Applied Geography for Sustainable Living

Eye on the World

Vol 4 No. 2, Jun 2022

© 2022, G. K. Lee. All rights reserved.

Applied Geography for Sustainable Living AppGeog4SL@gmail.com

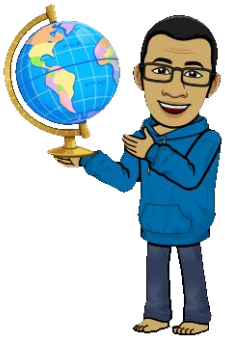
Applied Geography Education: the path to a more sustainable future.

Global Warming & Climate Change

In 1853, Eunice Foote conducted experiments on the interaction of sunlight with various gases. One of them was CO_2. From her studies, she wrote a report stating if the levels of CO_2 increase, atmospheric temperatures would rise.

Misinformation causes loss of valuable time to act.

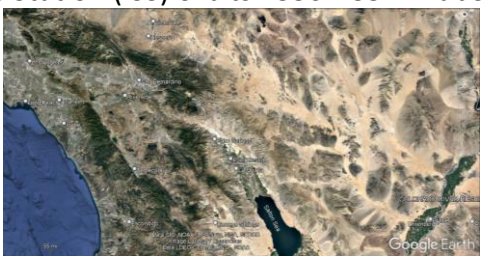
In case you haven't realized it, global warming and climate change are real. Anyone who doesn't realize this may be choosing to ignore the facts or is very disconnected from Nature. To be clear, the two topics are interrelated, but they are not the same. Basic geography should make this obvious.



Global Warming, by its name, involves the globe, a model of the spherical Earth. Geographically, this is talking about the warming of planet Earth as a whole: the air (atmosphere), land (lithosphere), and water, (hydrosphere) comprising the three general types of surfaces on Earth. Climate scientists include the frozen surfaces (the cryosphere) in the discussion.

People confuse climate change with global warming as they don't know the definition of climate and the significance of the relative geographic scales (e.g., global, regional, and local) of the two terms. Climate is the history of the weather for a place on Earth. The place can be a specific spot (local scale) or an area (regional scale) that is larger than the local scale but smaller than the global scale.

The International Space Station (ISS) orbits ~330-435 km above the Earth. A global-scale view is

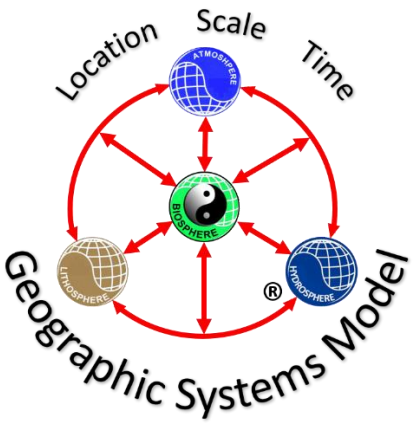


on the left (i.e., you can only see a hemisphere, half the Earth at a time). The images of Los Angeles, CA (center), and Kansas City, KS (right). It is hard to see a small town representing the local scale from this altitude.

In This Issue

Global Warming & Climate Change	1-7	Handling Summer Heat	8

©2022, G. K. Lee. All rights reserved.



The Geographic Systems Model is a holistic, non-linear model representing the Earth's synergistic systems. The natural heating of the Earth system started and evolved over the billions of years of Earth's existence and continues today and shapes the weather systems that make the climate. The industrial revolution put more greenhouse gases into the atmosphere causing warming to be faster than in the past several thousands of years (the Holocene).

Getting back to the climate change topic, most people don't understand the factors controlling weather and climate are related to a place, the location. The Geographic Systems Model has a checklist to guide studies of the Earth. The atmospheric controls for climate are summarized in the mnemonic "LLAOATS" (see left sidebar). This means the unique combination and interaction of these characteristics for a place determines its weather and therefore its climate. Those who don't understand this are perplexed when they read about global warming, yet their town had unusually cold weather. They take their local experience and interpret it relative to the global discussion which is inappropriate due to the mismatch of geographic scale. That would be like someone living off the grid in a remote place while WWII was raging and saying, everything here is fine, what's all this about killing and fighting?

