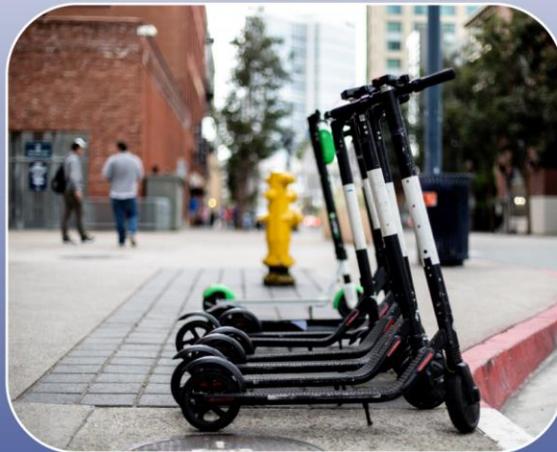




COLORADO EV EQUITY STUDY

August 2022



Colorado EV Equity Study

Combined Report

prepared for

Colorado Energy Office

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National Renewable Energy Laboratory

date

August 2022

Table of Contents

Executive Summary	1
Resumen ejecutivo	6
Section 1: Opportunities and Recommendations for EV Equity	12
1.0 Equity and Electric Vehicle Efforts in Colorado	13
1.1 Policy Resources	13
1.2 Policy Options.....	14
1.3 Improving Access to EV Ownership	16
1.4 Consumer Education and Outreach	20
1.5 Improving Access to EV Charging Infrastructure and Controlling Charging Costs	21
1.6 Shared Mobility	26
1.7 Reducing Air Quality Impacts.....	28
2.0 High Emission Vehicle Replacement Programs	30
2.1 New and Used Light-Duty Incentives	30
2.2 School Bus Incentives	38
2.3 New Medium and Heavy-Duty Incentives.....	40
2.4 Alternate Forms of Mobility Programming	44
2.5 EV Charging Infrastructure Considerations	48
2.6 Education and technical assistance considerations	49
2.7 Return on Investment.....	51
2.8 Recommendations for Program Evaluation	53
Section 2: Mapping EV Equity Populations	61
3.0 Review of Equity Definitions and Considerations	62
3.1 Overview	62
3.2 Definitions of EV Equity and EV equity communities.....	67
3.3 A Review of Data Variables	67
3.4 Developing the Indexes.....	71
3.5 Socioeconomic Index.....	71
3.6 Transportation Index	73
3.7 Scoring Methodology	74



- 3.8 Using the Indexes75
- Section 3: Techniques 82**
- 4.0 Project, Program, and Policy Prioritization Tools 83**
 - 4.1 EV Equity Dashboard83
 - 4.2 Prioritization Tool..... 104
 - 4.3 Survey..... 117
- 5.0 EV Equity Stakeholders 121**
 - 5.1 Advisory Committees 121
 - 5.2 Organizational Resources 122
- Section 4: Implementing EV Equity in Colorado 124**
- 6.0 Needs Assessment..... 125**
 - 6.1 Overview 125
 - 6.2 Community Needs Assessment..... 126
- 7.0 Colorado EV Equity Recommendations..... 150**
 - 7.1 Overview 150
 - 7.2 Resource Review 150
 - 7.3 Program Features 152
- 8.0 Next Steps for Policies and Programs to Advance Equity..... 170**
 - 8.1 Support Stronger, Coordinated Stakeholder Engagement for State-Run Programs 170
 - 8.2 Prioritize Community-Driven Investment Through New Enterprise Spending..... 171
 - 8.3 Expand EV Charging Infrastructure Offerings Throughout the State 171
 - 8.4 Balance Equity and Electrification Objectives 171
 - 8.5 Offer Electric Vehicle Incentives as Vouchers, Not Tax Credits 172
 - 8.6 Avoid Providing Transportation Electrification Incentives out of the General Fund..... 172
 - 8.7 Streamline Application Processes..... 172
 - 8.8 Combine Project Evaluation Processes..... 172
 - 8.9 Seek opportunities to implement steps identified in the Needs Assessment. 173

List of Tables

Table 1	Replace Your Ride: Income Eligibility Tiers	31
Table 2	Replace Your Ride—Tiered Applicant Benefits	32
Table 3	British Columbia EV Rebate—Tiered Vehicle Benefits.....	33
Table 4	Health and Human Services Poverty Thresholds	37
Table 5	Vehicle Class and Sample Voucher Amounts.....	42
Table 6	Vehicle Class and Sample Rebate/Voucher Amounts.....	43
Table 7	Sample Vehicle Replacement Program Characteristics	48
Table 8	Illustrative Cost-Effectiveness for Electric Vehicle Technologies	51
Table 9	Resources Reviewed in Developing Equity Focus Communities	62
Table 10	Indicators Identified in the Literature by Indicator Group	64
Table 11	Correlation Coefficients of the Percentile of Each Variable in Relationships of All Other Variables ¹	72
Table 12	Socioeconomic and Transportation Indicators.....	74
Table 13	Data Gathered for Use in the EV Equity Dashboard and Prioritization Tool	87
Table 14	Factors Included in the CO EV Equity Project Prioritization Tool	105
Table 15	Indicators Included in Each Prioritization Index and Corresponding Weights	109
Table 16	Average Block Group Score by County by Prioritization Index	115
Table 17	Further Resources in Moving Toward Racial Equity.....	125
Table 18	Needs Assessment Overview	127
Table 19	IAP2 Spectrum of Public Participation.....	133
Table 20	Regional Air Quality Council Strategic Plan Mission, Vision, and Objectives.....	136
Table 21	Evaluating Strategies and Program Elements to Center Equity	143
Table 22	Example Key Performance Indicators.....	146
Table 23	Transportation Electrification Programs Reviewed.....	151
Table 24	Matrix of Program Recommendations	167

List of Figures

Figure 1	Classification of Census Block Groups	70
Figure 2	Urban Socioeconomic Index (Focus Denver) ¹	76
Figure 3	Rural Socioeconomic Index ¹	77
Figure 4	Frontier Socioeconomic Index ¹	78
Figure 5	Urban Transportation Index ¹	79
Figure 6	Rural Transportation Index ¹	80
Figure 7	Frontier Transportation Index ¹	81
Figure 8	Home Tab	95
Figure 9	Health Tab	97
Figure 10	Vehicle Registration Tab	98
Figure 11	EVSE Tab	99
Figure 12	VMT Estimates Tab	100
Figure 13	AADT Estimates Tab	101
Figure 14	Free and Reduced Lunch Tab	102
Figure 15	Utility Rates Tab	103
Figure 16	Selecting Prioritization Factors	108
Figure 17	Single Applicant View	112
Figure 18	Multiple Application Evaluation	113
Figure 19	County Detail	114
Figure 20	County Index Overview	115

List of Acronyms

AAA	American Automobile Association
AADT	Annual Average Daily Traffic
ACS	American Community Survey
AFDC	Alternative Fuels Data Center
AFLEET	Alternative Fuel Life Cycle Environmental and Economic Transportation
API	Application Programming Interface
AQMD	Air Quality Management District
BC	British Columbia
BEV	Battery Electric Vehicle
CAC	Community Advisory Committee
CAD	Canadian Dollar
CARB	California Air Resources Board
CARES	Coronavirus Aid, Relief, and Economic Security Act
CARS	Car Allowance Rebate System
CBOs	Community-Based Organizations
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CEO	Colorado Energy Office
CEVC	Colorado Electric Vehicle Coalition
CHEAPR	Connecticut Hydrogen and Electric Automobile Purchase Rebate
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CNG	Compressed Natural Gas
CSU	Colorado State University
CVRP	Clean Vehicle Rebate Program
DCFC	Direct Current Fast Charge (EV charging station)
DERA	Diesel Emissions Reduction Act
DOE	US Department of Energy
DOLA	Department of Local Affairs
DOR	Department of Revenue
DOT	US Department of Transportation



DRCOG	Denver Regional Council of Governments
EPA	US Environmental Protection Agency
EFMP	Enhanced Fleet Modernization Program
EIAF	Energy/Mineral Impact Assistance Fund
EMFAC	EMission FACtor
EU	European Union
EV	Electric Vehicle
EVSE	Electric Vehicle Service Equipment
FCEV	Fuel Cell Electric Vehicle
FHWA	Federal Highway Administration
FPG	Federal Poverty Guidelines
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
GRADE	Grants to Reduce Aging Diesel Engines
GULCS	Go Ultra Low City Scheme
GVWR	Gross Vehicle Weight Rating
HB	House Bill
HEC	Higher Emission Community
HEV	Hybrid Electric Vehicle
IAP2	International Association for Public Participation
ICE	Internal Combustion Engine
ICEV	Internal Combustion Engine Vehicle
IOU	Investor-Owned Utility
IBC	International Building Code
IRC	International Revenue Code
JPAs	Joint Power Authorities
KPI	Key Performance Indicators
LCFS	Low Carbon Fuel Standards
LDV	Light Duty Vehicle
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
LMI	Low- to Moderate-Income

L1	Level 1 (EV charging station)
L2	Level 2 (EV charging station)
MaaS	Mobility-as-a-Service
MHDEV	Medium- and Heavy-Duty Electric Vehicle
MHDV	Medium- and Heavy-Duty Vehicle
MPG	Miles Per Gallon
MOR-EV	Massachusetts Offers Rebates for Electric Vehicles
MPO	Metropolitan Planning Organization
NATA	National Air Toxics Assessment
NBER	National Bureau of Economic Research
NCSL	National Conference of State Legislatures
NEPA	National Environmental Protection Act
NGOs	Non-Governmental Organizations
NO _x	Nitrogen Oxides
NREL	National Renewable Energy Laboratory
NYTVIP	New York Truck Voucher Incentive Program
OEM	Original Equipment Manufacturer
PHEV	Plug-in Hybrid Electric Vehicle
PM	Particulate Matter
RAQC	Regional Air Quality Council
RNG	Renewable Natural Gas
ROG	Reactive Organic Gases
ROI	Return on Investment
RSBPP	Rural School Bus Pilot Project
SB	Senate Bill
SNAP	Supplemental Nutrition Assistance Program
STEP	Sustainable Transportation Equity Project
TAC	Technical Advisory Committee
TAZ	Traffic Analysis Zone
TANF	Temporary Assistance to Needy Families
TCRP	Transit Cooperative Research Program
TCI	Transportation and Climate Initiative
TEN	Transportation Equity Network

TEP	Transportation Electrification Plan
US	United States
VAVR	Voluntary Accelerated Vehicle Retirement
VMT	Vehicle Miles Traveled
VW	Volkswagen
ZEB	Zero-Emission Bus
ZEV	Zero-Emission Vehicle
ZIP	Zone Improvement Plan

Executive Summary

The Colorado Energy Office undertook this electric vehicle (EV) equity study to establish an understanding of factors that would prevent areas with greater socioeconomic or transportation need from accessing electric transportation and its benefits, and to provide tools for the state of Colorado and its partners to design programs that support equitable electrification. This EV equity study report describes the menu of options available to support transportation electrification in an equity-centered approach and provides tools that would immediately support the state of Colorado in implementing these options. Throughout this report, the term ‘EV equity’ refers broadly to any policy, strategy, engagement, assistance, or other resource that supports equitable access to electric transportation and its benefits. The report is broken into four sections that focus on different questions of equity.

Section 1 focuses on opportunities and recommendations for EV Equity. Within this section, **Chapter 1** includes a menu of programs, policies, and initiatives that can be used by policymakers and community members to identify an intervention that meets their community’s needs. Interventions are broadly grouped into five categories, including: improving access to EV ownership, consumer education and outreach, improving access to and affordability of EV charging infrastructure, shared mobility programs, and reducing air quality impacts (focusing on school bus and transit electrification grants). This review was supported by several national online resources dedicated to compiling the programs, policies, legislation, and other incentives that support transportation electrification that are also discussed. **Chapter 2** provides guidance into design elements of high emission vehicle replacement programs, a priority that had been identified in the scope of this study. The chapter includes examples of existing vehicle replacement programs; return on investment metrics for different program types and considerations for specific applications; and specific strategies and design elements of these programs, including applicant eligibility, equitable design, vehicle eligibility, and other considerations. The chapter concludes with recommendations for evaluating programs and measuring benefits of the programs.

Section 2 focuses on mapping EV Equity populations. **Chapter 3** reviews equity definitions in use in Colorado, provided within Federal guidance, or used by other state and non-profit organizations. This provides the foundation of a framework for identifying priority areas based on socioeconomic factors and transportation needs. The remainder of the chapter describes the methodology used to define the EV equity communities used in this study. Two indexes were developed: 1) socioeconomic priority and 2) transportation priority.¹ The chapter includes the guiding questions used to inform the selection of indicators in each index, the indicators considered, the tests performed to ensure that the indicators used were meaningful to identify priority areas, and guidance on using the index.

Section 3 focuses on techniques that can be used to incorporate EV Equity into planning and programming. **Chapter 4** provides an overview of tools: 1) an EV Equity Dashboard that allows users to view transportation needs and the current status of electrification in Colorado (e.g., vehicle registrations, location of chargers); 2) a downloadable **prioritization tool** (Figure ES-1) that can be used to prioritize applications for electrification programs, incorporating the two indexes developed through the Colorado EV Equity Study; and 3) the results of a **survey** that summarize user experience in Colorado electrification programs.

¹ Note that these indexes are used within prioritization indexes developed later in this study.

Figure ES-1. Prioritization Tool

Application Evaluation Tool | Multiple applicant prioritization scores

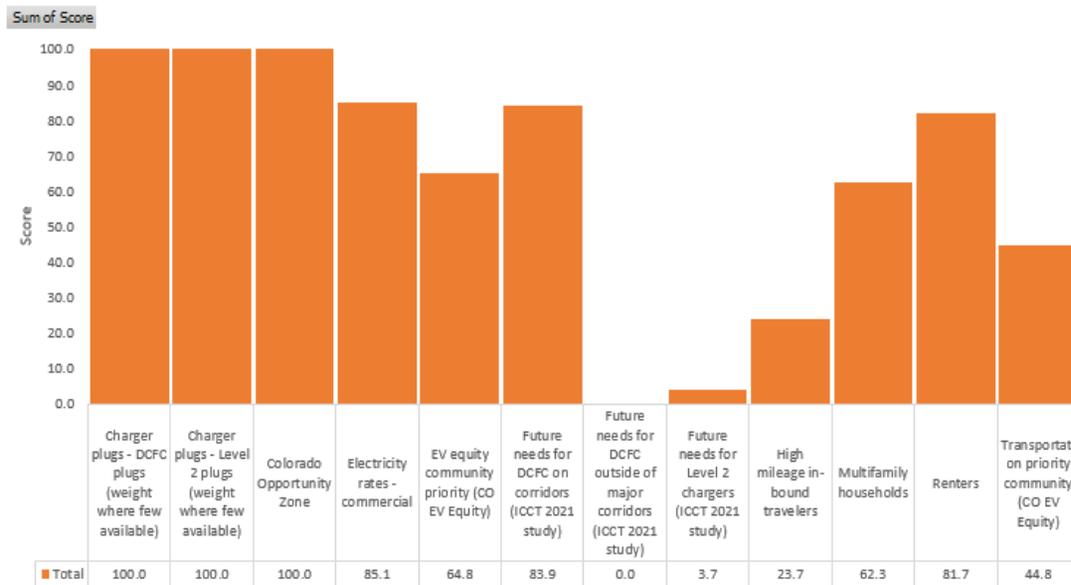
Instructions: Enter information in purple to see EV Equity scores for that applicant. If no address is found, look up the address online and confirm that the correct address/cross streets have been given. Note that changes to data on this page may take a moment to load. If you see #CALC errors, save the workbook and wait a minute for the APIs.

Index to be used for evaluation:

Public charger priority (DCFC)

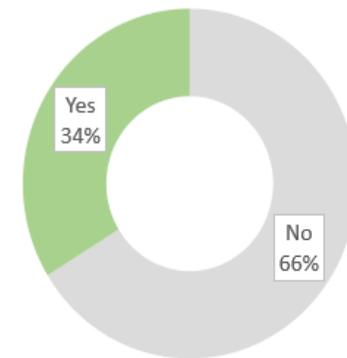
Applicant no.	Address	City	Funding	County	Disproportionately Impacted?	Total EVs + PHEVs	Index score result
1	3595 Table Mesa Dr	Boulder	\$2,500	Boulder County	No	4,212	76.2
2	120 Jefferson Street	Monte Vista	\$1,275	Rio Grande County	Yes	2	94.4
3	(your entry)	(your entry)		not found	not found	0	0
4	(your entry)	(your entry)		not found	not found	0	0
5	(your entry)	(your entry)		not found	not found	0	0
6	(your entry)	(your entry)		not found	not found	0	0
7	(your entry)	(your entry)		not found	not found	0	0
8	(your entry)	(your entry)		not found	not found	0	0
9	(your entry)	(your entry)		not found	not found	0	0
10	(your entry)	(your entry)		not found	not found	0	0

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Sum of Funding

Funding to disproportionately impacted communities



Also within **Section 3, Chapter 5** includes an overview of the activities of the Community Advisory Committee (CAC) and Technical Advisory Committee (TAC) that informed the EV Equity Study. The chapter also includes an overview of the organizations that are stakeholders to equitable transportation electrification, as well as a list of organizations connected to resources of engagement, advocacy, incentives, support for EV charging infrastructure, financing, networking, community organizing, community centers, planning, research, community engagement, and more. This list is included in the appendix to this report and includes more than 100 organizations. This long list underscores the intersectional nature of equitable transportation electrification and undoubtedly represents only a partial list of all of the organizations that are currently involved in EV equity or that provide resources that support EV equity objectives. A recommendation of this study is to combine these resources in an online format that would support future outreach.

Section 4 focuses on Implementing EV Equity in Colorado. **Chapter 6** provides a detailed Needs Assessment guide to help state agencies define an equity-centered transportation electrification program. The Needs Assessment follows an eight-step process for conducting an equity assessment, from defining the program area to reporting results (Table ES-1). The Needs Assessment includes easy-to-follow steps with guiding questions. Examples and worksheets are also included for ease of use. **Chapter 7** presents recommendations for Colorado transportation electrification programs focusing on elements identified in the Needs Assessment. For example, the Needs Assessment provides guidance on defining goals and objectives (step 3); all Colorado programs were reviewed to assess whether objectives were clearly stated and centered on equity. Best practices in Colorado were identified along with recommendations for Colorado programs, as shown in Table ES-2.

Table ES-1: Needs Assessment Steps

1: Define the program area(s)
2: Identify stakeholders, stakeholder roles, and develop a public participation plan
3: Define goals and objectives
4: Identify assets and deficiencies in the area
5: Refine understanding of assets and deficiencies by incorporating community-grounded input
6: Develop or modify program design based on feedback
7: Evaluate program effectiveness
8: Report results

Table ES-2: Matrix of Recommendations for Colorado Programs

Program element	Recommendations for Colorado programs
Objectives	State clear objectives to ensure transparency to the public, communicate program intentions, and focus program activities. Center equity communities within program objectives to ensure that program activities are focused on intended recipients. Set specific, measurable objectives to support program evaluation and help ensure that program dollars are spent as intended.
Minimum eligibility - Demographic and place-based	Limiting program eligibility to equity communities/individuals ensures that benefits are directed to those communities. Offering higher award amounts for equity communities/individuals can increase program access for participants who would not otherwise participate. Consider tying eligibility to enrollment in other programs, which would both limit enrollment only to lower income customers and streamline application processes (both for applicants and the state). However, enrollment pathways that are not dependent on other programs should be preserved in order to avoid excluding customers who qualify on the basis of income but are not enrolled in those programs.

Program element	Recommendations for Colorado programs
Minimum eligibility - Procedural and technical	Clearly state procedural and technical requirements, and provide technical support where relevant, to reduce barriers for differently resourced organizations and individuals. Particularly for light-duty EV programs in Colorado, consider expanding program eligibility to include used vehicles to help low-income individuals participate.
Data-sharing requirements	Clearly state personal identifiable information protection protocols in program documentation. Require applicants to share data that can be used in program outcomes, program measurement, and future program development.
Stakeholder engagement	Include a diverse group of stakeholders throughout 1) program development, 2) program outreach, and 3) proposal evaluation (where applicable). Include a mix of state agencies, municipalities, non-governmental and community-based organizations, utilities, and local community groups in program development to ensure that multiple perspectives are represented. Support programs with targeted, continuous outreach to ensure that information about relevant programs reaches intended customers. Include stakeholder outreach in project evaluation to ensure that projects with strong community connections are prioritized more highly.
Evaluation criteria - Demographic and place-based	Use demographic and place-based criteria to help to ensure that program funds are being spent in areas that do not have equal access to the benefits of transportation electrification or have been disproportionately impacted by transportation investments in the past. Consider weighting applications more highly when the applicant meets certain equity criteria to ensure that equity plays a large role in project selection. Consider increasing weight given to public benefits in project prioritization (note that many programs in Colorado for which a rubric was available prioritize public benefits between 10-20% of the total application score).
Evaluation criteria - General requirements and weighting	Transparently report the rubric used to evaluate proposals with an equity lens by ensuring that program applicants have complete information on the way their programs will be evaluated. Consider eliminating other requirements (e.g., that an area have a certain number of amenities or a certain number of registered electric vehicles) to support applications from under-resourced communities, or consider program applications holistically with other equity criteria.
Outcomes	Establish both qualitative and quantitative program outcomes that relate to equity. Include targeted outcomes in program objectives to ensure that the program remains focused on key equity outcomes.
Measurement	Set a baseline for performance measurement and specific targets to help better understand Colorado’s current support for transportation electrification in key areas and set priorities for the future. For programs requiring an application, include characteristics of successful and unsuccessful applicants in program measurement. Many of the state’s transportation electrification programs are increasingly gathering the data necessary to track program performance. Establish key performance indicators (KPIs) to track program performance and success related to process, output, and outcomes.

Also within **Section 4, Chapter 8** summarizes next steps for policies and programs to advance equity, with specific recommendations for some programs and general recommendations to both program managers and policy makers. These recommendations include:

- **Support stronger, coordinated stakeholder engagement for state-run programs by creating an independent organization of community members through which all engagement is directed.** A successful model is a non-profit led coalition. Key advantages of this approach include: 1) removing redundancy in stakeholder engagements, 2) managing payment and paperwork on behalf of community members, and 3) enjoying economies of scale with respect to community outreach. Use lists of stakeholders developed through the Colorado EV Equity Study for outreach.

- **Prioritize community-driven investments by adding new transportation electrification grant programming.** A grant program that allows community members to co-design a transportation electrification program around highly localized needs would ensure that equity is centered throughout program development, support capacity building, and enable community members to develop programming that meets highly localized needs.
- **Expand EV charging infrastructure investment to provide coverage the rest of the state.** This is necessary to support geographic equity, and can be done in a way that is mindful of other investments made throughout the state by utilities and government.
- **Increase incentives to low- and middle-income households.** Currently, all EV purchasers receive the same level of incentive regardless of the purchaser's income. Given that low- and middle-income households form the majority of the vehicle market, increasing incentives to low- and middle-income households will be critical to achieving equitable electrification.
- **Prioritize point-of-sale incentives wherever possible in order to reduce the effective purchase price of an EV.** Many dealers will allow a tax credit to be transferred and processed by the dealer, allowing a tax credit to be effectively an 'on-the-hood' incentive, but this is not universal.
- **Avoid providing transportation electrification incentives using General Fund dollars.** Prioritizing revenue sources outside of the General Fund reduces risk to other programs highly valued by underserved communities.
- **Streamline application processes.** Combining application processes so that individuals applying for an income-qualified program in the state are able to apply for other programs, or receive information on other programs. This would serve many objectives and reduce administrative burden both for the applicant and for the administrators. This could be done not only for state programs, but also for programs managed by utilities.
- **Combine project evaluation processes.** Grant applications are often scored using a manual process that may vary from program to program or cycle to cycle. Streamlining and combining these processes would reduce fragmentation for program administration in the way projects are prioritized, reduce bias, increase transparency, and free staff to provide community-facing support.
- **Seek opportunities to implement steps identified in the Needs Assessment.** As program resources become available, following the steps laid out in the Needs Assessment will help to ensure that equity is centered in the program elements, including defining goals and objectives, identifying assets and deficiencies, evaluating program effectiveness, and reporting. Proceeding through these steps is an iterative, evolving process, and one that will help ensure that all Coloradans have equitable access to the benefits of transportation electrification.

Resumen ejecutivo

La Oficina de Energía de Colorado llevó a cabo este estudio sobre la equidad de acceso a vehículos eléctricos para establecer un criterio sobre los factores que impedirían a las zonas con mayores necesidades socioeconómicas o de transporte acceder al transporte eléctrico o a sus beneficios, y para proveer herramientas al estado de Colorado y a sus asociados para diseñar programas que apoyen una electrificación equitativa. Este informe del estudio sobre la equidad de acceso a vehículos eléctricos describe el menú de opciones disponibles para apoyar la electrificación del transporte con un enfoque centrado en la equidad y ofrece herramientas que apoyarían inmediatamente al estado de Colorado en la implementación de estas opciones. En el presente informe, el término "equidad de acceso a vehículos eléctricos" se refiere en general a cualquier política, estrategia, participación, ayuda u otro recurso que apoye el acceso equitativo al transporte eléctrico y sus beneficios. El informe se divide en cuatro secciones que se centran en diferentes cuestiones de equidad.

La **Sección 1** se centra en las oportunidades y recomendaciones para lograr equidad de acceso a vehículos eléctricos. En esta sección, el **Capítulo 1** incluye un menú de programas, políticas e iniciativas que pueden ser utilizadas por los legisladores y los miembros de la comunidad para identificar una intervención que satisfaga las necesidades de sus comunidades. En general, las intervenciones se agrupan en cinco categorías, que incluyen: la mejora del acceso a la adquisición de vehículos eléctricos, la difusión y educación de los consumidores, la mejora del acceso y la asequibilidad de la infraestructura de carga de vehículos eléctricos, los programas de movilidad compartida y la reducción de los impactos sobre la calidad del aire (con enfoque en las subvenciones para los autobuses escolares y la electrificación del transporte). Esta revisión se apoyó en varios recursos nacionales en línea dedicados a recopilar programas, políticas, legislación y otros incentivos que apoyan la electrificación del transporte, que también se discuten aquí. El **Capítulo 2** proporciona orientación sobre los elementos de diseño de los programas de sustitución de vehículos con emisiones elevadas, una prioridad que se había identificado en el ámbito de este estudio. El capítulo incluye ejemplos de programas de sustitución de vehículos existentes; métricas de retorno de la inversión para diferentes tipos de programas y consideraciones para solicitudes específicas; así como estrategias y elementos de diseño específicos de estos programas, que incluyen la elegibilidad de los solicitantes, el diseño equitativo, la elegibilidad de los vehículos y otras consideraciones. El capítulo concluye con recomendaciones para evaluar los programas y cuantificar los beneficios de los mismos.

La **Sección 2** se centra en el mapeo de las poblaciones para analizar la equidad de acceso a vehículos eléctricos. El **Capítulo 3** revisa las definiciones de equidad que se utilizan en Colorado, establecidas en el contexto de las directrices federales o utilizadas por otras organizaciones estatales y sin fines de lucro. Esto proporciona la base de un marco que permite identificar las zonas prioritarias en función de los factores socioeconómicos y las necesidades de transporte. El resto del capítulo describe la metodología utilizada para definir la equidad de acceso a vehículos eléctricos en las comunidades utilizadas en este estudio. Se desarrollaron dos índices: 1) prioridad socioeconómica y 2) prioridad de transporte.² El capítulo incluye las preguntas orientadoras utilizadas para fundamentar la selección de los indicadores de cada índice, los indicadores considerados, las pruebas realizadas para garantizar que los indicadores utilizados fuesen representativos para identificar las áreas prioritarias, y la orientación sobre el uso del índice.

La **Sección 3** se centra en técnicas que pueden utilizarse para incorporar la equidad de acceso a vehículos eléctricos en la planificación y la programación. El **Capítulo 4** ofrece una descripción general de las herramientas: 1) un panel de información sobre equidad de acceso a vehículos eléctricos que permite a los usuarios conocer las necesidades de transporte y el estado actual de la electrificación en Colorado (por ejemplo, los registros de automotores, la ubicación de los cargadores); 2) una **herramienta de priorización** descargable (figura ES-1) que puede utilizarse para priorizar las solicitudes de programas de electrificación, incorporando los dos índices desarrollados a través del Estudio de Equidad de acceso a vehículos eléctricos de Colorado; y 3) los resultados de una **encuesta** que resume la experiencia de los usuarios en los programas de electrificación de Colorado.

² Hay que tener en cuenta que estos índices se utilizan dentro de los índices de priorización desarrollados más adelante en este estudio.

Figura ES-1. Herramienta de priorización

Herramienta de evaluación de aplicaciones | Múltiples puntajes de priorización de solicitantes

Instrucciones: Ingrese la información en los campos de color morado para ver los puntajes de Equidad de acceso a vehículos eléctricos para ese solicitante. Si no se encuentra una dirección, busque la dirección en línea y confirme que se ha ingresado la dirección/intersección de calles correcta. Tenga en cuenta que los cambios a los datos en esta página pueden demorar un momento antes de aparecer en pantalla. Si observa errores #CALC, guarde la hoja de trabajo y espere un minuto para que se carguen las API.

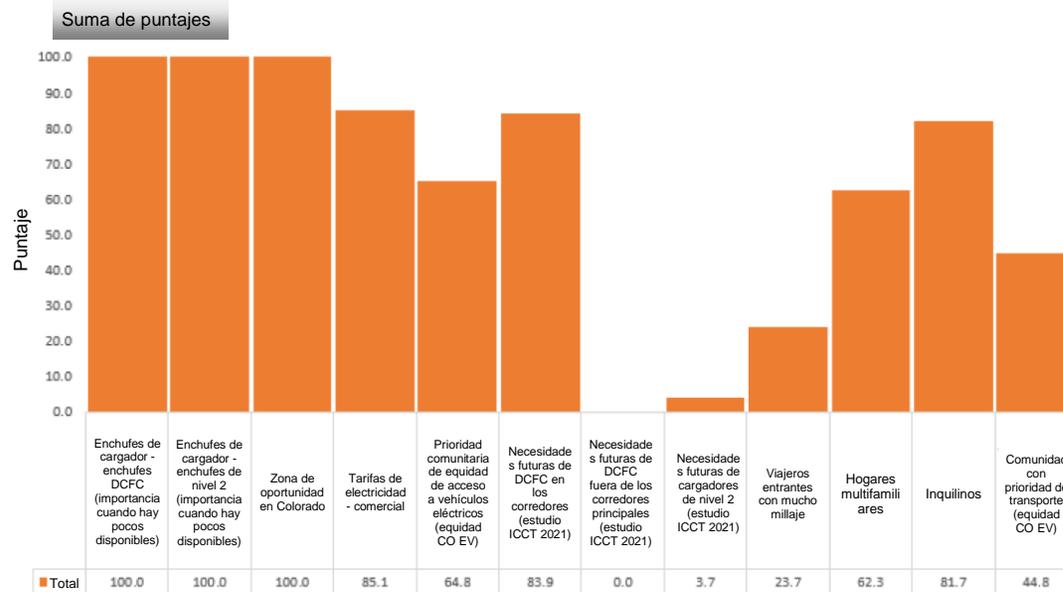
Índice a utilizar para la evaluación:

Prioridad de cargadores públicos (DCFC)

N.º de solicitante	Dirección	Ciudad	Financiamiento	Condado	¿Desproporcionadamente afectado?	Total de EV + PHEV	Resultado del puntaje índice
1	3595 Table Mesa Dr	Boulder	\$2,500	Boulder County	No	4,212	76.2
2	120 Jefferson Street	Monte Vista	\$1,275	Rio Grande County	Sí	2	94.4
3	(su dato)	(su dato)		no se encontró	no se encontró	0	0
4	(su dato)	(su dato)		no se encontró	no se encontró	0	0
5	(su dato)	(su dato)		no se encontró	no se encontró	0	0
6	(su dato)	(su dato)		no se encontró	no se encontró	0	0
7	(su dato)	(su dato)		no se encontró	no se encontró	0	0
8	(su dato)	(su dato)		no se encontró	no se encontró	0	0
9	(su dato)	(su dato)		no se encontró	no se encontró	0	0
10	(su dato)	(su dato)		no se encontró	no se encontró	0	0

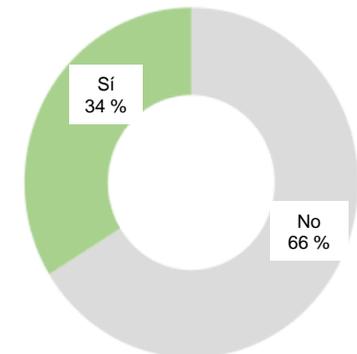
Núm. de solicitante

- 1
- 2
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- 10



Suma de financiamientos

Financiamiento a las comunidades desproporcionadamente afectadas



Además, en la **Sección 3**, el **Capítulo 5** incluye una descripción general de las actividades del Comité Asesor Comunitario (CAC) y del Comité Asesor Técnico (TAC) que aportaron información al estudio sobre equidad de acceso a vehículos eléctricos. El capítulo también incluye una descripción general de las organizaciones que son las partes interesadas en la electrificación equitativa del transporte, así como una lista de organizaciones relacionadas con los recursos de compromiso, promoción, incentivos, apoyo a la infraestructura de recarga de vehículos eléctricos, financiamiento, creación de redes, organización comunitaria, centros comunitarios, planificación, investigación, participación de la comunidad, etc. Esta lista se incluye en el apéndice de este informe e incluye más de 100 organizaciones. Esta larga lista destaca la naturaleza interseccional de la electrificación equitativa del transporte y, sin duda, representa solo una lista parcial de todas las organizaciones que participan actualmente en la equidad de acceso a vehículos eléctricos o que proporcionan recursos que apoyan los objetivos de la equidad de acceso a vehículos eléctricos. Una recomendación derivada de este estudio es la de combinar estos recursos en un formato en línea que sirva de apoyo para la futura difusión.

La **Sección 4** se enfoca en la aplicación de la equidad de acceso a vehículos eléctricos en Colorado. El **Capítulo 6** proporciona una guía detallada de Evaluación de necesidades que ayudará a las entidades estatales a definir un programa de electrificación del transporte centrado en la equidad. La Evaluación de necesidades sigue un proceso de ocho pasos para realizar una evaluación de equidad, desde la definición del área del programa hasta la presentación de los resultados (Tabla ES-1). La Evaluación de necesidades incluye pasos fáciles de seguir con preguntas orientadoras. También se incluyen ejemplos y hojas de trabajo para facilitar su uso. El **Capítulo 7** presenta recomendaciones para los programas de electrificación del transporte de Colorado, centrándose en los elementos identificados en la Evaluación de necesidades. Por ejemplo, la Evaluación de necesidades proporciona orientación sobre la definición de metas y objetivos (paso 3); se revisaron todos los programas de Colorado para evaluar si los objetivos estaban claramente establecidos y centrados en la equidad. Se identificaron las mejores prácticas en Colorado junto con las recomendaciones para los programas de Colorado, según se muestra en la Tabla ES-2.

Tabla ES-1: Pasos de la Evaluación de necesidades

1: Definir una o más áreas del programa
2: Identificar a las partes interesadas, las funciones de las partes interesadas y desarrollar un plan de participación pública
3: Definir metas y objetivos
4: Identificar activos y deficiencias en el área
5: Precisar la comprensión de los activos y las deficiencias mediante la incorporación de los aportes de la comunidad
6: Desarrollar o modificar el diseño del programa sobre la base de los comentarios
7: Evaluar la eficacia del programa
8: Presentar los resultados

Tabla ES-2: Matriz de recomendaciones para los programas de Colorado

Elemento del programa	Recomendaciones para los programas de Colorado
Objetivos	Establecer objetivos claros para garantizar la transparencia ante el público, comunicar las intenciones del programa y focalizar las actividades de este. Centrar las comunidades en términos de equidad dentro de los objetivos del programa para garantizar que las actividades del programa se enfoquen en los destinatarios previstos. Establecer objetivos específicos y medibles para apoyar la evaluación del programa y ayudar a garantizar que los fondos del programa se gasten según lo previsto.
Elegibilidad mínima: basada en la demografía y el lugar	Limitar la elegibilidad del programa a las comunidades/individuos en términos de equidad garantiza que los beneficios se destinen a esas comunidades. Ofrecer mayores cantidades de fondos a las comunidades/individuos identificados elegibles en términos de equidad puede aumentar el acceso al programa para aquellos participantes que, de otro modo, no participarían. Considerar la posibilidad de vincular la elegibilidad a la inscripción en otros programas, lo cual limitaría la inscripción solo a aquellos clientes con menores ingresos y agilizaría los procesos de solicitud (para los solicitantes y para el estado). Sin embargo, deben conservarse las modalidades de inscripción que no dependen de otros programas con el fin de evitar la exclusión de clientes que reúnen los requisitos sobre la base de sus ingresos pero que no están inscritos en dichos programas.

Elemento del programa	Recomendaciones para los programas de Colorado
Elegibilidad mínima - Procedimientos y técnicas	Establecer claramente los requisitos técnicos y de procedimiento, y proporcionar apoyo técnico cuando sea pertinente, para reducir los obstáculos que deben superar las organizaciones y los individuos con recursos diferentes. Especialmente en el caso de los programas de vehículos eléctricos ligeros en Colorado, considerar la posibilidad de ampliar la elegibilidad para el programa con el fin de incluir los vehículos usados y así ayudar a que participen las personas con ingresos bajos.
Requisitos para el intercambio de datos	Indicar claramente los protocolos para la protección de la información personal identificable en la documentación del programa. Requerir a los solicitantes que compartan datos que puedan ser utilizados para obtener resultados del programa, en la medición de este y en el desarrollo de futuros programas.
Participación de las partes interesadas	Incluir un grupo diverso de partes interesadas durante 1) el desarrollo del programa, 2) la difusión del programa y 3) la evaluación de propuestas (cuando sea aplicable). Incluir una combinación de entidades estatales, municipalidades, organizaciones no gubernamentales y comunitarias, empresas de servicios públicos y grupos comunitarios locales en el desarrollo del programa para garantizar la representación de múltiples puntos de vista. Apoyar los programas por medio de una difusión continua y específica para garantizar que la información sobre los programas pertinentes llegue a los clientes previstos. Incluir la difusión de las partes interesadas en la evaluación de los proyectos con el fin de garantizar que se prioricen en mayor medida aquellos proyectos con fuertes conexiones comunitarias.
Criterios de evaluación - Basados en la demografía y el lugar	Utilizar criterios basados en la demografía y en el lugar para ayudar a garantizar que los fondos del programa se utilicen en zonas que no tienen un acceso equitativo a los beneficios de la electrificación del transporte o que se han visto afectadas de forma desproporcionada por las inversiones en transporte en el pasado. Considerar la posibilidad de ponderar en mayor medida las solicitudes cuando el solicitante cumpla ciertos criterios de equidad con el fin de garantizar que la equidad desempeñe un papel importante en la selección del proyecto. Considerar la posibilidad de aumentar el factor de ponderación de los beneficios públicos en la priorización de los proyectos (hay que tener en cuenta que muchos programas de Colorado para los que se disponía de una rúbrica ponderan los beneficios públicos con valores entre el 10 y el 20 % del puntaje total de la solicitud).
Criterios de evaluación - Requisitos generales y ponderación	Informar de forma transparente sobre la rúbrica utilizada para evaluar las propuestas con una óptica de equidad, asegurándose de que los solicitantes del programa disponen de información completa sobre la forma en que se evaluarán sus programas. Considerar la eliminación de otros requisitos (por ejemplo, que una zona tenga un determinado número de servicios o un determinado número de vehículos eléctricos registrados) para respaldar las solicitudes de las comunidades con menos recursos, o considerar las solicitudes del programa de forma holística con otros criterios de equidad.
Resultados	Establecer resultados cualitativos y cuantitativos del programa que se relacionen con la equidad. Incluir los resultados previstos en los objetivos del programa con el fin de garantizar que el programa se mantenga centrado en los resultados clave de equidad.
Medición	Establecer una línea de referencia para la medición del desempeño y de establecimiento de objetivos específicos con el fin de ayudar a entender mejor el apoyo actual de Colorado a la electrificación del transporte en áreas clave y establecer prioridades para el futuro. En el caso de los programas donde se exige una solicitud, incluir en la medición del programa las características de los solicitantes seleccionados y no seleccionados. Muchos de los programas estatales de electrificación del transporte están recopilando de forma creciente la información necesaria para hacer un seguimiento del desempeño del programa. Establecer indicadores clave de rendimiento (KPI) para hacer un seguimiento del desempeño y el éxito del programa en relación con el proceso, la ejecución y los resultados.

Además, en la **Sección 4**, el **Capítulo 8** ofrece un resumen de los próximos pasos de las políticas y programas encaminados a fomentar la equidad, con recomendaciones específicas para algunos programas y recomendaciones generales para los gerentes de programas y para los encargados de elaborar las políticas. Estas recomendaciones incluyen:

Apoyar una participación más sólida y coordinada de las partes interesadas en los programas estatales mediante la creación de una organización independiente integrada por miembros de la

comunidad a través de la cual se dirija toda la participación. Un modelo que ha tenido éxito es uno dirigido por una coalición sin fines de lucro. Las principales ventajas de este enfoque son: 1) elimina la redundancia en la participación de las partes interesadas, 2) gestiona el pago y el papeleo en nombre de los miembros de la comunidad, y 3) disfruta de economías de escala con respecto a la difusión comunitaria. Utilizar listas de partes interesadas desarrolladas a través del Estudio de equidad de acceso a vehículos eléctricos de Colorado para su difusión.

Dar prioridad a las inversiones impulsadas por la comunidad mediante la adición de una nueva programación de subvenciones para la electrificación del transporte. Un programa de subvenciones que permita a los miembros de la comunidad codiseñar un programa de electrificación del transporte en torno a necesidades muy localizadas garantizaría que el desarrollo del programa se centre en la equidad, apoyaría la creación de capacidades y permitiría a los miembros de la comunidad desarrollar programas que satisfagan necesidades muy localizadas.

Ampliar la inversión en infraestructura de carga de vehículos eléctricos para proporcionar cobertura al resto del estado. Esto es imprescindible para apoyar la equidad geográfica, y se puede hacer teniendo en cuenta otras inversiones realizadas en todo el estado por las empresas de servicios públicos y el gobierno.

Aumentar los incentivos a las unidades familiares con ingresos bajos y medios. Actualmente, todos los compradores de vehículos eléctricos reciben el mismo nivel de incentivos, independientemente de los ingresos del comprador. Dado que las unidades familiares de ingresos bajos y medios constituyen la mayor parte del mercado de vehículos, aumentar los incentivos a las unidades familiares de ingresos bajos y medios será fundamental para lograr una electrificación equitativa.

Dar prioridad a los incentivos en el punto de venta siempre que sea posible para reducir el precio de compra efectivo de un vehículo eléctrico. Muchos concesionarios permitirán que un crédito fiscal sea trasladado y procesado por el concesionario mismo, lo que permitirá que un crédito fiscal entre en vigor localmente de forma efectiva, pero esto no es universal.

Evitar que se proporcionen incentivos para la electrificación del transporte utilizando dinero del Fondo General. Dar prioridad a las fuentes de ingresos fuera del Fondo General reduce el riesgo para otros programas muy valorados por las comunidades desatendidas.

Agilizar los procesos de solicitud. Combinar los procesos de solicitud para que los individuos que solicitan participar en un programa con calificación de ingresos en el estado puedan solicitar el ingreso en otros programas, o recibir información sobre otros programas. Esto serviría para muchos objetivos y reduciría la carga administrativa tanto para el solicitante como para los administradores. Esto podría hacerse no solo para los programas estatales, sino también para los programas administrados por las empresas de servicios públicos.

Combinar los procesos de evaluación de los proyectos. Las solicitudes de subvención suelen evaluarse mediante un proceso manual que puede variar de un programa a otro o de un ciclo a otro. Al racionalizar y combinar estos procesos se reduciría la fragmentación de la administración de programas en cuanto a la forma de priorizar los proyectos, se reduciría la parcialidad, se aumentaría la transparencia y permitiría que el personal preste apoyo a la comunidad.

Buscar oportunidades para poner en práctica los pasos identificados en la Evaluación de necesidades. A medida que los recursos del programa estén disponibles, seguir los pasos

establecidos en la Evaluación de necesidades ayudará a garantizar que los elementos del programa se centren en la equidad, incluyendo la definición de metas y objetivos, la identificación de activos y deficiencias, la evaluación de la eficacia del programa y la presentación de informes. Avanzar a través de estos pasos es un proceso iterativo y evolutivo, que ayudará a garantizar que todos los habitantes de Colorado tengan un acceso equitativo a los beneficios de la electrificación del transporte.

Section 1: Opportunities and Recommendations for EV Equity

1.0 Equity and Electric Vehicle Efforts in Colorado

1.1 Policy Resources

A large body of work shows that zero-emission vehicle (ZEV) adoption and EV Equity can be meaningfully advanced through the use of Government programs. ‘EV equity’ refers broadly to any policy, strategy, engagement, assistance, or other resource that supports equitable access to electric transportation and its benefits. A number of online databases provide information on incentives, policies, and programs that support electrification. Information on these resources is provided below to serve as a continuing resource to policy-makers and electrification advocates. The primary source used for the Colorado EV Equity Study was the Alternative Fuels Data Center (AFDC) Laws and Incentives Database, which was used both to develop programs within the EV Equity Resources Database and to support the development of a typology of policies and programs included later in this chapter.

Policy Resources

AFDC Laws and Incentives Database
NREL

Transportation Funding and Finance State Bill Tracking Database; State Policies Promoting Hybrid and Electric Vehicles
NCSL

Advanced Energy Legislation Tracker
Center for New Energy Economy, Colorado State University

Electric Vehicle Hub
Atlas Public Policy

The **Alternative Fuels Data Center Laws & Incentives Database** includes legislation, regulations, and incentives on a variety of transportation-related topics, including hydrogen and electric vehicles. The National Renewable Energy Laboratory (NREL), through a subcontractor, obtains information about new or updated legislation, regulations, and incentives via web search. Websites reviewed for new and updated information include State legislatures, energy commissions, the Federal Register, Federal agencies, and congressional committees. NREL also maintains a list of industry resources that are reviewed monthly to obtain and update relevant data. This includes the Clean Cities Coalition Network, U.S. Department of Energy regional managers, and relationships developed through industry meetings, events, and publications. Additionally, the Clean Cities Technical Response Service summarizes and analyzes requests and responses from the public to inform the AFDC. Finally, NREL maintains a robust list of 60+ State and Federal points of contact who provide and/or verify information on a rolling basis. The AFDC includes State, Federal, and some local/regional legislation on fuel economy and efficiency, aftermarket conversion and idle reduction, as well as a wide variety of alternative fuel technologies (e.g., electric vehicles, natural gas vehicles, hydrogen fuel cell vehicles). The Electrification Coalition provides an interactive dashboard for the AFDC data in their EV Policy Dashboard.³

The **National Conference of State Legislatures (NCSL)** provides several searchable bill tracking databases that cover a variety of policy issues. The **State Policies Promoting Hybrid and Electric Vehicles database** summarizes recent trends in electrification (including the number of States that offer incentives to support EV adoption), States that have comprehensive State regulatory policies, multistate agreements, key trends in electrification (such as Volkswagen’s Clean Air Act Civil Settlement), Federal incentives, and registration fees on hybrid and electric vehicles. An interactive map allows users to review policies

³ Electrification Coalition. 2021. Detailed State EV Policy Dashboard. <https://www.electrificationcoalition.org/detailed-policy-dashboard/>.

specific to each State.⁴ NCSL also provides a **Transportation Funding and Finance State Bill Tracking Database**, searchable by topic, State, keyword, status, bill number, year, and author. Data for these databases are sourced from the AFDC and from the LexisNexis® State Net®.

The Center for New Energy Economy at Colorado State University (CSU) maintains the **Advanced Energy Legislation Tracker**, which provides current legislative language, recent actions, bill sponsor information, and policy trend analyses on advanced energy legislation, including policies focusing on transportation. Data are available for all 50 States and the District of Columbia and are searchable by bill status, year introduced, and keyword (or multiple keywords). Results show a distribution of bills across States, policy categories, and statuses.⁵

Atlas Public Policy's EV Hub covers a broad range of EV-related data, including market data, vehicle registrations, infrastructure deployment, public policy, research, public and private funding awards and opportunities, media coverage, utility filings, Volkswagen settlement activities, and road networking funding. The State Policy database covers enacted policies, proposed legislation, requests for proposal and information, and public funding opportunities. As with the Advanced Energy Legislation tracker, search results include detailed text as well as trends, highlighting geographic and time distribution of new policies.⁶ State and local agencies are granted free access.

Caret builds on current policy information to allow users to estimate projected cost, EV adoption rate, and emissions reductions that would result from specific policy choices. The software can be used to calculate how stacking incentives could make EV models affordable to low- and moderate-income (LMI) households. Incentive types supported by the software include new EV, used EV, made in America, original equipment manufacturer (OEM), internal combustion engine (ICE) scrap and replace, and EV charging.⁷ Due to cost, this resource was not used for this study.

For the Colorado EV Equity study, the sources above were supplemented with targeted web searches of relevant Colorado agencies, as well as private and non-profit organizations working in fields of transportation, electrification, and equity. Finally, policies and programs were sourced internally from institutional knowledge within the Colorado Energy Office, as well as the Colorado Department of Public Health.

1.2 Policy Options

In many cases, programs and policies that support EV equity are already in place in Colorado—and may have a greater or lesser impact on equity based on program features. A major focus of the State has been to lower the purchase cost of EVs, as prohibitively high purchase costs prevent many potential buyers from considering purchasing an electric vehicle. Purchase subsidies have been shown to provide strong support for EV adoption, especially when paired with other circumstantial and value-based inclinations toward

⁴ National Conference of State Legislatures. 2021. State Policies Promoting Hybrid and Electric Vehicles. <https://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state-chart.aspx>.

⁵ Advance Energy Legislation Tracker. N.d. Search Advanced Energy Legislation. <https://www.aeltracker.org/>.

⁶ Atlas Public Policy. N.d. EV Hub. <https://www.atlasevhub.com/>.

⁷ Center for Sustainable Energy. 2020. Decision-makers have a new data-driven platform to spur EV adoption at least cost and time. <https://energycenter.org/thought-leadership/news/decision-makers-have-new-data-driven-platform-spur-ev-adoption-least-cost>.

EVs.⁸ These policies are shown to be highly effective at encouraging EV adoption, particularly when phase-out of purchase subsidies in China and Denmark correspond with rapid declines in EV sales.^{9,10}

Another primary focus of policy-making in the State is on improving access to EV charging infrastructure, including home-based EV charging infrastructure. Studies of current EV owners suggest that more than 80 percent of all charging occurs at home, which presents an often-insurmountable constraint on households with no easy access to home-based charging. Only 47 percent of all personal vehicles in the U.S. have a dedicated off-street parking space at an owned household.¹¹

As a result, Federal and State subsidies, often working with partners such as utilities, have increasingly moved into this space to increase access to EVs and EV charging infrastructure through public investment. However, when there are no eligibility requirements for subsidies, public investments tend to go overwhelmingly to wealthier individuals and communities.¹² An analysis from Massachusetts found that just 9 percent of the State's Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) program investments went to zip codes with median household incomes less than 80 percent of the statewide median.¹³ A main focus of current national EV policy-making is to shift from a near-exclusive focus on subsidies that benefit wealthier individuals, to ensuring that a broader range of transportation users are included in EV policy. In the Colorado EV Equity Study, these communities are referred to as EV equity communities. A detailed description of these communities is included in Chapter 3, and broadly includes communities that have a high proportion of people who are low- to moderate-income (LMI), marginalized, people of color, frontline, rural, disproportionately air-quality burdened, and lacking in access to either transportation electrification modes or the benefits of transportation electrification.

Currently, efforts that do prioritize equitable EV adoption and access in the U.S. are being driven by State and local policies and programs. An increasing body of research evaluating these investments highlights the importance of modifying EV purchase incentives or replacing them with community-focused programs when they overwhelmingly direct funds to high-income households.¹⁴ California is a leader in this space, with a variety of EV incentive programs with income qualifications. However, a recent study found that equity metrics for California's Clean Vehicle Rebate Program (CVRP) improved after an income cap and income-tiered rebate structure were introduced, yet even then few disadvantaged communities received

⁸ Langbroek, Franklin, and Susilo. 2016. The effect of policy incentives on electric vehicle adoption. <https://www.sciencedirect.com/science/article/pii/S0301421516301550>.

⁹ Nikkei Asia. 2020. China will not end EV subsidies after cuts spark sales slump. <https://asia.nikkei.com/Spotlight/Electric-cars-in-China/China-won-t-end-EV-subsidies-after-cuts-spark-sales-slump>.

