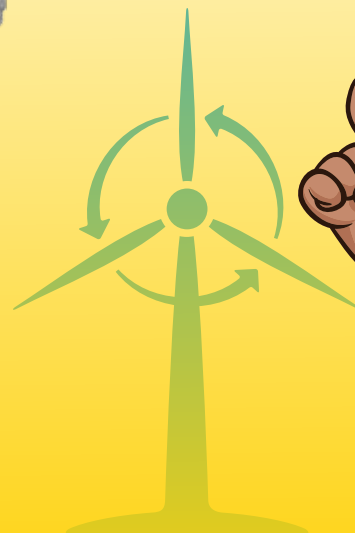


NEW YORK STATE

CONSERVATIONIST



Road to a Cleaner Future
Driving Away from Fossil Fuels!





NEW YORK STATE

CONSERVATIONIST



In this issue, students will learn how burning fossil fuels like gasoline and diesel in vehicles (cars, trucks, and buses) creates harmful pollution that can affect our health and the earth's climate and environment. Driving electric vehicles can help us use less fossil fuels, reduce pollution, and fight climate change.



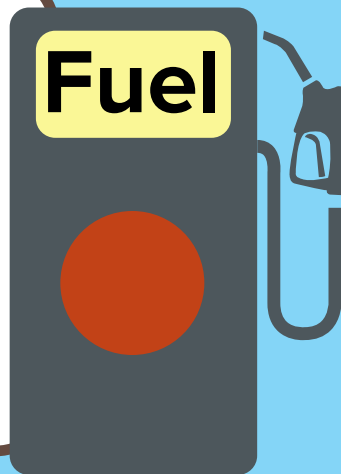
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HOW DO VEHICLES GO? HOW DO THEY MAKE AIR POLLUTION?

Most vehicles on the road today are powered by engines. An engine is a machine that burns fuel to make energy, moving the parts and wheels in a vehicle. Vehicles burning fossil fuels like gasoline and diesel make air pollution in the form of exhaust. A big part of this exhaust is carbon dioxide (CO₂), a greenhouse gas that is changing our climate. These tailpipe emissions are also harmful to human and environmental health.



Fossil fuels are used to make gasoline and diesel fuels that power engines. Fossil fuels are made deep underground, from plants and animals that died long ago. Mining and drilling for fossil fuels also makes air pollution and disturbs habitats where animals and plants live.

How do electric vehicles work? Do they cause air pollution?

- Electric vehicles use battery power instead of fuels to make the vehicle go. Vehicle batteries need to be charged up by plugging them into outlets or at fast-charging stations.
- If the electricity used to charge the vehicle comes from fossil fuels such as coal or natural gas, then there will be pollution made at the power plant.



- Charging electric vehicles with wind or solar power reduces air pollution.
- Driving an electric vehicle does not cause air pollution in your neighborhood.
- Scientists and engineers are working on more efficient and easier-to-recycle batteries to reduce environmental impacts and air pollution even more.



THE MYTH

MYTH:

You can't travel very far with an electric vehicle.

TRUTH: Electric vehicles are traveling farther than ever before. Some can go over 250 miles on a single charge.

MYTH:

Electric vehicle batteries take too long to recharge.

TRUTH: Fast-charging stations can have drivers back on the road in 30 minutes with an 80% charge.

MYTH:

Electric vehicle batteries don't last very long.

TRUTH: Electric vehicle manufacturers in the US guarantee their batteries last at least eight years or 100,000 miles. Most are expected to outlast the usable life of the vehicle.

THE AUTOMOBILE TIMELINE

Earliest cars are powered by windmills, springs, and steam.



Electric vehicles are popular and in demand. Thomas Edison works to build a better battery (1900-1912).



