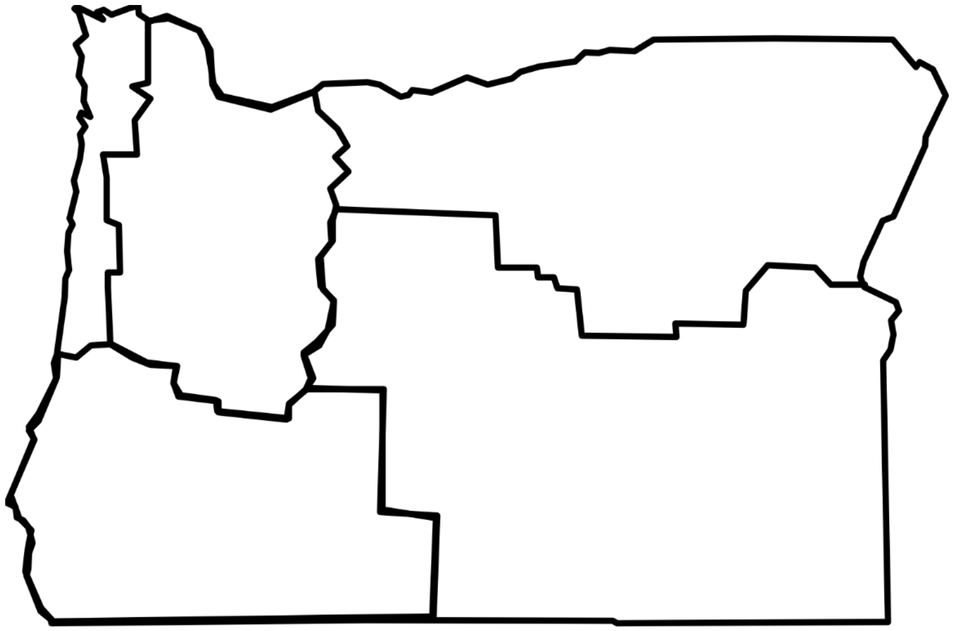


BARRIERS AND OPPORTUNITIES TO NET ZERO ENERGY COMMERCIAL-INDUSTRIAL DEVELOPMENT

FUNDED BY THE ENERGY TRUST OF OREGON NET ZERO FELLOWSHIP

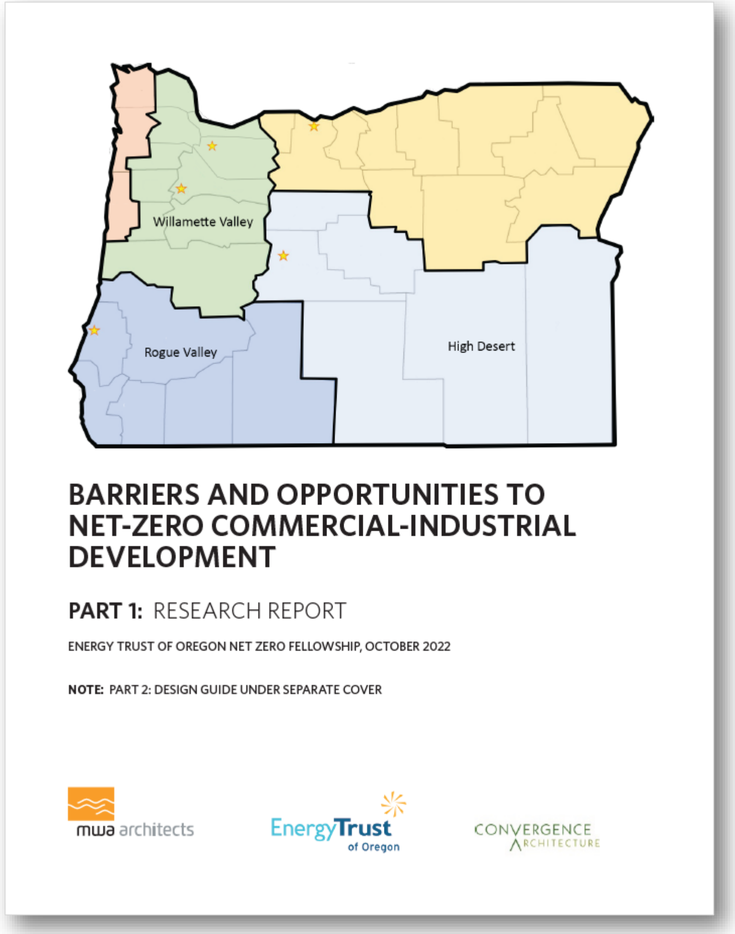
NOVEMBER 2022

mwa architects

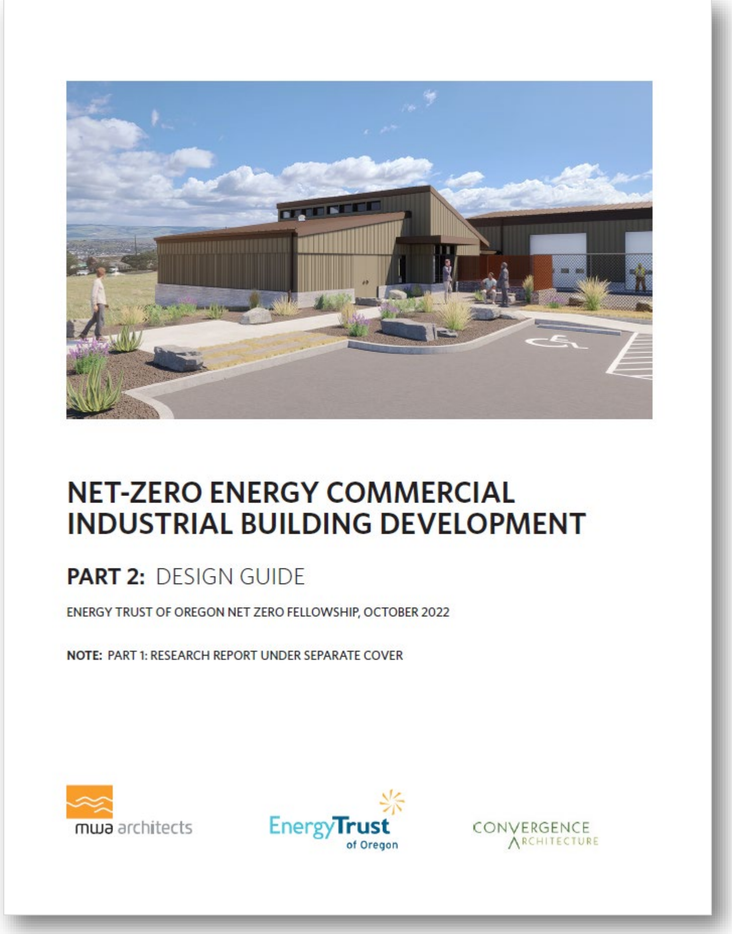
EnergyTrust of Oregon

CONVERGENCE ARCHITECTURE

RESEARCH DELIVERABLES



Part 1: Research Report



Part 2: Design Guide

RESEARCH OBJECTIVES

- Increase the design and development industry's knowledge of achieving net zero energy performance within commercial-industrial development in Oregon.
- Identify potential barriers in local development codes, standards, and policies.
- Provide a design process framework.
- Make net zero design accessible to communities across Oregon.
- Work with BIPOC individuals and women-owned businesses to expand the reach of the research.

RESEARCH METHODOLOGY

- Focus climate research on top three fastest growing regions in Oregon: Willamette Valley, Rogue Valley, High Desert.
- Collect development ordinances addressing net zero or energy conservation in the three regions.
- Conduct outreach through interviews with public agencies to gain local cultural and political perspectives.
- Identify opportunities in alignment with researched regions.

NET ZERO ENERGY

Development that **produces equal or more energy than used annually**.

This is commonly referred to as carbon neutral.

COMMERCIAL INDUSTRIAL DEVELOPMENT

WHAT: Publicly or privately owned individual buildings or collection of buildings. May be a development on a campus

