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#### CP Text: A just government should –

#### - Eliminate the use of fossil fuels.

#### - Eliminate their production subsidies for fossil fuels

#### - Establish an incentive program for artificial tree carbon capture

#### That reduces foreign energy dependence and kickstarts a renewable revolution.

**Monasterolo 19** Irene Monasterolo [Irene Monasterolo is a development economist with experience in policy monitoring and evaluation; institutional capacity building; governance of evidence-based sustainability policies; complex system thinking for modelling the resource-climate nexus; green fiscal and monetary policies for financing the green economy; and adaptation tools for building agricultural resilience to climate change, focusing on food risk and climate adaptation. She has worked as a scientist in academia, as an economist for consulting companies, as a consultant for the World Bank. She is currently Assistant Professor of Climate Economics and Finance at the Vienna University of Economics and Business and a Visiting Scholar with Stanford Energy's Sustainable Finance Initiative. She holds a PhD in Agri-food economics and statistics from the University of Bologna (IT) and held a post-doc at the Global Sustainability Institute in Cambridge (UK) focused on modelling the impact of resource constraints on global growth and political instability.] & Marco Raberto [Associate Professor of Business and Management Engineering, University of Genoa, Italy] (2019). The impact of phasing out fossil fuel subsidies on the low-carbon transition. Energy Policy, 124, 355–370. doi:10.1016/j.enpol.2018.08.051 // ash

The phasing out of fossil fuel subsidies contributes to improve the performance of the production factors, represented by unemployment (top panel) and firms’ capital (bottom panel). In the case of full fossil fuel subsidies (black line), the economy experiences the highest unemployment and the lowest firm's capital accumulation because the subsidies are fully financed via general taxation, thus depressing other investments (bottom panel) and consumption. In addition, since the country needs to import raw materials and fossil fuels from ROW, a carbon-intense economy means an outflow of liquidity to the foreign country. In contrast, the phasing in of green subsidies contributes to increase capital accumulation and employment (see Fig. 8 for details).

Fig. 7a: Production factors conditioned to green subsidies. Fig. 7a shows the effects on the production factors (y axis) of increasing levels of green fiscal policy and green sovereign bonds issuance (x axis). Higher levels of green subsidies lead to positive economic outcomes in terms of lower unemployment (top panel) and higher speed of capital accumulation in the production sectors (bottom panel), thus supporting the development of the green economy. Nevertheless, the trend in the fiscal and green bonds’ policy scenarios is slightly different. Our explanation is that the higher share of renewable energy production in the green subsidies scenarios implies lower fossil fuels extraction, thus lower revenues and profits for the mining company, and consequently lower money outflow to the ROW. In this way, the domestic economy displays higher purchasing power and domestic demand, with positive effects on unemployment rate and capital accumulation. This positive effect also emerges in BA's balance sheet (Fig. 3).

The interest rate set by the central bank could explain why the scenarios characterized by green subsidies financed with the issuance of green sovereign bonds are slightly less performing in terms of capital investments than the ones characterized by green fiscal policies. Indeed, the central bank's interest rate increases the most in the green bonds’ scenarios, thus counteracting the inflationary trend created by the green bonds’ issuance on the real economy. These results provide useful insights in the current discussion on what role, if any, central banks could play in the low-carbon transition by greening monetary policies.

7. Conclusion and policy implications

By applying an expanded version of the EIRIN SFC behavioral model, we find that reforming fossil fuel subsidies in high-income countries could create the conditions to foster a stable low-carbon energy transition, with positive socio-economic effects. Indeed, a gradual phasing out of fossil fuel subsidies contributes to shift investments to low-carbon energy production. In addition, it contributes to improve the real economy performance through higher capital accumulation in the domestic economy and the creation of green jobs and capital investments, supported by a dynamic credit market. Table 3 shows the impact of each policy and scenario to the real economy, green capital investments and the credit market.

#### Super trees are sufficient to solve international warming.

Vince 12 [Gaia Vince, BBC News, 4 October 2012, Sucking CO2 from the Skies With Artificial Trees, <http://www.bbc.com/future/story/20121004-fake-trees-to-clean-the-skies>] TR

