## C1: Economic Development

#### The economy is recovering but unstable

World Bank 21’ – World Bank, The World Bank Group is one of the world’s largest sources of funding and knowledge for developing countries. Its five institutions share a commitment to reducing poverty, increasing shared prosperity, and promoting sustainable development, “The Global Economy: on Track for Strong but Uneven Growth as COVID-19 Still Weighs”, World Bank Group, June 8th, 2021, [https://www.worldbank.org/en/news/feature/2021/06/08/the-global-economy-on-track-for-strong-but-uneven-growth-as-covid-19-still-weighs] Accessed 12/12/21 AHS//AP

Uncertain Outlook The June forecast assumes that advanced economies will achieve widespread vaccination of their populations and effectively contain the pandemic by the end of the year. Major emerging market and developing economies are anticipated to substantially reduce new cases. However, the outlook is subject to considerable uncertainty. A more persistent pandemic, a wave of corporate bankruptcies, financial stress, or even social unrest could derail the recovery. At the same time, more rapid success in stamping out COVID-19 and greater spillovers from advanced economy growth could generate more vigorous global growth. Even so, the pandemic is expected to have caused serious setbacks to development gains. Although per capita income growth is projected to be 4.9% among emerging market and developing economies this year, it is forecast to be essentially flat in low-income countries. Per capita income lost in 2020 will not be fully recouped by 2022 in about two-thirds of emerging market and developing economies, including three-quarters of fragile and conflict-affected low-income countries. By the end of this year, about 100 million people are expected to have fallen back into extreme poverty. These adverse impacts have been felt hardest by the most vulnerable groups – women, children, and unskilled and informal workers.

#### The private space sector is key to economic stability

Clark 20’ – Suzanne P. Clark, Suzanne P. Clark is president of the US Chamber of Commerce, “Space is our new economic frontier. The US can't afford to lose out”, CNN Business, March 2nd, 2020, [https://www.cnn.com/2020/03/02/perspectives/space-economic-frontier/index.html] Accessed 12/12/21 AHS//AP

The future of our economy depends on the vigorous pursuit of space exploration. And with NASA leading the way, the potential for growth — like space itself — has no limits. Since NASA's launch, American space exploration has always been a bipartisan venture. It was President Kennedy who announced our goal of going to the moon, but it was President Nixon who brought that goal to fruition. Reaching the next milestone in interplanetary travel requires a commitment from our leaders that spans political parties and administrations. And with a new space race getting underway — one that could prove even more consequential than the last — NASA needs bipartisan support from Congress today more than ever. Space is the most promising industry to arise since the birth of the tech sector, with growth projected to skyrocket in the coming years led by companies such as Boeing andNorthropGrumman,and new entrants, such as Virgin Galactic, SpaceX and Blue Origin. [According to US Chamber of Commerce economists](https://www.uschamber.com/series/above-the-fold/the-space-economy-industry-takes), the industry will be worth at least $1.5 trillion by 2040. While no one can fully grasp what our economy will look like 20 years from now, one thing is certain: the private sector space industry will transform how societies across the globe live, communicate and do business. In fact, it already has. Nearly every company depends on space-enabled technologies for day-to-day operations — whether they use satellite communications, remote sensing or location-based services. Businesses across multiple sectors are leveraging these and other technologies to stake their claim in this new economic frontier. Pharmaceutical companies such as Merck and Sanofi, for example, are conducting experiments in low-Earth orbit [aboard the International Space Station](https://www.issnationallab.org/research-on-the-iss/areas-of-research/life-sciences/) to evaluate the potential advantages of microgravity in developing new drug treatments that will help people live longer, healthier lives. Companies, such as Bigelow, are committed to making [off-Earth habitation](https://www.cnn.com/2016/05/05/tech/way-up-there-where-will-we-live-space/index.html) a reality. Even retailers are getting in on the action, with companies like Target [funding research](https://www.iss-casis.org/cottonsustainabilitychallenge/) on the International Space Station to produce more sustainable forms of cotton. Lunar colonies, asteroid mining and interplanetary travel — once the stuff of science fiction — could become a reality. But for any of that to happen, we need sustained and meaningful action from members of Congress. They can start by meeting the president's request for NASA funding. Included in the White House budget is [$12.4 billion](https://www.cnn.com/2020/02/10/tech/nasa-budget-moon-landing-artemis-scn/index.html) specifically for lunar explorationthat would include landing systems, continued development of the Space Launch System (SLS) and theOrion crew module. These spacecraft will allow us to shuttle people and equipment to the moon and back. They will take us not only beyond Earth's orbit but also into the next phase of commercial space development. Most importantly, they will ensure that the United States continues to outpace competitors like China and Russia in the space race. Our country must be the vanguard in exploring these new economic frontiers. Planting the American flag in the private sector space industry will help create the jobs of the future and allow the United States to lead the formation of best practices that will govern the industry for decades to come. Some might ask if returning to the moon is worth the expense. The answer is undeniably yes. Providing NASA with the resources it needs to succeed is a small investment that will yield tremendous dividends over time. To start, it would help secure American commercial dominance in a fast-growing industry. It also would be a catalyst for innovation and scientific discovery, with salutary effects that would benefit the entire economy. Just consider the [groundbreaking innovations](https://www.nasa.gov/sites/default/files/80660main_ApolloFS.pdf) that resulted from the Apollo program — from CAT scans and computer microchips to miniature cameras and cordless tools. These and myriad other inventions all had their origins in NASA research labs to expand human productivity in microgravity from the earliest era of Project Mercury to today's ISS. Now just imagine what new technologies we could discover by channeling our intellectual and economic resources into a return trip to the moon or even Mars. Will any of this be easy? No — and that's the point. More than 50 years ago, [we chose to go to the moon](https://er.jsc.nasa.gov/seh/ricetalk.htm) not because it was easy but because it was hard. And today, we choose to go back — and to venture even further into the beyond — because doing so will usher in a new era of American innovation.

