WORLD RESOURCES INSTITUTE

TECHNICAL NOTE

A DATASET OF ELECTRIC SCHOOL BUS ADOPTION IN THE UNITED STATES

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ABSTRACT

Transitioning to electric school buses (ESBs) from traditional diesel-powered school buses can reduce students' exposure to air pollution and decrease greenhouse gas emissions. School districts and private fleet operators around the United States are adopting electric school buses with increasing speed, but so far ESB adoption has not been tracked in a centralized, public way. WRI aims to create accessible data and analyses that can help school district staff, advocates, policymakers, and other stakeholders make evidence-based decisions and support the transition to ESBs. This technical note describes the methods used to create a first-of-its-kind dataset that tracks ESB adoption across the United States.

The dataset is organized primarily by school district and tracks the number of "committed" ESBs in each district. An ESB is considered "committed" starting when a school district or fleet operator has been awarded funding to purchase it, or has made a formal agreement to purchase it from a manufacturer or dealer. We would not consider an ESB "committed" if a school district or other fleet operator only stated that they plan to acquire ESBs. The dataset includes other details related to committed ESBs, such as the manufacturer and funding source(s). It also contains school district characteristics such as poverty, racial composition, and locale (urban, suburban, town, or rural), to enable wider analysis of the adoption of ESBs, including whether the transition to ESBs is happening equitably. ESB-related data were collected from a variety of publicly available sources, including news articles, school websites, industry publications, and social media posts. Other demographic and economic data come from reputable, public datasets, including the Environmental

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Technical notes document the research or analytical methodology underpinning a publication, interactive application, or tool.

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The dataset described in this technical note is available at https://datasets.wri.org/dataset/electric_school_bus_adoption.

Protection Agency, U.S. Census, and National Center for Education Statistics. This dataset will be updated quarterly over the life of WRI's Electric School Bus Initiative to include newly committed ESBs and additional indicators.

MOTIVATION

In recent years, the number of ESBs across the country has been growing rapidly, but ESB adoption is not being reported in a centralized, publicly accessible way. This dataset fills that gap and includes additional data that enable researchers, policymakers, and advocates to conduct their own analysis of ESB adoption based on school district characteristics such as average income, poverty level, racial composition, region, and locale (urban, suburban, town, or rural). This is the first step toward building a central hub for information on ESBs that will be complemented by innovative data combinations (e.g., scorecards, metrics, indices) and other information (e.g., case studies, community organizing tools, social connections) to help target users push to electrify school buses. This can inform policy evaluation, future policy design, research, and advocacy. We hope that the stakeholders who engage with this dataset will help us locate additional or improved information about ESB deployment that can be included in updates to the dataset.

INDICATOR AND SOURCE SELECTION CRITERIA

Indicator Selection Criteria

The following criteria guided our selection of indicators to include. These criteria were applied especially when developing the indicators in Category 4, "Socioeconomic and demographic characteristics," but they also informed decisions about indicators in all other categories, since not all information about the characteristics of ESBs, characteristics of school bus fleets, school district administrative structures, and so on, are equally useful for the dataset's target audience and intended purpose.

1. **Prevalent**: Indicators should be widely used in other work on related topics to enable comparison with other research, alignment with ESB funding criteria, and alignment with wider consensus on the most appropriate indicators to use on these topics. For example, in Category 4, we include indicators that have been regularly used to assess school districts' eligibility for federal funding for ESBs or other programs, such as percentage of children in poverty, which is used to assess eligibility for free and reduced school lunch and American Rescue Plan ESB funding.
2. **Curated**: Keeping in mind that we cannot predict all the ways stakeholders will want to use these data, this dataset should provide all of the information relevant to our expected use cases (see "Use Cases" section) without including so many indicators that it overwhelms nontechnical users or puts the burden on users to research and select indicators. For example, in Category 4, demographics should balance providing an adequately holistic understanding of socioeconomic and environmental health disparities and inequalities resulting from racism, wealth, geography, and other factors, but they do not need to include more than a few prevalent poverty-related indicators.
3. **Relevant to ESBs**: For health risk indicators, we selected indicators related to health issues that result from air pollutant exposure, since these are conditions that ESBs could improve. According to this criterion, we did not include factors such as water pollution, lead exposure, or proximity to Superfund sites. For indicators related to school bus fleets and school district administrative and geographic information, we included those that seemed most relevant to the adoption of ESBs, such as bus ownership structure and locale.

Source Selection Criteria

The following criteria guided our selection of the sources used to build this dataset. A full list of data sources can be found in Table A1.

1. **Reputable**: Data should come from government sources or other reputable and widely used sources such as academic journals, well-regarded industry publications, or peer-reviewed sources from think tanks or nonprofits. Some data (mainly related to ESB commitments) are only available from less verifiable sources like news articles or school district press releases. In those cases, we cross-checked information across multiple sources wherever possible and deferred to the most reputable or detailed source.
2. **Appropriate scale**: Data should either be already available at the school district level or available at a finer-grained resolution than the school district (i.e., census block group) so that it can be accurately scaled up to the school district level.

3. **Recent**: Data should be the most recent available, be regularly updated, and have been updated in the past three to five years.

DATA DESCRIPTION AND METHODS

This section describes the contents of the dataset. It groups the data into eleven categories and, for each, provides information such as how they were collected and/or analyzed, how they can be interpreted, and why they were included (in relation to the above indicator selection criteria).

Sheet 1. District-level Dataset on ESB Adoption

Category 1: School district characteristics

This category includes the base table of this dataset, which comes from the district directory of the National Center for Education Statistics (NCES) for the 2020–21 school year. This directory lists the nation's local education agencies (LEAs, which this technical note refers to as "school districts" for ease of understanding) by name and unique identification number (LEA ID). The U.S. Department of Education defines a local education agency as "a public board of education or other public authority legally constituted within a State for either administrative control or direction of, or to perform a service function for, public elementary schools or secondary schools in a city, county, township, school district, or other political subdivision of a State, or for a combination of school districts or counties that is recognized in a State as an administrative agency for its public elementary schools or secondary schools" (IDEA 2017).

The approximately 19,500 LEAs in the United States make up the rows of this dataset. There are nine types of LEAs, including several types of public education-related entities beyond what is typically referred to as a "school district," such as a state-operated agency or a service agency (see Table 1). This ESB adoption dataset includes all LEA types because there may eventually be ESBs owned by any of these LEA types. The dataset also includes any other entities (without LEA IDs) that have obtained electric school buses (i.e., private schools and private fleet operators). However, most LEAs are "regular public school districts that are not a component of a supervisory union" and most of the data related to school bus fleet characteristics, ESB fleet characteristics, and demographics (Categories 2–5 below) are associated with this type of LEA. This LEA type, along with "regular public school districts that are a component of a supervisory union," are what are most often referred to as "school districts," including in reference to there being roughly 13,500 school districts in the United States.

This category also contains data referring to geographic and administrative characteristics of the school district, including its address, location in various regional groupings, locale (urban, suburban, town, or rural), latitude and longitude coordinates, and others.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

School districts included in this dataset come from the 2020–21 Local Education Agency Universe Survey Data provisional directory file from the National Center for Education Statistics (NCES LEA Directory). All data in this category were available at the school district level, so no scaling or aggregation was necessary. See Table A1 for details.

This category, specifically the list of LEA IDs, served as the foundation for this dataset in that all other datasets were combined with the NCES LEA Directory using an XLOOKUP function in Excel that matched on LEA IDs. This was more effective than trying to match data to school districts based on name, since some school districts in different states have the same name, or are written differently in different contexts (e.g., Mt. Pleasant School District vs. Mount Pleasant School District).

