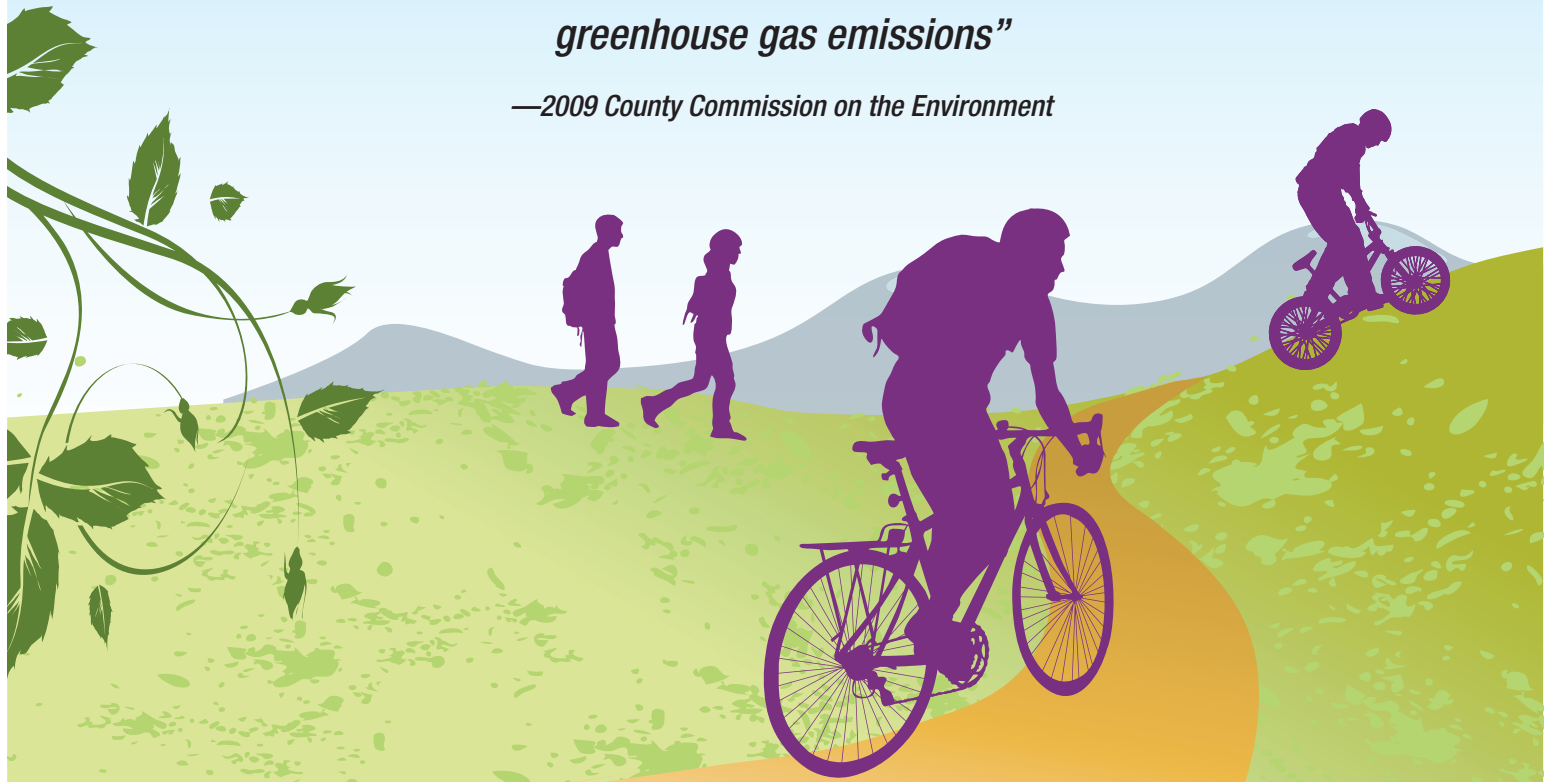


Bike 'n Hike to School

TEACHER TRANSPORTATION BACKGROUND PACKET

*“Transportation accounts for 45% of Santa Cruz County’s
greenhouse gas emissions”*

—2009 County Commission on the Environment



A Safe Routes to School Program of Ecology Action

- a local environmental non-profit in Santa Cruz since 1970.

<http://www.ecoact.org/Programs/Transportation> 831-426-5925 x144



Index

Fast Facts about Transportation in the U.S.....	3
Energy Use and Air Pollution	4
Sprawl Killed Alternative Transportation	6
The Cost of Driving	7
Alternatives to Car-based Travel.....	8
Web Resource for Teachers.....	10
Appendix I: Background Information on Climate Change	13
Appendix II: Climate Change Fact Sheet	16
References	2





Fast Facts about Transportation in the U.S.

Traffic congestion, air pollution, urban sprawl, and global warming are all common themes in the news today. Most often the cause is linked to our automobile-dominated transportation system. Americans drive more miles per year and own more cars per capita than any other nation in the world; a fact due largely to our land use patterns, the lowest gasoline prices of any industrialized nation, and a culture that has become accustomed to using the automobile as its primary mode of travel.

Interesting statistics:

- In Santa Cruz County, 85% of commuters drive and 72% of them drive alone. Nationally, 91% of commuters drive and 84% of them drive alone.
- In Santa Cruz County, 3% of commuters bike to work and 4% walk. In 1990, 4% of Americans walked to work, and less than half a percent bicycled.
- In 1969, 42% of students walked or biked to school; by 2001 that number had dropped to only 16%.
- In Delft Holland, bicycles are used for 43 percent of all trips; in Tokyo, the majority of travel is by public transportation, cycling, or walking.
- A 2009 Santa Cruz County Commission on the Environment report found that as of 2006, our county produced 2.7 million tons of greenhouse gases each year or 10.6 tons per person.
- This same study found that 45% or 1.2 million tons of the county's greenhouse emissions are due to transportation.
- Since 1983, the number of miles that Americans travel in vehicles has doubled.
- In the U.S. the number of personal vehicles has grown 181% since 1969, but the population has only increased by 40%. In California, the state's 34 million residents own 25 million cars!
- In 2007, Santa Cruz County residents drove 5.4 million miles a day and used almost 300,000 gallons of gasoline every day!
- We could easily walk or bike more: Half the trips we make are less than three miles, 40 percent are less than two miles, and 28 percent are less than one mile.
- Even though biking or walking is feasible, 75 percent of trips that are one mile or less are made by car.

Car-related Conundrums:

- Urban development sprawls into fertile valleys and forest land, destroying animal habitat, increasing people's reliance on cars, and making trips longer.
- Air pollution is a growing problem; transportation accounts for about half of all air pollution.
- Climate change, which is largely a result of transportation-related greenhouse gas emissions, is bringing warmer, wetter winters and hotter, dryer summers.
- Stress-related concerns such as road rage are escalating.
- People are spending more time driving and less time walking and bicycling, which may increase risk for heart disease, diabetes, and other obesity-related health problems.
- Traffic congestion on major highways is drastically increasing trip times.

Energy Use and Air Pollution

Fossil fuels (oil, natural gas, and coal) are found beneath the earth's surface. They are formed from the carbon remains of plants and animals that lived hundreds of millions of years ago. Oil is refined to produce the gasoline that powers our cars. Gas burned in car engines contributes to air pollution, water pollution, acid rain, and climate change.

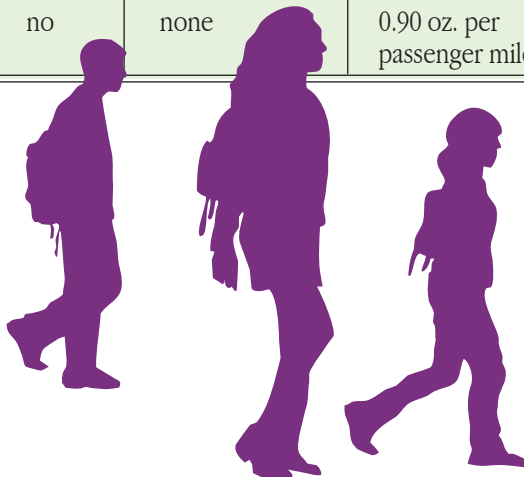
Driving is energy inefficient

Driving, especially driving alone (single occupancy vehicle trip), uses a lot of fossil fuels and is the most energy inefficient way of getting places. For modes of transportation that require physical activity (bicycling, walking, etc.) food is the fuel, not gasoline. Food energy is measured in kilocalories. One kilocalorie (kcal) is the equivalent of what we commonly refer to as a "calorie" in food. One peanut butter sandwich (about 310 kcals) provides the energy needed to travel 4 to 8 miles by bicycle or 2-4 miles of walking. For comparison, there are 31,000 kcals in a gallon of gasoline and the average car burns 1600 kcals per mile! Additionally, the food our bodies burn as fuel emits no pollution, but every gallon of gas burned emits over twenty pounds of CO₂ and pollution!

Energy Use Comparison

mode	fuel source	energy use per passenger	active?	health benefits	pollutants emitted per passenger mile
bicycling	food	40 kcal/mi	yes	physical activity	none*
walking	food	100 kcal/mi	yes	physical activity	none*
bus (full: 40 riders)	gas	200 kcal/mi	no	none	0.10 oz. per passenger mile
carpool (4 people)	gas	400 kcal/mi	no	none	0.20 oz. per passenger mile
car (driver only)	gas	1,600 kcal/mi	no	none	0.90 oz. per passenger mile

*immeasurable amounts of CO₂.





Air Pollution

Motor vehicles are California's largest air pollution source, accounting for more than 40% of the statewide total. Some metropolitan areas, such as Los Angeles, exceed federal health standards for carbon monoxide and/or ozone. Motor vehicles emit 72% of nitrogen oxides and 52% of reactive hydrocarbons, which both contribute to the formation of smog, acid rain, and ozone. These pollutants adversely affect the health of plants and animals and vulnerable segments of the human population, including the elderly, children, and people with respiratory problems.

Climate Change

The fact that the ten hottest years in the last century have all occurred in the last 15 years has led to the Intergovernmental Panel on Climate Change to conclude in 2007 that warming of the climate system is now "unequivocal". This panel concluded that scientists know with "virtual certainty" that human produced carbon dioxide is responsible for this pattern of warming. When fossil fuels are burned, carbon dioxide, the major heat-trapping "greenhouse" gas, is released. This is the same gas that humans breathe out as we "burn" food in our bodies. However, the carbon dioxide we respire is so negligible that it does not contribute to global warming.

Heat trapping gases occur naturally in the atmosphere at levels that have been relatively stable for many thousands of years. However, humans' burning of gasoline, coal, oil and natural gas, as well as deforestation around the planet, has dramatically increased the concentration of greenhouse gases in the earth's atmosphere. Since the Industrial Revolution in the late 1800s, the concentration of carbon dioxide, the major greenhouse gas, has increased 30%. The thickening blanket of greenhouse gases traps heat that would otherwise escape, similar to the way heat is held inside by the windshield of a car parked in the sun or inside a plant greenhouse. Consequently, the temperature on Earth appears to be warming because the increase in greenhouse gases is trapping more heat. A warmer planet may result in more frequent and larger hurricanes, the melting of glaciers and polar ice caps, with a subsequent rise in sea level and catastrophic flooding.

Motor vehicles and gas and coal-fired electricity are the two major producers of greenhouse gases. In the U.S., 33% of greenhouse gas emissions come from motor vehicles; in California cars and trucks produce 43% of the state's greenhouse gases. In 2006, governor Schwarzenegger signed an ambitious plan that calls for reducing California's greenhouse gas emissions to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. In 1998, Santa Cruz City Council passed Resolution NS 23,741 the Cities for Climate Protection Act and joined 500 local governments around the world to reduce emissions of greenhouse gases within their local jurisdictions.

For more Climate Change information, statistics, and facts, see Appendix I and II.





Sprawl Killed Alternative Transportation

Before 1950, people usually lived and worked in the same community. They could walk, cycle, use horses or take a trolley to their work site from residential areas located close to the city center. People could reach stores and do errands on foot and children could easily walk or cycle to school. Urban sprawl changed this centralized system and people became increasingly reliant on personal vehicles.

The push toward the suburbs resulted from:

- Home ownership loans from the Federal Housing Authority for people wanting to move to the suburbs.
- The desire to escape urban crowds. In the late 1800s, cities were dirty, diseased, and unsafe places, and this perception has continued to influence people's choices.
- The desire to separate industrial, commercial, and residential land uses.
- The mobility and convenience presented by cheap and accessible, mass-produced automobiles and the national highway system developed under President Eisenhower in the 1950s.

If You Build It, They Will Come

With urban sprawl, land far from city centers and public transit routes is developed for roads, housing, and commercial uses. Because of urban sprawl, more people are driving longer distances to go to work, school, shopping and errands. More driving means more traffic congestion, longer travel times, and more emissions. Building more and bigger roads is not the solution. Time after time, bigger highways are filled to congestion levels years sooner than expected.

Paving the Way to Problems

As cities spread outward, agricultural land, forest, streams, wetlands, and other natural areas are developed. The American Farmland Trust reported that from 1982 to 1992, 400,000 acres per year of "prime" farmland was covered over by urban and suburban development. This translates into 45.7 acres per hour, every single day. Besides eliminating homes for plants and animals, urban development decreases the number of trees that clean the air and soak up seasonal rain. Consequently, air quality and storm water management problems increase as spongy forest land is transformed into impermeable roofs and asphalt roads. What were once 25-year floods now occur every year, largely due to the increase in paved land.





The Cost of Driving

The actual cost of driving extends far beyond the amount paid at the gas pump. The average U.S. family spends almost \$8,000 a year – 19% of their personal income – to operate and maintain their private vehicles.

