Welcome!

The Architect's Role in Addressing Climate Change:
Greenhouse Gas Mitigation Strategies at a Community and District Scale

Wed, October 14, 2015 12:00 PM - 1:00 PM EDT

Earn 1.0 AIA HSW LUs

Moderator

Daniel Williams, FAIA, APA

Daniel E. Williams, FAIA, APA is a practicing architect and planner in Seattle and Miami and an internationally recognized expert in sustainable design. Mr. Williams is a member of the experts team for the Clinton Climate + Initiative, advising on projects in Toronto and London. He served as 2006 chair of the AIA's Sustainability Task Group and sat on the national advisory council for United States Environmental Protection Agency - NACEPT. His book Sustainable Design: Ecology, Architecture and Planning, published Earthday 2007 by John Wiley & Sons, was called a top 10 book on sustainable design by the Royal Academy of Architects and top 5 in sustainable design and planning by Planetizen. Dan has taught and lectured in architecture and planning for over 30 years and is on the Master of Sustainable Design faculty at the University of Florida's extension in Singapore. He is working on a book that illustrates the designs connectivity between science and art.

Questions?

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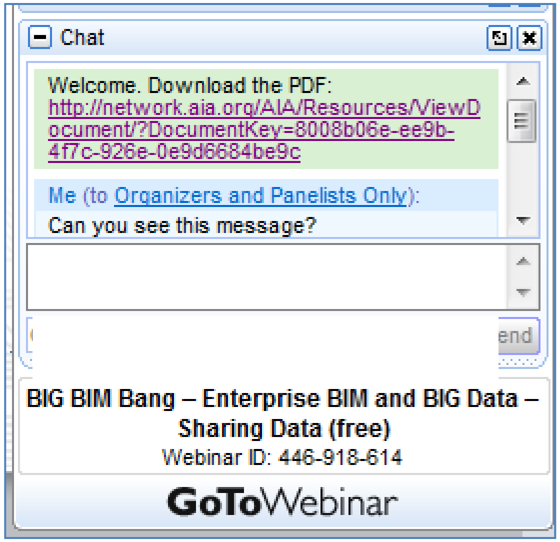

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Speaker

Bruce Race, FAIA, FAICP, PhD

Bruce Race is the principal and founder of RACESTUDIO and is responsible for all aspects of project planning, design and delivery. Since founding RACESTUDIO in Berkeley, CA in 1994, his projects have received 32 design and planning awards including national awards from the American Institute of Architects, American Planning Association, Environmental Protection Agency and Society of College and University Planning. The Long Range Development Plan for UC Merced received a national 2012 AIA COTE Top Ten Green Projects Award, and the Owings Award for Environmental Excellence in 2013. Dr. Race is the Director of University of Houston's Center for Sustainability and Resilience (CeSAR). His design talent, practice experience, and research interests intersect in his classroom studios where he emphasizes design innovation grounded by real world experience.

Course Description

Architects design cities, districts, and buildings and the impact of our present urban design approach is the source of about 70% of GHG emissions. This seminar will review popular mitigation and adaptation strategies discovered in a national survey of 200 U.S. towns and cities. Climate action planning for low carbon cities includes GHG mitigation, climate adaptation, and resilience strategies. The presenter will share emerging urban design outcomes from climate planning and effectiveness of popular strategies of GHG reductions at a block, district, and city scale.

Learning Objectives

1. Discuss the scope of GHG emissions that in the architecture professions' portfolio
2. Review what cities are doing to mitigate GHG emissions in climate action plans
3. Review the effectiveness of mitigation strategies
4. Demonstrate effective strategies at city, district, and block scales

And now for our presentation:

The Architect's Role in Addressing Climate Change:

Greenhouse Gas Mitigation Strategies at a Community and District Scale

Building Cities with Aspirations

Restoration Tax Credits and Façade Restoration Program

Park Design Competition and Renovation

LRT System Regional Plan and $25M Redevelopment Commitment

First PBID in California and Downtown Partnership Management

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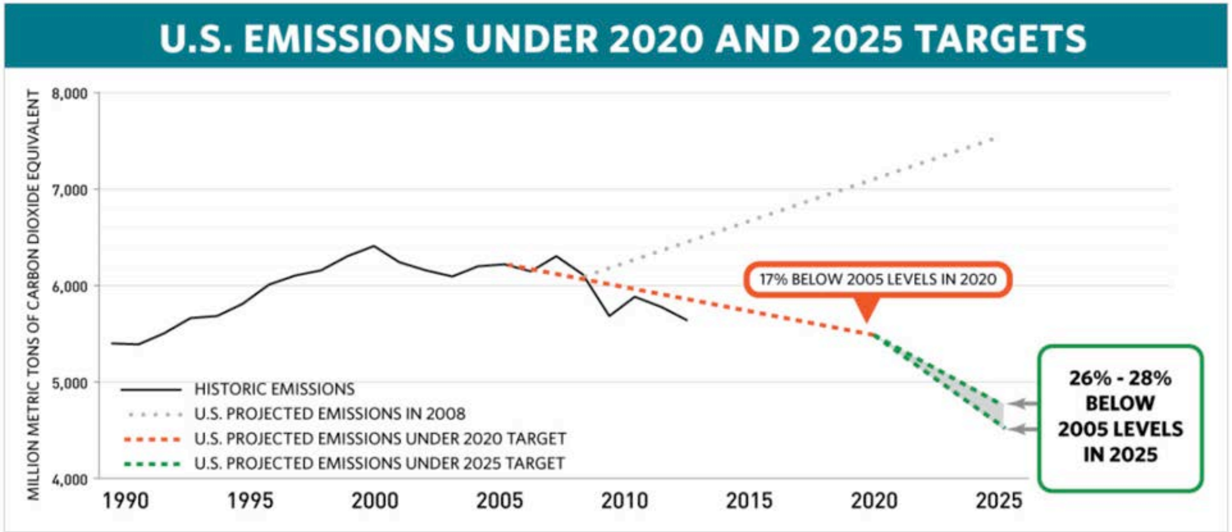
We all get WAY less carbon …



(Source: International Energy Agency, 2015)

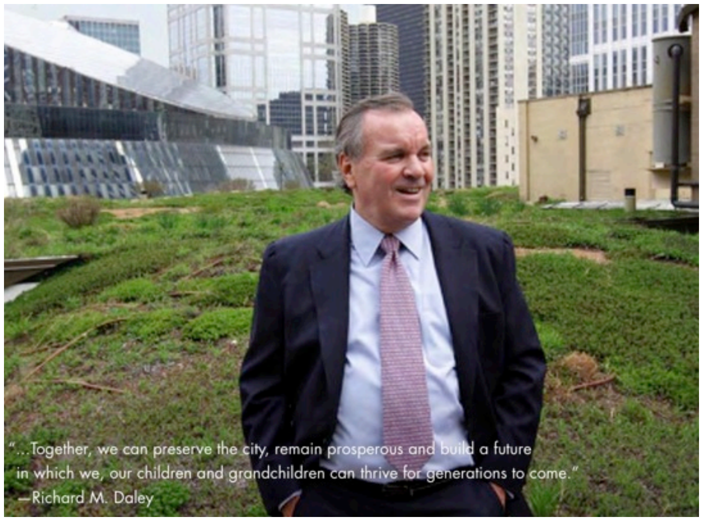
2013 U.S. Climate Action Plan:

- Carbon pollution standards for new and existing power plants.
- Post-2018 heavy-duty vehicle fuel efficiency standards.
- Achieve a 40-45% reduction in methane emissions from 2012 levels by 2025 from oil and gas production.

(248.7M / 392M) x 0.20 = 12.7 % per capita CO^2e

We are allowed about 1/8th the carbon footprint we had in 1990.

Motivation for Climate Action Plans



Chicago Mayor Daley

- Make Chicago the greenest city
- Projects and programs that implement CAP

Mayor Will Wynn of Austin

- Mayor that advocated and lead city to consensus regarding mitigation planning
- Later became CEO of Austin Energy - - greenest municipal energy company

Political leadership provides motivation

- Cities credit **local political leadership** (63%) and local **criticize advocates** (45%) as their primary motivation for preparing a CAP.
- Over a third (36%) of CAP cities identify a **strong local sustainability tradition**.
- Motivations also include conditions from the **funder** to complete a CAP (10%) and **state requirements** (9%).

Source: 2012-2013 survey Bruce Race P.I.

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Universal Strategies– Centered, Compact, Connected

CAP cities are employing **similar strategies** for mitigating GHG emissions, regardless of climate region, while responding to different adaptation challenges.

Cities in states **with and without** comprehensive planning requirements **employed similar supply-side and demand-side strategies**.

CENTERED: CAP strategies are reinforcing (64%) and influencing (39%) city commitments to **developing in and adjacent to downtowns**.

COMPACT AND CONNECTED: High eGRID CO^2e cities are placing an emphasis **on increasing density and transit-oriented development,** low CO^2e cities share **reduced parking standards** as a common strategy.

West, Northwest and Upper Midwest climate regions are **employing more form-changing policies** than other regions.

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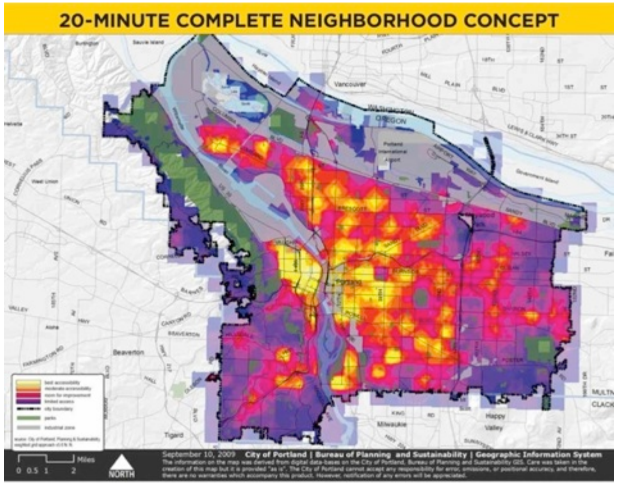
Influence on Urban Form Policies–Mitigation



CAPs are making cities more compact, concentric, and centered with a higher **"passive performance"** - - walking and biking.

84% of survey cities reported that their CAP **emphasizes walking and biking.**

CAP cities are **reducing parking** requirements (49%) and **expanding transit** services (48%),

Larger cities (>250,000) CAPs more often increasing **density around transit**.

Almost half (48%) of survey cities are pursuing higher **energy efficiency standards**.

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Influence on Urban Form Policies–Adaptation

Boulder

Annapolis

CAP influence over infrastructure policies seems to be supporting popular city form policies.

65% cited **walking and biking infrastructure** and 46% identified on-site **stormwater** management as an important action.

Climate **adaptation issues** most often addressed by CAP cities are heat islands, flooding, drought and wildland fires.

