Oregon Energy Strategy
Energy Wallet, Air Quality, and Geospatial Mapping Complementary Analyses

This document provides the draft technical approach for three environmental justice (EJ) and equity related analyses that will feed into the Oregon Energy Strategy: an Energy Wallet, Air Quality Modeling, and Geospatial Mapping.

These analyses serve to help understand and interpret the results of the modeling conducted for the Oregon Energy Strategy. Energy pathways modeling is the primary tool used in the Oregon Energy Strategy technical approach, but models have analytical limits and certain equity considerations may be difficult to quantify, namely questions around energy burden, affordability, health impacts, community well-being, and economic vulnerabilities.

Working in collaboration with ODOE and the Environmental Justice & Equity Working Group, the Clean Energy Transition Institute (CETI) consultant team[1] has developed an approach to address EJ and equity considerations specified through three analyses as described in this document. These analyses are meant to complement the energy modeling and provide additional information to help guide policy discussions in early 2025.

ODOE is [accepting comments](#) on this approach until 5 p.m. on November 27, 2024. As detailed below, ODOE is requesting feedback on the selection of customer groups for the proposed Energy Wallet analysis, regional groupings for the Air Quality modeling, and the prioritization of indicators to analyze in the geospatial mapping.

Methodology Overview

Figure 1 below shows how the energy modeling, which is the foundation of the entire technical approach, works in conjunction with the three EJ and equity related analyses.

The energy modeling calculates the energy needed to power Oregon's economy and the least-cost way to provide that energy while also meeting clean electricity and emissions goals.
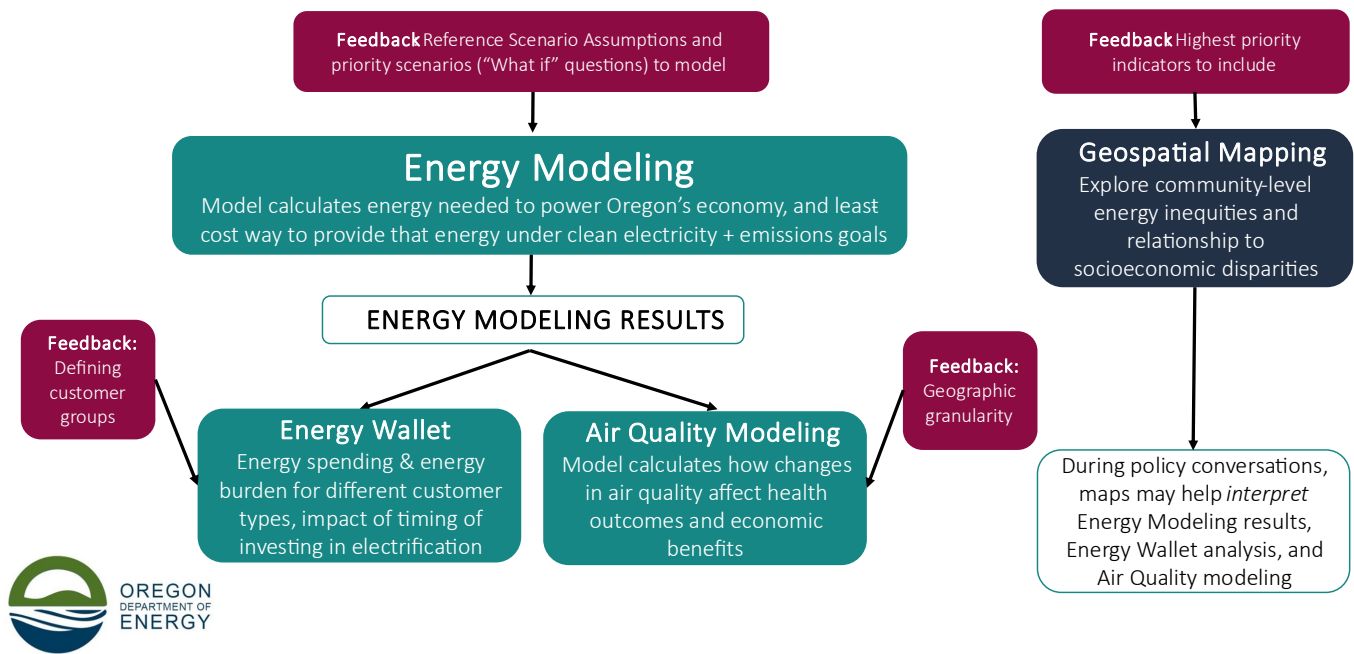
Once the energy modeling is complete, the results feed into two subsequent analyses. First, the Energy Wallet analysis examines energy spending and energy burden for different customer types, as well as how the timing of investing in electrification impacts customer costs. Second, the Air Quality Modeling takes the energy modeling emissions results and calculates the impact of reduced particulate matter on health outcomes and economic benefit.

On a separate track that does not interact directly with the energy modeling, the geospatial mapping explores community-level energy inequities and their relationship to socioeconomic disparities. The mapping helps to further understand potential effects of different pathways across Oregon and to inform policy discussions.

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[1] The CETI consultant team is comprised of: Clean Energy Transition Institute (CETI), Evolved Energy Research, Rockcress Consulting (Rockcress), and Moment Energy Insights.

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Figure 1. Overview of EJ/Equity Analysis

Energy Wallet

Description

As more Oregonians begin to electrify their homes and vehicles and electricity grows as a share of overall delivered energy, electricity bills will increase. However, bills for other forms of fuel will decrease at the same time (e.g., natural gas, gasoline). To determine the impact this shift might have on household budgets in Oregon, the CETI team will develop analysis that looks at five different customer groups to understand how their energy consumption changes over time as their usage shifts between petroleum, electricity, natural gas, and other fuels. The type of analysis is what we call an Energy Wallet, which highlights the affordability of energy for different customer groups and considers various factors, including vehicle miles traveled, location, income, and homeownership.

The Energy Wallet analysis is based on the cost of delivering energy to customers, rather than an evaluation of different rate designs or projection of fuel prices at the pump. These costs are estimated by calculating the cost of producing and delivering energy to a household, combined with the cost of incremental investment in electrified and high efficiency equipment. These costs are based on results from the energy pathways modeling, calculated by applying percentage changes in the cost of serving customer energy needs to present-day energy bills. By calculating the costs this way, the change in costs over time is aligned with the model results. Because the cost of energy is the main driver of prices that customers pay, this approach approximates the change in prices that households are likely to experience under different scenarios.

