Addressing Climate Action, Resiliency, and Education

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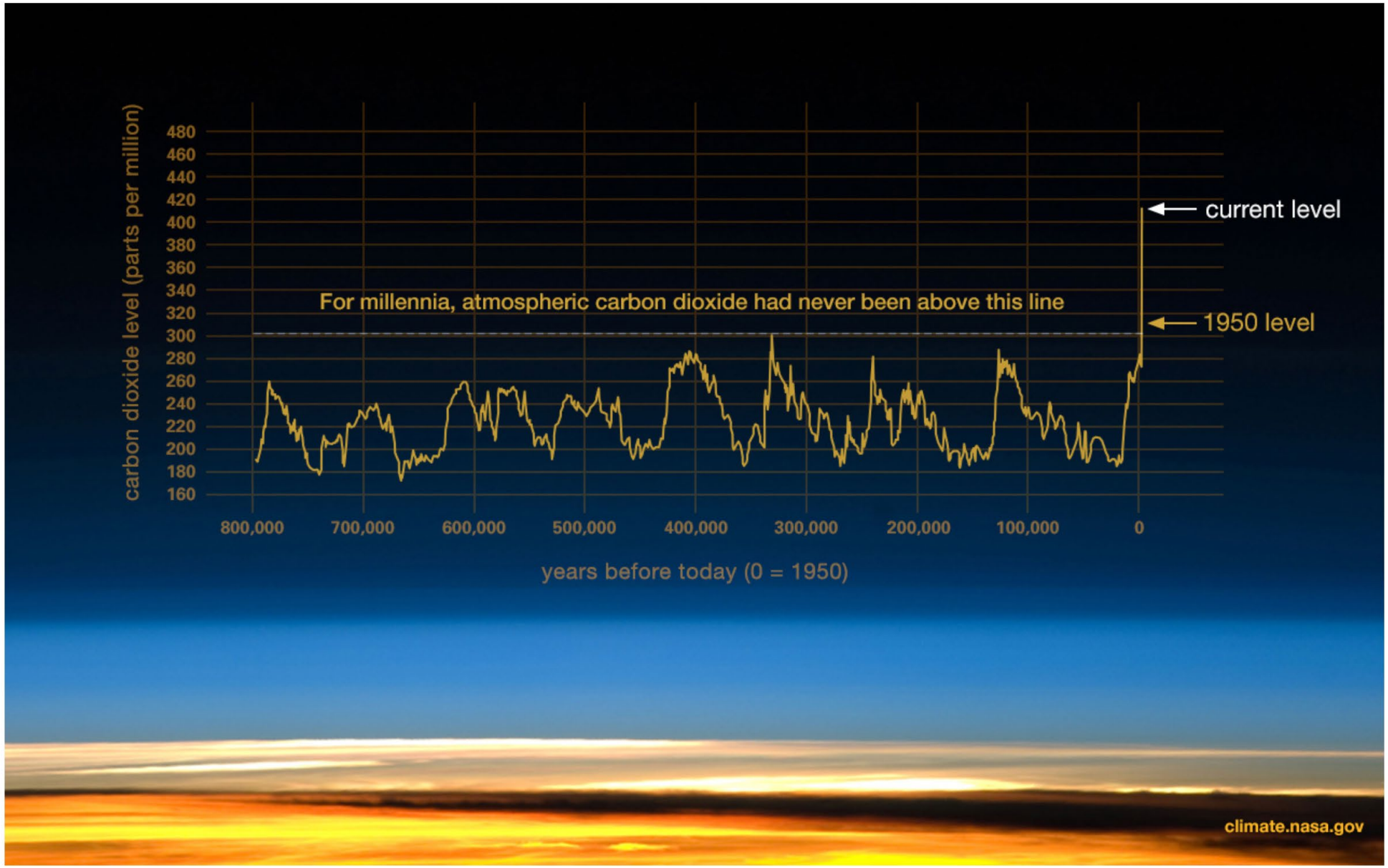
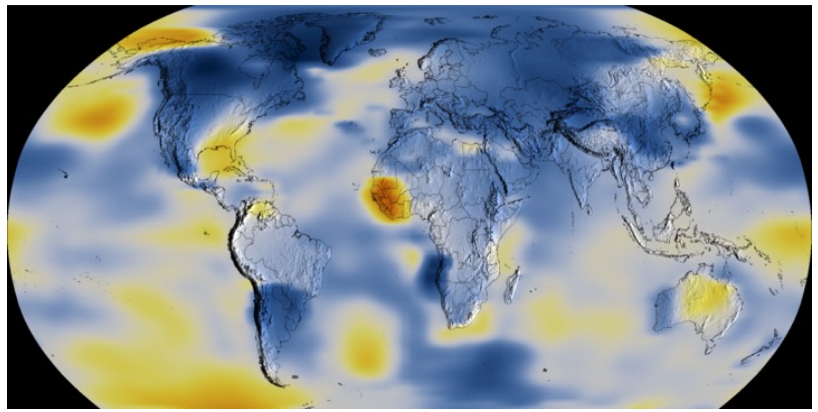
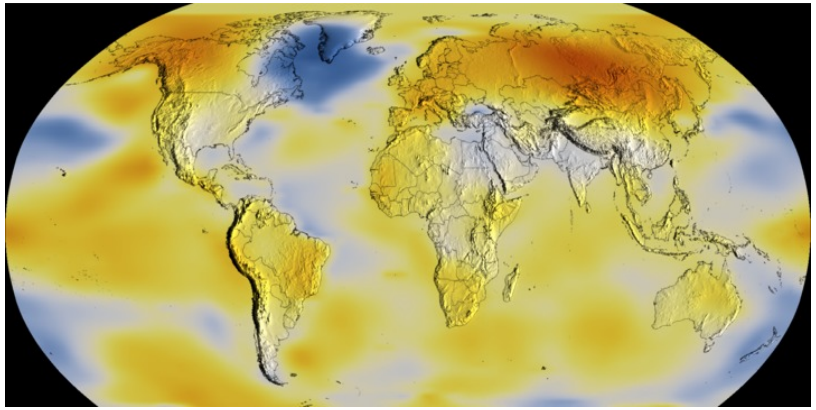
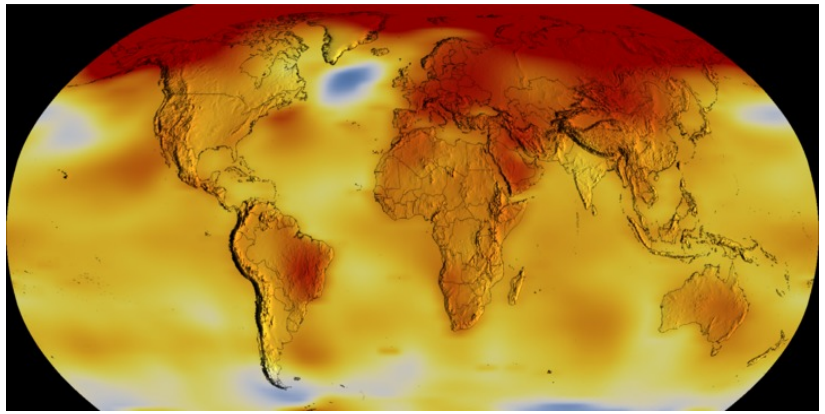
Goals for Today

1. Outline the Global Context of Climate Action and Sustainability
2. Highlight critical Frameworks and associated tools
3. Deeper dive into Education for Sustainability including "Key Competencies in Sustainability"
4. Examples of Competencies in sustainability
5. Resources and slide deck link

