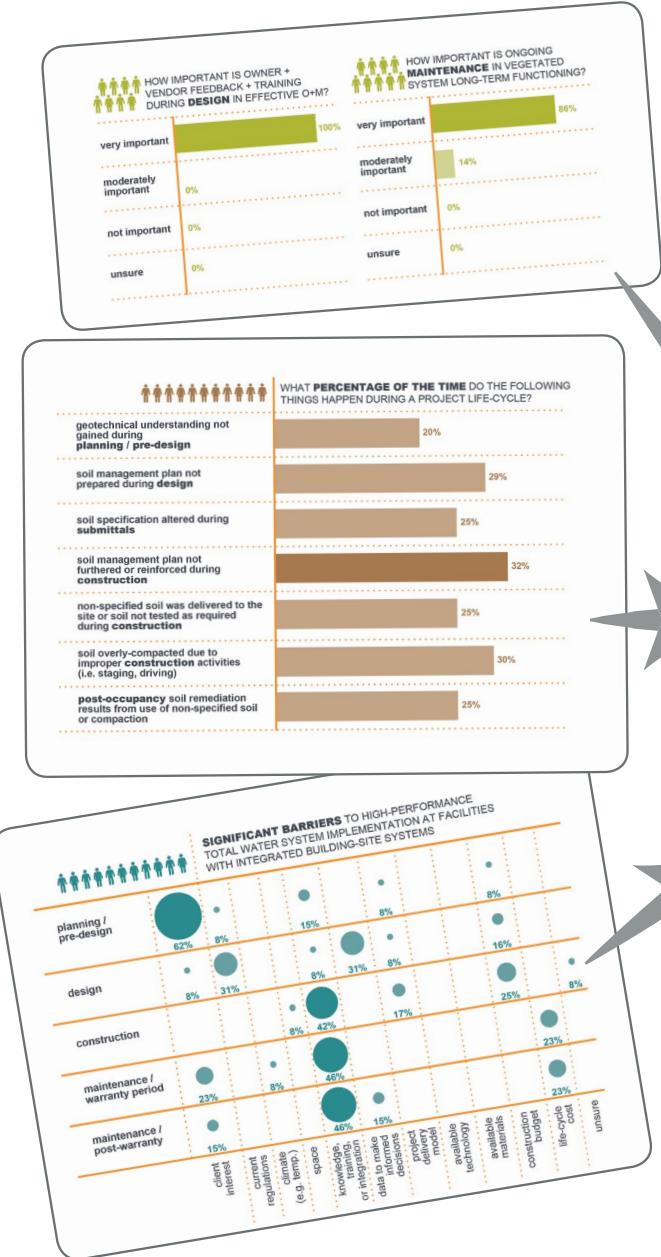


EXPERT INPUT: The research team engaged 89 industry thought leaders, divided into seven working groups—Water, Soil, Vegetation, Materials, Habitat, Human Health and Well-Being, Climate—to participate in online surveys and group interviews. The white paper incorporates these experts' insight and recommendations.

89 INDUSTRY THOUGHT LEADERS

8 GROUP INTERVIEWS

283 ONLINE SURVEY QUESTIONS



FINDINGS: The surveys and interviews revealed expectations of site commissioning's triple-bottom-line benefits, and statistically significant, cross-disciplinary support for GSA's adoption of site commissioning (n=89). Based on the primary and secondary research, the research team concluded that GSA's adoption of site commissioning is feasible.



INTERCONNECTED BENEFITS: Landscapes delivered through a site commissioning process can function, justifiably, as dynamic resources that enhance environmental sustainability, foster social benefits, and wisely steward financial resources.

