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## **Innovative Approaches of utilizing space for the monitoring, and mitigation of the Covid-19 crisis and for the preparedness and prevention of future pandemics**

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### **Abstract and Introduction:**

The current Covid-19 pandemic has put the world on a standstill. The number of positive cases reaching millions globally and the death toll in the hundreds of thousands. Every one of our lives have been impacted. This event shows us the devastation and havoc that infectious diseases and pandemics can cause. The most significant chapters in history that led to the most lives lost on Earth have not been wars but pandemics. The Spanish Flu of 1918 is reported to have infected 500 million and estimated 50 million deaths.

Space agencies, organizations and industries are rising to the occasion to play whatever role they can in assisting with the current Covid-19 pandemic. The space sector has been impacted with space agencies having to delay launches, employees working from home and the space industry being economically affected as other major industries. Space stakeholders have long before recognized the benefits that space can provide in improving health of populations. Attendees at the third UN conference on the exploration and peaceful uses of outer space (UNISPACE III) in July 1999, adopted a declaration that included recommendations to use space technology to help control infectious disease.

The aim of this project is to investigate how the space sector can significantly support monitoring, mitigating, and also prevent pandemics on Earth. Studies have shown the immense benefit in prevention rather than treatment and management. Looking at the current Covid-19 pandemic with lives lost, industries shutting down, and the devastation it has had on all our lives, thus, particular emphasis will also be put on pandemic prevention and preparedness. Space technology has already been playing various roles to assist in several aspects of public health, global health and environmental health. These includes earth observation for the environment and infrastructure, as well as remote sensing playing a key role in assisting disaster relief. Experiences that industry has gained from space exploration in preventing forward contamination and back contamination, as well as astronaut experiences of living and working in an isolated environment, may also be helpful. We will explore different roles that space can play utilizing: remote sensing, satellite and communications technology; telehealth/telemedicine and tele-epidemiology; space agencies and industry as a whole; space spinoffs; as well as the space sector's expertise and experience in order address epidemics/pandemics. This includes the ability for the space sector to bring individuals from different countries, cultures and backgrounds to work together.

### **Background rationale:**

The current Covid-19 pandemic has infected millions and resulted in hundreds of thousands of deaths. It has put the economy and business sector into chaos. Many industries are at a standstill, losses are estimated in the billions. The space sector itself has been impacted.

Experts believe that we are now more at risk of pandemics than ever before due to increasing population, wars and increased travel/tourism. Space stakeholders have long before recognized the benefits that outer space can provide in improving health of populations. Attendees at the third UN conference on the exploration and peaceful uses of outer space (UNISPACE III) in July 1999, adopted a declaration that included recommendations to use space technology to help control infectious disease.

Space assets have already had a role in environmental monitoring and have also been used in areas of health care for disaster management, public health emergencies, and infectious disease outbreak. Space spinoffs involve making use of technology on Earth that was originally developed for space or by space agencies, or both, and are increasingly seen to play an important part in health care on Earth

#### **Main issues addressed:**

- Identify interdisciplinary, intercultural and international approaches to prevent and mitigate pandemics.
- Highlight space assets' contributions in assisting global and public health currently.
- Assess the current approach of Covid-19 pandemic mitigation (by major stakeholders such as WHO, UN, governments, NGOs, etc.) and identify areas of need where space assets can contribute.
- Review activities of major space organizations and agencies (such as UNOOSA, NASA, ESA, CSA, JAXA, CNSA, CNES, DLR, etc.) pertaining to infectious diseases and epidemics/pandemics.
- Explore gaps and areas of improvement on existing space asset contributions.
- Address potential challenges of international cooperation, social, legal, philosophical, commercial and raising awareness of space's role in pandemics.
- Develop platforms of participation for leading and emerging space nations, governments and non-governmental organizations in implementing such future space assets.
- Explore possibilities of international cooperation on international health and disaster relief using space assets as a mean to bring nations together.
- Review current operating policies and protocols for space agencies and industry in the event of a pandemic.
- Identify gaps in procedures and protocols that occurred in operations during the current Covid-19 pandemic.
- Perform cost-benefit analysis for various approaches utilizing space technology for pandemic prevention and relief.
- Explore options of utilizing Artificial Intelligence (AI) and machine learning and space assets in the possibility of preventing/predicting and managing pandemics.
- Review and provide recommendation to stakeholders for innovative ways of using space assets for prevention, monitoring better detection, early warnings and management of infectious diseases (including pandemics).

#### **Approach to the Team Mission:**

- One central Lead/Chair (Dr. Farhan Asrar) overseeing the entire project
- Three sub-teams spread out over the geographical/time zone locations (to effectively connect participants and carry out their duties)
  1. **Monitoring:** Focus on utilizing space technology and satellites to monitor current epidemics/pandemics as well as for monitoring factors and risk factors that can be associated with pandemics (monitoring temperature; air quality & environment; monitoring vectors/animals that can carry pathogens, etc.
  2. **Mitigation:** How space can help the current Covid-19 crisis, as well as future pandemics
  3. **Preparedness and Prevention:** How space can assist in better preparedness and assist in preventing future pandemics

#### **Main tasks to be accomplished:**

- White paper/Report that will be sent to UNOOSA, international space agencies, and stakeholders and decision makers in government, health and space sector. This report will be divided into 4 sections: 1). Monitoring, 2). Mitigation, 3). Preparedness and Prevention, and 4). Overall findings and Executive Summary (of all sections)
- Presentation of findings at a future conference.
- Publication of findings in a peer-review journal (Post-ISP deliverable)