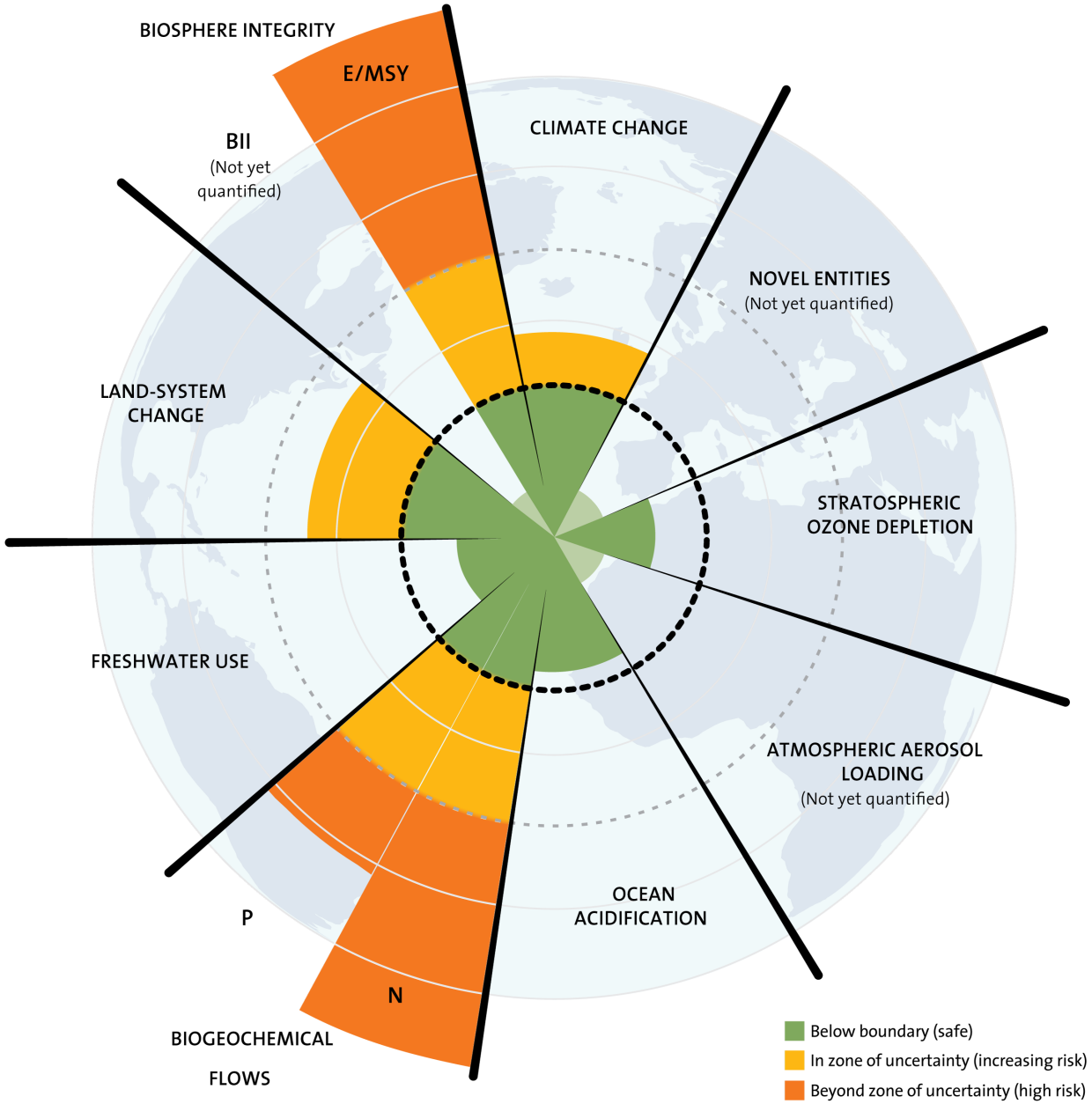


https://climate.nasa.gov/evidence/

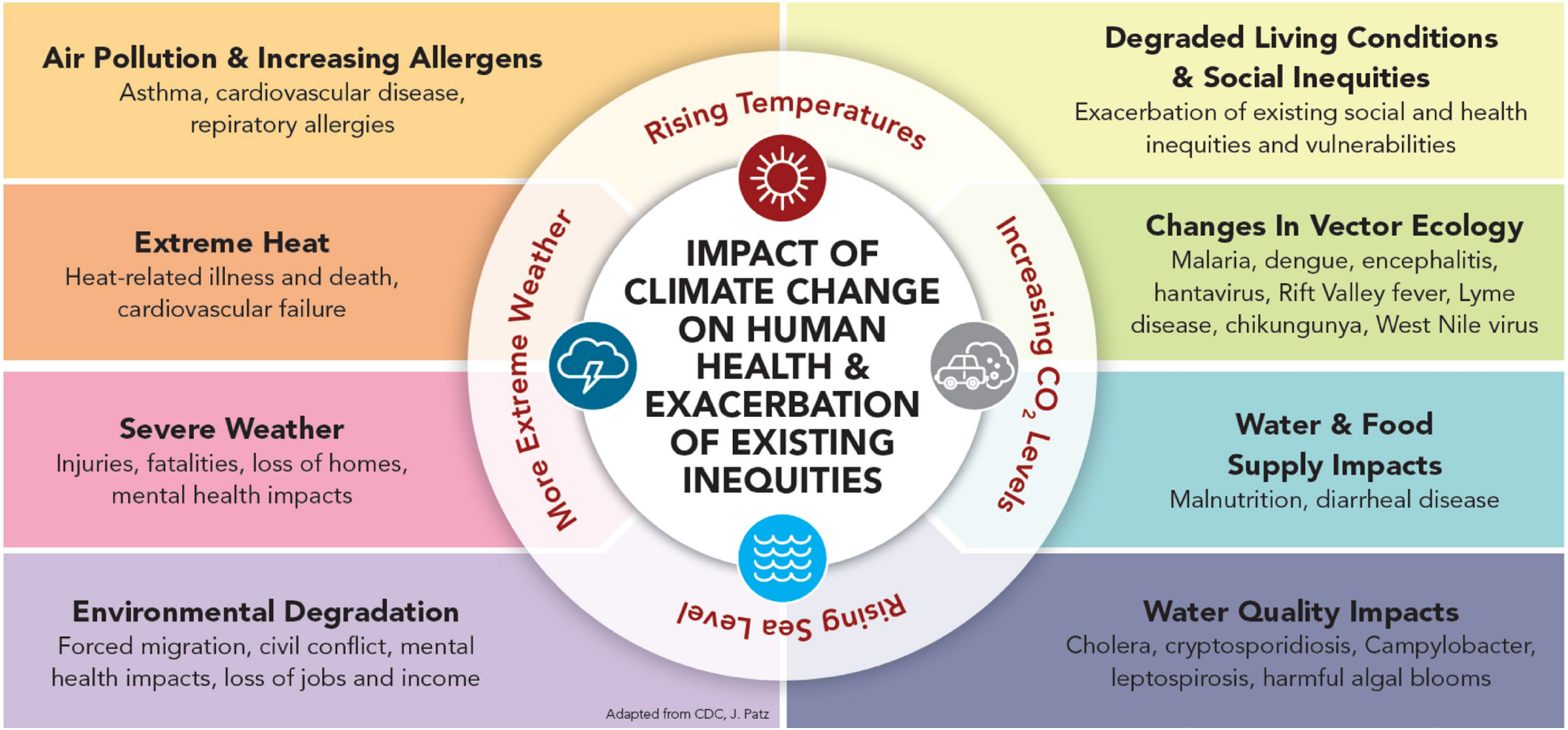




https://climate.nasa.gov/vital-signs/global-temperature/

https://www.noaa.gov/education/resource-collections/climate/climate-change-impacts



https://www.stockholmresilience.org/


Air Pollution & Increasing Allergens
Asthma, cardiovascular disease, repiratory allergies
Degraded Living Conditions & Social Inequities
Exacerbation of existing social and health inequities and vulnerabilities
Extreme Heat
Heat-related illness and death, cardiovascular failure
Changes In Vector Ecology
Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
Severe Weather
Injuries, fatalities, loss of homes, mental health impacts
Water & Food Supply Impacts
Malnutrition, diarrheal disease
Environmental Degradation
Forced migration, civil conflict, mental health impacts, loss of jobs and income
Water Quality Impacts
Cholera, cryptosporidiosis, Campylobacter, leptospirosis, harmful algal blooms
Rising Temperatures
Increasing CO_2 Levels
Rising Sea Level
More Extreme Weather
IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH & EXACERBATION OF EXISTING INEQUITIES
Adapted from CDC, J. Patz

SUSTAINABLE DEVELOPMENT GOALS

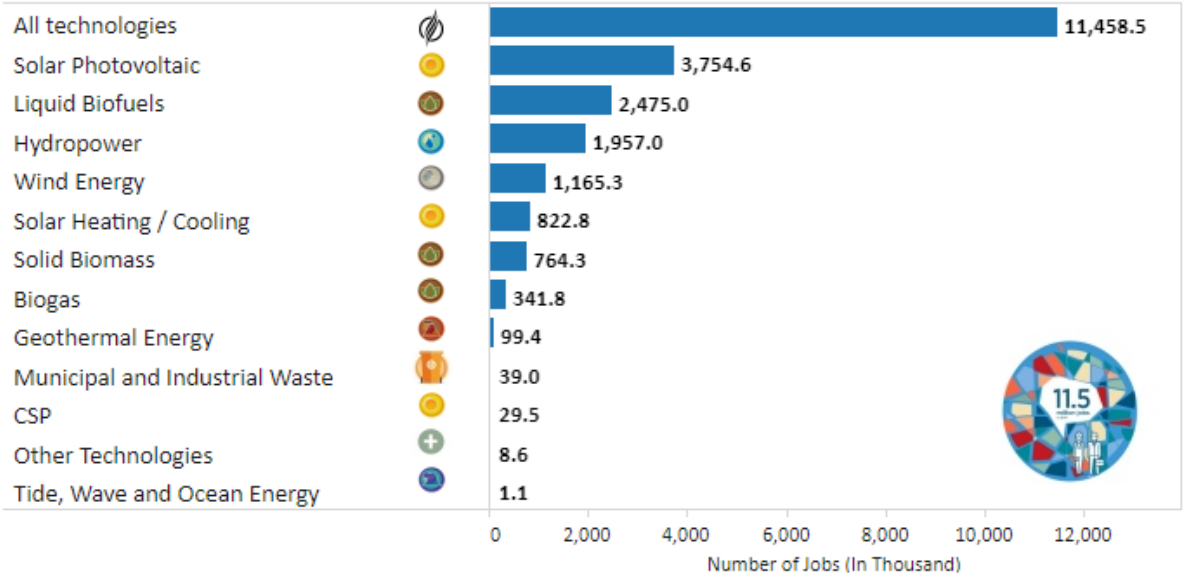
https://www.un.org/sustainabledevelopment/

Renewable Energy Employment by Country

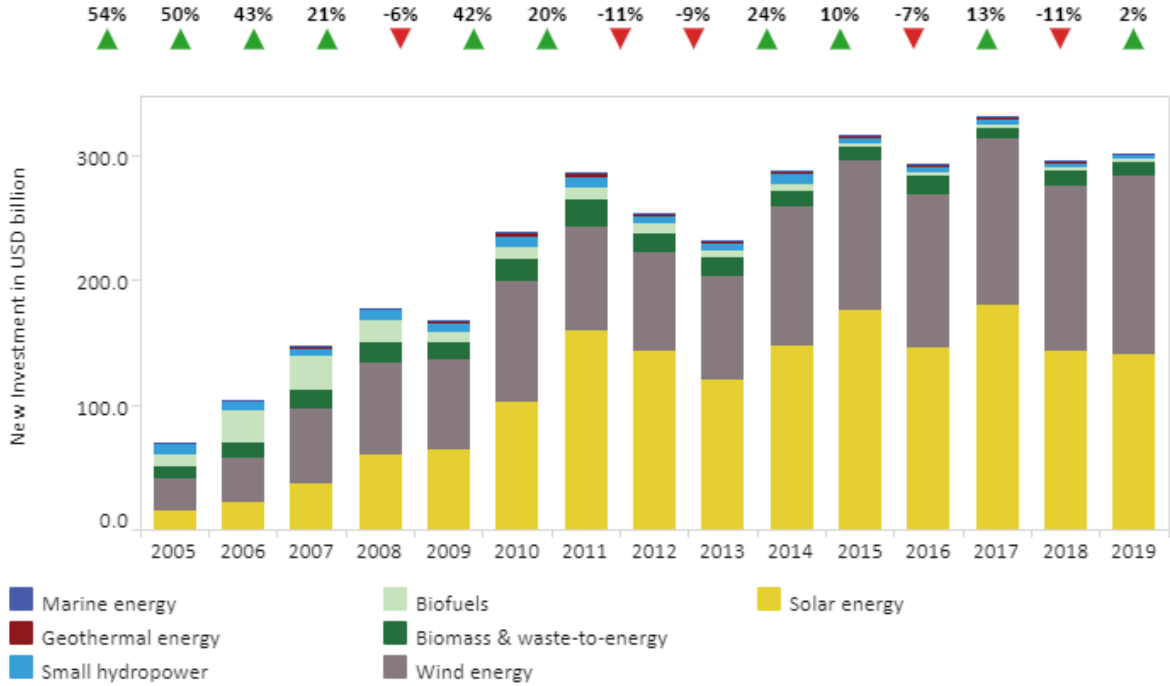
This dashboard showcases employment figures in the renewable energy sector worldwide by country and technology.

Renewable Energy Employment by Technology

Show for: All World



Source IRENA jobs database. Figures provided are the result of a comprehensive review of primary information sources by national entities such as ministries and statistical agencies, and secondary data sources such as regional and global studies.This is an ongoing effort to update and refine available knowledge. Totals may not add up due to rounding.'Other Technologies' include jobs which are not technology specific.



Source Frankfurt School-UNEP Centre/BNEF. 2020.Global Trends in Renewable Energy Investment 2020, http://www.fs-unep-centre.org. Note: Investment volume adjusts for re-invested equity. Total values include estimates for undisclosed deals.

https://www.irena.org/Statistics/View-Data-by-Topic/

"Climate change is one of the greatest challenges facing the planet today, and we believe businesses are an essential part of the solution. Representing more than 200 CEOs from America's leading companies, the new Business Roundtable position on climate change reflects our belief that a national market-based emissions reduction policy is critical to reducing greenhouse gas emissions to levels designed to avoid the worst effects and mitigate the impacts of climate change."

