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Community Greenhouse Gas Solutions

Prioritizing Emissions-Reducing Strategies

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Our Project in 60 Seconds

Partnering with AECOM Environment, we address climate change mitigation at the community scale by providing recommendations for effective strategies to reduce greenhouse gas emissions (GHG). We performed cost-benefit analyses on 20 GHG reduction strategies such as installing efficient appliances, taking public transit and installing solar panels. Combined with relevant geographic requirements, these analyses informed development of our software model and serve as the basis for tailored GHG reduction plans. Dubbed SAFEGUARD, our software prioritizes reduction strategies based on cost effectiveness. SAFEGUARD addresses the political feasibility of implementing strategies by allowing the user to override the software's economic prioritization. Accompanying the software is a user manual and detailed methods describing the processes used to build the model and determine the required inputs. We used the City of San Buenaventura (Ventura), California, as a case study to test the model and methods that comprise our GHG reduction toolkit. Beyond the broad discussion of the project's motivation and methods included in the report, our deliverables include an inventory of Ventura's GHG emissions, the SAFEGUARD model and its resulting recommendations for Ventura. We have created a useful tool for consultants and governments to determine optimal greenhouse gas reduction strategies at the community scale.

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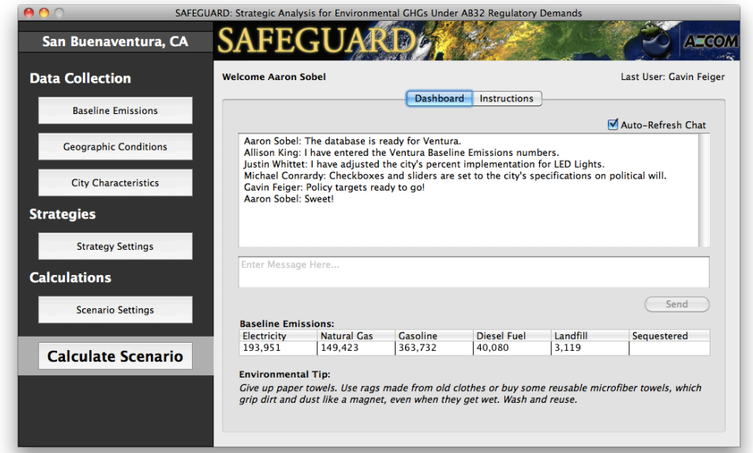
Significance of Communities

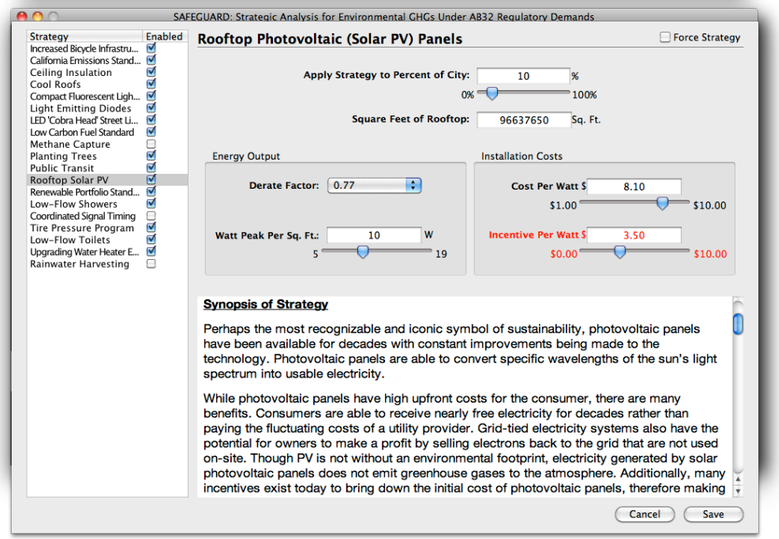
Climate change is unequivocal and largely human-caused.[1] To avoid the consequences of climate change, the whole world will need to take part in a coordinated effort to reduce emissions to the level deemed necessary by the best science available. Despite nearly 18 years of effort, starting with the creation of the United Nations Framework Convention on Climate Change (UNFCCC) in Rio de Janeiro and continuing through, most notably, Kyoto, and, most recently, Copenhagen, a politically feasible global policy has not been constructed. Unwilling to wait for an overarching mandate, smaller actors are beginning to enact strategies feasible within their sphere of influence.

