Engagement

1. What are attributes of a High Performance School?
2. What knowledge gaps exist?
3. What challenges are there to achieving a high performance school?
4. What additional tools can we provide?

HED CHPS LOS ANGELES UNIFIED LA READY FOR THE WORLD DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

Building Excellence

The Blueprint for High Performance Environments and the Financial Advantage

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CHPS

LA

DSA
DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

Today's Session Team

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HED
ARCHITECT | EDUCATION SECTOR LEADER

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STATE ARCHITECT

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LAUSD
READY FOR THE WORLD

DSA
DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

Who are you?

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READY FOR THE WORLD

DSA
DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

HED CHPS LOS ANGELES UNIFIED SCHOOL DISTRICT READY FOR THE WORLD DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

1 **WHAT IS A HP SCHOOL?**
WHAT ARE THE BENEFITS?

2 **CHPS**
RESOURCE AND TOOLS

3 **LOS ANGELES USD**
RESULTS AND CASE STUDIES

4 **DSA**
WHERE WE ARE & ARE GOING

5 **RESOURCES & QUESTIONS**

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What is a HP Environment and What are the Financial Benefits

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1978 Oldsmobile Cutlass

2023 Tesla Model Y

If you were a professional driver

- Which would you **rather drive**?
- Which would give you **greater job satisfaction**?
- **Would you drive somewhere** else if they offered you the newer car?

- Which one **safer**?
- Which has **lower operating cost**?
- Which is **healthier** for the driver? For the community?
- Which is more **sustainable**?
- Which is more **equitable**?

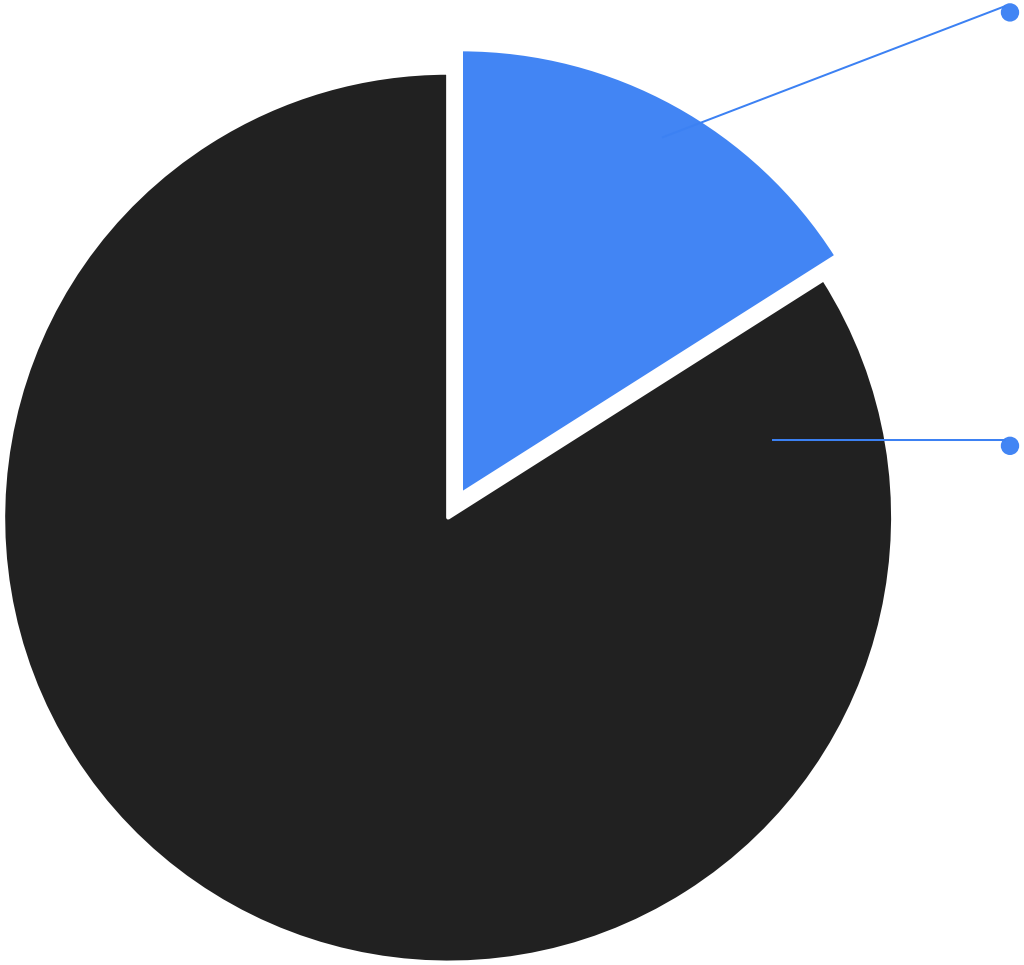
How do we accelerate this transition?

Working Definition:

High performance schools include decades of design iteration, feedback, and research, holistically centered on student outcomes.

0.65

Impact, in grade levels, of moving an average child from the worst classroom to the best



16% Quality of the Classroom Environment

84% All other Factors

- Socioeconomic
- Teacher quality
- Family Support
- Nutrition
- Sleep
- Etc.

Academic Achievement

Factors affecting the gap between the highest and lowest achieving students.

QUATTROCCHI KWOK ARCHITECTS

Advancing Your World.

It is our promise that through the **positive impact** of design, our teams create **exceptional, sustainable solutions** for our clients, the community, and **the world**.

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“First we shape our buildings;
thereafter they shape us.”
- Winston Churchill
HED
SFUSD
VANIR

What is a High Performance School?

- Code
- Sustainable
- Responsive to Climate Realities
- Health and Wellness
- Flexible
- Fostering Community
- Conserving Resources
- Future Forward
- Adaptable
- Maximizing daylight
- Safe
- Educational
- Aspirational
- A Teaching Tool
- Great acoustics
- Low Emitting Materials
- Efficient and Right Sized Systems
- Renewable materials and energy
- Electrification
- Safe and Secure

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Call to action: Create better than just Adequate environments

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Infuse higher level needs for long term benefits.
Physiological are short term – psychological benefits are long term.

Need categories	Need examples
Self-actualization needs	Self-fulfillment; Growth; Unity Understanding; Beauty; Morality; Transcendence; Exploration; Play
Esteem needs	Positive self-evaluation; Dignity; Achievement; Mastery; Competence; Independence; Reputation; Prestige
Social needs	Giving and receiving affection; Intimacy; Friendship; Tenderness; Affiliation; Love; Belongingness
Safety needs	Security; Stability; Predictability; Protection; Freedom from fear; Structure; Order; Law; Limits
Physiological needs	Nutrition; Water; Air; Sleep; Shelter; Clothing (temperature control); Reproduction

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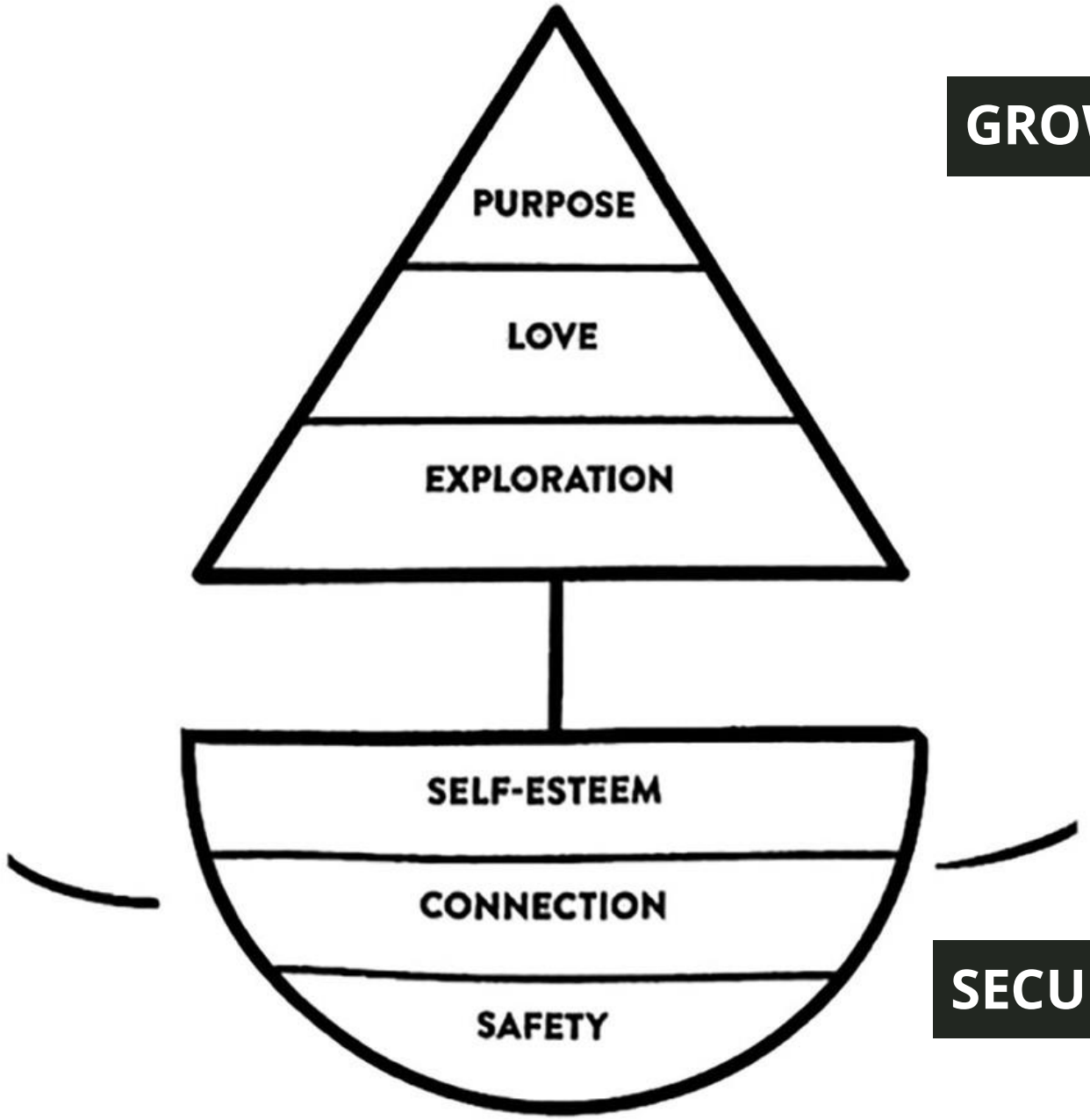
Maslow's hierarchy is an interrelated set of variants that needs to work together toward a higher purpose.

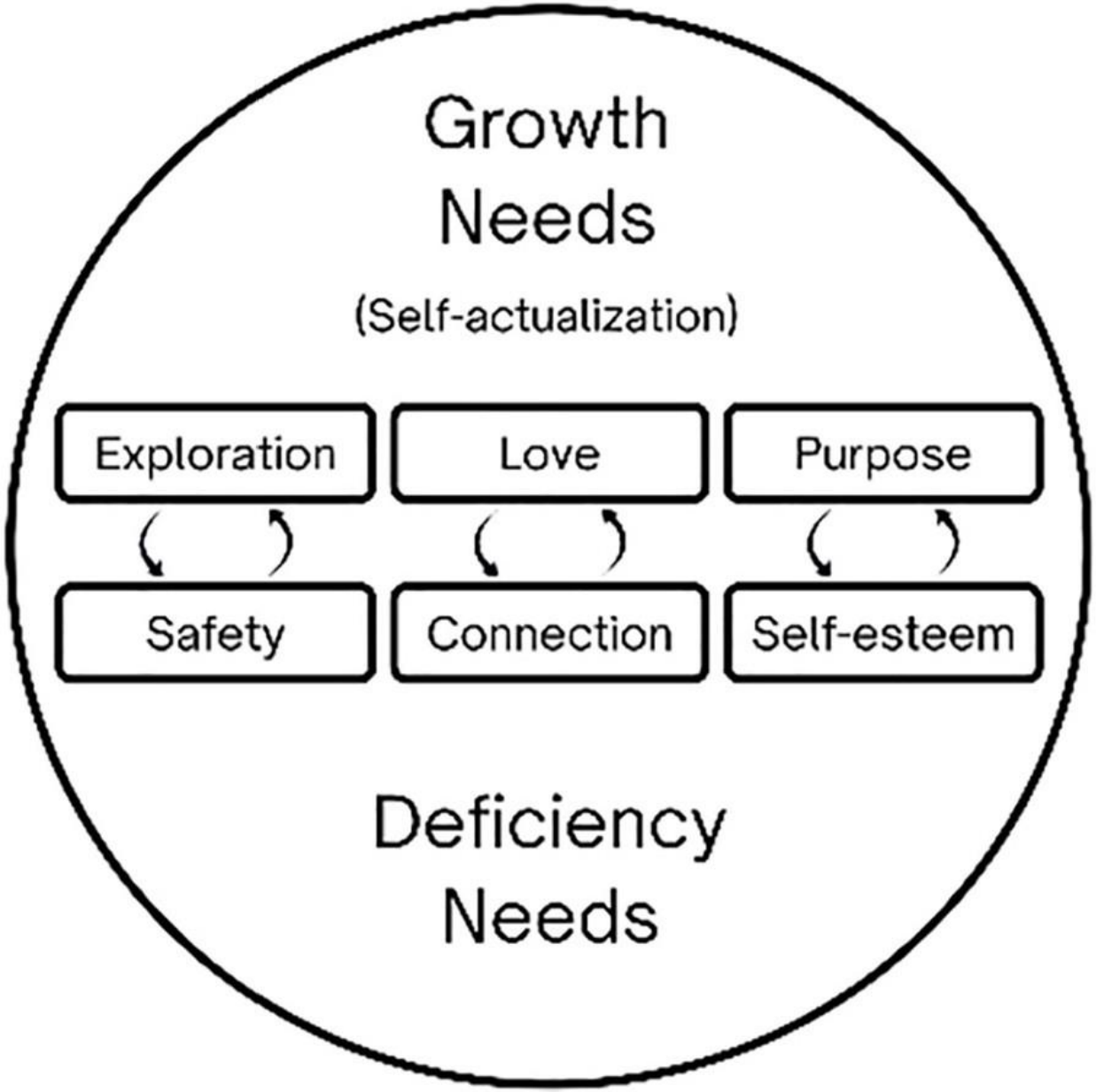
Like our educational environments, these needs are interrelated.



Kaufman's (2020) Sailboat Metaphor Representing Deficiency and Growth Needs.

The call to Action:

When scoping projects, ensure that Growth Needs are Optimized along with the Deficiency Needs



Adding on to Kaufman's (2020) Sailboat Metaphor.