GAS



First electric vehicles
(1828-1835)

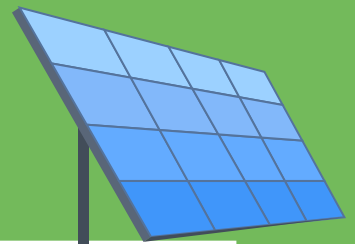


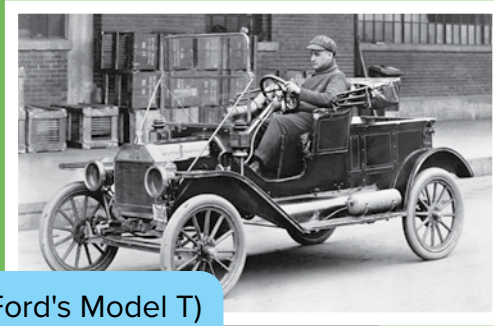
Cars become smaller,
more fuel-efficient, and
emit less pollution (1980).



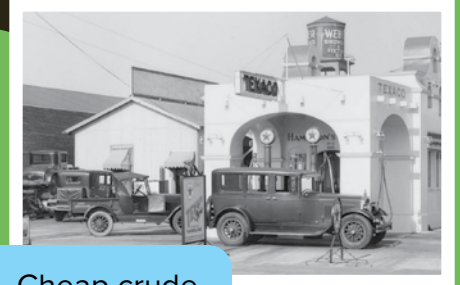
New regulations to reduce
pollution from vehicles create
renewed interest in electric
vehicles (1990-1992).

Manufacturers work to improve
electric vehicles and batteries
(1996-2000).

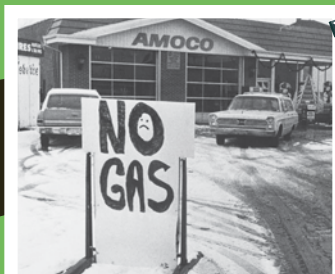




Gas powered cars (Ford's Model T) become widely available and affordable (1908-1912).



Electric vehicles decline. Cheap crude oil, a fossil fuel, is discovered in Texas and gas becomes available at stations across the U.S. (1920-1935).



High gas prices and shortages lead to the development of a few electric vehicles. With limited battery power, these electric vehicles cannot travel very far and people lose interest (1968-1979).



Large road cruisers using a lot of gas and causing a lot of pollution are built (1950-1960).



With the introduction of the Tesla Model 3, electric vehicle sales in the U.S. increased 80% in 2018. Sales are expected to increase again, with goals of reducing greenhouse gases to fight climate change (2018 to present).



Investments in nationwide charging infrastructure, developments in technology, and cheaper batteries lead to a wide range of electric vehicles (2006-2014).



HEALTH EFFECTS



When the air is clean, we can breathe easier and be more active outdoors. People with asthma sometimes have trouble breathing when the air is polluted. The closer you are to a busy road, the more pollution there is in the air. Some people live in areas that have busy streets with lots of vehicle emissions. Try to stay away from busy roads when walking and playing, especially in the morning and afternoon when traffic is heaviest.

Types of Pollution from Fossil Fuel Engines

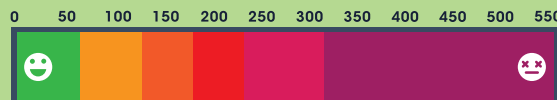
Particulate matter (PM) is made of tiny pieces of soot, sort of like dust or dirt. Some of these particles are so small you can't see them, and they can go deep into your lungs. Breathing in particulate matter can trigger an asthma attack or irritate your throat and make you cough.



Other pollution includes invisible gases such as nitrogen oxides (NO_x) and carbon monoxide (CO). Breathing in too much of these pollution gasses is harmful to people, our pets, and wild animals. Some of these gasses can make your eyes sting, others can make it hard to breathe.

How do you know when the air quality is bad?

The Air Quality Index (AQI) is a color-coded scoring system for outdoor air quality. If you go to <https://on.ny.gov/nyaqi>, you will find more information on the AQI for New York State. If the map is colored orange, red, or purple, it is best to limit your outdoor activities or just play inside. Green means the air is good so head outdoors to enjoy some fresh air.



