

KLAUS & BENJAMIN TEUBER

CATAN®

NEW ENERGIES™

RULEBOOK

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It's the 21st century on the island of Catan. Long gone is the agrarian society first founded by Viking ancestors. In addition to the traditional resources, today's Catanians also need energy to keep their society growing and thriving.

Unfortunately, pollution from fossil fuel is a growing threat, causing natural disasters and inhibiting resource production. New, cleaner energy technology is available, but it's more expensive to build.

You—the leaders of the Catanian communities—are at a crossroads; do you invest in new energy production, or do you opt to continue the route of cheaper fossil fuels and risk early disaster for the whole island?

The choice (and the responsibility) is yours!

COMPONENTS

19 Land hexes



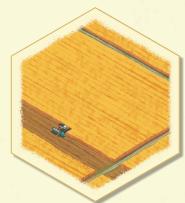
4x Forest



3x Hills



4x Pasture



4x Fields



3x Mountains



1x Desert

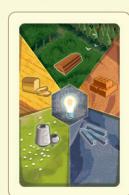
18 Number discs



6 Double-sided sea frames



95 Resource cards (19x of each)



Resource and
science card back



Lumber



Brick



Natural fiber



Food



Steel

20 Science cards



25 Development cards



Development
card back



RESEARCH GRANT
Take 2 resources of your choice from the supply.



ROAD CONSTRUCTION
Build 2 roads for free.



HIGH YIELD
Take 1 resource from up to 3 hexes with your renewable power plant(s)



VICTORY POINT



CLEANUP
Move the Inspector; OR, remove 1 hazard and steal 1 card from someone with the same or higher LF.

6x Progress cards (2x of each)

5x Victory
point cards

14x Cleanup cards

4 Player boards
(1 per player)



2 Special victory point tiles

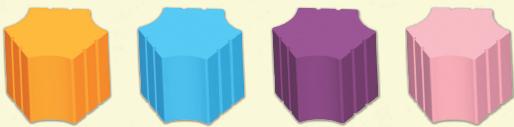


Longest Trade Route

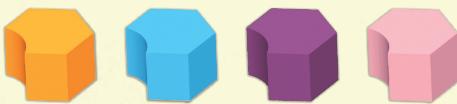


Cleanest Environment

16 Cities
(4 per player)



20 Towns
(5 per player)



48 Roads
(12 per player)



4 VP markers
(1 per player)



24 Fossil fuel power plants
(6 per player)



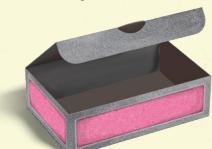
36 Renewable power plants
(9 per player)



4 Warehouse tiles
(1 per player)



4 Player boxes



(assemble before first game)

1 Environmental inspector



20 Energy



1 Global footprint marker



43 Brown event discs



9x Climate conference



8x Environmental pollution



9x Air pollution



9x Production increase



8x Rain and flooding

36 Green event discs



3x Climate conference



1x with 4-player indicated



12x Sustainable production



4x with 4-player indicated



12x Government funding



4x with 4-player indicated

1 Event disc bag



10 Hazard tokens



2 Dice

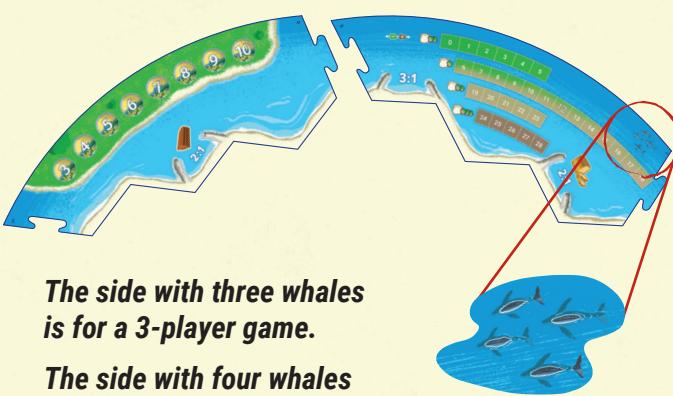


SETUP

FIRST GAME SETUP

If this is your first time playing *CATAN® – New Energies™* (aka *New Energies*), we recommend using the setup shown here. It provides a balanced set of starting positions for your first experience.

- 1 Assemble the frame by matching the numbers at the puzzle-ends of the frame pieces together. Start with the global footprint track piece, making sure that the side showing the correct number of players is face up.



**The side with three whales
is for a 3-player game.**

**The side with four whales
is for a 4-player game.**

Then continue assembling the frame. You may need to flip frame pieces over to ensure that the puzzle-frames line up correctly.

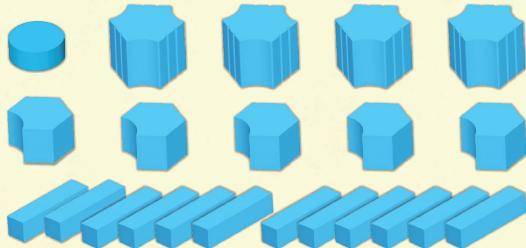
- 2 Arrange the hexes and number discs in the frame as shown.
- 3 Place the global footprint marker on the starting space of the global footprint track (space 9 for a 3-player game and space 12 for a 4-player game).
- 4 Place the "Longest Trade Route" and "Cleanest Environment" tiles, hazard tokens, energy, and dice next to the board.
- 5 Sort the resource cards and science cards by type and place them face up next to the board to form the supply.
- 6 Shuffle the development cards and place them in a facedown stack next to the science cards.
- 7 Put the 43 brown event discs in the bag.





