- Understanding Environmental Justice (EJ) areas' opportunities and challenges in energy transformation
  - 1 Motivation and Problem Statement
    - Definition of Environmental Justice (EJ) Area
      - Background

        Ensuring ***equitable access to energy transformation*** for ***low- and moderate-income (LMI) communities*** will require a detailed understanding of the specific ***challenges and opportunities of clean energy deployment*** in these areas.

        Electric transportation, high-efficiency home heating, energy efficiency, and distributed energy resources may face ***barriers to adoption*** that limit ***customers in these communities*** from ***sharing the value of these options an…***

        - Action under the Background

          Therefore, it is important to ***understand the barriers*** and ***explore opportunities*** for ***underserved communities in the earlier stage of energy transformation***.

      - 1.1 Statement
        - Problem 1

          Utilizing the ***Pennsylvania Department of Environmental Protection's (PA DEP)*** definition of an Environmental Justice (EJ) area, ***can a representative EJ area in the Philadelphia region*** be selected for a ***case study to examine barriers and opportunities to deployment of EV, clean and efficient home heating systems, "whole home" energy efficiency measures, and distributed energy resources***?

          - Actions under the Problems

            Discuss if the ***selected EJ area is representative of Greater Philadelphia region***, and if ***these barriers differ between urban and non-urban EJ areas***.

            Problem 2

            Old Representative Criteria
        - Problem 2

          Can ***recommendations*** be developed to remove ***barriers to adoption*** that are ***actionable by utilities and/or local/state/local government***?

          Actions under the Problems
      - 1.2 Considerations
        - New Criteria

          The ***Pennsylvania Deparment of Environmental Production*** enacted a ***new policy*** to determine the Energy Justice Communities in Pennsylvania on September 16, 2023.

          The new policy, and the tools illustrating its use, ***override the old criteria*** of ***selecting Census tract or Census block group where 20 percent or more individuals live at or below the federal poverty line, and/or 30 percent…***

          New Criteria Source

          - Action under the New Criteria

            We ***first*** summarize the ***current methodology*** for ***determining the Energy Justice Communities in Pennsylvania***.

            2 Energy Justice Communities, New Policies

            Then, we discuss programs ***available in the PPL and PECO service territories***, as well as programs ***from utiliti…***

            3 Programs in Eastern Pennsylvania

            We ***end*** with a ***summary*** of ***ongoing work*** in the area, including the ***outline of a methodology*** to select a ***representative*** EJ community, given the ***old*** EJ criteria.

            4 Ongoing Work
  - 2 Energy Justice Communities, New Policies

    Action under the New Criteria

    - Summary of Cons and Diffs for Different Tools

      Indicators related to Pollution

      Indicators related to Population

      Tribes

      Workforce Development

      Water and Wastewater

      Transportation

      Legacy Pollution

      Housing

      Health

      Energy

      Climate Change

      Low Income

      Environmental Indicator

      Demographic (Socioeconomic) Indicator

Purpose of Section 2

In this ***section*** we summarize the ***new methodology to determine EJ*** communities.

New Representative Criteria

- New Criteria Source

  The ***full*** documentation is available at [***PADEP, 2023***]

  New Criteria

  References

PennEnviroScreen (DEP)

Purpose of the PennEnviroScreen

The purpose of the ***PennEnviroScreen*** tool is primarily to ***implement Energy Justice (EJ) policy***.

The screen tool indicates ***if EJ policy should apply***, and it is updated on an ***annual*** basis.

- EJ Policy

  In this context EJ policy relates to permit ***applications***, ***inspections***, ***grants*** and ***enforcement*** actions.

Used Units

The tool uses ***census block group geographic resolution***.

- As Smallest

  This is the ***Smallest geographic unit*** the ***U.S. Census Bureau*** publishes.

Advanced Risk Codification Model

Many EJ tools use a **more complexified version** to codify: $\operatorname{Risk} = \operatorname{Threat} \times \operatorname{Vulnerability}$

In the context, the above codification is: $\operatorname{Risk} = \operatorname{Pollution\ Burden} \times \operatorname{Population\ Characteristics}$

2 Categories Contained

The model has two broad categories: Pollution Burden and Population Characteristics.

Pollution Burden

- Environmental Exposure

  (a) ***Environmental Exposure***: ***measure magnitude*** of ***exposure levels*** or ***proxies for pollution***

  Chemical Pollution

- Environmental Effects

  (b) ***Environmental Effects***: ***adverse environmental conditions caused by pollution*** that is ***proximity-based***

  Living Environment

Population Characteristics

- Sensitive Populations

  (a) ***Sensitive Populations***: ***Population health characteristics*** that result in ***increased vulnerability to environmental threats*** that may be ***caused by or increase adverse effects***

  Health

- Socioeconomic Populations

  (b) ***Socioeconomic Populations***: ***Population-level demographic characteristics*** associated with ***impacts from pollution***, which can affect the communities' ability to ***prevent adverse effects of environmental threats*** (e.g., ***race, poverty, unemployment***)

  Economy

Components Contained by Each Category

Within those two categories, there are the following ***components***.

Used indicators in Table 1 and 2

Tables 1 and 2 summarize the indicators used.

Table 1: Indicators, Pollution related

#	Indicators	Category	Component
1	Ozone	Pollution Burden	Environmental Exposure
2	Fine $<$ Pm 2.5	Pollution Burden or Population Characteristic	Environmental Exposure
3	Diesel Particulate Matter	Pollution Burden or Population Characteristic	Environmental Exposure
4	Toxic Air Emissions	Pollution Burden or Population Characteristic	Environmental Exposure
5	Pesticides	Pollution Burden or Population Characteristic	Environmental Exposure
6	Traffic Density	Pollution Burden or Population Characteristic	Environmental Exposure
7	Compressor Stations	Pollution Burden or Population Characteristic	Environmental Exposure
8	Children's Lead Risk	Pollution Burden	Environmental Exposure
9	Oil Gas Locations (Conventional Wells)	Pollution Burden	Environmental Exposure
10	Oil Gas Locations (Unconventional Wells)	Pollution Burden	Environmental Effects
11	Proximity to Railroads	Pollution Burden	Environmental Effects
12	Land Remediation	Pollution Burden	Environmental Effects
13	Hazardous Waste and Storage Sites	Pollution Burden	Environmental Effects
14	Municipal Waste Sites	Pollution Burden	Environmental Effects
15	Coal Mining	Pollution Burden	Environmental Effects
16	Impaired lakes and streams	Pollution Burden	Environmental Effects
17	Abandoned Mining Concerns	Pollution Burden	Environmental Effects
18	Flood Risk	Pollution Burden	Environmental Effects
19	Asthma	Pollution Burden	Environmental Effects

Table 2: Indicators, Population related

#	Indicators	Category	Component
20	No Health Insurance	Population Characteristic	Sensitive Population
21	Cancer	Population Characteristic	Sensitive Population
22	Disability	Population Characteristic	Sensitive Population
23	Heart Disease	Population Characteristic	Sensitive Population
24	Socioeconomic Population	Population Characteristic	Sensitive Population
25	Low Educational Attainment	Population Characteristic	Socio-Economic Population
26	Linguistic Isolation	Population Characteristic	Socio-Economic Population
27	Housing -Burdened Low-Income Households	Population Characteristic	Socio-Economic Population
28	Poverty	Population Characteristic	Socio-Economic Population
29	Unemployment	Population Characteristic	Socio-Economic Population
30	Race	Population Characteristic	Socio-Economic Population
31	Age over 64	Population Characteristic	Socio-Economic Population
32	Age under 5	Population Characteristic	Socio-Economic Population

- Spreadsheet with all Indicators and Sources of Data

  In [***Lamadrid and Simons, 2023***] we provide a spreadsheet with all indicators and sources of data.

  References

EJScreen (EPA)

- EJ Area Determination

  In past screening experience, EPA has found it helpful to establish a **suggested Agency starting point** for the purpose of **identifying geographic areas that may warrant further consideration, analysis, or outreach**. The use of an **initial filter** promotes consistency and provides a pragmatic **first step** for EPA programs and regions when interpreting screening results. For early applications of EJScreen, EPA identified the **80th percentile** filter as that **initial starting point**. In other words, an area with **any** of the **13 EJ Indexes** **at or above** the **80th** **(national rather than states')** percentile should be considered as a **potential candidate for further review**. **Further review** may include considering other factors and other sources of information such as **health-based information, local knowledge, proximity and exposure to environmental hazards, susceptible populations, unique exposure pathways, and other federal, regional, state, and local data**. The initial filter is **simply** a starting point, and **program offices and regions** should perform **(empirical) additional analysis** before making any decisions about potential environmental justice issues. As EPA gains further experience and insight into the performance of the tool and its applicability for different uses, program offices and regions may opt to designate starting points that are more **inclusive or specifically tailored** to meet programmatic needs more effectively.
  The 80th percentile filter in EJScreen is **not** intended to designate an area as an "EJ community." EJScreen provides screening level indicators, **not** a determination of the existence or absence of EJ concerns. The Agency may **revise** this approach in the future based on **experience**.