¹⁰ Electrek. 2017. Denmark to relaunch its electric vehicle market with incentives after a year with almost no sales. <https://electrek.co/2017/04/19/denmark-electric-vehicle-incentive/>.

¹¹ Traut et al. 2013. U.S. residential charging potential for electric vehicles. <https://doi.org/10.1016/j.trd.2013.10.001>.

¹² Transport Research International Documentation. 2020. Equity Assessment of Plug-in Electric Vehicle Purchase Incentives with a Focus on Atlanta, Georgia. <https://trid.trb.org/view/1737724>.

¹³ Streetsblog Massachusetts. 2021. Analysis: Bay State's EV Rebate Program Overwhelmingly Benefits Wealthy suburbanites. <https://mass.streetsblog.org/2021/02/18/analysis-bay-states-ev-rebate-program-overwhelmingly-benefits-wealthy-suburbanites/>.

¹⁴ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California's Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

the rebate.^{15,16} The California Enhanced Fleet Modernization Program (EFMP), in contrast, was found to have higher rates of investment in disadvantaged communities, likely due to a change in the program to support both new and used EV purchases (as well as some fuel-efficient conventional internal combustion vehicle purchases).

As the Greenlining Institute and others observe, the success of a mobility policy or program depends on the needs of the community it is intended to serve.¹⁷ What follows is a menu of programs, policies, and initiatives that can be used by community members to identify an intervention that meets their community's needs.

1.3 Improving Access to EV Ownership

1.3.1 EV Purchase and Lease Programs

EV purchase incentives can support equitable EV outcomes by lowering the effective purchase price of EVs for LMI purchasers. EV purchase incentives typically come in the form of tax credits, grants, and rebates. Historically, Colorado has offered some of the largest incentives in the country toward the purchase of a new battery electric vehicle (BEV), plug-in hybrid electric vehicle (PHEV), and (previously) hybrid electric vehicle (HEV).¹⁸ In the past, Colorado's EV tax credit incentive also supported used vehicles.

An increasing number of States have made EV purchase tax credits income-based, prioritizing low- to moderate-income individuals whose incomes either fall below a multiple of the Federal Poverty Line (e.g., 300 percent of the Federal Poverty Line) or are already enrolled in other income-qualified programs. An example of this is the Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR) program, which offers income-qualified purchase incentives toward the purchase/lease of both new and used vehicles.¹⁹ While establishing a higher income threshold may enable

EV Purchase and Lease Programs

Key Partners

Colorado Department of Revenue
Regional Air Quality Council
Utilities
State Government
Original equipment manufacturers
Advocacy organizations and EV Clubs
(e.g., Four Corners Office for Resource Efficiency, Nissan LEAF Owners Colorado)

Equity Considerations

Advisory services
Air quality
Buyer eligibility criteria
Purchase and transaction costs
Used and new vehicle eligibility
Vehicle emissions
Vehicle MSRP

¹⁵ Ju, Cushing, and Morello-Frosch. 2020. An equity analysis of clean vehicle rebate programs in California. <https://doi.org/10.1007/s10584-020-02836-w>.

¹⁶ Guo and Kontou. 2021. Disparities and equity issues in electric vehicles rebate allocation. <https://doi.org/10.1016/j.enpol.2021.112291>.

¹⁷ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California's Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

¹⁸ U.S. Energy Information Administration. 2017. Analysis of the Effect of Zero-Emission Vehicle Policies: State-Level Incentives and the California Zero-Emission Vehicle Regulations. <https://www.eia.gov/analysis/studies/transportation/zeroemissions/>.

¹⁹ Connecticut Department of Energy and Environmental Protection. N.d. CHEAPR: Connecticut Hydrogen and Electric Automobile Purchase Rebate. <https://portal.ct.gov/DEEP/Air/Mobile-Sources/CHEAPR/CHEAPR--Home>.

more individual buyers to qualify, tying program eligibility to existing income-qualified programs may reduce the program’s administrative burden.

Narrowing or expanding vehicle eligibility requirements may ensure that program funds are limited to vehicles that would be purchased by income-qualified buyers. A 2018 study by the National Bureau of Economic Research suggests that, in order for California to reach its goal of 1.5 million EVs by 2025, subsidies of up to \$18 billion dollars may be necessary (noting that more research is needed to identify barriers and drivers of EV adoption as EV technology becomes more mature and cost-competitive).²⁰ Furthermore, older and wealthier consumers place a relatively lower importance on EV purchase incentive than other consumer groups.^{21,22} Given that low- and middle-income households form the majority of the vehicle market, sizing incentives to achieve targeted EV adoption given certain eligibility requirements may be critical to reach EV adoption goals.

The Colorado Automobile Dealers Association has supported capping program eligibility to vehicles priced at \$60,000 or less.²³ Tying incentives to the replacement of vehicles that are less fuel-efficient or have higher mileage may also be effective at reducing air quality impacts to EV equity communities. Alternatively, feebate initiatives such as the French “Bonus-Malus” program provide incentives for purchasing fuel efficient vehicles while simultaneously adding additional taxes to the purchase of inefficient vehicles.²⁴ Particularly for LMI buyers, receiving incentive funds at the time of sale (also referred to as ‘on the hood’ incentives) substantially reduces transaction costs and total purchase cost.²⁵

Utilities support EV purchase as well. Peninsula Clean Energy’s Used EV Rebate Program provides up to \$4,000 to income-qualifying residents of San Mateo County toward the purchase of used EVs.²⁶ Xcel Energy offers rebates for both used and new EVs to income-qualified buyers who agree not to claim the State EV tax credit.²⁷ Using a rebate reduces total financing costs that a customer has to assume, and corresponding interest a customer pays until they get a rebate and/or tax credits.

EV purchase cost can also be reduced through group buy agreements, where a local agency negotiates a discounted price from one or more EV dealers or original equipment manufacturers (OEMs). Colorado was

²⁰ National Bureau of Economic Research. 2021. Subsidizing Low- and Middle-Income Adoption of Electric Vehicles: Quasi-Experimental Evidence from California. <https://www.nber.org/papers/w25359>.

²¹ Jenn et al. 2020. An in-depth examination of electric vehicle incentives: Consumer heterogeneity and changing response over time. <https://www.sciencedirect.com/science/article/abs/pii/S0965856418311091?via%3Dihub>.

²² National Bureau of Economic Research. 2021. Subsidizing Low- and Middle-Income Adoption of Electric Vehicles: Quasi-Experimental Evidence from California. <https://www.nber.org/papers/w25359>.

²³ Green Car Reports. 2016. Colorado simplifies electric-car initiative, but axes used models. https://www.greencarreports.com/news/1103986_colorado-simplifies-electric-car-incentive-but-axes-used-models.

²⁴ The International Council on Clean Transportation. 2020. Actions Speak Louder than Words: The French Commitment to Electric Vehicles. <https://theicct.org/blog/staff/actions-speak-louder-words-french-commitment-electric-vehicles>.

²⁵ The 2016 passage of HB 16-1332 enabling buyers to transfer rebates to either a dealership or financing agency can effectively turn ZEV tax credits into an instant discount.

²⁶ Peninsula Clean Energy. N.d. Used Electric Vehicle Rebate Program. <https://www.peninsulacleanenergy.com/usedev/>.

²⁷ Xcel Energy. 2021. Transportation Electrification Plan: Public Service Company of Colorado 2021-2023. https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf.

the site of the nation's first electric vehicle group buy program, in which Boulder County worked with a local Nissan dealership to offer a group discount off the Nissan LEAF. The vehicle was discounted 62 percent, which enabled the dealership to quadruple its monthly average LEAF sales.²⁸

1.3.2 EV Loan Programs

Access to low-interest loans have been shown to help address barriers to the uptake of energy-efficient measures for LMI households.²⁹ EV loan programs offered at low-interest rates for LMI buyers helps to make EVs more affordable by reducing finance costs. Programs that are accompanied by educational resources, such as those offered currently through many advocacy and education groups currently operating in the State, can reduce the transaction costs associated with the effort of identifying and applying for a loan.

In Washington State, the EVs for EVERYONE program offers residents low-interest loans for both new and used EVs through a partnership between Plug in America and the Express Credit Union. In addition to loans, program participants in EVs for EVERYONE also receive a free annual membership to the Plug in America toll-free support line with optional access to an EV owner as a mentor to assist in car-buying, which may reduce purchasers' transaction costs.³⁰

Another notable example is the Clean Vehicle Assistance Program in California, administered by the Beneficial State Foundation (the nonprofit organization supporting a community development bank with branches in California, Oregon, and Washington) on behalf of the California Air Resources Board (CARB), which offers income-qualified State residents both grants and lower-interest loans toward the purchase of an EV and home charger installation.^{31,32}

EV Loan Programs

Key Partners

Credit Unions
Banks
Original Equipment Manufacturers
Advocacy organizations and EV clubs
(e.g., Nissan LEAF Owners Colorado,
Denver Electric Vehicle Council,
Western Colorado Vehicle EV Club)

Equity Considerations

Advisory services
Air quality
Buyer eligibility criteria
Finance charges
Used and new vehicle eligibility
Vehicle emissions

²⁸ SWEEP: Southwest Energy Efficiency Project. 2018. Electric Vehicle Group Buy Programs: Handbook & Case Studies. <https://www.swenergy.org/Data/Sites/1/media/documents/transportation/sweep-group-buy-report-2018-07-25.pdf>.

²⁹ U.S. Office of Energy Efficiency & Renewable Energy. N.d. SEE Action: State & Local Energy Efficiency Action Network. <https://www4.eere.energy.gov/seeaction/system/files/documents/LMI-final0914.pdf>.

³⁰ Express Credit Union. N.d. Electric Vehicle Loans. <https://expresscu.org/borrow/electric-vehicle/>.

³¹ Clean Vehicle Assistance Program. N.d. <https://cleanvehiclegrants.org/>.

³² Center for Sustainable Energy. 2019. Clean Vehicle Assistance Program Adoption Survey Report. <https://cleanvehiclegrants.org/wp-content/uploads/2020/08/BSF-CVA-Program-Evaluation-Report-2019-Final.pdf>.

1.3.3 Buy-Back Programs

Buy-back programs can support equitable mobility outcomes both by improving air quality in EV equity communities and by taking high-emission vehicles out of circulation. Examples of buy-back programs include the Federal Car Allowance Rebate System (also: ‘Cash for Clunkers’) and California’s Clean Cars 4 All.

Program considerations include ensuring that internal combustion engine vehicles (ICEV) remain off the road (by scrapping the vehicle, such as cutting the vehicle’s frame rails in half and cutting a hole in the engine block, as is the case with Colorado’s Transit Bus Replacement Program), and narrowing eligibility requirements to target less fuel-efficient vehicles and vehicles with higher mileage.³³ In California, the Enhanced Fleet Modernization Program has two buy-back programs: Retirement-only and Scrap and Replace. Income-qualified drivers may retire an older vehicle and receive money toward purchase of a more fuel-efficient vehicle or other mobility options (such as a transit pass).³⁴ Note that these programs will be discussed in more detail in Chapter 2.

An important feature of any buy-back program is the role of measurement and analysis. An example of this is the local Bay Area Clean Cars for All program. Under the Bay Area Clean Cars for All Program, income-qualified applicants can apply for funds to help retire their vehicle with a PHEV, BEV, or fuel cell electric vehicle (FCEV). The program is evaluated using a full cycle focus on data and metrics, from application start to after someone has received their grant. Applicants to the program provide information on location, household size, income, type of home, whether they need a loan, and how they heard about the program. These metrics are used to refine the program’s approach.³⁵

Buy-Back Programs

Key Partners

Regional Air Quality Council
Colorado Department of Public Health and Environment

Equity Considerations

Advisory services
Air quality
Applicant eligibility
Award amounts
Mobility options

³³ Colorado Department of Transportation. N.d. Volkswagen Settlement—Transit Bus Replacement Program. <https://www.codot.gov/programs/planning/grants/vw-settlement-bus>.

³⁴ California Air Resources Board. N.d. Enhanced Fleet Modernization Program. <https://ww2.arb.ca.gov/our-work/programs/enhanced-fleet-modernization-program/about>.

³⁵ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California’s Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

1.4 Consumer Education and Outreach

Marketing and education efforts have been shown to be particularly important in communicating cost savings associated with EV ownership and providing technical support on the financial and technical changes required of EV owners. EV clubs currently operating in the State already target specific areas of the State (e.g., Drive Electric Northern Colorado, Electric Vehicles Four Corners) or a specific demographic (e.g., Women Who Charge).

A number of programs in the State have developed recently, reflective of the role that these programs may play in expanding EV adoption. Drive Electric Colorado, supported by the Department of Energy and Clean Cities Coalitions, has partnered with a range of Colorado-based car dealerships and other stakeholders to provide EV educational resources and events across the State.³⁶ Xcel Energy, within its Transportation Electrification Plan, has expanded advisory services, targeting residential and multifamily housing, fleet assessment and outreach, and community planning.³⁷

The efficacy of these programs can be remarkable. Smart Columbus credits putting 12,000 people behind the wheel of an EV with a Ride & Drive roadshow strategy that was often coordinated by and held at local employers and showcased a variety of vehicles to fit drivers' various budgets.³⁸

A key consideration is in identifying relationships. Local organizations and member advocacy groups have existing relationships with specific communities, which may be useful in providing consumer education (as described in detail in the Greenlining Institute's recent *Clean Mobility Equity: A Playbook*). For example, the San Joaquin Valley Air Pollution Control District partnered with Valley Clean Air Now, which had an existing program that supported low-income vehicle owners who needed repairs to pass a smog test.³⁹

Consumer Education and Outreach

Key Partners

- EV charging infrastructure providers
- Banks
- Credit unions
- State, local, and Tribal Government
- Utilities and electric co-ops
- Community centers (e.g., Denver Public Library)
- EV clubs (e.g., Drive Electric Northern Colorado, Electric Vehicles Four Corners, Women Who Charge)
- Advocacy organizations (e.g., AARP, Colorado Cross-Disability Coalition)

Equity Considerations

- Advisory services
- Community needs
- Community relationships
- Language and cultural factors
- Preferred and available means of communication (e.g., access to broadband, community hubs)

³⁶ Drive Electric Colorado. N.d. <https://driveelectriccolorado.org/>.

³⁷ Xcel Energy. 2021. Transportation Electrification Plan: Public Service Company of Colorado 2021-2023. https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf.

³⁸ Smart Columbus. 2021. The Smart Columbus Ride & Drive Roadshow: Best Practices. <https://smart.columbus.gov/playbook-assets/electric-vehicle-consumer-adoption/the-smart-columbus-ride--drive-roadshow--best-practices>.

³⁹ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California's Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

Making sure that outreach is done mindful of the relevant language and cultural context is also important. For instance, CalVans hired fluent Spanish speakers from the community.⁴⁰ The Ventura County Air Pollution Control District provides information on the benefits of program spending (including money invested in disproportionately impacted communities, emissions reductions, grant spending by type) in both English and Spanish.⁴¹

1.5 Improving Access to EV Charging Infrastructure and Controlling Charging Costs

1.5.1 EV Charging Infrastructure Installation Programs

Installing EV charging infrastructure can promote EV adoption among EV equity communities by reducing obstacles to drivers' public and home-based EV charging. This is particularly pressing for communities who may not have as regular access to a garage, a private network of EV charging infrastructure, or regular access to public EV charging infrastructure.

In Colorado, Charge Ahead Colorado grants support both electric vehicles and community-based Level 2 and DCFC charging stations. Both public and private entities are eligible to apply. Applications for stations at workplaces, multifamily housing, and tourist destinations are of particular interest.⁴²

Xcel Energy offers a range of 'make ready' infrastructure investment programs ('make ready' refers to financing all of the costs associated with installing EV charging infrastructure up to the charging infrastructure).⁴³ Xcel's programs aim to expand access to EV charging infrastructure for multifamily housing, fleets, workplaces, small commercial locations, community destinations, and other public locations. Many of these programs are income-qualified.⁴⁴ Across the State, a number of utilities and electricity cooperatives offer different types of rebates and loans for EVs and EV charging infrastructure, including Black Hills Energy in the southeast, Gunnison County Electric Association and Holy Cross Energy in the west, San Isabel Electric Association in the south, and Xcel Energy which operates in several regions statewide. Some of these programs offer both income-qualified and geography-qualified rebates toward

EV Charging Infrastructure Installation Programs

Key Partners

Utilities and electric co-ops
State and local Government
EV charging infrastructure providers

Equity Considerations

Advisory services
Air quality
Applicant eligibility
Award amounts
Community eligibility

⁴⁰ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California's Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

⁴¹ Ventura County Air Pollution Control District. N.d. Incentive programs. http://www.vcapcd.org/grant_programs.htm.

⁴² Colorado Energy Office. N.d. Charge Ahead Colorado. <https://energyoffice.colorado.gov/zero-emission-vehicles/charge-ahead-colorado>.

⁴³ Xcel Energy. N.d. Public Charging EV Solutions. <https://www.xcelenergy.com/staticfiles/xcel-responsive/Marketing/CO-PublicCharging-summary-table.pdf>.

⁴⁴ Xcel Energy. 2021. Transportation Electrification Plan: Public Service Company of Colorado 2021-2023. https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf.

the cost of installing EV charging infrastructure.⁴⁵ Xcel Energy has released a detailed Transportation Electrification Plan for 2021-2023 which includes initiatives for subsidizing installation of EV charging infrastructure for multifamily housing and further funding available for low-income or high-emission communities.⁴⁶

A funding source being developed in coastal Western States to target greenhouse gas (GHG) reduction programs includes the Low Carbon Fuel Standards (LCFS). LCFS regulates the carbon intensity of fuels used in transportation. Standards are expressed in terms of the ‘carbon intensity’ of gasoline and diesel fuel based on a lifecycle assessment of direct emissions associated with production, transportation, and use of a fuel. Providers of transportation fuels must meet LCFS carbon intensity standards, in some cases by purchasing credits in order to achieve the standard.⁴⁷ The credits have been shown to be very effective at generating revenue to be used towards supporting the construction of EV charging infrastructure.⁴⁸

1.5.2 Public Home-Based Charging Programs

Increasing access to public charging located near residences (i.e., ‘home-based’) increases equitable outcomes by enabling EV equity communities to charge EVs without access to a garage, particularly for community members who live at multifamily dwellings or in locations where it is not feasible to install at a residence.^{49 50} These opportunities are typically supported through grants and regulation.

One common intervention is ‘streetlight charging,’ where streetlights are modified to provide at least Level 1 (i.e., 120 volts) charging access. In many cases, the upgrade requires simply replacing incandescent bulbs with light emitting diode (LED) bulbs, which generates a sufficient energy surplus that EV charging is possible with no additional energy demand. In Los Angeles, the Bureau of Street Lighting has installed more than 400 charging stations on streetlights throughout the City.⁵¹ The

Public Home-Based Charging

Key Partners

Utilities and electric co-ops
State and local Government
EVSE providers

Equity Considerations

Advisory services
Air quality
Applicant eligibility
Award amounts
Community eligibility

⁴⁵ Xcel Energy. 2021. Summary of 60-Day Notice: Identifying Higher Emissions Communities. <https://www.xcelenergy.com/staticfiles/xcelresponsive/Company/Rates%20%20Regulations/Regulatory%20Filings/TEP60-DayNotice-HigherEmissionCommunities.pdf>.

⁴⁶ Xcel Energy. 2021. Transportation Electrification Plan: Public Service Company of Colorado 2021-2023. https://www.xcelenergy.com/staticfiles/xcelresponsive/Company/Rates%20%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf.

⁴⁷ California Air Resources Board. N.d. Low Carbon Fuel Standard: About. <https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/about>.

⁴⁸ The International Council on Clean Transportation. 2020. Actions Speak Louder than Words: The French Commitment to Electric Vehicles. <https://theicct.org/publications/lcfs-and-evs-dec2020>.

⁴⁹ Denver Department of Environmental Health. 2020. Opportunities for Vehicle Electrification in the Denver Metro area and Across Colorado: Overcoming Charging Challenges to Maximize Air Quality Benefits. <https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/EV/EVFinalReport.pdf>.

⁵⁰ The International Council on Clean Transportation. 2021. Colorado charging infrastructure needs to reach electric vehicle goals. <https://theicct.org/sites/default/files/publications/colorado-charging-infra-feb2021.pdf>.

⁵¹ Metropolitan Energy Center. N.d. Streetlight Charging in the Kansas City Right-of-Way. <https://metroenergy.org/programs/current-projects/streetlight-ev-charging/>.

program is at least partially funded by the Mobile Source Air Pollution Reduction Review Committee, which includes CARB, the Los Angeles County Metropolitan Transportation Authority, and others.^{52,53}

In 2020, Portland General Electric launched a pilot program to install two level 2 chargers on utility poles and coordinated with the city to designate adjacent spaces as EV-only parking.⁵⁴ Locations were selected based on concentration of multifamily housing, access to off-street parking, local propensity for near-term EV adoption, proximity to an accessible ramp, and features of the built environment.⁵⁵

Internationally, the City of London has a grant program known as the Go Ultra Low City Scheme (GULCS), which provides funding to local authorities within the United Kingdom for activities that encourage EV adoption. The program includes funding for installing charging infrastructure on lamp posts and other street furniture.⁵⁶

Another intervention involves simply granting residents permission to make modifications to public infrastructure in order to install EV charging infrastructure. In New Orleans, the City Council has voted to allow EV owners to apply for permits to install curbside chargers for personal, noncommercial use.⁵⁷

1.5.3 EV Charging Cost Control Programs

High charging costs associated with demand charges could impose a burden on income-constrained households and could deter potential buyers from considering a transition to an electric vehicle. While the cost of charging an EV at home using an L1 or L2 charger is typically lower than fueling a car with gasoline, electricity costs can vary by time-of-use. Managing demand costs can encourage EV adoption by EV Equity groups by eliminating unexpected costs. Furthermore, recent surveys have found that respondents who identify as low-income, persons of color, and renters indicate a greater concern about the cost of charging an EV than is true for other survey respondents.⁵⁸

EV Charging Cost Control Programs

Key Partners

Utilities and electric co-ops
State Government

Equity Considerations

Advisory services
Air quality
Applicant eligibility
Award amounts
Community eligibility

⁵² LA Lights. N.d. EV Charging Stations. https://lalights.lacity.org/connected-infrastructure/ev_stations.html.

⁵³ Clean Transportation Funding. 2020. The City of LA Gets a Charge Out of its Street Lights. <http://www.cleantransportationfunding.org/news/2020/city-la-gets-charge-out-its-street-lights>.

⁵⁴ Oregon Citizens' Utility Board (CUB). 2020. Curbside EV Charging Comes to Southeast Portland. <https://oregoncub.org/news/blog/curbside-ev-charging-comes-to-southeast-portland/2182/>.

⁵⁵ Portland General Electric. 2020. RE: Advice No. 20-32, Schedule 16 Electric Vehicle Pole Charging Demonstration Project Extension. https://assets.ctfassets.net/416ywc1laqmd/4uHMWOVoV0ei1LGGi5JBy7/6fa8ddefe9381e93caafbbf3eaaac1/PGE_Advice_No_20-32_Sch_16_EV_Pole_Charging_Demo_Project_Ext_OL_110320.pdf.

⁵⁶ London Councils. N.d. Go Ultra Low City Scheme: London aims to be the Ultra-Low Emission Vehicles (ULEV) capital of Europe. <https://www.londoncouncils.gov.uk/our-key-themes/transport/roads/gulcs>.

⁵⁷ Southeast Louisiana Clean Fuel Partnership. N.d. On-Street Electric Vehicle Charging Resources for the City of New Orleans. http://cityofno.granicus.com/MetaViewer.php?view_id=7&clip_id=2322&meta_id=323753.

⁵⁸ Hathaway, et al. 2021. A Utility Roadmap for Expanding Customer Adoption of Electric Vehicles. <https://www.mdpi.com/2032-6653/12/2/81/pdf>.

Xcel Energy offers customers (both income-qualified and otherwise) ongoing rebates in exchange for participation in one of the utility’s optimization programs. Optimization programs take advantage of a relatively long window of time available for charging by scheduling charging blocks to period(s) that better distribute energy load on the grid.⁵⁹ Some electric utilities offer EV-specific rates based on time of use to incentivize charging at off-peak hours. Green Mountain Power in Vermont offers off-peak EV charging rates at a 20 percent discount to normal residential rates.⁶⁰

1.5.4 EV-Ready Building Codes

Building codes are widely seen as critical to help overcome critical barriers to EV adoption, as most EV drivers do the overwhelming majority of their charging at home.⁶¹ Retrofitting an existing building is up to four to six times more expensive than installing EV-ready charging during construction.⁶²

Building codes vary widely between States and municipalities. Denver has an International Building Code (IBC)/International Revenue Code (IRC) that requires that one space be EV-ready per dwelling unit and up to 80 percent of parking spaces at multifamily dwellings be EV-capable. Boulder and Fort Collins have similar codes with varying requirements for multifamily dwellings.⁶³

EV-Ready Building Codes

Key Partners
Local Government
Building trade organizations (e.g., Associated Builders and Contractors)
Department of Local Affairs

Equity Considerations
Advisory services

1.5.5 Building Performance Standards

Few policy interventions exist to encourage owners of existing residential and commercial buildings to retrofit buildings to offer charging options. Less than 10 percent of the Nation’s stock of housing was built within the last 10 years.⁶⁴ Building Performance Standards have become effective tools for requiring owners of existing buildings to complete energy efficiency upgrades (including the installation of EV charging infrastructure). However, such upgrades may be costly, as they often require additional upgrades to come into compliance with current building codes.

Building Performance Standards

Key Partners
State and local Government
Building trade organizations (e.g., Associated Builders and Contractors)
Alliance Center

Equity Considerations
Advisory services
Air quality

⁵⁹ Xcel Energy. 2021. 2021/2022 Demand-Side Management Plan: Electric and Natural Gas. https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/CO-DSM/CO_2021-22_DSM_Plan_Final.pdf.

⁶⁰ Green Mountain Power. 2020. New GMP Electric Vehicle Charging Rebates Help Customers Save Money. <https://greenmountainpower.com/new-gmp-electric-vehicle-charging-rates-help-customers-save-money/>.

⁶¹ US Department of Energy. 2021. Home charging. <https://www.energy.gov/eere/electricvehicles/charging-home>.

⁶² Southwest Energy Efficiency Project. 2022. EV Infrastructure Building Codes. <https://www.swenergy.org/transportation/electric-vehicles/building-codes>

⁶³ U.S. Environmental Protection Agency. 2021. An Introduction to Electric Vehicle-Ready Buildings. <https://www.epa.gov/sites/production/files/2021-04/documents/webinar-ev-ready-buildings-2021-03-24.pdf>.

⁶⁴ U.S. Environmental Protection Agency. 2021. An Introduction to Electric Vehicle-Ready Buildings. <https://www.epa.gov/sites/production/files/2021-04/documents/webinar-ev-ready-buildings-2021-03-24.pdf>.

Building Performance Standards place requirements on building owners to improve a building’s energy or emission profile, often including strategies that include providing electric vehicle charging infrastructure. A statewide or expanded building performance standard that requires the construction of Level 2 EV charging infrastructure would promote equity by supporting the development of EV charging infrastructure in multi-unit dwellings and commercial structures, particularly older structures. Note that developers of new construction in Denver may choose to increase EV charging infrastructure as one of several options to meet requirements of Denver’s Green Building Ordinance.⁶⁵

Building certification programs frequently included in municipal building performance standards are increasingly considering charging infrastructure as a factor in a building’s overall rating.⁶⁶ The US Environmental Protection Agency (EPA) ENERGY STAR program recently announced a commitment to expand the ENERGY STAR program to accelerate electrification retrofits in existing homes.⁶⁷ New buildings may receive partial credit for installing charging stations under the Leadership in Energy and Environmental Design (LEED) program, Enterprise Green Communities, and National Green Building Standard ICC/ASHRAE 700 (any one of which may be used to achieve compliance with Denver’s Green Building Ordinance).^{68 69 70}

1.5.6 Building Improvement Grants, Loans, and Tax Credits

Grants and loans made to support building upgrades can encourage building owners, including owners of multi-unit dwellings and workplaces, to add electric vehicle charging infrastructure.

Green Investment Funds have become increasingly common in recent years. These funds may be used to incrementally fund energy performance improvements in either new or existing buildings. These funds frequently take the form of grants and low-interest loan programs. Ontario has committed \$325 million in the province’s Green Investment

Building Improvement Grants, Loans, and Tax Credits

Partners

Legislative bodies
Energy Efficiency Business Coalition (EEBC)

Equity Considerations

Advisory services
Air quality
Applicant eligibility
Community eligibility

⁶⁵ Denver Community Planning and Development. N.d. Denver’s Green Buildings Ordinance. <https://www.denvergov.org/content/denvergov/en/denver-development-services/commercial-projects/green-roof-initiative.html>.

⁶⁶ American Council for an Energy-Efficient Economy. 2020. Mandatory Building Performance Standards: A Key Policy for Achieving Climate Goals. https://www.aceee.org/sites/default/files/pdfs/buildings_standards_6.22.2020_0.pdf.

⁶⁷ U.S. Environmental Protection Agency. 2021. Through Public-Private Partnerships, EPS Helps to Advance Efficiency and Reduce Emissions of American Homes and Buildings. <https://www.epa.gov/newsreleases/through-public-private-partnerships-epa-helps-advance-efficiency-and-reduce-emissions>.

⁶⁸ <https://www.usgbc.org/credits/new-construction-core-and-shell-retail-new-construction-healthcare-data-centers-new-construc?return=/credits/New%20Construction/v4.1>.

⁶⁹ Enterprise Green Communities Criteria. 2020. 2020 Criteria Checklist. <https://www.greencommunitiesonline.org/checklist>.

⁷⁰ American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) and International Code Council (ICC). 2016. ICC/ASHRAE 700-2015 National Green Building Standard. https://books.google.com/books/about/ICC_ASHRAE_700_2015_National_Green_Build.html?id=GUI8DAEACAAJ.

Fund toward projects that fight climate change, grow the economy, and create jobs. Money in the program is available for social housing retrofits and installing charging stations.⁷¹

Tax credits can encourage building owners to upgrade building infrastructure to accommodate electric vehicles. Sustainable building tax credits enable building owners to apply for a tax credit towards construction, installation, or renovation of sustainable building products, including electric vehicle charging infrastructure. In 2021, New Mexico expanded the State’s Sustainable Building Tax Credit to cover the cost of electric vehicle charging infrastructure at new and existing structures, with a greater percentage of the installation cost covered for affordable housing.⁷²

1.6 Shared Mobility

Shared mobility can be supported through several mechanisms, from public-private-partnerships, private organizations, grants to community-based organizations (CBOs), and others. Shared mobility programs can support EV equity communities by increasing transportation options for community members who may not have the financial means to purchase a vehicle or do not prioritize spending on vehicle ownership. Shared mobility may increase mobility options for transit-dependent populations by forming connections between community members who are wheelchair users, people who experience blindness, community members who are not of driving age, and others.

Shared mobility programs can also support equitable outcomes when zero emission transportation alternatives are used, which can improve air emissions in disproportionately air quality burdened communities. These shared mobility initiatives frequently take the form of carsharing (i.e., a form of car rental where cars are typically rented in hour intervals, and vehicles are often stored in public parking spaces), volunteer transportation organizations (i.e., a combination of volunteer driver programs, shared vehicle utilization, and ride sharing), and vanpools (i.e., transporting small groups of commuters by van).

1.6.1 Carsharing

In Los Angeles, the Blue LA car-sharing program provides access to EVs and required charging infrastructure. The program started as a carsharing pilot project with a grant from CARB as a public-private partnership. The pilot targeted disadvantaged communities identified through the California Environmental Protection Agency’s CalEnviroScreen tool.⁷³ The Denver-based nonprofit, Colorado CarShare, offers subsidized hourly rates and monthly subscriptions for individuals enrolled in income-qualified housing programs. In 2021, the program received Coronavirus Aid, Relief, and Economic Security

Shared Mobility

Partners
Community-based organizations and non-profits
Colorado Department of Transportation
Colorado Department of Health and Environment
Transit agencies and organizations
Legislative bodies

Equity Considerations
Applicant eligibility criteria
Community eligibility criteria
Mobility options

⁷¹ Government of Ontario. N.d. Green Investment Fund. <https://www.ontario.ca/page/green-investment-fund>.

⁷² 55th Legislature of State of New Mexico. 2021. House Bill 15. <https://www.nmlegis.gov/Sessions/21%20Regular/bills/house/HB0015.HTML>.

⁷³ Shared-Use Mobility Center. 2019. Electric and Equitable: Learning from the BlueLA Carsharing Pilot. https://learn.sharedusemobilitycenter.org/wp-content/uploads/NewFile_SUMC_04.15.19.pdf.

Act (CARES) Act funding to purchase EVs and EV charging infrastructure in under-resourced communities.^{74,75}

1.6.2 Volunteer Transportation Organizations

An unusual example of a shared mobility program is the Green Raiteros program in California, an electric ridesharing program called ‘indigenous Uber’ by the City’s Mayor. The program has now been formally established as a volunteer transportation organization and provides on-demand transportation for the majority Latino communities living in the rural central valley. CARB only recently began providing State-level funding.⁷⁶

1.6.3 Vanpool

Vanpool can fill a gap between public transit and carshare. Vanpools include 5 to 15 commuters traveling in a shared van. In 2018, California-based benefit corporation Green Commuter began operating as a vendor under Los Angeles County Metropolitan Transportation Authority’s (Metro) Vanpool Supplier Bench and became the first U.S.-based company to offer electric vehicles in a vanpool program. The vanpools receive fare subsidies, with a greater subsidy available for electric-powered vanpool (\$650 per month for electric-powered vanpools, compared to \$250 per month for gas-powered).⁷⁷

1.6.4 Grants for Emerging EV Mobility Options

Although grants support many of the other program, policy, and regulatory tools listed in this chapter, they are included here as a standalone program for one reason: some grants are designed less with a particular intervention in mind, and instead provide financial support for a wide range of solutions put forward by local communities, often combining many of the programs described elsewhere in this chapter with community capacity-building.

Many examples of community-led grant programs are highlighted by the Greenlining Institute for supporting equitable missions, processes, and outcomes. Several community-driven shared mobility initiatives have been supported by CARB grants. For example, in the San Joaquin Valley of California, the Ecosystem of Shared Mobility includes three mobility services: 1) carshare, 2) voluntary rideshare, and 3) a Mobility-as-a-Service (MaaS) platform.⁷⁸ The Sustainable Transportation Equity Project (STEP), also in California, is described as a transportation equity pilot that aims to increase transportation in disadvantaged and low-income communities via two types of grants: 1) planning and capacity building grants and 2) implementation grants. CARB administers the program. Eligible communities must prepare a community mobility needs assessment to receive funds for purposes as wide-ranging as carshare,

⁷⁴ Colorado CarShare. N.d. 3 Easy Rate Plans: Choose the Right Plan. <https://carshare.org/individual-rates/>.

⁷⁵ City of Denver, CO. N.d. Denver Deploys Electric Car Share in Under-resourced Communities. <https://www.denvergov.org/Government/COVID-19-Information/Public-Orders-Response/News-Updates/2021/Electric-Car-Share>.

⁷⁶ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California’s Clean Transportation Programs <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

⁷⁷ Green Car Congress. 2019. First all-electric vanpools in U.S. begin commuter service at L.A. Metro. <https://www.greencarcongress.com/2019/05/20190514-vanpool.html>.

⁷⁸ California Climate Investments. N.d. 2020 Profiles: Clean Mobility Options for Disadvantaged Communities, San Joaquin Valley. <http://www.caclimateinvestments.ca.gov/2020-profiles-c/cmo>.

bikeshare, shared mobility, urban forestry, bike paths, community transportation needs assessments, and outreach events.^{79,80}

1.7 Reducing Air Quality Impacts

In general, any improvement in air quality emissions associated with increased deployment of Medium- and Heavy-Duty Electric Vehicles (MHDEV) has the potential to provide a benefit to EV equity communities by improving air quality, particularly for disproportionately impacted communities. For a comprehensive list of such strategies, please refer to the Colorado Medium- and Heavy-Duty Vehicle Study prepared by MJB&A. Programs within the State and one example outside of the State is included for its strong equity connection.

School and Transit Bus Electrification

Partners

- School districts
- Transit agencies
- Federal Transit Administration
- Legislative bodies

Equity Considerations

- Air quality
- Community eligibility criteria
- Mobility options

1.7.1 School Bus Electrification Grants

In Colorado, the Alt Fuels Colorado program (now discontinued) incentivized the replacement of all pre-2009 vehicles in public, private, and non-profit fleets, including Class 4-8 School Buses, with electric and renewable natural gas (RNG) fleet vehicles.

In California, the California Energy Commission School Bus Replacement Program has nearly \$100 million in funding to replace diesel school buses with zero- or low-emission vehicles. Priority is given to grant applicants in disadvantaged, low-income communities. Complementary agreements provide further support to the program by providing charging infrastructure and workforce training.^{81,82,83}

1.7.2 Transit Bus Electrification Grants

Transit bus electrification is a particularly pressing topic in California, where all transit agencies in the State are required by CARB to transition to 100 percent zero-emission bus fleets by 2040.⁸⁴ The State has

⁷⁹ California Air Resources Board. 2020. Grant awards announced for new \$19.5 million pilot funding equitable, clean transportation options in disadvantaged and low-income communities. <https://ww2.arb.ca.gov/news/grant-awards-announced-new-195-million-pilot-funding-equitable-clean-transportation-options>.

⁸⁰ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California's Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

⁸¹ California Energy Commission: Official Blog. 2018. California Energy Commission Works to Replace State's Oldest, Most Polluting School Buses. <https://calenergycommission.blogspot.com/2018/07/california-energy-commission-works-to.html>.

⁸² California Energy Commission. N.d. School Bus Replacement. Program. <https://www.energy.ca.gov/programs-and-topics/programs/school-bus-replacement-program>.

⁸³ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California's Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

⁸⁴ California Air Resources Board. 2018. California transitioning to all-electric public bus fleet by 2040. <https://ww2.arb.ca.gov/news/california-transitioning-all-electric-public-bus-fleet-2040>.

also made nearly half a billion dollars available to transit agencies toward the purchase of electric buses, charging systems, and bus infrastructure through the California Transit and Intercity Rail Capital Program.⁸⁵

Colorado's objective is to transition all of Colorado's transit fleet to BEV, PHEV, or FCEV: specifically, by transitioning 1,000 transit vehicles to one of these vehicle types by 2030, and transitioning 100 percent of transit vehicles to one of these vehicle types by 2050.⁸⁶ The Clean Transit Enterprise, established through SB1-260, will provide support to transit agencies seeking to reduce emissions. Additionally, Volkswagen Settlement funds have been set aside to replace older transit vehicles with both zero-emission and renewable natural gas options.⁸⁷

⁸⁵ California Department of Transportation. N.d. Transit and Intercity Rail Capital Program (TIRCP). <https://dot.ca.gov/programs/rail-and-mass-transportation/transit-and-intercity-rail-capital-program>.

⁸⁶ Colorado Department of Transportation. 2021. Transit Zero Emission Vehicle Roadmap. <https://www.codot.gov/programs/innovativemobility/assets/colorado-transit-zev-roadmap-2021-11.pdf>

⁸⁷ Colorado Department of Transportation. N.d. Volkswagen Settlement—Transit Bus Replacement Program. <https://www.codot.gov/programs/planning/grants/vw-settlement-bus>.

2.0 High Emission Vehicle Replacement Programs

This chapter summarizes information on high emitter vehicle replacement/ electrification programs and recommends how Colorado could implement such programs, with a focus on ensuring program outcomes that reduce transportation and environmental inequities. Colorado does not have a requirement that a vehicle be scrapped in order to be eligible for the State’s Electric Vehicle Tax Credit (as of February 2022).⁸⁸ To support an analysis of how a vehicle replacement program could be developed in Colorado, this chapter includes:

- A summary of key observations from high emitter vehicle replacement/ electrification programs implemented or proposed elsewhere in the U.S.
- A summary of available information on the “return on investment” (ROI) for these programs as measured in terms of dollars per ton of pollutant reduced (greenhouse gas emissions and criteria pollutants).
- A recommended implementation and monitoring plan to ensure that these policies and programs are achieving environmental, economic, and equity objectives.

2.1 New and Used Light-Duty Incentives

2.1.1 Overview

The goal of vehicle replacement programs is to incentivize drivers to replace their older high-emission vehicles with new zero or low emission vehicles- with the replacement often required to be alternatively fueled (hybrid, full electric, renewable natural gas, clean hydrogen). Vehicles targeted by vehicle replacement programs include medium- and heavy-duty commercial vehicles as well as private light duty vehicles. These programs typically require proof that the older vehicle is put out of commission rather than simply resold and operated by another driver who would continue to emit emissions at a high rate. Rather than exclusively providing funds for the purchase of a vehicle, some programs subsidize alternative transportation such as the use of transit or car share given the retirement of a qualifying older vehicle.

Programs are frequently sponsored at the State level and administered by State environmental, air quality, or energy agencies. A notable exception to the State-agency administration is in British Columbia, where the SCRAP-IT program was initially administered by the province of British Columbia, but since 2004 has been administered by a not-for-profit independent society. The program is administered by an

Why Light-Duty EV Incentives?
Lower cost per-vehicle
Lower cost per ton CO₂ reduction
Lower cost per ton PM_{2.5} and NO_x reduction
Incentive can cover a higher percentage of replacement vehicle cost
More fully replaces trips previously made by privately owned ICEVs
Economically empowers equity-focused populations

⁸⁸ Colorado Energy Office. N.d. Zero Emission Vehicle Tax Credits. <https://energyoffice.colorado.gov/zero-emission-vehicles/zero-emission-vehicle-tax-credits>.

independent, elected Board of Directors, and draws funding from a variety of sources, including public and private.⁸⁹

Some existing programs have specific equity components for eligibility either based on the income level of the vehicle owner or based on the area their vehicle operates in (for commercial vehicles). Income-based eligibility criteria for additional benefits are evaluated by income falling below a multiple of the Federal Poverty Guidelines (FPG) or through verification of enrollment in other income-qualified programs. However, only eleven of the programs reviewed provided special considerations for LMI vehicle owners or impacts to LMI communities. Of those programs, many offer tiered benefits with higher income brackets receiving lower incentives (per vehicle or participant).

Table 1 shows an example of how income-tiered benefits can be broken up based on household size. These tiers are part of the Replace Your Ride program (funded through the Enhanced Fleet Modernization Program or administered by the California Air Resources Board). This is one of the only programs identified that offers varying levels of incentive depending on the applicant's income tier. The following table provides an illustration of the incomes that correspond with the program's definitions for low-income applicant, moderate-income applicant, and above moderate-income applicant. The groups' income tiers are defined based on their percentage over Federal poverty guidelines.

Table 1 Replace Your Ride: Income Eligibility Tiers

Number of People in Household	<225% Federal Poverty Guidelines/ Low-Income	300% Federal Poverty Guidelines/Moderate	400% Federal Poverty Guidelines/Above Moderate
1	\$28,980	\$38,640	\$51,520
2	\$39,195	\$52,260	\$69,680
3	\$49,410	\$65,880	\$87,840
4	\$59,625	\$79,500	\$106,000
5	\$69,840	\$93,120	\$124,160
6	\$80,055	\$106,740	\$142,320
7	\$90,270	\$120,360	\$160,480
8	\$100,485	\$133,980	\$178,640

Table 2 shows how benefits are allocated differently among these income groups. While incentives are differentiated for the purchase of new or used eligible vehicles (given the retirement of a qualifying older vehicle), all eligible participants in the alternative transport incentive program receive the same maximum funds for car-sharing or public transit use.

⁸⁹ SCRAP-IT. N.d. FAQs. <https://scrapit.ca/faqsinfo/faqs/>.

Table 2 Replace Your Ride—Tiered Applicant Benefits

	Low Income (<225% FPL) \$4,500 Incentive	Moderate Income (<300% FPL) \$3,500 Incentive	Above Moderate Income (<400% FPL) \$2,500 Incentive
Vehicle Purchase	\$4,500	\$3,500	\$2,500
Alternative Transportation	\$7,500	\$7,500	\$7,500

The success of these programs has been evaluated based on the distribution of benefits across sociodemographic groups, associated carbon and criteria pollution emission reductions, and the unit cost of those reductions. For example, the most extensive EV replacement program was the nationwide Car Allowance Rebate System (CARS), colloquially known as “Cash for Clunkers.” Implemented from July-August of 2009, CARS targeted in-use vehicles with an EPA fuel economy rating of 18 MPG or lower. The program was wildly popular and ran out of funding 4 months ahead of plan. Ultimately, the program provided \$3 billion in incentives to replace 670,000 vehicles at a cost of approximately \$3,500-\$4,500 each. However, subsequent research has found the program did not equitably distribute benefits. Benefits generally went to households that were wealthier and more highly educated than the average household purchasing a vehicle at that time.⁹⁰ Additionally, 45 percent of vehicles purchased likely would have been replaced in the next 8 months without the incentive, leading to a relatively high estimated cost of CO₂ emission abatement (with a cost per ton ranging from approximately \$91 to \$288).⁹¹ Targeted eligibility, such as the tiered-income levels in the Replace your Ride program or the Connecticut CHEAPR program, have been developed to ensure equitable distribution of benefits.

Additionally, at least one program reviewed offered tiered benefits depending on vehicle eligibility. As of 2021, British Columbia’s SCRAP-IT program offers different benefits depending on vehicle characteristics.⁹² Applicants with older, higher-emission vehicles are eligible for the maximum available benefit, including purchase of an electric vehicle from a participating dealership. Because rebates are dealership-allocated, program participants must purchase the vehicle from the dealership directly. Both new and used vehicles are available, and program participants are able to search for available vehicles on the program website (Table 3).⁹³

⁹⁰ Brookings Institution. 2013. Cash for Clunkers: An Evaluation of the Car Allowance Rebate System. <https://www.brookings.edu/research/cash-for-clunkers-an-evaluation-of-the-car-allowance-rebate-system/#cancel>.

⁹¹ Li, Linn, and Spiller. 2010. Evaluating ‘Cash-for-Clunkers’: Program Effect on Auto Sales and the Environment. https://www.researchgate.net/publication/228272830_Evaluating_'Cash-for-Clunkers'_Program_Effect_on_Auto_Sales_and_the_Environment.

⁹² BC Hydro. 2021. Scrapping your car could earn you \$6,000 towards an electric car. <https://www.bchydro.com/news/conservation/2021/scrap-old-car-ev-rebate.html>.

⁹³ SCRAP-IT. N.d. Find an electric vehicle. <https://program.scrapit.ca/vehicles>.

Table 3 British Columbia EV Rebate—Tiered Vehicle Benefits

Model Year	Vehicle Type	Eligible for EV Rebate (New/Used)	Eligible for Other SCRAP-IT Rebates
2001 or older	Any internal combustion engine (gas/fossil fuel propelled only)	Yes	Yes
2002 or newer	Vehicle with a fuel consumption rating of 16.7 miles per gallon (city) or better	No	Yes
Any	Vehicle with a fuel consumption rating of 16.7 miles per gallon (city) or worse	Yes	Yes
Any	BEV, hydrogen fuel cell	No	No

Applicants whose vehicles are ineligible for the full EV rebate may receive other SCRAP-IT rebates, including BC Transit pass, e-bike rebate, carshare credit, and cash. Program applicants who scrap a vehicle that is not eligible for any other rebate may also receive a \$100 Canadian dollar cash rebate.

Most of the programs identified in the database only subsidize the price of new EVs but some, particularly those with considerations for equity, include subsidies for the purchase of used EVs as well. With so few EVs entering the market compared to traditional gasoline vehicles, the used EV market has remained limited—just 34 percent of respondents in a survey by carmax.com reported purchasing their EV used whereas approximately 70 percent of car sales are for used vehicles across all vehicle powertrains.^{94,95} However, as EVs continue to make up a greater share of annual sales in the U.S., the used EV market will continue to grow. The Connecticut CHEAPR program provides purchase subsidies for new and used EVs, including both BEVs and PHEVs. Eligibility is limited to applicants already enrolled in certain qualifying low-income programs (see text box).⁹⁶

⁹⁴ Green Car Congress. 2019. U.S. used vehicles sales are more than double the number of new vehicle sales. <https://www.greencarcongress.com/2019/07/20190716-fotw.html>.

⁹⁵ Carmax. 2017. 2017 Hybrid & Electric Cars Survey Results. <https://www.carmax.com/articles/hybrid-electric-2017-survey-results>.

⁹⁶ CHEAPR: Connecticut Hydrogen and Electric Automobile Purchase Rebate. N.d. Rebate+ Qualifying State and Federal Programs. <https://portal.ct.gov/-/media/DEEP/air/mobile/CHEAPR/CHEAPR---Rebate-Plus---Qualifying-State-and-Federal-Programs.pdf>.

2.1.2 Program design

Low-interest loans for EV purchases or EV leasing can support equitable EV outcomes by lowering the up-front cost of EVs for LMI households. Access to low-interest loans have been shown to help address barriers to the uptake of energy-efficient measures for LMI households.⁹⁷ Programs that are accompanied by educational resources, such as those offered through many advocacy and education groups currently operating in the State, can also reduce the transaction costs associated with the effort of identifying and applying for a loan. In Washington State, the EVs for EVERYONE program offers residents low-interest loans for both new and used EVs through a partnership between Plug in America and the Express Credit Union. Program participants in EVs for EVERYONE also receive a free annual membership to the Plug in America toll-free support line with optional access to an EV owner as a mentor to assist in car-buying.⁹⁸

Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR): Qualifying State and Federal Programs

- » Energy Assistance Program (CEAP)
- » Weatherization Assistance Program (WAP)
- » Supplemental Nutrition Assistance Program SNAP (formerly known as Food Stamp Program)
- » Temporary Assistance for Needy Families (TANF), Temporary Family Assistance (TFA) or Tribal TANF
- » Head Start
- » Supplemental Security Income (SSI)
- » National School Breakfast and Lunch Program (NSLP)
- » Bureau of Indian Affairs General Assistance

Similarly, low-cost leasing allows drivers to spread out the large purchase burden of EVs while benefiting from lower operation costs to drive. The only program currently operating for affordable EV leasing is in Sacramento through a partnership with Electrify America and the American Automobile Association (AAA). Lease terms last from three to twelve months and cost \$11 daily or \$449 per month including insurance and maintenance.

An innovative new vehicle purchase incentive was put in place in France in 2008 to both reduce the cost (and annual taxes) of more efficient vehicles while increasing the cost of vehicles with higher emissions. This type of system is known as “feebate” and the structure is highly flexible. France reevaluates the subsidy and tax amounts annually. Also, beginning in 2015, the Government added an additional provision for the “conversion” to a new EV from a gasoline vehicle over 22 years old, diesel vehicles over 18 years old for applicants above a given tax threshold, or diesel vehicles over 13 years old if the applicant is below a given tax threshold. The incentives provided are also increased for LMI households.

Vehicle replacement programs targeting light-duty vehicles are the most mature of the policy options reviewed, with example implementations at both the State and Federal level.

The level of rebate offered may vary depending on both characteristics of the applicant as well as the vehicle, including:

⁹⁷ Department of Energy, Office of Energy Efficiency and Renewable Energy. N.d. State and Local Energy Efficiency Action Network (SEE Action). <https://www4.eere.energy.gov/seeaction/system/files/documents/LMI-final0914.pdf>.

⁹⁸ Express Credit Union. N.d. Electric Vehicle Loans. <https://expresscu.org/borrow/electric-vehicle/>.

- Level of individual income (i.e., tiered incentive levels with higher dollar amounts available to lower-income individuals)
- Vehicle characteristics (i.e., higher incentive levels to older or more highly emitting vehicles)

For example, a higher level of rebate may be available to lower-income households, similar to the Replace Your Ride program in California. Higher-emitting vehicles may also be eligible for a higher level of incentive, similar to the SCRAP-IT program in British Columbia.

Vehicle Eligibility

Incentives offered to Colorado residents seeking to replace a high-emission vehicle can limit eligibility for both the purchased vehicle and the replaced vehicle.

Requirements for a scrapped vehicle include:

- Age of the vehicle based on the vehicle’s model year (e.g., ten years or older)
- EPA fuel economy rating of the vehicle (e.g., 18 MPG or lower)
- Powertrain of the vehicle (i.e., diesel, gasoline)
- Applicant-owned (with no active liens)
- Currently in operation (i.e., in driving condition, continuously insured at least six months prior to application)
- Evidence of scrappage

Providing eligibility limits ensures that the vehicle replacement results in a substantial emission reductions. Targeting older vehicles for replacement ensures that EVs are not replacing a fuel-efficient ICE vehicle. Studies have shown that EV incentives are often awarded to drivers who may be more environmentally conscious and own more fuel-efficient cars, effectively limiting the emissions benefit associated with an EV “upgrade.”⁹⁹ There is also evidence that limiting program eligibility to older vehicles with less remaining useful life may generate lower air quality benefits, as older vehicles are likely to be replaced with or without a scrap and replacement program.¹⁰⁰

In general, scrap and replacement programs require proof that an ICE vehicle has been retired. Programs also target vehicles of a certain age or level of emissions in order to target the highest emitting vehicles. Under the “Replace Your Ride” program in California, the retired vehicle must be a gasoline or diesel-powered vehicle and must be a model year of 2011 or older to qualify. The Car Allowance Rebate System (CARS), colloquially known as “Cash for Clunkers,” targeted in-use vehicles with an EPA fuel economy rating of 18 MPG or lower.