#### Economic decline causes war – overwhelms interconnected systems and causes cascading failure.

Pamlin and Armstrong 15[Dennis Pamlin, Executive Project Manager, Global Challenges Foundation, Stuart Armstrong, James Martin Research Fellow, Future of Humanity Institute. February 2015. “Global Challenges: 12 Risks that Threaten Human Civilization.*”* http://www.astro.sunysb.edu/fwalter/HON301/12-Risks-with-infinite-impact-full-report-1.pdf]

Often economic collapse is accompanied by social chaos, civil unrest and sometimes a breakdown of law and order. Societal collapse usually refers to the fall or disintegration of human societies, often along with their life support systems. It broadly includes both quite abrupt societal failures typified by collapses, and more extended gradual declines of superpowers. Here only the former is included. The world economic and political system is made up of many actors with many objectives and many links between them. Such intricate, interconnected systems are subject to unexpected system-wide failures due to the structure of the network – even if each component of the network is reliable. This gives rise to systemic risk: systemic risk occurs when parts that individually may function well become vulnerable when connected as a system to a self-reinforcing joint risk that can spread from part to part (contagion), potentially affecting the entire system and possibly spilling over to related outside systems. Such effects have been observed in such diverse areas as ecology, finance and critical infrastructure (such as power grids). They are characterised by the possibility that a small internal or external disruption could cause a highly non-linear effect, including a cascading failure that infects the whole system, as in the 2008-2009 financial crisis. The possibility of collapse becomes more acute when several independent networks depend on each other, as is increasingly the case (water supply, transport, fuel and power stations are strongly coupled, for instance). This dependence links social and technological systems as well.319 This trend is likely to be intensified by continuing globalisation, while global governance and regulatory mechanisms seem inadequate to address the issue. This is possibly because the tension between resilience and efficiency can even exacerbate the problem. Many triggers could start such a failure cascade, such as the infrastructure damage wrought by a coronal mass ejection,324 an ongoing cyber conflict, or a milder form of some of the risks presented in the rest of the paper. Indeed the main risk factor with global systems collapse is as something which may exacerbate some of the other risks in this paper, or as a trigger. But a simple global systems collapse still poses risks on its own. The productivity of modern societies is largely dependent on the careful matching of different types of capital (social, technological, natural...) with each other. If this matching is disrupted, this could trigger a “social collapse” far out of proportion to the initial disruption. States and institutions have collapsed in the past for seemingly minor systemic reasons. And institutional collapses can create knock-on effects, such as the descent of formerly prosperous states to much more impoverished and destabilising entities. Such processes could trigger damage on a large scale if they weaken global political and economic systems to such an extent that secondary effects (such as conflict or starvation) could cause great death and suffering.