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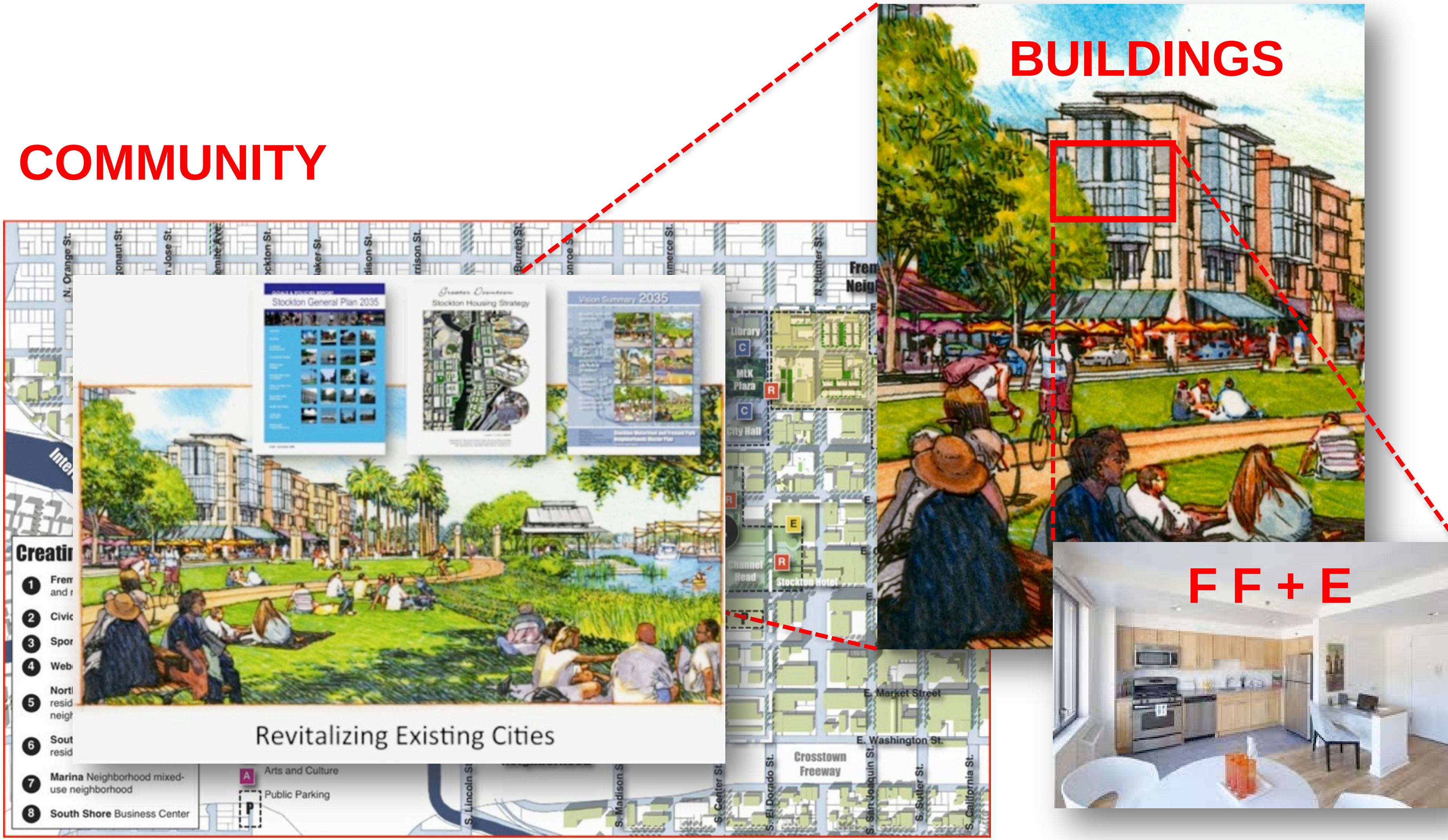
COMMUNITY



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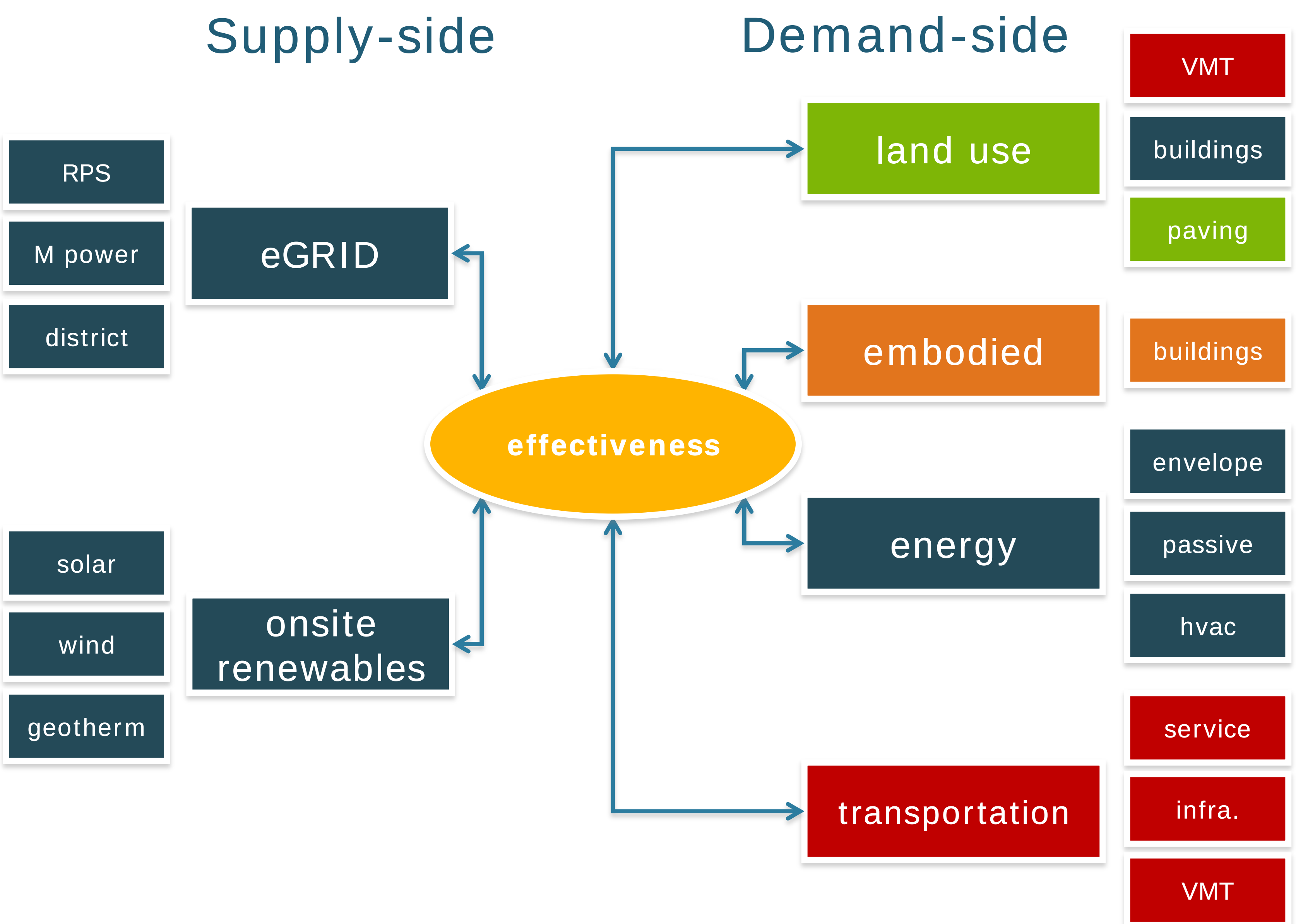
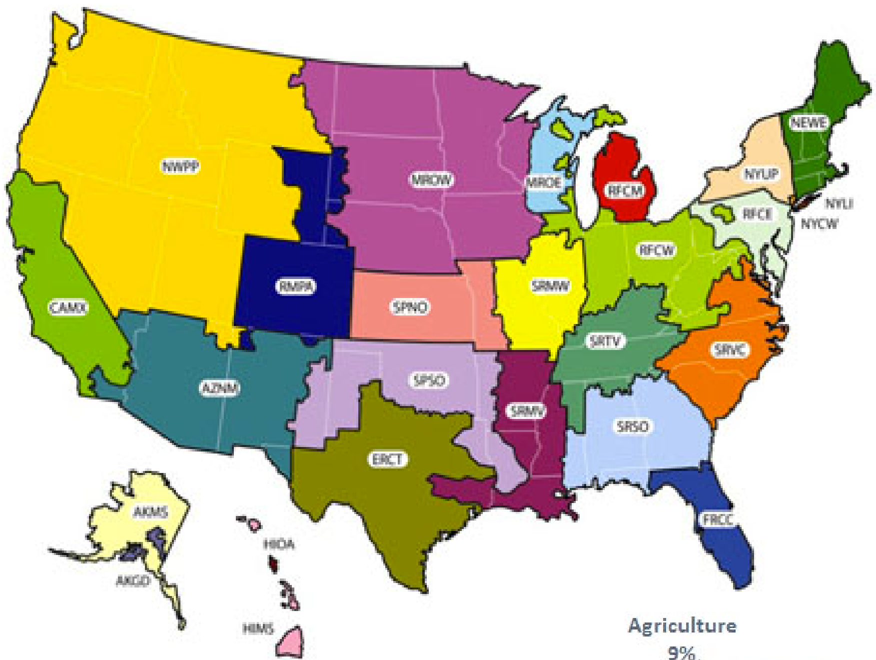
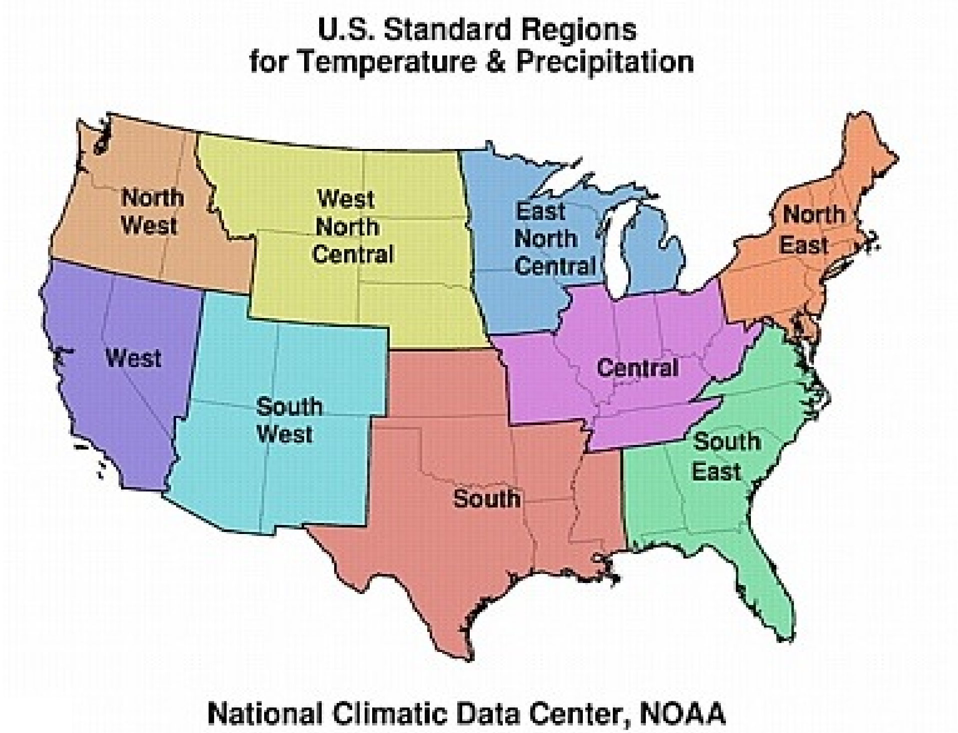
Creating Effective GHG Mitigation Strategies