Calculation of the Indexes

EJ Index Calculation

$\operatorname{EJ \, Index} = \operatorname{The \, Environmental \, Indicator \, \mathbf{Percentile}} \times \\
\operatorname{Demographic \, Index \, for \, Block Group}$
Where $
\operatorname{EJ \, Index} \in \{ \\
\quad \operatorname{Particulate \, Matter \, 2.5}, \\
\quad \operatorname{Ozone}, \\
\quad \operatorname{Nitrogen \, Dioxide}, \\
\quad \operatorname{Diesel \, Particulate \, Matter}, \\
\quad \operatorname{Toxic \, Releases \, to \, Air}, \\
\quad \operatorname{Traffic \, Proximity}, \\
\quad \operatorname{Lead \, Paint}, \\
\quad \operatorname{Superfund \, Proximity}, \\
\quad \operatorname{RMP \, Facility \, Proximity}, \\
\quad \operatorname{Hazardous \, Waste \, Proximity}, \\
\quad \operatorname{Underground \, Storage \, Tanks}, \\
\quad \operatorname{Wastewater \, Discharge}, \\
\quad \operatorname{Drinking \, Water \, Non-Compliance} \\
\}$, which reflects 13 environmental indicators
$\operatorname{The \, Environmental \, Indicator} \in \{ \\
\quad \operatorname{The \, Indicator \, of \, Particulate \, Matter \, 2.5}, \\
\quad \operatorname{The \, Indicator \, of \, Ozone}, \\
\quad \operatorname{The \, Indicator \, of \, Nitrogen \, Dioxide}, \\
\quad \operatorname{The \, Indicator \, of \, Diesel \, Particulate \, Matter}, \\
\quad \operatorname{The \, Indicator \, of \, Toxic \, Releases \, to \, Air}, \\
\quad \operatorname{The \, Indicator \, of \, Traffic \, Proximity}, \\
\quad \operatorname{The \, Indicator \, of \, Lead \, Paint}, \\
\quad \operatorname{The \, Indicator \, of \, Superfund \, Proximity}, \\
\quad \operatorname{The \, Indicator \, of \, RMP \, Facility \, Proximity}, \\
\quad \operatorname{The \, Indicator \, of \, Hazardous \, Waste \, Proximity}, \\
\quad \operatorname{The \, Indicator \, of \, Underground \, Storage \, Tanks}, \\
\quad \operatorname{The \, Indicator \, of \, Wastewater \, Discharge}, \\
\quad \operatorname{The \, Indicator \, of \, Drinking \, Water \, Non-Compliance} \\
\}$,
$\operatorname{Demographic \, Indicator \, for \, Block \, Group} = \frac{1}{2}(\operatorname{The \, People \, of \, Color \, Share} + \\
\operatorname{The \, Low-Income \, Share})$.

Demographic (Socioeconomic) Indicator

Calculation of the Indexes

Environmental Indicator

- Environmental Indicator

Key Medium	Indicator	Details	Source	Data Year
Air	Particulate matter 2.5 (PM 2.5)	Annual average PM2.5 levels in air	EPA's Office of Air and Radiation, fusion of modeled and monitored data	2020
Air	Ozone	Average of the annual top ten daily maximum 8-hour ozone concentrations in air	EPA's Office of Air and Radiation, fusion of modeled and monitored data	2020
Air	Nitrogen Dioxide (NO2)	Average annual nitrogen dioxide (NO2) levels expressed as part per billion (by volume).	NASA's Health and Air Quality Applied Sciences Team (HAQAST)	2020
Air	Diesel particulate matter	Diesel particulate matter level in air	EPA Hazardous Air Pollutants	2020
Air	Toxic Releases to Air	RSEI modeled toxicity-weighted concentrations in air of TRI listed chemicals.	Calculated from 2021 Risk-Screening Environmental Indicators (RSEI) Geographic Microdata results for the air pathway, retrieved 5/16/2023	2021
Air/other	Traffic proximity and volume	Count of vehicles (AADT, avg. annual daily traffic) at major roads within 500 meters, divided by distance in meters (not km)	Calculated from 2020 U.S. Department of Transportation traffic data, retrieved 1/19/2023	2020
Dust/ lead paint	Lead paint	Percent of housing units built pre-1960, as indicator of potential lead paint exposure	Calculated based on Census/ American Community Survey (ACS) data, retrieved 12/16/2023	2018-2022
Waste/ air/ water	Superfund proximity	Count of proposed or listed NPL - also known as superfund - sites within 5 km (or nearest one within 10 km), each divided by distance in kilometers	Calculated from EPA Superfund NPL boundaries and site (Final and Proposed) plus Superfund Alternative Approach (SAA) boundaries and sites 2/26/2024	2024
Waste/ air/ water	Risk management plan (RMP) facility proximity	Count of RMP (potential chemical accident management plan) facilities within 5 km (or nearest one within 10 km), each divided by distance in kilometers	Calculated from EPA RMP database, retrieved 2/26/2024	2024
Waste/ air/ water	Hazardous waste proximity	Count of hazardous waste facilities (TSDFs and LQGs) within 5 km (or nearest within 10 km), each divided by distance in kilometers	TSDF data calculated from EPA RCRAInfo database, retrieved 1/31/2024	2024
Waste/ air/ water	Underground storage tanks (UST) and leaking UST (LUST)	Count of LUSTs (multiplied by a factor of 7.7) and the number of USTs within a 1,500-foot buffered block group	Calculated from EPA UST Finder, retrieved 2/2/2023	2023
Water	Wastewater discharge	RSEI modeled toxic concentrations at stream segments within 500 meters, divided by distance in kilometers (km)	Calculated from RSEI modeled toxic concentrations to stream reach segments, created 12/27/2023	2021
Water	Drinking water non-compliance	Score based on number of Safe Drinking Water Act violations not returned to compliance that community water systems have received over the past five years; violations are weighted based on age and severity	Calculated from Safe Drinking Water Information System (2023 quarter 4 data) and Safe Drinking Water Act Public Water System Supervision Program's Enforcement Response Policy	2023

#Indicator #Catergory

EJ Index Calculation

Supplemental Index Calculation

See Details in [EJScreen Technica](https://www.epa.gov/system/files/documents/2024-07/ejscreen-tech-doc-version-2-3.)

- Demographic (Socioeconomic) Indicator

1. People of color:
* The percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial.
2. Low-income:
* The percent of a block group's population in households where the household income is less than or equal to twice the federal "poverty level."
3. Unemployment rate:
* The percent of a block group's population that did not have a job at all during the reporting period, made at least one specific active effort to find a job during the prior 4 weeks, and were available for work (unless temporarily ill).
4. Limited English speaking:
* Percent of people in a block group living in limited English speaking households. A household in which all members age 14 years and over speak a non-English language and also speak English less than "very well" (have difficulty with English) is limited English speaking.
5. Less than high school education:
* Percent of people age 25 or older in a block group whose education is short of a high school diploma.
6. Under age 5:
* Percent of people in a block group under the age of 5.
7. Over age 64:
* Percent of people in a block group over the age of 64.

#Indicator #Catergory

EJ Index Calculation

Supplemental Index Calculation

See Details in [EJScreen Technica](https://www.epa.gov/system/files/documents/2024-07/ejscreen-tech-doc-version-2-3.)

- Supplemental Index Calculation

  $\operatorname{Supplemental \, Index} = \operatorname{The \, Environmental \, Indicator \, \mathbf{Percentile}}
  \times \\
  \operatorname{Supplemental \, Demographic \, Index \, for \, Block \, Group}$
  Where $
  \operatorname{Supplemental \, Index} \in \{ \\
  \quad \operatorname{Particulate \, Matter \, 2.5}, \\
  \quad \operatorname{Ozone}, \\
  \quad \operatorname{Nitrogen \, Dioxide}, \\
  \quad \operatorname{Diesel \, Particulate \, Matter}, \\
  \quad \operatorname{Toxic \, Releases \, to \, Air}, \\
  \quad \operatorname{Traffic \, Proximity}, \\
  \quad \operatorname{Lead \, Paint}, \\
  \quad \operatorname{Superfund \, Proximity}, \\
  \quad \operatorname{RMP \, Facility \, Proximity}, \\
  \quad \operatorname{Hazardous \, Waste \, Proximity}, \\
  \quad \operatorname{Underground \, Storage \, Tanks}, \\
  \quad \operatorname{Wastewater \, Discharge}, \\
  \quad \operatorname{Drinking \, Water \, Non-Compliance} \\
  \}$, which reflects 13 environmental indicators
  $\operatorname{The \, Environmental \, Indicator} \in \{ \\
  \quad \operatorname{The \, Indicator \, of \, Particulate \, Matter \, 2.5}, \\
  \quad \operatorname{The \, Indicator \, of \, Ozone}, \\
  \quad \operatorname{The \, Indicator \, of \, Nitrogen \, Dioxide}, \\
  \quad \operatorname{The \, Indicator \, of \, Diesel \, Particulate \, Matter}, \\
  \quad \operatorname{The \, Indicator \, of \, Toxic \, Releases \, to \, Air}, \\
  \quad \operatorname{The \, Indicator \, of \, Traffic \, Proximity}, \\
  \quad \operatorname{The \, Indicator \, of \, Lead \, Paint}, \\
  \quad \operatorname{The \, Indicator \, of \, Superfund \, Proximity}, \\
  \quad \operatorname{The \, Indicator \, of \, RMP \, Facility \, Proximity}, \\
  \quad \operatorname{The \, Indicator \, of \, Hazardous \, Waste \, Proximity}, \\
  \quad \operatorname{The \, Indicator \, of \, Underground \, Storage \, Tanks}, \\
  \quad \operatorname{The \, Indicator \, of \, Wastewater \, Discharge}, \\
  \quad \operatorname{The \, Indicator \, of \, Drinking \, Water \, Non-Compliance} \\
  \}$,
  $\operatorname{Supplemental \, Demographic \, Indicator \, for \, Block \, Group} \\
  = \frac{1}{5}(\\
  \quad \operatorname{The \, Low-Income \, Share} + \\
  \quad \operatorname{Persons \, with \, Disabilities \, Share} + \\
  \quad \operatorname{Limited \, English \, Speaking \, Share} + \\
  \quad \operatorname{Less \, than \, High \, School \, Education \, Share} + \\
  \quad \operatorname{Low \, Life \, Expectancy} \\
)$.