Doug McMillon
Chairman, Business Roundtable
President & CEO, Walmart

https://www.businessroundtable.org/climate

November

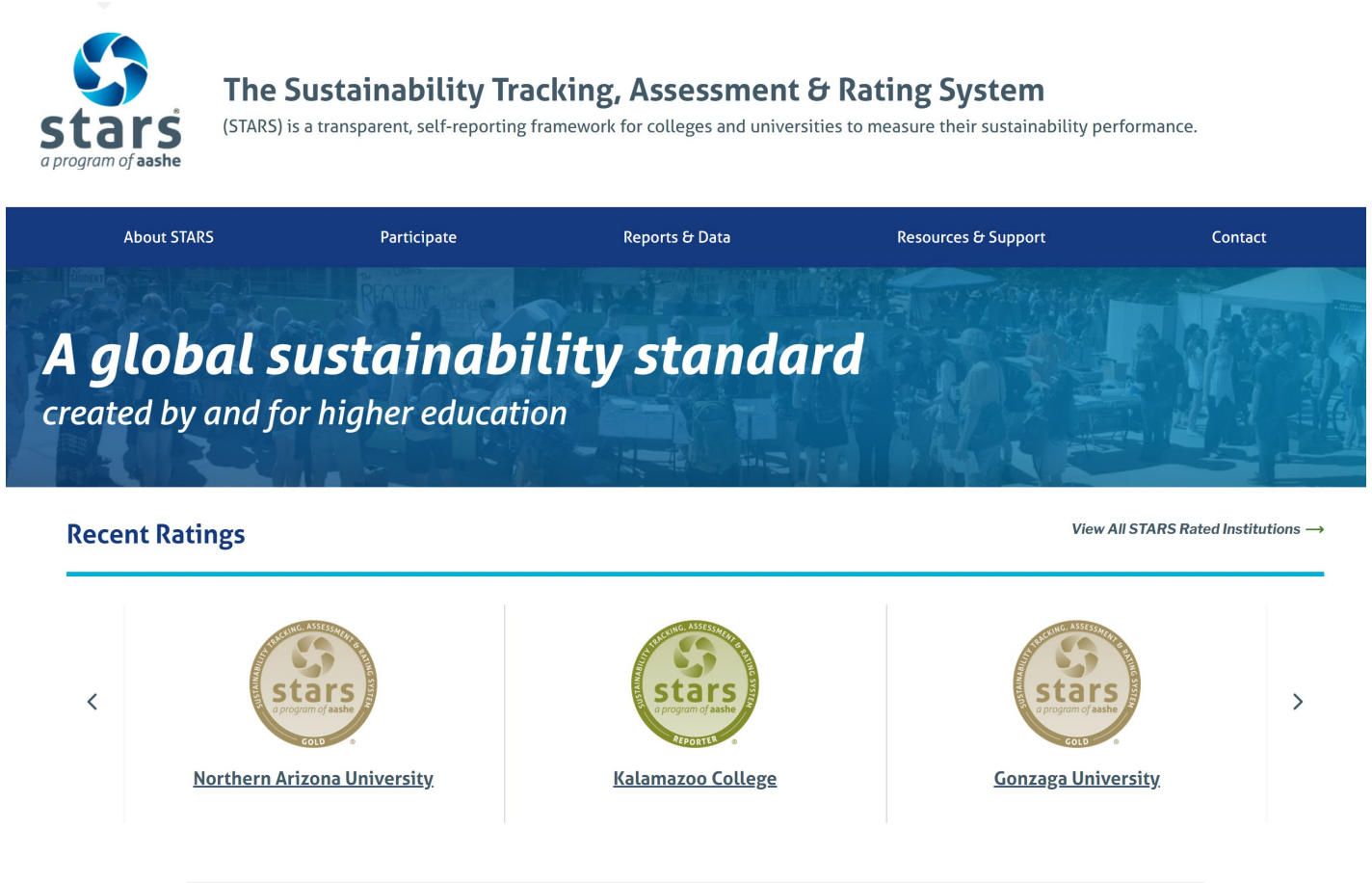
Lynna Odel

If I can't save us
then let me feel you
happy and safe
under my chin.
If this will drown
or burn
then let us drink starlight
nap under trees
sing on beaches—
the morning rush to sit indoors
what, again?
If we are dying
then let me rip open
and bleed Love,
spill it, spend it
see how much
there is
the reward for misers is
what, again?
If this life is ending
then let me begin
a new one

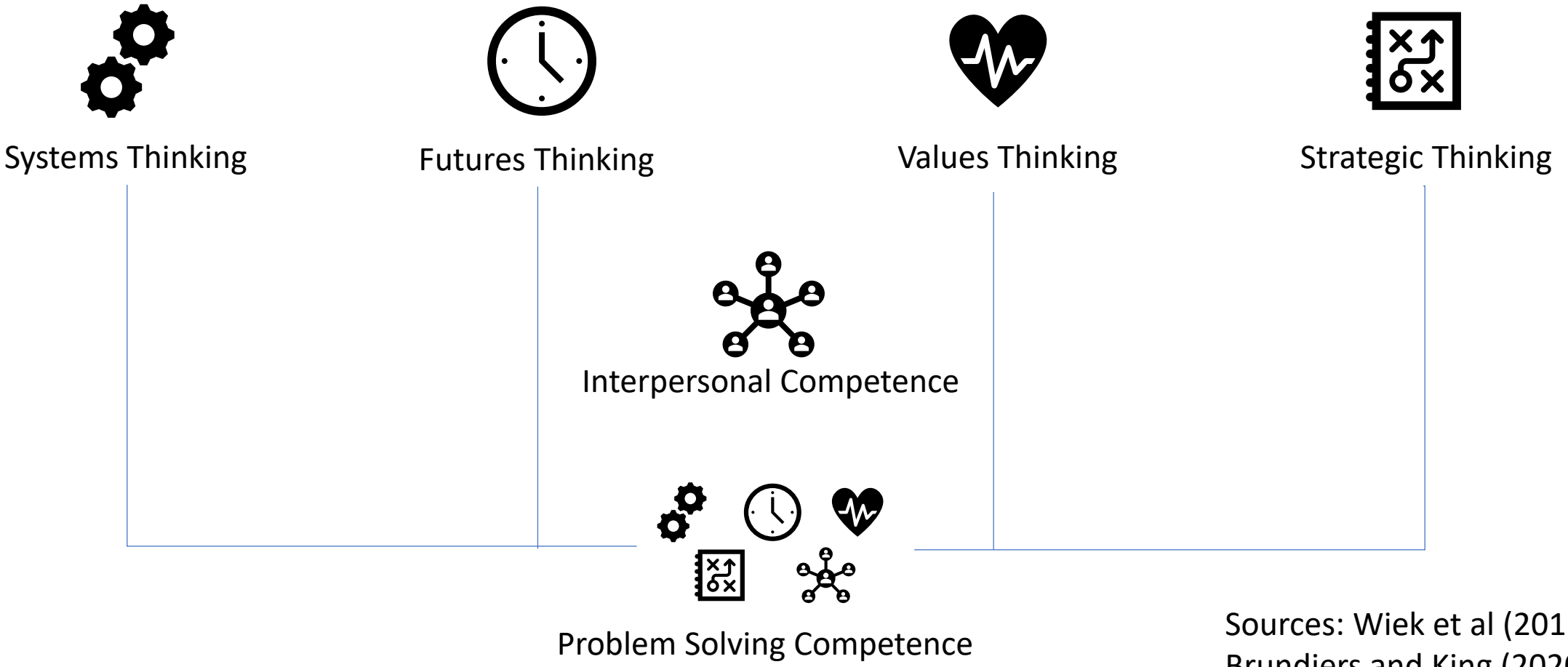
https://medium.com/the-climate-reporter/5-art-installations-about-climate-change-we-should-be-talking-about-8c310366194e

https://yaleclimateconnections.org/2017/07/climate-art-more-and-better-with-time/

Association for the Advancement of Sustainability in Higher Education



Key Competencies in Sustainability Framework



Sources: Wiek et al (2011)
Brundiers and King (2020)

Systems Thinking Competency

The ability to analyze sustainability problem cutting across different domains and scales, thereby considering agents, cause-effect structures, cascading effects, inertia, feedback loops, etc.

Why we need it: Critical foundation for anticipating future trajectories, identifying potential intervention points and crafting intervention strategies

Futures-Thinking Competency

The ability to anticipate how sustainability problems and solutions might evolve over time, considering alternative development pathways for current systems and crafting new and difference pictures of the future

Why we need it: Critical for orienting the planning activities, developing adaption responses, exercising precaution in decision making

Values-Thinking

The ability to collectively map, specify, apply, reconcile and negotiate sustainability values, principles, goals, and target (not about dictating values, but identifying one's own values and applying/understanding them as part them to the thinking process

Why we need it: Critical for assessing the un-sustainability of current and future systems for creating sustainability visions of those systems

Strategic Thinking

The ability to collectively design and implement transformational (systemic) intervention and transition strategies toward a sustainable outcome

Critical for designing and implementing plans that create the intended transformational change or outcome

Interpersonal Competency

The ability to motivate and facilitate research and solution sets for sustainability outcomes. I.e:

- Communication and negotiation skills
- Team work
- Participatory and collaborative skills within and outside of academia (govt. business and society)

Why we need it: The other competencies rely on this – in essence

Integrated Problem Solving Competency

The ability to apply different problem solving frameworks to complex sustainability problems and develop viable solution options

Why we need it: Enables meaningful integration of problem analysis, sustainability assessment, visioning and strategy building

Key Competency in sustainability
Systems-thinking
Futures-thinking
Values-thinking
Strategic-thinking
Interpersonal
Integrated Problem-Solving

+

Steps of Problem-Solving Process
1. Problem Analysis & Framing
2. Scenario-developments
3. Visioning
4. Assessments
5. Strategy creation
6. Synthesis

+

Activities?
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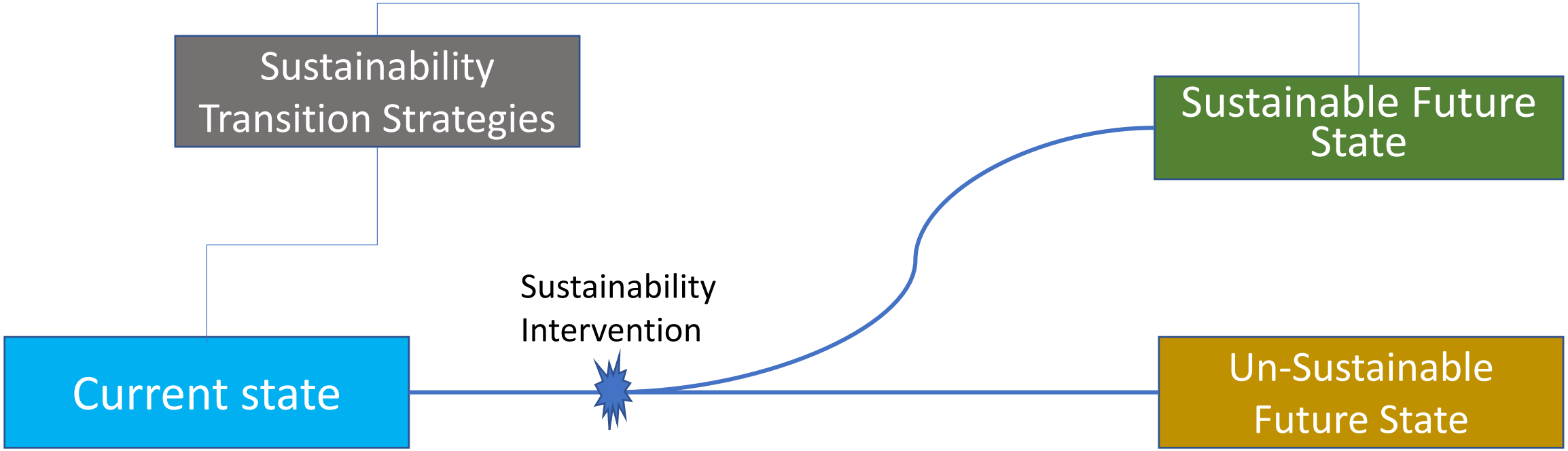
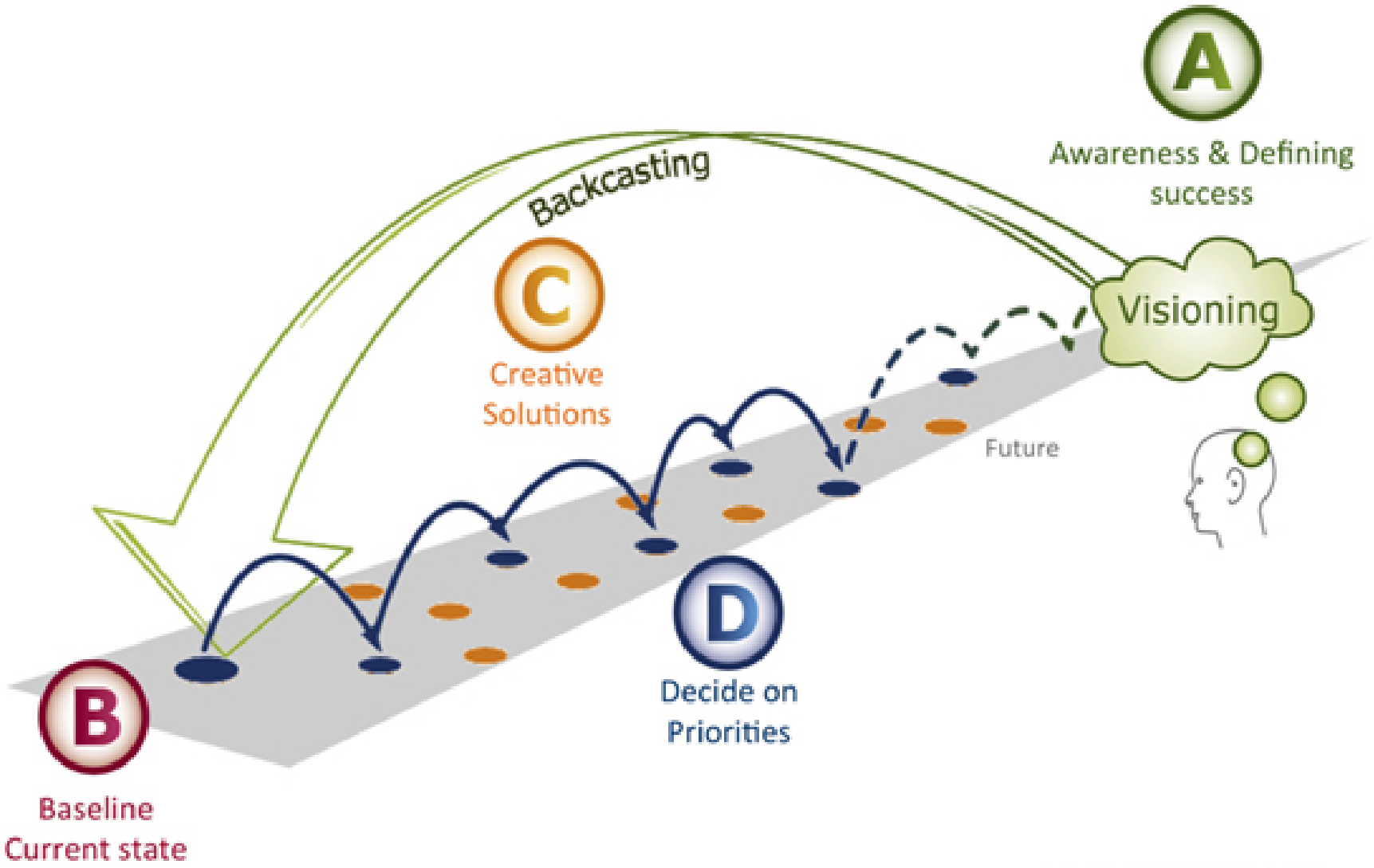
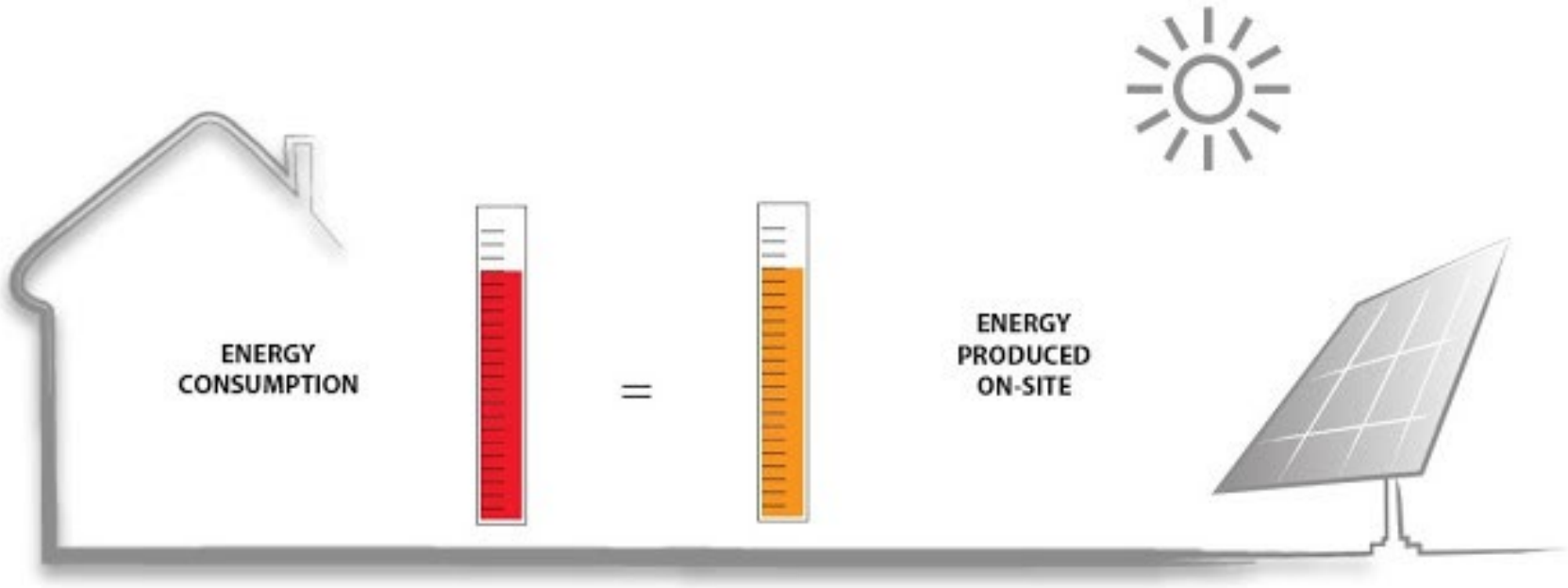
Integrated Problem Solving Competency

