

ARIZONA CLIMATE CHANGE ADVISORY GROUP

CLIMATE CHANGE ACTION PLAN AUGUST 2006



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EXECUTIVE SUMMARY

Executive Order 2005-02

On February 2, 2005, Governor Janet Napolitano signed Executive Order 2005-02 establishing the Climate Change Advisory Group (CCAG). Appointed by the Governor, the 35-member CCAG comprised a diverse group of stakeholders who brought broad perspective and expertise to the topic of climate change in Arizona. The Governor's Executive Order directed the CCAG, under the coordination of the Arizona Department of Environmental Quality (ADEQ), to:

- 1) prepare an inventory and forecast of Arizona greenhouse gas (GHG) emissions; and
- 2) develop a Climate Change Action Plan with recommendations for reducing GHG emissions in Arizona.

The Executive Order emphasized that “Arizona and other Western States have particular concerns about the impacts of climate change and climate variability on the environment, including the potential for prolonged drought, severe forest fires, warmer temperatures, increased snowmelt, reduced snow pack and other effects.”

The Executive Order also recognized that “actions to reduce GHG emissions, including increasing energy efficiency, conserving natural resources and developing renewable energy sources, may have multiple benefits including economic development, job creation, cost savings, and improved air quality.”

The CCAG Process

The CCAG held its first meeting on July 14, 2005, followed by a year of intensive fact-finding and consensus building, facilitated by the Center for Climate Strategies (CCS). The CCAG met six times during this period, and five sector-based technical work groups (TWGs) of the CCAG – Energy Supply (ES); Residential, Commercial, Industrial and Waste Management (RCI); Transportation and Land Use (TLU); Agriculture and Forestry (AF); and Cross-Cutting Issues (CC) – met a total of 40 times via teleconference.

The recommendations adopted by the CCAG underwent two levels of screening. First, a potential policy option being considered by a TWG was accepted as a “priority for analysis” and developed for full analysis only if it had a supermajority of support from CCAG members (with a “supermajority” defined as five or fewer “no” votes or objections). Second, after the analyses were conducted, only policy options that received at least majority support from CCAG members were adopted as recommendations by the CCAG and included in this report.

Of the 49 policy recommendations adopted by the CCAG, 45 received unanimous consent, two (2) received a supermajority of support, and two (2) received a majority of support.

Emissions Inventory and Forecast

Prior to the first meeting of the CCAG, a preliminary inventory and forecast of GHG emissions for Arizona for years 1990 through 2020 was produced pursuant to Executive Order 2005-02.

The inventory provided several critical findings, including:

- Between 1990 and 2005 Arizona's net GHG emissions increased by nearly 56%, from an estimated 59.3 million metric tons carbon dioxide equivalent (MMtCO_{2e}) to an estimated 92.6 MMtCO_{2e}.
- Arizona's GHG emissions are forecasted to increase by 148% from 1990 to 2020, taking into account the effects of recent energy efficiency actions adopted by the State. Without these actions emissions growth in 2020 would be forecasted to increase by 159% over 1990 levels.
- The transportation and electricity sectors account for more than three-fourths – roughly 77% – of Arizona's total GHG emissions.

Figure E-1 below shows the relative amount of GHG emissions contributed by each sector in 2000.