Many children and adults have asthma. In 2018, an estimated 19.2 million adults and 5.5 million children in the U.S. had asthma.

Asthma is a chronic lung disease that sometimes makes it hard to breathe. People with asthma are more sensitive to breathing in things like mold, pollen, cigarette smoke, and air pollution. When someone has an asthma attack their lungs get very irritated, swell, and fill with mucus. Medication, like an inhaler, is used to treat asthma and its symptoms.

People with asthma should stay inside on days when the air quality is not in a safe range.

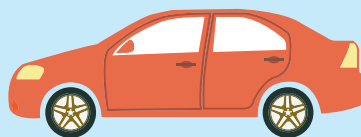
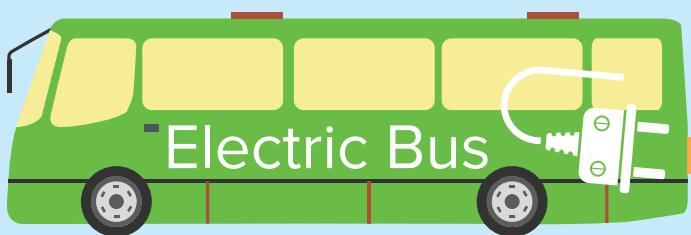


Why is this important? What can you do?

There are many cars, trucks, and buses on our roads that burn fossil fuels, adding a lot of pollution and carbon dioxide (CO₂) to our air. CO₂ is a greenhouse gas that is causing climate change. We need to reduce our use of fossil fuels in order to decrease air pollution, be healthier, and slow down climate change.

Travel clean

Plug in your car! Okay, not your family's regular car, but one of the many electric vehicles now available. If your family is shopping for a new car, try to get them to consider an electric vehicle.



- Every gallon of gasoline burned creates air pollution. If you walk or ride your bike, you won't burn any gas at all!
- Lawn equipment also produces air pollution. Don't mow your lawn on a bad air quality day. Use electric trimmers and mowers instead of gas-powered equipment.

- You can make a difference by showing your friends and parents how important it is to act responsibly and help the environment every day by recycling, saving energy, carpooling, using less fossil fuel, and keeping our air clean.

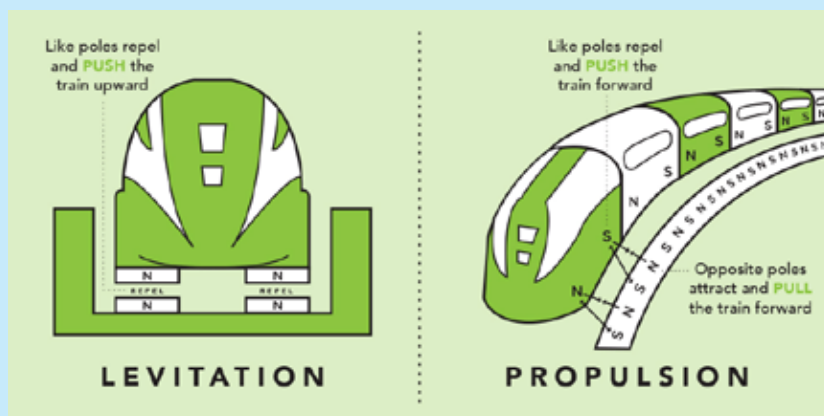
- If we all work together, small changes to protect the environment will add up and can make a big difference for people, plants, and animals.

FUTURE TRANSPORTATION

A hyperloop is a magnetic levitation vehicle in a vacuum tube that can transport people very quickly from one place to another. On November 8, 2020, the first passengers tested a hyperloop vehicle in Las Vegas.

How does magnetic levitation work?

Magnetic levitation has been used on some train systems since the 1970s. Like-pole magnets repel or move away from one another and can lift the train off the track. Opposite-pole magnets attract or move towards one another pulling the train forward down the track.



