

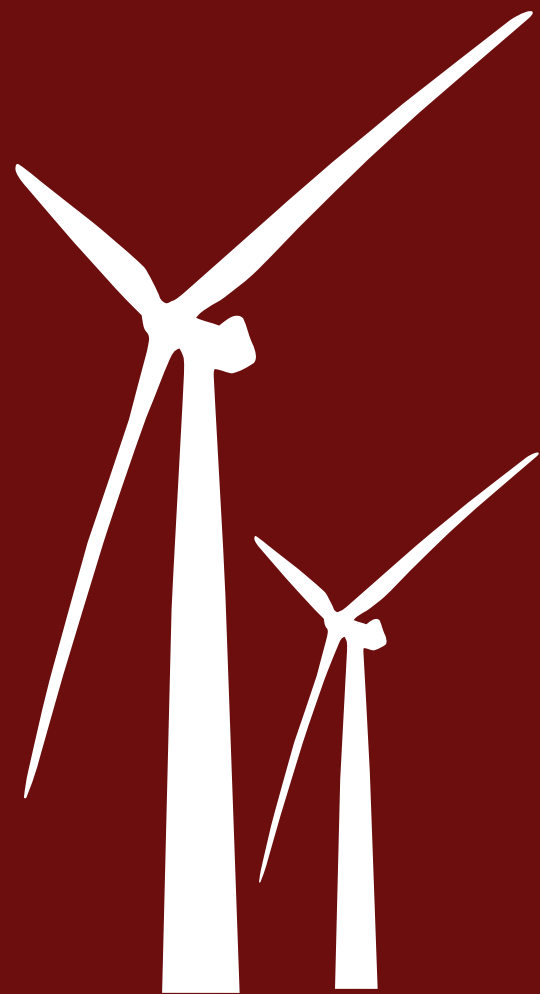


How to talk about **CLIMATE CHANGE**

Featuring:

- What is **Climate Change**?
- What is **Renewable Energy**?
- What is **Heritage**?

Each section in this glossary is divided into two reading levels: 'Put Simply' and 'A Bit More Complex'.



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PREFACE



This glossary is one of the outputs of the Mills Archive Trust's Reading EmPOWERed project, and we are grateful to Polly Bodgener, our renewable energy intern, who produced and illustrated it.

The Mills Archive Trust is a repository for records of wind- and water-power structures, both traditional and modern. While, as our name suggests, our beginnings were focused on mills and all things milling, in recent years we have become concerned with two other themes: *Renewable Energy* and *Feeding the World*. Like milling, these topics are affected by our global climate crisis, and hold important historical lessons, providing we can glean them from the records.

The Reading EmPOWERed project, funded by the **National Heritage Lottery Fund** (with thanks to lottery players), is a two-year endeavour that explores the evolution of mills to modern renewable energy, as well as the role that these structures can play in combating climate change. With help from our local community and beyond (in the form of volunteers, interns, universities and other organisations), our aim is to interpret our records on wind- and water-power in novel, diverse ways.

This glossary is an example of this. It ties together heritage, wind- and water- power and climate change, using both MAT records and external sources.

For more work like this, head to <https://new.millsarchive.org/reading-empowered>.

~ Rachel Riddell, Information and Engagement Manager



What is CLIMATE CHANGE?

Put Simply

Small Word

Big Picture

Atmosphere

A layer of gases that surrounds the Earth like a shell.

The atmosphere is made up of lots of different gases, including oxygen, nitrogen, and carbon dioxide. These gases exist in a delicate balance – this balance makes life on Earth possible! It gives us oxygen to breathe and protects us from the Sun. A small percentage of carbon dioxide can help to keep our planet warm enough to live on. But if there is too much carbon dioxide, the Earth will start to heat up.

Carbon Footprint

Your carbon footprint shows the total amount of greenhouse gases you generate.

Everyone has a carbon footprint. The size of someone's carbon footprint depends on how much energy they use. Activities like riding in a car and charging a phone can release carbon dioxide into the atmosphere. Using less electricity makes your carbon footprint smaller, which is better for the planet.

Climate Change

The slow process of Earth heating up.

The gases in the atmosphere are in a delicate balance. If there is too much CO₂ in the atmosphere, more heat will be trapped. People have been using more and more fossil fuels. This releases more greenhouse gases into the atmosphere and less heat can escape into space. A warmer climate causes droughts, melting glaciers, and rising sea levels.