The Energy Wallet analysis will also examine how household energy costs are impacted by the year they purchase an electric vehicle (EV).

To produce an energy wallet for different customer groups, the CETI team identified several representative households with different profiles of energy consumption, income, housing types, and annual miles driven. While it is not possible to define all household realities, the goal is to provide

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insights into the changing energy costs for different households across electricity, natural gas, gasoline, and other fuels.

In summary, the Energy Wallet analysis will include the following:

1. Impact on household energy costs for five customer groups using both the Reference Scenario and a lower electrification and energy efficiency scenario from the energy modeling
2. Impact of year of EV adoption on household energy costs for each of the five customer groups, based on the Reference Scenario from the energy modeling

Methodology

Through collaboration with the Environmental Justice & Equity Working Group and ODOE, the CETI team developed a process for segmenting customers based on key factors that influence energy burden, listed in Table 1.

Table 1. Key Factors Identified Through Working Groups

Key Factor	Example Data Point
Geographic Location	Rural, Coastal, Urban
Housing Type	Manufactured Homes, Multifamily
Home Ownership	Renter, Homeowner
Energy Burden	Percentage of income spent on energy
Home Conditions	Age, Insulation
Access to Technology	Air Conditioning for Cooling and Air Filtering
Health	Indoor Air Quality

The next step was to develop customer groups using the key factors collected and identify if there were sufficient public data sources available. Inputs for the Energy Wallet analysis include the following for each distinct customer group:

- Present day annual energy consumption of each fuel type and associated annual bills
- Present day vehicle miles traveled (VMT) and associated VMT costs (i.e., cost of gasoline)
- Costs of providing energy of all types to the residential sector through 2050 from the energy modeling

The CETI team developed initial customer group based on key factors wherever there was sufficient data available to do so. This resulted in nine initial defined customer groups based on factors such as income, location, housing type, and homeownership (Table 2). Some of the key factors identified may also overlap with indicators used in the geospatial mapping.

The CETI team then conducted a brainstorming session using *Menti*[2] with the Environmental Justice & Equity Working Group to prioritize customer groups. The CETI team will finalize a list of five priority customer groups for the Energy Wallet analysis, incorporating feedback from the public comment period.

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[2] Menti, or Mentimeter, is a free, interactive presentation platform for hosting live virtual brainstorming sessions and polling.

Table 2. Initial Nine Customer Groups

Customer Group	Metric Description	Data Sources Used
Homeowner	A typical owner-occupied single-family detached home in Oregon.	2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens
Rural Home	A typical single-family detached home located in a rural region in Oregon.	2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's The High Cost of Energy in Rural America, Oregon Office of Economic Analysis, ODOT Regions
Coastal Home	A typical single-family detached home located in a coastal region.	2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens, Oregon Office of Economic Analysis, ODOT Regions
High Priority Area Homes[3]	A typical single-family detached home located within ODOE's high priority area counties.	ODOE's 10 Year Plan, 2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens report
Extreme Low-income Single-Family	A typical low-income owner-occupied single-family detached home with an income less than $15,000 a year.	ODOE's 10 Year Plan, 2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens report
Weatherization	A typical single-family detached home built prior to 1990 (assumed to have poor insulation).	2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens report
Manufactured Homes	A typical manufactured home, assumes cost of energy is 70% higher per square foot than the average cost of energy for a homeowner.	ODOE's 10 Year Plan, 2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens report
Average Renter	A typical reported renter-occupied single-family detached home.	ODOE's 10 Year Plan, 2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens report
Low-income Renter Multifamily	A typical reported low-income renter occupied multifamily home, includes all multifamily building types.	ODOE's 10 Year Plan, 2022 NEEA RBSA, US EIA Average Household Energy Expenditures data, ACEEE's How High Are Household Energy Burdens report

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[3] High priority areas are defined in ODOE's 10 Year Plan, which developed an index that includes the measure of energy burden along with other factors known to drive energy burden (affordability, poor home energy efficiency, and housing inequity issues, etc.).

Below in Table 3, we include an example dataset for this part of the process, which is intended to inform stakeholders when determining which of the nine customer groups they would like to see prioritized. The Primary Heating Type field represents the fuel type used by majority of households in each category, using Oregon data from the 2022 RBSA. The Energy Consumption field, also from 2022 RBSA Oregon data, represents the total annual average home fuel consumption across all fuel types (e.g., electric, natural gas).

The Energy Burden field comes from ACCEE's calculated energy burden by household for the Pacific region when available and from national estimates otherwise (sources are found in Table 2). The Vehicle Miles Traveled (VMT) field is from the H&T Affordability Index providing Oregon county-level VMT data and is the annual VMT per household.[4] The Energy Consumption and VMT fields are used as inputs in the Energy Wallet analysis. Energy burden for each customer group, and how it changes over time, will be a result of the Energy Wallet analysis not an input. The median energy burden estimates presented in Table 3 are intended to help inform decision-making around which customer groups to include in the analysis; however, they are not an input into the energy wallet analysis.

Table 3. Example Dataset

#	Customer Group	Primary Heating Type	Average Total Energy Consumption (kBTU)	VMT	Median Energy Burden[5]
1	Homeowner	Natural gas	95,990	19,631	2.3%
2	Rural Home	Electric	94,775	21,272	3.6%
3	Coastal Home	Electric	73,572	19,952	3.6%
4	High Priority Area Homes	Natural gas	95,778	19,096	4.5%[6]
5	Extreme Low-income Single-Family	Natural gas	53,076	19,728	**[7]
6	Weatherization	Natural gas	98,047	19,461	3.4%[8]
7	Manufactured Homes	Electric	72,345	21,260	5.3%
8	Average Renter	Electric	76,088	19,516	2.5%
9	Low-income Renter Multifamily	Electric	24,065	14,405	5.3%

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[4] The VMT numbers from the H&T Index are provided in Table 3 to give a sense of the difference in VMT across customer groups. These numbers may be replaced by updated VMT numbers from the Oregon Department of Environmental Quality and the Oregon Department of Transportation for the Energy Wallet analysis.

[5] Household energy burden is defined as the percentage of annual household income spent on annual energy bills. It does not include transportation, water, or telecommunication cost burdens in its energy burden calculations. The median energy burden is an important metric when understanding the impacts of energy costs by household. When developing these customer groups, the consultant team used ACEEE's median energy burden metric as a guide when considering which types of households to consider as a customer group. This data allowed us to explore the potential energy costs and impacts different household experience. For further information on energy burden and other county-level energy statistics in Oregon, see the 2024 Oregon County Energy Profiles .