Scientists are looking at ways to modulate the global temperature by removing some of this greenhouse gas from the air. If it works, it would be one of the few ways of geoengineering the planet with multiple benefits, beyond simply cooling the atmosphere. Every time we breathe out, we emit carbon dioxide just like all other metabolic life forms. Meanwhile, photosynthetic organisms like plants and algae take in carbon dioxide and emit oxygen. This balance has kept the planet at a comfortably warm average temperature of 14C (57F), compared with a chilly -18C (0F) if there were [no carbon dioxide in the atmosphere](http://www.ncdc.noaa.gov/cmb-faq/globalwarming.html). In the [Anthropocene](http://www.bbc.com/future/story/20120209-welcome-to-the-age-of-modern-man) (the Age of Man), we have shifted this balance by releasing more carbon dioxide than plants can absorb. Since the industrial revolution, humans have been burning increasing amounts of fossil fuels, releasing stored carbon from millions of years ago. Eventually the atmosphere will reach a new balance at a hotter temperature as a result of the additional carbon dioxide, but getting there is going to be difficult. The carbon dioxide we are releasing is changing the climate, the wind and precipitation patterns, acidifying the oceans, warming the habitats for plants and animals, melting glaciers and ice sheets, increasing the frequency of wildfires and raising sea levels. And we are doing this at such a rapid pace that animals and plants may not have time to evolve to the new conditions. Humans won't have to rely on evolution, but we will have to spend hundreds of billions of dollars on adapting or moving our cities and other infrastructure, and finding ways to grow our food crops under these unfamiliar conditions. Even if we stopped burning fossil fuels today, there is enough carbon dioxide in the atmosphere - and it is such [a persistent, lasting gas](http://www.guardian.co.uk/environment/2012/jan/16/greenhouse-gases-remain-air) – that temperatures will continue to rise for a few hundred years. We won't stop emitting carbon dioxide today, of course, and it is now very likely that within the lifetime of people born today we will increase the temperature of the planet [by at least 3C more](http://www.bbc.co.uk/news/science-environment-17488450) than the average temperature before the industrial revolution. Seek and capture Hence, the idea of finding ways of removing carbon dioxide from the atmosphere. One way to do this is to grow plants that absorb a lot of carbon dioxide and store it. But although we can certainly improve tree-planting, we also need [land to grow food](http://www.bbc.com/future/story/20120828-enriching-the-soil) for an [increasing global population](http://www.bbc.com/future/story/20120725-population-overload), so there's a limit to how much forestry we can fit on the planet. In recent years there have been attempts to remove the carbon dioxide from its source in power plants. [Scrubber devices](http://en.wikipedia.org/wiki/Scrubber)have been fitted to the chimneys in different pilot projects around the world so that the greenhouse gas produced during fossil fuel burning can be removed from the exhaust emissions. The carbon dioxide can then be cooled and pumped for storage in deep underground rock chambers, for example, replacing the fluid in saline aquifers. Another storage option is to use the collected gas to replace crude oil deposits, helping drilling companies to pump out oil from hard to reach places, in a process known as advanced oil recovery. Removing this pollution from power plants – called [carbon capture and storage](http://www.guardian.co.uk/environment/interactive/2008/jun/12/carbon.capture) – is a useful way of preventing additional carbon dioxide from entering the atmosphere as we continue to burn fossil fuels. But what about the gas that is already out there? The problem with removing carbon dioxide from the atmosphere is that it’s present at such a low concentration. In a power plant chimney, for instance, carbon dioxide is present at concentrations of 4-12% within a relatively small amount of exhaust air. Removing the gas takes a lot of energy, so it is expensive, but it’s feasible. To extract the 0.04% of carbon dioxide in the atmosphere would require enormous volumes of air to be processed. As a result, most scientists have baulked at the idea. Fake plastic trees [Klaus Lackner](http://www.columbia.edu/~kl2010/members_lackner.htm), director of the Lenfest Center for Sustainable Energy at Columbia University, has come up with a technique that he thinks could solve the problem. Lackner has designed an artificial tree that passively soaks up carbon dioxide from the air using “leaves” that are 1,000 times more efficient than true leaves that use photosynthesis. "We don't need to expose the leaves to sunlight for photosynthesis like a real tree does," Lackner explains. "So our leaves can be much more closely spaced and overlapped – even configured in a honeycomb formation to make them more efficient." The leaves look like sheets of papery plastic and are coated in a resin that contains sodium carbonate, which pulls carbon dioxide out of the air and stores it as a bicarbonate (baking soda) on the leaf. To remove the carbon dioxide, the leaves are rinsed in water vapour and can dry naturally in the wind, soaking up more carbon dioxide. Lackner calculates that his tree can remove one tonne of carbon dioxide a day. Ten million of these trees could remove 3.6 billion tonnes of carbon dioxide a year – equivalent to about 10% of our global annual carbon dioxide emissions. "Our total emissions could be removed with 100 million trees," he says, "whereas we would need 1,000 times that in real trees to have the same effect." If the trees were mass produced they would each initially cost around $20,000 (then falling as production takes over), just below the price of the average family car in the United States, he says, pointing out that 70 million cars are produced each year. And each would fit on a truck to be positioned at sites around the world. "The great thing about the atmosphere is it's a good mixer, so carbon dioxide produced in an American city can be removed in Oman," he says.