Attributes that provide physiological benefits:

1. The need for change (comfortable variations in light, air, temperature, etc.)
2. The ability to act on our environment and see the effects of our actions
3. Meaningful stimuli
4. Places of refuge
5. Positive view to the outside

Principles of Biophilia

Visual Connection with Nature

Non-Visual Connection with Nature

Non-Rhythmic Sensory Stimuli

Thermal & Airflow Variablility

Presence of Water

Dynamic and Diffuse Light

Connection with Natural Systems

Biomorphic Forms and Patterns

Material Connection with nature

Complexity & Order

Prospect

Refuge

Mystery

Risk/Peril

Human Biological responses to nature: The Science Supporting the Benefits

	14 PATTERNS	•	STRESS REDUCTION	COGNITIVE PERFORMANCE	EMOTION, MOOD & PREFERENCE
NATURE IN THE SPACE	Visual Connection with Nature	• • •	**Lowered blood pressure and heart rate** (Brown, Barton & Gladwell, 2013; van den Berg, Hartig, & Staats, 2007; Tsunetsugu & Miyazaki, 2005)	**Improved mental engagement/ attentiveness** (Biederman & Vessel, 2006)	**Positively impacted attitude and overall happiness** (Barton & Pretty, 2010)
	Non-Visual Connection with Nature	• •	**Reduced systolic blood pressure and stress hormones** (Park, Tsunetsugu, Kasetani et al., 2009; Hartig, Evans, Jamner et al., 2003; Orsega-Smith, Mowen, Payne et al., 2004; Ulrich, Simons, Losito et al., 1991)	**Positively impacted on cognitive performance** (Mehta, Zhu & Cheema, 2012; Ljungberg, Neely, & Lundström, 2004)	**Perceived improvements in mental health and tranquility** (Li, Kobayashi, Inagaki et al., 2012; Jahncke, et al., 2011; Tsunetsugu, Park, & Miyazaki, 2010; Kim, Ren, & Fielding, 2007; Stigsdotter & Grahn, 2003)
	Non-Rhythmic Sensory Stimuli	• •	**Positively impacted on heart rate, systolic blood pressure and sympathetic nervous system activity** (Li, 2009; Park et al, 2008; Kahn et al., 2008; Beauchamp, et al., 2003; Ulrich et al., 1991)	**Observed and quantified behavioral measures of attention and exploration** (Windhager et al., 2011)	
	Thermal & Airflow Variability	• •	**Positively impacted comfort, well-being and productivity** (Heerwagen, 2006; Tham & Willem, 2005; Wigö, 2005)	**Positively impacted concentration** (Hartig et al., 2003; Hartig et al., 1991; R. Kaplan & Kaplan, 1989)	**Improved perception of temporal and spatial pleasure (alliesthesia)** (Parkinson, de Dear & Candido, 2012; Zhang, Arens, Huizenga & Han, 2010; Arens, Zhang & Huizenga, 2006; Zhang, 2003; de Dear & Brager, 2002; Heschong, 1979)
	Presence of Water	• •	**Reduced stress, increased feelings of tranquility, lower heart rate and blood pressure** (Alvarsson, Wiens, & Nilsson, 2010; Pheasant, Fisher, Watts et al., 2010; Biederman & Vessel, 2006)	**Improved concentration and memory restoration** (Alvarsson et al., 2010; Biederman & Vessel, 2006) **Enhanced perception and psychological responsiveness** (Alvarsson et al., 2010; Hunter et al., 2010)	**Observed preferences and positive emotional responses** (Windhager, 2011; Barton & Pretty, 2010; White, Smith, Humphryes et al., 2010; Karmanov & Hamel, 2008; Biederman & Vessel, 2006; Heerwagen & Orians, 1993; Ruso & Atzwanger, 2003; Ulrich, 1983)
	Dynamic & Diffuse Light	• •	**Positively impacted circadian system functioning** (Figueiro, Brons, Plitnick et al., 2011; Beckett & Roden, 2009) **Increased visual comfort** (Elyezadi, 2012; Kim & Kim, 2007)		
	Connection with Natural Systems				**Enhanced positive health responses; Shifted perception of environment** (Kellert et al., 2008)
NATURAL ANALOGUES	Biomorphic Forms & Patterns	•			**Observed view preference** (Vessel, 2012; Joye, 2007)
	Material Connection with Nature			**Decreased diastolic blood pressure** (Tsunetsugu, Miyazaki & Sato, 2007) **Improved creative performance** (Lichtenfeld et al., 2012)	**Improved comfort** (Tsunetsugu, Miyazaki & Sato 2007)
	Complexity & Order	• •	**Positively impacted perceptual and physiological stress responses** (Salingaros, 2012; Joye, 2007; Taylor, 2006; S. Kaplan, 1988)		**Observed view preference** (Salingaros, 2012; Hägerhäll, Laike, Taylor et al., 2008; Hägerhäll, Purcella, & Taylor, 2004; Taylor, 2006)
NATURE OF THE SPACE	Prospect	• • •	**Reduced stress** (Grahn & Stigsdotter, 2010)	**Reduced boredom, irritation, fatigue** (Clearwater & Coss, 1991)	**Improved comfort and perceived safety** (Herzog & Bryce, 2007; Wang & Taylor, 2006; Petherick, 2000)
	Refuge	• • •		**Improved concentration, attention and perception of safety** (Grahn & Stigsdotter, 2010; Wang & Taylor, 2006; Wang & Taylor, 2006; Petherick, 2000; Ulrich et al., 1993)	
	Mystery	• •			**Induced strong pleasure response** (Biederman, 2011; Salimpoor, Benovoy, Larcher et al., 2011; Ikemi, 2005; Blood & Zatorre, 2001)
	Risk/Peril	•			**Resulted in strong dopamine or pleasure responses** (Kohno et al., 2013; Wang & Tsien, 2011; Zald et al., 2008)

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Measurable Positive Returns:

TABLE 1. BIOPHILIA IMPACTS FOR POSITIVE RETURNS

INDICATOR / SECTOR	HEALTH & WELL-BEING IMPACTS	FINANCIAL IMPACTS	
		DIRECT	INDIRECT
OFFICES	presenteeism, performance, productivity	absenteeism, staff retention; lease rate, churn	talent acquisition, health claims, employee satisfaction
EDUCATION	attention, learning rate	absenteeism, test scores	graduation rates
RETAIL	customer attention, brand perception	hedonic value, sales; staff retention	dwell time, return patronage, social media attention
HEALTHCARE	healing rate, analgesic intake	patient turnover; staff retention	visitor perception
HOSPITALITY	staff performance, perception of place	average daily room rate (ADR, RevPAR)	employee satisfaction, brand loyalty, social media attention; total revenue per available room (TRevPAR)
COMMUNITIES	perception of safety, crime rate; overall public health	tourism; crime rate	investment attraction, migration; real estate value, tax base; climate change adaptability, resilience, equity; incarceration rate

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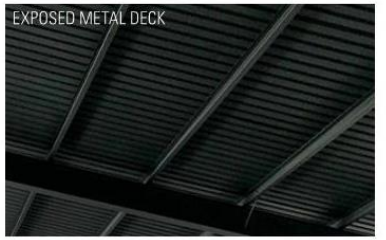
What could this look like?

Interior | Look + Feel

- Humans are innately drawn to nature
- Biophilic: provide clarity, reduce stress, improve well-being
- Forms, patterns, colors and texture from nature



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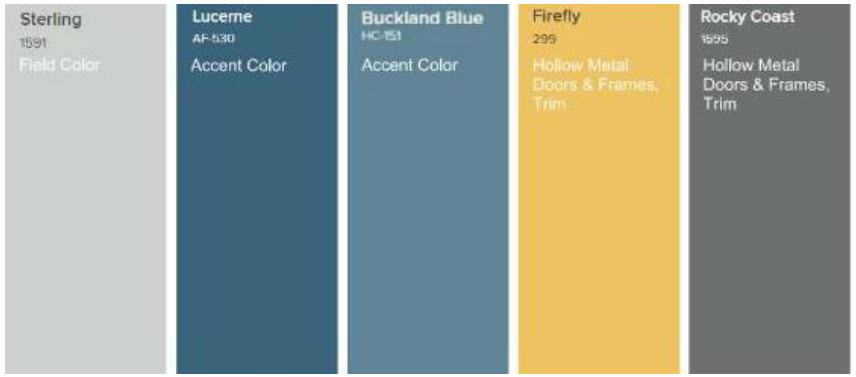
What could this look like?



Bowditch Middle School
Biophilia in Schools

- Restorative Benefits
- Enhanced Creativity
- Improves Cognitive Function and Productivity
- Increased Memory and Concentration
- Reduces Boredom, Stress, and Aggression

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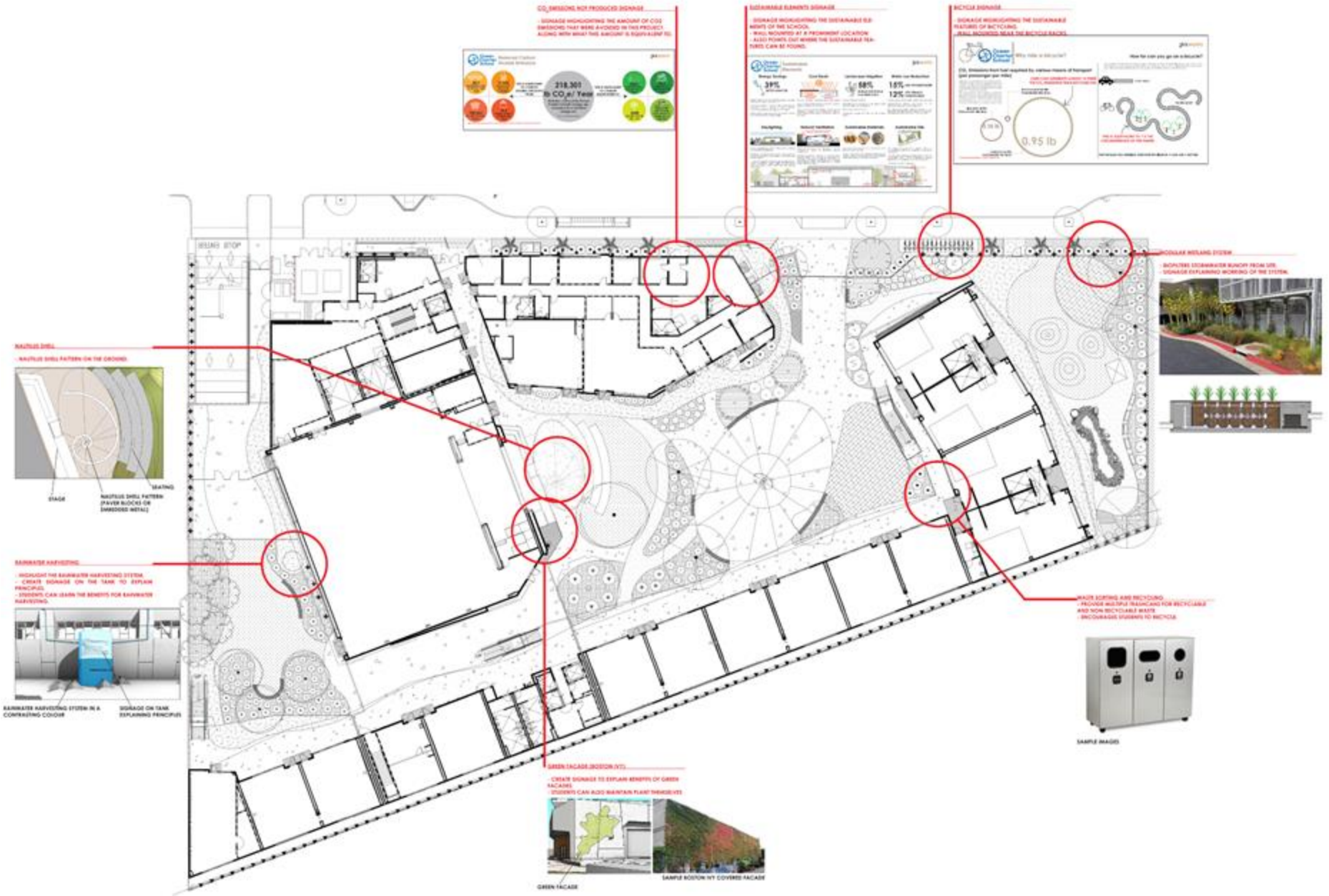
Education on Display - Educational Environment as a 3D Teaching Tool

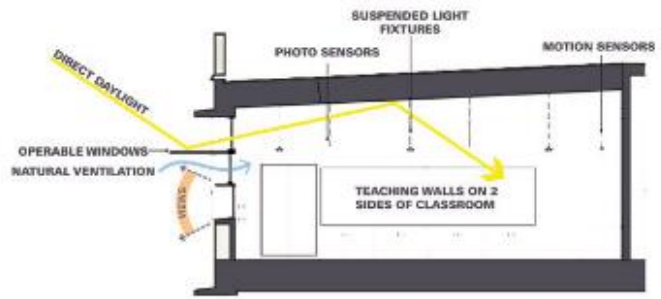


LAUSD-
Charles Kim ES

- Designed as a high-performance school without client's initial buy-in
- Became 1 of 2 Demonstration Site for CHPS for LAUSD
- Prompted Formal Adoption of CHPS by LAUSD
- Compact Urban ES on less than 2 acres
- No additional fee or budget allocated

EUI (KBTU/SF-YR)

34.8 designed **30.4** actual



Classroom showing sustainable design features

Sustainable Site Plan

Sustainable strategies incorporated into school design

State Funding is positively addressing:

1. Learning Loss – Health and Wellness as a focus
2. Early Childhood Education
3. Nutritional Needs
4. Career Technical Education – Learning by Doing

K12 Federal Funding Under the Inflation Reduction Act

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COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS

TOOLS AND RESOURCES

Schools Themes

1. We need student-centered holistic solutions
2. Break down ‘topical’ silos
3. Lack of evidence based and applied research
4. Need 3rd Party facilitation
5. Collaboratively developed solutions
6. Competitive Implementation