⁹⁹ DeShazo. 2016. Improving Incentives for Clean Vehicle Purchases in the United States: Challenges and Opportunities. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/03/Improving_Incentives_for_Clean_Vehicle_Purchases_in_the_U.S..pdf.

¹⁰⁰ Resources for the Future. 2020. How Targeted Vehicle Scrappage Subsidies Can Reduce Pollution Effectively. <https://www.rff.org/publications/issue-briefs/how-targeted-vehicle-scrappage-subsidies-can-reduce-pollution-effectively/>.

Requirements for the purchased vehicle include:

- Powertrain of the vehicle (e.g., BEV, FCEV, or PHEV)
- Used or new
- Maximum purchase price (e.g., a Manufacturer Suggested Retail Price of \$50,000)
- Sold by a dealer participating in certain consumer protection programs (e.g., post ‘no haggle’ prices, limited financing options)

To ensure that incentive money is not used on luxury vehicles and expands the stock of vehicles available to lower-income car purchasers, the program should set a maximum purchase price for the vehicle. The Massachusetts MOR-EV program has a cap of \$50,000 on the purchase price of an eligible vehicle, ensuring that program funds are not used to purchase “luxury” vehicles. The Colorado Automobile Dealers Association has supported capping program eligibility to vehicles priced at \$60,000 or less.

Applicant Eligibility

A best practice identified through the review of high emitter vehicle replacement programs is to set program eligibility to target specific populations. The following table provides a range of eligibility thresholds that could be used to set eligibility limits for applicants and provides a sample of income thresholds in use in the State to determine eligibility limits, as well as income thresholds in use for vehicle replacement programs in other States. Colorado’s Temporary Assistance to Needy Families (TANF) program, Colorado Works, has one of the lower income thresholds in the State, set at 125 percent of Federal poverty guidelines.¹⁰¹ Medicaid eligibility (for adults without dependent children) is set at 133 percent.¹⁰² Colorado households earning less than 200 percent of Federal poverty guidelines are eligible for Supplemental Nutrition Assistance Program (SNAP) (formerly referred to as ‘food stamps’).¹⁰³

The Replace Your Ride program, administered by the South Coast Air Quality Management District in California, restricts funds to individuals in households with income at or below 400 percent of the Federal poverty level (for context on thresholds, see (Table 4). Replace Your Ride further offers varying levels of incentive to lower-income households, (with households earning 225 percent of Federal poverty guidelines receiving the highest incentive, and households earning 400 percent of Federal poverty guidelines receiving the least incentive). The Connecticut CHEAPR program offers the same level of assistance to all applicants earning 200 percent of Federal poverty guidelines.

¹⁰¹ Code of Colorado Regulations. 2013. Department of Human Services: Colorado Works Program. <https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=5312>.

¹⁰² Colorado Department of Health Care & Policy Financing. N.d. Programs for Adults. <https://hcpf.colorado.gov/programs-adults>.

¹⁰³ Colorado Department of Human Services. N.d. Supplemental Nutrition Assistance Program (SNAP). <https://cdhs.colorado.gov/snap>.

Table 4 Health and Human Services Poverty Thresholds

People in Household	Poverty Guideline (100%)	125%	200%	300%	400%
1	\$12,880	\$16,100	\$25,760	\$38,640	\$64,400
2	\$17,420	\$21,775	\$34,840	\$52,260	\$87,100
3	\$21,960	\$27,450	\$43,920	\$65,880	\$109,800
4	\$26,500	\$33,125	\$53,000	\$79,500	\$132,500
5	\$31,040	\$38,800	\$62,080	\$93,120	\$155,200
6	\$35,580	\$44,475	\$71,160	\$106,740	\$177,900
7	\$40,120	\$50,150	\$80,240	\$120,360	\$200,600
8	\$44,660	\$55,825	\$89,320	\$133,980	\$223,300

Higher eligibility thresholds will enable more applicants to participate in the program but will increase program cost. A best practice in limiting costs associated with program administration for an income-qualifying program is to tie eligibility requirements to enrollment in other programs. The Connecticut CHEAPR program accepts proof of enrollment in a number of programs (including Temporary Assistance for Needy Families, the Supplemental Nutrition Assistance Program, Supplemental Security Income, and others).

While California's Clean Vehicle Rebate Project does limit rebates to single filers making less than \$150,000 or joint filers making less than \$300,000, this program has been repeatedly criticized for disproportionately benefiting high-income individuals.^{104,105} Based on administration preferences, a lower threshold from the options above is recommended in order to ensure that benefits are not directed to high-income households.

In 2006, the California Air Resources Board (CARB) adopted revisions to the Voluntary Accelerated Vehicle Retirement (VAVR) regulations to use remote sensing devices and other technologies to identify high emitting vehicles as possible candidates for voluntary retirement. Air quality management districts use remote sensing devices located at roadside locations to identify vehicles emitting high amounts of Reactive Organic Gases (ROG), CO, and NO_x.¹⁰⁶

Other Considerations

For programs that look to incentivize EV ownership, it is important to ensure that there are incentives or parallel programs in place to encourage the installation of charging infrastructure. Recognizing that many car buyers may not have access to home-based EV charging infrastructure, an increasing number of programs reviewed provide incentives to support the installation of home-based EV charging infrastructure. A notable example of such a program is the Clean Vehicle Assistance Program in California, administered by the Beneficial State Foundation (the nonprofit organization supporting a community development bank with branches in California, Oregon, and Washington) on behalf of the California Air

¹⁰⁴ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook, Lessons from California's Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

¹⁰⁵ Ju, Cushing, Morello-Frosch. 2020. An equity analysis of clean vehicle rebate programs in California. <https://doi.org/10.1007/s10584-020-02836-w>.

¹⁰⁶ California Air Resources Board. 2006. Public Workshop to Discuss Revisions to the Voluntary Accelerated Vehicle Retirement Regulation. https://ww3.arb.ca.gov/msprog/avrp/vavr_workshop_presentation_03-20-06.pdf.

Resources Board (CARB), which offers income-qualified State residents both grants and lower-interest loans toward the purchase of an EV and home charger installation.^{107,108}

Loans can also support access to electric vehicles and the supporting infrastructure, with an exceptional example in the Community Housing Development Corporation Financing Assistance Pilot Project Driving Clean Assistance Program. Through grant support, the Richmond, California-based program provides applicants up to \$5,000 toward the purchase of either a hybrid or plug-in electric vehicle and \$2,000 toward the purchase of a level 2 in-home charger. The program also offers loans to low-income car buyers with poor credit in combination with budget counseling and financial education training.¹⁰⁹

An important consideration is also the timing of the subsidy. While scrap-and-replace programs may target high emitting vehicles, a requirement to provide evidence of scrappage may delay the payment of incentive dollars to low-income car buyers. A growing body of research suggests that the timing of the incentive is a key factor in program adoption, with rebates applicable closer to the time of sale being preferable.¹¹⁰ Income tax credits and purchase rebates, both frequently used in the United States, require a delay that can vary from a period of months to the end of the tax year. Washington State’s one-time vehicle tax reduction entitles new and used car buyers to receive a benefit close to the time of sale. Dealers are required to maintain records and pass through the incentive to the individual purchaser at the time of sale. Buyers may request a refund for private transactions.¹¹¹

2.2 School Bus Incentives

2.2.1 Overview

Incentive programs for school buses are another policy option for removing heavy duty, high-polluting vehicles from the roadways. Because younger populations disproportionately interact with school buses, a program to electrify school buses can help reduce exposure to diesel exhaust among younger populations who have greater vulnerability to local air pollution.¹¹² Many electric school bus incentive programs are relatively new. For example, in 2021,

Why School Bus Incentives?
Targeted, community-focused air quality benefits
Target younger, more vulnerable populations

¹⁰⁷ Clean Vehicle Assistance Program. N.d. Grants and loans for income-qualified Californians. <https://cleanvehiclegrants.org/>.

¹⁰⁸ California Air Resources Board. 2019. Clean Vehicle Assistance Program Adoption Survey Report. <https://cleanvehiclegrants.org/wp-content/uploads/2020/08/BSF-CVA-Program-Evaluation-Report-2019-Final.pdf>.

¹⁰⁹ California Air Resources Board. N.d. Clean Transportation Incentive Project Summaries. http://ww2.arb.ca.gov/sites/default/files/2020-11/Appendix%20A_FundingPlan_11_4_2020_Final_%20EDITED%2011.5.2020.pdf.

¹¹⁰ The International Council on Clean Transportation. 2016. Principles for Effective Electric Vehicle Incentive Design. <https://theicct.org/publications/principles-effective-electric-vehicle-incentive-design>.

¹¹¹ Washington State Department of Revenue. N.d. Clean alternative fuel and plug-in hybrid vehicles—sales/use tax exemptions. <https://dor.wa.gov/content/clean-alternative-fuel-and-plug-hybrid-vehicles-salesuse-tax-exemptions>.

¹¹² U.S. Environmental Protection Agency. 2021. School Bus Rebates: Diesel Emissions Reduction Act (DERA). <https://www.epa.gov/dera/rebates>.

Minnesota will be the first midwestern State to launch an electric school bus pilot project, deploying \$3 million in grants to projects across the State.¹¹³

For equity, the programs reviewed generally factor in equity based on either characteristics of the district or based on mapped criteria. California Energy Commission's School Bus Replacement program targets equity by requiring that applicants be currently operating in equity-focused communities and/or serve a school district where a majority of students are eligible for free or reduced-priced meals.¹¹⁴ The program is available to school districts, county offices of education, and transportation joint power authorities (JPAs).¹¹⁵

Air quality considerations are factored more prominently in the older School Bus Rebate program enacted within the Diesel Emissions Reduction Act (DERA). The program determines eligibility by evaluating whether the bus to be replaced transports a high number of students, travels a high number of annual miles (e.g., 10,000), and/or is in use at least three days a week over the course of the school year. To ensure that buses provided under the grant program are not sold (thereby losing the air quality benefit to the recipient community), DERA further requires that applicants have no active liens against the bus to be replaced, and that the engine and chassis be scrapped before receiving payment.¹¹⁶ The Rural School Bus Pilot Project (RSBPP) ranks applications based on the size of the air district (with priority given to air districts in smaller communities), then by age of the vehicle to be replaced, and then by mileage of the vehicle.¹¹⁷

2.2.2 Program Design

Vehicle replacement programs that target school buses have generally been implemented through grant applications submitted by bus owners (including school districts, charter schools, county offices of education, joint powers authorities, and other bus operators). Typically, private applicants, private transportation companies, and non-profits are not eligible to apply.

Applicant Eligibility and Equitable Design

Applicant eligibility considerations generally consider geography (e.g., presence of equity-focused communities), design of the vehicle, the number of people who may receive the air quality benefit provided by a vehicle, and assurances that the replaced vehicle serves its intended purpose and is not sold.

From the review, the following considerations ensure that benefits are equitably distributed:

- Operating in equity-focused communities
- Percentage of students eligible for free or reduced-priced meals

¹¹³ Minnesota Pollution Control Agency. N.d. Electric school bus pilot project. <https://www.pca.state.mn.us/sites/default/files/p-f2-52k-fy21.pdf>.

¹¹⁴ California Air Resources Board. N.d. School buses program. <https://ww2.arb.ca.gov/our-work/programs/school-buses/about>.

¹¹⁵ California Energy Commission. N.d. Docket Log. <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=18-TRAN-01>.

¹¹⁶ U.S. Environmental Protection Agency. 2021. School Bus Rebates: Diesel Emissions Reduction Act (DERA). <https://www.epa.gov/dera/rebates>.

¹¹⁷ North Coast Unified Air Quality Management District. N.d. Rural School Bus Pilot Project (RSBPP). <https://www.ncuaqmd.org/rural-school-bus-pilot-project-rsbpp>.

- Design (e.g., class 3-8 diesel power buses, Gross Vehicle Weight Rating of at least 10,000 lbs.).
- Number of students transported
- Number of annual miles traveled
- Number of days in use per week over the course of the school year
- Applicant-owned (with no active liens)
- Vehicle to be replaced is currently in operation
- Vehicle to be replaced is not out of compliance with other regulation (or has several years until falling out of compliance)
- Proof of scrapping replaced vehicle's engine and chassis (prior to receiving payment)
- Age of the vehicle to be replaced
- Air quality district

The North Coast Unified Air Quality Management District's Rural School Bus Pilot Project (RSBPP), located in California and supported with funding from CARB, ranks grant applicants based on location (in a rural air quality district), then by age, then by mileage. This approach supports targeting grant funding both to a particular area (in this case, rural communities) and, within those communities, identifying more polluting vehicles. Furthermore, grant funding could be prioritized in areas where equity concerns are greatest, by prioritizing communities where districts serve a high percentage of students receiving free- or reduced-priced meals, or in equity-focused communities.

Other Considerations

By collecting data from applicants, the program can be further targeted to inform future grant awards. The Minnesota Pollution Control Agency requires grantees to report data for one full school year, including days in use, vehicle miles traveled, kWh/mile, energy costs, mechanical issues, and performance. The data and lessons learned can be used to inform future electric school bus grants.

2.3 New Medium and Heavy-Duty Incentives

2.3.1 Overview

Medium- and Heavy-Duty Vehicles include vehicles of class 2b-8 (as designated by the Federal Highway Administration, US Census Bureau, and US Environmental Protection Agency), corresponding to a Gross

Vehicle Weight Rating of greater than 8,500 pounds.¹¹⁸ The most common form of funding for medium- and heavy-duty vehicles throughout the country is through the Volkswagen Environmental Mitigation Trust. The trust was designated after Volkswagen was found to have violated the Clean Air Act in 2017; the resulting settlement went into a trust designated toward achieving reductions of NO_x emissions in the U.S. and has been used for State-level programs across the country. These funds are commonly targeted at replacing diesel commercial trucks or school buses which have higher rates of criteria pollutant emissions.

Why Medium and Heavy-Duty Vehicle Incentives?
 Lower cost per ton CO, PM_{2.5}, and NO_x reduction
 Lower cost per ton CO₂ reduction
 Targeted air quality benefits

The former ALT Fuels Colorado, administered by the Regional Air Quality Council, provided funding for the purchase of new public or private freight trucks and buses given the retirement of a vehicle of Model Year 2009 or older. Funds were available to all public, private, and non-profit fleets throughout the State. Vehicle classes 4-8 were eligible, including medium- and heavy-duty fleet vehicles, shuttle buses, school buses, freight switchers, forklifts and port cargo handling equipment, and airport ground support equipment. Funding was also available for the installation of a level 2 or DCFC EV charging station with each EV purchase.¹¹⁹

Several medium and heavy-duty vehicle replacement programs do not operate at a statewide level, but rather focus on improving freight-related emissions within a specific operational area, including the NYC Clean Trucks program. Trucks operating in “Industrial Business Zones,” areas where higher concentrations of low-income households are disproportionately affected by poor air quality, are eligible. In contrast to income-eligibility which provides clean mobility at reduced prices for LMI participants, programs with this qualification structure are targeted at reducing criteria pollutants in impactful areas by replacing the most high-mileage and high-emission vehicles.

In New York, the New York Truck Voucher Incentive Program (NYTVIP) offers discounts to fleets across the State purchasing or leasing BEV, FCEV, PHEV, as well as hybrid-electric and Compressed Natural Gas (CNG) medium- and heavy-duty vehicles. The incentive amount for on-road trucks varies greatly, with incentives for Class 4 vehicles ranging from \$55,000 for a plug-in hybrid truck to \$100,000 for a battery-electric truck.¹²⁰

In Massachusetts, the MOR-EV Trucks Program offers rebates towards the purchase or lease of a battery electric or fuel cell electric vehicle that has a gross vehicle weight rating (GVWR) of over 8,500 pounds. Rebate values range anywhere between \$7,500 and \$90,000 depending on the size of the vehicle, among other considerations. The Massachusetts MOR-EV program offers larger rebate amounts to parties whose vehicles are registered or operate more than half the time within census areas that meet the State's Environmental Justice Income Criteria¹²¹. Electric truck incentive programs looking to ensure equitable outcomes should engage in similar efforts to identify fleets that operate in corridors and neighborhoods that are disproportionately impacted by air pollution.

¹¹⁸ Alt Fuels Data Center. 2012. Vehicle Weight Classes & Categories. <https://afdc.energy.gov/data/10380>

¹¹⁹ Alt Fuels Colorado. 2021. Settlement Funding Program Guide. <https://raqc.egnyte.com/dl/ryNkMQYh78/?>

¹²⁰ New York State Energy Research and Development Authority (NYSERDA). N.d. Truck Voucher Incentive Program. <https://www.nyserd.org/All-Programs/Programs/Truck-Voucher-Program>.

¹²¹ Mass.gov. N.d. MOR-EV Rebate Program. <https://www.mass.gov/service-details/mor-ev-rebate-program>.

A sample of voucher amounts available to trucks of varying class is included in Table 5.

Table 5 Vehicle Class and Sample Voucher Amounts

Vehicle Class	GVWR (lbs.)	MOR-EV Voucher Amount	NYTVIP Voucher Amount
Class 2b	8,501-10,000	\$7,500	\$0
Class 3	10,000-14,000	\$15,000	\$0
Class 4	14,000-16,000	\$30,000	\$100,000
Class 5	16,000-19,500	\$45,000	\$110,000
Class 6	19,500-26,000	\$60,000	\$125,000
Class 7	26,000-33,000	\$75,000	\$150,000
Class 8	>33,000	\$90,000	\$185,000

The Port Authority of New York and New Jersey operates the Clean Truck Replacement Program for applicants seeking to replace port drayage trucks that frequently serve the port. Replacement trucks may use any powertrain technology with a model year engine 2014 or newer, with specific requirements that the replacement vehicle be scrapped. The program covers up to 50 percent of the cost of the replacement truck, up to \$25,000.¹²²

2.3.2 Program Design

A vehicle replacement program that targets medium- and heavy-duty vehicles have typically been implemented through rebates and discounts issued to vehicle owners. Reflective of the current maturity of the technologies available, the truck replacement programs reviewed in these recommendations typically include a range of zero-emission technology options, including fuel cell and battery electric.

Applicant Eligibility and Equitable Design

Incentives for truck replacement programs offer benefits to equity-focused communities by providing improvements in air quality. Truck fleets that purchase new vehicles typically only keep the vehicles for a couple of years before they enter the used market, leading to a preponderance of secondary and tertiary owners. To maximize the air quality improvement, targeting larger and older vehicles for replacement can have the biggest impact on emission reductions. Equitable design for this sector therefore includes both used and new vehicles that accelerate fleet turnover and remove the oldest and most polluting trucks out of service. The following factors are considered in the program design:

- Gross Vehicle Weight Rating (GVWR): 8,500 and up
- Emissions standards of the vehicle
- Level of incentive available for each vehicle class
- Level of incentive available for high emission vehicles

¹²² Port Authority of New York and New Jersey. N.d. Truck Replacement Program. <https://www.panynj.gov/port/en/our-port/sustainability/truck-replacement-program.html>.

- Age of the vehicle to be replaced
- Area of truck operations

The dollar value for the Massachusetts MOR-EV program and the New York NYTVIP program of each voucher is equal to approximately \$0.75/lb. to \$6.25/lb. of the vehicle's GVWR. Targeting classes of vehicles for higher levels of incentive could increase a program's effectiveness at targeting areas where air quality emissions are poor and certain classes of trucks are more prevalent. One of the oldest programs in the country, the Carl Moyer Program operating out of California, assigns varying levels of incentive to any vehicle class. The level of incentive is calculated using a formula that accounts for the vehicle's age, estimated remaining useful life, estimated offset emissions, and other factors. An overview of rebate/voucher amounts commonly found in many of the medium- and heavy-duty vehicle replacement programs is included in Table 6.

Table 6 Vehicle Class and Sample Rebate/Voucher Amounts

Vehicle Class	GVWR (lbs.)	Sample Rebate/Voucher Amounts
Class 2b	8,501-10,000	0-\$7,500
Class 3	10,000-14,000	0-\$15,000
Class 4	14,000-16,000	\$30,000-\$100,000
Class 5	16,000-19,500	\$45,000-\$110,000
Class 6	19,500-26,000	\$60,000-\$125,000
Class 7	26,000-33,000	\$75,000-\$150,000
Class 8	>33,000	\$90,000-\$185,000

To pursue outcomes oriented towards advancing equity, eligibility criteria may also include frequent deliveries to a particular location (similar to the delivery criteria applied in the Port Authority of New York and New Jersey's Clean Truck Replacement Program) or based on vehicle registration (as in the MOR-EV Trucks Program).¹²³ For equity-targeted incentives based on geography, the following additional criteria should be considered:

- Level of additional rebate offered (e.g., 10 percent)
- Area criteria (e.g., proof of deliveries within a specified area, registration within a certain area)

In the case of California, the CalEnviroScreen mapping tool is frequently used to identify disadvantaged communities where additional incentive is offered.

Colorado has begun to identify and evaluate potential policy options in developing a detailed medium- and heavy-duty ZEV strategy. In the Colorado Medium- and Heavy-Duty Vehicle Study, State agencies partnered to study challenges and opportunities associated with the ZEV fleet transition.¹²⁴ Lowering costs and

¹²³ Mass.gov. N.d. MOR-EV Rebate Program. <https://www.mass.gov/service-details/mor-ev-rebate-program>.

¹²⁴ Colorado Energy Office. 2021. Polis Administration Releases New Colorado Medium- and Heavy-Duty Vehicle Study. <https://energyoffice.colorado.gov/press-releases/polis-administration-releases-new-colorado-medium-and-heavy-duty-vehicle-study>.

speeding up ZEV deployment by developing incentives and evaluating innovative solutions that lower barriers for fleet operators were some of the listed recommendations to speed up the transition.¹²⁵

2.4 Alternate Forms of Mobility Programming

While most programs focus on the replacement of vehicles, an increasing number of vehicle replacement programs include provisions that allow travelers to use alternative forms of transportation after replacing a vehicle. Many of these allow program participants to combine vouchers to be used toward micromobility, transit, and carshare services. In general, where a program participant selects alternate forms of mobility programming, that person becomes ineligible for an incentive toward the purchase of a new vehicle. While many of these programs require program participants to select an option, an emerging best practice is to allow program participants to select what amount of incentive to dedicate to multiple mobility options. Although more administratively complicated, allowing program participants to choose from many different options ensures that program participants maintain similar levels of mobility and access as are possible with private vehicle ownership.

Why Alternate Forms of Micromobility?
Low per-vehicle incentive costs
Higher per-trip energy efficiency
Lower cost per ton PM_{2.5} and NO_x reduction
Targeted air quality benefits
Economically empowers equity-focused populations

2.4.1 Micromobility Incentives

Micromobility incentives have an opportunity to cover a greater percentage of the replacement cost of a new vehicle that can replace many of the trips previously made by cars, depending on the level of incentive offered. Electric bicycles (e-bikes) make it possible for people of any level of fitness to transport goods and people. In fact, in 2018, the United States Postal Service initiated an urban delivery program using a specially designed e-bike.¹²⁶

The SCRAP-IT program in British Columbia allows program participants to receive up to a \$750 voucher toward the purchase of an electric bicycle (e-bike). The Bay Area Air Quality Management District Clean Cars 4 All program allows eligible program participants up to \$9,500 toward the purchase of either a BEV or PHEV, or up to \$7,500 toward a number of micromobility incentives.

The Colorado Energy Office has operated two e-bike pilots in 2020 and 2021 to evaluate outcomes providing e-bikes to low-income essential workers. The 2020 pilot was a proof of concept providing e-bikes to thirteen participants to illustrate the value of this transport mode for relatively short trips. The 2021 pilot will evaluate both private and shared e-bike ownership models for the program and will inform the later expansion for similar programs across the State.

A vehicle replacement program that supports micromobility options (including individual ownership of e-scooter, e-bikes, and others) is a new program type of the options reviewed here. However, perhaps in

¹²⁵ Colorado Energy Office. 2021. Colorado Medium- and Heavy- Duty (M/HD) Vehicle Study. <https://drive.google.com/file/d/1N8tQp0v1RPK86Kle08ZQ83rKsY4Ja5Tx/view>.

¹²⁶ Bicycling.com. 2018. UPS Launches New Delivery Program with Electric Bikes. <https://www.bicycling.com/news/a24442179/ups-delivery-program-electric-bikes/>.

recognition of their greater energy efficiency on a per-mile basis and in response to community demand for such programs, micromobility incentives are becoming increasingly common.

Key considerations that may influence the design of a micromobility program include:

- Level of incentive offered
- Location of the applicant (e.g., clean air agency district, equity-focused communities, areas with higher likelihood of ICE vehicle trip replacement)
- Micromobility replacement characteristics (i.e., electric-powered, bicycle class, presence of pedals, minimum/maximum purchase price, resale conditions)

The level of incentive may not equal the incentive offered for a replacement BEV or PHEV because e-bikes and e-scooters are much less expensive than an electric car. Incentives in Finland, the Netherlands, and France range from approximately \$1,200 to approximately \$3,000 per vehicle (after conversion). The Bay Area Quality Management District's Clean Cars 4 All program provides a grant of up to \$7,500 toward the purchase of an e-bike, helmets, lights, cargo equipment, and other accessories. Households of more than one person may also purchase more than one e-bike (making it possible to use e-bikes to replace trips made by an ICE vehicle used for transportation of multiple household members).¹²⁷

Targeting certain geographic areas can improve the efficacy of a micromobility incentive by prioritizing disadvantaged neighborhoods and maximizing air quality improvements. The Bay Area Air Quality Management District Clean Cars 4 All program requires that applicants live in a disadvantaged community, as defined through the CalEnviroScreen tool (which includes indicators of air quality in the disadvantaged community designation).¹²⁸ Given e-bikes and e-scooters' range, and characteristics of the built environment, it is also likely that certain areas with greater density and more tourist activity may support a higher level of trip replacement.¹²⁹

The allowable characteristics of the e-bike also vary, although all programs reviewed require the bicycle to be equipped with an electric motor (as opposed to a traditional, muscle-powered bicycle). The Bay Area Air Quality Management District Clean Cars 4 All requires e-bikes to be equipped with fully operable pedals; and be labeled Class 1, Class 2, or Class 3. SCRAP-IT requires that the e-bike purchase price be at least \$1,200 CAD, while the vehicle replacement program in France sets a maximum purchase price of 60,000 euros.¹³⁰ The program in France is also expected to forbid applicants from reselling the e-bike for at least six months after purchase.¹³¹

¹²⁷ Bay Area Air Quality Management District (BAAQMD). N.d. Clean Cars for All: Mobility Options. <https://www.baaqmd.gov/funding-and-incentives/residents/clean-cars-for-all/mobility-options>.

¹²⁸ Moving California. N.d. Clean Cars 4 All. <https://ww3.arb.ca.gov/msprog/lct/vehiclescrap.htm>.

¹²⁹ Colorado Energy Office. N.d. Can Do Colorado eBike Pilot Program. <https://energyoffice.colorado.gov/zero-emission-vehicles/can-do-colorado-ebike-pilot-program>.

¹³⁰ Hover Store. 2021. How to get the conversion bonus for an electric bike. <https://hover-store.fr/comment-obtenir-prime-conversion-velo-electrique/>.

¹³¹ Hover Store. 2021. How to get the conversion bonus for an electric bike. <https://hover-store.fr/comment-obtenir-prime-conversion-velo-electrique/>.

It is important to note that e-bikes generally replace between 25-40 percent of the trips previously made by ICE vehicles, though studies suggest that a higher degree of trip replacement may be possible.¹³² The type of e-bike can impact the level of trip replacement; cargo bikes made up only 12 percent of reported e-bikes in a recent survey but were highly valued by respondents in their open-ended responses.¹³³ E-bikes with an extra seat also make it easier for parents or caretakers of children to transport children via bicycle, and these sorts of bikes allowed cyclists to replace all the daily trips that they might take in a car with an e-bike instead.¹³⁴ Both the level of trip replacement and higher per-mile energy efficiency must be considered in program evaluation.

2.4.2 Transit

Transit can replace long-distance trips, and trips where shared mobility infrastructure is lacking. The SCRAP-IT program in British Columbia provides for new and used EVs in addition to BCTransit passes.¹³⁵ The Replace your Ride program, administered by the South Coast Air Quality Management District (AQMD) in California, allows applicants to receive up to \$7,500 toward either carshare or transit. The program initially offered tiered benefits, with the largest incentive given to the lowest-income applicants.¹³⁶ Clean Cars for All, managed by the Bay Area AQMD in California, also offers up to \$7,500. However, in the case of Clean Cars for All, applicants may choose to combine incentives (for example, by combining a \$1,700 grant toward the purchase of an e-bike with a \$5,800 grant for public transit).¹³⁷

Instead of a vehicle, some vehicle replacement programs allow program participants to receive funds toward transit. Key program considerations include:

- Transit pass option (e.g., pre-loaded transit card, monthly/annual transit card)
- Participant location
- Discounted transit options (for all income-qualified participants)

The Replace your Ride program, administered by the South Coast AQMD in California, allows applicants to receive up to \$7,500 toward either carshare or transit. The program initially offered tiered benefits, with the largest incentive given to the lowest-income applicants.¹³⁸ Clean Cars for All, managed by the Bay Area AQMD in California, also offers up to \$7,500. However, in the case of Clean Cars for All, applicants may

¹³² Bourne et al. 2020. The impact of e-cycling on travel behaviour: A scoping review. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7456196/>.

¹³³ MacArthur et al. 2018. A North American Survey of Electric Bicycle Owners. <https://rosap.nhtl.bts.gov/view/dot/37442>.

¹³⁴ Thomas. 2021. Electric bicycles and cargo bikes—Tools for parents to keep on biking in auto-centric communities? Findings from a U.S. metropolitan area. <https://www.tandfonline.com/doi/full/10.1080/15568318.2021.1914787#>.

¹³⁵ SCRAP-IT. N.d. Rebate Choices. <https://scrapit.ca/rebatechoices>.

¹³⁶ Sheldon and Dua. 2019. Assessing the effectiveness of California's "Replace your Ride." https://www.researchgate.net/publication/335531283_Assessing_the_effectiveness_of_California%27s_Replace_Your_Ride.

¹³⁷ Bay Area Air Quality Management District (BAAQMD). N.d. Clean Cars for All: Mobility Options. <https://www.baaqmd.gov/funding-and-incentives/residents/clean-cars-for-all/mobility-options>.

¹³⁸ Sheldon. 2019. Assessing the effectiveness of California's "Replace Your Ride." https://www.researchgate.net/publication/335531283_Assessing_the_effectiveness_of_California%27s_Replace_Your_Ride.

choose to combine incentives (for example, by combining a \$1,700 grant toward the purchase of an e-bike with a \$5,800 grant for public transit).¹³⁹

2.4.3 Carshare

Carsharing and ride-hailing services, where available, can fully replace trips previously made using a personally owned vehicle. The British Columbia SCRAP-IT program allows program participants to receive up to \$500 toward select carshare programs.¹⁴⁰ In 2021, the Bay Area Air Quality Management District Clean Cars 4 All program plans to allow program participants to scrap-and-replace a vehicle with funds that can be used toward carshare.¹⁴¹

Although it is not associated with vehicle replacement explicitly, Colorado Carshare offers reduced rates for customers enrolled in qualifying affordable housing programs. With funding from the Federal CARES act, Denver’s Office of Climate Action, Sustainability, and Resiliency added seven EVs to Colorado Carshare’s fleet in “under-resourced” communities in Denver. This program aligns with the Denver Vehicle Electrification plan which highlights the introduction of EVs in car-sharing fleets, especially those that are accessible by underserved communities and from multifamily housing.¹⁴²

Instead of a vehicle, some vehicle replacement programs allow program participants to receive funds toward carshare. Key program considerations include:

- Eligible carshare provider
- Level of incentive

None of the programs reviewed allow program participants to use credits either for Uber or Lyft. The SCRAP-IT program in British Columbia allows program participants to receive an incentive for two carshare co-ops, a carshare, and a traditional carshare.¹⁴³ The Replace Your Ride program allows participants to receive an incentive from one of the largest car-sharing companies in the world and a commercial vanpool.¹⁴⁴

To ensure an equitable program design, EV incentives for ride hailing vehicles should set aside funding for low and moderate-income drivers, with larger rebate amounts for these populations who may experience a larger financial burden for a new vehicle purchase.

¹³⁹ Bay Area Air Quality Management District (BAAQMD). N.d. Clean Cars for All: Mobility Options. <https://www.baaqmd.gov/funding-and-incentives/residents/clean-cars-for-all/mobility-options>.

¹⁴⁰ SCRAP-IT. N.d. Rebate Choices. <https://scrapit.ca/rebatechoices>.

¹⁴¹ The Mercury News. 2021. Bay Area air district will pay you up to \$9,500 to swap your old car for an electric one. Here’s how. <https://www.mercurynews.com/2021/10/06/bay-area-air-district-will-pay-you-up-to-9500-to-swap-your-old-car-for-an-electric-one-heres-how/>.

¹⁴² City and County of Denver. 2020. Denver Electric Vehicle (EV) Action Plan. <https://www.denvergov.org/files/assets/public/climate-action/denvervehicleelectrificationactionplan.pdf>.

¹⁴³ SCRAP-IT. N.d. Rebate Choices. <https://scrapit.ca/rebatechoices>.

¹⁴⁴ South Coast Air Quality Management District. N.d. Replace Your Ride: Replacement Options. <https://xappprod.aqmd.gov/RYR/Home/ReplacementOptions>.

2.4.4 Sample Program for alternate forms of mobility programming

A sample program is included in Table 7. In this example, the applicant’s income level primarily determines the level of incentive for the replacement mobility option (similarly to the Replace Your Ride program in California). In this example, income eligibility thresholds are set at 200 percent of Federal poverty guidelines (FPG), 300 percent of FPG, and 400 percent of FPG.

Table 7 Sample Vehicle Replacement Program Characteristics

Income Level	Applicant May Receive One:			Applicant Must Select One:		
	Any Scrapped ICEV	Scrapped ICEV 20 Years or Older	Scrapped ICEV <15 mpg	New or Used BEV Incentive	Combined Value of Alternate Mobility Incentives	Combined Maximum Value of all Incentives
200% of FPG	\$0	\$3,500	\$3,000	\$3,000	\$3,000	\$6,500
300% of FPG	\$0	\$3,500	\$3,000	\$2,000	\$2,000	\$5,500
400% of FPG	\$0	\$3,500	\$3,000	\$1,000	\$1,000	\$4,500

In this sample program, program participants are required to scrap an ICE vehicle in order to receive the incentive. A higher vehicle rebate is available for older vehicles. Different levels of incentive are offered toward the replacement of any ICE vehicle, any ICE vehicle 20 years or older (i.e., model year 2001 or older), or with a fuel economy equal to or less than 15 miles per gallon (similarly to SCRAP-IT in British Columbia). This tiered incentive is reflective both of potential air quality benefits as well as mobility benefits. In the case of alternate forms of mobility programming, a best practice is to offer applicants flexibility in determining the best mobility solution to meet their needs. Under this program design, applicants may choose either a new or used BEV incentive, or a combination of alternate mobility options (including e-bike, scooter, transit, or carshare).

2.5 EV Charging Infrastructure Considerations

One of the most significant barriers to EV adoption is the availability of EV charging infrastructure which is used to charge the vehicle. This issue is especially prevalent for those who do not own their household (and therefore have difficulty installing a level 2 home charger) or who live in multifamily housing and are less likely to have a dedicated parking space for an EV with access to an outlet. For those without home charging, the availability of public charging stations, particularly DCFC fast chargers, becomes critical for enabling EV ownership.

However, EV charging infrastructure is expensive, with DCFC chargers costing over \$100,000 between the purchase and installation of the equipment. Federal and State subsidies for EV charging infrastructure installation exist to defray purchase and installation costs for both private household chargers and public chargers. For example, the Charge Ahead Colorado program provides grants for 80 percent of EV charging infrastructure costs for non-home installations with maximum funding increasing with the power of the charger installed. These stations can be workplace-based or public, including installations at multifamily housing. Similarly, Xcel Energy supports EV charging infrastructure installation across their Residential,

Multifamily, and Commercial portfolios¹⁴⁵. The Commercial portfolio, for example, has programs like Public DCFC and Community Charging Hubs, which provide design, construction, and advisory services for businesses, municipalities, and community-focused organizations. Community Charging Hub projects (defined as chargers with at least four Level 2 ports) can also earn rebates if they meet income-qualified criteria or are located within a High-Emission Community (HEC)¹⁴⁶. These awards are up to \$2,200 for each eligible Level 2 charging port and up to \$31,200 for each eligible DCFC port.

The Bay Area Air Quality Management District Clean Cars 4 All program allows eligible program participants to receive additional funding on EV charging infrastructure in addition to a maximum \$9,500 grant amount toward the purchase of either a BEV or PHEV. Grantees can receive a \$2,000 rebate for a home charger, \$600 for a Level 2 portable charger, or \$500 on a public charging card.¹⁴⁷

2.6 Education and technical assistance considerations

Marketing and education are an increasingly important aspect of all of the vehicle replacement programs reviewed. Complicated programs may limit program reach and increase the need for greater spending on educational materials or direct technical assistance. Information on the benefits of transportation electrification generally supports better awareness of the advantages of transportation electrification.

Educational resources that have been used to increase outreach and program success include:

- Automobile shows
- Community events (including outreach, education, ride and drives)
- Flyers
- Mentorship
- Multi-language materials
- Online and TV marketing
- Smog testing events
- Telephone support
- Websites

¹⁴⁵ Xcel Energy. 2021. Transportation Electrification Plan: Public Service Company of Colorado 2021-2023. https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf.

¹⁴⁶ Xcel Energy. 2021. Xcel Energy Drives Toward Electric Vehicle Future in Colorado. <https://investors.xcelenergy.com/news-market-information/press-releases/press-release/2021/Xcel-Energy-Drives-Toward-Electric-Vehicle-Future-in-Colorado/default.aspx>.

¹⁴⁷ Bay Area Air Quality Management District (BAAQMD). N.d. Clean Cars for All: Grant Amounts. <https://www.baaqmd.gov/funding-and-incentives/residents/clean-cars-for-all/eligibility>.

Considering the communities targeted throughout this outreach can improve the reach of an incentive program to equity-focused communities. In many cases, those relationships can be strengthened by reaching out to existing organizations. For example, EV clubs currently operating in the state already target specific areas of the state (e.g., Drive Electric Northern Colorado, Electric Vehicles Four Corners) or a specific demographic (e.g., Women Who Charge).

While flyers and online and TV marketing can be a part of an effective strategy, employing in-person, interactive marketing has been shown to be more effective. One of the more extensive examples of this is in the Washington State EVs for EVERYONE program, which provides program participants with a free annual membership to the Plug in America toll-free support line with optional access to an EV owner as a mentor to assist in car-buying.¹⁴⁸ Even less extensive interaction can have a powerful impact, however. A recent National Bureau of Economic Research (NBER) study comparing the efficacy of two replacement programs in California found that marketing scrap and replace programs to low-income individuals at local "Tune-In, Tune up" smog testing events resulted in higher levels of adoption than in a neighboring program where marketing occurred mostly online with limited targeted marketing.¹⁴⁹ Similarly, Smart Columbus credits a Ride & Drive roadshow with putting 12,000 people behind the wheel of an EV.¹⁵⁰

For medium- and heavy-duty electric vehicle programs, education and technical assistance is almost always included. Since medium- and heavy-duty vehicles are usually part of fleets, much of these advisory services focus on fleets. Xcel Energy is spending \$1.3 million from 2021 to 2023 on advisory services, with much of that going to fleet advisory and assessments and community planning.¹⁵¹ These advisory services include, but are not limited to, monitoring key vehicle performance indicators to identify which vehicles are best suited to be replaced with EVs and advising on fleet and workplace charging infrastructure needs.

Case studies and pilot programs are also effective for MHDEV. The Clean Cities Coalition Network, for example, lists hundreds of projects that have been funded by the U.S Department of Energy's Vehicle Technologies Office that advance affordable transportation fuels and technologies.¹⁵² Many of these projects focus on medium- or heavy-duty vehicles and provide practical examples of truck electrification. While these focus on publicly funded projects, some private logistics companies have also advertised case studies of truck electrification projects. XPO Logistics is conducting a test of Daimler battery electric trucks, the eCascadia Freightliner, in Oakland, CA¹⁵³. The pilot is an opportunity to see how these trucks perform in the real-world and the pilot is partially funded by the Bay Area Air Quality Management District.

¹⁴⁸ Express Credit Union. N.d. Electric Vehicle Loans. <https://expresscu.org/borrow/electric-vehicle/>

¹⁴⁹ National Bureau of Economic Research. 2018. Subsidizing Low- and Middle-Income Adoption of Electric Vehicles: Quasi-Experimental Evidence from California. <https://www.nber.org/papers/w25359>

¹⁵⁰ Smart Columbus. 2022. The Smart Columbus Ride & Drive Roadshow: Best Practices. <https://smart.columbus.gov/playbook-assets/electric-vehicle-consumer-adoption/the-smart-columbus-ride---drive-roadshow--best-practices>

¹⁵¹ Xcel Energy. 2021. Transportation Electrification Plan: Public Service Company of Colorado 2021-2023. https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf

¹⁵² Clean Cities Coalition Network. N.d. Partnerships and Projects. <https://cleancities.energy.gov/partnerships/>

¹⁵³ XPO Logistics. 2021. XPO Logistics Tests Battery-Electric Truck from Daimler Trucks North America. <https://investors.xpo.com/news-releases/news-release-details/xpo-logistics-tests-battery-electric-truck-daimler-trucks-north>

2.7 Return on Investment

Return on investment can be defined as the benefit per dollar of program spending. In the case of an electric vehicle replacement program, the most direct benefit focuses on emissions reductions. These metrics can be refined to focus specifically on benefits to EV equity communities or population groups, and be used to prioritize investments, measure and track program success, and communicate the value of continued program investment.

2.7.1 Emissions Reduction

Key ROI metrics for transportation electrification include dollars spent per ton of CO₂ reduced as well as dollars spent per ton of pollutant reduced. Key pollutants from a health perspective include fine particulate matter (PM_{2.5}) and oxides of nitrogen (NO_x).

To provide one set of benchmarks for emissions reduction ROI, the project team employed the Investment Strategy Tool developed by the Transportation and Climate Initiative (TCI), a regional collaboration of over a dozen States that seeks to reduce emissions in the transportation sector. The tool developed by TCI estimates changes in travel behavior, air pollution, and economic outcomes from investments in a range of different transportation strategies. In estimating the results of electrification strategies, the tool sources data from national studies on the performance of both conventional and alternative forms of transportation, given differences in capital costs, fuel costs, maintenance costs, and estimated emissions. The tool aggregates study results to provide an estimated cost per ton reduction in common pollutants associated with negative health outcomes and GHG emissions. These estimates are shown in Table 8. Ranges of estimates are provided, reflecting future uncertainty as well as local variations in underlying assumptions about costs, efficiency, and other factors.

Table 8 Illustrative Cost-Effectiveness for Electric Vehicle Technologies

Policy/Program	\$ per New Vehicle	\$ per Ton CO ₂ (2022-2032) ¹	\$ per Ton CO ₂ (2022-2040)	\$million per Ton PM _{2.5} (2032)	\$million per Ton NO _x (2032)
Consumer incentives for new light-duty EVs	\$6,000-\$6,500	\$800-\$1,200	Not modeled	\$10-\$20	\$0.5-\$1.0
Electric school buses	\$125,000-\$175,000	\$2,600-\$3,400	\$1,400-\$1,800	\$100-\$150	\$3.0-\$4.0
Electric trucks—medium duty/urban	\$60,000-\$80,000	\$1,200-\$1,600	\$600-\$1,000	\$15-\$25	\$0.4-\$0.6
Shared e-scooters & e-bikes	NA	\$40,000-\$60,000	Similar to 2032	\$1,000-\$1,500	\$50-\$70
E-bike ownership subsidies	\$700-\$800	\$3,500-\$4,000	Similar to 2032	\$140-\$160	\$5-\$8

¹ Cumulative dollar spent per cumulative ton of CO₂ reduced between the specified years.

It should be noted that these values are supported by existing research, and where research is lacking, estimates may be incomplete, particularly for newer forms of mobility. While early research suggests that

e-bike trips may replace some automobile trips, there is a need for continued research in the area.¹⁵⁴ If micromobility trips could replace a larger number of ICE vehicle trips, the cost-effectiveness of those strategies as a means of improving air quality would also increase.

Under this analysis, and for this mix of technologies and current average costs, a strategy that focused on reducing GHG emissions in the most cost-effective manner would focus on light-duty EVs, which are associated with the lowest cost per ton reduction in CO₂. However, a strategy that focused on other air quality emissions associated with negative health effects could target either light-duty EVs or electric trucks, both of which are cost-effective ways to reduce PM and NO_x emissions. The analysis also suggests that cost-effectiveness improves over longer time horizons (for example, by extending the period of analysis from 2032 to 2040), as the up-front costs of new vehicles and infrastructure pay off in terms of year-over-year emission reductions.

The results in Table 8 reflect some Colorado-specific factors, such as fuel prices and the carbon intensity of the electric grid, but also national average assumptions about other factors. Details on the estimates in Table 8 are provided in the Appendix.

The cost-effectiveness results for specific applications may vary, depending on factors such as:

- Age, miles driven, and fuel efficiency of vehicles that are replaced.
- The specific type of vehicle (e.g., 25- vs. 40-foot bus, refuse vs. utility vs. delivery truck).
- Costs associated with local grid upgrades to support charging applications at high-intensity locations such as bus depots.
- Any targeting of incentives to subsets of the population such as low and middle-income consumers for light-duty EV purchase. As of yet there is little data available from the national sources to observe the cost-effectiveness of such targeted incentive programs.

Individual programs run by various State and regional agencies were also reviewed to look for data on cost-effectiveness or ROI. The estimates for light-duty replacement programs fall in the same general range as shown in Table 8. In California, the Clean Cars 4 All program provides incentives up to \$9,500 for low-income drivers to scrap and replace old vehicles with zero emission vehicles. Between 2015 and 2020, the program has provided around \$73 million of vehicle incentives, retired and replaced over 11,000 vehicles, and reported CO₂ reductions of around 56,000 metric tons.¹⁵⁵ This program has reported a cost of \$1,299 per ton of CO₂ reduced, according to the California Climate Investments Annual Report, which is near the upper limit of the estimate for dollar per ton of CO₂ abated from 2022-2032.¹⁵⁶ In Massachusetts, the MOR-EV program provides rebates of up to \$2,500 for the purchase or lease of a battery electric or fuel cell vehicle. Between 2014 and 2021, the program has administered over \$41 million dollars of

¹⁵⁴ Bigazzi and Wong. 2020. Electric bicycle mode substitution for driving, public transit, conventional cycling, and walking. <https://www.sciencedirect.com/science/article/abs/pii/S136192092030599X>.

¹⁵⁵ California Air Resources Board. 2020. EFMP Retire and Replace Program Statistics. https://ww2.arb.ca.gov/sites/default/files/2021-03/2020_q4_%20EFMP%20Website%20Statistics%20Tables%20Cumulative.pdf.

¹⁵⁶ California Climate Investments. 2021. Annual Report, Cap-and-Trade Auction Proceeds. https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/auctionproceeds/2021_cci_annual_report.pdf.

rebates and achieved CO₂ reductions of 49,926 metric tons, with an implied cost-effectiveness of \$828 per ton of CO₂ reduced, which is near the lower limit per ton of CO₂ abated from 2022-2032.¹⁵⁷

2.7.2 Observations

The type of EV replacement program that a State or municipality chooses to implement will be dependent on the objective of the program. If the goal of the program is to obtain the greatest amount of GHG reduction at the lowest cost, then the best strategy (according to the values presented in Table 8 above) may be to target replacement of old light-duty vehicles. However, if the program's objective is to deploy the greatest number of EVs onto the roadways, then the best strategy could be to target light-duty vehicles, where the per-vehicle incentive amount would be far lower than for a bus or truck. However, in the long run, it is important to convert all vehicle segments to zero emissions. Investment may be required in all segments, but incremental investments can be made based on cost-effectiveness as one consideration.

Alternatively, if the program places a greater emphasis on EV ownership for lower-income communities, then a program may choose to offer a greater incentive amount per-vehicle in order to facilitate greater ownership rates for a targeted population. While such a program design would likely affect the cost-effectiveness of a program from a per-vehicle or per-GHG reduction basis, it may be justified in pursuit of more equitable outcomes.

Overall, there is limited data from which to judge ROI specific to policies and programs with income or other equity-based criteria. For example, the effectiveness of incentives at increasing adoption of new EVs, used EVs, or electric micromobility by low-income consumers is not well-understood. Programs that target truck and bus replacement towards areas with disadvantaged populations also are just beginning to be implemented.

2.8 Recommendations for Program Evaluation

A high emission vehicle replacement program would be responsible for ensuring that adopted policies and programs are achieving key objectives (for more on evaluation, see the Needs Assessment in Chapter 6). For a high emission vehicle replacement program, evaluation would primarily focus on environmental, economic, and equity objectives.

Program success can be measured by focusing on several key indicators, including:

- Estimated change in statewide GHG emissions with and without the program,
- Distribution of program resources in equity-focused communities,
- Distribution of air quality benefits in equity-focused communities,
- Economic outcomes of program participants,

¹⁵⁷ Massachusetts Offers Rebates for Electric Vehicles. N.d. MOR-EV Program Statistic. <https://mor-ev.org/program-statistics>.

- Mobility outcomes of program participants,
- Economic outcomes in equity-focused communities.

This list is not exhaustive and is intended to provide guidance to community groups in determining program evaluation metrics.

Applicant Benefits

Some program information required of applicants will be used to determine eligibility and can also be used to evaluate the equity of the project to individual applicants. Much of the information used to determine applicant benefits would be gathered over the course of the application, and can be used to support both emission and economic benefits, including:

- Vehicle make and model
- Vehicle fuel type (BEV, FCEV, PHEV)
- Vehicle price
- Total rebate/incentive amount
- Applicant income or income category
- Applicant ZIP code
- Retired vehicle year, make and model (if applicable)
- Retired vehicle mileage (if applicable)
- Retired vehicle fuel economy (if available)

This information can be used to identify where emission benefits and program dollars are spent, and can be done at many units of geography (including ZIP code). Targets can be set based on distribution of program dollars, education and outreach, vehicle replacement rates, program education and outreach, and other program features.

Additionally, information on program outcomes can be used to inform refinements to program design. Many of the vehicle replacement programs reviewed include surveys that focus on program effectiveness.

Some programs also distribute voluntary surveys to better understand ZEV driver motivations, demographics, and program effectiveness.¹⁵⁸ Topics for this survey may include:

- Demographic information of the program participant (e.g., age, gender)
- Education levels of the program participant
- Residence characteristics (e.g., owned, rented, single family, multifamily)
- EV charging behavior (e.g., mostly at home, mostly at work, mostly on route)
- EV home charger access (e.g., level 2 charging station already installed, installed level 2 charging station, plan to install level 2 charging station, have no plans to install level 2 charging station, etc.)
- Method for learning about program
- Importance of the incentive in deciding to replace the scrapped vehicle
- Importance of educational experience in program participation
- Importance of financing options in program participation

This data can be combined to identify both areas of improvement, evaluate who is receiving benefit and who is not, and identify a distribution of benefits. For example, the Mecklenburg County Air Quality Grants to Reduce Aging Diesel Engines (GRADE) reports the number of projects distributed in the Charlotte-Mecklenburg area by county and total number of projects—in addition to benefits associated with air quality emissions.

Emissions Benefits

Emissions benefits can be calculated in several ways, in part determined based on the program design. Vehicle replacement programs that are currently in place target a variety of outcomes, including making electric vehicles more accessible to the general population, making electric vehicles more accessible to low-income households, reducing greenhouse gas emissions, and reducing negative air quality emissions associated with transportation in general. Depending on the program’s specific objectives, several approaches may support the program’s evaluation of emissions benefits.

Emissions benefits will also vary depending on the mobility type offered, with some new considerations that will influence the way programs are evaluated. For example, e-bikes have a much higher efficiency on a per-mile basis when compared to electric vehicles, based on e-bike class type. E-bikes’ energy consumption is typically reported on a watt hour per mile (Wh/mi) basis, with some users reporting typical consumption varying from 25 Wh/mi (no pedal assist) to 15 Wh/mi (with pedal assist).¹⁵⁹ Xcel reports a

¹⁵⁸ Center for Sustainable Energy. N.d. Evaluating and Maximizing Electric Vehicle Incentive Impacts and Accelerating Net Zero Transportation. <https://energycenter.org/thought-leadership/research-and-reports/evaluating-and-maximizing-electric-vehicle-incentive>.

