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Clean Cities Coalitions 2021 Activity Report

Mark Singer, Caley Johnson and Alana Wilson

National Renewable Energy Laboratory

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This publication is part of a series. Past Clean Cities Coalitions Activity Reports and multiyear data compilations can be found at *www.afdc.energy.gov*.

List of Acronyms

AFV	alternative fuel vehicle
B20	mid-level biodiesel blend
BIM	Behavioral Impact Model
CNG	compressed natural gas
CO_{2e}	carbon dioxide-equivalent
DAC	disadvantaged community
DOE	U.S. Department of Energy
E85	high-level ethanol blend
EEJUC	energy and environmental justice underserved community
EUI	energy use impact
EV	electric vehicle
GGE	gasoline gallon equivalent
GHG	greenhouse gas
GREET model	Greenhouse gases, Regulated Emissions, and Energy use in Technologies model
HDV	heavy-duty vehicle
HEV	hybrid electric vehicle
IR	idle reduction
LDV	light-duty vehicle
LNG	liquefied natural gas
MGGE	million gasoline gallon equivalents
NCFP	National Clean Fleets Partnership
NEVI	National Electric Vehicle Infrastructure
NREL	National Renewable Energy Laboratory
RNG	renewable natural gas
VMT	vehicle miles traveled
VTO	Vehicle Technologies Office

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Introduction

The U.S. Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy's Vehicle Technologies Office (VTO) works with local Clean Cities coalitions across the country as part of its Technology Integration Program. These efforts help businesses and consumers make smarter and more informed transportation energy choices that can save energy, lower costs, provide resilience through fuel diversification, and reduce air emissions. This report summarizes the success and impact of coalition activities based on data and information provided in their annual progress reports.

A national network of more than 75 Clean Cities coalitions active in nearly every state brings together stakeholders in the public and private sectors to use alternative including electric vehicles (EVs) and renewable fuels, idle-reduction (IR) measures, fuel economy improvements, and new transportation technologies as they emerge. To ensure success, coalitions leverage a robust set of expert resources and tools provided by DOE and its national laboratories. From technical assistance and handbooks to websites and targeted analysis, these resources contribute to every facet of coalition success. This strong national framework of resources, which facilitates a consistent vision and informed coalitions, is a hallmark of the network.

Clean Cities coalitions use an online tool to report advanced vehicle technology activity, infrastructure development, and relevant energy/fuel use information for their regions.

Each year, Clean Cities coalition directors submit annual reports of their activities and accomplishments for the previous calendar year. Data and information are submitted via an online reporting tool that is maintained as part of the Alternative Fuels Data Center at the National Renewable Energy Laboratory (NREL). Directors submit a range of data that characterize the membership, funding, projects, and activities of their coalitions. They also submit data about use of alternative fuel vehicles (AFVs) (including EVs[1] and hybrid electric vehicles [HEVs]), sales of alternative fuels, IR initiatives, fuel economy improvement activities, and programs to reduce vehicle miles traveled (VMT).

This report compiles the accomplishments of all coalitions throughout the nation in calendar year 2021. Coalition directors assembled the data based on voluntary reports from their stakeholders—the private and public entities that are members of the coalitions. As such, each individual coalition report represents a subset of Clean Cities coalition activities. Taken together, they are an important indicator of how data, information, and resources can be effectively leveraged through the national network of Clean Cities coalitions and stakeholders to achieve significant results. Accomplishments from the National Clean Fleets Partnership (NCFP) are also reported directly by the national partners.

NREL analyzes the submitted data to determine how broadly energy use in the United States has shifted as a result of coalition activities. The two main components of energy use tracked by NREL are (1) energy savings from efficiency projects, measured in gasoline gallon equivalents (GGE), and (2) alternative fuel use. The alternative fuel use numbers in this report have been adjusted to account for any gasoline or diesel content (e.g., with biodiesel or ethanol blends), as

[1] EVs include all-electric vehicles and plug-in hybrid electric vehicles, but not hybrid electric vehicles.

well as for any conventional fuels used upstream to produce, distribute, or deliver alternative fuels. Analysis also accounts for the efficiency differences between AFVs and conventional vehicles.[2] Ultimately, these two components are combined and reported as energy use impact (EUI) in GGE. EUI is a metric that measures combined progress in energy savings from efficiency projects and increased fuel diversity through use of alternative fuels. Both components provide consumers and businesses with more energy choices. When achieved at scale, these strategies support DOE's mission to pursue more affordable, efficient, and clean energy choices. This report summarizes the EUI and related greenhouse gas (GHG) emissions reduction impacts of coalition activities.

A compilation of data from this report, along with reports from previous years, can be accessed on the Alternative Fuels Data Center's Maps and Data page (https://afdc.energy.gov/data/categories/clean-cities). Reports from previous years can be downloaded in their entirety at *www.afdc.energy.gov*.

Summary of Key Findings

Coalitions achieved an EUI of nearly 1 billion GGE in 2021.

Clean Cities coalition activities in 2021 resulted in an EUI of nearly 1 billion GGE, comprising net alternative fuels used and energy savings from efficiency projects. Table 1 represents the combined results of all strategies to increase fuel diversity and energy efficiency in the nation's fleets. Clean Cities coalition and stakeholder participation in vehicle and infrastructure development projects remained strong, and the resulting EUI increased in 2021.

Table 1. Energy Use Impact of Each Portfolio Element

Project Type	Coalition Impact (MGGE [a])	Percent of Total Coalition Impact [b]	Change From Last Year
AFVs	645.2	68%	↓ −3%
HEVs	57.5	6%	↑ 61%
EVs	48.3	5%	↑ 25%
Fuel economy	44.8	5%	↑ 3%
Idle reduction	41.2	4%	↓ −7%
VMT reduction	40.4	4%	↑ 7%
Off-road	28.5	3%	↓ −13%
Estimated outreach impact	49.7	5%	↓ −12%
***Total EUI* [c]**	**955.7**	**100%**	↑ **0.1%**

[a] Million gasoline gallon equivalents
[b] Totals and subtotals may differ from the sums due to rounding.
[c] The *Clean Cities Coalitions 2021 Activity Report* is focused on the impacts of coalition activities and projects and excludes related DOE-led efforts that were included in this report series prior to 2016.

[2] Net alternative fuel used and energy savings from efficiency projects are expressed in GGE in this report using the lower heating value ratio of the fuels.

Clean Cities coalition activities reduce GHG emissions as they impact energy use. Table 2 shows that coalition-reported activities prevented nearly 5 million tons of carbon dioxide-equivalent (CO_2e) emissions. The GHG benefits increased 0.3% in 2021 as coalitions continue to focus on technologies with improved GHG benefits on a per GGE reduced basis and as the life cycle of many alternative fuels such as electricity or biofuels is becoming less carbon intense.

Coalitions averted nearly 5 million tons of GHG emissions—the equivalent of removing over 1.4 million conventional cars from the road.

Table 2. GHG Emissions Reduced by Clean Cities Coalitions in 2021

Project Type	Tons CO_2e of GHG Emissions Averted	Equivalent of Conventional Cars Removed [a]	Percent of Coalition Total
AFVs	2,022,078	577,681	40%
HEVs	680,079	194,290	14%
Fuel economy improvements	531,946	151,970	11%
Idle reduction	488,668	139,606	10%
VMT reduction	475,601	135,873	10%
EVs	400,145	114,316	8%
Off-road vehicles	90,780	25,935	2%
Outreach events estimate	310,422	88,684	6%
Coalition total	**4,999,718**	**1,428,354**	**100%**

[a] Calculated as total passenger car GHG emissions (Tables 2–13 in the U.S. Environmental Protection Agency's "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2020") divided by total short-wheelbase light-duty vehicles (Table VM-1 in the Federal Highway Administration's "Highway Statistics 2020").

Coalitions were successful in securing project grant awards from numerous outside (non-DOE) sources. For other federal, state, and local agencies and private sector foundations, see the Funding section. The 183 project grant awards in 2021 generated $118 million in funds from coalition members and project partners, in addition to $1.7 million in DOE grant funds. Coalitions also collected $1.1 million in stakeholder dues and $3.4 million in operational funds from host organizations. In macro terms, this non-DOE supplemental funding represents a 2:1 leveraging of the $60 million included in the VTO Technology Integration budget in 2021.

Clean Cities coalition directors spent nearly 135,300 hours pursuing their coalitions' goals in 2021. The average director is quite experienced and has held the director position for over 7 years. Directors logged more than 3,756 outreach, education, and training activities in 2021, which reached an estimated 25 million people. Activities that reached energy and environmental justice underserved communities[3] were tracked

Of all coalition outreach, education, and training activities in 2021, 25% reached energy and environmental justice underserved communities.

[3] EEJUCs are communities at the front line of pollution and climate change, communities with high energy expense or fossil dependence, indigenous communities, and those historically overburdened by racial and social inequity.

for the second time in 2021 and accounted for 25% of all activities.

Attribution and Fuel Use Factors

To clarify the link between coalition activities and end results, this *Clean Cities Coalitions Activity Report* includes an attribution factor that accounts for the percentage of a project's outcome that is likely to be a result of coalition activities, rather than the activities of other project participants. This attribution factor was used in the estimates of impacts for fuel economy, VMT reduction, IR, alternative fuel use, and outreach projects. Directors estimated the percentage of each project's outcome that the coalition was responsible for, and then the project's overall outcome was multiplied by that percentage to determine the individual coalition's impact. Although subjective, this method attempts to address the issue of attribution where a coalition is one of several partners involved in a project. To reduce the subjectivity of this factor, NREL provides a tool to help a coalition estimate its contribution to a given project.

Coalition-Reported Data

Directors submitted information about their stakeholders' alternative fuel use and energy savings, broken down according to the technologies in the Technology Integration portfolio, using an online reporting tool. NREL analyzed the data, converted them into an equivalent net quantity of gasoline for each element of the portfolio, and reported the data in GGE. As shown in Table 1, Clean Cities coalition efforts impacted 956 MGGE of energy in 2021.

Clean Cities coalitions' work with local fleets led to a substantial reduction in GHG emissions. To estimate the GHG reductions resulting from coalition activities, NREL used a version of the Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model.[4] This model accounts for the fuel life cycle, or "well-to-wheels" factor of GHG emissions for transportation fuels, which includes fuel production, transport, and usage in the vehicle. It does not consider emissions from indirect land use changes or vehicle manufacturing and decommissioning.

Alternative Fuels and Vehicles

As shown in Figure 1, alternative fuels (used in AFVs and in biodiesel blends) and fuel savings from HEVs collectively accounted for 751 MGGE, or 83% of the coalition-reported net alternative fuel use and energy savings from efficiency projects (excluding outreach in Table 1).

In 2021, coalitions reported a total inventory of 1.3 million AFVs, split among 10 fuel and technology types. The total vehicles reported by directors increased by 32.5% from 2020. A large portion of the increase was related to a coalition reporting an estimate of registered vehicles using mid-level ethanol blends.

The EUI due to renewable diesel use grew by 41% in 2021.

Among the more common fuel types, vehicles operating on ethanol blends grew by 93% to 516,313 vehicles. However, this growth is dominated by a single coalition reporting an estimate of 275,000 LDVs using mid-level ethanol blends. Biodiesel

[4] Argonne National Laboratory. 2020. The Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) Model.

vehicles decreased by 20% to 163,116. Compressed natural gas (CNG) vehicles increased by 7% to 93,153. EVs increased by 34% to 314,936, and HEVs increased by 13% to 177,900. Large percentage increases were also reported for vehicle technologies with relatively low vehicle counts. Vehicles operating on renewable natural gas (RNG or biomethane) grew by 53% to 11,043, and vehicles operating on renewable diesel grew by 62% to 19,089. The least common vehicle technology type, hydrogen vehicles, decreased by 10% to 371. Propane vehicles increased by 6% to 31,982.

The EUI increased by 1.5% across all vehicle technologies and increased for the majority of technologies individually: HEVs increased by 61%, renewable diesel vehicles by 41%, EVs by 25%, hydrogen vehicles by 19%, CNG vehicles by 5%, and liquefied natural gas (LNG) vehicles by 4%. Despite the large increase in estimated ethanol vehicles, ethanol EUI (as reported as E85, a high-level ethanol blend) grew just 4% overall. Many of these vehicles were estimated to use lower quantities of ethanol. Propane EUI was flat compared to 2020. The EUI decreased for RNG vehicles by 29% and 32% for biodiesel vehicles—largely offsetting the gains across the other technologies.