Emissions	A gas that has been released into the air	Burning fossil fuels releases greenhouse gases into the atmosphere. These greenhouse gases are also called emissions.
Fossil Fuels	Gas, oil, and coal are fossil fuels. Once they have been used, they cannot be used again.	These non-renewable resources are called fossil fuels because they are made over millions of years from the remains of dead organisms. When fossil fuels are burned to make electricity or power machinery, they release harmful greenhouse gases like CO ₂ . Fossil fuels are taken from the Earth by mining or drilling. These resources cannot be used more than once. Fossil fuels are running out. It is more important than ever to use renewable energy, which is better for the planet.
Global Warming	The Earth is slowly warming up.	Heat from the sun travels through space and is absorbed or reflected back by the Earth. This keeps the planet warm, which lets us live here. Global warming happens when heat from the sun cannot escape back into space and is trapped by greenhouse gases in the atmosphere.
Greenhouse Gases	Greenhouse gases like CO ₂ and methane trap heat in the Earth's atmosphere.	Greenhouse gases usually keep the Earth warm enough to live on. The more greenhouse gases there are in the atmosphere, the more heat is trapped.
Pollution	Any material or gas that harms the environment	Pollution comes from many different things. Burning fossil fuels releases harmful gases into the environment. Littering is also an example of pollution.
Resilience	Making changes in response to the danger of climate change	Resilience means being able to get through a difficult situation. Climate change is difficult, but it does not have to be the end of the world. There are lots of ways that people and countries can be resilient. Planting trees and building better houses are examples of resilience.

Climate Change: A Bit More Complex

Small Word

Big Picture

Anthropocene

An unofficial unit of geological time. It refers to the most recent period in Earth's history when human activity started to have a significant impact on the planet's climate and ecosystems.

Geologists divide the Earth's history into **epochs**. They determine the rough length of these epochs by studying **stratigraphy** (layers of rock). Stratigraphy can reveal extinction events if you know where to look. The **Holocene** is the official name given to the time since the last ice age. The Anthropocene was originally proposed by Dutch atmospheric chemist Paul Crutzen in 2000. He argued that human activity since the Industrial Revolution was changing the atmospheric composition so much that it constituted a new epoch.

Atmosphere

A layer of gases surrounding the Earth.

The atmosphere is made up of lots of different gases – this is called **atmospheric composition**. These gases all play a role in sustaining life on Earth. According to NASA, the atmosphere contains 78.08% nitrogen, 20.95% oxygen, and 0.93% argon. Greenhouse gases like carbon dioxide and methane also play an important role by trapping enough heat to keep the Earth warm enough to live on. If the amount of greenhouse gases increases, the Earth will start to heat up.

Carbon Footprint

A carbon footprint represents the total amount of carbon dioxide generated by the actions of an individual, product, company, or country.

Carbon footprints are used to calculate and measure the amount of CO₂ released into the atmosphere by an activity, product, or organisation. Activities like driving a car, shipping products, and using air conditioning can release greenhouse gases. Using less electricity makes your carbon footprint smaller, which is better for the planet.

Carbon Sequestration	<p>The process of removing carbon from the atmosphere and storing in a solid form.</p>	<p>There are two methods of carbon sequestration.</p> <ol style="list-style-type: none">1) Biological carbon sequestration occurs when carbon is stored or used by the natural environment. For example, plants turn carbon dioxide and water into oxygen and glucose during photosynthesis. This is part of why deforestation is so dangerous.2) Geological carbon sequestration is the largely artificial process of storing carbon underground or in rock. Carbon capture and storage (CCS) means compressing CO₂ and injecting it into deep rock formations for permanent storage.
Climate Change	<p>The slow process of our planet heating up due to human activity.</p>	<p>The term refers to long-term shifts in weather patterns, but now is more commonly used to describe increasingly irregular climatic conditions, including global warming. Climate change can be attributed to the increase of greenhouse gases in the Earth's atmospheric composition. Increased global temperatures are a result of relatively sudden changes in human land use and industrial output.</p>
Emissions	<p>Gas or radiation (such as heat or light) that has been released into the atmosphere.</p>	<p>Emissions created by people and industrial processes are sometimes referred to as anthropogenic emissions. This is different to emissions released by natural disasters like volcanic eruptions.</p>
Fossil Fuels	<p>A non-renewable energy source (like gas, coal, and oil) formed from the remains of dead organisms that is extracted and burned as fuel.</p>	<p>Fossil fuels are burned to generate power, and are also broken down into other useful substances. The fossil fuel resources on this planet are finite, meaning the reserves will run out. The inability of organisations or countries to stop using fossil fuels is called fossil fuel dependency. When fossil fuels are burned to make electricity or power machinery, they release harmful greenhouse gases like CO₂. The correlation between fossil fuel usage and the greenhouse effect has been scientifically proven.</p>