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#### uniqueness

#### China is on the brink of Space based solar to provide inexhaustible energy

**Snowden 19** (Scott Snowden, Mar 12, 2019, has written about science and technology for 20 years for publications around the world, Solar Power Stations In Space Could Supply The World With Limitless Energy, Forbes, <https://www.forbes.com/sites/scottsnowden/2019/03/12/solar-power-stations-in-space-could-supply-the-world-with-limitless-energy/?sh=23471fec4386> ) SJ

While on the surface of the Earth, society still struggles to adopt solar energy solutions, many scientists maintain that giant, space-based solar farms could provide an environmentally-friendly answer to the world's energy crisis. Only last week, we reported that China [was planning to](https://www.forbes.com/sites/scottsnowden/2019/03/05/china-plans-to-build-the-worlds-first-solar-power-station-in-space/#51f7f9c35c94) build the world's first solar power station to be positioned in Earth's orbit. Because the sun always shines in space, an orbital solar power station is seen as an inexhaustible source of clean energy. "Above the Earth, there's no day and night cycle and no clouds or weather or anything else that might obstruct the sun's ray, so a constant power source is available," said Ali Hajimiri, professor of electrical engineering at the California Institute of Technology and co-director of the university’s [Space Solar Power Project](https://www.spacesolar.caltech.edu/). Collecting solar power in space and wirelessly transmitting was first described by Isaac Asimov in 1941 in his short story Reason. In 1968, American aerospace engineer Peter Glaser published the first technical article on the concept – Power From The Sun: Its Future in the journal [Science](http://www.sciencemag.org/). Space-based solar power attracted considerable attention in the 1970s as the necessary individual technical components – in essence, photovoltaic cells, satellite technology and wireless power transmission – were developed. Despite the concept being technically feasible, it was considered economically unrealistic at the time and research ultimately stalled. “The idea seems to be going through a resurgence and it’s probably because the technology exists to make it happen,” said John Mankins, a former NASA scientist who was at the forefront of this field in the 1990s, before it was abandoned. Global energy demands are only going to grow, says Hajimiri. The global population is expected to reach a staggering 9.6 billion by 2050, according to a [United Nations report](http://www.un.org/en/development/desa/news/population/un-report-world-population-projected-to-reach-9-6-billion-by-2050.html), so methods of generating large quantities of clean energy must be found. A space-based solar power system could provide energy to everyone, even in places that don't receive sunlight all year round, like northern Europe and Russia. In April of 2015, a research agreement between Northrop Grumman and Caltech provided up to $17.5m for the development of innovations necessary to enable a space solar power system. Three Caltech professors head up the project: joining Hajimiri were Harry Atwater and Sergio Pellegrino. Caltech is just one institution working on developing this technology. We know that scientists at the Chongqing Collaborative Innovation Research Institute for Civil-Military Integration in China are constructing a facility to test the theoretical viability of the concept and plans to develop an orbital photovoltaic array [were announced](https://phys.org/news/2009-11-japan-eyes-solar-station-space.html) in Japan some time ago. One of the biggest issues to overcome is that of getting an array of solar panels large enough to make the project viable into orbit. Early concept designs in the 1970s featured giant arrays that would've proved very difficult to actually get into orbit. "The systems of the 70s for solar power satellites, the cost estimates suggested, at that time, that it might be as much as a trillion dollars to get to the first kilowatt hour because of the way the designs worked. Essentially a single satellite, a platform, an integrated, monolithic platform about the size of Manhattan," said Mankins.However, with SpaceX and Blue Origin slowly driving the cost of orbital delivery down, suddenly the concept seems a little closer to reality. "Going to modular systems to allow mass production, I believe was the answer to how to get solar power satellite costs down to something more reasonable," said Mankins.

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#### Aff crushes the renewable energy investment critical to sustained Chinese growth

Ma 17 (Ma Tianjie, China Dialogue managing editor, Greenpeace's Program Director for Mainland China, “What Trump can learn from China about competitiveness,” 1-17, <http://www.climatechangenews.com/2017/01/17/what-trump-can-learn-from-china-about-competitiveness/)//cmr>