Figure E-1 Arizona Greenhouse Gas (GHG) Emissions in 2000

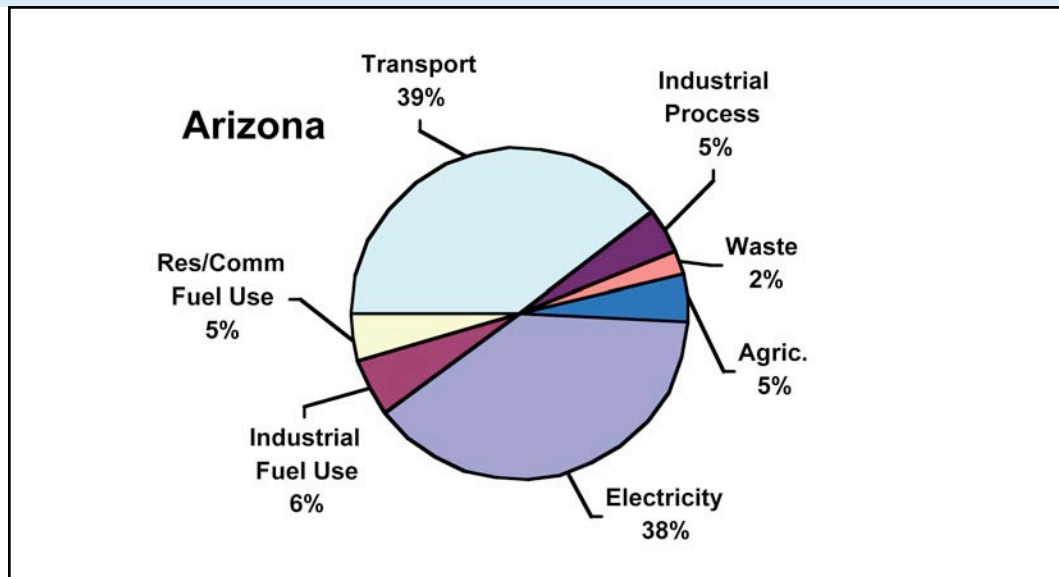
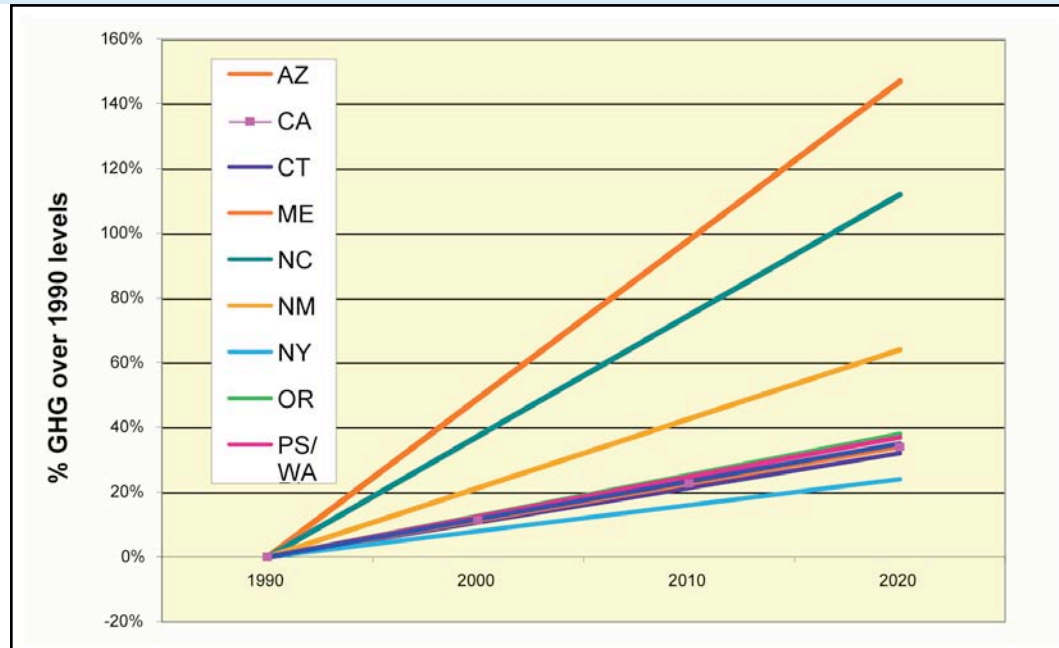


Figure E-2 below shows how Arizona’s projected growth in GHG emissions compares to the growth rates in other states with climate action plans.

Figure E-2 Comparison of 1990-2020 GHG Emissions Growth for States with Climate Plans



While Arizona’s high emissions growth rate presents challenges, it also provides major opportunities. Because more than three-fourths of Arizona’s GHG emissions are directly related to energy and transportation, the opportunity exists for Arizona to reduce its GHG emissions while continuing its strong economic growth by being more energy efficient, using more renewable energy sources, building new infrastructure “right” in the first place to produce lower GHG emissions and increasing the use of cleaner transportation modes, technologies and fuels.

The CCAG’s Recommended Policy Options

The CCAG is recommending a comprehensive set of 49 policy options to reduce GHG emissions in Arizona. The CCAG strongly recommends early and aggressive implementation of the recommendations and a corresponding set of incentives to promote their early adoption. The CCAG believes that early action and implementation of its policy recommendations are critical to put Arizona quickly on the path toward significant emissions reductions. The CCAG also urges that the policy options be implemented as a set, to the greatest extent practicable, to achieve the maximum GHG emissions reductions possible.

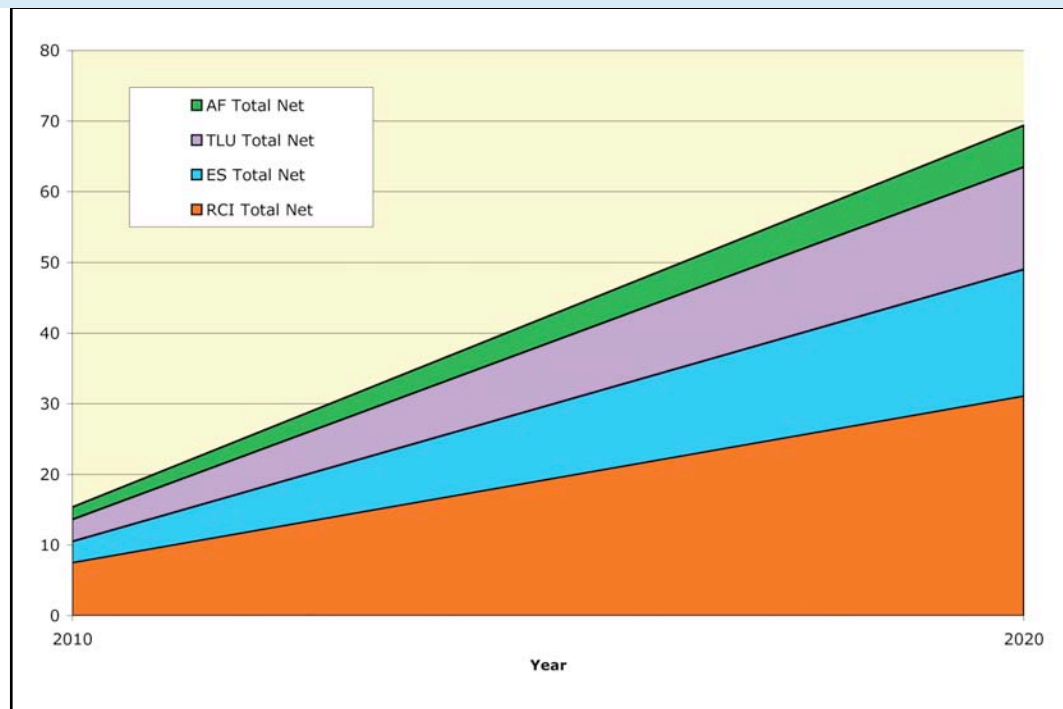
Overarching Recommendation: Set a State Goal to Reduce Arizona’s GHG Emissions to 2000 Levels by 2020 and to 50% below 2000 Levels by 2040.

As an overarching policy matter, the CCAG recommends that Arizona establish a statewide goal of reducing future GHG emissions to a level equal to 2000 emissions by the year 2020 and to 50% below the 2000 emissions level by the year 2040.