Energy Efficient

Safe & Secure

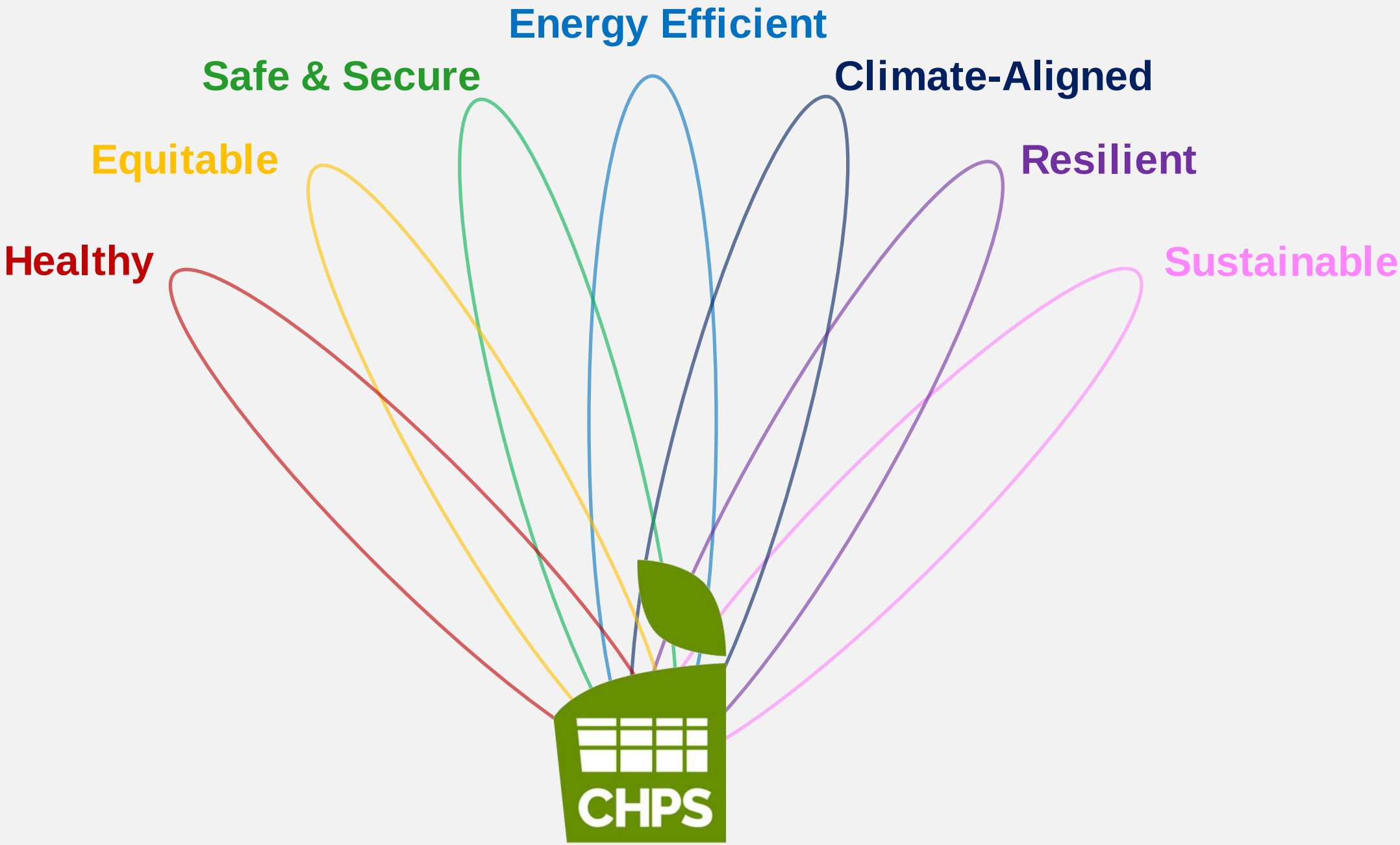
Climate-Aligned

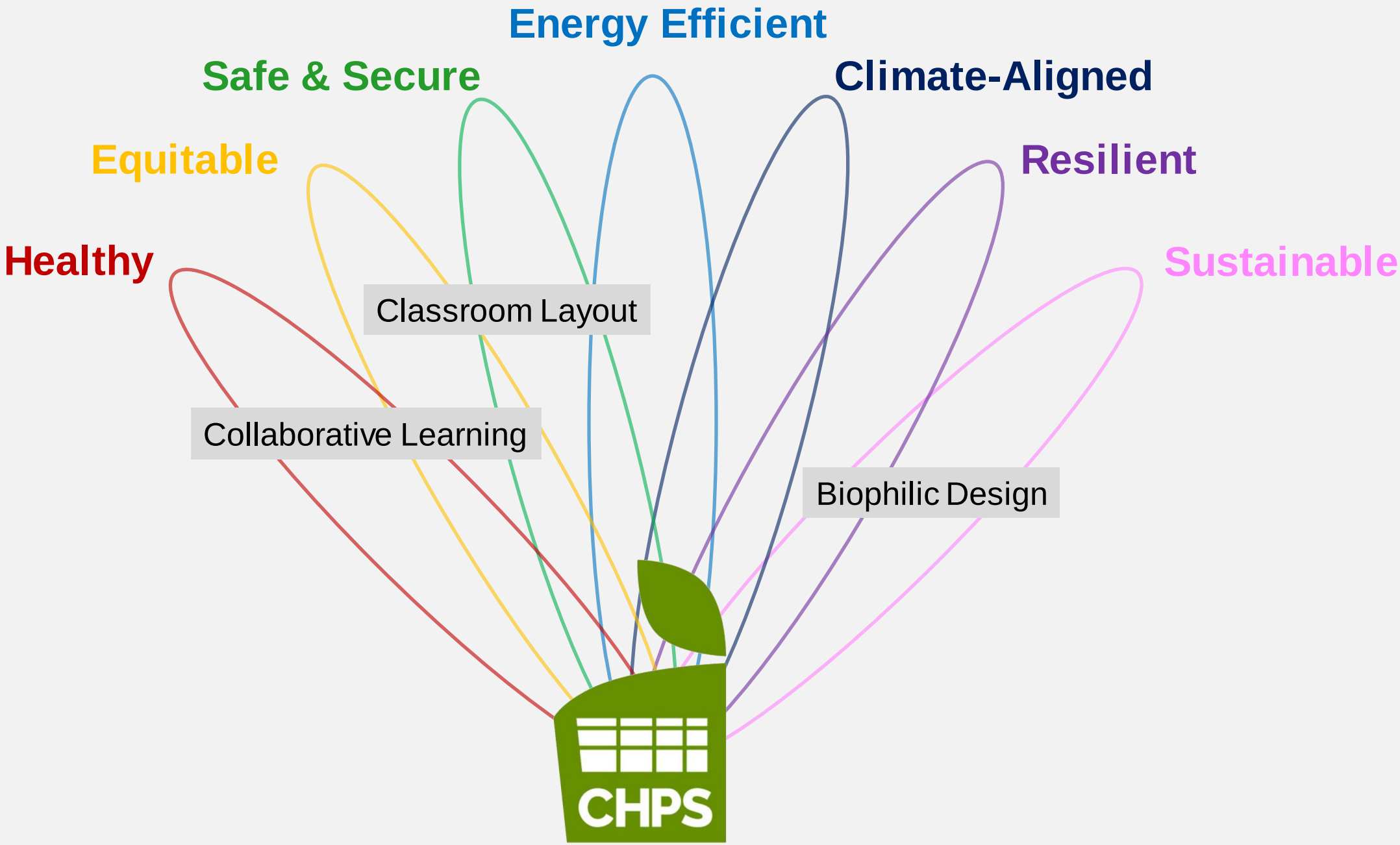
Equitable

Resilient

Healthy

Sustainable


Energy Efficient
Safe & Secure
Climate-Aligned
Equitable
Resilient
Healthy
Sustainable
CHPS


Energy Efficient
Safe & Secure
Climate-Aligned
Equitable
Resilient
Healthy
Sustainable
Classroom Layout
Collaborative Learning
Biophilic Design
CHPS

Mission

We aspire to make every school an ideal place to learn.

For over **20 years**, CHPS has developed and maintained the nation's **only** third-party building standard explicitly designed by K12 schools and focused on improving student performance.

Priorities:

- Increase student performance and health of students & staff
- Reduce operating costs through better design
- Enhance environmental stewardship

Abbott Downing, Concord NH (NE-CHPS)

Existing Programs

Third-Party building standards only address new construction or major renovations.

LEED for Building Design and Construction (BD+C)
This rating system is for buildings that are new construction or major renovations.

LEED for Interior Design and Construction (ID+C)
This rating system is for interior spaces that are a complete interior fit-out

US CHPS Criteria 2.0
Criteria & Implementation Guide for New Construction & Major Renovation of School Buildings

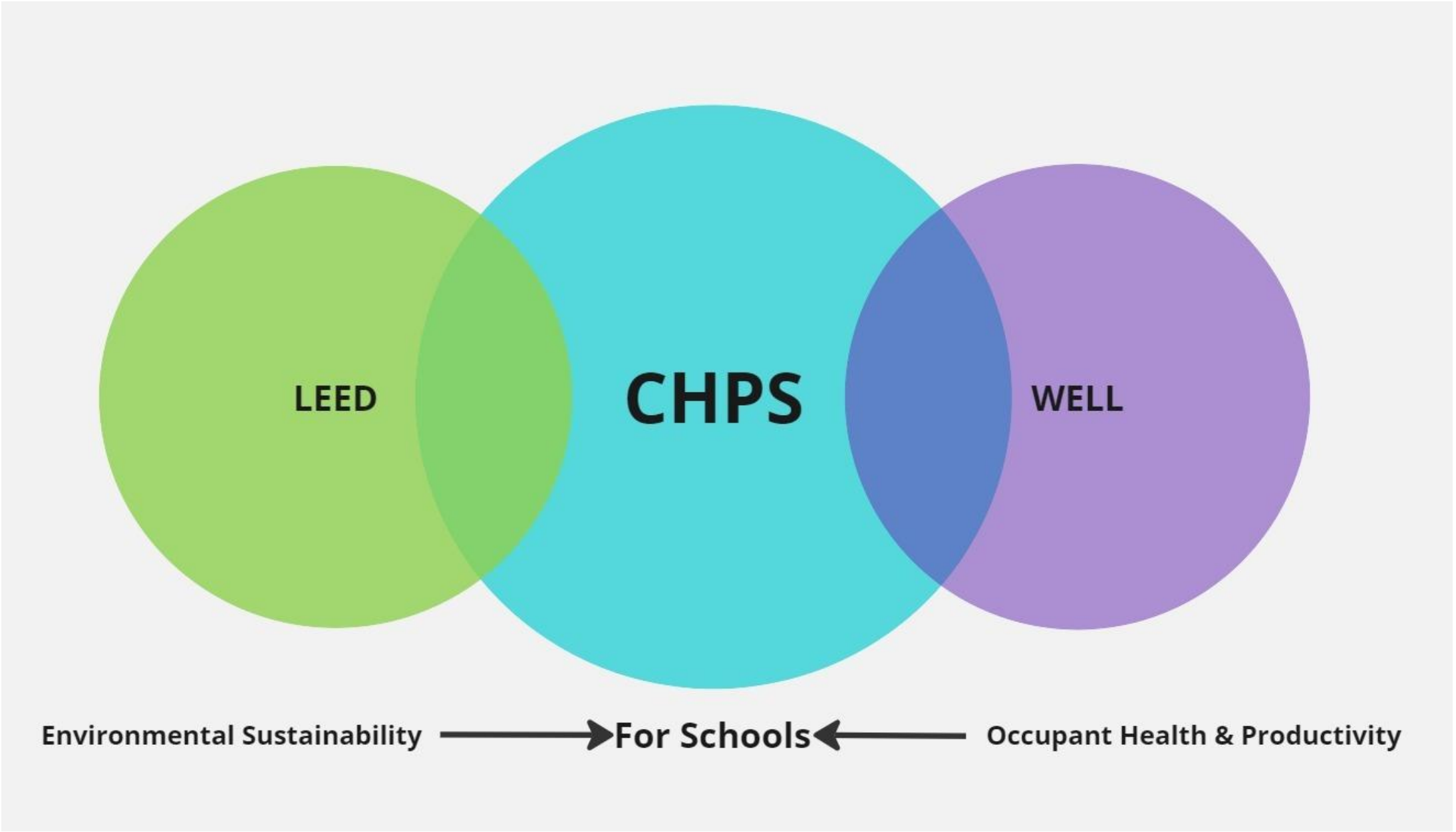
- A major renovation is defined by a substantial improvement to a building of at least two of the following systems: lighting, HVAC, building envelope, interior surfaces, and/or site.

LEED

LIVING BUILDING CHALLENGE℠

INTERNATIONAL WELL BUILDING INSTITUTE™

GREEN GLOBES


LEED
CHPS
WELL
Environmental Sustainability
For Schools
Occupant Health & Productivity

Sustainable strategies incorporated into school design

COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS

Better buildings. Better students.

CA-CHPS Criteria v2.0

For New Construction & Major Renovation/Additions
of Classroom and Non-Classroom Buildings

Published April 2021
Edited June 2021

CHPS Impact

- Over **800** CHPS projects nationwide
- **70+** school districts have used CHPS
- **4** of top **25** largest school districts require CHPS:
  - *Los Angeles USD, CA (#2)*
  - *Fairfax County Public Schools, VA (#11)*
  - *Dallas ISD, TX (#16)*
  - *Cypress-Fairbanks ISD, TX (#21)*
- Rhode Island requires CHPS
- Massachusetts & Colorado provide state funding to CHPS schools
- Washington used CHPS as the basis for their required Washington Sustainable Schools Protocol (WSSP)

US-CHPS Overview, based on v2.0

- 250 points total; 52 for prerequisites
- 7 Sections:
  - **Integration & Innovation:** 2 prereqs, 7 credits, 35 points, includes climate action
  - **Indoor Environmental Quality:** 5 prereqs, 15 credits, 81 points
  - **Energy:** 2 prereqs, 3 credits, 20 points
  - **Water:** 2 prereqs, 6 credits, 20 points
  - **Site:** 1 prereq, 7 credits, 23 points, includes exterior measures
  - **Materials and Waste Management:** 1 prereq, 5 credits, 16 points
  - **Operations and Maintenance:** 2 prereqs, 5 credits, 18 points

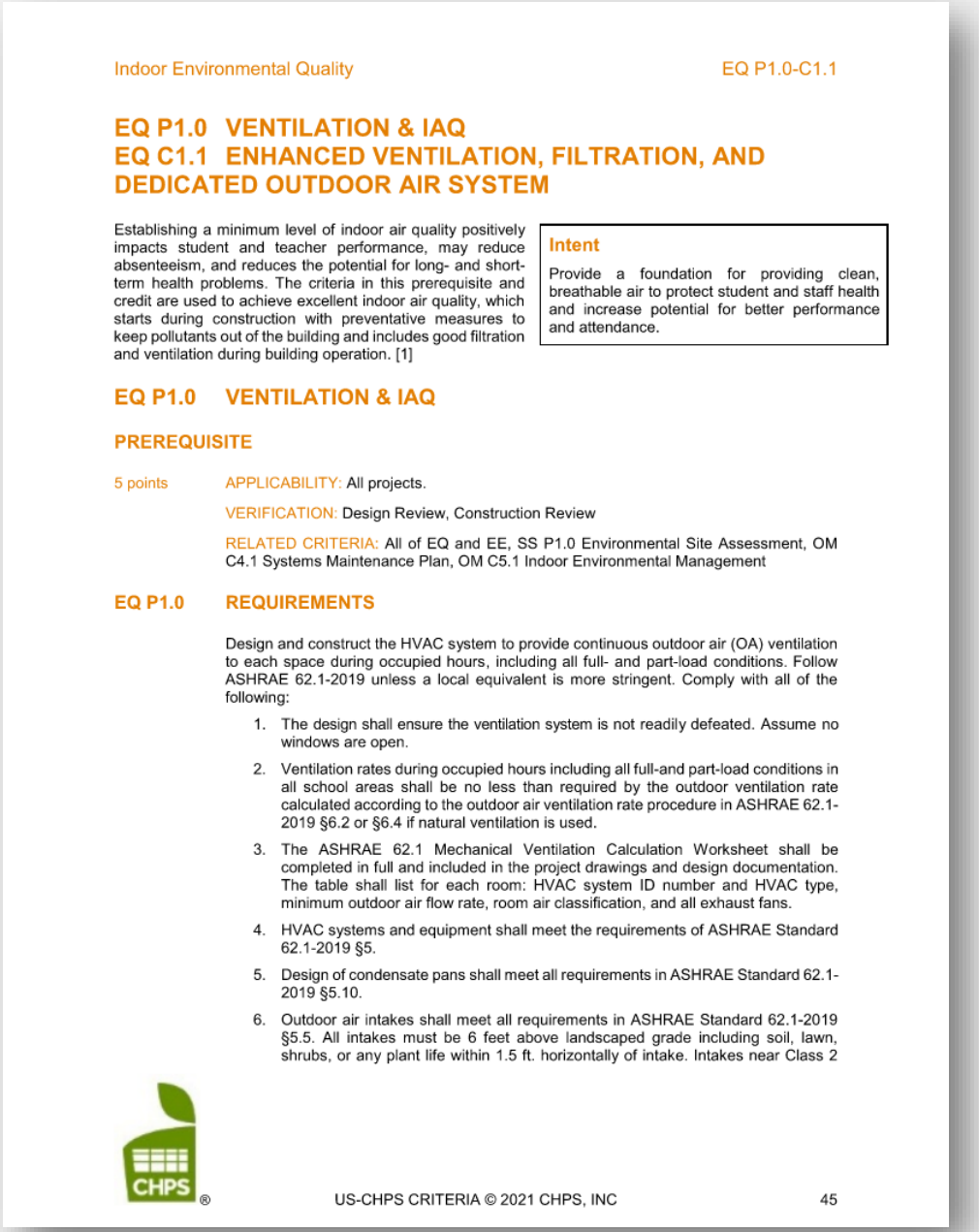
How can CHPS help?

