

## ACTIVITY 5.1 TOWN PLANNER

From the Chapter Five of the Mission Mars Diary  
[marsdiary.org/activities/town-planner](http://marsdiary.org/activities/town-planner)

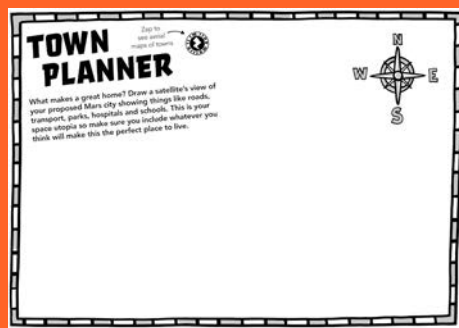
## LEARNING LEVEL

KS2, P5-7, Y4-6

## CURRICULUM LINKS & DIFFERENTIATION IDEAS

View detailed curriculum links for England, Scotland, Northern Ireland and Wales in the Teacher Toolkit, plus differentiation ideas for your region and year level.

[marsdiary.org/resources/#teacher-toolkit](http://marsdiary.org/resources/#teacher-toolkit)



## Resources Required

- Smartphone or device for Zap code (optional – see Useful Links)
- Online maps of the local area
- Images of the surface of Mars

## Background to this Activity

This activity provides students with the opportunity to practice their mapping and drawing skills, by imagining what their city on Mars would look like if seen from a satellite. This could be likened to the photos taken by drone that we now regularly see.

## Running the Activity

Explain to the children that they are going to design their own Martian city. Look at some examples of bird's eye view photographs of towns and cities containing recognisable features (e.g. Houses of Parliament, Blackpool Tower) to ensure the children understand the concept. Use online maps to display local places known to the children, identifying some of the human and physical features in their own environment. Discuss with the children the placement of human features, such as homes, schools, farms, etc. Encourage the children to ask why they have been placed there.

Look at some images of the surface of Mars, focusing on the physical features of the planet: atmosphere, terrain, water, climate etc. What impact would these have on building a settlement?

## Questions for the Class

- What are the basic needs humans would need fulfilled in the settlement?
- How can you include these within the plan?
- What sort of infrastructure would be required to allow people to live there?
- How does the physical geography of Mars impact on

the design of the city?

- How does this settlement compare with cities on Earth? What are their similarities and differences?
- 

## Additional Challenges / Extension Activities

Write about the map to explain its features:

- Lower: Why is that feature included? How will it help the settlement?
- Upper: What happens in that place? How is the settlement going to develop in the future?

Write a science fiction story set in the city

## Ideas for Differentiation

*Lower:*

Overlay a grid on the map. Use four figure grid references to locate features on the map.

*Upper:*

Overlay a grid on the map. Use six figure grid references to locate features on the map.

Add physical geographical features to the map as well as human geography. Research the Martian environment to ensure they are accurate.

Create a key, using symbols to explain the features on the map.

## Useful Links

Zappar Content: Download or view the Zappar content for this activity on its webpage (URL to the left) or access it via the Zap.

Images of the surface of Mars taken by Mars Express:  
[http://www.esa.int/spaceinimages/Missions/Mars\\_Express](http://www.esa.int/spaceinimages/Missions/Mars_Express)

# Your Mission MARS DIARY

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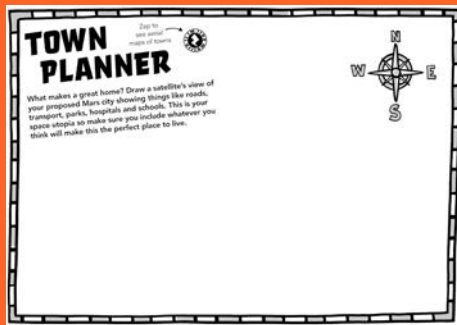
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KS2, P5-7, Y4-6

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## ACTIVITY 5.2 BIODOME GARDEN