## C2: Star Wars

#### Multinational companies deescalate conflict between nations

Kaesar 20 - Joe Kaeser, Chairman of the Supervisory Board, Siemens Energy, World Economic Forum, January 9th, 2020 “What can companies do to de-escalate the US-China trade war?” [https://www.weforum.org/agenda/2020/01/companies-deescalate-us-china-trade-war/] Accessed 1/30/22 SAO

So, what can multinational companies do to prevent a decoupling of China and the US? The answer is co-opetition: cooperate and compete – with a clear stance and eyes wide open. For cooperation to work, all parties involved must benefit. Win-win is the watchword. And this is critical in a world that is more connected than ever before. That’s what we at Siemens advocated at our first Belt and Road International Summit in Beijing in June of 2018. The response was overwhelming. Over 1,200 representatives from over 30 countries took part. If the BRI becomes a zero-sum game, international support will wane and ultimately projects will fail. To be able to compete, a company must lead in innovation and invest in training, education, and infrastructure; it must adopt best practices and meet highest governance standards; and it must serve society wherever it does business. Whether friend, enemy, or frenemy, no one is interested in a second-rate company. In 1985, Siemens was the first multinational company to sign a cooperation agreement with the Chinese government. The agreement resulted in an unprecedented transfer of technology and knowledge. It went far beyond the sale of products. It called for founding joint ventures and providing local training and education. Just 10 years later, Siemens operated 30 joint ventures in China. Today, the company generates annual revenue of about €8 billion in China and employs more than 33,000 people. It’s one of the largest foreign-invested companies in China, with interests in 89 local companies. Both China and Siemens have benefited enormously from co-opetition. And that is how multinational companies can and should prevent decoupling in the future.

#### Space wars would kill millions

Bender and Klimas 18’ – Bryan Bender and Jacqueline Klimas, Bryan Bender is a senior national correspondent for POLITICO, where he focuses on the Pentagon, NASA, and the defense and aerospace industries. He was previously the national security reporter for the Boston Globe, where he covered U.S. military operations in the Middle East, Asia, Latin America, and the Balkans. He also writes about terrorism and government secrecy. He is an adjunct professor at the Walter Cronkite School of Journalism at Arizona State University and the author of “You Are Not Forgotten,“ the story of an Iraq War veteran’s search for a missing World War II fighter pilot in the South Pacific, “Space war is coming — and the U.S. is not ready”, Politico, April 6th, 2018, [https://www.politico.com/story/2018/04/06/outer-space-war-defense-russia-china-463067] Accessed 01/04/21 AHS//AP

War is coming to outer space, and the Pentagon warns it is not yet ready, following years of underinvesting while the military focused on a host of threats on Earth. Russia and China are years ahead of the United States in developing the means to destroy or disable satellites that the U.S. military depends on for everything from gathering intelligence to guiding precision bombs, missiles and drones. Now the Pentagon is trying to catch up — pouring billions more dollars into hardening its defenses against anti-satellite weapons, training troops to operate in the event their space lifeline is cut, and honing ways to retaliate against a new form of combat that experts warn could affect millions of people, cause untold collateral damage and spread to battlefields on Earth. “We are now approaching a point where ‘Star Wars’ is not just a movie,” said Steve Isakowitz, CEO of The Aerospace Corp., a government-funded think tank that serves as the military’s leading adviser on space. He said the U.S. can no longer afford to take its dominance for granted. "That supremacy in space has enabled us to have the world’s greatest war-fighting capability ... whether it is our soldiers on the field, our drones that fly overhead, our bombers that travel around the world, intelligence we collect," he told POLITICO. "More and more every day, literally, we become more dependent on it. "And our adversaries know that," he added in an interview. Americans' fears of a possible Soviet military advantage helped inspire the first space race after the Sputnik launch in 1957, and former President Ronald Reagan's "Star Wars" program in the 1980s sought to create a space-based shield against a nuclear missile attack. In recent decades, though, space has mostly been a realm for peaceful exploration and collaboration, typified by the Russian rockets that carry American astronauts to the International Space Station. But the worry that cooperation could turn to confrontation has been in the background for years. A 2001 report issued by then-Defense Secretary Donald Rumsfeld warned that an attack on space systems during a conflict “should not be considered an improbable act.” “If the U.S. is to avoid a ‘Space Pearl Harbor,’ it needs to take seriously the possibility of an attack on the U.S. space system,” the report said.