The recommended goal for reductions in Arizona’s GHG emissions reflects the CCAG’s policy options recommendations. In fact, the CCAG’s recommended policy options, if fully implemented, could reduce GHG emissions in Arizona by several million metric tons more than the amounts called for in the recommended goal. The CCAG’s policy options could cut Arizona’s GHG emissions by more than 69 MMtCO₂e in 2020, reducing GHG emissions to more than five percent (5%) below the 2000 level. Cumulative GHG emissions reductions from 2007-2020 for all the policy options combined could total more than 485 MMtCO₂e (adjusted for overlap to avoid double-counting of reductions).

Figure E-3 below shows the annual GHG reductions that could be achieved by sector through the CCAG’s recommended policy options from 2010 to 2020. As Figure E-3 illustrates, a significant portion of the achievable reductions are associated with energy efficiency and renewable energy policy options in the residential, commercial, and industrial sectors.

Figure E-3 2010 through 2020 GHG Reductions, by Sector



- AF – Agriculture and Forestry
- TLU – Transportation and Land Use
- ES – Energy Supply
- RCI – Residential Commercial Industrial (fuel use)

The recommended goal for Arizona is consistent with the goals set by other states, including those in the West, that are implementing GHG reduction strategies:

AZ	2000 levels by 2020; 50 percent below 2000 levels by 2040
CA	2000 levels by 2010; 1990 levels by 2020; 80 percent below 1990 levels by 2050
CT	1990 levels by 2010; 10 percent below by 2020; 75 percent below by 2100
MA	1990 levels by 2010; 10 percent below by 2020; 75 percent below by 2100
ME	1990 levels by 2010; 10 percent below by 2020; 75 percent below by 2100
NJ	3.5 percent below 1990 levels by 2005
NM	2000 levels by 2012; 10 percent below by 2020; 75 percent below 2050
NY	5 percent below 1990 by 2010; 10 percent below 1990 levels by 2020
OR	1990 levels by 2010; 10 percent below by 2020; 75 percent by 2050
RI	1990 levels by 2010; 10 percent below by 2020; 75 percent by 2100
WA (Puget Sound)	1990 levels by 2020; 70-80 percent below 1990 levels by 2050

Reducing Arizona's GHG emissions to the recommended levels through full implementation of all of the CCAG's recommendations also would result in significant economic benefits for the state, including substantial economic cost savings, new job creation and enhanced economic development. The Center for Climate Strategies (CCS) has calculated overall net economic cost savings from the CCAG's recommendations of more than \$5.5 billion between 2007-2020, with additional significant cost savings also expected between 2020-2040 (although not calculated by CCS). The CCS also has calculated an average net economic cost savings of nearly \$13 per ton of GHG emissions reduced under the CCAG's recommended policy options (if fully implemented).

The Policy Options

The CCAG is recommending a comprehensive set of forty-nine (49) policy options:

Cross-Cutting (CC) Issues

The CCAG is recommending five (5) policy options to facilitate reductions in Arizona's GHG emissions across economic sectors and address issues associated with climate change. These policy options include:

- Set a State GHG Reduction Goal (as stated above) (CC-1)
- Establish a GHG Emissions Reporting Mechanism (CC-2)
- Establish a GHG Emissions Registry (CC-3)
- Undertake Climate Action Education and Outreach (CC-4)
- Develop a State Climate Change Adaptation Strategy (CC-5)

Residential, Commercial, Industrial and Waste Management (RCI) Sectors

The CCAG is recommending a set of twelve (12) policy options to reduce emissions from the RCI sector, including improving energy efficiency, substituting lower-emissions energy resources, and strategies to reduce emissions from the production of electricity consumed by the RCI sector. The state's rapid growth and limited pursuit of energy efficiency to date offers particularly strong opportunities to reduce emissions through improving the efficiency of buildings, appliances and industrial practices. The RCI policy options include:

- Set Demand-Side Efficiency Goals and Establish Funds, Incentives, and Programs to Achieve Them (RCI-1)
- Establish State Leadership Programs to Achieve Energy Savings and Promote Clean Energy (RCI-2)
- Implement Enhanced Appliance Efficiency Standards (RCI-3)
- Adopt Building Standards/Codes/Design Incentives for Energy Efficiency and Smart Growth (RCI-4 & RCI 5)
- Encourage Distributed Generation of Renewable Energy and Combined Heat and Power (RCI-6 & RCI 7)
- Implement Electricity Pricing Strategies that Support Energy Conservation (RCI-8)
- Promote Low-Global-Warming-Potential Refrigerants in Commercial Operations (RCI-9)
- Provide Incentives for Consumers to Switch to Low GHG Energy Sources (RCI-10)
- Increase Recycling and Solid Waste Management and Reduction (RCI-12)
- Increase Water Use Efficiency and Promote Energy Efficiency and Renewable Energy Production from Water and Wastewater Management (RCI-13)

Energy Supply (ES) Sector

The CCAG is recommending a set of eight (8) policy options to significantly reduce GHG emissions from the ES sector. The principal challenge in addressing GHG emissions from Arizona's electricity sector is the state's extraordinary growth rate and the accompanying projected increase in energy demand. New policies are needed to increase utilization of Arizona's renewable energy resources, like solar, wind, biomass and geothermal, and reduce reliance on pulverized coal technology. The ES policy options include:

- Increase the Environmental Portfolio Standard by 1% each year through 2025 (ES-1)
- Provide Incentives for and Encourage Investment in Renewable Energy (ES-3)
- Explore Development of a National or Regional GHG Cap and Trade Program (ES-4)
- Implement Carbon Intensity Targets (ES-6)
- Reduce Barriers to Renewables and Distributed Generation of Clean Energy (ES-9)
- Implement Net Metering and Advanced Metering for Energy Consumption (ES-10)
- Implement Pricing Strategies to Promote Energy Conservation and Use of Renewable Energy (ES-11)
- Implement Integrated Resource Planning (ES-12)

Transportation and Land Use (TLU) Sector

The CCAG is recommending a set of thirteen (13) policy options to reduce GHG emissions reductions from the TLU sector, including improved vehicle fuel efficiency, increased usage of lower-emissions fuels, greater use of lower-emissions means of travel and land use and other strategies to decrease the growth in fuel use and vehicle miles traveled (VMT). GHG emissions from the TLU sector, which are expected to more than double by 2020 (over 1990 levels), are influenced by transportation technologies and fuels, along with population, economic growth and land use policies that affect the demand for transportation services. The TLU policy options include:

- Adopt the Clean Car Program (TLU-1)
- Implement Policies to Promote Smart Growth Planning, Infill, Increased Density and Transit-Oriented/Pedestrian Friendly Development (TLU-2)
- Promote Multi-Modal Transit (TLU-3)
- Reduce Vehicle Idling (TLU-4)
- Set Standards for Alternative Fuels (TLU-5)
- Provide Incentives for Hybrid Vehicles (TLU-7)
- Explore Feebates (TLU-8)
- Implement a Pilot Program for Pay-As-You-Drive Insurance (TLU-9)

- Encourage Low Rolling Resistance Tires and Promote Proper Tire Inflation (TLU-10)
- Provide Incentives for Accelerated Replacement/Retirement of High-Emitting Diesel Vehicles (TLU-11)
- Increase the Use of Biodiesel (TLU-12)
- Implement Practices and Procurement Policies to Achieve a Lower-GHG-Emitting State Vehicle Fleet (TLU-13)
- Reduce the Speed Limit to 60 mph for Commercial Trucks on Highways/Freeways (TLU-14)