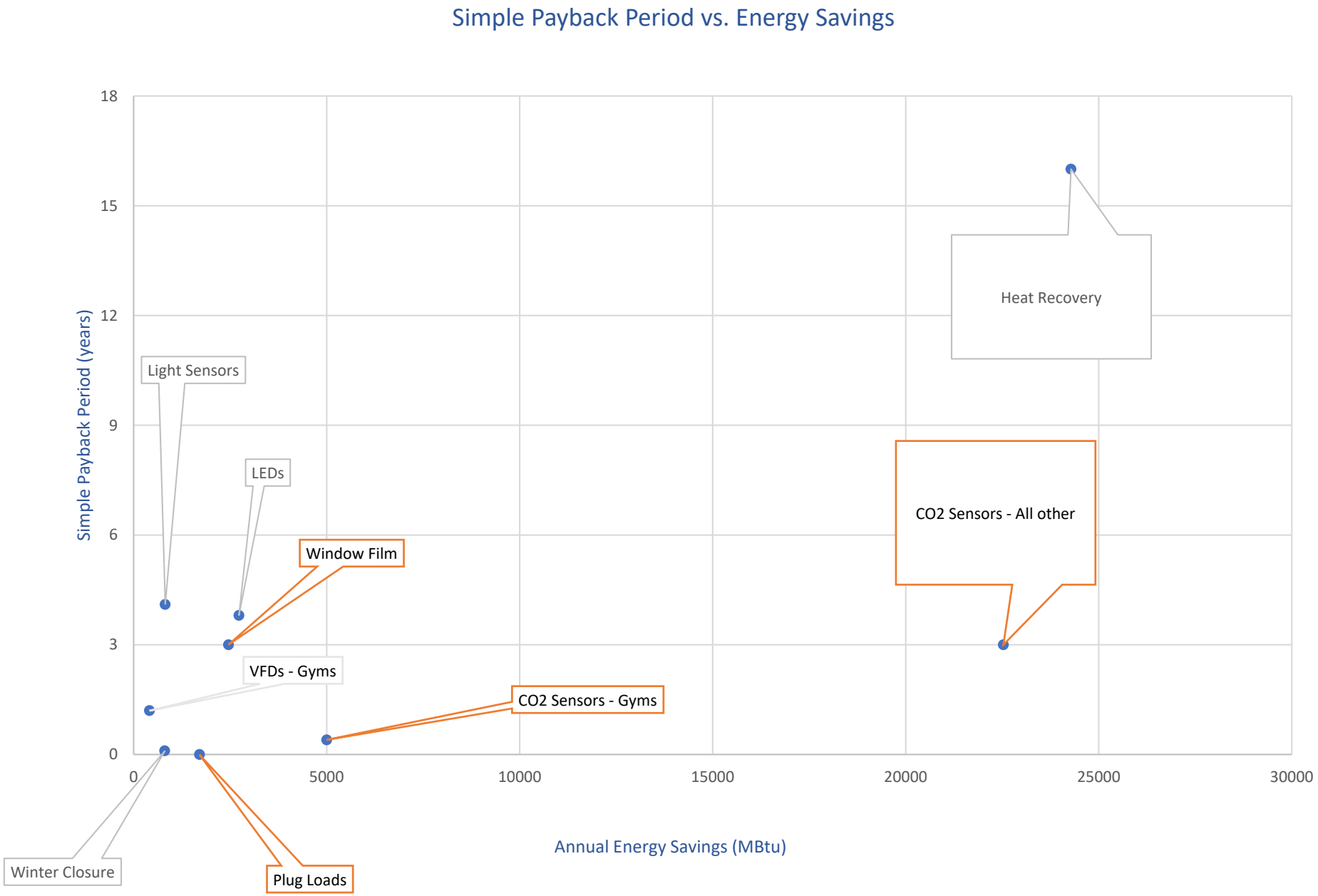





SMCCCD
Sustainability
Initiative

ZNE Strategy

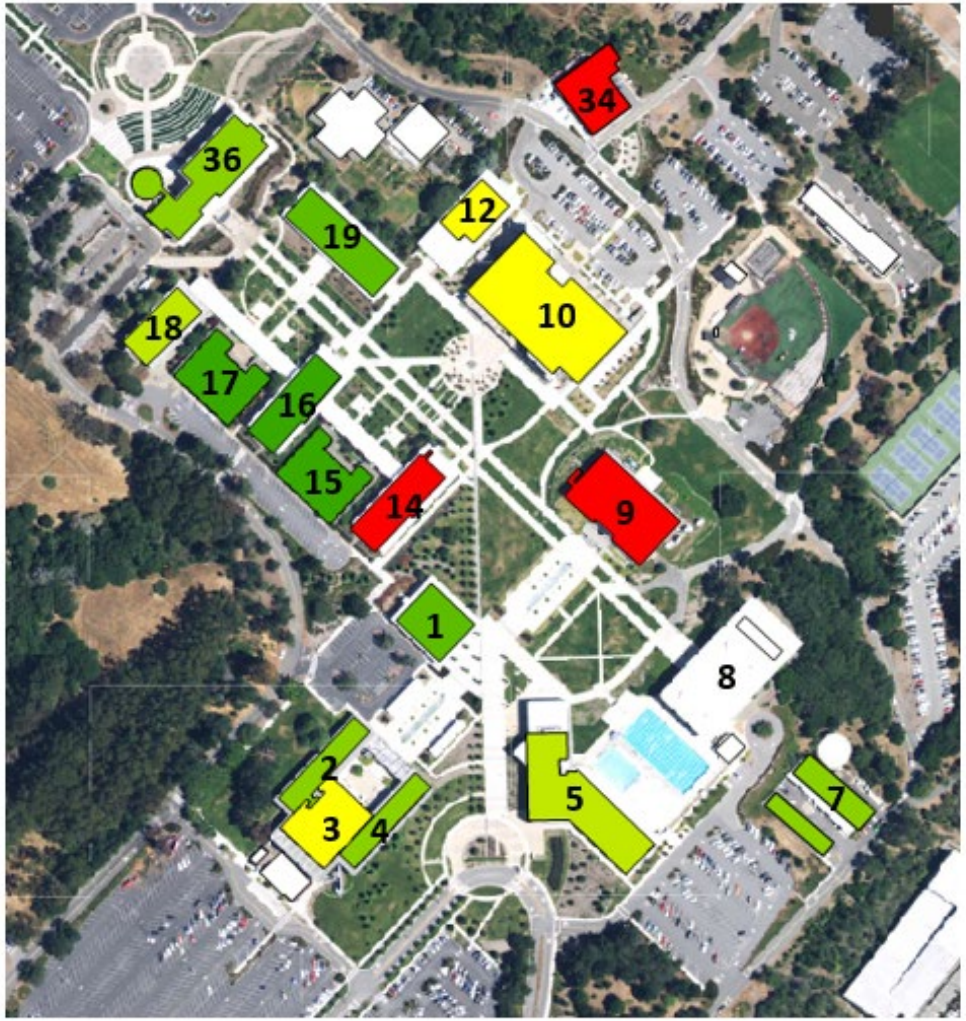



Simple Payback Period vs. Energy Savings
Simple Payback Period (years)
18
15
12
9
6
3
0
0
5000
10000
15000
20000
25000
30000
Annual Energy Savings (MBtu)
Heat Recovery
Light Sensors
LEDs
Window Film
CO2 Sensors - All other
VFDs - Gyms
CO2 Sensors - Gyms
Winter Closure
Plug Loads