[6] Corresponds to ACEEE's upper-quartile energy burden for the Pacific region as an approximation of the energy burden for High Priority Area Homes as we've defined them.

[7] ACEEE does not have information on energy burden for households with reported incomes less than $15,000.

[8] Corresponds to ACEEE's median energy burden for households with homes build before 1980 as an approximation of the energy burden for households with homes built before 1990.

Example Results

Figures 2 and 3 below are examples of the Energy Wallet analysis from the Evolved Energy Research Achieving 100% Clean Energy in Wisconsin study.

Figure 2 shows the change in estimated energy expenditures for average customer consumption over time. Estimated bills are calculated by applying percentage changes in the cost of serving customer energy needs to present-day energy bills for electricity, gas, gasoline, and diesel.

For the Oregon Energy Strategy, the Energy Wallet analysis will be compared across five different customer groups for the Reference Scenario (rather than one customer group across multiple scenarios, as shown in Figure 2) as well as for the lower electrification and energy efficiency scenario.

Figure 2. Estimated Annual Household Energy Expenditures (Achieving 100% Clean Energy in Wisconsin, 2022)
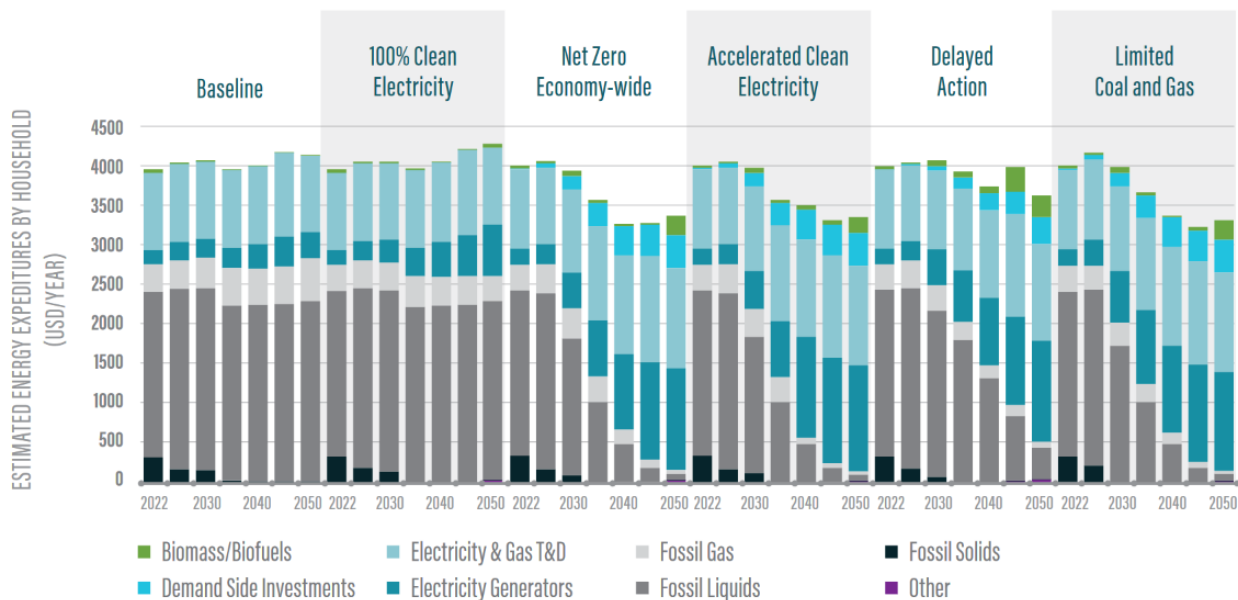
Figure 3 shows how household energy costs are impacted by the year they purchase an electric vehicle (EV), something that low-income customers are forecast to do later than other customers. This shows both the equity challenge of electrification and the benefits of measures (such as IRA incentives) that help low-income customers pay for large capital investments.

For the Oregon Energy Strategy, the analysis of EV purchase year shown in Figure 3 will be compared across five different customer groups for the Reference Scenario.

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Figure 3. Direct Household Energy Costs and EV Purchase Year (Achieving 100% Clean Energy in Wisconsin, 2022)
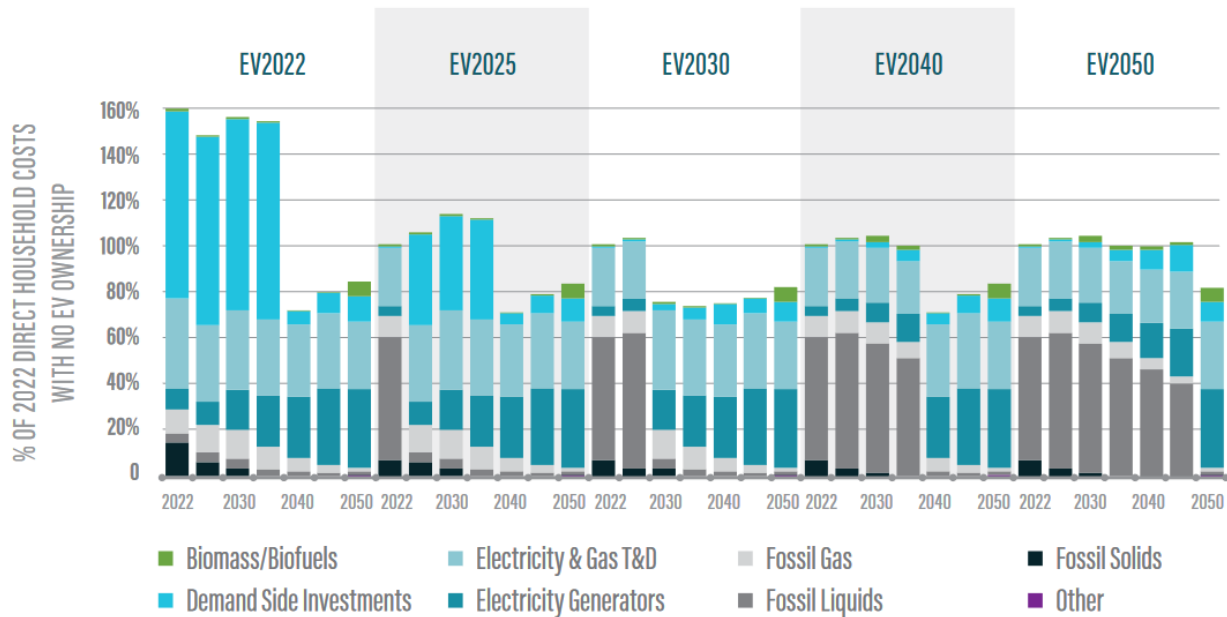
Air Quality Modeling

Description

Evolved's modeling toolkit directly interfaces with the EPA COBRA model, allowing us to determine the benefits of reduced pollutant emissions on public health outcomes.