## C3: Asteroid Mining

#### Global warming devastating now

**Williams 10** - Lynda Williams “Irrational Dreams of Space Colonization” [https://www.tandfonline.com/doi/abs/10.1080/10402650903539828?journalCode=cper20] // ahs emi

Life on Earth is more urgently threatened by the destruction of the biosphere and its life-sustaining habitat due to environmental catastrophes such as climate change, ocean acidification, disruption of the food chain, bio-warfare, nuclear war, nuclear winter, and myriads of other manmade doomsday possibilities. If we accept these threats as inevitabilities on par with real astronomical dangers and divert our natural, intellectual, political, and technological resources from solving these problems into escaping them, will we be playing into a self-fulfilling prophesy of our own planetary doom?

#### There is enormous potential in realistic space mining

**Carter 21,** 10-19-2021, "Space Mining: Scientists Discover Two Asteroids Whose Precious Metals Would Exceed Global Reserves", Forbes, <https://www.forbes.com/sites/jamiecartereurope/2021/10/19/the-age-of-space-mining-just-got-closer-as-scientists-discover-two-asteroids-whose-precious-metals-would-exceed-global-reserves/?sh=2b189574713b> PM

16 Psyche, the large metallic asteroid ideal for space mining. We know the age of private space travel is here, but what about the wider commercial space industry? “Space mining” has been talked-up in recent years, but the hype-cycle has peaked with the realization that the technology to fetch rare-Earth metals from distant asteroids is some way off. That’s not stopped NASA’s plans to launch, in 2022, its “Psyche” mission to a large metallic asteroid called 16 Psyche that’s thought to be largely metallic—and so ideal for space mining. However, the NASA plans to merely orbit and document 16 Psyche, and in any case won’t reach the asteroid—situated in the asteroid belt between Mars and Jupiter—until 2026. Now researchers have uncovered two metal-rich near-Earth asteroids (NEAs) that could one day be mined for iron, nickel and cobalt could for use on Earth or in space. They’re reckoned to be 85% metal and one is thought to contain enough iron, nickel and cobalt to exceed Earth’s reserves. Published in the Planetary Science Journal, the paper documents the examination of two asteroids, 1986 DA and 2016 ED85, whose light appears to be similar to asteroid 16 Psyche. The researchers used the NASA Infrared Telescope Facility on the island of Hawaii. The NASA Infrared Telescope Facility, Keck I, Keck II, and Subaru Telescopes at the Mauna Kea ... [+] Observatories On the Big Island of Hawaii The largest metal-rich body in the solar system, Psyche is about 230 million miles/370 million kilometers from Earth and about 140 miles/226 kilometers wide. Possibly made of iron and nickel, it’s thought to be the leftover core of a planet that failed during its formation. In comparison, 1986 DA and 2016 ED85 are tiny—just a few miles wide, yet thought to be the result of the cores of developing planets like 16 Psyche being destroyed early in the Solar System’s history. Crucially, they’re far closer to Earth than Psyche, so would be better targets for mining. “Our analysis shows that both NEAs have surfaces with 85% metal such as iron and nickel and 15% silicate material, which is basically rock,” said lead author Juan Sanchez, who is based at the Planetary Science Institute in Arizona. “These asteroids are similar to some stony-iron meteorites such as mesosiderites found on Earth ... it is rewarding that we have discovered these “mini Psyches” so close to the Earth.” A 164-foot/50-meter metallic object similar to the two asteroids 1986 DA and 2016 ED85 studied ... [+] created the Meteor Crater in Arizona. So could we mine these “mini Psyches?” The paper explored the mining potential of 1986 DA and found that it’s 85% metal—and that its iron, nickel and cobalt could exceed the global reserves of these metals. It’s also possible that the researchers have stumbled on to a seam of metal-rich asteroids. By studying the orbits of 1986 DA and 2016 ED85 they identified four possible asteroid families in the main asteroid belt—home to 16 Psyche. “We believe that these two “mini Psyches” are probably fragments from a large metallic asteroid in the main belt, but not 16 Psyche itself,” said David Cantillo, an undergraduate student in the Department of Geosciences at the University of Arizona. “It’s possible that some of the iron and stony-iron meteorites found on Earth could have also come from that region in the Solar System, too.” Wishing you clear skies and wide eyes.