Category 2: School bus fleet characteristics

These data refer the school district's overall school bus fleet characteristics, including the number of buses, mileage, and ownership model. With a few exceptions, these data are only available for the 100 largest U.S. school bus fleets, and are updated annually. This is only a small fraction of the country's school districts but represents about one-fifth of all U.S. school buses (91,400 out of approximately 480,000 school buses) (ASBC n.d.).

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

This category includes several calculated variables. The calculations, sources, and notes for these variables are explained in Table 2. *School Bus Fleet* (2019) provides data on the number of route buses and the annual route mileage (sum of all buses) for the 100 largest school bus fleets. We divided the annual route mileage by the number of route buses to estimate the average annual route mileage per bus. We divided the average annual route mileage per bus by 180 school days (the standard

Table 1 | **LEA Types and Definitions**

TYPE CODE	TYPE NAME	DEFINITION
1	Regular public school district that is NOT a component of a supervisory union	Local government administrative authority that governs the education system at a specified local level on behalf of the public and the state that is not component of a supervisory union.
2	Regular public school district that is a component of a supervisory union	Local government administrative authority that governs the education system at a specified local level on behalf of the public and the state that is component of a supervisory union.
3	Supervisory union	Administrative center or county superintendent's office serving as the administrative center.
4	Service agency	Agency that does not operate schools and instead provides specialized educational services (such as career and technical education) or related services (such as services in individualized education programs, or IEPs) to other education agencies.
5	State agency	State operated agency that operates schools or programs that provide public elementary and/or secondary level instruction Federal operated agency that provides elementary and/or secondary level instruction.
6	Federal agency	A federal agency that is charged, at least in part, with providing elementary or secondary instruction or support services.
7	Independent charter district	Education unit created under the state charter legislation that is not under the administrative control of another local education agency and that operates one or more charter schools and only charter schools.
8	Other education agency	Education unit that does not fall within the definitions of the other existing LEA types.
9	Independent charter district	School district that operates one or more schools that are designed for a specific educational need or purpose.

Source: Adapted from NCES (2021).

for the United States, based on NCES n.d.b.) to estimate the average daily route mileage per bus. This indicator was included so that users can look at districts with ESBs and see the various route lengths they might travel, or to calculate potential fuel cost savings or air pollution reduction in their own district. "Average daily route mileage per bus" may reflect the total mileage of several different routes that a single school bus drives in a given day. We do not know the number of routes typically served by a bus each day in a given school district. For that reason, this variable should not be interpreted as the mileage that a typical student would travel each day. Assigning a single bus to multiple daily routes is especially common in districts that have staggered school start and end times, and is an increasingly common practice given the shortages of school bus drivers that deepened in 2021 (Lieberman 2021).

This variable should not be interpreted as the mileage that a typical student would travel each day. All data in this category were available at the school district level, so no scaling or aggregation was necessary.

Category 3: Electric school bus fleet characteristics

These data include whether a school district has any committed electric school buses; if it does, the data include other information about those buses, such as the number of committed ESBs, the number of ESBs in each procurement stage (See "Sheet 2: Bus-level data"), government agencies, charging companies, and utilities involved. The data from Sheet 2 are aggregated up to the school district level from the more detailed data on ESB commitments collected at the individual bus level found in "Sheet 2: Bus-level data." These data were collected by WRI and have not previously been published in a compiled format. This dataset does not include information on alternative-fuel buses other than electric buses, such as compressed natural gas (CNG) or propane buses.

WHICH ELECTRIC SCHOOL BUSES ARE INCLUDED IN THIS DATASET?

The electric school bus "adoption" process consists of many phases, including visioning, technical preparations, awarding of government funding to purchase an ESB, placing an order, taking delivery of the bus, and using the bus to transport students, among others (see Figure 1). Before any of these steps are taken, some school districts may announce their intention to acquire ESBs, while other districts set long-term targets for full fleet electrifica-

Table 2 | **Sources and Calculations for Calculated Variables in Category 2, "School Bus Fleet Characteristics"**

VARIABLE ID	VARIABLE	CALCULATION	UNIT	SOURCE	NOTES
2b	Total number of buses		Number	*School Bus Fleet* (2019)	Data available only for the 100 largest school bus fleets.
2c	Number of route buses		Number	*School Bus Fleet* (2019)	Data available only for the 100 largest school bus fleets, with a few exceptions. See "Sources" for school districts with this information that are outside of the 100 largest fleets
2d	Annual route mileage		Miles	*School Bus Fleet* (2019)	Data available only for the 100 largest school bus fleets.
2e	Average annual route mileage per bus	2e = 2d / 2c	Miles	WRI analysis, based on *School Bus Fleet* (2019)	Data available only for the 100 largest school bus fleets.
2f	Average daily route mileage per bus	2f = 2e / 180	Miles	WRI analysis, based on *School Bus Fleet* (2019) and assuming 180 school days per year (NCES n.d.b)	Data available only for the 100 largest school bus fleets. This may reflect the total mileage of several different routes a school bus may take each day and should not be interpreted as the mileage one student would travel on a typical school day.
2g	Students transported daily		Number	*School Bus Fleet* (2019)	Data available only for the 100 largest school bus fleets.

Note: See Table A1 for further detail.

Source: Authors.

tion. We therefore had to determine when in this process to include an ESB in this dataset. This dataset tracks "committed" ESBs.

- **Definition:** An ESB is considered "committed" when a school district or fleet operator has been awarded funding to purchase it, or has made a formal agreement to purchase it from a manufacturer or dealer. We would not consider an ESB "committed" if a school district or other fleet operator only expressed interest in ESBs or stated that they plan to acquire ESBs, without having been awarded funding or having reached a formal agreement with a third party. See "Sheet 2: Bus-level data" for more information about the stages of procurement included in the definition of "committed."
- **Examples**: Examples of information that would lead to a designation of "committed" include a public announcement that a school district has been awarded funding from a federal school bus rebate program like the one created by the Diesel Emissions Reduction Act (DERA), or a news article stating that a school district has placed an order for ESBs from a manufacturer. An unsuccessful or pending funding application for ESBs, or a 2035 full-fleet electrification target that is not substantiated by funding or formal agreements, would not be considered "committed" (though it may be included in Category 6, "Expressions of interest in ESBs").
- **Rationale**: We chose this starting point for considering an ESB "committed" for two main reasons: good data availability and to avoid overcounting. Relatively good data are available about when an ESB reaches this phase because there are official announcements when school districts and private fleet operators are awarded public funds for ESBs, and nearly all ESBs tracked to date are supported by public funds. We also chose this starting point because our research and school district engagement suggest that when an ESB reaches this phase of the adoption process, there is a step-change increase in the likelihood that it will continue advancing through the adoption process and be put into operation in due course. Therefore, this starting point helps avoid overcounting, giving a more accurate estimate of the ESB adoption.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

See "Sheet 2: Bus-level data" for the sources and collection methods of these data.

Figure 1 | **Electric School Bus Roadmap**

Source: Shaver and Wang (forthcoming).

Category 4: Socioeconomic and demographic characteristics

These data describe the social, economic, and demographic characteristics of the school district. As described in "Indicator Selection Criteria," we tried to include data that would provide an adequately holistic understanding of socioeconomic and environmental health condition disparities among school districts, in alignment with wider thinking on the topic and what is relevant to ESBs, without including so many indicators that they burden nontechnical users with researching and selecting indicators. This section includes data on each school district's number of enrolled students, whether the district is controlled by an Indian Tribe or the Bureau of Indian Education (Bureau of Indian Education n.d.), median household income, percentage of households below the federal poverty level, the distribution of the population among race and ethnic categories, the number of school students with a disability, and whether the school district was qualified for ESB funding from the American Rescue Plan.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

Most of these data were sourced from NCES, a federal entity responsible for collecting and analyzing data related to education in the United States. NCES draws on U.S. Census data to publish these demographic, social, and economic data at the school district level.