Methodology

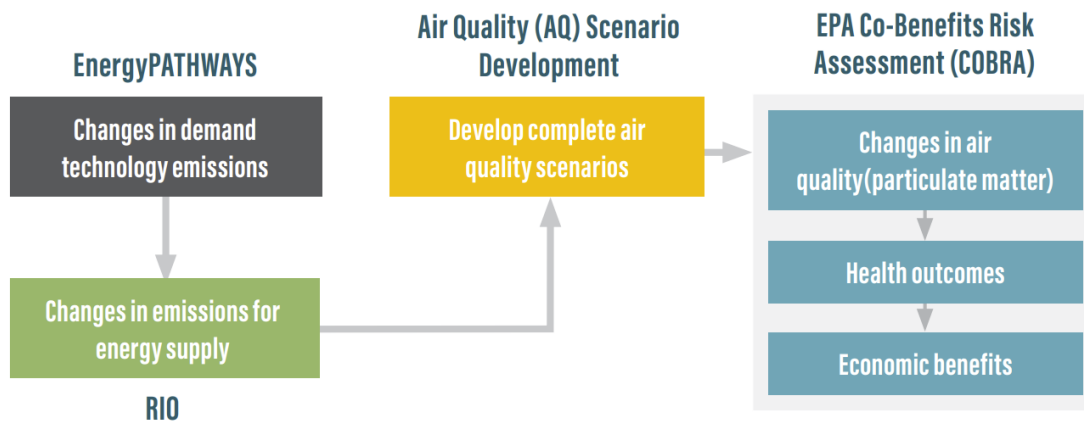The CETI team will use the EPA COBRA integration to calculate the benefits of reductions in criteria air pollutants over business-as-usual.[9] Certain greenhouse gas reduction measures, such as reduced fuel combustion in cars and reduced smokestack emissions from gas and coal fired power plants, reduce criteria air pollutant emissions in addition to greenhouse gas emissions.

The COBRA model determines the impacts of changes in fine particulate matter ($PM_{2.5}$) concentrations, as well as secondary particulate matter that can be formed by atmospheric reactions of nitrous oxides (NOx), sulfur dioxide (SO_2), ammonia (NH_3)**,** and volatile organic compounds (VOCs). EPA COBRA reports metrics such as reduced mortalities, days of work lost, and hospital admissions, and convert those to economic benefits.

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[9] The US Environmental Protection Agency has designated six criteria air pollutants that it regulates to protect public health and the environment: sulfur dioxide, nitrogen dioxide, particulate matter, carbon monoxide, ozone, and lead.

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**Figure 4. Energy Modeling and EPA COBRA Integration**

While the energy modeling results will be for two Oregon zones (West and East), the CETI team heard feedback from the Environmental Justice & Equity Working Group about the importance of understanding more localized air quality impacts. The CETI team therefore developed a set of regions in Oregon to use for Air Quality modeling.

First, the CETI team developed a set of county clusters by weighting variables related to air quality: average temperature in January and August, average number of vehicles, levels of fine particulate matter, average percent of community members living at or below the federal poverty level, and the average percent of adults with asthma.

We then overlaid those county clusters with other regions in Oregon, including the regional employment offices from the Oregon Office of Economic Analysis, as well as the transportation regions from the Oregon Department of Transportation to develop the proposed regions shown in Figure 5.

Figure 5. Proposed Regions for Air Quality Modeling; Developed by Oregon Energy Strategy Consultant Team
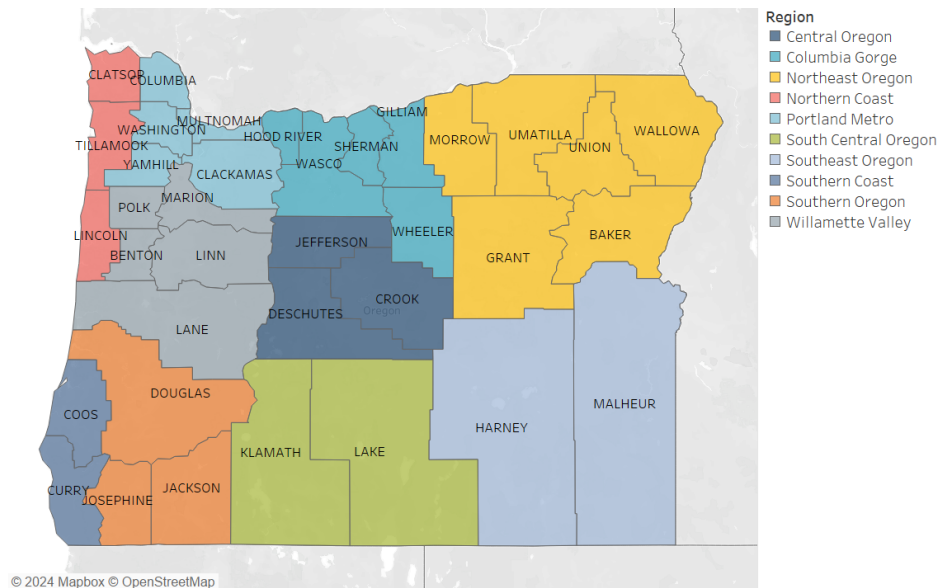
? **Feedback requested: Are these regions helpful for interpreting results about health impacts due to changes in air quality? Would you recommend any changes?**

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Example Results

Figure 6 shows an example of the health impacts results produced by the Air Quality modeling, showing the range of avoided deaths in the Northwest from a recent study that CETI and Evolved produced called Net-Zero Northwest.

For the Oregon Energy Strategy, the health impacts would be reported by Oregon region (shown in Figure 5) rather than by state, as shown in Figure 6. The results may also be somewhat different, as the Net-Zero Northwest study modeled different greenhouse gas emission reduction levels across Oregon and the Northwest states.