Agriculture and Forestry (AF) Sectors

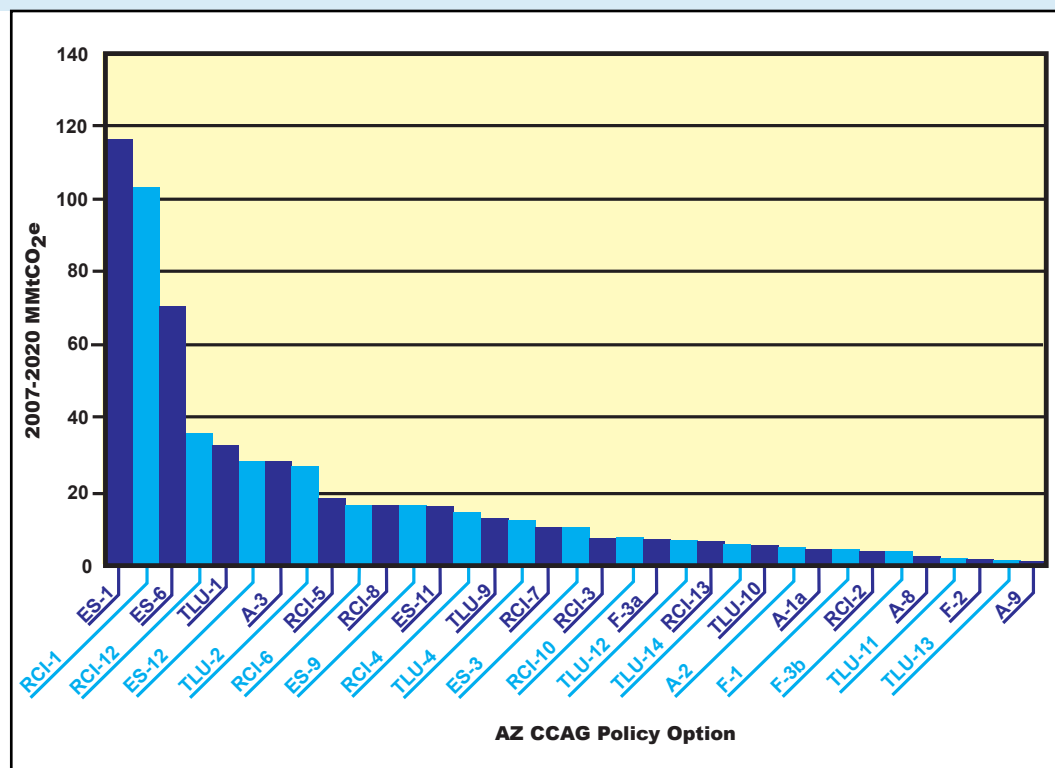
The CCAG is recommending eleven (11) policy options for the AF sectors. While the AF sectors are directly responsible for only a small amount of Arizona's current GHG emissions, there are opportunities for GHG reductions in the sectors, as well as reductions in overall GHG emissions in the state by increased carbon sequestration through new policies and practices in the AF sectors. The AF policy options include:

- Use Manure Digesters to Reduce Methane Emissions from Livestock Operations and Promote Energy Use of the Captured Methane (A-1)
- Use Biomass Feedstocks for Electricity or Steam Production (A-2)
- Increase Ethanol Production and Use (A-3)
- Convert Agricultural Land to Grassland or Forest to Increase Carbon Sequestration (A-7)
- Reduce Conversion of Farm and Rangelands to Developed Uses (A-8)
- Promote Consumption of Locally Produced Agricultural Commodities to Reduce Transportation Emissions (A-9)
- Decrease the Conversion of Forestland to Developed Uses (F-1)
- Increase Reforestation and Restoration of Forestland (F-2)
- Improve Forest Ecosystem Management (F-3a & 3b)
- Improve Commercialization of Biomass Gasification and Combined Cycle Technologies (F-4)

GHG Reductions from the Recommended Policy Options

Figure E-4 below shows the amount of GHG emissions reductions achievable under each individual, quantified policy option cumulatively from 2007-2020, ranked by its GHG reduction potential. The CCS was able to quantify the GHG emissions reduction potential for 35 of the 49 total recommended policy options.

