

# What is Climate Change?

For the past ten thousand years, human civilization has grown and thrived during a time of stable climate.

To understand climate change, it helps to know the difference between weather and climate.

Weather is what we feel each day such as sun, rain, or heat. Climate is the average of those patterns over many years.

This steady climate allowed people to grow food, build cities, and shape the modern world

What kept our planet in balance is something called the greenhouse effect. A layer of gases in the atmosphere including CO<sub>2</sub>, CH<sub>4</sub>, and NO<sub>2</sub> traps some of the sun's heat and keeps Earth warm enough for life. For thousands of years this system stayed in balance.

But that balance has changed. Since the Industrial Revolution around 250 years ago, humans have burned large amounts of coal, oil, and gas to power homes, vehicles, and industry. This has released extra greenhouse gases into the air. As a result, more heat is trapped, and the planet is warming much faster than it naturally would. This rapid human driven warming is what we call climate change.

The stable world we depend on is now changing quickly.

# Why Does It Matter?

A warmer planet is not just about slightly hotter summers. It means putting more energy into Earth's natural systems. This added energy changes the weather around the world in dangerous ways. We already see the effects.

Heatwaves are becoming longer and more extreme. Power systems are pushed to the limit. Dry seasons last longer, leading to droughts and wildfires.

At the same time, warmer air holds more moisture. This means heavier rain, flash floods, and stronger storms. Warmer oceans fuel bigger hurricanes and typhoons.

These are not random events. They are signs of a climate system that is losing its balance. The cost is high. Crops fail. Homes and schools are damaged. Families are forced to move.

In Mission Zero, the DISASTER CARDS you draw are inspired by these real world events. They remind us that the longer we wait, the harder it will be to fix.

# What Can We Do About It?

Climate change is a big problem, but it is a problem we can solve throughout history, people have come together to achieve incredible things.

When we focus on a clear goal, we can create smart and powerful solutions.

There is no single answer to climate change. We need to act quickly to change the way we power our lives. This includes how we produce energy, how we make things, how we travel, how we grow food, and how we heat and cool our homes.

This process is called **DECARBONIZING**.

To decarbonize means to reduce or remove greenhouse gas emissions caused by human activity. We can do this by switching to cleaner energy, improving technology, and restoring nature to help absorb carbon.

In this game, and in real life, every action matters. Each solution brings us closer to restoring balance.

It all begins with understanding where emissions come from and what solutions can effectively address them.



How We Produce Energy  
How We Make Things  
How We Live and Work  
How We Grow and Serve Our Food  
How We Travel  
How We Treat Nature

These are the activities that release greenhouse gas emissions. In the game, they are shown as **SOURCE CARDS**, and they are your main targets for decarbonization.

For each of these sources, there are already many smart and proven solutions. In Mission Zero, these are your **SOLUTION CARDS**. They represent real world technologies and strategies such as solar panels, wind power, switching to electricity, capturing carbon from factories, and restoring forests to absorb carbon from the air.

The goal of the game, and the goal for all of us in the real world, is to use these solutions as widely and quickly as possible to reduce emissions.

This book will guide you through the real world solutions for each major source of emissions.

**YOUR MISSION STARTS NOW.**

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# How We Produce Energy

## OIL & GAS

The oil and gas industry creates emissions at almost every step. It starts when companies drill underground or under the sea to get oil and natural gas. Methane can leak from wells, pipelines, and storage tanks. Processing oil and natural gas into fuels like gasoline also uses energy and releases CO<sub>2</sub>. The main gases from this sector are CO<sub>2</sub> and methane.

### METHANE REDUCTION



Stop methane leaks from gas pipelines.

Example: Fix leaks in pipelines and use methane detection technology.

### CLEAN ENERGY



Make electricity from the sun, wind, water, or other sources that don't burn fossil fuels.

Example: Run oil pumps using solar panels instead of diesel generators.

### EFFICIENCY



Use smarter machines that need less energy to do the same job.

Example: Upgrade equipment and improve compressor efficiency at gas processing plants.

### CARBON CAPTURE



Trap carbon dioxide from factories or power plants before it goes into the air.

Example: Add carbon capture system to refineries

# ELECTRICITY

Electricity is the largest single source of greenhouse gas emissions in the world. Most electricity comes from burning fuels like coal, oil, or gas in big power plants. When we burn these fuels, they release a gas called CO<sub>2</sub> into the air. CO<sub>2</sub> traps heat and disrupts the balance of Earth's climate.

## CLEAN ENERGY



Make electricity from the sun, wind, water, or other sources that don't burn fossil fuels.

Example: Solar PV farms, wind farms, geothermal plants, hydroelectric dams

## EFFICIENCY



Use smarter machines or systems to improve the efficiency.

