To Do:

Proofread and print timeline stories

Vocabulary 10 minutes

* Give class a vocabulary sheet
* Say the words aloud and have the class repeat x 2
* Vocabulary quiz

Answers:

1. Manure
2. Smog
3. Local
4. Global
5. Methane
6. Mask
7. Health
8. Increase
9. Pollution, pollutants
10. developing countries

Timeline - 15-20 minutes (if class does it then 25-30)

* Cavemen
  + <http://www.techtimes.com/articles/61545/20150619/early-humans-have-been-polluting-the-earth-400000-years-ago-says-researchers.htm>
* Romans
  + <http://www.smithsonianmag.com/history/air-pollution-has-been-a-problem-since-the-days-of-ancient-rome-3950678/?page=2>
  + <http://www.pbs.org/wnet/need-to-know/environment/was-the-roman-empire-a-victim-of-climate-change/6724/>
  + <http://an-emission-impossible-world.blogspot.com.es/2013/12/ancient-pollution.html>
* Horse to car transition? New York
  + <http://nautil.us/issue/7/waste/did-cars-save-our-cities-from-horses>
  + <http://www.citylab.com/commute/2013/12/reality-check-cars-didnt-save-our-cities-horse-manure/7742/>
  + <http://evworld.com/urban.cfm>
* London
  + <http://time.com/4554972/great-smog-london-crown-netflix/>
  + <http://today.tamu.edu/2016/11/14/researchers-solve-mystery-of-historic-1952-london-fog-and-current-chinese-haze/>
* China-India
  + <http://fortune.com/2017/01/10/china-red-alert-pollution-pm2-5/>
  + <http://www.scmp.com/week-asia/society/article/2053387/and-you-thought-beijing-polluted>
  + <http://edition.cnn.com/2016/12/07/fashion/sneaker-pollution-mask-designer/>

Illustration of local and global pollution and effects of moving factories and other pollutants outside of the city (ratio of pollution and area) - 5 minutes

increase of global pollution but decrease local pollution and illness if you move factories, increased life expectation

Inversion and why L.A. and other valleys have worse air pollution - include video - 5 minutes

<https://www.youtube.com/watch?v=L7i7N-je-aM>

<http://www.yourcentralvalley.com/news/smoke-worsens-valley-air-quality/230992251>

Quiz for comprehension 20 minutes

1. What is local pollution?
2. What is global pollution?
3. What happens to the levels of local and global pollution when you move factories outside of cities?
   1. The levels of local and global pollution increase.
   2. The levels of local and global pollution decrease.
   3. The level of local pollution increases and the level of global pollution decreases.
   4. **The level of local pollution decreases and the level of global pollution increases.**
   5. The levels of local and global pollution do not change.
4. How has the approach to managing pollution changed over time?
   1. **Humans changed their focus from managing local pollution to managing global pollution.**
   2. Humans changed their focus from managing global pollution to managing local pollution.
   3. Humans changed their focus from ignoring all pollution to managing all pollution.
   4. Humans have not changed how we manage pollution.
5. What does the expression “not in my backyard mean”?
   1. It is okay and I want it close to me.
   2. **It is okay, but I don’t want it close to me.**
   3. It isn’t okay and I want it close to me.
   4. It isn’t okay and I don’t want it close to me.
6. Did cavemen have local pollution? If yes, what kind of pollution?
7. What could China and India do to reduce local pollution? Why would this reduce local pollution? Would this affect global pollution?
8. What happened in London in 1952?
9. What did cars do for cities? What was the problem before?
10. What caused pollution in ancient Rome?
11. Why is smog a bigger problem in Los Angeles and other cities located in valleys?

a vignette activity or hypothetical polluted city?

<https://www.youtube.com/watch?v=L7i7N-je-aM>

<http://www.yourcentralvalley.com/news/smoke-worsens-valley-air-quality/230992251>

Options for extending 2 eso class

debate between priorities of local and global pollution - with a vignette (a town hall meeting about what to do about the pollution in the city).

have the class tell about the phases in pollution and the different cities to the class

spend longer on vocabulary

do an online pollution activity

<http://learningenglish.voanews.com/a/air-pollution-global-warming-wind-farms-ocean-waves-energy/1909519.html> - podcast WHO pollution deaths

Discussion question:

Which is more important, increasing people's standard of living, or protecting the environment?

* Do you think cars should be banned from city centers?
* Should we make the development of renewable energy sources an economic priority?
* What is the main problem with renewable energy sources?
* What can large cities do to improve their air quality?
* How can we protect the environment and at the same time improve people's standard of living?
* Would you rather live during the great smog of london or during the time of horses in NYC?