Global Warming

Global warming describes how the Earth is slowing warming up.

Heat from the sun is absorbed or reflected into space back by the Earth and the atmosphere. This keeps the planet warm and habitable. Global warming happens when heat from the sun cannot escape back into space and is trapped by greenhouse gases in the atmosphere. You might hear about a temperature threshold or **tipping point** of 1.5°C, which seems like a small number. Human activities are estimated to have caused a temperature rise of approximately 0.8°C to 1.2°C compared to pre-industrial levels. Keeping temperature rise below 1.5°C will reduce the likelihood of irreversible harm to life on Earth.

Pollution

The release or introduction of harmful substances into the environment

Harmful materials are called pollutants. Pollutants can be natural, like volcanic ash and vapour. Pollution more commonly refers to the substances released by human processes, like burning fossil fuels or exhaust from cars.

Resilience

The capacity for social, economic and environmental systems to maintain their essential functions under difficult conditions.

Resilience normally means the ability of something or someone to withstand and recover from difficult circumstances. In this case, the difficult circumstance is climate change. Building resilience refers to the need for organisations and companies to take steps to adapt to climate change. Adaptation can involve planting more trees in cities to reduce heat or investing in better insulation for buildings. The failure to adapt (or the failure to take human needs into account while trying to adapt) is called **maladaptation**.

What is RENEWABLE ENERGY?

Put Simply

Small Word

Big Picture

Carbon Neutral

Removing the same amount of CO₂ that is put into the atmosphere.

Net Zero is similar, except Net Zero refers to removing all greenhouse gases, not just carbon dioxide.

Distributed Generation

Generating power near the places where it will be used.

In the UK, energy travels from where it is made to where it is used through the **National Grid**. This means energy sometimes has to travel a long way. Energy is sometimes lost during the journey. Distributed generation means that energy is produced at or near the place it will be used. If you have solar panels on your roof, that is an example of distributed generation!

Ecofriendly

Being ecofriendly means doing something that is kind to the planet.

Recycling your rubbish, or picking up litter, or using renewable energy are all eco-friendly activities.

Energy Mix

The different energy sources used by a country.

Electricity can be created from many different things. It can be made using wind, water and heat from the sun, or from fossil fuels. The energy mix is made by using lots of different energy sources, like ingredients to make a cake.

<p>Hydroelectricity</p>	<p>Electricity generated using waterpower</p>	<p>Electricity can be generated using water-power. Water is full of energy. Rivers flow, and the sea has tides and currents that push and pull the water. Hydroelectric power plants turn this moving (kinetic) energy into electrical energy. Water forces a turbine to turn, which powers a generator for making electricity.</p>
<p>Kinetic Energy</p>	<p>The energy of moving objects.</p>	<p>Anything that moves has kinetic energy. Mechanical energy is a form of kinetic energy. When a windmill's sails are turning, it is using kinetic energy.</p>
<p>Motive Power</p>	<p>The energy used to move machinery</p>	<p>This energy can come from anywhere. In the past, millers used the power of wind and water to work their mills.</p>
<p>Net Zero</p>	<p>The goal to reduce emissions</p>	<p>Net Zero is the goal of reducing the impact of greenhouse gas emissions to almost nothing. It means creating a balance between how many emissions are released, and how much greenhouse gas is removed from the atmosphere.</p>
<p>Renewable Energy</p>	<p>Sources of power that can be used over and over again.</p>	<p>Renewable energy comes from resources like wind, water, and the sun. Windmills and watermills have used renewable energy for hundreds of years.</p>
<p>Single Use Plastics</p>	<p>Plastic objects that can only be used once.</p>	<p>Plastic is made using fossil fuels. Single use plastics are very wasteful. If you only use a plastic straw once and throw it away, another one will have to be made. It is better to use a metal straw that can be used more than once. Single use plastics are bad for the environment because they end up in landfills and in the ocean. These plastics can hurt animals and fish.</p>