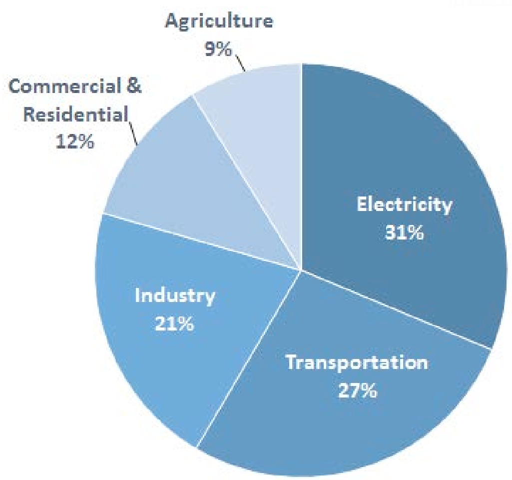
Energy and Climate Context



EPA eGRID



Climate Regions



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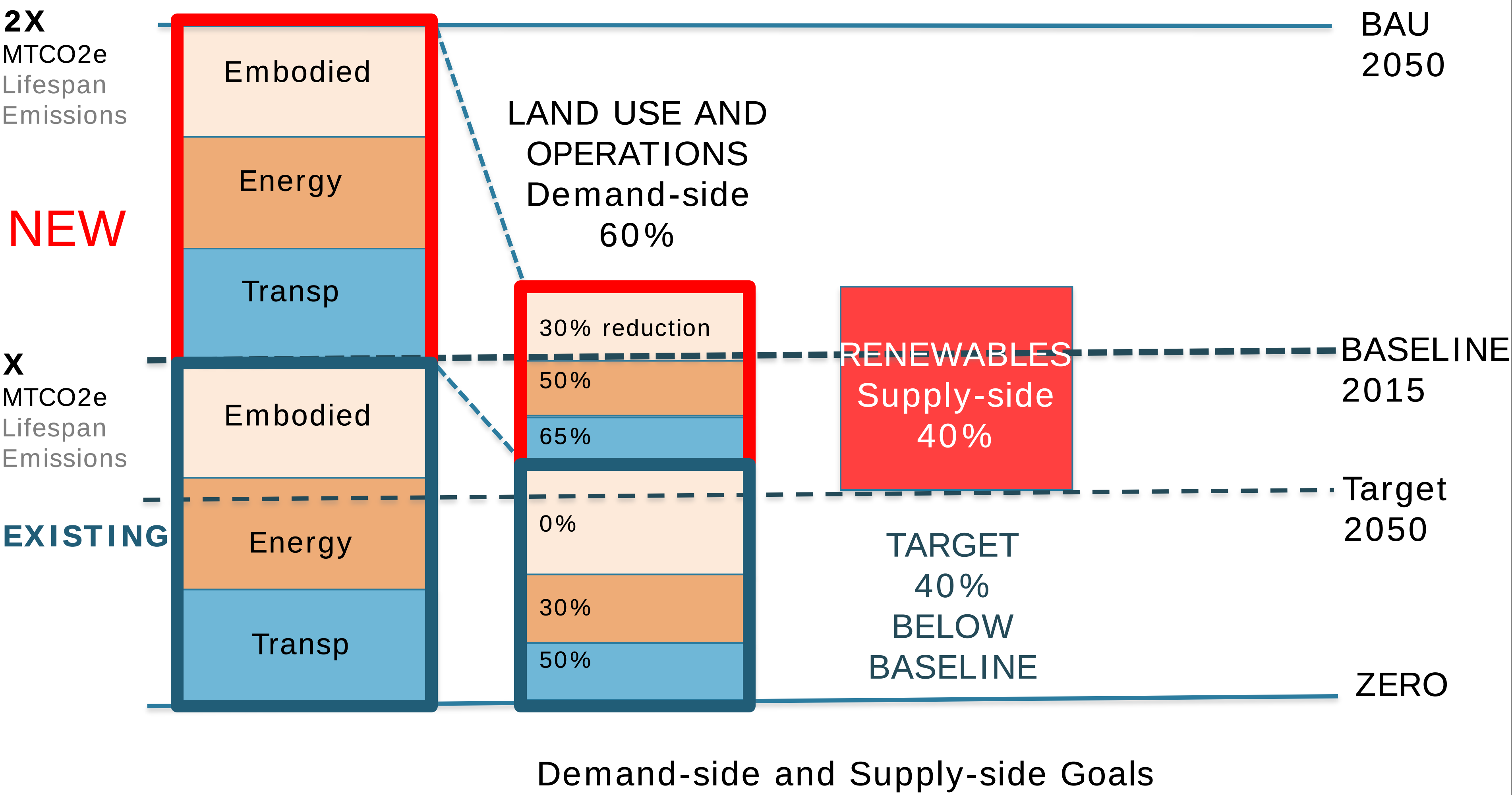
GHG Mitigation Baselines and Targets



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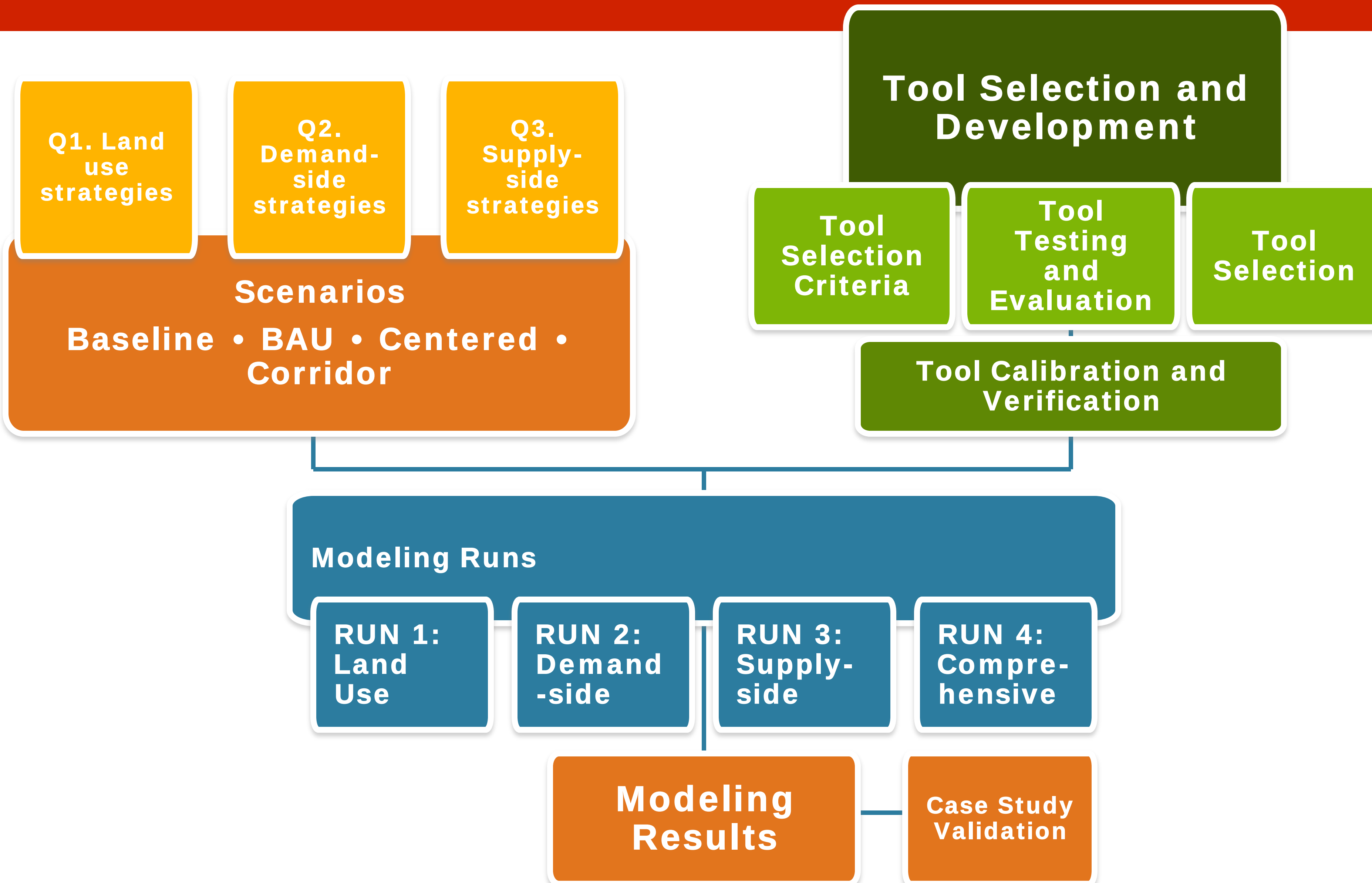
Modeling Scenarios



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Smart Growth Scenarios–Average U.S. City

Baseline City, 50,000 pop.

BAU City, 100,000 pop.

Centered City, 100,000 pop.

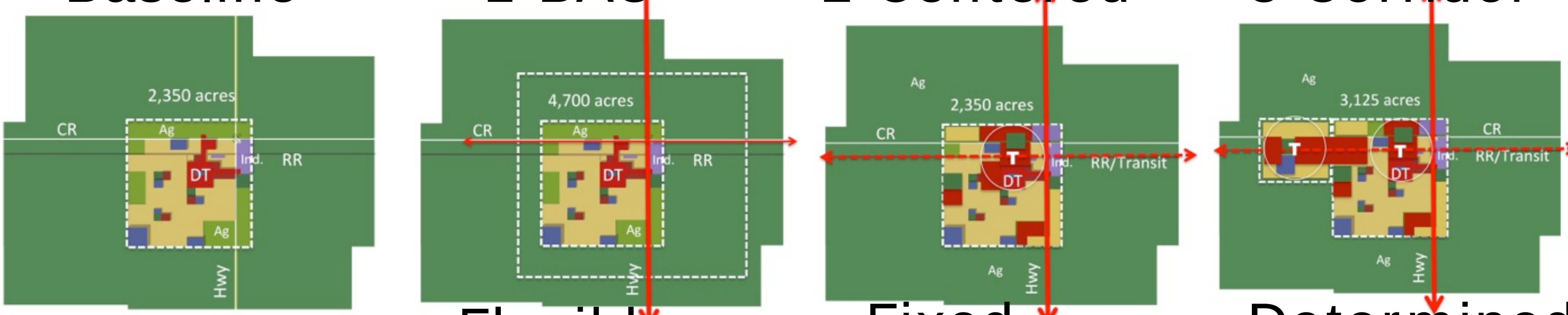
Corridor City, 100,000 pop.

t

- Transit dependent

- Development and redevelopment organized along transit corridor
- Medium density redevelopment and infill
- Transit dependent