Category 5: Environmental justice and health

This section includes four variables that are the result of WRI analysis and have not previously been published at the school district level (to the best of the authors' knowledge): percent low-income, percent non-white and/or Hispanic, average ozone concentration (parts per billion, ppb), and average concentration of fine particulate matter (PM2.5, measured in micrograms per cubic meter, $\mu g/m^3$). Together with the data from Category 4, the data in this section can be used to understand the extent to which ESBs are being adopted equitably among school districts with differing racial and economic characteristics and with different pollution burdens.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

Percent low-income is defined as the percent of households with a household income less than or equal to twice the federal poverty level. Percent non-white and/or Hispanic is defined as percent of individuals who identified as anything other than "white alone" and Non-Hispanic on the American Community Survey. Average ozone concentration is defined as summer seasonal average of daily maximum 8-hour ozone concentration in air (ppb). Average PM2.5 concentration is defined as annual average concentration of PM2.5 fine particulate matter (ug/m3).

These four variables were based on data from the Environmental Protection Agency (EPA)'s Environmental Justice Screening tool, 2021 release (EPA 2021a), which collects data from various sources, including the U.S. Census. Census block groups were associated with a school district (LEAID) based on the Geographic Relationship Files published by NCES (NCES 2022). All variables were calculated as the population-weighted average of the values for all census block groups within the school district's geographic boundaries for which data were available. If a census block group was included in multiple school districts, it was included in the averages for all of those school districts.

Category 6: Expressions of interest in ESBs

This category includes data that could help identify school districts that have expressed interest in ESBs or environmental sustainability, or school districts in cities or towns that have expressed interest in electric public vehicles. These include whether, to our knowledge, the school district previously applied for funding for ESBs but was not awarded that funding, whether the city where the school district is located is a member of the Climate Mayors Electric Vehicle Purchasing Collaborative, and whether the school district has made a sustainability commitment. A sustainability commitment can refer to several types of commitments, such as membership in the Green Schools National Network or Schools for Climate Action, as detailed in Table A1. Additional indicators will be added as more information is found.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

Once an indicator was selected, the data were collected from the website of the relevant program or commitment and manually entered into the corresponding cells. Some of these indicators were already at the school district level, such as the Green Schools National Network, in which case no scaling or aggregation was necessary. Some indicators were at the city level, such as the Climate Mayors Electric Vehicle Purchasing Collaborative, in which case we associated the commitment with the school district(s) in that city.

Category 7: Sources

This category includes links to sources that are not included in Table A1, such as unawarded applications for ESB funding (Category 6) and groups involved in ESB adoption (Category 3).

Sheet 2. Bus-level data

This category includes detailed information on ESB commitments at the individual bus level. Unlike the district-level sheet, each row of this table represents a single ESB, identified by a "Bus ID" that was assigned based on the bus operator's LEA ID (See Table A1 for details). This data structure enables us to capture elements that would be difficult or confusing to demonstrate at the district level. Namely, the dataset now includes the most recently known adoption stage of the bus as well as the quarter, if known, that the bus entered each stage of adoption. It also contains the dollar amount of the award that went toward the bus and toward the charging infrastructure. Data that were included in the previous dataset version—including the bus manufacturer, model, type, dealer, funding source, and bus charger information—are now disaggregated at the bus level. This allows the user to ascertain the number and distribution of these variables more clearly, especially for districts that have ESBs from different funding sources and manufacturers. Finally, each ESB includes the date of the most recent source that we have found and links to the sources of the adoption data.

ESB COMMITMENT STAGES

Based on the definition of a "committed" ESB (see Category 3) and the available data on ESB adoption, we identified four stages of the adoption process through which most ESBs move. These are:

1. **Awarded**: A fleet operator is awarded funds, most often from a public entity, to purchase an ESB. This award is publicly announced.
2. **Ordered**: The fleet operator submits an order with a bus dealer to purchase an ESB.
3. **Delivered**: The ESB arrives at the fleet operator's bus depot, yard, or other transportation hub.
4. **Operating**: The ESB is now used on regular routes transporting students.

We indicate the quarter (for instance, 2021 Q4) that the ESB was awarded, ordered, delivered, and first operating when the data are available; otherwise, these fields are left blank. Where the quarter is not known, some stages note only the year. This enables tracking of the time it takes buses to reach each stage of adoption and tracking the number of commitments at different stages by quarter. The most recent known adoption stage is indicated in the column labeled "Current status of bus."

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

As there is no known public, centrally available dataset on ESB adoption, we used Google with the search term "electric school bus" (quotes included) to find sources that reported ESBs that had been committed, including news articles, school websites, social media posts, government funding announcements, and datasets from government or nonprofit entities. We also gathered some information from correspondence with our partners, which we confirmed with published sources wherever possible. The sources for ESB adoption are listed at the end of the row of each fleet operator, as indicated in Category 7 of Table A1. Once we completed a comprehensive initial collection of ESB adoption data, new ESBs were identified using Google news alerts with "electric school bus" to receive notifications of news related to ESB adoptions. We also tracked the disbursement of funds from major ESB funding opportunities, such as the Volkswagen Diesel Emissions Environmental Mitigation Trust (n.d.) and the EPA's Diesel Emissions Reduction Act rebates and grants (EPA n.d.a.).

Sheet 3. Utilities

Category 8: Utility data

This category includes information on the electric power utilities operating in each school district. The "Utility name" variables include the names of all utility companies that operate within the boundaries of the school district. Variables covering the possible utility ownership structures include "Cooperative ownership," "Municipal ownership," "Investor ownership," and the like. These variables indicate whether any utility of the specified ownership model operates anywhere in the school district. For example, a "Yes" under "Cooperative ownership" indicates that one or more cooperative electric power utilities operate in that school district. The "RTO/ISO variable" indicates which regional transmission organization or independent system operator serves that school district. Additional research is underway to determine which utilities serve the schools and bus depots in each school district, since some school districts have multiple electric power utilities, meaning that different utilities could serve school buildings and bus depots.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

Spatial data on utility company boundaries in 2020 was sourced from Homeland Infrastructure Foundation-Level Data (HIFLD 2020). GIS analysis was conducted using these shapefiles and shapefiles of school districts from NCES (2020) to determine which utility service areas intersect with which school districts. The resulting dataset was exported from ArcGIS as a spreadsheet and merged into this dataset using an XLOOKUP Excel function based on LEA IDs.

Sheet 4. Counties

Category 9: County data

This category lists all the counties that intersect with each school district. Some school districts are entirely contained within one county, but almost 4,000 LEAs contain two or more counties. These data are important because certain funding opportunities, datasets, or decision-making powers relevant to ESBs are at the county level and not the school district level. School districts that contain more than one county are listed in multiple rows. For example, a district that contains two counties will appear in two rows, one with three counties will appear in three rows, and so on. Where school districts contain more than one county, the order of the counties listed with each school district is not meaningful (i.e., the county with the most area in the school district is not necessarily listed first).

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

These data come from the School District Geographic Relationship Files published by NCES, which list the counties associated with each school dis- trict (NCES 2022). For school districts not included in the Geographic Relationship Files, we used the county listed in the NCES LEA Directory for the 2020–21 school year.