  Demographic (Socioeconomic) Indicator

  Environmental Indicator

- Unit

  The standard unit of analysis in EJScreen is the Census "**block group**." (rather than **census traits** which **contains** block group) A block group is an area defined by the Census Bureau that usually has in the range of 600-3,000 people living in it. The US is divided into more than 230,000 block groups. Block group resolution is the finest level of detail that Census data can be publicly shared.

- Buffer

  EJScreen utilizes "buffers" to identify an area on the map that includes everyone who lives within a certain distance of a point, line, or polygon. A point might be a factory seeking an emissions permit, for example, and the report could focus on the demographics and environmental conditions within approximately 1 mile of that factory.
  In EJScreen, buffers can be drawn up to **10 miles around** a point, line, or polygon. If you have selected a geographic point, the tool will apply a buffer around that point. The buffer ring will **aggregate** appropriate portions of the **intersecting block groups**, **weighted by population**, to create a representative set of data for the **entire** ring area, honoring variation and dispersion of the population in the **block groups within it**. **For each indicator, the result is a population-weighted average, which equals the indicator values of the block groups inside the buffer, averaged over all residents in the block groups who are estimated to be inside the buffer.**
  "Percentiles" are an important part of EJScreen. **Every** indicator in EJScreen is put into perspective by showing its associated **percentiles**.

CEJST (White House)

Criteria

Census tracts are considered disadvantaged if they:
* $\forall \text{burden category} \in \text{burden catergories} \colon \\ \operatorname{Meet}(\text{census tracts}, \operatorname{threshold}(\text{burden catergory}))$

* Are on lands within the boundaries of Federal Recognized Tribes.

Burden Categories and their Thresholds

- Low Income

  * **Definition**: Percent of a **census tract's** population in households where household income is at or below **200%** of the **Federal poverty level**, **not** including **students** enrolled in **higher education**.
  * **Calculation**: As above
  * **Used in**: Climate change category
  * **Responsible party**: First Street Foundation
  * **Source**: [American Community Survey](https://www.census.gov/programs-surveys/acs) from 2022
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

  Energy

  Climate Change

  Health

  Housing

  Legacy Pollution

  Workforce Development

Climate Change

Census tracts are at or above the **90th** percentile for expected agriculture loss rate **OR** expected building loss rate **OR** expected population loss rate **OR** projected flood risk **OR** projected wildfire risk
AND are at or above the **65th** percentile for low income

#Catergory

Low Income

Expected Annual Loss (EAL) (for each consequence for each hazard, flow)

* **Definition**:
$\text{EAL} := \text{Exposure} \cdot \text{Annualized Frequency} \cdot \text{Historic Loss Ratio}$
where:
* EAL: **Expected Annual Loss**, the average economic loss in **dollars** resulting from i hazards each year.
* **$\text{Exposure} := \text{VaR}$**: **Value at Risk**, a __, natural hazard consequence factor__ that is the representative value of building, population, or agricultural potentially exposed to a **natural hazard occurrence (NHO)**.
* **$\text{Annualized Frequency} := \hat{p}_L = \hat{\mathbb{P}}(NHO)$**: A __natural hazard incidence factor__ that represents the expected frequency or probability of a **natural hazard occurrence** per year.
* **$\text{Historic Loss Ratio} = \hat{L}$**: A __natural hazard consequence factor__ that represents the estimated percentage of the exposed building value, population, or agriculture value expected to be lost due to a **natural hazard occurrence**.

Properties of EAL

- EAL Score (for all consequences for each hazard, quantile)

  1. To generate the relative hazard type Expected Annual Loss scores, the Expected Annual Loss values for **each** of the three consequence types-building, population equivalence, and agriculture-are summed to represent the **total** Expected Annual Loss for each **hazard type** in each community
  2. and are then ranked across communities of the **same type**.
  3. Each community's Expected Annual Loss score is then determined based on its rank **nationally**.
  4. A **composite** Expected Annual Loss score measures the national rank of total Expected Annual Loss of a community considering **all** 18 natural hazards, while a **hazard type** Expected Annual Loss score measures the national rank or percentile of Expected Annual Loss of a community from **that** hazard.

EAL Rate (for each consequences for all hazards, ratio)

* **Definition**: Expected Annual Loss Rate is defined as the proportion of the total value expected to be lost annually for a given community. Expected Annual Loss Rate is calculated **separately for building, population, and agriculture consequence types** for **all** 18 natural hazard types (individually and composite).

- Details

  [National Risk Index Technical Documentation.](https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf#page143)

- Expected Agriculture Loss Rate

  * **Definition**: Expected agricultural value at risk from losses due to fourteen types of natural hazards. These hazards have some link to climate change. They are: avalanche, coastal flooding, cold wave, drought, hail, heat wave, hurricane, ice storm, landslide, riverine flooding, strong wind, tornado, wildfire, and winter weather.
  * **Calculation**: The rate is calculated by dividing the agriculture __*~~VaR~~ EAL*__ by the total building value.
  * **Used in**: Climate change category
  * **Responsible party**: Federal Emergency Management Agency (FEMA)
  * **Source**: [National Risk Index](https://hazards.fema.gov/nri/expected-annual-loss) from 2014 to 2021
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- Expected Building Loss Rate

  * **Definition**: Expected building value at risk from losses due to fourteen types of natural hazards. These hazards have some link to climate change. They are: avalanche, coastal flooding, cold wave, drought, hail, heat wave, hurricane, ice storm, landslide, riverine flooding, strong wind, tornado, wildfire, and winter weather.
  * **Calculation**: The rate is calculated by dividing the building __*~~VaR~~ EAL*__ by the total building value.
  * **Used in**: Climate change category
  * **Responsible party**: Federal Emergency Management Agency (FEMA)
  * **Source**: [National Risk Index](https://hazards.fema.gov/nri/expected-annual-loss) from 2014 to 2021
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- Expected Population Loss Rate

  * **Definition**: Expected fatalities and injuries due to fourteen types of natural hazards each year. These hazards have some link to climate change. They are: **avalanche, coastal flooding, cold wave, drought, hail, heat wave, hurricane, ice storm, landslide, riverine flooding, strong wind, tornado, wildfire, and winter weather**. Population loss is defined by the Spatial Hazard Events and Losses and National Centers for Environmental Information's (NCEI).
  * **Calculation**: It reports the **number of fatalities and injuries caused by the hazard. An injury is counted as one-tenth (1/10) of a fatality**. The NCEI Storm Events Database classifies both **direct and indirect** injuries. Both types are counted as **population loss**. The total number is divided by the **population** in the census tract to get the population loss rate..
  * **Used in**: Climate change category
  * **Responsible party**: Federal Emergency Management Agency (FEMA)
  * **Source**: [National Risk Index](https://hazards.fema.gov/nri/expected-annual-loss) from 2014 to 2021
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- Projected Flood Risks

  * **Definition**: A high precision, climate-adjusted model that projects flood risk for properties in the future. The dataset calculates how many **properties** are at **risk** of **floods** occurring in the **next thirty** years from **tides, rain, riverine and storm surges**. The **risk** is defined as an **annualized** 1% chance or a **26%** chance total over the **30-year** time horizon. The risk does **not** consider **property value**. The tool calculates **tract-level risk** as the **share** of properties meeting the **risk threshold**.
  * **Calculation**: Model
  * **Used in**: Climate change category
  * **Responsible party**: First Street Foundation
  * **Source**: [Climate Risk Data Access](https://firststreet.org/documentation) from 2022
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- Projected Wildfire Risk

  * **Definition**: A 30-meter resolution model projecting the wildfire exposure for **any specific location** in the contiguous U.S., **today** and with **future** climate change. The **risk** of wildfire is calculated from **inputs** associated with **fire fuels, weather, human influence, and fire movement**. The **risk** does not consider **property value**.
  * **Calculation**: Model
  * **Used in**: Climate change category
  * **Responsible party**: First Street Foundation
  * **Source**: [Climate Risk Data Access](https://firststreet.org/documentation) from 2022
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

Energy

Communities are identified as disadvantaged if they are in census tracts that:
ARE at or above the **90th** percentile for energy cost **OR** PM2.5 in the air
AND are at or above the **65th** percentile for low income

#Catergory

Low Income

- Energy Cost

  * **Definition**: **Average** household **annual** energy cost in dollars divided by the **average** household **income**.
  * **Calculation**: As above
  * **Used in**: Energy category
  * **Responsible party**: Department of Energy (DOE)
  * **Source**: [LEAD Tool](https://www.energy.gov/scep/low-income-energy-affordability-data-lead-tool-and-community-energy-solutions) from 2018
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- PM2.5 in the Air

  * **Definition**: **Average** household **annual** energy cost in dollars divided by the **average** household **income**.
  * **Calculation**: As above
  * **Used in**: Energy category
  * **Responsible party**: Department of Energy (DOE)
  * **Source**: [LEAD Tool](https://www.energy.gov/scep/low-income-energy-affordability-data-lead-tool-and-community-energy-solutions) from 2018
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

