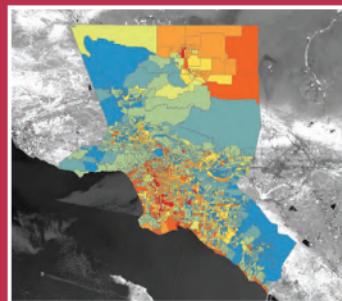


DEVELOP National Program
**HEALTH AND
AIR QUALITY**

Los Angeles Health and Air Quality

Identifying Communities of Vulnerability: Using NASA Earth Observations To Enhance Public Health Tracking of Particle Exposure and Extreme Heat Events in Los Angeles, CA

Heat waves and elevated concentrations of particulate matter are two major public health issues in Los Angeles County, CA. In an integrative approach to these two issues, the project objective is to study the relationship between previously unexamined Multi-angle Imaging Spectroradiometer L1 radiance measurements and Environmental Protection Agency PM2.5 data and to identify areas of community-level susceptibility to heat stress and air pollution using U.S. Census 2009 tract-level demographic data and Landsat Thematic Mapper information. This study utilizes remote sensing in combination with a ground-based network of data to create a more comprehensive approach to tracking public health concerns of heat stress and air quality.



Bangladesh Health and Water

Mapping Cholera Outbreaks in Bangladesh: Understanding the Correlation Between Cholera Outbreaks and Sea Surface Temperatures, Sea Surface Height, Salinity, and Chlorophyll-a Estimates

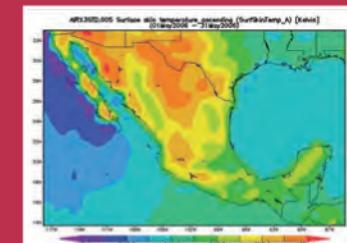
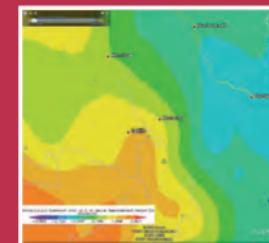
Research has demonstrated that cholera epidemics occur seasonally in Bangladesh, with peak outbreaks happening twice a year when large monsoon events are frequent (spring and fall). While these patterns are known, this knowledge alone cannot predict the severity and location of cholera outbreaks until a monsoon event occurs or an outbreak is reported. Remote sensing products can be used to better understand the correlation between outbreak occurrence, sea surface temperature (SST), sea surface height (SSH), salinity, and chlorophyll-a estimates. Using NASA EOS, a gridded global image was developed, allowing for a better understanding of the relationship between the data observed within the context of geographically diverse locations. The primary deliverable of this project is the production of a baseline map using remote sensing data for the pilot design and development of an application to connect Earth science products to water and health studies.



Monterrey Health and Air Quality

Vehicular and Industrial Emissions in the Monterrey, Mexico, Metropolitan Area in Relation to Public Health

The Monterrey Metropolitan Area (MMA) is one of the most industrialized cities in Mexico and currently faces air pollution problems caused by several geographic and humanmade factors. Health data and SIMA readings, as well as carbon monoxide, ozone, AOT, PM10, and PM2.5, were combined on maps and in graphs to find their correlation. It was discovered that deaths due to respiratory disease increased as PM10 levels increased, with an estimated lag time of about 2 years. With these data, the current project team decided to study vehicular and industrial emissions inside the MMA and their relation to public health. To determine costs of health care related to respiratory diseases, a time-series model was produced using daily data of PM10 concentration, temperature, humidity, and registered cases in hospitals (Morel and Sanchez, 1993). This model has been successfully applied to Mexico City and Santiago de Chile. The compound PM10 was the main focus of the project. The team also plans to study the surface wind speed with satellite data. This relation will be simulated through various models and software. The output of this simulation was used as input for the economic time-series model. By using models and software packages like HYbrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) and BenMAP, more understandable data were obtained to help government officials take more effective action and raise awareness among MMA inhabitants. This also provided more organized data for future research. The state government and other collaborators will be able to continue processing multiple datasets of emissions and other pollutants for the further study of the air quality in the MMA.

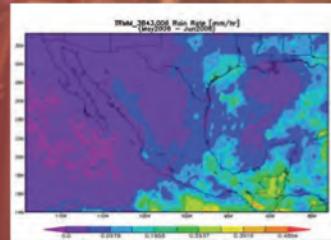
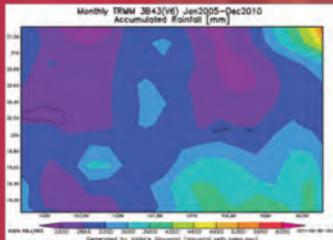


HEALTH AND AIR QUALITY

Lerma River Health and Water

Water Shortage and Quality Concerns in Mexico's Lerma-Chapala Basin

The Lerma River is the largest inland river in Mexico and second longest overall, running over 708 kilometers through the five states of Guanajuato, Michoacán, Jalisco, Mexico, and Querétaro until finally emptying into Lake Chapala, Jalisco. The river's basin covers an area of roughly 53,667 square kilometers and is one of the most densely populated areas in Mexico. The prevalence of agriculture and industrial activity in the area has contributed to pollution in the Lerma River as well as a depletion of water levels in the river and its neighboring tributaries. This study looked at factors that contribute to these shortages, such as periods of low precipitation and reduction of basin size. It also examined the lack of availability of potable water due to pollution and industry discharges, as well as how poor water quality contributes to incidences of parasitic infections and other diseases. Data from NASA satellites were used to develop topographic maps that show where and how the water of the Lerma River and Lake Chapala is being used in agriculture, as well as to explore the correlation between industry and high levels of pollution in the river evidenced by high pH levels and spikes in phosphate levels.



Mexico Health

Public Health Concerns Regarding Dengue Fever in Mexican States

Dengue Fever is a virus-based disease transmitted by the female mosquito, *Aedes aegypti*, and rarely *Aedes albopictus*, when it bites a human for its blood meal. Currently, more than one-third of the world's population (2.5 billion people) lives in areas where there is a risk of Dengue transmission. Measures to reduce the vectors' habitat and limit exposure to bites are used to decrease the severity of the virus's incidence. NASA Earth observations were applied to assess Mexico's climate and vegetation indices data so that correlations between environmental factors and reported Dengue Fever cases could be drawn. These results are relevant for epidemiological surveillance and enhanced decision support for preventive measures to ensure public health.