

Team Number: 058

School Name: San Juan College High School

Area of Science: Environmental Science

Project Title: Establishing CH<sub>4</sub> absorbing Zeolite towers in the Four Corners Region and its potential for its local and global emission

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### **Problem Definition:**

Methane (CH<sub>4</sub>), a greenhouse gas that traps atmospheric heat is produced naturally by decomposition of organic wastes and anthropologically by agricultural practices, municipal solid waste landfills and by the processing and transportation of coal, oil and natural gas.

Studies have shown that significant methane gas emissions are associated around natural gas producing facilities (Allen, 2014). Northwest NM that cradles the San Juan Basin is one of the most actively natural gas producing region from both conventional and unconventional tight sands, coal bed methane and shale formations (Information on the San Juan Basin, 2016). There are over 20,000 known oil and gas wells in the San Juan Basin according to NGI's Shale Daily.

Space – based imaging spectrometers from California Institute of Technology has determined that the Four Corners Region where we are located has a large methane enhancement due to the presence of the oil, natural gas and coal industry. This extensive airborne survey led by NASA has even coined the term “hot spot” to describe the overall magnitude of methane gas presence in the Four Corners region of the United States.

### **Problem Solution:**

According to a study done by D. Allen for the University of Texas in 2013, establishment of equipment in place that reduces methane emissions does reduce its emission by 99%. Current studies states that some species of Zeolites, porous materials commonly used as adsorbents (Kim et.al., 2013) has a very promising CH<sub>4</sub> sorption capacity. If we can establish Zeolite towers that can absorb certain amounts of CH<sub>4</sub> emitted primarily by the petroleum industry within the Four Corners Region, it may show a significant drop in the amount of methane gas coming from this area.

Our project will show a simulation of the potential effects of these Zeolite towers across the San Juan Basin to the amount of methane gas produced from the petroleum industry in the region. A topographic map of a section of the Four Corners Region will be overlapped on the interface. Depending on CH<sub>4</sub> sorption capacity, wind patterns and topography, the simulation should show how the Zeolite towers can influence the amount of CH<sub>4</sub> that will originate from the Four Corners Region. CH<sub>4</sub> sorption capacity, wind patterns and topography are our three sliders that we can vary to show expected results.

**Progress to Date:**

As of now, the team has conducted numerous research about the following:

1. Topography of the San Juan Basin which includes North West New Mexico and South West Colorado where most of the coal, oil and gas facilities are located.
2. Locations of major Coal Bed Methane (CBM) sources.
3. Documentation of wind patterns across the basin in the past 50 years.

We also have contacted Mr. Steve Sims, one of the lecturers in the 2016 Supercomputing Challenge Kickoff in Socorro, NM last fall to guide us on how to overlap a map on the interface but he has not yet responded on our e-mail to him so we are at a lost on this part of our project. We also have not yet received any e-mails from a possible professional mentor to guide us on our project. So far only our Science teacher is the one helping us progress on our programming and research.

**Expected Results:**

The simulation should show us that the potential effects of establishing Zeolite towers in reducing the amount of CH<sub>4</sub> that is originating in the Four Corners Area due to the Oil and Gas industry in the region. This will hopefully inspire future researches and studies in finding simpler ways of safely reducing excessive greenhouse gases such as methane gas which is an inevitable by product of industrialization.

**References:**

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