Health

Communities are identified as disadvantaged if they are in census tracts that:
ARE at or above the **90th** percentile for asthma **OR** diabetes **OR** heart disease **OR** low life expectancy
AND are at or above the **65th** percentile for low income

#Catergory

Low Income

- Asthma

  * **Definition**: Share of people who answer “yes” to both of these **questions**: “Have you ever been told by a health professional that you have asthma?” and “Do you still have asthma?”.
  * **Calculation**: As above
  * **Used in**: Health category
  * **Responsible party**: Centers for Disease Control and Prevention (CDC)
  * **Source**: [PLACES data](https://www.cdc.gov/places/index.html) from 2016-2019
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- Diabetes

  * **Definition**: Share of people ages **18 years** and **older** who have been told by a **health professional** that they have diabetes other than **diabetes during pregnancy**.
  * **Calculation**: As above
  * **Used in**: Health category
  * **Responsible party**: Centers for Disease Control and Prevention (CDC)
  * **Source**: [PLACES data](https://www.cdc.gov/places/index.html) from 2016-2019
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- Heart Disease

  * **Definition**: Share of people ages **18 years** and **older** who have been told by a **health professional** that they had angina or coronary heart disease.
  * **Calculation**: As above
  * **Used in**: Health category
  * **Responsible party**: Centers for Disease Control and Prevention (CDC)
  * **Source**: [PLACES data](https://www.cdc.gov/places/index.html) from 2016-2019
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

- Low Life Expectancy

  * **Definition**: **Average** number of years people have **left** in their lives. The tool reverses the **percentiles** for this burden. This means that census tracts with **lower** numbers have **higher** life expectancies and that census tracts with **higher** numbers have **lower** life expectancies.
  * **Calculation**: As above
  * **Used in**: Health category
  * **Responsible party**: Centers for Disease Control and Prevention (CDC)
  * **Source**: [U.S. Small-Area Life Expectancy Estimates Project (USALEEP)](https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html#data) from 2010-2015
  * **Available for**: All U.S. states and the District of Columbia

  #Indicator

Housing

Communities are identified as disadvantaged if they are in census tracts that:
Experienced historic underinvestment **OR** are at or above the **90th** percentile for housing cost **OR** lack of green space **OR** lack of indoor plumbing **OR** lead paint
AND are at or above the **65th** percentile for low income

#Catergory

Low Income

- Historic Underinvestment

  * **Definition**: Census tracts that experienced **historic underinvestment** based on **redlining maps** created by the federal government's **Home Owners' Loan Corporation (HOLC)** between **1935** and **1940**. The tool uses the **National Community Reinvestment Coalition's methodology** for converting **boundaries** in the HOLC maps to **census tracts**. Census tracts meet the threshold when they have a score of **3.25** or **more** out of **4**. The historic underinvestment burden is **not** available for **tracts** that were not included in the original **HOLC maps** because there is no underlying data.
  * **Calculation**: National Community Reinvestment Coalition's methodology
  * **Used in**: Housing category
  * **Responsible party**: National Community Reinvestment Coalition (NCRC)
  * **Source**: [Dataset of formerly redlined areas](https://www.openicpsr.org/openicpsr/project/141121/version/V2/view) using digitized maps from the Home Owners Loan Corporation (HOLC), using 2010 census boundaries
  * **Available for**: Metro areas of U.S. that were graded by the Home Owners' Loan Corporation

- Housing Cost

  * **Definition**: Share of households that are both earning **less than 80%** of **Housing and Urban Development's Area Median Family Income** **and** are spending **more than 30%** of their income on **housing costs**.
  * **Calculation**: As above
  * **Used in**: Housing category
  * **Responsible party**: Department of Housing and Urban Development (HUD)
  * **Source**: [Comprehensive Housing Affordability Strategy dataset](https://www.huduser.gov/portal/datasets/cp.html) from 2014-2018
  * **Available for**: All U.S. states, the District of Columbia, and Puerto Rico

  #Indicator

- Lack of Green Space

  * **Definition**: Share of land with **developed surfaces** covered with **artificial materials** like concrete or pavement, excluding **crop land used for agricultural purposes**. Places that lack green space are also known as **nature-deprived**.
  * **Calculation**: As above
  * **Used in**: Housing category
  * **Responsible party**: [Multi-Resolution Land Characteristics (MRLC) consortium](https://www.mrlc.gov/about); data analysis provided by [The Trust for Public Lands](https://www.tpl.org/) and [American Forests](https://www.americanforests.org/)
  * **Source**: [Percent Developed Imperviousness](https://www.mrlc.gov/data/nlcd-2019-percent-developed-imperviousness-conus) (CONUS) from 2019
  * **Available for**: All contiguous U.S. states and the District of Columbia

  #Indicator

- Lack of Indoor Plumbing

  * **Definition**: Housing without **indoor kitchen facilities** or **complete plumbing facilities**.
  * **Calculation**: As above
  * **Used in**: Housing category
  * **Responsible party**: Department of Housing and Urban Development (HUD)
  * **Source**: [Comprehensive Housing Affordability Strategy dataset](https://www.huduser.gov/portal/datasets/cp.html) from 2014-2018
  * **Available for**: All U.S. states, the District of Columbia, and Puerto Rico

  #Indicator

- Lead Paint

  * **Definition**: Share of homes built before **1960**, which indicates **potential lead paint exposure**. Tracts with **extremely high** home values (i.e. **median home values of the tract** above the **90th percentile of the nation**) that are **less likely** to face health risks from lead paint exposure are not included.
  * **Calculation**: As above
  * **Used in**: Housing category
  * **Responsible party**: U.S. Census
  * **Source**: [American Community Survey](https://www.census.gov/programs-surveys/acs) from 2015-2019
  * **Available for**: All U.S. states, the District of Columbia, and Puerto Rico

  #Indicator

- Legacy Pollution

  Communities are identified as disadvantaged if they are in census tracts that:
  Have at **least one** abandoned mine land **OR** Formerly Used Defense Sites **OR** are at or above the **90th** percentile for proximity to hazardous waste facilities **OR** proximity to Superfund sites (National Priorities List (NPL)) **OR** proximity to Risk Management Plan (RMP) facilities
  AND are at or above the 65th percentile for low income

  #Catergory
  Low Income

- Abandoned Mine Land

  * **Definition**: **Presence (Number)** of an abandoned mine left by **legacy coal mining operations**.
  * **Calculation**: As above
  * **Used in**: Legacy pollution category
  * **Responsible party**: Department of the Interior (DOI)
  * **Source**: [Abandoned Mine Land Inventory System (e-AMLIS)](https://www.osmre.gov/programs/e-amlis) from 2017
  * **Available for**: All U.S. states, the District of Columbia

- Formerly Used Defense Sites

  * **Definition**: **Presence (Number)** of Properties that were **owned, leased, or possessed** by the **United States**, under the **jurisdiction of the Secretary of Defense** prior to **October 1986**.
  * **Calculation**: As above
  * **Used in**: Legacy pollution category
  * **Responsible party**: U.S. Army Corps of Engineers
  * **Source**: [Formerly Used Defense Sites (FUDS)](https://www.usace.army.mil/Missions/Environmental/Formerly-Used-Defense-Sites/) from 2019 Available for: All U.S. states and the District of Columbia
  * **Available for**: All U.S. states, the District of Columbia

- Proximity to Hazardous Waste Facilities

  * **Definition**: **Number** of hazardous waste facilities **(Treatment, Storage, and Disposal Facilities and Large Quantity Generators)** within **5 kilometers (or nearest beyond 5 kilometers)**, each divided by **distance in kilometers**.
  * **Calculation**: As above
  * **Used in**: Legacy pollution category
  * **Responsible party**: Environmental Protection Agency (EPA)
  * **Source**: [Treatment, Storage, and Disposal Facilities (TSDF) data](https://enviro.epa.gov/envirofacts/rcrainfo/search) from 2020 calculated from EPA's RCRA database as compiled by EPA's EJScreen
  * **Available for**: All U.S. states, the District of Columbia , and Puerto Rico

  #Indicator

- Proximity to Superfund Sites

  * **Definition**: **Number** of **proposed** or **listed Superfund** or **National Priorities list (NPL) sites** within **5 kilometers (or nearest one beyond 5 kilometers)**, each divided by **distance in kilometers**.
  * **Calculation**: As above
  * **Used in**: Legacy pollution category
  * **Responsible party**: Environmental Protection Agency (EPA)
  * **Source**: [CERCLIS database](https://cumulis.epa.gov/supercpad/cursites/srchsites.cfm) from 2020 as compiled by EPA’s EJScreen
  * **Available for**: All U.S. states, the District of Columbia , and Puerto Rico

  #Indicator

- Proximity to Risk Management Plan (RMP) Facilities

  * **Definition**: **Count** of **Risk Management Plan (RMP) facilities** within **5 kilometers (or nearest one beyond 5 kilometers)**, each divided by **distance in kilometers**. These facilities are mandated by the **Clean Air Act** to file RMPs because they handle substances with significant **environmental** and **public health risks**.
  * **Calculation**: As above
  * **Used in**: Legacy pollution category
  * **Responsible party**: Environmental Protection Agency (EPA)
  * **Source**: Source: [RMP database](https://www.epa.gov/ejscreen/download-ejscreen-data) from 2020 as compiled by EPA’s EJScreen
  * **Available for**: All U.S. states, the District of Columbia , and Puerto Rico