Baseline | 1 BAU | 2 Centered | 3 Corridor



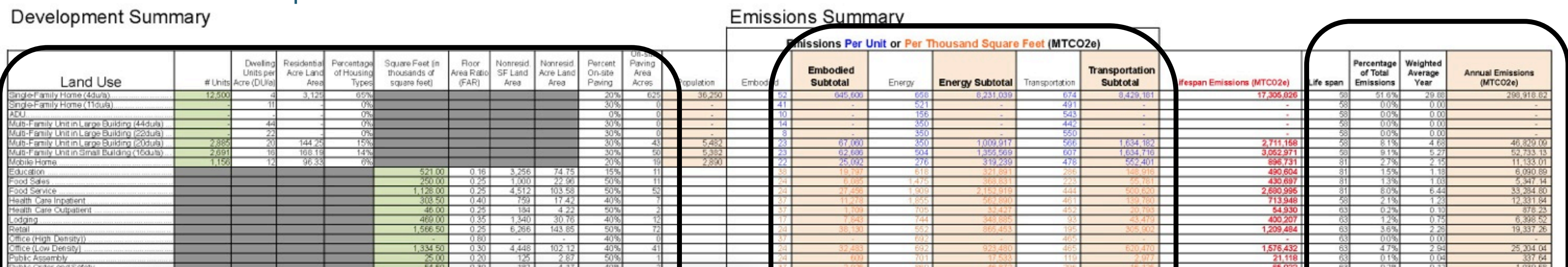
Flexible | Fixed | Determined

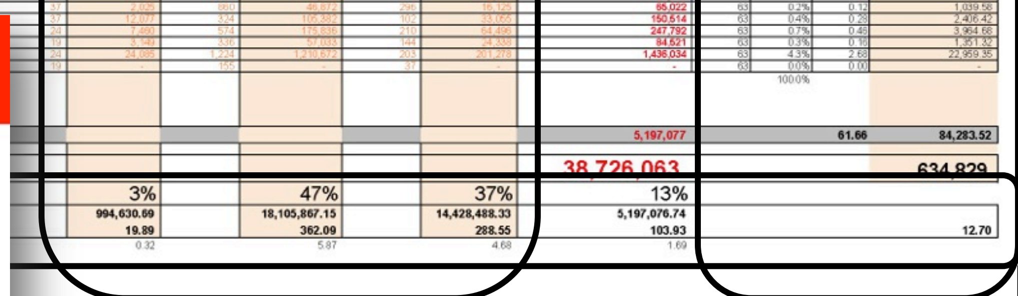
Modeling – Embodied, Energy, Transportation, and Paving Lifespan MTCO2e

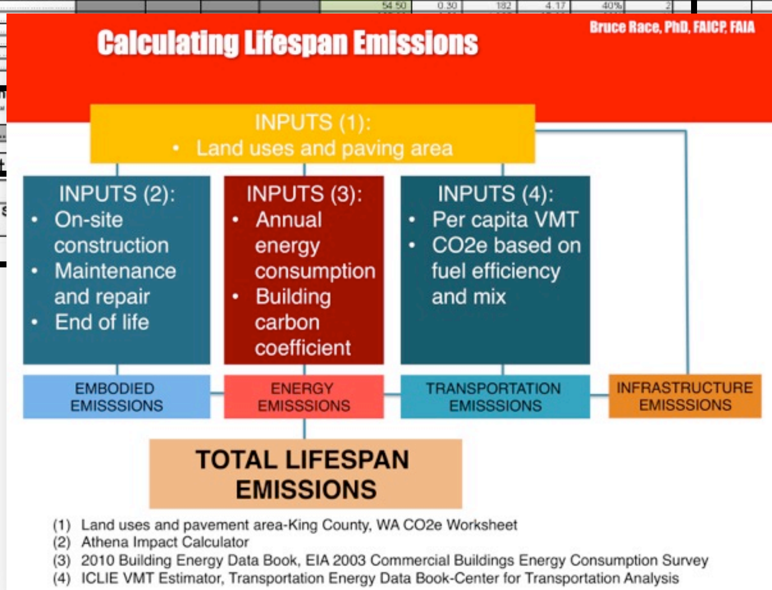
LAND USE CALCULATOR
- Added land uses
- Site area
- Paving area
- Densities
- Population

SUBTOTAL/PERCENTAGE
- Embodied
- Energy
- Transportation
- Paving

ANNUALIZED EMISSIONS
- Building type
- Percentage of total







PER CAPITA EMISSIONS
- Lifespan
- Annualized

Summary Sheet

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Mitigation Assumptions by 2050

Transportation goals–400% mpg, 30% VMT

- Fuel efficiency (CAFÉ standards takes current 20mpg to 54.5mpg by 2025 - - 80mpg achievable by 2050)
- VMT (30% improvements due to infrastructure and transit services)

Building efficiency goals–50% energy, 30% embodied

- Energy efficiency (70% for new construction and 30% for existing building stock - - assumes 50% overall)
- Embodied emissions (case studies identify 20-25% reductions possible under current technologies - - 30% assumed by 2050)

Renewable energy goals–40%

- RPS (all but 13 states have RPS policies - - assume 30% by 2050)
- Goal of 10% for all onsite renewable

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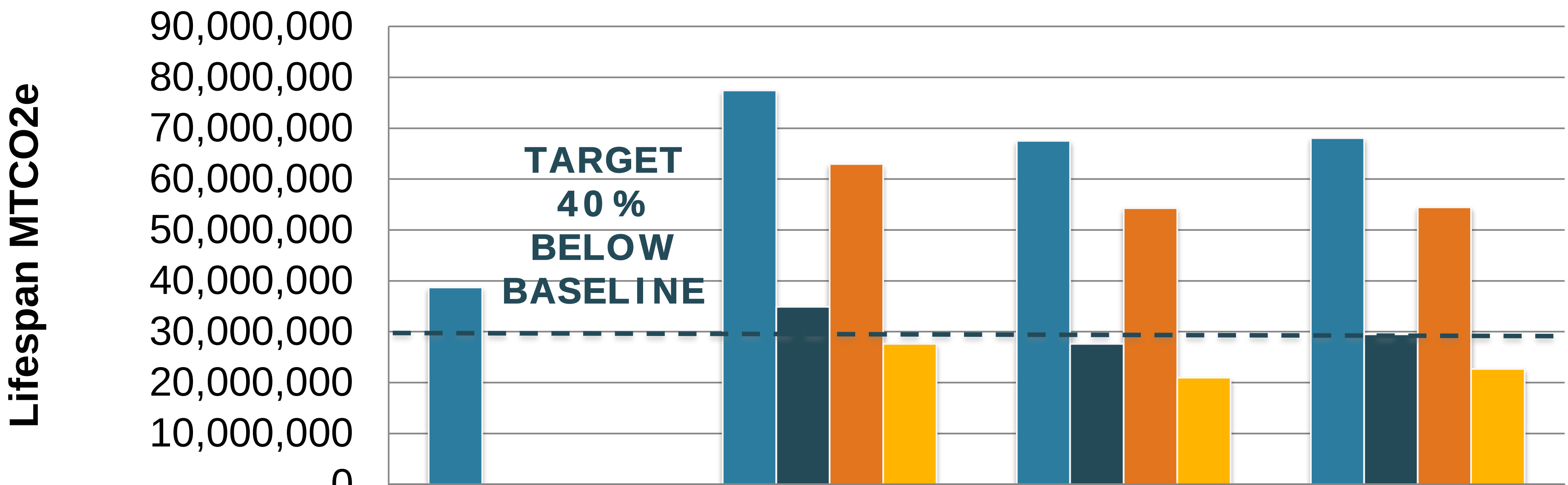
Four Model Runs



	Baseline Scenario	BAU Scenario	Centered City Scenario	Corridor City Scenario
1. Land Use	38,726,063	77,449,508	67,517,377	68,038,946
2. Demand		34,878,352	27,598,033	29,491,995
3. Supply		62,965,146	54,275,532	54,463,660
4. Comprehensive		27,636,171	20,977,110	22,704,353

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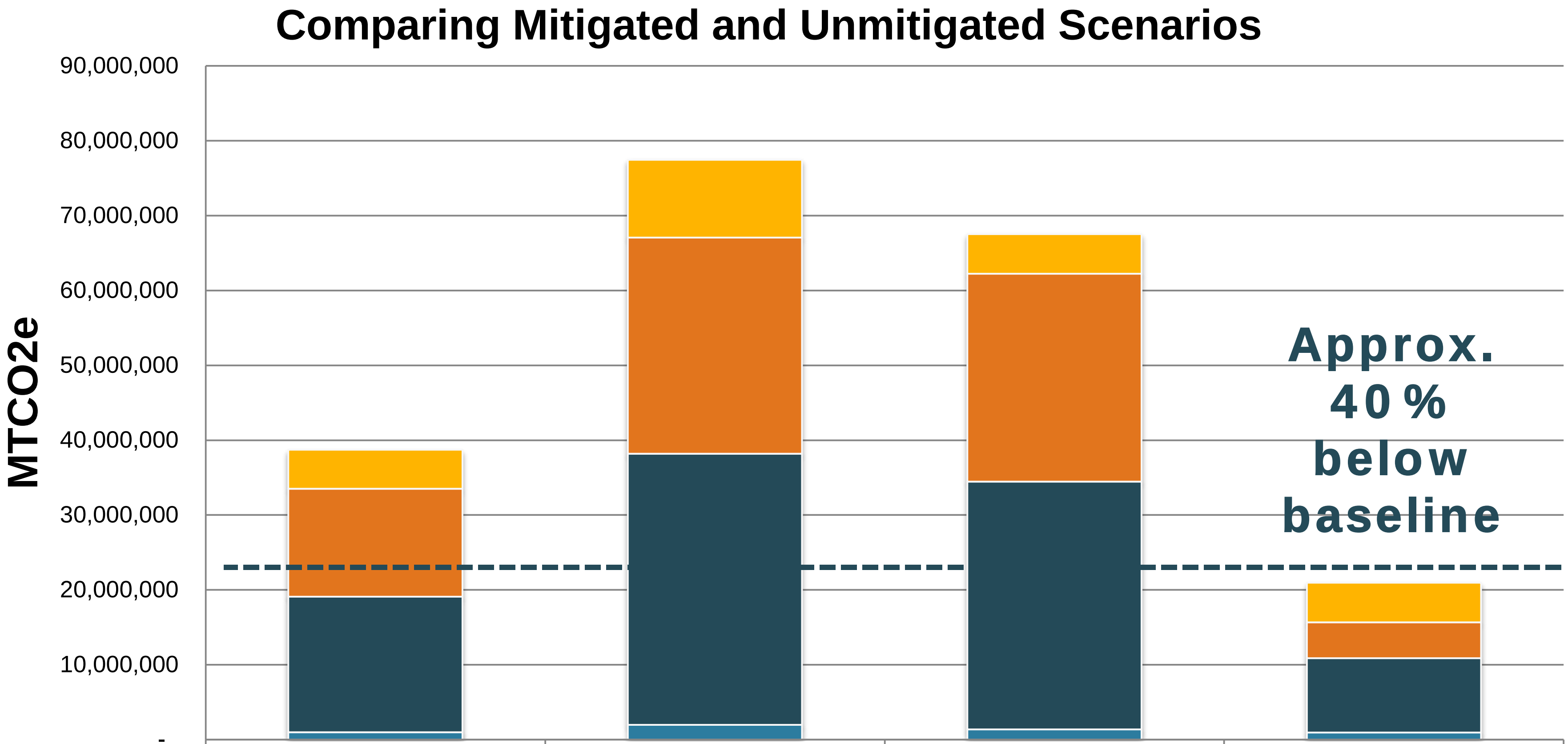
Effectiveness of Mitigation Strategies



	Baseline	BAU	Centered City-Unmitigated	Centered City-Mitigated
Paving	5,197,076	10,393,863	5,285,792	5,285,791
Transporation	14,428,488	28,855,543	27,749,038	4,795,380
Energy	18,105,867	36,210,905	33,104,613	9,931,383
Embodied	994,630	1,989,196	1,377,933	964,533