¹⁵⁹ Electrek. 2020. The Truth: How far can an electric bicycle really go on a single charge? <https://electrek.co/2020/06/12/how-far-can-an-electric-bicycle-really-go-on-a-charge/>.

typical BEV's range as 3 kWh/mi. This is the equivalent of 333 Wh/mi, making the pedal-assist e-bike more than twenty times more efficient than a BEV.¹⁶⁰

Emissions benefits for vehicle replacement programs are generally characterized by their cost per metric ton of emissions benefit, which provides a metric to compare the efficacy of different emission reduction schemes. It is by this metric that some critics of the Car Allowance Rebate Scheme ('Cash for Clunkers') argue that that program's estimated cost per ton of CO₂ emissions ranges from about \$92 -\$288 per metric ton of CO₂ emissions reduction.^{161,162} Other pricing schemes set the cost of carbon much lower. The Biden Administration set the social cost of carbon at \$51 per metric ton. This is comparable to the EU emissions trading system's cap-and-trade value per metric ton of CO₂, which reached a high of approximately \$53 per ton in April of 2021.^{163,164}

Calculating emissions benefits at the time of vehicle scrappage increases the overall administration burden associated with a vehicle replacement program but has the advantage of ensuring that vehicle replacement targets the most highly emitting vehicles. The Carl Moyer Program uses estimated emissions reductions in determining vehicles' eligibility and maximum grant amount using the California-exclusive Emission FACTor (EMFAC) model. The annual weighted surplus emission reduction must satisfy cost-effectiveness limits in order to be eligible for the program and to determine the incentive amount. For medium-and heavy-duty vehicles, the Carl Moyer Program calculations factor in the technology of the vehicle to be replaced, the emission factors associated with that technology, the deterioration rates of replaced technology, annual amount of activity, discount rate and project life of the technology, and estimated percentage operation within the State. For light-duty vehicles, the annual weighted surplus emissions reductions are calculated based on an average emissions rate by model year of the replaced vehicle, an expected project life of three years, and a discount rate of one percent. The complexity of this evaluation, and requirements for determining eligibility, may in part be responsible for the fact that the majority of the program's expenditure supports air quality emission improvements in larger vehicles. The program has spent \$20,000 per replaced engine, on average, over the first 21 years of the program.¹⁶⁵

The MOR-EV program uses the Alternative Fuel Life Cycle Environmental and Economic Transportation (AFLEET) tool, to conduct both an environmental and economic costs and benefits analysis of alternative and advanced fuel vehicles. The tool was developed through a partnership between the Department of Energy's Clean Cities program and the EPA to support metropolitan areas and Clean Cities coalitions in estimating criteria air pollutant reduction for alternative technology vehicles. The tool can be used to estimate life-cycle petroleum use, life-cycle greenhouse gas emissions, vehicle operation air pollutant

¹⁶⁰ Xcel Energy. N.d. Electric Vehicle Frequently Asked Questions. <https://www.xcelenergy.com/staticfiles/xcel-responsive/Marketing/Energ-Portfolio-EV-FAQ.pdf>.

¹⁶¹ Li, Linn, and Spiller. 2013. Evaluating "Cash-for-Clunkers": Program effects on auto sales and the environment. <https://www.sciencedirect.com/science/article/abs/pii/S0095069612000678>.

¹⁶² Brookings Institution. 2013. Cash for Clunkers: An Evaluation of the Car Allowance Rebate System. https://www.brookings.edu/wp-content/uploads/2016/06/cash_for_clunkers_evaluation_paper_gayer.pdf.

¹⁶³ The Biden Administration. 2021. A Return to Science: Evidence-Based Estimates of the Benefits of Reducing Climate Pollution. <https://www.whitehouse.gov/cea/blog/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/>.

¹⁶⁴ Reuters. 2021. EU carbon price hits record high above 45 euros a tonne. <https://www.reuters.com/business/energy/eu-carbon-price-hits-record-high-above-45-euros-tonne-2021-04-20/>.

¹⁶⁵ California Air Resources Board. 2019. Carl Moyer Program Statistics: 2019 Reporting Cycle. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/status/2019%20Moyer%20Statistics%2008272020_v7-final.pdf.

emissions, and costs of ownership for light-, medium-, and heavy-duty vehicles. The tool allows program administrators to estimate the difference in annual emissions for a BEV, PHEV, or FCEV using either default assumptions.

Economic Benefits

Economic benefits can broadly be divided into two types: job and wealth creation, and transportation cost savings and accessibility benefits. Transportation electrification can support job creation in several ways:

- Vehicle and equipment manufacture—Any local jobs associated with the production of electric vehicles, supply equipment, and/or component parts such as batteries.
- Charging infrastructure installation and maintenance—Jobs associated with construction, installation, maintenance, and preservation of charging equipment.
- Vehicle and equipment sales and repair—Automobile, truck, and e-bike dealerships and repair facilities.
- Services—Jobs associated with the provision of new electric mobility services, such as shared e-bike systems.
- Business-to-business purchases—Any indirect new economic activity supported as a result of business-to-business purchases that take place as a result of new directly created jobs in the electric mobility industry (e.g., new employment associated with energy sales).
- Household purchases—Any induced new economic activity supported as a result of household spending by direct employees and indirect employees.
- Business and consumer cost savings on vehicles, fuel, and maintenance. To the extent that electric vehicle technologies save businesses and consumers money over time, these savings will be reinvested in the economy, multiplying the long-term benefits.

Several studies have examined the economic benefits of electrification in the United States. For example, a study by the National Renewable Energy Laboratory estimated that job creation for national light-duty EV investment would range from 109,000 jobs per year per 73 million vehicles to 52,000 jobs per year per 12 million vehicles.¹⁶⁶ Another study estimated that nearly 6 jobs are supported for every \$1 million invested in battery electric buses.¹⁶⁷ A study of e-scooters in Portland, OR, found that 700,400 trips were supported by 1,533 independent contractors earning a total of \$643,000 in wages.¹⁶⁸ Based on new modeling as well as a review of existing literature, a recent study for the State of Rhode Island estimated that various electrification investments and programs would create between 1 and 18 jobs per million

¹⁶⁶ National Renewable Energy Laboratory. 2016. National Economic Value Assessment of Plug-In Electric Vehicles. <https://www.nrel.gov/docs/fy17osti/66980.pdf>.

¹⁶⁷ Jobs to Move America. 2019. Transforming Transit, Realizing Opportunity: How battery-electric buses can benefit the environment, the economy, and public transit. https://jobstomoveamerica.org/wp-content/uploads/2019/12/BEB-Report_electronic.pdf.

¹⁶⁸ City of Portland, Oregon. 2019. 2018 E-Scooter Findings Report. <https://www.portlandoregon.gov/transportation/article/709719>.

dollars of new investment.¹⁶⁹ This was in the same range of estimates for traditional infrastructure investment (such as shared-use paths and roadway construction and maintenance), which produce approximately 10 to 12 direct jobs per million dollars.¹⁷⁰ Higher numbers of jobs are created if indirect benefits and economic efficiency/cost savings benefits are considered.

Job and Wealth Creation

Transportation electrification will require support from administrators, marketing professionals, automotive service technicians and mechanics, vehicle dealers, urban and regional planners involved in planning upgrades, electricians, contractors, electrical power-line technicians, sales professionals, and even data scientists.¹⁷¹ Developing a stronger understanding of transportation electrification's economic benefits, and specifically how equitably those benefits are distributed, will support efforts to continuously improve Colorado's vehicle replacement program.

Program administrators should consider tracking the percentage of a program's funding (including direct costs paid out, and administration costs) being spent within target communities, and the amount directed toward CBOs.

For commercial operators (including recipients of an electric school bus or an electric truck), job and wealth considerations associated with an equitable vehicle scrap and replacement program could initially be captured through a survey of grant applicants or required under the terms of a grant award. A sample of questions include:

- How many jobs have been created through this program?
- What job titles are associated with new employment?
- What level of cost savings has your organization experienced with your new zero-emission vehicle?
- What wage and benefit levels are associated with newly created jobs?
- What other community benefits have your organizations provided as a result of the new zero-emission vehicle purchase? Examples include participation in zero-emission vehicle events, providing training to community members, directing community members to financial resources associated with vehicle electrification, mentoring other fleets interested in transitioning to EVs and others.

The job creation and economic benefits to local communities will vary greatly depending upon the specific program or strategy, how it is implemented, and measures taken to ensure that local residents benefit from new jobs. Also, not all jobs are equal—a skilled job such as electrical equipment installation will pay

¹⁶⁹ State of Rhode Island. 2020. Clean Transportation and Mobility Innovation Report: Rhode Island's Roadmap to a Clean Transportation Future. Prepared by AECOM et al. <http://climatechange.ri.gov/documents/mwg-clean-trans-innovation-report.pdf>.

¹⁷⁰ Dowell, P., and L. Petraglia. 2012. NCHRP 08-36, Task 103: Mining Recovery Act Data for Opportunities to Improve the State of Practice for Overall Economic Impact Analysis of Transportation Investments. Prepared for American Association of State Highway and Transportation Officials. [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36\(103\)_FR.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36(103)_FR.pdf).

¹⁷¹ City of Sacramento. 2019. Sacramento EV Blueprint- Task 5.2: EV Economic Pathways. Prepared for the City of Sacramento by Frontier Energy. https://www.cityofsacramento.org/-/media/Corporate/Files/Public-Works/Electric-Vehicles/5-2_EV-Blueprint_Final-EV-Economic-Pathways.pdf?la=en.

much better and provide better career opportunities than a job with no educational requirement, such as rebalancing e-scooters. This points to the need to take action to complement electrification programs with equity-focused measures to help communities reap economic benefits. Examples of these complementary measures include:

- Training and workforce development programs to build skills among local workers in electric vehicle technologies, including accreditation programs at local community colleges and universities to enable apprentice programs for EV charging installation, maintenance, and repair.
- Requirements or targets to hire local and/or disadvantaged businesses.
- Partnerships with industry to develop locally based supply chains for electric vehicle and equipment manufacturing.
- Outreach to youth through high-schools and community colleges to educate students about green jobs and allow for job shadowing, internships, site tours, and others.

Evaluating a program's success based on job and wealth creation can be done using an economic impact analysis (using economic input/output modeling tools including REMI, IMPLAN, RIMS II, or others). However, while Colorado is home to several important small businesses working in transportation electrification, none of the major original equipment manufacturers (OEMs) have a vehicle manufacturing facility within the State.¹⁷² A greater percentage of costs associated with installing EV charging infrastructure may be spent within the State, but the variability of such costs (particularly soft costs associated with permitting, coordinating with stakeholders, and others) presents a range of challenges that do not lend themselves well to a regular system-level analysis that would support program evaluation.

Travel Cost Savings and Accessibility Benefits

To capture the benefits associated with ongoing savings associated with EV ownership,¹⁷³ grant applicants can be asked either through survey or required ongoing feedback questions to identify program benefits. Sample questions include:

- How much money have you spent on maintenance in the past year?
- How does that compare with maintenance costs you paid prior to obtaining your electric vehicle?
- How many miles have you driven in the past year?
- Did you install charging equipment to support your vehicle? If so, how much did it cost?
- How often do you use public charging infrastructure? How much does it cost you to use it?

¹⁷² Denver Business Journal. 2021. What Colorado needs to become an electric vehicle manufacturing hub <https://www.bizjournals.com/denver/news/2021/02/28/colorado-electric-vehicle-manufacture-solid-power.html>.

¹⁷³ Consumer Reports. 2020. EVs Offer Big Savings Over Traditional Gas-Powered Cars. <https://www.consumerreports.org/hybrids-evs/evs-offer-big-savings-over-traditional-gas-powered-cars/>.

- Has your participation in this program increased your access to important destinations? This can include work, healthcare, grocery, education, and other essential services.

Avoided fuel costs can be estimated based on the applicant's ZIP code, average price per gallon of gasoline, and estimated cost of electricity.

Section 2: Mapping EV Equity Populations

3.0 Review of Equity Definitions and Considerations

3.1 Overview

The project team defined ‘EV equity’ to refer broadly to any policy, strategy, engagement, assistance, or other resource that supports equitable access to electric transportation and its benefits. For a complete list of the resources reviewed to support this study, please see the Appendix.

A key task in supporting equitable transportation electrification is the development of an agreed-upon set of definitions to both identify the communities of focus and desired outcomes. Equitable transportation electrification can only be achieved by being mindful that certain communities have obstacles in adopting electrification, whether driven by historical treatment, adverse environmental impacts, or socioeconomic factors. This literature review of Federal, State, and local resources was used to identify equity-focus communities, with a focus on both critical factors to consider establishing socioeconomic priorities and transportation priority communities that could be targeted for transportation electrification support.

This review also summarizes how equity and EV equity communities are discussed in Colorado regulation, State agency policies, and transportation plans. The review also includes Federal agency policy definitions of communities considered in environmental justice by the U.S. Department of Transportation, Environmental Protection Agency, and Department of Energy. The chapter concludes with a review of how other States, metropolitan planning organizations (MPOs), counties, and non-profits have used metrics to define underserved communities. Altogether, 25 resources were reviewed, including eight from Colorado, seven from Federal agencies, four from other States/MPOs/Counties, and six from non-profits. The sources are summarized in Table 9.

Table 9 Resources Reviewed in Developing Equity Focus Communities

Source	Organization/Agency	Title	Year
Colorado	Colorado Department of Transportation	Statewide Transit Plan	2020
Colorado	Colorado General Assembly	House Bill 21-1266	2021
Colorado	Colorado Department of Transportation	Statewide Transportation Plan	2020
Colorado	Colorado Department of Public Health and Environment	Climate Equity Data Viewer	2021
Colorado	Denver Climate Action Task Force	Denver Climate Action 2020 Recommendations Report	2020
Colorado	Denver Human Services	Denver Human Services Index	2021
Colorado	City and County of Denver	Denver Neighborhood Equity Index	2021
Colorado	Colorado General Assembly	Senate Bill 21-260	2021
Federal	U.S. Department of Transportation	Final DOT Environmental Justice Order 5610.2(a)	2012

Source	Organization/Agency	Title	Year
Federal	Federal Highway Administration	Environmental Justice Analysis in Transportation Planning and Programming: State of the Practice	2019
Federal	U.S. Environmental Protection Agency	National Measures Technical Appendix for the EJ 2020 Action	2016
Federal	U.S. Department of Energy	Environmental Justice Strategy	2017
Federal	National Academy of Sciences	TCRP Research Report 214—Equity Analysis in Regional Transportation Planning Processes, Volume 1—Guide	2020
Federal	Executive Office of the President	Executive Order 13985: Advancing Racial Equity and Support for Underserved Communities Through the Federal Government	2021
Federal	The Federal Interagency Working Group on Environmental Justice	Promising Practices for EJ Methodologies in NEPA Reviews	2016
Other States/MPOs/Counties	Omaha-Council Bluffs Metropolitan Area Planning Agency	Transportation Improvement Program	2020
Other States/MPOs/Counties	California Office of Environmental Health Hazard Assessment	CalEnviroScreen	2021
Other States/MPOs/Counties	Portland Department of Transportation	Equity Index	2021
Other States/MPOs/Counties	North Central Texas Council of Governments	Environmental Justice Index	2021
Non-profit organizations	Greenlining Institute	Mobility Equity Framework	2018
Non-profit organizations	Greenlining Institute	Clean Mobility Equity: A Playbook	2021
Non-profit organizations	Urban Institute	Access to Opportunity through Equitable Transportation	2020
Non-profit organizations	PolicyLink	Equity Manifesto	2018
Non-profit organizations	Transform	A Framework for Equity in New Mobility	2017
Non-profit organizations	LINK Houston	Equity in Transit	2020

The review uncovers several key trends. One of the most important to note is that no single definition is in use to define communities that are at the focus of equity-driven efforts, at either the Federal or State level. To identify equity-focus communities, agencies use a variety of terms, including disadvantaged, equity-focused, underserved, underrepresented, disproportionately impacted, transportation disadvantaged, and under-resourced communities. ‘Environmental justice community’ is also sometimes used, generally indicating the use of baseline equity indicators (i.e., low-income and people of color).

At a minimum, the definition of an ‘equity-focus community’ includes individuals who are people of color and/or low-income individuals. ‘People of color’ include individuals who are Black, Hispanic/Latino, Asian American, and Native American or Alaska Native. Low-income is often assessed by comparing an individual’s income to Federal poverty guidelines (as determined by the Department of Health and Human Services) or local median household income. In both cases, a threshold percentage is used. Individuals

whose income falls below 200 percent of Federal poverty guidelines might be identified as ‘low-income’ in one context, whereas individuals whose income falls below 85 percent of area median household income would be classified as ‘low-income’.

Note also that while ‘minority’ is often used in guidance documents to refer to people of color to reflect that at some point in the past many of these groups have been racial minorities within their communities, it has become more common to use ‘people of color.’ This shift in language reflects the fact that, in many cases, these groups are now the racial majority in their community, and that ‘minority’ may carry an unintended negative connotation. The project team’s review of resources continues to use the word ‘minority’ where it is used in the reviewed report, but generally shifts to ‘people of color’ elsewhere.

The literature shows that some definitions of equity-focus community take a more inclusive approach, expanding to include more demographic characteristics. A selection of both baseline and comprehensive indicators gathered from the literature are summarized by indicator group in Table 10.

Table 10 Indicators Identified in the Literature by Indicator Group

Indicator group	Measures
Baseline equity indicators	<ul style="list-style-type: none"> • Low-income (calculated based on median household income or poverty status) • People of color (any race/ethnicity aside from non-Hispanic white alone)
Access to transportation	<ul style="list-style-type: none"> • Access to education • Access to full-service grocery stores • Access to jobs • Access to parks/open spaces • Access to services • Food deserts
Air quality	<ul style="list-style-type: none"> • Diesel PM • Ozone • PM 2.5
Built environment	<ul style="list-style-type: none"> • Average block perimeter • Compact neighborhood score • Household density • Population density • Street intersection density • Traffic proximity and volume
Educational attainment	<ul style="list-style-type: none"> • Adults with less than a high school diploma • Children not participating in preschool • Children not reading at grade level by 3rd grade
English-language proficiency	<ul style="list-style-type: none"> • Limited English proficiency • Linguistic isolation (i.e., households in which all members 14 years of age and older speak a non-English language and speak English less than 'very well') • People who speak a language other than English at home

Indicator group	Measures
Environmental exposure (not included in air quality group)	<ul style="list-style-type: none"> • Drinking water contaminants • Groundwater threats • Hazardous waste generators and facilities • Impaired water bodies • Lead paint • Pesticide use • Proximity to National Priorities List sites • Proximity to Risk Management Plan sites • Wastewater discharge
Health	<ul style="list-style-type: none"> • Access to first trimester care during pregnancy • Asthma hospitalization rate • Cardiovascular disease • Life expectancy • Low birth weight infants • Obesity (in general population, children, and/or teens) • Teen births
Natural disaster and climate risk exposure	<ul style="list-style-type: none"> • Drought • Flood • Wildfire
Socioeconomic factors (not addressed elsewhere)	<ul style="list-style-type: none"> • Age (over 65 years of age or under 18 years of age) • Disability • Foreign-born populations • Households without Internet access • Housing cost burden • Number of SNAP (food assistance) eligible people that are not enrolled • Presence of populations with unique mobility considerations (e.g., Amish communities)
Traveler characteristics	<ul style="list-style-type: none"> • Workers commuting by transit • Zero-vehicle households

It is important to note that the data used to develop an index depends entirely on availability. In many cases, more indicators might be appropriate, but no data set that offers the appropriate level of geographic coverage is available (for example, LINK Houston observed that regional sidewalk presence and condition would have been included in their index had the dataset been available). Data can be expensive to collect, be released at a delay, and be technically complicated to process. As a result, the data used to develop an index or identify the presence of an equity-focus community may already be out-of-date and not reflect current conditions on the ground.

In determining whether a particular area should be identified for the presence of an equity-focus community, several approaches are used. In general, equity analysis reviewed in this literature review finds that transportation agencies and organizations use geographic boundaries established by the United States Census (U.S. Census), typically a census tract or census block group.

To establish the presence of EV equity communities, it is common to use a threshold approach. Using the threshold approach, where the concentration of individuals who are people of color within a census tract

exceeds an identified threshold concentration (typically a regional average), that census tract will be identified as having a high proportion of individuals who are people of color. This approach can be problematic for several reasons, especially the possibility that large concentrations of people of color might be overlooked where the overall population is large, or the tendency for such thresholds to appear arbitrary. These pitfalls are explained in greater detail in *TCRP Research Report 214: Equity Analysis in Regional Transportation Planning Processes*.¹⁷⁴

To address the challenges associated with using a threshold approach, several approaches have been recommended and used in equity analysis. The FHWA report *Environmental Justice Analysis in Transportation Planning and Programming: State of the Practice*¹⁷⁵ also provides a number of alternate approaches. Some of the approaches identified across the literature include:

- Developing an index of multilayered EV equity communities to identify regionally specific needs. This approach should use the percentage population of interest (e.g., 25 percent of individuals in a block group) to calculate a cumulative index score.
- Test differences for statistical significance to confirm that variation does not occur by chance.
- Use standard deviations to characterize level of need or areas of focus (e.g., areas where the concentration of an equity-focus community is more than one standard deviation higher than the regional average might be assigned a category of ‘high need’ versus ‘low need’).
- Supplement data analysis with qualitative methods that allow for different types of input (e.g., the presence of informal transit networks).

Ultimately, public engagement is critical. Without community input on the analysis methodology, it is possible to develop measures that do not reflect the lived experience of specific communities. Both the definition of ‘equity-focus community’ and the process for defining an equity-focus community is changing, particularly in light of events following the death of George Floyd in the spring of 2020. An emerging best practice is for community members to co-define demographic characteristics to ensure that the most vulnerable are included to create the most comprehensive definition of an equity-focus community. This practice can help ensure, for instance, that a large community of Vietnamese speakers with Limited English proficiency is not overlooked by broadly summarizing the local Asian population, or that a large population of retirees is not hidden within a broadly defined ‘transit dependent’ population. Identifying these communities helps to make programs more successful by highlighting unique needs.

The review identifies many common themes that focus on equitable outcomes, and all highlight the importance of fair treatment and meaningful involvement of all people regardless of race, color, national origin, and income, as required through Title VI of the Civil Rights Act. Transportation equity is further specified as equal and fair access to affordable transportation and mobility for all community members. Some documents focus on equity in the process (for example, encouraging equitable participation in

¹⁷⁴ National Academies of Sciences, Engineering, and Medicine. 2020. TCRP Report 214: Equity Analysis in Regional Transportation Planning Processes, Volume 1: Guide. <https://doi.org/10.17226/25860>

¹⁷⁵ FHWA. 2019. Environmental Justice Analysis in Transportation Planning and Programming: State of the Practice. <https://rosap.ntl.bts.gov/view/dot/43567>

decision-making), where others spotlight equitable outcomes (such as reducing disproportionate impacts of pollution, or ensuring that all groups can affordably access certain interventions).

Several transportation agencies have identified project prioritization as an important tool to repair past injustices (i.e., prioritizing projects that serve traditionally underserved or disproportionately impacted communities). At a Federal level, a great deal of emphasis is placed on methods for conducting an equity analysis as required under Title VI of the Civil Rights Act or conducting an environmental justice analysis as required under the National Environmental Policy Act (NEPA). Both of those approaches are project or program-specific and seek to avoid adverse impacts to people of color and low-income populations in project and program delivery.

A growing body of research focuses on the appropriateness of considering equity impacts during policy design, particularly driven by non-profit organizations like the Greenlining Institute, PolicyLink, and Transform. These organizations highlight the importance particularly of considering equity throughout the policy development, and the absolute criticality of including public input in all mobility work, and to incorporate public input in setting appropriate measurements for success.

3.2 Definitions of EV Equity and EV equity communities

From these definitions and considerations above, the project team defined ‘EV equity’ to refer broadly to any policy, strategy, engagement, assistance, or other resource that supports equitable access to electric transportation and its benefits. For a complete list of the resources reviewed to support this study, please see the Appendix.

The definition of EV equity communities proposed in this chapter complements the EV Equity definition. Both are informed by special considerations specific to transportation electrification as well as factors that are likely to influence equitable access to electrified transportation or the benefits of electrified transportation. While the data indicators selected are indicative of where concentrations of EV equity communities currently reside and may provide insight into where EV equity communities have historically been underserved, it is important to note that additional factors may influence the adoption of electric vehicles. In other words, data can identify “EV equity communities,” but every community is different, and specific needs must emerge based on feedback from people residing in the communities described here through a process of thoughtful community engagement.

3.3 A Review of Data Variables

The framing of the equity definitions is guided by the understanding that EV equity communities may share a number of socioeconomic characteristics that, taken together, present a complicated array of challenges—only one of which is obtaining transportation. The factors selected were chosen for their usefulness in identifying (at the level of a desktop review) the key characteristics that may deter community members from participating in the electrification economy. The questions the project team used to guide this review include:

1. What are the leading demographic factors that can impede access to electrification?
1. Where are residents facing housing and transportation expenditure burdens?
2. Which communities would benefit from community-wide solutions?

3. How should we identify communities where individual, or household-level interventions would be more needed?

Through this process, two themes emerged: First, an individual's socioeconomic characteristics can influence EV adoption (as a personal automobile). Second, a community's current transportation mobility options can provide insight into suitable EV interventions. Note that these indexes are distinct from other indexes developed to support prioritization (described in Chapter 4).

To support an analysis of both factors, two groups of indicators were identified as important. The first group of indicators form the **socioeconomic index**, meant to capture the degree of financial burden that might impede participation in the electrification economy. For example, low- to moderate-income households, people with lower educational attainment, and residents with limited English proficiency, are all likely to have a higher proportion of their incomes set aside for transportation and housing costs.

The second group of indicators form the **transportation index**, and are meant to capture both transportation costs, as well as disparities in access to transportation that might be caused by the built environment or access to services. For example, residents in communities with no or low-quality transit tend to be more dependent on cars, are likely to drive more, and generally have higher transportation costs. This can contribute to financial strain, congestion, and air quality issues.

The data to support the analysis are drawn from two sources:

- U.S. Census Bureau, American Community Survey program, 2015-2019 ACS 5-Year Estimates¹⁷⁶
- Center for Neighborhood Technology's AllTransit^{TM177}

In striving for consistency with other efforts in Colorado, the analysis follows a similar approach as is used for the Climate Equity Data Viewer developed by the Colorado Department of Health and the Environment.¹⁷⁸ That tool summarizes data at the census block group level, categorizing communities based on important characteristics (e.g., urban vs. rural). This approach is reflective of the wide variety of human environments that Colorado residents enjoy, from densely-populated downtown Denver to ranching communities on the eastern plains.

To account for the varying geographies, census block groups are categorized based on their population densities as urban, rural, or frontier communities. Oil and gas communities are not included separately in the CO EV Equity Study due to the overlap of these communities with rural and frontier communities.

- Urban areas include census block groups with their centroids in U.S. Census delineated Urbanized Areas (50,000 or more people) and Urban Clusters (between 2,500 and 50,000 people).

¹⁷⁶ U.S. Census. 2021. American Community Survey (ACS). <https://www.census.gov/programs-surveys/acs/>.

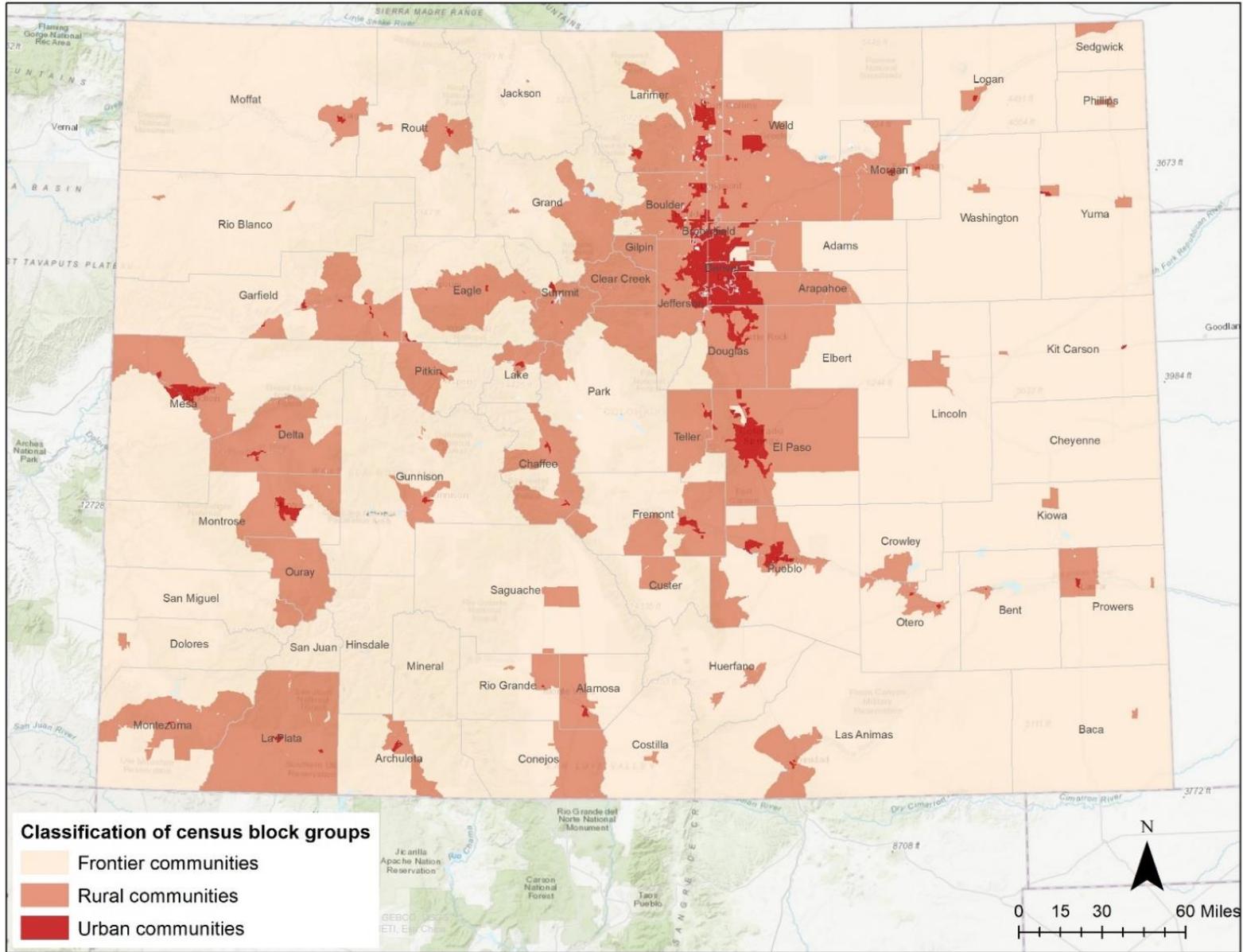
¹⁷⁷ Center for Neighborhood Technology. 2019. AllTransit Methods. <https://alltransit.cnt.org/methods/AllTransit-Methods.pdf>.

¹⁷⁸ <https://storymaps.ArcGIS.com/stories/be558ce8cb1f49f98a18d35d36d8156b>.

- Rural communities include block groups outside urban areas with densities greater than six people per square mile; and
- Frontier communities have six people or fewer per square mile.

The classification of census block groups is included in the next figure (Figure 1)..

Figure 1 Classification of Census Block Groups



3.4 Developing the Indexes

To identify the indicators that would meaningfully capture important significant underlying barriers to transportation electrification, the project team used the following method:

1. Build an index with as many variables as possible,
2. Identify any variables that have a high level of correlation,
3. Eliminate variable(s) with a high degree of correlation,
4. Rerun the analysis with the reduced variable set,
5. Eliminate variable(s) with a low degree of correlation with the overall index.

3.5 Socioeconomic Index

The initial list of data variables considered to create the socioeconomic index in each of the geographic areas are presented below. All the data are from the U.S. Census Bureau, American Community Survey program, 2015-2019 ACS 5-Year Estimates:

1. People of color
2. Percentage renters
3. Low- and moderate-income households (population living in a household where income was less than 200 percent Federal poverty guidelines)
4. Percentage of population with a disability
5. Percentage of limited English proficiency households
6. Adults with less than high school education
7. Cost-burdened households (i.e., the percentage of households that pay more than 30 percent of their income for housing)
8. Population under 5 years of age
9. Population over 64 years of age
10. Overcrowded housing (i.e., percentage of households with more than one person per room)
11. Percentage of households in poverty
12. Percentage of workers not employed (i.e., the percentage of unemployed population over 16 years of age in the civilian labor force)

13. Income per capita

14. Multifamily housing (i.e., all housing units other than single family detached)

Many of these factors may be related. For example, it intuitively follows that an area with a large number of households with more than one person per room is likely to also be an area with a larger amount of multifamily housing. In developing an index of indicators, the project team sought to avoid applying undue weight to indicators that likely reveal similar underlying socioeconomic conditions. Where a high degree of covariance is identified, a variable can be dropped with minimal influence on the final index. Table 11 shows the results of a test of variables that illustrates the results of the correlation test for the urban communities.

Table 11 Correlation Coefficients of the Percentile of Each Variable in Relationships of All Other Variables¹

1. People of color		35	54	21	55	68	34	30	36	51	41	15	63	19
2. Percent renters	35		65	21	31	30	60	20	31	36	60	16	44	76
3. Low- and moderate-income households	54	65		40	41	58	56	4	23	45	81	26	77	44
4. Percent population with a disability	21	21	40		7	34	15	11	26	10	33	18	42	9
5. Percent Limited English proficiency	55	31	41	7		51	28	19	24	42	33	8	41	25
6. Adults with less than high school education	68	30	58	34	51		29	20	15	45	45	16	64	13
7. Cost-burdened households	34	60	56	15	28	29		3	26	29	47	15	46	49
8. Pop. under 5 years of age	30	20	4	11	19	20	3		32	29	4	3	30	27
9. Pop. 65+ years of age	36	31	23	26	24	15	26	32		31	18	5	26	18
10. Overcrowded housing	51	36	45	10	42	45	29	29	31		35	13	47	29
11. Percent of households in poverty	41	60	81	33	33	45	47	4	18	35		27	60	41
12. Percent of workers not employed	15	16	26	18	8	16	15	3	5	13	27		27	7
13. Income per Capita	63	44	77	42	41	64	46	30	26	47	60	27		20
14. Multifamily housing	19	76	44	9	25	13	49	27	18	29	41	7	20	
Overall Index	70	69	88	50	55	72	63	16	19	57	77	38	83	50

¹ Numbers show the absolute value of the percentage. A high value is indicated with a lighter color, and a low value is indicated with a darker color.

The project team identified only one pair of variables that were strongly correlated: 3) low- and moderate-income households and 11) percent of households in poverty. The project team elected to remove the low- to moderate-income households in order to focus on the poorest population. The variables measuring the percentage of children and seniors had a low correlation (less than 20 percent) with the overall index, so they were also dropped. The recalculated index, using only these (10) variables, is more evenly distributed, which suggests that each indicator plays an important role in differentiating

the communities studied. This process was repeated until the final correlation coefficients with the cumulative index were more evenly distributed and no single variable dominated the index.

A similar approach was applied in creating the indexes for rural and frontier block groups. The covariance analysis in these communities resulted in two different sets of variables that comprise the respective socioeconomic indexes and transportation indexes.

3.6 Transportation Index

Independent of the socioeconomic variables included in the socioeconomic index developed above, the project team developed a transportation index to focus on issues specific to transportation. The initial list of indicators analyzed consisted of car ownership, commute mode share, and transit access variables. The mode of commute and vehicle ownership data are from the U.S. Census Bureau, American Community Survey program, 2015-2019 ACS 5-Year Estimates. Note that job access via a 30-minute transit trip and the AllTransit Performance Score are only available in urban areas, and therefore were not tested for either frontier or rural block groups.

15. Transportation costs as a percentage of income (modeled transportation costs associated with auto ownership, auto use, and transit use),
16. Percent non-single vehicle occupancy commute
17. Percent of zero vehicle households,
18. Percent of one vehicle households,
19. Job access via a 30-minute transit trip, and
20. AllTransit Performance Score

Table 12 summarizes the final indicators used to calculate the socioeconomic and transportation indexes in the urban, rural and frontier communities.

Table 12 Socioeconomic and Transportation Indicators

Indicator Group	Urban Indicators	Rural Indicators	Frontier Indicators
Socioeconomic	<ul style="list-style-type: none"> • People of color • Percent population with a disability • Percentage of Limited English proficiency households • Cost-burdened households • Overcrowded housing • Percentage of households in poverty • Percentage of workers not employed • Multifamily housing 	<ul style="list-style-type: none"> • Percent population with a disability • Percentage of Limited English proficiency households • Cost-burdened households • Population Under 5 Years of Age • Overcrowded housing • Percentage of workers not employed • Multifamily housing 	<ul style="list-style-type: none"> • Percent population with a disability • Percentage of Limited English proficiency households • Less than high school education • Cost-burdened households • Population Under 5 Years of Age • Overcrowded housing • Percentage of workers not employed • Multifamily housing
Transportation	<ul style="list-style-type: none"> • Transportation costs as percent of income • Percent non-single vehicle occupancy commute • Percent of zero vehicle households • Percent of one vehicle households • Job access via a 30-minute transit trip • AllTransit Performance Score 	<ul style="list-style-type: none"> • Transportation costs as percent of income • Percent non-single vehicle occupancy commute • Percent of zero vehicle households • Percent of one vehicle households 	<ul style="list-style-type: none"> • Transportation costs as percent of income • Percent non-single vehicle occupancy commute • Percent of zero vehicle households • Percent of one vehicle households

3.7 Scoring Methodology

Each of the final variables chosen is assigned a percentile value by ordering the values from lowest to highest. This methodology is identical to the methodology used by the CalEnviroScreen tool, which assigns a percentile ranking to identify census tracts in California most affected by pollution. The project team’s review of equity definitions and considerations revealed this method as a best practice to identify geographic disparity.¹⁷⁹

By this method, census block groups with a high percentage of people of color would have a high percentile score to correspond to its ranking within the State. All variables’ percentile ranking is calculated. The average of these percentiles is then calculated for each block group and standardized on a scale of 0 to 100. Higher scores indicate a greater level of need based on socioeconomic indicators and a greater level of need based on transportation disparity.

¹⁷⁹ Office of Environmental Health Hazard Assessment. 2017. CalEnviroScreen 3.0. <https://oehha.ca.gov/media/downloads/calenviroscreen/report/ces3report.pdf>.

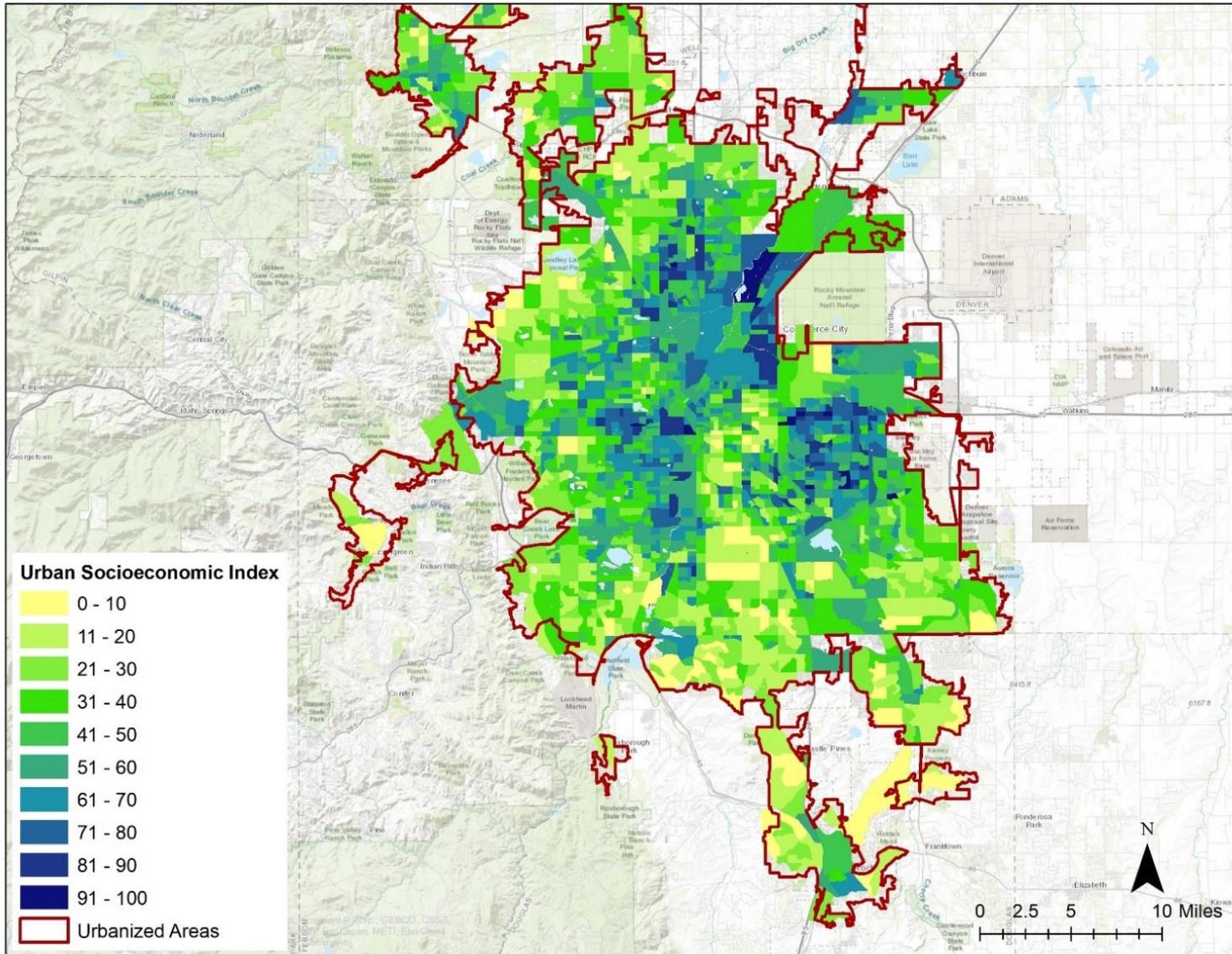
The percentile ranking method minimizes the influence of outliers in the dataset. This is especially useful when evaluating data across large areas such as statewide data.

3.8 Using the Indexes

The geography-specific indexes serve as a baseline for identifying EV equity communities. Block groups that have a higher score can be understood to be higher priority for interventions related to EV equity. However, additional relevant data variables must be layered on to the index to tailor interventions for different communities (see Chapter 4). The further involvement of CBOs and community engagement in planning and designing programs for electric vehicle adoption is necessary to prevent unintended consequences that past plans and investments have perpetrated.

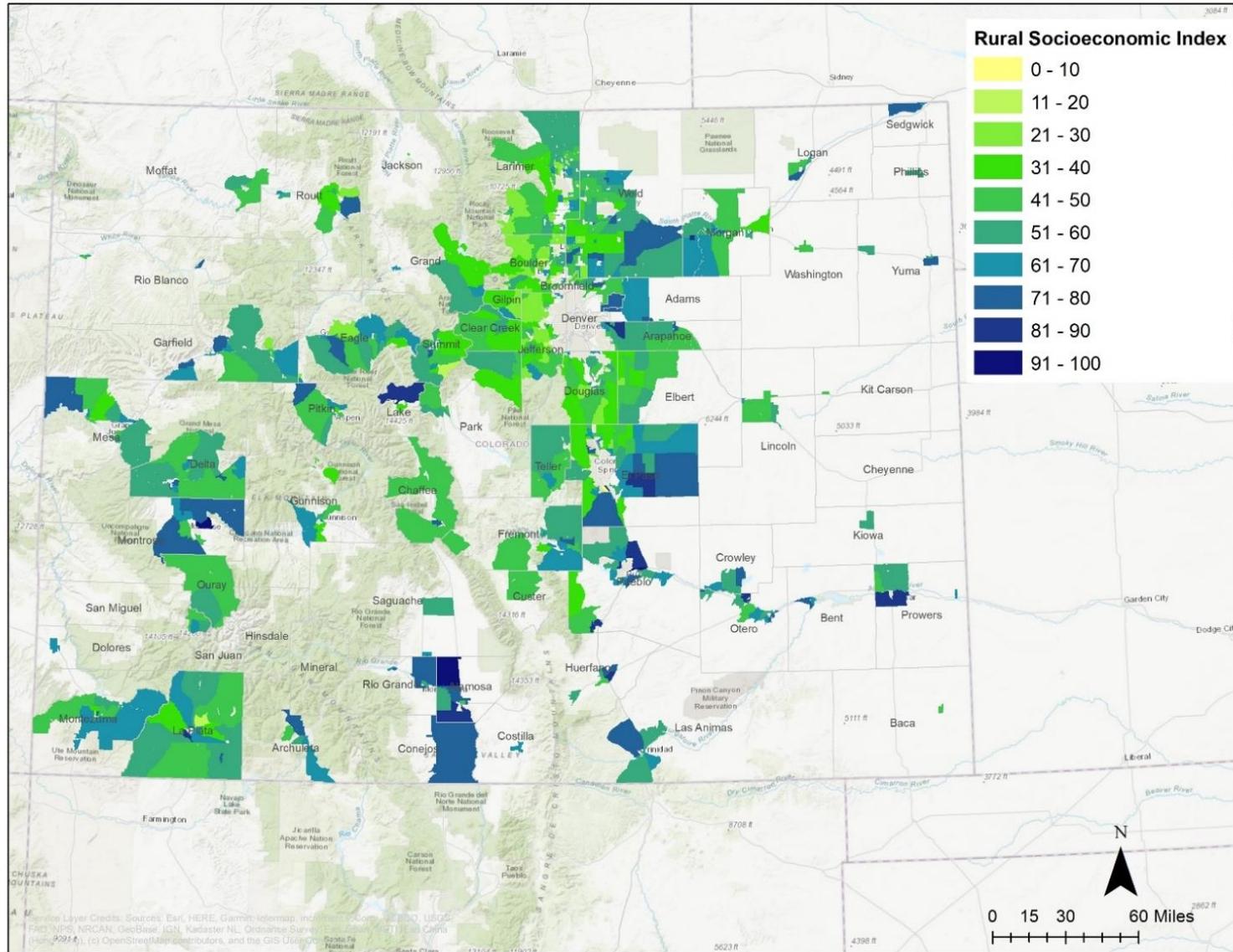
Maps summarizing the calculated urban socioeconomic index, rural socioeconomic index, frontier socioeconomic index, urban transportation index, rural transportation index, and frontier transportation index follow below, starting with (Figure 2).

Figure 2 Urban Socioeconomic Index (Focus Denver)¹



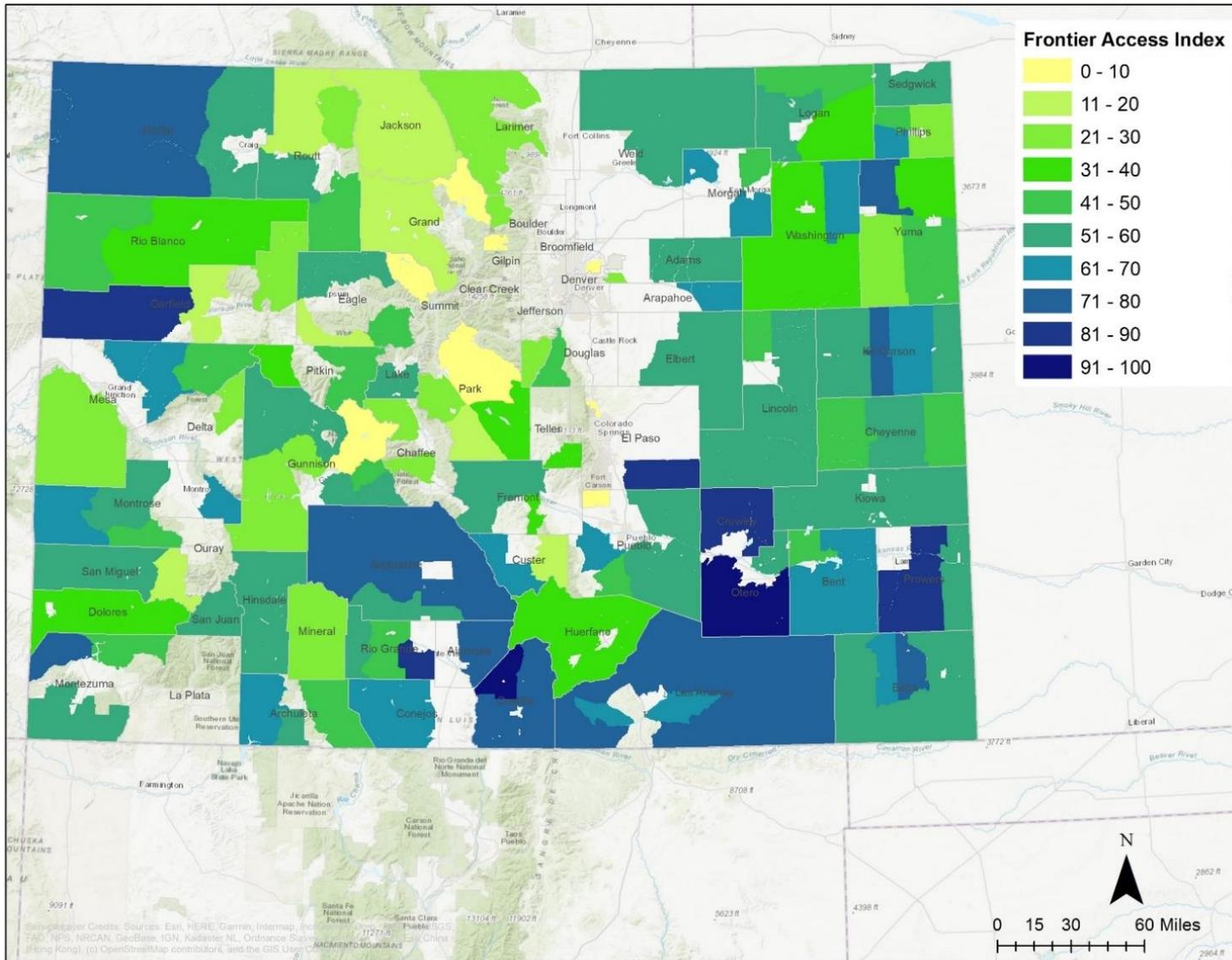
¹ Block groups with higher scores have higher cumulative socioeconomic vulnerabilities.

Figure 3 Rural Socioeconomic Index¹



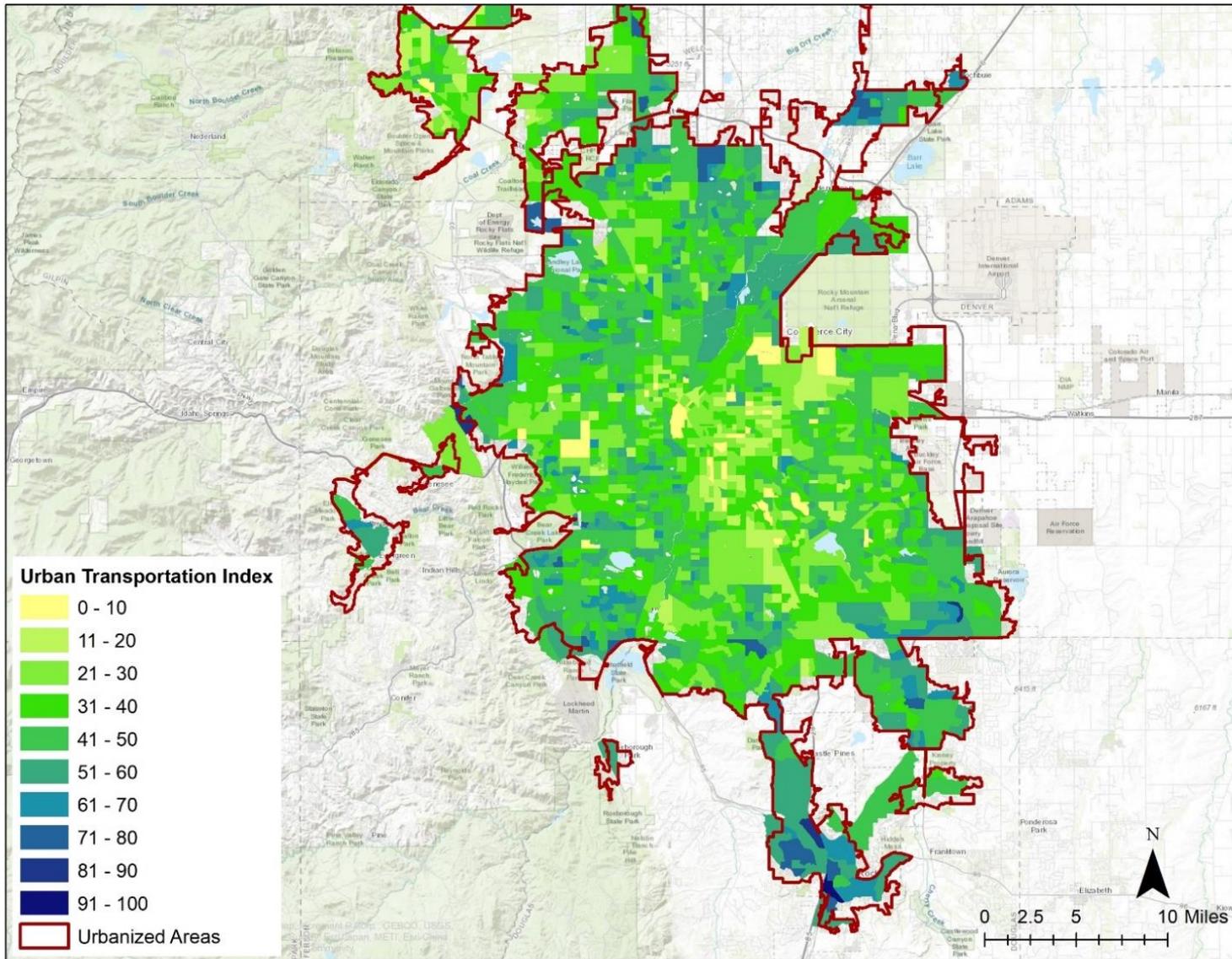
¹ Block groups with higher scores have higher cumulative socioeconomic vulnerabilities.