  #Indicator

- Transportation

  Communities are identified as disadvantaged if they are in census tracts that:
  ARE at or above the **90th** percentile for diesel particulate matter exposure **OR** transportation barriers **OR** traffic proximity and volume
  AND are at or above the **65th** percentile for low income

  #Catergory

  - Diesel Particulate Matter Exposure

    * **Definition**: (**Number of**) Mixture of particles in **diesel exhaust** in the air, measured as **micrograms** **per cubic meter**.
    * **Calculation**: As above
    * **Used in**: Transportation category
    * **Responsible party**: Environmental Protection Agency (EPA)
    * **Source**: Source: [National Air Toxics Assessment (NATA)](https://www.epa.gov/ejscreen/download-ejscreen-data) from 2014 as compiled by EPA's EJScreen
    * **Available for**: All U.S. states, the District of Columbia , and Puerto Rico

    #Indicator

Transportation Barriers

* **Definition**: **Average relative cost** and **time** spent on **transportation** relative to (**divided by**) **all other tracts**. This burden only applies for census tracts with populations greater than **20** people.
* **Calculation**: As above
* **Used in**: Transportation category
* **Responsible party**: Department of Transportation (DOT)
* **Source**: [Transportation access disadvantage](https://www.transportation.gov/equity-Justice40#:~:text=Transportation%20access%20disadvantage%20identifies%20communities%20and%20places%20that%20spend%20more%2C%20and%20take%20longer%2C%20to%20get%20where%20they%20need%20to%20go.%20(4)) from 2022
* **Available for**: All U.S. states, the District of Columbia

Traffic Proximity and Volume

* **Definition**: **Number** of vehicles **(average annual daily traffic)** at **major roads** within **500 meters**, divided by **distance in meters**.
* **Calculation**: As above
* **Used in**: Transportation category
* **Responsible party**: Department of Transportation (DOT)
* **Source**: [Traffic data from 2017 as compiled by EPA's EJScreen](https://www.epa.gov/ejscreen/download-ejscreen-data)
* **Available for**: All U.S. states, the District of Columbia, and Puerto Rico

Water and Wastewater

Communities are identified as disadvantaged if they are in census tracts that:
ARE at or above the **90th** percentile for **underground storage tanks and releases** **OR** **wastewater discharge**
AND are at or above the **65th** percentile for low income

#Catergory

Underground Storage Tanks and Releases

* **Definition**: **Weighted** formula of the **density (Number / 1,500 feet)** of **leaking underground storage tanks** and the **number** of **all active underground storage tanks** within **1,500 feet** of the census tract boundaries.
* **Calculation**: As above
* **Used in**: Water and wastewater category
* **Responsible party**: Environmental Protection Agency (EPA)
* **Source**: Calculated from EPA’s [UST Finder](https://www.epa.gov/ust/ust-finder) from 2021 as compiled by EPA's EJScreen
* **Available for**: All U.S. states, the District of Columbia, and Puerto Rico

Wastewater Discharge

* **Definition**: **Risk-Screening Environmental Indicators (RSEI)** modeled **toxic concentrations (Model indicators rather than normal concentrations)** at stream segments within **500 meters**, divided by **distance in kilometers**.
* **Calculation**: Model Indicator **RSEI**
* **Used in**: Water and wastewater category
* **Responsible party**: Environmental Protection Agency (EPA)
* **Source**: [Risk-Screening Environmental Indicators (RSEI) model](https://www.epa.gov/ejscreen/download-ejscreen-data) from 2020 as compiled by EPA’s EJScreen
* **Available for**: All U.S. states, the District of Columbia, and Puerto Rico

Workforce Development

Communities are identified as disadvantaged if they are in census tracts that:
ARE at or above the **90th** percentile for linguistic isolation **OR** low median income **OR** poverty **OR** unemployment
AND more than 10% of people ages 25 years or older whose high school education is less than a high school diploma

Low Income

Linguistic Isolation

* **Definition**: Share of households where no one over age **14** speaks English very well.
* **Calculation**: As above
* **Used in**: Workforce development category
* **Responsible party**: U.S. Census
* **Source**: [American Community Survey](https://www.census.gov/programs-surveys/acs) from 2015-2019
* **Available for**: All U.S. states, the District of Columbia but not Puerto Rico based on feedback during the beta period

- Low Median Income

  * **Definition**: Percentile of median income calculated as a share of the area's median income.
  * **Calculation**: As above
  * **Used in**: Workforce development category
  * **Responsible party**: U.S. Census
  * **Source**: [American Community Survey](https://www.census.gov/programs-surveys/acs) from 2015-2019; 2010
  * **Available for**: All U.S. states, the District of Columbia, and Puerto Rico (2015-2019); American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands (2010)

- Poverty

  * **Definition**: Share of people living at or below 100% of the Federal poverty level.
  * **Calculation**: As above
  * **Used in**: Workforce development category
  * **Responsible party**: U.S. Census
  * **Source**: [American Community Survey](https://www.census.gov/programs-surveys/acs) from 2015-2019; 2010
  * **Available for**: All U.S. states, the District of Columbia, and Puerto Rico (2015-2019); American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands (2010)

- Unemployment

  * **Definition**: Number of unemployed people as a share of the labor force (Unemployment rate).
  * **Calculation**: As above
  * **Used in**: Workforce development category
  * **Responsible party**: U.S. Census
  * **Source**: [American Community Survey](https://www.census.gov/programs-surveys/acs) from 2015-2019; 2010
  * **Available for**: All U.S. states, the District of Columbia, and Puerto Rico (2015-2019); American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands (2010)

- High School Education

  * **Definition**: Share of people aged 25 years or older who didn't graduate from high school.
  * **Calculation**: As above
  * **Used in**: Workforce development category
  * **Responsible party**: U.S. Census
  * **Source**: [American Community Survey](https://www.census.gov/programs-surveys/acs) from 2015-2019; 2010
  * **Available for**: All U.S. states, the District of Columbia, and Puerto Rico (2015-2019); American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands (2010)

- Tribes

  * **Definition**: The Land Area Representation (LAR) dataset depicts American Indian land areas for Federally Recognized Tribes. The LAR dataset depicts the exterior extent of a Federal Indian land area. Not all Federally Recognized Tribes have a designated land area; therefore, they may not have an associated land area represented in the land area dataset.
  * **Calculation**: As above
  * **Used in**: Displaying land within the boundaries of Federally Recognized Tribes and point locations of Alaska Native Villages on the map
  * **Responsible party**: Bureau of Indian Affairs (BIA)
  * **Source**: [Land Area Representation (LAR) dataset](https://www.bia.gov/bia/ots/dris/bogs) from 2018
  * **Available for**: Federally Recognized Tribes, including Alaska Native villages

- Used Units

  Census traits

2.1 Formulation

EJ score

Overall Methodology

The EJ score has ***six*** steps, illustrated in ***Figure 1***.

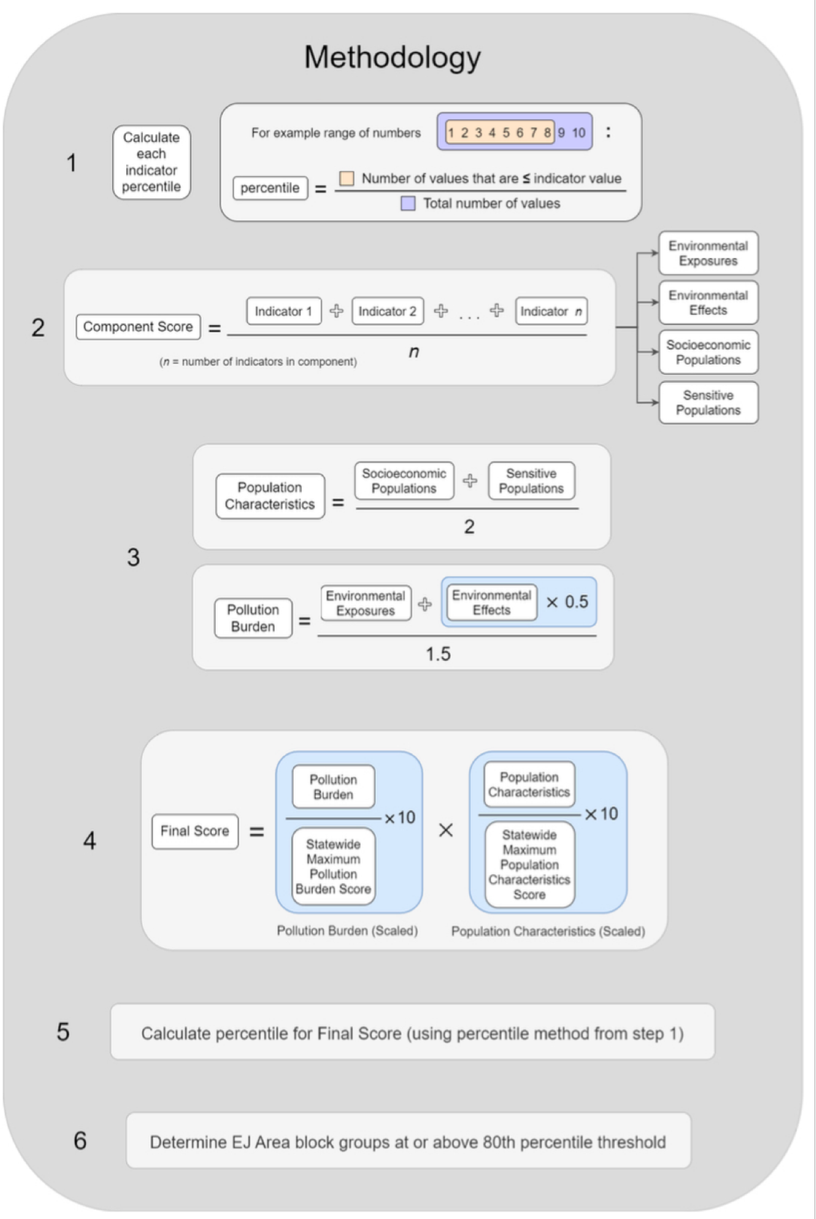


Figure 1: Overall Methodology

Indicators of EJ Score

The score considers ***32 indicators*** from different sources, including ***federal*** (e.g., ***EPA***, ***Census Bureau***) and ***state*** (e.g., ***Pennsylvania Department of Environmental Protection***, ***DEP***).