Figure 6. Impact of Pollutant Reductions on Health Metrics in the Northwest (Source: Net Zero Northwest, 2023)

Range of Avoided Deaths Attributed to Annual Pollutant Reductions by State (per million people)
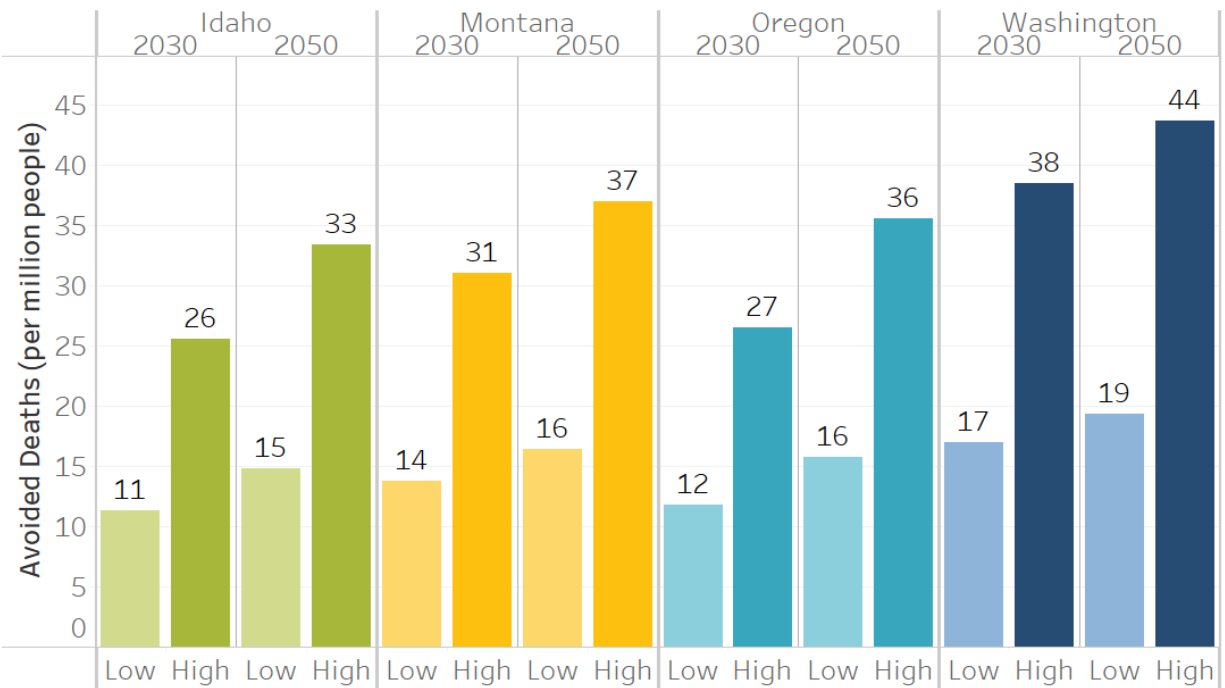
Source: Evolved Energy Research. *Net-Zero Northwest Energy Pathways Analysis Technical Report,* June 2023, p. 201. (Note: All labels on the bars are rounded. Low and high estimates reflect the range of findings in the epidemiological studies of health outcomes used in the modeling.)

Geospatial Mapping

Description

Lastly, the CETI Team will develop geospatial mapping with equity overlays that could be used to identify communities with environmental, resiliency, community well-being, economic, and equity vulnerabilities. These maps use a similar methodology to the interactive ArcGIS maps created for CETI's *Community-Defined Decarbonization* report, in which they used publicly available datasets to understand community-level energy inequities and their relationship to socioeconomic disparities.

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Methodology

Data Sources

The geospatial mapping approach data sources are publicly available datasets from state and federal agencies. This ensures consistency across spatial and temporal aspects of geographies. When available, the datasets represent census tracts in Oregon from 2018 to 2022.

For sociodemographic and housing characteristics, 5-year estimates from the American Community Survey (ACS) are queried as raw counts using the TidyCensus package. Data on energy burden, household IRA rebate eligibility, and "Disadvantaged" categorization from the Climate and Economic and Justice Screening Tool (CEJST) are made available from the U.S. Department of Energy (DOE).

Data sources were chosen based on:

- Environmental justice and energy justice-related literature
- Relationship to Oregon community benefits (Customer and system resiliency, economic, environmental, energy equity, and health and wellbeing)
- Oregon environmental justice community definition outlined in HB 4077, including but not limited to the following:
  - Communities of color, communities experiencing lower incomes, communities experiencing health inequities, tribal communities, rural communities, remote communities, coastal communities, communities with limited infrastructure and other communities traditionally underrepresented in public processes and adversely harmed by environmental and health hazards, including seniors, youth and persons with disabilities *(See full list of potential indicators in Appendix A.)*

Data Processing

All data processing was conducted in RStudio (v.4.4.0). Census-Tract level datasets were joined using the unique GEOID and processed when necessary to reflect a single aggregate value (i.e., the percentage of families living at or below the 150% federal poverty level, rather than raw estimates of the number of households at or below 50%, 100%, and 150% of the federal poverty level) (Table 1). Nine census tracts were removed from the analysis because they had a population of zero (all located in the Pacific Ocean).

Once all the values were summarized to reflect a single Census Tract, the dataset is joined to a 2022 Tigris census tract shapefile and exported as a single shapefile. The final dataset includes 44 columns representing 41 justice-related variables for 992 census tracts.

Environmental Justice & Equity Working Group Feedback

Feedback from the Environmental Justice & Equity Working Group included suggested priority indicators for geospatial mapping related to Tribal communities, rural communities, the percentage of individuals employed in natural resources, indicators of poverty, those without health insurance, race and ethnicity, air quality, and average energy burden.

Mapping

Bivariate maps will be created, each displaying two indicators and enabling users to visualize the relationship between the two (e.g., the community-level relationship between energy burden and percent manufactured homes, as shown in Figure 7).

Example Results

CETI prepared five initial maps for proof-of-concept and shared the list of possible indicators (Appendix A) with the Environmental Justice & Equity Working Group. Two static maps (Figures 7 and 8) emerged as applicable to Phase 2 policy discussions. Moving forward, CETI proposes including these maps, along with additional maps of interest, for a total of 10-15 maps.

? Feedback requested: Which indicators (variables) from the list in Appendix A are highest priority to map and analyze their relationship? Are there any important variables (with publicly available data sources) that you would add to the list?

Figure 7. Relationship map showing energy burden and the percent of manufactured homes.
Data Source(s): US DOE LEAD Tool, ACS 5-year estimates, 2018 – 2022
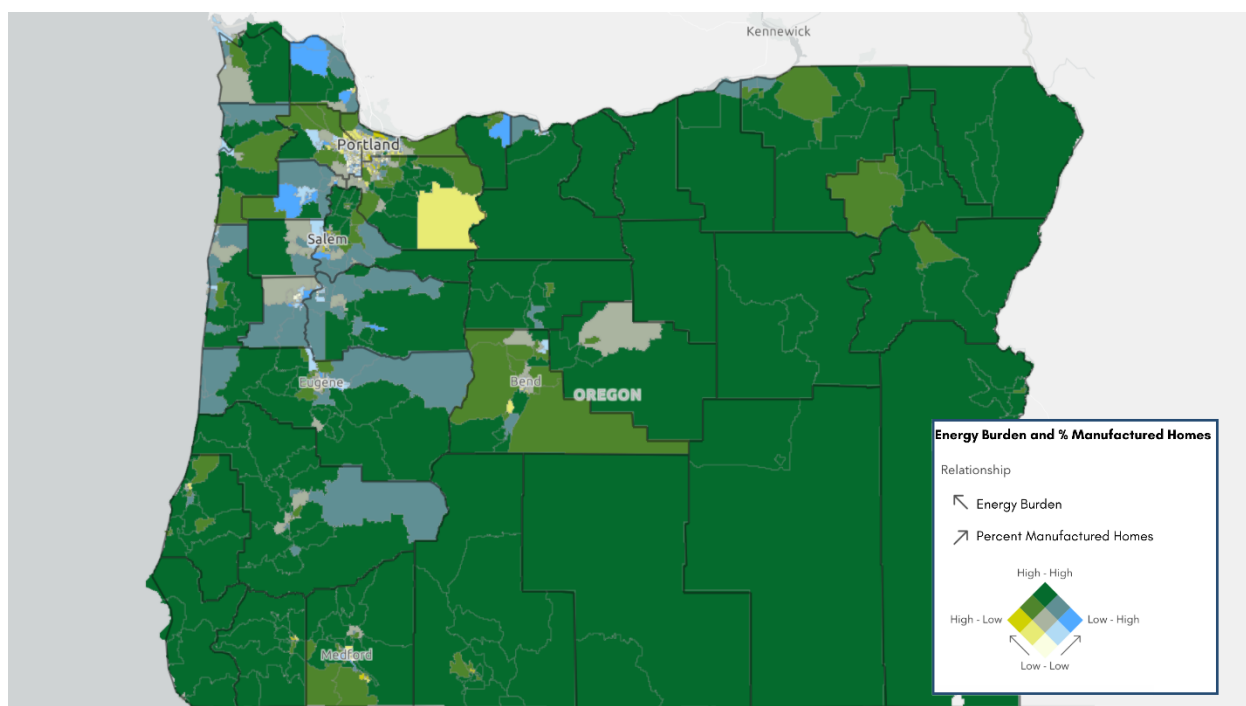
Figure 7 shows 161 census tracts in the 75th percentile for both energy burden (i.e., more than 5% energy burden) and percentage of households living in manufactured homes (i.e., greater than 12.7% of families living in manufactured homes). These tracts represent communities that could be prioritized for equitable home and energy investments.

Figure 8. Relationship map showing fine particulate matter (PM 2.5) and adult asthma prevalence (%).
Data Source(s): Climate and Economic Justice Screening Tool (CEJST), Centers for Disease Control (CDC) PLACES Data
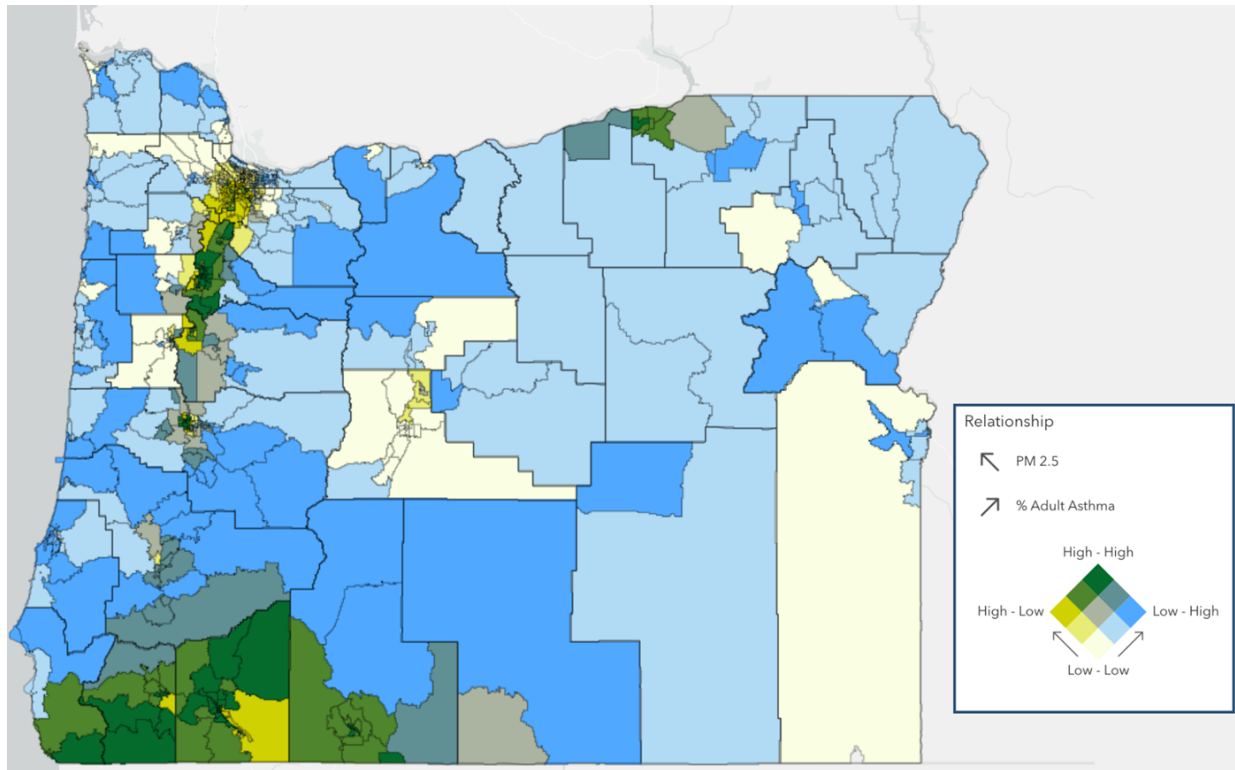
Figure 8 shows the community-level relationship between particulate matter (PM 2.5) and percentage of adult asthma. This census tract analysis can help supplement the results from the Air Quality modeling to understand current air quality and potentially air quality-related health disparities at a local level.

Public Comment

Feedback Encouraged

ODOE is accepting comments **on this approach until 5 p.m. on November 27, 2024.** As detailed below, ODOE is requesting feedback on the selection of customer groups for the proposed Energy Wallet analysis, regional groupings for the Air Quality modeling, and the prioritization of indicators to analyze in the geospatial mapping.

For more information, visit the Oregon Energy Strategy webpage, please email energy.strategy@energy.Oregon.gov with any questions.

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Appendix A. List of Potential Indicators

Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
Total Population	TotalPop	N/A	N/A	ACS Table B01001: Sex by Age	N/A	2018-2022 Census Tract
Percent of Non-Hispanic White Individuals	PrcWhte	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "Communities of color"	ACS Table B03002: Hispanic or Latino Origin by Race	(B03002_003E/ B01001_001E) * 100	2018-2022 Census Tract
Percent of Hispanic Individuals	PrcHsp			ACS Table B03002: Hispanic or Latino Origin by Race	(B03002_012E/ B01001_001E)*100	2018-2022 Census Tract
Percent of Non-Hispanic Black Individuals	PrcBlck			ACS Table B03002: Hispanic or Latino Origin by Race	(B03002_004E/ B01001_001E)*100	2018-2022 Census Tract
Percent of Non-Hispanic American Indian and Alaska Native Individuals	PrcNtve			ACS Table B03002: Hispanic or Latino Origin by Race	(B03002_005E/ B01001_001E) * 100	2018-2022 Census Tract
Percent of Non-Hispanic Asian Individuals	PrcAsn			ACS Table B03002: Hispanic or Latino Origin by Race	(B03002_006E/ B01001_001E) * 100	2018-2022 Census Tract

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Appendix A. List of Potential Indicators

Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
Percent of Non-Hispanic Other Individuals	PrcOthr			ACS Table B03002: Hispanic or Latino Origin by Race	(B03002_008E/ B01001_001E)*100,	2018-2022 Census Tract
Percent of individuals without a HS diploma	PrcNoHSDplma	Economic, Health and Wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes" and "communities traditionally underrepresented in public processes".	ACS Table B15003: Educational Attainment for the Population 25 Years and Over	((B15003_002E + B15003_003E + B15003_004E + B15003_005E + B15003_006E + B15003_007E + B15003_008E + B15003_009E + B15003_010E + B15003_011E + B15003_012E + B15003_013E + B15003_014E + B15003_015E + B15003_016E)/B15003_001E) *100	2018-2022 Census Tract
Percent of Individuals who speak English "less than 'very well'"	PrcESL	Economic, Health and Wellbeing	Environmental Justice Community definition contains "communities traditionally underrepresented in public processes" and "communities of color".	ACS Table C16001: Language Spoken at Home for the Population 5 Years and Over	((C16001_005E + C16001_008E + C16001_011E + C16001_014E + C16001_017E + C16001_020E + C16001_023E + C16001_026E + C16001_029E +C16001_032E + C16001_035E + C16001_038E)/ C16001_001E) *100	2018-2022 Census Tract

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Appendix A. List of Potential Indicators

Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
Percent of Individuals at or below 150% of the Federal Poverty Line	PrcPvrty	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	ACS Table C17002: Ratio of Income to Poverty Level in the Past 12 Months	((C17002_002E + C17002_003E + C17002_004E + C17002_005E)/ C17002_001E)*100	2018-2022 Census Tract
Percent of unemployed individuals	PrcUnmploy	Economic	Environmental Justice Community definition contains "communities experiencing lower incomes".	ACS Table B23025: Employment Status for the Population 16 Years and Over	(B23025_005E/ B23025_003E)*100	2018-2022 Census Tract
Percent of individuals >= 65 years old	Prc65	Customer and system resiliency, Economic, Health and wellbeing	Environmental Justice Community definition contains "seniors".	ACS Table B01001: Sex by Age	((B01001_020E + B01001_021E + B01001_022E + B01001_023E + B01001_024E + B01001_025E + B01001_044E + B01001_045E + B01001_046E + B01001_047E + B01001_048E + B01001_049E)/ B01001_001E)*100	2018-2022 Census Tract
Percent of non-institutionalized individuals with a disability	PrcDsablty	Customer and system resiliency, Economic,	Environmental Justice Community definition	ACS Table B18101: Sex by Age by Disability Status	((B18101_004E + B18101_007E + B18101_010E + B18101_013E + B18101_016E + B18101_019E + B18101_023E +	2018-2022 Census Tract

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Appendix A. List of Potential Indicators

Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
		Health and wellbeing	contains "persons with disabilities".		B18101_026E + B18101_029E + B18101_032E + B18101_035E + B18101_038E)/ B18101_001E)*100	
Percentage of Individuals without Health Insurance	PrcNoHlthInsr	Economic, Health and wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	ACS Table B27010: Types of Health Insurance Coverage by Age	((B27010_017E + B27010_033E + B27010_050E + B27010_066E)/ B27010_001E)*100	2018-2022 Census Tract
Per Capita Income	PerCapIncm	Economic	Environmental Justice Community definition contains "communities experiencing lower incomes".	ACS Table B19301: Per Capita Income in the Past 12 Months (in 2022 Inflation-Adjusted Dollars)	N/A	2018-2022 Census Tract
Percent of individuals <= 17 years old	Prc17	Customer and system resiliency, Health and wellbeing	Environmental Justice Community definition contains "youth".	ACS Table B01001: Sex by Age	((B01001_003E + B01001_004E + B01001_005E + B01001_006E + B01001_027E + B01001_028E + B01001_029E + B01001_030E)/ B01001_001E)*100,	2018-2022 Census Tract

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Appendix A. List of Potential Indicators

Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
Percent of single parent-headed households with children under 18 present	PrcSnglPrnt	Economic, Health and wellbeing	Environmental Justice Community definition contains "youth" and "communities experiencing lower incomes".	ACS Table B09002: Own Children Under 18 Years by Family Type and Age	(B09002_008E/ B09002_001E)*100,	2018-2022 Census Tract
Percent of Individuals Receiving Supplemental Security Income	PrcSupSI	Economic, Health and wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	ACS Table B19056: Supplemental Security Income (SSI) in the Past 12 Months for Households	(B19056_002E/ B19056_001E)*100	2018-2022 Census Tract
Percent of Individuals Receiving Social Security Income	PrcSSI	Economic, Health and wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	ACS Table B19055: Social Security Income in the Past 12 Months for Households	(B19055_002E/ B19055_001E)*100	2018-2022 Census Tract
Percent of Individuals Receiving SNAP benefits	PrcSNAP	Economic, Health and wellbeing	Environmental Justice Community definition contains "communities	ACS Table B22010: Receipt of Food Stamps/SNAP in the Past 12 Months by	(B22010_002E/ B22010_001E)*100,	2018-2022 Census Tract

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Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
			experiencing lower incomes".	Disability Status for Households		
Percent of Individuals Receiving Medicare	PrcMedcr	Economic, Health and wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	ACS Table B27010: Types of Health Insurance by Age	((B27010_006E + B27010_022E + B27010_038E + B27010_055E + B27010_066E)/ B27010_001E)*100	2018-2022 Census Tract
Percent of Vacant homes	PrcVct	Economic, Environmental	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B25002: Occupancy Status	(B25002_003E/ B25002_001E)*100,	2018-2022 Census Tract
Percent of Individuals who own their home	PrcHmwnrshp	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B25003: Tenure	(B25003_002E/ B25003_001E)*100,	2018-2022 Census Tract

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Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
Percent of homes built <= the year 1980	PrcHs1980	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B25034: Year Structure Built	$((B25034\_007E + B25034\_008E + B25034\_009E + B25034\_010E + B25034\_011E)/ B25034\_001E)*100$	2018-2022 Census Tract
Percent of households with no Internet	PrcNoIntrt	Customer and system resiliency	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B28002: Presence and Types of Internet Subscriptions in Household	$(B28002\_013E/ B28002\_001E)*100$	2018-2022 Census Tract
Percent of households without running water	PrcNoWtr	Customer and system resiliency, Health and Wellbeing	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B28002: Plumbing Facilities for All Housing Units	$(B25047\_003E/ B25047\_001E)*100$	2018-2022 Census Tract

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Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
Percent of Manufactured Homes	PrcMoblHms	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B25024: Units in Structure	(B25024_010E/ B25024_001E)*100	2018-2022 Census Tract
Percent of Multi-family homes (10 + units)	PrcMltUnt	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B25024: Units in Structure	((B25024_007E + B25024_008E + B25024_009E)/ B25024_001E)*100	2018-2022 Census Tract
Percent of Individuals Employed in Agriculture, Forestry, Fishing, Hunting, and Mining	PrcPsrcDpdnt	Customer and system resiliency, Economic, Environmental, and Energy Equity	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B08126: Means of Transportation to Work by Industry	(B08126_002E/ B08126_001E)*100	2018-2022 Census Tract

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Appendix A. List of Potential Indicators

Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
Percent of Homes Dependent on Bottle, Tank or LP Gas, Fuel oil or Kerosene, Coal or coke, or Wood	PrcAltFuels	Customer and system resiliency, Economic, Environmental, and Energy Equity	Environmental Justice Community definition contains "adversely harmed by environmental and health hazards"	ACS Table B25040: House Heating Fuel	$((B25040\_003E + B25040\_005E + B25040\_006E + B25040\_007E) / B25040\_001E) * 100$	2018-2022 Census Tract
Average Energy Burden	EnrgyBrdn	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	DOE LEAD Tool	N/A	2018-2022 Census Tract
Percent of homes at 0-80 % AMI (i.e., prioritized IRA incentives)	perc_AMI_0_80	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	DOE LEAD Tool	Calculated percentage by dividing the total households in 0-80 .csv by total households in 0-150+ .csv.	2018-2022 Census Tract
Percent of homes at 80-150% AMI (IRA incentive eligibility)	perc_AMI_80_150	Customer and system resiliency, Economic, Environmental, Energy Equity,	Environmental Justice Community definition contains "communities	DOE LEAD Tool	Calculated percentage by dividing the total households in 80-150 .csv by total households in 0-150+ .csv.	2018-2022 Census Tract

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Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
		and Health and Wellbeing	experiencing lower incomes".			
Percent of homes at 150% AMI (IRA incentive eligibility, albeit slightly reduced)	perc_AMI_150	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes".	DOE LEAD Tool	Calculated percentage by dividing the total households in 150+ .csv by total households in 0-150+ .csv.	2018-2022 Census Tract
Binary[10] Categorization for "Disadvantaged Community" and therefore eligible for Justice40 funds, as defined by CEJST.	J40_eligbl	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "communities experiencing lower incomes" and "adversely harmed by environmental and health hazards"	DOE LEAD Tool	N/A	2018-2022 Census Tract
Binary categorization for Rural, as defined by the USDA.	Rural	Customer and system resiliency, Economic, Environmental, Energy Equity,	Environmental Justice Community definition contains "rural communities"	USDA RUCA	Rural (1) classified as codes 4-10, Urban (0) classified as codes 1-3.	2010 Census Tract

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[10] Binary in this case means a column with "1" or "0", where 1 indicates presence of the value (i.e., is eligible for Justice40 funds, or is rural) and 0 indicates no presence.

Appendix A. List of Potential Indicators

Variable Name	Column	Oregon Community Benefits	Oregon EJ Mapping Themes	Source	Processing	Geography
		and Health and Wellbeing				
Binary categorization for remote, as defined by the USDA.	Remote	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "remote communities"	USDA Frontier and Remote (FAR) codes	St_intersect() FAR zip codes with 2024 Census Tract to identify level 4 FAR (1) census tracts and non-FAR census tracts (0).	2010 Zip Code
Binary categorization for coastal communities, as defined by NOAA.	Coastal	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "coastal communities"	NOAA "Defining Coastal Counties" Report	Used list of Shoreline Counties in report to classify (1) coastal census tracts and (0) non-coastal census tracts.	2010 County
Binary categorization for Tribal, as defined	Tribal	Customer and system resiliency, Economic, Environmental, Energy Equity, and Health and Wellbeing	Environmental Justice Community definition contains "Tribal communities"	US Census legal and statistical boundary for American Indian, Alaska Native, and Native Hawaiian entities.	St_intersect() tribal lands boundary with census tracts to identify tribal census tracts (1) and non-tribal (0) census tracts	2018-2022 Census Tract

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