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Embodied CO2e Emissions

Table 6.5

Building Type Embodied CO2e Sensitivity Analysis

Modeling Assumptions	**Athena Impact Calculator (1)**	**Case Studies**
Single Family (Wood Frame) ***Assume:*** ***.220 MTCO2e/m2***	46,900 kgCO2e 280 m2 **.169 MTCO2e/m2**	HIGH (2) 51,400 kgCO2e 225 m2 **.224 MTCO2e/m2** MID. 49,300 kgCO2e **.219 MTCO2e/m2** LOW (no basement) 30,000 kgCO2e **.133 MTCO2e/m2**
Single Story Commercial (Metal Stud) ***Assume:*** ***.262 MTCO2e/m2***	314,000 kgCO2e 1,200 m2 **.262 MTCO2e/m2**	Grocery Store (4) 3,528 MTCO2e 9,393 m2 **.376 MTCO2e/m2** Warehouse (4) 8,257 MTCO2e 35,400 m2 **.233 MTCO2e/m2**
High Density Residential/Mixed-use (Wood Frame) ***Assume:*** ***.180 MTCO2e/m2***	1,050,000 kgCO2e 8,000 m2 **.131 MTCO2e/m2**	HIGH (3) (LESOSAI) 3 kgCO2e/m2 per year 60 yrs x 3 = 180 kgCO2e **.180 MTCO2e/m2** LOW (3) (Athena Impact Est.) **.138 MTCO2e/m2**
Multi-Story Office (Steel Frame) ***Assume:*** ***.400 MTCO2e/m2***	3,920,000 kgCO2e 7,200 m2 **.544 MTCO2e/m2**	10-L Office (4) 14,937 MTCO2e 33,018 m2 **.452 MTCO2e/m2** 16,480 m2 (5) **.300-.410 MTCO2e/m2**
Hospital ***Assume:*** ***.400 MTCO2e/m2***	NA	10,752 m2 (5) **.360-490 MTCO2e/m2**
School/Education ***Assume:*** ***.409 MTCO2e/m2***	NA	13,500 m2 (5) **.380-.520 MTCO2e/m2**

Notes:
1. See Table 6.2 for program description for building types
2. Single-family estimates from NAHB (Carnow, 2008, pp. 2-8)
3. 6L Wood frame multi-family project in Vancouver, BC modeled (S. Tanner, 2012, pp. 77-80)
4. Non-residential UK case studies (M.Sansom, 2012)
5. Comparative analysis of structural systems for three building types by the Alliance for Sustainable Building Products (Burridge, 2013)

Percentage of Embodied GHG

Scenarios

BAU	2.5%
City Centered (Unmitigated)	2.0%
City Centered (Mitigated)	4.8%

Embodied percentage increases as we approach net zero

Meeting Goals–Centered City vs. BAU

Table 6.15

Comparative Benefits of Strategies for Centered City Scenario

	Goals	Strategies Top strategies from Study 2 CAP City Survey	Worksheet Results Reductions in CO2e of BAU	Worksheet Results State and Federal Influence
Land Use	15% reduction in VMT CO2e from land use compactness due to transportation (VMT) and building energy reductions	• Make cities more compact, concentric, and centered with a higher "passive performance" - - walking and biking. • Reinforce and influencing city commitments to developing in and adjacent to downtowns.	18% (10.1 gtCO2e)	Transit funding
	50% reduction in CO2e from paving (uses existing roads)	• Place an emphasis on increasing density and transit-oriented development.		
Demand-side Mitigation	50% reduction of CO2e from buildings	• Pursue higher energy efficiency standards for buildings.	23% (13.0 gtCO2e)	Building codes
	30% reduction in embodied CO2e		1% (0.6 gtCO2e)	Vehicle fuel efficiency standards
	30% reduction in VMT	• Reduce parking requirements and expanding transit services.	11% (6.2 gtCO2e)	
	800% improvement in vehicle fuel economy and fuel mix		29% (16.4 gtCO2e)	
Supply-side Mitigation	40% reduction in CO2e from power generation	• Provide incentives for renewable energy.	18% (10.2 gtCO2e)	State RPS policies
Target Reductions 40% below Baseline 54.3 tgCO2e in reductions			**100%** **(56.5 gtCO2e lifespan emissions, 42% below baseline)**	

About 18% of reductions come from **smart growth land use features**

Approximately 64% of the CO2e reductions are from **demand-side strategies**

- Energy efficient buildings
- Reduced VMT
- Better vehicle fuel efficiency and fuel mix
- Reducing the embodied CO2e in new construction and renovation

About 18% of the overall reduction in CO2e would come from **supply-side strategies**

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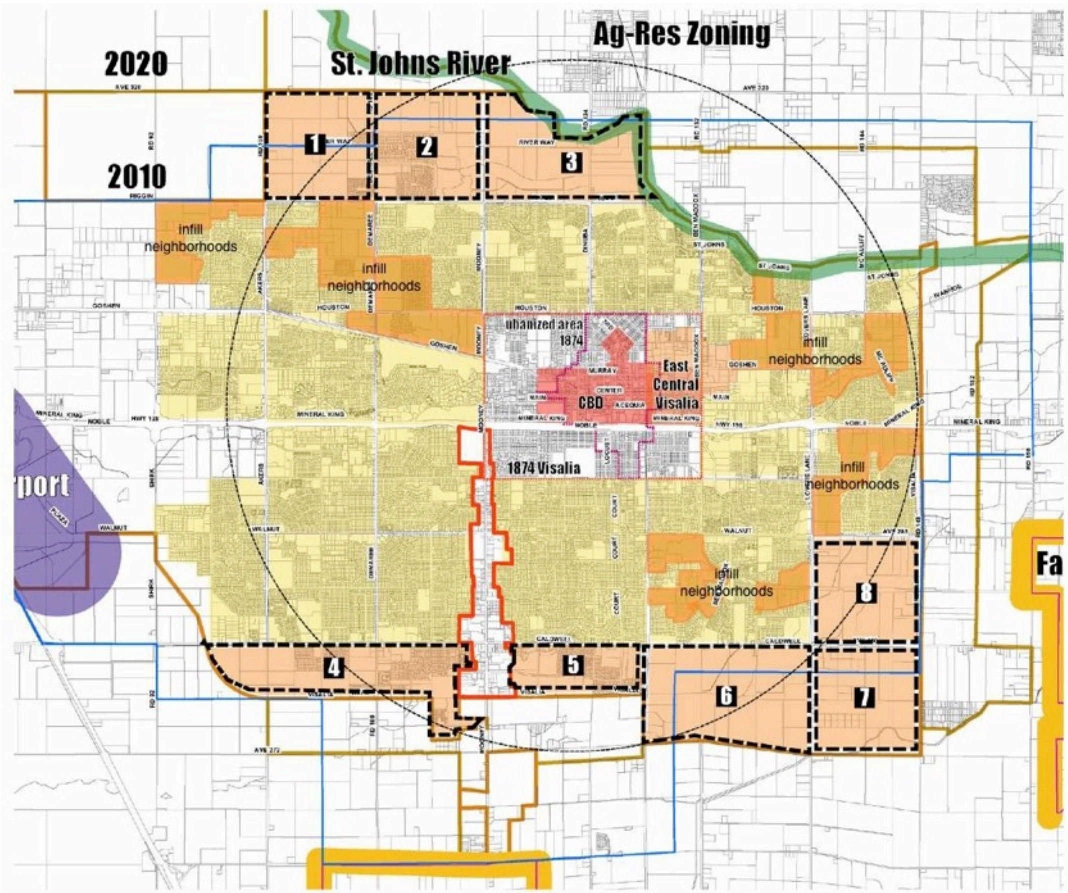
Strategic Choices–Comprehensive Plan



Neighborhood 1: Riverway 1 Master Plan

Neighborhood 2: Riverway 2 Master Plan

Neighborhood 3: Riverway 3 Master Plan

Neighborhood 4: Caldwell West Master Plan

Neighborhood 5: Caldwell East Master Plan

Neighborhood 6: Southeast Area Specific Plan

Neighborhood 7: Road 148 South Village Master Plan

Neighborhood 8: Road 148 North Village Master Plan

Visalia, CA Smart Growth Strategies

- Edge/expansion sites
- Infill neighborhoods
- Core/downtown districts
- Dispersed infill
- ADUs

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Case Study–East Downtown Visalia

Downtown Expansion Strategies Visalia

Right:

Estimate Development Program Summary

1. Santa Fe

Opp. Sites	*10.52 acres*
Residential	*250 units*
Commercial	*206,000 SF*

2. East Main

Opp. Sites	*19.63 acres*
Residential	*350 units*
Commercial	*106,000 SF*

3. Civic Center

Opp. Sites	*10.00 acres*
Office	*280,000 sf*

4. Central Park

Opp. Sites	*10.00 acres*
Residential	*400 units*
Commercial	*20,000 SF*

5. Ben Maddox Business Center

Opp. Sites	*19.00 acres*
Office	*500,000 SF*

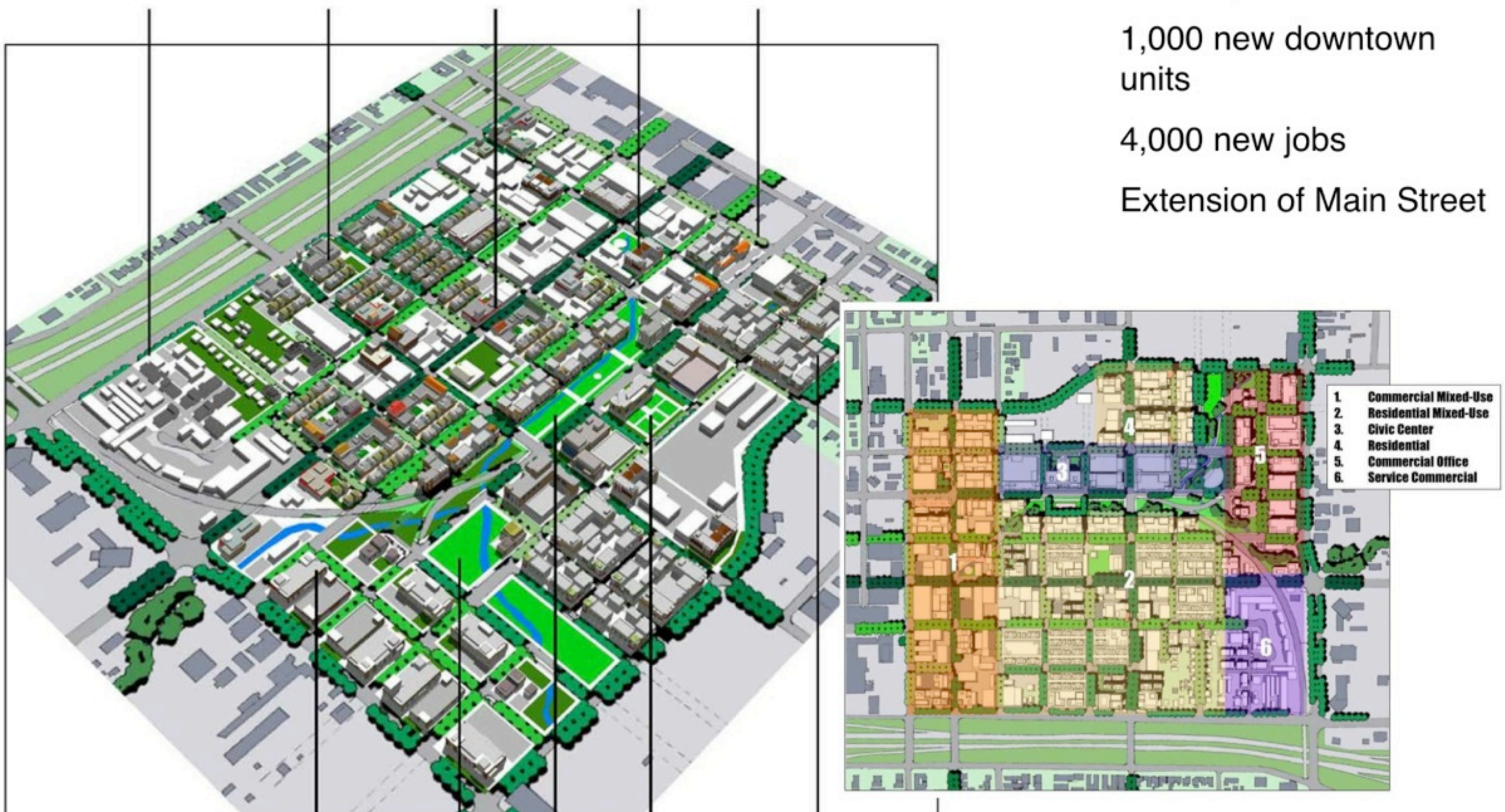
6. East Acequia Service Commercial

Opp. Sites	*3.59 acres*
Serv. Commercial	*40,000 SF*

Open Space	*15.66 acres*

TOTAL

Opp. Sites	*88.4 acres*
Residential	*1,000 units*
Employment	*1,152,000 SF*



New building types in market place

1,000 new downtown units

4,000 new jobs

Extension of Main Street

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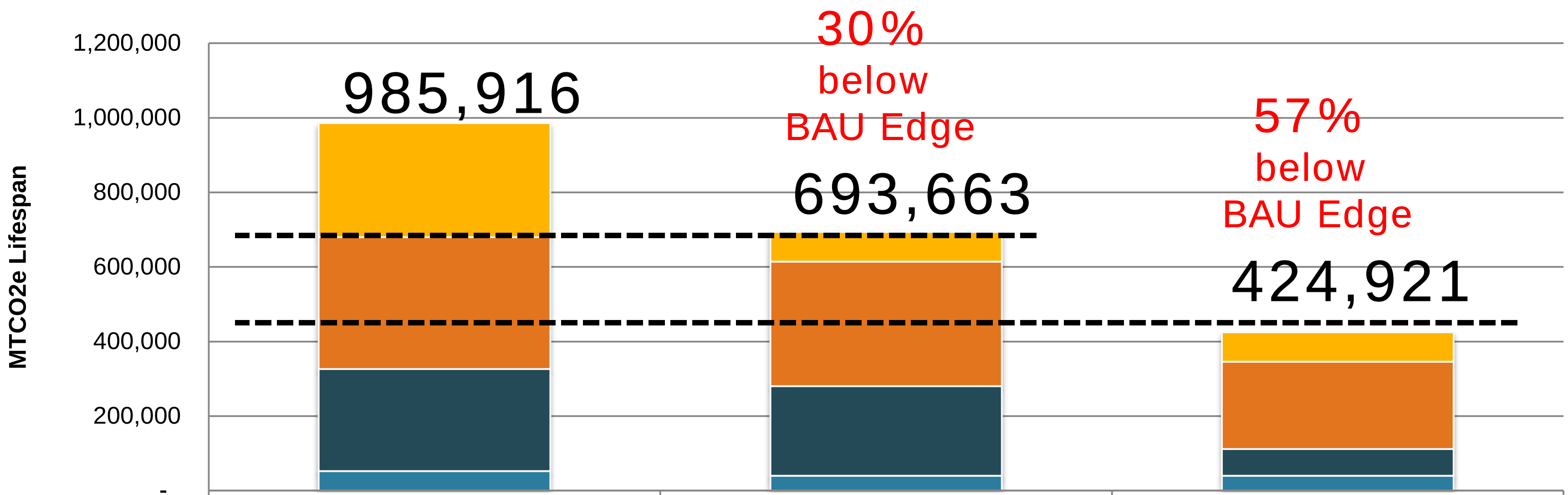
Infill District vs. Edge Development in Visalia

Scenario Comparison–2025 Build-out



	BAU-Edge	East Main–Land Use Only	East Main–Mitigated
Paving	306,450	79,230	79,230
Transportation	352,844	333,821	233,675
Energy	274,284	240,851	72,255
Embodied	52,338	39,761	39,761

Assumptions

- Embodied–30% of national ave. BAU, 30% of national ave. Mitigated
- Demand-side Energy–50% of national ave. for BAU, 70% of national ave. for Mitigated
- Supply-side Energy–60% of national ave. for BAU, 80% of national ave. for Mitigated
- Transportation–54.5MPG (CAFÉ standards), 30% VMT reduction for Mitigated

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Case Study–Neighborhood

Neighborhood Typologies

Low Density Neighborhood
10,000 Population

Medium Density Neighborhood
10,000 Population

High Density Neighborhood
10,000 Population

Low 956 acres

2008 Merced Baseline
3.36 M MTCO2e Lifespan
5.75 MTCO2e Per Capita Annual

SMART BLOCK DEVELOPMENT
2.18 M MTCO2e Lifespan
3.72 MTCO2e Per Capita Annual

Targets: Below U.S. Average
Demand-side
Embodied 30% reduction
Energy 50% reduction
VMT 21% reduction
23-48mpg
Supply-side
60% reduction in CO2e

High 552 acres

2008 Merced Baseline
2.87 M MTCO2e Lifespan
4.91 MTCO2e Per Capita Annual

SMART BLOCK DEVELOPMENT
1.75 M MTCO2e Lifespan
2.99 MTCO2e Per Capita Annual

Targets: Below U.S. Average
Demand-side
Embodied 30% reduction
Energy 50% reduction
VMT 21% reduction
23-48mpg
Supply-side
60% reduction in CO2e

Development Summary

Land Use	# Units	Dwelling Units per Acre (DU/a)	Residential Acre Land Area	Percentage of Housing Types	Square Feet (in thousands of square feet)	Floor Area Ratio (FAR)	Nonresid. SF Land Area	Nonresid. Acre Land Area	Percent On-site Paving	On-site Paving Area Acres	Population
Single-Family Home (4du/a)	660	4	165	17%					20%	33	1,914
Single-Family Home (11du/a)	1,900	11	173	49%					30%	51.81818	5,510
ADU	-	-	-	0%					0%	0	-
Multi-Family Unit in Large Building	250	60	6	6%					30%	1.704545	475
Multi-Family Unit in Large Building	800	30	36	20%					30%	10.90909	1,520
Multi-Family Unit in Large Building (20du/a)	300	20	15.00	8%					30%	5	570
Multi-Family Unit in Small Building (16du/a)	-	16	-	0%					30%	0	-
Mobile Home	-	12	-	0%					20%	0	-
Education					163.40	0.32	511	11.72	15%	2	
Food Sales					-	0.25	-	-	50%	0	
Food Service					-	0.25	-	-	50%	0	
Health Care Inpatient					-	0.40	-	-	40%	0	
Health Care Outpatient					-	0.25	-	-	50%	0	
Lodging					-	0.35	-	-	40%	0	
Retail					130.70	0.40	327	7.50	50%	4	
Office (High Density))					-	0.80	-	-	40%	0	
Office (Low Density)					-	0.30	-	-	40%	0	
Public Assembly					-	0.20	-	-	50%	0	
Public Order and Safety					-	0.30	-	-	40%	0	
Religious Worship					-	0.20	-	-	30%	0	
Service					-	0.30	-	-	40%	0	
Warehouse and Storage					-	0.40	-	-	40%	0	
Manufacturing					-	0.40	-	-	40%	0	
Vacant					-	0.03	-	-	40%	0	
	3,910		**395**	**100%**	**294.10**		**837**	**19**		**107**	**9,989**

Total Developed Land Area....... 552 Acres
Residential + Nonresidential + 25 % streets = Total Development Land Area...

Pavement.................................. 10,691 Thousands of SF

Emissions Summary

Emissions Per Unit or Per Thousand Square Feet (MTCO2e)

Land Use	Embodied	Embodied Subtotal	Energy	Energy Subtotal	Transportation	Transportation Subtotal	Lifespan Emissions (MTCO2e)	Life span	Percentage of Total Emissions	Weighted Average Year	Annual Emissions (MTCO2e)
Single-Family Home (4du/a)	36	23,862	132	86,920	219	144,668	255,449	58	21.0%	12.16	4,412.31
Single-Family Home (11du/a)	29	54,367	104	197,800	160	303,283	555,450	58	45.7%	26.44	9,594.14
ADU	7	-	31	-	176	-	-	58	0.0%	0.00	-
Multi-Family Unit in Large Building	10	2,487	70	17,503	144	35,950	55,941	58	4.6%	2.66	966.25
Multi-Family Unit in Large Building	6	4,627	70	56,009	179	142,985	203,622	58	16.7%	9.69	3,517.10
Multi-Family Unit in Large Building (20du/a)	16	4,881	70	21,003	184	55,237	81,122	58	6.7%	3.86	1,401.19
Multi-Family Unit in Small Building (16du/a)	16	-	101	-	197	-	-	58	0.0%	0.00	-
Mobile Home	15	-	55	-	155	-	-	81	0.0%	0.00	-
Education	27	4,346	124	20,191	93	15,181	39,718	81	3.3%	2.63	493.11
Food Sales	17	-	295	-	73	-	-	81	0.0%	0.00	-
Food Service	17	-	382	-	144	-	-	81	0.0%	0.00	-
Health Care Inpatient	26	-	371	-	150	-	-	58	0.0%	0.00	-
Health Care Outpatient	26	-	141	-	147	-	-	63	0.0%	0.00	-
Lodging	12	-	149	-	30	-	-	63	0.0%	0.00	-
Retail	17	2,227	110	14,442	63	8,296	24,965	63	2.1%	1.28	399.14
Office (High Density))	26	-	138	-	151	-	-	63	0.0%	0.00	-
Office (Low Density)	17	-	138	-	151	-	-	63	0.0%	0.00	-
Public Assembly	17	-	140	-	39	-	-	63	0.0%	0.00	-
Public Order and Safety	26	-	172	-	96	-	-	63	0.0%	0.00	-
Religious Worship	26	-	65	-	33	-	-	63	0.0%	0.00	-
Service	17	-	115	-	68	-	-	63	0.0%	0.00	-
Warehouse and Storage	13	-	67	-	47	-	-	63	0.0%	0.00	-
Manufacturing	17	-	245	-	66	-	-	63	0.0%	0.00	-
Vacant	13	-	31	-	12	-	-	63	0.0%	0.00	-
									100.0%		
Pavement							534,567			58.73	9,102.12
Total Project Emissions							**1,750,834**				**29,885**
		6%		24%		40%	31%				
Emission Category Subtotals (MTCO2e)		96,797.23		413,868.10		705,601.13	534,567.19				
Per Capita MTCO2e		9.69		41.43		70.64	53.52				2.99

