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**Colorado’s Pollution Reduction Planning Standards:  
A Model To Account for Greenhouse Gas Pollution Impacts of Planning Choices in the  
Built Environment.**

Shoshana Lew; Herman Stockinger; Rebecca White; Theresa Takushi; Erik Sabina; Chris Porter

7,364 words

1 **Abstract**

2  
3 For many years, the question of how to measure the pollution impacts of infrastructure choices in the built  
4 environment has perplexed policymakers, complicated by the reality that use of any transportation system implicates  
5 the choices of countless individuals in their daily lives. Nonetheless, extensive research as well as common sense  
6 reflect that the options available — and the infrastructure built primarily by public sector agencies — influences the  
7 choices that those individual users are able to make.

8  
9 With transportation being the number one source of greenhouse gas pollution in the United States, the  
10 implementation of practical approaches to tackling this urgent problem depends on establishing viable policies and  
11 methodologies for assessing and regulating these impacts of building choices, often referred to as “induced  
12 demand.” Colorado’s recently implemented Greenhouse Gas Pollution Reduction Planning standards, established in  
13 2021 following new state legislation, offer a case study for how to implement pollution reduction targets for  
14 transportation planning agencies, leveraging the competencies, authorities and influences of specific institutions that  
15 govern transportation planning within the state.

16  
17 **Background**

18  
19 In 2021, the Colorado legislature passed, and Gov. Jared Polis signed, Senate Bill 21-260, a holistic transportation  
20 package that combined sustainable funding for roads and bridges as well as for electrification and multimodal  
21 transportation, with a variety of policy provisions intended to make transportation more sustainable, improve equity  
22 and reduce greenhouse gas pollution from the transportation sector. Included in this legislation was a requirement  
23 that the Colorado Department of Transportation implement policies to account for greenhouse gas emissions impacts  
24 of “regionally significant” [transportation projects](#).

25  
26 In light of this new legislative requirement, the Colorado Transportation Commission (TC), which oversees CDOT’s  
27 budget and certain policies including major rulemaking, initiated a formal rulemaking process in July 2021 to amend  
28 the state’s planning rules in order to reduce greenhouse gas pollution from transportation. This would separate  
29 targets for the state to be implemented by CDOT — as well as for Metropolitan Planning Organizations who  
30 establish plans for metropolitan areas.

31  
32 The Transportation Commission rulemaking focused on the connection between public sector-funded transportation  
33 projects and vehicle travel; namely that what we build, combined with the emissions of vehicles themselves,  
34 influences driving patterns and commensurate GHG pollution. This connection is exceedingly complex in practice,  
35 particularly given the number of independent actors — namely every traveler and vehicle owner — who have  
36 discretion over their personal travel choices and will not be governed by this rule and policy. Thus, the rules  
37 endeavored to isolate what role state and regional governments play in affecting travel through decisions about  
38 where and how to build infrastructure.

39  
40 Upon completion, the standard fulfilled the new legislative requirement pursuant to SB21-260, as well as one of  
41 several transportation strategies identified in the state’s Greenhouse Gas Pollution Reduction Roadmap.

42  
43 **Overview of the rule**

44  
45 The Colorado Greenhouse Gas Pollution Reduction Planning Rule, as finalized by the state Transportation  
46 Commission on [December 16, 2021](#), focuses on improving air quality, reducing smog and providing more travel  
47 options. The standard requires the Colorado Department of Transportation and the state’s five metropolitan planning  
48 organizations to determine the total greenhouse emissions expected from future transportation projects and reduce  
49 emissions by set amounts. This standard recognizes that the projects we build have an impact on how Coloradans  
50 travel and will help bring about a transportation system that provides more choices for travelers across the state.

51  
52 There are a number of key provisions included in the new standard. First, the rule requires CDOT and the state’s  
53 five metropolitan planning agencies analyze their transportation plans to show the GHG impacts in future years.

1 Agencies must use sophisticated travel models, detailed further below, to make this determination for different years  
2 in the future, and the emission goals differ for each agency and metro region.

3  
4 As specified in the legislative text of SB21-260, the modeling applies to “regionally significant projects,” which are  
5 those projects that result in a fundamental change to the way people travel (e.g., new highway lanes). Importantly,  
6 the rule does not implicate state-of-good-repair projects (e.g., a surface treatment overlay or bridge rehabilitation or  
7 replacement in-kind), nor does it implicate the vast majority of rural projects, unless they add significant throughput  
8 capacity to the system. This distinction, consistent with legislative direction, creates an important differentiation  
9 between those projects that materially alter how the infrastructure will be used or its impact on a community, versus  
10 those changes that are strictly asset management.