WHY: Employment centers providing living wage jobs

WHERE: Located in industrially zoned neighborhoods

COMMERCIAL INDUSTRIAL TYPOLOGIES

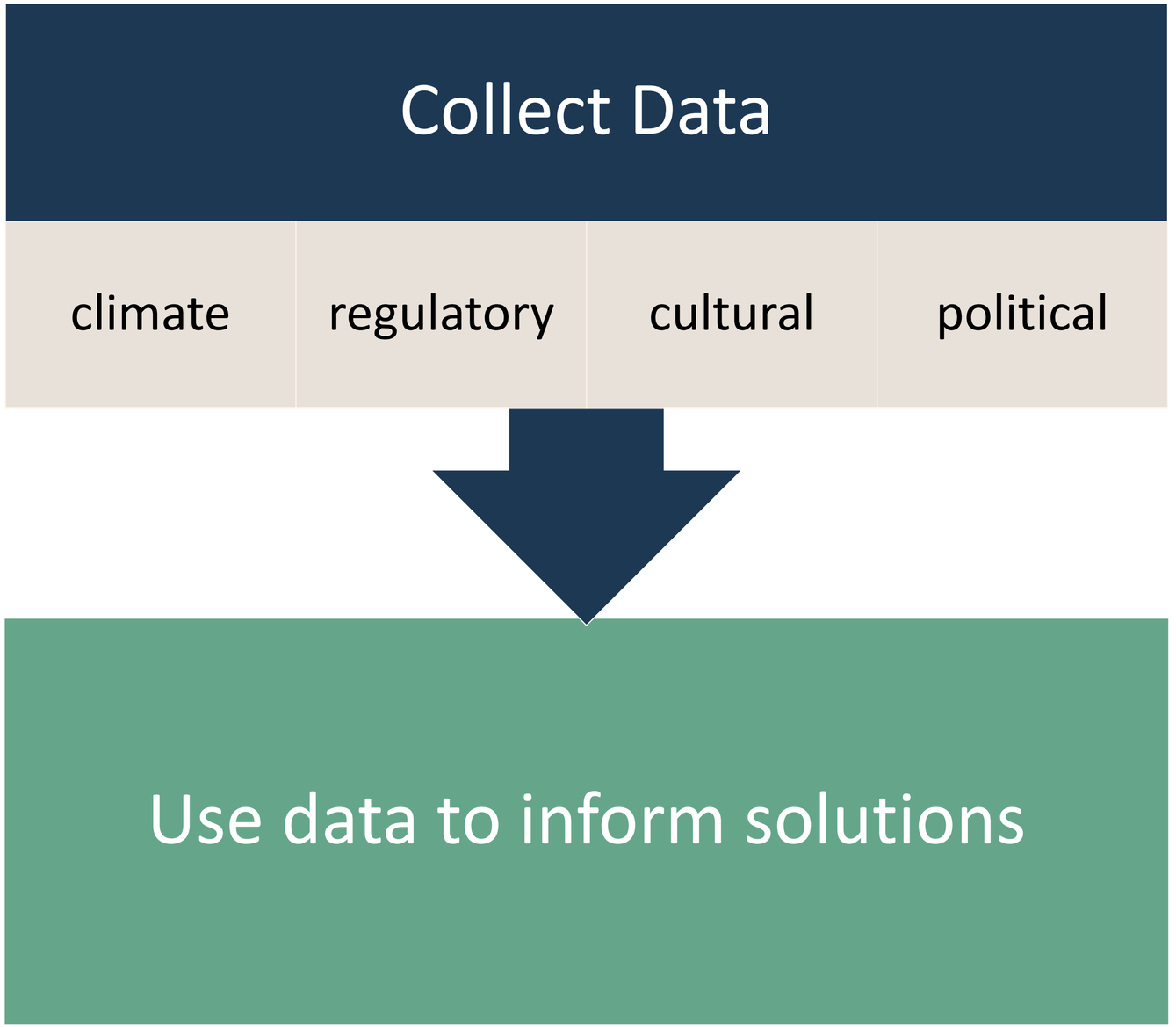
Mixed-use office

Warehouse

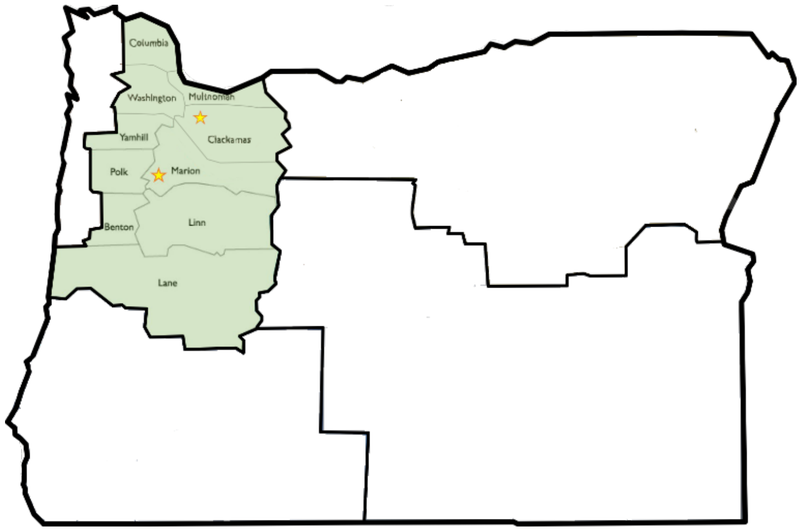
Pre-engineered metal building

Unoccupied service building

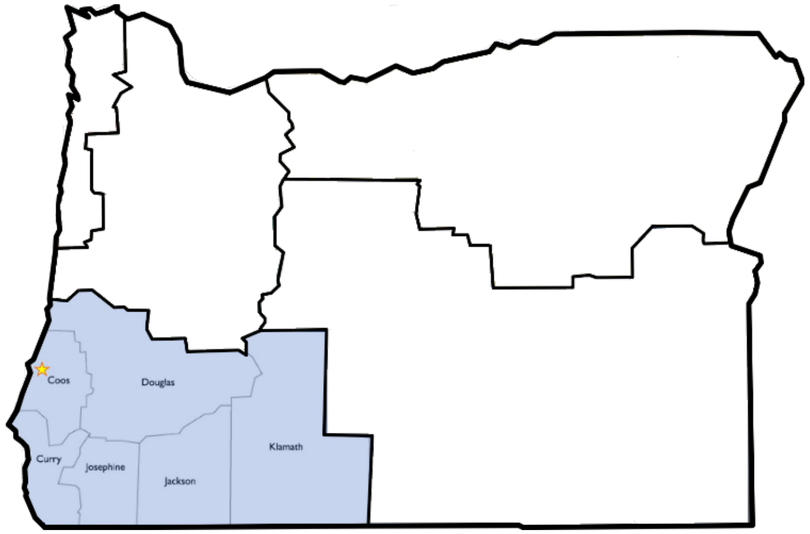
FRAMEWORK TO GET TO NET ZERO



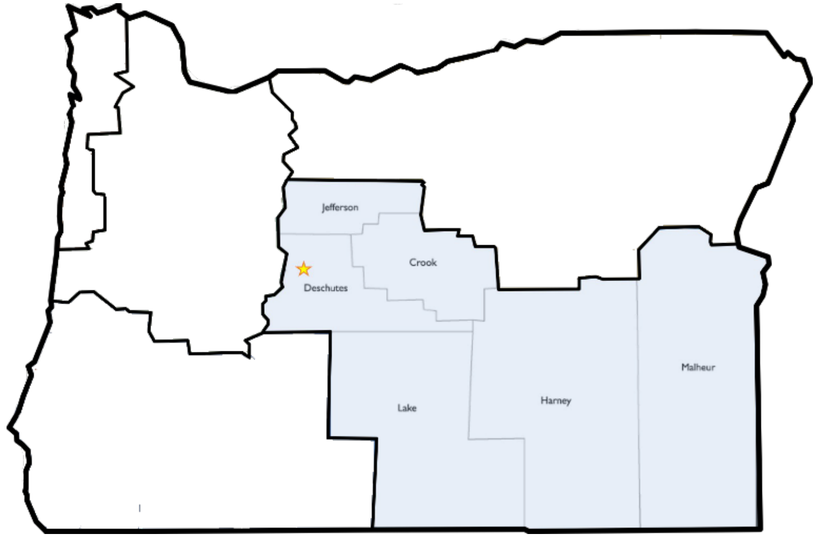
STUDY AREAS



WILLAMETTE VALLEY



ROGUE VALLEY



HIGH DESERT

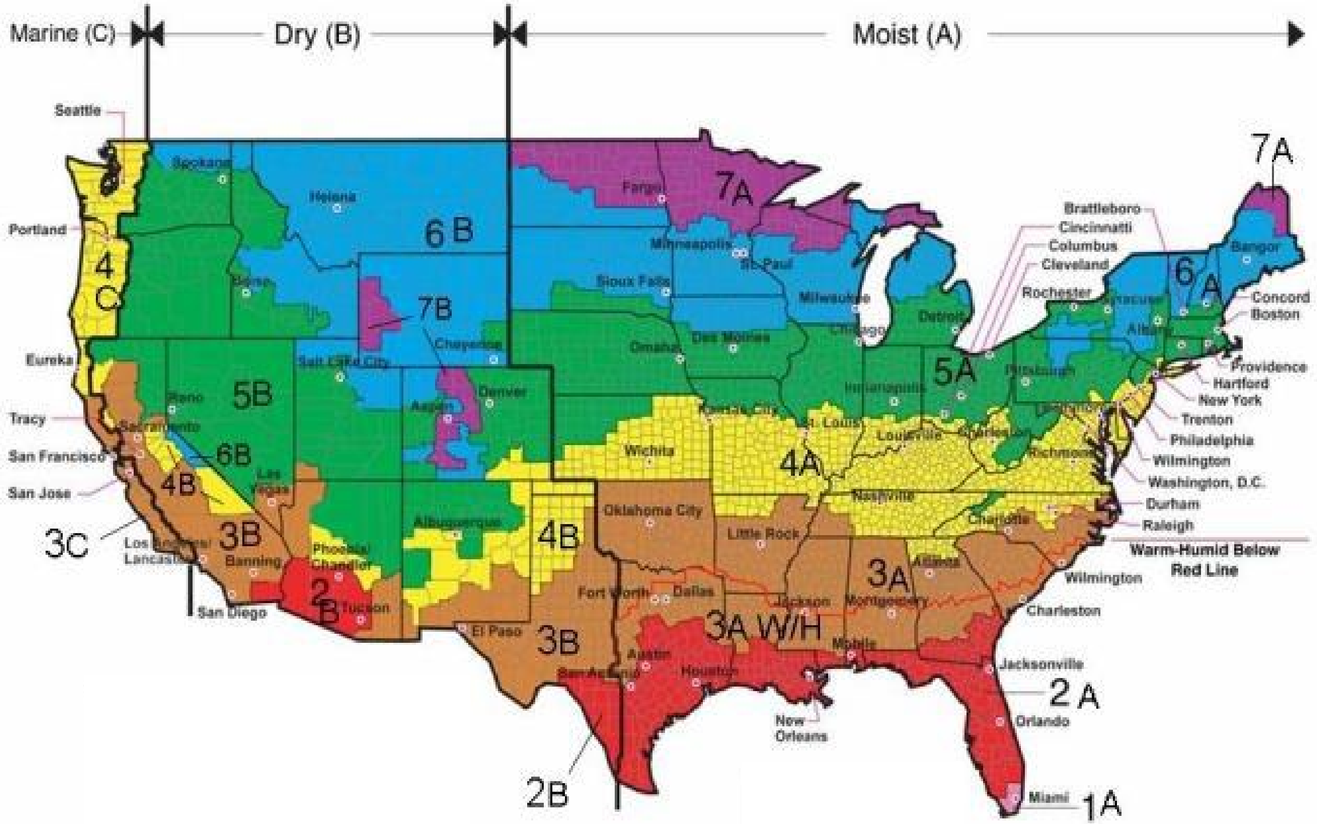
REGIONAL CLIMATIC OPPORTUNITIES

Temperatures will increase up to 4° Fahrenheit by 2040

WILLAMETTE VALLEY
- Today = 4C (mixed marine)
- Future = 3A (warm humid)

ROGUE VALLEY
- Today = 4C (mixed marine)
- Future = 3B (warm dry)

HIGH DESERT
- Today = 5B (cool dry)
- Future = 4B (mixed dry)