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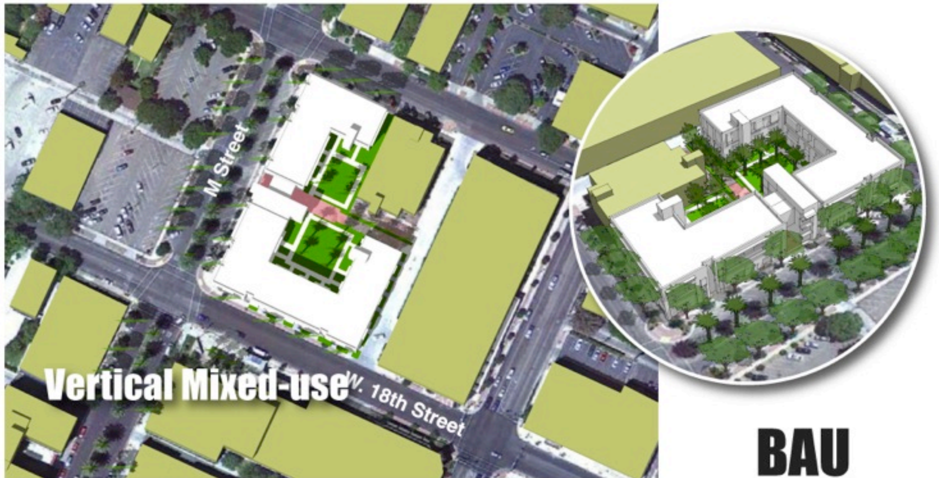
Case Study–Block



Vertical Mixed-use

PROGRAM

Site Area	53,000 NSF (1.2 acres)
Resid.	1.2a @ 52 DU/a = 60 DUs
Commercial	8,000 SF (ground floor)

SMART BLOCK DEVELOPMENT

18,712 MTCO2e Lifespan
2.80 MTCO2e Per Capita Annual

4 % Embodied | 28 % Energy | 63 % Transportation | 4% Paving

COMPACT DEVELOPMENT (2008 Merced CAP Baseline)

31,928 MTCO2e Lifespan
4.78 MTCO2e Per Capita Annual

3 % Embodied | 25 % Energy | 69 % Transportation | 2 % Paving

Targets: Below U.S. Average

30% reduction | 50% reduction | 21% reduction
60% reduction

BAU

PROGRAM

Site Area:	20 Acres
Resid.	15A @ 4 DU/a=60 DUs
Commercial	8,000 SF (pad)

(2008 Merced CAP Baseline)

54,215 MTCO2e Lifespan
5.36 MTCO2e Per Capita Annual

2.9 X RMU Smart Block

Horizontal Mixed-use

PROGRAM

Site Area	87,120 NSF
Resid.	2a @ 30 DU/a = 60 DUs
Commercial	8,000 SF (single story storefront)

SMART BLOCK DEVELOPMENT

21,028 MTCO2e Lifespan
3.17 MTCO2e Per Capita Annual

2 % Embodied | 24 % Energy | 64 % Transportation | 9% Paving

COMPACT DEVELOPMENT (2008 Merced CAP Baseline)

35,506 MTCO2e Lifespan
5.35 MTCO2e Per Capita Annual

2 % Embodied | 21 % Energy | 71 % Transportation | 6 % Paving

Targets: Below U.S. Average

30% reduction | 50% reduction | 21% reduction
60% reduction

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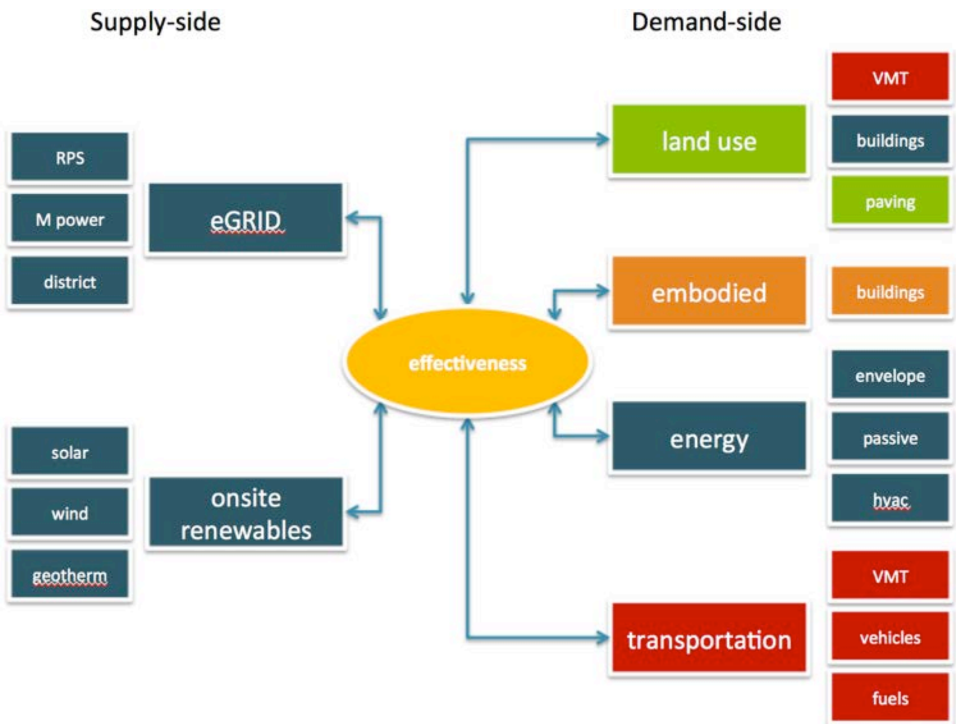
Effectiveness of Strategies

- Reduction of CO2e in the grid
- District-scale renewables

- Roof-top distributed solar
- Small scale wind
- Site or district geothermal



1 acre
193 boreholes
290,400 GSF

363 DUs @ 800 GSF/DU

Assumes:
1 borehole/225 SF
1 borehole heats/cools 1,500 GSF

- Compact and connected development
- Low-impact, green infrastructure
- Locally and sustainably harvested timber
- Efficient building envelope- insulation and ventilation
- Create a walking city
- Add new transit technologies– fuel efficiency

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Summary and Conclusions

Demand-side Strategies: How effective are demand-side strategies, such as increasing energy efficiency of buildings and improving mobility services, in reducing GHG emissions?

The bulk of reductions in CO2e come from increasing energy efficiency of **buildings**, and most importantly**, implementing CAFÉ standards** for cars and trucks.

Modeled **demand-side strategies** suggest they can reduce lifespan CO2e by up to **64% below the BAU scenario**.

These strategies are **dependent on state and federal actions** and regulations.

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Summary and Conclusions

Supply-side Strategies: How effective are common demand-side strategies in combination with supply-side strategies?

Reduction in the amount of CO2e in the grid and use of renewable onsite sources are assumed to provide up to a 30% reduction in emissions below the BAU scenario. In reality, this **varies from state to state** depending on the CO2e content in the eGRID region.

The Merced validation case study demonstrates **supply-side reductions compared to the national average can be quite steep**.

Cities with **low CO2e in the grid** and located in a climate with fewer heating degree-days, have a **distinct advantage**.

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Summary and Conclusions

Conclusion

Many CAP city long-term targets are to be 80% below 1990 GHG emissions levels by 2050. The mitigated scenarios included informed assumptions about how much demand-side and supply-side reductions could be expected by mid century. **It will require innovation and intergovernmental cooperation.**

The **enhanced passive-performance of cities** with walk-first neighborhoods that reduce VMT, energy use, water, and waste by design is an **important down payment for a low carbon future.**

The cities with **growth polices** focused on compact, centered and connected development patterns, **energy efficient construction** and retrofit of existing buildings, seem to be on the **right track**.

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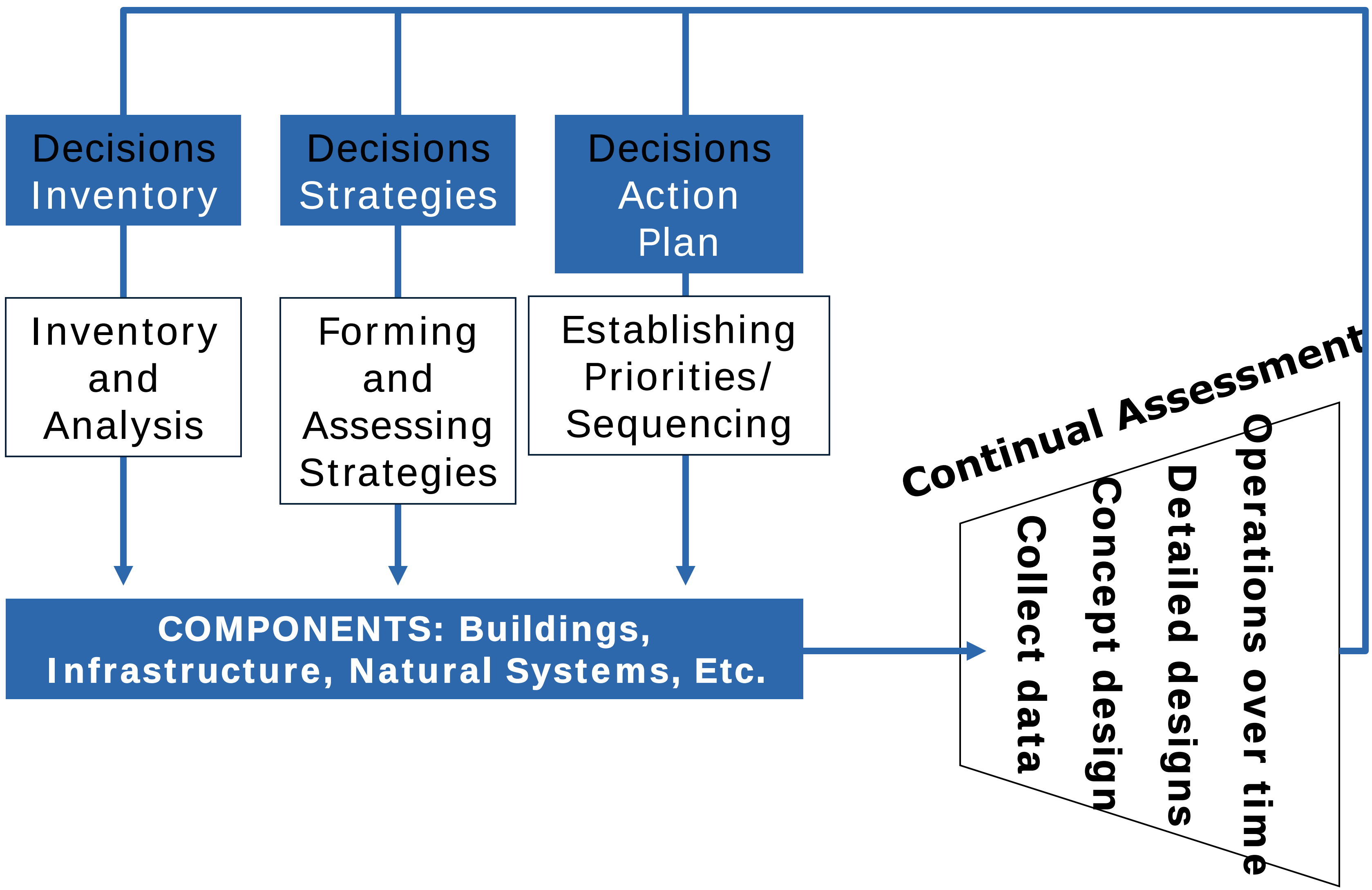
Implementation

- Continuous assessment
- Policy-level Commitment
- Strategic Investments
- Rewarding good behavior