References

- Indicators related to Pollution

Table 1: Indicators, Pollution related

#	Indicators	Category	Component
1	Ozone	Pollution Burden	Environmental Exposure
2	Fine < Pm 2.5	Pollution Burden or Population Characteristic	Environmental Exposure
3	Diesel Particulate Matter	Pollution Burden or Population Characteristic	Environmental Exposure
4	Toxic Air Emissions	Pollution Burden or Population Characteristic	Environmental Exposure
5	Pesticides	Pollution Burden or Population Characteristic	Environmental Exposure
6	Traffic Density	Pollution Burden or Population Characteristic	Environmental Exposure
7	Compressor Stations	Pollution Burden or Population Characteristic	Environmental Exposure
8	Children's Lead Risk	Pollution Burden	Environmental Exposure
9	Oil Gas Locations (Conventional Wells)	Pollution Burden	Environmental Exposure
10	Oil Gas Locations (Unconventional Wells)	Pollution Burden	Environmental Effects
11	Proximity to Railroads	Pollution Burden	Environmental Effects
12	Land Remediation	Pollution Burden	Environmental Effects
13	Hazardous Waste and Storage Sites	Pollution Burden	Environmental Effects
14	Municipal Waste Sites	Pollution Burden	Environmental Effects
15	Coal Mining	Pollution Burden	Environmental Effects
16	Impaired lakes and streams	Pollution Burden	Environmental Effects
17	Abandoned Mining Concerns	Pollution Burden	Environmental Effects
18	Flood Risk	Pollution Burden	Environmental Effects
19	Asthma	Pollution Burden	Environmental Effects

#Catergory #Indicator

- Indicators related to Population

Table 2: Indicators, Population related

#	Indicators	Category	Component
20	No Health Insurance	Population Characteristic	Sensitive Population
21	Cancer	Population Characteristic	Sensitive Population
22	Disability	Population Characteristic	Sensitive Population
23	Heart Disease	Population Characteristic	Sensitive Population
24	Socioeconomic Population	Population Characteristic	Sensitive Population
25	Low Educational Attainment	Population Characteristic	Socio-Economic Population
26	Linguistic Isolation	Population Characteristic	Socio-Economic Population
27	Housing -Burdened Low-Income Households	Population Characteristic	Socio-Economic Population
28	Poverty	Population Characteristic	Socio-Economic Population
29	Unemployment	Population Characteristic	Socio-Economic Population
30	Race	Population Characteristic	Socio-Economic Population
31	Age over 64	Population Characteristic	Socio-Economic Population
32	Age under 5	Population Characteristic	Socio-Economic Population

#Catergory #Indicator

- Rationale of Selected Indicators

For each one of the indicators selected, the documentation [***PADEP, 2023***] includes a ***rationale*** for inclusion with e.g., ***academic references, and data sources***. There is also a reference for future indicators (e.g., hyper local data for Philadelphia and Pittsburgh, Broadband Internet Access), see page 90, [PADEP, 2023].

There is also a ***reference*** for ***future indicators*** (e.g., ***hyper local data*** for Philadelphia and Pittsburgh, ***Broadband Internet Access***), see ***page 90***, [***PADEP, 2023***]

References

Step 1

Each ***block group*** has values of each indicator, and each ***block group*** is given a ***percentile*** based on its position in the ***statewide*** distribution of values.

$$P = \frac{v_i}{v_{\text{all}}} \times 100,$$

$q_{i, j} = \frac{\#_{i, j}}{m} \times 100$

where,
$q_{i, j} = q(I_{i, j}) = 1 - F_{I_j}(I_{i, j})$: Percentile score (index, 0-100) of the j-th indicator within i-th **block group**, which is quantile transformation
$\#_{i, j} = \#(I_{i^{\prime}, j} \leq I_{i, j} \land i^{\prime} \in \{1, 2, …, m\})$: Number of blocks whose j-th indicator values are less than i-th **block group's** indicator value $I_{i, j}$
$\sum\limits_{i = 1}^m \#_{i, j} = m$: Total number of **block groups**

- Dealing with Missing Data

If data is ***absent***, a value of ***zero*** is given and they are ***excluded*** from the percentiles.

- High and still Acceptable

Even if an indicator is ***acceptable***, it could be ***high*** according to the percentile.

- Step 2

There are ***four*** components to the EJ score:
1. ***Environmental Exposures***
2. ***Environmental Effects***
3. ***Sensitive Populations***
4. ***Socioeconomic Populations***

The score for each component is generally calculated by ***averaging percentile values*** of all of the indicators ***within those groups***.

$$C = \frac{\sum c}{n}$$

$C_i = \frac{\sum\limits_{j \in \mathcal{C}_i} q_{i, j}}{|\mathcal{C}_i|}$

where,
$C_i \in \{\operatorname{EXP}_i, \operatorname{EE}_i, \operatorname{SOC}_i, \operatorname{SP}_i\}$: Specific component score (index, 0-100) within i-th block group
$\sum\limits_{j \in \mathcal{C}_i} q_{i, j}$: Sum of all indicator percentiles within component C_i within i-th block group
$|\mathcal{C}_i|$: Number of indicators within component C_i
The first two components (Environmental Exposures and Environmental Effects) are the Pollution Burden. The last two components (Sensitive Populations and Socioeconomic Populations) are the Population Characteristics.

Step 3

- 2.2 Pollution Burden

The ***Pollution Burden (PB)*** score is calculated by taking the weighted ***average*** of ***Environmental Exposures (EXP)*** and ***Environmental Effects (EE)***, with ***environmental effects*** being weighted ***0.5*** of exposures.

$$\mathrm{PB} = \frac{\mathrm{EXP_{avg}} + (\mathrm{EE_{avg}} \times 0.5)}{1.5}$$

$\operatorname{PB}_i = \frac{\operatorname{EXP}_i + (
\operatorname{EE}_i \times 0.5)}{1.5}$

where,
PB_i: Pollution Burden Score (index, 0-100) within i-th block group
EXP_i: Average of Environmental Exposure indicators within i-th block group
EE_i: Average of Environmental Effects indicators within i-th block group

- 2.3 Population Characteristics

The ***Population Characteristic (PC)*** score is the ***average*** of the ***Senssitive Populations*** and ***Socioeconomic Populations*** component scores.

$$\mathrm{PC} = \frac{\mathrm{SOC_{avg}} + \mathrm{SP_{avg}}}{2}$$

$\operatorname{PC}_i = \frac{\operatorname{SOC}_i + \operatorname{SP}_i}{2}$

where,
PC_i: Population Characteristic Score (index, 0-100) within i-th block group
SOC_i: Average of Socioeconomic populations indicators within i-th block group
SP_i: Average of Sensitive populations indicators within i-th block group

Step 4

2.4 Final Score

The final score is calculated by scaling the PB and PC aggregates ***between 1 and 10*** then ***dividing by*** the ***maximum block group*** and ***multiplying by 10***.

The final score percentile is calculated for ***each block group***, then compared to the ***statewide*** distribution.

$\operatorname{F}_i = (\frac{\operatorname{PB}_i}{\operatorname{PB_{max}}} \times 10) \times (\frac{\operatorname{PC}_i}{\operatorname{PC_{max}}} \times 100)$

$$\mathrm{F} = \left(\frac{\mathrm{PB}}{\mathrm{PB_{max}}} \times 10\right) \times \left(\frac{\mathrm{PC}}{\mathrm{PC_{max}}} \times 10\right)$$

where,
F_i: Final Score (index, 0-100) within i-th block group
$\operatorname{PB_{max}}$: Highest block group Population Burden Score in state (index, 0-100)
$\operatorname{PC_{max}}$: Highest block group Population Characteristic Score in state (index, 0-100)

The ***gradient*** of ***percentile*** shows the scale of EJ ***vulnerability throughout*** the state.

Each gradient group of percentile shows different scale of EJ vulnerability throughout the state.

- Any block group is an ***EJ area if its final score percentile is greater than or equal to the 80th percentile***, $\operatorname{isEJArea}(\operatorname{F}_i) = I(q(\operatorname{F}_i) \geq 80)$

3 Programs in Eastern Pennsylvania

Action under the New Criteria

- Programs

In this section we summarize programs available in ***Pennsylvania*** for ***two electric utilities***, ***PECO*** in the ***Philadelphia*** region and ***PPL***, Covering the ***Lehigh Valley***, ***Harrisburg*** and ***Lancaster***.