The urgency of climate change mitigation along with the slow nature of large-scale politics begs communities to begin efforts toward the reduction of greenhouse gas emissions. Communities respond to citizen pressure, prepare for predicted community-level mandates, pursue economic benefits of efficiency and desire resource security. Often the idea of states as laboratories for the country are posed in order to solve problems. Through the same logic communities fulfill a similar laboratorial role. Community economic structures provide opportunities for grants, loans, subsidies and other funding from every level of government as well as private industry. In turn, communities are subject to benefits of economic sustainability through environmental sustainability. Ultimately lack of power and authority within the centralized global or national structure as well as necessity to act quickly requires a strong role and commitment at the local level.

Emissions Reduction Strategies

The heart of the analysis, and the bulk of our research, lies in a menu of 20 emissions-reducing strategies. Recognizing that there are potentially hundreds of greenhouse gas reduction strategies, we focused closely on 20 strategies over the course of our project. We thoroughly researched and analyzed each of these twenty strategies, performing a complete cost-benefit analysis of implementation and calculating potential emissions savings for the community. Safeguard's design allows the inclusion of more strategies in the future. As the results of our case study indicate, more strategies will be necessary to achieve the long-term emissions reduction goals.





Determining Strategy Feasibility

Geographic

Geographic feasibility is determined through physical attributes of a given city and is imperative for determining reduction strategy feasibility. Trees cannot be planted without space to plant them, buildings cannot be insulated if there is not a building to insulate and rainwater cannot be collected if there is no rain.

Economic

This project accepts the assertion that worldwide climate mitigation is warranted, and focuses on the economics of reducing emissions on a localized, city scale. In the context of California's policy goals for reducing emissions—and assuming that communities wish to meet these policy goals—we perform a cost-effectiveness analysis of attaining reduction goals at the least cost to the community. By compiling strategy-specific cost-benefit analyses and emissions calculations, our model prioritizes emissions reduction strategies by one of two criteria (at the user's preference): lowest cost-per-reduction or shortest payback-per-reduction.

Political

Political feasibility is the decisive criteria determining the success or failure of a greenhouse gas reduction strategy. Geographic and economic factors allow technical prioritization of reduction strategies, but political feasibility is the determining factor for final action. While quantitatively measuring political feasibility is interesting and may be useful at certain levels, failings of currently established methods prompted us to pursue a different approach. Safeguard's design addresses the political feasibility of greenhouse gas reduction strategies within a community through extensive customizable options within each of the strategies. Each strategy includes a checkbox to enable or disable a strategy in the analysis, regardless of economic efficiency. Additionally, each strategy has a slider allowing the user to specify the amount of the strategy that could feasibly be employed.

Policy-Driven Reduction Targets

Each path toward a solution requires an end goal. While there is no current government mandate on cities, the entire state of California established the nation's first cap on GHGs. California's Global Warming Solutions Act of 2006 (AB 32) establishes a near-term greenhouse gas reduction goal of 1990 emission levels by 2020 and, combined with a related executive order (S-3-05), calls for a reduction of 80% below 1990 levels by 2050.[2,3] SAFEGUARD scales these goals to the community-level providing cities with targets of their own.

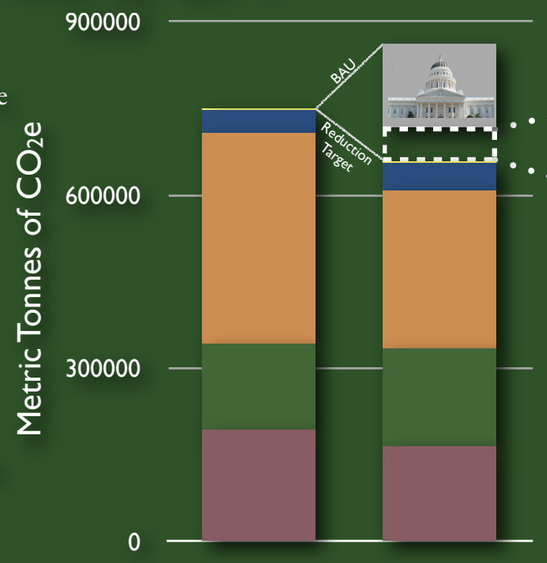
Case Study: San Buenaventura, CA

2008 Population[4]: 108,787

2007 GHG Emissions Inventory: 750,305 metric tonnes of CO_2e

SAFEGUARD provides a profitable set of emissions-reducing strategies, which Ventura can apply to achieve the 2020 goal, returning to 1990 emissions.

With the current set of strategies and estimated implementation levels for Ventura, SAFEGUARD is unable to counteract the business as usual emissions growth and reach the 2050 reduction goal. However, with more strategies and increased implementation Ventura may be able to reduce to 80% below 1990 levels.



$55,400,000 annual savings

$68,000,000 upfront capital cost