Implementation of GHG Strategies



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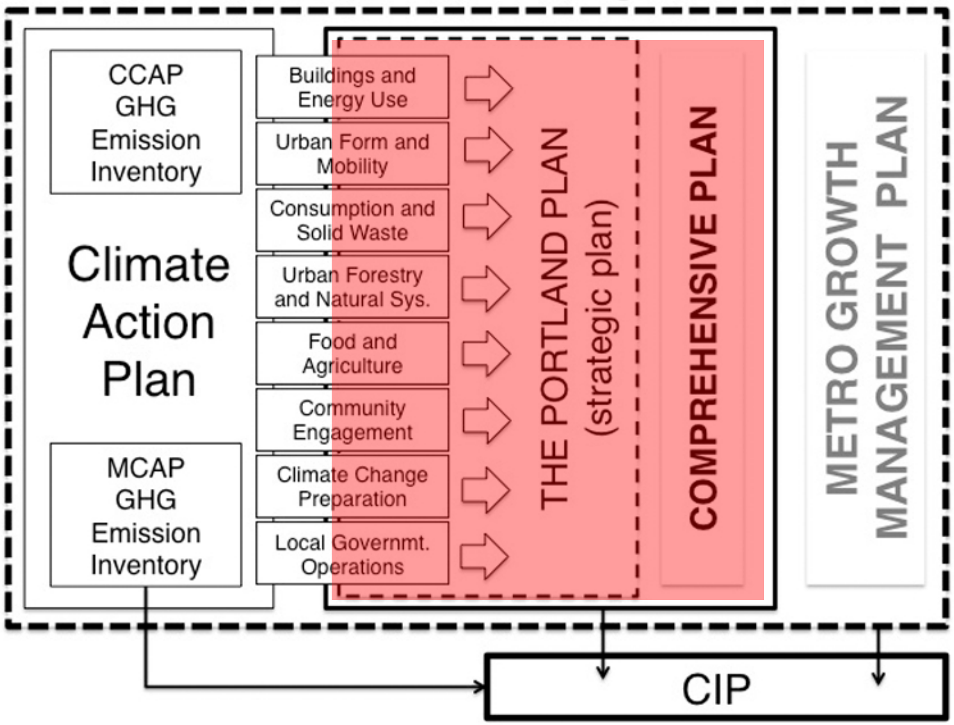
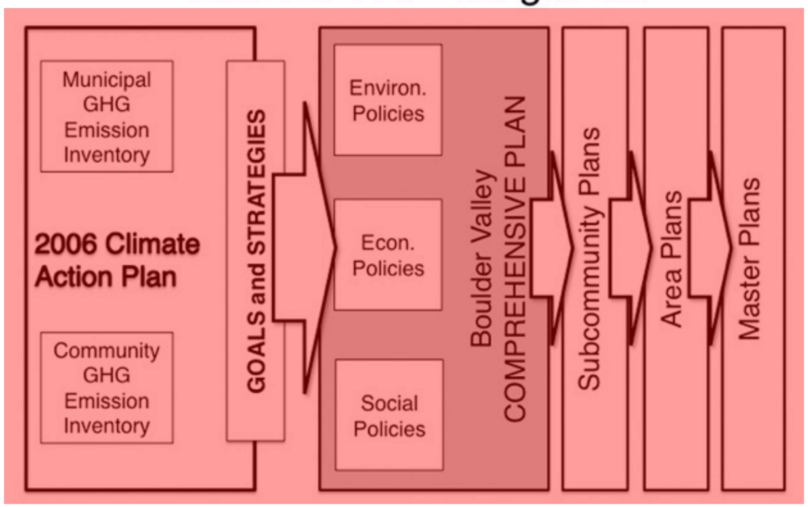
Integration of GHG Reduction Strategies

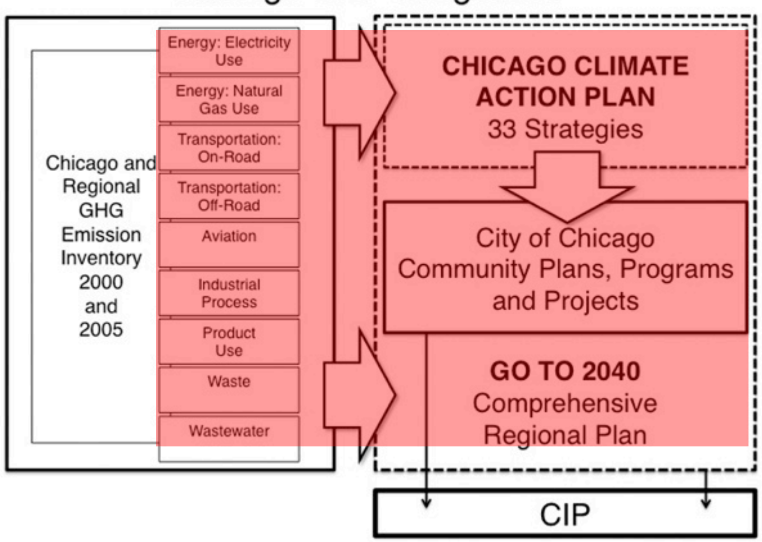
Portland CAP Integration

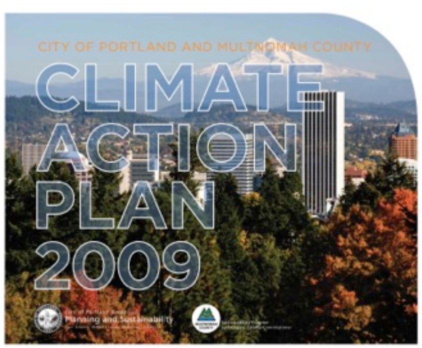


Boulder CAP Integration



Chicago CAP Integration

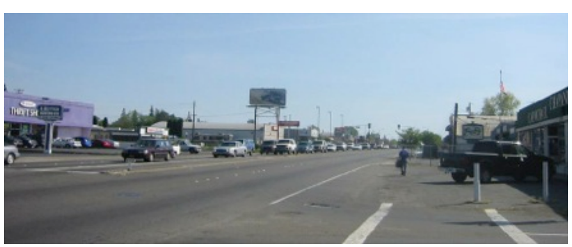




Policy Level Commitment

Smart Growth Street

reinvesting in **Fair Oaks Boulevard** as a centerpiece **Smart Street** for Carmichael



50% of vacant commercial corridor land in unincorporated Sacramento County developed at townhouse densities houses 50,000 people - - in transit corridors and saves 5,000 acres of farm land

8-9-07 progress draft

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Visible Evidence of a Low Carbon City

Imagining Sustainability:

What does a sustainable community look like? What are its visible features?

Defining Good Behavior:

How do we measure success at a community and regional scale? Who defines the metrics and monitors our success?

Rewarding Good Behavior:

How do we reward good behavior? What are the incentives for sustainable investment and who allocates them?

Market Square, Houston

Lauren Griffith Associates

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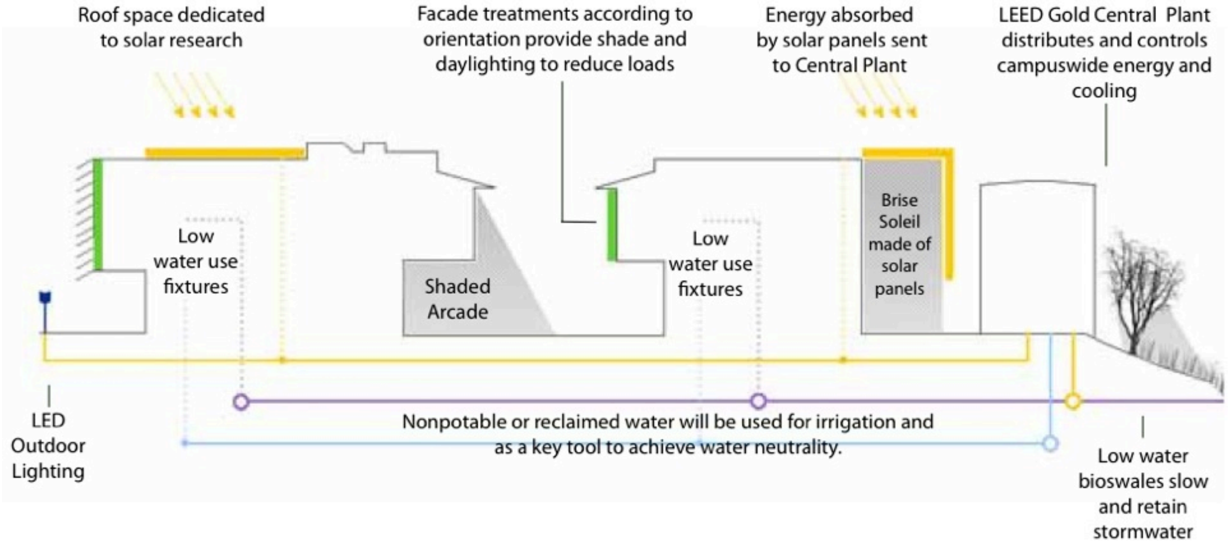
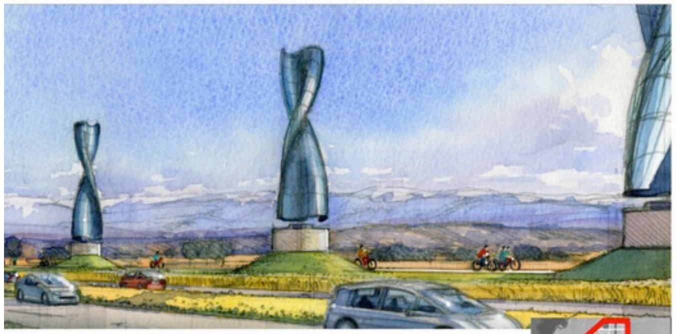
Q + A



University of California, Merced and University Community • RACESTUDIO

2012 AIA COTE Top Green Project Award

he Natural Edge



ampus Loop Road

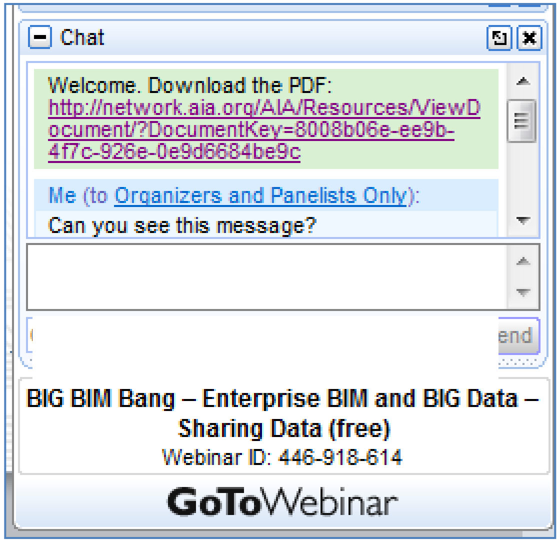
Campus Loop Road defines a distinct, publicly-accessible edge between the built and natural environment. Native planting along this edge protects the 30,000 acres of adjacent vernal pool grasslands, which provide habitat for ten endangered or threatened species.

Visible renewable energy infrastructure demonstrating the campus' sustainability mission, such as wind turbines and solar panels.

Naturally landscaped bioswale median directs stormwater to multi-function holding areas .

Questions?

Submit a question to the moderator via the chat box.



Content-related questions will be answered during the Q&A portion as time allows.

Thank you for joining us!

This concludes the AIA/CES Course **#RUDC1503**. The webinar survey/report form URL is listed in the chat box ***and*** will be included in the follow-up email sent to you in the next hour.

Survey Link: **<redacted>**

Each AIA member attendee at your site must report credit by completing the webinar survey/report form within the next 3 business days. Credit will automatically appear on your transcript within 2 weeks.

Tablet and smartphone users must copy down the above survey link.

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