But beyond such grand notions, leaders from around the world may also learn from China’s actual experience in recent years of seeking alternative “engines” of economic growth, a theme that this year’s Davos is keen to explore. President Xi’s entourage of Chinese business leaders this year includes some of the country’s most successful entrepreneurs. A few are from the renewable energy sector, which is one of the country’s fastest growing sectors and key to China achieving its environmental and social goals. So what can the world learn from China’s experience of investing in renewables such as solar and wind? Invigorating the economy China’s renewable power capacity has grown rapidly in recent years. Wind capacity increased 31 gigawatts (GW) in 2015 to 145GW, which is more than Europe. China installed an average of two wind turbines an hour. Solar is also growing quickly, with 15GW installed in 2015 bringing total capacity to 43GW. In both cases these additions were the largest one-year increases achieved by any country. For comparison, the 2015 wind capacity increase was roughly equivalent to the UK’s entire renewable power capacity, while the growth in solar was roughly equivalent to adding the combined solar capacity of the UK and Spain. As a result of this booming sector, renewable energy is a major employer in China. In 2015, it employed 3.5 million people, nearly a million more than work in the Chinese oil and gas sector. Jobs in renewables have grown by 1.8 million since 2012. In comparison, there were 769,000 jobs in the sector in the US in 2015, an increase of just 157,000 since 2012. China believes that its 13th Five-Year Plan will create an additional 13 million renewables jobs by 2020. This is more than 5,000 jobs a day, assuming a constant job creation rate over the 13th Five-Year Plan period (2016-2020). These new jobs include China’s current 3.5 million jobs in renewables. If we consider the fact that fewer than 55,000 people worked in coal mines in the US at the end of 2016, it means in one year, China will create 34 renewables jobs for every US coal mining job. Commitment to invest The strong and steady growth of renewables in China is in large part due to the country’s unwavering commitment to invest in this burgeoning sector. The country’s largest policy bank, the China Development Bank, for example, has been credited for shoring up the solar PV industry at times of great turbulence. Nowadays, China is the world’s largest clean energy investor, investing US$102.9 billion (709.7 billion yuan) in renewables in 2015 (excluding large hydro power). This accounts for 36% of global investment and a 17% increase on 2014. China expects to add a further 100GW of domestic wind power capacity and a similar amount of solar power capacity between 2015 and 2020, to meet its goal of peaking emissions by 2030 at the latest. This will mean investing a further US$361 billion (2.5 trillion yuan) in renewable power by 2020. Today, Chinese companies dominate the global renewable energy market; the world’s largest wind energy company and five of the top six solar firms are Chinese. The country is also investing in clean energy internationally, taking advantage of a rapid global increase in demand for renewable power (clean energy will be the largest single source of power capacity growth in the next five years, according to the International Energy Agency). In 2016, China’s foreign investment in renewables included 11 deals worth more than US$1 billion (6.9 billion yuan), with a total value of US$32 billion (220 billion yuan), a 60% increase on the previous year. Dwarfing the US At this year’s WEF, leaders may receive very different messages from the world’s top two economies when it comes to renewable energy. While China is embracing a sector that many believe will be the basis of how society powers itself in the future, the incoming US administration appears focused on fossil fuels, appointing an oil company executive and a “climate denier” to head the State Department and the Environmental Protection Agency, respectively. China has invested more than the US in renewable energy each year since 2012. US investment in renewables in 2015 was US$44.1 billion (304 billion yuan) – a 19% increase on the previous year, but less than half that of China. The number of renewable energy jobs in the US increased by around 6% in 2015 to 769,000. Employment in solar grew 12 times as fast as overall job creation in the US, overtaking oil and gas extraction (172,400 jobs in December 2016) and coal mining (53,800 jobs). These are impressive numbers on their own. But over the same period, renewable energy jobs in China increased by 133,000, nearly three times as fast. Any change to US policies on climate action or renewables must be seen in the context of the global low-carbon transformation that is underway. Although measures to curb renewables and reward fossil fuel investments in the US could certainly drive renewables investment elsewhere, they are unlikely to pose a threat to the continued deployment of clean energy on a global scale. Along with India and other countries, China is embracing decarbonisation. The overwhelming majority of Chinese people say they are prepared to pay more for low carbon electricity, compared to around half of US citizens, according to polls in 2013 and 2014. As President Xi’s speech at Davos will show, China is embracing more than just decarbonisation. It is poised to harness the powerful forces of the sun, the wind and other renewable sources of energy to reconfigure its massive economy and ensure its future global competitiveness.

#### Impact

#### Collapse causes miscalc and lash-out – global war

Carpenter 15 (Ted Galen, a senior fellow at the Cato Institute and a contributing editor at The National Interest, The National Interest, “Could China's Economic Troubles Spark a War?”, 9/6/15, <http://nationalinterest.org/feature/could-chinas-economic-troubles-spark-war-13784?page=2>, 6/24/16)//cmr

Global attention has focused on the plunge in the Shanghai stock market and mounting evidence that China’s economic growth is slowing dramatically. Moreover, the contagion appears to be spreading, characterized by extreme volatility and alarming declines in America’s own equity markets. Those worries are compounded because there always have been doubts about the accuracy of Beijing’s official economic statistics. Even before the current downturn, some outside experts believed that Chinese officials padded the results, making the country’s performance appear stronger than it actually was. If China is now teetering on the brink of recession, the political incentives for officials to conceal the extent of the damage would be quite powerful. The focus on the possible wider economic consequences of a severe Chinese economic slowdown is understandable, since the ramifications could be extremely unpleasant for the U.S. and global economies. But we should also be vigilant about how such economic stress might affect Beijing’s diplomatic and military behavior. It is not unprecedented for a government that feels besieged to attempt to distract a discontented public by fomenting a foreign policy crisis. In Henry IV, Shakespeare pithily described that process as the temptation to “busy giddy minds with foreign quarrels.” China’s leaders likely feel increasingly uncomfortable. The implicit bargain that has been in place since the onset of market-oriented reforms in the late 1970s has been that if the public does not challenge the Communist Party’s dominant political position, the Party will deliver an ever-rising standard of living for the people. The bloody Tiananmen Square crackdown in 1989 was a graphic reminder of what happens if the Party’s position is challenged. However, until now, the economic portion of the bargain seemed secure, characterized by breathtaking, often double digit, rates of growth. It is uncertain what happens if the Party can no longer maintain its part of the implicit bargain, but it is likely that a dangerous degree of public discontent will surface. Beijing might refrain from deliberately provoking a major foreign policy crisis, since the Chinese economy depends heavily on export markets, and access to those markets would be jeopardized by war. However, the need to preserve and strengthen national unity and distract the public from mounting economic troubles is likely to impel Chinese leaders to adopt very hardline policies in at least three areas. And all of those situations entail the danger of miscalculations that could lead to war. One issue is the South China Sea. Beijing has made extraordinarily broad territorial claims that encompass some 90 percent of that body of water. China is pressing its claims with air and naval patrols and the building of artificial islands. Those policies have brought Beijing into acrimonious disputes with neighbors such as Vietnam and the Philippines, which have rival territorial claims, and with the world’s leading maritime power, the United States, which resists any manifestation of Chinese control over the South China Sea and the crucial commercial lanes that pass through it. The conditions are in place for a nasty confrontation. Chinese leaders have already stressed the country’s alleged historical claims to the area, and made it clear that it will not tolerate being subjected to humiliation by outside powers. Such arguments are designed to gain domestic support by reminding the Chinese people of the country’s long period of weakness and humiliation in the 1800s and early 1900s. A second issue is Taiwan. Beijing has long argued that Taiwan is rightfully part of China and was stolen from the country in the Sino-Japanese war in 1895. Although Chinese leaders have exhibited patience regarding the issue of reunification, relying in large measure on growing cross-strait economic ties to entice Taiwan to eventually accept that outcome, Beijing has also reacted very sharply whenever Taiwanese officials have pushed an agenda of independence, as during the administration of Chen Shui-bian from 2000 to 2008. The danger of renewed confrontation is rising, since public opinion polls indicate that the nominee of Chen’s old party, the pro-independence Democratic Progressive Party, will be Taiwan’s next leader. A new crisis in the Taiwan Strait would be extremely serious, since the United States has obligated itself to consider any Chinese efforts at coercion as a “grave breach of the peace” of East Asia. Yet there is little doubt that there would be widespread domestic support on the mainland for a stern response by the Beijing government to a Taiwanese attempt to enhance its de-facto independence. Indeed, there might be more political danger to the regime if it did not take a strong stance on that issue. The third possible arena for crisis is the East China Sea. China is increasingly adamant about its claims to the Diaoyu/Senkaku islands, which are under Japanese control. From China’s perspective, those islands were stolen by Imperial Japan at the same time that Tokyo took possession of Taiwan following the 1895 war. And ginning up public anger against Japan is never difficult. China just finished celebrating the 70th anniversary of the end of World War II, which is touted in China as “the Chinese People’s War of Resistance Against Japanese Aggression and the World Anti-Fascist War.” Recalling Japan’s invasion of China, and the resulting atrocities, was a prominent theme of the various commemorative events. But the animosity is not based solely on historical grievances. Anger at Japan over the ongoing East China Sea dispute and other matters has already produced anti-Japanese riots in Chinese cities, characterized by attacks on Japanese businesses and automobiles. There is a powerful incentive for Chinese leaders to take an uncompromising stance on the Diaoyu/Senkaku feud, confident that the Chinese people will back such a stance. All of this suggests that the United States and its allies need to proceed cautiously about dealing with China, especially on these three issues. Now is not the time to press a Chinese leadership that likely feels beleaguered by the country’s economic woes. The last thing we should do is give those leaders further temptation to distract the Chinese people with a foreign policy confrontation. Such a strategy entails the grave risk of miscalculation and escalation, and that would be a tragedy for all concerned.