Cañada College Building EUI

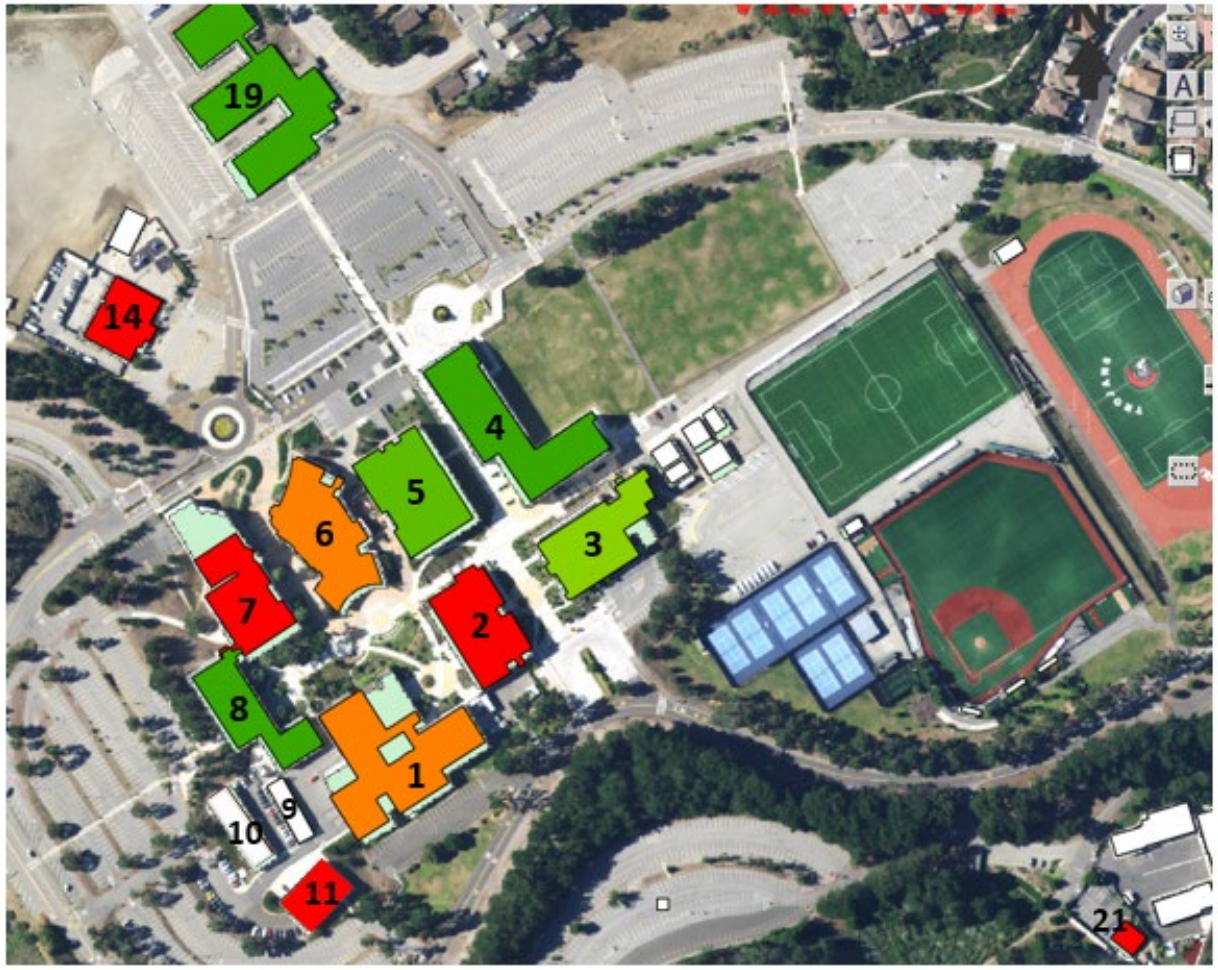
EUI (kBtu/ft2/year)		
EUI	Color	Bldg #s
31-40		6
41-50		--
51-60		7,9,16
61-70		1
71-80		3,17
81-90		13
91-100		18
101-125		8
126-150		5

College of San Mateo Building EUI

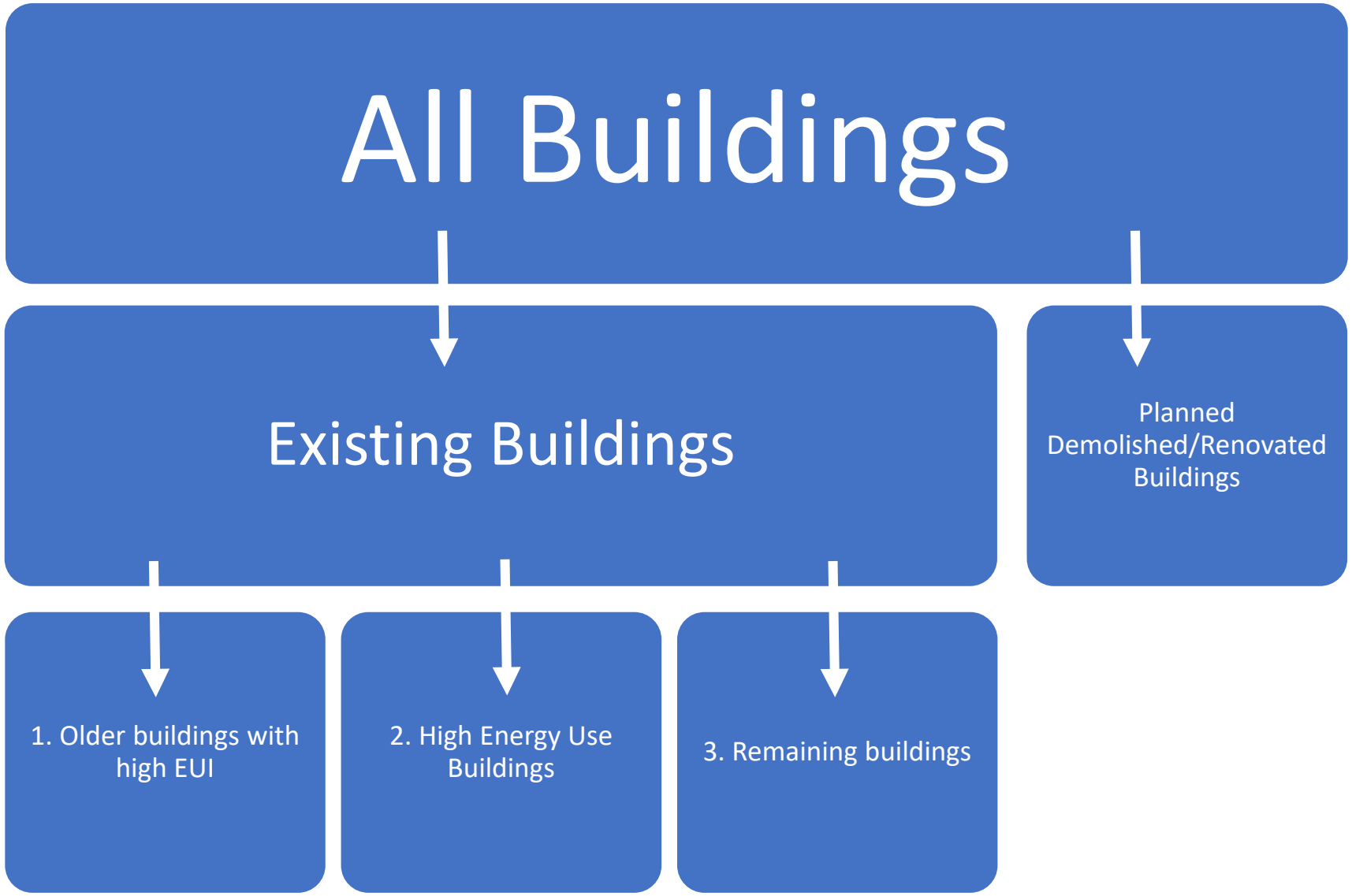


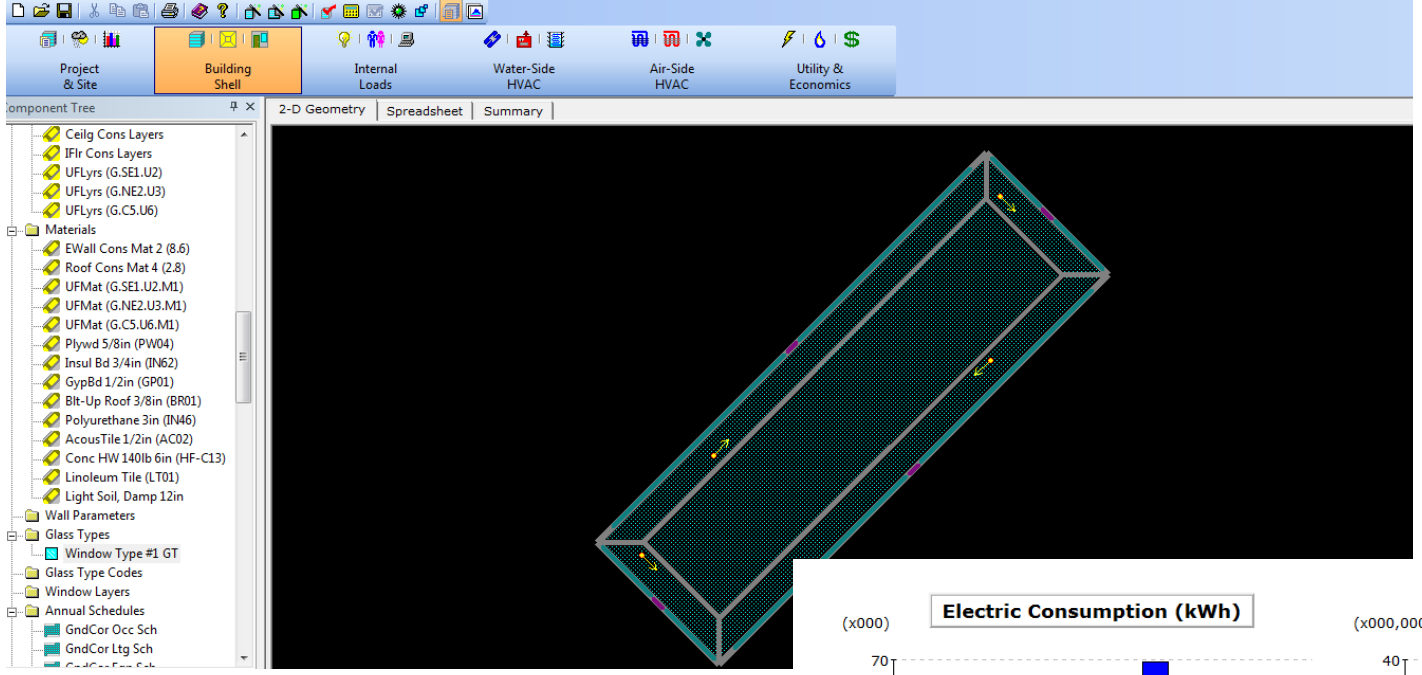
EUI (kBtu/ft2/year)		
EUI	Color	Bldg #s
31-40		15,16,17
41-50		19
51-60		1,2,4,7,36
61-70		5,18
71-80		3,10,12
81-90		--
91-100		--
101-125		DO
126-150		9,14,34

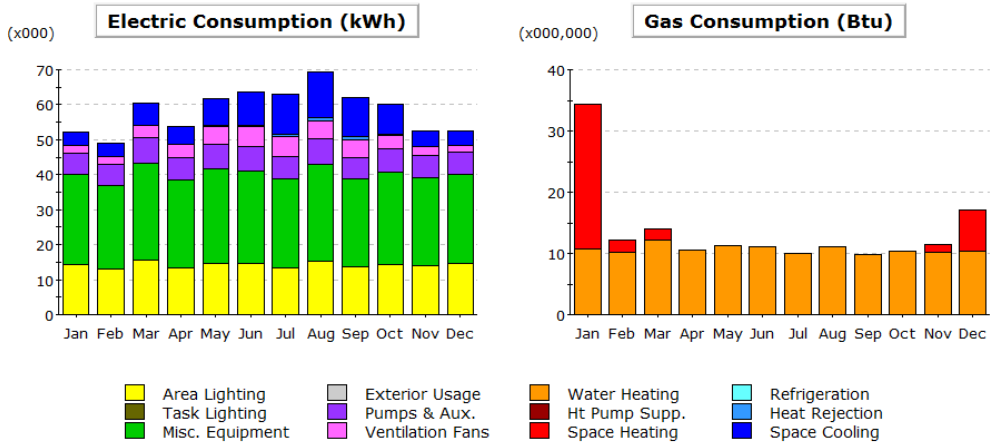
Skyline College Building EUI



EUI (kBtu/ft2/year)		
EUI	Color	Bldg #s
31-40		4,8,19
41-50		5
51-60		3
61-70		--
71-80		--
81-90		7
91-100		1,6
101-125		--
126-150		2,7A,11,14,21