Figure E-4 CCAG Recommended Policy Options, by Quantified Individual GHG Reduction 2007-2020



Policy Option	MMtCO _{2e}
Environmental Portfolio Standard/Renewable Energy Standard and Tariff (ES-1)	116.00
Demand-Side Efficiency Goals, Funds, Incentives, and Programs (RCI-1)	103.00
Carbon Intensity Targets (ES-6)	70.40
Solid Waste Management (RCI-12)	36.00
State Clean Car Program (TLU-1)	32.50
Integrated Resource Planning (ES-12)	28.00
Ethanol Production and Use (A-3)	28.00
Smart Growth Bundle of Options (TLU-2)	26.70
“Beyond Code” Building Design Incentives and Programs for Smart Growth (RCI-5)	18.00
Distributed Generation/Combined Heat and Power (RCI-6)	16.00
Electricity Pricing Strategies (RCI-8)	16.00
Reduce Barriers to Renewables and Clean Distributed Generation (ES-9)	16.00
Pricing Strategies (ES-11)	16.00
Building Standards/Codes for Smart Growth (RCI-4)	14.00
Pay-As-You-Drive Insurance (TLU-9)	12.30
Reduction of Vehicle Idling (TLU-4)	11.80
Distributed Generation/Renewable Energy Applications (RCI-7)	10.00
Direct Renewable Energy Support (ES-3) (including Tax Credits and Incentives, R&D, and siting/zoning)	10.00
Appliance Standards (RCI-3)	7.00
Demand-Side Fuel Switching (RCI-10)	7.00
Forest Ecosystem Management – Residential Lands (F-3a)	6.40

Policy Option	MMtCO₂e
Biodiesel Implementation (TLU-12)	6.20
Water Use and Wastewater Management (RCI-13)	6.00
60 mph Speed Limit for Commercial Trucks (TLU-14)	5.20
Low Rolling Resistance Tires and Tire Inflation (TLU-10)	4.80
Biomass Feedstocks for Electricity or Steam Production (A-2)	4.54
Manure Management – Manure Digesters (A-1)	3.82
Forestland Protection from Developed Uses (F-1)	3.73
State Leadership Programs (RCI-2)	3.00
Forest Ecosystem Management – Other Lands (F-3b)	2.90
Reduce Conversion of Farm and Rangelands to Developed Uses (A-8)	1.59
Accelerated Replacement/ Retirement of High-Emitting Diesel Fleet (TLU-11)	1.20
Reforestation/Restoration of Forestland (F-2)	0.65
State Lead-By-Example (via Procurement and SmartWay) (TLU-13)	0.40
Programs to Support Local Farming/Buy Local (A-9)	0.15

The data presented illustrate the potential “stand alone” GHG emissions reductions achievable separately under each individual policy option if the option was implemented solely by itself and not in conjunction with other policy options. The potential GHG emissions reduction figures do not account for overlaps that could occur between reductions achievable under individual policy options if the options were implemented together.

For example, while Figure E-4 shows cumulative GHG emissions reductions of 116 MMtCO₂e for policy option ES-1 as a “stand alone” option, the total would become 70.3 MMtCO₂e if the option were implemented in conjunction with all of the other recommended policy options, due to overlaps (especially with the RCI sector). See pages H-3 to H-4 in Appendix H. The same principle applies for ES-6, which changes from 70.4 MMtCO₂e to 50.3 MMtCO₂e. See page H-18 in Appendix H. When adjusted for overlaps to avoid double counting, the cumulative GHG emissions reductions potentially achievable from 2007-2020 through full implementation of all of the CCAG’s recommended policy options is 485.4 MMtCO₂e. See Table 1-3 on page 24 and footnote 15.