Sheet 5. Congressional districts

Category 10: Congressional district data

This category lists all of the congressional districts that exist within a school district, as well as the number of congressional districts that are within the LEA, if known. Similar to Sheet 4, school districts appear in as many rows as the number of congressional districts that they contain. The order in which congressional districts are listed with a school district is not meaningful.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

These data come from the School District Geographic Relationship Files published by NCES, which list the congressional districts associated with each school district (NCES 2022). For school districts not included in the Geographic Relationship Files, we used the congressional district listed in the NCES LEA Directory for the 2020–21 school year.

Sheet 6. State school bus fleets

Category 11: State school bus fleet data

This section compiles school bus fleet data at the state level. In addition to including the total number of ESBs for each state, this section also records the percentage of the statewide school bus fleet that is electric and data on the number of students who use the school bus as their primary mode of transportation.

DATA SOURCE, COLLECTION METHOD, AND/OR ANALYSIS METHOD

The total of ESBs per state is based on the number of committed ESBs recorded on Sheet 1. We calculated the percentage of the state school bus fleet that is electric using school bus registration data from Atlas EV Hub (2022). The data on primary modes of transportation to school come from the National Household Travel Survey (Federal Highway Administration 2017).

USE CASES

A main value-add of this dataset is its compilation and organization of data on ESBs (Category 3) in a useful, cohesive structure that enables comparison between school districts and with other datasets (such as U.S. Census or other demographic data). Many users may want to filter the data to identify only school districts with ESBs, and then filter or sort based on other characteristics. This could answer questions such as "How are ESBs distributed across school districts of different income levels or racial compositions?" or "How are ESBs distributed across different regions of the country, states, or urban and rural areas?" Users can also take a deeper look into data trends in the bus-level sheet to answer questions such as "What funding sources have been used most frequently to fund ESBs?", "How many committed buses are from a given operator?", or "How many buses were awarded in the fourth quarter of 2020?" This data can also be used to better understand the rate of adoption of ESBs in a given school district—including, for example, if they piloted a few buses and then scaled up by ordering many more.

This dataset includes all school districts, not only school districts with ESBs, to enable comparisons between school districts with ESBs and the wider universe of school districts, such as "Do school districts with ESBs have a higher percentage of people of color than the average school district?"

Examples of Use Cases

- A staff member or student in a school district is trying to find information about how their school district compares to others with regard to sustainability and equity outcomes. They would use this information to assess the feasibility of transition to ESBs based on their similarity to other school districts with ESBs or to advocate for cleaner bus fleets if similar schools have been able to make the change.
- A journalist is looking for the most up-to-date data on ESB adoption in the United States and wants to run analyses that compare ESB adoption against other indicators, such as air pollution exposure of children. The journalist would use the data to write a piece on the case for ESBs from a health perspective.
- A congressional staffer wants to know how the district or state of their member of Congress compares to others when it comes to ESB adoption. That staffer would use the data to advocate for full appropriations of zero-emissions school bus funding allocated in federal legislation, such as the 2021 infrastructure bill and/or the Reconciliation bill.
- ESB advocates working at the local, state, or federal government level want to know characteristics of their school bus fleet and how many are ESBs. They would use the data to create a snapshot of the current status in order to bolster efforts to write ESB-friendly policy. They can also see which congressional districts overlap with their school district so that they can determine which congressmembers to contact.

We see very limited potential for misuse of these data or use of the data for efforts not aligned with the goals of WRI's Electric School Bus Initiative. It may be possible to use these data to advocate against the use of public funding to support ESB adoption, if ESB adoption is not deemed to be widespread, equitable, or cost-effective enough to justify the investment. It may also be possible for an advocate or school district or state official to use these data to argue against the adoption of ESBs in their

jurisdiction (i.e., to argue for other alternative-fuel buses like propane or CNG) if they deem there to be insufficient nationwide piloting or use of ESBs. We anticipate that these risks will decrease as the number of ESBs committed and in operation increases in the early 2020s.

LIMITATIONS

Limitations in Data Availability (Data Gaps)

A current major data gap regards school bus fleet characteristics at the school district level, including number of buses, age of buses, ownership model, and number or share of students transported. This dataset only includes data for the 100 largest school bus fleets (from *School Bus Fleet* magazine) and a few select other districts. We are looking into additional sources for these data, including from state vehicle registration data or ESB grant applications. There are also gaps in socioeconomic data relating to some LEA types like charter schools and tribal schools, and in the socioeconomic characteristics of school districts served by ESBs that are owned by a private fleet operator, in cases where we do not know where those ESBs operate.

Quarters are used to track ESB adoption stages because sources often do not include specific dates. Very few of the ESBs that are listed in Sheet 2 have a known quarter for each of the four commitment stages. It is uncommon for news outlets, districts, or dealers to announce each stage, leading to gaps in our knowledge of the full adoption timeline of every ESB. For example, an ESB delivery may be covered by local news or announced on a school district website, but the date that the bus first began operating on regular routes was not. Sometimes sources may also mention the status of the bus without indicating the specific time period that the bus entered that stage.

Uncertainty and Potential Bias

Data on the number and location of electric school buses in the United States were aggregated from hundreds of news articles, funding announcements, press releases, and other disparate online sources. This method of data collection is a source of uncertainty in the dataset. We are unable to quantify the amount of uncertainty; this section explains where and how error may have been introduced, how that impacts the use of the findings, how we are working to counteract that source of uncertainty, and how users might counteract that uncertainty in their use of the data.

- **Outdated information:** The real-world situation may have changed since the source was published (as is the case with any static dataset). To counteract this uncertainty, users can search for additional or more recent sources about ESBs in particular districts of interest. We intend to update the dataset quarterly to limit the accumulation of out-of-date information across the entire dataset.
- **Omitted information:** Given the disparate and numerous sources used to collect these data, the dataset may inadvertently omit ESBs (or details about ESBs) for which data are publicly available. We hope that the publication of this dataset will lead users to provide WRI with missing information that can be included in updates.
- **Unknown location of buses owned by private fleet operators:** Several private fleet operators have committed to ESBs. Some of these operators serve school districts around the country, and in some cases, there is not information about where the ESBs will operate. In such cases, the ESBs are listed as owned by the fleet operator, but no associated geographic or demographic information is provided. This means the school buses are included in the total number of ESBs and number of entities with ESBs (and in some cases in the count of ESBs by funding source), but they would not be represented in analyses of the distribution of ESBs by region, income, and so forth. To counteract this uncertainty, the Electric School Bus Initiative is working to build partnerships with fleet operators so that, among other things, we can access more accurate information on the school districts that these ESBs serve. As we learn about the location of these ESBs, updates to this dataset will list those ESBs with the school district they serve, and the fleet operator will be noted in the school district's "Fleet operator" column.
- **Double-counting of school buses owned by private fleet operators:** In other cases, we may have information that the ESBs owned by a private fleet operator will serve a given school district. However, some school districts have a hybrid model of school bus ownership where they own some buses and contract with a private operator for others.

Given the fragmented nature of information available, this could potentially lead to double-counting. For example, a news article from the local newspaper covering a school district may indicate that the district is "getting" a certain number of ESBs, while funding allocation announcements (for example, from the EPA's DERA program) may state that the fleet operator will be purchasing those same buses. This could potentially lead to the same bus(es) being listed under both the school district and the fleet operator. To counteract this uncertainty, the Electric School Bus Initiative is working to build partnerships with fleet operators so that, among other things, we can access more accurate information on the school districts that these ESBs serve. As we learn about the location of these ESBs, updates to this dataset will list those ESBs with the school districts they serve, and the fleet operator will be noted in the school district's "Fleet operator" column.

