

Living on the Moon: Questions to Consider

Your future lunar city is set at least 100 years in the future. It has already gone through many years of development. It started as a collection of lunar landers that expanded into an outpost. Gradually it grew into a village and is now a fully functioning city.

Your challenge: Build on this history to develop a future lunar city. You will describe where your city is located on the Moon, share its innovative features, and provide a detailed description of how your city uses two of the Moon's resources in futuristic ways to keep its residents safe and healthy.

Use the topics and questions below to guide your research, brainstorming, and design sessions. Remember that no city can provide everything—especially one on the Moon! What are the most important elements in your future lunar city? What makes your city futuristic, innovative, and scientifically plausible? What tradeoffs do you need to make?

City Location

The conditions and geography of the Moon are very different than on Earth. From your research, you learned that the Moon is covered in regolith, the terrain is full of huge craters, there are lunar highlands that look like old, eroded mountains, and the poles have ice hidden deep inside huge craters. The near side of the Moon always faces the Earth, while the far side always faces away from the Earth. As you think about the Moon, discuss where you'd like to locate your city.

- What areas of the Moon are possible locations?
- What are the benefits of these different locations? What are the drawbacks?
- How do the natural features of each potential area impact your city and its residents (for example, mountains, craters, access to water, sunlight)?

Livable Atmosphere

The Moon has no breathable atmosphere and no plants. All it has is an exosphere, which is not that much more than the vacuum of space. It has some molecules of

different gases floating around in it, along with Moon dust that is gritty and clings to everything. To survive and thrive, people will need breathable air at the right pressure. Remember the Moon's low gravity means there is less pressure than on Earth.

- How do you supply breathable air at the right pressure?
- How do you maintain comfortable humidity and temperature?
- How do you replenish oxygen and process excess carbon dioxide so that the air stays breathable?
- How do you filter contaminants out of the air?

Water

At first, scientists thought there was no water on the Moon, but recently they discovered that it exists frozen deep within craters at the poles. This water has to be mined, the way we mine for precious metals and oil on Earth. Small amounts of water are also embedded in lunar soil. Your residents will need water for drinking, bathing, and growing crops. It can also be used to make fuel, especially rocket propellant.

- How does your city harvest water and make it drinkable?
- How does your city supply water? Is there a water recycling system?
- What are the ways water is used in your lunar city? Are there uses that won't be allowed because it's a limited resource?

Energy

Energy will be essential to sustaining life on the Moon. Your residents will need it to harvest water and breathable air, grow crops, stay warm and cool during the Moon's temperature swings, move people and goods around, and travel back to Earth or onward to Mars.

- What energy source(s) does your lunar city use? Is wind a source of energy on the Moon? What about nuclear fusion or fission? Solar energy from light and/or heat?
- What are some ways that energy could be stored and released during the lunar night, when residents need to be kept warm?
- What hazards threaten your city's energy supplies?

Industry & Manufacturing

Thanks to certain abundant resources, there are great mining and manufacturing opportunities on the Moon. For example, water extracted from lunar craters and regolith can be processed into hydrogen and oxygen—two key elements for rocket propellant. Other elements could be used to make electronics and batteries.

- What resources does your city mine or produce?
- How are these different resources being used in your future city? Is there a Moon resource you use to produce breathable air? To build structures? To grow crops?
- What methods are being used to extract and mine these resources?
- Does your lunar city trade any resources with Earth?

Structures and Housing

On the Moon, buildings will need to protect people from the Moon's many hazards—such as lunar dust, radiation, meteorites, and moonquakes—while also providing breathable air and pressure.

- What Moon resources do you use as building materials? How might these materials affect a building's design?
- How might buildings take advantage of the Moon's terrain?
- Where do your residents live? Individual houses, apartments, or a new configuration? How do your home designs create comfortable places for people to sleep, eat, relax, and exercise?
- How do your city's buildings protect against the Moon's harsh conditions and hazards?

Food

On the Moon, special systems will be needed to grow crops. There are no pastures for farm animals or oceans for seafood. What do your residents eat?

- What crops can you grow and/or farm successfully in small spaces with low gravity? Are some growing methods more efficient on the Moon than others?
- What high-value, nutritious food do you produce?
- How do you provide crops light, water, and humidity?

Transportation

Transportation options need to be designed with the Moon's limits and resources in mind. Traditional Earth-based options like biking, walking, and driving cars will be challenging.

- How do your residents travel around your future city? Is there more than one way to get around?
- What lunar resources are used in your transportation system?
- How do your residents travel back and forth to Earth, Mars, and beyond?

Government, Zoning, & Services

On the Moon, there will need to be ways to govern the people. This includes making and enforcing laws, settling disputes, and planning city growth.

- How is your city zoned? Are the zones separate or are there mixed-use zones (e.g., commercial and residential or commercial and industrial) in your city?
- How is your city governed? Who makes the laws and regulations?
- How does your city provide basic and emergency services (e.g., education, medical, fire)?
- How does your city provide various utilities (water, sewer, waste management and recycling, electricity, Internet)?
- What Moon hazards are possible disruptions to residents' access to those utilities? What alternatives does your city provide?

People, Health & Education

Think about your city's residents. Are they Moon natives, born on the Moon without ever traveling to Earth? How do the Moon's conditions (e.g., low gravity) and restrictions (e.g. staying indoors or traveling outside with protective gear) affect the community and its people?

- How would you describe the people who live in your city and what they do?
- What does your city offer for entertainment and cultural enrichment?
- What specific activities do people need to engage in to stay healthy on the Moon?
- How are public spaces for recreation incorporated into your city?
- How are people educated in your lunar city?