BREN SCHOOL OF ENVIRONMENTAL SCIENCE & MANAGEMENT
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SANTA BARBARA COUNTY AIR POLLUTION CONTROL DISTRICT

Investigating the Feasibility of Greenhouse Gas Mitigation in Santa Barbara County

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Group Project Brief

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Project Motivation

While climate change is a global issue, many of the factors that influence greenhouse gas (GHG) emissions, such as transportation infrastructure, land use, and waste disposal, are controlled by local governments. Consequently, local action to mitigate GHGs is critical to combating climate change, and will be essential to achieving California's ambitious GHG reduction targets.

Introduction

The California Global Warming Solutions Act (AB-32) directs California to reduce GHG emissions to 1990 levels by 2020 and to 80% below 1990 levels by 2050.[1] To comply with AB-32, local governments must reduce GHG emissions at a rate that is consistent with state targets. The Santa Barbara County Air Pollution Control District (APCD), the local agency responsible for air quality monitoring and environmental compliance with responsibilities under AB-32, commissioned this project to determine which GHG mitigation strategies are best-suited for Santa Barbara County.

GHG Mitigation

GHG mitigation describes any technology, practice, or policy that reduces or limits GHG emissions or increases their sequestration. GHG mitigation strategies vary widely in complexity and cost. Simple and inexpensive strategies include carpooling, energy efficiency retrofits, and organic waste reduction. More expensive strategies, on the other hand, include flare gas recapture, electricity generation via solar power or wind, and the replacement of gasoline and diesel-powered vehicles with electric vehicles.

Evaluating GHG Mitigation Strategies

In order to assess the relative merits of GHG mitigation strategies, it is necessary to compare their cost and GHG reduction potential. One commonly used comparison tool is a GHG abatement cost curve. A GHG abatement cost curve displays the cost and mitigation potential of multiple GHG strategies side-by-side such that the impacts of an individual strategy and all strategies in aggregate can be viewed.

Another important consideration when selecting GHG mitigation strategies is the ease of strategy implementation. GHG mitigation strategy recommendations, then, should be based on cost, GHG reduction potential, and implementation feasibility.

Project Objectives

The objective of this project was to determine the cost-effectiveness and implementation feasibility of GHG mitigation strategies in Santa Barbara County. This required:

1. Creation of a GHG emissions forecast for Santa Barbara County;
2. Generation of a Santa Barbara County-specific GHG abatement cost curve; and
3. Analysis of the opportunities and barriers to strategy implementation.

Methodology

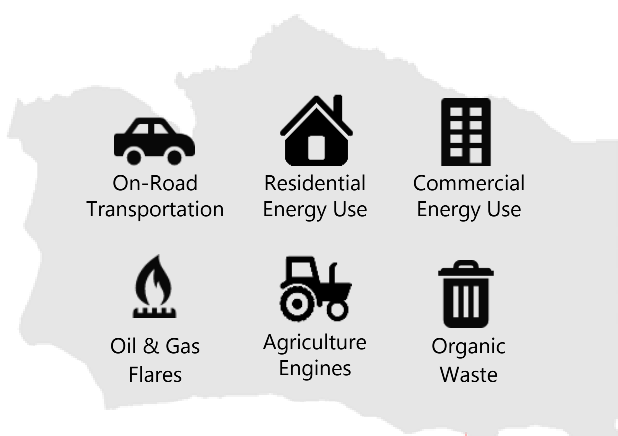
The first step of this project was to generate a GHG emissions forecast for Santa Barbara County. This forecast served as the baseline from which GHG reductions due to mitigation strategies were calculated. The second step was to calculate the total cost and mitigation potential of select GHG mitigation strategies and summarize the results in a GHG abatement cost curve. The final step was to investigate incentive programs, legislation, and zoning codes that could influence the implementation of GHG mitigation strategies.

Time Horizon

GHG emissions, emission reduction potential, and mitigation costs were calculated over a time horizon from 2015 to 2040. A start year of 2015 was selected because this is the first year that any GHG mitigation strategies that we investigated could be implemented. An end date of 2040 was chosen because the data used to generate GHG emissions projections did not extend beyond this year.

GHG Emissions Forecast

The forecast includes emissions from the following sources:

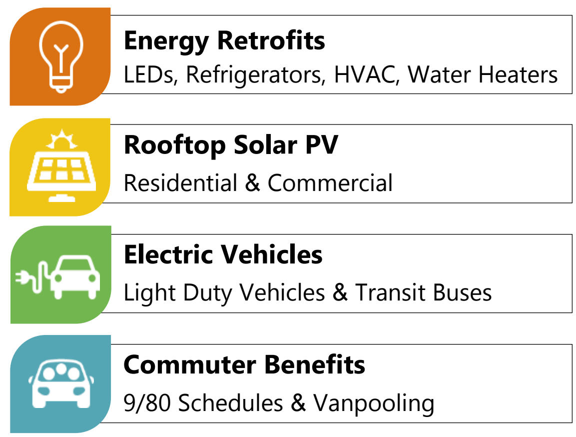


To forecast GHG emissions from 2015 to 2040, we assumed that current economic and demographic trends continue.