Figure 1 shows the percentage of EUI according to fuel type. CNG remains at the top of the list, accounting for 47% of the EUI, even though only 7% of the total vehicle population uses CNG. This contrasts with E85, a high-level ethanol blend, which accounts for only 10% of the AFV EUI, although 39% of reported AFVs can use E85.

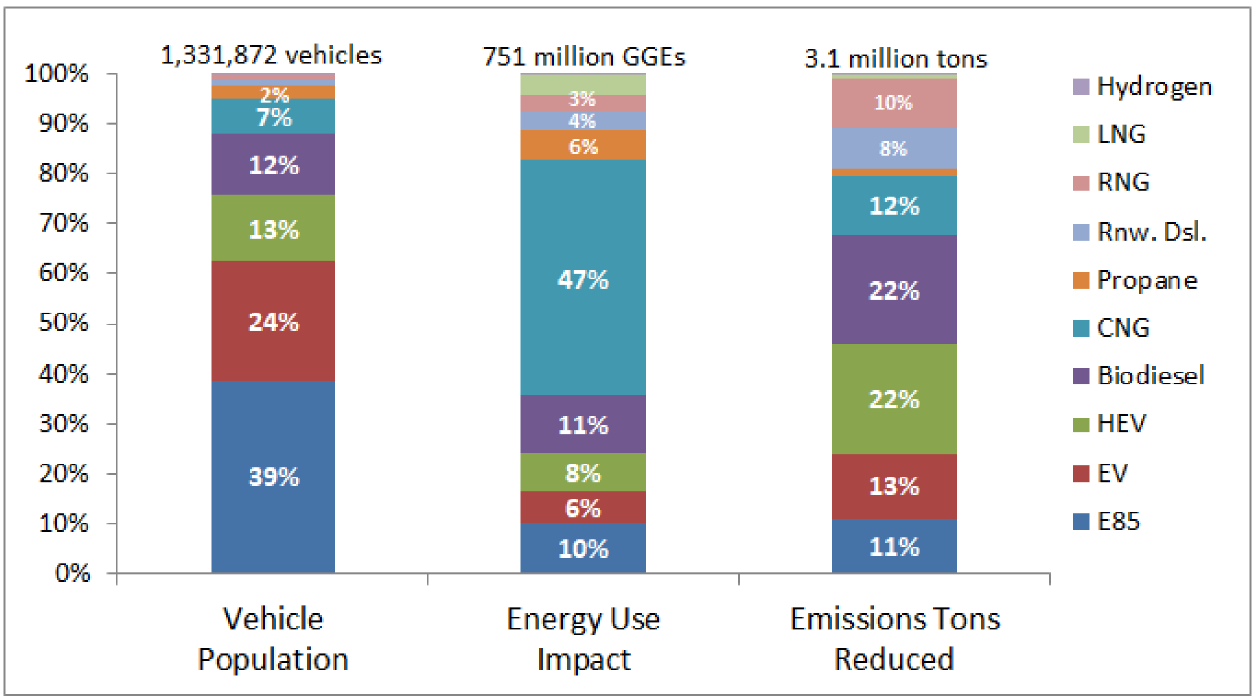

Figure 1. 2021 percentage of AFVs, EUI, and GHG emissions reductions by fuel type

The average EUI per vehicle, shown in Table 3, reveals some interesting trends. For a given vehicle, this number is influenced by five factors:

1. Dedicated AFVs (those that can only operate on alternative fuel) have a higher EUI than flex-fuel, dual-fuel, or bi-fuel vehicles that can switch between fuels. Simply stated,

dedicated AFVs use alternative fuel 100% of the time, while those with interchangeable fuel systems may only use alternative fuel some of the time.

2. The number of miles per year that the AFV travels (higher mileage uses more alternative fuel).
3. The AFV's fuel consumption. Large vehicles that are doing more work tend to consume more fuel. Therefore, Table 3 separates light-duty vehicles (LDVs) and heavy-duty vehicles (HDVs) to increase fidelity.
4. The amount of conventional fuel contained in an alternative fuel blend (e.g., mid-level biodiesel blends like B20 still contains 80% conventional diesel, so only a portion of the B20 fuel consumed counts toward the alternative fuel usage).
5. The amount of conventional fuel used to produce or transport the alternative fuel. For example, the diesel used to grow the corn that is turned into ethanol is subtracted from the EUI.

Table 3. Average Annual EUI per Vehicle in 2021

Fuel	GGE per HDV	# of HDVs	GGE per LDV	# of LDVs
LNG	8,123	3,969	NA	NA
Hydrogen	7,616	77	387	294
CNG	5,920	55,965	612	37,188
RNG	5,475	3,720	511	7,323
HEV	4,940	6,959	135	170,941
EV	3,316	6,026	92	308,910
Propane	1,757	14,564	1,121	17,418
Renewable diesel	1,610	16,182	597	2,907
E85	1,358	5,655	134	510,658
Biodiesel	844	93,788	88	69,328

Alternative fuels and AFVs were responsible for greater total GHG emissions reductions than any other coalition-reported activity. These reductions were calculated by subtracting the life cycle GHG emissions resulting from the use of an alternative fuel in a vehicle from the life cycle GHG emissions resulting from the use of gasoline or diesel fuel in an equivalent vehicle. For these calculations, gasoline is considered the baseline fuel for all LDVs, and diesel is considered the baseline fuel for HDVs. An exception is made for school buses, where gasoline is considered the baseline fuel for buses using E85, CNG, LNG, and propane because many baseline buses use gasoline, and these vehicles are equipped with spark-ignition (gasoline-like) engines.

As shown in Figure 1, the emissions reductions are not necessarily proportional to the alternative fuel used because the various alternative fuels result in different levels of life cycle emissions. RNG is a prime example of a fuel that has extremely low life cycle emissions because it has the net effect of reducing methane (a GHG) emissions from landfills, wastewater treatment facilities, and farms. It is also worth noting that VMT reduction, HEVs, IR, and fuel economy improvement projects have a disproportionately high emissions reduction compared to their EUI because these conservation measures "eliminate" 100% of the emissions that would have resulted from the fuel they save. AFVs generally demonstrate a net "reduction" in emissions compared to vehicles that use conventional fuels but usually do not "eliminate" all the GHG emissions.

VMT reduction, HEVs, IR, and fuel economy improvement projects have a disproportionately high emissions reduction compared to their EUI.

High-Impact Fleets and Vehicle Segments: Although HDVs represented only 16% of the reported AFVs, these HDVs are responsible for 77% of the EUI from AFV and HEV projects. The average HDV that operates on alternative fuels impacts 18 times as much fuel use as the average LDV. The use of LNG is confined exclusively to HDVs. Likewise, the overwhelming majority of renewable diesel, CNG, biodiesel, RNG, and hydrogen is used by HDVs (94%, 94%, 93%, 84%, and 84%, respectively). Technologies with contributions more evenly split between LDVs and HDVs include HEVs, propane vehicles, and EVs, where HDVs accounted for 60%, 57%, and 41%, respectively. The only technology whose contributions were dominated by LDVs was E85 (with only 10% from HDVs).

The average EUI of an HDV in the Technology Integration Program is 18 times as much as an LDV.

Idle Reduction

The estimated energy savings in 2021 for IR technologies and policies was 41.2 MGGE. The number of IR projects decreased 4% in 2021, and the quantity of energy that these projects saved decreased 7%. As shown in Figure 2, at 14.9 MGGE, automatic engine shutoff was responsible for the greatest percentage (36%) of energy savings. Auxiliary power units at 10.5 MGGE, IR policies at 4.9 MGGE, the "other" category at 4.1 MGGE, and driver training at 3.3 MGGE followed with significant percentages (26%, 12%, 10%, and 8%, respectively). Direct-fire heater at 1.6 MGGE, truck-stop electrification at 0.8 MGGE, thermal storage at 0.6 MGGE, and onboard batteries at 0.4 MGGE represented 4%, 2%, 1%, and 1%, respectively, of the IR energy savings. The remaining methods combined to represent less than 1% of the total savings.

Savings from automatic engine shutoff grew by 36% from 2020 to 2021.

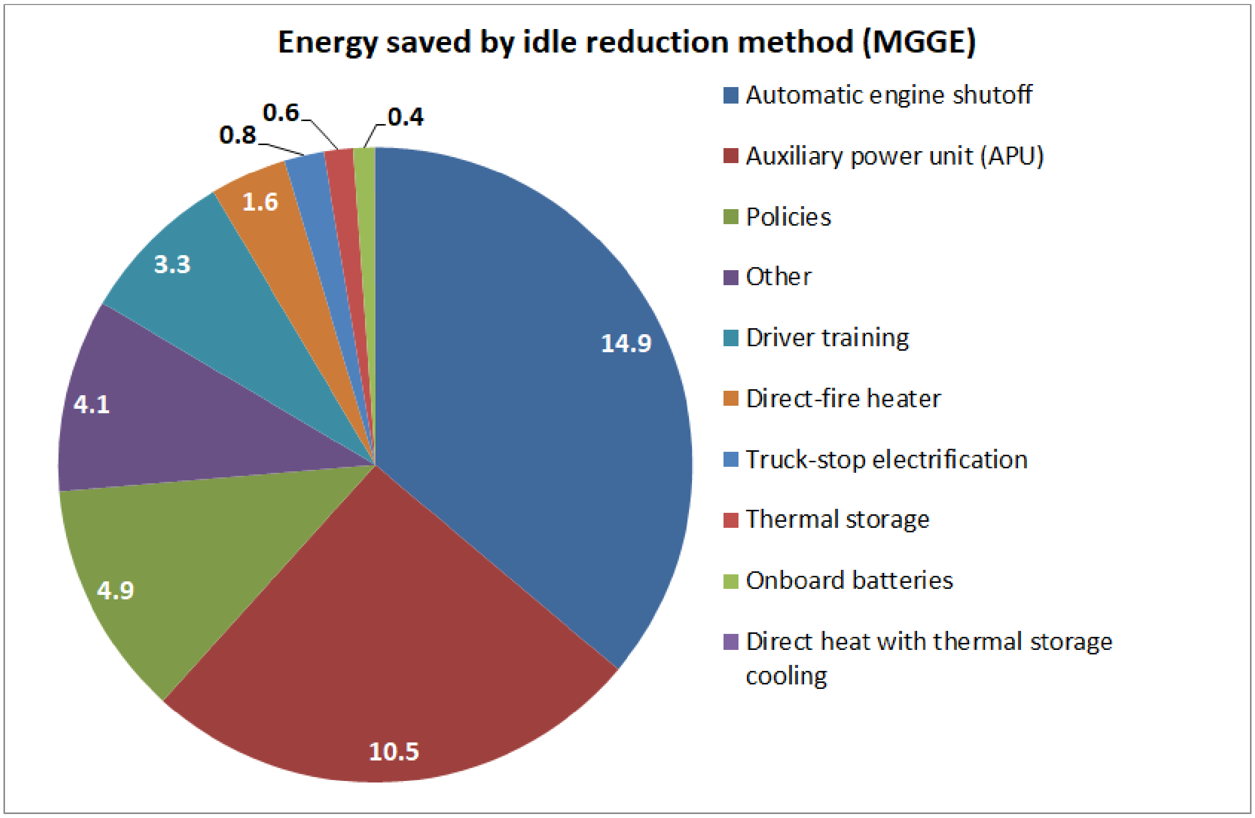

Figure 2. Energy savings measured in MGGE from IR projects, 2021

Fuel Economy

Coalitions completed a range of fuel economy projects aimed at using energy more efficiently. Non-HEV coalition-reported fuel economy projects accounted for a total savings of 44.8 MGGE, which was an increase of 3% from the reported 2020 savings. Figure 3 includes the range of fuel economy technologies advanced by coalitions. There were 79,517 vehicles in the non-HEV fuel economy technology category, equating to an average annual EUI of 563 GGE per vehicle. Figure 3 shows the fuel economy improvement projects with the largest improvements were those replacing vehicles with more efficient vehicles (including diesel vehicles) and driver training. Automatic tire inflation systems, the "other" category, hydraulic hybrid vehicles, and low-rolling-resistance tires all showed improvements over 500 GGE per year per vehicle.