Latitude

Land/Water Distribution

Atmospheric Circulation

Oceanic Circulation

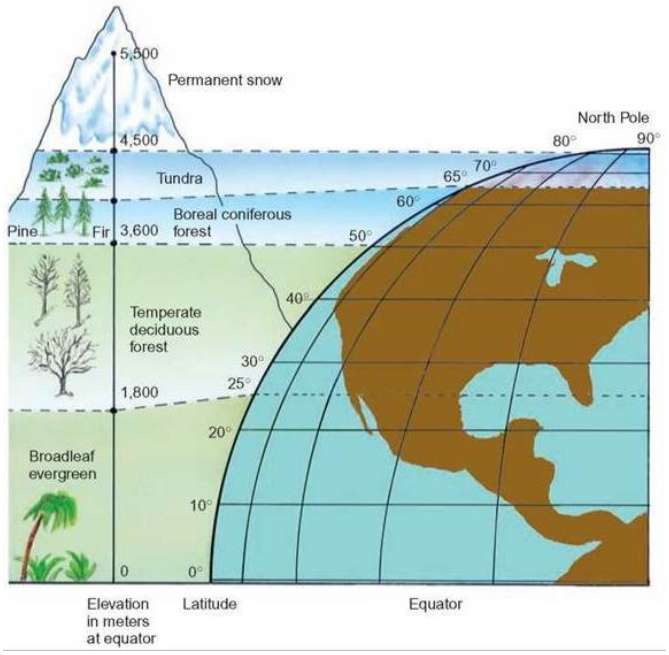
Altitude

Topography

Storms

The complexity of natural systems is confusing to many people. It starts with the fact that most people never learn about systems and non-linear thinking in school. Schools and exams tend to focus on learning to solve a problem for the single right answer. The real world is multiple choice.

The diagram on the right shows the similar effect that latitude and altitude have on the heat and moisture at a place. The Equatorial region is where you tend to find more heat than in most other places on the globe. As you move away from the place of heat (the Equator), temperatures get cooler (e.g., polar regions). For any latitude (position north or south of the Equator), temperatures decrease going away from sea level. That's why the temperatures on tall mountains are cooler than on the beach or valley floor.



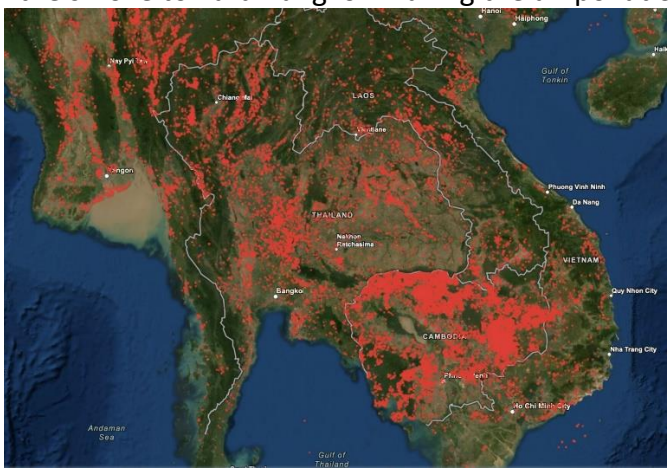
From Schoolbag.info under educational free use copyright clause.

This shows that climates are different for places at different latitudes. And for places at the same latitude, climates can be different depending on the altitude of the place. For two places at the same latitude and altitude, more differences at the local scale matter: which side of the mountain (e.g., north, or south), the direction of the prevailing winds, and storm systems coming

©2021, G. K. Lee. All rights reserved.

into the area, etc. The type of vegetation cover, culture and living practices of the people, etc. all make differences in the weather and climate of a place.

With this clear understanding of the differences between global warming and climate change, it is easy to see why many people think their effort doesn't amount to a hill of beans when it comes to reducing greenhouse gas emissions to help save the planet. Again, it is a matter of perceiving geographic scale (i.e., size). Below, a NASA satellite image shows the annual winter agricultural practice of burning crop residues to prepare the land for planting. The winter monsoon winds carry the smoke toward Bangkok making the air pollution there among the worst in the world at that time



of year. On some days, visibility is so bad it limits airport flight operations and flight cancellations. The annual burning is a traditional farm practice because it is cheap, and many farmers struggle in poverty, unable to buy equipment that would help remove crop residues without burning. There are so many small farms doing this, and it all adds up to create big problems. Now, reverse that idea, and think about what can happen if many individuals take local action to cut back on activities that put greenhouse gases into the atmosphere causing global warming. All those small actions add up.

