BERKELEY LAB FOUNDATION

Achieving Climate Goals

Greenhouse Gas Emissions Monitoring in Napa County

Despite global efforts to reduce greenhouse (GHG) emissions, atmospheric concentrations of the major GHGs continue rising. Carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) have increased since pre-industrial times by 49%, 162% and 24% respectively; this collective increase is the primary force behind climate change.

Lawrence Berkeley National Laboratory (LBNL) proposes a project in Napa County, California to serve as a model for how state-of-the-art GHG monitoring technologies and advanced modeling can inform actions to meaningfully reduce GHGs. Having real-time access to information about where GHGs are being produced (sources) and naturally stored (sinks) would empower policymakers, businesses, and the public to optimize their mitigation strategies to maximize impact.

We plan to set up five monitoring towers where GHG measurements will be collected. We will then calculate the atmospheric transport, which simulates the movement of air masses, to estimate measurement footprints (i.e., how far we can "see" with the measurements). Using this data, we will estimate sources and sinks of GHG emissions, including the level of uncertainty associated with those estimates, at a county scale. This independent and quality-controlled information will be shared with partners to support the development, implementation, and monitoring of local and regional climate action goals. This will be **the first public-private-international collaboration that promotes real time observations-based approaches to support climate policy** and will contribute to the development of a global blueprint for this type of project.

Monitoring changes to a region's sink capacity of both natural and agricultural land in response to climate change is another critical component of this project. Currently, most estimates of sink capacity are based on inventories based on information about known sources of GHGs, which often yield substantially different estimates compared to those inferred from atmospheric measurements. Such measurement-based data are critically needed to generate baseline local, national, and regional emission estimates for future trend projection and emission controls. Our project would produce those results following international standards (provided by WMO as a technical United Nation agency) for cross-validation among different geographic regions.

Napa County Resource Conservation District (Napa RCD) -- a non-regulatory public agency that supports Napa residents in conserving and managing natural resources -- is LBNL's main partner in this effort. They initiated the effort by requesting technical assistance from the World Meteorological Organization (WMO) to better understand the impacts of forest management on GHG emissions; the WMO Secretariat then encouraged its longtime partner LBNL to get

involved. WMO has identified a growing need for regional monitoring, as their Global Atmosphere Watch Programme does not capture the diverse patterns of GHG variability on the ground. **WMO sees the results of this pilot as being important to achieving global climate goals.**

Napa County is an ideal pilot site because strong climate commitments are present already. There is a process underway to develop a multi-jurisdictional, countywide climate action and adaptation plan -- one of the few in California. This enables us to establish baseline GHG emissions and then track the impact of climate action goal implementation over time. Additionally, it is a county containing diverse land uses, including large areas of natural and working lands, as well as concentrated urban corridors. This will provide a better understanding of GHG sources and sinks resulting from varying types of land management.

Currently, GHG measurements are not being collected across Napa County, as the necessary infrastructure is not in place. We have identified ten prospective sites for establishing an effective GHG monitoring network at a 500,000-acre scale. We are building a collaboration with conservation organizations (e.g., Napa RCD, Pepperwood Preserve), local government (e.g., Napa County Climate Action Committee), and large landowners and commercial actors (Gamble Family Vineyards and others) in order to develop and validate a robust, standardizable approach to GHG sources and sinks evaluation, and use this information to inform local policy development and climate action.

Our team has demonstrated powerful end-to-end capabilities, expertise, and partnerships with which to lead the development of this pilot project. LBNL has extensive experience in the field of atmospheric GHG observations and has partnered for many years with the Department of Energy (DOE), the California Energy Commission (CEC), and WMO in their GHG measurement work. Napa RCD has demonstrated great success in bringing together key stakeholders to effectively manage Napa County resources and fight climate change.

The costs involved in this project are (1) tower infrastructure, (2) power and communication, (3) instrumentation for the monitoring network, (4) instrumentation housing at the base of the tower, (5) inlet system setup for air sample analysis, (6) as well as the staff time required for data collection and analysis of the measurements. We estimate the materials costing about $500K per tower for five to ten towers. To execute the pilot, we will need five years of staff time at about $200K per year. **We are seeking $6M to fully realize this vision from a combination of public funding and philanthropy.** There is no government funding currently in place for this project, but it will be built on a platform of many millions of dollars of investments in LBNL by the DOE over decades to better understand the impact of a changing climate on natural ecosystems. It will also build on recent investments in LBNL by the CEC to estimate and mitigate CH_4 emissions associated with the oil and gas industry in California's Southern San Joaquin Valley.