Consistency among Data Sources

This dataset draws from multiple data sources that differ in their method, time of publication, and other characteristics. Combining these to produce new insights presents a potential quality risk. We used the criteria described in "Indicator Selection Criteria" (Section 2) to ensure that all the data are as consistent, accurate, and fit for purpose as possible. We also describe the limitations of this dataset above, and include information in Table A1 that informs users of the specific characteristics and caveats of each included dataset.

Comprehensiveness of Indicators

The social, economic, environmental, and demographic data included in this dataset are ones that we determined to be relevant and robust, but they are by no means comprehensive. A nuanced understanding of the disadvantages or environmental injustices a community has experienced would require a wider array of information on topics such as exposure to various pollutants, health outcomes, access to services, employment, the policy and historical context, and many others. It would also benefit from a look at spatial scales larger and smaller than the school district level. However, we hope that the data provided here can help identify areas for further research. Updates to this dataset may include additional social, economic, environmental, and demographic indicators.

APPENDIX A. DATA DESCRIPTION AND SOURCES

Descriptions of Major Sources

- **The National Center for Education Statistics (NCES)** is an entity of the U.S. Department of Education responsible for "collecting and analyzing data related to education in the U.S. and other nations." Many of the data are updated yearly and presented in Excel or comma-separated value files at the school, district, and state levels, based on U.S. Census data. We collected data from NCES largely at the district level and use its district identifier number, known as a local education agency (LEA) ID, to ensure accurate data merging and tracking.
- *School Bus Fleet* is a pupil transportation trade publication that releases various surveys and statistics. Most of our data come from the magazine's survey of the top 100 school district fleets of 2019.
- **Homeland Infrastructure Foundation-Level Data (HIFLD)** is a public-domain website containing a variety of nationwide geospatial data. We used this source to determine utility boundaries so we could see how they overlap with school district boundaries using GIS analysis.

Table A1 | Data Description and Sources

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
SHEET 1: DISTRICT-LEVEL DATA								
0a	Has committed ESBs?		Categorical	Yes, No		Original WRI data collection	Various, see "Sources" columns for each school district	
1. School district characteristics								
1a	State		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1b	LEA or Entity Name	Local Education Agency or Entity Name	Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1c	LEA ID	Local Education Agency identification number	Identifier			NCES 2022	https://nces.ed.gov/ccd/files.asp	Also referred to as "NCES School District ID." This field displays the 7 digit school identification number. The first 2 digits identify the state and the last 5 identify the district ID. Put together, they make a 7 digit unique ID code for each school district. Note that private school LEA IDs do not follow this format. For private fleet operators without an assigned LEA, we created and assigned our own identifier based on the operator's name and state (i.e. First Student in Massachusetts has an ID of "25FIRST," Suffolk Transportation Services in New York has an ID of "36SUFFO"). When the state is known but not the district, the first two numbers are the state FIPS code with "XXXXX" following (i.e. 45XXXXX). When the private operator is known but not the state, the first two numbers are "00" followed by the first five letters of the operator (i.e. 00MIDWE for Midwest Transit Equipment)
1d	Street address 1		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1e	Street address 2		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1f	City		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1g	State		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1h	ZIP code		Code			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1i	Website		URL			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1j	Has LEA ID?		Binary	Yes/No		NCES 2022	https://nces.ed.gov/ccd/files.asp	
1k	LEA type (number)		Categorical	1 to 9		NCES 2022	https://nces.ed.gov/ccd/files.asp	We assigned the text "N/A" to entities that do not have an LEA ID, such as private fleet operators.

Table A1 | Data Description and Sources (Cont.)

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
1l	LEA type (name)		Categorical	- Regular public school district that is not a component of a supervisory union - Regular public school district that is a component of a supervisory union - Supervisory union administrative center - Service agency - State agency - Federal agency - Independent charter district - Other education agency - Specialized public school district - N/A		NCES 2022	https://nces.ed.gov/ccd/files.asp	We used "N/A" to indicate entities that do not have an LEA ID, such as private fleet operators.
1m	Supervisory union LEA ID (if applicable)		Identifier	LEA ID of district's supervisory union		NCES 2022	https://nces.ed.gov/ccd/files.asp	
1n	Locale (category full number)		Categorical	11, 12, 13 ,21, 22, 23, 31, 32, 33, 41, 42, 43		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/SchoolLocations	For a more detailed description of the locale classifications and criteria, see https://nces.ed.gov/programs/edge/docs/LOCALE_DEFINITIONS.pdf.
1o	Locale broad category (number)		Categorical	1 to 4		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/SchoolLocations	For a more detailed description of the locale classifications and criteria, see https://nces.ed.gov/programs/edge/docs/LOCALE_DEFINITIONS.pdf .
1p	Locale broad category (name)		Categorical	Rural, Town, Suburban, Urban		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/SchoolLocations	For a more detailed description of the locale classifications and criteria, see https://nces.ed.gov/programs/edge/docs/LOCALE_DEFINITIONS.pdf.
1q	Census Region		Categorical	Midwest, Northeast, South, West, None		U.S. Census	https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf	
1r	Census Division		Categorical	-East North Central - East South Central - Middle Atlantic - Mountain - New England - Pacific - South Atlantic - West North Central - West South Central - None		U.S. Census	https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf	
1s	Latitude		Number	Coordinate	Degrees	NCES 2022	https://nces.ed.gov/programs/edge/Geographic/SchoolLocations	Coordinates of the centroid of the school district
1t	Longitude		Number	Coordinate	Degrees	NCES 2022	https://nces.ed.gov/programs/edge/Geographic/SchoolLocations	Coordinates of the centroid of the school district

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
2. School bus fleet characteristics								
2a	Ranking of school bus fleet size		Number	1 to 101		School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets
2b	Total number of buses		Number		Buses	School Bus Fleet 2019; Original WRI data collection	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets, with a few exceptions. See "Sources" for school districts with this information that are outside of the 100 largest fleets
2c	Number of route buses		Number		Route buses	School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets
2d	Annual route mileage		Number		Miles	School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets
2e	Average annual route mileage per bus		Number		Miles	WRI analysis, based on School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets. See technical note for methodology.
2f	Average daily route mileage per bus		Number		Miles	WRI analysis, based on School Bus Fleet 2019 and assuming 180 school days per year	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets. This may reflect the total mileage of several different routes a school bus may take every day, such as in districts that have staggered school start and end times to be able to use each bus on multiple routes each day, which is increasingly common given the 2021 increase school bus driver shortages. This variable should not be interpreted as the mileage that one student would travel on a typical school day. See technical note for methodology.
2g	Number of students transported daily		Number		Students	School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets
2h	Fleet Ownership structure		Categorical	district, state, contractor, hybrid		School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets
2i	Starting hourly pay for drivers		Number		USD	School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets
2j	Labor shortage		Categorical	Mild, Moderate, Severe, Desperate, N/A		School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets
2k	Unionized?		Categorical	Yes, No, N/A		School Bus Fleet 2019	https://www.schoolbusfleet.com/research/download?id=10117399	Data is available only for the 100 largest school bus fleets

Table A1 | Data Description and Sources (Cont.)

