MUNIKL’26
UNOOSA
STUDY GUIDE

Under Secretary General: Aras Sayın

Academic Assistant: Yağmur Erdem

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Letter From the Secretary General

Dear Delegates,

It is a great pleasure for me to welcome you all to the fourth annual session of Izmir Kız High School Model United Nations Conference. I am Ecrin Tügen, and I will be serving as your Secretary General for this conference. I am here to ensure you have an unforgettable experience in the best way possible.

During the conference, you will not only engage in diplomatic discussions, but you will also develop your leadership and communication skills, gain a deeper understanding of international issues, learn about the policies of other countries, practice crisis management, and socialize with delegates from other schools who may become your close friends. Briefly, this conference will offer you far more than you expect.

Of course, a great conference does not come together easily. I would like to extend my heartfelt thanks to my Executive, Organization, and Academic Teams, who have worked constantly and intensively throughout the entire process. I am certain that this conference will be amazing because of their hard work.

MUNIKL'26 has been my biggest dream for years; finally, my dream comes true with your interest and participation. I cannot fully express how grateful I am to all of you for being part of this journey. Wishing you a beneficial, enjoyable and truly unforgettable conference experience.

Warm Regards,

Ecrin Tügen

Letter From the Under Secretary General

Dear delegates,

It is a great pleasure to welcome you all to the Fourth Annual Session of the Model United Nations Conference of İzmir Kız High School. My name is Aras Sayın, and I will be serving as your Under Secretary General. I am currently a senior at Karşıyaka Anatolian High School (also known as 15 Temmuz Şehitleri Anatolian High School), and this marks my 33rd MUN experience and third MUNIKL conference. I am confident that our committee will run in a structured and efficient manner.

Our aim is not only to debate, but also to develop realistic and well-thought-out solutions regarding the colonization and habitability of Mars. I encourage you to approach discussions with creativity, responsibility, and a strong sense of collaboration.

The committee will follow a semi-crisis procedure, starting with structured debate and transitioning into a more dynamic format. Your final document may vary depending on the committee's progress, and the crisis phase is expected to begin around the second day.

You will be expected to write directives and respond to evolving situations, so please review the study guide carefully, as it contains essential information for the committee.

Beyond the academic aspect, I encourage you to engage with one another, share perspectives, and make the most of this opportunity to develop your communication and diplomacy skills. A respectful and open-minded environment will ensure a productive and enjoyable conference for everyone.

If you have any questions, feel free to contact me, or any other academic member of the committee. We are here for you.

I look forward to meeting you all and seeing your contributions.

Best of luck,

Aras Sayın

Under Secretary General

Letter From the Academic Assistant

Dear Delegates,

It is a great pleasure to welcome you all to the Fourth Annual Session of the Model United Nations Conference of İzmir Kız High School. My name is Yağmur Erdem, and I will be serving as your Academic Assistant throughout this conference. I am a junior at Cahide Ahmet Dalyanoğlu Anatolian High School. This conference will be my 22nd MUN experience and second MUNIKL conference. This conference is really important to me so I will expect a great performance from all of you.

Our goal is not only to debate, but also to find realistic and practical solutions to the issues in our agenda. I encourage you to share your ideas, listen to others, and work together in a respectful and cooperative way.

During the conference, you will work with other delegates, write directives, and take part in discussions. Please make sure to read the study guide carefully, as it will help you better understand the topic and prepare for the sessions.

If you have any questions or need help, feel free to contact me or any member of the academic team.

I look forward to meeting you all.

Best regards,

Yağmur Erdem

Academic Assistant

Glossary

Astrobiology

The interdisciplinary scientific field that studies the origin, evolution, distribution, and potential existence of life in the universe, particularly on planets such as Mars.

Atmospheric Pressure

The force exerted by gases in a planet's atmosphere on its surface; on Mars, it is less than 1% of Earth's, limiting the stability of liquid water.

Biosphere

The global sum of all ecosystems where life exists or could exist on a planetary body; Mars currently lacks a natural biosphere.

COPUOS (Committee on the Peaceful Uses of Outer Space)

A United Nations body responsible for promoting international cooperation and developing policies for the peaceful use of outer space.

Outer Space Treaty (1967)

The foundational international agreement establishing that outer space is the province of all humankind and prohibiting national sovereignty over celestial bodies.

Extraterrestrial Settlement

The establishment of a permanent human presence on a celestial body outside Earth.

Planetary Protection

Policies and practices aimed at preventing biological contamination of other planets and protecting potential extraterrestrial ecosystems.