Time to Stop Talking and Get Walking

You can start by knowing your carbon footprint (i.e., how much you contribute to greenhouse gas emissions) by going to either the EPA or the Nature Conservancy to use the online carbon footprint calculator. [Note: The greenhouse gases are not just carbon dioxide (CO_2) which is the majority, so it makes the headlines. The others are, in descending order of % methane (CH_4), nitrous oxide (N_2), and the F-gases (HFCs, CFCs, and SF_6.] Then visit the Columbia Climate School website to get a list of easy-to-do things to start reducing your carbon footprint. Keep an account of any money saved. Put the money in a separate cookie jar or bank account so you can see and touch the money you saved.

CO_2 is the biggest culprit and is linked to electricity consumption especially if generated by burning fossil fuels (e.g., fuel oil, coal, gas, etc.). Reducing electricity use starts with simple daily habits:

1. **Turn off lights** when leaving the room empty.
2. **Minimize using major appliances** (e.g., washer/dryer, dishwasher, electric stove/oven, air conditioner/heating, and other appliances with heating elements (e.g., space heaters, coffee maker, slow cookers, etc.) at the same time and during peak demand times (e.g., many power companies charge higher rates for using electricity from 2 pm to 7 pm during weekdays).
3. **Do not use the dishwasher;** handwash dishes. Use greywater for toilet flushing or watering plants outdoors (not indoors as oils and food residues might attract bugs).

©2021, G. K. Lee. All rights reserved.

4. **Replace existing light bulbs with LEDs**. [Note: An LED may cost more per bulb than an incandescent bulb, but for 25,000 hours of use, each LED is equal to buying 160 incandescent bulbs or three CFLs (compact fluorescent bulbs.] The electricity used to power each type of bulb for 25,000 hours is about $30 for an LED, $50 for CFL, and $160 for regular incandescent bulbs. Yes, it's only a few pennies difference for the electricity for each bulb/day over the 25000 hours which is a few years, but the goal is to cut down on greenhouse gas emissions for the long haul (i.e., think future generations to have a future on Earth).
5. **Using solar camping lights:** We bought these and use them for camping (which is less often now. They are bought and paid for, so why let them sit unused?). We started using them daily for room lighting, especially if bright light is not needed for the activity at hand. We place the solar panel and the camping lanterns in the west-facing windows with the strongest exposure to sunlight during the daytime for charging each morning. On sunny days, the lights are fully charged for each night. These lights are also emergency lights when commercial power is lost. The station lights went to the bedroom (#1 below). The tent lights can be easily *moved and used where needed (e.g., #2 hanging over the kitchen island.*

Radio station emergency lights

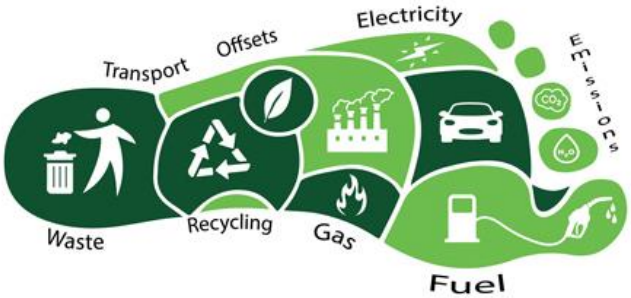
Tent Lanterns

6. **12 Volt DC lighting** (another camping light option) is used as the work light for the computer workstation in the office. The batteries are on 24/7 float charge drawing a minimum amount of electricity. This is part of our emergency lighting if commercial power is lost.
7. **Reduce Air Conditioner Use:** In addition to not running the air conditioner during peak hours (2 pm to 7 pm on weekdays), we harvest and stockpile cool air. This requires routinely monitoring the temperatures of the main rooms, and outside weather conditions (e.g., temperature, wind speed, wind direction, barometric pressure. The cool air harvesting begins in the evening after the outside air temperature is equal to or less than the inside temperature. When this condition is met, the windows are opened to let in the cool night air. If needed, a fan can be used to draw in cool air (but we try not to use electricity). The windows are not closed until the next day, usually about mid-morning when the outside air temperature is higher than inside. After the windows are closed, we close the blinds to keep the sunlight out. [Note: Sunlight entering a room is absorbed by the materials in the room converting light to heat.] The air conditioner is