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
3. Electric school bus fleet characteristics								
3a	Number of ESBs committed		Number		ESBs	Original WRI data collection	Various, see "Source" columns in Bus-level sheet	Linked from "Bus-level data" sheet. "Committed" includes buses that have been awarded, ordered, delivered, or are in operation. See technical note for details on the criteria for including specific ESBs in this dataset.
3b	Has delivered or operating ESBs?		Binary	Yes/No		Original WRI data collection	Various, see "Source" columns in Bus-level sheet	Linked from "Bus-level data" sheet. Included to enabler users to quickly determine whether the district or fleet operator has the ESBs in their possession at the time of publication
3c	Number of ESBs awarded		Number			Original WRI data collection	Various, see "Source" columns in Bus-level sheet	Linked from "Bus-level data" sheet
3d	Number of ESBs ordered		Number			Original WRI data collection	Various, see "Source" columns in Bus-level sheet	Linked from "Bus-level data" sheet
3e	Number of ESBs delivered		Number			Original WRI data collection	Various, see "Source" columns in Bus-level sheet	Linked from "Bus-level data" sheet
3f	Number of ESBs operating		Number			Original WRI data collection	Various, see "Source" columns in Bus-level sheet	Linked from "Bus-level data" sheet
3g	Government agency involved (non-funding)		Text	Any government agency involved in the adoption of the district's ESB(s) that did not provide funding for the purchase of the bus		Original WRI data collection	Various, see "Source" columns for each school district	
3h	Utility/Energy company Involved		Text	Utility or Energy company involed in the adoption of the district's ESB(s)		Original WRI data collection	Various, see "Source" columns for each school district	There are multiple columns for this variable to capture when a school district has worked with more than one utility or energy company.
3i	Other groups Involved		Text			Original WRI data collection	Various, see "Source" columns for each school district	There are multiple columns for this variable to capture when a school district has worked with more than one other group, such as a local advocacy organization.
3j	Other notes		Text			Original WRI data collection	Various, see "Source" columns for each school district	

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
4. Socioeconomic and demographic characteristics								
4a	Tribal school district		Binary	Yes/No		Based on whether LEA ID starts with "59"	https://nces.ed.gov/ccd/files.asp	
4b	Number of students in district		Number	Student count at the LEA level	Students	NCES, 2020-21	https://nces.ed.gov/ccd/elsi/tableGenerator.aspx	Includes students attending a school in the LEA, students placed in private schools by the LEA and funded by the LEA, and children participating in a prekindergarten program that is administered directly by the LEA, or by its grantees or subcontractors. Does not include students given vouchers to attend private schools or students placed by their parents in private schools whose tuition is paid for by their parents but who receive special education services from their home district. For details, see https://www2.ed.gov/about/inits/ed/edfacts/eden/non-xml/fs052-16-1.docx.
4c	Number of schools in district		Number	Number of schools within the LEA	Schools	NCES, 2020-21	https://nces.ed.gov/ccd/elsi/tableGenerator.aspx	
4d	Percentage of schools in district that are Title I schoolwide eligible		Number		Percentage	NCES, 2020-21	https://nces.ed.gov/ccd/elsi/tableGenerator.aspx	Title I provides financial assistance to LEAs for low-income children. The categories included in the count of "Title I schoolwide eligible schools" from the ElSi table generator include "Title I schoolwide eligible-Title I targeted assistance program," "Title I schoolwide eligible school-No program," and "Title I schoolwide school." For more information about Title I, see https://www2.ed.gov/programs/titleiparta/index.html
4e	Percentage of students in district eligible for free or reduced price lunch		Number		Percentage	NCES, 2020-21	https://nces.ed.gov/ccd/elsi/tableGenerator.aspx	For more information about the National School Lunch Program, see https://www.fns.usda.gov/nslp
4f	Median household income	Median household income and benefits of the total population within LEA geographic boundaries	Number		USD (2019 inflation-adjusted dollars)	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	This dataset can be found by applying the following filters on the NCES Education Demographic and Geographic Estimates data download page: "Total population," "Income and benefits (in 2019 inflation-adjusted dollars)," "Total households," and "Median household income (dollars)"

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
4g	Percent of population below the poverty level	Percent of families and people within LEA geographic boundaries whose income in the past 12 months is below the poverty level	Number		Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	This dataset can be found by applying the following filters on the NCES Education Demographic and Geographic Estimates data download page: "Total population," "Percentage of families and people whose income in the past 12 months is below the poverty level," and "All people"
4h, 4i	Percent White	Percent of total population within LEA geographic boundaries who identified as White	Number	Includes two categories: percent of total population who identied as White alone, and percent who identified as White alone or in combination with one or more other races (multiracial)	Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	
4j, 4k	Percent Black or African American	Percent of total population within LEA geographic boundaries who identified as Black or African American	Number	Includes two categories: percent of total population who identied as Black or African American alone, and percent who identified as Black or African American alone or in combination with one or more other races (multiracial)	Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	
4l, 4m	Percent American Indian and Alaska Native	Percent of total population within LEA geographic boundaries who identified as American Indian or Alaska Native	Number	Includes two categories: percent of total population who identied as American Indian or Alaska Native alone, and percent who identified as American Indian or Alaska Native alone or in combination with one or more other races (multiracial)	Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	
4n, 4o	Percent Asian	Percent of total population within LEA geographic boundaries who identified as Asian	Number	Includes two categories: percent of total population who identied as Asian alone, and percent who identified as Asian alone or in combination with one or more other races (multiracial)	Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	
4p, 4q	Percent Native Hawaiian and Other Pacific Islander	Percent of total population within LEA geographic boundaries who identified as Native Hawaiian or Other Pacific Islander	Number	Includes two categories: percent of total population who identied as Native Hawaiian or Other Pacific Islander alone, and percent who identified as Native Hawaiian or Other Pacific Islander alone or in combination with one or more other races (multiracial)	Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	
4r, 4s	Percent some other race	Percent of total population within LEA geographic boundaries who identified as some other race	Number	Includes two categories: percent of total population who identied as some other race alone, and percent who identified as some other race alone or in combination with one or more other races (multiracial)	Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
4t	Percent two or more races	Percent of total population within LEA geographic boundaries who identified two or more races	Number		Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	
4u	Percent Hispanic or Latino (of any race)	Percent of total population within LEA geographic boundaries who identified as Hispanic or Latino of any race	Number		Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	Ethnicity (Hispanic or Latino) is collected separately from race in the U.S. Census. This means that, in the context of the race and ethnicity percentages included here, a Hispanic or Latinx person can be any race(s), and several of the race categories listed here may include Hispanic or Latinx people. Hispanic or Latinx are often considered or identity as people of color. Therefore, adding together the percentages of races other than White is NOT an appropriate way estimate the percentage of people of people of color in a given school district.
5. Environmental justice and health								
5a	EPA Region	Environmental Protection Agency region	Categorical	1 to 10		EPA n.d.b.	https://www.epa.gov/aboutepa/regional-and-geographic-offices	
5b	Percent non-white and/or Hispanic	Percent of individuals who identified as anything other than "white alone" and Non-Hispanic on the American Community Survey, population-weighted average of all census block groups within LEA geographic boundaries	Number		Percentage	EJScreen 2021 (with WRI analysis); NCES 2021	https://gaftp.epa.gov/EJSCREEN/2020/; https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles	This is the same variable that EJScreen refers to as "Percent minority." ACS 5-Year Average 2015-2019.
5c	Percent low-income (200% of federal poverty level)	The percent of households with a household income less than or equal to twice the federal poverty level, population-weighted average of all census block groups within LEA geographic boundaries	Number		Percentage	EJScreen 2021 (with WRI analysis); NCES 2021	https://gaftp.epa.gov/EJSCREEN/2020/; https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles	ACS 5-Year Average 2015-2019

Table A1 | Data Description and Sources (Cont.)