While American families pay a lot for transportation, governments pay much more. In California during 2002, the government spent almost \$12 billion on road construction and maintenance! Society also pays the price in environmental degradation, traffic accidents, and medical expenses. The cost of motor vehicle crashes in California in 2000 was over \$20 billion in damaged property, health care, and lost lives. Additionally, consider the costs to society such as time wasted in traffic congestion, traffic safety and enforcement expenses, and the property costs of parking lots! In many urban areas, over 50% of the land is devoted to roads and parking lots for private automobiles. Imagine if only a quarter of this land were devoted to community centers, parks, or local shops that people might be able to access by foot, bicycle or public transportation. If this were the case, our towns might not need so many parking lots in the first place! Considering all of the personal, public, and societal costs of an auto-oriented system of transportation we can see that it is very expensive for everyone. However, it is important to remember many transportation costs, including environmental and societal costs, are not immediately apparent.

Traffic Deaths

Every year in the U.S., more than 40,000 people die in traffic crashes, averaging about one death every 13 minutes. Yet our society accepts these deaths quietly, as if they could not have been prevented. Young people are particularly affected. Motor vehicle collisions are the leading cause of death for every age from 2 to 33 years. Almost one-third of the 5,700 pedestrians killed by automobiles each year are children under the age of 15. In California, more than 4,000 people are killed each year in traffic crashes. Young drivers under 25 are also statistically more likely to be involved in fatal crashes than any other age group.

Transportation & Health

In 1969, 42% of elementary students walked or biked to school; by 2001 that number had dropped to only 16%. In conjunction with a decrease in walking/bicycling to school, the percentage of U.S. children and adolescents who are overweight has quadrupled in the past 30 years; most of this increase occurred since the late 1970s. In Santa Cruz County, 32% of our 9 – 13 year olds are considered overweight or obese. Children who are overweight have an increased risk for a premature death due to heart disease, cancer, diabetes, and asthma.

Lack of physical activity, along with unhealthy diets, are to blame for the increase in childhood obesity/incidence of overweight youth. In fact, the Centers for Disease Control and Prevention (CDC) report that 62 percent of children ages 9 to 13 years do not participate in any organized physical activity and 23 percent do not engage in any free-time physical activity outside of school hours. Replacing car trips with walking and cycling can increase our physical activity, contribute to quality family time, instill a sense of well-being, and build healthy habits for life.



Alternatives to Car-based Travel

Driving It Home:

There is a whole range of partial solutions to the problems of an auto-dependent transportation system. Some of the changes need to come through government legislation, but most need to come from changes in personal travel habits.

Finding A Better Way

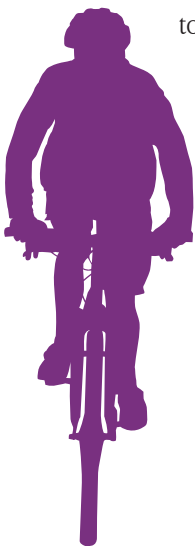
The easiest way for an individual or a family to reduce the environmental impact of personal transportation is to choose to drive less, bicycle, walk, or take the bus. If driving is the only option, choose the most efficient vehicle available, and keep it well-maintained. By choosing to live close to work and services that fill most needs, a family can further reduce its environmental impact from transportation and turn time spent in an automobile into family time.

Schools contribute immensely to the increasing number of cars on the road; up to 25% of traffic can be linked to the school commute. Kids can make a huge difference in their communities—especially at their schools, where traffic congestion and air quality are often problems at the beginning and end of the school day. Encourage students to examine and change their families' transportation habits, especially for trips to school. The least polluting methods of transportation are also the least expensive and the healthiest. Unfortunately, these methods are often perceived to be less safe, and less culturally acceptable.

- **Walking or Cycling:** It takes about 10 minutes to walk 1/2 mile or bike almost two miles! Walking and cycling produce no pollution, and are excellent forms of exercise.
- **Taking the Bus:** Buses usually run regardless of the number of passengers. A bus with as few as seven passengers uses less fuel per passenger per mile than a typical car carrying only a driver. A bus with 40 passengers uses much less fuel than 10 cars with four passengers each.
- **Ride-sharing or Carpooling:** With two people in a vehicle, emissions per person are reduced by half; with three people, by even more. Regular trips to work, school, or after-school activities are the easiest to arrange around a carpool. Ride with, or give a ride to, classmates, co-workers or friends.

Auto Alternatives

If every one of the 200 million cars in the U.S. were replaced by cars that were just 10 mpg more fuel efficient, carbon dioxide emissions would be reduced by 250 million tons per year, cutting our annual carbon dioxide contribution to global warming by nearly 20%.





How to be oil smart

- Limit unnecessary trips by combining errands and taking a shopping list so nothing is forgotten.
- Take the most direct route and choose destinations that are closer, such as a neighborhood store.
- Use the Yellow Pages and the phone to shop before heading to the store.
- Travel light; extra weight decreases fuel economy. Hauling an extra 100 pounds in your vehicle reduces fuel economy by up to 2%.
- Drive less aggressively. Aggressive driving—rapid acceleration and braking—can lower gas mileage by as much as 33% on the highway and 5% in town. Aggressive drivers are using an extra 125 gallons of gas and spending \$250 more than average drivers each year.
- Know when to use the air. Air conditioning can decrease your fuel efficiency by as much as 12% in stop-and-go traffic, so consider cracking the windows. But at high speeds, driving with the windows open can decrease the overall efficiency of the vehicle.
- If you are stopping for more than ten seconds—except in traffic—turn off your engine. Idling for more than ten seconds uses more gas and creates more global warming pollution than simply restarting your engine.
- Keep tires fully inflated and engines tuned for the best fuel efficiency.
- Use a fuel-efficient vehicle, and encourage your family to consider fuel efficiency and alternative fuels when buying their next car. For example, a car that gets 20 mpg uses an average of 600 gallons of gas, emits 6.8 tons of CO₂ and costs \$1380 in gasoline per year. As compared to a car that gets 40 mpg uses an average of 300 gallons of gas, emits 3.4 tons of CO₂ and costs \$690 in gas per year.

New Technologies

As fossil fuel supplies decline and concern about environmental impacts grow, people will look to alternative sources of fuel for their vehicles. Some new fuel vehicles are already in existence:

- **Electric Cars** use large stacks of batteries to power an electric motor. They are ideal for people who drive a limited distance each day, as recharging batteries can take up to several hours.
- **Electric-Assisted Bicycles** make biking a breeze for hilly areas, and can be pedaled where the land is more level.
- **Hybrid Vehicles** use a combination of electric and gasoline power to get very high gas mileage; they use an engine to convert a fuel, such as gasoline, into electricity on board the vehicle. Hybrid vehicles are powered by one or more electric motors or a combination of electric motors and motion from the engine. These vehicles are expected to serve as transition vehicles to fuel cell vehicles.
- **Fuel Cells** use hydrogen combined with oxygen as a fuel; their only emissions are clean air and water. America's space shuttles have used fuel cells for years to produce their electricity and drinking water. However, hydrogen must first be extracted from water using electricity produced at power plants.

While these technologies are exciting, there are several caveats. The electricity to charge batteries in electric cars and to produce hydrogen will be drawn from electric systems powered by nuclear energy (about 20%), coal and gas-fired generators (about 70%), and hydroelectric dams (about 10%) all across America. The overwhelming majority of electricity produced in the U.S. is from non-renewable, polluting sources.



Web Resource For Teachers

CURRICULUM RELATED:

<http://www.portlandonline.com/transportation/index.cfm?c=40561&a=222273>

Curriculum developed by City of Portland entitled “*SmartMoves*” for K-5th grade; many lesson plans, handouts, etc.

<http://www.portlandonline.com/transportation/index.cfm?c=40561&a=222276>

Middle School version of Portland “*SmartMoves*” curriculum; 10 lessons ranging from health and safety to environmental and planning issues, very comprehensive and lots extensions, handouts

http://www.climatesolutions.org/publications/CS_Smart_Moves_for_Washington_Schools_0-10-24_55.pdf

Washington State “*Smart Moves’ transportation & the environment’* activities for K-12

http://www.intercitytransit.com/files/25/More_Smart_Moves_Activity_Book.pdf

more Smart Moves curriculum: great lessons on transportation history in this country (el), water quality and impervious surfaces (e/m), health issues (e,m), economics and the environment (h), fuel efficiency and health (h); all have worksheets

<http://www.saferoutestoschools.org/lessonplans.shtml>

Marin County lesson plans for multiple ages; environmental, safety and health related

<http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/classact.html#1>

National Safe Routes to School Lesson Plan ideas; mostly focused on safety, many ideas but not laid out as ‘curriculum’

<http://www.saferoutesne.com/educators/srintheclassroom.html>

Nebraska SRTS site with fun powerpoint jeopardy game and activity ideas in classroom for K-8th graders; also links to other sites with classroom ideas

<http://www.saferoutes-wa.org/schools/curriculum>

Washington State SRTS site with myriad of links to curriculum sets



RESOURCES FOR CHILDREN ON CLIMATE/CO₂

<http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterToolsGHGCalculator.html>

Carbon calculator to compute individual carbon footprint from EPA

<http://www.epa.gov/climatechange/kids/index.html>

EPA produced site made especially for children. Simple explanations for children on climate change, climate, greenhouse effect, personal empowerment; games and related activities

<http://www.epa.gov/climatechange/wycd/waste/kids.html>

EPA produced site; climate wheel recommended for middle school students; carbon calculator, etc pretty good

<http://www.epa.gov/climatechange/kids/animations.html>

EPA produced site with animation and clear descriptions for elementary children of global warming; water cycle and carbon cycle. Three separate animation lessons.

<http://www.epa.gov/OMS/climate/420f05004.htm#step1>

EPA site to calculate Greenhouse emissions from passenger vehicle

<http://www.earthday.net/footprint/flash.html>

Fun, comprehensive lifestyle calculator

LOCAL INFORMATION

<http://www.ecoact.org/Programs/Transportation/index.htm>

Ecology Action's transportation page with descriptions of all of our programs.

<http://www.bikesmart.org/>

Ecology Action's Youth Bike Safety Education program

<http://www.ci.santa-cruz.ca.us/pw/ep/saferoutes.html>

Santa Cruz City produced site with bike/ped maps to local schools

<http://www.sctrfficsafety.org/index.html>

SC Community Traffic Safety Coalition site. Lots of local links relating to bicycle and pedestrian issues. See reference to Ride n' Stride Bicycle and Pedestrian Safety Program for K-5th grade children. For more information, contact Kithy Chavez at 454-4317.

<http://www.ci.santa-cruz.ca.us/pw/ep/warming.html>

SC City site that explains global warming in plain terms for adults.





<http://www.commutesolutions.org/calc.htm>

Demonstrates direct and indirect costs of driving. Program of SCCRTC

<http://projectbiketrip.org/>

The Bicycle Trip bike shop sponsored bike repair and education program for schools.

<http://peoplepowersc.org/>

Santa Cruz County Bicycle advocacy group and high school alternative transportation school program.

SAFE ROUTES TO SCHOOL (SRTS) RESOURCES

www.activelivingresources.org/saferoutestoschool.php

Includes a City SRTS program and other resources.

www.bikesbelong.org

The Bikes Belong Coalition's site includes photo library with SRTS images and other information about benefits of bicycling.

www.cdc.gov/nccdphp/dnpa/kidswalk

CDC's Kids Walk-to-School program; encourages children to walk to and from school

<http://safety.fhwa.dot.gov/saferoutes>

FHWA is responsible for administering federal SRTS program funds to state DOTs.

www.bikeleague.org/programs/saferoutes

The League's site includes a 4-minute video on SRTS, bicycling curricula and other resources.

www.saferoutesinfo.org

includes contacts for state SRTS coordinators, a guide, training opportunities, program tracking and evaluation resources, and information about International Walk to School Day.

www.railstotrails.org

RTC's site includes resources on walking, bicycling, health improvement, decreased oil use and reduced carbon emissions.

www.saferoutespartnership.org

SRTS National Partnership, a network of more than 400 organizations; includes interactive U.S. map that allows users to access SRTS-specific information for all 50 states;



Appendix I: Background Information on Climate Change

Provided by the Earth Day Network: <http://www.earthday.net/resources/2006materials/default.aspx>

What is climate change?

“...a truly global threat.”

- Kofi Annan, Secretary-General of the UN, Referring to climate change November 2004.

The term climate change refers to global changes in temperature, wind patterns, and precipitation. These changes are being driven by a gradual warming of the Earth's atmosphere (commonly referred to as global warming). The Earth's climate has been changing slowly over the centuries. Cold periods have alternated with warm periods. However, these changes have been happening at a much faster and devastating rate in recent years. The 1980s and 1990s were the warmest decades on record. Science indicates that this acceleration is due to human activity.

The Earth's atmosphere traps heat escaping from the surface of the planet, which keeps us warm. Carbon dioxide, part of the mixture of gases in our atmosphere (called greenhouse gases), is very good at trapping heat. Some of the greenhouse gases are released into the atmosphere from nature every day. For example, carbon dioxide enters the atmosphere daily from decaying plant matter and forest fires.

In the past, natural processes could handle the amounts of greenhouse gases generated, and the system remained in balance. In recent decades, however, human activity through increased use of fossil fuels and cutting down of forests has been overloading the natural processes. Greenhouse gases are now being generated by the burning of fossil fuels to run cars and factories and heat buildings, as well as by industrial processes. These releases of greenhouse gases have shifted the atmosphere's natural balance.


As well, large tracts of the Earth's forests are being cut down for wood and to clear land for farming and for cities and towns. That leaves fewer trees to absorb and store carbon dioxide from the atmosphere. The balance of gases in the atmosphere has changed significantly. The result: more heat is being trapped in the atmosphere. The more heat trapped, the warmer the Earth becomes, and the greater climates across the globe will change.

“Climate change is the most severe problem we are facing today, more serious than even the threat of terrorism.”

-David King, UK Government Advisor, January 2004.

Climate change is now accepted as a major threat to the world's continued viability. We are now experiencing major upheavals in weather, agricultural production, and fresh water availability, as well as a significant rise in sea levels from unrestrained carbon emissions. The impacts of climate change once thought of as unimaginable and farfetched are now occurring.

While there is consensus among most scientists, corporate leaders, government officials, NGOs, and international bodies that global warming must be halted, there is also consensus that for a variety of reasons public demand for immediate action lags far behind the need. Polls show that while 70% of Americans think



climate change is bad, solving climate change falls to the bottom of the list of concerns when compared to what people perceive as more immediate problems, such as crime, public education, housing, etc.

Whilst there is a powerful scientific, moral and commonsense case to be made for taking action, there has not been enough focus on how climate change will directly affect communities. As a result, the general public tuned out. The media downgraded the story focusing on distant effects, such as thinning ice, not the impacts on the human population and available solutions and politicians have been reluctant to take action until their constituents ask them to do something. The result of this has been confusion of what is happening and inaction.

Through Earth Day Network's work with 12,000 partners and NGOs in over 174 countries we know that we have the power to reach and educate large numbers of people. By focusing on climate change, and more specifically the solutions to climate change we can show individuals and communities how they can do something tangible to make a difference.

What is happening as a result of climate change?

"The Greenland ice sheet is likely to be eliminated in the next 50 years unless much more substantial reductions in greenhouse gas emissions are made"

-Jonathon Gregory, Climatologist, April 2004.

An increase in overall temperature is changing weather patterns. Hurricanes and other extreme weather are likely to be more severe and devastating, as witnessed recently by Hurricanes Katrina and Rita.

We are currently caught in a vicious cycle, as the temperature increases due to the use of fossil fuels and other activities the ice caps are melting. Not only does the melting of this ice raise water levels, but it releases carbon dioxide that has been trapped in ice for millions of years. This carbon dioxide further adds to the warming of the planet. If we cannot stem the melting of the ice through a reduction in greenhouse gas emissions we are inadvertently adding millions more tones of CO₂ into the atmosphere.


Some scientists are predicting that rain and snow will increase in some places and decrease in others. This would lead to floods in some areas and droughts in others. Severe weather, such as heat waves, extreme cold, tornados, windstorms, typhoons, blizzards, etc., may happen more often. Sea levels may rise, flooding low lands near oceans where millions of people live. Some of these areas may stay under water permanently. Vector borne diseases may spread to new areas. Species of plants, animals, and fish may become extinct as their habitats change.

How will this affect me?

"We have coastal erosion, droughts, and in the last decade we have experienced an unusual high level of tropical storms. Salt water intrusion into our soils has affected our traditional food supply and we now see the flooding of low-lying areas."

-Paani Laupepa, Ministry of Natural Resources Tuvalu, October 2001.

Climate change is already affecting and will continue to affect the whole world. Not only is the physical environment affected, but also the health, jobs, economies, cultures and communities of the people living on our planet.



Most developing countries do not contribute as many emissions to the atmosphere as industrialized, developed countries do. However, many people agree that developing countries will face the greatest hardships due to climate change. Developing countries do not have the money, the organizations or the technologies to help them adapt to current and future changes. There has been a reluctance of developed countries to promote the use of existing solutions as they have incorrectly been viewed as not economic.

Over time, it is expected that rainfall in Africa and the Middle East will continue to decrease. This means less water for people to use for drinking, cleaning, and growing crops, in a region where water is already scarce. Low-lying countries and islands like the nations of Southeast Asia may be submerged as sea levels rise, displacing large populations. As weather patterns change around the world, people who depend on crops for their livelihood will find it increasingly difficult to get good yields.

As climate change progresses it is impossible to say for sure what exactly will be affected. The only guarantee is that millions of people will lose family members, homes, communities, and jobs due to climate change. It is highly unlikely that anyone, rich or poor, black or white will be unscathed.

What can I do?

While we could never stop the natural cycles of warming and cooling in the climate, we can reduce our own personal contribution. There are many things that you as an individual can do. These include:

Be energy efficient in your choices. There are many energy efficient alternatives to every day items, whether it be a compact fluorescent light bulb, a more effective refrigerator, or a hybrid car the smallest change will have a big impact on climate change.

Use renewable sources of energy and make your home more energy efficient. There are often tax incentives and long-term savings to be made by switching to renewable sources of energy. Visit <http://www.dsireusa.org> to see the various grants and incentives available in your state.