Figure 4 Frontier Socioeconomic Index¹



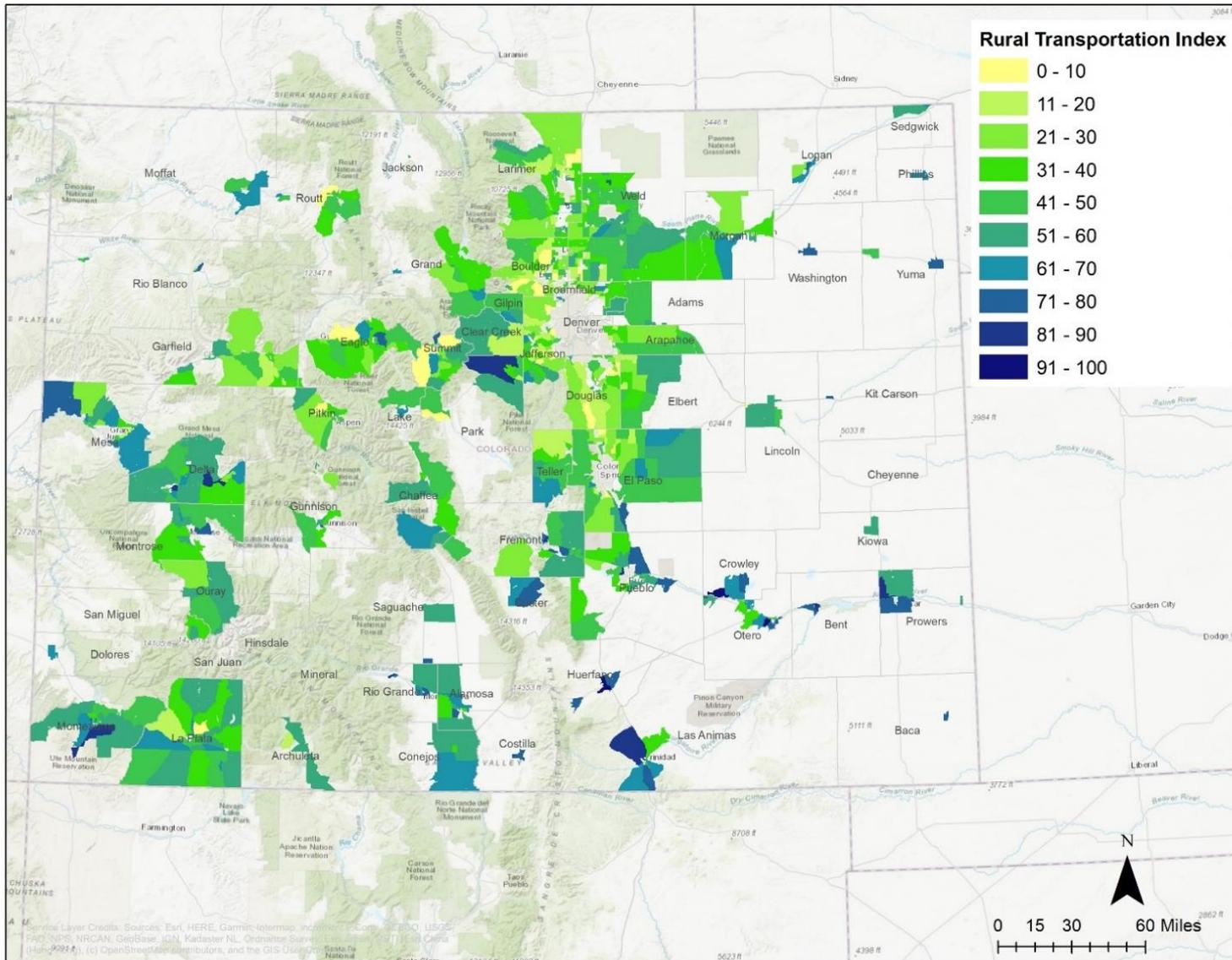
¹ Block groups with higher scores have higher cumulative socioeconomic vulnerabilities.

Figure 5 Urban Transportation Index¹



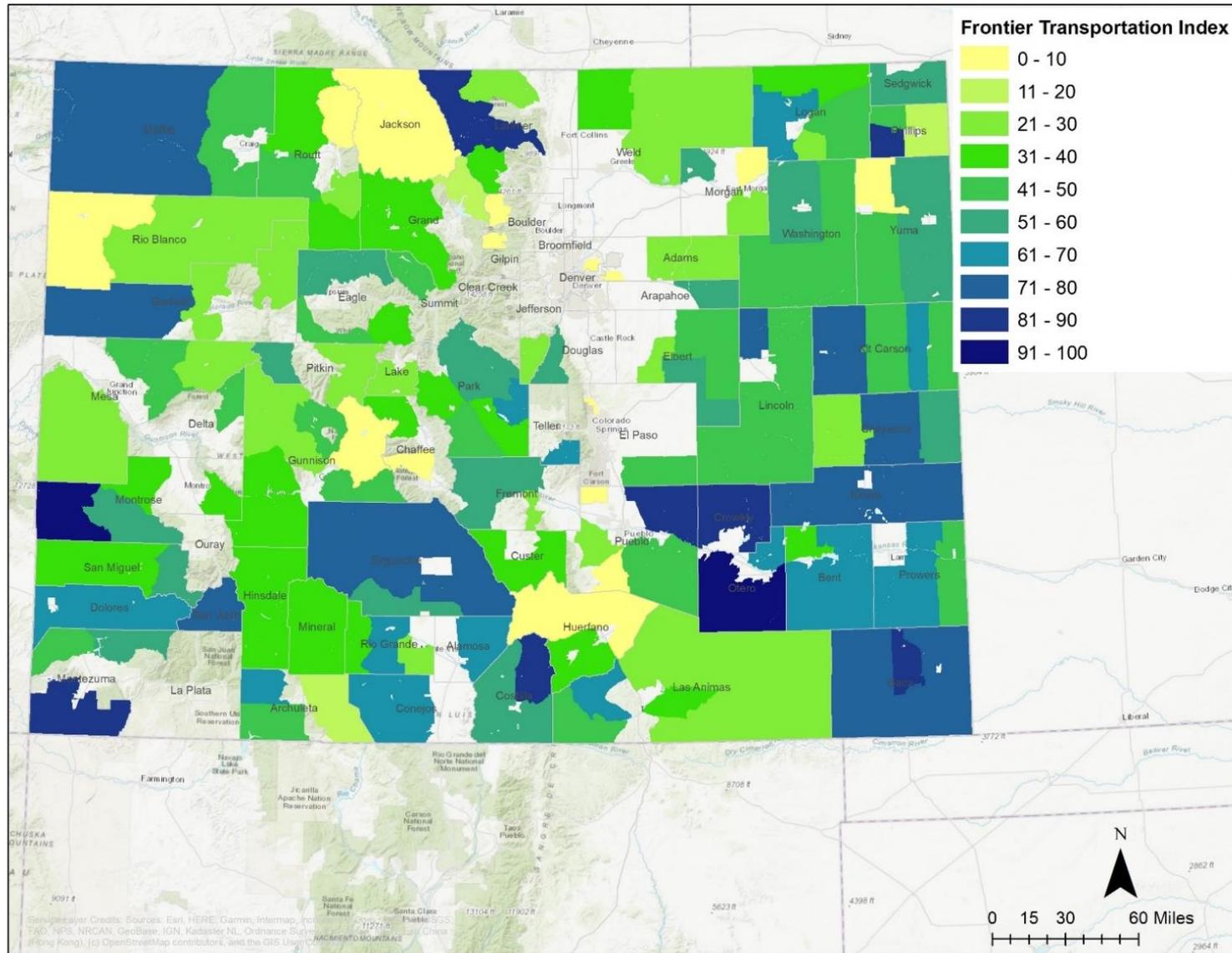
¹ Block groups with higher scores have higher cumulative transportation-related vulnerabilities.

Figure 6 Rural Transportation Index¹



¹ Block groups with higher scores have higher cumulative transportation-related vulnerabilities.

Figure 7 Frontier Transportation Index¹



¹ Block groups with higher scores have higher cumulative transportation-related vulnerabilities.

Section 3: Techniques

4.0 Project, Program, and Policy Prioritization Tools

To better understand the State’s needs with respect to equitable electrification, the project team developed three tools: an EV Equity Dashboard, a place-based project prioritization tool that focuses on where transportation electrification and related resources are currently located, and a survey tool that will allow program managers to evaluate how different populations experience existing transportation electrification programs. The three tools meet distinct but complementary needs with respect to ensuring equitable access to the benefits of transportation electrification: 1) highlighting areas that are underserved, and 2) highlighting areas for improvement amongst underserved individuals.

4.1 EV Equity Dashboard

Data Collection Process

Before paring down to the indicators that would be included in the mapping tool, the team developed a list of candidate datasets and went through a data gathering process to identify and procure as many of these datasets in as recent vintage as possible. A summary of this data gathering process follows below. For consistency with the Colorado Department of Public Health and Environment’s Climate Equity Data Viewer, which uses the census block group as the primary geographic unit of analysis, the project team gathered as much data as possible at the block group level. For the purposes of the EV Equity Dashboard in which the user can explore in detail each indicator, the project team retained the geography in which each dataset was received except for the annual average daily traffic (AADT) counts from the Colorado Department of Transportation (CDOT), which were converted from line geometries to block group for the purposes of mapping.

For the data that are natively available in different geographic resolutions such as ZIP code, traffic analysis zone (TAZ) or school district, the project team used the ratio of overlapping areas to distribute the counts from these geographic layers to block group level geographies. For proportional data (for example, annual average energy costs by ZIP code), the project team used the area weighted average of proportions for data conversion. The point data that represents the location of charging stations are spatially joined with block groups to aggregate the counts of total ports by charger type at the block group level. The AADT data were collected from a highway shapefile (with line geometry), and the project team used spatial overlay to intersect this GIS layer with block group boundaries for aggregating the traffic counts.

Datasets Gathered

Socioeconomic data - These are the starting point for equity analysis. Socioeconomic indicators may be used to indicate areas of historic inequities, areas that have experienced a lack of investment, and areas that should be prioritized for certain types of investment. The following indicators were all sourced from the US Census Bureau’s American Community Survey program: Population density (per square mile), share of households in poverty, share of households with one vehicle, share of households with zero vehicles, share of housing units built before 1959, share of housing units occupied by renters, share of limited English proficiency households, share of multi-family households, share of cost-burdened households, share of overcrowded housing, share of people of color, share of population under 5 years of age, share of population with a disability, share of population with no high school degree, share of unemployed workers, and share of workers who did not drive alone to commute. The Colorado Department of Education

provided data on the percentage of students receiving free and reduced lunch percentage by school district. To summarize school district data at the block group level for use in the prioritization tool, the project team took the average free and reduced lunch percentage that applied at the school district level and assigned that percentage to the block groups based on land area.

Air quality and respiratory hazards - These are the starting point for understanding how communities are burdened by emissions. Asthma hospitalization rates were provided by the Colorado Department of Public Health and Environment (CDPHE). The ambient concentration of Diesel Particulate Matter (PM), emissions sources, and the National Air Toxics Assessment (NATA) Respiratory Hazard Index were provided by the EPA.

Housing - This is the starting point for understanding limitations that may prevent home-based, overnight charging. Renters, individuals living in older housing, and individuals living in multifamily housing may have less access to home charging. Older housing, built before 1959, was typically built with fuse boxes that supported 30- or 60-amp service, and are insufficient to meet the demands of overnight electric vehicle charging without an electrical upgrade. Renters have less control over their housing units to modify and install charging infrastructure. Individuals living in multifamily housing units like apartment complexes and condominiums often do not have access to garages and carports, which may more easily support home-based, overnight charging. In cases where carports are available, many lack access to an electrical outlet or a designated parking space. These data were drawn from the US Census bureau as well.

Transportation - These indicators represent a starting point for understanding communities that lack access to jobs and opportunities, as well as individuals who may prioritize non-traditional forms of transportation. Populations that pay a higher percentage of income on transportation costs are less likely to use a single occupancy vehicle to complete a commute, zero vehicle households, single vehicle households, and households that have less access to jobs within a 30-minute transit trip, or have a lower AllTransit Performance score (developed by the Center for Neighborhood Technology to indicate areas with less access to transit that is frequent, well-connected to jobs, or highly utilized). These data were drawn from the US Census Bureau's American Community Survey program and the Center for Neighborhood Technology.

Vehicle fleet mix - The vehicle fleet mix provides insight into areas with higher levels of uptake of EVs and PHEVs, areas with a higher percentage of older vehicles (likely to be more highly emitting vehicles), and areas with more Medium- and Heavy-Duty Vehicles (MHDV) (likely to be a more highly emitting vehicle on a per-vehicle basis). The project team received this data from CDPHE, which prepared a special tabulation for use in this study of the IHS Markit Vehicles in Operation & Vehicle Registration Data. The project team calculated the percentage of light duty EVs as a share of all light duty vehicles. The project team also summarized the number of medium and heavy-duty vehicles registered at the ZIP code level (with the caution that registration data may not also indicate areas where vehicles are used). To identify areas where higher concentrations of older vehicles may be located, the project team summarized areas with a high number of 10+ year old vehicles and 20+ year old vehicles.

Charging infrastructure - Charging infrastructure, both currently available and future needs, provides important information on where travelers will be able to charge their electric vehicles. For future EV charging needs (summarized by station), the project team used estimates developed in ICCT Working

Paper 2021-08: Colorado Charging Infrastructure Needs to Reach Electric Vehicle Goals.¹⁸⁰ For current EVSE (summarized by station and by port), the project team used the U.S. Department of Energy (DOE) Vehicle Technology Office’s Alternative Fuels Data Center data on the location of existing or planned charging stations, both public and private, with breakdowns by number of ports available for L1, L2, and DCFC. The project team summarized data current as of July 22, 2021, at the block group level. Specifically, the project team calculated the number of ports available within a half mile of block group centroids by charger type. Approximately one in eight public chargers serve only Tesla vehicles and are only accessible by Tesla drivers. As Tesla vehicles represent a large fraction of the current light duty EVs on the road, the project team retained these in the public category but allowed Tesla ports to be filtered out of the dashboard view.

Utility energy costs - The cost of electricity is a critical consideration for a successful transition to an EV future for residential households, commerce, and industry. The project team sourced this data at the ZIP code level from the Open Energy Data Initiative, a data lake repository that includes US Electric Utility Companies and Rates by ZIP code maintained by NREL from both private and public sector sources.¹⁸¹¹⁸² Average residential, commercial, and industrial electricity rates with likely ZIP codes for both investor-owned utilities (IOU) and non-investor-owned utilities are presented in the EV Equity Dashboard. Areas with higher energy costs may face a higher financial burden to transition to EVs. Some transportation electrification programs offer higher capital investment award amounts for applicants located in areas with higher average energy cost to support greater investment.

Travel model - Travel data can provide insight into areas where commuters are traveling greater distances to reach their destination. From CDOT, the project team incorporated modeled vehicle miles traveled (VMT) as calculated through the statewide activity-based travel demand model as a measure of travel intensity between block groups. The project team mapped and included in the indexes the VMT by home block group (trips made by residents, no matter their destination), as well as VMT by destination block group (trips made to that block group, no matter their origin).

Funding sources - Program spending for Charge Ahead Colorado (by the Regional Air Quality Council/RAQC and Colorado Energy Office/CEO) and the Volkswagen (VW) Settlement Transit Bus Replacement Program were provided by email from program managers. Funding by ALT Fuels Colorado was drawn from a list of fleets receiving funding available online.¹⁸³ The spending for ALT Fuels was assigned based on the awardee’s address or, where multiple addresses were found, the address closest to a major population center. Note that the addresses provided to ALT Fuels likely reflected the registration address for the vehicle but may not reflect the area where the vehicle is in service.

Special Considerations

It is common for data to require some interpretation. The VMT counts used in this analysis represent simulated travel and not observed travel (as is the case with all travel demand models); results have not been validated to the TAZ level and may over or underestimate actual travel; the model also estimates

¹⁸⁰ <https://theicct.org/publications/colorado-charging-infra-feb2021>

¹⁸¹ [https://openei.org/wiki/Open_Energy_Data_Initiative_\(OEDI\)](https://openei.org/wiki/Open_Energy_Data_Initiative_(OEDI))

¹⁸² <https://data.openei.org/submissions/4042>

¹⁸³ <https://cleanairfleets.org/afc-award-page>

transit, bicycle, and pedestrian trips, but those trip summaries are not included in this dashboard; income is modeled in 2010 dollars; and VMT is for personal travel only (not commercial vehicle travel).

Table 13 includes all of the data for use in the EV Equity Dashboard and Prioritization Tool.

Table 13 Data Gathered for Use in the EV Equity Dashboard and Prioritization Tool

Indicator	Details	Vintage Year(s)	Publication Year	Source Agency/Org	Format	Geographic Resolution	Access Type	Frequency of Update
AADT on CDOT highways	These data represent the annual average daily traffic counts (AADT) and annual average daily truck traffic counts (AADT Trucks) on the segments of public highways maintained by the Colorado Department of Transportation (CDOT). The highways include interstates, U.S. highways State highways. Public data source.	2019	2021	CDOT	CSV, KML, Shapefile, GeoJSON	Line	Public	Annual
Vehicle miles traveled (VMT) by destination zone	Modeled VMT as calculated through the statewide activity-based travel demand model. The statewide model summarizes trips between origin-destination traffic analysis zone (TAZ) pairs by household income (low income or less than \$30K, modest income or \$30K-\$60K, middle income or \$60K-\$100K, upper income or \$100K-\$150K, and top income or \$150K+), mode (i.e., drive alone, shared ride with two persons, shared ride with 3+ persons), and purpose of the trip (i.e., work, school, shop, meal, personal business, social recreational, and escort). Data only available upon request.	2015	2018	CDOT	CSV	Traffic Analysis Zone (TAZ)	Private	Dependent on funding
Asthma hospitalization rate (per 100K)	These data show the Age-Adjusted Colorado Census Tract Rate of Asthma-Related Hospital Discharges (2013-2017) and Inpatient Hospitalizations per 100,000 persons based on the ICD-10 Code of J45-J46. The rates are based on the geocoded billing address of discharged individuals with the selected ICD-10 Codes and 2013-2017 Population Estimates from the American Community Survey. Public data source.	2013-2017 5-Year Estimates, CDPHE Hospitalization data 2016	2019	CDPHE	CSV, KML, Shapefile, GeoJSON	Census Tract	Public	Annual

Indicator	Details	Vintage Year(s)	Publication Year	Source Agency/Org	Format	Geographic Resolution	Access Type	Frequency of Update
Total vehicle registrations by ZIP Code	Special data tabulation provided by the CDPHE that includes anonymized make, model, model year, vehicle type, gross vehicle weight class (through class 2a or GVW of less than 8,500 lbs.), fuel type, body class, body style, vehicle year, city, State, and ZIP code. Data sourced from CO DMV and Polk IHS. Data available only by purchase.	All vehicles registered in the State of Colorado through January of 2021.	2021	CDPHE	CSV	Census Block Group	Private	Varies
AllTransit performance score	The CNT AllTransit Performance Score, at the census block group scale, reflects the overall quality of transit in relation to the actual use of transit. It is calculated with an ordinary least square fit using the Transit Connectivity Index (“can I get transit?”) combined with a job accessibility metric (Jobs Accessible in 30 Minute Transit Ride) and weighted to reflect the fraction of people who use transit to get to work. It includes control variables for households and location (i.e., people per household, household income, commuters per household, block size, fraction of renters, fraction of single-family homes, and transit access shed size). The weighted sum from this regression is scaled from zero to 100, and then rescaled by percentile to get an even distribution of scores on a scale from zero to 10 where zero represents no connectivity to transit and 10 represents the highest relative transit connectivity in the country. [see: https://www.cnt.org/tools/alltransit] Data available on request.	2018 Transit data, 2013-2017 5-Year Estimates, 2015 Longitudinal Employment-Household Dynamics	2018	CNT	CSV	Census Block Group	Private	Dependent on funding

Indicator	Details	Vintage Year(s)	Publication Year	Source Agency/Org	Format	Geographic Resolution	Access Type	Frequency of Update
Job access via a 30-minute transit trip	See AllTransit Performance Score	2018 Transit data, 2013-2017 5-Year Estimates, 2015 Longitudinal Employment-Household Dynamics	2018	CNT	CSV	Census Block Group	Private	Dependent on funding
Transportation costs as percent of income	<p>The metric combines data on auto ownership, auto use, and transit use as dependent variables in a multidimensional regression to estimate the cost of transportation, while accounting for household and local environment variables as independent variables (i.e., median household income, household size, commuters per household, household residential density, walkability and street connectivity, transit connectivity and access, and employment access and diversity). With regression equations that produce the best possible fit from all the independent variables, the predicted results were multiplied by the appropriate price for each dependent variables (autos, miles, and transit trips) to obtain individual transportation costs for that component. Total transportation costs were calculated as the sum of the three cost components as follows: Where: C = cost factor (i.e., dollars per mile) F = function of the independent variables (FAO is auto ownership, FAU is auto use, and FTU is transit use) Public data source.</p>	2015 National Transit Database (transit cost), 2010 Consumer Expenditure Survey (inflated to 2013 dollars) (auto ownership cost), 2013 Illinois odometer readings (auto usage)	2017	CNT	CSV	Census Block Group	Private	Dependent on funding

Indicator	Details	Vintage Year(s)	Publication Year	Source Agency/Org	Format	Geographic Resolution	Access Type	Frequency of Update
Free and reduced lunch % by school district	School Level data is reported for the 2016-2017 school year based upon the Fall Pupil Membership (Student October) data. Data used includes 2016-2017 K-12 Pupil Membership by School and Free and Reduced Lunch Eligibility. Public data source.	2016-2017	2017	CO Department of Education	XLSX	School district	Public	Irregular/unknown
Major roads	Polyline (linear) geographic features representing public roads under local jurisdiction that are functionally classified as arterials or collectors. Public data source.	2018	2021	CDOT	CSV, KML, Shapefile, GeoJSON	Line	Public	As Needed
Average cost of energy	U.S. Electric Utility Companies and Rates: Look-up by ZIP code (2019). This dataset provides average residential, commercial, and industrial electricity rates with likely zip codes for both investor-owned utilities (IOU) and non-investor-owned utilities. Note: the files include average rates for each utility (not average rates per zip code), but not the detailed rate structure data found in the [OpenEI U.S. Utility Rate Database](https://openei.org/apps/USURDB/). Public data source.	2019	2020	NREL, using Federal (EIA Form 861) and market data (ABB, The Velocity Suite, [http://energy.marketintel.com/])	CSV	ZIP code (see other considerations)	Public	Annual
Diesel PM concentration	Ambient concentration estimates of hazardous air pollutants for the 2014 National Air Toxics Assessment (NATA). The dataset contains concentration estimates at the census tract level for all pollutants modeled for NATA. The census tract shapes and attributes are from a dataset published by ESRI in 2013 for the year 2010. The concentration estimates are based on air quality and dispersion modeling of emissions from the 2014 National Emissions Inventory (NEI). Public data source.	2014	2018	EPA	CSV	Census Tract	Public	Unknown

Indicator	Details	Vintage Year(s)	Publication Year	Source Agency/Org	Format	Geographic Resolution	Access Type	Frequency of Update
Emission sources	Emissions data from the 2014 National Emissions Inventory (NEI) for many different source groups, such as point, nonpoint, on road, and nonroad, and multiple source types within each group. The service also contains emissions for biogenics and fires. The emissions data were allocated to shapes depending on source type, with many allocations being to grid cells of 4 and 12 km in the continental U.S., 9 km cells in Alaska, and 3 km cells in Hawaii, Puerto Rico, and the Virgin Islands. Public data source.	2014	2018	EPA	CSV	Lat/Long, Grid	Public	Unknown
National Air Toxics Assessment (NATA) respiratory hazard index	Summary of air toxics and health effects in the United States. Developed as a screening tool to identify pollutants, emission sources, and places that should be studied further to identify cancer risks from breathing air toxics over a period of years. Calculates concentration and risk based on emissions data. Public data source.	2014	2018	EPA	CSV	Census Tract	Public	Unknown
National Highway Freight Network	There are four types of highway freight network (primary, non-primary, critical rural, critical urban) and only primary and non-primary highway freight network are mapped for CO. Public data source.	2020	2020	FHWA	Shapefile	Line	Public	Unknown
Future EV charging infrastructure deficient areas	Report details charging requirements to meet low-growth EV and high-growth EV scenarios. Data summarized by county for 2025 and 2030. ICCT model based on EV stock, EV uptake rate, vehicle stock turnover, charging behavior, and demographic factors. Public data source.	2021	2021	ICCT (for the CEO)	PDF	County	Public	N/A

Indicator	Details	Vintage Year(s)	Publication Year	Source Agency/Org	Format	Geographic Resolution	Access Type	Frequency of Update
EV charging infrastructure Supply by Block Group	Total number of stations and port counts as reported by the Alternative Fueling Station Locator. Information is gathered from trade media, Clean Cities coordinators, the Submit New Station Form on the Station Locator website, infrastructure equipment and fuel manufacturers, original equipment manufacturers (OEMs), and industry groups. Public data source.	2021	2021	NREL	CSV	Census Block Group	Public	Ongoing
Population density (per square mile)	Population density per square mile calculated per block group. Table B01003. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of households in poverty	Percent of all households whose income in the past 12 months fell below poverty guidelines (100% threshold). Table B17021 Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of households with one vehicle	Percent of total occupied units with no vehicle available. Table B25044 Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of households with zero vehicles	Percent of total occupied units with no vehicle available. Table B25044. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of housing units built before 1959	Percent of housing units built before 1959 as a share of all housing. Table B25036.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of housing units occupied by renters	Percent of all housing units occupied by renters as a share of all housing. Table B25003. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of Limited English proficiency households	Percent of all households with limited English-speaking status. Table B16002. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of multifamily households	Percent of all 2+ units as a share of all housing. Table C25032. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual

Indicator	Details	Vintage Year(s)	Publication Year	Source Agency/Org	Format	Geographic Resolution	Access Type	Frequency of Update
Share of cost-burdened households	Cost-burdened households include any household that spends more than 30 percent of its income for rented housing, housing units with a mortgage, and housing units without a mortgage as a percentage of all housing. Tables B25070 and B25091. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of overcrowded housing	Percent of occupied housing units with more than 1.00 occupants per room. Table B25014 Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of people of color	Total population for whom race and ethnicity is known who NOT identify as Not Hispanic or Latino White Alone. Table B03002. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of population under 5 years of age	Percent of all individuals under 5 years of age. Table B01001. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of population with a disability	Percent of total civilian noninstitutionalized population that report a disability. Table B18108. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of population with no high school degree	Total population over 25 years with less than high school educational attainment. Table B15003 Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of unemployed workers	Percent unemployed workers over 16 years in civilian labor force. Table B23025 Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual
Share of workers who did not drive alone to commute	Percent of workers over the age of 16 who did not drive alone as a means of transportation to work. Table C08301. Public data source.	2015-2019 5-Year Estimates	2020	U.S. Census Bureau	CSV, KML, Shapefile, GeoJSON	Census Block Group	Public	Annual

Dashboard

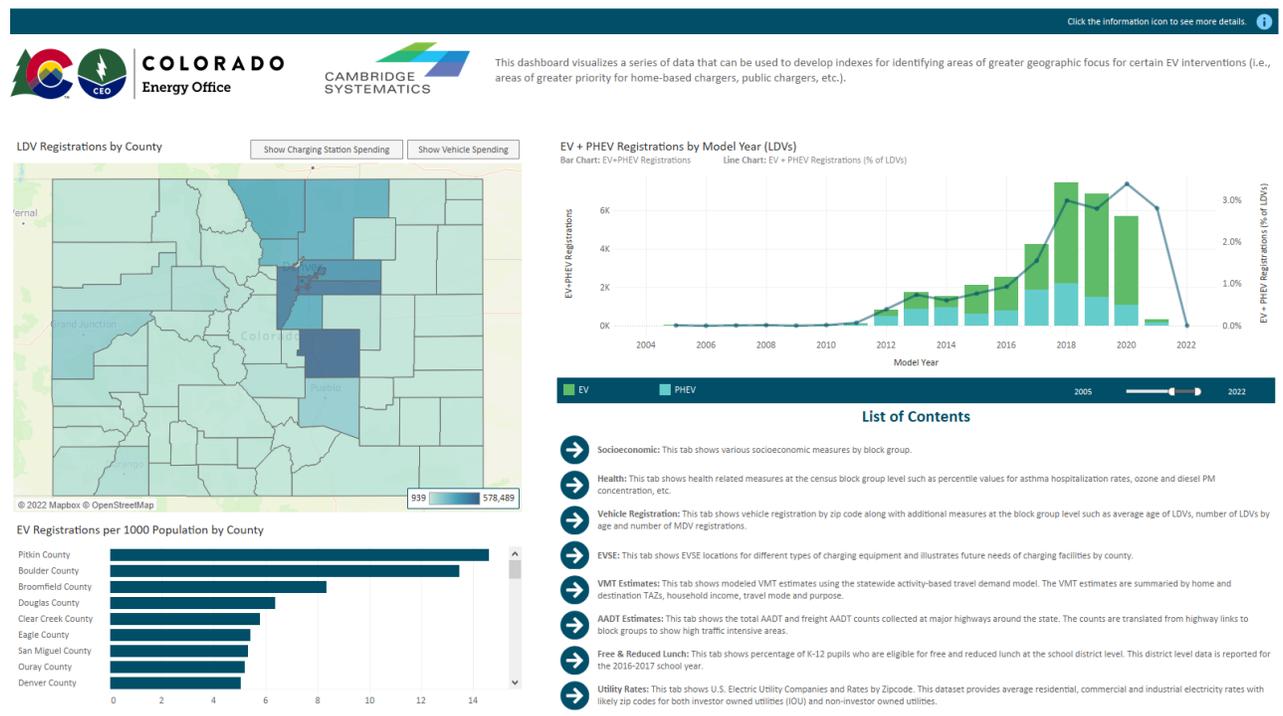
All of the data described above have been mapped into the EV Equity Dashboard using Tableau. On each of the maps in the Dashboard, the user can hover over any given geography (zip code, block group, tract, county, school district, TAZ, roadway, charging station location) and see a pop-up (referred to as a ‘tool-tip’) with charts of further detail on the data in that area. On the charging station locations map, the user can select a given point on the map and pull out a ring of a desired distance to sum the locations within that area. Lasso and other standard group select features are also available on each map to filter and summarize by map selection.

The indicators are split over nine tabs, including: Home, Socioeconomic, Health, Vehicle Registration, EV charging infrastructure, VMT Estimates, AADT Estimates, Free and Reduced Lunch, and Utility Rates. These are each described below.

Home

The home page provides a snapshot of summary statistics (Figure 8). This page shows, moving clockwise from the top left: 1) a heatmap of light duty vehicle registrations by county, 2) a bar chart showing electric vehicle + port-in hybrid registrations by model year, 3) links to other tabs in the dashboard, and 4) a bar chart showing EV registrations per 1,000 people by county.

Figure 8 Home Tab



Socioeconomic

This tab includes an interactive heatmap of socioeconomic and transportation indicators by block group. Users can filter by county, to show only Disproportionately Impacted communities as defined by HB21-1266, and area type (i.e., urban, rural, frontier).¹⁸⁴

Socioeconomic indicators:

- Population density (per square mile)
- Share of population under 5 years old
- Share of population with no high school degree
- Share of people of color
- Share of population with disability
- Share of unemployed workers
- Share of workers who do not drive alone to commute
- Share of cost-burdened households
- Share of overcrowded households
- Share of multifamily households
- Share of households in poverty
- Share of households with zero vehicle
- Share of households with one vehicle
- Share of households with limited English proficiency
- Transportation costs as share of income
- Share of housing units built before 1959
- Share of housing units occupied by renters
- All Transit Score
- Climate Equity Score
- Disproportionately Impacted community (1=Yes, 0=No)
- Tribal lands (1=Yes, 0=No)
- Opportunity zone (1=Yes, 0=No)

¹⁸⁴ https://www.colorado.gov/pacific/sites/default/files/PCO_CHSC_CountyDesignations_2016.pdf.

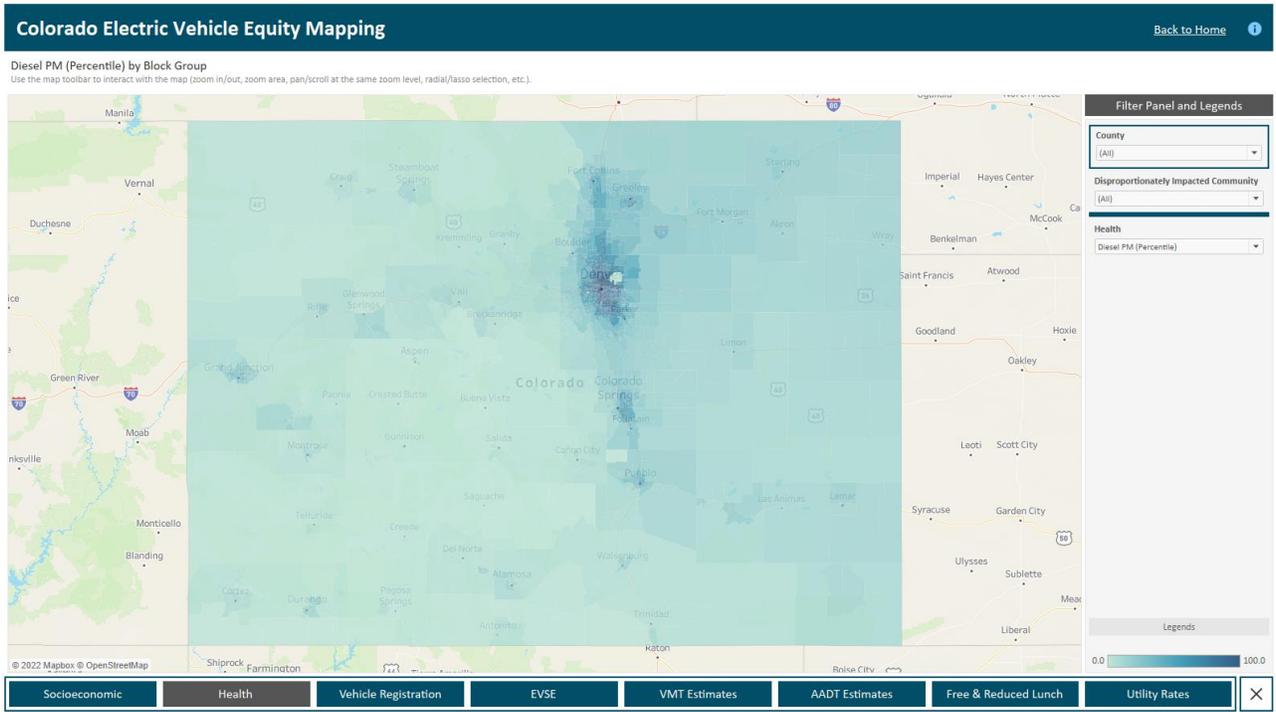
Health

The Health view shows a heat map of health indicators by block group (Figure 9). Results can be filtered by county or to show only Disproportionately Impacted communities as defined by HB21-1266.

Health indicators include:

- PM_{2.5} (percentile)
- Ozone (percentile)
- Traffic Proximity and Volume (percentile)
- Diesel PM (percentile)
- Asthma Hospitalization Rate per 100k people (percentile)

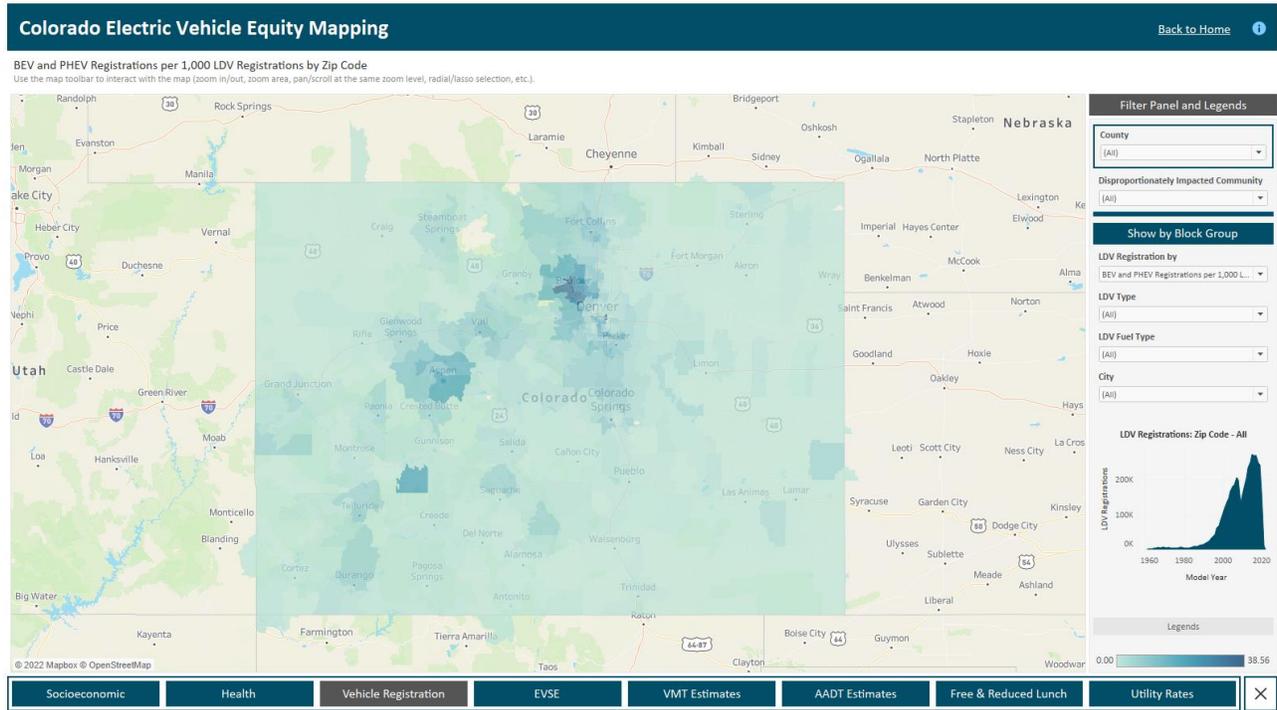
Figure 9 Health Tab



Vehicle Registration

The vehicle registration tab shows a heat map of vehicle registrations by ZIP code (Figure 10). Results can be filtered by county or to show only Disproportionately Impacted communities as defined by HB21-1266. The view can be further filtered by light duty vehicle (LDV) registrations (total registrations, BEV, and PHEV registrations per 1,000 registrations), LDV type (car, light truck, or motorcycle), and by city.

Figure 10 Vehicle Registration Tab

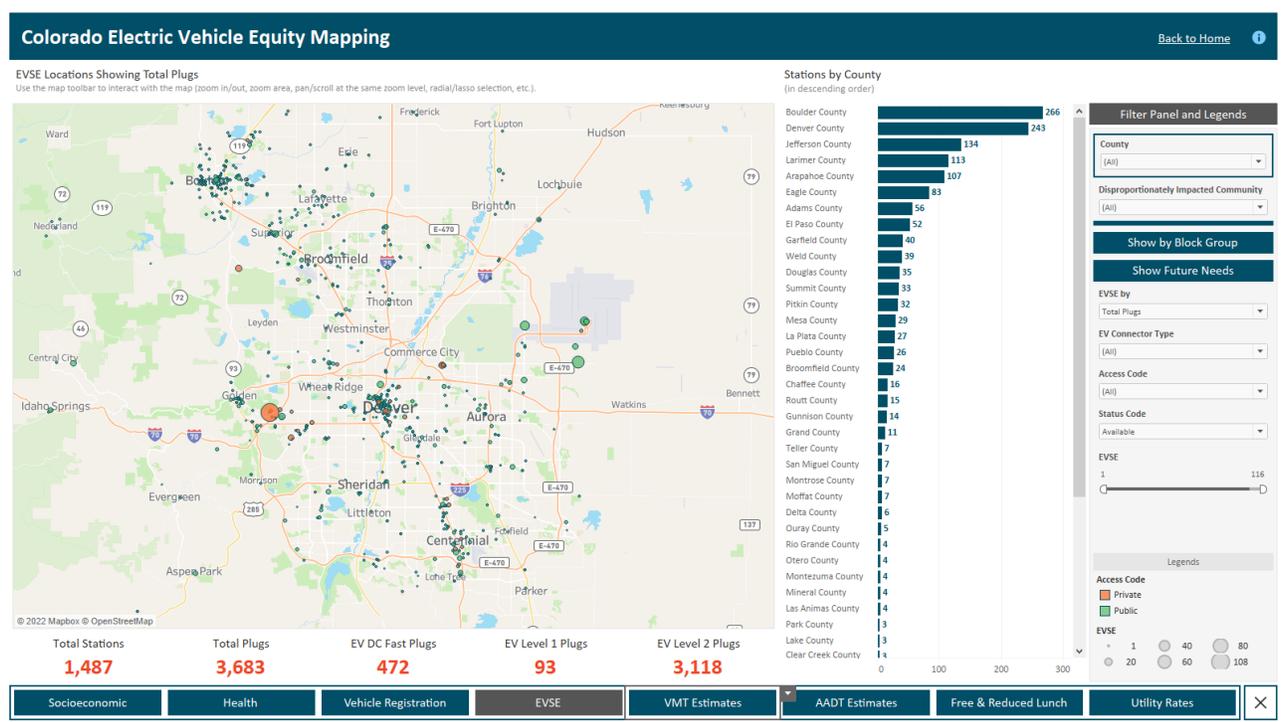


EV charging infrastructure

The EVSE (Electric Vehicle Service Equipment) tab shows a proportional symbol map that shows individual EV charging stations (each circle) by number of ports (size of the circle) (Figure 11). Results can be filtered by county or to show only Disproportionately Impacted communities as defined by HB21-1266. Users can also filter EVSE (by total ports, total stations, total L1 ports, L2 ports, and DCFC ports), by EV connector type (Tesla, Other [including J1772 and CHAdeMO]), access type (public or private), and status code (available, planned, or temporarily unavailable).

This tab also shows the number of stations by county (sorted in descending order) alongside the map. Summary statistics show the total number of stations, the total ports, L1 ports, L2 ports, and DCFC ports.

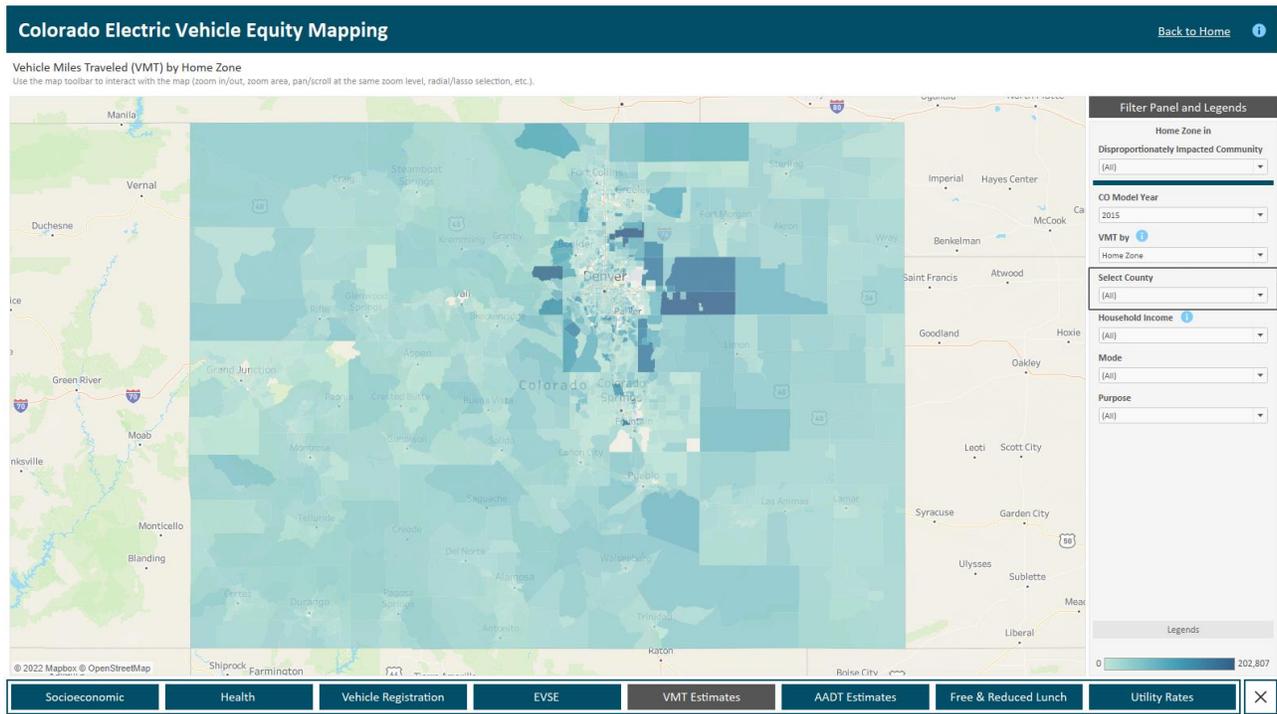
Figure 11 EVSE Tab



VMT Estimates

The VMT Estimates tab summarizes results from modeled VMT, as calculated through CDOT’s statewide activity-based travel demand model, by block group (Figure 12). Users can filter to show results only for Disproportionately Impacted communities as defined by HB21-1266, model year (near-current VMT as of 2015 or expected future VMT in 2045), VMT by type (destination zone, home zone), county, household income (delineations determined in CDOT’s modeling process to include less than \$30K, \$30K-\$60K, \$60K-\$100K, \$100K-\$150K, and \$150K+), by mode (drive alone, shared ride with 2 other people, shared ride with 3 or more people), and trip purpose (work, school, shop, meal, personal business, social/ recreational, or escort). Note that when VMT is filtered by destination zone/home zone, filtered county results will reflect that selection. For example, if VMT by home zone is selected and Arapahoe County, the heat map will use darker shading to show areas of higher-VMT that were made by the residents of those areas in Arapahoe County. Home zone shows areas of high-mileage travelers regardless of where the trip starts and ends, whereas destination zone shows areas that have a higher number of high-mileage trips terminating in that area.

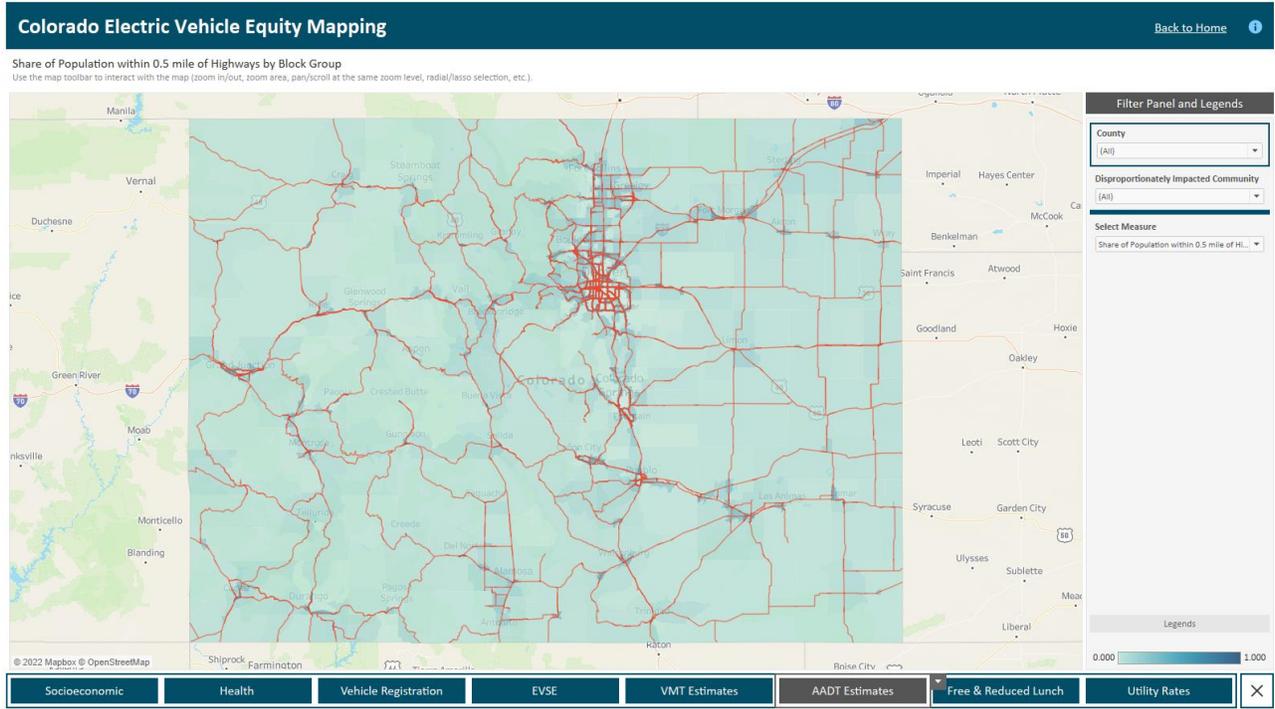
Figure 12 VMT Estimates Tab



AADT Estimates

The AADT estimates tab shows annual average daily traffic (AADT) by major roadway (Figure 13). Users can filter to show results by county or to show only Disproportionately Impacted communities as defined by HB21-1266. Users can filter to show Total AADT, total freight AADT, the share of the population with 0.5 miles of highways, and the population within 0.5 miles of highways.

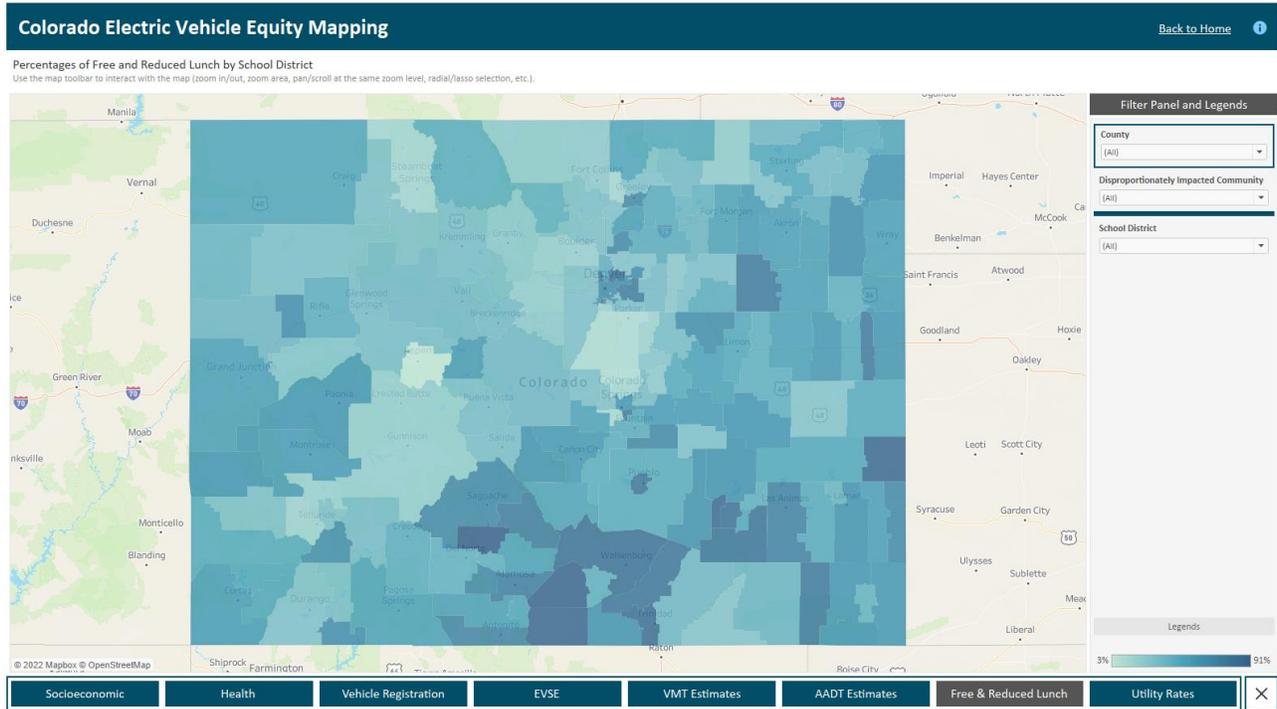
Figure 13 AADT Estimates Tab



Free and Reduced Lunch

The Free & Reduced Lunch Tab summarizes the proportion of students who receive a free or reduced-price lunch by school district (Figure 14). Users can filter to show results by county, by school district, or to show only Disproportionately Impacted communities as defined by HB21-1266.