Technical Standards and Design Criteria:

- EQ P1.0 – Ventilation and IAQ
- EQ C1.1 - Enhanced Ventilation, Filtration and Dedicated Outdoor Air Systems
- EQ C1.2 – Demand Controlled Ventilation
- EQ P10.0 – Thermal Comfort
- EQ P15.0 – Acoustical Performance
- EE P1.0 – Energy Efficient Design
- EE C4.1 – Advanced Ventilation Strategies
- OM P1.0 – Facility Staff and Occupant Training
- OM C5.1 – Indoor Environmental Management

Requirements:

- Detailed technical requirements
- Evidence and research based
- Developed and refined over 20+ Years for school projects
- Reviewed and updated by a national technical committee
- References broadly recognized industry standards



EQ P1.0 VENTILATION & IAQ
EQ C1.1 ENHANCED VENTILATION, FILTRATION, AND DEDICATED OUTDOOR AIR SYSTEM

Establishing a minimum level of indoor air quality positively impacts student and teacher performance, may reduce absenteeism, and reduces the potential for long- and short-term health problems. The criteria in this prerequisite and credit are used to achieve excellent indoor air quality, which starts during construction with preventative measures to keep pollutants out of the building and includes good filtration and ventilation during building operation. [1]

Intent

Provide a foundation for providing clean, breathable air to protect student and staff health and increase potential for better performance and attendance.

EQ P1.0 VENTILATION & IAQ

PREREQUISITE

5 points

APPLICABILITY: All projects.

VERIFICATION: Design Review, Construction Review

RELATED CRITERIA: All of EQ and EE, SS P1.0 Environmental Site Assessment, OM C4.1 Systems Maintenance Plan, OM C5.1 Indoor Environmental Management

EQ P1.0 REQUIREMENTS

Design and construct the HVAC system to provide continuous outdoor air (OA) ventilation to each space during occupied hours, including all full- and part-load conditions. Follow ASHRAE 62.1-2019 unless a local equivalent is more stringent. Comply with all of the following:

1. The design shall ensure the ventilation system is not readily defeated. Assume no windows are open.
2. Ventilation rates during occupied hours including all full-and part-load conditions in all school areas shall be no less than required by the outdoor ventilation rate calculated according to the outdoor air ventilation rate procedure in ASHRAE 62.1-2019 §6.2 or §6.4 if natural ventilation is used.
3. The ASHRAE 62.1 Mechanical Ventilation Calculation Worksheet shall be completed in full and included in the project drawings and design documentation. The table shall list for each room: HVAC system ID number and HVAC type, minimum outdoor air flow rate, room air classification, and all exhaust fans.
4. HVAC systems and equipment shall meet the requirements of ASHRAE Standard 62.1-2019 §5.
5. Design of condensate pans shall meet all requirements in ASHRAE Standard 62.1-2019 §5.10.
6. Outdoor air intakes shall meet all requirements in ASHRAE Standard 62.1-2019 §5.5. All intakes must be 6 feet above landscaped grade including soil, lawn, shrubs, or any plant life within 1.5 ft. horizontally of intake. Intakes near Class 2

Implementation:

- Detailed requirements for what needs to be addressed throughout design and construction process
- Describes research-based rationale for why these requirements are important
- Standard approach and requirements for designers and contractors

1 point — Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 15 or higher.

EQ C1.1.2 *Enhanced Ventilation Rate*

5 points — The outdoor airflow shall be no less than 130% of the value determined in accordance with the ASHRAE 62.1 ventilation rates.

EQ C1.1.3 *Dedicated Outdoor Air System*

5 points — Provide a dedicated outdoor air ventilation system (DOAS) that serves classrooms with the ability to efficiently process and manage ventilation down to the individual room level.

EQ P1.0-C1.1 IMPLEMENTATION

EQ P1.0 *Ventilation & IAQ*

CDs shall include design details and control sequences presented in a manner allowing that compliance with the prerequisite may be verified. In addition to information on the contract documents, calculations used to determine the most stringent outdoor air ventilation rate shall be signed by the project engineer. ASHRAE 62.1-2019 Mechanical Ventilation Calculation Worksheet shall be completed by the project engineer documenting that each space meets the minimum outdoor air quantities according to ASHRAE 62.1-2019 calculations. The spreadsheet shall show that the outdoor air quantity in each room served by an HVAC system meets the minimum outdoor air quantity for the space. For multiple spaces the spreadsheet shall show that the minimum outdoor air quantities are met in each space including during times when all VAV boxes are turned down to their minimum flow positions. A completed table shall be compiled by the project engineer and included in the project drawings and design documentation.

The table shall list for each room:

- the HVAC system ID number,
- HVAC type,
- the minimum outdoor air flow rate,
- the room's air classification, and
- all exhaust fans.

Minimum outdoor air quantities for all spaces shall be verified during HVAC system Testing and Balancing and included in minimum Commissioning requirements when all VAV boxes are turned down to their minimum flow positions.

Throughout this criterion, ventilation air means the designed outdoor air flow rate for maximum occupancy.

Controls shall be specified that operate the HVAC fans to provide outdoor air ventilation continuously during occupied hours, whether or not there is a need for heating or cooling. Thermostats with an "automatic" setting do not meet this requirement, since in this mode, the fans cycle on and off according to demands for heating or cooling.

The HVAC shall be operated continuously during working hours except during scheduled maintenance and emergency repairs, or during periods in which the district can demonstrate that the quantity of outdoor air supplied by non-mechanical means meets the outdoor air supply rate required by ASHRAE Standard 62.1-2019, §6.2 (i.e., climate is suitable and an acceptable means for natural ventilation is provided).

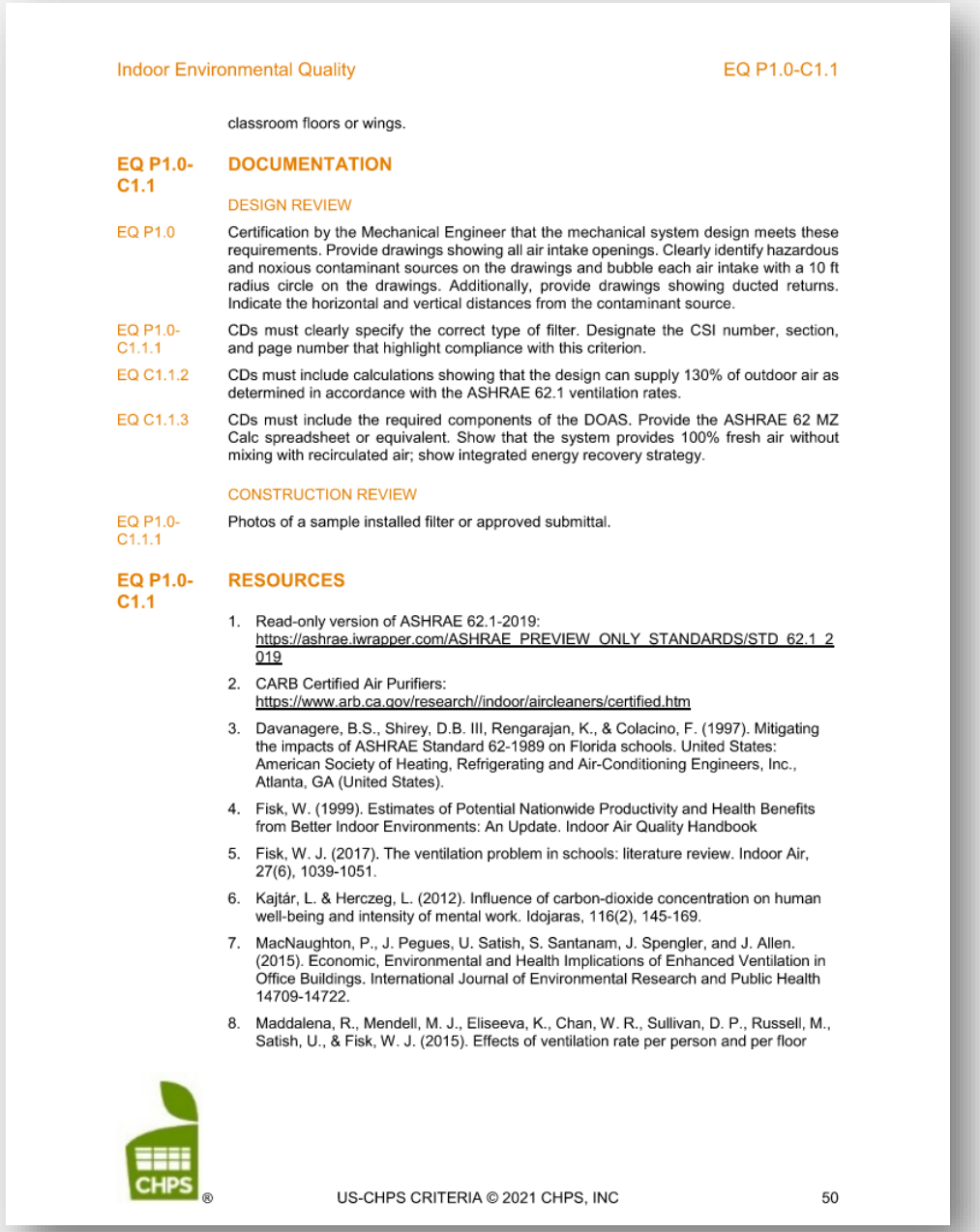
Natural ventilation systems must be engineered to demonstrate sufficient outdoor air ventilation and thermal comfort and shall adhere to natural ventilation guidelines, including:

Documentation:

- Requirements for designers and engineers for what should be included in documents
- Assists with accountability and review and certification of projects to ensure they meet requirements

Resources:

- Research and references that inform the criteria



classroom floors or wings.

EQ P1.0-C1.1 DOCUMENTATION

DESIGN REVIEW

EQ P1.0 Certification by the Mechanical Engineer that the mechanical system design meets these requirements. Provide drawings showing all air intake openings. Clearly identify hazardous and noxious contaminant sources on the drawings and bubble each air intake with a 10 ft radius circle on the drawings. Additionally, provide drawings showing ducted returns. Indicate the horizontal and vertical distances from the contaminant source.

EQ P1.0-C1.1.1 CDs must clearly specify the correct type of filter. Designate the CSI number, section, and page number that highlight compliance with this criterion.

EQ C1.1.2 CDs must include calculations showing that the design can supply 130% of outdoor air as determined in accordance with the ASHRAE 62.1 ventilation rates.

EQ C1.1.3 CDs must include the required components of the DOAS. Provide the ASHRAE 62 MZ Calc spreadsheet or equivalent. Show that the system provides 100% fresh air without mixing with recirculated air; show integrated energy recovery strategy.

CONSTRUCTION REVIEW

EQ P1.0-C1.1.1 Photos of a sample installed filter or approved submittal.

EQ P1.0-C1.1 RESOURCES

1. Read-only version of ASHRAE 62.1-2019: https://ashrae.iwrapper.com/ASHRAE_PREVIEW_ONLY_STANDARDS/STD_62.1_2019
2. CARB Certified Air Purifiers: https://www.arb.ca.gov/research//indoor/aircleaners/certified.htm
3. Davanagere, B.S., Shirey, D.B. III, Rengarajan, K., & Colacino, F. (1997). Mitigating the impacts of ASHRAE Standard 62-1989 on Florida schools. United States: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA (United States).
4. Fisk, W. (1999). Estimates of Potential Nationwide Productivity and Health Benefits from Better Indoor Environments: An Update. Indoor Air Quality Handbook
5. Fisk, W. J. (2017). The ventilation problem in schools: literature review. Indoor Air, 27(6), 1039-1051.
6. Kajtár, L. & Herczeg, L. (2012). Influence of carbon-dioxide concentration on human well-being and intensity of mental work. Idojaras, 116(2), 145-169.
7. MacNaughton, P., J. Pegues, U. Satish, S. Santanam, J. Spengler, and J. Allen. (2015). Economic, Environmental and Health Implications of Enhanced Ventilation in Office Buildings. International Journal of Environmental Research and Public Health 14709-14722.
8. Maddalena, R., Mendell, M. J., Eliseeva, K., Chan, W. R., Sullivan, D. P., Russell, M., Satish, U., & Fisk, W. J. (2015). Effects of ventilation rate per person and per floor

High School Modernization - BEFORE

Freemont HS, Quattrocchi Kwok Architects

- Recruit mediocre talent
- Higher teacher turnover
- Increased mental health issues including stress, anxiety, and depression amongst students
- More sick days with increased incidents of illnesses such as asthma
- Paying too much for utilities
- Negatively effecting ‘pride’

High School Modernization - AFTER

- Reduced absenteeism
- Improved Performance
- Employee attraction
- Employee retention
- Improved performance
- Reduced operating costs
- Environmentally sustainable
- Pride

Freemont HS, Quattrocchi Kwok Architects

LOS ANGELES UNIFIED SCHOOL DISTRICT

Tools for Districts and Case Studies, Metrics of Success

CASH Workshop

The Blueprint for High Performance Schools, the Financial & Academic Advantage

Christos Chrysiliou, FAIA, LEED AP
Chief Eco-Sustainability Officer

February 29, 2024

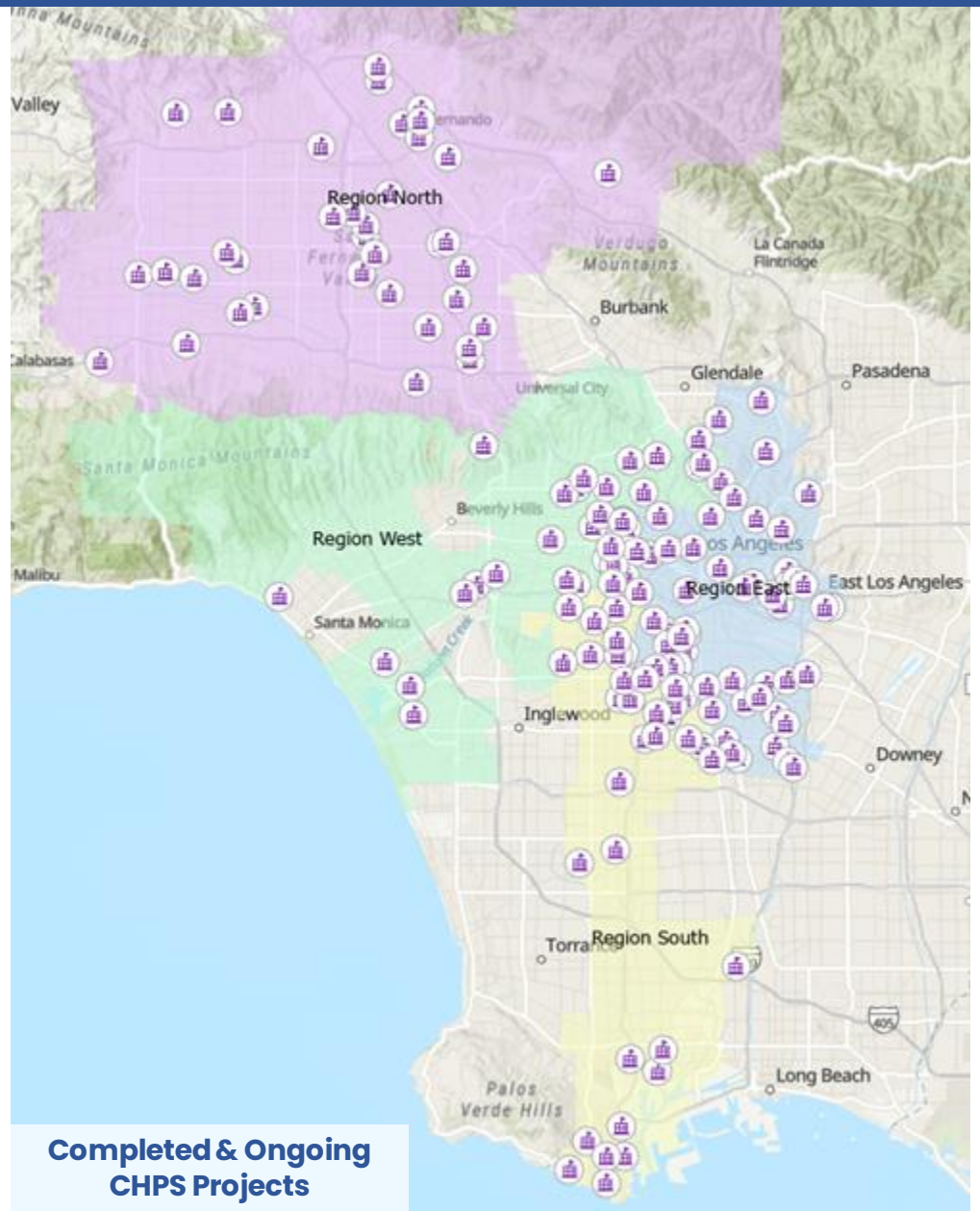
AGENDA

- LAUSD & Eco-Sustainability Office Background
- Sustainability Goals
- High Performance Case Studies