Passively Building for Resilience, Energy Trust Net Zero Fellowship 2018

WILLAMETTE VALLEY

Impact of Climate

- Wetter winters, drier summers, and decreased snowfall.
- Changes will impact environmental, social, and economic local conditions.
- This places stress on infrastructure, buildings and human health.

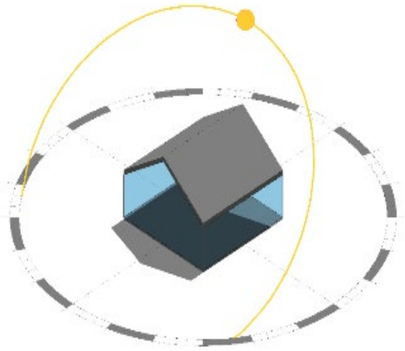


Figure 2 Willamette Valley Summer Solstice

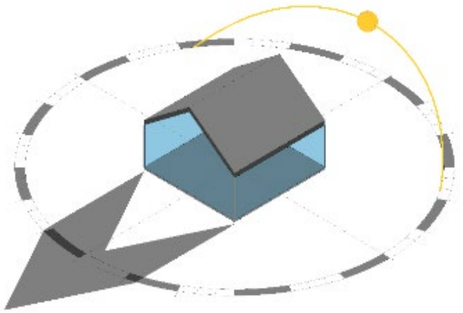


Figure 3 Willamette Valley Winter Solstice

WILLAMETTE VALLEY – AVERAGE TEMPERATURE + PRECIPITATION												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average high in F	46.8	51.1	56.1	61.1	67.6	73.4	81.1	81.8	76.6	64.4	52.4	45.8
Average low in F	34.7	35.4	37.8	40.7	45.3	50.1	53.4	53.1	49.0	42.8	38.4	34.4
Precipitation in inches	6.19	4.85	4.28	2.88	2.29	1.55	0.54	0.65	1.38	3.01	6.64	7.10

WILLAMETTE VALLEY: Regulatory Considerations

Washington County

- **Budget and resources** are needed to enact and implement a full climate action plan, County seeks to **align with Federal goals** of being net zero by 2050.
- Access to **grants, federal support, and other funding opportunities**, including Commercial Property Assessed Clean Energy (CPACE), would allow **community-endorsed energy conservation** proposals.

Metro Regional Government

- Metro's current sustainability plan is to have an **80% emissions reduction** across the organization by 2050.
- **Looking to peers**, like California, to see how state climate policies have developed and been implemented.
- **Capital planning** needs to account for the **costs of net zero policy** efforts.

