

QUESTION 1: The 'principles' for a 'Passivhaus' are: thermal insulation, airtightness, ventilation, high performance insulated windows and frames, being thermal-bridge-free.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: TRUE

QUESTION 2: Buildings are responsible for around 35% of the EU's energy consumption and 20% of its greenhouse gas emissions.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: FALSE It is 40% and 36% respectively.

QUESTION 3: In order to mitigate climate change, we need to reduce our energy demand, build more sustainably and choose low carbon energy options.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: TRUE

QUESTION 4: A building's energy performance can be improved by insulating walls, floors and roof spaces.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: TRUE

QUESTION 5: Retrofitting is about insulating and improving the energy performance of existing housing stock.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: TRUE

QUESTION 6: Making new buildings energy-efficient is not cost-effective in the long-run.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: FALSE

QUESTION 7: Turning down the heating thermostat and switching off unused lights does not save any carbon.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: FALSE It can achieve significant savings in the short term, but we also need to improve our infrastructure

QUESTION 8: Switching off unused lights and electrical appliances reduces energy bills.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: TRUE

QUESTION 9: Using sustainable building materials and ensuring the re-use of materials can reduce the overall life-cycle impact of buildings.

TRUE or FALSE?

CLIMANIA THE GAME



If correct, choose a retrofit component.

ANSWER: TRUE



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CLIMANIA The Climate Action Game has been developed by the Birmingham City University Big Green Building Centre with researchers Claudia Carter and Simeon Shlebov from Birmingham City University. The project collaborators include the GAP Arts Project, The Birmingham Architectural Association, The RPI West Midlands and Anthropocene Architecture School.



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QUESTION 10: A low-flow shower roughly halves water use and saves energy.

TRUE of FALSE?

ANSWER: TRUE Lower water use means less energy is required to heat the shower water.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 11: Retrofitting a building can include mechanical and electrical systems underground, temperature and light controls, and internal insulation measures.

TRUE or FALSE?

ANSWER: TRUE If correct, choose a retrofit component.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 12: Retrofitting a home does not consider the needs of its residents; it only counts carbon emissions.

TRUE or FALSE?

ANSWER: FALSE A retrofit project must consider the needs of its residents to be effective.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 13: The European Commission is looking for replicable, scalable and sustainable solutions to accelerate the annual rate of building renovation to lower carbon emissions from buildings.

TRUE of FALSE?

ANSWER: TRUE If correct, choose a retrofit component.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 14: Heat pumps are a fully renewable zero-carbon energy technology.

TRUE or FALSE?

ANSWER: FALSE Heat pumps need electric energy and not all energy is from renewable or zero-carbon sources; however, heat pumps tend to use less power than traditional heating systems.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 15: Absorption heat pumps are like air-source heat pumps but rather than being driven by electricity, they use a heat source such as natural gas, propane, solar-heated water or geothermal-heated water.

TRUE or FALSE?

ANSWER: TRUE If correct, choose a retrofit component.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 16: Heat pumps are unable to heat a whole house; they can only heat one room.

TRUE or FALSE?

ANSWER: FALSE In future new and existing houses may have heat pumps installed as a matter of course; or they may be so well-insulated they only need electric radiators.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 17: One type of insulation material is as good as any other for retrofitting homes.

TRUE or FALSE?

ANSWER: FALSE Materials choices do matter, and affect R-values; some are renewable and others are not; also the choice affects the cost of retrofitting.



If correct, choose a retrofit component.



CLIMANIA THE GAME

QUESTION 18: The R-value in the context of the built environment is a measure of the thermal resistance of a material (e.g., a window or a layer of insulation material).

TRUE or FALSE?

ANSWER: TRUE If correct, choose a retrofit component.



If correct, choose a retrofit component.



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QUESTION 19: An R-value (measuring thermal resistance) cannot be determined for the assembly of materials, only for a single material.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: FALSE An R-value can be given for a material (e.g., cork, wood wool or sheep wool), or for an assembly of materials (e.g., a wall or a window).

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QUESTION 20: Air source heat pumps do not work in cooler countries such as the U.K.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: FALSE Air source heat pumps can operate effectively, even in Scotland. The better insulated the house is, the more effective the system will be.

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QUESTION 21: Today, in northwest Europe, only 1% of building products are reused beyond the first building they are used to build.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: TRUE Source: EUCRBE Project, 2021

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QUESTION 22: Renovating a building releases 50-75% less carbon than building a new one.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: TRUE

CLIMANIA THE GAME

QUESTION 23: The U.K. can meet its legally binding climate targets without the “near-complete elimination of greenhouse gases from homes”

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: FALSE

CLIMANIA THE GAME

QUESTION 24: Installing solar panels and equipment on residential buildings may fall under ‘permitted development’ and therefore the homeowner would not need to apply to the Local Planning Authority for planning permission.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: TRUE

CLIMANIA THE GAME

QUESTION 25: Health and Safety consideration only apply to big building sites; they do not affect small renewable energy installations.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: FALSE Care needs to be taken by you and the builders/installers for any job – big or small. Especially working at height and with electricity can cause death or life-changing injuries.

CLIMANIA THE GAME

QUESTION 26: Retrofitting a building can include a new façade or other external insulation measures.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: TRUE

CLIMANIA THE GAME

QUESTION 27: The European Commission wants to increase the annual rate of building renovation from the present 1.2% to 2.9% to reach 2050 targets of nearly net zero carbon emissions from buildings.

TRUE or FALSE?

 If correct, choose a retrofit component.



ANSWER: TRUE

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QUESTION 28: Air source heat pumps lose efficiency below which temperature?

- A) 0 degrees Celsius
- B) 5 degrees Celsius
- C) 10 degrees Celsius

CLIMANIA THE GAME



ANSWER: A) 0 degrees Celsius
If correct, choose a retrofit component.

QUESTION 29: How much of its annual energy use will the average home use for heating?

- A) 40%
- B) 60%
- C) 80%

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ANSWER: B) 60%
If correct, choose a retrofit component.

QUESTION 30: How many households in the U.K. were classed as living in fuel poverty in 2019?

- A) 1-5%
- B) 6-10%
- C) 11-15%

CLIMANIA THE GAME



ANSWER: C) 11-15% Additional:
It was 13.4%
If correct, choose a retrofit component.

QUESTION 31: How much of a country's healthcare costs are due to its buildings?

- A) 20%
- B) 40%
- C) 60%

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ANSWER: B) 40% Additional: Every £1 spent retrofitting fuel-poor homes is estimated to save the NHS £0.24
If correct, choose a retrofit component.

QUESTION 32: Carbon emissions from newly constructed buildings occur as a result of?

- A) building materials
- B) operation of the building
- C) emissions embodied in the building materials and the operation of the building

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ANSWER: C) Therefore, both should count in calculating whether a building achieves the 'net-zero' target

QUESTION 33: The Cambridge Housing Model (CHM), a domestic energy model, calculated that domestic energy for heating and hot water (in the UK) amounts to?

- A) 85% of total energy use
- B) 75% of total energy use
- C) 65% of total energy use

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ANSWER: B) 75% of total energy use

QUESTION 34: Turning the heating thermostat down by 2 degrees from 20°C to 18°C can save how much energy over one year (in Terra Watts per Hour - TWh)?

- A) less than 20 TWh
- B) 20-30 TWh
- C) over 30 TWh

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ANSWER: C) over 30 TWh Additional:
UK's annual energy use was 1651 TWh in 2019
If correct, choose a retrofit component.

QUESTION 35: Turning the heating thermostat down by 1 degree from 19°C to 18°C can save what percentage of the energy needed to heat a home?

- A) 13% space heating energy
- B) 10% space heating energy
- C) 7% space heating energy

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ANSWER: A) 13%
If correct, choose a retrofit component.

QUESTION 36: What percentage of homes in Scotland currently have renewable or low emissions heating systems?

- A) around 0.1%
- B) around 1%
- C) around 10%

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ANSWER: A) around 0.1% Additional:
278,000 out of 2.45 million homes (0.11%)
If correct, choose a retrofit component.



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QUESTION 37: 'Deep retrofits' is a term used to describe?

- A) Using insulation material that is 30 mm deep
- B) Renovations that deliver energy savings of 60% or more
- C) Buildings that are renovated to include a geothermal heat pump

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ANSWER: B) Renovations that deliver energy savings of 60% or more

QUESTION 38: There are currently three types of heat pumps. Which one uses the relatively constant temperature of the earth as exchange medium?

- A) Absorption heat pumps
- B) Air source heat pump
- C) Geothermal heat pump

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ANSWER: C) Geothermal heat pump

QUESTION 39: When planning to install solar panels on your home's roof, you should do which of the following?

- A) Buy and immediately instal them yourself
- B) Contact the Local Planning Authority to discuss if installation would meet the limits and conditions of permitted development
- C) Complete a planning application without any discussion or checking out planning guidance

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ANSWER: B)  If correct, choose a retrofit component.

QUESTION 40: Any electrical installation and connection can be carried out by anyone with a rough idea of how this works.

TRUE or FALSE?

CLIMANIA THE GAME



ANSWER: FALSE Electrical installation and connections work must be carried out by a qualified electrician.

QUESTION 41: The highest Energy Rating for windows is:

- A) A+
- B) A++
- C) A+++

CLIMANIA THE GAME



ANSWER: B) A++

 If correct, choose a retrofit component.

QUESTION 42: Retrofit costs are higher for using standard products that the workforce are familiar with and sourcing products from suppliers closer to home

TRUE or FALSE?

CLIMANIA THE GAME



ANSWER: FALSE

 If correct, choose a retrofit component.

QUESTION 43: Taking time to design a retrofit solution and installing systems/products carefully from the outset can avoid the requirement for remedial work.

TRUE or FALSE?

CLIMANIA THE GAME



ANSWER: TRUE

 If correct, choose a retrofit component.

QUESTION 44: External wall insulation materials include rigid boards (e.g., made from expanded or extruded polystyrene, or polyurethane) and natural insulation boards (e.g., made from timber fibre or sheep's wool).

TRUE or FALSE?

CLIMANIA THE GAME



ANSWER: TRUE

 If correct, choose a retrofit component.

QUESTION 45: Retrofit is easy and straightforward and does not require a specialist workforce. Anyone can do it.

TRUE or FALSE?

CLIMANIA THE GAME



ANSWER: FALSE Inexperienced, careless or faulty work can mean that the retrofit may not work properly and need costly remedial action

 If correct, choose a retrofit component.



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QUESTION 1: How many homes does the U.K. have?

- A) 10-20 million
- B) 20-30 million

If correct, move one field



ANSWER: B) 28 million (UK Gov, 2021)

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QUESTION 2: How many buildings on average are knocked down in the U.K. annually?

- A) Less than 25,000
- B) More than 25,000

If correct, move one field



ANSWER: B) 50,000
Source: Exeter Centre for Circular Economy (ECCE, 2021)

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QUESTION 3: How many people in the U.K. want action on climate change?

- A) One third
- B) Two thirds

If correct, move one field



ANSWER: B) Source: Greener UK / Climate Coalition

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QUESTION 4: The UK building stock (homes and public buildings) is one of the oldest in Europe.

- A) True
- B) False

If correct, move one field



ANSWER: A) UKGBC - UK Green Building Council

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QUESTION 5: 'Carbon dioxide equivalents' is a metric calculating the amount of warming that one tonne of a greenhouse gas would create relative to one tonne of carbon dioxide over 100 years.

- A) True
- B) False

If correct, move one field



ANSWER: A)

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QUESTION 6: Overall, transport emissions in the U.K. have decreased significantly from 2015-2020.

- A) True
- B) False

If correct, move one field



ANSWER: B) Transport emissions have stayed relatively constant. Any savings from more efficient engines has generally been outweighed by additional vehicles and more journeys made.

CLIMANIA THE GAME

QUESTION 7: Transport is the second largest greenhouse gas emitting sector (U.K. statistics)

- A) True
- B) False

If correct, move one field



ANSWER: B) It became the largest emitting sector in 2016, overtaking the energy sector which had made huge savings by switching from coal to gas (and renewables).

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QUESTION 8: Transport produced 27% of the U.K.'s total emissions in 2019.

- A) True
- B) False

If correct, move one field



ANSWER: A) Source: UK Government

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QUESTION 9: The majority of U.K.'s greenhouse gas emissions in road transport comes from cars and taxis, which make up about 60% of the emissions.

- A) True
- B) False

If correct, move one field



ANSWER: A) Source: UK Government

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The Arts and Humanities Research Council is proud to support the UK Climate Action Game.

QUESTION 10: Lifetime emissions from electric cars are around 30-70% lower than conventional petrol cars.

- A) True
- B) False

If correct, move one field



ANSWER: A) Countries such as Sweden and France (where most electricity comes from renewables and nuclear) have larger savings compared to countries still relying largely on carbon fuels (such as the U.K.).



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QUESTION 11: Up-to-date data on climate change impacts, vulnerability, mitigation and adaptation are important to support global and national environmental policies.

- A) True
- B) False

If correct, move one field



ANSWER: A)



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QUESTION 12: Passive house (German: Passivhaus) is a voluntary standard for energy efficiency in a home or other building. It is an ultra-low energy heating/cooling concept which reduces the building's ecological footprint.

- A) True
- B) False

If correct, move one field



ANSWER: A)



CLIMANIA THE GAME

QUESTION 13: The carbon footprint of a person, product, or area is usually expressed as carbon dioxide equivalent (CO₂e).

- A) True
- B) False

If correct, move one field



ANSWER: A)



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QUESTION 14: January 2020 was the warmest January since records began in 1880?

- A) True
- B) False

If correct, move one field



ANSWER: A)



CLIMANIA THE GAME

QUESTION 15: 2011-2020 was one of the coolest decades on record.

- A) True
- B) False

If correct, move one field



ANSWER: B) It was the hottest!



CLIMANIA THE GAME

QUESTION 16: Idling (leaving the engine running while stopping for a while) negatively affects the car engine internals due to incomplete combustion and causes air pollution.

- A) True
- B) False

If correct, move one field



ANSWER: A)



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QUESTION 17: Burning large quantities of fossil fuels such as oil, coal and gas causes climate change.

- A) True
- B) False

If correct, move one field



ANSWER: A)



CLIMANIA THE GAME

QUESTION 18: The Earth is surrounded by a layer of greenhouse gases which trap heat from the sun and make our planet warm enough for humans, animals and plants to exist.

- A) True
- B) False

If correct, move one field



ANSWER: A)



CLIMANIA THE GAME

QUESTION 19: Carbon dioxide (CO₂) is not a greenhouse gas.

- A) True
- B) False

If correct, move one field



ANSWER: B)



CLIMANIA THE GAME

QUESTION 20: As the average temperature of the Earth increases, we are experiencing more unpredictable and extreme weather.

- A) True
- B) False

If correct, move one field



ANSWER: A)



CLIMANIA THE GAME

QUESTION 21: Climate change is causing colder winters and later springs; this confuses wildlife and can have a bad impact on crops we grow for food or feeding animals.

- A) True
- B) False

If correct, move one field



ANSWER: B) It causes warmer winters and earlier springs



CLIMANIA THE GAME

QUESTION 22: Carbon is a manufactured substance?

- A) True
- B) False

If correct, move one field



ANSWER: B)



CLIMANIA THE GAME

QUESTION 23: An average temperature increase of 1.5 degrees Celsius over 100 years can have a big impact on humans, plants and animals.

- A) True
- B) False

If correct, move one field



ANSWER: A)



CLIMANIA THE GAME

QUESTION 24: Climate change leads to:

- A) Heat waves
- B) Ocean acidification
- C) Sea level rise
- D) All of the above

If correct, move one field



ANSWER: D)



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QUESTION 25: The car is the greatest polluter because emissions from millions of vehicles add up. Therefore, walk and cycle more!

- A) True
- B) False

If correct, move one field



ANSWER: A)



CLIMANIA THE GAME

QUESTION 26: Which of the following can help reduce carbon emissions and pollution?

- A) When driving a car, accelerate fast and break often
- B) Do carpooling for daily commutes

If correct, move one field



ANSWER: B) Carpool is a great way to reduce journeys in cities



CLIMANIA THE GAME

QUESTION 27: In America, households located near a bus or rail stop drive on average 4,400 fewer miles less annually compared to households without access to public transport.

- A) True
- B) False

If correct, move one field



ANSWER: A)



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QUESTION 28: Airplane fuel is a high-carbon energy source; take-off and landing are the most fuel-intensive parts of a flight.

- A) True
- B) False

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If correct, move one field



ANSWER: A)

QUESTION 29: Travelling by train uses more energy than travelling by aircraft.

- A) True
- B) False

CLIMANIA THE GAME



If correct, move one field



ANSWER: B)

QUESTION 30: Greenhouse gas emissions from buildings arise primarily from:

- A) their building materials
- B) powering their heating and cooling system

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If correct, move one field



ANSWER: B)

QUESTION 31: 'You can reduce greenhouse gas emissions from buildings by installing solar panels on rooftops and geothermal energy.

- A) True
- B) False

CLIMANIA THE GAME



If correct, move one field



ANSWER: A)

QUESTION 32: Solar water heating and small-scale wind generation are climate-friendly energy sources.

- A) True
- B) False

CLIMANIA THE GAME



If correct, move one field



ANSWER: A)

QUESTION 33: Houses that are currently being built are always carbon neutral.

- A) True
- B) False

CLIMANIA THE GAME



If correct, move one field



ANSWER: B) The standard of energy efficiency depends on the planning policies and building regulations of a country/area

QUESTION 34: Incentive-based and mandatory policies can help increase the standard of energy efficiency in new buildings.

- A) True
- B) False

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If correct, move one field



ANSWER: A)

QUESTION 35: Building codes have little impact on the energy performance of current and new buildings.

- A) True
- B) False

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If correct, move one field



ANSWER: B) Strong building codes can help achieve high energy-efficiency standards.

QUESTION 36: The construction of micro-grids, district energy systems and waste to heat systems can help save energy.

- A) True
- B) False

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If correct, move one field



ANSWER: A)

QUESTION 37: Carbon dioxide from human activity is increasing how many times faster than it did from natural sources after the last Ice Age?

- A) 150 times
- B) 200 times
- C) 250 times

If correct, move two fields



ANSWER: C) Vostok Ice core data



CLIMANIA THE GAME

QUESTION 38: 'Fuel Poverty' is a term used to mean:

- A) A country or area has no access to any fuel.
- B) A household cannot afford to keep adequately warm at a reasonable cost, given their income.
- C) This is a made-up 'fake news' term.

If correct, move two fields



ANSWER: B)



CLIMANIA THE GAME

QUESTION 39: The oceans have absorbed how much of total anthropogenic (human made) carbon dioxide emissions in recent decades?

- A) 10-20%
- B) 20-30%
- C) 30-40%

If correct, move two fields



ANSWER: B)



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QUESTION 40: UNFCCC stands for:

- A) United Nations Forum for Climate Change Conspiracy
- B) Uniform National Framework for Combatting Climate Change
- C) United Nations Framework Convention on Climate Change

If correct, move two fields



ANSWER: C)



CLIMANIA THE GAME

QUESTION 41: Climate change adaptation means:

- A) The climate is adapting to changes caused by carbon emissions from human activity.
- B) People and decision-making are adapting to the impacts of climate change.

If correct, move two fields



ANSWER: B)



CLIMANIA THE GAME

QUESTION 42: Cities consume how much of the world's energy?

- A) One third
- B) Two thirds
- C) More than two thirds

If correct, move two fields



ANSWER: C) They also account for more than 70% of the world's greenhouse gas emissions



CLIMANIA THE GAME

QUESTION 43: How many of the buildings that will be in use in 2050, exist today?

- A) 40%
- B) 60%
- C) 80%

If correct, move two fields



ANSWER: C) Source: World Green Building Council, 2020



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QUESTION 44: How much of the world's population will be at risk of flooding by 2050?

- A) 20%
- B) 40%
- C) 60%

If correct, move two fields



ANSWER: A) Source: World Resource Institute, 2021



CLIMANIA THE GAME

QUESTION 45: For every £1 spent on protecting communities from flooding, you can avoid up to how many pounds of further damages

- A) £3
- B) £6
- C) £9

If correct, move two fields



ANSWER: C) Source: UK Government, 2019



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QUESTION 46: How much time do people spend on average in their homes in the U.K.?

- A) 25%
- B) 45%
- C) 65%

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If correct, move two fields



ANSWER: C)

QUESTION 47: Improving buildings for climate change includes:

- A) Insulation of walls and roof spaces
- B) Shading solutions for windows
- C) Fitting storm-water capacity drainage solutions
- D) All of the above

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If correct, move two fields



ANSWER: D)

QUESTION 48: Which of the following is best/'greenest' action to take: Recycle; Reduce; Reuse?

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If correct, move two fields



ANSWER: Reduce

QUESTION 49: Who is vulnerable to poor outdoor air quality:

- A) Fetuses in the womb
- B) Young children and elderly people
- C) Those with pre-existing medical conditions
- D) All of the above

CLIMANIA THE GAME



If correct, move two fields



ANSWER: D)

QUESTION 50: When using a diesel- or petrol-powered car, air quality can be improved by:

- A) Letting motors run while waiting (this is called idling engines)
- B) Accelerating fast and breaking hard
- C) Driving smoothly and switching the engine off when stopping for more than 10 seconds

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If correct, move two fields



ANSWER: C)

QUESTION 51: Carbon stays in the atmosphere for about:

- A) 30-95 years
- B) 10-30 years
- C) 1-2 years

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If correct, move two fields



ANSWER: A)

QUESTION 52: Fine particles emitted from vehicle brakes and tyres are responsible for more fine particle emissions than exhaust fumes.

- A) True
- B) False

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If correct, move two fields



ANSWER: A)

QUESTION 53: Since the Industrial Revolution, the acidity of surface ocean waters has increased by about one third. This is due to humans emitting a lot of carbon dioxide into the atmosphere, some of which the oceans absorb.

- A) True
- B) False

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If correct, move two fields



ANSWER: A)

QUESTION 54: Significant inequity exists between countries' greenhouse gas emissions and impacts suffered from climate change. This means that often those who contribute to climate change the least, suffer from it the most.

- A) True
- B) False

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If correct, move two fields



ANSWER: A)

QUESTION 55: The Paris Agreement was reached in 2020 and aims to enable humanity to boost the transition towards resilient, low-carbon societies and economies.

- A) True
- B) False

If correct, move two fields

ANSWER: B) Most is true but the actual date that nations around the globe reached the Paris Agreement was 2015.



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QUESTION 56: UHI stands for

- A) Usual Heat Installation
- B) Urban Heat Island
- C) Urban High Insulation



If correct, move two fields

ANSWER: B) An urban heat island means the urban area is several degrees warmer than its surrounding countryside due to higher density of buildings, transport infrastructure and commerce/industry.

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QUESTION 57: Greenhouse gases are:

- A) Gases to heat your garden greenhouse and encourage better crops
- B) Gases that absorb and emit radiant energy in the thermal infrared range
- C) Gases that are found in greenhouses



If correct, move two fields

ANSWER: B)

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QUESTION 58: Reducing air pollution usually also helps to mitigate climate change

- A) True
- B) False

If correct, move two fields

ANSWER: A)



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QUESTION 59: The main greenhouse gases in the Earth's atmosphere are water vapour (H₂O), carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and ozone (O₃).

- A) True
- B) False

If correct, move two fields

ANSWER: A)



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QUESTION 60: We need to get rid of all greenhouse gases to combat climate change.

- A) True
- B) False

If correct, move two fields

ANSWER: B) Without greenhouse gases the average temperature on Earth would be significantly colder (around -18 degrees Celsius / 0 degrees Fahrenheit)



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QUESTION 61: There are 149 countries in the world whose entire national carbon footprint is smaller than the footprint of the UK's construction sector.

- A) True
- B) False

If correct, move two fields

ANSWER: A) Source: Architects Climate Action Network, 2021



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QUESTION 62: A 'thermal bridge' causes heat to escape.

- A) True
- B) False

If correct, move two fields

ANSWER: A) It is an area or component of an object which has higher thermal conductivity than the surrounding materials, creating a path of least resistance for heat transfer.



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QUESTION 63: A thermal bridge is different from a cold bridge, a heat bridge, or a thermal bypass.

- A) True
- B) False

If correct, move two fields

ANSWER: B)



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QUESTION 64: Passive house (or German: Passivhaus) means:
A) A building that is unoccupied
B) A house that passively passes heat and cold in or out
C) A voluntary energy efficiency standard



If correct, move two fields



ANSWER: C)

QUESTION 65: Carbon footprint means:
A) making a footprint with a carbon-fibre shoe sole
B) the total amount of greenhouse gas emissions produced directly and indirectly by an individual, event, organisation, or product etc.
C) measuring the carbon emissions of journeys



If correct, move two fields



ANSWER: B)

QUESTION 66: The global average atmospheric concentration of carbon dioxide is below 400 parts per million (ppm)
A) True
B) False



If correct, move two fields



ANSWER: B) In November 2021 the amount of 415.01 ppm was recorded at Mauna Loa Observatory, Hawaii

QUESTION 67: Argentina's Upsala glacier, which was once the biggest glacier in South America, is shrinking at a rate of about 100 metres (about the length of a football field) per year.
A) True
B) False



If correct, move two fields



ANSWER: B) It is about 200 metres per year.

QUESTION 68: In February 2020, the Guardian Newspaper reported that 1 in 10 new homes in England is built on land with high flood risk.
A) True
B) False



If correct, move two fields



ANSWER: A)

QUESTION 69: Which of the following is a low-cost retrofit costing less than £500 in 2020:
A) Loft insulation
B) Solar water system
C) New energy efficient gas boiler



If correct, move two fields



ANSWER: A)

QUESTION 70: In 2014, triple glazed windows in the U.K. were twice as expensive as double-glazed windows.
A) True
B) False



If correct, move two fields



ANSWER: A) The average cost around 2014 for a double-glazed window was £261 per metre compared to £567 for a triple-glazed window. Triple-glazed windows had to be ordered from abroad which drives up costs.

QUESTION 71: When using innovative retrofit products, it pays off to do which of the following:
A) Carefully research and select them
B) Share learning and transfer knowledge
C) Consult with the local planning department
D) All of the above



If correct, move two fields



ANSWER: D)

QUESTION 72: Driving energy-efficiency requires action by:
A) Local and national government
B) Businesses and industry
C) Non-governmental and community-based organisations
D) All of the above



If correct, move two fields



ANSWER: D)

QUESTION 73: A square metre of concrete has how many times more embodied carbon compared to a square metre of brick?

- A) 2x
- B) 5x
- C) 10x

If correct, move three fields



kgCO₂/m³

ANSWER: C) Embodied carbon emissions from 1m³ brick is about 357 kgCO₂/m³ and from 1m³ concrete about 3570



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QUESTION 74: What did the Commission on Climate Change conclude in 2019 regarding reducing carbon emissions in the U.K.?

- A) Net-zero is necessary, but not feasible or cost-effective.
- B) Net-zero is necessary, feasible and cost-effective.
- C) Net-zero is unnecessary and costly, yet theoretically possible.

If correct, move three fields



ANSWER: B)



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QUESTION 75: Sulfur hexafluoride (F₆S) is a greenhouse gas that is roughly 10,000 times more potent than carbon dioxide (CO₂) at capturing heat. The gas is used as an insulator in the electronics industry.

- A) True
- B) False

If correct, move three fields



ANSWER: B) Almost all is true except the gas is 22,200 times (!) more potent than carbon dioxide. It is one of the top 10 greenhouse gases.



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QUESTION 76: Nitrous oxide (N₂O), commonly known as laughing gas, is amongst others used to improve the engine power of automobiles. Over a 100-year period it is how much more effective at trapping heat compared to carbon dioxide (CO₂)?

- A) 148 times
- B) 232 times
- C) 298 times

If correct, move three fields



ANSWER: C)



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QUESTION 77: Climate change mitigation means:

- A) Taking actions to reduce human emissions of greenhouse gases.
- B) Mitigating circumstances for countries who find it hard to reduce their carbon emissions.
- C) Increasing human emissions of greenhouse gases to mitigate natural climate change.

If correct, move three fields



ANSWER: A)



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QUESTION 78: Which of the following is not a climate change mitigation measure?

- A) Blue and green infrastructure
- B) Using sustainable building materials
- C) Installing blinds for windows facing South

If correct, move three fields



ANSWER: C) Would be called an adaptation measure which means while not reducing carbon it helps us protect ourselves from the negative impacts of climate change



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QUESTION 79: Which of the following is not a greenhouse gas (GHG)?

- A) Water vapour (H₂O)
- B) Oxygen (O)
- C) Nitrous oxide (N₂O)

If correct, move three fields



ANSWER: B)



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QUESTION 80: Which of the following has the highest average cost per square metre?

- A) Roof insulation
- B) Floor insulation
- C) External wall insulation

If correct, move three fields



ANSWER: C) Roof insulation: £14-£82; Floor insulation: £65-£130; External wall insulation: £150-£161



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QUESTION 81: Sort the life expectancy of different window materials from shortest to longest lifespan: aluminium, hard wood, soft wood, uPVC.

If correct, move three fields



ANSWER: Softwood 36 years; uPVC 37years; Aluminium 44 years; Hardwood 50 years



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QUESTION 82:

Brainstorm with the other players 2 actions you can do locally to reduce air pollution.



If you manage to think of the actions, all move one field forward.



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QUESTION 83:

Decide with the other players 3 actions you can do in your home to reduce energy use.



If you manage to think of the actions, all move one field forward.



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QUESTION 84:

Agree with all players a national policy (e.g., requirement for all firms, or citizens) that would help reduce carbon emissions.



If you manage to think of a policy, all move one field forward.



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QUESTION 85:

Mime your favourite means of local travel to the other players.



If they guess correctly, you move one field forward.



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QUESTION 86:

Mime the mode of transport you used (most recently) for longer-distance travel.



If they guess correctly, you move one field forward.



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QUESTION 87:

Act out (without words) what you think everyone should do daily to save energy.



If the other player(s) guess correctly, you move one field



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QUESTION 88:

Propose a local volunteer activity you can do with friends to help make this neighbourhood nicer.



If the other player(s) all like your idea, you move one field forward.



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QUESTION 89:

Draw (or if no paper and pen – mime) a 'green' (low/no carbon) energy source.



If the other player(s) guess correctly (and agree it is a 'green' source), you move one field forward.



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QUESTION 90:

If your home got flooded, what would you do first?



Everyone to share their action, then all move one field forward.



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QUESTION 91:

How many players (including you) are using refillable cups/bottles to reduce plastic waste?

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If two or more, all move one field forward.



QUESTION 92:

Have you visited a local park or river in the past fortnight?

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If you have, you move one field forward.



QUESTION 93:

Have you taken public transport in the past seven days?

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If yes, you move one field forward.



QUESTION 94:

Suggest an improvement to the local area that would also help absorb/reduce carbon emissions.

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If you all agree on an improvement/idea within 1 minute, all move one field forward.



QUESTION 95:

Brainstorm 3 actions that would help your neighbourhood to adapt to climate change (i.e., to reduce negative impacts such as extreme heat or flooding).

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If you all agree on 3 actions within 2 minutes, all move one field forward.



QUESTION 96:

Tell your co-players one thing you would love to have/see in your neighbourhood to make it better.

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Once you have done so, you move one field forward.



QUESTION 97:

Do you have double-/triple-glazing in the home you live (your actual home rather than in this game)?

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If you do, you move one field forward.



QUESTION 98:

How many (co-)players have travelled abroad (for pleasure rather than work) by airplane in the past 12 months?

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If two or less (including you), you move one field forward.



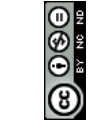
QUESTION 99:

How many players put on a jumper etc. rather than put the heating on/higher?

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If two or more (including you), you move one field forward.



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CHANGING PLANET 1: Winter Flood!

Rapid snowmelt and heavy rain means that many buildings are flooded. **Anyone who has a home with no or one retrofit component, finds their home 50 cm under water and must sit out two rounds until their home has dried out again.**



CHANGING PLANET 2: Storm!

Storm 'Ariel' has hit your area with gusts of over 100 miles (161 km) per hour ripping off roof tiles, solar panels and insulation - causing widespread damage. **Any players with a roof-based retrofit lose that retrofit part.**



CHANGING PLANET 3: Flash flood!

A heavy downpour of one month's rainfall in one hour causes a flash flood. **The player drawing this card, if travelling by car, moves back to a junction with alternative transport option(s). From now onwards use public or active transport only.**



CHANGING PLANET 4: Heat Wave!

Air temperatures have been over 30 degrees Celsius day and night for 3 days. **Anyone on a stretch of path/road without trees (the field you are on and the immediate ones before and after) will experience a heat stroke and need to move back three spaces.**



CHANGING PLANET 5: Prolonged cold spell!

Temperatures have plummeted. This means high energy bills to pay. **Any players with homes with no or one retrofit part move back three spaces; those with two retrofit parts move back two spaces, and those with three retrofit parts or more move back one space.**



CHANGING PLANET 6: Asbestos! An inspector is checking your house for Asbestos-containing thermal pipe insulation and drywall plaster. When disturbed during retrofitting work, asbestos could be very dangerous to health. **If you already have three or more retrofit actions completed, you are safe and move two spaces forward. If not, move two spaces back.**



CHANGING PLANET 7: Smog alert!

If you are **travelling by car, move back to the previous junction and choose an alternative means of transport.** If you have chosen to travel by **public transport (bus), move back one space.** Those on **bikes or walking can stay where they are** (but should go indoors and wait until the smog has lifted).



CHANGING PLANET 8: Early winter!

For a whole week the temperature dropped below 5 degrees Celsius. **Those with two or less retrofits must move back two spaces** to pay their increased heating bills at their energy company.



CHANGING PLANET 9: Local tornado!

A powerful tornado has formed and you, along with anyone else on your stretch of road must seek shelter in dedicated public buildings. **All players move to Moseley Road Baths or the Old Printworks junctions (whichever is nearer)!**



CHANGING PLANET 10: Biodiversity

Crisis! Species are suffering from disturbed ecosystems due to the impacts of climate change and human activity. A mass extinction event is spreading. Each player has a small but important part to play. **Go back to the closest field with a wild animal and care for them.**

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CHANGING PLANET 11: Drought!

A prolonged early summer drought leads to crop failure and water shortages across the country. Heat exchange and water recycling systems are failing. **Every player with a 'services and systems' retrofit loses it.**

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CHANGING PLANET 12: Wildfire!

Due to a prolonged drought and heat wave, some fields and forests are ablaze. This results in low air quality and unsafe conditions. **All players move back two spaces unless they are near (within a field of) a water source.**

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CHANGING PLANET 13: Pests!

Climate change gives some existing and accidentally imported or released species suitable conditions to flourish. Some insects and rodents have infested your home and compromised (nibbled!) your insulation. **All players with an insulation (any kind) retrofit lose it.**

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CHANGING PLANET 14: Listen to the Science!

Your household is split; half think that 'Retrofit' is just a money-making machine by big business, the other half think it is a necessity but don't understand the financial returns. **While you try and explain to all the science behind energy efficiency, you skip a turn.**

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CHANGING PLANET 15: All Glued Up!

Protest and stimulating critical debate are an essential part of a healthy democracy. A local pressure group advocating for insulation of all properties has taken to the streets and is blocking major roads. Short term disruption leads to long term gains. **You skip a turn, but get to pick an insulation retrofit part.**

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CHANGING PLANET 16: Home Fatigue!

Prolonged exposure to heat in homes and other buildings can lead to risks to human health, wellbeing and productivity. **For the next turn all players can only move one field forward instead of two.**

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CHANGING PLANET 17: Food Insecurity!

Climate change will challenge existing food supply chains. You are experiencing such insecurities due to European-wide crop failures. **You all need food, the time to finish the game has reduced by 3 minutes. The timekeeper needs to amend the time.**

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CHANGING PLANET 18: Drafty!

Poor quality housing stock costs countries' health systems a lot of money (in the UK it costs the NHS over £1bn a year). Unfortunately, you live in a century old house and have fallen ill with a cold. **Skip a turn and get better.**

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JOKER 1: Refurbishment VAT Tax Scrapped!

The U.K. government bows to public pressure and changes current legislation that places a 20% extra cost on retrofitting buildings. **The next time you answer a question, you can try a second time should you get it wrong.**

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JOKER 2: Energy Transition Now!

The government ends fossil fuels subsidies and uses the money to establish a National Climate Service. This will employ 1.5 million people in the retrofitting industry and invest in local supply chains to support a fair transition to a society that uses less energy. **The player who picked the card moves forward to the green pedestrian path field near the centre; all other players move forward to the next green space.**



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JOKER 3: Housing Justice is Climate Justice!

Your local climate justice group joins forces with tenants and trade unions to campaign for a National Retrofit Strategy with tenant protections ... and they win! Paint a placard, join the rally as it marches past and **move 2 spaces forwards.**

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JOKER 4: Local Government Grant!

Your retrofit grant application has been successful. **Move forward to the next green space and pick one retrofit component without having to take a green card.**

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JOKER 5: Inheritance – sharing is caring!

Your great-aunt Ida passed away recently. In her 94 years she lived frugally and ecologically aware. She left each of her family members (i.e., each player) some money for retrofit.

Everyone chooses one retrofit component. If you already have a fully retrofitted home, players can give their retrofit component to someone else.



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JOKER 6: Car Free Day!

Today is a car-free day! **If you are travelling by car (on a road), you need to go to the nearest junction (whether this is ahead or behind) and continue the game on your bike, a bus or walk next turn.** This affects everyone.



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JOKER 7: More electric charging points!

It is your lucky day. A newly fitted public electric charging point has been installed on your road. **If you are travelling by (electric) car (on road), move two fields forward.** Affects only you.

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JOKER 8: Polluter Pays Fund!

Fossil fuel companies have been paying into a fund to support street-by-street retrofit schemes. **All players travelling along a walking or cycling route received a letter to tell them that their home is included. Those players pick two retrofit components.**



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JOKER 9: Poor workmanship!

You hired a cheap building firm to install your retrofit without checking their qualifications and reviews. Unfortunately, their workmanship and quality of materials is so poor that your retrofit needs redoing! **Discard one retrofit.**



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The "Are you game for Climate Action?" project, was funded by the Arts and Humanities Research Council.



JOKER 10: Elections Results!

U.K. citizens just elected a climate action committed Government. To show that they are serious about the environment and social justice, they have issued a temporary scheme to allow **any household with no or one retrofit component to level up by picking up one (more) component.**



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JOKER 11: Retrofit Champion Award!

Your home has been nominated for this year's Annual Retrofit Champion Award. Congratulations! **If you have 3 or more retrofit components, move to the next green space; if you have 4 or more retrofit components installed, move to the central circle.** Otherwise, pick up a component.



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JOKER 12: Catch-up!

You have become a passionate advocate and leader for retrofitting buildings to provide a healthier lifestyle for future generations and a just transition to a zero-carbon economy. **You can choose one player who is behind you on the board and call them to the field ahead of you.**



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JOKER 13: Community Retrofit Trust!

Not everyone can afford retrofitting costs. Luckily, you and your neighbours showed initiative and founded a Community Trust to raise funds to retrofit properties in your area. **If all players unanimously agree, give one retrofit component to a player(s) with the least.**



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JOKER 14: Climate Refugees!

Climate change impacts people across the world unequally. Some countries are more prone to dramatic climate impact than others. You have decided to open your home for people who have lost theirs. **Collect a "built fabric" retrofit component to make your home suitable.**



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JOKER 15: Town Hall Meeting!

Climate change anxiety is a real thing! People are worried about what the future holds. Communication, mutual support and laughter are key to getting us through it. **All players must share a joke, the funniest one (by unanimous agreement) moves to the centre square immediately.**



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JOKER 16: Climate Knowledge Challenge!

The national broadcasting company is filming Climate Knowledge competition. Pick one partner and both of you pick an amber card each and enter the knowledge challenge! If you and your partner get both right, you each move 5 spaces forward. If not, stay where you are.



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JOKER 17: Financial Crash!

Several banks and financial lending organisations have been caught out on malpractices. Unfortunately, your bank is one of them and your loan paying for the retrofits defaults. **You lose all of your retrofit components.** Help!



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JOKER 18: Slow Food!

The Slow Food movement has encouraged local communal vegetable and fruit growing and a community kitchen. You decide to support this initiative. **Move 4 spaces forward where the community kitchen is located; but sit out your next turn.**



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