All Buildings
Existing Buildings
Planned Demolished/Renovated Buildings
1. Older buildings with high EUI
2. High Energy Use Buildings
3. Remaining buildings





Electric Consumption (kWh x000)

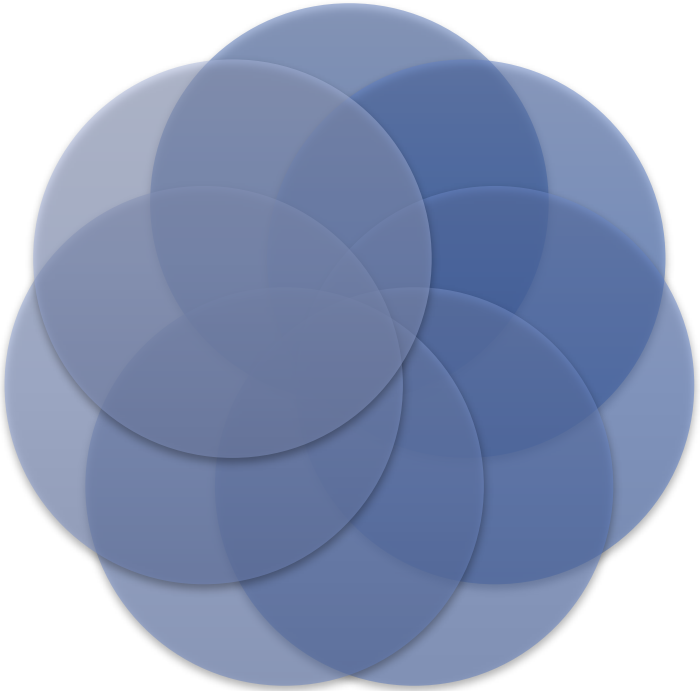
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.80	3.80	6.26	4.91	7.69	9.37	11.25	12.92	11.28	8.58	4.46	3.84	88.17
Heat Reject.	-	0.00	0.13	0.11	0.27	0.54	0.85	0.97	0.91	0.41	0.03	0.00	4.23
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-

Next Steps

ZNE Ready New Buildings

Continued Coordination/Collaboration with BUG's and other stakeholders

Building Occupancy vs. Building Schedule Analysis



Plug-Load controls integration

Massive MBCx Effort

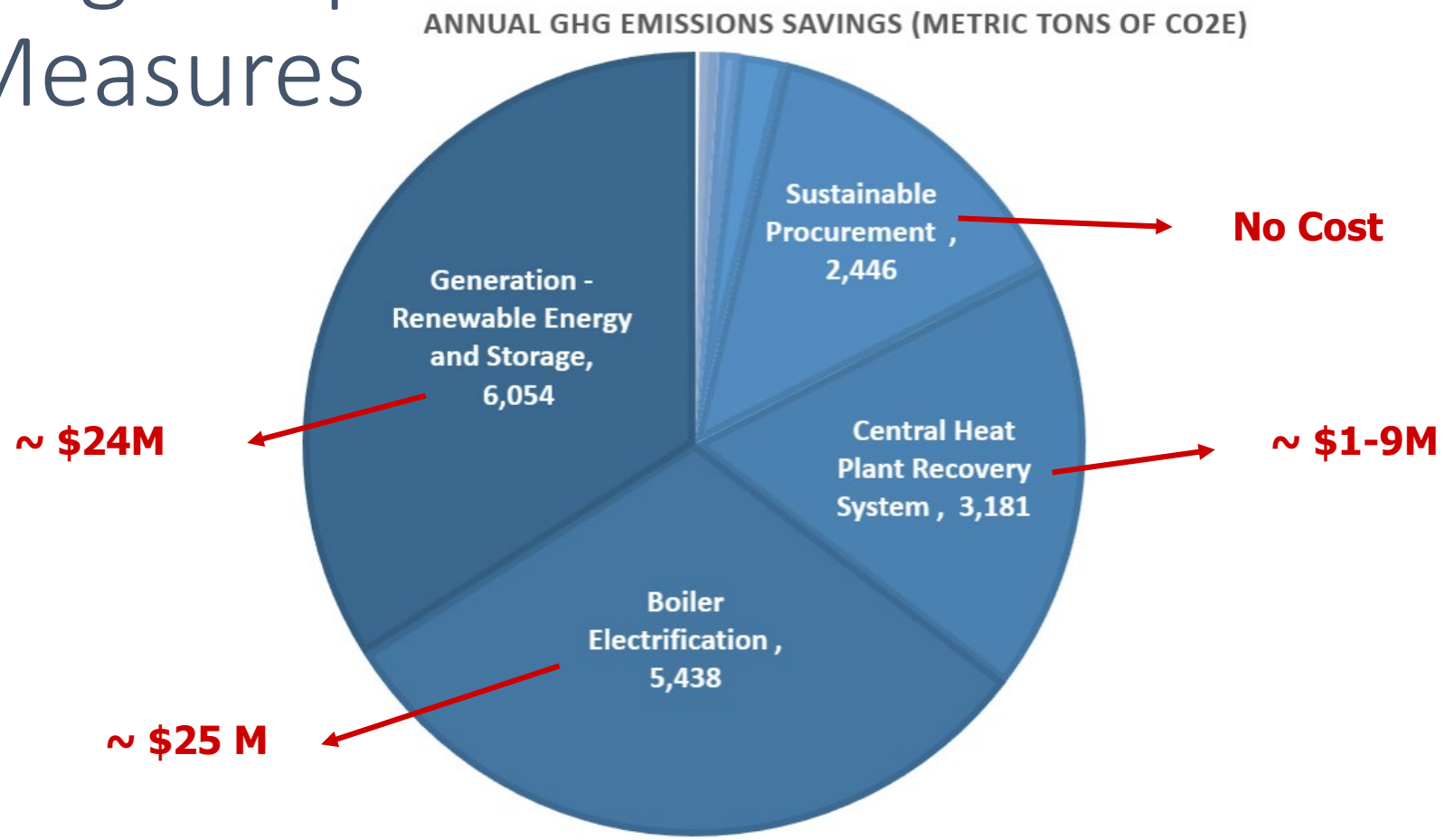
Training and development of staff with emphasis on trouble shooting and PM

Renewable Energy and Other DER Analyses

	Cañada	College of San Mateo	Skyline	Total
Gross Square Footage	318,255	710,169	540,538	1,568,962
Number of Buildings	28	39	33	100
Student Headcount	6,449	8,992	9,158	24,649
Faculty and Staff Headcount	399	642	643	1,684

	Cañada	College of San Mateo	Skyline	Total
Electricity from Grid (kWh)	1,755,848	8,578,269	5,017,897	15,352,014
Gas Usage (Therms)	136,611	524,895	311,485	972,911
Carbon Emissions from Utilities (Metric tons CO_2e)	1,146	4,844	2,857	8,847
Total Energy Spending	$372,863	$1,395,106	$901,106	$2,669,006

Large-Impact Decarbonization Measures



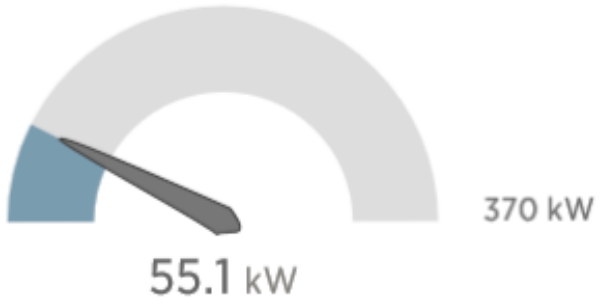
SMCCCD Electric Vehicle Charging Program

1. First 4 hours free for SMCCCD faculty, staff, and students

2. Sign up information on smccd.edu/sustainability website

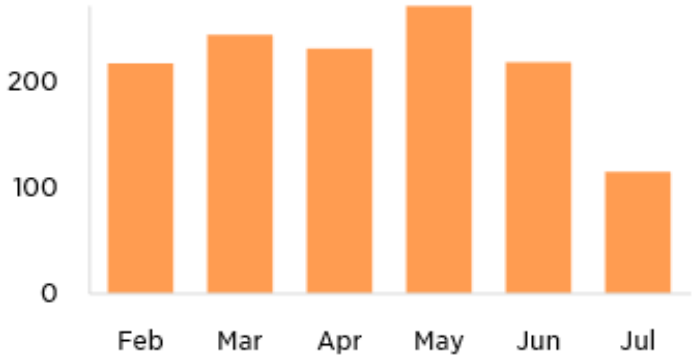

Francisco
33
San Bruno
Pacifica
82
1
92
Unio
San Mateo
16
Bair Island
84
Don Edwa
San Franci
Bay Natio
Wildlife
El Granada
280
101
Redwood City
92
35
Half
Moon Bay
12
Palo Alto

Real Time Power



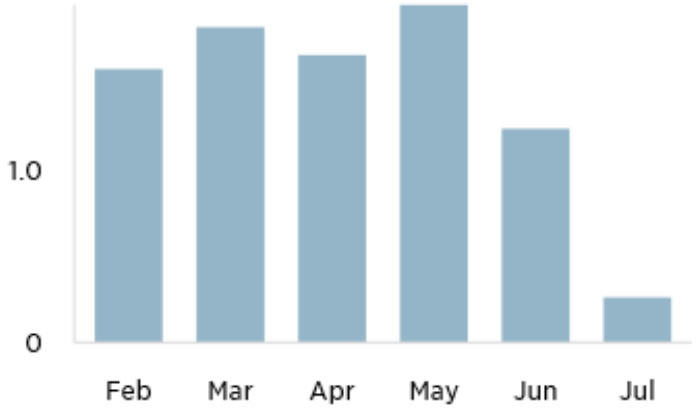
Unique Drivers

314 Connected Drivers



Sessions

in thousands




Justin Yu
Revenue Earned vs. Cost of Energy
$250.00
$200.00
$150.00
$100.00
$50.00
$-
DOLLAR AMOUNT
6/1/2017
7/1/2017
8/1/2017
9/1/2017
10/1/2017
11/1/2017
12/1/2017
1/1/2018
2/1/2018
DATE
Revenue ($)
Cost of Energy ($)


GEM
eLXD

Paper (308)

Ink & Toner (1078)

Filing & Binding (1359)

Mailing & Shipping (1187)

Writing (717)

Commute.org

Plan a trip | Get Rewarded | Guaranteed Ride | Shuttles | Re

JOIN TODAY AND START CARPOOLING!

Search the web to plant trees...

69,569,49

Trees planted by Ecosia users

GREEN OFFICE PROGRAM

Interested in reducing your campus carbon footprint and promoting sustainable office choices?

Participate in the district-wide voluntary Green Office Program!