Sustainability	The goal for all people to live comfortably on Earth now and in the future.	Sustainability means making changes that are better for the planet. Using more renewable energy and less fossil fuels is a change that is better for the environment and for people.
Turbine	A machine that uses the flow of water, air or steam to turn a wheel and make power.	A turbine is a machine that uses the force of wind or water against a blade to turn a rotor. It may not be as big as a wind turbine, but a waterwheel is also a turbine. Let's use the waterwheel as an example. Water pushes the paddles on the waterwheel. The force of the water makes the waterwheel turn. The waterwheel is connected to a shaft that transfers the energy from the water to the mill machinery.

Renewable Energy: A Bit More Complex

Small Word

Big Picture

Circular Economy	A model of production that seeks to reuse and recycle existing materials rather than throwing them away.	This model of resource production and consumption focuses on the reuse and reduction of waste. By recycling materials for as long as possible, less pollution and waste will be created. If fewer resources need to be obtained, there will be greater opportunities for nature to regenerate and recover.
Carbon Neutral	Any process where the amount of CO ₂ released is equal to the amount of CO ₂ released.	This is another term for Net Zero, but it tends to be used to refer to specific activities. See Net Zero for more information.

<p>Carbon Offsetting</p>	<p>A system where governments and businesses can pay compensation for their greenhouse gas emissions.</p>	<p>A government or business may release more greenhouse gases than expected in a year. When this happens, they may choose to offset their emissions. This means paying money to support projects that reduce emissions elsewhere. Countries can buy carbon credits from one another.</p>
<p>Distributed Generation</p>	<p>Generating power at or near the places where it will be used.</p>	<p>Energy often dissipates or is lost as heat when it passes through network components on the National Grid, such as transformers and conductors. Rather than focusing on transmitting power through the grid network, distributed generation focuses on putting power where people live and work. This can also be referred to as a decentralised energy system. It means energy can be generated according to the needs of communities. Putting solar panels on your roof, building your own wind turbine, or supporting community-owned renewable energy turbines are examples of distributed generation.</p>
<p>Ecofriendly</p>	<p>Actions or products that are not harmful to the planet.</p>	<p>Recycling your rubbish, or picking up litter, turning off electrical appliances, or using renewable energy are all eco-friendly activities. By reducing your consumption or changing your energy use habits, you also reduce your greenhouse gas emissions. When a product is described as ecofriendly, it suggests that it has been designed to have little or no impact on the environment. This includes how the product was made and how it will be used. If a company exaggerates how ecofriendly a product is, this is called greenwashing.</p>
<p>Energy Mix</p>	<p>The diversity of energy sources used by a particular country.</p>	<p>The power supply in the UK is generated from various renewable and non-renewable resources, including but not limited to solar, wind, hydro, gas, nuclear, and biomass.</p>

<p>Hydroelectricity</p>	<p>Electricity generated using waterpower rather than fossil fuels. This is considered to be a clean source of energy.</p>	<p>Water is full of energy. In a watermill, sluice gates control the flow of water through a waterwheel, which determines how fast the wheel turns. On a larger scale, dams hold back enormous bodies of water. Water is released through a spillway and forces a turbine to turn. Hydropower plants convert the kinetic energy of moving water into electrical energy.</p>
<p>Kinetic Energy</p>	<p>The energy of moving objects</p>	<p>Energy is measured in Joules. There are two basic types of energy: potential energy and kinetic energy. Potential energy is the energy stored in an object. Kinetic energy is the energy of a moving object. Let's use a tide mill as an example. When the tide rises, it fills the millpond. Water is then trapped there. The water in the millpond has potential energy in the form of gravity. When the tide has gone down enough to clear the millrace, the miller will open the sluice gates and release water onto the waterwheel. The potential energy stored in the millpond transforms into kinetic energy, which turns the waterwheel.</p>
<p>Motive Power</p>	<p>The energy used to move machinery</p>	<p>This energy can come from anywhere. Before the Industrial Revolution, wind and water were the main sources of motive power. In some cases, mills used muscle power from people or animals. During the Industrial Revolution, steam began to be used to power machinery.</p>
<p>Net Zero</p>	<p>The goal of achieving a balance between how many emissions are released and how much is removed from the atmosphere.</p>	<p>Net Zero describes achieving a balance involves reducing emissions. Ideally, what few human-made emissions remain can be reabsorbed through natural processes in the atmosphere and in biomes (such as plants photosynthesising). The UK intends to achieve Net Zero by 2050.</p>

Renewable Energy	Energy sources that can be used over and over again.	Renewable energy is generated by harnessing resources like wind, water, and the sun. Windmills and watermills used renewable energy for hundreds of years. Now turbines and dams are reviving this long history of renewable energy usage. Renewable energy is sometimes called green energy or clean energy . This means it does little or no harm to the environment.
Single-Use Plastics	Plastic objects that are designed to be used once or for a very short period of time before being thrown away.	Plastics are often made by refining fossil-fuel based petrochemicals. Single use plastics are bad for the environment because they end up in landfills, in the environment and in the ocean. Poor quality plastics will even leach chemicals into the surrounding environment. In 2015, a charge for single-use plastic bags was introduced in the UK. This led to more people using reusable shopping bags.
Sustainability	Ensuring the needs of present and future generations can be met	Sustainable activities avoid depleting natural resources and ensure the planet remains a healthy and viable living space for future generations. Sustainability involves recognising that our resources are not unlimited. Becoming more sustainable means making changes that will maintain and enhance social, economic, and environmental wellbeing.
Turbine	A machine that uses the turning of a wheel or rotor to generate power.	A turbine is a machine that uses the force of wind or water against a blade to turn a rotor. Turbines transform motive power into rotational energy, which can be applied in multiple ways, such as generating electricity. Turbines adapt the old turning mechanisms of windmills and waterwheels for new, more efficient purposes.



What is HERITAGE?

Put Simply

Small Word

Big Picture

Biodiversity	The number of different living things on Earth.	This includes animals, birds, plants, tiny organisms, and you. If there are more species in one area, it is biodiverse! If there are fewer species in an area, it is not very biodiverse.
Climate Justice	Efforts to create a fairer and more equal of living for people and the planet.	People from all backgrounds will need to work together to find solutions to the climate crisis.
Conservation	Looking after something and stopping it from being damaged or lost.	Conservation means looking after resources instead of wasting them. Heritage sites and the environment are resources. Someone who protects resources is a conservationist. For example, a millwright can be called a conservationist because they look after historic mills.
Industrial Heritage	Places and objects that show the history of technology and industry, like mills.	Industrial heritage shows how human technology has developed over time. It also shows how people used to live and work. Mills can teach us important things about how energy has been used throughout history, and how energy could be used responsibly in the future.

<p>Natural Heritage</p>	<p>Areas of nature that are protected</p>	<p>Heritage is the value of what existed before you. Nature has existed for a very long time. Humans have always used natural resources, but we are not always kind to the environment. Natural heritage is the total of everything precious or valuable in nature, like biodiversity and habitats.</p>
<p>Miller</p>	<p>A person who works in the mill.</p>	<p>Milling is a process where one substance is broken down to create another. A miller uses mill machinery to do this. If they own a corn mill, they use millstones to turn grain into flour.</p>
<p>Millwright</p>	<p>The person who fixes the mill if something goes wrong.</p>	<p>Millwrights are not the same as millers! Millwrights fix mills when they break.</p>
<p>Molinologist</p>	<p>Someone who studies mills.</p>	<p>While you are reading this, you are a molinologist!</p>
<p>Watermill</p>	<p>A watermill uses the power of water to operate machinery.</p>	<p>Watermills can be use the flow of rivers or the flow of the tides to create power.</p>
<p>Waterwheel</p>	<p>A waterwheel is attached to a watermill. It turns when water flows against its paddles.</p>	<p>There are three different types of waterwheel: Overshot, Breast, and Undershot. Overshot and breast wheels use gravity to drop water onto the wheel. Water turns undershot wheels from underneath.</p>

Windmill

A building that uses the power of the wind to operate machinery.

When the wind blows, it turns the sails of the windmill. This then turns the machinery inside the mill. There are lots of different types of windmills. Tower mills, smock mills, and post mills are three examples.

