The capital city of Mongolia, Ulaanbaatar, home to ~1 million residents, is the second most polluted city in the world for airborne particulate matter. The terrain, high latitude and snow cover result in air stagnation October-March, when particulate matter (PM2.5 and PM10) accumulate to dangerously high levels. While measurement accuracy is uncertain, 24-hour PM2.5 concentrations >1000 μg/m3 were reported, with wintertime mean PM2.5 concentrations of ~250 μg/m3. These values are many times the acceptable air quality guidelines established by World Health Organization and US Environmental Protection Agency’s (EPA) and pose a major threat to public health. Air pollution is linked to up to 25% of the annual deaths in Ulaanbaatar, pneumonia in children and cardiovascular diseases. Currently, the government air pollution-monitoring network routinely monitor PM2.5 and PM10 at four fixed locations in Ulaanbaatar using instruments with large uncertainties and very limited spatial coverage. In addition, the forecasting of pollution episodes is virtually nonexistent. Consequently, there is an urgent need to improve and standardize the regulatory air quality monitoring and forecasting in Ulaanbaatar, and increase the public awareness to protect public health.

We will develop a step-by-step approach to transfer forecasting and technical expertise to the National Agency for Meteorology and Environmental Monitoring (NAMEM) of Mongolia, to aid in helping them use all available global earth observations as well as improved monitoring of pollution on the ground to improve air quality monitoring and forecasting, decision-making, and ultimately educate the public about exposure mitigation and pollution reduction through daily air quality reports/warnings on public media. The managers of both the air quality and meteorological sections of the NAMEM and the Mongolian National Broadcaster (MNB; the National Agency for Television and Radio) are enthusiastic and willing to work extensively on this project with us. First, we will analyze and develop a suite of earth observation and modeling data sets for the Mongolian NAMEM to be used in monitoring and forecasts. We will also assist in validating the measurement methods and instrumentation used for the regulatory monitoring with help from Dr. Russell Long, USA EPA Office of Research and Development. These efforts will not only aid in constraining the satellite observations to accurate surface-based measurements and tracking exceptional events such as Asian dust storm outside the winter season, but also will be essential for strengthening the regulatory monitoring capacity for health risk assessments and decision-making. Second, the surface and earth observation data sets to will be integrated into a structured implementation plan for improved weather and air quality forecasts for NAMEM. This process will include extensive training and outreach period during which the PI’s will visit Mongolia for several weeks to train NAMEM scientists in depth and a follow-up period to monitor and assist remotely in the implementation of the aforementioned plan. Third, we would like to work closely with MNB in setting up routine air quality reports on national media to inform the citizens on the current air quality conditions across the region, forecasts, and AQI.