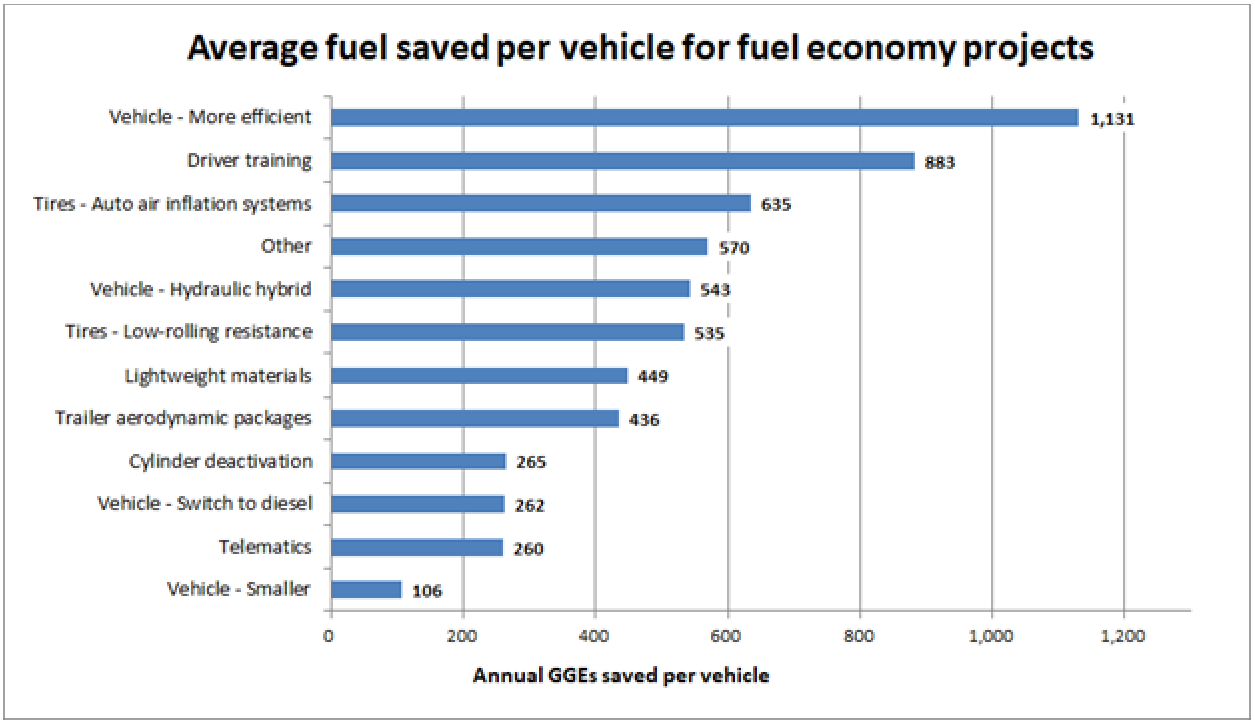

Figure 3. Average energy saved per vehicle for 2021 Clean Cities coalition fuel economy projects

Vehicle Miles Traveled Reduction

VMT reduction projects save fuel, and therefore money, while simultaneously curbing emissions. These types of projects include strategies such as carpooling, biking, teleworking, and public transportation. Of the 78 reporting coalitions, 53 (68%) reported at least one VMT reduction project in 2021, with a total of 434 projects reported. VMT projects are generally outside the scope of advanced vehicle, fuel, and systems research addressed by VTO. Since the primary purpose of this report is to analyze and document the impact of Clean Cities coalition efforts related to VTO technologies, the contribution of VMT projects to this analysis is limited to 20% of any given coalition's total energy savings. This cap affected seven coalitions; however, even with this limit in place, coalitions saved 40.4 MGGE of fuel with VMT activities. The project types, numbers, and sizes of the VMT projects are shown in Table 4.

Table 4. VMT Reduction Project Types, Number, and Energy Savings in 2021

Project Type	Number of Projects	Increase in # of Projects Over 2020	GGE Saved per Project [a]	DOE-Capped GGE Saved per Project
Route optimization	143	16	48,028	43,916
Mass transit	63	3	411,228	291,927
Nonmotorized locomotion (e.g., bicycles)	59	5	29,550	29,486
Carpooling	54	2	232,959	90,309
Telecommute	47	9	43,121	42,123
Other	30	1	151,145	134,442
Vanpooling	16	2	130,933	98,892

Project Type	Number of Projects	Increase in # of Projects Over 2020	GGE Saved per Project [a]	DOE-Capped GGE Saved per Project
Compressed work week	11	2	115,280	115,081
Car sharing (e.g., Zipcar)	11	3	21,532	21,514
Grand total	**434**	**43**	**131,934**	**93,054**

[a] GGE per project calculated before the 20% limit of coalition overall energy savings was implemented.

Off-Road Vehicles

Coalition impact extends beyond the road. Off-road project EUI was nearly 29 MGGE in 2021.

Vehicles used in off-road applications contributed to coalitions' overall accomplishments. Many of these projects were born out of synergies with on-road projects with existing stakeholders using several of the same alternative fuels, technologies, and strategies. Table 5 shows the number of off-road vehicles (or pieces of equipment) reported by coalitions in 2021. These categories are self-descriptive, except for three. "Construction equipment" includes cranes, earth movers, and similar equipment. The "recreation equipment" application includes jet skis, snowmobiles, and all-terrain vehicles. The "other" category includes vehicle speed limitations and changes to hydraulic pumps.

Table 5. Number of Off-Road Vehicles or Equipment and EUI in 2021

Application	Number of Vehicles	Energy Use Impact (GGE)	GGE Saved per Vehicle
Construction equipment	15,478	2,061,430	133
Forklifts	5,240	4,023,633	768
Other	3,550	1,757,986	495
Landscaping and lawn equipment	1,923	261,979	136
Mining equipment	1,140	1,054,683	925
Recreational equipment	887	194,791	220
Farm equipment	485	16,368	34
Ships	164	15,479,234	94,386
Railroads	66	3,633,615	55,055
Street sweeper	65	57,890	891
Planes	3	3,337	1,112
Total	**29,001**	**28,544,947**	**984**

Overall EUI contributions from off-road vehicles totaled 28.5 MGGE. Ships used the most fuel, despite having a relatively low number of vehicles. This is largely due to four large LNG vessels that use a considerable amount of fuel per vessel per year. Vehicles using biodiesel accounted for 29% of the AFVs included in this category. Vehicles using other fuels in off-road applications included all-electric vehicles (17% of the total) and propane vehicles (13%). Biodiesel use was focused in mining equipment, ships, and construction equipment applications. All-electric vehicles were primarily used in the other equipment, forklifts, recreational equipment, and construction equipment categories. Propane vehicles were primarily reported as forklifts and landscaping equipment. Applications varied widely in number of GGE saved per vehicle, as shown in Table 5.

National Clean Fleets Partnership Contributions

In April 2011, DOE began partnering with national fleets that operate in more expansive geographic areas than any one coalition covers. The NCFP currently has 28 partners, who lead by example and are pacesetters for local stakeholder fleets. Seven of them reported their fuel use data directly to NREL. NREL then allocated NCFP fuel use from these data to 73 individual coalitions based on fleet garage locations, refueling locations, and partner estimates. The directors then verified that they did assist the NCFP fleets operating in their regions and claimed full, partial, or no credit for the partner's alternative fuel use that was attributed to them. Table 6 shows the contributions to total Clean Cities EUI that were attributed to national partners. Their EUI of 204 MGGE represents a 15% increase from 2020.

Seven national fleets have partnered with Clean Cities coalitions, sharing data reflecting efforts that span geographic areas larger than that of any single coalition.

Table 6. Vehicles, EUI, and Emissions Reduction From National Partners

Fuel	Vehicles	Energy Use Impact (GGE)	GHG Reduced (tons)
CNG	23,929	140,719,482	130,882
LNG	1,664	27,552,393	24,429
EV	3,665	11,202,864	84,022
Propane	4,023	11,106,188	9,424
Fuel economy	14,439	5,315,583	63,180
HEV	6,692	2,992,618	35,383
RNG	600	2,601,779	27,488
Biodiesel	174	1,989,344	14,534
Hydrogen	3	39,818	220
Idle reduction	252	9,169	109
Off-road	295	6,297	36
VMT	0	15,377	183
Total	**55,736**	**203,550,910**	**389,889**

Estimated Contributions From Outreach Activities

This category measures impact from behavior changes such as vehicle purchases, fuel choice, driving habits, vehicle maintenance, and transportation patterns that were influenced by coalition outreach activities. Calculating these contributions involves a fair degree of uncertainty, but it is nevertheless important to quantify the impacts of educational and outreach activities as much as possible. Not doing so would imply that these activities had no impact, which is inaccurate. This section outlines our approach and provides the results.

Methods Used To Estimate Energy Use Impact From Outreach Activities

To estimate net alternative fuel use and emissions reductions from outreach events, NREL and Oak Ridge National Laboratory developed the Behavioral Impact Model (BIM) and added related functionality to the Clean Cities coalition annual reporting tool to make it compatible with the BIM.

Impacts from coalition outreach events are estimated using standard analytical methods derived from advertising and marketing industries.

Clean Cities directors reported the type of outreach event, number of people reached by each event, technologies presented, and percent that should be attributed to the coalition. To determine the number of people reached by a given event, the total number of people attending the event was multiplied by the percent of the event that the coalition claimed credit for. When multiple technologies were presented at a given event, the annual report assumed the number of people reached to be divided evenly among the technologies. These data are then entered into the BIM as "persons reached by the coalition about a given technology."

The BIM multiplies this number of people reached by the probability a person will take an action as a result of the outreach (defined as purchasing an AFV or more efficient vehicle, or as changing driving or fueling behavior). This probability is derived by comparing the outreach event and technology to comparable marketing media and products. Ten of these media-product combinations have a "customer conversion rate" that is recorded by various marketing firms, as shown in Table 7. The customer conversion rate is the ratio of purchases made (desired action) divided by the total number of people contacted through the outreach activity. The code column in Table 7 is provided for trackability through the calculation process, as continued to Table 9.

Table 7. Benchmark Customer Conversion Rates and Their Sources

Code	Benchmark Conversion Rate	Reference
1	0.6% for electronics (expensive, complicated) websites	Fireclick.com, accessed June 16, 2011
2	1.3% for environmentally related, incremental cost purchase	Bird, Lori. 2004. *Utility Green Pricing Programs: Design, Implementation, and Consumer Response*
3	2% for common websites and website ads	Nielsen and Facebook. 2010. *Advertising Effectiveness: Understanding the Value of a Social Media Impression*. And Fireclick.com, accessed June 16, 2011
4	2.5% for industry-specific mail	Direct Marketing Association. 2011
5	3.2% for email	Fireclick.com, accessed June 16, 2011
6	7% for affiliates and 8% for "social ads" that are endorsed by peers	Fireclick.com, accessed June 16, 2011. Nielsen and Facebook. 2010. *Advertising Effectiveness: Understanding the Value of a Social Media Impression*
7	0.6% AdMeasure product: LDVs	GfK Mediamark Research & Intelligence, LLC. 2011

Code	Benchmark Conversion Rate	Reference
8	5.5% AdMeasure product: Gasoline	GfK Mediamark Research & Intelligence, LLC. 2011
9	17% AdMeasure smoking cessation "actions taken"	GfK Mediamark Research & Intelligence, LLC. 2011
10	2% for direct mail to current customers	Eisenberg, B. "The Average Conversion Rate: Is it a Myth?" ClickZ. February 1, 2008

For activity-type/audience-action combinations that were not directly addressed by research, NREL adjusted the customer conversion rates based on the Ostrow Model of Effective Frequency, Krugman's Three Exposure Theory, and the authors' assumptions. Table 8 lists a set of relationships that increase or decrease the impact of advertisements.