11  
12 If this modeling shows that a transportation plan cannot meet the standard, agencies can modify their plans to  
13 provide more travel choices that have fewer GHG emissions such as walking, biking and transit. Upon completion  
14 of their plans, agencies are required to submit them to the state Transportation Commission in a public meeting,  
15 ensuring the transparency of prepared materials and relevant public comment. Schedules for plans were established  
16 to coincide with the timelines of pre-existing planning processes — in the case of CDOT, updating the state’s 10-  
17 year capital plan, and in the case of MPOs, updating their long-range regional transportation plans.

18  
19 If an agency cannot meet the greenhouse gas reduction levels, it can also choose to implement one or more  
20 mitigation measures as needed to meet the standard. These can include more public transit, more walking and  
21 bicycle trails, more medium- and heavy-duty electric vehicle charging stations, carpool programs and smarter land  
22 use policies. The rule requires CDOT and the Transportation Commission to put in place a policy process for  
23 identifying, documenting and quantifying an approved list of mitigations and how their benefits are to be measured.  
24 While this list will be updated, and anyone can [submit a proposed mitigation online](#), having an up-to-date published  
25 list of mitigations will help to streamline the process of determining their accounting, while also providing an  
26 ongoing glossary of best practices to help improve and accelerate planning and decision-making. The Transportation  
27 Commission approved a “Policy Directive” containing an initial list of approved mitigations on [May 19, 2022](#).

28  
29 The rule includes compliance and enforcement provisions such that if an agency still can’t meet its greenhouse gas  
30 reduction goals even after using mitigation measures, the Colorado Transportation Commission is required to restrict  
31 specific funding streams, requiring that the recipient agency spend those funds only on mitigation efforts or projects  
32 that reduce GHG emissions. Funding streams implicated by this provision include both federal dollars provided  
33 through the Title 23 program — including those allocated directly to the state DOT (CDOT), and those suballocated  
34 to MPOs — as well as certain state dollars. Specifically, SB21-260 established that state dollars provided to the  
35 state and MPOs through the state’s “Multimodal and Mitigation Options Fund,” which received significant funds  
36 through SB21-260, would be restricted based on compliance with the GHG pollution reduction planning rule, once it  
37 was put in place.

38  
39 The rule also provided the Transportation Commission the ability to issue waivers for certain projects as long as the  
40 overall plan of projects reflects a significant effort and priority is placed, in total, on projects and mitigation  
41 measures that reduce greenhouse gas emissions — and the specific projects being requested for a waiver do not  
42 result in a substantial increase in greenhouse gas emissions as compared to the required reduction levels contained in  
43 the rule.

#### 44 45 ***Projected regulatory impacts***

46 Consistent with requirements of the state of Colorado’s Administrative Procedures Act (section 24-4-103 (2.5),  
47 C.R.S), CDOT staff, assisted by economists at Cambridge Systematics, conducted [a cost-benefit analysis](#) (CBA) to  
48 determine the economic impacts of the rule. That analysis demonstrated that the standard is expected to generate  
49 billions in economic benefits for both members of the general public and for Colorado businesses.

50  
51 By way of methodology, the CBA assumed that the dollars available for expenditure are relatively static, such that  
52 the questions underlying a planning process, including significant GHG reduction criteria, relate to how those finite  
53 dollars are prioritized. The CBA essentially juxtaposed a “baseline” scenario that assumed the current projects in the  
54 agencies’ long range transportation plans, relative to an action scenario where a portion of dollars were shifted away  
55 from capacity expansion projects toward state-of-good-repair investments and/or projects that would achieve

1 progress toward regulatory compliance, such as incorporating bus rapid transit into roadways, adding  
 2 pedestrian/bike access or investing in infrastructure to support denser downtowns. Importantly, the action scenario  
 3 assumed that important capacity projects would continue to move forward and that between a quarter and a third of  
 4 dollars originally envisioned for capacity expansion would shift to other priorities.

5  
 6 The analysis showed that the most substantial benefits associated with the rule are expected to come from crash  
 7 reduction as well as lower vehicle operating costs (e.g., fuel), resulting from reduced vehicle miles traveled when  
 8 consumers are provided with more travel options. However, the rule also showed many other benefits, such as  
 9 decreased fuel and maintenance costs for businesses and individuals and reduced vehicle ownership costs for things  
 10 such as depreciation, insurance, license and registration fees and finance charges. Notably, regulatory analysis  
 11 preceded recent increases in gas prices, and higher gas prices would increase the benefit-to-cost ratio associated with  
 12 the rule. Table 1 presents costs and (savings) in the various categories.