The GHG emissions forecast also includes the anticipated reductions in GHG emissions due to the Renewable Portfolio Standard, Pavley Bill, and Low Carbon Fuel Standard.

GHG Abatement Cost Curve

Based on a literature review, data availability, and GHG mitigation potential, we chose to examine the following GHG mitigation strategies:



For each of these strategies, we calculated the total GHG reduction potential and the present value of the total cost over the time horizon. To create a GHG abatement cost curve, mitigation strategies were arranged along the horizontal axis from left to right in order of increasing cost. Each bar represents one GHG mitigation strategy. The width of the bar indicates the magnitude of achievable GHG reduction, while the height of the bar indicates the cost per ton of CO_2 equivalence (CO_2e) abated.

Implementation Feasibility

In order to determine the feasibility of implementing each of the GHG mitigation strategies we examined, we conducted a literature review of relevant:

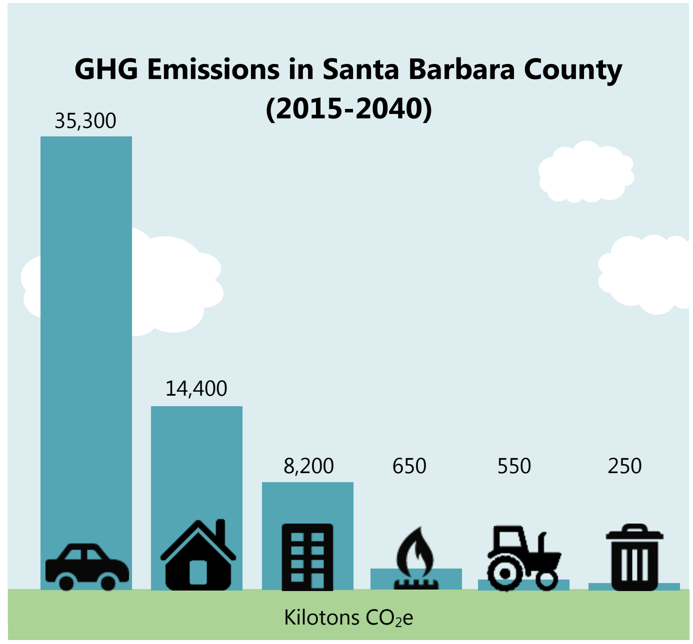
- Governmental Policies & Programs
- Zoning Codes & Permitting Processes
- Available Incentives & Financing Options
- Case Studies & Success Stories

Results

GHG Emissions Forecast

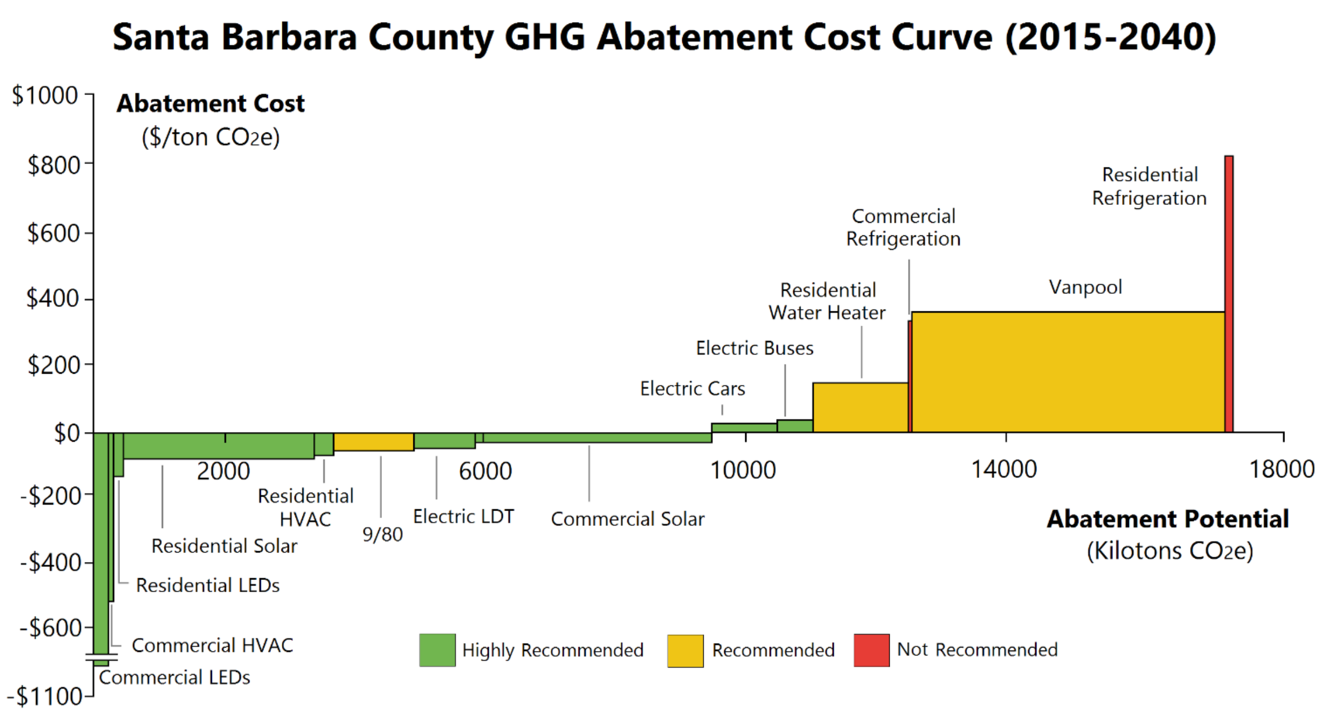
The select sources that we examined in Santa Barbara County are projected to emit more than 59,000 kilotons of CO_2e over the next 25 years.