In-Situ Resource Utilization (ISRU)

The practice of using local resources found on a planetary body, such as water, minerals, or atmospheric gases, to support missions and reduce dependence on Earth.

Closed-Loop Life Support System

A system that recycles essential resources such as air, water, and waste to sustain human life with minimal external input.

Space Colonization

The process of establishing permanent human habitats beyond Earth, including on planets, moons, or space stations.

Mars Colonization

The scientific and technological effort to establish sustainable human settlements on Mars.

Regolith

A layer of loose, fragmented material covering solid rock on planetary surfaces, widely present on Mars and useful for construction and resource extraction.

Cosmic Radiation

High-energy particles originating from space that can be harmful to living organisms, especially on planets without protective magnetic fields.

Sustainability

The ability of a system to maintain itself over the long term without external depletion of resources.

Terraforming

The theoretical process of altering a planet's atmosphere and environment to make it more Earth-like and suitable for human life.

Space Law

The body of international laws and agreements governing activities in outer space.

UNOOSA (United Nations Office for Outer Space Affairs)
The United Nations office responsible for promoting international cooperation and ensuring the peaceful use of outer space.

Habitability

The capacity of an environment to support life, based on factors such as temperature, water availability, atmosphere, and energy sources.

rIntroduction of the Committee

Overview of the United Nations Office for Outer Space Affairs

The United Nations Office for Outer Space Affairs (UNOOSA) is the branch office of the United Nations responsible for supporting peaceful international cooperation in outer space. While playing a significant role in establishing and strengthening legal and regulatory frameworks for space activities, it supports developing countries benefiting in space science and technology for sustainable socio-economic development. The Office was established in 1958 to provide support and advice to the United Nations's Committee on the Peaceful Uses of Outer Space (COPUOS), which was created to address scientific and legal aspects of the exploration and use of outer space for the benefit of all humanity.

Mandate, Functions and Institutional Framework

UNOOSA's mandate depends mostly on space law. Specifically, the 1967 Outer Space Treaty creates the foundation of this office's law. In this context UNOOSA's major functions are listed below:

- **International Cooperation & Policy:** Promotes peaceful space exploration and acts as the secretariat for the UN Committee on the Peaceful Uses of Outer Space (COPUOS).
- **Space Law and Registration**: Maintains the UN Register of Objects Launched into Outer Space and helps countries establish legal/regulatory frameworks for space activities.
- **Capacity Building (Space Applications)**: Runs programs like the Access to Space 4 All Initiative to help developing countries build capacity in satellite technology, remote sensing, and space science.
- **Disaster Management (UN-SPIDER)**: Operates UN-SPIDER, a platform that enables the use of satellite technology for disaster risk reduction and emergency response.
- **Sustainable Development**: Coordinates space activities to assist in achieving the UN **Sustainable Development Goals** (SDGs), focusing on how space technology can improve life on Earth.

Relevance of UNOOSA to Extraterrestrial Settlement

UNOOSA's role is becoming increasingly critical with regard to potential human settlements on celestial bodies such as Mars. Current international law prohibits the establishment of sovereignty in space and emphasizes that space is "the common heritage of all humanity."

In this context, issues such as the legal status, resource utilization, and governance structures of settlements on Mars will largely be shaped within the framework provided by UNOOSA. It is important for delegates to consider existing legal gaps and potential future regulatory needs in this regard.

Introduction of the Agenda Item

Agenda Item: *Approaching the Habitability of Mars to Create Additional Living Spaces for Humanity and Developing Infrastructure for Long-Term Civilizing*

Conceptual Definition of Habitability in Extraterrestrial Contexts

Conceptual definition of habitability refers to an environment's capacity to support human life and this capacity also relies on some factors. For example atmospheric composition, temperature range, water availability, radiation levels and energy resources. Mars isn't directly considered as "directly inhabitable" because it does not "naturally" meet the majority of these criterias, but rather a planet which "can be made habitable" through technology.

Scientific Literature shows that habitability is not only dependent on natural conditions but also can be achieved through engineering solutions and biotechnological achievements.

Rationale for Expanding Human Living Spaces Beyond Earth

The increase of; population on Earth, limited natural resources and global risks (climate change, pandemics, natural disasters) have accelerated the human race to find alternative living spaces. From this perspective, Mars is seen as the best candidate for long-term settlement for humans.
Besides, the idea of establishing a settlement in space is not just an "escape plan" it is also considered as humanity's scientific development and technological capacity.