8 Choose your player color and take the following pieces:

- 1 victory point (VP) marker
- 5 towns
- 4 cities
- 12 roads



9 Place your VP marker on space 3 of the VP track.

10 Place 1 town, 1 city, and 2 roads on the board as shown. Place your remaining pieces in front of you for now and collect your starting hand.

Each player takes resource cards from the supply that match the hexes adjacent to their city. Each player also takes 1 science card for their city.



Note: In a 3-player game, blue placements are not used. To play with blue, simply replace the unused color with blue pieces.

11 Place the environmental inspector on the desert.

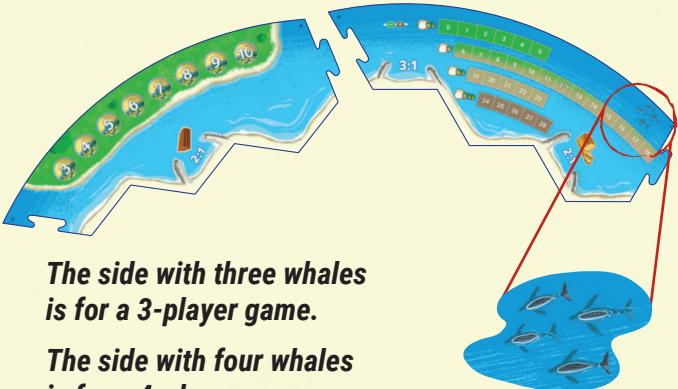
12 Finally, each player rolls the dice. The player that rolls highest is the first player.

13 Continue reading at "Player Boards" on page 8.

STANDARD GAME SETUP

If you are ready for some variety in your *New Energies* game, follow these steps:

- Assemble the frame by matching the numbers at the puzzle-ends of the frame pieces together. Start with the global footprint track piece, making sure that the side showing the correct number of players is face up.



Then continue assembling the frame. You may need to flip frame pieces over to ensure that the puzzle-frames line up correctly.

- Place the hexes **randomly** inside the frame.
- Arrange the number discs face down in A-B-C order. Starting in any corner of the board, place the number discs on the hexes in a spiral pattern (in alphabetical order, **skipping the desert**) moving toward the center hex. Then turn them over so the number side is face up.



- Place the global footprint marker on the starting space of the global footprint track (space 9 for a 3-player game and space 12 for a 4-player game).

Victory point (VP) track



5

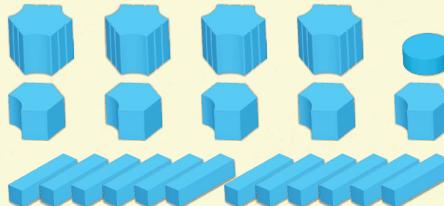


- Place the "Longest Trade Route" and "Cleanest Environment" tiles, hazard tokens, energy, and dice next to the board.
- Sort the resource cards and science cards by type and place them face up next to the board to form the supply.



9 Chooses your player color and take the following pieces:

- 1 victory point (VP) marker
- 5 towns
- 4 cities
- 12 roads



10 Place your VP marker on space 3 of the VP track.

11 Place the environmental inspector on the desert.

Place your starting pieces

Each player rolls the dice. The player that rolls highest is the first player.



Round 1

The first player places 1 town on an intersection of their choice and then places 1 road on a path next to that town. The next player to the left does the same until all players have 1 town and 1 road on the board.

Important: When placing a town, stay two paths away from all other towns.



Example: Orange may build a new town on the intersection circled green, but not on the intersections circled red.

Round 2

Starting with the last player and going in reverse order, each player places 1 city on an intersection of their choice and their second road on an adjacent path.

Important: When placing a city, stay two paths away from all other towns and cities.

Collect your starting hand

Each player takes resource cards from the supply that match the hexes adjacent to their city (1 card per hex). Each player also takes 1 science card for their city.



- 7** Shuffle the development cards and place them in a facedown stack next to the science cards.
- 8** Put the 43 brown event discs in the bag.

Prepare your player board

Each player takes:

- 1 player board
- 9 renewable power plants
- 6 fossil fuel power plants
- 1 warehouse tile

Preparing your player board

1 Shuffle the green event discs face down and give 9 random discs to each player. Without looking at them, place your discs face down on the renewable power plant spaces on your player board. Then place your renewable power plants (green) on top of the discs.

3-player game: Remove the 9 green event discs with the 4-player indicator and return them to the box before dealing out the remaining discs to players.