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#### Link Story

#### First, the US commercial space industry is booming – private space companies are driving innovation

**Lindzon** 2021 [(Jared Lindzon, A FREELANCE JOURNALIST AND PUBLIC SPEAKER BORN, RAISED AND BASED IN TORONTO, CANADA. LINDZON'S WRITING FOCUSES ON THE FUTURE OF WORK AND TALENT AS IT RELATES TO TECHNOLOGICAL INNOVATION) "How Jeff Bezos and Elon Musk are ushering in a new era of space startups," Fast Company, 2/23/21, https://www.fastcompany.com/90606811/jeff-bezos-blue-origin-elon-musk-spaces-space]

In early February, Jeff Bezos, the founder of Amazon and one of the planet’s wealthiest entrepreneurs, dropped the bombshell announcement that he would be stepping down as CEO to free up more time for his other passions. Though Bezos listed a few targets for his creativity and energy—The Washington Post and philanthropy through the Bezos Earth Fund and Bezos Day One Fund—one of the highest-potential areas is his renewed commitment and focus on his suborbital spaceflight project, Blue Origin. Before space became a frontier for innovation and development for privately held companies, opportunities were limited to nation states and the private defense contractors who supported them. In recent years, however, billionaires such as Bezos, Elon Musk, and Richard Branson have lowered the barrier to entry. Since the launch of its first rocket, Falcon 1, in September of 2008, Musk’s commercial space transportation company SpaceX has gradually but significantly reduced the cost and complexity of innovation beyond the Earth’s atmosphere. With Bezos’s announcement, many in the space sector are excited by the prospect of those barriers being lowered even further, creating a new wave of innovation in its wake. “What I want to achieve with Blue Origin is to build the heavy-lifting infrastructure that allows for the kind of dynamic, entrepreneurial explosion of thousands of companies in space that I have witnessed over the last 21 years on the internet,” Bezos said during the Vanity Fair New Establishment Summit in 2016. During the event, Bezos explained how the creation of Amazon was only possible thanks to the billions of dollars spent on critical infrastructure—such as the postal service, electronic payment systems, and the internet itself—in the decades prior. “On the internet today, two kids in their dorm room can reinvent an industry, because the heavy-lifting infrastructure is in place for that,” he continued. “Two kids in their dorm room can’t do anything interesting in space. . . . I’m using my Amazon winnings to do a new piece of heavy-lifting infrastructure, which is low-cost access to space.” In the less than 20 years since the launch of SpaceX’s first rocket, space has gone from a domain reserved for nation states and the world’s wealthiest individuals to everyday innovators and entrepreneurs. Today, building a space startup isn’t rocket science. THE NEXT FRONTIER FOR ENTREPRENEURSHIP According to the latest Space Investment Quarterly report published by Space Capital, the fourth quarter of 2020 saw a record $5.7 billion invested into 80 space-related companies, bringing the year’s total capital investments in space innovation to more than $25 billion. Overall, more than $177 billion of equity investments have been made in 1,343 individual companies in the space economy over the past 10 years. “It’s kind of crazy how quickly things have picked up; 10 years ago when SpaceX launched their first customer they removed the barriers to entry, and we’ve seen all this innovation and capital flood in,” says Chad Anderson, the managing partner of Space Capital. “We’re on an exponential curve here. Every week that goes by we’re picking up the pace.”

**And, Crushing these inspirations now will delay next-gen space applications by decades**

**Hampson 17** Joshua Hampson, Security Studies Fellow at The Niskanen Center, Niskanen Center, January 25, 2017, “The Future of Space Commercialization”, https://niskanencenter.org/wp-content/uploads/2017/01/TheFutureofSpaceCommercializationFinal.pdf