©2021, G. K. Lee. All rights reserved.

turned on with the thermostat set at 78° F. [Notes: Electricity rates are low during off-peak hours. Also, it will take less energy to cool the inside air temperature which is usually in the upper 70°s, like the thermostat setting. If we wait until the temperature inside gets into the 80°s or higher, the air conditioner will need to run longer to cool the inside air. Using this technique, the office temperature only got up to 82° F when the outside temperature reached a maximum of 101° F one afternoon. The air conditioner was not turned on at any time during the peak hour period of 2 pm to 7 pm.] There have been nights when the outside air temperature was still in the low 90° F close to midnight. We are lucky that only one small kitchen window and the bedroom windows get full direct afternoon sunlight. This is where the solar lanterns and the solar panel are put for charging.

8. **Reduce Hot Water Use**: The apartment is all electric so reducing hot water use reduces the electric bill. This means doing laundry with cold water and putting flow restrictors in the shower. When opening the faucet for hot water, catch the cold water and use it for making coffee, rinsing dishes, brushing teeth, watering indoor plants, or flushing the toilet. Take "Navy" showers (i.e., get wet; turn off water; soap up; turn on the water to rinse off; turn off the water when done). An alternative is the modified mandi (Indonesia bath common throughout SE Asia). Put a large bucket (~19 L/5 gallons) and a scoop in the shower or tub. Fill the bucket, mixing hot and cold water to a comfortable temperature. Scoop water to get yourself wet; soap up; scoop to rinse off. Leave any clean water for the next person or use it to brush your teeth or flush the toilet.
9. **Clothes Drying:** We cannot put clotheslines on the balcony, but the balcony is covered. Ours has a low solid wall instead of an iron railing. Making a laundry drying rack that stays below the height of the railing will keep it out of sight. Due to limited space, the priority will be for the heavier items (e.g., towels, blankets, etc.), though with careful scheduling we might be able to dry all the clothes this way and eliminate using the clothes drier during the summer.
10. **Drive Less, Drive Smart:** Reducing fuel consumption is the goal. Driving less can mean planning efficient routes to avoid backtracking, multiple trips, combining errands, etc. Driving smart includes maintaining your vehicle for efficient operation (e.g., tune-up, tire pressure, etc.), driving to maximize mileage (e.g., no fast starts, speeding, sudden stops, etc.),

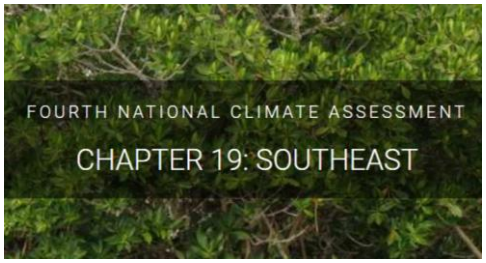


Graphic from ecomatcher.com

11. **Recycle Realistically:** Avoid or reduce buying things in plastic. [Note: Plastic recycling is a myth and scam. Sequester plastic by re-using and re-purposing plastic items.]. Recycling of metals, glass, and paper/cardboard works. If you can, compost food scraps for your garden (e.g., traditional or container).

Stepping Up Your Game

To get the full benefit of your hard-earned tax dollars, get the National Climate Change Assessment (NCA) for your region, click here., scroll down to "Regions," and click on the region for your state. You can download it or read it online.



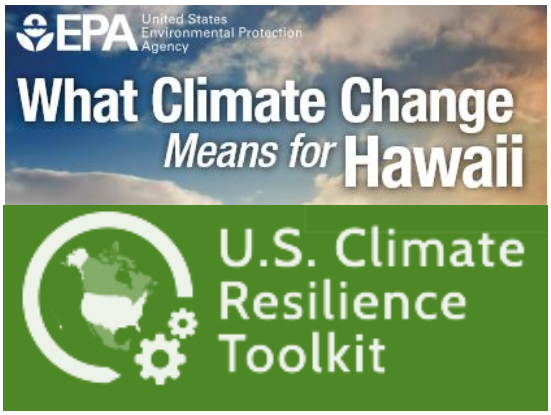
The NC regional report will give you a general view of the