13  
 14 Table 1  
 15 Economic Benefits (Cost Savings)  
 16 (Net Neutral Investment Levels)  
 17 (Net Present Value, Millions of 2021 Dollars)  
 18

Time Frame	Vehicle Operating Cost	Social Cost of Carbon	Air Pollution	Safety (Crashes)	Traffic Delay	Physical Inactivity	Total Social Cost Savings
2022-2025	(372)	(60)	(21)	(481)	(774)	(17)	(1,724)
2026-2030	(1,781)	(258)	(82)	(2,332)	(3,098)	(75)	(7,626)
2031-2040	(4,670)	(589)	(125)	(7,183)	(4,693)	(237)	(17,497)
2041-2050	(4,210)	(323)	(42)	(9,027)	397	(289)	(13,494)

19  
 20 Key specific benefits of the rule are summarized as follows:  
 21  
 22

- 23 • **Vehicle operating cost:** Fuel and maintenance costs per mile driven. Costs per mile change over time  
 24 consistent with projected changes in fuel prices and the mix of the vehicle fleet including conventional  
 25 fuels (e.g., gasoline and diesel) versus zero-emission vehicles (e.g., electric and hydrogen). Vehicle cost  
 26 savings provide travelers with more out-of-pocket money that they can spend on other goods and services  
 27 of higher value to them. Businesses also save money for work travel and goods movement expenses. These  
 28 savings benefit the state's economy.  
 29
- 30 • **Social cost of carbon:** Global climate change is expected to result in a variety of negative economic effects  
 31 to the world and national economy, including Colorado. Examples include costs of flood prevention and  
 32 mitigation, health care costs associated with excessive heat as well as fire prevention, control and damages.  
 33 Carbon emissions are valued based on guidance issued by the Biden Administration at a discount rate of  
 34 2.5%, consistent with Colorado Senate Bill (SB) 21-260. The social cost increases over time, from \$83 per  
 35 metric ton of CO2 emissions for emissions occurring in 2025 to \$116 per metric ton of CO2 for emissions  
 36 occurring in 2050 (all costs in 2020 dollars).  
 37

- 1 • **Air pollution:** Costs associated with air pollution include higher health care costs as well as damage to  
2 structures and natural systems. Values per ton of particulate matter (PM) and oxides of nitrogen (NOx)  
3 reduced are based on modeling conducted in support of federal rulemakings on vehicle tailpipe emission  
4 standards.  
5
- 6 • **Safety (crashes):** Costs associated with crashes resulting in fatalities or injuries include higher medical  
7 costs, insurance costs, vehicle property damage and lost workplace productivity. These costs impact  
8 Colorado’s economy. Motor vehicle crash reductions are estimated based on national average fatality and  
9 injury crash rates per VMT and are valued based on federal guidance on the value of a statistical life and  
10 average value of injury crashes.  
11
- 12 • **Traffic delay:** Traffic delay results in increased travel time for “on-the-clock” business travel and freight  
13 movement as well as more time spent traveling for commuting, errands and other personal travel. These  
14 time losses negatively impact Colorado’s economy. To estimate delay reduction associated with emissions-  
15 reducing transportation investments, hours of traffic delay reduced (per VMT reduced) are derived from  
16 Texas Transportation Institute studies of national traffic congestion and mitigation measures including  
17 transit expansion. For highway capacity expansion projects, which reduce delay, hours of delay reduced are  
18 based on modeled relationships between volume, capacity and travel time. Capacity expansion projects  
19 consider the effects of “induced demand,” or increased traffic that is observed to result over time after  
20 roads are expanded. This increased traffic may lead to net increases in greenhouse gas emissions as a result  
21 of the project and may offset to some degree the delay reduction benefits.  
22
- 23 • **Physical inactivity:** A lack of physical activity is associated with increased mortality and other negative  
24 health outcomes, increasing health care costs. Investments in walking and bicycling infrastructure and  
25 transit services increase physical activity, reducing those associated costs. Physical inactivity in this  
26 analysis is valued based on health care cost savings per mile of walking and bicycling activity.  
27

28 Further, the standard is likely to spur greater downtown and main street revitalization as well as increased access to  
29 jobs. For example, policies that support dense, walkable downtowns and main streets tend to spark significant  
30 economic vitality in those areas, providing customers for restaurants and small businesses. Investments in transit  
31 also spur economic benefits such as increased property values and agglomeration benefits from more efficient land  
32 use. Colorado’s successful “Revitalizing Main Street Program” has demonstrated this confluence of benefits  
33 effectively. Initiated during the early months of COVID, this program has now provided roughly 200 grants to  
34 communities across the state to support active infrastructure downtown. These benefits are difficult to quantify and  
35 were not included in the initial cost-benefit analysis, but CDOT is pursuing additional analysis currently to ensure  
36 that these benefits are more fully captured in mitigation policies.  
37

38 In a similar vein, the rule is expected to increase access to jobs. Because Colorado already has a very complete  
39 roadway network, households that have access to cars have the ability to access employment by driving. By contrast,  
40 for residents who do not own cars or have disabilities that preclude driving, many jobs are essentially inaccessible.  
41 A more robust transit network will increase access to jobs for these residents and will provide a larger pool of  
42 potential employees for businesses. As an example, within the eight-county Denver Regional Council of  
43 Governments (DRCOG) region, 6% of households do not have cars, and 9% of residents have mobility disabilities.  
44 While it is also not quantified in the initial cost-benefit analysis, greater access to employment for these individuals  
45 could bring significant economic and equity benefits.  
46