Table 3 summarizes the ***main*** programs in ***Eastern Pennsylvania***, including the ***PECO*** and ***PPL*** service territories.

Table 3: Programs in Eastern Pennsylvania

Entity	Category	Program	Benefit ($)	Benefit type	Description
PECO	Clean and Efficient Home Heating Systems	Energy Star Air Source Heat Pump (Tier 1)	200	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Air Source Heat Pump (Tier 2)	300	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Central Air Conditioning (Tier 1)	150	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Central Air Conditioning (Tier 2)	200	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Ductless Mini-Split Heat Pump (Tier 1)	150	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Ductless Mini-Split Heat Pump (Tier 2)	300	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Whole home energy efficiency	Virtual Energy Assessment	N/A		- Free virtual visit from a PECO energy advisor, free energy saving items (LED lightbulbs, smart power strip)
PECO	Whole home energy efficiency	In-home energy check up	250	Value up to	- Must be at or below 200% of the federal poverty line
PECO	Whole home energy efficiency	In-home energy check up (for electric heat)	375	Value up to	
PECO					
PECO	Low Income Assistance	LIHEAP (Federally funded)	3,000	Cash or crisis grant	$45,000 for household of 4 - CASH grant is a one-time direct payment - CRISIS grant is a direct payment for a heating emergency - Emergency include main heating source has been shut-off or within 15 days of being shut-off for non-payment, fuel payments, repairing leaking pipes and broken furnaces
PPL	Whole home energy efficiency	In-home audit rebate for Electric Heating and central air	350	Rebate	Rebate - Must use a certified building analysis - PPL has tool to find contractor
PPL	Whole home energy efficiency	In-home audit for electric heating or Central A/C	200	Rebate	Rebate - Must use a certified building analysis - PPL has tool to find contractor
PPL	Whole home energy efficiency	Virtual Home Energy Assessment	N/A	Energy audit	No cost
PPL	Clean and Efficient Home Heating Systems	Smart Thermostat (self install)	50	Rebate	-limit of five rebates per account between June 2021 and May 2026
PPL	Clean and Efficient Home Heating Systems	Smart Thermostat (professional install)	100	Rebate	-limit of five rebates per account between June 2021 and May 2026
PPL	Clean and Efficient Home Heating Systems	Heat Pump Water Heater	400	Rebate	- Limit of two rebates per account between June 1, 2021 and May 31, 2026. - Universal Energy Factor (UEF) $\geq$ 2.3
PPL	Clean and Efficient Home Heating Systems	Air Source Heat Pump (ASHP) (Tier 1)	350	Rebate	- Limit of two rebates per account between June 1, 2021 and May 31, 2026. - Rebates not available for new construction
PPL	Clean and Efficient Home Heating Systems	Air Source Heat Pump (ASHP) (Tier 2)	450	Rebate	-Limit of two rebates per account between June 1, 2021 and May 31, 2026. - Rebates not available for new construction
PPL	Clean and Efficient Home Heating Systems	Ductless Mini-Split Heat Pump	400	Rebate	-Rebates not available for new construction. -Limit of five rebates per account between June 1, 2021 and May 31, 2026. -Equipment already rebated via midstream or instant discount channel does not qualify for additional incentives.
PPL	Clean and Efficient Home Heating Systems	Central Air Conditioner (CAC) (Tier 1)	200	Rebate	-Limit of two rebates per account between June 1, 2021 and May 31, 2026. -Rebates are not available for new construction.
PPL	Clean and Efficient Home Heating Systems	Central Air Conditioner (CAC) (Tier 1)	300	Rebate	-Limit of two rebates per account between June 1, 2021 and May 31, 2026. -Rebates are not available for new construction.
PPL	Whole home energy efficiency	Attic Insulation (electric heated house)	500	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one attic insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Attic Insulation (central A/C, non-electric heat)	200	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one attic insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Basement Wall Insulation (electric heat)	500	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one basement wall insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Basement Wall Insulation (central A/C, non-electric heat)	200	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one basement wall insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Air Sealing	200	Rebate	- must be installed in an existing permanent living space - limit of one rebate per account between June 1, 2021 - May 31, 2026
PPL	Whole home energy efficiency	When the above are combined an additional bonus rebate is given	350	Rebate	
PPL	Low Income Assistance	LIHEAP (Federally funded)	3,000	Cash or crisis grant	$41,625 for household of 4 - Eligible to up to $3,000 to help pay heating bill - Closed until early November

B Programs Available Beyond Pennsylvania; Programs

4 Ongoing Work

Action under the New Criteria

4.1 Programs beyond Pennsylvania

- **Other Programs**

  In ***Appendix B*** we include a list of ***other*** programs available from ***other*** utilities.

  The utilities we sample include ***ConEd*** in ***New York***, ***PG&E*** in ***California***, ***Columbia Gas*** of ***Ohio***, ***Eversource*** and ***Green Mountain Power*** in the ***New England Region***, and ***Dominion Energy*** In ***Virginia*** and the ***Carolinas***.

Table 6: Programs in Other Utilities

Entity	Category	Program	Benefit ($)	Benefit type	Description
ConEd	Clean and Efficient Home Heating Systems	Geothermal installation credit	25,000	Credit on invoice	- Must get approved by a contractor from conEd approved list
ConEd	Clean and Efficient Home Heating Systems	Geothermal installation credit (Disadvantaged Community	35,000	Credit on invoice	- Must get approved by contractor from conEd approved list -Must be member of disadvantaged community
ConEd	Clean and Efficient Home Heating Systems	Heat Pump Water Heater swap	1,000	Rebate	-Must purchase from a participating distributor
ConEd	Clean and Efficient Home Heating Systems	Clean Heat Financing		Financing	- Coned selected financing providers can help finance heat pump cost with little to no upfront cost - Qualified individuals include, income-eligible multifamily building with 5 or more units Commercial and industrial building owners - Commercial office tenants under triple-net leases who occupy large footprints - Long-term commercial leaseholders -Non-profits -Small business -Single-family homeowner
ConEd	Clean and Efficient Home Heating Systems	Air-Source heat pump	10,000	Credit on invoice	- Up to $10,000
PG&E	Clean and Efficient Home Heating Systems	Energy Action Guide	N/A		- Approved contractors will visit home Online platform
Dominion Energy	Clean and Efficient Home Heating Systems	Smart Thermostat	30	Rebate	- Limit of two rebate per household -must live in single-family detached residence -Home must have a heat pump -Purchaser must buy and activate Energy Star certified smart thermostat
Green Mountain Power	Clean and Efficient Home Heating Systems	Induction Cooktop Rebate	200	Rebate	- Must be replacing fossil fuel cooktop - Must be used for new, installed electric induction cooktop/range - One rebate per GMP account
Eversource	Clean and Efficient Home Heating Systems	Demand Response Solution: Smart thermostat	70	Annual Savings	- Receive $50 reward for successfully enrolling and an addition $20 for each summer enrolled
Eversource	DER	Demand Response Solution: Home Battery Storage	1,375	Annual Savings	- Incentives are based on average kW per event
Columbia Gas of Ohio	Low Income Assistance	Income-Eligible Weatherization	N/A	Up to 200% of the federal poverty line	

Table 7: Federal Programs

Entity	Category	Program	Benefit ($)	Benefit type	Description
U.S DOE	Low Income Assistance	Weatherization Assistance Program (WAP)	7,669	Grant	- At or below 200% of the poverty income guidelines - Or receive supplemental security income -Or Aid to families with Dependent children
U.S HHS	Low Income Assistance	Low-Income Home Energy Assistance Program (LIHEAP)	300-1,000	Grant	- Must meet income guideline, $45,000 for a family of 4 - Rent or own a home
U.S Department of Agriculture	Low Income Assistance	Single Family Housing Repair Loans and Grants	10,000-40,000	Loan	- Inside USDA eligible location - Must be over 62 or older 0 Unable to afford credit elsewhere

- Data Source

  We complement the information with select ***Federal programs*** from the ***Department of Energy*** (***DOE***), ***Department of Health and Human Services (HHS***) and ***the Department of Agriculture (USDA***) in Table 7.

4.2 Ongoing and Future Work

There are ***three*** main current areas for the work nowadays.

- Ongoing and Future Work 1.

  We are ***calculating summaries of the changes in the number of EJ communities*** with the old and new methodologies, according to the ***census year data*** used to create classifications

- Ongoing and Future Work 2.

  - Old Representative Criteria

    In order to determine a ***representative EJ*** are, we selected initially based on the ***two metrics*** used for EJ classification, namely ***income*** and ***ethnicity*** of Census block groups.

    The selection ***(representative)*** of Census block groups was based on the ***distribution (from the 20th to the 80th percentile)*** of ***median household income*** and the ***rate of non-white populations*** within census tract block groups.

    Actions under the Problems

    - Summary of Old Representative of Census Block Groups

      We calculate the ***joint distribution*** of median household income and the rate of non-white populations, selecting data ranging from the ***20th to the 80th percentile***.

      The final dataset includes 498 census tract blocks in the ***PECO*** service area and 220 census tract block groups in the ***PPL*** service area.

      Table 4 summarizes demographics for EJ Census block groups between the 20th and 80th percentile in the ***PE...***

Table 4: Demographics per tract block group, EJ in PECO

Variable Name	Mean	Standard Deviation	Minimum	Maximum
Number of White	505.6	390.2	19	2100
Number of Non-white	936.0	509.0	123	3464
Median house income	61,364	14,757	37,837	93,411
Non-white rate (%)	0.649	0.186	0.337	0.954

Table 5 summarizes demographics for EJ Census block groups between the 20th and 80th percentile in the PPL...

