

THE BRIGHT IDEAS CHALLENGE

What will cities look like in 2050 – how will they be powered to be vibrant, healthy and clean places for people to live?

Use this Workbook to log your team's progress as you come up with an innovative solution to an energy challenge faced by cities of the future. Scribble, draw, make notes – this is your tool to capture your team's bright ideas as you shape the future!



The Bright Ideas Challenge Singapore is a Shell initiative, organised by Science Centre Singapore STEM Inc and supported by Ministry of Education.

Terms and Conditions apply: shell.com.sg/brightideaschallenge

STUDENT WORKBOOK

Imagine you're in the future...

It's 2050. You're living in a busy, highly populated city. What will it look like and how will it be powered to become a vibrant, healthy and clean place for people to live?

As populations grow and thrive, demand for energy grows as well. Energy to refrigerate food and medicines, to build roads and hospitals, to make plastics, fuels and fertilisers, to transport goods across the world and to the corner shop, and to enable access to better education and job opportunities.

But this increasing demand for energy is contributing to rising pressure on our climate. Enabling a decent way of life for people across the world, whilst addressing environmental stresses (including climate change) has never been more important. The big challenge, simply put, is how can the world produce and consume much more energy while emitting much less CO₂.

Challenges like this will be tackled by the creativity and innovative ideas of people like you. That's why we're asking you to team up with your classmates to apply your imagination and problem solving skills to help shape the cities of the future.

Activity 1
What's the competition all about?
▶ Watch video ▶ Complete activity

Activity 2
What future city challenge will you solve?
▶ Watch video ▶ Complete activity

Activity 3
Explore technologies for your bright idea
▶ Watch video ▶ Complete activity

Activity 4
Complete your entry
▶ Watch video ▶ Complete activity

Great prizes to be won!

- ▶ Up to S\$5,000 prize package for your school to super-size STEM
- ▶ A trip to Make the Future Live in London to experience Shell's festival of ideas and innovation

Activity 1: Understanding the energy challenge

Activity objectives

- ▶ Understand the energy transition: what is it and why is it important?
- ▶ Form a clear picture of what you'll need to do to enter The Bright Ideas Challenge

▶ Watch video 1: The Bright Ideas Challenge

Your challenge is to come up with an idea for a city in 2050 that could: create more clean and affordable energy and/or make the city more energy efficient.

Your entry

- ▶ To submit a valid entry, you'll need to complete all six sections of the **Bright Ideas Entry Form** as a team
- ▶ You can also submit optional supporting materials to bring your idea to life. You could include:
 - ▶ A short film (three minutes max)
 - ▶ Computer generated visuals, photographs, technical drawings, etc. (displayed on no more than two pages of A4)
 - ▶ A physical prototype that you've built

Tip: Whilst supporting resources are not required, they may be helpful for getting your idea across in an interesting and creative way.



Judging criteria

Your entry will be judged against the following criteria, so keep this in mind as you prepare your entry, and check back regularly to make sure you stay on track!

- ▶ **Answering the challenge (25%)**
How will your idea help solve the energy problem you've identified in your research? Have you justified the need for the solution?
- ▶ **Quality and creativity of the solution (30%)**
Is your idea innovative and will it work?
- ▶ **Based on solid research (25%)**
Have you backed up your idea with relevant scientific knowledge and/or technical information to support it?
- ▶ **Overall presentation (10%)**
Have you communicated your idea effectively and persuasively in your entry? You need to convince the judges!
- ▶ **Collaboration and project management (10%)**
Did your team collaborate effectively and did you demonstrate your ability to manage a project?

Project Plan

Now that the challenge has been set, it's time to put together a Project Plan with your team to help you delegate tasks, stay organised and manage your time effectively. Your teacher will let you know how much time you have to complete each activity and you should update the Project Plan template below as you work your way through your Workbook.

Tip: When delegating tasks, consider the particular skills or knowledge of your team members – you may have noticed these during the ice-breaker activity. What skills can you bring to your team?

	Key tasks to complete List the tasks that need to be completed for each activity	Team member responsible Write the name of the person/people next to their assigned task	Status Keep track of what still needs to be done	Deadline Manage your time by writing down deadlines for each task
Activity 1 Understanding the energy challenge (We've filled this out for you as an example)	1. Watch The Bright Ideas Challenge video 2. Identify key trends and problems/issues 3. Discuss steps to enter the competition	All All All – as homework	Complete Complete Incomplete	Today Today [You decide]
Activity 2 Future cities				
Activity 3 Future technologies				
Activity 4 Complete your entry				

Meet the team

Martin and his colleagues in Shell's Scenarios team are there to ask "what if?" questions to explore alternative views of the future. They consider long-term trends in economics, energy supply and demand, geography and social change to help build visions of the future.

Shell has been using scenario-planning since the early 1970s. It has helped the company, as well as governments across the world, make informed decisions because Scenarios can paint vivid pictures of how the world might appear in the decades ahead.

Meet two members of the team:



Martin Haigh
Senior Energy Adviser

Primary responsibility
I look at statistics and mathematical models to get a clear picture of trends in energy supply and demand.

Educational background
University degrees in mathematics – I also studied chemistry and physics at A-level which set me up well.

Favourite part of the job
I work with a team that looks at everything from human behaviour and economics, to environmental issues and energy technology trends – it's like putting together a jigsaw puzzle of the future.



Mallika Ishwaran
Senior Economist

Primary responsibility
I look at how different government policy areas, such as climate change, air pollution, water and the environment more generally, will impact on how energy is produced and used in the future.

Educational background
PhD degree in economics – maths has been really important!

Favourite part of the job
It's really exciting to look towards the future, to an energy system that meets our needs while also safeguarding our environment for future generations to enjoy – I'm excited about coming into work every day.



Activity 2: Future cities

Activity objectives

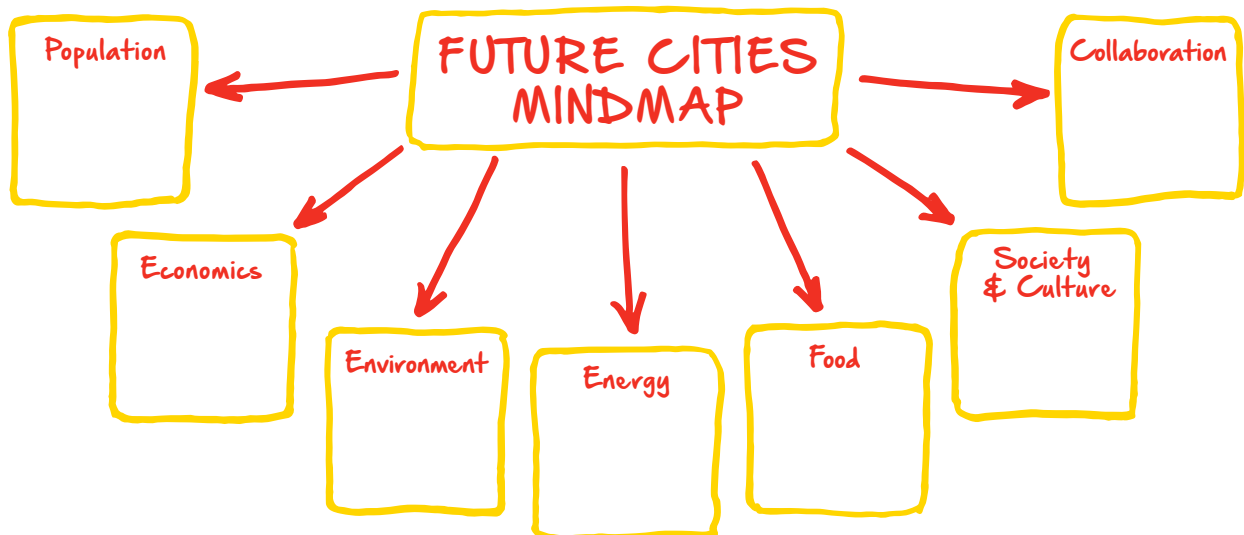
- ▶ Research the key trends that might shape cities in 2050 and build a vision for what future cities will look like
- ▶ Identify a problem faced by a future city that you would like to solve as a team
- ▶ Identify key energy challenges a future city may face

▶ Watch video 2: Future cities

Collaboration – i.e. different people, businesses and governments working together – is very important when it comes to solving big, global problems. And to successfully collaborate and innovate together you need to see the big picture. A mind map is a great way of gathering facts and ideas from different areas and seeing how you can bring them together to solve a problem.

Grab a big piece of paper with your team and draw a mind map using the key trends from the video as headings.

Complete the map with information and facts you've discovered from the video and class discussion. It might look a bit like this:



Tip: Mind mapping will help you organise your thoughts visually and make connections – a proven way of sparking creative thinking and seeing the big picture!

Plan your research

Now step back, look at your mind map and think about the connections between trends. Discuss the facts and ideas with your team and draw arrows between them. Are there any gaps in your knowledge on certain trends? Use your Project Plan to track what areas you'll need to research further and any deadlines.

Why not assign different trends to different team mates? Your team can record the individual research results on the team mind map; adding new facts, information and connections between trends as you go.

Kick start your research

If you're able to get online, you could try the websites below to start your research:

- ▶ Shell's interactive Future Cities webpage: www.futurecities.shell.com
- ▶ Shell's New Lenses on Future Cities webpage: www.shell.com/global/future-energy/scenarios/future-cities
- ▶ The United Nations Environmental Programme's website on energy: www.unep.org/energy/Topics

Back up your research!

You've done your research and mind mapping, now it's time to choose a specific energy problem a city might face in 2050 that your team would like solve. Start by recording important research results and insights:

Research results and insights	Source (book title, website, etc.)

Choose your future city energy problem

It's time to choose the problem faced by a future city that you want to focus on, using all the information you've collected through your research.

Describe the problem your team will solve	
Describe why this problem is important for your team to solve	

Tip: Your problem will be easier to solve if it is quite specific and focused.

Presenting the problem your team will solve

Your teacher may ask you to present your research results to the group. Imagine you have two minutes to summarise your research to your classmates. How could you clearly and creatively present the problem you've chosen to solve?



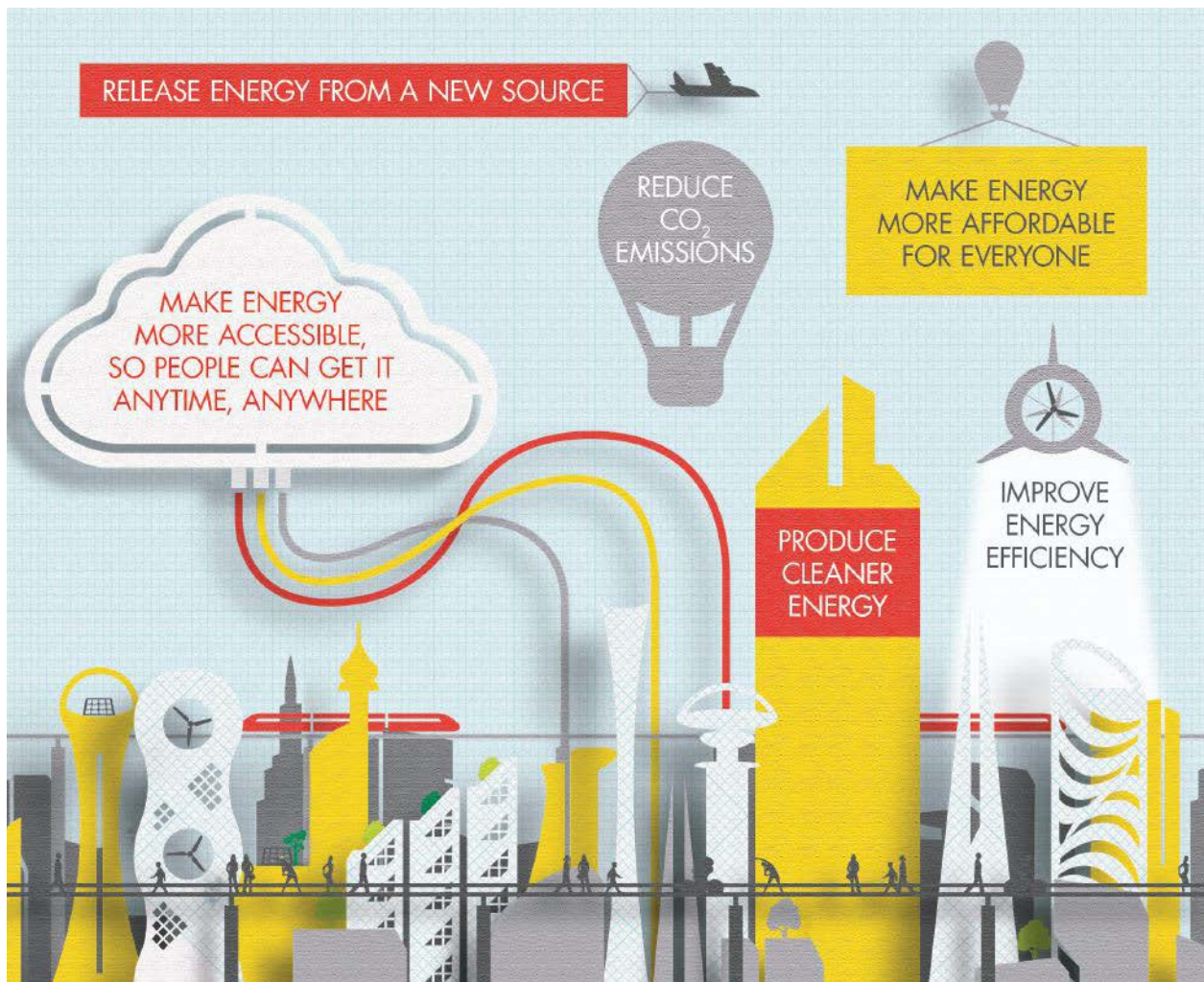
Activity 3: Future technologies

Activity objectives

- ▶ Practise creative problem solving and generate innovative ideas
- ▶ Reflect upon the information you have gathered about future problems

▶ Watch video 3: Future technologies

How could different technologies help solve the energy problem you've identified? You may need to do some more research. Why not start by looking at existing technologies and scientific inventions that can be adapted to shape cities in 2050 and which:



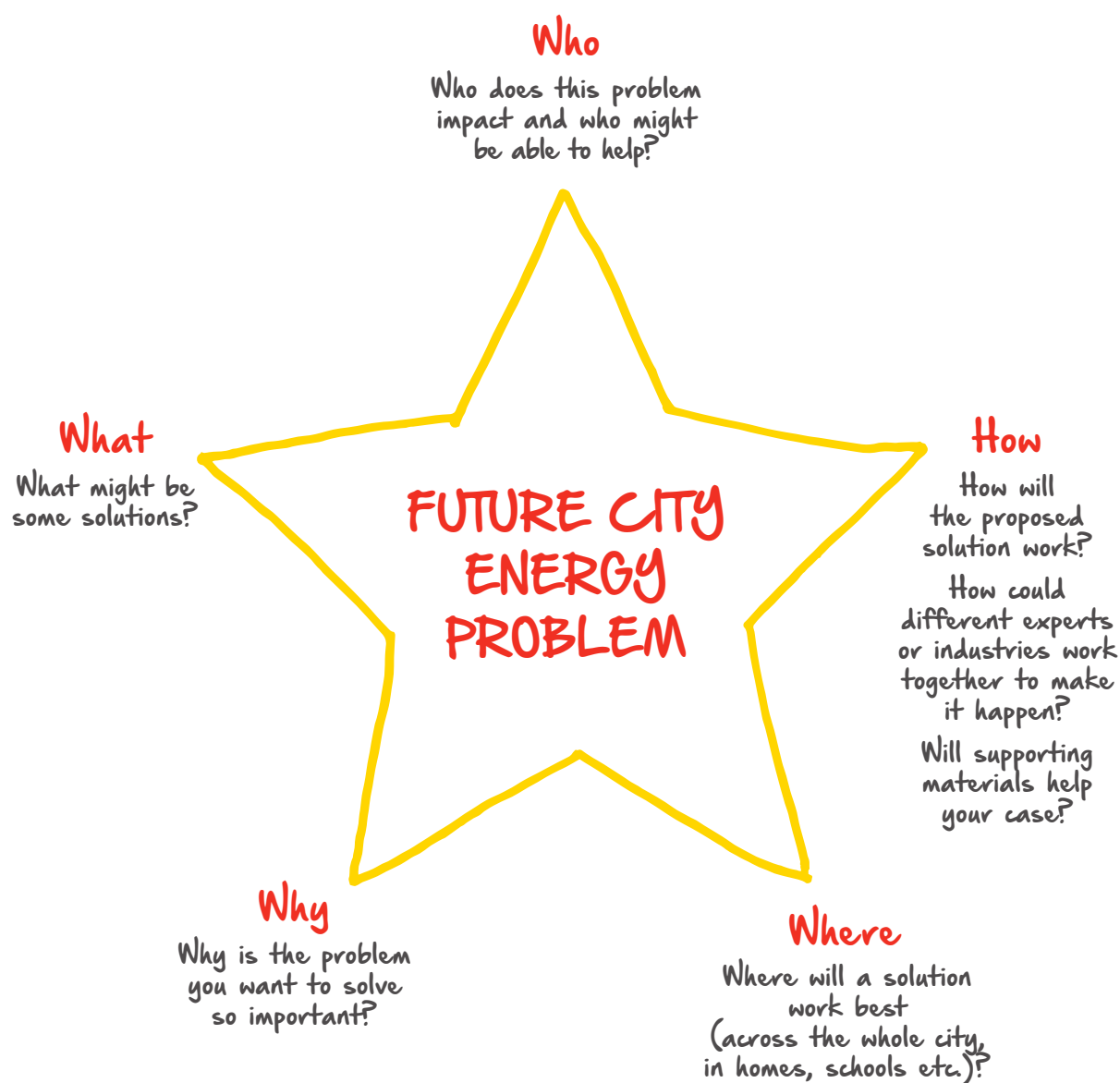
Tip: Are there any remaining gaps you need to research further? Look at your Project Plan and decide next steps.

Here are some ways for your team to get creative and come up with an innovative solution to your chosen energy problem.

Try Starbursting

It's time for some blue sky thinking to generate ideas that could solve the problem you've identified for a future city! You could use the Starbursting technique. Ask your teacher for some flip chart paper and draw a five pointed star with your future city energy problem written in the middle.

Working your way through each point, write down any ideas that come to mind:



Tip: Remember there are no bad ideas at this stage. Sometimes the most simple or whacky ideas are the best!

Try a SWOT analysis

This approach will help you think about the strengths, weaknesses, opportunities and risks of your ideas, helping you choose the best and most feasible solution.

Your idea:	
<i>What are the strengths of your solution?</i>	<i>What are the weaknesses of your solution?</i>
<i>What other positive opportunities does your solution create?</i>	<i>Are there any risks to your solution?</i>

Tip: Feeling stuck? Ask your teacher for a Bright Ideas “Generator Card” to spark some out-of-the-box ideas.

Meet the people behind the technology

Here are just a few people who help invent, design and build some of the technologies you may be exploring as part of your solution. They use their expertise in science, technology, engineering and maths, alongside skills like creativity, problem solving, collaboration, and communication in their jobs every day – just like you're doing as you complete The Bright Ideas Challenge!



HYDROGEN

Alice Elliott
Senior Hydrogen Researcher

Primary responsibility
You may not have heard of hydrogen-powered cars, but they're becoming much more common and could play an important role in providing low-carbon transport in the future. The hydrogen 'at the pump' needs to be very pure though, and that's an important part of my job.

Educational background

Maths and sciences at secondary school and Material Sciences at university.

Favourite part of the job

Nearly all of my work is done in collaboration with others – companies, governments or institutes. It's a great feeling when everyone agrees on a really great solution to a problem.



INVENTORS

Elena Dieckmann & Ryan Robinson
Directors at AEROPOWDER – a company that creates cheaper and more environmentally-friendly insulation from waste feathers.

Aeropowder won a Shell competition, which gives money to innovative business ideas

Primary responsibility
Elena is in charge of research and product development. Ryan looks after production and business planning.

Educational background

Ryan focused on the three sciences, maths and D&T at school and then studied Biology at university. Elena, who went to school in Germany, did maths and biology followed by Innovation Design Engineering at university.

Favourite part of the job

We enjoy discovering clever uses for everyday materials (like feathers) to reduce waste and solve a problem. Each day is great and different: one day we visit a chicken factory, the next day could be a brainstorming workshop with lots of interesting people.





FUEL SCIENTIST

Drew Stinton

Shell Formula 1® Trackside Scientist

Primary responsibility

I attend all the Formula 1 races working alongside Scuderia Ferrari. I test the Shell race fuels used to power Sebastian Vettel and Kimi Raikkonen's cars on the race track to check they comply with Formula 1 regulations and analyse the Shell engine oil to see how well the engine is performing.

Educational background

Triple science at GCSE, with Chemistry and Biology at A'level. I then did an Advanced Engineering Apprenticeship sponsored by Shell and a Higher National Diploma in Operations Engineering.

Favourite part of the job

Working directly alongside Scuderia Ferrari – it's great to see firsthand how Formula 1 technology, including innovations to improve efficiency, are being incorporated into road-going vehicles. Another part of the job that's very rewarding is travelling around the world!



CARBON CAPTURE AND STORAGE

Alissa Cotton

Carbon Capture and Storage Analyst

Primary responsibility

Using my engineering skills to find ways to reduce greenhouse gas emissions.

Educational background

Maths and triple sciences at GCSE, the three sciences at A'level and Environmental Science at university.

Favourite part of the job

I love working with people from all around the world to solve challenges.



Activity 4: Complete your entry

▶ Watch video 4: Share your bright idea

Your competition entry checklist

- Complete all six sections of your Bright Ideas Entry Form (one per team)
- Prepare any supporting materials (optional)
- Ask your teacher to submit your entry to the competition

Support materials

These can be:

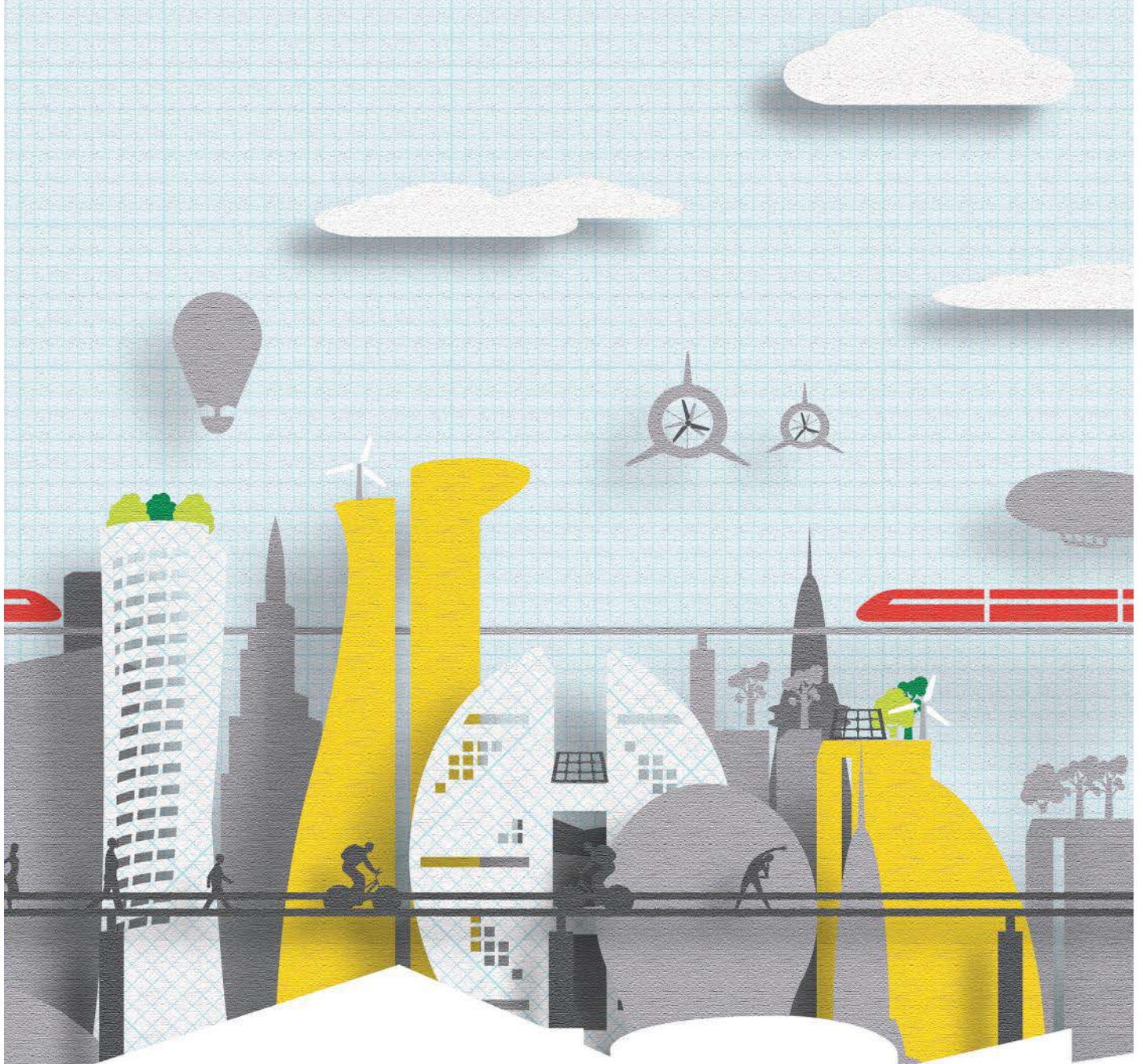
- ▶ A short film (three minutes max)
- ▶ Computer generated visuals, photographs, technical drawings, etc. (displayed on no more than two pages of A4)
- ▶ A physical prototype that you've built

Ask your teacher for more information if you plan on creating supporting materials – they can make sure your ideas follow the rules in the Terms and Conditions. Then they'll need to email supporting materials or a separate film (three minutes max) demonstrating how the physical prototype works. Just make sure your team name is clearly visible otherwise we won't be able to submit your work to the judging panel.



Next steps

If you enjoyed The Bright Ideas Challenge, why not sign up to Make the Future Singapore Festival and see many other bright energy ideas in action, including the world-famous Shell Eco-marathon competition?



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