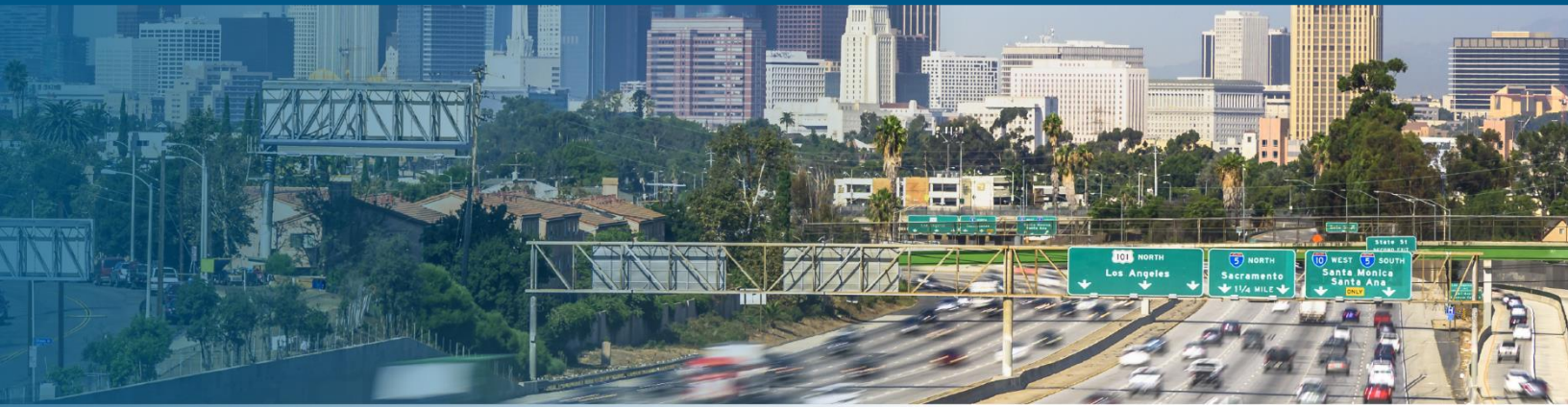


Introduction



Background

Climate change is already having profound impacts on people and planning in California. Local governments, institutions, project developers, and communities across the state must prepare for growing climate impacts while working to reduce their greenhouse gas (GHG) emissions. These are real challenges, but they also represent new opportunities. We can design and build healthier neighborhoods, develop solutions for clean air, and create more equitable, resilient communities and economies. This Handbook offers data and methods to help effectively achieve these objectives.

Local governments and communities are increasingly experiencing the effects of climate change and, in response, are developing measures and plans to mitigate and adapt to those effects. Climate change is principally driven by human actions, particularly burning fossil fuels like coal, oil, and natural gas that emit GHGs. GHGs trap heat in the atmosphere, which slowly increases global average temperatures, causing additional cascading effects such as extreme heat and heat waves, melting polar ice, disappearing snowpack, rising sea levels, changing precipitation patterns, ocean acidification, and more extreme or more frequent weather events.

To slow the pace of climate change and prevent its worst effects from materializing, local, state, and national governments must design measures that mitigate (i.e., lessen the severity or even eliminate) the root cause of the issue: GHG emissions from human

activities. To do so, they need tools and resources to accurately assess and quantify GHG emissions, and to design effective methods to reduce emissions.

In response to this need, the California Air Pollution Control Officers Association (CAPCOA) prepared this report, *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity: Designed for Local Governments, Communities, and Project Developers* (hereafter referred to as the “Handbook”). The Handbook provides methods to quantify GHG emission reductions from a specified list of measures, primarily focused on project-level actions. The Handbook also includes a method to assess potential benefits of different climate vulnerability reduction measures, as well as measures that can be implemented to improve health and equity, again at the project level.

CAPCOA included a wide range of measures in the Handbook that are frequently used to reduce GHG emissions, bolster communities against expected climate impacts, and enhance community health and equity. To focus on the most effective measures, they were screened using the following factors:

- Feasibility of quantifying emissions reductions or benefits.
- Availability of robust and meaningful data, including peer reviewed studies.
- Ability of measures (alone or in combination with other measures) to appreciably reduce GHG emissions, reduce climate vulnerabilities, and improve health and equity.

This does not mean that other measures should not be considered or may not be effective or quantifiable; on the contrary, there are many ways to reduce emissions of GHGs, reduce climate vulnerabilities, and improve health and equity. CAPCOA seeks to provide a high-quality quantification tool to local governments, communities, and stakeholders with the broadest applicability possible. CAPCOA encourages users to be bold and creative as they approach the challenges of climate change and equity and does not intend for the Handbook to limit the scope of measures considered.

In addition to CAPCOA, other organizations that helped to prepare this Handbook include the Sacramento Metropolitan Air Quality Management District, with contract support from ICF, Fehr & Peers, and STI, who performed the technical analysis.

Process and Approach for Handbook Development

The Handbook builds on CAPCOA’s previous efforts to provide accurate and reliable quantification measures. In 2010, CAPCOA published [Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emissions Reductions from Greenhouse Gas Mitigation Measures](#) (hereafter referred to as the “2010 Handbook”). Since that time, climate science has evolved and GHG reduction practices have advanced in sophistication. New priorities have also arisen, such as strengthening climate resilience and infusing health and equity into integrated planning efforts. Therefore, CAPCOA decided it was time to develop an updated and expanded resource to provide the latest data and methods to quantify GHG emissions reductions, climate change vulnerability reductions, and equity improvements in a single resource: The Handbook.

The Handbook development process involved five key tasks.

1. Identifying and evaluating new and emerging GHG reduction measures and removing outdated measures from the 2010 Handbook.
2. Evaluating and selecting climate risk reduction and health and equity measures.
3. Developing methods to quantify GHG emissions reduction measures and identify associated co-benefits.
4. Developing methods to assess climate change vulnerability and a framework to quantify reductions in climate vulnerabilities.
5. Developing health and equity measures.

The development process was a collaborative and methodical effort that involved careful review and input from experts in agencies, academia, public organizations, non-governmental organizations (NGOs), and other stakeholder groups. A technical advisory committee (TAC) was formed to provide ongoing guidance, peer review, and quality control assurance at each step of the process. The Handbook was drafted and finalized through an iterative process that incorporated comments and suggestions from the Sacramento Metropolitan Air Quality Management District, the TAC, and the public.

The Handbook was primarily funded by a California Department of Transportation (Caltrans) Senate Bill (SB) 1 Adaptation Planning Grant. Additional funding was provided



WHAT'S NEW IN THIS HANDBOOK?

This Handbook is an updated and expanded resource from the 2010 Handbook. It provides the following.

- Updated data and new measures to quantify GHG emission reductions.
- Method to identify and score future potential climate hazards.
- Measures to quantify reduced vulnerability to climate change.
- Measures to improve health and equity.

by the Sacramento Metropolitan Air Quality Management District, the California Department of Public Health, and the Bay Area Air Quality Management District.

In 2024, the CAPCOA Board added 11 new quantified measures (see Appendix F). The additions were facilitated by the U.S. EPA's Climate Pollution Reduction Grants program.

Intent and Audience

The purpose of the Handbook is to provide local governments with accurate, reliable, and standardized emission reduction quantification methods for land use, climate action, and long-term planning. It also aims to support and enhance the consideration of climate vulnerabilities, health, and equity during the planning process. The Handbook is intended to support the efforts of local governments to address GHG emissions and vulnerabilities to climate change in their planning efforts and environmental review of new projects, and to achieve more equitable outcomes when addressing these impacts. The Handbook will also be useful for project proponents and other parties interested in enhancing resiliency, sustainability, and equitable development.



The guidance provided in the Handbook specifically addresses appropriate procedures to apply quantification methods to achieve accurate and reliable results. The Handbook includes background information on programs and concepts associated with the quantification of GHG emissions and climate change vulnerability. The Handbook does not provide policy guidance on any of these issues, nor

does it dictate how a jurisdiction should address questions of policy. Policy considerations are left to individual agencies and their governing boards. The Handbook is intended to create a standardized approach to quantifying GHG reduction and climate change resilience measures so the effectiveness of these measures can be considered and compared on a common basis.

Using the Handbook

The Handbook is organized as follows.

- *Chapter 1: Introduction* – provides an overview of the Handbook and its contents.
- *Chapter 2: Integrated and Resilient Planning* – discusses the changing climate, its impacts on society and public health, federal and state planning efforts to address the problem, and how equity and resilience can be improved.