Table 5: Demographics per tract block group, EJ in PPL

Variable Name	Mean	Standard Deviation	Minimum	Maximum
Number of White	946.1	427.6	198	2415
Number of Non-white	341.9	292.9	36	1464
Median house income	60,609	12,203	41,000	84,688
Non-white rate (%)	0.246	0.128	0.071	0.503

- Data Source

  We obtained this data, including median household income and non-white rate, from the ***American Community Survey (ACS***) 5-year dataset, utilizing survey data from ***2018 to 2022*** [***ACS, 2022***].

  References

- New Representative Criteria

  Given the ***new EJ criteria***, we are considering a new method to select a representative EJ area

  Purpose of Section 2

- Ongoing and Future Work 2.

  The Environmental Protection Agency (***EPA***) has a national EJ screening tool (***EJScreen)*** [***EPA, 2023***].
  We are now working to ***compare*** these two tools (***PennEnviroScreen (DEP) and EJScreen (EPA)***) and ***determine*** differences in using each one

  References

- References

[*ACS, 2022*] ACS (2022). 2022: Acs 5-year estimates subject tables. Technical report, United States Census Bureau.

[*EPA, 2023*] EPA (2023). Environmental justice screening and mapping tool, ejscreen. Technical report, Environmental Protection Agency.

[*Lamadrid and Simons, 2023*] Lamadrid, A. J. and Simons, K. (2023). Environmental justice indicators. Technical report, Lehigh University.

Spreadsheet with all Indicators and Sources of Data

[*PADEP, 2023*] PADEP (2023). Pennsylvania environmental justice mapping and screening tool (pennenviroscreen) methodology documentation. Technical report, Pennsylvania Department of Environmental Protection.

New Criteria Source

Rationale of Selected Indicators

Indicators of EJ Score

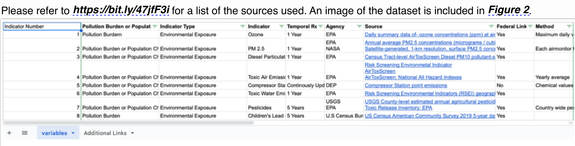
Data Source

Ongoing and Future Work 2.

Appendix

- A Sources of metrics for EJ Screening Tool

Please refer to ***https://bit.ly/47jIF3I*** for a list of the sources used. An image of the dataset is included in ***Figure 2***.



Indicator Number	Pollution Burden or Populat	Indicator Type	Indicator	Temporal Re	Agency	Source	Federal Link	Method
1	Pollution Burden	Environmental Exposure	Ozone	1 Year	EPA	Daily summary data of, ozone concentrations (ppm) at ea	Yes	Maximum daily v
2	Pollution Burden or Population Cr	Environmental Exposure	PM 2.5	1 Year	EPA NASA	Annual average PM2.5 concentrations (micrograms / cub Satellite-generated, 1-km resolution, surface PM2.5 conce	Yes	Each airmonitor f
3	Pollution Burden or Population Cr	Environmental Exposure	Diesel Particulat	1 Year	EPA	Census Tract-level AirToxScreen Diesel PM10 pollutant a	Yes	
4	Pollution Burden or Population Cr	Environmental Exposure	Toxic Air Emissi	1 Year	EPA	Risk Screening Environmetal Indicator AirToxScreen: National All Hazard Indexes	Yes	Yearly average
5	Pollution Burden or Population Cr	Environmental Exposure	Compressor Sta	Continously Upd	DEP	Compressor Station point emissions	No	Chemical values
6	Pollution Burden or Population Cr	Environmental Exposure	Toxic Water Emi	1 Year	EPA	Risk Screening Environmetal Indicators (RSEI) geograp	Yes	
7	Pollution Burden or Population Cr	Environmental Exposure	Pesticides	5 Years	USGS EPA	USGS County-level estimated annual agricultural pesticid Toxic Releases Inventory: EPA	Yes	Country wide pe
8	Pollution Burden	Environmental Exposure	Children's Lead	5 Years	U.S Census Bur	US Census American Community Survey 2019 5-year da	Yes	

variables · Additional Links ·

Figure 2: Sample of Detailed Metrics for EJ communities

- B Programs Available Beyond Pennsylvania; Programs

In this section we summarize programs available in ***Pennsylvania*** for ***two electric utilities***, ***PECO*** in the ***Philadelphia*** region and ***PPL***, Covering the ***Lehigh Valley***, ***Harrisburg*** and ***Lancaster***.

Table 3 summarizes the ***main*** programs in ***Eastern Pennsylvania***, including the ***PECO*** and ***PPL*** service territories.

Table 3: Programs in Eastern Pennsylvania

Entity	Category	Program	Benefit ($)	Benefit type	Description
PECO	Clean and Efficient Home Heating Systems	Energy Star Air Source Heat Pump (Tier 1)	200	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Air Source Heat Pump (Tier 2)	300	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Central Air Conditioning (Tier 1)	150	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Central Air Conditioning (Tier 2)	200	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Ductless Mini-Split Heat Pump (Tier 1)	150	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Clean and Efficient Home Heating Systems	Energy Star Ductless Mini-Split Heat Pump (Tier 2)	300	Rebate	-Product must be new, meet Efficiency Requirements, and installed in a residence that currently receives PECO residential electric service -Application for purchased/installed equipment must be submitted within 90 days of purchase/installation -Application must include a paid receipt with the model number, manufacturer, purchase price, and purchase date
PECO	Whole home energy efficiency	Virtual Energy Assessment	N/A		- Free virtual visit from a PECO energy advisor, free energy saving items (LED lightbulbs, smart power strip)
PECO	Whole home energy efficiency	In-home energy check up	250	Value up to	- Must be at or below 200% of the federal poverty line
PECO	Whole home energy efficiency	In-home energy check up (for electric heat)	375	Value up to	
PECO					
PECO	Low Income Assistance	LIHEAP (Federally funded)	3,000	Cash or crisis grant	$45,000 for household of 4 - CASH grant is a one-time direct payment - CRISIS grant is a direct payment for a heating emergency - Emergency include main heating source has been shut-off or within 15 days of being shut-off for non-payment, fuel payments, repairing leaking pipes and broken furnaces
PPL	Whole home energy efficiency	In-home audit rebate for Electric Heating and central air	350	Rebate	Rebate - Must use a certified building analysis - PPL has tool to find contractor
PPL	Whole home energy efficiency	In-home audit for electric heating or Central A/C	200	Rebate	Rebate - Must use a certified building analysis - PPL has tool to find contractor
PPL	Whole home energy efficiency	Virtual Home Energy Assessment	N/A	Energy audit	No cost
PPL	Clean and Efficient Home Heating Systems	Smart Thermostat (self install)	50	Rebate	-limit of five rebates per account between June 2021 and May 2026
PPL	Clean and Efficient Home Heating Systems	Smart Thermostat (professional install)	100	Rebate	-limit of five rebates per account between June 2021 and May 2026
PPL	Clean and Efficient Home Heating Systems	Heat Pump Water Heater	400	Rebate	- Limit of two rebates per account between June 1, 2021 and May 31, 2026. - Universal Energy Factor (UEF) $\geq$ 2.3
PPL	Clean and Efficient Home Heating Systems	Air Source Heat Pump (ASHP) (Tier 1)	350	Rebate	- Limit of two rebates per account between June 1, 2021 and May 31, 2026. - Rebates not available for new construction
PPL	Clean and Efficient Home Heating Systems	Air Source Heat Pump (ASHP) (Tier 2)	450	Rebate	-Limit of two rebates per account between June 1, 2021 and May 31, 2026. - Rebates not available for new construction
PPL	Clean and Efficient Home Heating Systems	Ductless Mini-Split Heat Pump	400	Rebate	-Rebates not available for new construction. -Limit of five rebates per account between June 1, 2021 and May 31, 2026. -Equipment already rebated via midstream or instant discount channel does not qualify for additional incentives.
PPL	Clean and Efficient Home Heating Systems	Central Air Conditioner (CAC) (Tier 1)	200	Rebate	-Limit of two rebates per account between June 1, 2021 and May 31, 2026. -Rebates are not available for new construction.
PPL	Clean and Efficient Home Heating Systems	Central Air Conditioner (CAC) (Tier 1)	300	Rebate	-Limit of two rebates per account between June 1, 2021 and May 31, 2026. -Rebates are not available for new construction.
PPL	Whole home energy efficiency	Attic Insulation (electric heated house)	500	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one attic insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Attic Insulation (central A/C, non-electric heat)	200	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one attic insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Basement Wall Insulation (electric heat)	500	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one basement wall insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Basement Wall Insulation (central A/C, non-electric heat)	200	Rebate	-New home construction does not apply - Limit of one attic insulation rebate per account and one basement wall insulation rebate per account between June, 2021 - May, 2026
PPL	Whole home energy efficiency	Air Sealing	200	Rebate	- must be installed in an existing permanent living space - limit of one rebate per account between June 1, 2021 - May 31, 2026
PPL	Whole home energy efficiency	When the above are combined an additional bonus rebate is given	350	Rebate	
PPL	Low Income Assistance	LIHEAP (Federally funded)	3,000	Cash or crisis grant	$41,625 for household of 4 - Eligible to up to $3,000 to help pay heating bill - Closed until early November

Programs