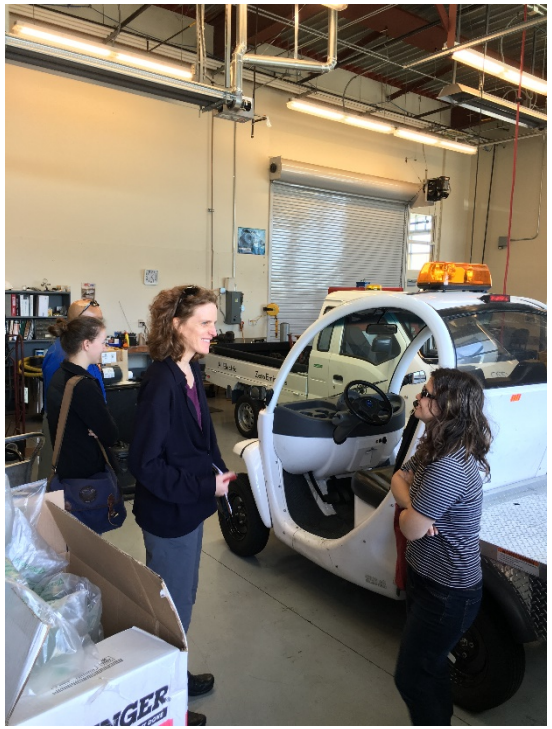
Empower yourself by utilizing sustainable practices in your office / cubicle to promote operational efficiency and increase cost savings

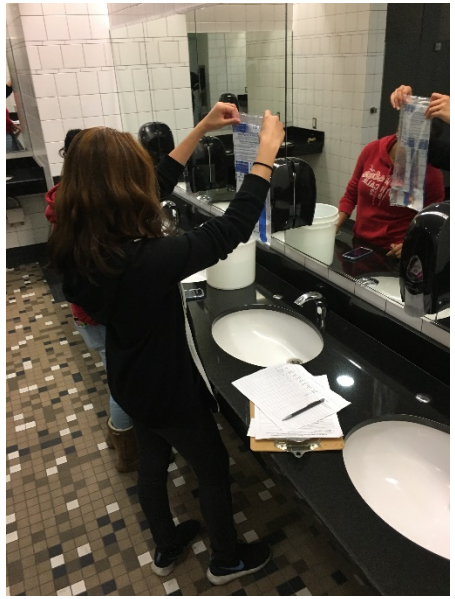
Take Action by actively helping to reduce waste, energy, and water usage on campus

Become a Leader by spreading the word and promoting a sustainable campus lifestyle to help the district reduce greenhouse gas emissions

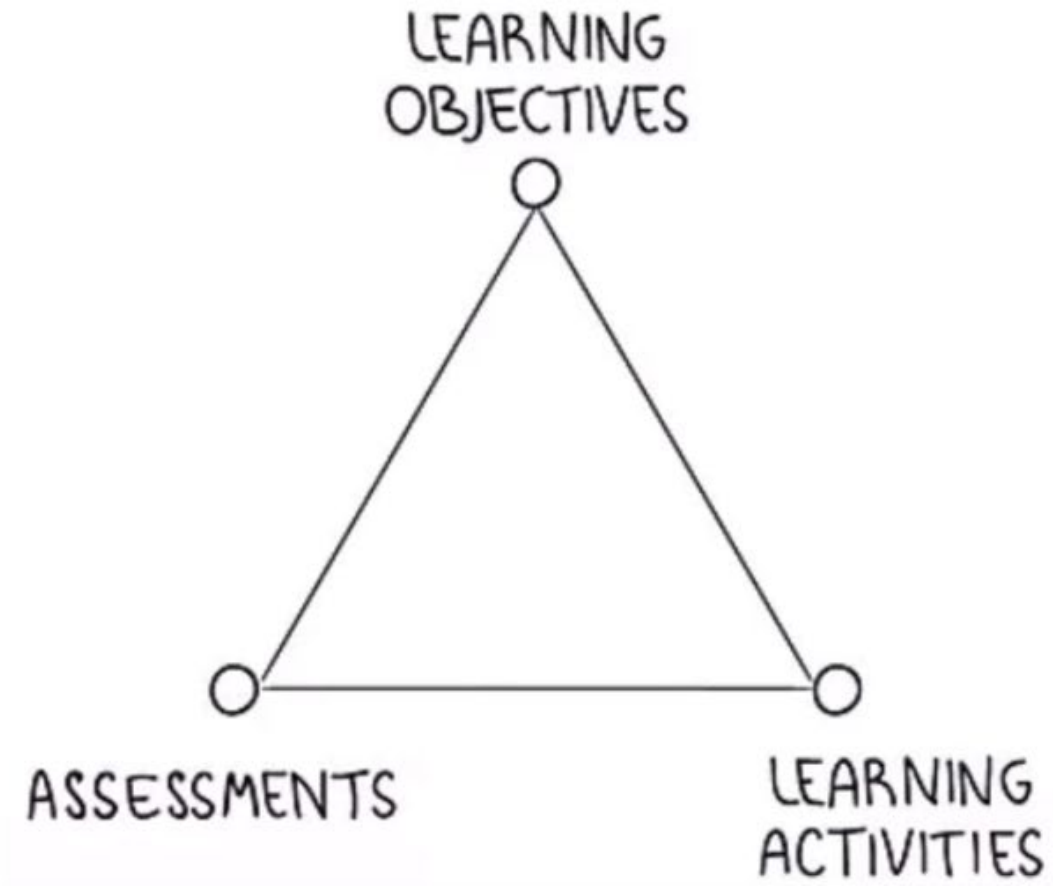
Zero Waste by 2025

Decrease Waste Production ↓ + Increase Waste Diversion ↑ = ZERO WASTE





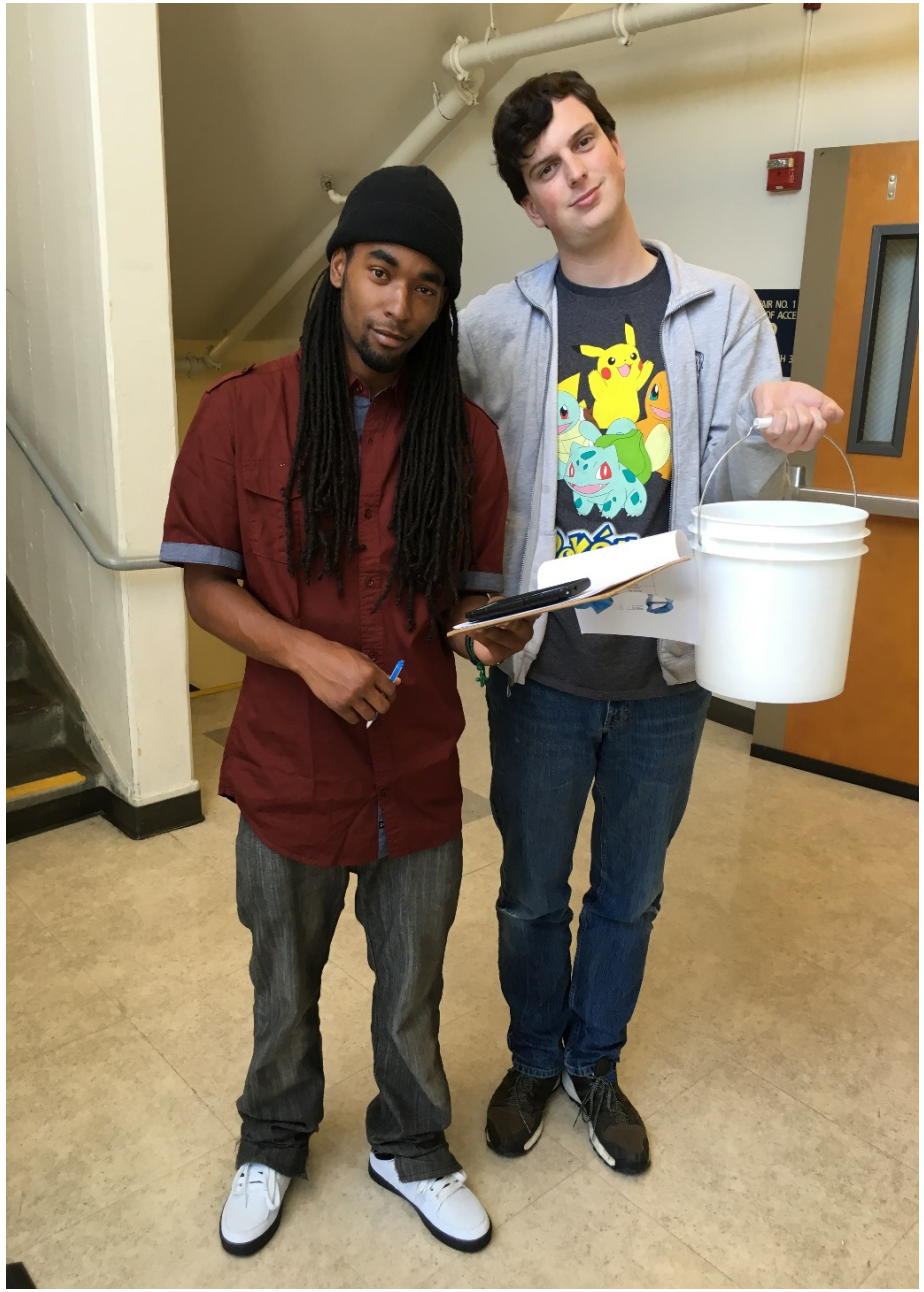
Work to Create Constructive Alignment

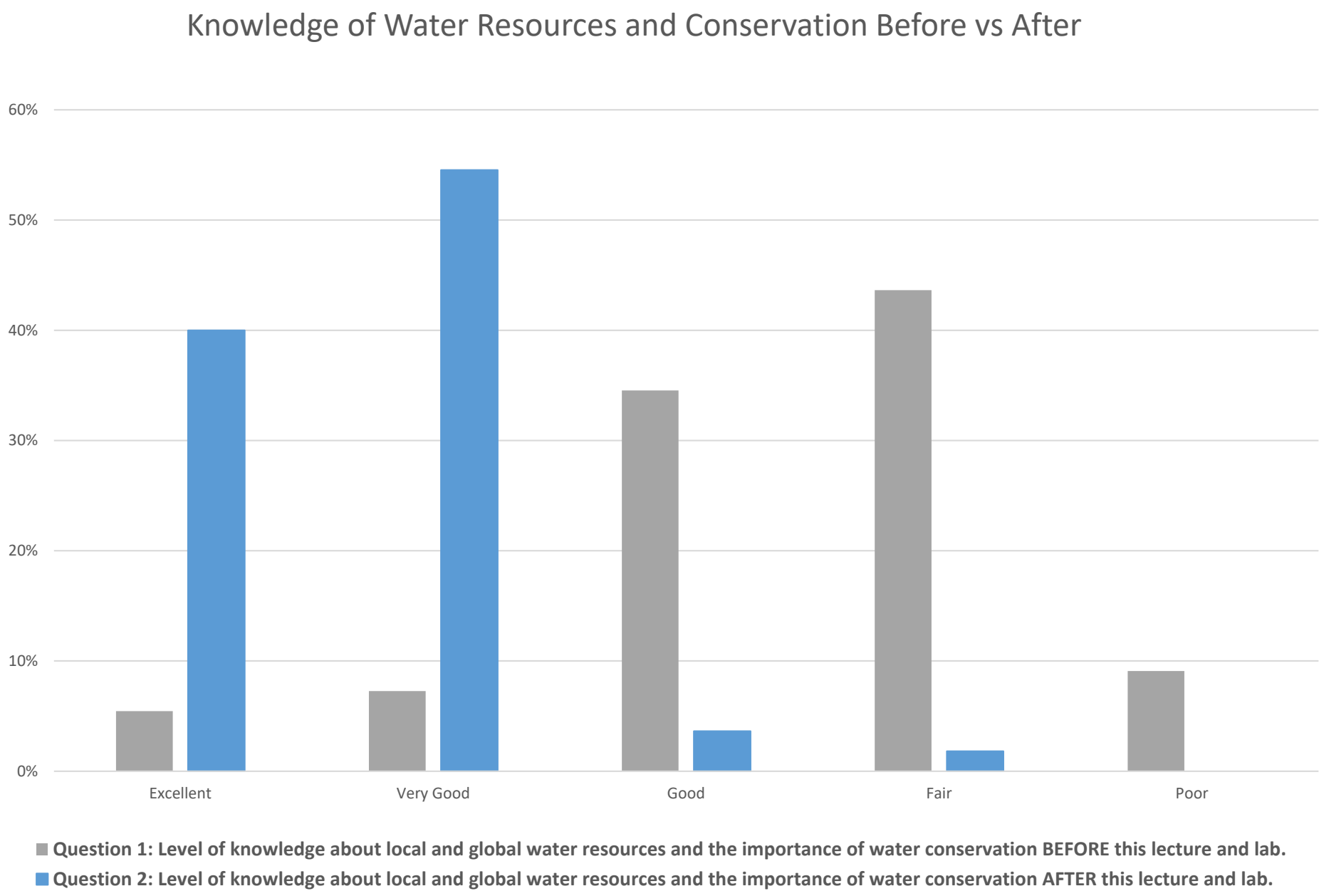


Constructive alignment makes sure that these three elements work together to create a richer teaching and learning experience