Playa Vista Elementary School

ECO-SUSTAINABILITY OFFICE

LAUSD – A Brief Background



Completed & Ongoing CHPS Projects

80,890,070 building square footage

25,392 structures

31,700 classrooms

6,389 acres of land

800+ campuses

710 square miles of site boundaries

525,944 students (K-12)

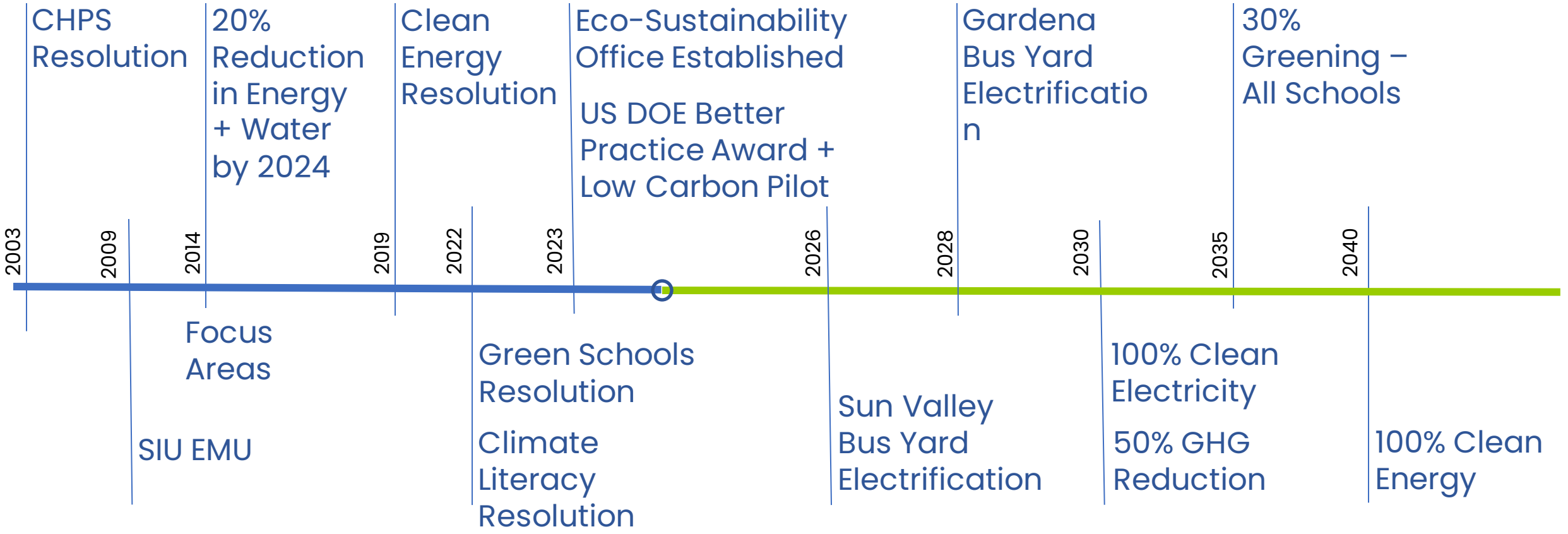
66,523 employees

Nation's second-largest school district

20 years since CHPS was adopted by LAUSD

- **142** LAUSD CHPS projects completed

Timeline of Achievements & Goals



LAUSD ECO-SUSTAINABILITY OFFICE

Decarbonization

Electrification

Across ALL Divisions

Eco-Sustainability Focus Areas

Energy Conservation

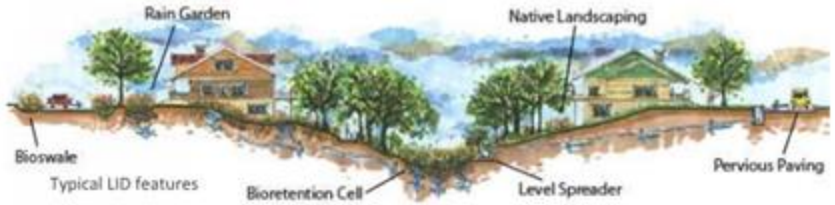
GOALS: 20% Energy Use Intensity reduction by 2024 100% Renewable Energy by 2030, and All Other Energy Sectors by 2040

- Lighting Retrofit Program
- LAUSD/LADWP Direct Install Program
- Prop 39 Clean Energy Jobs Act

Water Stewardship

GOAL: 20% Water Consumption reduction by 2024 from 2014 baseline.

- Stormwater Management & Capture (DROPS)
- Recycled Water Projects
- Plumbing Fixture Retrofits
- Irrigation Controller Replacements



Eco-Sustainability Focus Areas

High Performance Schools

GOAL: Ensure a safe, healthy, and comfortable learning environment in energy & water efficient schools

Criteria: Energy, Water, Air Quality, Educational Integration & Innovation, Recycling & Waste Management, O&M

- 142 CHPS recognized projects to date
- 7 LEED Certified projects

Campus Ecology

GOAL: Increase campus green space, school gardens, and outdoor learning spaces

Features: Outdoor Classroom, drought tolerant planting, landscaping materials, accessible walkways, irrigation

- Over 400 School gardens, 18 EEC outdoor classrooms
- 70 SEEDS learning gardens completed

Eco-Sustainability Focus Areas

Emerging Technology

GOAL: Collaborate with industry leaders, innovators, utilities, and municipal partners to identify and pilot cutting edge sustainability technology

Energy Conservation:

- LED Fixtures
- Large fans as HVAC offset
- Microgrid & Battery Storage
- Plug Load Monitoring & Control
- Innovative Rooftop Mount for Solar Panels
- HVAC Controls
- Occupancy Controlled Thermostat
- Thermal Insulation Coating
- Solar Reflective Coating

Water Conservation:

- Plumbing Fixture Replacement
- Hydrogel Soil Amendment
- Leakage Detection
- Water Audits
- Smart Water Meters
- Drip Irrigation
- Weather Monitoring Station
- Ozone Water Treatment – Cooling Tower

Awareness & Outreach

GOALS: Increase Eco-Literacy, develop partnerships, encourage participation and celebrate accomplishments.

- HEROES for Zero Contest
- DROPS Educ. and Outreach
- EmPowered
- Green Janitors Educ. Program
- Magenta House
- GPRO

LAUSD Board Resolutions

Clean Energy Resolution (2019)

- Transitioning LAUSD to 100% Clean, Renewable, Energy Resulting in Healthier Students and More Sustainable, Equitable, Communities

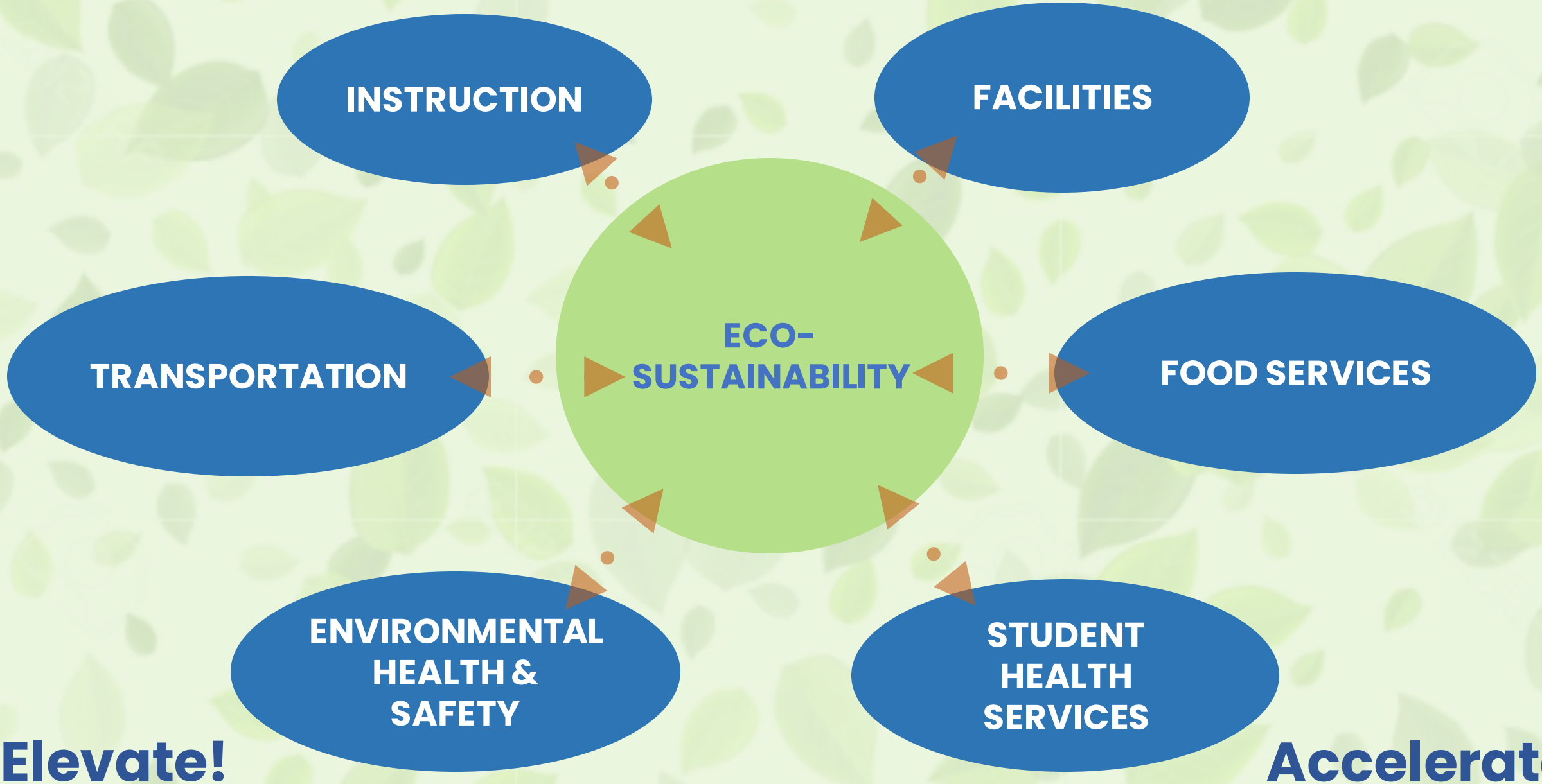
Climate Literacy Resolution (2022)

- Enacting a comprehensive Climate Literacy Program for LAUSD to help address the escalating climate crisis. Climate Literacy covers education about environmental justice, green jobs and correcting misinformation.

Green Schools for All Resolution (2022)

- Establishes a minimum standard of 30% green space for all campuses

An Integrated Response across LAUSD Divisions



Elevate!

Accelerate!

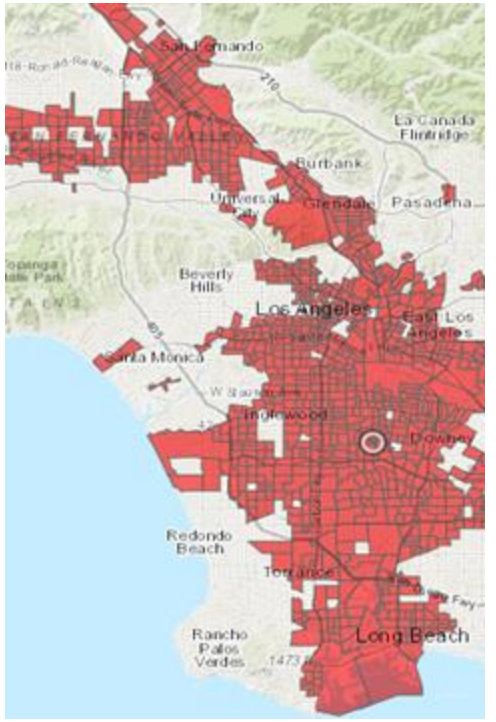
HIGH PERFORMANCE CASE STUDIES

CASE STUDY #1 – JORDAN HS – BACKGROUND

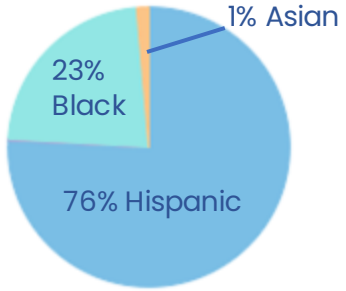
Background on Jordan HS

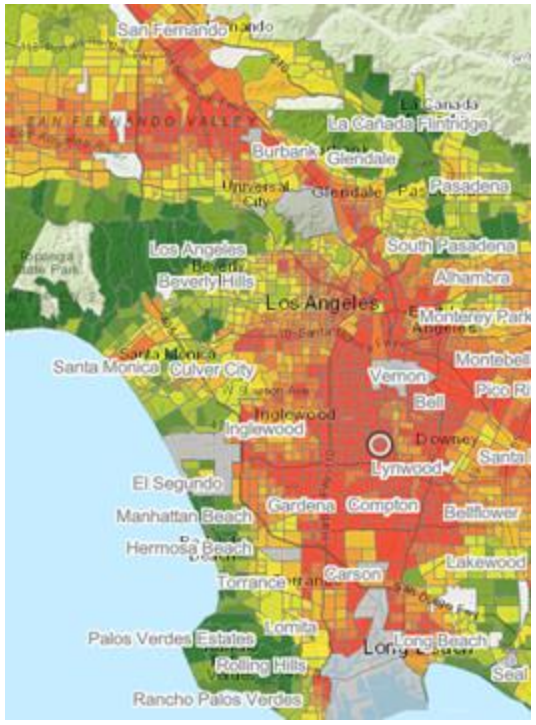
- Constructed in 1920, an industrial corridor developed along Alameda Avenue around the school
- Property abuts a local metal recycling plant, which negatively impacts air quality
- As a result, the surrounding Watts neighborhood has experienced high asthma rates
- 99% of students are non-white
- 98% qualify for free or reduced lunch

Jordan HS with Neighboring Metal Recycler



Race / Ethnicity Profile





CalEnvironScreen Analysis

Overall Percentiles	
CalEnviroScreen 4.0 Percentile	99
Pollution Burden Percentile	93
Population Characteristics Percentile	98
Sensitive Populations	
Asthma	94
Low Birth Weight	59
Cardiovascular Disease	98

CASE STUDY #1 – JORDAN HS – PROJECT

High Performance Project at Jordan HS

- Renovations of two main classroom buildings, construction of two new three-story classroom buildings, and administration building renovation
- Site-wide improvements to garden and electrical infrastructure

High Performance Features

- Achieved majority of CHPS and LEED points for reducing water use for landscaping by installing a native garden and an efficient irrigation system
- Installed cool roofs to mitigate the urban heat island effect and reduce use of cooling system
- Minimized construction waste by reusing 94% of the existing structural elements

Site Plan:

Designed by:

DLRGROUP
ARCHITECTURE ENGINEERING PLANNING INTERIORS

Certified by:

CHPS COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS
Better buildings. Better students.