#### 47 *Impacts to disadvantaged communities*

48

49 One area of particular interest for many stakeholders has been about the impact of the rule to Disproportionately  
50 Impacted (DI) communities — and it is anticipated that the rule will have important positive effects as those  
51 communities generally face greater impacts from climate change than the overall population. This is well  
52 documented in studies and reports, including the following:  
53

- 1 • “Populations including older adults, children, low-income communities and some communities of color are  
2 often disproportionately affected by, and less resilient to, the health impacts of climate change.” Source:  
3 [The Fourth National Climate Assessment](#).  
4
- 5 • “Minorities are most likely to currently live in areas where the analyses project the highest levels of climate  
6 change impacts with 2°C of global warming or 50 cm of global sea level rise. Those with low income or no  
7 high school diploma are approximately 25% more likely than non-low-income individuals and those with a  
8 high school diploma to currently live in areas with the highest projected losses of labor hours due to  
9 increases in high-temperature days with 2°C of global warming.” Source: [EPA’s Climate Change and  
10 Social Vulnerability in the United States](#).  
11

12 Work in Colorado also has demonstrated the local, disproportionate impacts on communities due to climate change.  
13 The Colorado Department of Public Health and Environment has developed a [climate equity data viewer](#) that uses  
14 population and environmental factors to calculate a climate equity score for every census block group in Colorado.  
15 A higher value indicates a worse score.  
16

17 Another way to consider this question is to consider the co-benefits of this rule to air quality. Efforts that reduce  
18 GHGs from transportation also directly reduce other emissions, including particulate matter and ozone precursors.  
19

20 Additionally, this rule will provide benefits to multiple groups of transit-dependent individuals. According to the  
21 2010 Census, 41.8 million Americans over age 18 were persons with disabilities, 40 million were over the age of 65,  
22 and 32 million were living below the poverty level for people above age 18. Currently, DI communities are more  
23 likely to have limited access to high quality and efficient transportation either through transit or in a personal  
24 vehicle. Many of the individuals cited in the above census data are also totally dependent on transit due to physical  
25 abilities or age.  
26

27 The study, [“Transit Deserts: The Gap Between Supply and Demand,”](#) reflected that these populations are often  
28 marginalized and are especially vulnerable if their access to jobs, goods and services is restricted. High quality and  
29 easily accessible modes of transportation, such as transit, are especially important to protect and elevate these  
30 populations. A [2015 study](#) from Harvard found that individuals who do not have reliable access to any type of  
31 transportation mode struggle to reach jobs and services and as a result, their opportunity for upward economic  
32 mobility is limited. DI individuals who lack reliable transportation are more likely to be unemployed or  
33 underemployed with more chronic health issues. [The Colorado Health Institute examined](#) transportation disparities  
34 and its negative impact on individuals trying to access preventative as well as acute care. The organization found  
35 that 5.5% of Coloradans reported difficulty getting to doctor’s appointments because they were not able to find  
36 transportation. According to the [American Hospital Association \(AHA\)](#), transportation challenges prevent more than  
37 3.6 million Americans from receiving medical care each year. Thus, overall, increasing access to more modes of  
38 travel will improve community equity and health through cleaner air, higher wages and better access to healthcare  
39 services.  
40

#### 41 ***Regulatory process and stakeholder outreach*** 42

43 Colorado’s choice to initiate this regulatory process through the state Transportation Commission — with staff  
44 support from the Colorado Department of Transportation — was significant. While many environmental rules in the  
45 state are promulgated through the state’s Air Quality Control Commission, collocating this rule with the state’s  
46 transportation planning rules (which are holistically established through the Transportation Commission) was an  
47 important decision for ensuring practicability of the rule as well as subject matter expertise.  
48

49 Importantly, transportation stakeholders and practitioners also weighed in strongly in favor of working with  
50 regulators and staff whom they work with on other matters, so housing the rule within the well-established  
51 transportation entities also helped to build buy-in.  
52

53 Throughout the rulemaking process, creating an inclusive dialogue was of utmost importance to both CDOT and the  
54 Commission. Indeed, even before beginning formal proceedings, CDOT staff convened a set of key experts with

1 different vantage points and viewpoints to begin developing high-level concepts for the rule. This included  
2 representatives from different parts of the state, both urban and rural, as well as both proponents and skeptics of the  
3 rule, in concept. This network has evolved into a more technical group of staff, during the implementation phase,  
4 that now maintains a key role in working through ongoing modeling and compliance matters.