Strategic, Scientific and Socioeconomic Significance

The colonization of Mars is a process that could have economic and geopolitical consequences beyond scientific research. The development of space technologies could lead to the formation of new industries, competition for resources, and a reshaping of international power balances.

Historical Development of Mars

Early Mars Missions and Foundational Discoveries

The first successful space missions to Mars were carried out in the 1960s and 1970s. The Mariner program, particularly led by the United States, provided the first detailed data on the Martian surface. The Mariner 4 mission (1965) obtained the first close-up images of the Martian surface and revealed that the planet was much drier and more cratered than previously thought.

Following this, the Viking 1 and Viking 2 missions (1976) became the first spacecraft to successfully land on Mars, providing comprehensive data on the planet's geology, atmosphere, and potential biological activity. While biological experiments conducted as part of these missions did not provide direct evidence of active life on Mars, they strengthened the possibility that the planet may have had more habitable conditions in the past.

These early missions highlighted the harshness of Mars' surface conditions and shaped the direction of subsequent research.

Advancements in Planetary Science and Astrobiology

Starting from the 1990s, Mars research has gained a new dimension thanks to more advanced technologies and interdisciplinary approaches. Orbital vehicles such as the Mars Global Surveyor, Mars Odyssey, and Mars Reconnaissance Orbiter have provided high-resolution data on the planet's surface, mineral composition, and climate history.

In particular, mineralogical analyses have revealed clay minerals and sulfate compounds on the Martian surface, indicating the past presence of liquid water. These findings suggest that Mars may have had suitable conditions for microbial life in the past.

Studies in the field of astrobiology have focused on searching for traces of life on Mars. Modern rover missions developed within this scope have yielded findings that may be related to life, such as the presence of organic molecules, ancient lake beds, and sediment structures.

In the scientific literature, it is accepted that Mars had a thicker atmosphere and a warmer climate in its early periods, thus offering a habitable environment, albeit temporarily

Evolution of Theoretical and Practical Approaches to Habitability

Approaches to the habitability of Mars have undergone a significant transformation over time. While early research focused on whether life already existed on Mars, today this approach has shifted to the question of whether it can be made suitable for human life.

In this context, theoretical studies have introduced the concept of "terraforming." Terraforming aims to bring the planet to Earth-like conditions by thickening and increasing the temperature of the Martian atmosphere. However, current scientific studies show that there are not enough carbon dioxide reserves on Mars to carry out this transformation.
In parallel, more feasible approaches have been developed. These include solutions such as closed life support systems, bioregenerative ecosystems, and local resource utilization (ISRU). Furthermore, recent studies show that "micro-habitable zones" can be created in limited areas on the Martian surface.

This transformation reveals that Mars research has moved from being solely exploration-focused to focusing on technological and engineering solutions that will make human settlement possible.

Scientific and Technical Considerations for Martian Habitability

Environmental and Atmospheric Conditions on Mars

Mars is currently considered an extremely unsuitable planet for human life. Its atmosphere is covered mostly by carbon dioxide (%95) and its surface pressure is only about %1 of the Earth's surface pressure. This low pressure prevents liquid water from staying on the surface. Additionally, the planet's average surface temperature is considerably low and shows serious fluctuation.
Studies show that Mars could have liquid water and a thicker atmosphere in the past. However, over time, the loss of its global magnetic fields caused solar winds to erode its atmosphere, resulting in the planet's cold and arid state.
Besides that, one of Mars' most critical problems is radiation. The planet's lack of magnetic field and its thin atmosphere allow galactic cosmic rays to reach its surface.
According to measurements, radiation dose on Mars is at significant levels , posing serious risks to human health.

Barriers to Human Survival and Biological Sustainability

The biggest barriers for Human Survival on Mars are high radiation, low gravity (%38), lack of oxygen and extreme environmental conditions. Long-term studies reveal that radiation increases the cancer risk and causes damage on a cellular level.
Also, low gravity causes serious physiological problems. Including: muscle wasting and increased bone density. Moreover, living in a closed and isolated environment brings problems including psychological stress, depression and decrease in cognitive performance. The lack of a natural biosphere in Mars states the dependence of synthetical systems. This situation presents a major engineering and biological challenge from a sustainability perspective.

Life Support Systems and Closed-Loop Ecosystems

For sustainable life, closed-loop ecosystems and life support systems have a critical role. These systems include: oxygen production, water recycling and waste management.
Systems which are developed by space agencies have achieved a level of %90 in recovering water. Likewise, oxygen production via electrolysis and ensuring carbon cycle by plant based systems are possible.
Scientific studies show that bioregenerative systems created by using microorganisms and plants are one of the most promising solutions for life on Mars. These systems will be playing a critical role in both food production and atmospheric balance.

Infrastructure Development

Infrastructure development on Mars will mostly depend on the use of local resources (ISRU-In Situ Resource Utilization-) because the resources that are transported from Earth are limited.
Research shows that Martian Soil (regolith) can be used as a building material and habitats can be constructed using 3D printing technologies, furthermore, underground structures covered with regolith would provide natural protection against radiation.
In terms of water resources, it is thought that the ice reserves on Mars could be melted and used. It is also possible to produce fuel from carbon dioxide in the atmosphere, which is crucial for long-term missions.

Long-Term Adaptation and Terraforming Prospects

The concept of "terraforming" is emerging as a way to make Mars suitable for human life in the long term. This process involves thickening the planet's atmosphere and increasing its temperature.
However, current scientific studies show that Mars does not have sufficient CO_2 reserves, and therefore, terraforming on a global scale is not possible with current technology.
Alternative approaches include more feasible solutions such as creating habitats on a local scale (for example, creating a greenhouse effect with silicon aerogel).

Legal and Ethical Frameworks

Applicability of International Space Law to Exasterrestrial Settlement

Space activities are organized within the framework of international law, primarily the 1967 Outer Space Treaty. This treaty states that space is "the common heritage of all mankind" and no state can establish sovereignty over celestial bodies.
In this framework, the legal status of settlements established on Mars is very complex and existing regulations are inadequate in many respects.

The Principle of Non-Appropriation and Its Implications

The Principle of Non-Appropriation declares that no country can ever make territorial claims. Nonetheless, this condition creates serious uncertainties in resource usage and economic activities.
Specifically, the increase in private companies' roles leads to important discussions on how this principle is interpreted.

Governance, Jurisdiction, and Property Rights in Space

It is not yet clear on how colonies that are established on Mars will be governed. In the current system the country which sends a spacecraft holds the authority of that region. Nevertheless, this model is thought to be insufficient for permanent settlements.
In the Scientific Literature, the need to create a new international governance model for Mars is a NECESSITY.

Ethical Considerations: Planetary Protection and Human Responsibility

Planetary Protection Principles' goal is to prevent biological contamination on Mars. These policies are critical; especially to ensure potential local life forms will not be harmed.
Furthermore, whether humanity has the right to alter another planet is significantly debatable.

Contemporary Developments and Ongoing Initiatives

Current Mars Missions and Research Programs

There are many missions intended for Mars today. These missions' aims are: collecting data about the planet's geology, climate and possible signs of life. A complete list is given below:

- Hope Probe (UAE): Providing a complete picture of Martian climate and atmosphere.
- ExoMars Trace Gas Orbiter (ESA/Roscosmos): Analyzing atmospheric gases for biological or geological activity.

- MAVEN (NASA): Investigating how Mars lost its atmosphere.
- Mars Reconnaissance Orbiter (MRO) (NASA): Studying climate, geology, and providing high-resolution imagery and communication support.
- Mars Express (ESA): Long-running mission taking orbital images and studying atmospheric evolution.
- 2001 Mars Odyssey (NASA): Ongoing mapping of the surface composition.
- Mars Sample Return (NASA/ESA): A multi-mission campaign to bring samples collected by Perseverance back to Earth, with upcoming steps planned to launch around 2027.
- ESCAPADE (NASA): A twin-satellite mission scheduled to arrive in 2027 to study Mars' magnetic field and its response to solar wind.
- SpaceX Starship: Planning to launch the first uncrewed Starships to Mars by 2026 to test entry/landing, with cargo missions intended for 2030.
- MOXIE: A technology experiment on Perseverance that has successfully converted atmospheric carbon dioxide into oxygen, crucial for future human missions.
- Artemis Program (NASA): While focused on the Moon, Artemis serves as a preparatory program for human Mars exploration.

Role of National Space Agencies

National Space Agencies are the primary authorities on Mars research. Agencies take an important role in terms of generating scientific data and technological development. These Agencies form the basis of manned-Mars missions. A complete list of agencies is given below:

- United States of America (USA): National Aeronautics and Space Administration (NASA)
- People's Republic of China (PRC): China National Space Administration (CNSA)
- Russian Federation: State Space Corporation (ROSCOSMOS)
- Republic of Turkiye: Turkish Space Agency (TUA)
- Japan: Japan Aerospace Exploration Agency (JAXA)
- Republic of India: Indian Space Research Organisation (ISRO)
- United Arab Emirates (UAE): UAE Space Agency (UAESA)
- Kingdom of Saudi Arabia (KSA): Saudi Space Agency (SSA)
- Republic of Korea: Korea AeroSpace Administration (KASA)
- Commonwealth of Australia: Australian Space Agency (ASA)
- Federative Republic of Brazil: Brazilian Space Agency (AEB)
- Republic of South Africa: South African National Space Agency (SANSA)
- United Mexican States: Mexican Space Agency (AEM)
- Republic of Indonesia: National Research and Innovation Agency (BRIN)

Member States of the European Space Agency (ESA)

The following nations maintain their own national space agencies while simultaneously operating as constituent members of the European Space Agency (ESA), a multilateral intergovernmental organization dedicated to space exploration:

- French Republic: National Centre for Space Studies (CNES)
- Federal Republic of Germany: German Aerospace Center (DLR)
- Italian Republic: Italian Space Agency (ASI)
- United Kingdom: UK Space Agency (UKSA)
- Kingdom of Spain: Spanish Space Agency (AEE)
- Kingdom of the Netherlands: Netherlands Space Office (NSO)
- Kingdom of Belgium: Belgian Federal Science Policy Office (BELSPO)
- Swiss Confederation: Swiss Space Office (SSO)
- Kingdom of Sweden: Swedish National Space Agency (SNSA)
- Kingdom of Norway: Norwegian Space Agency (NOSA)
- Kingdom of Denmark: DTU Space
- Republic of Austria: Austrian Space Agency (ALR)
- Republic of Finland: Business Finland - Space
- Hellenic Republic (Greece): Hellenic Space Center (HSC)
- Ireland: Enterprise Ireland (Space Division)
- Portuguese Republic: Portugal Space
- Grand Duchy of Luxembourg: Luxembourg Space Agency (LSA)
- Czech Republic: Ministry of Transport (Space Activities)
- Republic of Poland: Polish Space Agency (POLSA)
- Romania: Romanian Space Agency (ROSA)
- Republic of Estonia: Estonian Space Office
- Hungary: Department for Space Research and Activities
- Republic of Slovenia: Slovenian Space Office

Private Sector Involvement and Commercial Initiatives

In recent years, the private sector has become increasingly active in Mars research. Reusable rocket technologies, in particular, have significantly reduced costs.

These developments have made Mars colonization a more realistic goal.

International Cooperation versus Strategic Competition

Mars exploration involves both cooperation and competition. While international projects encourage information sharing, competition between major powers is also rapidly increasing.

<u>This suggests that geopolitical tensions may rise in space in the future.</u>

Key Issues for the Deliberation (Debate)

Establishing Sustainable Human Presence on Mars

- How can long-term human life on Mars be made sustainable?
- To what extent should life support systems be independent?
- How can dependence on Earth be reduced?

Development of Resilient and Scalable Infrastructure

- How should modular housing systems be designed?
- How should radiation protection be ensured?
- To what extent is the use of local materials (regolith) feasible?

Resource Utilization and In-Situ Resource Management (ISRU)

- How should water, mineral, and atmospheric resources on Mars be utilized?
- How should the use of these resources be regulated under international law?
- Will resource utilization lead to competition or cooperation?

Governance Models for Emerging Extraterrestrial Settlements

- Who will have sovereignty on Mars?
- Is the current Outer Space Treaty sufficient?
- Is a new international authority necessary?

Equitable Access and Inclusion of Developing States

- How can developing countries be included in the process?
- How can access to space technologies be equalized?
- How can the principle of "common human heritage" be preserved?

Risk Management and Safety of Human Missions

- How can radiation and health risks be minimized?
- How should emergency scenarios be managed?
- How should psychological and social risks be addressed?

Stakeholders and Geopolitical Dynamics

Major Space-Faring Nations

Countries like the US, China, and Russia are leaders in Mars exploration, possessing both technological and financial capacity. Their policies will directly impact the future of Mars.

Emerging Space-Faring Nations

In recent years, new countries including; India, the United Arab Emirates, and European countries have joined the space race. This is leading to the operation of a more multi-actor and capable system in space.

Private Corporations and Commercial Entities

The private sector has reduced the cost and accelerated the space program, particularly through the use of reusable rocket technologies. However, this has led to inadequate regulatory frameworks.

International and Intergovernmental Organizations

- NASA
- ESA
- CNSA
- ROSCOSMOS
- Mohemmed Bin Rashid Space Centre
- SpaceX

United Nations Treaties and Principles on Outer Space

https://www.unoosa.org/pdf/publications/STSPACE11E.pdf

the 1967 Outer Space Treaty

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