CASE STUDY #1 – JORDAN HS – OUTCOMES

Impacts at Jordan HS Since Construction Finished in 2016

69% reduction in water use

~$80,000 in annual water utility savings

24% increase in students meeting state English testing standards

Classroom Modernization


Jordan HS Native Garden

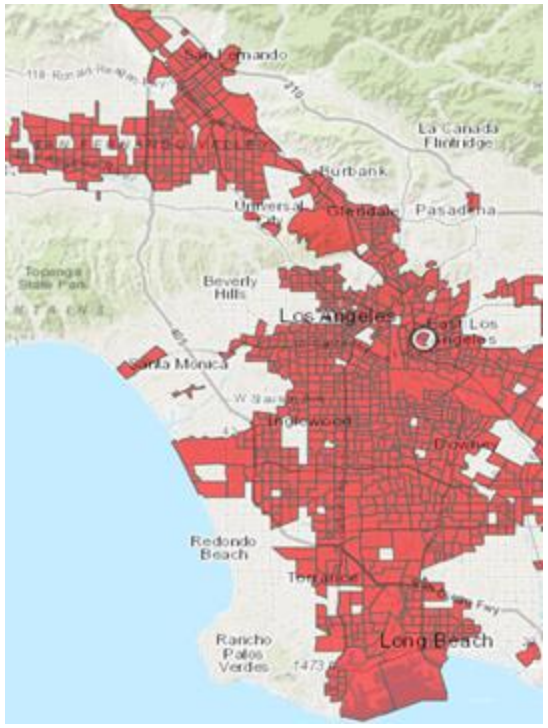
Source: California Assessment of Student Performance & Progress & English Language Proficiency Assessments for California

CASE STUDY #2 – FIRST ST ELEMENTARY – BACKGROUND

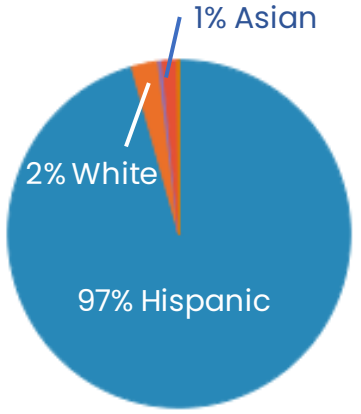
Background on 1st Street Elementary School

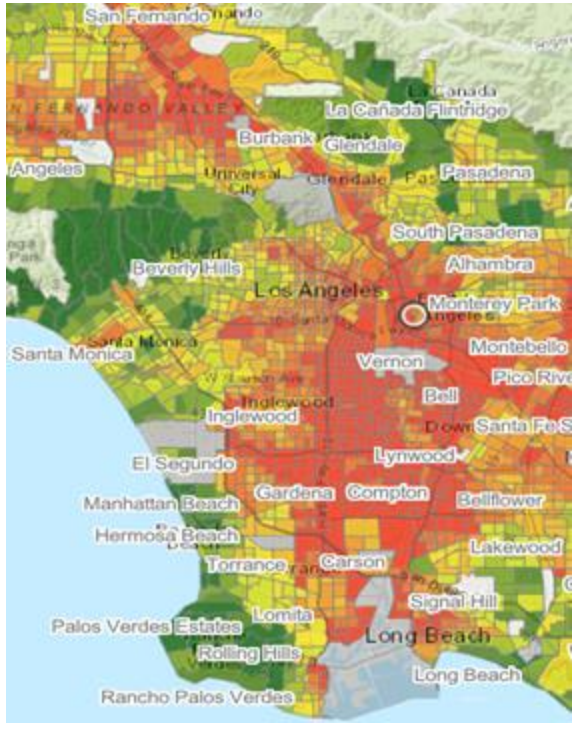
- Originally constructed after the 1933 Long Beach earthquake
- Operated as an assimilation center for immigrant families, providing lessons in English and on American culture
- In 2014 the east building was determined to be eligible for national, state, and city historic registers
- 97% non-white student body
- 98% qualify for free or reduced lunch

First Street Main Entrance



Race / Ethnicity Profile





CalEnvironScreen Analysis

Overall Percentiles	
CalEnviroScreen 4.0 Percentile	94
Pollution Burden Percentile	85
Population Characteristics Percentile	92
Sensitive Populations	
Asthma	66
Low Birth Weight	88
Cardiovascular Disease	52

CASE STUDY #2 – FIRST STREET ELEMENTARY – PROJECT

High Performance Project

- Seismic retrofit of an existing 2-story classroom building
- Modernizing 10 classrooms and food service building
- Construction of a new lunch pavilion

High Performance Features

- Cool roofs to mitigate the local urban heat island effect and reduce reliance on cooling systems
- Superior energy efficient design, targeting a 22% increase in performance over Title-24
- Received full points from CHPS in the recycled materials, certified wood, and low-emitting building material categories

Designed by:

gkk | CD

Certified by:

CHPS COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS
Better buildings. Better students.

Site Plan:

CASE STUDY #2 – FIRST STREET ELEMENTARY – IMPACT

Impacts at First Street Elementary Since Construction Finished in 2018

22% Reduction in Energy Use or ~$23,000 in avoided costs

244% Increase in Students Meeting State Math Standards

80% increase in Students Meeting State English Standards

First Street Under Construction

First Street Completed

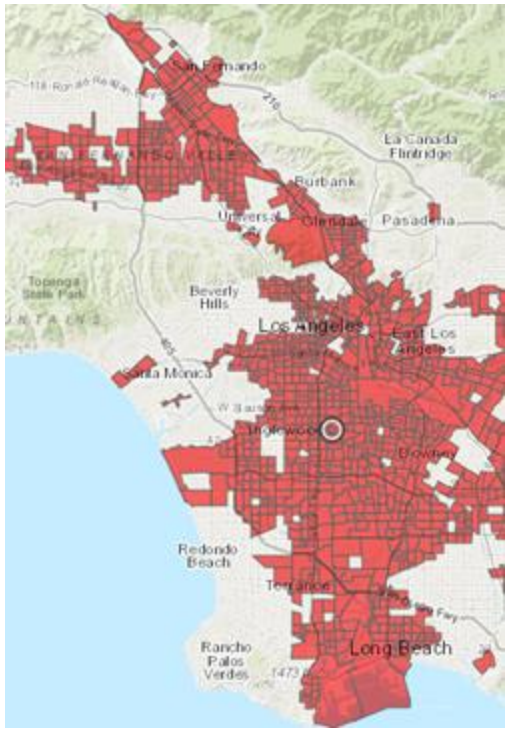
Source: California Assessment of Student Performance & Progress & English Language Proficiency Assessments for California

CASE STUDY #3 – JOHN C. FREMONT HS - BACKGROUND

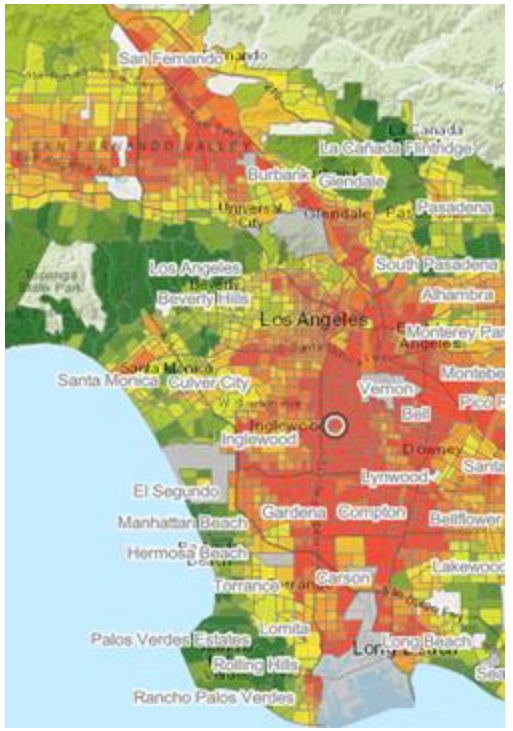
Background on John C. Fremont High School

- 99% non-white student body
- 98% qualify for free or reduced lunch
- Historical High School built in 1924, with Global Media Arts, Law & Social Justice, Medical Science, and STEAM programs.

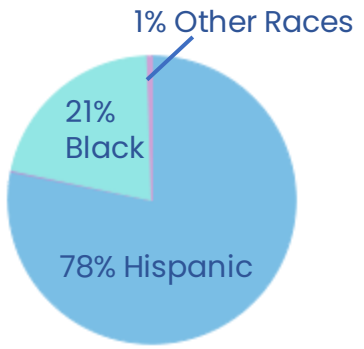
New Main Entrance at Fremont HS



Race / Ethnicity Profile



CalEnvironScreen Analysis



Overall Percentiles	
CalEnviroScreen 4.0 Percentile	93
Pollution Burden Percentile	82
Population Characteristics Percentile	92
Sensitive Populations	
Asthma	88
Low Birth Weight	37
Cardiovascular Disease	98

CASE STUDY #3 – JOHN C. FREMONT HS – PROJECT

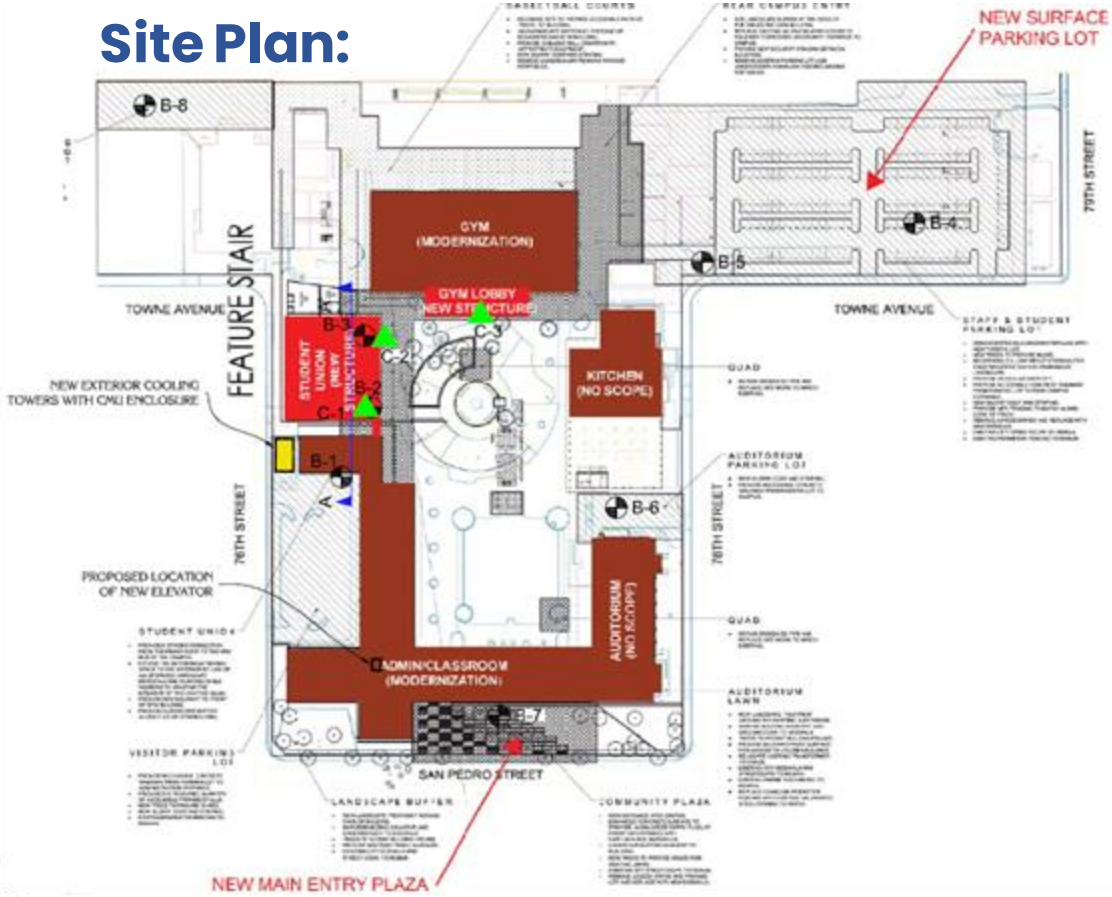
High Performance Project at Fremont HS

- Modernization of the main three-story classroom building
- Modernization of the existing Gymnasium
- Construction of a new two-story student union and library building

High Performance Features

- A 35% performance above Title-24 was targeted through the installation of:
  1. Highly efficient condensing hot water boilers
  2. Water-cooled magnetic bearing chillers
  3. Radiant heating
  4. Strategic use of shading
- Received full points in View and Electric Lighting CHPS categories, ensuring classrooms received ample natural and artificial light

Site Plan:



Designed by: LPA

Certified by: CHPS COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS. Better buildings. Better students. · U.S. GREEN BUILDING COUNCIL LEED GOLD USGBC

CASE STUDY #3 – JOHN C. FREMONT HS – IMPACT

Impacts at John C. Fremont HS Since Construction Finished in 2016

- Received CASH/AIACC Leroy F. Greene Honor Award & Design Honor Award for Modernization / Transformation

10% Reduction in Electricity Use, or ~$32,000 in avoided costs

6% Increase in students meeting state Math testing standards

14% increase in students meeting state English testing standards

Updated Fremont HS Campus

Source: California Assessment of Student Performance & Progress & English Language Proficiency Assessments for California

Thank You!

Christos Chrysiliou, FAIA, LEED AP
Chief Eco-Sustainability Officer

DIVISION OF THE STATE ARCHITECT

WHERE WE'VE BEEN, WHERE WE ARE AND WHERE DO WE GO FROM HERE

DSA
DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

CALIFORNIA LEADS THE WAY

EXECUTIVE ORDERS BY BROWN ADMINISTRATION

B-16-12
Set goal of 1 million ZEVs by 2020

B-30-15
Sets interim target of greenhouse gas emissions 40% less than 1990 levels by 2030

B-55-18
Achieve statewide carbon neutrality by 2045

CALIFORNIA LEADS THE WAY

GOVERNOR NEWSOM'S EXECUTIVE ORDERS

N-19-19

Requires every aspect of state government to redouble its efforts to reduce greenhouse gas emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy.

N-79-20

Sets a goal that 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035.