©2021, G. K. Lee. All rights reserved.

climate change assessment for the group of states in your region. They will rate the confidence (e.g., low, medium, high, very high) they have in the scientific data and analysis used to make the assessment. In science, nothing is considered certain because conditions are always changing. Any report is a snapshot at a given point in time. The report used existing data, but while the report is being written, more data could be coming in but hasn't been analyzed. To the NCA scientists also rate the probability they think the climate impact they've identified will happen (e.g., very likely, likely, as likely as not, unlikely, very unlikely). And because conditions can change as time goes by, the NCA also includes what they call a "Traceable Account" so you can see how they came to their assessment with access to the data. This is good science because you can see for yourself what and how they did it. And if the conditions change, their assumptions and thinking back then don't apply now, and you may have an idea of what to try to do for the new situation.

Narrow It Down to Your State

Regions cover many states, so look for a climate change study for your state, county, or city. Each level you come closer to your city or neighborhood will be more detailed. The idea is to get enough detail for you to start using the US Climate Resilience Tool Kit to plan to prepare your home for the climate changes that will affect you personally. This link to the Tool Kit-steps will guide you through specific things you can do to prepare for climate changes that will affect you at your location.



(The original is black; we opted to go green.)

Why go through all this effort? Climate change can trigger events that could be slow to see and feel, or the change could be very quick and create an emergency or disaster. When it happens at your home, whether you are trained or not, you are the first responder. Until someone calls for help, the officials have no idea there is a problem. The general rules for future natural disasters are 1) they will be more frequent, be more intense, and maybe last longer than in the past; 2) the farther you are from a large population center the longer you may have to wait for help to come. In a major disaster, they will try to help the greatest number of people in the shortest possible time. Experience from major disasters like Katrina and Sandy, send a clear message: help may not arrive as fast as you hope or want. You'll have to handle it yourself and then wait to see IF help will come. If you try to handle it on your own, and help does arrive, consider it a bonus. If you do nothing and wait for help to come, well, don't be surprised if they were too busy helping thousands of others and didn't have time or personnel to help you or a few of your neighbors living far away from the city.

Learning From Nature & Learning to Care for Nature

People like to think they can control things in their lives. The truth is they are lucky if they can control themselves let alone try to control anything or anyone outside of themselves. Many Indigenous people live very close to Nature. Every day they are out searching for food or doing daily activities in Nature. They can successfully live sustainably because they have learned to care for their environment. All people interact with their environment to get air, water, food, and shelter from the weather and climate. (e.g., materials for clothing, housing, etc.). In the past, some civilizations thrived while others collapsed. How they treated the environment meant the life or death of their civilization. Caring for Nature enables people to survive and thrive.

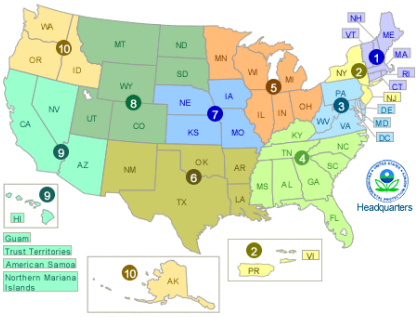
©2021, G. K. Lee. All rights reserved.

Take a Hint from Köppen

Click here for a general introduction to Ecoregions.

When Köppen's climate classification came out in 1884, there were fewer weather stations around the world than we have today. He used plants as bio-weather stations because they respond to heat and moisture, the two key climate indicators. By carefully selecting plants and studying their relationship to the seasonal variations at their location, he set five main climate groups by latitude and subdivided these by seasonal temperature and rainfall patterns. These two variables are key to shaping the environment to support life (e.g., ecosystems and habitats). Use this link to learn how to see the 13-minute wildland tool kit video.

More Detailed Ecoregion Information



You need to get more local information to make full use of the NCA data to your advantage handle climate change in your locale. The ecoregions shown in the wildland tool kit are general. To get more specific ecology information, click here. The Environmental Protection Agency (EPA) classifies ecoregions at four levels of detail: Level I has 15 different regions for North America. Level II gives more detail resulting in 52 regions. Level III and Level IV give even more details.