WILLAMETTE VALLEY: Washington County

Cultural and Political Context

Development context	Technology sectors growth
Recent policy movement	CPACE energy conservation financing
Barriers	Historically slow/no growth jurisdiction
Recommendations	Project delivery re-thinking: phases, funding, and services

WILLAMETTE VALLEY: Metro

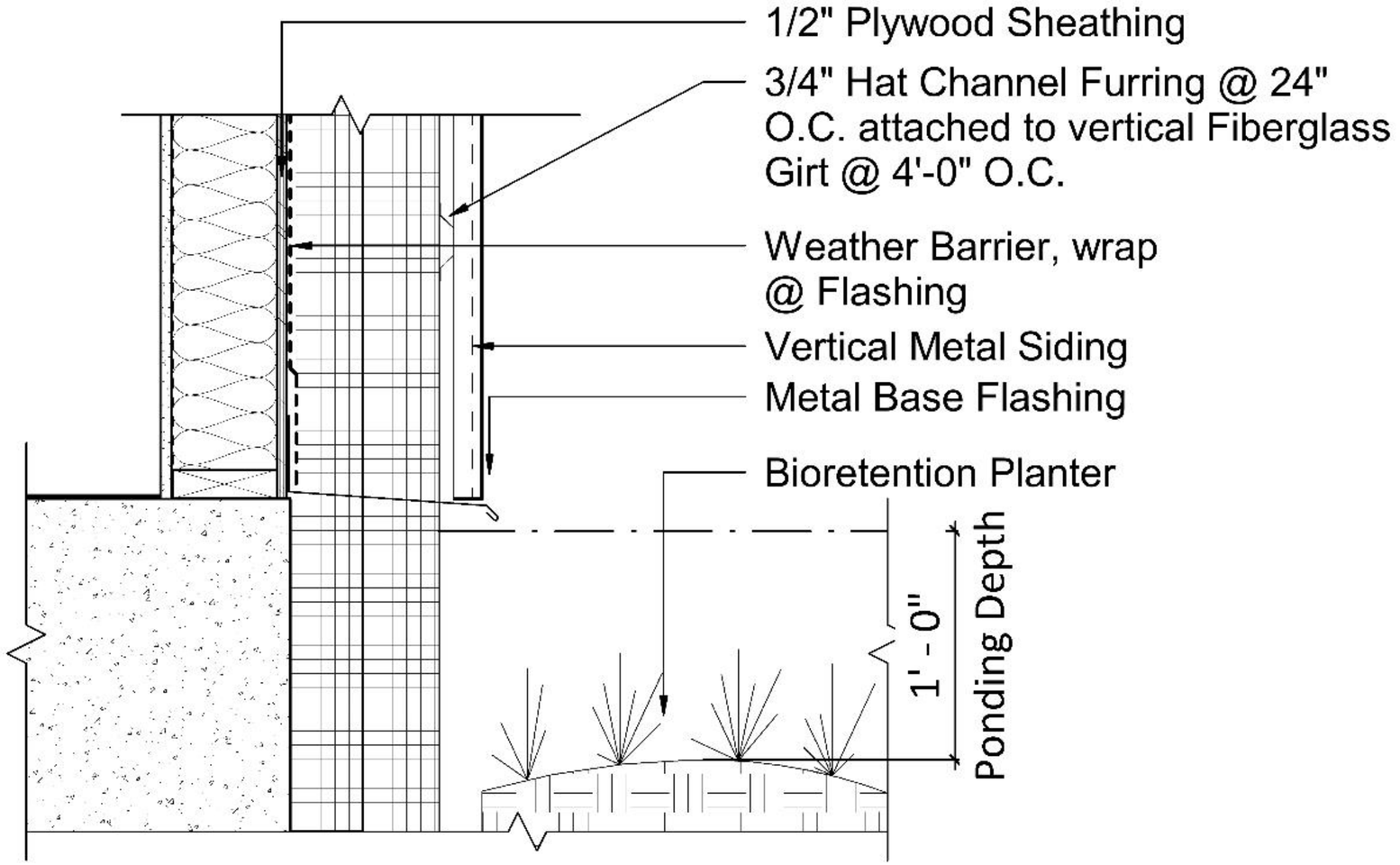
Cultural and Political Context

Development context	Internal operations + maintenance building assets plus fleet transitioning to net zero energy
Recent policy movement	International Living Future Institute CORE Certification program adoption
Barriers	Plan needs to address existing assets and energy consumption
Recommendations	Develop + implement a program for existing assets with emphasis on addressing local climate solutions

WILLAMETTE VALLEY: Design Opportunities

Characteristics

- Extensive Greenroof
- Stormwater Detention
- Rainwater Collection
- Thermal Break
- Biophilia/Health
- Engineered Soils
- Integrated Design



Bioretention Planter

ROGUE VALLEY

Impact of Climate

- Characterized by warm summers featuring a long dry season and mild winters. Summers and winters often feature clear skies. The valley experiences a long growing season.

- The latitude of the Rogue Valley is approximately 42 degrees north with over 195 clear days providing solar energy generation opportunities.