- *Chapter 3: Measures to Reduce GHG Emissions* – provides details on measures and methods to quantify and reduce GHG emissions, accompanied by measure factsheets.
- *Chapter 4: Assessing Climate Exposures and Measures to Reduce Vulnerabilities* – outlines a method to assess climate change vulnerability and the potential benefits of different climate risk reduction measures at the project level.
- *Chapter 5: Measures for Advancing Health and Equity* – describes measures to improve public health and social equity.
- *Chapter 6: Resources to Support Resilient and Equitable Emission Reduction Planning* – presents additional resources that can help resilient and equitable planning efforts.
- *Appendix A: Key Terms and Definitions* – defines the key terms used in the Handbook.
- *Appendix B: Federal and State Planning Framework* – describes federal and state regulations and policies related to reducing GHG emissions, increasing climate resilience, and improving public health and social equity.
- *Appendix C: Emission Factors and Data Tables* – provides the emission factors and data used to estimate GHG emission reductions.
- *Appendix D: Climate Vulnerability Worksheets* – contains worksheets planners can use to assess climate vulnerability.
- *Appendix E: Measure Index* – crosswalks the Handbook measures to cross-cutting themes across all chapters (e.g., active transportation).
- *Appendix F: Summary of Updates to the Handbook* – summarizes the revisions and updates made to the Handbook since the 2021 comprehensive update.

Because the quantification and analysis methods in the Handbook were developed to meet the highest standards for accuracy and reliability, CAPCOA believes they will be generally accepted for most purposes, though the decision to accept any quantification method rests with the reviewing agency and Handbook user. The methods contained in the Handbook include generalized information about the measures, including considerations and best practices for successful implementation and assumptions that influence the expected measure outcome. These assumptions include emissions factors, energy usage rates, climate exposures for a specific location, and other data from various sources (most commonly from published data from public agencies). The data were carefully reviewed to ensure they represent the best information available. The use of generalized information allows the quantification methods to be applied across a range of circumstances, including variations in location, climate, and population density, among others.

For instances in which high quality, project-specific data are available, those data should be used instead of the more generalized data presented in the Handbook. The quantification and analysis methods provided in this Handbook allow for such substitutions. Handbook users should confirm any substituted data meets quality standards and will not result in an inappropriate or under- or overestimation of measure benefits. CAPCOA will not be able to provide case-by-case review of adjustments or project-specific data inputs. More information on the measures and analysis data are provided in Chapter 3, *Measures to Reduce GHG Emissions*, Chapter 4, *Assessing Climate Exposures and Measures to Reduce Vulnerabilities*, and Chapter 5, *Measures for Advancing Health and Equity*.



APPROPRIATE USES OF THE HANDBOOK

- Explore emissions reduction measures and identify methods to quantify GHG reductions for a program or plan.
- Learn about co-benefits of reducing GHG emissions.
- Conduct a preliminary assessment of climate vulnerability for a project or a plan.
- Explore ways to make a project or plan more climate resilient.
- Identify ways to include and empower underserved and marginalized communities and address their concerns.

Equally important to understanding how to effectively use the Handbook is knowing its limitations and potential *misuses*. This will help safeguard against inappropriate application of the Handbook in certain contexts. The Handbook should not be used to dictate public policy or provide legal advice. While the list of measures presented in the Handbook is comprehensive, it should not be used to exclude or reject other strategies from consideration. As discussed above, there are many ways to reduce emissions, reduce climate vulnerabilities, and improve health and equity, some of which may not be captured in this Handbook or may be developed after its publication. Conversely, the Handbook measures and quantitative methods (including available defaults) should not be automatically applied to a project without thoughtful consideration of project-specific circumstances. Finally, the Handbook should not be used to complete an environmental justice analysis pursuant to Executive Order 12898 or the National Environmental Policy Act (NEPA). The Handbook may be used as a starting point for these types of analyses, but it does not constitute guidance for compliance with the executive order or NEPA requirements.

References

California Air Pollution Control Officers Association (CAPCOA). 2010. *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*. August. Prepared by CAPCOA in association with Northeast States for Coordinated Air Use Management, National Association of Clean Air Agencies, Environ, and Fehr & Peers.