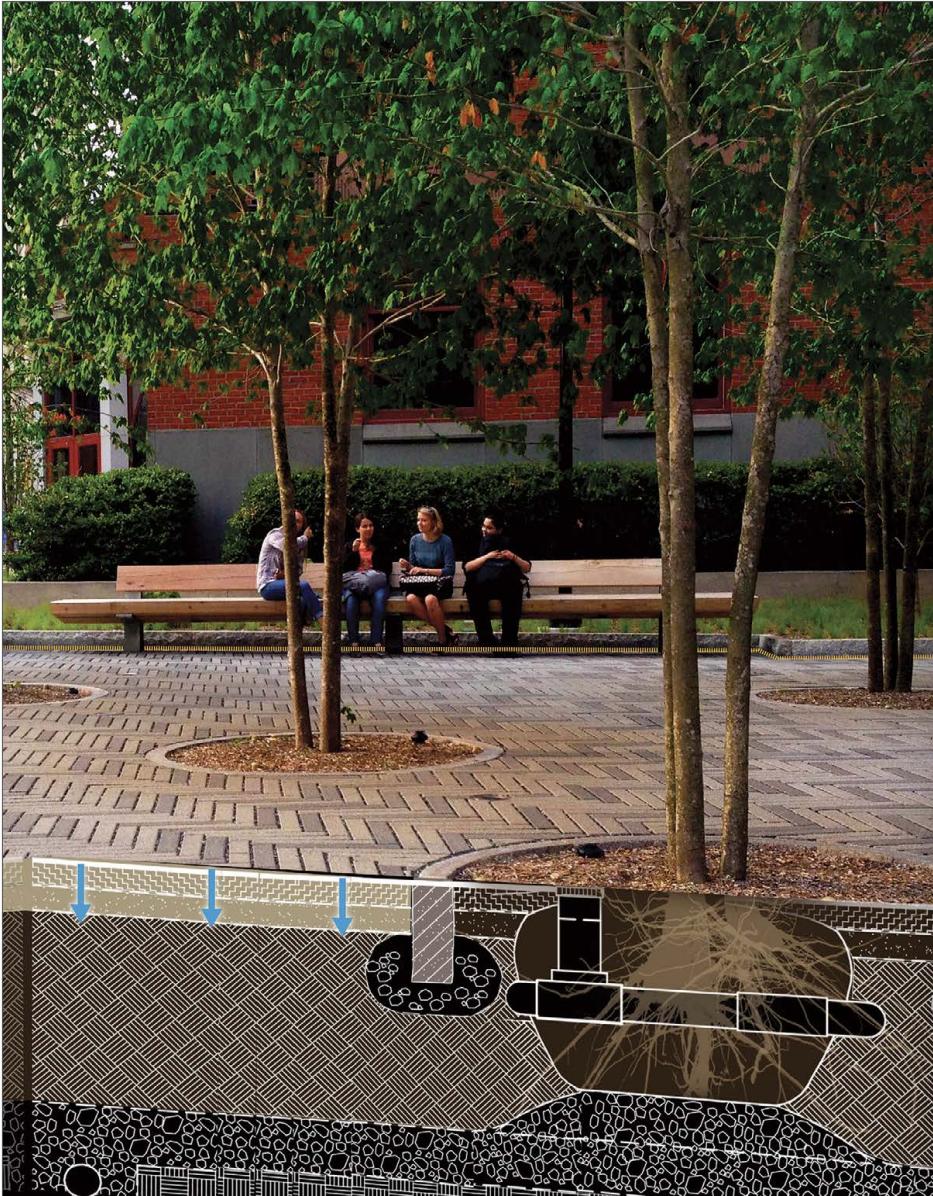


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Image credit: Andropogon Associates