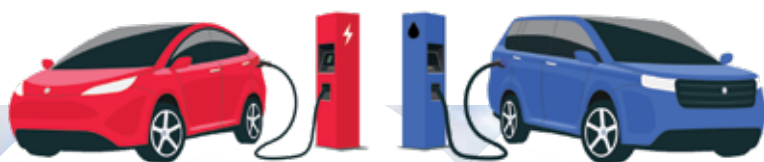
Graphics by Carly Wilkins, Energy Department.

Now that you know where the future of transportation is headed, you can be a part of it. Do your best to reduce transportation-related pollution in your life by carpooling, taking a bus, or asking an adult if you can walk or bike rather than drive when running errands. Be a part of the cleaner future by talking to your friends and family about clean transportation to spread the word. You can also work hard in school to become a scientist, engineer, or healthcare worker when you grow up, to make a difference in human and environmental health.

TRANSPORTATION WORD SEARCH:

ENERGY	BATTERY
PLUG	ASTHMA
CLIMATE	CARPPOOL
FUEL	CARBON
ELECTRIC	PARTICULATE
POLLUTION	AIR
VEHICLES	CLEAN
LUNGS	FAMILY
ENVIRONMENT	SCIENCE
RESOURCES	FUTURE
TRANSPORTATION	HEALTH

F	T	E	M	B	T	P	L	N	F	Q	A	L	E	E
M	S	N	C	E	L	D	O	U	R	Z	M	P	N	C
J	Y	E	B	U	O	I	Q	E	N	L	H	A	V	N
D	F	R	G	A	T	U	S	A	B	G	T	R	I	E
B	T	G	E	U	F	O	I	S	S	X	S	T	R	I
C	S	Y	L	T	U	R	P	V	V	J	A	I	O	C
N	A	L	V	R	T	E	T	A	M	I	L	C	N	S
S	O	R	C	T	C	A	R	P	O	O	L	U	M	C
P	J	E	B	P	B	L	B	C	Z	X	S	L	E	I
Y	S	E	G	O	N	A	E	L	C	H	M	A	N	R
Q	L	K	Z	U	N	O	A	U	G	J	D	T	T	T
X	K	I	F	U	T	U	R	E	F	P	Y	E	T	C
X	N	N	M	X	V	E	H	I	C	L	E	S	C	E
N	O	I	T	A	T	R	O	P	S	N	A	R	T	L
K	R	D	Q	D	F	H	T	L	A	E	H	G	Z	E



Eye Spy with My Transportation Eyes:

While you are out and about, play a game of clean transportation eye spy. Score points by spying people making good transportation choices,

like driving a hybrid or electric car, taking a bus or train, or riding a bike. Earn double points by spying a vehicle charging station in use!



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Conservationist for Kids

Supplement for Classroom Teachers – Road to a Cleaner Future

Driving Away from Fossil Fuels! April 2021

Most of the energy required to light and heat homes, run businesses, and drive cars comes from fossil fuels like coal, natural gas, and oil. Fossil fuels are nonrenewable energy. There are renewable energy sources such as the sun, wind, and water. Renewable energy sources are green and sustainable. They are better for our health and the environment and can be replaced by nature over time and reused. Fossil fuels are made from plants and marine organisms that died millions of years ago and were buried deep underground. They are unsustainable or limited and will not last forever. Finding, producing, and transporting fossil fuels pollutes our air, water, and land and destroys natural habitats.

New York State's electric supply is one of the cleanest in the nation due to efforts over the past decade to phase out coal and reduce emissions from the power sector. Hydroelectricity is our primary source of renewable generation. Transportation is now the largest source of greenhouse gas emissions in NYS.

How can we reduce pollution from the many cars, trucks, and buses on our roads? In this issue of *Conservationist for Kids*, students will learn how driving electric vehicles powered by renewable energy reduces fossil fuel use and pollution.

Lesson: Renewable Energy

Before beginning this lesson, it may be helpful to review some previous *Conservationist for Kids* articles discussing air pollution and climate change. These articles are available for viewing and download at <http://www.dec.ny.gov/education/40248.html>. Each issue also has an associated teacher supplement with additional resources and activities for educators to use in the classroom.