Follow Köppen's example by watching for changes in local native plants. See if there is a native plant society in your area to learn which native plants to watch. Plants are sensitive environmental indicators. Learn about how other local plants and animals connect to these native plant indicators and you begin to understand how climate changes affecting it will send ripple effects through your local ecosystem.

Everyone must do as much as they can in their daily lives to reduce their carbon footprint. All the small actions can amount to something as more and more people take action. It starts with you.

Set a good example for others to follow. Share your knowledge and practices. Keep track of the money you save and use it to prepare an emergency kit for possible local emergencies created by climate changes that affect your community.

Reduce your carbon footprint and strive to live sustainably.

Protecting yourself and your habitat begins with you. Take the carbon footprint challenge. Find your carbon footprint using an online calculator (e.g., the EPA or the Nature Conservancy). Then do things to reduce it as much as you can. Strive to reduce your carbon footprint as much as possible. Once you do, try to sustain that level while continuing to find ways to reduce it further.

Be the change you want to see.

---Arleen Lorrance, 1974

©2021, G. K. Lee. All rights reserved.

Coping with Summer Heat

Graphic from clipart-library.com

Whether you believe in global warming and climate change doesn't change the fact that summers are getting hotter than before. The basic approach we advocate is avoidance: Do not go out in the sun and heat unless you must.

If you must go out, cover as much skin as possible with sun-blocking clothing. Unless you have a medical condition, we do not suggest buying UV-resistant clothing. The KISS approach is to take the clothing, stretch a single layer between two hands, and hold it up to the light. The less light coming through the better. Clothing should be of natural fiber, long pants, long sleeve shirts, sunglasses, and a broad-brimmed hat with neck and face covering. Additional accessories include a small folding umbrella (light-colored; portable shade, and for females, teaming up with one or two others, the umbrellas can form a small privacy shelter in the field where no toilets are available); sunblock; a small spray bottle with water (to mist your face and neck for evaporative cooling); drinking water bottle; a compact analog thermometer; a folding hand fan (to speed evaporative cooling); and an evaporative cooling towel (which come in different sizes for your neck to towel/sheet size).

In excessively hot weather, it is best to avoid the heat of the day and to go out only in the early morning or early evening. If you must go out during the day, be sure to never leave anyone sitting in the car in the heat. It could be a death sentence.

Pay attention to weather reports and forecasts for extreme heat events. Learn about the Heat Stress Index to better prepare to know about and recognize heat-related illnesses. The information and knowledge could save your life. To use the Heat Stress Index chart, you need to know the dry air temperature and the relative humidity. You can make or buy a hygrometer to calculate the relative humidity.

Heat Stress Index

click here for (F°)	RELATIVE HUMIDITY (%)												
TEMPERATURE (C°)	40	45	50	55	60	65	70	75	80	85	90	95	100
27	27	27	27	27	28	28	28	29	29	29	30	30	31
28	28	28	28	29	29	29	30	31	32	32	33	34	35
29	29	29	29	30	31	32	32	33	34	36	37	38	39
30	30	31	31	32	33	34	35	36	38	39	41	42	44
31	31	32	33	34	35	37	38	39	41	43	45	47	49
32	33	33	35	36	38	39	41	43	45	47	50	53	56
33	34	36	37	38	41	42	44	47	49	52	55	58	
34	36	38	39	41	43	46	48	51	54	57			
36	38	40	42	44	47	49	52	56					
37	41	43	45	47	51	53	57						
38	43	46	48	51	54								
39	46	48	51	54									
40	49	52	55										
41	51	54											
42	54												
43	58												

Caution	Extreme Caution	Danger	Extreme Danger
Fatigue possible	Sunstroke, muscle cramps, and/or heat exhaustion possible	Sunstroke, muscle cramps, and/or heat exhaustion likely	Heat stroke or sunstroke likely

All of the items shown above have been in personal use for many years conducting field trips in the drier U.S. states. The hottest trip was a two-week camping trip in the summer of 2017 to the US National Parks of Death Valley, Zion, and Grand Canyon. We endured temperatures of 120° F/ 48.8° C in Death Valley, and 115° F/46.1° C in Zion. [Note: This was the first time I had traveled to those parks in the summer. Normally I would avoid the excessive summer heat. This was the only time available for this trip before my niece started medical school, so we did it as safe-Lee as possible.]

©2021, G. K. Lee. All rights reserved.