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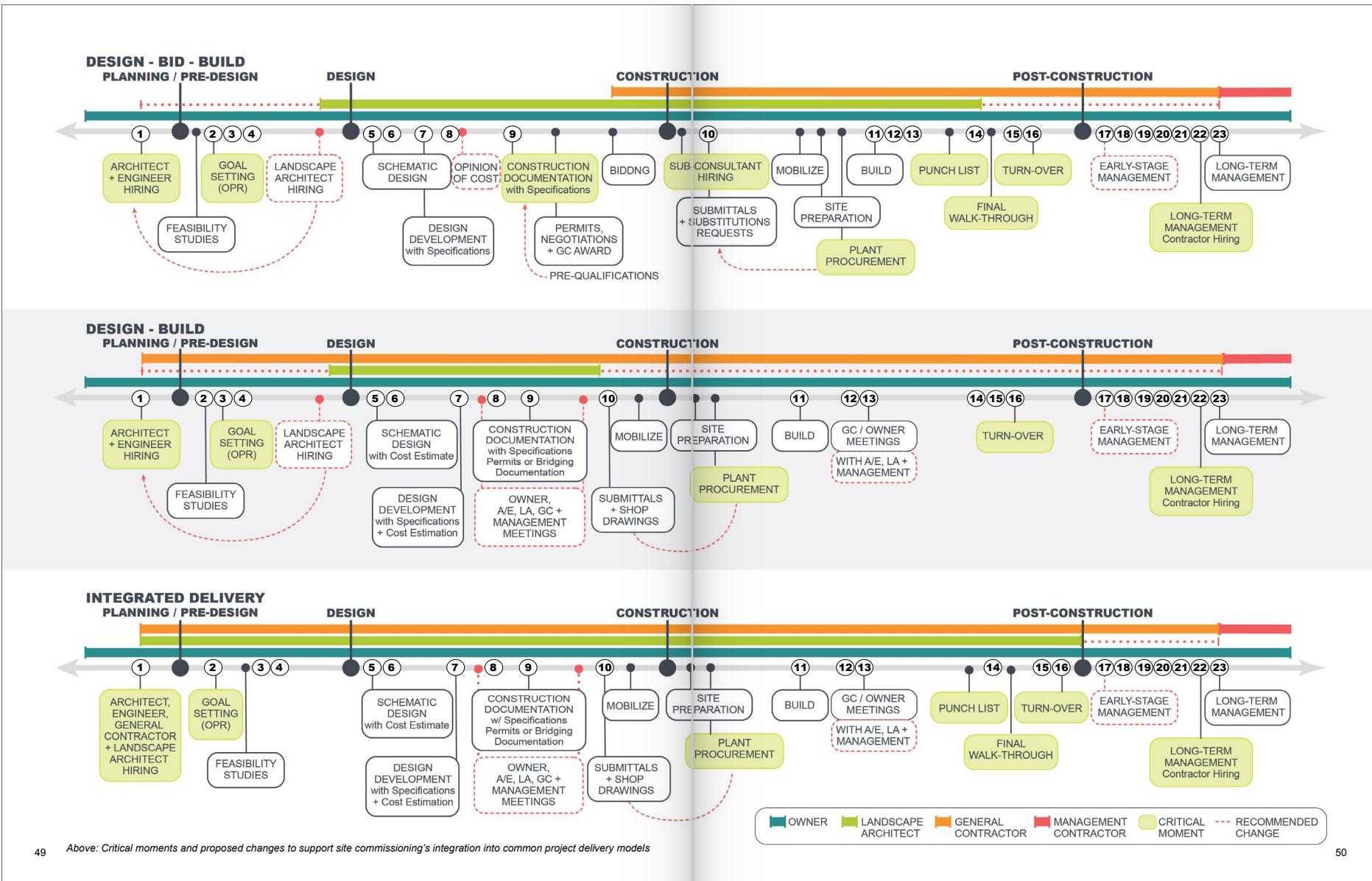
COMPREHENSIVE RESOURCE: The white paper synthesizes the primary and secondary research and then outlines a broadly-applicable site commissioning framework and implementation strategy. The graphically-rich publication was written for policy-makers, but designed to be relevant and accessible to design, construction, and management practitioners.

SITE COMMISSIONING ASSESSMENT METRICS CHART	DATA TYPES	PERFORMANCE LEVEL			PHASE ENGAGEMENT				MONITORING FREQUENCY*				
		Tier 1	Tier 2	Tier 3	Planning / Pre-Design	Design	Construction	Substantial Completion	Post-Construction	Only during construction	Only at end of warranty	Annually	Quarterly
	General Examples												
 Water	Water Use Flow Rate Water Quality	Water balance, capture/re-use, irrigation rate, discharge rate Weather data, discharge rate, runoff volume Temperature, dissolved O ₂ , pH, suspended solids, nutrients	X X X										
 Soil	Storage Capacity Chemical Properties Physical Properties Biological Properties	Total pore space, water holding capacity K, Ca, Mg, pH, soluble salts, cation exchange capacity Particle size distribution, moisture, infiltration, compaction Soil organic matter, macronutrients and micronutrients, microbial biomass (C, N), pathogens	X X X										
 Vegetation	Plant Coverage Health + Vigor Maintenance Effort Species Richness Transpiration	Percent cover, coverage density, biomass Height, spread, DBH, rooting depth, fluorescence, disease Total hours, total expenses Plant counts, biodiversity, Plant Stewardship Index Leaf area index, porometer measurement, sap flow meter	X X X X										
 Materials	Constructability Durability Porous Pavement Permeability Cost-Benefit	Construction methods evaluation Corrosion, cracking, disfigurement, discoloring Infiltration rate First cost, maintenance cost, replacement cost and frequency	X X X										
 Habitat	Habitat Value Pollinator Biodiversity Non-pollinator Biodiversity	Plant species selection, bloom time, fruiting time Richness, evenness Richness, evenness	X X X										
 Human Health + Well-Being	Accessibility Access to Amenities Safety Satisfaction Human Behavior Educational Value Local Economic Impact	ABAAS compliance, ease of wayfinding Access to physical activity and mentally restorative locations Incident reports, crime statistics Employee retention rate, self-reported happiness User counts, behavior mapping, preference Interpretive element quantity/quality, user understanding Employee/contractor commute distance, material purchases	X X X X X										
 Climate	Weather Energy Use Heat Island Effect Carbon Sequestration	Air temperature, relative humidity, precipitation, wildfire risk Material embodied energy, wattage usage, emissions Albedo, shaded area, surface temperature Carbon footprint, carbon storage, carbon credits	X X X										

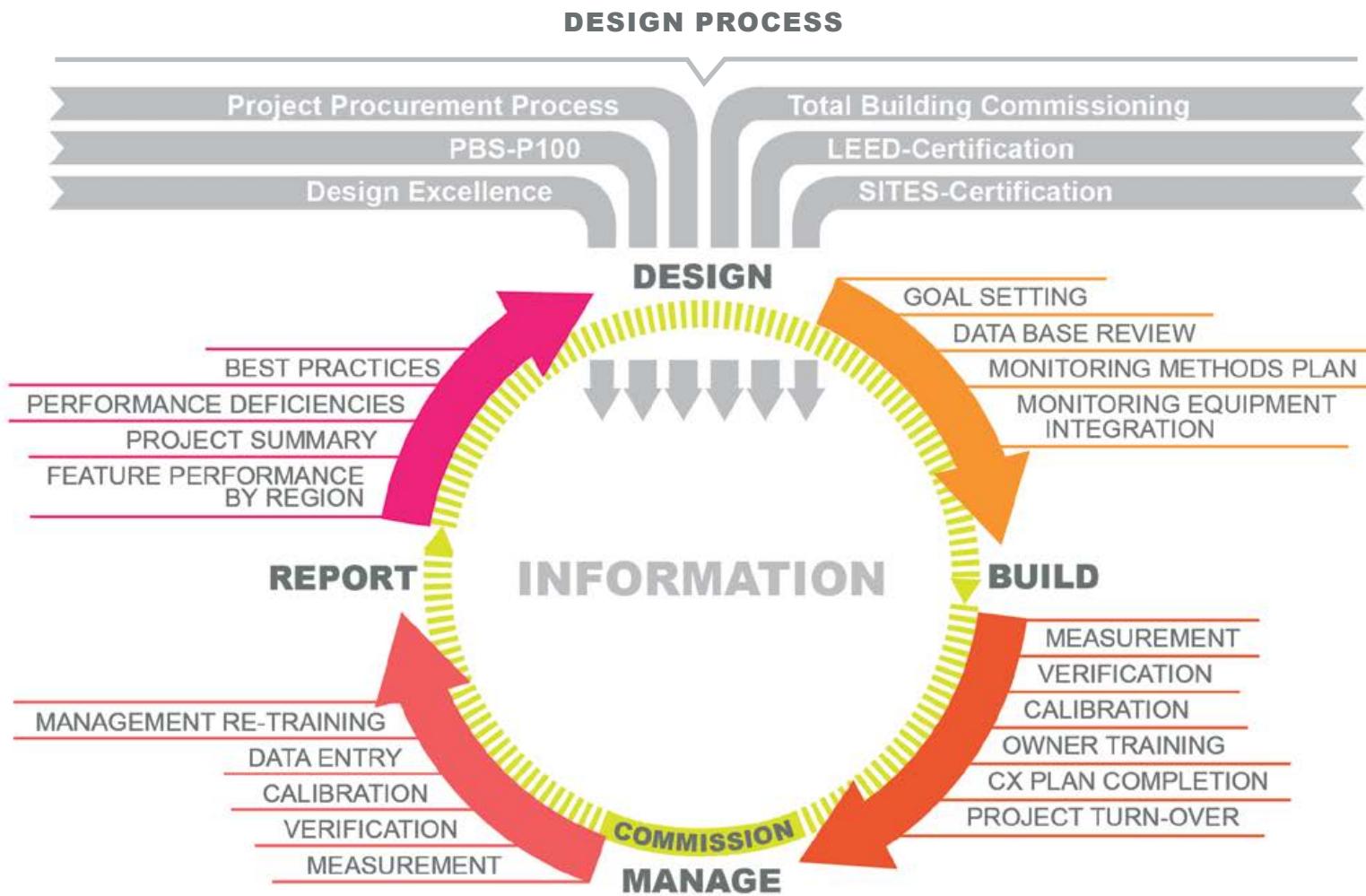
* = Frequencies recommended by Working Groups to gain basic performance data that balances cost, accuracy + usefulness

ACTIONABLE FRAMEWORK: The white paper proposes assessment metrics and monitoring frequency for four “Core Attributes” (Water, Soil, Vegetation, Materials) and three “Supporting Attributes” (Habitat, Human Health and Well-Being, Climate). These attributes dovetail with SITES, which is already required for GSA land development.



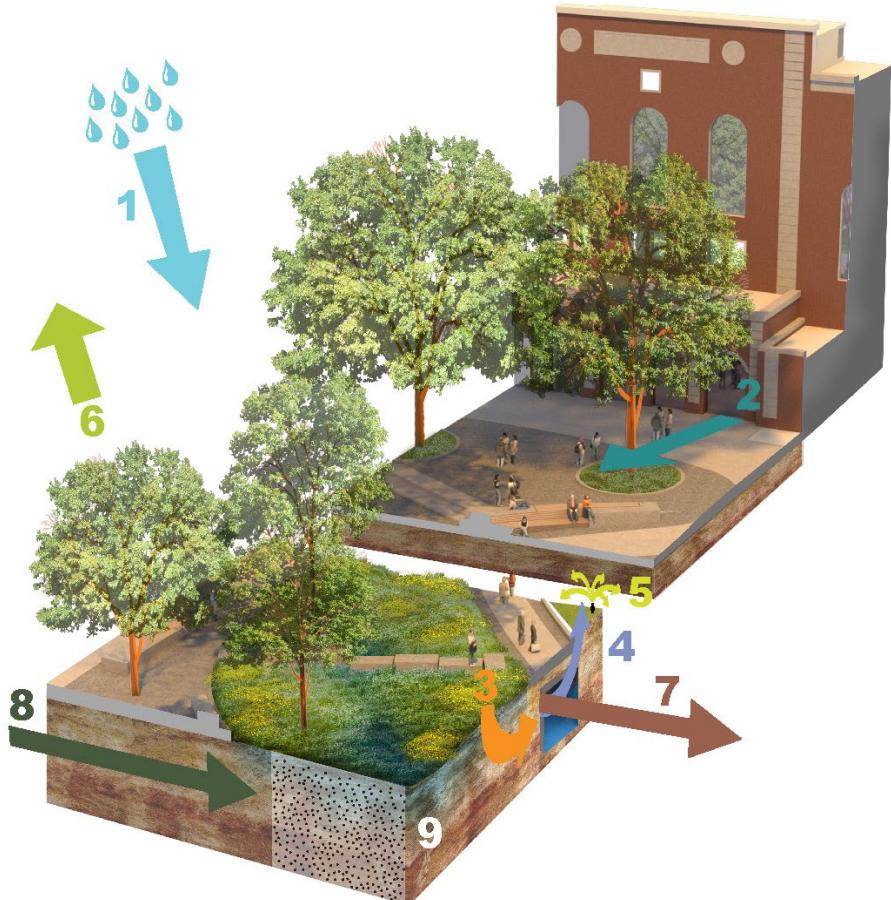


IMPLEMENTATION: Site commissioning could be easily integrated into various project delivery models. In all scenarios, the landscape architect is engaged early on (prior to establishing landscape performance goals) and project turn-over becomes a critical moment for managing accountability and fostering success.



ADAPTIVE FEEDBACK LOOP: Advancing beyond conventional design, construction, and management processes through site commissioning, within and beyond GSA, requires an adaptive feedback loop. This would enable information to accumulate and practices to improve over time.