Heritage: A Bit More Complex

Small Word

Bigger Picture

Biodiversity

The variety of life on Earth, including but not limited to birds, animals, people, plants, and organisms.

Life on Earth is based around lots of different **ecosystems**. Species support other species in both simple and surprising ways. Biodiversity describes the number and variety of species in a given area. For example, a rainforest is more biodiverse than a cornfield. This is because the rainforest ecosystem supports thousands of species, whereas a **monocultural** cornfield supports far fewer.

Climate Justice

Efforts by individuals or groups to call for solutions to the climate crisis.

Climate justice movements see social inequalities and the exploitation of the planet's resources as connected. The effects of climate change are felt more heavily by those in the poorest regions of our planet. The goal of climate justice is to create a more equitable society in the process of protecting the environment.


Conservation

Actions taken to protect and preserve resources for future generations.

Conservation describes any work done to protect something so it can be used or enjoyed in the future. For example, there are not many traditional windmills and watermills left in the UK. The Mills Archive collects records of milling history because it wants to conserve information about mills.

Industrial Heritage	Places, objects, and documents that show the history of technology and industry.	Industrial heritage is important because it shows how human technology has developed over time. Milling history, for example, shows how people have used energy over time. In particular, traditional mills show the established potential of renewable energy.
Natural Heritage	The environmental and cultural significance of nature in the past, present, and future.	Natural heritage is often used to identify areas of nature that are valuable and need protection. National Parks and nature preserves are examples of natural heritage in action. Natural heritage also refers to the importance of preserving natural resources, like biodiversity, habitats, and ecosystems.
Miller	The person who operates the machinery in the mill.	Millers operate the machinery on a day-to-day basis. A miller may own the mill, rent it, or just work in it. If they work in a corn mill, they are in charge of ensuring the grain is ground properly. Milling is a process where one substance is broken down to create another. A miller uses mill machinery to do this. If they own a corn mill, they use millstones to turn grain into flour. Mills often run in the family, and can be passed down through generations.
Millwright	The person who fixes the mill if something goes wrong.	Millwrights are not the same as millers! Many millers may be able to repair mills, but becoming a millwright takes many years of training. Millwrights combine the skills of engineers and carpenters to fix and maintain mill machinery. It is currently an endangered craft.
Molinologist	Someone who studies the history and technology of mills.	

Monoculture	Growing only one crop at a time in a given area.	Monocultures are used in large-scale farming. Creating the space for them often involves clearing land by deforestation. Monocultures reduce biodiversity because fewer species exist in the area. Growing monocultures also depletes the nutrients in the soil.
Watermill	A watermill uses the power of water to operate machinery.	Watermills use the flow of the rivers or the flow of the tides to turn their machinery. Watermills have mechanisms that control how fast the water flows against the waterwheel. This allows millers to control how fast the machinery works.
Waterwheel	A waterwheel is a piece of machinery that converts the flow of water into rotational energy to power machinery.	There are three types of waterwheel: overshot, breast, and undershot. Water is dropped onto an overshot wheel from above, pushing the paddles in a forward motion. On a breast wheel, water falls onto the wheel from mid-way up its height. Undershot wheels are placed in the millstream, and the force of water from below turns the wheel. If the river floods, the waterwheel cannot operate because the water is too high to generate the necessary gravitational force.
Windmill	A building that uses the power of the wind to operate machinery. When wind blows, it turns the sails of the windmill.	Windmills are designed to best exploit the natural wind resources of a given area. If the wind blows too fast, many windmills are equipped with an automatic brake. This stops the machinery getting damaged. There are several types of windmills, including tower, smock, and post mills. Many windmill styles vary depending on where they were built and what they milled.



*Heritage, archives, and
renewable energy initiatives
have a shared motive – the
conservation of our planet's
wonders.*

Climate change affects all people around the world. The enormity of climate change as a phenomenon can make it difficult to understand or talk about. Understanding of the key issues can also be complicated by the tendency to talk about climate change using specialised language, buzzwords, and technical jargon.

In order to have an open and transparent dialogue about climate change, it is important that the language used to discuss it is well understood and accessible.

These glossaries put milling and industrial heritage into conversation with climate change. Milling is one of the world's oldest industries. Understanding mills can reveal how the relationship between nature, energy use, and industry has changed over time, and continues to change to this day.



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