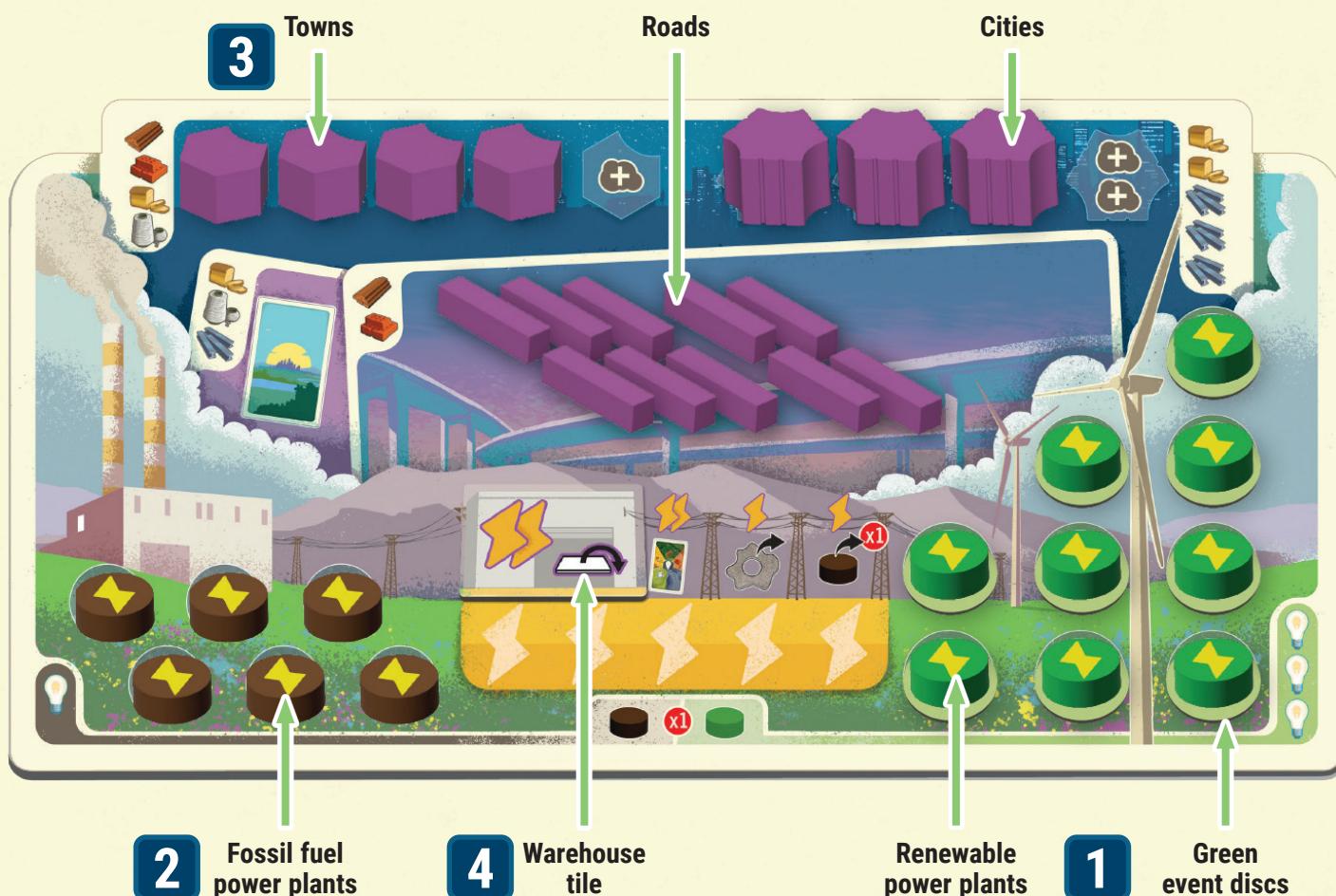


2 Place your fossil fuel power plants (brown) on their spaces.

3 Place your remaining towns, cities, and roads on their spaces.

4 Place your warehouse tile, cost side up, in its space.

Your player board should look like the one below at the beginning of the game.



RULES

OBJECTIVE

The first player to have 10 victory points (VPs) on their turn wins; **OR** if the game ends before any player reaches 10 VPs, whoever has the best balance of energy between renewable and fossil fuels wins.

TURN OVERVIEW

New Energies is played in a series of turns moving clockwise around the board, starting with the first player. Each turn is broken up into distinct phases, each of which must be completed in the following order:

- 1 Event Phase
- 2 Production Phase
- 3 Action Phase
- 4 End of Turn

EVENT PHASE

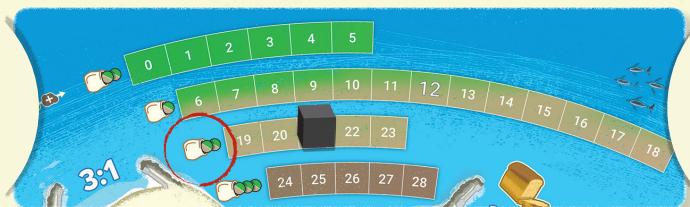
At the beginning of each player's turn, event discs are drawn from the bag. These discs might trigger events. Triggered events have a variety of effects, which are detailed on pages 17 and 20.

The bag starts with 43 brown event discs. When the bag is empty, the second end game condition triggers.

If you want to prevent the game from ending early, you must build renewable power plants to add more discs to the bag. More discs in the bag means more turns.

DRAW EVENT DISCS

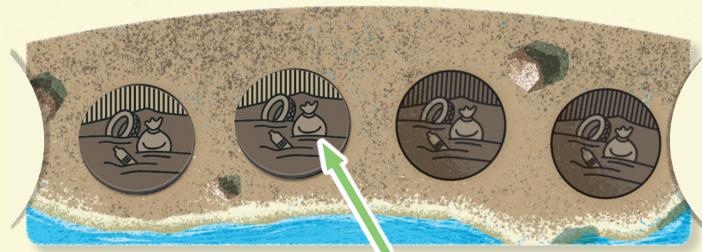
Draw a number of event discs from the bag indicated by the global footprint level. The marker on the global footprint track shows how many discs you need to draw.



Example: The global footprint marker is on space 21. Draw 2 event discs from the bag.

If you need to draw multiple discs, resolve each one before drawing the next one. If resolving an event moves the global footprint level and changes the number of discs to be drawn, you still draw the number of discs indicated at the **beginning** of your turn.

Place the event disc you just drew on the matching space on the frame.



Example: Blue draws an environmental pollution event disc and places it in the corresponding space on the board. Since only two of four places are occupied, the event is not yet triggered.

Triggering an event

If you fill the last available space for an event with a disc, the event immediately takes place. Remove all of this event's tokens from the board and put them back in the box. They are not needed for the rest of the game.

When an event is triggered, read out loud the event description found on pages 17 and 20 and follow the instructions given there.

After you finish drawing event disc(s) and resolving any triggered events, move on to the next phase.



Example: It is Orange's turn, and they draw a rain and flooding event disc. They place it on the last available space on the rain and flooding track. The event is triggered because all spaces are now full. Each player places a hazard token on one of their towns or cities.

Empty bag?

If the bag is empty when you need to draw an event disc, the game ends immediately (see "Winning the Game" on page 16 for final scoring).

Event details

There are seven different events that could be triggered: four brown events, two green events, and one brown/green event.



Brown events generally have negative effects such as adding hazards and increasing the global footprint track. The bag starts with only brown event discs.



Green events reward players who have a low local footprint (LF) (see “Local environmental footprint” on page 12) or who have invested in renewable energy. At the beginning of the game, the green event discs are underneath the players’ renewable power plants. As you build those plants, add the uncovered discs to the bag.

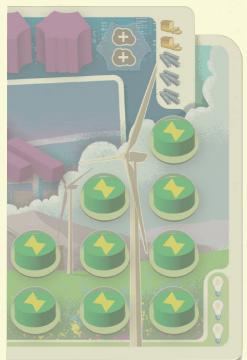


The brown/green event rewards the player with the lowest LF and penalizes the player with the highest LF. Brown/green event discs are either brown or green.

Some events trigger effects for the players with the highest or lowest value of something (i.e., lowest LF, most renewable power plants, etc.). If multiple players have the highest/lowest value, the event will affect each of those players. However, if **all** players have the same value, nothing happens.



Example: The Sustainable Production event is triggered. Each player checks to see how many renewable power plants they’ve built. Pink has built 0 renewable power plants; Orange has built 1 renewable power plant; Blue has built 1 renewable power plant; and Purple has built 0 renewable power plants (continues next column).



Orange and Blue have both built the most renewable power plants on the board (thus the fewest on their player board), so each takes 1 resource card of their choice from the supply.

Hazards from events

In some cases, events cause hazard tokens to be placed on a town, city, or hex.

Hazards block production for that location (see “Production Phase” on page 11).

Each town, city, and hex may only have 1 hazard token. If there is a hazard token on a hex, you may not place the environmental inspector on that hex. Similarly, hazards may not be added to the hex with the environmental inspector.



Example: The Environmental Pollution event is triggered. The active player rolls a 6. The environmental inspector is already on the 6 on the pasture hex, so no hazard token is placed there. Place 1 hazard token on the 6 on the mountains hex.

Removing hazards

There are three ways to remove hazards:

- During any Production phase, remove all hazard tokens from hexes, towns, and cities that do not produce this turn **due to a hazard**. Note that the environmental inspector also blocks production but does not count for removing hazard tokens (see "Produce resources" on page 11).
- During your Action phase, you may pay 1 energy to remove 1 hazard token from a hex, town, or city of your choice (see "Energy use summary" on page 15).
- During your turn, you may play a cleanup development card (see "Development cards" on page 16).

PRODUCTION PHASE

ROLL DICE

Roll both dice. The sum of the dice determines which hexes produce resources.

Produce resources

- **Towns:** Any player who has a town on a hex that produces this turn receives 1 corresponding resource card for each town on the hex.
- **Cities:** Players receive 1 corresponding resource card PLUS 1 science card for each city on the hex.
- **Power plants:** Power plants produce 1 energy if they are on a hex that produces (i.e., no hazard) **and** if the building the power plant is attached to receives resources (again, no hazard).

You may never have more than 5 energy. If you receive more than 5, ignore the extra energy.



Example: Purple rolls a 9. They gain 2 steel from their towns. Pink gains 1 steel from their town and 1 energy from their power plant. If the roll was a 4, Pink would gain 1 natural fiber from their town, while Blue would gain 1 natural fiber and 1 science for their city and 1 energy from their power plant.

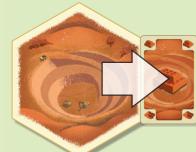
Important: Hazards block production (resource cards, science cards, and energy) from the affected hex, town, or city. At the end of the Production phase, remove all hazard tokens from hexes, towns, and cities that did not produce this turn due to hazards.