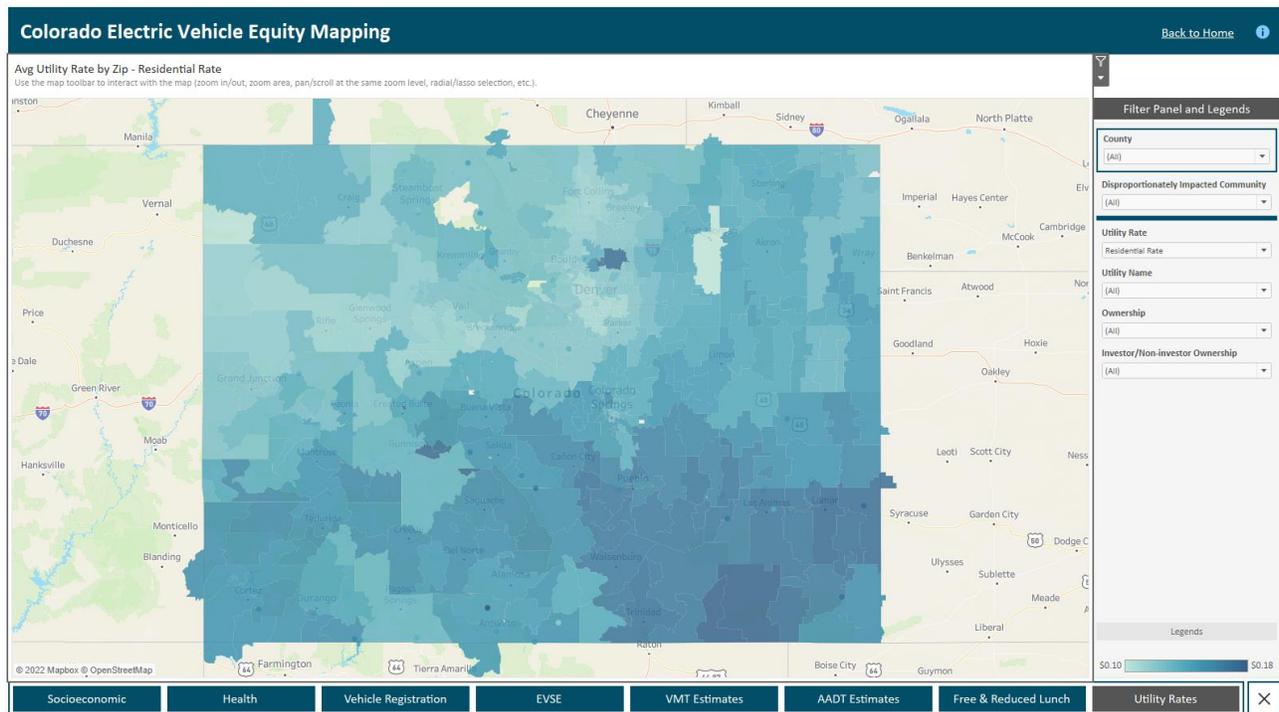
Figure 14 Free and Reduced Lunch Tab



Utility Rates

The Utility Rates Tab summarizes average utility rate by ZIP code (Figure 15). Users can filter to show results by county, by school district, or to show only Disproportionately Impacted communities as defined by HB21-1266. Users can filter by utility rate (residential, commercial, or industrial), by utility name, and by ownership (investor-owned, non-investor owned).

Figure 15 Utility Rates Tab



Considerations for the EV Equity Dashboard

The dashboard can be used to explore data included in the prioritization tool (see below) and be a resource to help guide the many stakeholders of electrification in understanding which areas need particular attention in order to achieve an equitable transition to a future of cleaner, shared mobility. It also provides insights into the many needs and challenges that may be specific to different parts of the State with respect to electrification. Exploring these needs will be critical to achieving electrification goals. As low- and middle-income households form the majority of the vehicle market, it will be critical to identify strategies that encourage greater EV adoption among lower- and middle-income Coloradans.

The data included in this tool reflect the project team's understanding of key obstacles and drivers of EV adoption. However, research in the area of transportation electrification is constantly evolving. For example, greater detail on station characteristics (such as whether the station is well-lit, the station is located in an area with a lower crime rate, energy costs are reasonable, and others) could provide additional nuance to factors that encourage EV drivers to use particular stations.

4.2 Prioritization Tool

This documentation is a companion guide to the EV Equity Prioritization Tool Excel workbook, referred to within this document as ‘the prioritization tool.’ The prioritization tool was developed using a rapid prototyping approach in collaboration with the CEO and State agency partners in the latter half of 2021. The tool allows program managers, policy-makers, and others to identify priority areas for transportation electrification investment based on both factors currently used in project prioritization and more recently-identified factors that can highlight the presence of underserved communities. Note that the prioritization tool requires Excel 365.

These factors can be used to prioritize program investment, inform current and future programming and policies, or where to target outreach. The prioritization tool allows users to select up to 12 unique factors to create a customized prioritization index. For example, a program manager might determine that their program priorities include directing investment to areas where relatively little EV charging infrastructure has been installed, areas that models suggest have a high need for EV charging infrastructure in the future, areas where electricity costs are high, areas with a high concentration of underserved communities (such as renters, multifamily households, and others), and areas that have high need for transportation support. The tool will allow the program manager to flexibly add relevant factors to a customized index with user-defined weights. That index can then be used to evaluate individual applications or groups of applications while providing important information about the key factors driving the area’s scores.

Data and Development

The tool was developed as an Excel® workbook and consists of nine worksheets. The tool was developed in order to allow program managers to identify key factors of electrification, equity, transportation need, and environmental impacts in a single location. All of the data included in the tool are also included in the EV Equity Dashboard, which allows both program managers and members of the public to review relevant data in a visual presentation.

The project team selected 39 factors that can be used in project prioritization (Table 14). These factors include indexes developed through the Colorado Electric Vehicle (EV) Equity Study, indexes developed through the CDPHE Climate Equity Framework, designated equity areas (such as Colorado Opportunity Zones or Disproportionately Impacted communities defined under HB21-1266), electrification indicators (such as the count of DCFC plugs available at the block group level), environmental indicators (such as the concentration of ozone at the block group level), and socioeconomic indicators (such as the concentration of multifamily households). These data are identified in the Field_names tab.

Table 14 Factors Included in the CO EV Equity Project Prioritization Tool

Type	Factor name	Description
Composite indicator	EV equity community priority (CO EV Equity)	EV Equity community index, including: <ul style="list-style-type: none"> • People of color • Percent population with a disability • Percentage of Limited English proficiency households • Cost-burdened households • Less than high school education • Overcrowded housing • Percentage of households in poverty • Percentage of workers not employed • Population Under 5 Years of Age • Multifamily housing
Composite indicator	Transportation priority community (CO EV Equity)	Transportation priority community index, including: <ul style="list-style-type: none"> • Transportation costs as percent of income • Percentage of non-single vehicle occupancy commute • Percentage of zero vehicle households • Percentage of one vehicle households • Job access via a 30-minute transit trip • AllTransit Performance Score
Composite indicator	Climate Equity Score ¹	The percentile of the climate equity result (0 to 100). Note: This variable is used in the data viewer for the map display. It is referred to as the "Climate equity score" for simplicity.
Composite indicator	Colorado Opportunity Zone	Colorado Opportunity Zone as designated by the State of Colorado following the passage of the U.S. Tax Cuts and Jobs Act of 2017.
Composite indicator	Environmental burden score (Climate Equity Framework) ¹	The environmental burden result (0 to 10). This is the weighted average of scores for environmental exposures, environmental effects, and future climate hazard costs, standardized to values from 0 to 10.
Composite indicator	Environmental effects score (i.e., hazards) (Climate Equity Framework) ¹	Environmental effects score. This score is the averaged percentiles of the following input data: proximity to National Priorities List sites, proximity to Risk Management Plan sites, wastewater discharge indicator, and proximity to hazardous waste facilities.
Composite indicator	Future climate hazards costs score (Climate Equity Framework) ¹	Future climate hazards costs score. This score is the averaged percentiles of the following input data: projected per capita costs under a severe climate and high population growth scenario associated with flood—bridges, flood—buildings, drought—crops, drought—cattle, drought—skiing, drought—rafting, wildfire—buildings, wildfire—suppression. County-level. All block groups within a county receive the same value.
Electrification indicator	Charger plugs—DCFC plugs (weight where few available)	DCFC Plug Count (percentile rank)
Electrification indicator	Charger plugs—Level 1 (weight where few available)	Level 1 Plug Count (percentile rank)
Electrification indicator	Charger plugs—Level 2 plugs (weight where few available)	Level 2 Plug Count (percentile rank)

Type	Factor name	Description
Electrification indicator	Electricity rates—commercial	Average commercial electricity hourly charge (\$/kWh) (percentile rank)
Electrification indicator	Electricity rates—residential	Average residential energy hourly charge (\$/kWh) (percentile rank)
Electrification indicator	Future needs for DCFC on corridors (ICCT 2021 study)	DC Fast corridor EVSE needs (percentile rank) by 2030 (High Growth Scenario)
Electrification indicator	Future needs for DCFC outside of major corridors (ICCT 2021 study)	DC Fast non-corridor EVSE needs (percentile rank) by 2030 (High Growth Scenario)
Electrification indicator	Future needs for home chargers (ICCT 2021 study)	Home charger needs (percentile rank) by 2030 (High Growth Scenario)
Electrification indicator	Future needs for Level 2 chargers (ICCT 2021 study)	Public Level 2 charger needs (percentile rank) by 2030 (High Growth Scenario)
Electrification indicator	Future needs for workplace chargers (ICCT 2021 study)	Workplace needs (percentile rank)
Electrification indicator	Housing units built before 1960 (electrical service upgrade indicator)	Percentile rank of pre-1960 housing
Electrification indicator	BEVs and PHEVs	Percentage of Light Duty EV and PHEV registrations (percentile rank)
Transportation indicator	High mileage in-bound travelers	Total VMT by destination block group (i.e., all trips and roundtrips associated with the driver's intended destination) (percentile rank)
Transportation indicator	High mileage out-bound travelers	Total VMT by home block group (i.e., all trips and roundtrips associated with a driver's home address) (percentile rank)
Transportation indicator	Light duty vehicles over 10 years of age	Count of Light Duty Vehicles over 10 years of age (percentile rank)
Transportation indicator	Light duty vehicles over 20 years of age	Count of Light Duty Vehicles over 20 years of age (percentile rank)
Transportation indicator	Medium and heavy-duty vehicles	Count of registered Medium and Heavy-Duty Vehicles (percentile rank)
Transportation indicator	Older vehicles (average age)	Average age of Light Duty Vehicles (percentile rank)
Environmental indicator	Asthma rates	Percentile rank of age-adjusted asthma hospitalization rate
Environmental indicator	Diesel PM emissions	Percentile rank of diesel PM
Environmental indicator	Heart disease	Percentile rank of heart disease prevalence
Environmental indicator	Ozone	Percentile rank of ozone levels
Environmental indicator	PM _{2.5} levels	Percentile rank of PM _{2.5} levels
Environmental indicator	Traffic proximity and volume	Percentile rank of traffic proximity

Type	Factor name	Description
Socioeconomic indicator	Free and reduced lunch	Estimated number of students receiving free and reduced lunches (estimated by calculating the percentage of land area in block group belonging to the school district's land area)—Percentile rank
Socioeconomic indicator	High school diploma	Percentile rank of less than high school education
Socioeconomic indicator	Linguistic isolation	Percentile rank of percent linguistic isolation
Socioeconomic indicator	Low income	Percentile rank of percent low income
Socioeconomic indicator	Low weight births	Percentile rank of low weight birth rate
Socioeconomic indicator	Multifamily households	Percentile rank of percent multifamily households
Socioeconomic indicator	People of color	Percentile rank of percent people of color
Socioeconomic indicator	Renters	Percentile rank of percent housing units renter occupied

¹ CDPHE. 2021. Climate Equity Data Viewer. <https://drive.google.com/file/d/1iytdPG5iK2VBNply8k6oT6LU6-QKML0a/view>.

Indexes and Weights

The tool has been developed with seven pre-defined prioritization indexes:

- **Home-based charger priority** (i.e., areas where EV chargers may be needed in homes and less available)
- **Public charger priority (L2)** (i.e., areas where L2 chargers may be needed)
- **Public charger priority (DCFC)** (i.e., areas where DCFC may be needed)
- **Workplace charger priority** (i.e., areas where EV charging infrastructure may be needed at workplaces)
- **EV replacement priority** (i.e., areas where older vehicles and high traffic may suggest a priority for vehicle replacement by EVs)
- **E-bikes, transit, and others** (i.e., areas where alternative forms of mobility may be more needed)
- **Freight priority** (i.e., areas where air quality may be more negatively impacted by freight traffic)

Each index was developed based on priorities identified in program objectives, evaluation criteria currently in use, and available data. For example, the ALT Fuels Colorado program objective was to improve air quality throughout the State, which is why areas with a high concentration of diesel

particulate matter (PM) have been included as a pre-loaded factor for the Freight priority index.¹⁸⁵ Similarly, the DCFC Plazas Grant Program provides additional consideration for project applications located in Colorado Opportunity Zones, which is why the presence of Colorado Opportunity Zones is included as a factor for the Public Charging Priority (DCFC) index.¹⁸⁶ All of the indexes include the EV Equity Community Priority index and Transportation Priority Community index developed through the Colorado EV Equity study as a way to measure the presence of EV equity communities and areas with greater mobility needs.

To provide maximum flexibility, both individual indicators and composite indicators are included, but should be used in the tool with some caution. For example, users are able to identify areas with a higher concentration of low-income individuals and also Colorado Opportunity Zones, but as the Colorado Opportunity Zone designation is determined based on the percentage of low-income individuals as of 2017, including both in prioritization will cause the presence of low-income individuals to be weighted very highly in project prioritization. It may be the user’s intention to weigh certain factors carefully, but to avoid double-counting, review factor descriptions on the Field_names tab carefully.

Users can select a different set of indicators by clicking within the cell. A drop-down box will appear (Figure 16) with the different factors that can be selected.

Figure 16 Selecting Prioritization Factors

Colorado EV Equity Study | Prioritization factors and weights

Instructions: This tab contains the measures, and relative weight of each measure, that will be used to prioritize elements.

Customizable - Select any cell for options *Customizable*

#	Index	Factor	Factor weight
2	Public charger priority (L2)	Charger plugs - DCFC plugs (weight where few available)	2.5%
		Charger plugs - Level 2 plugs (weight where few available)	7.5%
		Charger plugs - Level 2 plugs (weight where few available)	5.0%
		Electricity rates - commercial	5.0%
		Electricity rates - residential	5.0%
		Future needs for DCFC on corridors (ICCT 2021 study)	5.0%
		Future needs for DCFC outside of major corridors (ICCT 2021 study)	5.0%
		Future needs for home chargers (ICCT 2021 study)	10.0%
Future needs for Level 2 chargers (ICCT 2021 study)	10.0%		
Future needs for workplace chargers (ICCT 2021 study)	10.0%		
		Electricity rates - commercial	5.0%

Once the factors have been selected for each index, specific weights can be applied. In the example in Figure 16, a weight of 2.5 percent has been assigned to ‘charger plugs—DCFC plugs (weight where few available)’. This will assign a weight of 2.5 percent to areas that have a lower concentration of DCFC than

¹⁸⁵ Regional Air Quality Council. 2021. ALT Fuels Colorado. <https://cleanairfleets.org/programs/alt-fuels-colorado>.

¹⁸⁶ Colorado Energy Office. 2021. EV Fast Charging Plazas. <https://energyoffice.colorado.gov/zero-emissions-vehicles/ev-fast-charging-plazas>.

other areas of the State. A text warning in the workbook will warn users when weighting needs to be adjusted to reach 100 percent.

Table 15 shows the prioritization indexes, indicators, and weights included in the prioritization indexes at the time of publication. Some weights have been set based on conversations with program managers. For example, the Public charger priority (DCFC) prioritization index assigns a higher weight to areas with higher commercial electricity weights based on the understanding that charging stations that are more likely to have high operation costs need more support in the form of capital investment. Another example is within the Public charger priority (L2) prioritization index, which assigns a lower weight on prioritizing areas where few DCFC are available due to the need to provide greater coverage for L2 chargers.

Table 15 Indicators Included in Each Prioritization Index and Corresponding Weights

Indicator Group	Indicator	Weight
Home-based charger priority <i>(i.e., areas where EV chargers may be needed in homes and less available)</i>	Charger plugs—DCFC plugs (weight where few available)	5.0%
	Charger plugs—Level 1 (weight where few available)	5.0%
	Charger plugs—Level 2 plugs (weight where few available)	5.0%
	Housing units built before 1960 (electrical service upgrade indicator)	5.0%
	Multifamily households	10.0%
	Renters	10.0%
	Electricity rates—residential	5.0%
	Future needs for home chargers (ICCT 2021 study)	10.0%
	High mileage out-bound travelers	15.0%
	EV equity community priority (CO EV Equity)	20.0%
	Transportation priority community (CO EV Equity)	10.0%
Public charger priority (L2) <i>(i.e., areas where L2 chargers may be needed)</i>	Charger plugs—DCFC plugs (weight where few available)	2.5%
	Charger plugs—Level 2 plugs (weight where few available)	7.5%
	Future needs for DCFC on corridors (ICCT 2021 study)	5.0%
	Future needs for DCFC outside of major corridors (ICCT 2021 study)	5.0%
	Future needs for Level 2 chargers (ICCT 2021 study)	10.0%
	Electricity rates—commercial	5.0%
	High mileage in-bound travelers	15.0%
	Renters	10.0%
	Multifamily households	10.0%
	EV equity community priority (CO EV Equity)	10.0%
	Transportation priority community (CO EV Equity)	10.0%
Colorado Opportunity Zone	10.0%	
Public charger priority (DCFC)	Charger plugs—DCFC plugs (weight where few available)	20.0%
	Charger plugs—Level 2 plugs (weight where few available)	5.0%
	Future needs for DCFC on corridors (ICCT 2021 study)	7.5%

Indicator Group	Indicator	Weight
<i>(i.e., areas where DCFC may be needed)</i>	Future needs for DCFC outside of major corridors (ICCT 2021 study)	7.5%
	Future needs for Level 2 chargers (ICCT 2021 study)	2.5%
	Electricity rates—commercial	20.0%
	High mileage in-bound travelers	7.5%
	Renters	2.5%
	Multifamily households	2.5%
	EV equity community priority (CO EV Equity)	10.0%
	Transportation priority community (CO EV Equity)	10.0%
	Colorado Opportunity Zone	5.0%
Workplace charger priority <i>(i.e., areas where EV charging infrastructure may be needed at workplaces)</i>	Electricity rates—commercial	20.0%
	Future needs for workplace chargers (ICCT 2021 study)	20.0%
	High mileage in-bound travelers	40.0%
	EV equity community priority (CO EV Equity)	10.0%
	Transportation priority community (CO EV Equity)	10.0%
EV replacement priority <i>(i.e., areas where older vehicles and high traffic may suggest a priority for vehicle replacement by EVs)</i>	Light duty vehicles over 20 years of age	16.7%
	Light duty vehicles over 10 years of age	16.7%
	Older vehicles (average age)	16.7%
	High mileage out-bound travelers	25.0%
	EV equity community priority (CO EV Equity)	10.0%
	Transportation priority community (CO EV Equity)	15.0%
E-bikes, transit, and others <i>(i.e., areas where alternative forms of mobility may be more needed)</i>	EV equity community priority (CO EV Equity)	25.0%
	Transportation priority community (CO EV Equity)	25.0%
	Electricity rates—residential	10.0%
	Housing units built before 1960 (electrical service upgrade indicator)	10.0%
	Charger plugs—Level 1 (weight where few available)	10.0%
	Charger plugs—Level 2 plugs (weight where few available)	10.0%
	Traffic proximity and volume	10.0%
Freight priority <i>(i.e., areas where air quality may be more negatively impacted by freight traffic)</i>	Medium and heavy-duty vehicles	20.0%
	PM 2.5 levels	10.0%
	Diesel PM emissions	10.0%
	Heart disease	5.0%
	Asthma rates	5.0%
	Traffic proximity and volume	20.0%
	EV equity community priority (CO EV Equity)	15.0%
	Transportation priority community (CO EV Equity)	15.0%

Single Applicant Evaluation

The tool can be used both to evaluate single project applicants as well as groups of applicants. To evaluate project scores for a single applicant, the Single_Applicant tab allows users to enter the applicant's address and find prioritization scores for that block group. Each address's census block is determined by way of an Application Programming Interface (API) using the WEBSERVICE function in Excel®. Note that this function does not operate on a Mac or on older versions of Excel.¹⁸⁷ On this and subsequent tabs, user-entered information is identified in purple (Figure 17). Users can enter an address, select the index to be used (in the example in Figure 16, Public charger priority (DCFC) has been selected), and any additional criteria that should be used in applicant scoring.

Once project information has been entered, the tool will provide the relevant county, latitude and longitude for approximate global positioning system (GPS) coordinates, the total population by block group, the total registered light duty EVs and PHEVs at the county level as of January 2021, the population per square mile, whether the area is designated by the U.S. Census as urban or rural, and whether the project is located in a block group that has been designated a Disproportionately Impacted population.

The tool will show the final index score for the selected prioritization index (in Figure 17, the project example would receive an index score of 67.8 for the Public charger priority [DCFC] index), as well as a bar chart illustrating the scores for each factor included in the Public charger priority index. Higher scores reflect areas that are better for meeting the needs identified in the prioritization, including the ability to serve EV equity communities and transportation priority communities.

¹⁸⁷ Microsoft. 2021. WEBSERVICE Function. <https://support.microsoft.com/en-us/office/webservice-function-0546a35a-ecc6-4739-aed7-c0b7ce1562c4>.

Figure 17 Single Applicant View

Application Evaluation Tool | Single applicant detail prioritization scores

Instructions: Enter information in purple to see EV Equity scores for that applicant. If no address is found, look up the address online and confirm that the correct address/cross streets have been given. Note that changes to data on this page may take a moment to load. If you see #CALC errors, save the workbook and wait a minute for the APIs.

Applicant information

Street: 5955 S Holly St
 City: Centennial

Index to be used for evaluation: Public charger priority (DCFC)

Index score: **67.8**

Geography:

GEOID / FIPS Code: 80050056351
County: Arapahoe County
Lat: 39.6089
Lon: -104.9236

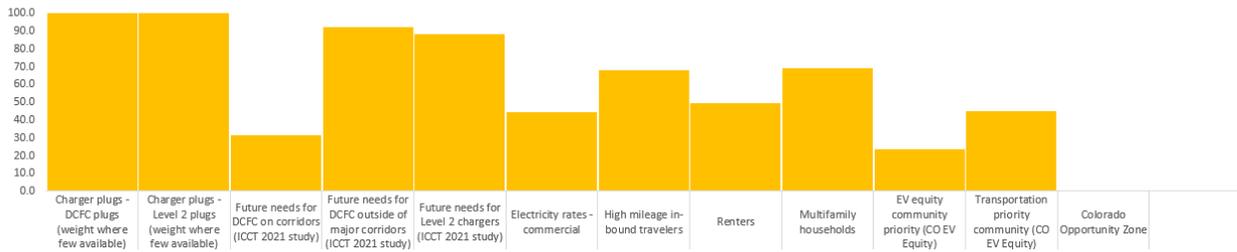
<https://geocoding.geo.census.gov/geocoder/>
<https://nominatim.openstreetmap.org/ui/search.html>
https://geo.fcc.gov/api/census/#!/area/get_area

Applicant scoring:	Points	Max award
Index score (Public charger priority (DCFC))	6.8	10.0
Applicant serves multi-family housing:	0	5
Applicant located at a workplace: (other)	5	5
(other)	0	0
(other)	0	0
Total score:	11.8	20

Select demographic and vehicle characteristics:

Total population (block group)	2,375
Total registered light duty EVs + PHEVs (county):	2,557
Population / sq. mi.	5,507.2
Urban / Rural*	Urban
Disproportionately Impacted population?*	No

*Urban area refers to an area with a population of 50,000 or more, or an 'urban cluster' of at least 2,500 people. All other locations are designated as 'rural'. Designation is made by the US Census Bureau.
 ** Disproportionately impacted population is defined in HB 1266: <https://leg.colorado.gov/bills/hb21-1266>



Multiple Applicants

The process to evaluate multiple applicants is similar to the process described above for single applicants with one difference: up to 10 addresses can be entered. After entering the address and city, other location detail will automatically populate, including the county, whether the address is located in a block group that qualifies as being Disproportionately Impacted under HB21-1266, the number of EVs and PHEVs registered in the county, and the index score for that address. Entering the applicants' funding request will allow program managers to see a breakdown of program spending in Disproportionately Impacted communities compared to non-Disproportionately Impacted communities (Figure 18).

Users of the prioritization tool should be cautious when entering multiple addresses, as the addresses are submitted to three unique web-based APIs.¹⁸⁸ Submitting a large number of requests can cause the workbook's results to load slowly or the API's response time to slow.

After entering information, users can find more detail on the individual factors that make up each index score result by reviewing the bar chart. In the example in Figure 18, an application for a DCFC at 120 Jefferson Street, Monte Vista,¹⁸⁹ has received a score of 94.4 under the Public charger priority (DCFC) prioritization index. A user has selected application number 2 using the slicer underneath the table (bottom left). The bar chart shows the individual factors that make up the Public charger priority (DCFC)

¹⁸⁸ U.S. Census Bureau. N.d. Welcome to Geocoder. <https://geocoding.geo.census.gov/geocoder/>. OpenStreetMap. 2022. Nominatim. <https://nominatim.openstreetmap.org/ui/search.html>. Federal Communications Commission. N.d. API Documentation for Developers. https://geo.fcc.gov/api/census/#!/area/get_area.

¹⁸⁹ Not an actual applicant address. All addresses shown in the example figures belong to public libraries, all of which were selected at random.

score. At the far right, the donut chart shows the breakdown of all funding in Disproportionately Impacted communities relative to non-Disproportionately Impacted communities.

Figure 18 Multiple Application Evaluation

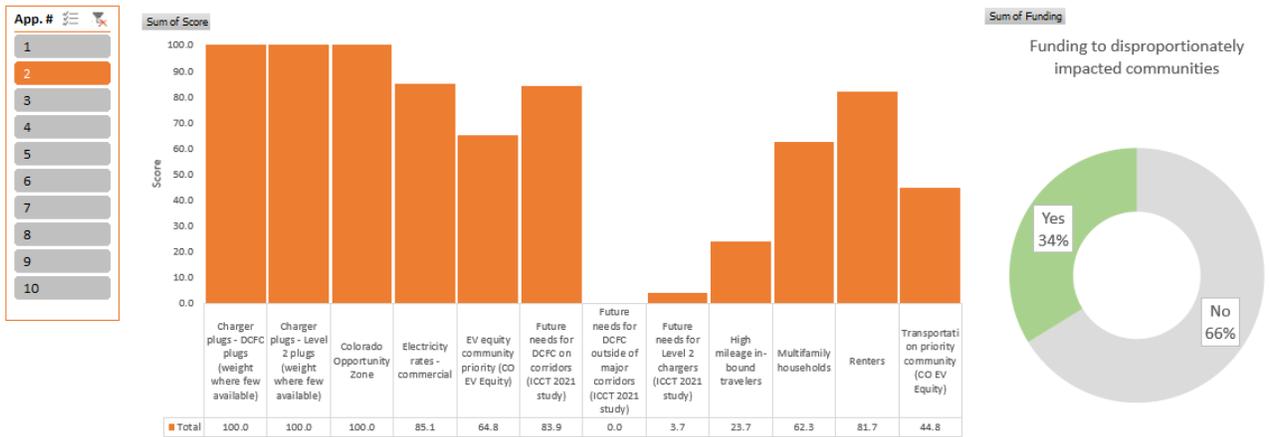
Application Evaluation Tool | Multiple applicant prioritization scores

Instructions: Enter information in purple to see EV Equity scores for that applicant. If no address is found, look up the address online and confirm that the correct address/cross streets have been given. Note that changes to data on this page may take a moment to load. If you see #CALC errors, save the workbook and wait a minute for the APIs.

Index to be used for evaluation:

Public charger priority (DCFC)

Applicant no.	Address	City	Funding	County	Disproportionately Impacted?	Total EVs + PHEVs	Index score result
1	3595 Table Mesa Dr	Boulder		\$2,500 Boulder County	No	4,212	76.2
2	120 Jefferson Street	Monte Vista		\$1,275 Rio Grande County	Yes	2	84.4
3	(your entry)	(your entry)		not found	not found	0	0
4	(your entry)	(your entry)		not found	not found	0	0
5	(your entry)	(your entry)		not found	not found	0	0
6	(your entry)	(your entry)		not found	not found	0	0
7	(your entry)	(your entry)		not found	not found	0	0
8	(your entry)	(your entry)		not found	not found	0	0
9	(your entry)	(your entry)		not found	not found	0	0
10	(your entry)	(your entry)		not found	not found	0	0



County Detail

To look at average scores for all block groups within a county, the County_detail tab will allow users of the prioritization tool to select a county to explore county-specific data. Users can see the county’s average score for all of the pre-determined prioritization indexes. Users can also filter results to show only Disproportionately Impacted communities. Users can also see detailed factor results for an index that they select.

In the example in Figure 19, San Miguel County has been selected, and results have been filtered to show only scores for the Disproportionately Impacted block groups within the county. The results show that the county scores high for Public charger priority (DCFC): the average score for all Disproportionately Impacted block groups within the county is 88 for that index. The lowest index score is Freight priority, for which the Disproportionately Impacted block groups in San Miguel County have an average score of 19.

The Public charger priority (DCFC) prioritization index has been selected, which allows users to see the scores for each of the individual factors that are included in the index. Of the factors included in that index, the highest score is for Charger plugs—DCFC plugs (weight where few available), with a score of 100.

Figure 19 County Detail

County Index Detail View | County population share by index threshold

Instructions: This tab shows the total population, the percentage of the county DI population, and the rank (by percentage) for each index within the county.



County Index Overview

To review all counties' scores, the County_overview tab allows users of the prioritization tool to see, at a high level, all of the counties' scores for each of the preloaded prioritization indexes (Home-based charger priority; Public charger priority (L2); Public charger priority (DCFC); Workplace charger priority; EV replacement priority; E-bikes, transit, and others; Freight priority). This view can be used to prioritize short-, mid-, and long-term investments based on available amounts of program funding or based on higher average index scores.

This view also allows users to filter results to show only Disproportionately Impacted communities by clicking within the purple cell. If that filter is turned on and there are no Disproportionately Impacted block groups within the county (for example, in Clear Creek County in Figure 20), no index scores will be visible for that county.

Figure 20 County Index Overview

County Index Overview | Average index scores by county

Instructions: This tab shows the total DI population, the percentage of the county DI population, and the rank (by percentage) for each index within the county.

User selections

Filter to show only Disproportionately Impacted communities*?

* Disproportionately impacted population is defined in HB 1266 as 'a community that is in a census block group where the proportion of households that are low income, that identify as minority, or that are housing cost-burdened is greater than 40%; or any other community as identified or approved by a state agency, if the community: Has a history of environmental racism perpetuated through redlining, anti-Indigenous, anti-immigrant, anti-Hispanic, or anti-Black laws; or is one where multiple factors may act cumulatively to affect health and the environment and contribute to persistent disparities. See: <https://leg.colorado.gov/bills/hb21-1266>

	Home-based charger priority	Public charger priority (L2)	Public charger priority (DCFC)	Workplace charger priority	EV replacement priority	E-bikes, transit, and others	Freight priority	Number of DI BGs
Adams County	56	54	50	53	64	54	81	194
Alamosa County	59	69	88	53	46	83	19	11
Arapahoe County	45	46	36	44	46	40	66	201
Archuleta County	53	53	62	65	73	62	16	5
Baca County	59	62	91	52	66	87	31	4
Bent County	72	82	96	45	52	92	24	4
Boulder County	51	53	48	59	44	33	35	65
Broomfield County	38	46	36	50	42	16	42	4
Chaffee County	26	42	54	64	54	48	13	4
Cheyenne County	50	67	87	34	72	81	31	1
Clear Creek County	72	71	47	90	89	60	48	0
Conejos County	75	52	86	57	82	93	24	6
Costilla County	81	74	94	56	76	94	25	4
Crowley County	88	88	87	65	78	88	17	2

Average Index Scores by County

Table 16 shows the average block group score by county for all of the prioritization indexes within the prioritization tool. This approach can be used to identify short- and long-term priorities by county and by program area (Table 16). Note that these scores are intended to show priority areas for each county, not to provide a statewide ranking.

To illustrate how the results can be interpreted based on the tool’s configuration at the time of publication, Pitkin County can be seen to have a high priority with respect to workplace chargers, with a workplace charger priority score of 76. The prioritization tool shows that the main reason for this high score is that block groups in Pitkin County have higher commercial electricity rates, a higher need for future workplace chargers, and higher-mileage in-bound travelers than other block groups in the State.

Table 16 Average Block Group Score by County by Prioritization Index

County	Home-Based Charger Priority	Public Charger Priority (L2)	Public Charger Priority (DCFC)	Workplace Charger Priority	EV Replacement Priority	E-bikes, Transit, and Others	Freight Priority
Adams	56	54	50	53	64	54	81
Alamosa	59	69	88	53	46	83	19
Arapahoe	45	46	36	44	46	40	66
Archuleta	53	53	62	65	73	62	16
Baca	59	62	91	52	66	87	31

County	Home-Based Charger Priority	Public Charger Priority (L2)	Public Charger Priority (DCFC)	Workplace Charger Priority	EV Replacement Priority	E-bikes, Transit, and Others	Freight Priority
Bent	72	82	96	45	52	92	24
Boulder	51	53	48	59	44	33	35
Broomfield	38	46	36	50	42	16	42
Chaffee	26	42	54	64	54	48	13
Cheyenne	50	67	87	34	72	81	31
Clear Creek	72	71	47	90	89	60	48
Conejos	75	52	86	57	82	93	24
Costilla	81	74	94	56	76	94	25
Crowley	80	86	97	65	73	93	17
Custer	46	36	81	60	86	64	20
Delta	56	61	73	64	70	68	18
Denver	49	43	23	31	36	49	73
Dolores	47	67	92	50	61	66	11
Douglas	46	59	62	73	45	24	32
Eagle	59	70	42	80	62	30	27
Elbert	68	74	92	94	93	53	35
El Paso	57	53	57	51	61	68	55
Fremont	44	43	78	45	45	73	16
Garfield	49	62	49	68	49	44	21
Gilpin	60	61	76	85	90	37	12
Grand	58	59	43	81	77	46	14
Gunnison	32	37	63	41	44	42	5
Hinsdale	47	38	32	71	98	54	13
Huerfano	49	57	91	44	48	78	8
Jackson	24	22	59	20	47	45	2
Jefferson	40	41	36	43	51	33	53
Kiowa	52	38	84	36	56	88	15
Kit Carson	57	55	52	33	61	80	23
Lake	42	38	73	43	45	63	8
La Plata	63	64	79	75	58	58	14
Larimer	52	56	63	59	42	38	35
Las Animas	50	50	83	34	51	90	24
Lincoln	61	78	77	70	65	85	21
Logan	52	72	91	52	41	81	16
Mesa	51	49	60	54	64	63	41
Mineral	12	16	16	59	90	21	6

County	Home-Based Charger Priority	Public Charger Priority (L2)	Public Charger Priority (DCFC)	Workplace Charger Priority	EV Replacement Priority	E-bikes, Transit, and Others	Freight Priority
Moffat	39	39	46	24	34	65	12
Montezuma	56	50	72	55	53	75	19
Montrose	53	55	73	61	56	71	18
Morgan	49	52	50	37	47	73	30
Otero	49	47	78	31	36	89	26
Ouray	66	53	85	83	93	52	25
Park	45	48	70	81	89	42	19
Phillips	37	50	84	36	47	75	20
Pitkin	52	63	38	76	49	35	14
Prowers	51	58	87	35	35	88	23
Pueblo	51	42	76	44	39	84	39
Rio Blanco	30	43	38	28	49	50	11
Rio Grande	56	54	75	45	56	84	20
Routt	42	47	51	63	57	41	11
Saguache	71	71	93	54	61	85	18
San Juan	84	82	94	60	91	58	20
San Miguel	69	70	90	82	72	46	16
Sedgwick	56	42	86	38	55	87	25
Summit	51	55	41	65	51	33	18
Teller	51	43	77	72	74	58	21
Washington	59	68	91	53	68	76	17
Weld	56	55	65	58	50	58	57
Yuma	56	60	82	49	56	79	22

4.3 Survey

Overview

The Colorado Electric Vehicle (EV) Equity survey was designed to gather broad public feedback on transportation electrification programs. In particular, the survey focused on factors that led program participants to either purchase an EV or install EV charging infrastructure, with a focus on benefits that were experienced by or more likely to be experienced by EV equity communities. The survey was distributed through paid promotion on social media, mass email distribution, through the Colorado Electric Vehicle Coalition (CEVC), through the Technical Advisory Committee (TAC) and Community Advisory Committee (CAC) of the Colorado EV Equity Study, and through word of mouth. The survey could be completed between December 14, 2021, and January 19, 2022, and was available in both English and Spanish.

Altogether, approximately 1,520 participants responded to the survey. Approximately 462 respondents had installed EV charging infrastructure at a building that they owned/managed, and 192 had received an

incentive toward the installation of that EV charging infrastructure. Approximately 436 participants received a credit toward the purchase of a battery electric vehicle. EV owners who had not received a credit were not asked further questions to narrow the survey's focus on program experience. Approximately 15 percent of survey respondents used the Spanish language version of the survey. Note that the results of this survey are not statistically significant. Particularly with a high number of responses in this survey, these responses can regardless provide meaningful insight into program design.

Deploying this survey or a similar survey to program participants as a condition of program participation would also provide continuously updated insights into program participation (including the number of participants whose incomes fall below Federal poverty guidelines or identify as a person of color) and what elements of program design are more or less successful. This information can be used to inform key performance indicators (KPIs) and future program design. Note that if a version of this survey is used in KPI development, results from that survey should be used in setting baseline indicators.

The detailed findings from this survey are included in this chapter. A selection of the highlights from this analysis, combing feedback obtained from the Technical Advisory Committee and Community Advisory Committee, includes:

- EV charging infrastructure maintenance costs are the main pain point for non-single-family households, except for community/Government buildings. One possible explanation for this is that energy costs fluctuate more when chargers are used irregularly. When chargers are used regularly throughout the day, demand charges are less likely to suddenly spike.
- Community/Government buildings that were NOT used for fleet management reported having more difficulty with paperwork and being more unhappy at unpredictable monthly costs. A possible explanation for this is that community/Government buildings that are not used for fleet management are less likely to have dedicated staff who may have better access to resources of information and time to resolve EV installation issues. It may be useful for EV advisors to further specialize outreach to the public sector and develop specialists who focus on Government buildings with fleets alongside specialists who focus on other public buildings.
- More than three-quarters of respondents who installed EV charging stations at townhouses/multifamily housing indicated that paperwork was at least moderately difficult. As this is a particularly critical area for the State to achieve electrification goals in an equitable way, support for townhouses/multifamily housing could be an area of greater advisory support.
- People of color were three times less likely than non-people of color to start their shopping experience either very interested or only interested in an EV. A possible explanation for this is that a positive shopping experience may be more important for people of color.
- People of color who had purchased an EV were much more likely to use a credit union.
- Lower-income EV purchasers were much more likely to report difficulty in finding information to participate in a tax credit.
- Community events (including automobile shows, general community events, and others) and social media were very important for lower-income car buyers and people of color to learn about incentives.

- EV charging infrastructure installers had very positive experience with advisors.
- Only about one percent of survey respondents who used the Spanish language version of the survey indicated receiving a tax credit toward the purchase of a battery electric vehicle, 6 percent of Spanish survey respondents indicated installing EV charging infrastructure to their home or building, and less than one percent of Spanish survey respondents indicated that they had received an incentive to support that installation. As noted before, this could be caused by the particular distribution streams used for this survey. These differences could also reflect an opportunity to increase awareness of EV and EV charging station programs among Colorado's Spanish-speaking population.
- A high number of survey respondents indicated that they had purchased their EV using cash without a loan. One explanation for this is that lower-income individuals may have less access to better financing or interest rates. Another explanation is that EV buyers included in this sample may have access to other sources of wealth.
- With respect to the difficulty of paperwork, one possible explanation is the level of coordination required by applicants. One reviewer commented that their local housing authority was trying to install chargers to support a carshare program, and both financial management and maintenance staff were required to coordinate. This is particularly challenging during staffing shortages.

Considerations for future surveys, considering input from the Technical Advisory Committee and Community Advisory Committee, includes:

- Separating out EV charging station questions to isolate responses that apply to L2 chargers or to DCFC chargers would be a benefit, as the maintenance and installation costs of the two technologies are very different.
- COVID-19 supply chain impacts may limit EVs available to purchase or test drive. These shortages may be a factor to consider in future surveys.
- Finding more information about unpredictable monthly costs would be a benefit. One question that came up in discussion is whether the installed EV charging station was accessible by the public, as public EV charging stations sometimes have higher costs associated with vandalism.
- The use of telematics could provide insight into some of the costs associated with installing EV charging stations at public buildings. However, telematics are more common at Government buildings and for fleet managers, and less common at other community buildings.
- Finding more information about what information was available to EV buyers and when could be a benefit, as some dealers are thought to provide information on tax credits more transparently than others.
- While this survey was designed to focus on: 1) individuals who had installed an EV charging station at property they owned or managed, 2) individuals who had received an incentive toward the installation of an EV charging station, and 3) individuals who had received a tax credit from the State of Colorado toward the purchase of an EV, there was broad interest from reviewers to combine these results with a survey targeted at individuals who are reluctant to purchase an EV or install an EV charging station as well.

For complete survey responses, please see the Appendix.

4.3.1 *Future Research*

The tools described here represent an important first step. The tools and methods described in this document should be considered living documents that will continue to evolve with use and deeper understanding.

The prioritization tool has been developed to provide a framework. For future development, consider refining the way people of color are included within the tool to have a greater sensitivity to historic inequities by specific populations (paying particular attention to Black communities, Tribes, the Latinx community, and distinct Asian communities). If there are opportunities to develop the tool for use by many agencies, it may be desirable to develop the tool in an online platform (such as an R Shiny dashboard).

Finally, best practices with respect to community engagement is a growing field. Particularly with the increased focus on issues of diversity, equity, and inclusion across the Nation, best practices are expected to continue to evolve. Considering the diversity of programs that have been developed to address electrification needs, and the unique needs of communities across the country, new program categories and means of prioritization are likely to follow.

5.0 EV Equity Stakeholders

5.1 Advisory Committees

The project team engaged both a Technical Advisory Committee (TAC) and Community Advisory Committee (CAC) to inform development of this project and particularly the survey described in the previous chapter. These groups were engaged to ensure analysis and deliverables were relevant, fit within the context of program development, and were rooted in the appropriate community context. The Colorado Electric Vehicle Coalition (CEVC) and the CEVC Equity Subgroup were instrumental in identifying members for both committees. A technical committee can be useful for similar studies.

In selecting members for the CAC, the project team identified the following key characteristics and target groups:

- Low-income individuals
- People of color
- Individuals with disabilities
- Older adults
- Renters
- Essential workers
- Environmental justice advocacy groups
- Workforce development organizations
- Affordable housing organizations
- Public transit organizations
- Linguistically-isolated communities
- Rural communities
- Families

Additionally, the following regions were identified to ensure that the CAC would represent all areas of the state:

- Northern Colorado
- Southern Colorado
- Western Colorado
- Eastern Colorado
- Central/Metro
- Statewide

5.2 Organizational Resources

The project team also prepared a review of organizations and resources to support equitable access to transportation electrification and the benefits of transportation electrification. As of July 2021, Colorado State agencies were involved in around a dozen programs and policies to encourage EV adoption. Several notable programs include the Colorado Department of Revenue Innovative Motor Vehicle and Truck Tax Credit¹⁹⁰ (supporting the purchase of electric and plug-in hybrid electric vehicles), the Colorado Energy Office Charge Ahead Colorado grant program to support funding for EV charging infrastructure, the ReCharge Colorado program that supports EV education and coaching, the CanDo Colorado eBike Pilot Program, and the DCFC Plazas Program to support access to DCFC at plazas. Colorado's Department of Local Affairs Impact Assistance Program for Public Fleets offers a grant for counties and municipalities looking to electrify their fleets. Many parallel programs exist at the Federal level, including a Plug-In Electric Vehicle Tax Credit for individuals purchasing a new electric vehicle. At the State level, CDOT's VW Settlement Transit Program (part of the Consolidated Call for projects) supports transit electrification.¹⁹¹

At the local level, Denver's Regional Air Quality Council managed the ALT Fuels Colorado program, which (until 2022) provided grants to public, private and non-profit fleets for converting pre-2009 vehicles to cleaner fuels. The City and County of Denver also recently released the Denver Electric Vehicle Action Plan which lays out its programming priorities to encourage EV adoption.

Xcel Energy is making a large investment in transportation electrification under programs developed through the utility's Transportation Electrification Plan. The Utility is approved to spend approximately \$110 million through 2023 on programs that support the installation of EV charging infrastructure, purchase of EV, advisory services, and more.¹⁹² Black Hills Energy also has an approved Transportation Electrification Plan and will provide approximately \$1.2 million in electrification assistance.¹⁹³

Given the wide-ranging impacts of transportation electrification and the diverse groups who will support equitable transportation electrification, a number of organizations provide resources of money, advocacy, education, information, networking, programming, planning, and other support. Federal agencies, State agencies, municipalities, utility and energy providers, non-governmental organizations (NGOs) and think tanks, banks and credit unions, CBOs, trade organizations, networking groups, Tribal governments, and others have been identified.

Several local non-profits and coalitions were identified for their work in EV equity in particular, including the Northern Colorado Clean Cities Coalition and Drive Clean Colorado (formerly: Denver Metro Clean Cities Coalition), which house programs that offer educational services and foster dialogue surrounding EV adoption. Colorado Carshare offers discounted rates for EV carsharing to encourage EV use. Non-profits

¹⁹⁰ Colorado Department of Revenue, Taxation Division. N.d. Income 69: Innovative Motor Vehicle and Truck Credits for Electric and Plug-in Hybrid Electric Vehicles. <https://drive.google.com/file/d/18lYc9Spc4wBa2T-ZJkLaiMpHF3M1mZOE/view>.

¹⁹¹ Colorado Department of Transportation. N.d. Volkswagen Settlement—Transit Bus Replacement Program. <https://www.codot.gov/programs/planning/grants/vw-settlement-bus>.

¹⁹² Utility Dive. 2021 Colorado approves Xcel's \$110M transportation electrification plan, with strong equity emphasis. <https://www.utilitydive.com/news/colorado-approves-xcels-110m-transportation-electrification-plan-with-st/593367/>.

¹⁹³ The Colorado Sun. 2021. Stingy electrification plan by Black Hills Energy drives Pueblo inequity, advocates say. <https://coloradosun.com/2021/10/26/vehicle-electrification-pueblo/>.

and research organizations operating at the national level offer expertise and activism in promoting EV equity, including but not limited to the Greenlining Institute, the National Research Defense Council, and the National Council of State Legislatures. However, many NGOs who work closely with traditionally underserved communities such as low income and people of color populations, Tribal populations, and individuals with disabilities will have a stake in identifying equitable outcomes.

Organizations and select resources are included in the Appendix under Organizational Resources. Continuing to develop this list with input by the named organizations could help to develop relationships between these organizations and increase awareness of each organization among other stakeholders of transportation electrification and equity. Note that, while this list includes more than 100 organizations across many different organization types, there are many other communities and organizations investing in transportation electrification that are not included in the list.

Section 4: Implementing EV Equity in Colorado

6.0 Needs Assessment

6.1 Overview

The following document describes a process that can be used by agencies within the State of Colorado to define a transportation electrification program that centers equity. Incorporating equity into program development (or program refinement) is not a linear process followed by a singular outcome. Equity is both a process and an outcome designed to address racial, socioeconomic, and other characteristics. Promoting equity outcomes will continue to evolve, as individual participants' understanding continues to grow and underlying demographics continue to evolve. As communities change, revisiting the process is critical. This is particularly true when considering transportation electrification. The most innovative policies designed to more broadly distribute the benefits of transportation electrification may unintentionally favor wealthy consumers, providing important support to electric car manufacturers but failing to reach the most vulnerable communities.

This toolkit describes an eight-step process that can be used to help support equitable outcomes in transportation electrification. The framework is developed considering the unique opportunity in Colorado with SB21-260 and the passage of the State infrastructure bill. The toolkit describes the process of establishing a State-sponsored program to support transportation electrification, engaging with stakeholders, defining goals and outcomes, identifying assets and deficiencies, incorporating community-grounded indicators, modifying program design based on feedback, reviewing progress with the community, evaluating program effectiveness, and reporting back to the community.

The toolkit is written with a focus on program development, starting with a new transportation electrification program at the beginning of the program development process. However, any step in this process can be implemented at any time. Because of the interconnectedness of many of these steps, it is recommended that all of the steps be reviewed in their entirety before following guidance in one of the steps. For example, a program that has resources to implement Key Performance Indicators for the first time will likely want to revisit earlier steps to ensure that assumptions, data, stakeholders, objectives, and other factors are still current.

The documented process described here provides transparency around the agency's process for engaging stakeholders and incorporating stakeholder feedback. However, even the steps described in this needs assessment toolkit should be revisited periodically based on feedback from the public and program managers. In light of the passage of Colorado's SB21-260, the new State enterprises are uniquely positioned to incorporate steps described in this toolkit.

The project team reviewed a number of excellent resources while developing this document. While many resources are referenced throughout the document, the project team would like to particularly highlight a small selection of additional resources in Table 17 for further review.

Table 17 Further Resources in Moving Toward Racial Equity

Resource	Year	Author
Portland Racial Equity Toolkit (RET)	2022	City of Portland Office of Equity and Human Rights
Racial Equity Toolkit	2021	City of Seattle Race and Social Justice Initiative (RSJI)

Resource	Year	Author
Racial Equity Toolkit	2021	Michigan Department of Civil Rights
Clean Mobility Equity: A Playbook	2021	The Greenlining Institute
Racial Equity Impact Analysis	2020	City of Oakland, CA
Community Engagement Principles & Recommendations	2019	Elevated Chicago
Mobility Equity Framework	2018	The Greenlining Institute
Racial Equity Toolkit	2016	Government Alliance on Race and Equity

6.2 Community Needs Assessment

The following Community Needs Assessment provides an eight-step approach that can be used by State agencies, planning organizations, utilities, transportation electrification program managers, and others to design and refine transportation electrification programs in a way that centers equity. In addition to recommended practices and important considerations, each step also includes a list of questions to consider and suggests methods for engaging the community that have been implemented in similar planning contexts. The primary audience for this guidance is State employees managing a transportation electrification program or programs.

A best practice for conducting a Community Needs Assessment is to evaluate needs at an organizational level, which supports program development by institutionalizing an equity-centered approach throughout the organization. Conducting an assessment of the organizational approach to equity issues, collaboratively reviewing relevant historical context,¹⁹⁴ and co-identifying where shortfalls exist based on current program spending will better coordinate program activities and embed equity throughout. If the Community Needs Assessment is done on a program-by-program basis, it is best done by intentionally engaging the community throughout the process. By incorporating the community throughout the planning process, not only are equitable outcomes highlighted early, but potential partners may be identified through targeted relationship building. When community engagement is incorporated at the end, program staff may spend valuable resources in time and money redesigning programs that fail to meet community objectives and spend additional resources to rebuild community trust.¹⁹⁵

It cannot be emphasized enough that there is no single program to implement EV equity. Equity is centered throughout the programs and policies of an organization—with input from community partners. Table 18 provides an overview of the steps included in the Needs assessment.

¹⁹⁴ City of Portland Office of Equity and Human Rights. 2016. City of Portland Racial Equity Toolkit. <https://www.portlandoregon.gov/oehr/article/592297>.

¹⁹⁵ Greenlining. 2021. Clean Mobility Equity: A Playbook Lessons from California’s Clean Transportation Programs. <https://greenlining.org/wp-content/uploads/2021/03/Clean-Mobility-Equity-A-Playbook-Greenlining-Report-2021.pdf>.

Table 18 Needs Assessment Overview

Step	Questions
15. Define the program area(s)	<ul style="list-style-type: none"> • What is your organizational or program focus (e.g., air quality, affordability, anti-displacement, education, defense, economic development, environmental conservation, health, mobility, safety, workforce development)? • What is your organizational or program geographic focus (e.g., statewide, Denver metropolitan area, I-70 corridor, Grand Valley)? • What other program areas should be considered, as either primary or secondary areas of focus? What other organizations can become partners to support these areas of focus? • What funding is available, if known? What use restrictions are on that funding?
16. Identify stakeholders, stakeholder roles, and develop a public participation plan.	<p>Identifying Participants</p> <ul style="list-style-type: none"> • What community members may have an interest in the program area identified? Which community members already have relationships with the organization or program managers? • Who else needs to be at the table to ensure that diverse communities are represented? Is representation diverse with respect to constituents, geography, resources, size, and other important factors? • Who else needs to be at the table to ensure that the Community Needs Assessment process is successful and not duplicative (e.g., facilitators, data analysts, program managers developing complementary programs)? <p>Developing Meaningful Relationships</p> <ul style="list-style-type: none"> • What funding is available to compensate community partners for their time? • What trust needs to be developed for the organizations to fully participate in the process? • What level of engagement do community members seek? What is each organization's role in this process? • What principles for engagement should guide these interactions? • What educational materials or opportunities need to be shared with communities to help them participate in the process? • How will the program staff record, review, and incorporate feedback? How will this be communicated to stakeholders so they understand? <p>Public Engagement Sessions</p> <ul style="list-style-type: none"> • Are any organizations able to co-host with program staff to improve participation? • What are the logistics around public engagement to reduce barriers to participation? What is the right combination of in-person sessions, webinars, and online surveys? • Who is attending and participating? How did they hear about the event and why did they feel motivated to attend? How many are new to or have less experience with transportation electrification? How many are advocates who know about the topic already?
17. Define goals and objectives	<ul style="list-style-type: none"> • What are our priorities? • What goals describe outcomes that are important to community members? What do our stakeholders care about? • What are the greatest opportunities for creating change within our program area in the next year? In the next 5-10 years? • How can our organization or program meaningfully contribute to this goal? What objectives capture those actions? • What strategies for implementing objectives do community members recommend? • How is equity centered within each of these objectives?

Step	Questions
<p>18. Identify assets and deficiencies in the area</p>	<ul style="list-style-type: none"> • Is the program area clearly understood by stakeholders? Do all stakeholders understand the scope of the needs and deficiencies, as limited by the program area? • What other needs and deficiencies have been defined by organizations and programs with similar program areas or goals? • If multiple organizations are conducting needs assessments, can those efforts be combined? For example, are other mobility programs surveying the State? • What data can stakeholders provide from within their organization? What data can stakeholders suggest outside of their organizations? Are there important differences in the way data are interpreted? • After initial mapping exercises have been completed, do these results make sense to both your organization and to the community? Are other needs missing? • Do the objectives identified in the previous step address the assets and deficiencies identified? Do either objectives, assets, or deficiencies need to be refocused? • What technological resources exist within the community? Is there a large unbanked community? Do they have access to smart phones and access to home Internet? • What obstacles to achieving program objectives have been identified by the community?
<p>19. Refine understanding of assets and deficiencies by incorporating community-grounded input</p>	<ul style="list-style-type: none"> • Are there any data gaps? How can the data be acquired? • What indicators have been suggested by the community? If they are not part of the dashboard currently, what needs to be done to include them? • How has the community feedback been incorporated? • What is the plan to provide transparency on the feedback gathered? • How is qualitative feedback going to be considered?
<p>20. Develop or modify program design based on feedback</p>	<p>Eligibility</p> <ul style="list-style-type: none"> • Who is eligible for the program? Is it determined by individual applicant characteristics or program enrollment (e.g., income 200 percent of Federal poverty guidelines, enrolled in Supplemental Nutritional Assistance Program [SNAP])? • Is eligibility open to all areas of the State, or only areas that meet certain criteria (e.g., areas that are underserved with respect to transportation, areas that qualify as Disproportionately Impacted communities under HB21-1266, Higher Emissions Community as defined in Xcel Energy’s TEP programs) • How is eligibility administered? Is eligibility determined based on enrollment in other income-qualified programs (including Temporary Aid for Needy Families, Colorado’s Weatherization Assistance Program, Colorado’s Low-income Energy Assistance Program, Colorado’s Affordable Residential Energy Program, and others)? If not, what staff resources are required to establish minimum eligibility? • How much does administration cost? <p>Technological Requirements</p> <ul style="list-style-type: none"> • What are the program’s procedural and technical requirements (e.g., use of a specialized software, permitting requirements, planning documents)? Is advisory support available to help applicants meet those requirements? • What data are applicants required to provide? Are those data requirements reasonable? What privacy concerns can be addressed? Do stakeholders understand how data requirements will inform future program development? • What technologies are eligible for program funding? What vehicle types? What other mobility options? <p>Communications</p> <ul style="list-style-type: none"> • How is the program promoted? In what languages and through which venues? Are all program design elements (e.g., minimum eligibility, evaluation criteria, data-sharing requirements) clearly communicated? • How are program materials distributed? What technical and procedural requirements apply? • What opportunities for engagement will stakeholders have in the future?

Step	Questions
	<p>Targeted Strategies</p> <ul style="list-style-type: none"> • What tiers are available to meet the needs of differently resourced communities? • Which EV equity communities are served by the strategies developed? Which are not? • What are the tradeoffs for each of the strategies? How can these tradeoffs be mitigated? <p>Review with community stakeholders</p> <ul style="list-style-type: none"> • How have these strategies incorporated feedback from previous engagement sessions? What feedback was not included and why? • What might be the unintended consequences of these strategies and how can they be mitigated? • What mitigation is feasible? What might be feasible in the future? • What should broader public engagement look like and what resources are needed to enact it?
21. Evaluate program effectiveness	<ul style="list-style-type: none"> • Which KPIs align with the goals and objectives that have been chosen? • What data assets have already been identified? Can that data be used to support a KPI? • Who is responsible for data collection and measurement? Are they part of the process of selecting these KPIs? • Do the KPIs selected meet SMART criteria? • Who is responsible for implementing the program(s)? Are they part of the process of selecting KPIs? • How often should this be measured? • Should measurement be done by community, by area of the State (e.g., urban, rural), or some other designation?
22. Report results	<ul style="list-style-type: none"> • How regularly will reports be completed? • What resources do we need to ensure that we can provide timely, thorough documents? • What formats are compelling to our audience(s)? Does a written document satisfy our audience's needs? Do other formats help to communicate results (e.g., a website, a map)? • What opportunities are there for members of the public to provide feedback on what has been developed? How can we expand those opportunities? • How do we obtain feedback on the report itself (i.e., the readability of documents, presentation of data) as opposed to the program/organization described? • How are report findings shared out?

6.2.1 Define the Program Area(s)

Many of the programs developed in Colorado are impacted by legislation that includes language that will inform the programs' goals, outcomes (described below), and the program area. For example, in SB21-260, the Community Access Enterprise program area is defined as air pollution, greenhouse gas emissions, and mobility. Both SB21-260 and HB21-1266 highlight the need for lawmakers to provide consideration for rural, urban, and disproportionately impacted communities.^{196,197} Program areas can be identified by

¹⁹⁶ Colorado General Assembly. 2021. SB21-260 Sustainability of The Transportation System. <https://leg.colorado.gov/bills/sb21-260>.

¹⁹⁷ Colorado General Assembly. 2021. SB21-260 Sustainability of The Transportation System. <https://leg.colorado.gov/bills/hb21-1266>.

asking what the program has the ability to impact, and where those impacts are likely to occur. Common program areas in the public sector include:¹⁹⁸

- Air quality
- Children and youth
- Community engagement
- Contracting equity
- Criminal justice
- Economic development
- Education
- Environment
- Food access and affordability
- Government practices
- Health
- Housing
- Human services
- Jobs
- Mobility/Transportation
- Planning and development
- Public safety
- Utilities
- Workforce development

The program area is also geographically bound and can be defined as being statewide, regional, local, or any other unit of geography. While the available funding is considered primarily in step 4 (identify assets and deficiencies), if there are restrictions on funding that limit the program area to a particular geography, that restriction may also play a role in defining the program area.

In other cases, the program area has previously been defined, but may be reinvigorated by taking a fresh assessment of the program's area of influence or by expanding the organization's geographic reach. For example, the Regional Air Quality Council (RAQC) was established in 1989 to serve as the lead air quality planning agency for the Denver metropolitan area, and in 2013 expanded its program area to include the Denver metropolitan area and the Denver Metro/North Front Range Ozone Non-Attainment Area.¹⁹⁹ Also, although the RAQC focuses on air quality, secondary program areas might include mobility and health. Through RAQC's Charge Ahead Colorado Program, RAQC plays an important role in supporting clean mobility options for the seven-county Denver metropolitan area.²⁰⁰

Defining the program area can be useful to establish a geographic focus and overlapping areas of interest. For example, lack of access to affordable transportation (mobility inequity) is tied to poor job access (economic inequity) or highway routes that cut through neighborhoods (torn community fabric) now impact people's access to clean air because of increased freight truck traffic (public health inequity) and access to community resources (social inequity). Broadly defined program areas may support the development of a multisector approach in later steps of this Community Needs assessment, and support

¹⁹⁸ Government Alliance on Race & Equity. 2016. Racial Equity Toolkit: An Opportunity to Operationalize Equity. https://racialequityalliance.org/wp-content/uploads/2015/10/GARE-Racial_Equity_Toolkit.pdf.

¹⁹⁹ Regional Air Quality Council. 2020. About. <https://raqc.org/about/#executiveorder>.

²⁰⁰ Regional Air Quality Council. 2022. Charge Ahead Colorado. <https://cleanairfleets.org/programs/charge-ahead-colorado>.

collaboration across industries or agencies.^{201,202} Possible multisector approaches for EV charging programs can include collaboration with workforce development agencies to improve job opportunities for residents in EV equity communities and collaboration with economic development to mitigate displacement pressures of EV charging, improving multiple outcomes for residents of EV equity communities.²⁰³

Questions

- What is your organizational or program focus (e.g., air quality, affordability, anti-displacement, education, defense, economic development, environmental conservation, health, mobility, safety, workforce development)?
- What is your organizational or program geographic focus (e.g., statewide, Denver metropolitan area, I-70 corridor, Grand Valley)?
- What other program areas should be considered, as either primary or secondary areas of focus? What other organizations can become partners to support these areas of focus?
- What funding is available, if known? What use restrictions are on that funding?

6.2.2 *Identify Stakeholders, Stakeholder Roles, and Develop a Public Participation Plan*

It is a best practice for program staff to reach out to community stakeholders several times in the program design process to iterate and improve outcomes and develop community buy-in for the program. While stakeholder engagement is included here as an individual step, the stakeholder engagement process should be revisited throughout the Community Needs Assessment and modified based on stakeholder feedback.

The community engagement process begins by developing a list of CBOs, communities that have an interest in the program areas identified. This group of community members should include both CBOs with which staff already have a relationship, as well as other organizations identified by the public (for a list of CBOs identified through the CO EV Equity Survey, see the Appendix). By maintaining a list of CBOs serving different geographic areas, constituents, and focus areas, it may be possible to streamline the process of engaging CBOs during program development. Tracking CBOs across agencies can help program staff in many different agencies quickly identify potential partners, prevent outreach fatigue by CBOs, highlight CBOs that are eager to find opportunities for engagement, and identify areas where CBO engagement could be expanded. Note that the Colorado EV Equity Study has identified many of the organizations that could be included in a shared database.

²⁰¹ Greenlining. (2021). Clean Mobility Equity: A Playbook Lessons from California's Clean Transportation Programs. Greenlining. <https://greenlining.org/wp-content/uploads/2021/03/Clean-Mobility-Equity-A-Playbook-Greenlining-Report-2021.pdf>.

²⁰² TransitCenter & Center for Neighborhood Technology. (2021). Equity in Practice: A Guidebook for Transit Agencies. <https://www.cnt.org/sites/default/files/publications/Equity-in-Practice.pdf>.

²⁰³ Greenlining. (2021). Clean Mobility Equity: A Playbook Lessons from California's Clean Transportation Programs. Greenlining. <https://greenlining.org/wp-content/uploads/2021/03/Clean-Mobility-Equity-A-Playbook-Greenlining-Report-2021.pdf>.

Another critical group of stakeholders that should be engaged through the process is State agency partners, data specialists, policy-makers, elected officials, and others. This broader group of other stakeholders may be called upon to provide technical expertise during the data collection, help align program efforts and reduce duplicative efforts, share best practices with respect to program design and implementation, and provide resources with respect to outreach to community members.

With the list of identified organizations and communities, the next step is to identify groups' roles. Depending on both agency capacity and CBO capacity, as well as the availability of funding for both groups, some groups may want to essentially take a role as a member of the project team, whereas other groups may choose to participate on a less frequent basis. When working with CBOs or communities, the Elevated Chicago Community Engagement Principles recommend prioritizing transparency in the decision-making process, using common terms and concepts understood by the public, and offering multiple engagement opportunities to fit varying work and family schedules. In some cases, additional education may be necessary to help community members meaningfully engage with the process.²⁰⁴ Additional education may include background concepts of the program area (such as different types of EV charging or EVs), review of baseline data, and explanation of organizational processes to understand how changes can be made.

These levels of engagement were developed to be mindful of the principles of public participation identified by the International Association for Public Participation (IAP2), widely implemented by a number of planning organizations.²⁰⁵ For example, Elevated Chicago built upon the IAP2 spectrum and developed a set of principles and recommendations especially targeted to organizations working on public infrastructure (in the case of Elevated Chicago, the focus was on Transit Oriented Development).²⁰⁶ The IAP2 framework (Table 19) has been used successfully to guide community engagement across many sectors, including during development and planning for public infrastructure.

²⁰⁴ Elevated Chicago. 2021. Community Engagement Principles & Recommendations <https://elevatedchicago.org/Elevated%20Community%20Engagement%20Principles-Digital.pdf>.

²⁰⁵ IAP2 USA. 2018. IAP2 spectrum. <https://iap2usa.org/resources/Documents/Core%20Values%20Awards/IAP2%20-%20Spectrum%20-%20stand%20alone%20document.pdf>.

²⁰⁶ Elevated Chicago. 2021. Community Engagement Principles & Recommendations <https://elevatedchicago.org/Elevated%20Community%20Engagement%20Principles-Digital.pdf>.

Table 19 IAP2 Spectrum of Public Participation

	Inform	Consult	Involve	Collaborate	Empower
Public Participation Goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives and/or solutions.	To obtain public feedback on analysis, alternatives and/or decision.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Promise to the Public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

Clearly identifying different levels of engagement and corresponding roles can help make engagement more inclusive and manage expectations for all parties. **Community partners** take a leading role in designing the program, **stakeholders** take on an advisory role through focus groups, and broader **public engagement** involves infrequent informational meetings, review sessions, and surveys.²⁰⁷ Throughout this Community Needs Assessment, the type of community engagement (community-based partner, community stakeholders, or broader public engagement) will be specified.

When working with community members, being mindful of certain principles is useful for successful engagement. Identifying these principles in collaboration with community members sets the stage for a more collaborative public participation process. The following set of principles is adapted from Elevated Chicago's Community Engagement Framework:²⁰⁸

- Know your audience—remember that community groups are not members of a monolithic 'equity community,' but all join the conversation with unique experiences. Observe who is not present.
- Engage with a learning mindset—be an active listener, share successes and failures, and commit to growing through the process.
- Respect time commitments—be prepared, follow through, highlight the important questions, and be realistic about review times.

²⁰⁷ University of Kansas Community Tool Box. 2014. Section 7. Conducting Needs Assessment Surveys. <https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/conducting-needs-assessment-surveys/main>.

²⁰⁸ Elevated Chicago. 2021. Community Engagement Principles & Recommendations <https://elevatedchicago.org/Elevated%20Community%20Engagement%20Principles-Digital.pdf>.

- Identify and share decision-making authority—transparently identify what decision is to be made and who will make that decision. Share authority with the community where possible.
- Show value in feedback—build trust by actively demonstrating where feedback has been incorporated at regular intervals (not just at the end). Always strive to compensate for this work.
- Set clear expectations—be clear what community members can expect from program staff, and clearly identify what you hope to receive from community members.
- Meet people where they are—meet people where they are in terms of physical space, understanding, and emotion.
- Be self-aware—take time to find out how the organization/program is perceived, the energy of organization staff in general or on a particular day, and how different information is being received.
- Be respectful.

When preparing for public engagement, organization and program staff can help develop a successful plan for public engagement by identifying important areas for feedback and flagging additional materials that will need to be prepared in order to have a productive discussion.²⁰⁹ Some topics may need further explanation or education; providing that education to stakeholders can help stakeholders provide more-informed feedback.²¹⁰ For example, explaining that a Level 1 (L1) charger operates at 120 volts may be less compelling to community members than further explaining that a L1 charger typically adds 2-5 miles of range per hour of charging.²¹¹ Identifying tradeoffs throughout the program is also an important tool to ensure that community members understand what feedback can influence programming decisions. Co-creating the methods of public engagement with the community-based partners and community stakeholders is useful for building ownership of a plan that meets expectations and fits within stakeholder schedules.

Particularly when working with members of the community, it is most important that community partners feel that the time they commit is worthwhile. If at all possible, prioritize compensating partners for their time. Among Colorado State agencies, this model has not been widely implemented, and some reports indicate that paperwork and tax requirements represent a persistent obstacle. Exploring a more formal organization of community members that can be sustained beyond individual engagement efforts could benefit a number of State agencies and organizations. An example of such an organization can be found in Chicago, where the Transportation Equity Network forms a sustained coalition of compensated stakeholders who regularly work with regional agencies on a variety of projects to better center transportation equity within regional planning efforts.²¹² Whether or not compensation is possible, it is very important to demonstrate to community partners that program development has changed as a result of community input.

²⁰⁹ City of Portland Office of Equity and Human Rights. 2016. City of Portland Racial Equity Toolkit. <https://www.portlandoregon.gov/oehr/article/592297>.

²¹⁰ Greenlining. 2018. Mobility Equity Framework: How to Make Transportation Work for People. https://greenlining.org/wp-content/uploads/2019/01/MobilityEquityFramework_8.5x11_v_GLI_Print_Endnotes-march-2018.pdf.

²¹¹ Charged Electric Vehicles Magazine. 2019. Liquid cooling in electric vehicles: What to know to keep EVs on the go. <https://chargedevs.com/newswire/liquid-cooling-in-electric-vehicles-what-to-know-to-keep-evs-on-the-go/>.

²¹² Center for Neighborhood Technology. 2021. Transportation Equity Network. <https://www.cnt.org/transportation-equity-network>.

Questions

Identifying Participants

- What community members may have an interest in the program area identified? Which community members already have relationships with the organization or program managers?
- Who else needs to be at the table to ensure that diverse communities are represented? Is representation diverse with respect to race, ethnicity, income, resources, constituents, geography, size, and other important factors?
- Who else needs to be at the table to ensure that the Community Needs Assessment process is successful and not duplicative (e.g., facilitators, data analysts, program managers developing complementary programs)?

Developing Meaningful Relationships

- What funding is available to compensate community partners for their time?
- What trust needs to be developed for the organizations to fully participate in the process?
- What level of engagement do community members seek? What is each organization's role in this process?
- What principles for engagement should guide these interactions?
- What educational materials or opportunities need to be shared with communities to help them participate in the process?
- How will the program staff record, review, and incorporate feedback? How will this be communicated to stakeholders so they understand?

Public Engagement Sessions

- Are any organizations able to co-host with program staff to improve participation?
- What are the logistics around public engagement to reduce barriers to participation? What is the right combination of in-person sessions, webinars, and online surveys?
- Who is attending and participating? How did they hear about the event and why did they feel motivated to attend? How many are new to or have less experience with transportation electrification? How many are advocates who know about the topic already?

6.2.3 Define Goals and Objectives

Defining goals and objectives begins the process of turning the program area identified in step 1 into actions. Goals are broadly defined priorities for the organization or program manager and should be strongly connected to outcomes that are important to stakeholders. Goals can be both short- and long-term.²¹³ An example goal for a program that is focused on safety would be to 'reduce the number of fatalities for travelers in all areas of the State.'

²¹³ U.S. Department of Transportation Federal Highway Administration. 2013. Performance Based Planning and Programming Guidebook. https://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/.

In the case of Colorado transportation electrification programs, **goals** may be informed through legislation. Returning to the example of the Community Access Enterprise, SB21-260 specifies that the enterprise was ‘created to serve the primary business purpose of equitably reducing and mitigating the adverse environmental and health impacts of air pollution and greenhouse gas emissions produced by motor vehicles used to make retail deliveries to consumers within local communities.’²¹⁴

Goal-setting is, as with all of the steps included in the Community Needs Assessment, best done with community engagement. Focus groups and workshops are effective tools for both goal-setting and determining objectives. Inviting the organizations identified in step 2 as **community partners** or **stakeholders** to this process will ensure that the goals are grounded in outcomes that are important to the community and will help develop support for the program that can carry on throughout program implementation.

At both an organizational level and program level, setting **objectives** can be an effective way of further focusing program activities, building support for the program, and revealing strategies that support implementation. Objectives should follow from goals but should also be sufficiently detailed and specific to be evaluated through ongoing performance measurement.²¹⁵ Objectives should focus on actions that fall within the organization or program managers’ areas of influence. The RAQC’s 2021-2026 Strategic Plan includes eleven objectives in four categories (Table 20). These objectives were developed with facilitation support provided by the Denver Regional Council of Governments (DRCOG) and an outside consultant.²¹⁶ Transparently stated objectives support trust-building with the community and are helpful for planning for the future.

Table 20 Regional Air Quality Council Strategic Plan Mission, Vision, and Objectives

Mission: We collaborate to improve air quality and protect Colorado's health, environment, and economy through planning, policy development, and program implementation.			
Vision: Clean air provides us the opportunity to breathe easy.			
Strategic Perspectives and Objectives:			
Community and Residents	Financial Health	Effective Programs	Skilled and Empowered Staff
<ul style="list-style-type: none"> • Improve Air Quality and Public Health • Expand Leadership Role • Increase Support & Adoption of Initiatives & Policies 	<ul style="list-style-type: none"> • Improve Financial Resource Utilization • Improve Continuous Funding Streams 	<ul style="list-style-type: none"> • Improve Program Processes • Expand Programs & Services • Improve Partnering 	<ul style="list-style-type: none"> • Increase Opportunities for Professional Growth & Learning • Improve Technology & Tools • Improve Collaboration & Teamwork

²¹⁴ Colorado General Assembly. 2021. SB21-260 Sustainability of The Transportation System. <https://leg.colorado.gov/bills/sb21-260>.

²¹⁵ U.S. Department of Transportation Federal Highway Administration. 2013. Performance Based Planning and Programming Guidebook. https://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/.

²¹⁶ Regional Air Quality Council. 2021. Strategic Plan 2021-2026. https://raqc.egnyte.com/dl/St5SSpW0ca/RAQC_StrategicPlan_2021-2026.pdf.

One framework to develop goals is targeted universalism.^{217,218} Targeted universalism involves creating a universal goal for the whole population within the geographic area and developing different strategies to best meet the needs and circumstances of specific communities.²¹⁹ This is different than a universal approach in which one goal is created, and non-unique strategies are used across the population. It is also distinct from a targeted approach that uses unique goals for different groups within a population. Some agencies may find targeted universalism helpful to bypass legal challenges to targeted approaches while still addressing historic inequities. For example, the EV Car Sharing and Mobility Hubs in Affordable Housing Pilot funded by the California Air Resources Board stated a universal goal for low-income and disadvantaged communities and provided targeted interventions to respond to the specific needs of the communities served.²²⁰

The process of setting objectives should be done in a way that is mindful of the specific actions or strategies required by each stakeholder, and the steps required to measure progress. For example, one of the RAQC objectives (included in Table 20) is to: ‘Increase Support & Adoption of Initiatives and Policies.’ The Strategic Plan identifies the following performance measurement as a corresponding strategy for that measure: ‘Track and annually report on outreach efforts to all communities, workgroups, and stakeholders’.²²¹ This performance measure will allow program managers to identify the success of their actions and refocus where needed.

Questions

- What are our priorities?
- What goals describe outcomes that are important to community members? What do our stakeholders care about?
- What are the greatest opportunities for creating change within our program area in the next year?²²² In the next 5-10 years?
- How can our organization or program meaningfully contribute to this goal? What objectives capture those actions?

²¹⁷ Greenlining. 2021. Clean Mobility Equity: A Playbook Lessons from California’s Clean Transportation Programs. <https://greenlining.org/wp-content/uploads/2021/03/Clean-Mobility-Equity-A-Playbook-Greenlining-Report-2021.pdf>.

²¹⁸ Michigan Department of Civil Rights. 2021. Racial Equity Toolkit: A Road Map for Government, Organizations and Communities. https://www.michigan.gov/documents/mdcr/Racial_Equity_Toolkit_revised_February_2021_717626_7.pdf.

²¹⁹ Haas Institute for a Fair and Inclusive Society at University of California Berkeley. 2019. Targeted Universalism: Policy & Practice. https://belonging.berkeley.edu/sites/default/files/targeted_universalism_primer.pdf?file=1&force=1.

²²⁰ Greenlining. 2021. Clean Mobility Equity: A Playbook Lessons from California’s Clean Transportation Programs. <https://greenlining.org/wp-content/uploads/2021/03/Clean-Mobility-Equity-A-Playbook-Greenlining-Report-2021.pdf>.

²²¹ Regional Air Quality Council. 2021. Strategic Plan 2021-2026. https://raqc.egnyte.com/dl/St5SSpW0ca/RAQC_StrategicPlan_2021-2026.pdf.

²²² Seattle Office for Civil Rights. 2012. Racial Equity Toolkit to Assess Policies, Initiatives, Programs, and Budget Issues. <https://www.seattle.gov/Documents/Departments/RSJI/Resources/Racial-Equity-Toolkit-Fillable-RSJI-August-2012.pdf>, pg. 4.

- What strategies for implementing objectives do community members recommend?
- How is equity centered within each of these objectives?

6.2.4 Identify Assets and Deficiencies in the Area

The next step in this process is to identify assets and deficiencies by program area. As described in step 1, this will involve both the area of focus for the organization or program (such as air quality or mobility), but also the geographic extent of the program. Program assets include anything that can support the organization or program in achieving the goals and objectives defined in the previous step, and include (but are not limited to) funding, staff resources, technical expertise, data, equipment, methodologies, stakeholder groups, communication systems, and even infrastructure that has been previously supported by program spending (for example, charging stations that were funded during a previous program cycle). Deficiencies include any area for improvement, and can be both the deficiency the organization or program is meant to address (for example, a lack of charging stations) and any obstacle that may hinder success.

Time and technical expertise are particularly important for this exercise. Step 4 and Step 5 both focus on identifying assets and deficiencies, but step 4 emphasizes coordination with technical and organizational peers, staff and step 5 emphasizes coordination with the wider community. The first pass at identifying assets and deficiencies is done to set up processes for identifying and managing data, develop clear examples using actual data when asking other stakeholders for feedback, lighten the level of effort in subsequent requests, and to focus subsequent conversations. However, both steps require engagement with other organizations. At this step, engaging with technical staff and peer organizations can help reduce costs associated with collecting and preparing data. Engaging with technical and organization peer organizations is likely to occur through a consultative process.

For the Colorado EV Equity Study, identifying community assets and deficiencies focused on measuring the level of deployment for transportation electrification infrastructure, EVs, air quality effects associated with conventional transportation methods, and benefits associated with transportation electrification by geography. To identify areas for improvement for programs by relevant community members located anywhere in the State, a survey tool was deployed to identify how existing programs were deficient with respect to meeting community members' needs.

Data assets used included both national and State resources. This includes the Colorado Department of Public Health and Environment's Climate Equity Data Viewer, which can be used to capture environmental burdens (such as air pollution) at a block group level.²²³ The project team also identified block groups that are classified as Disproportionately Impacted under HB21-1266.²²⁴ The Colorado Department of Transportation travel demand model was used to approximately estimate the VMT into and from block groups around the State. Other important data sources included the Colorado Department of Education, EPA, NREL, FHWA, and the Center for Neighborhood Technology (CNT) (see Data Indicator Mapping and Index Scoring Development for the complete list of data sources).

²²³ Colorado Department of Public Health and Environment. 2021. Climate Equity Data Viewer. <https://storymaps.ArcGIS.com/stories/46bf289f92bc4629a0a1266de4bb7f97>.

²²⁴ Colorado General Assembly. 2021. HB21-1266 Environmental Justice Disproportionate Impacted Community. <https://leg.colorado.gov/bills/hb21-1266>.

Finally, one of the most important considerations for organizations and program managers is the amount of funding available to support program efforts. Identifying the source of organization or program funding for several years in the future is important for ensuring that program activities are not interrupted.

Questions

- Is the program area clearly understood by stakeholders? Do all stakeholders understand the scope of the needs and deficiencies, as limited by the program area?
- What other needs and deficiencies have been defined by organizations and programs with similar program areas or goals?
- If multiple organizations are conducting needs assessments, can those efforts be combined? For example, are other mobility programs surveying the State?
- What data can stakeholders provide from within their organization? What data can stakeholders suggest outside of their organizations? Are there important differences in the way data are interpreted?
- After initial mapping exercises have been completed, do these results make sense to both your organization and to the community? Are other needs missing?
- Do the objectives identified in the previous step address the assets and deficiencies identified? Do either objectives, assets, or deficiencies need to be refocused?
- What technological resources exist within the community? Is there a large unbanked community? Do they have access to smart phones and access to home Internet?
- What obstacles to achieving program objectives have been identified by the community?

6.2.5 *Refine Understanding of Assets and Deficiencies by Incorporating Community-Grounded Input*

After the first assessment of assets and deficiencies, it is important to ground-truth indicators in the communities' own understanding and test the approach. Organizational and program staff should plan to present the results to a broader group of community members to obtain feedback and identify additional data that may speak to important community concerns. Where prioritization indexes are being used, they may need to be modified to include new indicators or weighted differently to reflect new priorities (see Chapter 4). The EV Equity prioritization tool has been developed to reflect socioeconomic, transportation, environmental, and electrification needs specific to a variety of programs in use in Colorado. However, the dashboard is a starting point to identify EV equity communities and should be revisited and updated periodically to ensure its relevance and appropriateness in addressing community needs.

Partners and CBOs can provide information on previously undiscovered data, provide insight into how data are interpreted, and raise community concerns that can be measured by a known data source (for example, using asthma hospitalization rates to measure a community's concern about air quality illness).

Hosting broad **public engagement** sessions can be helpful to gain insight into the organization or program area's assets and deficiencies. These sessions can occur in a variety of formats, including an open forum with a presentation and discussion, stations with activities and one-on-one interaction between staff and community members, or facilitated small group sessions with large group report-backs of discussion topics. Public engagement sessions provide residents an opportunity for community members to reflect on what has

worked well within their community and what might explain persistent inequalities. Co-hosting these public engagement sessions with CBO and other community stakeholders can support broader participation.²²⁵

In addition to quantitative indicators, qualitative data and indicators identified by the community can be factored into project prioritization or geographic spending. Qualitative indicators can highlight existing issues in the community that quantitative indicators might not uncover. When included, consider assigning equal weighting to these indicators when combined with quantitative indicators in the dashboard. As programs evolve, efforts to capture lived experiences of the community, similar to gathering quantitative data to inform program design, can move programs further towards equity.

Questions

- Are there any data gaps? How can the data be acquired?
- What indicators have been suggested by the community? If they are not part of the dashboard currently, what needs to be done to include them?
- How has the community feedback been incorporated?
- What is the plan to provide transparency on the feedback gathered?
- How is qualitative feedback going to be considered?

6.2.6 *Develop or Modify Program Design Based on Feedback*

After assets and deficiencies have been identified, the organization and program design can be developed. Essentially, this task is to use the assets identified and determine what specific steps are necessary to meet the objectives and goals developed in previous steps. This process will likely require the organization and program staff to return to steps 3, 4, and 5 as new considerations come to light while evaluating what actions are feasible. This step is also best done through extensive stakeholder engagement.

A best practice here is to develop program design incorporating a menu of program design elements that will help achieve goals. This step involves more collaborative and empowering levels of public participation. When developing strategies, work with **community partners** and other **stakeholders**, to determine how to collaboratively address community needs and deficiencies identified in the previous steps.²²⁶ Example strategies that can be implemented in program elements that can ensure that program spending is directed to target communities include (but is not limited to):

- Ensure that procedural and technical requirements are developed mindful of differently resourced organizations and individuals

²²⁵ Elevated Chicago. 2021. Community Engagement Principles & Recommendations. <https://elevatedchicago.org/Elevated%20Community%20Engagement%20Principles-Digital.pdf>.

²²⁶ Michigan Department of Civil Rights. 2021. Racial Equity Toolkit: A Road Map for Government, Organizations and Communities. https://www.michigan.gov/documents/mdcr/Racial_Equity_Toolkit_revised_February_2021_717626_7.pdf.

- Establish minimum eligibility requirements (considering individual applicant characteristics, place-based characteristics, and procedural and technical characteristics)
- Integrate evaluation criteria that particularly prioritize investment in certain communities (considering individual applicant characteristics, place-based characteristics, and procedural and technical characteristics)
- Conduct targeted outreach in communities that have lower levels of program uptake

Additionally, incorporate the community stakeholder comments from throughout the process, ask follow-up questions, and be prepared to explain why feedback was or was not incorporated to continue to build trust with the stakeholders.²²⁷ After drafting the menu of strategies, carefully consider potential unintended consequences and develop modified strategies to mitigate these unintended consequences.

²²⁷ Greenlining. 2021 Clean Mobility Equity: A Playbook Lessons from California’s Clean Transportation Programs. <https://greenlining.org/wp-content/uploads/2021/03/Clean-Mobility-Equity-A-Playbook-Greenlining-Report-2021.pdf>.

Table 21 has been adapted from Portland’s Racial Equity Worksheet,²²⁸ and provides an example worksheet that can be used to organize strategy ideas and consider the feasibility and effectiveness of each. Using this worksheet with community partners and other stakeholders can help to focus program design (or redesign) on the strategies that provide the most benefit to the community while balancing limited program resources. Considering which communities benefit is also recommended to ensure that strategies are reaching target communities. The examples in the table are provided for illustration, and should be developed with careful consideration from program managers (focus on feasibility) and community members (focus on effectiveness).

²²⁸ City of Portland Office of Equity and Human Rights. 2016. Racial Equity Toolkit Worksheet. <https://www.portlandoregon.gov/oehr/article/592296>.

Table 21 Evaluating Strategies and Program Elements to Center Equity

Draft strategies to administer the program that advance equity or lessen unintended consequences of the program design. Identify how EV equity communities benefit from each drafted strategy. Are there complimentary/additional strategies from partner organizations that support your program objectives? Use this table to rank drafted strategies' effectiveness and feasibility to prioritize which strategies to pursue.

Element	Effectiveness	Higher Feasibility	Lower Feasibility
Program Strategies	Higher Effectiveness	<i>(example) Limit eligibility for electric vehicle rebates to individuals whose incomes are 200% of Federal poverty levels or lower</i>	
	Lower Effectiveness		
Mitigation Strategies	Higher Effectiveness		<i>(example) Distribute charge cards to low-income residents to use at charging stations where energy costs are high</i>
	Lower Effectiveness		
Complementary Strategies (work done across programs or with other organizations/ industries)	Higher Effectiveness	<i>(example) Collaborate with local health care clinics that cater to people of color to provide reduced-cost charging for visitors</i>	
	Lower Effectiveness		

As the program design elements become more fully fleshed out, expanding engagement to include a wider range of stakeholders is useful for building support, testing assumptions, and identifying alternatives. For strategies that have low feasibility in the short-run, consider whether those strategies might be more feasible in the long run. Finalizing strategies used for each of the program elements, and forming consensus, will likely require several rounds of iteration.

Questions

Eligibility

- Who is eligible for the program? Is it determined by individual applicant characteristics or program enrollment (e.g., income 200 percent of Federal poverty guidelines, enrolled in Supplemental Nutritional Assistance Program [SNAP])?

- Is eligibility open to all areas of the State, or only areas that meet certain criteria (e.g., areas that are underserved with respect to transportation, areas that qualify as Disproportionately Impacted communities under HB21-1266, Higher Emissions Community as defined in Xcel Energy’s Transportation Electrification Plan programs²²⁹)
- How is eligibility administered? Is eligibility determined based on enrollment in other income-qualified programs (including Temporary Aid for Needy Families, Colorado’s Weatherization Assistance Program, Colorado’s Low-income Energy Assistance Program, Colorado’s Affordable Residential Energy Program, and others)? If not, what staff resources are required to establish minimum eligibility?
- How much does administration cost?

Technological Requirements

- What are the program’s procedural and technical requirements (e.g., use of a specialized software, permitting requirements, planning documents)? Is advisory support available to help applicants meet those requirements?
- What data are applicants required to provide? Are those data requirements reasonable? What privacy concerns can be addressed? Do stakeholders understand how data requirements will inform future program development?
- What technologies are eligible for program funding? What vehicle types? What other mobility options?

Communications

- How is the program promoted? In what languages and through which venues? Are all program design elements (e.g., minimum eligibility, evaluation criteria, data-sharing requirements) clearly communicated?
- How are program materials distributed? What technical and procedural requirements apply?
- What opportunities for engagement will stakeholders have in the future?

Targeted Strategies

- What tiers are available to meet the needs of differently resourced communities?
- Which equity communities are served by the strategies developed? Which are not?
- What are the tradeoffs for each of the strategies? How can these tradeoffs be mitigated?²³⁰

Review with Community Stakeholders

- How have these strategies incorporated feedback from previous engagement sessions? What feedback was not included and why?
- What might be the unintended consequences of these strategies and how can they be mitigated?

²²⁹ <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/CO%20Recent%20Filings/Higher-Emissions-Community-60-Day-Notice.pdf>.

²³⁰ City of Portland Office of Equity and Human Rights. 2016. City of Portland Racial Equity Toolkit. <https://www.portlandoregon.gov/oehr/article/592297>.

- What mitigation is feasible? What might be feasible in the future?
- What should broader public engagement look like and what resources are needed to enact it?

6.2.7 Evaluate Program Effectiveness

Evaluating the program’s success helps to ensure that the program continues to improve in effectiveness and measures progress toward meeting electrification and equity objectives. Performance measures, also known as **key performance indicators (KPIs)**, are an important part of this assessment. Performance measures are useful for clarifying goals, establishing a baseline against which future success will be measured, informing future policy decisions, resetting priorities, identifying changing needs, and communicating the value of program activities. Designing programs to center equity often includes missteps, and these missteps provide an opportunity to retool and improve programs.²³¹ Developing a better understanding of how to meet the needs of a maturing clean energy market will require program success to be carefully monitored over time.

KPIs are built to measure progress toward meeting specific objectives (step 3) using available data (steps 4 and 5) and evaluate program design (step 6). It is very common to iterate over those steps while developing measures to ensure that program activities are aligned.²³² This is, as with all of the steps described in the Community Needs Assessment, an important opportunity to engage with community members and other stakeholders to ensure that measures meet minimum quality criteria. A common framework is the SMART criteria (see sidebar), which ensures that measures are meaningful and feasible. Using the SMART criteria while selecting performance measures is useful to test performance measures before deploying limited resources to measure activities that may not be meaningful to the community.

When selecting performance measures, it is common to review performance measures that have been developed by peer agencies, lists of performance measures that have been previously developed, and recent research. The Victoria Transport Policy Institute provides KPI resources on transportation evaluation factors, including *Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transport*

SMART Criteria

S (Specific)

Is the desired outcome clear?

Which groups are targeted?

M (Measurable)

What data is needed?

Who would be responsible for measurement?

A (Attainable/Achievable)

How do we ‘move the needle’?

What are the constraints?

Who would be responsible for administering the program(s) ?

Who is responsible for measurement?

R (Realistic/Relevant)

Is this meaningful to community members?

Is this measure connected to our goals and objectives?

Do we have the resources to measure this?

T (Time Sensitive)

Does this better address long- or short-range goals?

How often should this be measured?

²³¹ City of Portland Office of Equity and Human Rights. 2016. City of Portland Racial Equity Toolkit. <https://www.portlandoregon.gov/oehr/article/592297>.

²³² Lane et al. 2015. Livability Performance Measures to Transportation Plans and Projects. <https://rosap.ntl.bts.gov/view/dot/29083/Email>.

Planning (2022).²³³ The Greenlining Institute provides similar guidance on 12 equity indicators that meet specific equity goals in the *Mobility Equity Framework* (2018).²³⁴

Developing KPIs with community members is often done through a workshop approach. At this workshop, providing a list of sample KPIs and quality criteria (such as SMART, above) is useful to both start the conversation and to help participants critically evaluate the KPIs. These workshops are often time-intensive and best held over at least one day because of the level of coordination and discussion required. It may be possible to select KPIs in a less collaborative process, but without extensive input during development those measures are not likely to satisfy the SMART criteria above. Both community members and technical staff are critical for these sessions, as community members must be engaged to ensure that measures are meaningful to the public, and technical staff must be on hand to ensure that the measurement is feasible given current resources. While many of the steps in this toolkit are iterative, KPIs are particularly likely to be refined over time.

Table 22 provides a sample of example KPIs that may be relevant to the transportation electrification programs reviewed in Colorado, adapted from several resources. These KPIs are not exhaustive and can be modified by program managers. Note that it may be useful to include KPIs that measure harm (or avoidance of harm) that can result from programs, including displacement and a decrease in affordability.

Table 22 Example Key Performance Indicators

Measure Group	Example Measure(s)
Affordability	<ul style="list-style-type: none"> Percentage of household spending on transportation costs (can be broken down by demographic and income group) Percentage of low-income households that spend more than 20% of budgets on transport¹
Accessibility	<ul style="list-style-type: none"> Travel time to important destinations (e.g., jobs, schools, medical services, recreational centers, parks)² Travel time comparing equity and non-equity communities Households within walking distance of important destinations (e.g., jobs, schools, medical services, recreational centers, parks) Number of charging stations/ports within 3 miles of targeted groups
Displacement	<ul style="list-style-type: none"> Change in average rents Loss of affordable housing units
Economic development	<ul style="list-style-type: none"> Direct and indirect change in employment (throughout construction, operations, and maintenance) Direct and indirect change in labor income (throughout construction, operations, and maintenance) Support for local industries and employment
Environment	<ul style="list-style-type: none"> Community exposure to transportation-related emissions Reduction of GHG and air pollution emissions per vehicle replacement per year Total reduction in GHG and air pollution emissions Reduction in average PM 2.5 concentrations on key freight corridors

²³³ Victoria Transport Policy Institute. 2022. <https://www.vtpi.org/equity.pdf>.

²³⁴ Greenlining. 2018. *Mobility Equity Framework: How to Make Transportation Work for People*. https://greenlining.org/wp-content/uploads/2019/01/MobilityEquityFramework_8.5x11_v_GLI_Print_Endnotes-march-2018.pdf.

Measure Group	Example Measure(s)
Fair labor practices	<ul style="list-style-type: none"> Percentage of contractors paid fair wages (especially for those whose employment is supported by program spending) Basic employment benefits and protections (throughout construction, operations, and maintenance)
Health	<ul style="list-style-type: none"> Asthma hospitalization rates
Processes	<ul style="list-style-type: none"> Number of applications received Spending in equity communities as a % of total spending Number of grant awardees who follow a public participation plan Number of applicants who indicate that advisors were helpful in the grant application process
Reliability	<ul style="list-style-type: none"> Charging station downtime Turnaround time for charging station repair
Safety	<ul style="list-style-type: none"> Number of safety related issues reported Percent of community charging facilities combined with other community facilities

¹ Victoria Transport Policy Institute. 2021. Well Measured: Developing Indicators for Sustainable and Livable Transport Planning. <https://www.vtpi.org/wellmeas.pdf>.

² Bells and Walker. 2017. Looking Beyond the Mean for Equity Analysis: Examining Distributional Impacts of Transportation Improvements. <https://www.worldtransitresearch.info/research/6426/>.

Note that while some of the KPIs above reflect organizational process (e.g., number of applications received, number of safety related issues reported) that fall more within the organization's control, some KPIs are closer to measuring outcomes that are meaningful to the public (e.g., direct and indirect change in employment) but harder to measure. When selecting measures, consider including a mix of KPIs that reflect both the effectiveness of the organization as well as KPIs that are closer to measuring meaningful change in the community.²³⁵

When KPIs have been identified, the process of developing a plan for data collection must begin. While measures should be selected based on whether they are thought likely to be realistic and achievable, developing a data collection plan while selecting measures adds additional time demands on a workshop that is often already time-intensive. Developing KPIs requires resources of time and expertise to identify appropriate data sources (surveys, Federal data sources, State data sources), return to the assets identified in step 4, and establish data collection protocols and provide timely reports to the community.

The KPIs are used to set a baseline understanding of program performance. KPIs can be used for existing and new programs. Just as programs are modified based on insights gained through performance measurement, the KPIs themselves are likely to be changed over time to better meet changing needs.

Questions

- Which KPIs align with the goals and objectives that have been chosen?
- What data assets have already been identified? Can that data be used to support a KPI?

²³⁵ Zietsman et al. 2011. A Guidebook for Sustainability Performance Measurement for Transportation Agencies. <https://www.trb.org/Publications/Blurbs/166313.aspx>.

- Who is responsible for data collection and measurement? Are they part of the process of selecting these KPIs?
- Do the KPIs selected meet SMART criteria?
- Who is responsible for implementing the program(s)? Are they part of the process of selecting KPIs?
- How often should this be measured?
- Should measurement be done by community, by area of the State (e.g., urban, rural), or some other designation?

6.2.8 Report Results

With program design finalized, a best practice is to report both the final program design and, at regular intervals, report the program's (or programs') progress. Transparent reporting is an important way to build ownership within the organization around goals, program design, outcomes, and successes. It is also an effective tool for stakeholder engagement, as reviewing a document or website has the lowest barrier to entry of any of the stakeholder engagement methods previously described. Broad public engagement sessions to socialize the feedback and gather feedback may be necessary to reach community members (particularly for those who find technical details inaccessible, or do not have access to the Internet).

By documenting where stakeholder engagement occurred and how community partner and stakeholder feedback influenced the program design, it is also possible to validate the stakeholder engagement process, identify areas where additional public participation could be beneficial, and build trust with the community. Reporting must be accessible (e.g., using online tools that are clearly communicated) and identify opportunities for engagement identified in the public participation plan (Step 2). and updating the public participation process based on feedback is also an excellent way to build trust with the public.

Program report elements include:

- Goals (see previous steps)
- Objectives (see previous steps)
- Program history
- Program design elements (e.g., incentive amounts, criteria for participation, eligible technology, program spending, administration)
- Performance measures (e.g., number of applications processed, number of meetings held, number of charging stations constructed)
- Outcomes (e.g., testimonial from individuals whose transportation needs are met very well, communities whose needs are well served by available charging infrastructure)
- Frequency for updating the document

In developing reporting documents, it is important to consider the different audiences that will review the report. Consider that agency staff, policy-makers, industry experts, and members of the public with varying levels of technical expertise will be reviewing the document. Writing the document in plain language is a best practice. Reviewing the Federal Plain language guidelines is an excellent resource on

writing in clear, understandable documents.²³⁶ Where technical information could be useful to a small number of stakeholders, consider referencing detailed accompanying materials. When the report is drafted, reviewing the final document with community partners and other stakeholders is an effective way to test the comprehensibility of the report, and also prepare community members to share the contents with their communities.

Xcel Energy’s Transportation Electrification Plan (TEP) Semi-Annual Report is a strong example of how reporting can demonstrate the effectiveness of transportation electrification programs and support other stakeholder engagement activities. The report provides an overview of programs offered under the TEP, program history, rebate amounts, criteria for participation, program spending, number of engagements, and program participants. The report also clearly identifies stakeholder activities that supported program outreach.²³⁷

Questions

- How regularly will reports be completed?
- What resources do we need to ensure that we can provide timely, thorough documents?
- What formats are compelling to our audience(s)? Does a written document satisfy our audience’s needs? Do other formats help to communicate results (e.g., a website, a map)?
- What opportunities are there for members of the public to provide feedback on what has been developed? How can we expand those opportunities?
- How do we obtain feedback on the report itself (i.e., the readability of documents, presentation of data) as opposed to the program/organization described?
- How are report findings shared out?

²³⁶ U.S. General Services Administration. 2011. Federal plain language guidelines <https://www.plainlanguage.gov/guidelines/>.

²³⁷ Xcel Energy. 2021. Transportation Electrification Plan Semi-Annual Report Proceeding No. 20A-0204E <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/TEP%20Semi-Annual%20Report%20October%202021.pdf>.

7.0 Colorado EV Equity Recommendations

7.1 Overview

This chapter of the Colorado EV Equity Study includes a review of transportation electrification programs, discussion of key program features where equity may be prioritized, recommendations to increase adoption of EVs by EV equity communities, a summary matrix of recommendations, and next steps to advance equity in Colorado. This is not an exhaustive review of all programs available in the State, but rather a sample of primarily State and regional programs designed to advance transportation electrification.

7.2 Resource Review

The project team reviewed a sample of public programs and utility programs developed to support transportation electrification. All the programs reviewed provide funding for transportation electrification, either through incentive or education. As of December 2021, funding was available for EV charging infrastructure, BEV, e-bikes, transit, school buses, MHDEV, zero emission bus (ZEB), recognition, and education (Table 23). EV charging infrastructure funding included both Level 2 (L2) chargers and DC Fast Chargers (DCFC) and were designed to meet needs associated with home-based charging including multifamily housing (i.e., overnight), fleet charging, workplace charging, and public charging. The programs reviewed are supported by Black Hills Energy, the City and County of Denver, the Colorado Energy Office (CEO), the Colorado Department of Local Affairs (DOLA), the Colorado Department of Revenue (DOR), the Regional Air Quality Council (RAQC), and Xcel Energy.

This review focused on incentives and educational support supported through policy, planned investments required by investor-owned utilities (IOUs) under Senate Bill 19-077, an example of electrification support provided by an electric co-op (Tri-State Generation and Transmission Association) (Table 23). Under SB19-077, IOUs are required to prepare TEPs detailing planned investments in transportation electrification, including EV-specific rates, rebates, programs, and pilots. The Xcel Energy package of programs was valued at approximately \$110 million over three years, was approved by the Public Utility Commission vote in January 2021. Black Hills Energy's plan will be worth \$1.3 million over three years.²³⁸

²³⁸ Will Toor, Colorado Energy Office. 2018. Colorado's Electrified Transportation Future & the Role of Utilities. <https://energyoffice.colorado.gov/blog-posts/colorados-electrified-transportation-future-the-role-of-utilities>.

Table 23 Transportation Electrification Programs Reviewed

Program Name	Category	Overseen by
Ready EV (Black Hills Energy TEP)	EV charging infrastructure (Level 2 only), BEV	Black Hills Energy
Tri-State Initiatives to Expand EV Access and Adoption	EV, education, EV charging infrastructure (L2, DCFC)	Tri-State Generation and Transmission Association, Inc.
Colorado CarShare	Carshare	Colorado CarShare ¹
Consolidated Call for Capital Projects/VW Settlement Transit Grants	ZEB	CDOT
Electric Vehicle Direct Current Fast-Charging (DCFC) Plazas Grant Program	EV charging infrastructure (DCFC)	CEO
ReCharge Colorado	Education	CEO
Drive Electric Colorado	Education	CEO, Drive Electric USA
ALT Fuels Colorado	MHDEV, ZEB, EV charging infrastructure	CEO, RAQC
Charge Ahead Colorado	EV charging infrastructure (L2, DCFC)	CEO, RAQC
CanDo Colorado e-bike program	eBike	CEO, RAQC, and City and County of Denver
Energy/Mineral Impact Assistance Fund Grant (EIAF)	EV, MHDEV, EV charging infrastructure	DOLA
Renewable and Clean Energy Initiative	All EV/ EV charging infrastructure project types, as well as other clean energy projects	DOLA
Innovative Motor Vehicle and Truck Credits for Electric and Plug-in Hybrid Electric Vehicles	BEV, MHDEV, as well as other alternative fuel vehicles	DOR
Clean Air Champions	Recognition	RAQC
EV Purchase/Lease Rebates	BEV	Xcel Energy
Multifamily Housing Portfolio (Xcel Energy TEP) <i>(Includes Shared Parking—Site Host-Provided Equipment, Shared Parking—Full-Service, Assigned Parking—Full-Service, and New Construction Rebate)</i>	EV charging infrastructure	Xcel Energy
Partnership, Research, and Innovation Portfolio (Xcel Energy TEP) <i>(Includes Electrify Paratransit Mobility Pilot, Municipal Refuse Fleet Pilot, Electric Car Sharing for Underserved Communities Pilot, and others)</i>	All EV/ EV charging infrastructure project types	Xcel Energy
Xcel Energy Commercial Portfolio (Xcel Energy TEP) <i>(Includes Fleet EV Solutions, Workplace EV Solutions, Public and Community charging Hub EV Solutions, Small Commercial, Electric School Bus Rebate, and others)</i>	EV charging infrastructure, BEV, MHDEV, ZEB	Xcel Energy

Program Name	Category	Overseen by
Xcel Energy Residential Portfolio (Xcel Energy TEP) <i>(Includes EV Accelerate at Home—Home Charging Service, Home Wiring Rebate Program, and Residential Advisory Program)</i>	EV charging infrastructure, Education	Xcel Energy

¹ Colorado CarShare. 2022. Mission. <https://carshare.org/our-mission/>.

7.3 Program Features

Program elements were reviewed according to key program features. A key resource in developing the typology of program features described here was the Greenlining Institute’s *Clean Mobility Equity: A Playbook*. That excellent resource is highly recommended for further reading on how best to implement anti-racist, community-centered solutions.²³⁹ The evaluation focused on whether program elements were transparently stated, support transportation electrification objectives, and embed equity throughout.

The project team’s approach to this review was to meet with a small group of program managers in November of 2021 and review program documents online. While some materials in this review were provided by program managers, the project team sought to primarily review documents that would be available to any member of the public. Program information was compiled primarily from documents available online and materials provided by program managers.

The project team reviewed whether program objectives were strongly connected to outcomes and program measurement. Program outcomes help to ensure that benefits reach their intended recipients. Measurement is an assessment of the program’s effectiveness in achieving its stated goals (and may or may not overlap with program outcomes). In general, the project team focused their review to identify what aspects of the process could be improved to more directly center equity, and to identify where the needs of EV equity communities were elevated (e.g., through prioritization). The program minimum eligibility was reviewed to identify whether equity was a factor in determining participants’ ability to participate in important programs. Data-sharing requirements were reviewed in order to identify whether participant information could be used to inform program development in the future. Stakeholder engagement was reviewed in order to identify to what extent stakeholders were involved in development, prioritization, evolution, and program outreach.

A brief overview of the project team’s findings is included below.

7.3.1 Objectives

Clearly stated program objectives and mission can help transportation electrification programs deliver intentional benefits and focus the program’s activities. A well-defined objective or set of objectives can be used to support evaluation of a program’s success and provides transparency and accountability to the public. A best practice identified with respect to objective-setting is to set a specific, measurable

²³⁹ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook Lessons from California’s Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

statement that supports the achievement of a goal.²⁴⁰ To increase a program’s focus on equity, including equity within the program objective ensures that equity objectives are tracked throughout the program.

Examples of stated objectives currently in place in the reviewed Colorado programs include:

- Gather data to inform the development of future programs
- Improving air quality
- Promoting more equitable access to the benefits of transportation electrification
- Reducing greenhouse gas emissions
- Restoring resources to communities that have been disproportionately impacted by environmental impacts (including air quality and use of mineral fuel)

Many of the objectives identified by the project team were embedded within a description of the program. For example, DOLA’s Renewable and Clean Energy Initiative’s objective is to ‘support efforts by local governments and regional collaborations to engage in Renewable and Clean Energy projects that will help reach Colorado’s 2040 100 percent renewable energy goal’. This objective is identified within program guidance to grant applicants.²⁴¹ Some programs clearly identify a list of specific objectives, including Charge Ahead Colorado, which explicitly lists five objectives that applicants are required to address in their applications.²⁴² Including specific objectives in program activities

Many programs in Colorado also cite gathering data, sparking innovation, providing a proof of concept, or informing the development of future programs as another important objective with their programs, including Charge Ahead Colorado, the Municipal Refuse Fleet Pilot, and Xcel Energy’s TEP programs. Many of Xcel Energy’s TEP programs also include a focus on equity within program objectives, which will support those programs in developing and improving programs’ focus on equity.

Almost all of the programs reviewed include transportation electrification objectives related to the program category in which the spending occurs or targeting other benefits of transportation electrification (most frequently, air quality improvements). The DCFC Plazas Grant Program, for example, aims to increase access to DCFC across Colorado.²⁴³

Several programs centered equitable outcomes within the program objectives themselves. A strong example of this is Colorado Car Share, which has the stated objective to increase mobility options, particularly for low-income households.²⁴⁴ Xcel Energy’s Electric Car Sharing program (part of the utility’s

²⁴⁰ ICF. 2013. FHWA Performance Based Planning and Programming Guidebook. https://www.transit.dot.gov/sites/fta.dot.gov/files/Performance_Based_Planning_and_Programming_Guidebook.pdf.

²⁴¹ Colorado Department of Labor. 2021. Renewable and Clean Energy Initiative (HB21-1253). <https://drive.google.com/file/d/1HKiWoPRA0Eud6argqmgX3lZbfH6w9lQ/view>.

²⁴² RAQC & CEO. Charge Ahead Colorado: Grant Application Guide. <https://raqc.egnyte.com/dl/ZphW107zjR>.

²⁴³ CEO. 2022. DCFC Plazas (EV Fast-Charging Plazas). <https://energyoffice.colorado.gov/zero-emissions-vehicles/ev-fast-charging-plazas>.

²⁴⁴ Colorado CarShare. 2022. Mission. <https://carshare.org/our-mission/>.

Partnership, Research, and Innovation Portfolio or PRI Portfolio) similarly aims to deliver benefits of transportation electrification to more diverse communities and expand car sharing services to underserved communities.

Two of the programs reviewed have objectives of increasing EV equity by targeting very specific underserved populations, including Xcel Energy’s Paratransit pilot (part of Xcel Energy’s PRI Portfolio), which targets individuals with disabilities, and the CanDo Colorado eBike Pilot, which targets low-income essential workers.²⁴⁵ The Energy/Mineral Impact Assistance Fund Grant (EIAF) aims to support communities that are socially and/or economically impacted by the development, processing, or energy conversion of minerals and mineral fuels.²⁴⁶

Transportation electrification programs in Colorado can center equity by transparently stating objectives. This increases transparency to the public, communicates program intentions, and focuses program activities. Additionally, centering EV equity communities within program objectives can ensure that program activities are focused on intended recipients. Finally, setting specific, measurable objectives supports program evaluation and can ensure that program dollars are spent as intended.

7.3.2 Minimum Eligibility—Demographic and Place-Based

Limiting program eligibility to a particular group of applicants can help to center equity outcomes by ensuring that program benefits reach intended recipients.²⁴⁷ As described earlier, a substantial investment will be required to enable States to reach vehicle electrification goals, and wealthier consumers tend to place a lower importance on incentives.²⁴⁸ For programs that are open to all applicants, offering a higher award amount to applicants who meet certain equity-centered eligibility requirements may also improve a program’s focus on equity.

Minimum eligibility requirements identified in the program review that were demographic or place-based included:

- Disproportionately impacted community as defined by Colorado HB21-1266
- Higher Emission Communities (HECs) as defined in Xcel Energy’s TEP programs
- Communities with insufficient access to transportation services or other affordable transportation options

²⁴⁵ CEO. 2021. Can Do Colorado eBike Pilot Program. https://drive.google.com/file/d/1VRjaiW_fV0_AneSr5c7i8XgmMU4twPk/view?ts=6009df18.

²⁴⁶ Colorado Department of Local Affairs. 2021. Energy and Mineral Impact Assistance Fund Program Grant Application Guidelines. <https://drive.google.com/file/d/16LBF9sUL6nx3cv1K0B73lTMgH1teAT9w/view>.

²⁴⁷ Greenlining Institute. 2021. Clean Mobility Equity: A Playbook Lessons from California’s Clean Transportation Programs. <https://greenlining.org/publications/reports/2021/clean-mobility-transportation-equity-report/>.

²⁴⁸ National Bureau of Economic Research. 2021. Subsidizing Low- and Middle-Income Adoption of Electric Vehicles: Quasi-Experimental Evidence from California. <https://www.nber.org/papers/w25359>.

- Be enrolled in an income-qualified program (including Temporary Aid for Needy Families, Colorado’s Weatherization Assistance Program, Colorado’s Low-income Energy Assistance Program, Colorado’s Affordable Residential Energy Program, and others)

In general, most of the programs currently administered by State agencies do not limit program eligibility to specific applicants. In some cases, specific groups are encouraged to apply. For example, Charge Ahead Colorado encourages applicants from workplaces and organizations that support multifamily housing.²⁴⁹

Equity is centered in several of the programs reviewed by offering higher award amounts to applicants who meet certain criteria, which may encourage greater program participation by applicants who meet certain equity-focused requirements. For example, ALT Fuels Colorado offered a higher match to applicants for applicants seeking funding for electric school buses.²⁵⁰ Similarly, Xcel Energy’s Home Wiring Rebate Program (part of Xcel Energy’s Residential Portfolio) offers higher award amounts to applicants enrolled in other income-qualified programs (including Temporary Aid to Needy Families or TANF, Supplementary Nutrition Assistance Program or SNAP, and others).²⁵¹

Equity is also centered in the programs reviewed by limiting eligibility to certain program applicants, as is done in several of Xcel Energy’s TEP PRI Portfolio programs. Xcel’s Electric Car Sharing for Underserved Communities Pilot centers equity by intending to prioritize communities that have at least one of three criteria: 1) be located within a disproportionately impacted community, 2) live in an HEC as defined by Xcel Energy, or 3) have insufficient access to transportation services or other affordable transportation options.²⁵² Similarly, the Electrify Paratransit Mobility Pilot intends to prioritize funding to serve underserved communities in the program design, by providing rebates that support the purchase or lease of paratransit shuttles.²⁵³ Programs that limit eligibility to applicants who either belong to an equity population or provide service to an equity community do not explicitly include equity in the evaluation criteria, although all applicants will meet minimum equity criteria identified (such as Electric Car Sharing for Underserved Communities, and CanDo Colorado eBike Pilot Program).^{254 255} While the overall program funding available is low relative to the needed investment, Black Hills’ Ready EV program also provides additional incentive amounts to program applicants who meet certain equity criteria.²⁵⁶

The transportation electrification programs in Colorado can center equity by limiting awards to individuals who meet certain demographic criteria (including income, location in a disproportionately impacted

²⁴⁹ RAQC. 2022. Charge Ahead Colorado. <https://cleanairfleets.org/programs/charge-ahead-colorado>.

²⁵⁰ RAQC. 2022. ALT Fuels Colorado. <https://cleanairfleets.org/programs/alt-fuels-colorado>.

²⁵¹ Xcel Energy. 2022. Home Wiring. <https://ev.xcelenergy.com/home-wiring-rebate>.

²⁵² Xcel Energy. 2021. Transportation Electrification Plan. https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan/.

²⁵³ Xcel Energy. 2021. Summary of 60-Day Notice: Electrify Paratransit Mobility Pilot. <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/Paratransit%20Mobility%20PRI%20Pilot%2060%20Day.pdf>.

²⁵⁴ Xcel Energy. 2021. Transportation Electrification Plan. https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan/.

²⁵⁵ CEO. 2021. Can Do Colorado eBike Pilot Program. https://drive.google.com/file/d/1VRjaoiW_fV0_AneSr5c7i8XgmMU4twPk/view?ts=6009df18.

²⁵⁶ Xcel Energy. 2021. Transportation Electrification Plan. https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan/.

community, serving K-12 students, and others). Another effective practice is to provide higher award amounts to communities based on one of several income-based and other criteria. This provides some flexibility for applicants to meet one of several requirements. Offering higher amounts can support equitable access for communities who might not otherwise be able to participate in a program.

7.3.3 *Minimum eligibility—Procedural and technical*

The project team reviewed programs to ensure that procedural requirements were reasonable for differently resourced organizations, and consideration was given in technical requirements for different EV equity communities. Common procedural and technical minimum eligibility factors included:

- Site accessibility and safety (e.g., safety elements including lighting, site accessibility for persons with persons with a disability)
- Applicant details (e.g., address, DUNS identification number, income information, driving experience)
- Construction (e.g., constructed in a timely fashion, materials purchased in the United States)
- Coordination (e.g., coordinating with a utility, coordinating with a local Government)
- Deadlines (e.g., admission deadlines, construction completion deadlines)
- Design (e.g., number of parking spaces, grid connection, opportunities for siting combinations, connector protocols and others)
- Documentation (e.g., receipts, invoices)
- Funding (e.g., match, contribution, readiness)
- Method of submission (e.g., online, by email)
- Operations (e.g., down time, cost recovery, years in operation following construction, location of project or vehicle, payment methods)
- Ownership (or permission of the owner of the property, vehicle, fleet, or others)
- Procurement (e.g., procured following award, procurement for new vehicles only)
- Quality (e.g., application legibility, application completeness)

All of the programs reviewed included some requirements that applicants include certain individual details (such as address), meet program deadlines, provide necessary documentation, submit using a particular method, and be completed by the EV/ EV charging infrastructure owner. Technical specifications for EV charging infrastructure were generally implemented to ensure that project funds would be used to support accessible sites that were newly constructed, coordinated with utilities, completed in a timely fashion, designed in such a way as to support public charging, in operation for several years following award, and constructed to all applicable design standards. These requirements protect consumers by ensuring that projects are safe, feasible, completed in a timely fashion, accessible to the public, and available when

needed for many years. Both Charge Ahead Colorado and ALT Fuels Colorado include these requirements in their programs (note that ALT Fuels Colorado is no longer accepting applicants).^{257 258}

Technical and procedural requirements for EV funding are similar. Applicants must provide information by certain deadlines (e.g., with tax filings) and agree to use funds only for certain vehicles. However, limiting procurement to allow only the purchase of new vehicles may also present a barrier to low-income individuals seeking to purchase a used vehicle.

A best practice with respect to procedural requirements is present in the CanDo Colorado eBike Pilot Program, which offered applicants up to 10 hours of technical support from Bicycle Colorado to support their application.²⁵⁹ Providing this technical support can help to reduce barriers for differently resourced organizations. Indirectly, ReCharge Colorado and Drive Electric Colorado serve a similar purpose and provide education that can help to reduce barriers to entry for many of the transportation electrification programs in Colorado. For more complicated grant programs, such as the Sustainable Transportation Equity Project in California, it may be useful to have larger teams of advisors who specialize in different aspects of the grant application (e.g., GHG calculation, budgeting, local Government coordination). Surveys can also be an effective tool to assess how program participants who take advantage of technical support to inform changes both to individual programs and to the way technical support is delivered.²⁶⁰

A best practice beyond requirements that protect the efficiency of transportation electrification programs is to explicitly target equity focus communities in design requirements. An excellent example of this in Colorado is present in the DCFC Plazas Grant Program, which requires projects to meet accessibility requirements to accommodate persons with disabilities and consider safety in design (including lighting, level of public activity, signage, and safety precautions).²⁶¹

7.3.4 Data-Sharing Requirements

In order to evaluate a transportation electrification program's success, particularly with regard to reaching equity communities, it is necessary to first have the data to track performance. Both quantitative and qualitative data can provide insight into how a program is experienced by the groups the programs are intended to serve. Increasingly, transportation electrification programs are requiring program applicants to share data with the public and with the awarding organization. In the case of EV charging infrastructure grants in particular, data sharing ensures that the EV charging infrastructure can be located by the public and that information about the charger's use can inform future program development or project implementation.

²⁵⁷ RAQC. 2022. Charge Ahead Colorado. <https://cleanairfleets.org/programs/charge-ahead-colorado>.

²⁵⁸ RAQC. 2022. ALT Fuels Colorado. <https://cleanairfleets.org/programs/alt-fuels-colorado>.

²⁵⁹ https://drive.google.com/file/d/1VRjaoiW_fv0_AneSr5c7i8XgmMU4twPk/view?ts=6009df18.

²⁶⁰ https://ww2.arb.ca.gov/sites/default/files/2021-09/081321_step_interim_report_to_post.pdf.

²⁶¹ CEO. 2022. DCFC Plazas (EV Fast-Charging Plazas). <https://energyoffice.colorado.gov/zero-emissions-vehicles/ev-fast-charging-plazas>.

A list of the data required for program types is included below. Some of these data categories best apply to only certain programs (for example, electricity sales are only relevant to program applicants who have received funding for EV charging infrastructure).

- Analysis of EV charging patterns, including state of charge
- Application and bid documents
- Audits
- Case studies
- Communication with the public
- Electricity sales
- Energy consumption
- Geographic distribution of program participants
- Number of vehicles deployed
- Participant information (including age, sex, income, marital status, education)
- Station down time
- Station location (i.e., providing station information to the Alternative Fuels Data Center)
- Station use, including charging events, connect and disconnect types, start and end times, average power, energy per charging event
- Testimonials
- Total cost of ownership
- Vehicle use, including VMT, trips, trip length, miles, and overall demand

All of the State-run programs that support public EV charging infrastructure require applicants to provide station location information to the Alternative Fuels Data Center and that stations be networked.²⁶² The State-run programs are also bound by the Colorado Open Records Act and require that bid documents be open to the public.

Some newer programs require more extensive data sharing on usage and performance. For example, the Electric Car Sharing for Underserved Communities Pilot requires that program applicants enroll in Xcel Energy's Fleet Electrification Advisory Program, through which applicants will be advised on gathering telematics data (including VMT, state of charge, charging analysis, total cost of ownership, and GHG reductions). Xcel Energy in turn will report program costs, vehicle utilization rates, differences in design

²⁶² RAQC. 2022. Charge Ahead Colorado. <https://cleanairfleets.org/programs/charge-ahead-colorado>.

compared to actual cost, operating metrics of vehicles, public outreach, electricity consumption of carshare vehicles, level of energy demand for carshare vehicles, and geographic distribution of program participants.²⁶³ Similarly, the Electrify Paratransit Mobility pilot must share utilization rates, number of trips taken, and miles driven, operating cost, and estimated electricity consumption.²⁶⁴ Requirements for Xcel Energy’s Municipal Refuse Fleet Pilot are similar.²⁶⁵

Providing as many data points as possible, particularly in cases where doing so can be done cost-effectively, can support equity outcomes by providing a foundation of data upon which to evaluate program reach and effectiveness. A best practice identified in Colorado is to require program applicants to provide relevant data to inform future program development and make new public assets available to a wider public.

7.3.5 Stakeholder Engagement

Meaningful stakeholder engagement supports equity outcomes by giving the public an opportunity to identify priorities and ensure that program design takes into consideration the needs of the community. Stakeholder engagement is referenced in the transportation electrification programs reviewed in three areas:

- Program design
- Program outreach
- Proposal evaluation (especially for EV charging infrastructure)

All three represent best practices in Colorado that could be expanded by increasing the level of proactive engagement.

Stakeholder engagement played an important role in the development of both Black Hills Energy’s plan and Xcel Energy’s plans. For example, stakeholders in both Black Hills Energy and Xcel Energy’s Transportation Electrification Plan proceedings recommended expanding. In the case of Black Hills Energy, following criticism by outside stakeholders with respect to the utility’s income-qualified programs, which ultimately were enhanced and expanded through partial settlement agreements that were adopted by the Public Utilities Commission of Colorado, the utility added funding for income-qualified customers to purchase new or used electric vehicles.²⁶⁶ Incorporating stakeholder engagement through program development can increase public support for new transportation electrification programs and increase the

²⁶³ Xcel Energy. 2021. Transportation Electrification Plan. https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan/.

²⁶⁴ Xcel Energy. 2021. Summary of 60-Day Notice: Electrify Paratransit Mobility Pilot. <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/Paratransit%20Mobility%20PRI%20Pilot%2060%20Day.pdf>.

²⁶⁵ Xcel Energy. 2021. Summary of 60-Day Notice: Municipal Refuse Fleet Electrification Pilot. <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/Municipal%20Refuse%20Fleet%20Pilot%2060%20Day.pdf>.

²⁶⁶ Claudine Custodio, Vote Solar. 2021. Colorado Regulators Approve Black Hills’ Transportation Electrification Plan. <https://votesolar.org/colorado-regulators-approve-black-hills-transportation-electrification-plan/>.

equity focus of the programs by ensuring that programs meet community needs. Periodic engagement throughout program administration can also help ensure that programs evolve and remain responsive to the needs of the communities served by these programs.

Stakeholder engagement is included in program outreach in many of Xcel Energy's TEP programs. Stakeholder engagement also prominently featured in the development of the TEP, which continues through quarterly TEP stakeholder meetings.²⁶⁷ An example of this proactive engagement is included in program guidance for Xcel Energy's Electric Car Sharing for Underserved Communities Pilot, which requires that community organizations be invited to support development and distribution of outreach materials developed through the pilot.²⁶⁸ Xcel Energy's Municipal Refuse Fleet Pilot was developed with input from a diverse group of stakeholders including the Environmental Justice Coalition, Energy Outreach Colorado, the Natural Resources Defense Council, the Southwest Energy Efficiency Project, Western Resource Advocates, the Transportation Electrification Plan Stakeholder group, the CEO, CDOT, the RAQC, and Commission Staff.²⁶⁹ Xcel Energy's Electrify Paratransit Mobility Pilot specifies outreach methods that include website information, digital and print campaigns, case studies, white papers, videos, and other interactive media. Xcel Energy also indicates that program outreach will be prioritized to people with disabilities.²⁷⁰

Stakeholder engagement in project prioritization is included in several of the programs reviewed. Charge Ahead Colorado requires applicants at workplaces and multifamily housing to complete surveys of EV charging infrastructure users (primarily to identify whether planned EV charging infrastructure investments would be used and whether the installation of EV charging infrastructure would increase tenant/employee interest in purchasing an EV).²⁷¹ This low-cost stakeholder engagement could further prioritize equity-focused investments by expanding surveys to include equity-focused questions. The DCFC Plazas Grant Program indicates that program applicants who include community engagement strategies that include diverse demographics that typically do not have access to EV charging infrastructure are evaluated more favorably. Applicants are also encouraged to partner with utilities, local governments, and engage with regional stakeholders.²⁷²

²⁶⁷ Xcel Energy. 2021. Transportation Electrification Plan. https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan/.

²⁶⁸ Xcel Energy. 2021. Transportation Electrification Plan. https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan/.

²⁶⁹ Xcel Energy. 2021. Summary of 60-Day Notice: Municipal Refuse Fleet Electrification Pilot. <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/Municipal%20Refuse%20Fleet%20Pilot%2060%20Day.pdf>.

²⁷⁰ Xcel Energy. 2021. Summary of 60-Day Notice: Electrify Paratransit Mobility Pilot. <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/Paratransit%20Mobility%20PRI%20Pilot%2060%20Day.pdf>.

²⁷¹ RAQC. N.d. Charge Ahead Colorado: Electric Vehicle Charging Survey. <https://raqc.egnyte.com/dl/CclHbZcjD>

²⁷² CEO. 2022. DCFC Plazas (EV Fast-Charging Plazas). <https://energyoffice.colorado.gov/zero-emissions-vehicles/ev-fast-charging-plazas>.

7.3.6 Evaluation Criteria—Demographic and Place-Based Criteria

Evaluation criteria are similar to minimum eligibility criteria above with some distinctions: evaluation criteria tend to be used for different program types (eligibility criteria frequently apply to grants and EV charging infrastructure as opposed to EVs), may change more frequently based on changing priorities, and tend to include many more indicators. Evaluation criteria are used especially in higher-dollar award projects, such as for MHDEV, ZEB, and EV charging infrastructure. Many of the programs reviewed here do not employ evaluation criteria, but instead require applicants to meet certain minimum eligibility requirements only (see above). An example of a program that uses evaluation criteria is the Consolidated Call for Capital Projects/VW Settlement Transit Program, for which applications are evaluated using a range of criteria in order to determine whether or not the project will receive an award.²⁷³

For programs that do use evaluation criteria in determining whether or not to make an award, using demographic and place-based criteria is an effective method to ensure that those programs are focused in areas that do not enjoy equal access to the benefits of transportation electrification or have been disproportionately affected by transportation pollution. These criteria can focus on particular environmental, infrastructure, or social attributes in an area. By prioritizing applicants based on their location and the demographic characteristics of the area, program managers can ensure that program resources are equitably distributed and/or ensure that spending is prioritized for communities that have not received high historical investment.

Examples of demographic and place-based factors used in evaluation criteria of the programs reviewed include:

- Enrolled in an income-qualified program (including Temporary Aid for Needy Families, Colorado’s Weatherization Assistance Program, Colorado’s Low-income Energy Assistance Program, Colorado’s Affordable Residential Energy Program, and others)
- Have an income that falls below certain thresholds (e.g., 60 percent of the State median income, 200 percent of Federal poverty guidelines, or 80 percent of area median income)
- Have insufficient access to transportation services or other affordable transportation options
- Located in a Colorado Opportunity Zone
- Located in a disproportionately impacted community as defined by Colorado HB21-1266
- Located in a distressed area, as defined in the Colorado Department of Public Health’s Climate Equity Map
- Located in an HEC as defined in Xcel Energy’s TEP programs
- Located in a utility’s service area
- Located in close proximity to housing authorities

²⁷³ <https://www.codot.gov/programs/transitandrail/assets/2020-cdot-cccp-nofa-final-9-30-2019>.

- Located in underserved areas
- Proximity to high-density residential areas
- Supported by stakeholder engagement

One way many programs center equity is by awarding more points to applications from communities that have been disproportionately impacted by the harmful impacts associated with the combustion (i.e., air quality) or extraction of fossil fuels. The EIAF requires applicants to demonstrate that the project is located in an area that is negatively impacted by minerals and mineral fuels and that the project has a relationship to and addresses energy and mineral industry impacts.²⁷⁴ The Plazas program evaluates applications more favorably that are in distressed locations as defined using CDPHE’s Center for Health and Environmental data or defined on the Climate Equity Map.²⁷⁵

Many of the programs reviewed also center equity by prioritizing applications that meet socioeconomic criteria as well. The Plazas program provides additional consideration for projects located in Colorado Opportunity Zones or in ‘underserved areas’ (i.e., within ¼ of a mile of housing authorities; or areas where low-income populations commute and shop).²⁷⁶ A smaller number of programs reviewed focused on mobility options. Xcel’s Electric Car Sharing and Paratransit grade applicants on the existing mobility options in the area.²⁷⁷ Charge Ahead and the Renewable and Clean Energy Initiative prioritize projects in areas with few existing chargers.²⁷⁸

Several programs used a wide range of criteria that target the environmental benefits of transportation electrification, the mobility benefits of transportation, and demographic characteristics of the community where the project would be located. Xcel Energy evaluates many programs based on whether the project is located in one of Xcel Energy’s designated HECs, which includes demographic characteristics (e.g., percentage of the population that identifies as a person of color), traffic impacts, at risk of certain health impacts, or historically underserved (e.g., linguistic isolation).²⁷⁹

Centering equity may require carefully considering the unintended consequences of other criteria used in project evaluation. Centering equity can also be supported by using a broad combination of place-based equity that can include environmental, health, or demographic factors.

7.3.7 Evaluation Criteria—General Requirements and Weighting

Transparently reporting the criteria that are used for application-based projects helps project applicants to better prepare during the application process and provides greater accountability for transportation electrification programs.

²⁷⁴ <https://drive.google.com/file/d/16LBF9sUL6nx3cv1K0B73lTMgH1teAT9w/view>.

²⁷⁵ https://drive.google.com/file/d/1gPDOzR_bmsL5UBjDpyKHe2DH4Z7R7TYh/view.

²⁷⁶ <https://theicct.org/publications/colorado-charging-infra-feb2021>.

²⁷⁷ RAQC. 2021. Charge Ahead Colorado: Grant Application Guide. <https://raqc.egnyte.com/dl/ZphW107zjR>.

²⁷⁸ <https://drive.google.com/file/d/1gOgLIOnS5IP9Scib7vOXOuCXegZAKtuJ/view?usp=sharing&authuser=0>.

²⁷⁹ https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan.

Aside from the demographic and place-based criteria described above, the program review uncovered the following elements with respect to general requirements:

- Access to amenities
- Benefits
- Budget and financial planning
- Cost
- Environmental impact
- Feasibility and implementation
- Fleet transition planning
- Innovation
- Operational planning
- Organization and staff experience
- Power delivery planning
- Project design
- Project narrative
- Scalability, replicability, sustainability
- Schedule
- Sustainability and resiliency
- Vehicle turnover

Transportation electrification programs in Colorado could center equity by reducing or eliminating match requirements for applicants who meet certain demographic characteristics, or whose mission is to provide services to areas with higher concentrations of equity communities. The Xcel Energy Electric Car Sharing Pilot, for example, encourages applicants to bring resources of expertise, cultural insights, support on education and outreach, insight into needs assessment, coordination with local governments (for example to secure a right-of-way), and other resources—in addition to exempting community applicants from co-funding requirements.²⁸⁰

Most of the programs reviewed included evaluation criteria for higher dollar-value programs or EV charging infrastructure programs, such as ALT Fuels Colorado or Charge Ahead Colorado. In general, program criteria tends to focus on whether the program meets program objectives, quality of the application (i.e., quality of presentation and completeness of the application), community needs/benefits (defined as access to the benefits of transportation electrification), financial readiness to match/purchase/maintain the infrastructure, organizational readiness to operate/maintain vehicles/infrastructure, use of renewable energy sources, resiliency of the project, dedicated funds, code and safety compliance, data reporting, local grid readiness, and equity.

While project applications should be evaluated to ensure that program objectives are being met, evaluation criteria should be considered holistically with other equity requirements. Some programs prioritize applicants based on the project’s likelihood of being used by a large number of people. Xcel Energy’s Electric Car Sharing Paratransit program cites “amenities in or around the siting area that are best served by [their respective] services” as a criterion.²⁸¹ The DCFC Plazas Grant program also cites

²⁸⁰ https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan.

²⁸¹ <https://www.xcelenergy.com/staticfiles/xcel-responsive/Company/Rates%20&%20Regulations/Electric%20Car%20Sharing%20for%20Underserved%20Communities%20Pilot%2060%20Day.pdf>.

neighborhood density as a factor in evaluating applications.²⁸² Several programs consider the benefits provided by the project or the need for the project with respect to providing access to the benefits of transportation electrification (including Charge Ahead Colorado, ALT Fuels Colorado, the Electric Vehicle Direct Current Fast-Charging (DCFC) Plazas Program, Energy/Mineral Impact Assistance Fund, and the Renewable and Clean Energy Initiative.^{283 284 285 286 287} While ensuring that project dollars serve a larger group of people promotes access and ensures that the benefits of transportation electrification are more broadly distributed, prioritizing projects in areas with amenities or higher rates of use may also inadvertently direct project dollars away from underserved communities. Requiring a higher match from higher resourced areas, or offering more funding in underserved communities, can help to balance competing priorities.

7.3.8 Outcomes

Clearly stated program outcomes can help to track whether a program meets stated objectives and supports equity by providing insight into where program dollars are being spent and which groups are benefiting. The programs currently reporting outcomes generally describe outcomes in terms of dollars spent or communities served.

Charge Ahead Colorado requires that program fund recipients provide information to the Alternative Fuels Data Center Station Locator.²⁸⁸ The stations specifically funded by Charge Ahead Colorado are identified on the Colorado EV Equity Dashboard. The vehicles funded through the Consolidated Call for Capital Projects/VW Settlement Transit Program and ALT Fuels Colorado program are also shown on the Colorado EV Equity dashboard. Drive Electric Colorado features testimonials to showcase how educational programs have helped consumers to better understand the benefits of electric vehicles and ultimately make an electric vehicle purchase.²⁸⁹ Colorado Car Share also reports how carshare services have supported member outcomes through video testimonials.²⁹⁰

A best practice identified within several of the programs reviewed were implemented in Xcel Energy's Transportation Electrification programs, which clearly stated program objectives. The Renewable and Clean Energy Initiative also clearly identifies desired outcomes.²⁹¹

²⁸² https://drive.google.com/file/d/1gPDOzR_bmsL5UBjDpyKHe2DH4Z7R7TYh/view.

²⁸³ RAQC. 2021. Charge Ahead Colorado: Grant Application Guide. <https://raqc.egnyte.com/dl/ZphW107zjR>.

²⁸⁴ RAQC. 2022. ALT Fuels Colorado. <https://cleanairfleets.org/programs/alt-fuels-colorado>.

²⁸⁵ CEO. 2022. DCFC Plazas (EV Fast-Charging Plazas). <https://energyoffice.colorado.gov/zero-emissions-vehicles/ev-fast-charging-plazas>.

²⁸⁶ DOLA. 2022. Energy/Mineral Impact Assistance Fund Grant (EIAF). <https://cdola.colorado.gov/funding-programs/energy/mineral-impact-assistance-fund-grant-eiaf>.

²⁸⁷ DOLA. 2022. Renewable and Clean Energy Initiative. <https://cdola.colorado.gov/funding-programs/energy/mineral-impact-assistance-fund-grant/renewable-and-clean-energy-initiative>.

²⁸⁸ RAQC. 2021. Charge Ahead Colorado: Grant Application Guide. <https://raqc.egnyte.com/dl/ZphW107zjR>.

²⁸⁹ Drive Electric Colorado Channel. N.d. <https://www.youtube.com/channel/UCzEBuFnAELxZHZdaaMmyBew>.

²⁹⁰ Colorado CarShare.Channel. N.d. <https://www.youtube.com/user/egocarshareco/featured>.

²⁹¹ Colorado Department of Labor. 2021. Renewable and Clean Energy Initiative (HB21-1253). <https://drive.google.com/file/d/1HKiWoPRA0Eud6argqmgX3lZbfH6w9lQ/view>.

Many of the programs reviewed were implemented only a short time before the review, and relatively few retrospective outcomes were available to be reported. However, a few programs stand out for providing clearly stated outcomes easily identified on program websites. Clean Air Colorado describes specific accomplishments of named champions. For example, one awardee is recognized for launching the first electric bus in the transit agency’s service territory.²⁹² ReCharge Colorado provided the clearest outcomes in the project team’s review, identifying the number of outreach events hosted through the program, the number of organizations who have received coaching, the number of EVs purchased, and the number of EV charging infrastructure installed.²⁹³

7.3.9 Measurement

Evaluating a program’s success by measuring its performance using measures is a best practice for ensuring that programs make meaningful progress toward stated objectives. These measures are typically referred to as performance measures or Key Performance Indicators (KPIs). Program evaluation may be done by program staff, but an emerging best practice is for this evaluation to be done by an independent third party or by a semi-independent group within the organization (such as the organization’s financial group). Performance measures can be useful to ensure that program objectives are clear and achievable, provide a target for program managers, inform policy decisions in the future, set priorities for future planning cycles, and communicate the value of transportation electrification.

Measures are an effective way to track program success in a variety of ways, including outcomes. In general, performance measures focus on three areas:

- Outcome measures (e.g., the change in the number of individuals who indicate that their transportation needs are being met very well)
- Output measures (e.g., the amount of money being spent per application)
- Process measures (e.g., the number of applications processed per year)

Some examples within each of these categories include:

- Total funds awarded with the program
- Number of successful applicants
- Geographic distribution of participants
- Customer survey satisfaction rates
- Electricity consumption and demand from charging stations
- Emissions reductions resulting from the program

²⁹² RAQC. 2022. Regional Air Quality Council’s Clean Air Champions. <https://raqc.org/program/regional-air-quality-councils-clean-air-champions/>.

²⁹³ CEO. N.d. ReCharge Colorado: An Electric Vehicle Coaching Program for Colorado Communities. https://energyoffice.colorado.gov/sites/energyoffice/files/2020-08/recharge_flyer_8.25.20_final.pdf.

The more-established transportation electrification programs in Colorado had generally not incorporated KPIs or program evaluation into their public reporting as of December of 2021. The EIAF publicly reports funding allocations on an annual basis.²⁹⁴ Newer programs are increasingly asking applicants for data that may be used to support more robust performance measurement in the future. For example, applicants to the Consolidated Call for Capital Projects/Volkswagen Settlement Transit program grantees are required to provide their plan for measuring project success including metrics, outputs, and other data.²⁹⁵ Xcel Energy has also committed to evaluating TEP programs, including the impact of advisory services on participation rates and impacts to emissions.

Tracking program measurement can help to protect against unintended outcomes. For example, the largest electrification incentive in the State, the Innovative Motor Vehicle and Innovative Truck Credits, provides up to \$2,500 toward the purchase of a light-duty electric vehicle for all applicants. Unlike the Federal tax credit, the credit is available for all qualified applicants regardless of the manufacture of the vehicle. Neither the Federal tax credit nor the Innovative Motor Vehicle and Innovative Truck Credits set minimum eligibility threshold criteria on participants. Establishing a baseline and measuring this incentive's performance with respect to reaching different communities would help policymakers and legislators to better understand the outcomes associated with offering this substantial credit.

A summary matrix of program recommendations is included in Table 24.

²⁹⁴ DOLA. 2021. Energy and Mineral Impact Assistance Fund Program Grant Application Guidelines. <https://drive.google.com/file/d/16LBF9sUL6nx3cv1K0B73lTMgH1teAT9w/view>.

²⁹⁵ CDOT. N.d. Settlement Program Supplemental Application: CDOT 2020 Consolidated Call for Capital Projects. <https://www.codot.gov/programs/transitandrail/assets/2020-cccp-settlement-program-supplemental-questions>.

Table 24 Matrix of Program Recommendations

Program Element	Best Practice(s) Identified in Colorado	Recommendations for Colorado Programs
Objectives	<ul style="list-style-type: none"> The CanDo Colorado eBike program explicitly identifies equity in the mission: seeks to ‘increase access to eBikes for low-income essential workers while maximizing air quality benefits.’ 	<ul style="list-style-type: none"> Transparently stating objectives increases transparency to the public, communicates program intentions, and focuses program activities. Centering equity communities within program objectives can ensure that program activities are focused on intended recipients. Setting specific, measurable objectives supports program evaluation and can ensure that program dollars are spent as intended.
Minimum eligibility—Demographic and place-based	<ul style="list-style-type: none"> Xcel Energy’s Electric Car Sharing for Underserved Communities program intends to prioritize communities that have at least one of three criteria: be located in a disproportionately impacted community (as defined by HB21-1266), live in an income-qualified Higher Emission Community (HEC) as defined through the Xcel Energy TEP, or otherwise demonstrate insufficient access to affordable transportation options. Many of Xcel Energy’s TEP programs tie eligibility to enrollment in other income-eligible programs (including Supplementary Nutrition Assistance or SNAP, Temporary Aid to Needy Families or TANF, Colorado’s Weatherization Assistance Program or WAP). 	<ul style="list-style-type: none"> Limiting program eligibility to equity communities ensures that benefits are directed to equity communities. Tying eligibility to enrollment in other programs is an effective way to limit enrollment only to lower income customers and to streamline the process (both for applicants and the State) but may exclude potential customers who qualify on the basis of income but are not enrolled in those programs. Program pathways should be preserved that do not depend on enrollment in other programs. Offering higher award amounts for equity communities can also support equitable access for applicants who would not otherwise be able to participate in the program.
Minimum eligibility—Procedural and technical	<ul style="list-style-type: none"> Most of the transportation electrification programs in Colorado provide clear documentation of procedural and technical requirements. The CanDo Colorado eBike Pilot Program further offered applicants technical advisory services to applicants who had submitted full proposals. 	<ul style="list-style-type: none"> Clearly stated procedural and technical requirements, particularly when accompanied by technical support where relevant, can reduce barriers for differently resourced organizations and individuals. Particularly for BEV programs in Colorado, limiting program eligibility to only new vehicles may also present a barrier to low-income individuals seeking to purchase a used vehicle.
Data-sharing requirements	<ul style="list-style-type: none"> Xcel Energy’s Multifamily Housing Portfolio requires applicants to share data on annual usage, including site-specific data on load-shifting, energy sales, and aggregated customer energy usage profile data. 	<ul style="list-style-type: none"> Clearly state personal identifiable information protection protocols in program documentation. Require applicants to share data that can be used in program outcomes, program measurement, and future program development.

Program Element	Best Practice(s) Identified in Colorado	Recommendations for Colorado Programs
Stakeholder engagement	<ul style="list-style-type: none"> • Xcel Energy’s Small Commercial Program identified a list of organizations that had been involved with program development, including both State agencies, municipalities, NGOs, CBOs, and utilities. • ReCharge Colorado, Drive Electric Colorado, and Xcel Energy’s Advisory Services provide a variety of information services, including information about the benefits of electric vehicles, technical support, planning support, and general information. 	<ul style="list-style-type: none"> • Include a diverse group of stakeholders throughout 1) program development, 2) program outreach, and 3) proposal evaluation (where applicable). • Including a mix of State agencies, municipalities, NGOs, CBOs, utilities, and local community groups in program development can ensure that many different perspectives are represented. • Supporting those programs with targeted, continuous outreach ensures that information about relevant programs reaches intended customers. • Including stakeholder outreach in project evaluation can ensure that projects with strong community connections are prioritized more highly.
Evaluation criteria—Demographic and place-based	<ul style="list-style-type: none"> • The DCFC Plazas Grant Program indicates that applicants who demonstrate that projects will be located near high-density residential areas, in underserved areas, Colorado Opportunity Zones, or distressed locations as defined by the Colorado Department of Public Health and Environment will be evaluated more favorably. 	<ul style="list-style-type: none"> • An expanded list of demographic and place based criteria that prioritizes spending in areas with a higher concentration of equity communities, transportation disadvantaged communities, and other relevant program characteristics (e.g., considering the number of students who receive free or reduced lunch for a school bus replacement program) can help to ensure that program funds are being spent in areas that do not have equal access to the benefits of transportation electrification or have been disproportionately impacted by transportation investments in the past. • Weighting the application evaluation more highly when the applicant meets certain equity criteria can also ensure that equity plays a large role in project selection (note that many programs in Colorado for which a rubric was available prioritize public benefits between 10-20% of the total application score).

Program Element	Best Practice(s) Identified in Colorado	Recommendations for Colorado Programs
<p>Evaluation criteria— General requirements and weighting</p>	<ul style="list-style-type: none"> • The Energy/Mineral Impact Assistance Fund Grant publishes the evaluation rubric on its program website. • Many of the Xcel Energy equity-focused programs limit eligibility to applicants who meet certain demographic or place-based requirements (see above); however, for some programs for which applicants must submit a proposal, Xcel intends to support projects located in areas that meet equity criteria (such as the Electrify Paratransit Mobility Pilot). 	<ul style="list-style-type: none"> • Transparently reporting the rubric used to evaluate proposals can support equitable outcomes by ensuring that program applicants have complete information on the way their programs will be evaluated. • Prioritizing projects in areas with amenities or higher rates of use may also inadvertently direct project dollars away from underserved communities. Considering transportation electrification criteria alongside equity criteria may support under-resourced communities' applications for certain programs. • While project applications should be evaluated to ensure that program objectives are being met, evaluation criteria should be considered holistically with other equity criteria.
<p>Outcomes</p>	<ul style="list-style-type: none"> • Colorado CarShare gathers feedback from members in the form of testimonials. • Clean Air Champions highlights program successes of awardees on its website. 	<ul style="list-style-type: none"> • Both qualitative and quantitative program outcomes can help provide support for transportation electrification. Including targeted outcomes in program outcomes is another strong recommendation for transportation electrification programs to ensure that the program remains focused on key equity outcomes.
<p>Measurement</p>	<ul style="list-style-type: none"> • The Xcel Energy School Bus Electrification Program will track costs and impacts of project costs, VMT, energy consumption, demand, energy sales by time of day, geographic distribution of program participants, emissions reduction, and customer survey data. • Xcel Energy further publishes a Semi-Annual Report on program progress summarizing outcomes associated with many of the programs approved in the Xcel Energy TEP. 	<ul style="list-style-type: none"> • Setting a baseline for performance measurement and setting specific targets could help better understand Colorado's current support for transportation electrification in key areas and set priorities for the future. For programs requiring an application, program measurement could also include characteristics of successful and unsuccessful applicants. • Many of the State's transportation electrification programs are increasingly gathering the data necessary to track program performance. Performance measurement (sometimes also referred to as Key Performance Indicators or KPIs) is a critical way to track program performance and can track program success in a variety of ways.

8.0 Next Steps for Policies and Programs to Advance Equity

All of Colorado's transportation electrification programs can support equitable transportation electrification, but no single program can achieve equitable outcomes alone. No single program or policy can be implemented to more equitably advance transportation electrification in the State of Colorado. Rather, all of the programs currently in operation in the State should be considered for their role in advancing equitable outcomes.

However, several key steps have been identified through the project team's review of transportation electrification and equity focused initiatives in the State, as well as work on previous chapters. These recommendations focus on the area of focus, based on the Colorado EV Equity Study's earlier review of programs, policies, and initiatives in Colorado that advance equitable transportation electrification and gaps identified through this program review. The project team narrowed recommendations to three key areas:

8.1 Support Stronger, Coordinated Stakeholder Engagement for State-Run Programs

State agencies in Colorado have increasingly sought input from wide-ranging stakeholder groups of both non-profit and CBOs. While case-by-case solutions can support individual efforts, the administrative burden for both program staff and for individual participants can be quite high, particularly when completed on a case-by-case basis. Strengthening the stakeholder engagement process would be a benefit to all of the programs reviewed. An established network of compensated stakeholders could be called upon not only for multiple projects, but also across multiple organizations.

One model for engagement is to establish an independent organization through which all community engagement can be directed. Such an organization can provide a means for community members to be fairly compensated for their time, and also provides a stable model that supports capacity-building by both community members and agency staff engaging with the group. An example of this type of organization is the Transportation Equity Network (TEN) in Chicago. TEN served as a partner to the Chicago Department of Transportation on the Strategic Plan for Transportation completed in June of 2021, and provided a vehicle for 30 Chicago-area civic, community, and advocacy organizations to collaborate with in the development of the plan.^{296 297} Supporting the establishment of a non-profit coalition of community representatives could support equitable outcomes for many of the programs summarized in this document and remove persistent administrative barriers to stakeholder engagement. The development of such a group can be supported through grants, and ongoing advisory services can be contracted similar to other vendors used by the State.

²⁹⁶ Chicago Department of Transportation. 2021. CDOT Announces Landmark Strategic Plan for Transportation Focused on Equity, Increasing Access to Opportunities, and Reducing Economic Hardship. https://www.chicago.gov/city/en/depts/cdot/provdrs/future_projects_andconcepts/news/2021/july/cdot-announces-landmark-strategic-plan-for-transportation-focuse.html.

²⁹⁷ Chicago Department of Transportation. 2021. Strategic Plan for Transportation. https://www.chicago.gov/city/en/depts/cdot/supp_info/cdotstrategicplan.html.

8.2 Prioritize Community-Driven Investment Through New Enterprise Spending

Encourage participation by stakeholder groups and to develop community-driven investment, consider adding a program similar to the Sustainable Transportation Equity Project in California, which provides grants to identify communities' mobility needs and grants to fund community-driven projects.²⁹⁸ The project has had a high level of community support within the State, and integrates equity throughout the needs assessment (from defining the program area, to setting goals, designing the program/project, setting measures, and defining outcomes).

8.3 Expand EV Charging Infrastructure Offerings Throughout the State

Support for transportation electrification is particularly robust in the Denver metro area, where the Xcel Energy service area overlaps with other programming offered by local municipalities, the State, and RAQC. The size of Xcel Energy's investment in its TEP programs is both broad and substantial: Xcel Energy will spend approximately \$110 million in TEP programs from 2021-2023. Altogether, the nearly 20 programs included in Xcel Energy's residential portfolio, EV purchase/lease rebates, multifamily housing portfolio, commercial portfolio, public charging & electric mobility services, research, and advisory services address transportation electrification needs for all transportation modes and charging scenarios. However, investment in equitable access to transportation electrification across the state may not meet local needs. Within the Xcel Energy service area, there is broad support for home-based EV charging infrastructure (including at multifamily housing), both in terms of funding and technical support. Outside of the Xcel Energy service area, similar programs are not well-funded and often fragmented into small service territories (particularly true for electric co-ops in the State). Considering these investments and strategically supplementing them will ensure that the benefits of transportation electrification are experienced equitably throughout the State.

8.4 Balance Equity and Electrification Objectives

Vehicle registration data in the State suggests that much of the spending for the Innovative Motor Vehicle and Truck Credits for Electric and Plug-In Hybrid Electric Vehicles spending has supported the purchase of luxury vehicles.²⁹⁹ While tax credits can help to spur adoption of electric vehicles, research suggests that these incentives are not as highly valued by wealthy consumers as other income groups.^{300,301} Given that low- and middle-income households form the majority of the vehicle market, sizing incentives to achieve targeted EV adoption given certain eligibility requirements may be critical to reach EV adoption goals.

²⁹⁸ CARB. 2022. Sustainable Transportation Equity Project (STEP). <https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program-1>.

²⁹⁹ CEO. 2022. EVs in Colorado Dashboard. <https://energyoffice.colorado.gov/zero-emission-vehicles/evs-in-colorado-dashboard>.

³⁰⁰ Jenn et al. 2020. An in-depth examination of electric vehicle incentives: Consumer heterogeneity and changing response over time. <https://www.sciencedirect.com/science/article/abs/pii/S0965856418311091?via%3Dihub>.

³⁰¹ National Bureau of Economic Research. 2021. Subsidizing Low- and Middle-Income Adoption of Electric Vehicles: Quasi-Experimental Evidence from California. <https://www.nber.org/papers/w25359>.

8.5 Offer Electric Vehicle Incentives as Vouchers, Not Tax Credits

An emerging best practice with respect to EV incentives is to make payments through cash vouchers, which can lower the upfront cost of EVs by making incentive dollars available at the time of sale. However, Colorado has taken steps to provide tax credits in a manner that is similar to a voucher. Under HB16-1332, vehicle buyers are able to transfer tax credits to financing entities. This allows purchasers to finance a lower amount that is effectively ‘on the hood’, which can reduce the purchase price of an EV by lowering the amount financed. Furthermore, the maximum available tax credit is not tied to the filer’s full year tax bill. Taking steps to expand awareness of these program features and support is critical in the short run. For future programs, prioritizing the use of vouchers for electric vehicle subsidies would help ensure that financial support is offered at the point of sale and ensure that the advertised incentive amount will be received by the recipient.

8.6 Avoid Providing Transportation Electrification Incentives out of the General Fund

The Greenlining Institute notes that using general funds to support electric vehicle incentives can have the unintended consequence of jeopardizing funding to other social programs that provide critical support to low-income communities.³⁰² The Innovative Motor Vehicle Income Tax Credit has historically been supported with revenue from the General Fund,³⁰³ unlike new programs created in SB21-260 that are supported through new fees on retail deliveries, passenger ride services, and others. Prioritizing revenue sources outside of the General Fund helps to prevent risk to programs that are highly valued by underserved communities.

8.7 Streamline Application Processes

Combine application processes so an applicant to any of the many income-qualified programs in the State also receives information on other EV charging infrastructure/EV programs. If the same can be done for other applications/income-qualified processes, seek out those opportunities to simplify administration (for example, any application that might require a credit check, such as applying for a loan, opening a credit card, or installing solar panels on a house). Note that while streamlining application processes across income-qualified processes can support better access to transportation electrification, certain programs may still want to extend eligibility to applicants who are not enrolled in any income-qualified program.

8.8 Combine Project Evaluation Processes

Similarly, project evaluation processes for many of the larger grant programs are similar but managed independently. Combining project evaluation processes would reduce fragmentation, reduce staff workload, reduce bias in scoring, and increase transparency in the way evaluation is occurring. Combining this process with a methodology that could be used to support Federal Justice40 requirements (i.e., that 40 percent of

³⁰² Greenlining Institute. 2016. Electric Vehicle for All: An Equity Toolkit. <https://greenlining.org/resources/electric-vehicles-for-all/#tab3-section1>.

³⁰³ Legislative Council Staff. 2019. Final Fiscal Note: Modify Innovative Motor Vehicle Income Tax Credits. <https://atlaspolicy.com/evaluateco/>.

clean transportation spending project benefit be directed to disproportionately affected communities) will prepare agencies to meet coming requirements and would support better equitable investment sooner.³⁰⁴

8.9 Seek opportunities to implement steps identified in the Needs Assessment.

As program resources become available, following the steps laid out in the Needs Assessment will help to ensure that equity is centered in the program elements, from defining goals and objectives, identifying assets and deficiencies, evaluating program effectiveness, and reporting. Proceeding through these steps is an iterative, evolving process, and one that will help Colorado to ensure that all Coloradoans have equitable access to the benefits of transportation electrification.

³⁰⁴ The White House. 2021. The Path to Achieving Justice40. <https://www.whitehouse.gov/omb/briefing-room/2021/07/20/the-path-to-achieving-justice40/>.



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