Educate yourself and others. The more you know the bigger, more effective difference you can make in your community. Please see our resources page (<http://www.earthday.net/resources>) for helpful fact sheets, talking points, and links to climate change websites. In addition, teachers and other members of Earth Day Network's Educators Network can access climate change lesson plans on the Teacher's Corner (<http://www.earthday.net/involved/teachers/default.aspx>).

Vote for the best candidate in local and national elections. Ask your local representative where they stand on climate change and what solutions they plan to implement in your area. To find out the contact address for your local representative check <http://www.congress.org>.

Take Earth Day Network's Earth Day Footprint Quiz to see how your actions impacts affect the environment and what actions you can take to change it (<http://www.earthday.net/footprint/index.asp>).



Appendix II: Climate Change Fact Sheet

Provided by the Earth Day Network: <http://ww2.earthday.net/node/149>

Oil and cars

- Unless we make fundamental transportation changes, in 2030 the number of automobiles in the world will increase by 50%.
- According to Chevron, the world consumes two barrels of oil for every barrel discovered.
- It took 125 years to consume the first trillion barrels of oil in the world will consume the next trillion in only 30 years, according to Chevron.
- By 2030, the world will consume 47% more oil than it did in 2003.
- New energy discoveries are mainly occurring in places where resources are difficult to extract physically, technically, economically, and politically.
- Oil production is in decline in 33 of the 48 largest oil-producing countries, yet energy demand is increasing around the globe as economies grow and nations develop.
- Oil and gas currently provide more than half of the world's energy supply, and according to the International Energy Agency, they, along with coal (which also releases CO₂) will continue to be the major sources of energy well into the 21st century unless things are changed.
- The International Energy Agency estimates that the world will need to invest \$16 trillion over the next three decades to maintain and expand energy supply.
- Over half the world's oil supplies lie in just 5 countries.

Temperature and sea level changes

- During the last one hundred years the global temperature has warmed by an average of 0.6°C.
- It is predicted that global temperatures in 2100 will be 5.8°C warmer than they were in 1990. This will make the Earth warmer than it has been in 50 million years.
- Much of the United States has already warmed, by as much as 4°F.
- None of the lower 48 states in the U.S. experienced below average temperatures in 2002.
- The current pace of sea-level rise is three times the historical rate, and appears to be accelerating.
- Scientists estimate the sea level will rise by 19 inches by 2100, though it could rise as much as 37 inches.
- Of particular concern is the stability of the West Antarctic Ice Sheet. A sudden collapse would raise sea levels 16-20 feet, though the likelihood of such a collapse before the year 2100 is low.

Carbon dioxide

- Since the beginning of the Industrial Revolution, carbon dioxide (a green house gas linked to climate change) in the atmosphere has increased by 31%.
- Despite natural emissions of carbon dioxide (CO₂) emitted by volcanoes, for example, human activities are now adding about 7 billion metric tons of carbon into the atmosphere every year.
- Automobiles count for a third of the U.S.'s Carbon Dioxide (CO₂) emissions—the largest source after power plants.
- Each gallon of gasoline burned creates about 20 pounds of CO₂.
- Vehicles in the United States release more CO₂ than all the energy sources (such as heating, electricity, vehicles, and factories) in all of India.



Converting CO₂

- One fully grown tree transforms 13 pounds of CO₂ per year.
- One acre of trees produces enough oxygen for 18 people every day.
- There are approximately 400 trees per acre of land in forested areas.
- On average, it takes one acre to convert 1.25 tons of CO₂ per year

Effects of climate change

- Diseases such as malaria and West Nile virus will occur in large numbers in the U.S. as a result of warmer temperatures, because the carriers of disease (i.e. mosquitoes) thrive in warmer climates.
- Global warming is already impacting agriculture and biodiversity. 10% of all known plant species are under threat of extinction.
- 17 Million Americans, 5 million of which are children, suffer from asthma.
- Childhood asthma rates more than doubled from 1980 to the mid-1990s and they remain historically high. Asthma is one of the most prevalent chronic childhood diseases and is a major cause of childhood disability according to the CDC.
- Currently, at least 14 million school days are missed annually to asthma (CDC).
- People living in cities such as Atlanta, Baltimore, and Cincinnati could by mid-century see a 60% increase in the number of high smog level days.
- The Arctic ice pack has lost an area twice the size of Texas since the mid-1970's.
- Climate change is having a disastrous effect on coral reefs, including in the Florida Keys, the Bahamas, and Mexico.
- Winter temperatures in the Arctic have warmed by as much as 7° F over the last 60 years, a faster rate than in any other region. This affects wildlife such as foxes, caribou, walruses, and polar bears. It also affects the lifestyles of native peoples in the Arctic.



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