Effects of Climate Change to Schools

Fire

Photo by Nikolay Maslov on Unsplash

Extreme Heat

Photo by Jess Zoerb on Unsplash

Drought

Photo by Chanelle on Unsplash

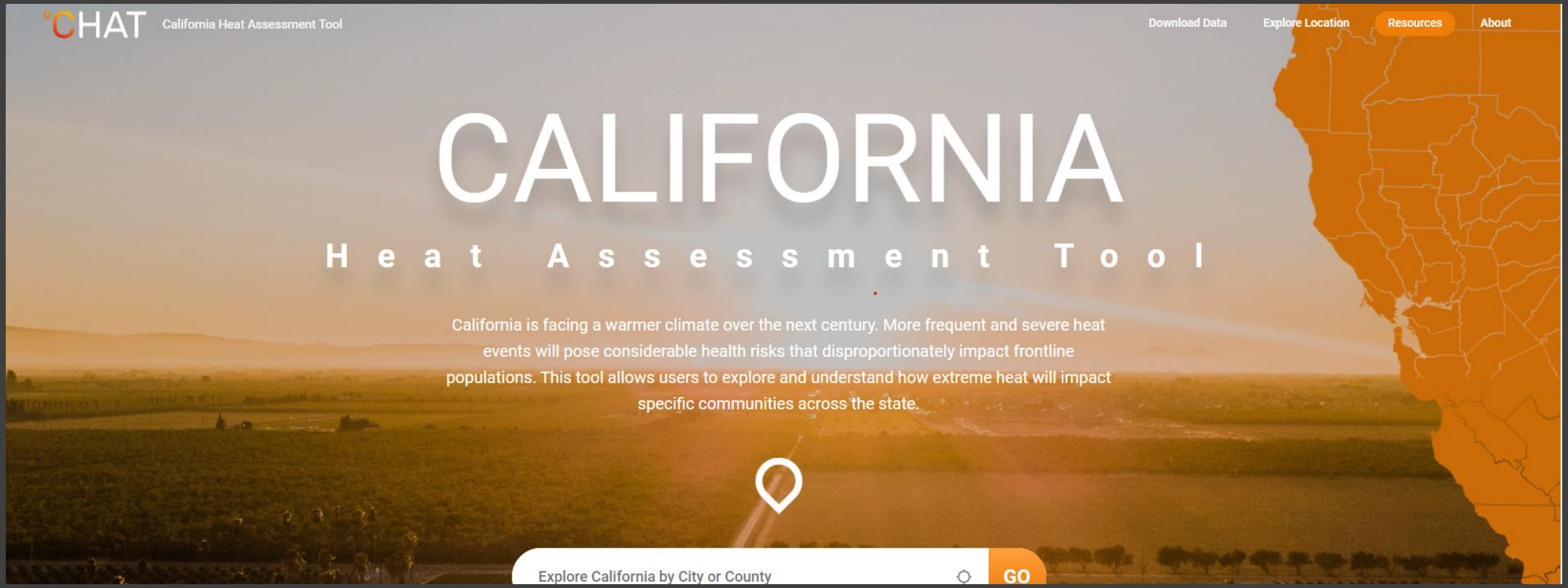
Flood

Photo by Mika Baumeister on Unsplash

“We are the first generation to feel the sting of climate change, and we are the last generation that can do something about it.” – Jay Inslee

Photo by Rod Long on Unsplash

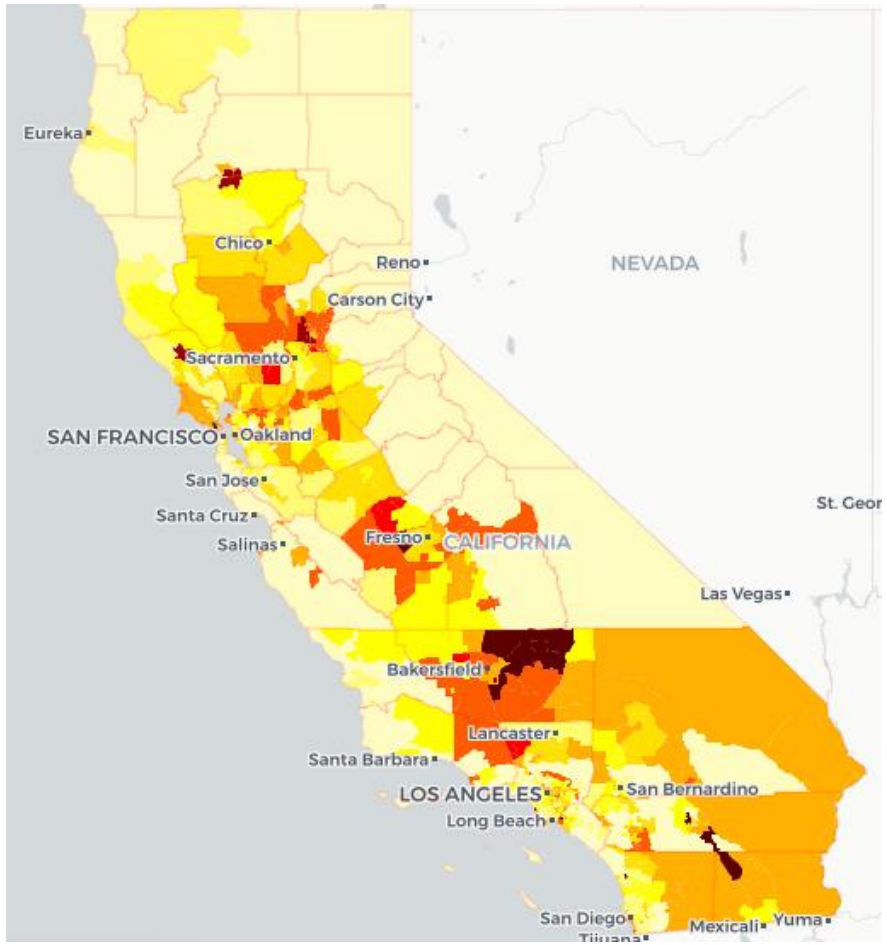
SUSTAINABILITY is an EQUITY issue



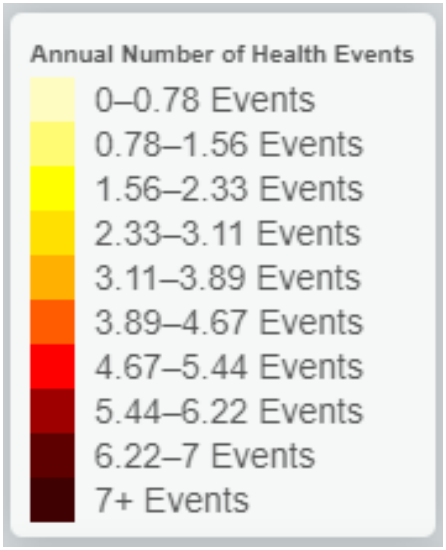
EXTREME HEAT
www.cal-heat.org

The California Heat Assessment Tool was funded by the California Natural Resources Agency for local and state health practitioners to better understand dimensions of heat vulnerability driven by climate changes and where action can be taken to mitigate the public health impacts of extreme heat in the future.

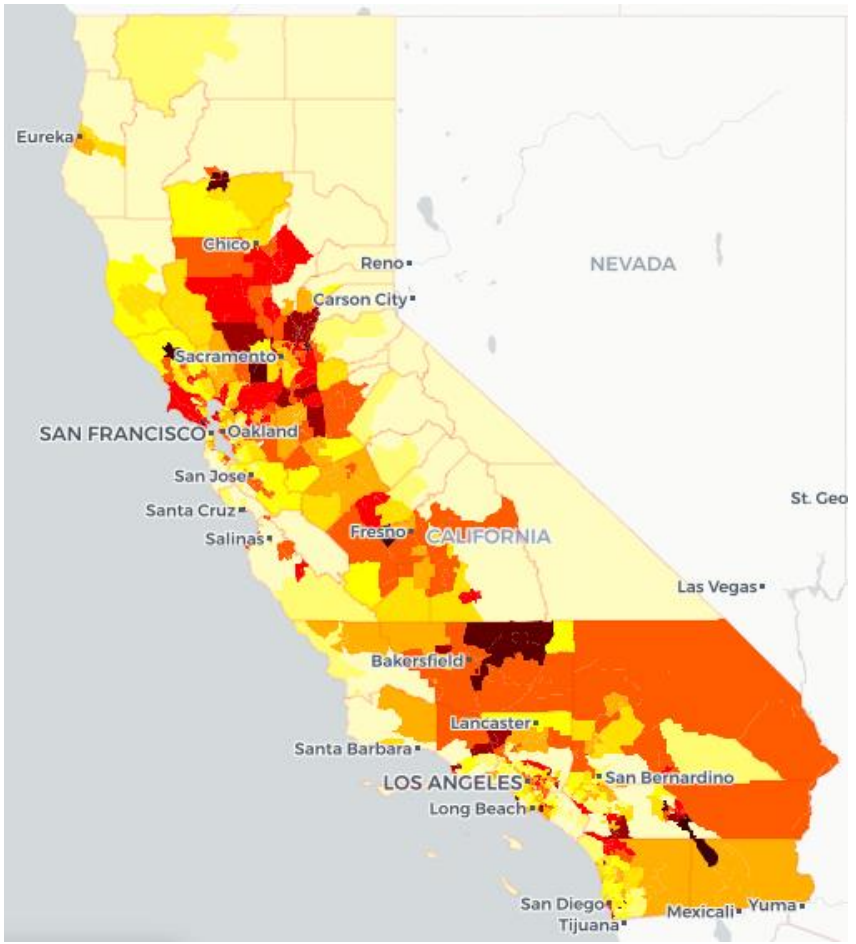
HEAT HEALTH EVENTS



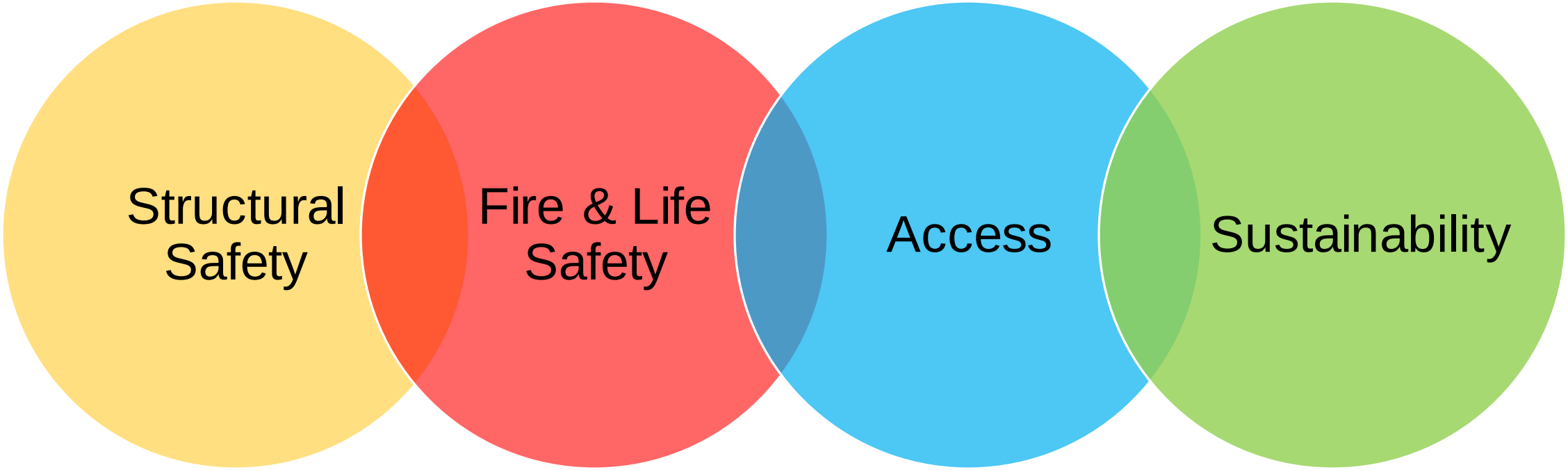
2021



A heat health event is any heat event that results in negative public heath impacts, regardless of the absolute temperature.



2041



DSA's Green Building Program: SUSTAINABILITY is SAFETY

GETTING TO ZERO *OVER TIME*

DIVISION OF THE STATE ARCHITECT

DEPARTMENT OF GENERAL SERVICES

Increase school facility energy efficiency and reduce greenhouse gas emissions with each new construction and modernization, leading to a zero net energy and zero net carbon future.

Mandatory Measures for Schools

- Bicycle parking
- Electric vehicle charging
- Light pollution reduction
- Grading to manage surface water flow
- Shade trees
- Water conserving plumbing fixtures
- Outdoor potable water use in landscape areas
- Water resistance and moisture management
- Building Reuse
- Construction waste disposal and recycling
- Recycling by occupants
- Pollutant control during construction
- Finish material pollutant control
- MERV-13 filters
- CO2 monitoring in classrooms
- Acoustical control and exterior noise transmission
- HVAC refrigerants without chlorofluorocarbons and halons
- Embodied Carbon of Materials

Accomplishes large water savings by choosing climate adapted plants, improving soil conditions, using, and maintaining high efficiency irrigation equipment and managing the irrigation schedule to fit the plants water needs as they are influenced by local climate.

2016 CALGreen: Model Water Efficient Landscape Ordinance (MWELO)

2019 CALGreen: Shade Trees

Requires Shade Trees to provide shade to:

50% of parking areas
within 15 years

20% of landscape areas within 15 years

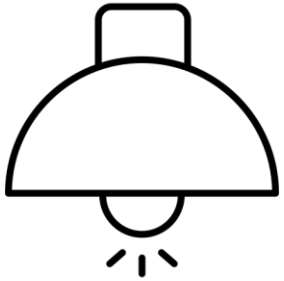
20% of hardscape areas within 15 years

Photo by Ryan Jacobson on Unsplash

2019 Energy Code and CalGreen

Acceptance Testing Requirements for Lighting and HVAC systems:

- Ensures that the installed equipment is operating as designed and in compliance with the Energy Code.
- Requires certified Acceptance Testing Technicians (ATTs) to be used for
  - ✓ Indoor and Outdoor Lighting and Controls
  - ✓ HVAC Systems and Controls



Created by Made from the Noun Project

Created by Ranah Pixel St

CO2 Monitors in new K-12 classrooms

Reduce Emissions through Electrification

Advance Resiliency & Equity

2022 Energy Code

- Heat Pump Technology
- Solar PV
- Battery Storage

Photo by myenergi on Unsplash

2022 CALGreen:

EV Charging

- 20% EV capable spaces (infrastructure)
- 25% of EV capable spaces provided with a charger

Approved Carbon Reduction Regulations Mandatory Measures

50,000 sf and greater for K-12 schools and community colleges, 100,000 sf and greater for nonresidential construction

BUILDING REUSE	Reuse existing building, maintain 45% of the existing structure and enclosure.
WBLCA	Performance Path- Conduct a cradle-to-grave whole building life cycle assessment demonstrating at 10% reduction in global warming potential (GWP).
PRESCRIPTIVE PATH	Comply with product GWP limits established in the BCCA. Based on 175% of IW-EDP GWP values (weighted average alternate available for concrete).