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
5d	Percent of school children with a disability	Percent of enrolled public school children with a disability	Number		Percentage	NCES, 2015-2019	https://nces.ed.gov/programs/edge/TableViewer/acsProfile/2019	This dataset can be found by applying the following filters on the NCES Education Demographic and Geographic Estimates data download page: "Relevant children - enrolled public," "Disability status of the civilian noninstitutionalized population," "Under 18 years," and "With a disability"
5e	Qualified for American Rescue Plan funding?		Categorical	Yes, No, N/A		EPA 2021	https://www.epa.gov/system/files/documents/2021-09/fy21-arp-elect-school-bus-rebate-elig-list.pdf	School districts qualified for the 2021 American Rescue Plan are eligible to apply for certain electric school bus rebates provided by the EPA.
5f	PM 2.5	Particulate Matter 2.5 (PM2.5) annual average, population-weighted average of all census block groups within LEA geographic boundaries	Number		µg/m^3	EJScreen 2021 (with WRI analysis); NCES 2021	https://gaftp.epa.gov/EJSCREEN/2020/; https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles	
5g	Ozone				ppb	EJScreen 2021 (with WRI analysis); NCES 2021	https://gaftp.epa.gov/EJSCREEN/2020/; https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles	
6. Expressions of interest in ESBs								
6a	Has any expression of interest in ESBs?		Binary	True/False		Original WRI data collection		
6b	ARP 2021 waitlist position	American Rescue Plan 2021 waitlist position	Number			EPA 2022	https://www.epa.gov/system/files/documents/2022-02/2021-arp-applicant-waitlist.pdf	
6c, 6d	DERA school bus rebates waitlist position, 2020 and 2021	Diesel Emissions Reduction Act School Bus Rebates 2020 waitlist position	Number			EPA 2021	https://www.epa.gov/sites/default/files/2021-01/documents/2020-rebate-wait-list-2021-01.pdf	
6e	Applied for ESB funding but not awarded		Text	Funding opportunity applied to		New Jersey Department of Environmental Protection, 2018 and 2020; North Coast Unified Air Quality Management District, 2018 and 2019	https://www.state.nj.us/dep/vw/phase1proposals.html; https://www.state.nj.us/dep/vw/phase2proposals.html; https://www.ncuaqmd.org/files/a0eddf108/RSBPP+YR+2+GGRF+17-18+Project+Ranking.pdf; https://www.ncuaqmd.org/files/5c75275cc/RSBPP+YR+3+GGRF+18-19+Project+Ranking.pdf;	This is not a comprehensive list. It is included for informational purposes but should not be used to analyze characteristics or trends of ESB funding applicants.

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
6f	Member of Climate Mayors Electric Vehicle Purchasing Collaborative?		Categorical	Yes, No, N/A		Climate Mayors, acccessed August 2021	https://driveevfleets.org/what-is-the-collaborative/	Collected based on the city of the LEA's main physical address (Category 1f)
6g	School district sustainability commitment?		Text	Commitment type as listed		Schools for Climate Action 2021; Green Schools National Network, accessed October 2021; and other sources as listed	https://schoolsforclimateaction.weebly.com/ , https://www.aclimatetothrive.org/ , https://www.theatlantavoice.com/articles/why-electric-school-buses-are-a-win-for-georgians/ , https://greenschoolsnationalnetwork.org/about/	This is not a comprehensive list
7. Sources								
7a	Sources		URL					This field includes links to sources not otherwise included in this table
SHEET 2: BUS-LEVEL DATA								
0b	Bus ID	Bus identification number	Identifier	This is a WRI-assigned value constructed by attaching a number after the district's LEA ID. For example, if a district with the LEA ID 1200000 has 3 ESBs, the ESBs would be assigned IDs of 1200000-1, 1200000-2, and 1200000-3. The order of the Bus IDs is insignificant.		Assigned by WRI		
1. School district information								
1a	State		Text				https://nces.ed.gov/ccd/files.asp	
1b	LEA or Entity name	Local Education Agency or Entity Name	Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1c	LEA ID	Local Education Agency identification number	Identifier			NCES 2022	https://nces.ed.gov/ccd/files.asp	Also referred to as "NCES School District ID." This field displays the 7 digit school identification number. The first 2 digits identify the state and the last 5 identify the district ID. Put together, they make a 7 digit unique ID code for each school district. Note that private school LEA IDs do not follow this format.
1d	Street Address 1		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1e	Street Address 2		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1f	City		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1g	State		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1h	ZIP Code		Code			NCES 2022	https://nces.ed.gov/ccd/files.asp	

Table A1 | Data Description and Sources (Cont.)

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
2. Fleet information								
2l	Fleet operator (if applicable)		Text	If the district's ESB is operated by a third-party fleet operator, it is listed here.		Original WRI data collection	Various, see "Source" columns	
3. ESB characteristics								
3a	Number of ESBs committed		Number		ESBs	Original WRI data collection	Various, see "Source" columns	"Committed" includes buses that have been awarded, ordered, delivered, or are in operation. See technical note for details on the criteria for including specific ESBs in this dataset.
3k	Current status of bus		Categorical	Awarded, Ordered, Delivered, Operating		Original WRI data collection	Various, see "Source" columns	See technical note for information about these stages of ESB adoption
3l	Quarter awarded		Date	Year and quarter in which the ESB was awarded to the LEA or entity	Year and quarter (i.e. 2020 Q1)	Original WRI data collection	Various, see "Source" columns	
3m	Quarter ordered		Date	Year and quarter in which an order was placed for the ESB	Year and quarter (i.e. 2020 Q1)	Original WRI data collection	Various, see "Source" columns	
3n	Quarter delivered		Date	Year and quarter in which the ESB was delivered to the LEA or entity	Year and quarter (i.e. 2020 Q1)	Original WRI data collection	Various, see "Source" columns	
3o	Quarter first operating		Date	Year and quarter in which the ESB first began transporting students	Year and quarter (i.e. 2020 Q1)	Original WRI data collection	Various, see "Source" columns	
3p	Bus OEM	Bus original equipment manufacturer	Text	Original equipment manufacturer of the ESB		Original WRI data collection	Various, see "Source" columns	
3q	Electric powertrain manufacturer		Text	Electric powertrain manufacturer of the ESB		Original WRI data collection	Various, see "Source" columns	
3r	Model		Text	Model name of the ESB		Original WRI data collection	Various, see "Source" columns	
3s	Type		Categorical	School bus type: A, B, C, or D		Original WRI data collection	Various, see "Source" columns	
3t	Dealer		Text	Bus dealer from which the ESB was purchased		Original WRI data collection	Various, see "Source" columns	
3u	Multiple funding sources used?		Categorical	Yes/No		Original WRI data collection	Various, see "Source" columns	Based on whether more than one funding source is listed in the ESB's row
3v	Funding source		Text			Original WRI data collection	Various, see "Source" columns	
3w	Agency administering funds		Text			Original WRI data collection	Various, see "Source" columns	
3x	Dollar amount toward bus		Number	Amount of money awarded specifically for the procurement of the ESB	USD	Original WRI data collection	Various, see "Source" columns	
3y	Charging company		Text	Company responsible for the ESB's charging infrastructure		Original WRI data collection	Various, see "Source" columns	
3z	Charging funding source		Text			Original WRI data collection	Various, see "Source" columns	A funding source is listed here if the funds were awarded specifically for the charging infrastructure