How Government Allows Space Business

Finally, the United States also needs to look at how it allows space business to be conducted. Organizational changes may allow the government to be better positioned to consider policies and regulation, and government business reforms may ensure that markets are not skewed too much. Responsible policies, however, will be the most important aspect of a healthy commercial space market. The United States benefits from promoting as large a space economy as possible. Such an economy would drive innovation and promote growth. For the government, a freestanding space economy would drive down costs of launches and services. How then should the government approach its space regulations? While the commercial space market is perhaps in a better shape than it ever has been, it still is relatively fragile. While this paper has mentioned the various pressures that are 208 growing on the U.S. government to review its space regulation, those pressures themselves do not mean that the United States should regulate for regulation’s sake. For example, in some cases the solution may simply be clarifying the decision process and enabling a review process. In approaching commercial space, government agencies should take as light-touch an approach as possible. Missions should be default-approved, with the burden of proof on the government to demonstrate that a particular mission would be risky to the public or national security. If within a standard period of time the government cannot articulate a specific reason as to why the mission should not move forward, it should be permitted. The application process for missions should be clearly articulated, and decisions should be consistent across applications from different companies. Informal processes should be formalized. Decisions made for national security reasons should at least be traceable, in case review is necessary. There should also be a public review process for challenging decisions. The remote sensing industry is an example of what can happen when overly burdensome regulations are put into place: American businesses are handicapped and industry advantage shifts to foreign competitors. In this regard, current policies that are archaic should also be revisited. The licensing process for remote sensing, for example, has been criticized as arbitrary. The result, at least from the commercial viewpoint, has 209 been that non-governmental remote sensing is provided mostly by non-American companies. The 210 review of the export control system should also continue, with regular updates. The specificity of 211 the restrictions means that they can become obsolete quickly, with non-American companies producing equipment American companies are constrained from selling abroad. In reviewing these processes and systems, the goal should be that the space market becomes self-supporting rather than a simple privatization of government tasks.212 The government can also avoid creating regulations to manage issues that could be managed under existing law. It is possible, for example, that tort law could be used to manage some of the possible issues of outer space, at least in issues between two American companies. Outer space is not a single policy area which requires a one-size-fits-all approach. There are a range of issues with a range of analogs in existing domestic and international law, and there will be a range of potential solutions to those particular issues. Space mining may be analogous to deep sea exploration, while debris clean-up in orbit would require international agreements and coordination. Maturity levels of different parts of the industry will also inform different approaches. Regulations, if found to be necessary, should be consistent, unambiguous, and specific. The process for rulings on decisions should be transparent and consistently applied. The government should avoid using catch-all categories and should instead specifically draft the rules for individual activities in space if needed. The government should also remember that the OST is not self-executing. Although there could be international consequences for decisions made about whether to regulate an activity in space or not, the United States has leeway in determining what needs authorization and how intensive “continuing supervision” needs to be. The United States also should not try to guess what 213 commercial uses of outer space may become viable or not. It is important to remember the lesson of AT&T’s 1960 license application: the commercial sector may surprise the government in what the latter believes to be viable.214 Because of Article VI mandate in the OST and the complexity of the issues at play, avoiding burdensome regulation is the hardest policy suggestion. The mere presence of complexity, however, does not mean that the government should err on the side of overly restrictive policies, especially when the benefits to liberalizing the regulations in this industry are so pronounced. Conclusion This recommended list of actions does not exhaust the possibilities for how the U.S. government can promote commercial outer space. New and complex problems will certainly arise in the future. For now, these proposals can help the United States realize the full potential of outer space for private actors and the government alike. Elevating space policy to a higher level within the government, codifying an attitude of openness to innovation, and making sure that any regulations—if needed—are up-to-date, clear, and reliably applied are key to realizing the benefits of space. A growing and robust commercial space economy will facilitate economic growth and promote domestic national security. The same incentives that drive innovation in the competitive, commercial sector will, over time, reduce the costs and increase the capabilities of American security space systems. Innovations in satellite technology will change how parts of the economy operate, and how the U.S. military projects power abroad. Cheap launch services can open Earth’s orbit and beyond to larger markets, eager entrepreneurs, and new inventors. Those services could also allow the United States to create a more resilient defense network in orbit and, if necessary, quickly reconstitute it. There are many challenges that stand in the way of that market—from the sheer difficulty of going to space to the geopolitical and legal complexities involved—but now is the time to get serious about crafting good space policy. The decisions in the next couple of years could define access to space, and the benefits we reap, for generations to come. The United States must decide between a risk-averse approach—restraining the market and ceding exploration and investment to more adventurous nations—and an optimistic and permissive approach, with intervention only when it is clearly necessary. The rise of a commercial space market will not necessarily be uneventful. There will be failures, and some of the optimistic companies that exist today will succumb to competitors or the difficulty of the task at hand. Investments in space will ebb and flow. But there will be no groundbreaking 215 innovation if we refuse to tolerate failures and allow the market to mature. Public safety, especially for launches, must remain a concern, but that does not have to come at the expense of promoting growth and defending national security. The United States is on the cusp of having an independent commercial space market. With a few smart decisions and a policy of regulatory restraint, the government can simultaneously promote innovation, growth, and national security, while proving that enterprise in space does not require the backing of a large nation state. That would be a giant leap for mankind.

#### B. Impact Story

**Space Innovations are essential to stop multiple extinction level issues**

**Beames 18** – Chairman of the SmallSat Alliance & Exec Chairman of York Space Systems, former Principal Director of Space & Intel-Office of UnderSecDef AT&L

Charles Beames, Chairman of the SmallSat Alliance, Executive Chairman of York Space Systems, former Principal Director of Space and Intelligence in the Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics (OUSD(AT&L)), active early stage investor in entrepreneurial space, former President of Vulcan Aerospace where he was responsible for asset allocation within a privately held aerospace investment portfolio exceeding $1B, Col. (ret.) in the USAF where he served 23 years in space & intelligence leadership positions around the world, SmallSat Alliance is on a path toward a new space horizon, first appeared in the July 2018 issue of SpaceNews Magazine, available at <https://spacenews.com/op-ed-smallsat-alliance-is-on-a-path-toward-a-new-space-horizon/>

We find ourselves still at the dawn of a new space century, mindful of the victories and setbacks of our past, eager to pass the torch to the next generation of space visionaries, scientists, engineers, and enthusiasts. We look to the future not just to see how much bigger, faster, or higher we can reach, but also how the United States, and specifically the U.S. space community, can again inspire the nations of the world to align with us, as it did in the 20th century.