Commission Adoption Meeting: Approved 8.1.23
Effective Date: July 1, 2024
August 1-3, 2023 Commission Meeting (ca.gov)

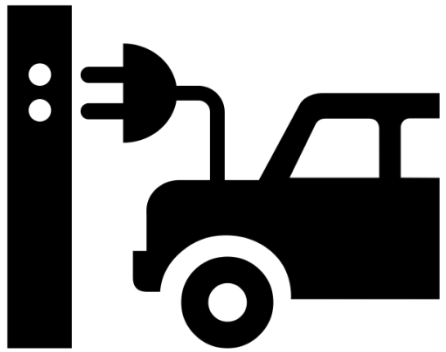
DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

CBSC CALIFORNIA BUILDING STANDARDS COMMISSION

2022 INTERVENING CODE CYCLE: CALGREEN

EV Charging: Charging Power Alternative and Existing Facilities

New parking facilities:
Requires Level 1, Low Power Level 2 or Level 2, or any combination thereof, providing a minimum total power based on number of parking spaces in a facility.



For existing facilities:
Required if installing new light fixtures in existing parking, adding to parking facilities, or installing solar PVs over parking. Requires chargers to be installed in EV capable spaces when a project is submitted to DSA.

Created by Luis Prado from Noun Project

CO2 Monitoring: Existing Facilities

Requires CO2 monitors in existing K-12 classrooms when a building is modernized.

Effective Date: July 1, 2024

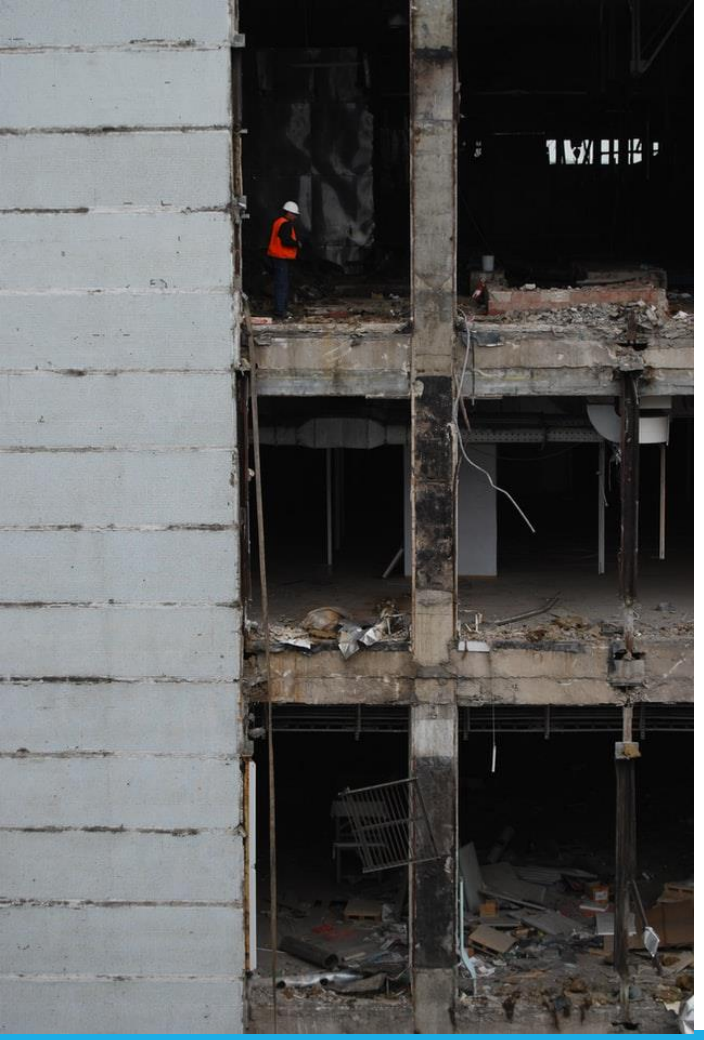
DSA SUSTAINABILITY PLAN REVIEW

Goals:

- Greater support at pre-application meetings
- Greater compliance of requirements
- Understanding of challenges in implementation
- Understanding of resources that need to be developed

New checklist: DSA 403-C to be submitted with each project

Intended to be used as a guide for submitting complete documents that incorporate the current CALGreen requirements for DSA adopted mandatory measures.



- Up to 90% of embodied carbon is retained the reuse of an existing building.
- Building reuse preserves community identity and helps stabilize communities by preserving historic connections.
- The EB Task Force will evaluate changes to regulations that encourages building reuse and ensure when an existing school building is modernized that safety standards are also addressed.
- Resulting regulations will address both resiliency and sustainability.

Photo by Kirill Sh on Unsplash

EXISTING BUILDINGS TASK FORCE: Resiliency and Sustainability

DSA SUSTAINABILITY EDUCATION AND OUTREACH

GETTING TO ZERO OVER TIME

K-12 PUBLIC SCHOOL DISTRICT COHORT

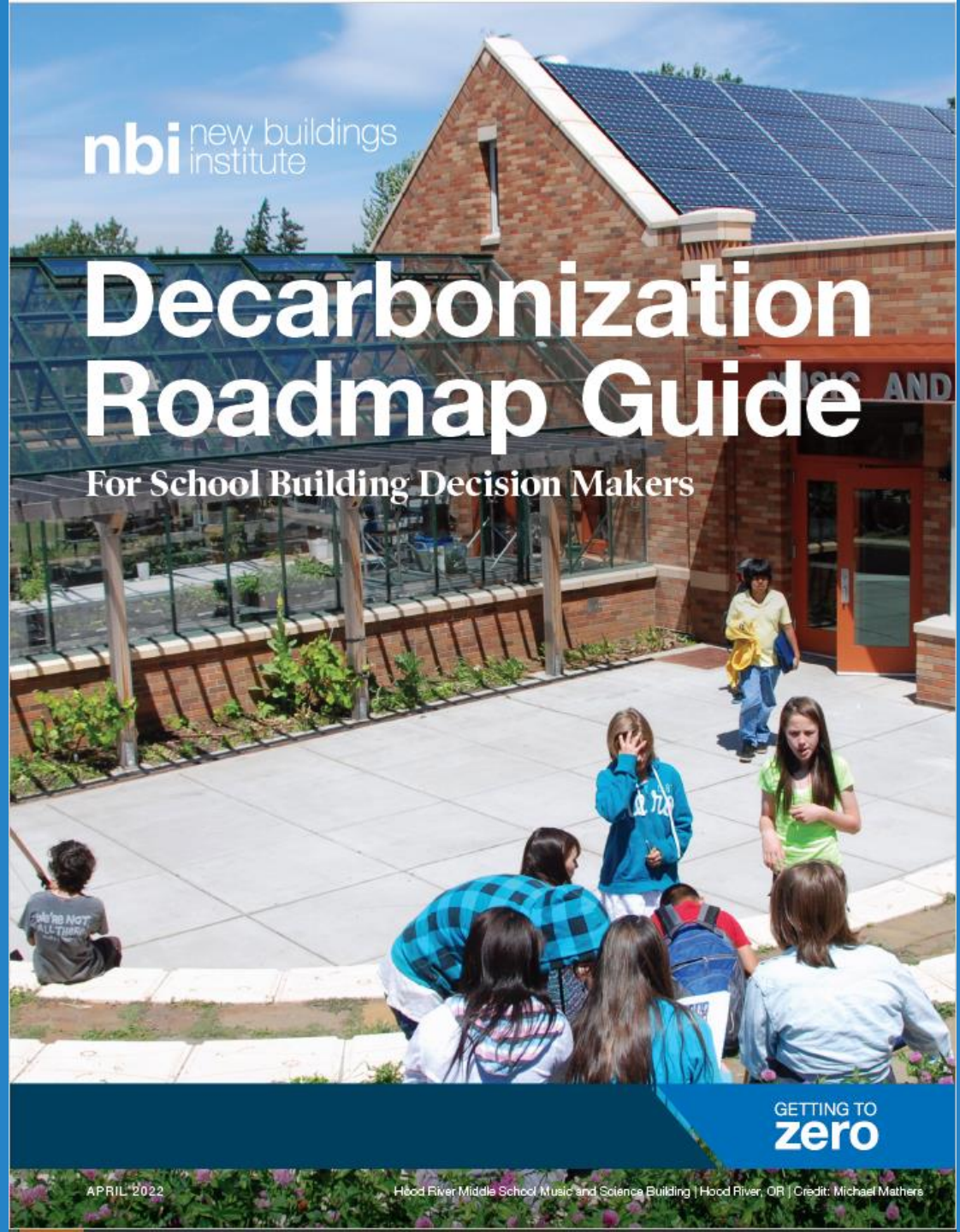
- New Construction
- Major Modernization
- System Replacement
- Equipment Replacement
- Operations & Maintenance

a DSA collaboration with nbi new buildings institute

ROADMAP TOOLKIT

- Stakeholder Engagement
- Goals
- Resolution
- Facility Assessment
- RFP
- Interview Q's
- OPR
- Project Checklist
- Reporting Template
- Media Release
- ZNC Bond Criteria

Decarbonization Roadmap Guide for School Building Decision Makers - New Buildings Institute

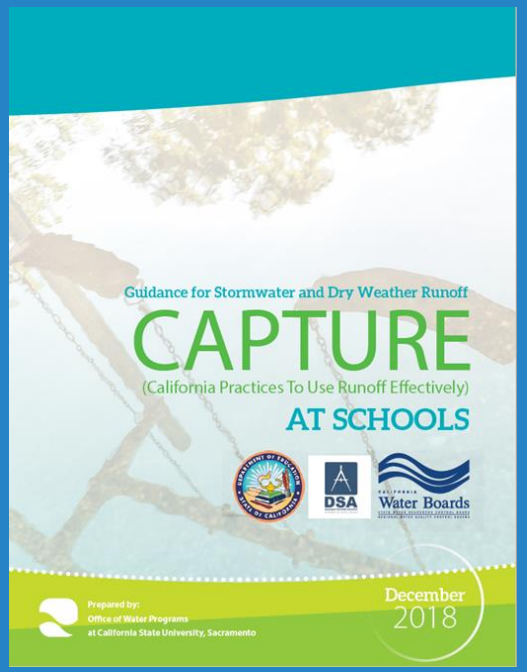


The All-Electric California Schools Kitchen of the Future

A DSA collaboration with:

Photo by Jonathan Borba on Unsplash

STORMWATER CAPTURE AND RUNOFF MANAGEMENT



Preserve, create, and enhance natural areas and features.

Minimize impervious surfaces.

Design with soils that promote infiltration.

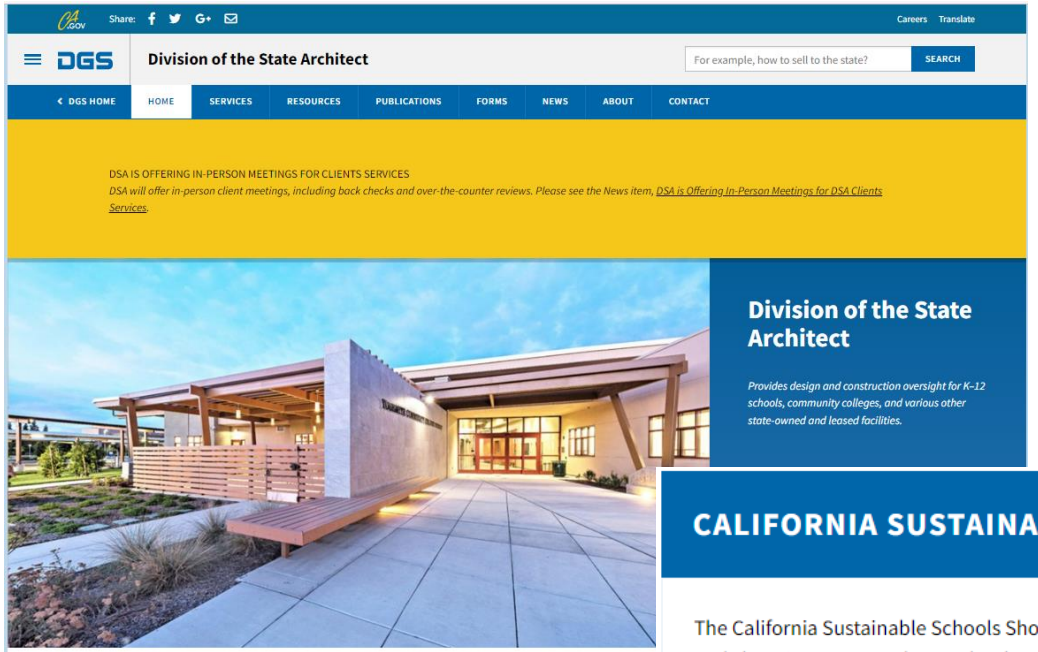
Arrange impervious surfaces to drain to permeable surfaces.

Design areas to prevent irrigation runoff.

Allocate space to stormwater control measures.

Incorporate visual stormwater features and learning opportunities.

Sustainable Schools Showcase



Yosemite Community College

Blach Intermediate School

Crafton Hills College

CALIFORNIA SUSTAINABLE SCHOOLS SHOWCASE

The California Sustainable Schools Showcase aims to acknowledge challenges, dispel myths, and share innovative solutions by showcasing school districts' efforts to plan for and prioritize sustainability in public school facilities in California. Educational, administrative, and maintenance buildings that exhibit innovative ideas and successfully capture both sustainability and energy efficiency through building programming, design, and the implementing of cutting-edge technology systems will be featured. Zero net energy, low carbon and carbon neutral facilities, and other strategies for sustainable schools will be highlighted to showcase those districts throughout the state who have been able to implement these strategies in both new construction and alterations to existing buildings.

California Sustainable Schools

- Medea Creek Middle School
- Suisun Valley School
- SBCCD's Sustainability Plan
- San Bernardino Community College District's Crafton Hills College
- Los Altos School District's Blach Intermediate School
- Yosemite Community College

DSA ACADEMY

DSA Academy

Photo by J. Kelly Brito on Unsplash

Accessibility Training:
California EVCS Accessibility
Housing at a Place of Education
Circulation Paths
Free, On Demand, Provides CEU credit

Sustainability Training:
All-Electric California Schools Kitchen of the Future
Green Schoolyards

Coming soon:
CALGreen Embodied Carbon Regulations
Free, On Demand, Provides CEU credit

RESOURCES:

Oakland HS Environmental Design Student Capstone Project video:
https://drive.google.com/file/d/16JASjAQTRoWD_gmnyc_xfEQZrNBJ0N6W/view
K12 Education and the Inflation Reduction Act
https://www.thisisplaneted.org/img/K12-InflationReductionAct-Final-Screen.pdf
LAUSD Eco Sustainability Office
http://lausd.org/eso
CHPS Resources and Product Guidance
https://chps.net/
DSA Achieving Net Zero Energy, Net Zero Carbon and Sustainable School Facilities
https://www.dgs.ca.gov/DSA/Resources/Page-Content/Resources-List-Folder/Achieving-Net-Zero-Energy-and-Net-Zero-Carbon-in-School-Facilities
New Buildings Institute Decarbonization Guide
K12 Education and the Inflation Reduction Act
https://newbuildings.org/hot-off-the-presses-new-grid-interactive-buildings-for-decarbonization-guide/?utm_content=271193131&utm_medium=social&utm_source=linkedin&hss_channel=lcp-3176424

- DSA Green Schoolyards Academy
- Green Schools National Network
- Schoolyard Forest System

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QUESTIONS? DISCUSSION

HED CHPS DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

Engagement

1. What are attributes of a High Performance School?
2. What knowledge gaps exist?
3. What challenges are there to achieving a high performance school?
4. What additional tools can we provide?

HED CHPS LOS ANGELES UNIFIED LA READY FOR THE WORLD DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES