Climate Change and Interstellar Exploration

“Knowing is not enough; we must apply. Willing is not enough; we must do,” said German polymath Johann Wolfgang von Goethe. The mercurial scientist, playwright and statesman captures a good summary for our times. It is not enough to have all the tools and all the inspiration. There is no substitute for action.

As the existential threat of climate change mounts, humans have once again turned their attention to the stars. Mars. SpaceX. Blue Origin. But what would seem to many as a backup plan – interstellar exploration and colonization – is in fact a necessary goal for today’s human societies. Put more simply: the challenge is not to conquer climate change here on Earth *or* find somewhere else to live. Rather, it is both.

Scientific climate change research and the interaction with society, which is the topic of my master’s degree, is important not only for addressing the current environmental crisis on Planet Earth. But it is also significant for understanding the climates of other celestial bodies, and perhaps more importantly, the ways that large problems are solved through collective action. Interstellar exploration will be facilitated by an understanding of the factors that influence climate change. These lessons will be invaluable for comprehending the conditions of other planets, and for stabilizing our own.

As a student of the Master’s in Climate and Society at the Columbia Climate School at Columbia University, I will study solutions to the challenges presented by climate change that have sprung from climate science, social science and public policy. The science, technology, and broad understanding of climate knowledge will enrich my understanding of dissecting and solving problems on planetary-sized scales. Once we can truly understand our own planet, then we can approach interstellar exploration with a confidence and expertise necessary to establish outposts throughout the solar system.

For the past six years, I have worked in impact investing in developing countries. I spent significant time in Sub-Saharan Africa, investing in companies growing with the rising local middle and consumer classes. These included the only Liberian healthcare clinic to stay open during the civil war and the Ebola epidemic, East Africa’s largest producer of lifesaving antiretroviral and antimalarial medicines, and one of the largest microfinance institutions. I later relocated to South East Asia to lead an ocean conservation impact and sustainable finance fund. This fund would invest in fisheries companies in the Philippines and Indonesia and then work with the companies to improve the sustainability of their operations as well as the surrounding fisheries communities.

At the centre of many of the greatest issues facing the human and natural world is climate change and the substantial social and natural consequences it will bring. My analysis of the fishery industries of Indonesia and the Philippines laid bare unsolved

tragedies of the commons and collective action challenges. Though overfishing and crude fisheries practices were often the primary recipient of the blame, climate change was playing a role in what can only be described in many areas as ecological collapse. Changes in ocean temperature, circulation, oxygen concentration, acidification, surface wind, storms and salinity due to climate change is wreaking havoc on the marine ecosystems. Positive feedback loops abound.

My previous work has been focused on social development and conservation in developing countries. This has involved highly quantative analysis and has been based at the interconnectedness of economics, natural science and social science systems. I have seen first-hand the complicated collective action disasters that plague many societies. I want to study climate change because innovation and technology present exciting new ways to solve many of these significant challenges. Big data, ecosystem management, sustainable and blended finance, artificial intelligence and machine learning, mathematics and mapping, income equality, improved policy: each piece is important to achieving the stabilization of natural and human systems on a long term and large scale.

NASA is one of the is one of the keenest observers of climate, and spends billions of dollars watching the Earth’s atmosphere, oceans, land, ice and biosphere. The ability to take a truly global perspective is fundamental to understanding how interstellar networks will function. In addition, gaining mastery of the mechanisms of climate and the complexities surrounding heating and cooling will prepare us for future interstellar outposts.

Many people today see climate change and space travel as competing forces: for attention, funding, and imagination. But this is not true. Both are big pieces in the continuum of human existence and solving both are necessary for us as humans to continue to exist as a species.

My subsequent career objectives and future impact ambitions are to explore whether market-based capitalist mechanisms in conjunction with policy frameworks can be used to bring about environmental conservation, ecological recovery, climate change mitigation and sustainable development. The complexity of the interaction between market systems and technology is giving rise to changes and challenges at a pace that could not have been previously anticipated. The possibilities of innovation and technology to address the causes of climate change will be nothing short of transformative for our society.

Massive amounts of attention need to be directed into adapting and transforming society for sustainable development. With the world population predicted to be eleven billion people by the end of the century, the current path of humanity is likely disastrous. That alone seems to justify significant analysis of sustainable development methods to prepare for the mounting stress to natural and human systems. Though many of the consequences of climate change are now apparent and even more yet to be discovered, I would like to be an informed agent of change that focuses on the ability of societies to mitigate, decelerate and possibly reverse the momentum of climate change.

It is exactly this global, cosmic-sized mentality that is necessary to address climate change that will tilt people's heads up to the stars. One of the greatest hurdles in dealing with climate change is a large cadre of people who are skeptical that humans can have that much of an affect on the earth. "The earth is a complicated place" they say, "who are we to guess what is going on." But we are not guessing. We are applying scientific principles to understand the reality around us on a global scale. That sort of confidence – to solve problems of extreme size – is what will then bring us to look to other planets as something that can be understood. Something that can be charted, just like an uncut trail in a forest, or an invisible atmospheric phenomenon. Interstellar exploration takes great courage and confidence. And so does solving climate change.

The focus of my master's research will be to combine many of the new developments in AI, blockchain, the Internet of Things (IoT) and machine learning and apply them to sustainable finance and climate mitigation strategies. I intend to become a climate expert that is skilled at analysing data on a local and planetary level. And then I will apply that analysis to ways that climate change can be slowed and mitigated on Earth.

AI is improving data verification and quality while generating new data and analysis that can be applied to forest conservation, deforestation and land degradation. Blockchain technology brings an open and transparent platform for the monitoring and management of forests and carbon. Blockchain recording and accounting increases trust and decreases fraud. There is also the ability of high-resolution imaging, from planes or from satellite images, to monitor forest conservation. These type of imaging technologies can track canopy growth, tree count, density, soil moisture and humidity, which are all important metrics for forest conservation and carbon predictions. They will also be important tools for surveying a new planet.

By creating a blockchain for climate change and tokenizing carbon, it will create a whole ecosystem for the monitoring, reporting and verification of data related to climate change. The complete stock of greenhouse gases will be able to be quantified, and carbon credits will be originated. In addition, it decentralizes and democratizes the data available as well as the funding. It creates a completely new asset class and enhances and accelerates our path towards climate change mitigation and reversal.

Blockchain and AI also have the potential to create a decentralized market for energy that incentivizes energy-saving and low-carbon alternatives. There are ways that these new technologies can manage our energy consumption better, reduce the carbon footprint of energy, improve efficiency, and ultimately reduce climate change. In the same way that cryptocurrency has become a disruptive technology, so has renewable energy, and there is great potential in increasing adoption when combining these two forces. The acceleration of clean energy options will make powering interstellar travel a reality. But so much of this new technology will come out of fighting climate change here on Earth. Which is why the close relationship between the two – the climate change crisis and interstellar travel dream – is so exciting.

Tokenization and blockchain technologies can allow a much wider spectrum of investors to participate in sustainable finance projects. It can promote social and financial inclusion by making the impact investing asset class more accessible. It can also use the power and transparency of the blockchain to increase trust between stakeholders. By increasing trust and transparency, even more investors can participate. If larger pools of capital are able to be gathered and directed towards sustainable finance and impact investing opportunities, their relative cost decreases. The result is that makes solving some of the most significant social and environmental problems, cheaper.

Though many of these technologies will be crucial to reducing the impact of climate change, the second piece, policy and adoption, is just as crucial. I intend to study the ways in which societies can use these technologies as tools to mitigate climate change and slow down environmental degradation. Our society has been so rapidly digitized that these are often the only solutions that people look to when trying to solve large problems. Simple things like putting a price on pollution, adaptation, funding, reporting, and activism, are all low-tech but high impact solutions. Not everything in interstellar travel and new planet colonies is about technology. This is not the Jetsons. So much of the big and structural work, that is often invisible to us humans, falls into the realms of social science, anthropology, and politics. Many of the STEM specialists will be instrumental in getting us onto the next planet. But I don’t know if I want to see a society designed and ruled by engineers.

This understanding of how to solve collective action problems will be invaluable here on Earth as well as in interstellar travel and life. The great explorers of history on Earth and in space have understood the importance of teamwork. But the many interstellar challenges that the future holds is not comparable to the crew of Columbus’s ships and the colonizers that followed, nor the team of Neil Armstrong and NASA. It is vastly more complicated and involves many more people. Climate change has become the collective action problem for our generation. It requires massive actions, sacrifices and intelligence across billions of people. It incorporates countries and people of different levels of development, perspective, resources and preferences.

Having the technology is not enough. Have the desire is not enough. As Goethe says, “We must do.” Climate change presents a challenge of scale and complexity similar to interstellar travel and life. It encompasses the entire world, and all the tiny micro-connections that pull Planet Earth into a single being. If we can not understand those connections – at the smallest as well as the largest level – then we are doomed to fail in space. Settling a new planet with an incomplete understanding of our own is a very dangerous mission. The climate scientists will be crucial to bringing vital knowledge to a new planet, as well as ensuring our old planet remains inhabitable. I will be able to demonstrate how the climate of new planets are structured and how the consumption of resources will impact the habitability of new planets. In addition, new information from new planets may actually teach us things about Planet Earth and ways that we can reverse the damage here that has already been done.

What distinguishes climate scientists from others, is that they analyse the environment from the community to the planetary scale. This is a crucial quality for interstellar travel as well a new planet colonization. With my climate training, I will be able to analyse large amounts of data on a local and planetary level. This will be useful, because micro and macro factors need to balance when building a human civilization on a new planet.

The climate crisis is one of the greatest threats facing humanity. The challenges are massive and immediate. Finding vital solutions are of utmost importance for the present and for future generations. But for future interstellar generations, the dynamics and variability of climate change, quantitative models of climate-sensitive natural and human systems, managing and adapting to climate, and applications of climate and society will be fundamental themes in their societies. Many of the new technologies that will be developed to fight climate change will undoubtedly be used on future human colonies on far away planets. Not to mention how new human societies will organize and deal with shifting climates and disasters.

As a climate expert, I will also be able contribute to the choice of planet for a new human colony. Ideally, it will be a planet with the right balance of water, heat and soil, and not excessive storms or natural disasters. Many of the energy technologies that have accelerated with the climate change mitigation movement, such as solar and wind power, batteries and electric vehicles, will be instrumental in building a functioning society on a new planet.

While we confront that challenges of the day here on Earth, it is important that we continue to contemplate the vast potentialities of the cosmos. To confront and explore the universe is humanity’s ultimate challenge. But to achieve stability here on earth, and to assess new frontiers in space, more knowledge of climate is needed. The climate experts will be an important part of interstellar travel and the establishment of a human civilization on a new planet. And just as importantly, the health and stability of Planet Earth is likely a mandatory requirement for interstellar travel far into the future. The mothership needs to be set right before we can successfully launch and maintain new interstellar societies.