CAVEMEN - SMOKE

It seems that people have been polluting the environment for a long time. Archeologists have found evidence of the first pollution made by humans. They found this evidence on the teeth of Paleolithic people that lived 400,000 years ago. The teeth were found in a cave in Israel. The teeth show that the Paleolithic people breathed in smoke while they cooked meat inside. The pollutant contained traces of charcoal from the fires that were used to cook the meat. Cooking food helped the Paleolithic people in many ways. They could eat more types of food and it made it easier to eat and digest food. However cooking with fire inside of caves caused air pollution. This pollution probably caused health problems for these Paleolithic people because we know that breathing in smoke and charcoal is bad for people's’ lungs. We now have learned how to control fire as we cook indoors and most people are not exposed to this pollutant.

ROMANS - AGRICULTURE

Before the Industrial Revolution, our planet’s atmosphere was still untainted by human-made pollutants. At least, that’s what scientists thought until recently, when bubbles trapped in Greenland’s ice revealed that we began emitting greenhouse gases at least 2,000 years ago.

Célia Sapart of Utrecht University in the Netherlands led 15 scientists from Europe and the United States in a study that charted the chemi­cal signature of methane in ice samples spanning 2,100 years. The gas methane naturally occurs in the atmosphere in low concentrations. But it’s now considered a greenhouse gas implicated in climate change because of emissions from landfills, large-scale cattle ranching, natural gas pipeline leaks and land-clearing fires.

Scientists often gauge past climate and atmosphere conditions from pristine ancient ice samples. The new research was based on 1,600-foot-long ice cores extracted from Greenland’s 1.5-mile-thick ice sheet, which is made up of layers of snow that have accumulated over the past 115,000 years.

Sapart and her colleagues chemically analyzed the methane in microscopic air bubbles trapped in each ice layer. They wanted to know if warmer periods over the past two millennia increased gas levels, possibly by spur- ring bacteria to break down organics in wetlands. The goal was to learn more about how future warm spells might boost atmospheric methane and accelerate climate change.

The researchers did find that methane concentrations went up—but not in step with warm periods. “The changes we observed must have been coming from something else,” Sapart says.

That “something else” turned out to be human activity, notably metallurgy and large-scale agriculture starting around 100 B.C. The ancient Romans kept domesticated livestock—cows, sheep and goats—which excrete methane gas, a byproduct of digestion. Around the same time, in China, the Han dynasty expanded its rice fields, which harbor methane-producing bacteria. Also, blacksmiths in both empires produced methane gas when they burned wood to fashion metal weapons. After those civilizations declined, emis- sions briefly decreased.

Then, as human population and land use for agricul- ture increased worldwide over the centuries, atmospheric methane slowly climbed. Between 100 B.C. and A.D. 1600, methane emissions rose by nearly 31 million tons per year. According to the most recent data, the United States alone generates some 36 million tons of methane per year.

“The ice core data show that as far back as the time of the Roman Empire, human [activities] emitted enough methane gas to have had an impact on the methane signature of the entire atmosphere,” Sapart says.

Although such emissions weren’t enough to alter the climate, she says, the discovery that humans already were altering the atmosphere on a global scale was “tremendously surprising.”

The discovery will compel scientists to rethink predic- tions about how future methane emissions will affect climate. “It used to be that before 1750, everything was considered ‘natural,’” Sapart says, “so the base line needs to be reconsidered, and we need to look farther back in time to see how much methane there was before humans got involved.”

NEW YORK CITY - HORSES

How the motorcar saved the city: From horse power to horsepower

The electric trolley and later cars became the main types of transportation in cities during the early 1900’s. Before this, horses were necessary in large cities for personal transportation, freight moving, and mechanical power. In 1880 about 150,000-175,000 horses lived in New York City. But all of these horses living in the cities caused problems. Horse manure filled the streets. The manure could not be cleaned up fast enough. Therefore, about three to four million pounds (KG) of manure was added to the city streets every day in New York City and Brooklyn. It was estimated in 1984 that if nothing changed, the city would be in 9 feet of horse manure by 1950 In addition to manure, urine, flies, and dead horses filled the streets. These pollutants all caused disease and sickness in the city. Horses also used many resources. For example, horses ate food grown on 5 acres of land in a year. This amount of land fed only 1 horse in a year but could feed 6-8 humans in a year. The problems of using horses increased as the population increased and as the standards of living increased because more people with more money meant more horses doing more things. In the 1890’s the electric streetcar replaced the horse as the method of transportation. Soon after, the internal combustion engine was improved. This led to the invention of cars. Cars were cheaper to own and use than horses and horse vehicles. Cars were also faster. In 1900, 4,192 cars were sold in the United States. By 1912, that number increased to 356,000 cars. In the 1920’s, trucks were also sold and they replaced all of the horses in the city. Cities became much cleaner. Cars and trucks had reduced the local pollution in the cities. Although automobiles contribute to local and global pollution, compared to horses they are much cleaner.

LONDON - SMOG

CHINA-INDIA - DEVELOPING COUNTRIES