5  
6 During the rulemaking process itself, the Transportation Commission and CDOT followed the state Administrative  
7 Procedures Act. Rulemaking in Colorado is governed by the State Administrative Procedure Act (“APA”), C.R.S. §  
8 24-4-101 et seq., which requires advance public notice of permanent rulemaking and at least one public rulemaking  
9 hearing to receive public input on the proposed rule. The APA requires that an agency create and consult with a  
10 representative group of stakeholders affected by and interested in the subject matter of the rule when rulemaking is  
11 contemplated or in progress. Members of the public may also request a regulatory analysis and/or a cost-benefit  
12 analysis of a rule. Notably, the Colorado Transportation Commission requested that staff far exceed public outreach  
13 requirements for rulemaking, which mandate one public hearing. CDOT held 10, with both virtual and in-person  
14 options, all across the state.

### 15 16 *Establishing targets and key modeling parameters*

17  
18 In 2013, CDOT began a project to build its first statewide travel model. At that time, the Denver Regional Council  
19 of Governments (DRCOG) had recently completed its project to implement one of the early activity-based models  
20 (ABMs) in the U.S. and had begun using the ABM as its primary analytical tool for planning. While GHG planning  
21 was not active at CDOT at that time, CDOT staff made the decision to adapt DRCOG’s ABM for state-scale use, as  
22 opposed to adopting the older trip-based model form. ABMs are powerful and flexible tools that support multi-  
23 modal planning, helping evaluate the effects on travel behavior of a wide range of characteristics of regions, people  
24 and travel modes. These ABM capabilities permit much more realistic evaluation of transportation planning’s effects  
25 on air pollutant emissions, transportation equity, safety, traffic congestion and numerous other outcomes that are key  
26 priorities to transportation policy makers. While CDOT could not in 2013 fully anticipate the planning policy  
27 challenges it would face in 2020, the complexity of the planning CDOT already was facing made it clear that older,  
28 simpler tools were not likely to serve effectively in future years.

29  
30 CDOT completed its ABM project in 2019, and immediately began using it on numerous challenging projects,  
31 among them the Front Range Passenger Rail effort that is still ongoing. At the same time, CDOT, the Colorado  
32 Energy Office (CEO) and the Colorado Department of Health and the Environment (CDPHE) began working on a  
33 statewide GHG reduction roadmap in response to the Colorado legislature’s passage of HB19-1261, which requires  
34 across-the-economy reductions in GHG emissions. Analysis conducted in that project utilized consultant tools, but  
35 CDOT began preparing to use its statewide model for the more detailed GHG analysis to come.

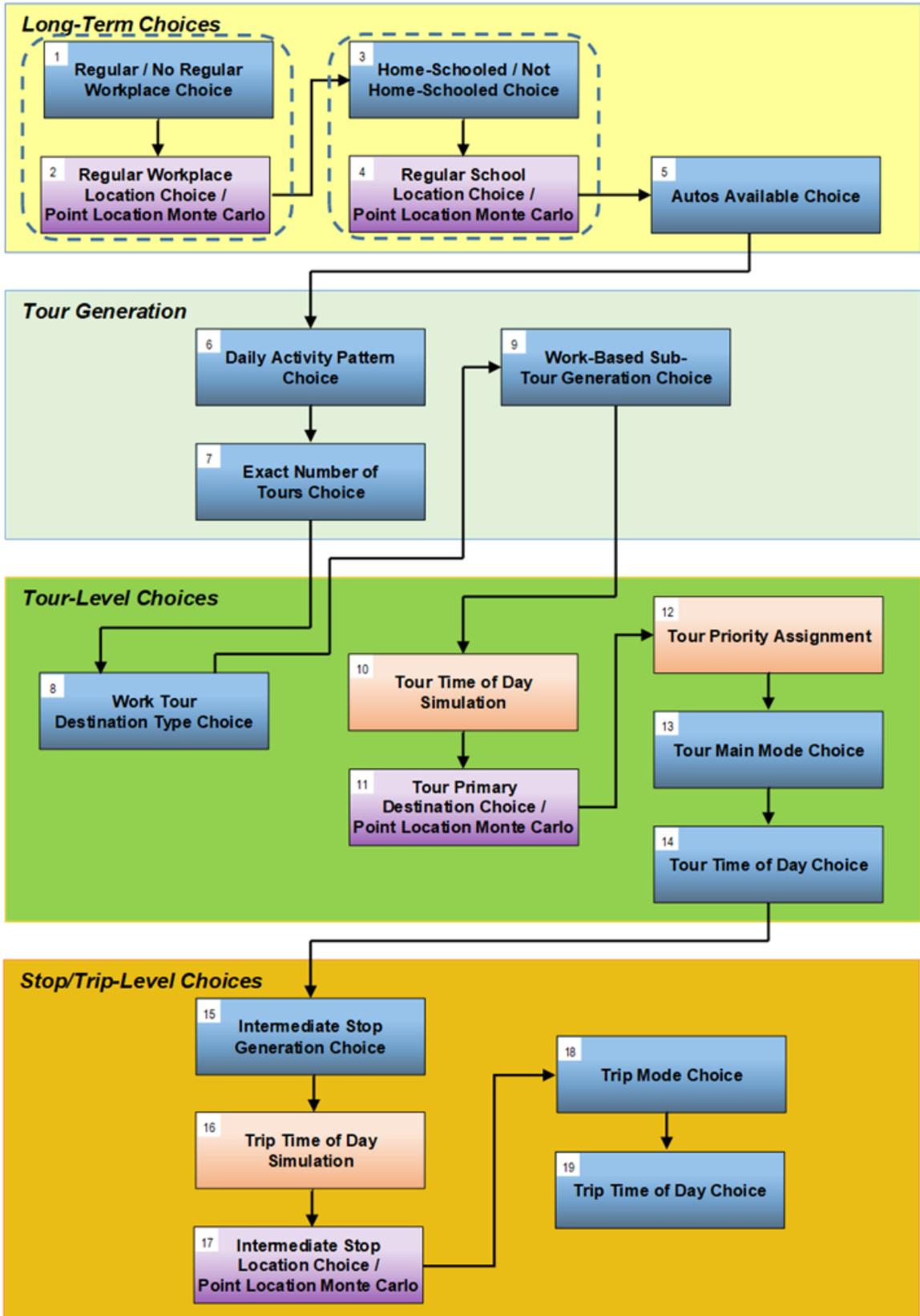
36  
37 CDOT’s statewide model structure is depicted in Figure 1, which shows the sequence of model components of  
38 which the overall model is composed. The model has many features that enhance its ability to evaluate the GHG  
39 effects of transportation infrastructure and programs:

- 40  
41 • It depicts each person individually, including characteristics important to that individual’s travel  
42 choices. For example, survey data show that, given existing bicycle infrastructure, women are less likely  
43 than men to choose to bicycle. CDOT’s ABM can examine scenarios in which bicycle infrastructure is  
44 more widespread and safer by adjusting the gender-bias constants to depict greater likelihood of women to  
45 bicycle if the system is safer.
- 46 • It explicitly depicts the choice between work-from-home and work elsewhere, allowing scenarios in which  
47 changes in propensity to work from home are affected by planning activities (programs/infrastructure) or  
48 by larger changes in society (e.g., COVID effects.)
- 49  
50 • It estimates the trips (number, type, etc.) that people make based on the activities they need to accomplish  
51 in a day, and the effect of travel conditions on peoples’ choice of how best to accomplish those tasks. This  
52 means that, for example, under a scenario examining a large highway expansion that reduces congestion, a  
53 person may decide to consume visual entertainment by going to a movie theater rather than watching a  
54 streaming service at home.

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- It depicts the location of households and jobs at the address level rather than at the coarse “zone” level that is common in older models. This is particularly important for modeling active transportation modes. When driving a car, the difference between a 0.5 mile and a 1.5 mile drive is of little importance, but when walking, such a difference is significant to most people. Detailed geographic depiction of the locations of households and jobs therefore is necessary to accurately estimate peoples’ propensity to use active travel modes.

Figure 1: CDOT's Statewide Travel Model



1 One of the model’s most important capabilities, hinted at in the above discussion of activities driving trip-making, is  
 2 the ability to examine “induced demand” for travel. Basic economic theory shows that, if a “good” is made  
 3 “cheaper,” people will consume more of it. So, if automobile travel is made cheaper in terms of taking less time to  
 4 accomplish, people will drive more. Activity-based models such as CDOT’s provide the sensitivities necessary to  
 5 examine the degree to which this inducement occurs as a result of a variety of transportation infrastructure  
 6 enhancements.

7  
 8 CDOT’s ABM was used to examine a range of infrastructure and program scenarios as CDOT worked to identify  
 9 “aggressive yet feasible” GHG reduction targets to be required of transportation plan updates:

- 10 • The first scenario examined the effect of enhancements to active modes.
- 11 • The second scenario examined extensions of transit services in addition to the travel choices scenario.
- 12 • The third scenario examined the effects of land use pattern changes (more development in denser, mixed-  
 13 use areas) in combination with the two scenarios above.

14  
 15 Supported by this analysis, an extensive process of consultation within CDOT, with partner agencies, and with  
 16 numerous stakeholders culminated in the selection of GHG reduction targets for each of the years for which GHG  
 17 reductions were required by state legislation.