#### Asteroid mining – even when resources are sent back to earth – is more environmentally sustainable than earth mining.

Hein 18, (Andreas M. Hein, PhD, Associate Professor at the University of Luxembourg), 10-10-2018, "Exploring Potential Environmental Benefits of Asteroid Mining," arXiv, <https://arxiv.org/abs/1810.04749> PM

Abstract Asteroid mining has been proposed as an approach to complement Earth-based supplies of rare earth metals and supplying resources in space, such as water. Existing research on asteroid mining has mainly looked into its economic viability, technological feasibility, cartography of asteroids, and legal aspects. More recently, potential environmental benefits for asteroid mining have been considered. However, no quantitative estimate of these benefits has been given. This paper attempts to determine if and under which conditions asteroid mining would have environmental benefits, compared to either Earth-based mining or launching equipment and resources into space. We focus on two cases: Water supply to cis-lunar orbit and platinum mining. First, we conduct a state-of-the-art of current environmental life cycle assessment for the space domain and platinum mining. Second, a first order environmental life cycle assessment is conducted, including goal and scope definition, inventory analysis, and impact assessment. We compare water supply to cis-lunar orbit with and without asteroid mining and go on to compare terrestrial with space-based platinum mining. The results indicate that asteroid water mining would have environmental benefits, as soon as the amount of water supplied via mining is larger than the mass of the spacecraft used for mining. For platinum mining, we find that by comparing the operations phase of terrestrial and space mining, space mining would have a lower environmental impact, if the spacecraft is able to return between 0.3 to 7% of its mass in platinum to Earth, assuming 100% primary platinum or 100% secondary platinum, respectively. For future work, we propose a more detailed analysis, based on a more precise inventory and a larger system boundary, including the production of the launcher and spacecraft. Keywords: asteroid mining, environmental life cycle analysis, ecological impact, sustainability, rare earth metals, platinum 1. Introduction Mining asteroids, and in particular mining Near Earth Asteroids (NEAs) has been frequently proposed as a source of resources for space and terrestrial applications [1]–[3]. Two broad categories of resources can be distinguished: volatiles and metals. Ross [4] identifies a variety of applications for these resources such as construction, life support systems, and propellant. Volatiles such as water are of particular interest for inspace applications, due to their abundance in carbonaceous (C-type) asteroids and their relative ease of extraction. For example, Calla et al. [5] explore the technological and economic viability of supplying water from NEAs to cis-lunar orbit. Regarding the supply of resources for terrestrial applications, only resources with a high market value are interesting, due to the high transportation cost. Hence, expensive metals such as rare earth metals and in particular the subgroup of platinum group metals have been the subject of asteroid mining studies [6]. The supply of platinum group metals is crucial for many terrestrial “green technologies” such as fuel cells and catalyzers [7]–[10]. However, there are two major concerns regarding platinum group metals. First, current supplies of platinum group metals are dominated by only a few countries, namely, South Africa, Russia, and Canada, which introduces political uncertainties into the supply chain [11]. The second concern is regarding the environmental impact of mining platinum group metals. Mines tend to go deeper and deeper, as resources in upper layers are depleted, which increases already high greenhouse gas emissions (currently ~40,000t CO2 per ton of platinum) [11], [12]. Mitigating these issues has led to initiatives for recycling rare Earth metals and investigating substitutes [13]–[15]. In addition, the local environment is severely impacted due to the use of hazardous substances during the extraction process [11]. Despite the potential environmental benefits of asteroid mining, either by reducing the number of launches into space or moving terrestrial industries into space, no dedicated studies for exploring these benefits has been conducted to the authors’ knowledge. Existing research on asteroid mining has mainly looked into its economic viability [2], [6], [16], [17], technological feasibility [2], [18]–[23], cartography of asteroids [24], [25], and legal aspects [26]–[28].