Example: Smart grids, efficient transformers, superconducting transmission lines, demand response systems

## BIO-BASED



Make electricity from plants or waste instead of coal or gas.

Example: Burning biomass, like wood chips, crop waste, or manure

## CARBON CAPTURE



Trap the pollution before it goes into the air and store it underground.

Example: Use machines like Direct Air Capture (DAC) or filters on power plants to grab CO<sub>2</sub> and store it deep in the ground

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# How We Make Things

# CEMENT

Making cement releases a large amount of CO<sub>2</sub>. First, limestone is heated in giant kilns at very high temperatures. This process uses fuels like coal or gas, which produce CO<sub>2</sub>. In addition, the limestone itself goes through a chemical reaction that releases even more CO<sub>2</sub>.

Since cement is a key ingredient in concrete for buildings, roads, and bridges, it's a big source of emissions worldwide.

## CARBON CAPTURE



Trap carbon dioxide from factories or power plants before it goes into the air.

Example: Install carbon capture systems at cement kilns.

## CLEAN ENERGY



Use renewable energy instead of fossil fuels for heating and operations.

Example: Power cement plants with solar, wind, or waste heat recovery.

## CIRCULARITY



Reuse old concrete and reduce the need for making new cement.

Example: Crush and recycle demolished concrete as a raw material in new projects.

## EFFICIENCY



Use less energy and better technology to produce the same amount of cement.

Example: Upgrade kilns and improve heat recovery systems.

# STEEL

Steel is made by heating iron ore in blast furnaces, often using coal or coal for fuel. This process releases large amounts of CO<sub>2</sub>. Additional emissions come from mining the iron ore and making steel products like beams, buildings, or cars. Because most steel production still relies on coal, it remains one of the biggest sources of industrial emissions.

## ELECTRIFICATION



Use electricity instead of burning coal in the steel-making process.

Example: Use electric furnaces (like giant ovens) instead of coal-burning ones to melt scrap metal and make new steel.

## GREEN HYDROGEN



Use green hydrogen made from renewable energy instead of coal to reduce iron ore and make steel.

Example: Make steel using a method called DRI that uses green instead of burning coal.

## CIRCULARITY



Recycle scrap metal instead of making new steel from raw materials.

Example: Increase the use of scrap steel in production.

## CARBON CAPTURE



Trapping carbon dioxide from factories or power plants before it goes into the air.

Example: Install carbon capture systems at blast furnace exhausts.

# PLASTIC

Plastic is made from oil and natural gas. Even more emissions are released during the chemical process that turns these fuels into plastic materials. This process uses a lot of energy and creates both CO<sub>2</sub> and methane. Making plastic products like bottles, bags, and packaging adds further emissions.

## CIRCULARITY



Reuse and recycle plastic products to reduce the need for making new plastic.  
Example: Collect and recycle used plastic bottles into new packaging.

## EFFICIENCY



Use less energy and smarter processes to produce the same amount of plastic.  
Example: Upgrade factory equipment to reduce energy use during plastic production.

## CLEAN ENERGY



Power plastic factories with renewable energy instead of fossil fuels.  
Example: Run plastic manufacturing plants using solar or wind power.

## BIO-BASED



Make plastic from plant-based materials instead of oil and gas.  
Example: Produce bioplastics from corn, sugarcane, or other renewable crops.

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# How We Live and Work

# BUILDING

Big buildings like offices, malls, and hospitals use energy every day.

Electricity powers lights, elevators, air conditioning, and heating.

If the electricity comes from fossil fuels, it creates emissions.

Buildings also use fuels directly for heating or cooling.

Special gases called refrigerants used in air conditioners can leak and cause powerful greenhouse effects. Over a building's lifetime, energy use is the biggest source.

## EFFICIENCY



Design buildings to use less energy for heating, cooling, and lighting

Example: Install insulation, energy-efficient windows, and LED lighting in offices and malls.

## CLEAN ENERGY



Use renewable energy sources to power building operations.

Example: Install rooftop solar panels or buy green electricity from the grid.

## ELECTRIFICATION



Switch heating, cooling, and cooking systems to run on electricity instead of gas or oil.

Example: Replace gas boilers with electric heat pumps.

## CIRCULARITY



Use recycled or reused materials in construction and reduce waste during building projects.

Example: Use recycled steel and concrete in new commercial buildings.

# HOME

Houses create emissions through daily energy use. Lights, fans, air conditioners, refrigerators, and other appliances all need electricity.

If that electricity comes from fossil fuels, it adds to emissions.

Some homes burn gas or oil for cooking, heating, or water heaters, creating more CO<sub>2</sub>. The size of the house, how well it's insulated, and how energy-efficient the appliances are all affect how much emissions it creates.

## CLEAN ENERGY



Use renewable energy to power household appliances and lighting.

Example: Install rooftop solar panels for home electricity.

## ELECTRIFICATION



Switch home heating, cooking, and water systems from gas or oil to electricity.

Example: Replace gas stoves with electric induction cooktops.

## EFFICIENCY



Use less energy by improving insulation and using energy-saving appliances.

Example: Install LED lights and upgrade to energy-efficient air conditioners.

## CIRCULARITY



Use recycled materials and reduce waste when building or renovating homes.

Example: Choose recycled wood or reclaimed bricks for home construction.

# WASTE

Humans create a huge amount of waste every day.

When garbage breaks down in landfills, it releases methane, a powerful gas that traps heat. Burning waste also produces CO<sub>2</sub>.

Sewage from homes and factories adds more emissions.

Because of how much waste we produce, it has become a major source of greenhouse gas emissions around the world.

## CIRCULARITY



Reduce, reuse, and recycle materials to avoid creating new waste.

Example: Expand recycling programs for plastics, paper, and metals.

## METHANE REDUCTION



Capture or treat methane before it escapes from landfills and waste sites.

Example: Install landfill gas collection systems to capture and burn methane.

## BIO-BASED



Switch to packaging and products made from plant-based, compostable materials.

Example: Use biodegradable packaging instead of plastic for food containers.

## CARBON CAPTURE



Trap greenhouse gases from waste incinerators before they go into the air.

Example: Add carbon capture systems to large waste-to-energy plants.

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# How We Grow and Serve Our Food

## CROPS

Growing food creates greenhouse gases at many steps. Fertilizers used on crops release nitrous oxide, a powerful gas that traps heat.

Some crops, like rice, grow in wet fields that produce methane.

Tractors and other farm machines burn fuel and make CO<sub>2</sub>.

Even making fertilizers, pesticides, and farming tools adds more emissions. Because we grow a lot of food to feed the world, agriculture is one of the biggest sources of emissions.

### SMART FARMING



Use better farming methods to reduce fertilizer use and cut emissions.

Example: Apply precision farming with GPS and sensors to avoid overusing fertilizer.

### BIO-BASED



Grow crops to make biofuels or other plant-based products instead of using fossil fuels.

Example: Produce bioethanol from corn or sugarcane for energy.

### METHANE REDUCTION



Change how crops like rice are grown to release less methane.

Example: Use alternate wetting and drying techniques in rice fields.

### CARBON CAPTURE



Store more carbon in the soil by changing how land is managed.

Example: Plant cover crops and reduce soil tilling to keep carbon underground.

## FARM ANIMALS

Farm animals like cows, sheep, and goats release methane when they digest food, especially from burping. Manure from animals also creates methane and nitrous oxide. Feeding animals needs large amounts of crops, which require fertilizer and fuel to grow, adding more emissions. Energy is also used to run farms, barns, and equipment like milking machines. Overall, livestock farming is a major source of methane and other greenhouse gases worldwide.

### METHANE REDUCTION



Cut down the gas animals release when they digest food.

Example: Feed cows special seaweed that helps them burp less methane.

### BIO-BASED



Use natural materials instead of fossil fuels in farm operations.

Example: Use manure to make biogas that powers farm equipment.

### SMART FARMING



Use technology to make farming more efficient and less polluting.

Example: Track animal health with sensors to reduce waste and improve feeding.

### CIRCULARITY



Reuse farm waste so nothing goes to waste.

Example: Turn leftover animal feed and manure into compost for growing crops.

## FOOD & BEVERAGES

Producing and preparing food and drinks creates emissions at many stages. At home, cooking with gas or charcoal also produces emissions. Factories use a lot of energy to cook, freeze, package, and process food. If that energy comes from coal, gas, or oil, it releases greenhouse gases. Refrigeration and storage add more emissions, especially if cooling gases leak. Making packaging materials like paper, glass, and aluminum also uses energy and creates emissions.

### CIRCULARITY



Reduce waste by reusing or recycling materials in the production process.

Example: Turn food scraps into animal feed or compost instead of throwing them away.

### ELECTRIFICATION



Switch machines from fossil fuels to electricity.

Example: Use electric ovens and forklifts in food factories instead of gas-powered ones.

### EFFICIENCY



Use less energy and resources to make the same amount of food.

Example: Upgrade refrigerators and cooking systems to use less electricity

### CLEAN ENERGY



Power factories and stores with renewable sources like solar or wind.

Example: Install solar panels on factory rooftops to run production lines.

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# How We Travel

# PASSENGER CAR

Passenger cars are the cars we use to go to school, work, shops, or travel. They help us get around, but they also create greenhouse gases. Most cars run on gasoline or diesel. These are fuels made from oil. When the fuel burns inside the car's engine, it releases CO<sub>2</sub>. Cars can also release smaller amounts of other gases like methane and nitrous oxide.

## ELECTRIFICATION



Use electric cars that run on batteries instead of gasoline or diesel

Example: Use Battery Electric Vehicles (BEVs), Plug-in Hybrid Electric Vehicles (PHEVs)

## EFFICIENCY



Make cars that use less energy to go the same distance.

Example: Smart traffic, route optimization, carpooling.

## BIO-BASED



Use fuel made from plants or waste instead of oil.

Example: Use bioethanol and biodiesel.

## GREEN HYDROGEN



Use green hydrogen gas to power cars with only water as the exhaust.

Example: Use hydrogen fuel cell electric vehicles (FCEVs).

# TRUCK

Trucks move goods over long distances, using diesel fuel for power. Burning diesel releases CO<sub>2</sub> and a small amount of nitrous oxide. Emissions happen during driving, idling in traffic, and even while loading or unloading goods. Because trucks carry heavy loads and drive long distances, they're a major transport-related source.

## GREEN HYDROGEN



Use green hydrogen fuel cells to power trucks with only water as exhaust.

Example: Deploy hydrogen-powered long-haul trucks for freight transport.

## ELECTRIFICATION



Switch from diesel engines to electric trucks powered by batteries.

Example: Use battery-electric delivery trucks for short-distance urban transport

## EFFICIENCY



Make trucks and logistics systems use less fuel for the same amount of work..

Example: Optimize routes with smart software

## BIO-BASED



Run trucks on biofuels made from plants or organic waste instead of diesel.

Example: Use biodiesel or renewable diesel for existing truck fleets.

# AVIATION

Airplanes release emissions mostly when flying. They burn jet fuel, producing CO<sub>2</sub> at high altitudes. This makes their warming effect even stronger. Long flights use more fuel, especially when planes carry heavy loads. Although only a small percentage of people fly often, aviation's climate impact is large compared to other transport.

## BIO-BASED



Use sustainable aviation fuel (SAF) made from plants or waste instead of fossil fuels.  
Example: Fly planes using biofuels made from used cooking oil or agricultural waste.

## ELECTRIFICATION



Use electric power for short flights with smaller planes or ground airport operations.  
Example: Develop battery-electric planes for short regional flights.

## GREEN HYDROGEN



Use green hydrogen gas to power cars with only water as the exhaust.  
Example: Design hydrogen-powered planes for medium-distance routes.

## EFFICIENCY



Improve airplane design and flight operations to use less fuel per trip.  
Example: Use lighter materials, better engines, and optimize flight routes.

# SHIP

Ships transport goods between countries across oceans and seas.

Most ships burn a heavy, dirty type of fuel that releases CO<sub>2</sub> and other air pollutants. Some newer ships use liquefied natural gas (LNG), but this can leak methane. Even when docked, ships may keep engines running for power, causing more emissions. Shipping is one of the biggest global transport emission sources because of the huge distances traveled.

## GREEN HYDROGEN



Use green hydrogen or ammonia as clean fuels instead of heavy oil for ships.  
Example: Develop hydrogen-powered cargo ships for international shipping.

## BIO-BASED



Run ships on biofuels made from plants or waste oils instead of fossil fuels.  
Example: Use biodiesel or renewable marine fuels for cargo ships.

## EFFICIENCY



Design ships and plan routes to use less fuel for the same distance.  
Example: Build ships with better hull designs and use slow steaming to reduce fuel use.

## ELECTRIFICATION



Use electric power for short-distance ferries or port activities.  
Example: Deploy battery-electric ferries for coastal and island routes.

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# How We Treat Nature

## DEFORESTATION

When trees are cut down or burned, the carbon stored in the wood and soil is released as CO<sub>2</sub>, adding more greenhouse gases into the air. Forests are often cleared to make space for farms, cattle, or buildings. Burning trees also releases methane and nitrous oxide. Without trees, the land can no longer absorb as much carbon.

This makes deforestation one of the biggest causes of climate change, especially in tropical areas like the Amazon.

### SMART FARMING



Grow more food using less land to avoid cutting down forests.

Example: Use precision farming tools to increase crop yields on existing farmland.

### CIRCULARITY



Reuse resources so we don't need to clear more forest for new ones.

Example: Use recycled wood and paper instead of cutting down new trees

### METHANE REDUCTION



Reduce methane emissions linked to forest loss and farming.

Example: Manage rice paddies better to release less methane and protect nearby forests.

### CARBON CAPTURE



Trap and store carbon to keep it out of the air.

Example: Reforestation - Restore damaged forests so trees can absorb more CO<sub>2</sub> from the atmosphere.

THE SOLUTIONS FOR  
CLIMATE CHANGE ARE HERE.

LET'S START OUR MISSION ZERO NOW.  
TOGETHER.



MISSION  
ZERO

# THE CLIMATE SOLUTION BOOK