18  
 19 Table 2: GHG Transportation Planning Reduction Levels (MMT of CO<sub>2</sub>e)

Regional Area	2025 Reduction Level	2030 Reduction Level	2040 Reduction Level	2050 Reduction Level
DRCOG	0.27	0.82	0.63	0.37
NFRMPO	0.04	0.12	0.11	0.07
PPACG	N/A	0.15	0.12	0.07
GVMPO	N/A	0.02	0.02	0.01
PACOG	N/A	0.03	0.02	0.01
CDOT/Non-MPO	0.12	0.36	0.30	0.17
TOTAL	0.43	1.5	1.2	0.70

20 [Web Source](#)

21  
 22  
 23  
 24 ***Implementation process, policy directives and mitigations***

25  
 26 The rule set in place a requirement to establish an ongoing administrative process, including guidelines for selecting,  
 27 measuring, confirming, verifying and reporting around mitigation measures. This, along with the compliance  
 28 process for agency submission of plans, composes just some of the ongoing work and modeling following  
 29 codification of the rule.

30  
 31 Agencies will model the travel impacts of their transportation plans using travel demand models, with a subsequent  
 32 GHG analysis of these plans through EPA’s Motor Vehicle Emission Simulator (MOVES). The technical outputs of  
 33 this work are reviewed by Colorado’s Department of Public Health and Environment. If agencies do not meet their  
 34 individual reduction levels as required by the planning standard, they can change the mix of projects in their  
 35 transportation plans and/or use GHG mitigation measures. GHG mitigation measures are projects and strategies  
 36 whose GHG and travel benefits cannot be accurately or easily captured and quantified in travel demand models.

1 On May 19, 2022, the Transportation Commission adopted Policy Directive 1610 on GHG Mitigation Measures.  
2 The policy directive fulfills the requirements of the GHG Planning Standard, adopted by the Commission in  
3 December 2021, to establish an ongoing administrative process and guidelines for selecting, measuring, confirming,  
4 verifying and reporting on GHG Mitigation Measures.  
5

6 GHG Mitigation Measures are an important, but voluntary, component of the GHG Transportation Planning  
7 Standard. Policy Directive 1610 provides an additional compliance mechanism for CDOT and the state's five MPOs  
8 to meet the GHG Reduction Levels found in the Planning Standard.

9 Appendix A in Policy Directive 1610 includes a list of GHG mitigation measures that have been reviewed, vetted  
10 and scored by CDOT subject matter experts and formally approved by the Transportation Commission. These  
11 approved GHG mitigation measures are "scored," which reflects the ability of a project to reduce GHG emissions  
12 relative to a certain metric, while providing a way to distinguish and value the location and context. One point is  
13 equivalent to one metric ton of avoided GHGs.  
14

#### 15 *Real-world impacts to date*

16 Within the initial months of the implementation process, real-world benefits and impacts of the rule are already  
17 emerging. Indeed, as planning agencies proceed through the first implementation cycle, it is clear that the presence  
18 of this policy is changing infrastructure project prioritization in a meaningful way, including encouraging the  
19 incorporation of elements like transit at the early stage of a project's development. Some of the specific benefits thus  
20 far include direct inclusion of more multimodal features in projects coming to fruition, empowerment of MPOs to  
21 serve as conveners of key conversations about the impacts of local infrastructure decisions, strengthening of  
22 modeling and other analytical capabilities.

#### 23 *Inclusion of more multimodal project features*

24 With the rule in place, these elements are becoming essential to the early stages of project scoping, rather than  
25 "afterthoughts." For example, cognizant of the rule being in place, CDOT has begun to incorporate transit into its  
26 most significant capacity projects, like the reconstruction of the "Floyd Hill" segment of I-70 through the mountains.  
27 Even ahead of the project going under construction, CDOT initiated a new micro-transit bus service called  
28 "Pegasus" to provide travelers through the corridor with a new transit option that will complement adding a third  
29 lane to a key segment of the interstate.

#### 30 *Empowerment of MPOs to drive important conversations about infrastructure impacts*

31 The presence of the rule has begun to fundamentally shift the conversations that are occurring within the state's  
32 largest Metropolitan Planning Organizations — and especially the MPO covering the Denver Metropolitan area (the  
33 Denver Regional Council of Governments, or "DRCOG").

34 For example, in the months since the rule has been in place, the Denver Regional Council of Governments has  
35 begun addressing land use in a meaningful way far exceeding past precedent. Its staff has begun to "pressure test"  
36 proposals by members to widen arterials that once composed much of the region's long range plan. This doesn't  
37 mean elimination of all capacity expansion projects, but rather, a more significant degree of due diligence that more  
38 fully assesses costs, benefits and priorities.

39 At the same time, DRCOG's planning process has moved rapidly toward significant transit investments like bus  
40 rapid transit, with active discussions underway about how to move those projects into earlier years of the plan  
41 because of the rule being in place. This offers real promise of accelerating the funding and delivery of those key  
42 multimodal investments in the Denver area.

#### 43 *Strengthening modeling and analytical capabilities*

44 As noted above, the rule prompts agencies to develop and adopt state-of-the-art travel demand models that take into  
45 account not just driving but also walking, biking, telework and smart development of the built environment. These  
46 are the same models necessary to fully examine factors like induced demand and land use patterns. Ultimately, the

1 incorporation of these types of models is critical to establishing a fuller picture of project impacts that considers  
2 more than driving alone.

3 Through implementation of the rule, CDOT and MPOs are working together to share best practices and technical  
4 capabilities and to ensure that each agency has in place experts and software to be able to comply with the rule. Over  
5 time, this will significantly expand the sophistication of analysis around these key issues.

6  
7 ***Conclusion: Lessons for other public sector entities***

8  
9 Since its legislative mandate and regulatory implementation in 2021, Colorado’s Pollution Reduction Planning  
10 Standard has established a first-of-its-kind prototype for discussions around the nation about how to account for and  
11 reduce emissions associated with transportation infrastructure. Colorado has and continues to participate in multiple  
12 peer exchanges with other interested states and has had extensive discussions with federal partners as they  
13 contemplate the future of GHG reduction at agencies like the Federal Highway Administration. As partners consider  
14 the lesson of Colorado’s standards, several key recommendations are relevant for consideration. These include:

- 15  
16 • **Government entities with direct subject matter expertise and jurisdiction over transportation dollars should take the lead:** As noted above, the regulating agency leading these rulemaking proceedings was  
17 Colorado’s Transportation Commission, a body with a direct connection to the transportation agency. In a  
18 similar vein, staff who have worked on the rule have primarily been officials in CDOT’s planning division,  
19 the same team with purview over the state’s long-range planning and interface with MPOs on their long  
20 range plans. The subject matter expertise, as well as practical vantage point, of these officials has been  
21 invaluable to the rule’s success. While some stakeholders, especially in the environmental community,  
22 were initially skeptical of CDOT and the Transportation Commission’s engagement in this space, many  
23 have since noticed that the jurisdiction of this policy is working well and is well integrated with the state’s  
24 overall transportation planning operations.
- 25  
26 • **When developing a new framework or policy to address GHG pollution reduction in transportation  
27 infrastructure, use familiar concepts to the extent possible:** Colorado developed its rule from scratch.  
28 While this provided an opportunity for creativity and a “blank canvas,” it was also critical to integrate  
29 concepts that would be familiar to implementing agencies. For example, much of the structure of the rule is  
30 similar to ozone conformity, though the statutory basis for the rule is different (it is not established under  
31 the Clean Air Act, but rather, under state law SB21-260 and Title 23 of the U.S. Code), as is its subject  
32 matter. Similarly, the concept of the approved mitigation list is derived from highway safety regulation,  
33 where long-established policy gives FHWA authority to restrict states’ spending to [“proven safety  
34 countermeasures” if they fail to meet safety targets](#). The familiarity of elements like these in the rule helped  
35 to ensure it would be implementable and has also made it easier for agency staff to familiarize themselves  
36 with new content.
- 37  
38 • **Create a big tent for stakeholder outreach, and keep everyone at the table:** The Colorado  
39 Transportation Commission requested that staff far exceed public outreach requirements for rulemaking via  
40 the Administrative Procedures Act, which mandates one public hearing. CDOT held 10, with both virtual  
41 and in-person options, all across the state. In addition, CDOT established an informal stakeholder working  
42 group that has evolved into a more technical venue for ongoing work around implementation. Importantly,  
43 all of these venues have included both supporters and skeptics of the rule. Maintaining an active dialogue  
44 with stakeholders of differing perspectives has continued to help strengthen and pressure test the policy and  
45 to ensure that it is practicable irrespective of different policy views.
- 46  
47 • **Balance good modeling with ongoing focus on real-world outcomes and improved options for  
48 citizens:** Developing rigorous modeling is critical both for developing and implementing a policy like  
49 Colorado’s GHG Pollution Reduction Planning Standard and for increasing the sophistication of analysis  
50 around issues like multimodal transportation, workforce dynamics and commuting patterns and land use.  
51 Colorado’s Activity-Based Model has continued to gain credibility in the field and to incorporate cutting-  
52 edge techniques. However, a good model alone is insufficient, and it must be paired with a real-world focus  
53 on how the implications of a policy will impact people, who are ultimately the consumers of all  
54

1 transportation investment. Ability to articulate the practical implications of a regulatory policy is critical for  
2 ensuring that it improves quality of life and place along with progressing toward environmental and climate  
3 goals.  
4

- 5 • **Be ambitious and embrace impact:** As evidenced by the debate around federal policies like [recent](#)  
6 [advisory guidance published by the Federal Highway Administration](#), policies related to reduction of  
7 greenhouse gas pollution reduction in infrastructure become quickly charged and tend to evoke strong  
8 policy reactions. Colorado is no exception, though significant stakeholder outreach has helped create a  
9 generally positive tone to surrounding dialogue, even with those who disagree with the premise of the rule.  
10 With that said, the “pushback” will likely be as strong for a policy that is purely symbolic as for one that  
11 achieves meaningful change and real impact. So, go for the impact.  
12