The transportation sector emits the most GHGs, accounting for over 35,000 kilotons of CO_2e over the time horizon. Residential and commercial energy use are the second and third largest sources of GHGs in our emissions forecast, emitting 14,400 and 8,200 kilotons of CO_2e from 2015 to 2040, respectively.



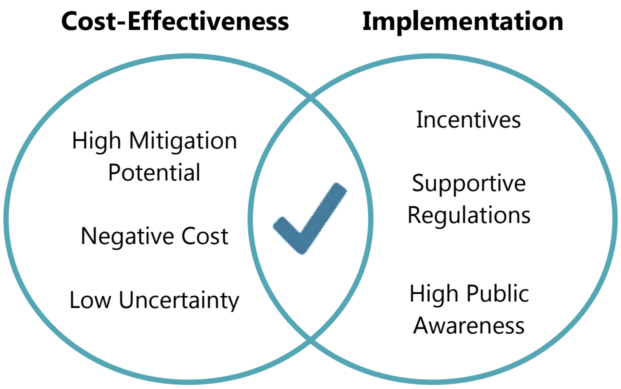
GHG Abatement Cost Curve

Santa Barbara County can mitigate approximately 10,000 kilotons of CO_2e from 2015 to 2040 at a negative cost and nearly 18,000 kilotons of CO_2e overall. Solar PV and most energy efficiency retrofits have a negative cost over their lifetime, while most of the strategies targeted at the transportation sector have a positive cost. Solar PV, vanpooling, and electric vehicles are among the strategies with the highest GHG mitigation potential.



Recommendations

The strategies we recommend are those that are cost-effective and have low barriers to implementation.



Solar PV and energy efficiency upgrades (with the exception of residential and commercial refrigeration) are highly cost-effective with significant GHG mitigation potential. These measures have an overall negative cost because the energy savings completely offset the initial costs over the time horizon. Consequently, we highly recommend county-wide efforts to support implementation of energy efficiency retrofits and solar PV. Additional strategies that we recommend include 9/80 work schedules, which were found to be cost-effective but potentially difficult to implement, water heater retrofits, which have a positive cost, but a relatively high mitigation potential, and vanpooling, which has a high positive cost but an exceptionally high mitigation potential. Strategies that we do not recommend include residential and commercial refrigeration retrofits, which have a high positive cost and a low mitigation potential.

Conclusion

This analysis is a critical first step to implementing GHG mitigation strategies in Santa Barbara County. The next step would be to extend this analysis to include additional GHG mitigation strategies within high GHG emitting sectors. It is also important that GHG emissions for other potentially high-emitting sectors, such as the industrial sector, be added to the GHG emissions forecast. These additional steps would aid county decision makers in identifying other strategies with high potential for GHG reduction in Santa Barbara County.

Another important next step will be to examine options for potential behavioral interventions since behavior plays a significant role in energy use, adoption of cleaner technologies, and purchasing decisions.

Finally, an analysis of the co-benefits of GHG mitigation strategies, such as air pollution reduction and job creation, would be useful in garnering political and public support for GHG mitigation in the county and further justify investment in these strategies.

Acknowledgements

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1. The California Air Resources Board (ARB). (2008). Climate Change Scoping Plan. Retrieved from http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf