Will a changing climate reshape the world order by 2050?

Why is climate change important?

Climate change is arguably both the hardest issue to grasp today and the most important to understand. Depending on location, it can manifest in everything from more violent forest fires to more intense storm seasons, to greater periods of drought. With sea levels slated to rise at least 4 ft. 7 in. (1.4m) meters by the end of the 21st century, coastal urban centers will suffer more flooding, groundwater infiltration, and storm surge. The climatic changes spurring sea level rise - a two-fold process of melting polar ice caps and expansion of warmer ocean waters - will result in greater climatological uncertainty across the board. Our cities will become hotter in summer and colder in winter, storms will wreak more damage in wetter parts of the world, and wildfires will regularly savage drier climates. Previously arable land will become unsuitable for growing crops and formerly perma-frosted regions will transition to breadbaskets. Spikes in particulate matter will make air harder to breathe. The scale of these changes will alter modern life as we know it.

As these events become more severe and more common, governments will face mounting pressures. Those with underdeveloped institutional capacity or weakened degrees of social resilience will have growing difficulty supporting their populations, increasing the likelihood for political strife and conflict. Numbers of environmental refugees are slated to rise significantly in coming decades, which will place more pressures on other parts of the world.

That climate change is predicted to create such degrees of damage and discord is a result of the fact that the systems supporting our current ways of life have become increasingly interconnected. Economic vitality is dependent on intricate patterns of international trade. Political instability in the Middle East has serious ramifications for policy in countries from the United States to Russia. More and more, access to fresh water, power and digital communications is dependent on cooperation and coordination between diverse and disparate parts of the world.

As a result, climate change impacts in one region affect the systems, management and daily life in those of another. If another hurricane takes out power in a global financial center like New York City, as Hurricane Sandy did in 2012, global economies will feel the effect. Researchers have found that the violent civil war in Syria was brought on in part from an extreme drought between 2006 and 2009 that was most likely due to climate change. That war, and the associated rise of groups like ISIS, has affected life both in neighboring countries as well as those farther afield.

Judging by current strife around Syria, climate change is beginning to reshape our world order. In coming decades, it will likely continue to do so in deepening degrees, impacting areas from public health to global trade and beyond. Many believe it stands to upend human existence as

we know it. When we look towards our future on this planet, we can no longer expect what has been to be a model for what is to come. Understanding more about its potential reach and impact is critical to understanding how we want to respond.

What is causing a changing climate?

Climate change comes in two forms. There is the kind caused by natural processes, and there is the kind created by humans. The former has been happening for millennia, produced by a range of factors from the sun's energy output to shifts in the earth's orbit. Since the late 18th century, however, that type of climate change has been supplanted. The Industrial Revolution and its innovations in manufacturing, production, transportation, power use, and more has led to rapid increases of pollutants, carbon dioxide and other emissions that trap heat in the atmosphere, known as greenhouse gases. For millennia, atmospheric carbon dioxide had never been above 325 parts per million. By 1950, levels had blown far past. Since then, massive changes in land use, such as the proliferation of parking lots and other paved surfaces, have made land absorb more sunlight, which our increasingly greenhouse gas filled atmosphere cannot adequately release. As a result, global temperatures continue to rise.

Most of this warming has occurred in the past 35 years, with the five warmest years on record all taking place since 2010. Much of this increased heat and greenhouse gas has been absorbed by our oceans. Since 1969, the top 700 meters of ocean water have warmed more than 0.22 degrees Centigrade and taken in 25% of emitted carbon dioxide. While these numbers may not seem drastic, the impacts are significant. The great ice sheets of the Artic, Antarctic and Greenland are melting at unprecedented rates, with some scientists predicting that the Arctic will be completely free of summer ice within fifteen years. This melting is not restricted to the poles. All across the globe, from the Alps to the Himalayas to the Andes and the Rockies, glaciers are retreating. Satellites show that spring snow cover in the Northern Hemisphere has declined over the last half century, with snow melts starting earlier, putting fresh water access for hundreds of millions at risk.

As glaciers have melted and ocean waters have warmed, seas have continued to rise. Today, seas are roughly 8 inches higher than they were in 1900, making many low-lying countries such as Bangladesh and the Maldives increasingly uninhabitable. A deadly side effect of this rising and warming is ocean acidification. As the ocean absorbs atmospheric CO_2, it becomes more acidic in its chemistry. Over the last 150 years, the acidity of surface ocean waters has increased by about 30 percent, creating harsher environments for wide swaths of animal life. Cetaceans, fish species, crustaceans and more are all adversely affected by acidic conditions, threatening the lives and livelihoods of all those who rely on our oceans for sustenance and support.

The climatic changes spurring these shifts mean more than melting glaciers and rising seas. They mean that the fires that devastated the entire continent of Australia in 2019 will become

the norm in regions around the world. They mean that heat waves and severe storms will grow in intensity. They mean that floods will grow more frequent and more powerful, leaving more people inundated for longer periods of time. They mean that more drought will threaten more of our food supplies. They mean that the world that we knew is changing into something more unpredictable and more unwelcome to human habitation that we have ever seen before.

How changed might our climate become in 2050?

Over the last quarter century, climate change impacts have grown in scope and scale. Global temperatures rose by two degrees Celsius since the 19th century, a tremendous change given the amount of energy it takes to raise earth's average surface temperature even a small amount. The seemingly small increase has resulted in drastic effects, from more horrific hurricanes to hotter temperatures to wildfires more destructive than anything in recorded history. How these shifts will play out over time is something beyond predictive capability - there are too many influencing events and inputs beyond our control. Even with the best research and foresight techniques, conditions will change in ways we can't fully anticipate.

Despite that uncertainty, there are a few emergent trends on which scientists increasingly agree. For starters, global temperatures will continue to rise. Cities like New York will soon have dramatically longer and hotter summers, with the number of days above 32 degrees Celsius slated to more than double by 2050. In a region like metropolitan New York, where hot weather comes with significant humidity, such high temperatures over prolonged periods will result not just in serious impacts to human health and well-being. They will also damage to the essential myriad systems that rely on ambient air cooling, like HVAC systems and electrical grids. CO_2 levels associated with those kinds of temperature increases could easily range from 550 to 600pm, up from the roughly 420ppm levels of today. Those amounts of CO_2 would directly result in decreased nutrient levels in agricultural production, spikes in pollution related deaths, and widespread slowing of human cognitive function.

Hotter temperatures will also lead to rising seas. Sea levels are likely to rise at least 38cm within the next thirty years, with those numbers quite possibly reaching 100cm in certain areas. Under those conditions, coastal centers like South Beach in Miami would lie underwater. Entire regions, such as greater Bangkok and the low-lying areas of southern Bangladesh, would sit below annual flood levels, placing millions of people at risk and sparking mass migration across the globe. Wealthier areas like the Netherlands and coastal England will likewise face mounting pressure, with growing swaths of land lying fully inundated for greater periods of time.

But rising seas mean more than higher oceans. The climatic changes that bring sea level rise also result in stronger storms, more intense rainfall, and bigger storm surge. Areas shaped by major rivers, like development along the Mississippi River Valley, will experience increasingly frequent flooding. Without intense intervention or adoption of new approaches to living with

water, these regions will see higher levels of deluge, with daily life interrupted on more regular bases for hundreds of thousands of people.

In more arid areas, rising temperatures are slated to bring both more intense rainfall as well as drought. When drought arrives, it will last longer. When rain comes, it will fall harder over shorter periods. The droughts will leave ground more compacted, making it harder for rain to absorb into soils and increasing the likeliness of mudslide. They will also make areas more vulnerable to wildfire. By 2050, the events that engulfed the entire western coast of North America in firestorms will become more common. From California to Spain, longer and more dangerous fire seasons will become the norm.

While the precise dates and degrees of change remain a mystery, the general trends are clear – global climate in 2050 will be warmer and its consequences increasingly more extreme.

What technologies could become potential climate solutions?

Some people call them a shot in the dark. Others insist they're escapist fantasy. For others, they're the saviours we can't ignore. Regardless of what words you use, negative emissions technologies demand our attention. An emerging area of research and development, they continue to dangle real potential to change the climate adaptation game.

In case you've yet to hear of them, here's a brief definition. Also known as 'carbon dioxide removal systems,' negative emissions technologies are tools to extract CO_2, one of the biggest contributors to global warming, from the atmosphere.

Their allure has multiple dimensions. Many acknowledge that as we move towards a net-zero or even net-negative world, halting all carbon emissions both immediately and in the long term is a daunting task. The primary avenues for achieving those goals lie in widespread adoption of more renewable energy and green technology systems. Due to widespread political, economic and cultural issues, however, many carbon drawdown plans recommend continuing certain sources of carbon use for certain periods of time, in the hopes of enabling smoother transitions. That carbon emitted now could be extracted from the atmosphere later presents a comforting prospect, that we could live in a world where the process of addressing climate change could be achieved through less disruptive means.

While they sound too good to be true, negative emissions technologies are no fantasy. They currently exist. From bioenergy generation to direct air capture to biochar, these tools have been proven to extract atmosphere CO_2. At present, however, the processes are very energy intensive, making the tools prohibitively expensive as blanket go-to strategies for effective sequestration at actionable scales.