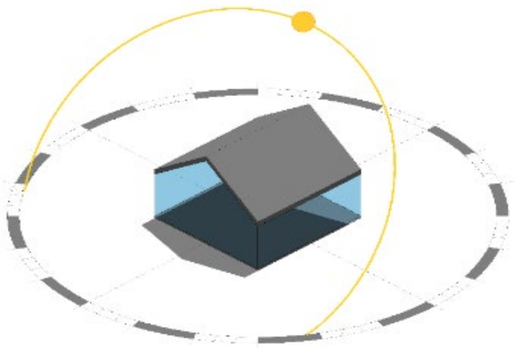


Figure 5 Rogue Valley Summer Solstice

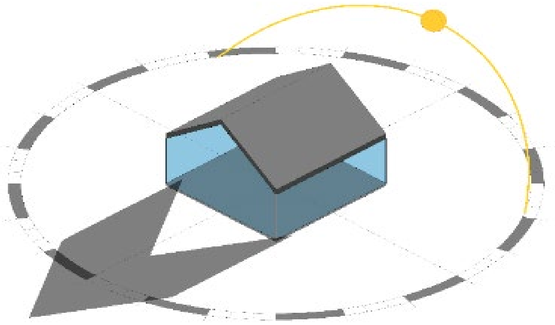


Figure 5 Rogue Valley Winter Solstice

ROGUE VALLEY – AVERAGE TEMPERATURE + PRECIPITATION												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average high in F	44.7	50.7	56.3	62.3	70.7	79.0	87.7	87.0	79.7	67.0	50.0	43.0
Average low in F	29.3	31.3	33.7	36.7	42.0	47.7	52.7	51.7	45.0	37.7	33.7	29.3
Precipitation in inches	3.19	2.56	2.39	1.56	1.29	0.73	0.39	0.45	0.72	1.43	3.40	3.92

ROGUE VALLEY

Regulatory Considerations

- Illegal water taking off of regional watersheds for marijuana production has put a strain on the already **stressed water and energy systems**, some state funding for enforcement support has emerged.

- Need government program **funding communities** seeking to develop their first **climate or energy action plan**.

- **Net zero needs to be economical and equitable** for all, especially in communities where clean, potable water is not a right.

ROGUE VALLEY: Medford

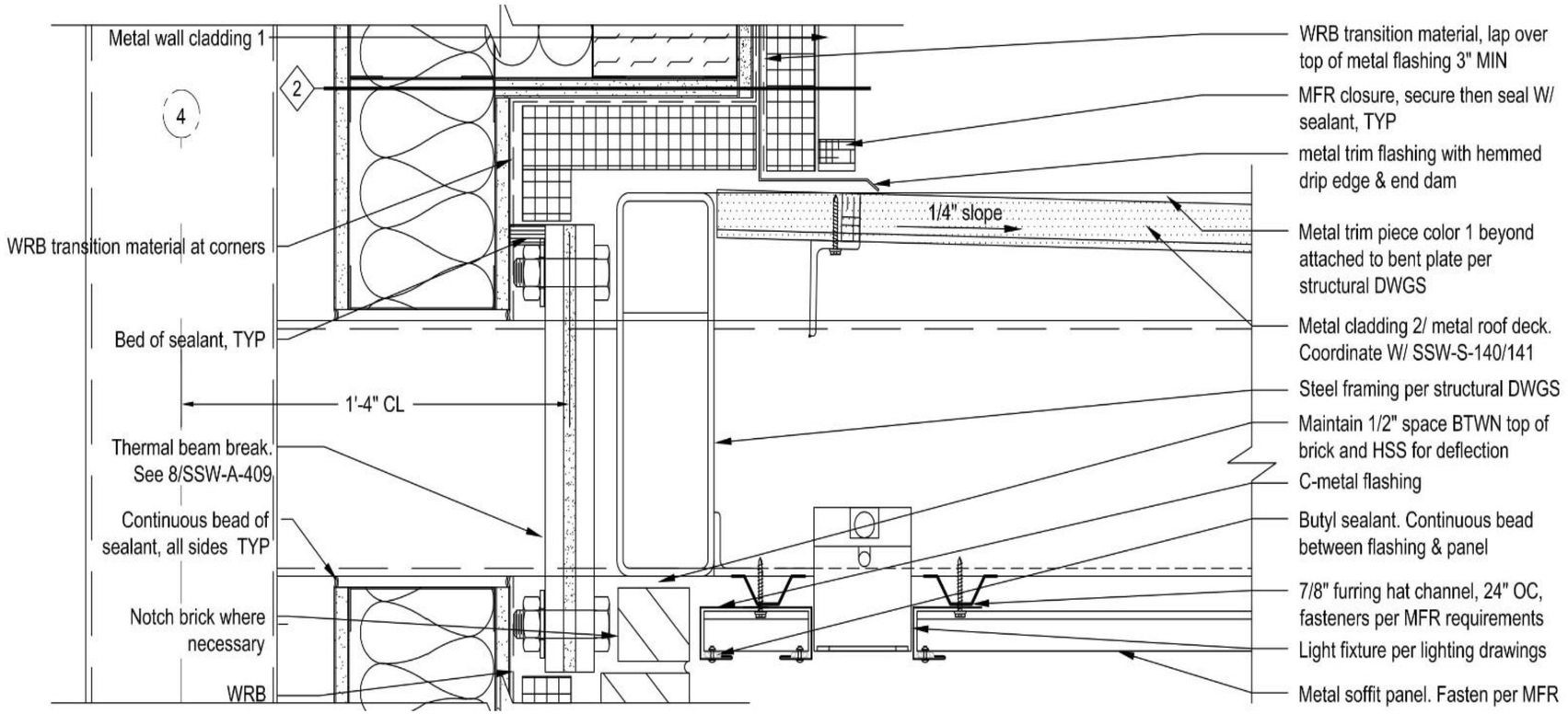
Cultural and Political Context

Development context	Agricultural industrial development
Recent policy movement	*Adaption Plan* emerging
Barriers	Water scarcity, illegal water + energy use, lack of power system redundancy, migrating industries due to climate change
Recommendations	Develop *Implementation Plan* to follow *Adaption Plan*; aggressively seek out federal grants targeting net zero development and ‘green’ job creation

ROGUE VALLEY: Design Opportunities

Characteristics

- Shading
- Water Quality/Runoff
- Thermal Break
- Insulation
- Fire Protection



Loading Dock Canopy Connection

HIGH DESERT

Impact of Climate

- Increase in temperature resulting in wetter winters and drier summers as well as decreased snowfall.