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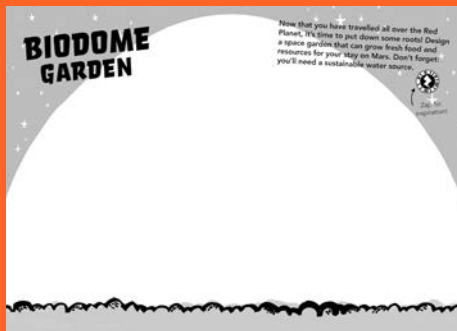
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### Resources Required

- Smartphone or device for Zap code (optional – see Useful Links)
- Seeds, soil, watering can, water etc

### Background to this Activity

The ability to create renewable food sources beyond Earth is essential if humans are going to successfully colonise other planets. Issues like the lack of a readily available water supply and microgravity will need to be considered, so that plants can be grown in extraterrestrial environments.

Scientists are working with astronauts on the ISS to research the effect of plant growth in zero gravity and create a 'space garden'. This will help supplement astronauts' food supplies with nutrient rich foods and help develop resource-efficient ways of growing crops on other planets. This project has the added benefit of supporting astronauts' wellbeing, because of the psychological benefits which gardening provides.

### Running the Activity

It may be useful to have a water cycle project running alongside this activity, for instance in another lesson, or one identified group could create a mini water cycle e.g. as in <https://principiaspacediary.org/activities/make-your-own-water-cycle/>

Research or identify the essential elements that a plant needs to grow – discuss the issues that a person would have on Mars, refer to Tim Peake's own project.

Also discover the list of best plants to grown in space.

Design a garden or mini garden that could grow on Mars either on paper or on a drawing application. Ensure that it is labelled. Also identify equipment, materials and/or machinery that would help a gardener on Mars to support his plans to thrive.

### Questions for the Class

- Why do you think water is so essential to life?
- Can you explain the water cycle to a friend?
- What does a plant need in order to grow?

### Additional Challenges / Extension Activities

Research or create recipes that incorporate your garden's produce.

Explore the EatWell Guide (see Useful Links) and ask students to design another Martian garden based on it and the volume of different food groups we need to eat each day.

### Ideas for Differentiation

Lower:

- Design and plant a 'garden' in groups using seeds you provide. Challenge the children to maintain their garden over the coming weeks. Which gardens grow the most successfully and why? The children should maintain a log of what has been done to maintain their garden, identifying patterns of what happened in the most successful gardens.

Upper:

- Design a garden and decide how it will best grow in Mars. What considerations would students need to make in this harsh environment? How could they ensure that their plants received enough nutrients, light and water? Ask students to present their ideas to a friend, another group or to the whole class.
- 'Hot seat' a gardener on Mars, starting with writing a list of questions to research.

### Useful Links

Zappar Content: Download or view the Zappar content for this activity on its webpage (URL to the left) or access

# Your Mission MARS DIARY

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## LEARNING LEVEL

KS2, P5-7, Y4-6

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it via the Zap.

EatWell Guide: <https://www.nhs.uk/Livewell/Goodfood/Pages/the-eatwell-guide.aspx>

Information about the top 10 space plants: <https://principiaspacediary.org/veg-in-space/>

Read the results of the Rocket Science project, in which Tim Peake took seeds to the ISS, so that schools could research if being in zero gravity effected how they grew: <https://schoolgardening.rhs.org.uk/Competitions/Rocket-Science>

ESA clip about space gardening, which includes images of how a future garden on Mars might look: <https://www.youtube.com/watch?v=RxlTZSEis4I>

NASA clip about space gardening: <https://www.youtube.com/watch?v=M7LslyCX7Jg>

Design a Space Dinner: <https://principiaspacediary.org/activities/eatwell-plates/>

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### ACTIVITY 5.3 ENERGISE YOUR CITY