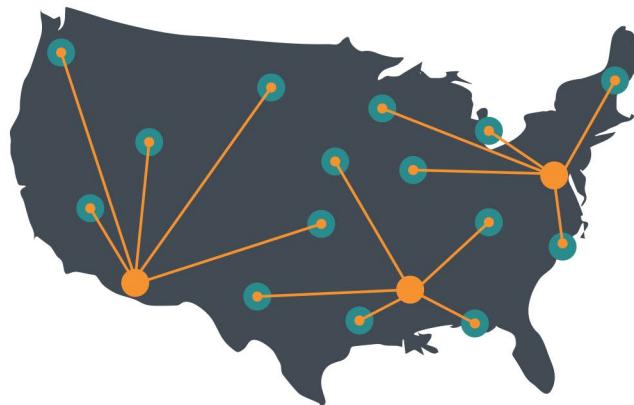


SIGNIFICANCE: Establishing landscape performance goals, designing and building to meet those goals, and then field-verifying performance over time—all through site commissioning—elevates the effectiveness of the design-construction-management team and increases each landscape's ability to provide essential services.





FEDERAL PILOT PROJECTS



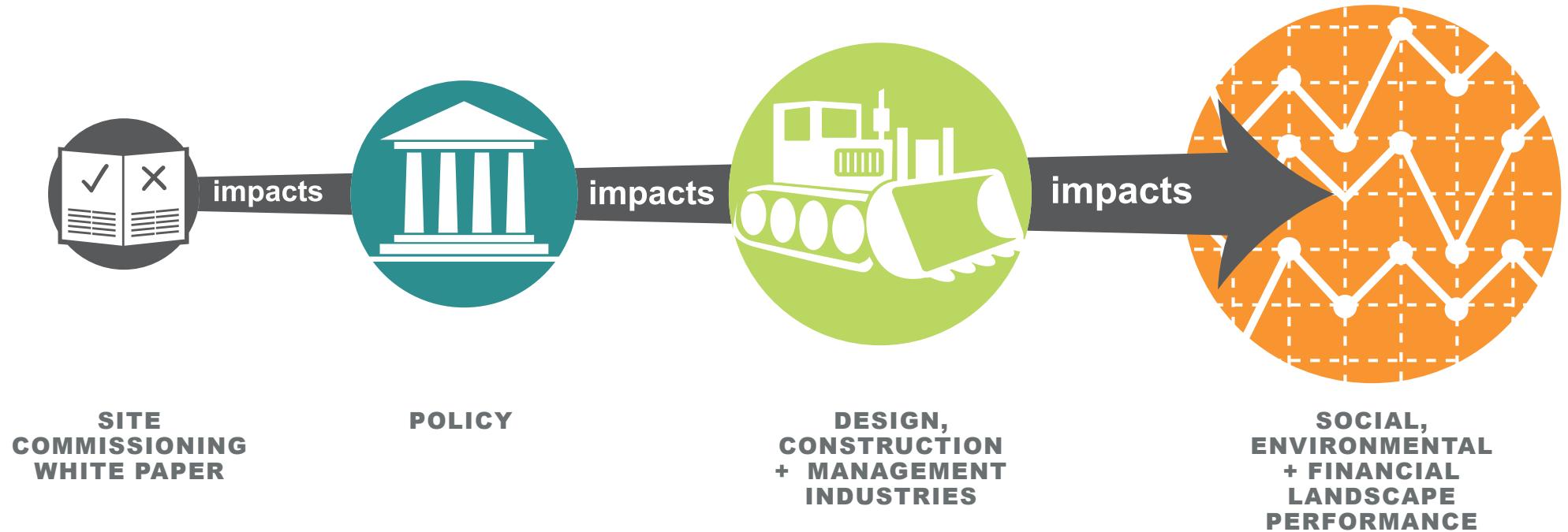
FEDERAL ROLL OUT



PRIVATE SECTOR ADOPTION



NATIONAL IMPACT: As one of the largest public real estate organizations globally, GSA's deployment of site commissioning could positively impact the design, construction, and management industries on a national scale, similar to the market shift resulting from GSA's adoption of LEED.



ELEVATING OUR PROFESSION: GSA's forward-thinking investigation into site commissioning and its possible adoption for all future development and major redevelopment projects has the potential to prove that investment in constructed landscapes is environmentally, socially, and financially worthwhile, while revolutionizing our industry.