- Abundance of moisture in the air, will increase storm intensity across Oregon and into the High Desert resulting in increased flooding.

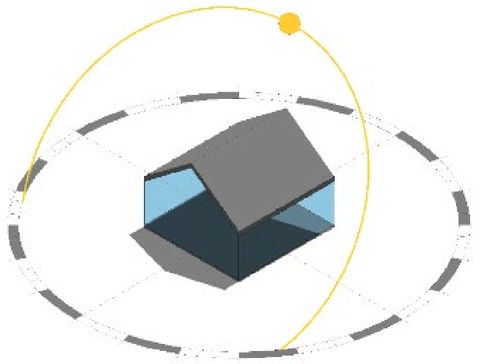


Figure 7 High Desert Summer Solstice

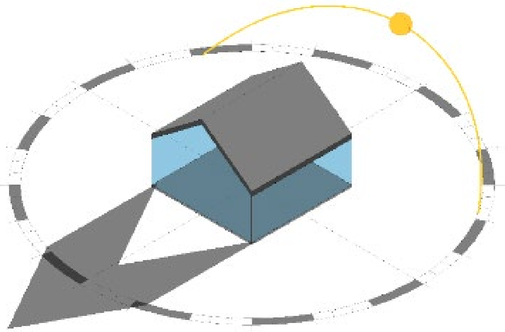


Figure 7 High Desert Winter Solstice

HIGH DESERT – AVERAGE TEMPERATURE + PRECIPITATION												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average high in F	40.2	44.5	52.2	58.7	66.7	74.7	85.0	84.0	76.0	63.2	47.7	38.5
Average low in F	21.7	23.2	27.2	30.2	36.5	42.2	47.0	45.7	38.5	31.5	26.2	20.5
Precipitation in inches	1.20	0.94	0.84	0.83	1.08	0.75	0.51	0.42	0.41	0.71	1.17	1.59

HIGH DESERT: Bend

Regulatory Considerations

- Experiencing a **population boom**
- Low new local jobs creation: a **community that works remotely**
- Commercial-industrial developments in the area are specifically in **public works, transportation, water/sewer infrastructure**
- **Community and City climate goals**: Bend City Council voted to establish an Environment and Climate Committee in 2020 with grant support

HIGH DESERT: Bend

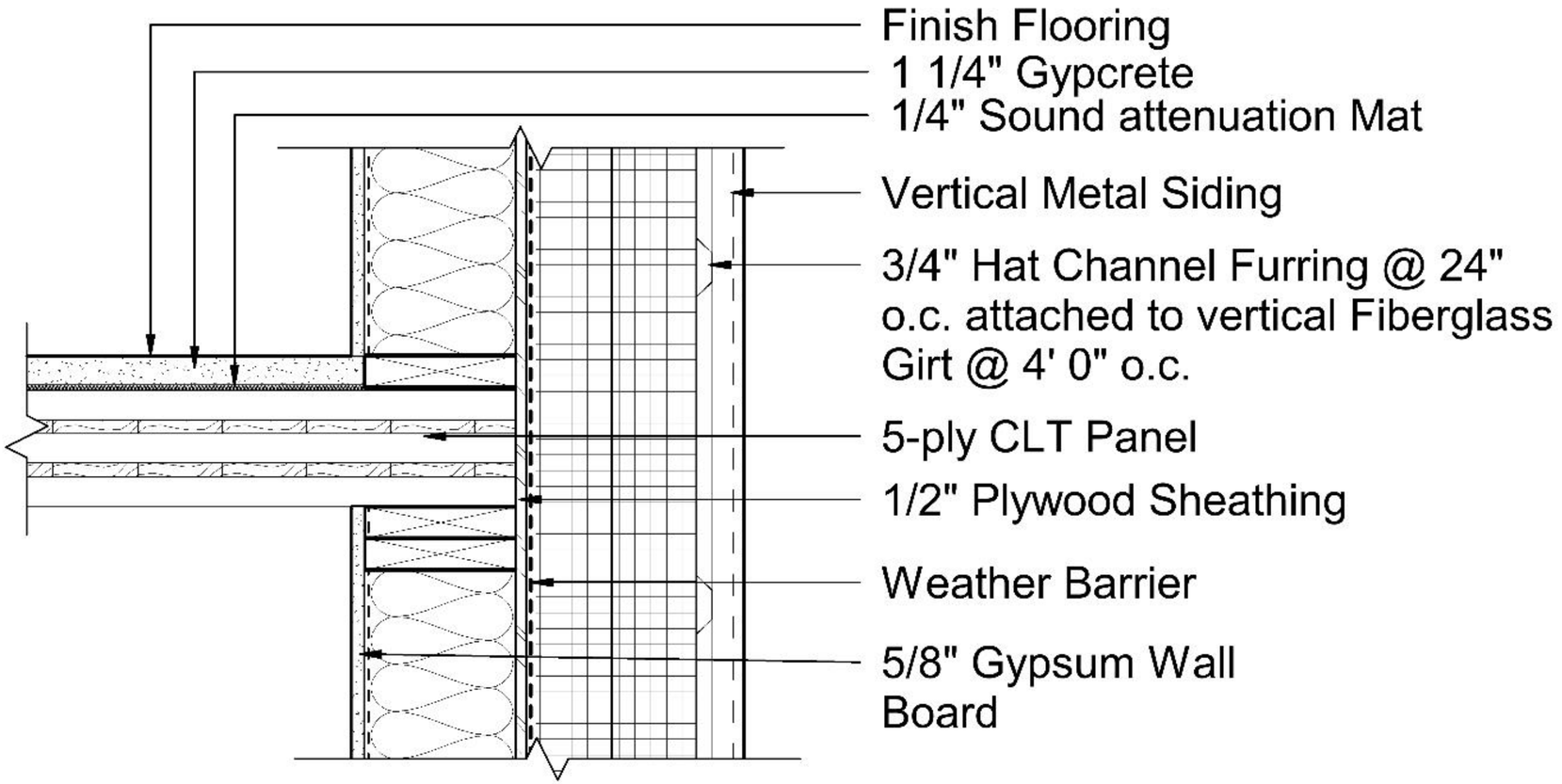
Cultural and Political Context

Development context	Limited commercial-industrial development: public agency expansion and resilience projects
Recent policy movement	Two plans: community and public action plans
Barriers	High residential growth and very low business growth creates an imbalance in opportunity (public vs. private)
Recommendations	Address all development types with net zero energy regulations (residential)