The SmallSat Alliance is an alliance of companies developing, producing, and operating in all segments of the ‘next generation’ space economy; championing renewed U.S. leadership in the burgeoning commercial space economy, and advocating for the transformation of government-led space capabilities. We are experienced space professionals who have chosen to join with others leveraging our decades of hard-won experience, to develop smarter ways to explore space in the 21st century.

A wonderful outgrowth of the legacy space program is the commercial, entrepreneurial, and job-creating commercial space business that it bequeathed. These next-generation enterprises range from multi-million-dollar startups providing rideshare opportunities or components for small satellites to multi-billion-dollar space data-analytic platforms reinventing urban car service and agricultural production. The early returns of this economic revolution are already on our doorstep: space data capabilities are exponentially growing elements of the 21st century world economy.

Beginning with the dreams and funding by successful tech entrepreneurs, enormous venture investments are already delivering wondrous benefits to the world.

Commercial Space – Profit and Non-Profit

There are really two major categories in the commercial sector, the profit driven and the non-profit. The classic for-profit companies include not only those designing, building, launching, and operating satellites but also the tech sector that is turning that raw space data into gold through machine-learning analytics. Since for-profit companies are no longer dependent upon the revenues generated by the Cold War space race culture of a bygone era, this new generation of space companies is able to more efficiently capitalize on Moore’s Law, the nonstop exponential growth in chip density, and the associated networking technology co-evolving with it. This new generation is building profitable businesses helping to clean up our oceans of garbage and debris with satellite surveillance, reconnoitering to assist in enforcing laws that protect our oceans from illegal, unregulated, unlicensed fishing, something that is rapidly depleting the world’s most valuable and essential lifeforms. It’s leading in the innovative use of low-cost satellite constellations to produce ubiquitous remote-sensing data, enabling small business owners to be more profitable and less wasteful. For example, precise timing signals from space are already optimizing transportation of people, goods, and services, with even further gains anticipated with the introduction of artificial intelligence to assist drivers, perhaps even someday replacing them entirely.

The non-profit sector is the other side of commercial space, concerned more for the general welfare of society, but every bit as integral to this new space enterprise. Much like every century before it in human history, ours is not without its unique challenges, some of which have been a consequence of the last, and all of which the space data domain can be leveraged to help solve. Examples are endless, but one challenge that this new space community is uniquely well-adapted for is to further inform worldwide resource allocation for the 21st century and beyond. These two primary resources are sustainable water and the materials needed for adequate housing for an ever-increasing human population. As cities and urbanization continue to expand, governmental planning challenges such as transportation design optimization for goods and services are only the beginning. Additionally, through using inexpensive remote sensing technologies, some members are designing space data analytics to mitigate human suffering from plagues, contain outbreaks, and combating illegal poaching. Some are connecting with other non-profits to curtail human trafficking for the sex trade or forced labor for migrant debt repayment. Still others are helping non-governmental organizations in their work to expose the use of **child**ren as **soldiers**. Addressing these challenges has little to do with resuscitating dreams conceived by long deceased science-fiction writers and much more to do with **turning “swords back into plowshares**” to **solve real threats to humanity**.

Other non-profit initiatives include pursuing an even more foundational understanding of who we are and how to be the best custodians of our environment. Much as exploring and monitoring the world’s oceans has advanced civilization through a better understanding of human life and the planet, so too does exploring and monitoring from space. Low Earth orbit (LEO) provides a unique vantage point to look back on the planet and understand what is happening, anticipate what might happen and prepare for the future. In addition to better understanding Earth, responsible and rapid exploitation of the low Earth orbit domain will enhance the understanding of the solar system and the rest of the universe. Small satellites already offer low-cost platforms to study and explore what lies beyond the Earth. Other members are pioneering the use of zero-carbon, hydrogen-based reusable propulsion systems to ensure we don’t worsen our atmosphere using kerosene-fueled rockets for the coming tsunami of satellite launches. Finally, a mission ensuring the general welfare and planet survival for the next thousand years is finally confronting the existential threat that asteroids and comets pose to humanity. These extra-terrestrial, deep-space threats are passing dangerously close to our planet, and today we have no solar map of them and no defense.