Source: Biggs, J.B. (2003)

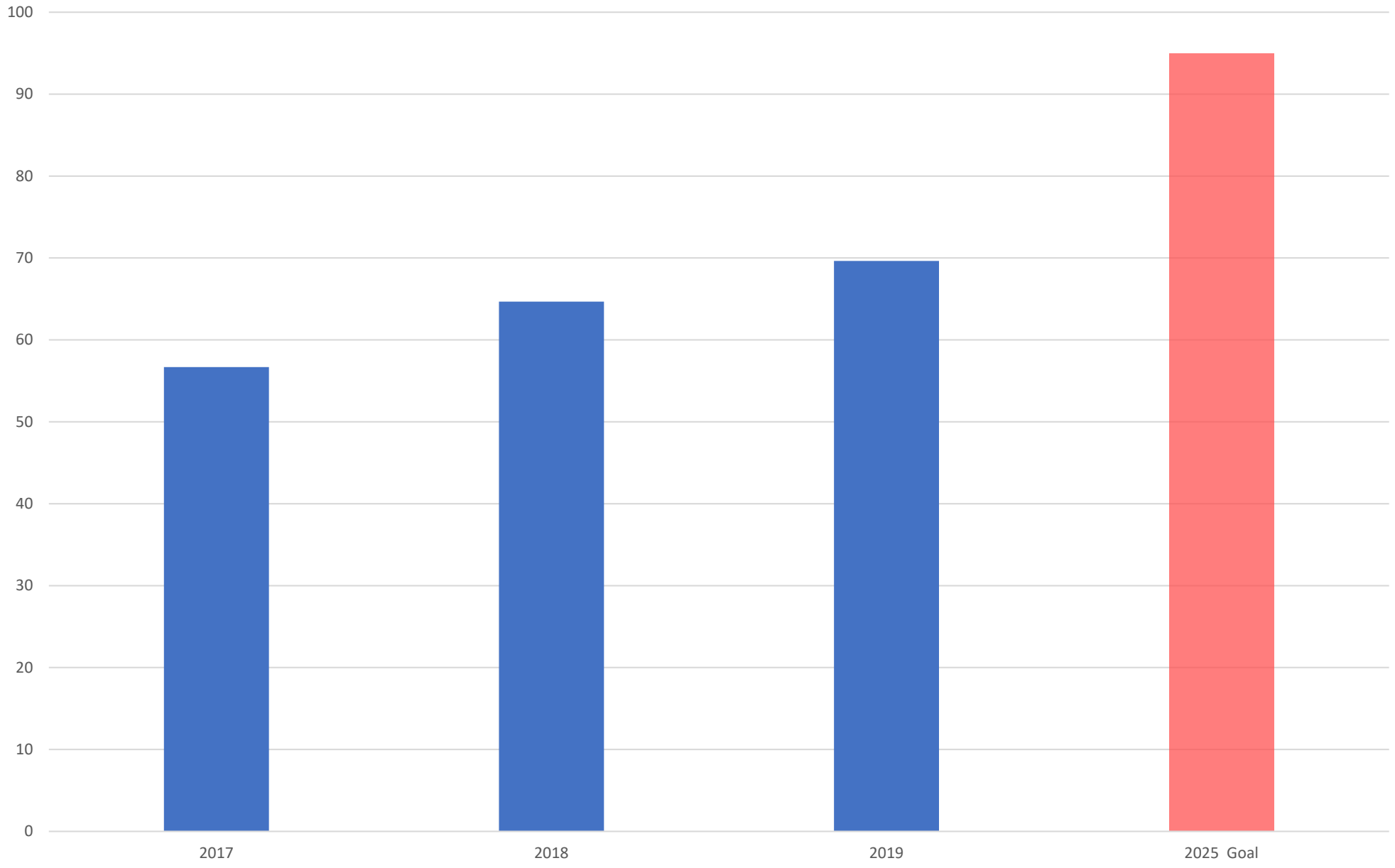
Group Type	Typical Characteristics of the Group/Person	Typical Group Size and Academic support	Typical Services
Novice (Mild)	Has a little to no previous interaction with sustainability. May not know how to define or describe sustainability.	20-40 learners with class time only and 1-3 faculty and/or staff facilitators.	Large data gathering and/or processing exercises as part of a class activity.
Intermediate (Medium)	Has some interest and exposure to sustainability topics as well as some grasp of sustainability key competencies.	3-20 learners with some time over a semester to devote outside of class to an issue.	Likely analyzing data or outcomes of a novice group or generating primary data and actionable information for a specific task.
Advanced (Spicy)	Individual or small group (honors students, for instance) that is concerned about a specific issue and exhibits several sustainability key competencies	1-3 learners that require 1:1 interaction and guidance at beginning, middle and end of an effort.	Often have at least one semester to devote to a specific issue, concern or effort and can offer professional level support, strategic direction, and insight on an issue or topic.




Knowledge of Water Resources and Conservation Before vs After
60%
50%
40%
30%
20%
10%
0%
Excellent
Very Good
Good
Fair
Poor
Question 1: Level of knowledge about local and global water resources and the importance of water conservation BEFORE this lecture and lab.
Question 2: Level of knowledge about local and global water resources and the importance of water conservation AFTER this lecture and lab.

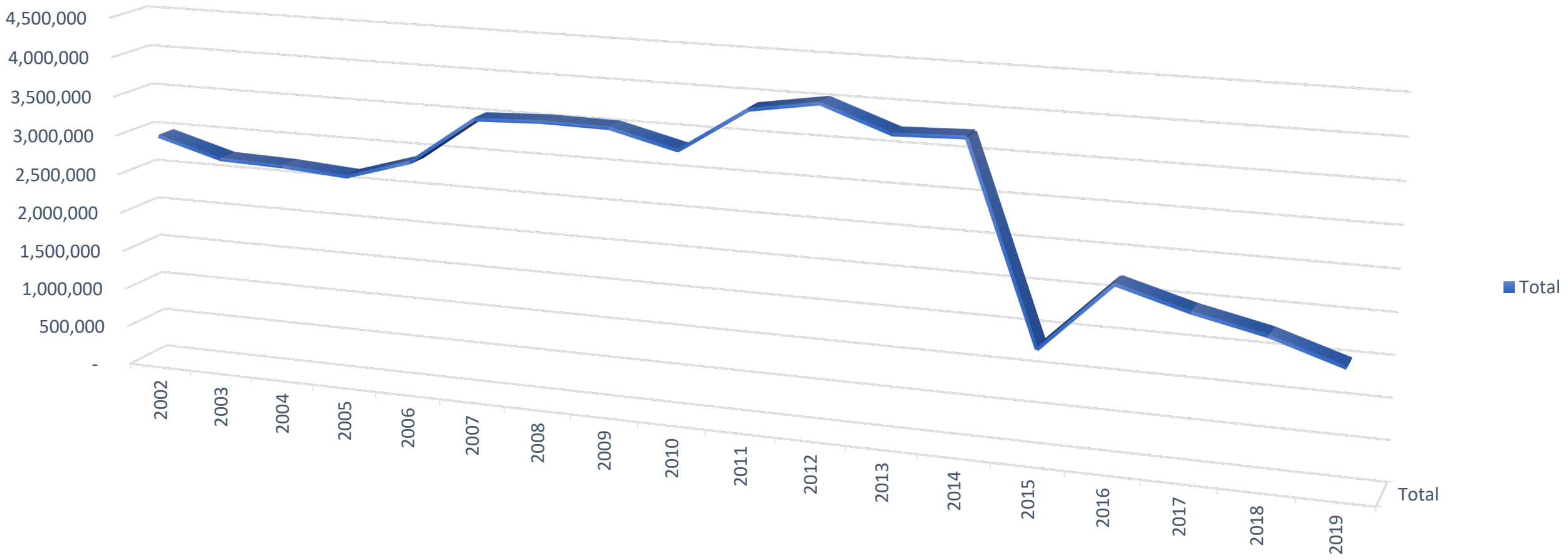

6
GARBAGE / TRASH
CANS / BOTTLES
PAPER / CARDBOARD
Garbage / Trash
Mixed Recycling
COMPOST
Green Gorillas
Green Gorillas

District Wide Diversion Rate




XL
CONSTRUCTION
XL
CONSTRUCTION
XL
CONSTRUCTION

Districtwide KWh




Why are we doing this?
COLLEGE CAMPUS ENERGY CONSUMPT
Exterior Lighting 7%
Misc 5%
Motors 3%
Air Compressors 1%
Office Equipment 4%
HVAC 40%
Interior Lighting 32%
Refrigeration 4%
Cooking 3%
Water Heating 1%
SAN MATEO COUNTY COMMUNITY COLLEGE DISTRICT
Facilities Planning Maintenance and Operations

References

Biggs, J.B. (2003) Teaching for Quality Learning at University (2nd edn.). Buckingham: The Society for Research Into Higher Education and Open University Press.

Brundiers, K. and King,J. (2020). *Key Competencies in Sustainability: Creating Change Agents Through Applied Learning* [PowerPoint slides]. Retrieved from https://drive.google.com/drive/u/0/folders/1Fqza8kHaOX_mfR5rgNL6DTKw56rHiCCU.

Brundiers, K. and Wiek, A. (2017). Beyond Interpersonal Competence: Teaching and Learning Professional Skills in Sustainability. *Education Sciences*, *7*(1), 39. https://doi.org/10.3390/educsci7010039

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Resources

- ASU's School of Sustainability Instructor Resources: https://schoolofsustainability.asu.edu/instructor-resources/who-we-are/#
- Campus as Lab Community of Practice monthly webinar series: Contact Rachelle Haddock at: rachelle.haddock@ucalgary.ca
- Centers for Sustainability Across the Curriculum: https://www.aashe.org/partners/centers-for-sustainability-across-the-curriculum/
- Disciplinary Associations Network for Sustainability (DANS): https://www.aashe.org/partners/dans/
- COVID-19 Resources for the Higher Education Sustainability: Communityhttps://docs.google.com/document/d/1UMU-nt2LSOjf-WGCS14fFZuMNyYtLXJDG85NIqWxMZo/edit#heading=h.knr67fk9yxfa
- Rutgers Coastal Climate Risk and Resilience Certificate: https://c2r2.rutgers.edu/certificate-program/
- San Mateo County Community College Sustainability Team: www.smccd.edu/sustainability
- Sustainability Improves Student Learning (SISL): https://serc.carleton.edu/sisl/index.html
- The Community College Handbook for Sustainability Education and Operations: https://www.gcseglobal.org/community-college-handbook-sustainability-education-and-operations
- The National Academies of Sciences, Engineering and Medicine: https://www.nationalacademies.org/our-work/strengthening-sustainability-programs-and-curricula-at-the-undergraduate-and-graduate-levels
- The U.S. Partnership for Education for Sustainable Development: https://uspartnership.org/

Other Useful Research

- Ayers, James & Bryant, Jayne & Missimer, Merlina. (2020). The Use of Reflective Pedagogies in Sustainability Leadership Education - A Case Study. Sustainability. 12. 10.3390/su12176726.
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- Corres, Andrea & Rieckmann, Marco & Espasa, Anna & Ruiz-Mallén, Isabel. (2020). Educator Competences in Sustainability Education: A Systematic Review of Frameworks. Sustainability. 12. 9858. 10.3390/su12239858.
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- Ossiannilsson, Ebba & Zhang, Xiangyang & Wetzler, Jennryn & Gusmão, Cristine & Aydin, Cengiz & Jhangiani, Rajiv & Glapa-Grossklag, James & Makoe, Mpine. (2020). From Open Educational Resources to Open Educational Practices For resilient sustainable education. Distances et médiations des savoirs. 10.4000/dms.5393.
- Wälitalo, Lisa & Robèrt, Karl-Henrik & Broman, Göran. (2020). An Overarching Model for Cross-Sector Strategic Transitions towards Sustainability in Municipalities and Regions. Sustainability. 12. 7046. 10.3390/su12177046.

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