HIGH DESERT: Design Opportunities

Characteristics

- Mass Timber + Renewables
- Thick Exterior Walls
- Low Heat Transfer
- Insulation



Floor to Wall Connection

IMPACT OF OPPORTUNITIES

SOLAR-BASED OPPORTUNITIES

- Solar energy collection
- Passive heating and cooling
- Daylighting
- Solar shading at windows and doors
- Whole building shading

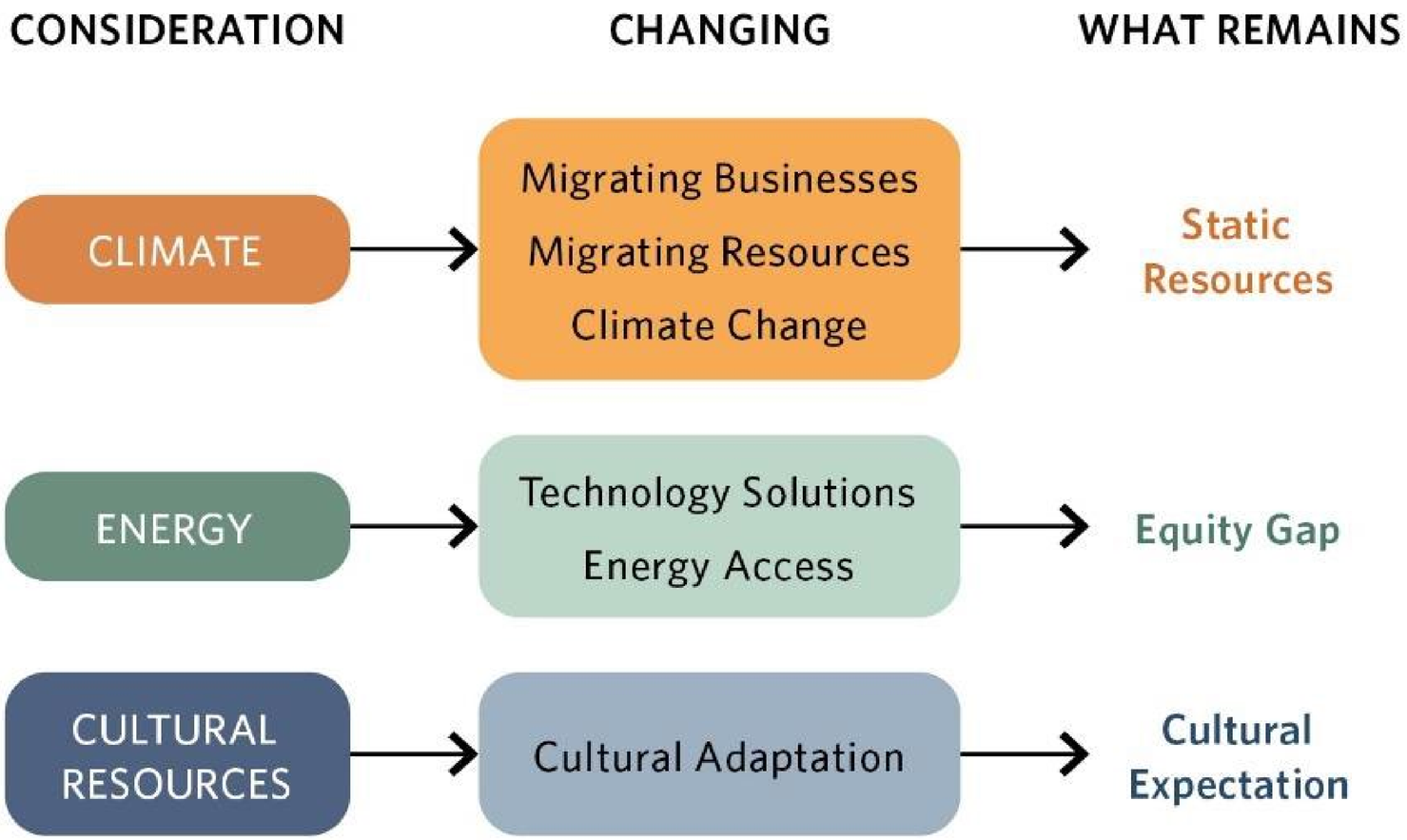
WATER-BASED OPPORTUNITIES

- Solar water pre-heating (showers/plumbing)
- Rainwater collection: irrigation and toilets
- Grey water recycling: irrigation and toilets
- Vegetated roof (fire resistant species) with rainwater collection or solar generation

GEOLOGY-BASED OPPORTUNITIES

- Thermal mass building envelope technology to mitigate temperature peaks and valleys
- Earth tubes for cooling
- Ground source heat pump technology

CONCLUSION


CONSIDERATION
CHANGING
WHAT REMAINS
CLIMATE
Migrating Businesses
Migrating Resources
Climate Change
Static Resources
ENERGY
Technology Solutions
Energy Access
Equity Gap
CULTURAL RESOURCES
Cultural Adaptation
Cultural Expectation