This lesson will teach students about:

- What is energy? Where do we get our electricity from?
- How does using renewable energy help the environment?

What is energy? Energy is all around us in different forms. It is in the food we eat, the light we see, and the music we hear. Energy provides the ability to do work, to move, and to make things happen or change. Energy is also described as a power that comes from a source.

- **There are two types of energy: potential and kinetic.** Stored energy is potential energy. Batteries and fuels like natural gas have potential energy. Anything in motion has kinetic energy. The wind blowing and ocean waves crashing on the beach have kinetic energy.

Where do we get electricity from? Electricity is made at power stations or plants that have rotating turbines attached to large generators. The turning of the turbines produces electricity. Most



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turbines are driven by steam or the combustion of natural gas. The water to make steam is boiled by burning fossil fuels like natural gas.

- **Renewable energy can be used to generate electricity too.** Some turbines are turned by water flowing at hydroelectric dams or the wind blowing. The Robert Moses Niagara Power Plant at Niagara Falls is NYS's largest source of renewable electricity. Smaller wind turbines and solar panels can be used on homes to also generate some electricity. The solar panels absorb energy from sunlight and convert it to electrical energy.

How does using renewable energy help the environment? If the electricity used to charge a vehicle comes from fossil fuels, then pollution will be made at the power plant, but not by the vehicle. Using renewable energy instead of fossil fuels to generate electricity reduces pollution and greenhouse gas emissions.

- Burning fossil fuels to produce electricity creates harmful emissions, including particulate matter (PM), sulfur dioxide (SO₂), nitrogen oxides (NO_x), and mercury (Hg). Greenhouse gas such as carbon dioxide (CO₂) that causes climate change is also emitted when fossil fuels are burned.
- Natural gas is mostly methane (CH₄). Methane is a very potent greenhouse gas that can leak from natural gas wells and pipelines. It absorbs much more energy (heat) in the atmosphere than carbon dioxide, adding to the greenhouse effect.

Additional References and Activities for the Classroom:

- DEC electric vehicle promo video <https://www.youtube.com/watch?v=CAhVftzNtkM>
- Using less energy and electricity in the first place helps to reduce pollution. Check out energy saving tips at <https://www.dec.ny.gov/public/43534.html>
- Explore energy and climate more by learning how DEC and NYS plan to reduce emissions even further <https://www.dec.ny.gov/60.html>
- Learn more about renewable energy by watching a video with your students <https://www.youtube.com/watch?v=8qmSzMwTkpk>
- **Make an electromagnetic train** <https://www.youtube.com/watch?v=Fd3O6sXBxgA>
As an example of future transportation (magnetic levitation) that does not use fossil fuels, this activity shows how a AAA battery and magnets in a copper coil create an electric field that pushes against the magnets to move a battery forward.
- **How to make a lemon battery** <https://www.youtube.com/watch?v=EA751OyNLOk>
Show your students how a battery works by making one out of lemons. The citric acid in a lemon, an electrolyte, reacts with the zinc metal in the nail sending electrons to the copper pennies to conduct electricity to light the LED bulb. Like a lithium-ion battery in an electric car, the battery converts chemical energy into electrical energy by an electro-chemical reaction. The chemical reaction moves negatively and positively charged particles or electrons around to produce an electric current. When a battery is used to power an electric car, the current flows from the battery through wires, and the electricity runs the motor to move the vehicle. Unlike the lemon battery, electric vehicle batteries can be recharged because the chemical reaction can be reversed.

Conservationist for Kids and an accompanying teacher supplement are distributed free of charge to 4th-grade classes throughout New York State three times per school year (fall, winter, and spring). If you would like to be added to or removed from the distribution list, need to update information, or if you have questions or comments, please e-mail the editor at KidsConservationist@dec.ny.gov or call 518-402-8047. Limited quantities of some back issues are also available on request. The full archives can be found online at www.dec.ny.gov/education/100637.html