Table 8. Relationships for Media Effectiveness and Their Sources

Code	Relationships	Source
A	Degree of media interactivity increases impact	Ostrow Model of Effective Frequency
B	Brand recognition increases impact	Ostrow Model of Effective Frequency
C	Long purchase cycle increases impact	Ostrow Model of Effective Frequency
D	Less frequent usage of item increases impact	Ostrow Model of Effective Frequency
E	Affordability of item increases impact	Ostrow Model of Effective Frequency
F	Simple message increases impact	Ostrow Model of Effective Frequency
G	Media clarity (not cluttered) increases impact	Ostrow Model of Effective Frequency
H	Message in relevant environment increases impact	Ostrow Model of Effective Frequency
I	Audience attentiveness increases impact	Ostrow Model of Effective Frequency
J	More steps in processing the media increases impact	Krugman's Three Exposure Theory
K	Availability of item increases impact	Authors' assumptions
L	Length of vigilance required decreases impact	Authors' assumptions

We adjusted the benchmark conversion rates shown in Table 7 by the relationships for media effectiveness shown in Table 8. The direct application of these rates and relationships is shown in Table 9, where the number relates to the code in Table 7 and the letters relate to the code in Table 8. The final customer conversion rates used are displayed in Table 10.

Table 9. Combination of Benchmarks and Relationships

Activity Type	Purchase New AFV	Use Alt. Fuel in Existing Vehicle	Use Biodiesel Blends in Diesel Vehicle	Purchase More Efficient Car	Operate Vehicle More Efficiently	Purchase HEV	Reduce Idling	IR HDV (Equipment Purchase)	Reduce VMT
Advancing the choice	6+H+I+J-E	6+H+I+J	6+H+I+J	6+H+I+J	6+H+I+J	6+H+I+J-E	6+H+I+J	6+H+I+J-E	6+H+I+J
Advertisement	7-K	8-K-L	8-K-L	7+E	9-G-L	7-K	9-L	7+E	9-L
Conference	6+H+J-E	6+H+J	6+H+J	6+H+J	6+H+J	6+H+J-E	6+H+J	6+H+J-E	6+H+J
Literature distribution	4+B+H-E	4+B+H	4+B+H	4+B+H	4+B+H	4+B+H-E	4+B+H	4+B+H-E	4+B+H
Media event	7-E-G-H-K	8-G-H-K	8-G-H-K	7-G-H+E-K	9-G-H-K	7-E-G-H+B-K	9-G-H-K	7-E-G-H-K	9-G-H-K
Meeting	6+A+B+I-E	6+A+B+I	6+A+B+I	6+A+B+I	6+A+B+I	6+A+B+I-E	6+A+B+I	6+A+B+I-E	6+A+B+I
Website	1+B+J	3+B+J	3+B+J	3+B+J	3+B+J	1+B+J	3+B+J	1+B+J	3+B+J

Table 10. Customer Conversion Rates Used in the BIM

Activity Type	Purchase New AFV	Use Alternative Fuel in Existing Vehicle	Use Biodiesel Blends in Diesel Vehicle	Purchase More Efficient Car	Operate Vehicle More Efficiently	Purchase HEV	Reduce Idling	HDV IR Equipment Purchase	Reduce VMT
Advancing the choice	2.0%	6.0%	6.0%	5.0%	7.0%	2.0%	5.0%	4.0%	8.0%
Advertisement	0.6%	5.5%	5.5%	2.0%	10.0%	2.0%	10.0%	3.0%	4.0%
Conference	2.0%	6.0%	6.0%	5.0%	7.0%	2.0%	5.0%	4.0%	8.0%
Literature distribution	2.0%	3.0%	3.0%	2.5%	3.0%	2.5%	3.0%	2.5%	5.0%
Media event	0.6%	2.5%	3.0%	1.2%	3.0%	1.2%	4.0%	2.0%	2.0%
Meeting—other	2.0%	7.0%	6.0%	5.0%	7.0%	2.0%	5.0%	4.0%	8.0%
Website	2.0%	4.0%	3.0%	3.0%	4.0%	3.0%	3.0%	3.0%	3.0%

The number of people reached multiplied by the appropriate customer conversion rate (from Table 10) results in the number of people assumed to take the intended action. After the conversion factors have been applied, the BIM is like the Clean Cities coalition annual reporting tool, as it converts the estimated number of vehicles purchased or number of people changing their driving habits into an EUI. We make downward adjustments of 30%–40% to the estimates, based on subject matter estimates, to account for probable overlaps between audiences attending outreach events and entities reporting their own EUI via a Clean Cities coalition. We apply the estimated EUI only to the reporting year in question, even though many of the vehicle purchases and behavioral changes will likely last beyond that year.

Estimated Outreach Accomplishments

Coalitions' outreach, education, and training activities were classified into 10 categories, as shown in Table 11. A total of 3,756 activity days were reported, which were estimated to have reached over 25 million people. This was heavily influenced by a media event effort by a single coalition that distributed a series of news releases that reached nearly 20 million people. Apart from this effort, outreach events reached over 5.7 million people overall and 1,526 people per event on average. Media events continued to be the activity that reached the most people. Social media and advertisement were each estimated to have reached over 1 million people. The reach of conference participation was down 90% and was likely impacted by the COVID-19 pandemic. Estimated persons reached through outreach decreased by 19% in 2021. This decrease, combined with the 14% increase in overall activities, indicates that the number of people reached by each activity was substantially reduced in 2021. Using the BIM, NREL estimates that Clean Cities coalition outreach events prompted and enabled actions that impacted nearly 50 MGGE of energy use in 2021, after accounting for a substantial overlap with reported impacts.

The pandemic is likely the main reason why 19% fewer people were reached through coalition outreach.

Table 11. Outreach, Education, and Training Activities

Activity Type	Number of Activity Days	Share of Total Activities	Activities Increase Since 2020	Persons Reached	Share of Total Persons Reached	Persons Increase Since 2020
Meeting – other	1,110	29.6%	39%	87,420	0.3%	76%
Meeting – stakeholder	846	22.5%	2%	12,178	0.0%	−38%
Workshop held by coalition	386	10.3%	−9%	146,716	0.6%	−4%
Social media	321	8.5%	−7%	1,007,731	4.0%	−49%
Conference participation	309	8.2%	−20%	54,522	0.2%	−90%
Literature distribution	276	7.3%	153%	208,567	0.8%	315%
One-on-one fleet outreach	254	6.8%	70%	1,693	0.0%	67%
Media event	155	4.1%	10%	22,726,960	89.7%	−15%
Advertisement	53	1.4%	83%	1,027,478	4.1%	−43%
Website	46	1.2%	−38%	68,202	0.3%	−44%
Total	**3,756**	**100.0%**	**14%**	**25,341,467**	**100.0%**	**−19%**

Figure 4 shows the range of technologies covered by the 3,756 outreach activity days. Each activity could, and often did, cover multiple technologies; each activity covered an average of 2.5 different technologies. Coalition outreach events covered EVs much

EVs were the most common topic of coalition outreach events.

more than any other technology type. The remaining technologies were included in 22%–39% of outreach activities.

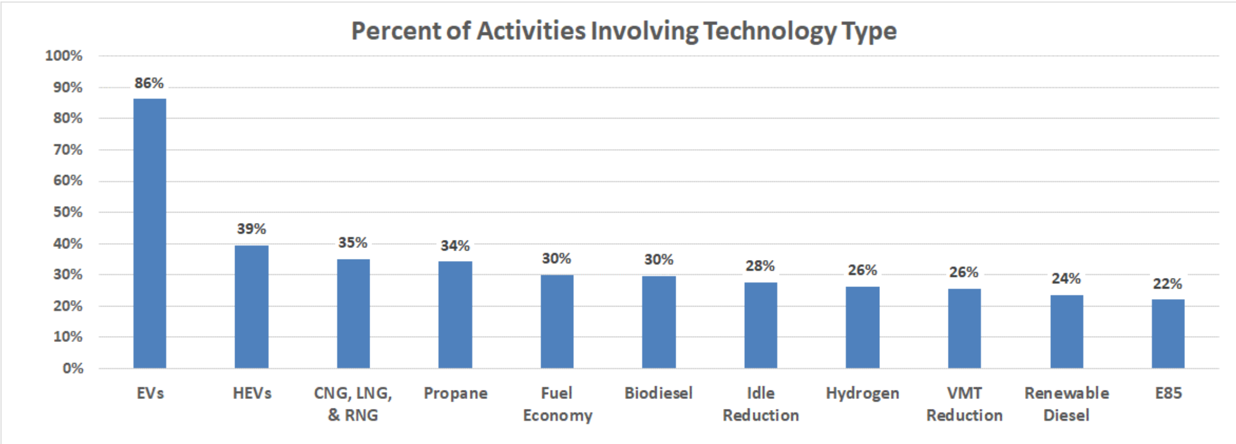

Figure 4. Percentage of outreach activities by technology type

Figure 5 shows government fleets were the most cited target audience, followed by private fleets, the general public, and the "other" audience group, which were each the target of close to 50% of activity days. Utility fleets and mass transit groups were targeted by 38% and 37% of activities, respectively. Fleets with delivery trucks, waste management, and airport applications were identified as audiences in less than 30% of the outreach activities. Just as with technology types, each activity could be, and often was, aimed at multiple audiences; each activity targeted an average of 3.8 different audiences. This composition of outreach activity audiences was consistent with 2020.

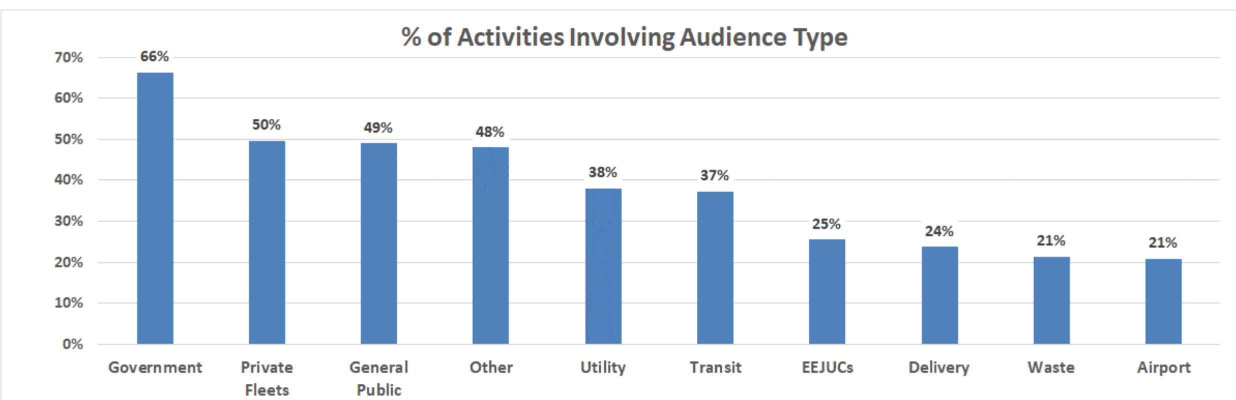

Figure 5. Percentage of outreach activities reaching each audience type

Figure 5 shows that activities with audiences that included energy and environmental justice underserved communities[5] (EEJUCs) represented 25% of activity days. The reporting tool does not provide a method to determine the portion of persons reached that were among each audience type. However, the portion of activity days (by activity type) that reached each audience type does allow a measure of how the activities including EEJUCs were unique from activities

[5] EEJUCs are communities at the front line of pollution and climate change, communities with high energy expense or fossil dependence, indigenous communities, and those historically overburdened by racial and social inequity.

overall. Figure 6 shows activities including EEJUC audiences were much more likely to include social media and literature distribution than activities overall. EEJUC-reaching activities were less likely to include meetings.

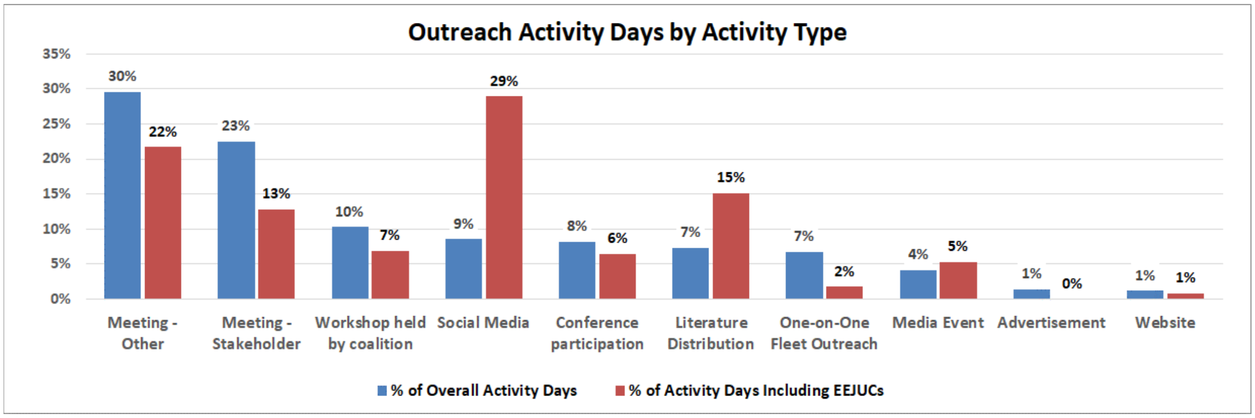

Figure 6. EEJUC activity types

Activities including EEJUC audiences covered electric vehicles even more consistently than activities overall, as shown in Figure 7. In addition, activities that included EEJUC audiences covered each of the other technologies more often than activities overall. This suggests outreach activities including EEJUCs tended to be more well-rounded and less targeted than overall activities. E85 was the only technology that was covered in less than 50% of activity days that included EEJUC audiences.