PRODUCTION



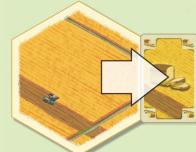
Forest produces lumber



Hills produce brick



Pasture produces natural fiber



Fields produce food



Mountains produce steel



Desert produces nothing



Cities produce science



Power plants produce energy

ACTION PHASE

Actions taken in this phase may be taken in any order and as often as allowed or you can afford.

TRADE

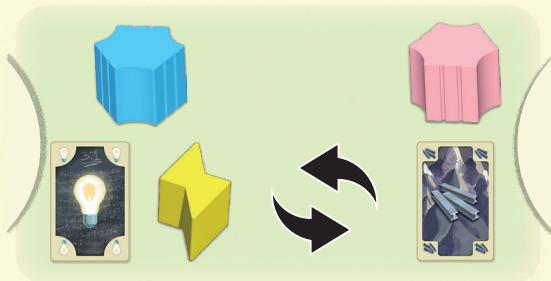
You may trade freely with other players and the supply to get the resources you need. You may trade any combination of resource cards, science cards, and energy.

There are three types of trades you may perform:

Trade with other players

To trade with other players, announce which resource(s) you want and which resource(s) you are willing to trade. Other players may accept your proposal, make counteroffers, or make their own proposals. You may not trade for energy if you already have 5 energy.

Important: You may not give away cards or trade matching resources ("trade" 3 steel for 1 steel, for example).



Example: It is Blue's turn, and they want 1 steel. Pink will trade 1 steel and wants 1 science and 1 energy in return. Blue agrees and the players exchange cards and energy.

Trade with the supply (4:1 resource cards, 3:1 science cards, 2:1 energy)

To trade with the supply:

Put 4 of the same resource card into the supply and take 1 card of a different resource or 1 science card; OR

Put 3 science cards into the supply and take 1 resource card of your choice; OR

Put 2 energy in the supply and take 1 resource card or science card of your choice.

Trade via a harbor (3:1 or 2:1 resource cards only)

If you have a town or city built on a 3:1 harbor, you may put 3 of the same resource card (any type) into the supply and take 1 card of a different resource or 1 science card from the supply. If you have a town or city built on a 2:1 harbor, you may put two of the resource shown into the supply and take 1 card of a different resource or 1 science card from the supply.



Example: Pink has a town at a lumber port. During their turn, they may exchange 2 lumber for any other resource or science card as often as they like.

BUILD/BUY

Building allows you to increase your resource production and VPs.

To build something, return the required combination of resource cards/science cards to the supply and then place what you have built on the board.

Before explaining individual building options, it is important to understand how building affects your local environmental footprint and thus the global footprint track.

Local environmental footprint (LF)

Your player board has storage spaces for your power plants, towns, and cities. On each space, there are one or two pollution icons with a plus (+) or minus (-) symbol. The sum of these icons indicates your local environmental footprint (LF).



Each visible + icon on your player board adds one to your LF.



Cities have two + icons, adding two to your LF.



Each visible - icon on your player board subtracts one from your LF.



Example: The Climate Conference event is triggered. Each player determines their LF (continues next page).

Example Continued:



Orange has five icons and two icons showing, so Orange's LF is 3.



Pink has five icons and no icons showing, so Pink's LF is 5.



Blue has four icons and one icon showing, so Blue's LF is 3.



Purple has six icons and zero icons showing, so Purple's LF is 6.

Climate Conference Result: Purple has the highest LF and discards 1 resource or science card of their choice. Orange and Blue both have the lowest LF and take 1 resource or 1 science card of their choice from the supply.

Global footprint track

Add the LF of all players together and track it on the global footprint track. During the game you may check the status by adding up the visible and icons on all player boards.

The global footprint marker moves forward on the track as you build towns, cities, and fossil fuel power plants.

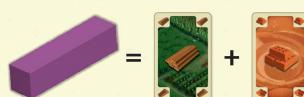
The global footprint marker moves backward on the track as you build renewable power plants or demolish fossil fuel power plants.

If there are four players, the global footprint marker starts the game at 12. Each player has an LF of three because they have each already built 1 town and 1 city.

If the global footprint marker would move beyond the first or last space on the track, it simply remains there until the total LF rises above 0 or drops below 28 for 4 players (21 for 3 players).

THE ACTIVE PLAYER MAY BUILD:

Roads



Roads are placed on empty paths. A new road must connect to one of your existing roads, towns, or cities. You may not build a road past an opponent's town or city.



Example: Purple may build a new road on the paths marked in green, but not on the path marked in red.

Longest Trade Route



The first player to build a continuous route of at least 5 roads receives the "Longest Trade Route" tile. If another player builds a longer route, they immediately receive the tile. The tile is worth **2 VPs**.



Example: Purple has a continuous route of 6 roads and receives the "Longest Trade Route" tile. Pink does not have the "Longest Trade Route" because their 7 roads are separated by Purple's town into a two-segment route and a five-segment route.

Towns



Towns are placed on empty intersections. A new town must connect to one of your existing roads and obey the distance rule explained below.

Distance Rule

When placing a town, stay at least two paths away from all other towns and cities.



Example: Orange may place a town on the intersection marked green, but not on the intersections marked red because of the distance rule.

To build a town, remove a town from your player board and place it on the desired intersection. Your player board now shows one more **(+)** icon and your **LF increases by one**. Move the marker forward one space on the global footprint track.

Each town is worth **1 VP**. When you build a town, move your marker one space forward on the VP track.

Cities



Cities always replace towns. To build a city, remove one of your towns, return it to your player board, and replace it with a city from your player board. If there is a power plant next to the town that you are replacing, the power plant stays there and attaches to the city.

The newly visible city space on your player board shows two **(+)** icons. However, the town you replaced covered up another **(+)** icon. The net result is one more **(+)** icon than you had before you built the city, so your **LF increases by one**. Move the marker forward one space on the global footprint track.

Each city is worth **2 VPs**. It is one point more than the town you removed, so move your marker forward one space on the VP track.

Power plants

You may only build 1 power plant each turn.

Exception: Power plants built as a result of a triggered event do not count toward the once per turn limit.

A power plant is built on a hex in a cutout area of one of your towns or cities. Take a power plant from your player board and place it on a hex next to one of your towns or cities.



A town may only have 1 power plant. Turn the town so that the cutout area is on the hex where you want to build the power plant.



A city may have up to 3 power plants. Turn the city so that each cutout area is on a different hex.

Power plants may only be built on land hexes with a number disc. Power plants may not be built on the desert or the sea.

Example: Orange wants to build a renewable power plant. After paying its cost, they decide to place the plant in the cutout facing the forest hex. When a 6 is rolled during a future Production phase, Orange receives 1 lumber, 1 science, and 1 energy.



Different technologies of power generation have different impacts on the environment and worldwide climate, from adding pollution to recapturing CO₂. More information on this topic can be found in the "Thematic Background" on pages 18-19.

Fossil fuel power plants



When you build a fossil fuel power plant, your player board shows one **(+)** icon and your **LF increases by one**. Move the marker forward one space on the global footprint track.

Demolish a fossil fuel power plant

Once during your Action phase, you may demolish 1 fossil fuel power plant that you have already built.

Pay 1 energy and return 1 fossil fuel power plant to your player board.

Your **LF decreases by one**. Move the global footprint marker back one space.

Fossil fuel power plants represent fossil energy generation methods such as coal-fired power plants. They are inexpensive to build but add more pollution to the environment.

Renewable power plants



When you build a renewable power plant, take the green event disc that was underneath the power plant and put it in the bag.

Your player board now shows one more **(-)** icon, and your **LF decreases by one**. Move the marker back one space on the global footprint track.

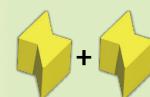
Renewable power plants represent modern energy generation methods such as wind power, solar energy, and hydropower. These developing technologies tend to be more expensive but reduce our environmental footprint.



Note: When the global footprint decreases below 6, additional event discs will be drawn. Reducing the global footprint this low means a high investment in renewable power plants and the addition of many green event discs to the bag. So the larger number of event discs you end up drawing will generally be green events that benefit players.

Energy uses

You may spend the energy your power plants generate on a variety of actions during your Action phase.



Return 2 energy to the supply to take 1 resource or science card of your choice.



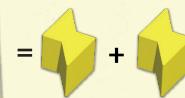
Return 1 energy to the supply to remove 1 hazard token from a hex, town, or city of your choice.



Return 1 energy to the supply to demolish 1 fossil fuel power plant. Limit of 1x per Action phase.



Warehouse



When you build a warehouse, turn the warehouse tile on your player board face up to show that it is active.

With a warehouse, you may hold three more cards (i.e., 10 cards) in your hand when a 7 is rolled during the Production phase. In that case, you only discard half your cards if you have 11 or more cards in your hand.

Development cards



To buy a development card, return the required resources to the supply and draw the top card from the development card stack. If the supply runs out, no more cards may be purchased.

Development cards remain hidden until used. They do not count toward the number of cards in your hand when a 7 is rolled. You may not trade or give away development cards. They may not be stolen by the environmental inspector.

You may play 1 development card during your turn by turning it face up in your play area. It may not be a card you bought this turn. You may play the card before drawing event disc(s) in your Event phase or at any time during your Action phase. If you turn over a progress card, follow its instructions. Then remove the card from play (*continues next page*).

There are three different types of development cards.

Progress cards (6x)

Road Construction (2x)



Build 2 new roads for free.

High Yield (2x)



Take 1 resource card from up to 3 different hexes containing your renewable power plants.



Example: Blue has 2 renewable power plants on the mountain hex and 1 renewable power plant on the pasture. After playing a high yield card, Blue may take 1 steel and 1 natural fiber from the supply.

Research Grant (2x)



Take 2 cards of your choice from the supply. These can be any combination of resource and science cards.

Victory point cards (5x)



Reveal any number of victory point cards on your turn if, with them, you reach at least 10 VPs to win.

Cleanup cards (14x)



When you play this card, you may choose to:

Move the Inspector (see pg. 11)

OR

Remove 1 hazard token from a hex, town, or city. Steal 1 random resource or science card from a player who has the same or higher LF than you.

After you play this card, place it face up in front of you.

Cleanest Environment



The first player to play 3 cleanup cards receives the "Cleanest Environment" tile. If another player plays more cleanup cards, they immediately receive the tile.

The "Cleanest Environment" tile is worth 2 VPs.

END OF TURN

If you have not won or if the game did not end on your turn, pass the dice and bag to the player on your left. That player begins their turn with the Event phase.

WINNING THE GAME

The game ends **immediately** if either of the following two conditions occurs:

You reach 10 VPs or more at any point during your turn.
You are the winner!

OR

The bag is empty when you need to draw an event disc. In this case, only players who have built more renewable power plants than fossil fuel plants may win. The winner is the player with the greatest positive difference between the number of renewable and fossil fuel power plants. In the event of a tie, the player with the most points wins. If no one has built more renewable power plants than fossil fuel plants, then all players lose (see example on the next page).



Example: Orange built 6 renewable power plants and 2 fossil fuel plants. Blue built 5 renewable power plants and 3 fossil fuel plants. Purple did not build any renewable power plants but did build 5 fossil fuel ones, so they are not eligible to win. Orange wins because their positive difference (4) is greater than Blue's (2).

EVENT DESCRIPTIONS

NOTE FOR ALL EVENTS: If multiple players tie, each of those players must take the action starting with the current player and proceeding clockwise around the table. If all players tie, no action is taken.

Air Pollution



The player(s) with the **highest LF** must place 1 hazard token on one of their cities. If all of a player's cities already have hazard tokens, place the token on one of their towns.

Environmental Pollution



The active player rolls the dice and places 1 hazard token on all hexes with this number. If that roll is a 7, they roll again until a different number is rolled. Do not place the hazard on a hex that contains the environmental inspector—he protects the hex from the hazard.

Production Increase



The player(s) with the **highest LF** may build 1 fossil fuel power plant for free. If they do, they also take 1 resource card from the hex where they placed their power plant (even if that hex currently has a hazard token on it). If they do not have a location to build the power plant, then nothing happens.

Rain and Flooding



All players must place 1 hazard token on one of their towns or cities.

Climate Conference



The player(s) with the **lowest LF** may take 1 resource or science card of their choice from the supply.

The player(s) with the **highest LF** must discard 1 resource or science card of their choice.

Government Funding



The player(s) with the **lowest LF** may take 1 development card from the supply.

Sustainable Production



The player(s) with the **most renewable power plants** may take 1 resource or science card of their choice from the supply.

THEMATIC BACKGROUND

CATAN-New Energies brings the island of Catan through the industrial revolution to the threshold of today's energy transition. Humanity now understands the risks that the currently dominant form of energy—fossil fuels—poses to civilization and the planet. We understand that a change in the way we get our energy is urgently needed.

ENERGY TRANSITION

In early 18th century England, Thomas Newcomen created a steam engine that ushered in the modern age. The steam engine, designed to pump water out of deepening coal mines to keep them producing, revolutionized society. It led to the railroad, the steamship, and, in the 19th century, electricity generation.

With the development of steam turbines, coal became the dominant fuel for generating electricity. Today, coal accounts for about one third of electricity generation, and more coal was used to generate electricity in 2021 than in any previous year. Recently, natural gas and, to a lesser extent, petroleum, have also been used to generate electricity. Together, these three fossil fuels account for nearly two thirds of total electricity generation worldwide (and more than 80% of total energy production, including transportation, heating, and industrial use).

The use of fossil fuels has led to local air pollution, caused damage to lands from mining, and generated flooding. It has also released enough carbon dioxide (CO₂), methane, and other greenhouse gases into the atmosphere to change the Earth's climate.

Since humans started burning fossil fuels, we have collectively released more than a trillion tons of CO₂ into the atmosphere. That's about as much as the combined mass of all human-made structures and objects built between 1900 and 2020. As a result, the Earth has warmed by 1.2° Celsius (2.16° Fahrenheit), and scientists project this warming will continue to between 2.4–2.6°C (4.32–4.68°F), according to the United Nations Environment Programme (UNEP). This level of warming means disruptions in rainfall and agricultural patterns, significant sea level rise and coastal flooding, loss of coral reefs, melting of glaciers and sea ice, and many other devastating changes. Limiting warming to this range (and avoiding further temperature rise with even worse consequences) requires a rapid energy transition where human society moves away from fossil fuels and becomes a net zero civilization by 2050.

Net zero refers to the total greenhouse gas emissions generated by humanity. In a net zero scenario there will still be some fossil fuel usage. But greenhouse gases produced will be offset by restoring lands with new trees and plants that absorb CO₂ during photosynthesis and by capturing CO₂ industrially, burying it in deep wells or processing it into products such as cement. The transition to net zero requires a drastic reduction in the use of fossil fuels, replacing coal, oil, and natural gas with renewable energies such as wind, solar, geothermal and hydropower. Many countries and companies have committed to reducing emissions as part of negotiations at the annual Climate Conference of the Parties (Climate COP). Several dozen countries have even committed to net zero emissions (usually by 2050). However, there is still a long way to go from our current energy use to achieving net zero emissions.



FOSSIL FUEL POWER PLANTS

In our game, fossil fuel power plants run on fossil fuels, each adding to a player's local footprint (LF). There are many forms of pollution caused by fossil fuels, including smog, acid rain and flooding, and greenhouse gases.

Smog: This mixture of pollutants and particles released when fossil fuels are burned not only causes haze, but also many health effects, including respiratory diseases such as lung cancer, emphysema, and asthma.

Acid Rain: When coal is burned, sulfur dioxide and nitrogen oxides are released into the atmosphere. These react with the water in the atmosphere and form acidic compounds. When these are then washed out of the atmosphere with the rain, they damage forests, plants, soils, crops, and aquatic life. Acid rain can also corrode stone and steel, damaging buildings and bridges.

Greenhouse gases: Burning coal releases CO₂ and other greenhouse gases into the atmosphere. There, these gases keep heat from escaping into space, creating a global warming effect. These acidic gases are also absorbed into the ocean, which can cause **flooding**, drought, and more frequent weather disasters. Since the beginning of the industrial revolution, the surface water of the oceans has acidified by 30%. This **ocean**

acidification has slowed the growth of and damaged the shells of marine life, not only coral and shellfish, but also tiny microorganisms that form the basis of the marine food chain. This, in turn, has implications for the well-being of marine life at all levels of the food chain.

While these fossil fuel power plants provide a consistent supply of energy to Catan, they also generate pollution, represented by +1 LF, and can damage towns, cities, and surrounding land.



RENEWABLE ENERGY

In recent years, great strides have been made in the development of renewable energy technologies—in particular, solar energy, where the sun's energy is converted into electricity, and wind energy, where the wind drives a turbine to generate electricity (similar to steam generation). The generation of electricity from solar and wind energy does not cause environmental pollution such as smog, flooding, or climate change. However, the production of these systems still causes widespread pollution as sand, metals, and rare earth minerals (e.g., lithium) are mined to make the panels, turbines, and batteries these systems use.

In our game, however, renewable power plants not only generate zero pollution, they also reduce your LF by 1. We can achieve this reduction in three ways: through technology, through nature-based solutions, and through moderating energy use.

Technology: CO₂ can already be captured during energy production. If the energy source is fossil fuel, then the energy is carbon neutral. If the energy source is biomass—for example crop residues—and the CO₂ produced during combustion is sequestered, then the process is carbon negative. However, the amount of energy required to sequester CO₂ is considerable, and the sequestration technology is still under development. In *New Energies*, this expense is modelled by renewable power plants costing 3 science cards.

Nature-based solutions: Another scenario occurs when large tracts of land, frequently based around wind turbines and solar farms, are planted and put into

service sequestering CO₂. These regenerative, nature-based solutions are composed of new trees, sustainable farms, and deep-rooted grasses that repair degraded soils, rebuilding carbon sinks damaged by mining, logging, industrial agriculture, and urban development. Since nature removes carbon from the air, there is a general reduction in greenhouse gases.

Reducing energy consumption: With the shift to new forms of energy that have a lower energy density than fossil fuels, people will also have to reduce their overall consumption and get by with less energy. A mix of lifestyle changes (e.g., more cycling and less driving), new technologies (such as green buildings that use significantly less energy for heating and cooling), and other developments could significantly reduce energy demand and thus reduce peoples' overall impact.

We are still in the early stages of development where renewable power plants decrease pollution. Therefore, in *New Energies*, these regenerative innovations cost more to develop but benefit the player (and the island) by reducing pollution levels. Energy technologies are continuously improving with capital investment. Players can invest in a warehouse that represents those advancements.



TOWNS AND CITIES

Why do towns and cities contribute to pollution on Catan? Just as there can theoretically be green energy, there can also be green cities. Currently, however, cities consume a lot of energy, mostly from fossil fuels, to sustain themselves—in the form of industry, heating, cooling, and transportation. So even if electricity generation is made more environmentally friendly, there is still a lot of pollution in towns and cities. In *New Energies*, towns add +1 LF while larger cities add +2 LF. In the future, perhaps cities will be truly sustainable, powered by renewable energy, with more human-powered transportation, with buildings designed to be net zero, with green spaces replacing parking lots, and with green roofs shaping the cityscape. But there is still a long way to go to realize that vision.

EVENT DESCRIPTIONS OVERVIEW

Air Pollution



The player(s) with the **highest LF** must place 1 hazard token on one of their cities. If all of a player's cities already have hazard tokens, place the token on one of their towns.



The active player rolls the dice and places 1 hazard token on all hexes with this number. If that roll is a 7, they roll again until a different number is rolled. Do not place the hazard on a hex that contains the environmental inspector—he protects the hex from the hazard.

Production Increase



The player(s) with the **highest LF** may build 1 fossil fuel power plant for free. If they do, they also take 1 resource card from the hex where they placed their power plant (even if that hex currently has a hazard token on it). If they do not have a location to build the power plant, then nothing happens.



Rain and Flooding

All players must place 1 hazard token on one of their towns or cities.

Climate Conference



The player(s) with the **lowest LF** may take 1 resource or science card of their choice from the supply.

The player(s) with the **highest LF** must discard 1 resource or science card of their choice.

Government Funding



The player(s) with the **lowest LF** may take 1 development card from the supply.

Sustainable Production



The player(s) with the **most renewable power plants** may take 1 resource or science card of their choice from the supply.

NOTE FOR ALL EVENTS: If multiple players tie, each of those players must take the action starting with the current player and proceeding clockwise around the table. If **all players tie**, no action is taken.

SOURCES FOR THEMATIC BACKGROUND

Thematic background author: Erik Assadourian

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