Dinosaurs Continue to Threaten the World!

Every time you ride in a car, turn on a light, or turn up the heater, a dinosaur is endangering your health, your planet, and your future!

You’ve probably never thought of dinosaurs as a threat to today’s world. Yet the dinosaurs that lived millions of years ago are threatening the world today. How?

The remains of prehistoric animals and plants became oil, coal, and natural gas. These “fossil fuels” are burned to power cars, heat buildings, run factories, and generate electricity to light our homes and run our appliances.

Fossil fuels provide approximately 80% of our energy! They power the world. But burning these fuels releases tons and tons of emissions into the air every day. And these emissions are polluting our air and also causing global warming.

Immediate Effects:
- causes chest pain
- coughing, nausea, headaches
- stings eyes
- makes breathing difficult
- increases asthma attacks
- turns air brown
- decreases visibility
- injures leaves and stunts plant growth

Long-Term Effects:
- prevents proper lung development in children
- increases respiratory illnesses
- increases risk of cancer
- affects animals’ health
- eats away plaster
- cracks rubber
- corrodes metals
- peels paint and fades color
- damages fabrics
- decreases property values
- tourism
- hurts agriculture

Global Warming

A natural, invisible layer of gases over the Earth traps some of the sun’s heat that radiates from our planet back into space. These gases help keep the Earth warm and livable. But more and more of these gases are being released into the atmosphere from the activities of humans, so more and more heat is being trapped. This is increasing the average temperature on Earth.

Caused by:
- Carbon dioxide (CO₂)
- Other gases – methane, nitrous oxide, chlorofluorocarbons (CFCs)

Effects:
- melts glaciers, which could raise sea levels and flood coastal areas
- melts polar ice, which polar bears depend on to live
- disrupts ocean currents, which changes climate patterns and affects wildlife
- causes more hurricanes, tornadoes, and cyclones worldwide
- changes and harms forests, crop lands, coral reefs, and wildlife habitats

Acid Rain

Emitted gases mix with water vapor and oxygen in sunlight to form acid rainwater. This acidic water falls to Earth as either rain or snow or fog.

Caused by:
- Sulfur oxides (SOₓ)
- Nitrogen oxides (NOₓ)

Effects:
- damages forests and crops
- kills fish and plants
- eats away buildings and statues
- pollutes water supplies

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It’s a sunny summer day, so naturally you want to go outside and play – rollerblade, bike, shoot baskets, whatever. But as you look out, you see that familiar brown haze in the sky. It’s a sunny summer smoggy day. The rap song starts to play through your head – “Smog...I’ll choke ya...Smog...it’s no good.”

You know that when you play outdoors on a smoggy day, your eyes sting and sometimes your throat hurts and your chest feels tight. But what you may not know is that the smog could very well be making you sick and doing some permanent damage to your heart and to your lungs. And you, as a kid, are at greater risk.

### Bad for Me, Worse for You
Air pollution is harmful to everyone, but the effects are worse for young people. Why?

One reason is that children and teens breathe faster and take in more air in relation to their body weight and lung size. And when playing hard, kids, like everyone else, breathe through their mouths. That means the air doesn’t pass through the natural filters in the nose; thus, the lungs are exposed to more pollutants.

Another reason that air pollution is harmful to those not yet grown-up is that they have not yet grown up. Bodies that are still growing and developing are more likely to be harmed from pollutants.

### Not Just an irritation
Besides just irritating the eyes, nose, sinuses, throat, and bronchial tubes, air pollution can cause serious, long-term damage. For example, children brought up in smoggy cities have been shown to have 10 to 15% less lung capacity – for life! And studies indicate that as air pollution increases so do such illnesses as bronchitis and asthma. Other studies report that more people die on heavily polluted days than when the air is relatively clean. In California, it is estimated that each year more than 9,000 people die prematurely as a result of illnesses aggravated by air pollution. Many more people are absent from school and work because of the effects of smog.

### Breathe Easy
So, it’s a smoggy day ... what do you do? Some tips include:
- cut back on outdoor activity, especially in summer
- exercise in the morning, particularly in summer
- stay indoors if you have bronchitis, asthma, or heart disease.
- And, of course, do your part to help reduce emissions that cause smog, so maybe your kids won’t have to worry about playing outdoors on a smoggy day.

### Smog..It’ll Choke Ya!

**What’s Your AQI?**

If you track the air quality index over time, you’ll notice seasonal trends. For example:
- Carbon monoxide is higher in the fall and winter months. Cold weather makes it much more difficult for emissions control systems on cars to work efficiently. Also, CO is higher in the mornings and evenings because of rush hour traffic.
- Ozone is higher in the summer. Heat and sunlight transform the hydrocarbon and nitrogen dioxide emissions into ozone. In most areas, ozone is higher in the afternoon when the sunlight has had time to react with emissions.

### Change with Seasons
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### What’s your community’s AQI...and what are you doing to improve it?

### Causes and Effects of Air Pollution

- **Smog...It’ll Choke Ya!**
- **What’s Your AQI?**
- **Change with Seasons**
- **What’s your community’s AQI...and what are you doing to improve it?**
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Combustion Chemistry

Air pollution comes from burning fossil fuels – in power plants, industries, vehicles. Today, air pollution is created mostly from the emissions from cars, trucks, planes, and trains.

To see just how vehicles create these emissions, we need to do a little “combustion chemistry.” Don’t worry, it’s not hard.

What Makes a Car Go?

First, let’s look at how a car works. In a car’s motor – called an internal combustion engine – four to eight pistons move up and down... to turn a crankshaft... that is connected to a drive train... that eventually turns the wheels of the car. This is sort of like the pedals of a bicycle going up and down... to turn a sprocket... that is connected to a chain... that eventually turns the wheel of the bike.

To push each piston down in its cylinder in the car’s engine, small amounts of vaporized gasoline (which is made from oil, a fossil fuel) are exploded, or combusted (get it... internal combustion engine), by a spark from the spark plug. The hot gas expands and pushes against the piston head. As the piston moves back up, it pushes the combusted gas out of the combustion chamber, making room for more vaporized gas to continue the process.

This action, of course, happens quickly over and over and over – just like the pedals on a bike going round and round and round.

The exhaust moves out of the combustion chambers, through the muffler, out the tailpipe, and into the air... vehicle emissions.

In a Perfect World

If combustion were complete – that is, if the gasoline were all burned – the emissions would not be such a problem. But combustion is rarely complete.

Getting Dieseled

You’re in your car at a stoplight, waiting behind an old yellow school bus. The light turns green, the bus moves out, and you are enveloped in a cloud of thick, black smoke. “Phew!” you say, trying to cough and hold your nose at the same time. “This can’t be good for me.”

You’ve just been “Dieseled” – and you’re right, it’s not good for you.

Dirty Diesel

Diesel engines, which are internal combustion engines designed to burn diesel fuel, have always been dirtier than other engines. They produce more emissions, especially fine particulate matter. One older, heavy-duty diesel truck can spew out as much soot as 150 average new cars! And diesel emissions do more harm.

Studies have found that the particles in diesel exhaust can cause cancer. That’s right.

There’s a cancer risk just breathing the air, especially when you’re driving in heavy traffic or standing at a busy intersection. The tiny particles can be inhaled into the lungs, where they embed themselves. There, chemicals dissolve out of the particles and spread through the body.

Even smaller particulate matter – nanoparticles, which are one thousandth the width of a human hair – are known to be able to cross into areas of the body that the larger particles cannot reach. Not good – especially over a lifetime.

Workhorses

So why don’t we just quit using diesels? Because diesel engines are like workhorses. They are powerful and reliable; they use less fuel than gasoline engines; and they are tough enough to be driven for years and years.

Ships and dock equipment that bring goods into ports, trains and trucks that haul products, tractors and bulldozers used on farms and in construction, and buses that transport people – all burn diesel fuel. Reducing diesel pollution without disrupting the many industries that depend on diesel engines is a big challenge.

The Clean-Up

Only a small percentage of all our vehicles run on diesel fuel, but in the past these vehicles had accounted for a very high percentage of pollutants pumped into the air. So, three basic approaches have been taken to clean up diesel exhaust.

1. Improve the diesel engine.

Newly designed diesel engines are much cleaner than those sold 10 or 15 years ago. These new diesel engines use filters – particulate traps – that can reduce particulate emissions by 80 to 90 percent. Some also have oxidation converters – like catalytic converters in gasoline-powered cars – that can reduce nitrogen oxide emissions by 25 to 50 percent. But this doesn’t mean the air will be instantly clean. The changes apply only to new engines. Many older diesel engines on our roads, railways, and waterways are still spewing out pollution. Government agencies are providing funding incentives to get these older vehicles replaced as soon as possible.

2. Clean up diesel fuel.

A new diesel fuel has been developed that has 97% less sulfur, a smelly element that affects both our health and the environment. The new fuel also reduces the emissions of particulate matter and of nitrogen oxides, both ingredients in smog. The new fuel will help older diesel engines run cleaner; but the new diesel engines running with the new fuel (the only fuel they will run on) will produce 88 percent fewer particulates, 77% less nitrogen oxides, and 3000 percent less sulfur! That means diesel can meet the same emission standards as gasoline-powered cars.

3. Convert to other fuels.

Many diesel trucks and buses are being converted to natural gas engines. Cleaner-burning natural gas has become particularly popular for buses that stay within a local area. Because they return to a central spot, they do not need to worry about finding places to fuel up. Also, a locomotive engine called the Green Goat uses more than 300 batteries along with its small diesel engine to improve fuel economy and reduce pollution.

Slowly but surely, dirty diesel is becoming a thing of the past.
More People
Many of the older “polluter” vehicles from the excessive pollution. These checks – either once a week or every 3 months – allow the gas to burn more completely so that carbon monoxide emissions were reduced. These catalytic converters were added to gasoline to keep engine deposits from building up, which helped fuel burn cleanly. Also, gasoline was produced with higher oxygen content, which is needed for complete combustion. The catalytic converter is one of the biggest reasons today’s cars produce less than 5% of the emissions produced by cars of the 1960s. The catalytic converter is also great for eliminating lead emissions, which are toxic to humans. Catalytic converters required unleaded gasoline, resulting in the rapid decline of the use of lead in gasoline.

The Catalytic Converter
Catalytic converters first appeared in new cars in 1975. According to many people, it was the most important device invented in the war against smog. Installed in the exhaust system of vehicles, the catalytic converter reduces carbon monoxide, hydrocarbon, and nitrogen oxide emissions. The catalytic converter is one of the biggest reasons today’s cars produce less than 5% of the emissions produced by cars of the 1960s. The catalytic converter is also globally responsible for eliminating lead emissions, which are toxic to humans. Catalytic converters required unleaded gasoline, resulting in the rapid decline of the use of lead in gasoline.

Reformulated Gasolines
Since burning gasoline in cars causes harmful emissions, it makes sense to try to change the gasoline so that it produces fewer emissions. The Clean Air Act has required just such changes in gasoline sold in smoggy areas. In the 1980s, detergents were added to gasoline to keep engine deposits from building up, which helps fuel burn cleanly. Also, gasoline was produced with higher oxygen content, allowing the gas to burn more completely so that carbon monoxide emissions were reduced. These “reformulated gasolines” helped reduce smog-forming emissions as much as 25%.

Smog Checks
In the 1980s, many states began to require vehicle checks to identify and fix vehicles emitting excessive pollution. These checks – either once a year or once every two years – have helped remove many of the older “polluter” vehicles from the roads.

The Battles So Far...

In 1970, the Clean Air Act (CAA) was passed. This federal law and its amendments in 1977 and 1990 established many requirements for states, industries, businesses, automakers, and others to reduce air pollution throughout the United States. Since motor vehicles are a major source of smog in the U.S., the Clean Air Act has many regulations that affect cars. Violators of CAA requirements can be fined or penalized in other ways.

The CAA and the development of new technologies are helping us defeat smog. We have made progress in the war against smog. Smog has retreated. For example, in California, ozone levels today are about half of what they were in 1980, and the number of “Health Advisories” has decreased from about 120 days per year to only about 20 days per year in the 2000s.

But despite all of the improvement, the war isn’t over. Smoggy cities, such as Los Angeles and Houston, must continue to work hard to meet Federal and State standards for ozone, particulate matter, and other air pollutants. It has been estimated that 160 million Americans live in areas in which at least one air pollutant is over the standard established by the Environmental Protection Agency. And, unfortunately, the decreases in pollutant levels seem to be leveling off since 2000. Air pollution from motor vehicles is still a major problem. With all that’s been done to reduce emissions, how can this be?

More People
First, there are simply a lot more people today, and the population keeps increasing. Not only are there more people, but also the people own more cars. Whereas a family of four in the 1960s might have owned one car, many now own two or three. There are 600 million passenger cars in the world today; by the year 2030, twice as many cars are expected – 1.2 billion.

More Miles
All these people are also driving more miles, which means they are burning more gasoline. Between 1970 and 2000, the total annual number of miles driven in the United States tripled – from 1 trillion to 3 trillion miles per year.

The war continues...

The number of miles per year is increasing so rapidly because:

- Many people commute long distances to work
- Three-fourths of the people drive to and from work alone
- Little mass transit is available in many cities.

More Vans, Trucks, SUVs

Mini-vans, small trucks, and especially sport utility vehicles have been very popular. And that’s been a problem because in the past, gas-mileage and emission requirements for these vehicles were not as tough as for cars. But this is changing. By 2009, cars of all sizes in California will have the same minimum standards for gas mileage and emissions.

More Products and Product Movement
As our population increases, so does business. For example, more products are manufactured, more ships bring products into ports, more equipment is used to load and unload the cargo, and more trucks and trains move the products all over the country. And all this activity increases air pollution.

All of our efforts at fighting smog have worked well, but they won’t be enough for the future. We must continue to reduce the emissions from motor vehicles and other sources if we’re going to win the war against air pollution.
Cool Cars

What kind of cars did your grandparents drive when they were young? No matter what kind, they were most likely powered by an internal combustion engine – basically the same kind of engine that powers most cars today. The internal combustion engine (ICE) has been around for more than 100 years.

But now, finally, car companies are developing other ways to power cars – ways that produce less pollution. Most of the new cars being developed are a form of the original electric vehicle (EV), which has been around since the early 1900s. Cars powered by electric motors have no tailpipe emissions – in fact, they have no tailpipes – so they are much less polluting than those powered by ICEs.

Some of these cars are available now; others are on the way. Before long, you may be driving one of these cool cars.

"Hybrid" means "of mixed origins" and a "hybrid vehicle" is a mixture of power sources – both an internal combustion engine and an electric motor.

Hybrid vehicles aren’t “zero” emission vehicles, since they do have an engine that uses gasoline. But their emissions are extremely low. Hybrids get good gas mileage because they run on both gasoline and electricity at the same time. And their electric batteries never need to be recharged! As the car runs, the gas engine turns a generator that charges the battery.

With a fuel cell, a vehicle can make its own electricity to power the electric motor – no need to plug in for a recharge.

Fuel cells have been around for more than 100 years, and they have been used to provide power in spacecraft. But they were always thought to be too expensive, too big, and too heavy to use in vehicles. Now, with new technology, that has changed. Fuel cell cars and buses are beginning to appear.

BETTER ICE

How has the internal combustion engine (ICE) been improved?

Through the years, technology has tweaked and toyed with the engine to save gasoline, improve performance, and reduce emissions. Some improvements include:

- Catalytic Converter to change polluting emissions into non-polluting emissions.
- Fuel-Injection to mix just the right amount of fuel and air for more complete combustion.
- Variable Valve Timing to precisely control when the valves open and close in each cylinder, resulting in more complete combustion.
- Lean Burn Engines to run on a "lean" mixture of fuel – more air, less gasoline; instead of the usual air to fuel ratio of 14.5 to 1, in the lean burn engine, it is about 22 to 1.
- Direct Injection to deliver the fuel right into the combustion chamber, which allows for “ultra-lean” mixtures – up to 50 to 1.

Each of these technologies cuts down on the amount of fuel used and the amount of emissions going into the air.

HYBRID VEHICLES

What’s it like to drive a hybrid vehicle?
The electric motor starts the car running. As speed increases, the internal combustion engine automatically turns on and assists in powering the car. In most hybrids, both the internal combustion engine and the electric motor are powering the car together most of the time. When the driver takes his/her foot off the accelerator to slow down, both the engine and the motor shut off.

There are a number of hybrid vehicles available today, such as the Toyota Prius shown here. In 2000, the year that hybrids were first introduced in America, only 9,000 were sold. By 2005, more than 205,000 were sold, and the number is increasing each year.

PLUG-IN HYBRID VEHICLES

Plug-in hybrids, like regular hybrids, have both a gasoline engine and an electric motor. But the plug-in hybrid has additional batteries installed, which allows the car to function as just an electric vehicle. The driver can turn off the gasoline engine and drive 30 to 40 miles on electric power only. That’s far enough for the daily commute of many drivers. But if you need to go farther, you can turn the gas engine on to help power and charge the car. Back at home, just plug the car into the wall to fully recharge the electric batteries overnight.

With a plug-in hybrid, your gas mileage can approach 100 mpg.

Emissions. The only air pollutants come from the power plant where the electricity needed to charge the battery is generated.

FUEL CELL VEHICLES

The Toyota Prius is available in both hybrid and plug-in hybrid models.

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The fuel cell combines hydrogen (in the fuel tank) with oxygen (from the air) to produce electricity to power the vehicle’s electric motor. And the only emissions are heat and pure water vapor. No pollutants.

Some fuel-cell vehicles can put compressed natural gas or even gasoline in their fuel tanks and then "reform" these fuels to produce the hydrogen needed to power the fuel cell. Some pollutants are produced with reformed fuels but up to 90 percent fewer emissions than with gasoline in an internal combustion engine.

So what’s the problem? The hydrogen fuel presents challenges. Hydrogen must be stored under pressure at an extremely low temperature, which is difficult to do. Also, there aren’t many fueling stations for hydrogen though some are being built.

These challenges, as well as others, currently make fuel cell vehicles very expensive. Costs will need to come down before we see many fuel cell vehicles on the road.

Toyota’s Fine N fuel cell concept car.
You’re driving across the state, even the country, and your car or truck is running low on fuel. What do you do? Easy. You pull into a filling station where you pump gasoline or diesel fuel into your vehicle. And you’re back on the road. That’s the way it’s been for years.

Gasoline isn’t the only fuel, however, that can run your car. Several others are powering cars, trucks, and buses, and others are being developed. Unlike gasoline, some of these fuels are renewable, which means we’ll never run out of them. And all of them burn cleaner than gasoline, which means they produce fewer emissions. Though we don’t see many yet, new types of filling stations are appearing along our roads.

Natural Gas

Natural gas – the same natural gas used for cooking and heating – is often a popular alternative to gasoline. Besides burning much cleaner than gasoline, it can be used in the internal combustion engines we already have, with a few changes to the engine.

Natural gas has other advantages. First, we have a huge network of underground pipelines that bring natural gas to our homes and businesses. Also, in the U.S., we have a lot of natural gas, so we don’t have to depend on importing it from other countries.

To use natural gas for vehicles, it must be either compressed or liquefied. Compressed natural gas (CNG) must be stored under great pressure in big, heavy cylinders. These cylinders can be a problem because:

1) They are expensive.
2) Only a few can be put in a vehicle due to their size and weight, so you can’t drive as far as with gasoline.

Liquefied natural gas (LNG) is made by refrigerating natural gas to minus 260˚ Fahrenheit to condense it into a liquid. LNG must be kept at this extremely cold temperature, but it takes up less space than CNG, which means more energy can be stored in the same amount of space. Thus, you can drive further with LNG.

Because the number of fueling stations is limited, the main use of both CNG and LNG is for vehicles that return to a central place each night for refueling. CNG is used mainly in fleet vehicles – “company cars.” And LNG, with its added power and driving range, is good for heavy-duty vehicles, such as trash trucks, delivery trucks, and busses.

Liquefied Petroleum Gas

Propane, or liquefied petroleum gas (LPG), is a low-emission fuel that has been in use for many years. Worldwide, approximately 9 million propane vehicles are now on the road. Many cities power taxis, police cars, buses, trolleys, and fleet vehicles with propane. But propane is not widely available, so it is used mainly only when private fueling facilities are available.

Ethanol

Ethanol is primarily made from the same corn that’s grown to feed livestock. Thus, it is a renewable fuel. Ethanol also burns cleaner than gasoline, so it is currently mixed into gasoline in a ratio of 10 percent ethanol to 90 percent gasoline and sold particularly in areas with air pollution problems.

Ethanol is now also being used to make E85 – a fuel than contains 85 percent ethanol and 15 percent gasoline. E85 can be run in any engine that can be used only in “flex-fuel vehicles.” It is currently being used to run on either 100 percent gasoline or on a mix of gas- line with up to 85 percent ethanol. Currently about 24 models run on E85 – mostly SUVs and trucks.

E85 does reduce the overall pollution to the environment, but since there’s less energy in ethanol than in typical, the car gets about 20 percent fewer miles per gallon of ethanol.

We couldn’t plant enough corn in the world to make enough ethanol to run our vehicles. However, a new form of ethanol is in the works. It allows ethanol to be made from bio-waste – such as waste from industries that produce food products. So perhaps in the next few years, more E85 will be produced and more flex-fuel vehicles will be developed.

Biodiesel

Want to run your car on left-over French- fry oil? It might be possible, if you had a diesel vehicle. Biodiesel fuel can be made from vegetable oils, animal fats, or recycled restaurant greases. It’s 10 or 20 percent vegetable oil and 80 or 90 percent conventional diesel fuel. Any regular diesel vehicle can run on these fuels.

Diesel vehicles will actually run on 100 percent vegetable oil – or waste vegetable oil from restaurants (like used french-fry oil from fast food restaurants!) – but not with- out significant modifications to the vehicle and perhaps some unknown effects to the vehicle!

Compared to regular diesel fuel, biodiesel does reduce tailpipe emissions, especially carbon dioxide, which contributes to global warming.

Hydrogen

Hydrogen may be the perfect automotive fuel. Hydrogen, either compressed as a gas or as a liquid, can be used in internal combustion engines. It not only gets good mileage but also burns very cleanly. And hydrogen’s combustion products are water and heat – the only emissions produced are heat and water vapor. Perfect!

Unfortunately, hydrogen isn’t produced in nature. Usually, we create it by chemically reforming either natural gas or methanol. But hydrogen can also be created using only water and the sun! Solar cells can be used to transform sunlight into electricity. Then this electricity is used to separate water (H₂O) – the Earth’s most abundant resource – into its hydrogen and oxygen elements. The result: “solar hydrogen” – the perfect zero-emission fuel.

So why haven’t we switched from gaso- line to hydrogen? There are some safety concerns and some problems with storing hydrogen. Also the process of creating hydrogen is presently still more expensive than producing gasoline, diesel, or natural gas. But hydrogen is so abundant and so clean that it could be the “fuel of the future.”

These alternatives to gasoline provide environmental advantages, but one is growing. Perhaps one will fuel your car of the future.

High Occupancy Vehicle (HOV) Lanes: These are also known as “carpool lanes.” Usually on major free- ways, one or more HOV lanes are reserved for cars carrying two or more people. These lanes are meant to encourage people to ride together, so that there are fewer cars on the road. In some states, these lanes may also be used by low-emission vehicles carrying only one person – such as hybrid or natural gas cars.

Traffic engineers and city planners have had lots of ideas about how to relieve traffic congestion. A few that are being tested are gaining some attention.

High-Occupancy Toll (HOT) Lanes: These are really carpool lanes that you are charged to drive in. But how much you pay varies according to how many people are in your car. With two occupants, you pay one fee, with three a lower fee, and maybe with four you can use the lane for free.

Personal Rapid Transit: Unlike a mass transit system, in which many people share a bus or a train, personal rapid transit has individual cars. The fare is per car, so you can ride alone if you choose, or share the cost with a few other people. At the station, you buy a ticket to a particular destination, get into a computer-controlled car that moves along a guideway above ground, and press a “go” button. The car takes you non-stop to another station in the system while you are free to do whatever you want. It’s quiet and quick for the rider since there is no stopping to pick up other passengers, and it’s good for the air since it runs on electric power.

Livable Communities: A good deal of traffic conges- tion is blamed on “sprawl” – the spreading of houses farther and farther from the areas where people work. In a “livable community,” work areas and living areas would not be in different places. The community would mix homes of all different prices and styles with stores, schools, offices, and other worksites. Goods (such as food and clothes) and services (such as laundromats and libraries) would all be within walking distance. Bike paths would connect to areas outside the community. And a public transportation center would easily provide travel to all other communities or “downtown” areas. The goal is to create a community built for people, not for cars.
On your way to the kitchen, you see your father already at work in his office – right down the hall. He is a telecommuter, working via e-mail and internet conferencing for a company thousands of miles away. But he rarely works alone since holograms of his co-workers from all over the country seem to always be floating around his office, having discussions with him. Your mother does commute to work, but on the electric-powered people mover, which leaves from the transit center a block away and drops her and other employees off right at their offices.

“Screen on,” you announce as you walk into the kitchen, and the back wall lights up. “Weather news,” you request, though the day’s temperature rarely won’t change what you wear since all your clothes are made from lightweight fabrics that automatically heat up or cool down to keep you at the perfect temperature. As the 3-D image of the newspaper reports the weather, you open the refrigerator and see that once again it is fully stocked. As soon as the supply of milk, juice, eggs, or other staples gets low, the refrigerator automatically notifies the grocery store for a delivery.

Outside, it’s a bright, sunny day, which means that the solar roof tiles on your house will be generating enough electricity to power your house. On cloudy days, your electricity comes from the generating plant at your house. On sunny days, your electricity comes from the solar roof tiles. On cloudy days, your electricity comes from the generating plant at your house. On sunny days, your electricity comes from the solar roof tiles. On cloudy days, your electricity comes from the generating plant at your house.

You hop into your electric vehicle, which is also powered by a hydrogen fuel cell. Today being sunny, your car’s photovoltaic outer “skin” will generate additional electrical current to charge the battery. The clear bubble roof closes and instantly adjusts its tint to allow in just the right amount of light. For a moment, you stare at the center of the steering wheel; a tiny camera reads the unique shape of your retinas and commands the engine to start. As the car backs itself into the street, the built-in speaker phone automatically calls Tanta to tell her you are on your way.

Tanta waves as you pull up to her house, and then points up to the sky. “Look,” she says. Looking up, you see many police and rescue “cars” flying in the air. Further down the street, you watch another police car on the road stop, unfold its wings, and take off vertically to join the others. “I think there’s been an accident,” Tanta exclaims as she jumps into your car. “I hope this doesn’t make us late for school!”

“Not to worry,” you reply, tapping your global positioning system screen. “The Smartway is wide open.” You’ve noticed that ever since the Maglev Rail Line was built from the port to carry cargo containers inland, very few trucks now crowd the Smartway. And those who do choose to use it have their engines magnetically levitated, electrically powered trains that are quiet and clean. You drive up to Kekko’s house, but he is nowhere to be seen. “I’ll find him!” Tanta states as she speeds her thumb from her forefinger, popping up a transparent screen from her finger glove. “His ID is programmed into my PCD (personal communication device), so I always know where he is, and right now, he’s just around the corner.”

“What’s up?” you holler to Kekko as you pull up alongside him while he is walking down the street, his head bobbing to the music playing in his ear, “Hey,” Kekko answers, “I was just trying out my new shoes!” Kekko is, indeed, sporting the newest model of nanogenerator shoes, which with each step produce electricity to power the wireless electronic devices built into his clothes, such as his PCD and music player.

With Kekko finally in the car, you head toward the Smartway, where as soon as you merge into traffic, your car locks onto a magnetic strip buried in the roadway. You take your hands off the wheel and command the car to roll back the bubble top and to turn up the music. As the car moves swiftly down the road, you look up at the clear blue skies.

Within minutes, you are pulling into your school’s parking lot. The three of you hop out and your car rolls away to park itself. As you walk onto campus, you see the school’s massive digital monitor announcing that everyone is to go to the Assembly Hall for a computer mind interface upgrade. “All you’ll have to do now,” the image on the monitor proclaims, “is think to pull up your computer screen, send messages…” “Oh my,” Tanta murmurs. “What is the world coming to?”

Kay, the future may not be exactly like this; perhaps you won’t have your own personal robot to make your breakfast and clean up after you, and maybe police cars won’t be spreading wings to fly. But many of the technologies described in the story are in use or are being tested and could be in common use before long.

One futuristic technology being tested is a “Smartway” vehicle control system – hands-free driving! A promising model uses magnetic sensors on the car that detect magnetic markers embedded in the roadway to keep the car in the proper position in its lane. But there’s more. The system will also detect vehicles, debris, or other obstacles in the road ahead so your car can automatically change lanes to avoid trouble and come smoothly down the road – all while you read a book or watch a movie or work on your computer. Reducing stop and go driving would truly help reduce air emissions, as well as increase safety and decrease stress!

The dreams of today can be the reality of tomorrow. What is the world coming to?
Technology is exciting. But it won’t clean up the air tomorrow. New cars, fuels, and roads take time and money. In the meantime, it’s up to you to reduce air pollution.

What can you do? Plenty!

Each and every one of us can help clean up the air every day, simply by the choices we make – the things we do or don’t do – without spending any or much money.

Look at the chart below and check off the behaviors practiced by you or your family. Also, on the Think Earth website, you’ll be able to print a list of recommendations indicating what your family and your school can do to support the environment even more.

Rememb... the only real solution to air pollution is for everyone to take care of the air!

Save Energy at Home

- Turn off lights, TVs, radios, appliances when you leave a room.
- Use toaster oven or microwave oven to cook small meals.
- Use light timers to automatically turn off lights.
- Keep the heater thermostat low – 68° or lower.
- Keep the air-conditioner thermostat high – 78° or higher.
- Close vents in unused rooms.
- Recycle and reuse paper, plastics, and metals.
- When replacing household appliances, choose ones that use less energy.

Promote Clean Air

- Use and support mass transit systems.
- Use and support bike lanes and pedestrian pathways in your community.
- Respond to newspaper articles and television shows about air-related issues.
- Support actions for clean air in your community.
- Call 1-800-CUTSMOG to report smoking vehicles.
- Write to elected officials to let them know that clean air matters.

Did you know? It costs a lot to keep your house lit and powered – both economically and environmentally. A typical American family spends $1,300 a year on utility bills. And the electricity generated by fossil fuels for a single home puts more carbon dioxide (CO2) in the air than two average cars (U.S. Department of Energy).

Earth website – www.thinkearth.org – you’ll find two environmental surveys, one to use at home and one at school. Once you complete the surveys and enter your answers on the Think Earth website, you’ll be able to print a list of recommendations indicating what your family and your school can do to support the environment even more.