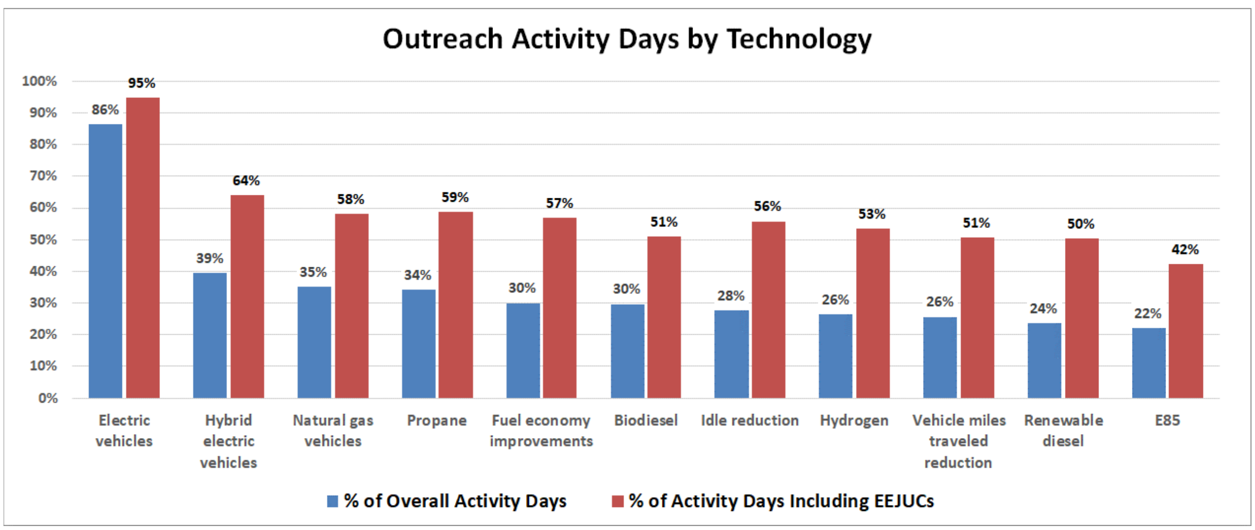

Figure 7. EEJUC activities by technology

Cumulative Energy Use Impact

Clean Cities coalitions have steadily increased their annual EUI as projects have been expanded and built upon each year. Figure 8 shows coalition annual EUI has reached new levels in recent years. In the last 6 years of tracking (2016–2021), annual coalition EUI has been nearly 1 billion GGE. The 2021 reporting year showed the coalitions continued the trend and achieved an annual EUI of nearly 1 billion GGE, with a slight increase from 2020.

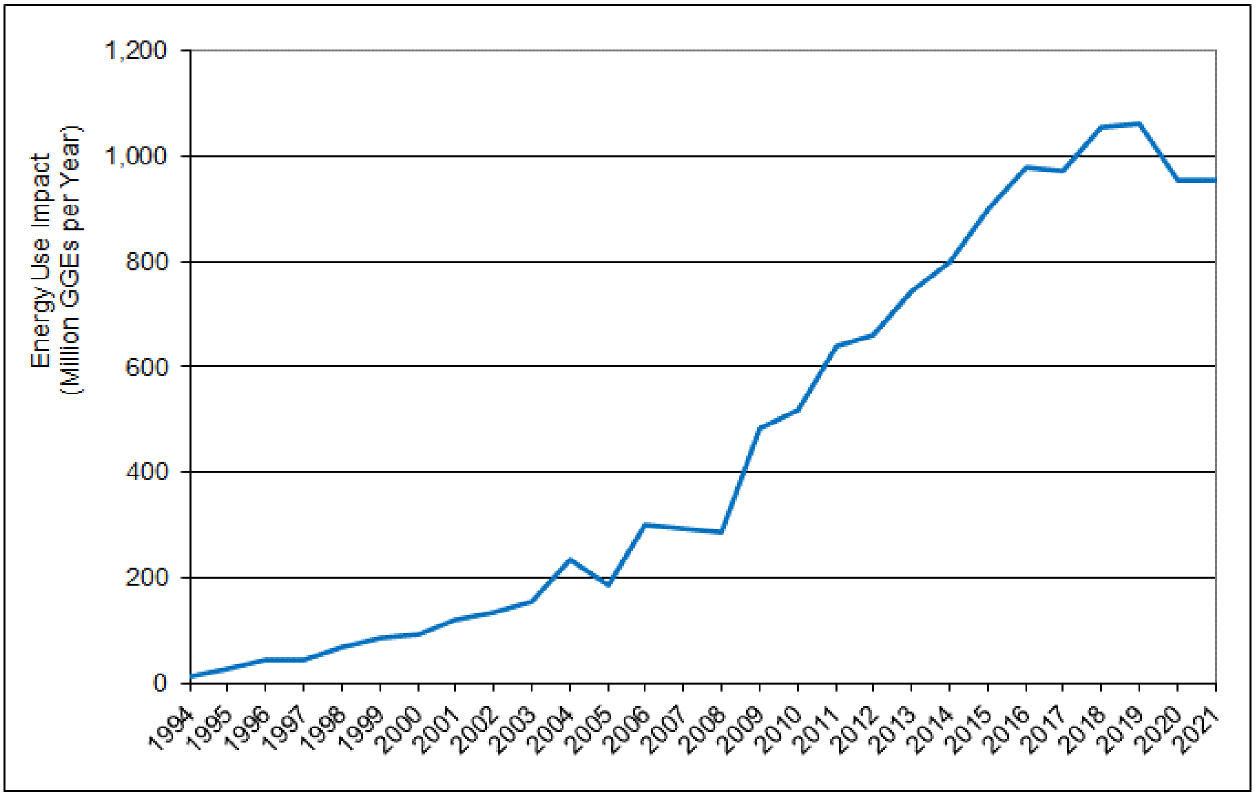

Figure 8. Increasing EUI from coalitions

The impacts of Clean Cities coalition efforts have added up considerably over the years. The full extent of the network's effect can be seen when the annual EUIs shown in Figure 8 are aggregated to a cumulative EUI. This cumulative measure, shown in Figure 9, is now nearly 13 billion GGE.

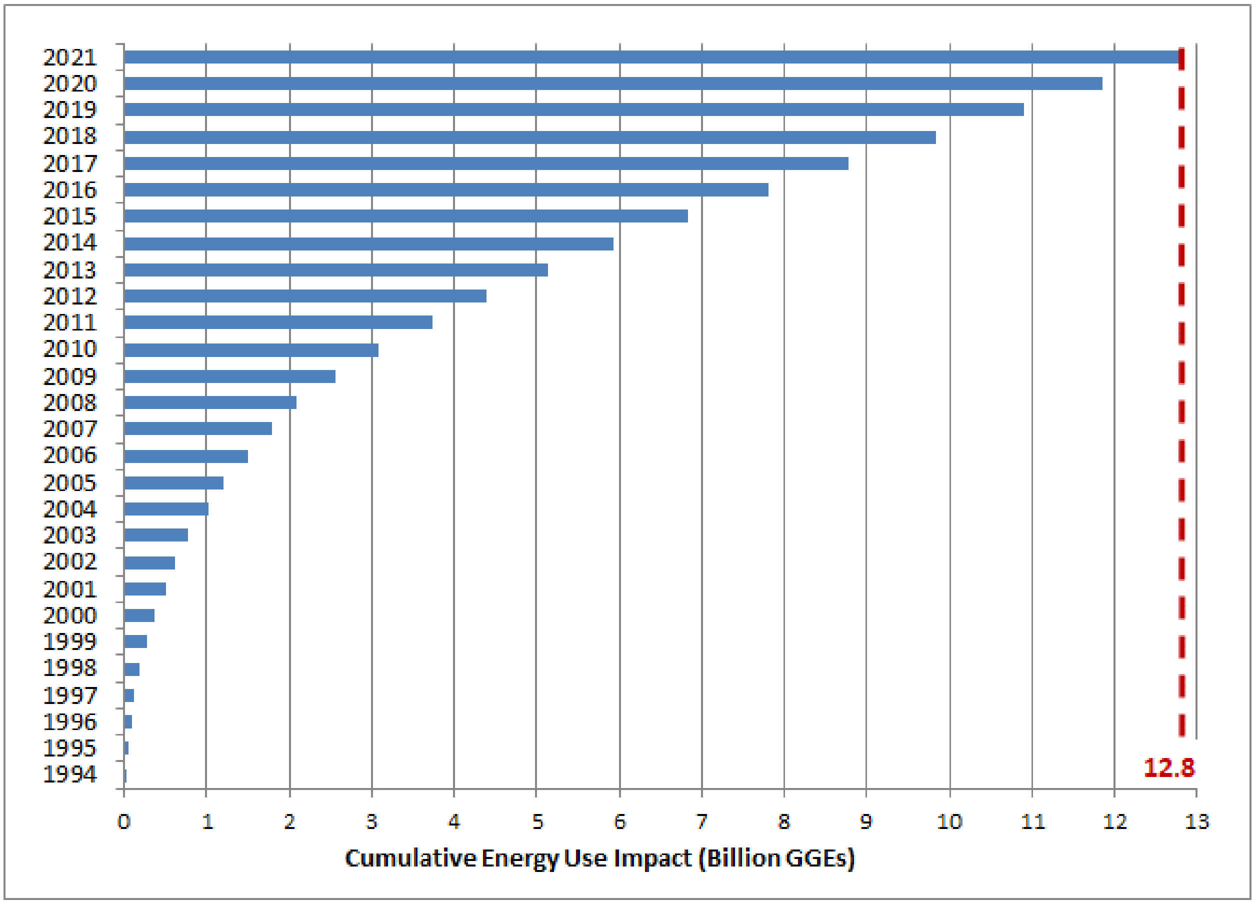

Figure 9. Cumulative accomplishments of all Clean Cities coalition activities

Notable GHG and Criteria Pollutant Emissions Trends

Alternative fuels and AFVs were responsible for more GHG emissions reductions than any other coalition-reported activity.

RNG is a prime example of a fuel that has extremely low life cycle emissions because it reduces methane emissions (a potent GHG) from landfills, wastewater treatment facilities, and farms.

Clean Cities activities reduced 5 million tons of GHG emissions in 2021—0.3% more than in 2020. These efforts have led to a cumulative emissions reduction of 67 million tons over the years, as shown in Figure 10. The relationship between the two has not always been consistent, since some technologies can be more effective at increasing EUI or reducing emissions than others (see Figure 3), and the Technology Integration portfolio evolves over time to stay relevant. Therefore, Figure 9 and Figure 10 do not reflect one another exactly. Furthermore, there was a shift in the emissions calculations in 2020 as the reporting tool was updated, along with the 2019 GREET model, which led to some discontinuities between the 2019 and 2020 reports. Similar updates were made in 2021 with the 2020 GREET model.

The average Clean Cities HDV reduced over 10 times as many GHGs as the average LDV. This is largely for the same reasons that HDVs have a larger EUI per vehicle ratio relative to LDVs. Other notable trends in GHG emissions that have been mentioned in other sections have been called out in boxes in this section.