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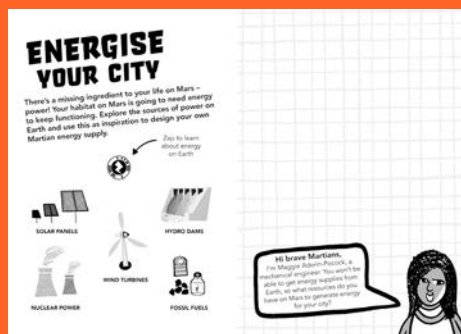
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KS2, P5-7, Y4-6

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### Resources Required

- Smartphone or device for Zap code (optional – see Useful Links)
- Access to information via books and online

### Background to this Activity

If humans are to spend extended periods of time on Mars, whether they are conducting research projects or living there on a more permanent basis, it will be essential to design an energy source.

Solar power will be used to power the ExoMars rover. Dust can be a problem however, covering panels and impacting on power generation. Mars is also further away from the sun than Earth, which means the heat and light from the sun isn't as intense, making solar power less efficient than on Earth. While the winds are great at stirring up the dust on Mars, they aren't powerful enough to efficiently generate energy to run a city. Geothermal energy looks like a viable option to power a settlement on Mars. Aerospace engineer Robert Zubrin believes that the methane puffs detected by NASA's Curiosity rover indicate potential geothermal power below the Martian surface. Drilling into Mars would release the hot water below its surface in the form of steam, which would be used to power a turbine and therefore generate power.

To prepare for this activity, you may wish to revisit Activity 3.1 'Weather on Mars', to discuss the Martian climate, as well as 3.4 'Design Your Mars Rover' to remind students that the ExoMars rover is powered by solar panels.

### Running the Activity

Encourage the children to become an 'expert' on one of the energy types noted on the activity sheet. Where is this type of energy used on Earth? Ask students to share with the rest of their group/with the class. What would be best, one type of energy or a combination?

What energy sources does Mars already have? Do we already use that energy on Earth? How?

Ask students to design and draw their 'energy plant'. Some children may go on to create a 3D model of how energy could be harvested in Mars, showing how they will use energy below and above the ground. They could do this by using recyclable materials, playdough/clay or construction toys.

### Questions for the Class

- What does 'sustainable energy' mean?
- What is the difference between renewable and non-renewable energy?
- Is your energy plant a sustainable energy source? Why or why not?
- Think about the energy sources we use on Earth. Which of those are sustainable and which aren't?
- Why is it important to use sustainable energy sources?

### Additional Challenges / Extension Activities

Ask students to research energy sources throughout history, or in a particular era of human history. Where these energy sources sustainable? What were the pros and cons of using each energy source?

Investigate where your local energy comes from. What types of energy sources are used in your local area?

### Ideas for Differentiation

Lower:

- Lower ability pupils can complete a survey of what energy is used in the classroom.
- Can they find evidence of these energy types in school, or can they find out how the school is



# Your Mission MARS DIARY

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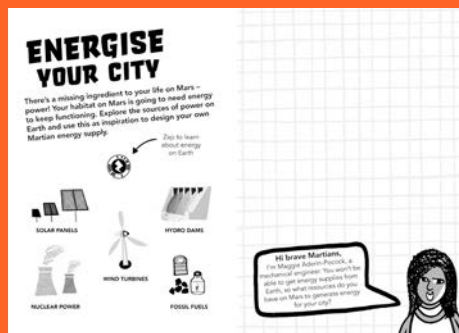
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KS2, P5-7, Y4-6

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powered? Ask students why it is important that energy is not wasted.

Upper:

- This would be a good opportunity to encourage debate about sustainable energy and discuss renewable and non-renewable energy sources on earth. If we were going to start again (for example on Mars), what could we do differently? Students can research renewable and non-renewable energy sources and split to 'argue' the case for either.
- Higher ability students could produce an energy manifesto for a future Martian city, providing a rationale for their energy choices.

## Useful Links

Zappar Content: Download or view the Zappar content for this activity on its webpage (URL to the left) or access it via the Zap.

Clip about different types of energy: <https://www.youtube.com/watch?v=KEeH4EniM3E>

Clip about different potential energy sources on Mars (includes artist's impression of future Martian city): [https://www.youtube.com/watch?time\\_continue=141&v=ysLHApdznic](https://www.youtube.com/watch?time_continue=141&v=ysLHApdznic)

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## ACTIVITY 5.4 PROTECT YOUR CITY

From the Chapter Five of the Mission Mars Diary

[marsdiary.org/activities/protect-your-city](https://marsdiary.org/activities/protect-your-city)

### LEARNING LEVEL

KS2, P5-7, Y4-6

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### Resources Required

- Smartphone or device for Zap code (optional – see Useful Links)
- Pens and pencils

### Background to this Activity

This activity encourages students to think about the conditions we need for successful life on another planet.

Mars has an atmospheric pressure which is much thinner than Earth's and is 95% carbon dioxide. This means that in order to survive, humans would need to live in a pressurised dome – and wear a pressurised spacesuit when they leave the dome – filled with oxygen. Humans would also need protection from the strong radiation on Mars, because it doesn't have a magnetic field like Earth which protects us from the sun's radiation.

Water is also essential for life. Humans living on Mars would need to develop a way to extract ice from the Martian soil and distil it into water, which could then be recycled and reused.

A colony on Mars would need to produce its own food in order to be sustainable. This would involve growing crops in special pressurised gardens. Students can refer back to Activity 5.2: Biodome Garden to consider where their gardens should be.

An energy source will also be essential. Students can refer to Activity 5.3: Energise Your City and decide what times of energy sources to use.

### Running the Activity

Start by referring back to Activity 1.1 Signs of Life (see Useful Links), to revise the differences between Earth and Mars. Encourage students to consider the differences between Earth and Mars, including atmosphere, temperature, climate and weather, gravitational forces, natural resource like water and food, natural energy

sources, the length of days and years.

Discuss in class what humans would need to create a habitat on Mars.

### Questions for the Class

- What are the biggest risks for settling on Mars?
- What will humans be able to do on Mars that machines can't already do?
- What sort of rules and laws would you want on Mars?
- How would you help support mental health and well-being in your Mars habitat?

### Additional Challenges / Extension Activities

Message from Buzz: read the letter Buzz Aldrin wrote to aspiring space settlers (see Useful Links). Can you write him a response?

### Ideas for Differentiation

*Lower:*

'Hot seat' a human who lives on a different planet, an alien who lives on a planet where humans are trying to settle and/or a 'city planner' for your chosen planet

Use ICT: To help you imagine your space habitat, draw it with the help of a cartoon or drawing apps. Use programmes such as Startopia (see Useful Links) and the Kerbal Space Programme (see Useful Links).

*Upper:*

Can students turn their space city into an advert, convincing people to settle there?

More able students could use this as group collaborative project. Each child could be responsible for a certain aspect after brainstorming what would be needed in the city to sustain life and for people to want to live there. Someone could draw, make a model or use a computer

# Your Mission MARS DIARY

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KS2, P5-7, Y4-6

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program to create the city, someone could describe the features and how they would sustain life and someone could be responsible for an advert to persuade people to go there. They could then take it in turns to tell the other groups about their city and what they were responsible for creating.

Produce a group presentation about your new space city in the form of a news report or television advert.

## Useful Links

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NASA animation of a future Mars habitat, including research areas, power generation, living quarters and food production: <https://www.youtube.com/watch?v=94blW7e1Otg>

Buzz Aldrin's letter: <http://buzzaldrin.com/space-vision/generation-mars/>

Startopia: <https://www.mobygames.com/game/startopia>

Kerbal Space Programme: <https://kerbalspaceprogram.com/en/>

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