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# A METRICS FRAMEWORK FOR GHG MONITORING

**Abstract**

Reducing net anthropogenic emissions of greenhouse gases (GHG) to zero is a key goal in mitigating climate change. The Intergovernmental Panel on Climate Change estimates that to limit global temperatures to 1.5 C above pre-industrial levels, net carbon dioxide emissions need to be reduced to zero by 2050, and net GHG emissions need to be reduced to zero by 2067. Tracking of global progress toward emissions reduction goals requires a combination of observational and modeling techniques to estimate the GHG concentration in the atmosphere, as well as fluxes to and from GHG sources and sinks. The problem explored in this paper is to draw on previous metrics-relevant studies to develop the core elements of a systems framework for deriving verification performance metrics to serve as a basis for international/industrial dialog and technical exchange. We survey the state of GHG monitoring efforts and considerations in designing GHGIS systems on various scales, and identified a number of city- and nation- scale efforts from which to develop benchmarks such as the National Inventory Reports of the UK, Switzerland, and Australia, and Indianapolis Flux Experiment (INFLUX), Los Angeles Megacities Carbon Project, and Northeast Corridor Urban Test Bed. Configurations that combine airborne, spaceborne, and terrestrial platforms and distributed low-cost terrestrial sensors in an Internet of Things network show considerable promise in light of recent technology trends. We lay the foundation for future system architecting efforts by identifying the steps for defining the requirements of a GHGIS system and assessing the types of instrument platform, processing algorithm, and data transmission architecture development that would enable the required performance. Future work will involve identifying a prototypical system architecting problem of particular interest and performing the detailed steps of architecting the system.