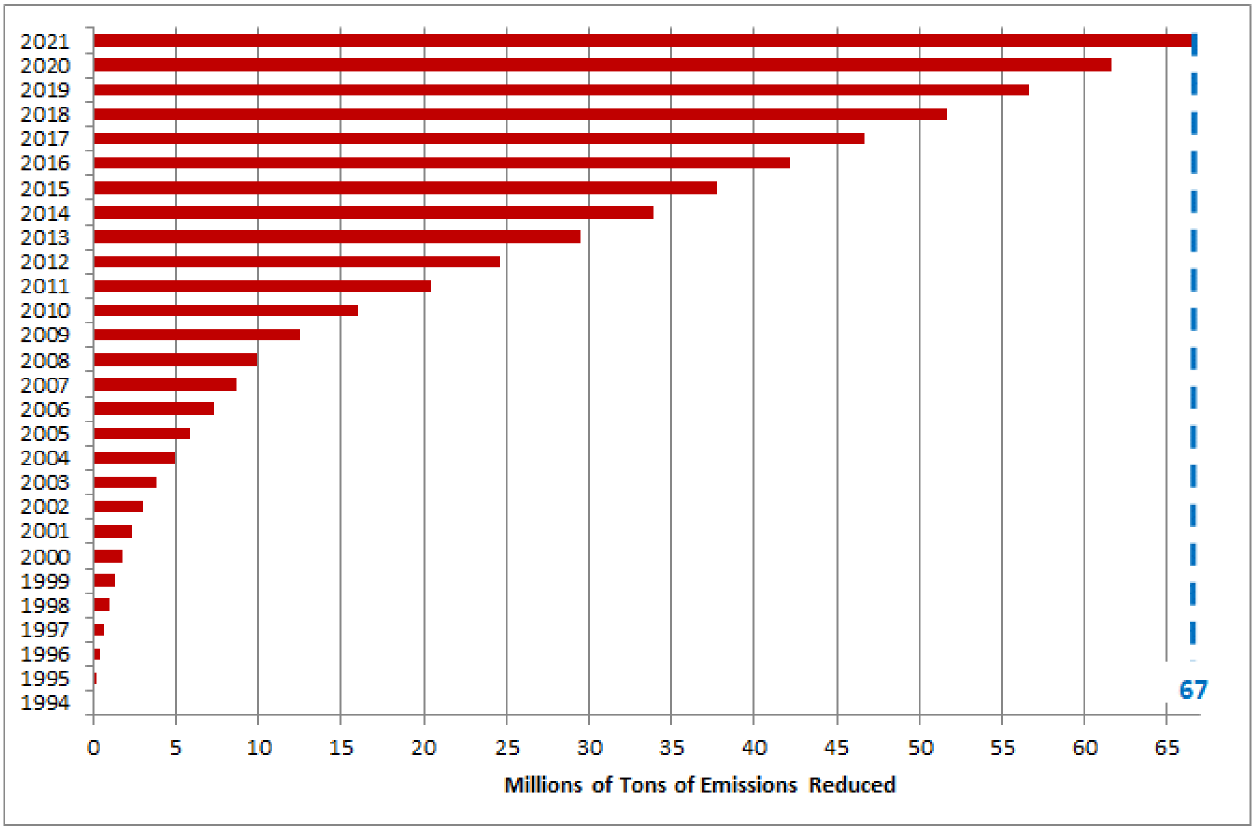

Figure 10. Cumulative emissions reductions from all Clean Cities coalition activities

Conservation measures "eliminate" 100% of the emissions that would have resulted from the fuel they save.

In addition to reducing GHG emissions, Clean Cities activities improve air quality by reducing nitrogen oxides and volatile organic compounds. These are two categories of emissions that react to form tropospheric (ground-level) ozone or smog and are frequently linked to health impacts and respiratory issues. Clean Cities reduced over 852 tons of nitrogen oxide emissions in 2021, with CNG and HEVs being the dominant reduction technologies. The coalitions also reduced 1,355 tons of volatile organic compounds, with VMT reduction, hybrids, and electric vehicles being the leading technologies achieving these reductions. Furthermore, they reduced nearly 17,000 tons of carbon monoxide, 113 tons of 10-micron particulate matter (PM_{10}), and 52 tons of $PM_{2.5}$.

Clean Cities' Benefits to Disadvantaged Communities

In addition to self-reporting underserved community audiences for outreach activities, coalitions were asked to identify the operating area for vehicles that were part of alternative fuel, EV, and fuel efficiency projects. This information enabled a proof-of-concept analysis to estimate the benefits felt by disadvantaged communities (DACs) based on federal Justice40 DAC definitions. The locations reported were based on five categories:

- Cities: Mainly within a set of cities or towns.
- Counties: Mainly within a set of counties.
- Coalition boundaries: Mainly within a coalition's boundaries
- Statewide: A range of locations across one or more states.
- Unknown.

Additionally, respondents could list multiple cities, counties, and states if applicable. For the purposes of assessing benefits for DACs, the analysis only included projects estimated to operate in a single city, county, or coalition area. Statewide projects and projects that occurred within coalition boundaries of statewide coalitions were excluded. Projects that operated in multiple cities, counties, or states (a total of 258 projects) were also excluded because of the additional time that would be required to clean the data and conduct additional geospatial analyses for this relatively small proportion of records (3.8% of total) and due to the exploratory, proof-of-concept nature of this initial analysis. A multi-area analysis methodology could be developed and added in the future. Any project that did not report a location was assigned to the "unknown" category. Using these filtering criteria, a total of 4,855 out of 6,739 projects were used in the following analysis.

Using both the DOE and National Electric Vehicle Infrastructure (NEVI) definitions of DAC,[6] a GIS analysis was done using QGIS software to calculate the percent of the population in each project area living in a designated DAC. An example of the difference between the DOE definition of DAC (Figure 11) and the more expansive NEVI definition of DAC (Figure 12) is shown in the map comparison for Maricopa County, Arizona. The NEVI definition is more expansive because it combines the separate DOE and U.S. Department of Transportation definitions of DAC. The maps show that using the DOE definition of DAC, 24.6% of the population resides in a designated DAC, compared to 34.4% if using the NEVI definition.

[6] The DOE, U.S. Department of Transportation, and NEVI DAC data layers are all available for download at https://www.anl.gov/es/electric-vehicle-charging-equity-considerations. An online interactive map showing the DOE definition of DAC is at https://energyjustice.egs.anl.gov/.

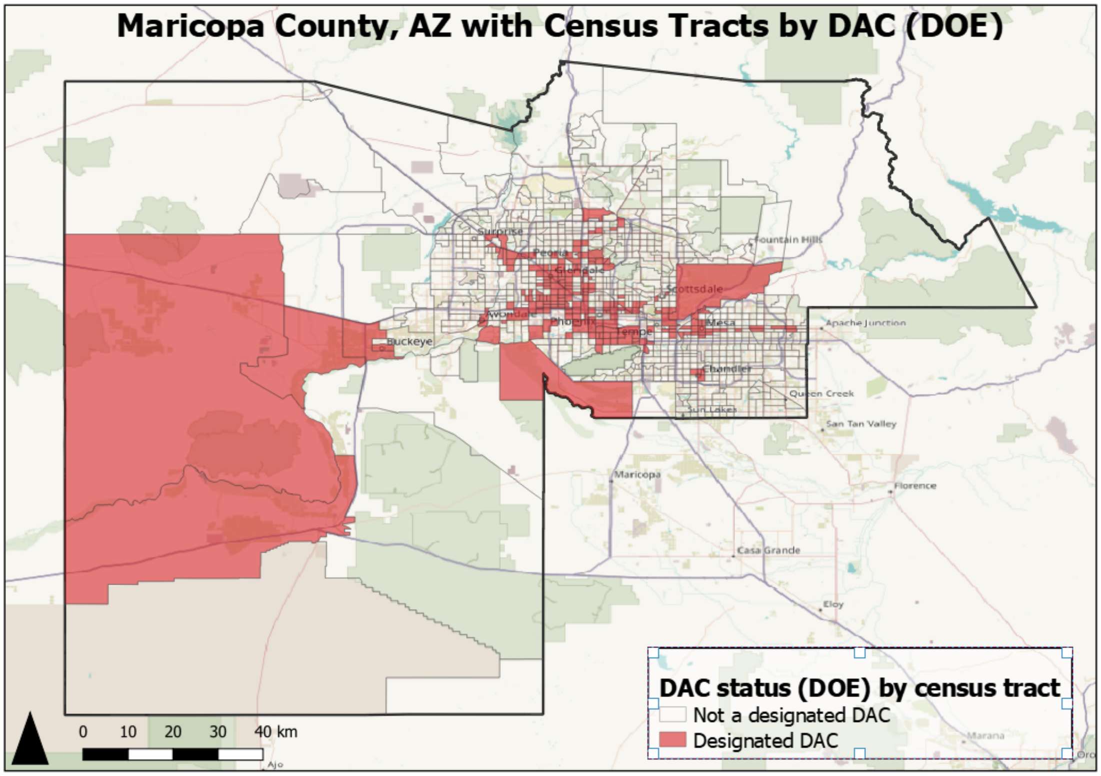

Figure 11. Using the DOE definition of DAC, 24.6% of the population of Maricopa County, AZ, lives in a designated DAC

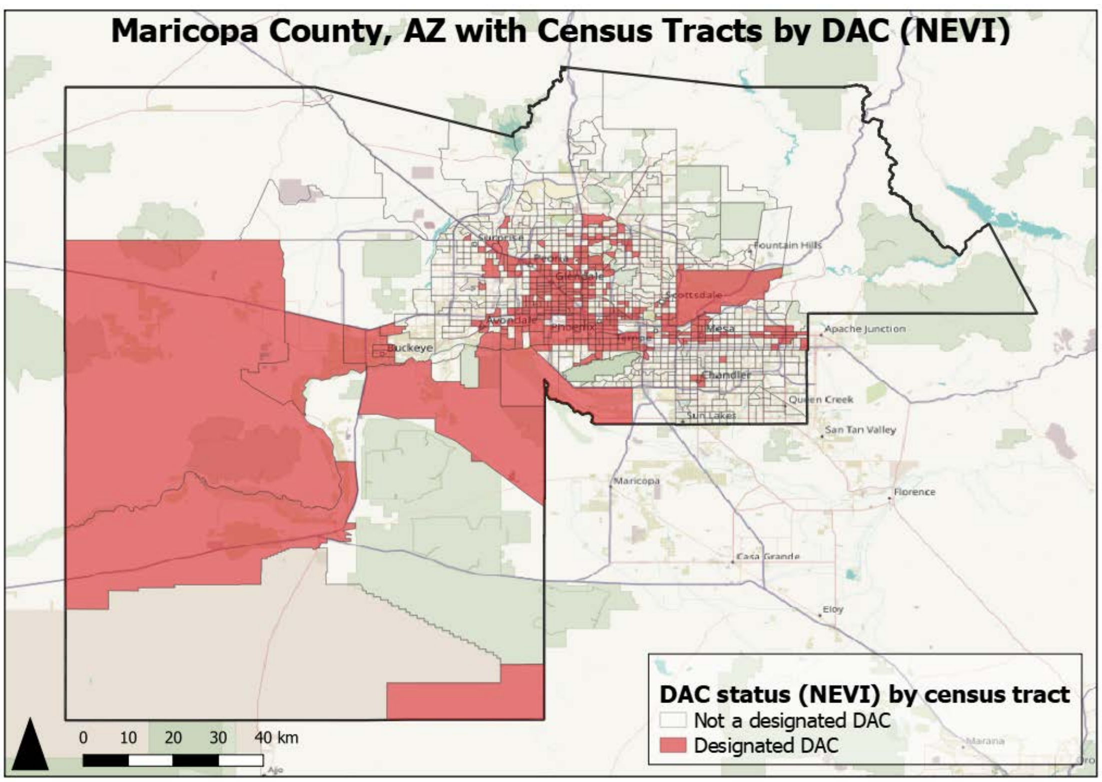

Figure 12. Using the NEVI definition of DAC, 34.4% of the population of Maricopa County, AZ, lives in a designated DAC

The total impact of benefits that may be accrued to DACs was estimated by multiplying the percent DAC for each geographic area (tabulated in GIS) by the reported percent of each project in that area attributable to a coalition's contribution. Results for the 4,855 projects analyzed based on the DOE and NEVI definitions of DAC are shown in Table 12. The differences in DAC definitions are also reflected in the relatively higher estimate of DAC impacts using the NEVI definition. The table includes general estimates based on the geospatial analysis that assumed impacts are evenly distributed across the population of each geographic area of operation. While the estimates have some uncertainty, the method is a first effort at a replicable, national-scale analysis of this nature that can inform efforts to comply with Justice40 guidance.

Table 12. Estimated Benefit Accrued to DACs From a Subset of 2021 Coalition Projects That Could Be Attributed to a Specific Operating Area

All Coalitions	DAC Impact Based on DOE Definition	DAC Impact Based on NEVI Definition
GGE reduced (gal)	22.5%	39.6%
GHG reduced (tons)	22.8%	39.7%

Alternative Fuel Vehicle Types and Applications

The online reporting tool allows directors to categorize their AFVs into key vehicle types and fleet applications. Figure 13 shows that the largest portion (31%) of AFVs were cars. Light trucks, vans, and SUVs represented 27% of vehicles. These were dominated by a single coalition reporting an estimate of registered vehicles using mid-level ethanol blends. Unknown LDVs—which are usually vehicles reported in conjunction with a Clean Cities coalition-supported fueling station—represented 26% of vehicles. Unknown HDVs—typically reported in conjunction with public biodiesel fueling stations—accounted for 5% of vehicles, while heavy-duty trucks without trailers, or delivery trucks, accounted for 4%. All remaining categories individually accounted for 2% or less of the vehicle population.

E85 vehicles in the light truck segment were the most frequently reported fuel/vehicle combination at 316,267. EVs in the car segment followed at 195,504. HEVs in the car segment were the next largest group, with 162,196 vehicles. E85-capable vehicles were also the largest portion (143,246 vehicles) of the unknown light-duty segment and were the most common fuel type reported across all vehicle types (516,313 vehicles).

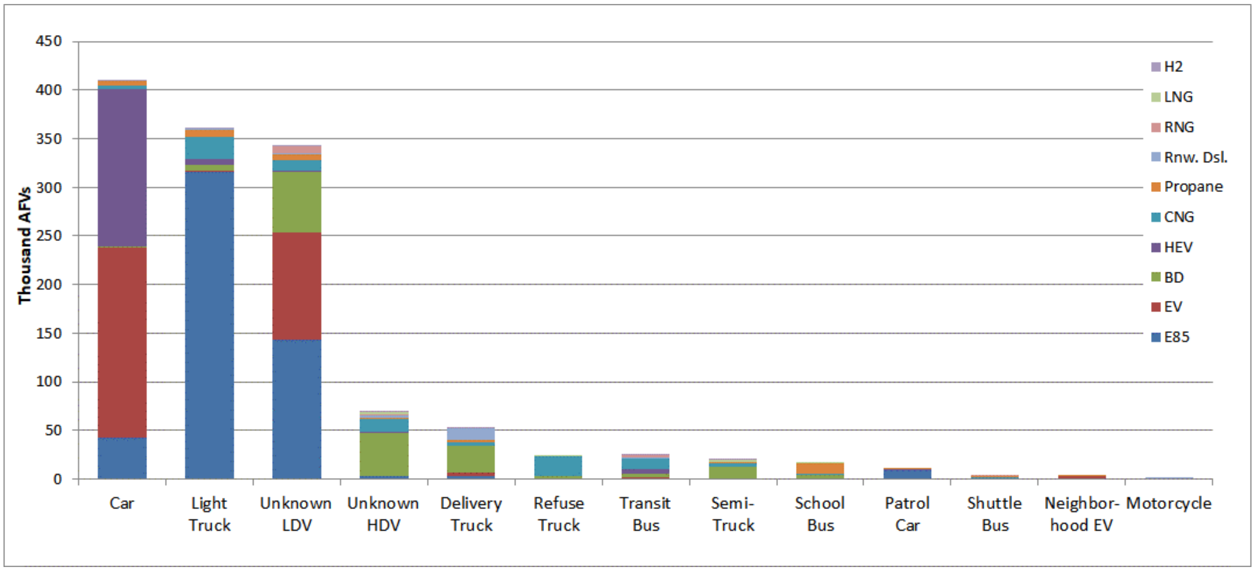

Figure 13. AFVs by vehicle and fuel type.

Note: Neighborhood EVs are small EVs only allowed on low-speed roads.

In addition to reporting vehicle types, directors also provided information about vehicle ownership and vehicle end use applications. As shown in Figure 14, more than half of the reported vehicles (66%) were owned by the general public or an unknown entity. Many of these vehicles were reported by fuel retailers to the director, often back-calculated from fuel sales and an assumption for how much fuel the average car uses per year. The next largest ownership groups of AFVs were local government fleets, commuters, corporate fleets, and state government fleets at 10%, 9%, 6%, and 5% of the total vehicles, respectively. If commuters are combined with the general public category, 75% of vehicles are owned by the general public.

75% of coalition-reported vehicles are owned by the general public and have benefited from Clean Cities coalition projects.

Of the fleet application types above 5% of reported vehicles, local government fleets decreased by 10% to 137,503, while corporate fleets grew by 14% to 73,391, and state government fleets grew by 9% to 72,867.

Flex-fuel vehicles or E85-capable vehicles and biodiesel vehicles were most often reported as being used by the general public. EVs and HEVs comprised 86% of commuter vehicles (67% and 19%, respectively). CNG and propane vehicles made up the largest portion of corporate vehicles at 61% combined (44.3% and 16.2%, respectively).

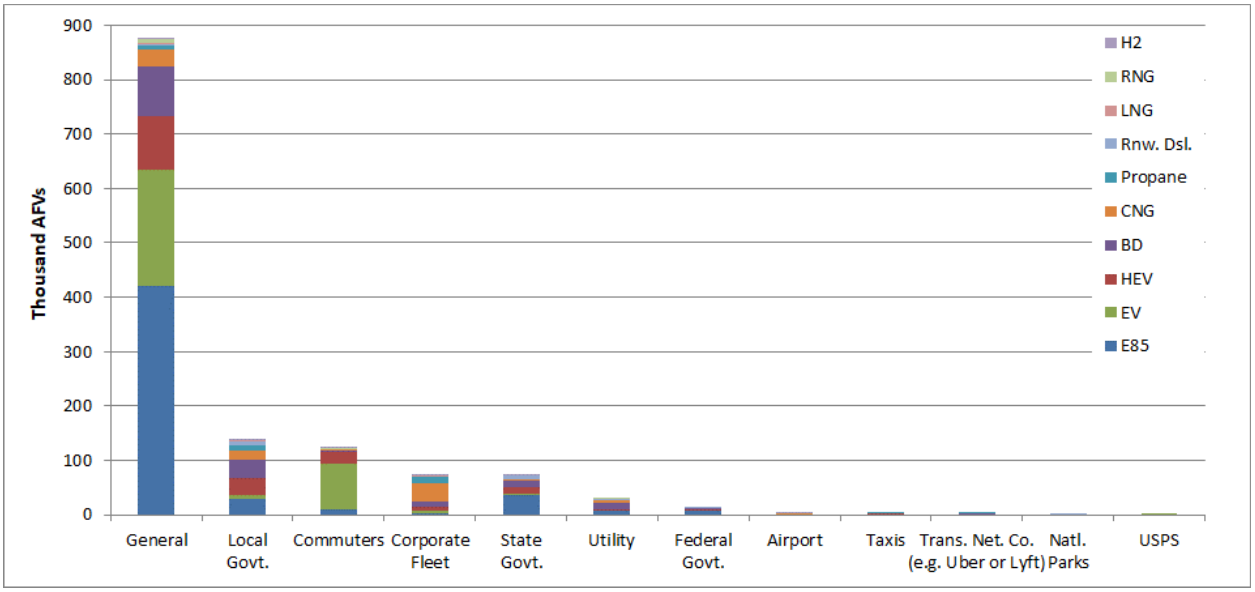

Figure 14. AFVs by application and fuel type

Emerging Technologies—Experimental, Prototype, and Demonstration Vehicle Projects

A small number of Clean Cities coalitions have worked with fleets and stakeholders who have an interest in field-testing advanced vehicle technologies (e.g., hydrogen and fuel cell vehicles). This subset of vehicles represents less than 0.1% of the total number of alternative fuel or advanced technology vehicles reported by coalitions. Some of these projects involve limited-production, experimental, or prototype/demonstration models that vehicle manufacturers make available under special lease arrangements. This is a way for the manufacturers to gather in-use performance data, evaluate durability, and refine engineering designs for future vehicle models that may be under development. In 2021, 371 hydrogen vehicles were reported, and the largest portion were for general public owners as reported for fueling stations. Data reported to Clean Cities coalitions for some of these vehicles show the noteworthy potential of these technologies for both energy and environmental benefits, but no significant market trends could be drawn from this limited data set.

Directors and Coalition Types

The average Clean Cities director has over 7 years of experience.

Collectively, directors reported spending a total of 2,706 hours per week on Clean Cities coalition tasks, which is equivalent to more than 135,300 total hours during the year.[7] This translates into nearly 68 full-time, experienced technical professionals working to increase the use of alternative fuels and reduce transportation energy use. For an individual coalition, the average amount of time spent coordinating Clean Cities coalition business per week was 34.7 hours. The average was stable compared to the 34.8 hours in 2020, while the median decreased to 30 from 34 hours. The reporting tool also gathered information on director experience. Directors have been on the job for an average of

[7] Assuming 50 work weeks per year.

over 7 years; 53% have held their position for 5 years or less, and 32%, or 25 directors, have 10 years or more of director experience.

Table 13. Coalition Metrics by Coalition Type

Coalition Type [a]	Total # of Coalitions	Average # of Stakeholders	Average Funds Raised	Average Network Impact (GGE)	Average Persons Reached
Nonprofit – stand-alone	37	225	$5,036,952	12,573,733	69,448
Regional governing coalition	15	161	$4,595,638	11,149,671	119,948
Government – state	11	364	$5,334,773	6,953,602	29,608
Nonprofit – hosted	9	59	$4,049,218	7,678,614	2,227,829
University	4	1,087	$20,391,037	13,405,511	134,584
Government – city or county	2	55	$56,072,936	10,005,967	29,087
Total/overall weighted average	**78**	**253**	**$6,976,119**	**10,919,286**	**324,891**

[a] Coalition types are defined in Appendix B.

Coalition types were tracked, and the relationships between coalition type and general metrics were analyzed. The coalition types correspond to their host organizations (which generally pay the director's salary) and are listed in the first column in Table 13 and defined in Appendix B. Stand-alone nonprofits are coalition types that are self-sustaining and do not operate as part of a larger host organization.

The number of coalitions in each grouping is listed in Table 13, followed by the average number of stakeholders, average funds (including grants and dues) received in 2021, average GGE of energy impacted, and average number of people reached through outreach events. The range of all metrics overlaps heavily between groups, and the low sample size precludes statistical significance. Furthermore, many variables affecting the metrics in this table were not controlled for, so no cause/effect relationships can be inferred between coalition type and specific metrics.

Coalitions based in universities created the highest average EUI and had the highest average number of stakeholders.

The most common coalition type was the stand-alone nonprofit, which also reported the second highest average EUI. Coalitions hosted in universities had the highest average number of stakeholders and the highest average EUI. Coalitions hosted by city and county governments were the least common and reported the fewest number of stakeholders. However, these coalitions raised the most funds on average, driven primarily by one coalition's grants from the Federal Transit Administration and state-level transportation grants. Coalitions in hosted nonprofits reached the most people in outreach events, a total that was heavily influenced by a single coalition that reached nearly 20 million people in press releases. Without this outlier, university-based coalitions would have reached the most people on average.

Funding

In 2021, 35 coalitions reported receiving 183 new project awards (project-specific grants) worth a total of $76.6 million. These coalitions also reported garnering $43.6 million in leveraged or matching funds for a combined total of $120 million in new grant and matching contributions. Thirteen of the 183 awards were at or above $1 million each. Table 14 presents a breakdown of the number and value of awards reported by the coalitions without the matching funds.

Table 14. Breakdown of 2021 Project Awards by Number and Value

Grant Range	Number of Grants	Share of Total Number	Total Value	Share of Grand Total Value
<$50,000	74	40%	$1,096,849	1%
$50,000–$99,999	22	12%	$1,539,190	2%
$100,000–$499,999	62	34%	$12,783,687	17%
$500,000–$999,999	12	7%	$8,702,518	11%
$1,000,000+	13	7%	$52,455,176	68%
Total	**183**	**100%**	**$76,577,420**	**100%**

Of the $76.6 million in primary grant dollars received, $1.7 million (2%) was reported as coming from DOE. Grant dollars were often reported as having multiple contributors for a single grant. The largest nongovernment contributor was from the Volkswagen settlement which was involved with $49 million in grant funding—64% of the total. State governments were involved in the second largest portion of the funding at 43%. Other federal contributors included the U.S. Department of Transportation's Federal Transit Administration and Congestion Mitigation and Air Quality Improvement Program, the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, and a grouping of other federal agencies.

Coalitions leveraged $2 of project funding for every $1 directed to coalitions by DOE.

In addition to new 2021 awards, directors reported the portions of previous multiyear awards spent during the calendar year. If a director failed to report the amount spent during 2021, the total amount of the award divided by the number of years of award duration was assumed. Coalitions reported spending 30% of the funds they were awarded in 2021, suggesting that projects start quickly after being awarded. In 2021, coalitions used a total of $85 million in project funds that were awarded and matched between 2015 and 2021.

In addition to project-related funds, coalitions reported collecting $1.1 million in stakeholder dues and receiving $3.4 million in operational funds, primarily from their host organizations. Combining these funds with non-DOE grant and matching funds totaled $123 million in supplemental non-DOE funds. This total represents 2:1 leveraging of the $60 million included in the VTO Technology Integration budget for 2021.

About the Stakeholders

Coalitions included nearly 20,000 stakeholders in 2021, with 35% of them from the private sector.

In 2021, 78 coalitions reported a total of 19,723 stakeholders, for an average of 253 stakeholders per coalition, similar to the average of 252 stakeholders in 2020. Coalitions drew local stakeholders from the public, private, and nonprofit sectors. Stakeholders included local, state, and federal government agencies; large and small businesses; auto manufacturers; car dealers; fuel suppliers; public utilities; nonprofits; and professional associations. Coalitions reported that 35% of stakeholders were from the private sector. This composition is more than the 31% reported in 2020 and shows a balance between public and private stakeholders.

Data Sources and Quality

Gathering data is often challenging for directors because they rely on voluntary reporting from their numerous stakeholders. Therefore, the annual report website contains some questions related to data sources and quality. In these questions, directors were asked to rate the quality of their data as excellent, good, fair, or poor. The “cumulative” bar in Figure 15 presents the response breakdown for the 78 directors who answered the question; 28% of the respondents classified their data as excellent, 65% as good, and 6% as fair. No respondents reported their data as poor.

The reporting tool also asked directors how they obtained their data. They could choose one or more of the following: online questionnaires (e.g., SurveyMonkey), written (paper or electronic) questions to stakeholders, phone interviews with stakeholders, coalition records (e.g., from project participation earlier in the year), or coalition estimates. Written questions and phone interviews were the most used method of data gathering, accounting for 27% and 25%, respectively. The third most used method was coalition records (18%), then estimates (17%), and finally online questionnaires (14%). Figure 15 shows that all collection methods resulted in similar levels of reliability.

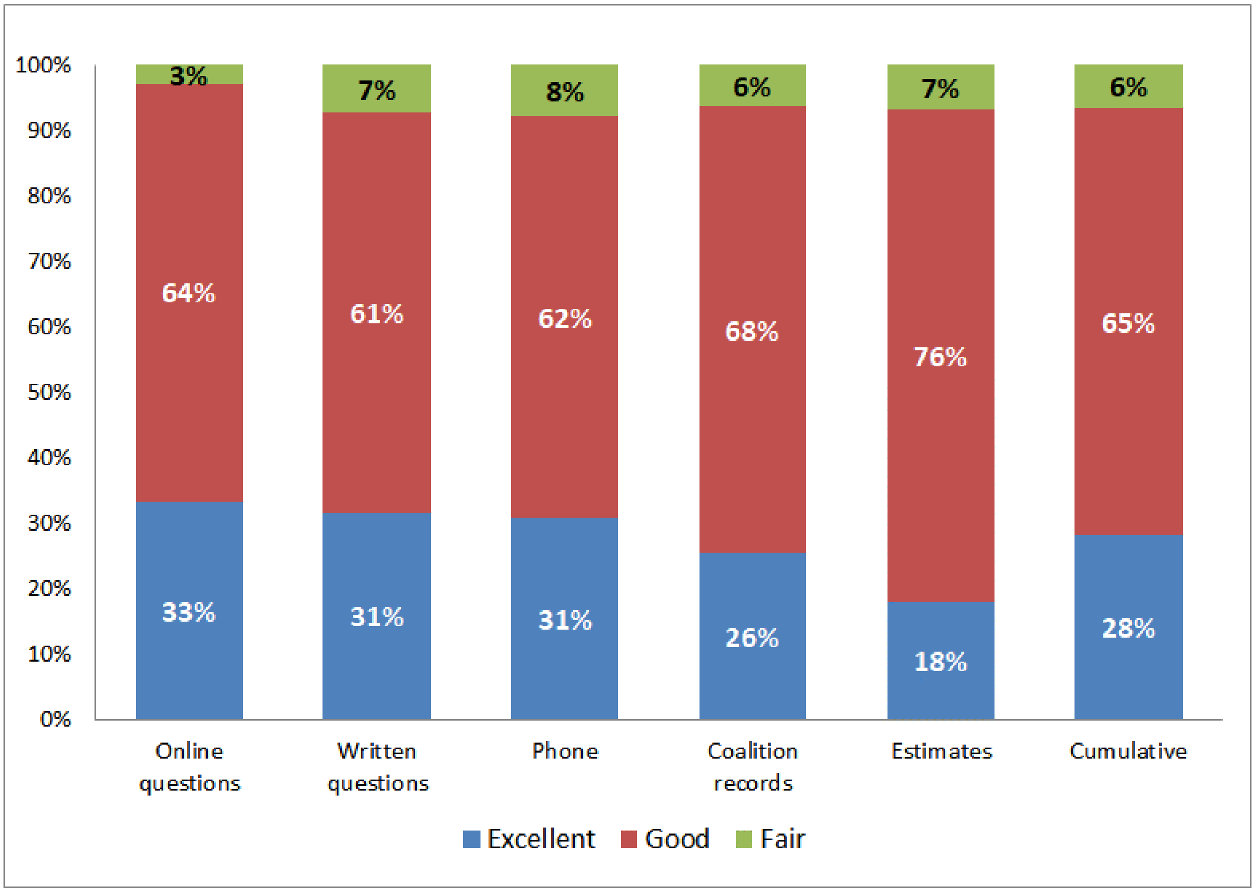

Figure 15. Data quality responses by data source

Conclusion

The 2021 *Clean Cities Coalitions Activity Report* helps quantify accomplishments and the impact of the coalition network. The report shows that Clean Cities coalitions had a year of many successful projects. The data indicate that the EUI is nearly 1 billion GGE for activities reported by coalitions in 2021. This was a slight increase from 2020 and led to a continued growth in reductions of GHG emissions.

Overall, Clean Cities coalitions maintained a high level of accomplishments. Coalition efforts continued to increase the number and diversity of AFVs and advanced vehicles on U.S. roads in 2021. The combined efforts of local Clean Cities coalitions, DOE, and DOE national laboratories bring together otherwise disparate groups to leverage people, funding, and resources to accelerate the nation's progress in increasing affordable, efficient, and clean transportation options.

Appendix A: Clean Cities Coalitions That Completed 2021 Annual Reports

State	Coalition
AL	Alabama Clean Fuels Coalition
AR	Arkansas Clean Cities
AZ	Valley of the Sun Clean Cities Coalition (Phoenix)
CA	Central Coast Clean Cities Coalition
CA	Clean Cities Coachella Valley Region
CA	East Bay Clean Cities Coalition (Oakland)
CA	Long Beach Clean Cities
CA	Los Angeles Clean Cities Coalition
CA	Sacramento Clean Cities Coalition
CA	San Diego Regional Clean Cities Coalition
CA	San Francisco Clean Cities Coalition
CA	San Joaquin Valley Clean Cities
CA	Silicon Valley Clean Cities (San Jose)
CA	Southern California Clean Cities Coalition
CA	Western Riverside County Clean Cities Coalition
CO	Drive Clean Colorado, a Clean Cities Coalition
CO	Northern Colorado Clean Cities Coalition
CT	Capitol Clean Cities of Connecticut
CT	Connecticut Southwestern Area Clean Cities
CT	Greater New Haven Clean Cities Coalition
DC	Greater Washington Region Clean Cities Coalition
DE	State of Delaware Clean Cities
FL	Central Florida Clean Cities Coalition
FL	North Florida Clean Fuels Coalition
FL	Southeast Florida Clean Cities Coalition
FL	Tampa Bay Clean Cities Coalition
GA	Clean Cities-Georgia
HI	Sustainable Transportation Coalition of Hawaii
IA	Iowa Clean Cities Coalition
ID	Treasure Valley Clean Cities
ID, MT, WY	Yellowstone-Teton Clean Cities Coalition
IL	Chicago Area Clean Cities
IN	Drive Clean Indiana

State	Coalition
KS	Central Kansas Clean Cities
KS, MO	Kansas City Regional Clean Cities
KY	Kentucky Clean Cities Partnership
LA	Louisiana Clean Fuels
LA	Southeast Louisiana Clean Fuel Partnership
MA	Massachusetts Clean Cities
MD	State of Maryland Clean Cities
ME	Maine Clean Communities
MI	Greater Lansing Area Clean Cities
MN	Minnesota Clean Cities Coalition
MO	St. Louis Clean Cities
NC	Centralina Clean Fuels Coalition
NC	Land of Sky Clean Vehicles Coalition (Western North Carolina)
NC	Triangle Clean Cities (Raleigh, Durham, Chapel Hill)
ND	North Dakota Clean Cities
NH	Granite State Clean Cities Coalition
NJ	New Jersey Clean Cities Coalition
NM	Land of Enchantment Clean Cities (New Mexico)
NY	Capital District Clean Communities Coalition (Albany)
NY	Clean Communities of Central New York (Syracuse)
NY	Clean Communities of Western New York (Buffalo)
NY	Empire Clean Cities
NY	Greater Long Island Clean Cities
NY	Greater Rochester Clean Cities
OH	Clean Fuels Ohio
OK	Central Oklahoma Clean Cities (Oklahoma City)
OK	Tulsa Clean Cities
OR	Columbia-Willamette Clean Cities
OR	Rogue Valley Clean Cities
PA	Eastern Pennsylvania Alliance for Clean Transportation
PA	Pittsburgh Region Clean Cities
RI	Ocean State Clean Cities
SC	Palmetto Clean Fuels Coalition
TN	East Tennessee Clean Fuels Coalition
TN	Middle-West Tennessee Clean Fuels Coalition
TX	Alamo Area Clean Cities (San Antonio)

State	Coalition
TX	Dallas-Fort Worth Clean Cities
TX	Houston-Galveston Clean Cities
TX	Lone Star Clean Fuels Alliance (Central Texas)
UT	Utah Clean Cities
VA	Virginia Clean Cities
VT	Vermont Clean Cities
WA	Western Washington Clean Cities
WI	Wisconsin Clean Cities
WV	State of West Virginia Clean Cities

Appendix B: Definition of Clean Cities Coalition Types

Coalitions have categorized themselves into six different types, depending on their organizational structures and relationship to hosts.[8] Some coalitions fit within multiple types. These types are:

1. "Government—City or County" coalitions are hosted by a city or county government such as a city department of transportation or municipally owned utility.
2. "Government—State" coalitions are hosted by a state government. This is generally in the state department of energy or department of environment. Coalitions hosted by a state university are not included in this category.
3. "Hosted in a Nonprofit" coalitions are hosted within a larger nonprofit or community service organization with 501(c)(3) status. The host organization's activities are broader in scope than the Clean Cities coalition, such as the American Lung Association.
4. "Stand-Alone Nonprofit" coalitions are nonprofits typically with 501(c)(3) status and operate with no or minimal oversight and management of a host organization.
5. "Regional Governing Coalition" coalitions are hosted in a multigovernmental body such as a council of governments, municipal planning organization, or regional planning commission.
6. "Hosted in a University" coalitions are hosted by a university (public or private).

[8] The relationship between a host organization and the coalition varies across the country. Typically, the director of the coalition is an employee of the host organization, and the coalition benefits from the resources available at the host organization.