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
3aa	Dollar amount toward charger		Number	Amount of money awarded specifically for the ESB's charging infrastructure	USD	Original WRI data collection	Various, see "Source" columns	
3ab	Notes		Text	Any other notable information not captured in the other columns		Original WRI data collection	Various, see "Source" columns	
7. Sources								
7a	Date of most recent source		Date		MM/DD/YYYY or Mon-YY if day is unknown			
7b	Sources		URL					This field includes links to sources not otherwise included in this table
SHEET 3: UTILITIES								
1. School district information								
1a	State		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1b	LEA name	Local Education Agency name	Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1c	LEA ID	Local Education Agency identification number	Identifier			NCES 2022	https://nces.ed.gov/ccd/files.asp	Also referred to as "NCES School District ID." This field displays the 7 digit school identification number. The first 2 digits identify the state and the last 5 identify the district ID. Put together, they make a 7 digit unique ID code for each school district. Note that private school LEA IDs do not follow this format.
8. Utility data								
8a	Utility name		Text			HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.92	There are multiple columns for this variable to capture when a school district has more than one utility operating within its boundaries.
8b	Cooperative ownership		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.93	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8c	Federal ownership		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.94	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8d	Investor ownership		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.95	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
8e	Municipal ownership		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.96	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8f	Municipal marketing authority		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.97	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8g	Political subdivision		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.98	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8h	State ownership		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.99	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8i	Wholesale		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.100	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8j	Not available		Categorical	Yes, No		HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.101	This variable indicates whether any utility of the specified ownership model operates anywhere in the school district.
8k	RTO/ISO	Regional transmission organization/ independent system operator	Text			HFILD 2020	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-retail-service-territories/explore?location=10.412340%2C163.801333%2C1.102	Incomplete data
SHEET 4: COUNTIES								
1. School district information								
1a	State name		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1b	LEA name	Local Education Agency name	Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	

Table A1 | **Data Description and Sources (Cont.)**

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
1c	LEA ID	Local Education Agency identification number	Identifier			NCES 2022	https://nces.ed.gov/ccd/files.asp	Also referred to as "NCES School District ID." This field displays the 7 digit school identification number. The first 2 digits identify the state and the last 5 identify the district ID. Put together, they make a 7 digit unique ID code for each school district. Note that private school LEA IDs do not follow this format.
9. County data								
9a	County name (State)		Text	County name followed by state name in parentheses.		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles; https://nces.ed.gov/ccd/files.asp	
9b	County FIPS Code	County-level Federal Information Processing System code	Code	5-digit county-level FIPS code. The first 2 digits of the code represent the state.		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles; https://nces.ed.gov/ccd/files.asp	
9c	Number of counties in LEA	Number of counties in Local Education Agency	Number	Number of counties that lie partially or wholly within the geographic boundaries of the LEA		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles; https://nces.ed.gov/ccd/files.asp	The number of times an LEA appears in this sheet depends upon the number of counties that lie partially or wholly within the geographic boundaries of the LEA. For example, an LEA with 5 counties will appear in 5 separate rows.
SHEET 5: CONGRESSIONAL DISTRICTS								
1. School district information								
1a	State		Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1b	LEA name	Local Education Agency name	Text			NCES 2022	https://nces.ed.gov/ccd/files.asp	
1c	LEA ID	Local Education Agency identification number	Identifier			NCES 2022	https://nces.ed.gov/ccd/files.asp	Also referred to as "NCES School District ID." This field displays the 7 digit school identification number. The first 2 digits identify the state and the last 5 identify the district ID. Put together, they make a 7 digit unique ID code for each school district. Note that private school LEA IDs do not follow this format.
10. Congressional district data								
10a	Congressional district		Identifier	State abbreviation and congressional district number (Format: AA-00)		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles; https://nces.ed.gov/ccd/files.asp	
10b	Congressional district code		Code	Census-provided code combining the 2-character numeric FIPS code and the 2 character numeric district code (Format: 0000)		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles; https://nces.ed.gov/ccd/files.asp	

Table A1 | Data Description and Sources (Cont.)

VARIABLE ID	VARIABLE	FULL NAME	DATA TYPE	DATA DESCRIPTION	UNIT	SOURCE	LINK	NOTES
10c	Number of congressional districts in LEA		Number	Number of congressional districts that lie partially or wholly within the geographic boundaries of the LEA		NCES 2022	https://nces.ed.gov/programs/edge/Geographic/RelationshipFiles; https://nces.ed.gov/ccd/files.asp	The number of times an LEA appears in this sheet depends upon the number of congressional districts that lie partially or wholly within the geographic boundaries of the LEA. For example, an LEA with 5 congressional districts will appear in 5 separate rows.
SHEET 6: STATE SCHOOL BUS FLEETS								
11. State school bus fleet data								
11a	State		Text					
11b	Number of committed ESBs		Number	Number of committed ESBs in state	ESBs	Original WRI data collection	Various, see "Source" columns in Sheet 2	Summed using a Pivot Table of data from Category 3a in Sheet 1
11c	Percent committed ESBs		Number	Percent of statewide school bus fleet that is committed electric	Percentage	Original WRI data collection; Atlas EV Hub	https://www.atlasevhub.com	
11d	Number of persons who ride the school bus to school		Number		Persons	Federal Highway Administration	https://nhts.ornl.gov	Data was retrieved from the National Household Travel Survey (2017)
11e	Percent of persons who ride the school bus to school		Number		Percentage	Federal Highway Administration	https://nhts.ornl.gov	Data was retrieved from the National Household Travel Survey (2017)

APPENDIX B. 2019 AND 2020 DERA SCHOOL BUS REBATES – ELECTRIC BUS SUMMARY

WRI received the following information on the 2019 and 2020 DERA electric school bus rebates as a response to a Freedom of Information Act (FOIA) Request submitted to the EPA in November 2021. This information is included as an appendix here because it is included in the dataset and not publicly available elsewhere.

2019 Selectees (1 bus total)

- Reynolds School District #7 (OR) – 1 ZEV bus
  - $20,000 paid out for ZEV bus
  - 2020 Blue Bird

2020 Selectees: (20 buses total)

- Center Unified School District (CA) – 5 ZEV buses
  - o $300,000 to be paid out
  - o 2021 Lion buses
- Elk Grove Unified School District (CA) – 4 ZEV buses
  - $260,000 to be paid out
  - 2021 Lion buses
- River Delta Unified School District (CA) – 4 ZEV buses
  - $260,000 to be paid out
  - 2021 Lion buses
- Robla School District (CA) – 1 ZEV bus o $65,000 to be paid out
  - 2021 Lion bus
- School District of Philadelphia (PA) – 2 ZEV buses
  - $130,000 to be paid out for ZEV buses
  - Lion buses
- Berkeley Unified School District (CA) – 4 ZEV buses
  - Note: Fleet is no longer participating in the 2020 Rebates

2020 Waitlist: (28 buses total)

- Burnett Transit (WI) – 1 ZEV bus for $65,000
- Pajaro Valley Unified School District (CA) – 5 ZEV buses for $300,000
- Esparto Unified School District (CA) – 1 ZEV bus for $65,000
- Shawnee Heights USD-450 (KS) – 2 ZEV buses for $130,000
- Fairfax County Public Schools - APP 2 (VA) – 4 ZEV buses for $260,000
- School District of Philadelphia (PA) – 2 ZEV buses $130,000
- Salt Lake City School District (UT) – 4 ZEV buses for $260,000
- Escondido Union High School District (CA) – 2 ZEV buses for $130,000
- Steamboat Springs School District (CO) – 1 ZEV bus for $65,000
- Fairfax County Public Schools – APP 1 (VA) – 4 ZEV buses for 260,000
- Croton-Harmon UFSD (NY) – 2 ZEV buses for $130,000

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