New research could change that. For example, Wil Srubar, an Assistant Professor at the University of Colorado at Boulder, has recently developed techniques to replace cement in concrete with cyanobacteria. As construction is one of the most heavily polluting industries,

and cement in particular emits huge amounts of CO_2 every year, this innovation presents opportunities for real positive change. Because cyanobacteria is a common class of microbe that captures energy through photosynthesis, this new type of concrete passively absorbs carbon from its surroundings. If the technology is scaled - and it is receiving considerable attention from large scale funders already - it could create buildings and cities capable of becoming not just carbon neutral but carbon negative. Imagine a city where all substrates and surfaces function like a forest, with carbon sinks cropping up wherever human development exists.

Despite its many potential benefits, the technology would be no silver bullet. Indeed, it could feasibly enact even more complex and dangerous repercussions. Introducing living organisms into uncontrolled urban environments stands the very real chance of creating lethal externalities, from the emergence of previously unseen diseases to new vulnerabilities in essential support systems. Were bio-hacked cyanobacteria to become the building blocks of our cities, it stands to reason that new, uncontrollable mutations might well cause unanticipated and widespread havoc, both domestically and across the globe.

Yet perhaps the most compelling risk that negative emissions present is one of human complacency. If we find ways to extract carbon from our atmosphere, what's to prevent us from continuing to produce more carbon, methane and other problematic substances, failing to curb the practices that result in greater climatic uncertainty in the first place?

To provide more help than harm, negative emissions must be implemented in conjunction with more cohesive energy efficient and net carbon neutral efforts across our borders. Technology alone is not enough to save us. With restraint, international coordination and thoughtful implementation, we stand a far better chance.

How does a changing climate affect global institutions?

Climate change increases stress on governmental structures, intensifying vulnerabilities present within. The more taxing a situation turns, the more difficult collaboration and communication often become, creating a vicious cycle that brings cultural and political tensions to the fore. It's the rare event when one country is effectively able to coordinate with another during times of crisis. Take the coronavirus pandemic and its wide reaching economic impacts. The international economy is reeling as a result of the virus' spread, yet there remains little consultation between governments, with plans for stimulus cropping up incrementally and separately across the globe.

As climate change progresses, the scale, scope and speed of difficulty will deepen around the world, testing the strength of international institutions to greater degrees. Indeed, climate issues are already showing both how difficult negotiation between countries is, and how insufficient our existing international institutions are to addressing issues of serious concern. When it comes to climate change, the authoritative limits of organizations like the United Nations or

the World Bank are progressively highlighted and undermined. All international agreements made since the first Conference of Parties (COP) Climate Change Convention in 1995 have been non-binding, with participating countries left to follow recommendations via voluntary interpretation. Many global leaders, such as the United States, have pulled out of agreements entirely.

Our international institutions, from the World Health Organization to the International Monetary Fund, retain only the power to recommend, pressure or sanction. They do not enforce. In times of strife, following recommendations that have less directly calculable benefit, such as recommendations from the 2016 Paris Climate Agreement that encouraged participating countries to support sustainable development and enhance adaptive capacity, can become political liabilities. Making moves towards measures that require longer periods of time to show results is all to often a harder move to sell.

Again, the coronavirus crisis currently gripping the planet is a useful reference to assess where our international systems might be heading. While not directly caused by climate issues, coronavirus and its devastations are imprints of what is likely to come. As climate change brings warmer temperatures and glacial melt, researchers anticipate that new infectious diseases will arise, to which modern humans have little to no immunity. Coronavirus has shown that sequestering such diseases can be near impossible. In our modern world of global supply chains and constant travel, what affects one part of the globe affects us all.

Sadly, our existing international bodies are not up to the task of managing such outbreaks. In the early days of coronavirus' reach, the World Health Organization sent out warnings, letting governments know that the virus required serious preventative measures. Some countries, like Singapore and South Korea, places where more recent outbreaks of SARS and MERS have left lasting impacts, took the recommendations to heart. Others, like the United States, Brazil and Italy, did not. The WHO has no authority to manage how international governments follow its recommendations, creating conditions where diseases and infections that might have been effectively regulated with cross governmental coordination go on rampant, causing widespread loss of life, economic fallout and social decay.

Researchers are certain that climate change will bring more and stranger viruses than we have experienced in living memory. With the conditions of scarcity, uncertainty and fear that come with such pandemics, many leaders may well work to strengthen their respective states and reinforce feelings of nationalism. Governments across the board could enact emergency restrictions and policies to navigate the mounting crises, restrictions that, when those crises abate, leaders may not readily relinquish. Such concentration of power often leads to diminished reliance on international governance and a weakened belief in the power of multilateral cooperation.

As the diseases, conflicts and extreme weather events that come with climate change increase, the inefficiencies and ineffectiveness of current global institutions will continue to show. The amount and frequency of refugee movements will only spike, bringing more conflict and

spurring greater demands on existing resources, challenging the ability of global institutions to manage and guide the flows. Only direct support, coordinated reimagining and international investment, can prevent the already present cracks in our institutions from breaking.

Does climate change mean the end of nation states?

Climate change will create new pressures for the nation state paradigm not seen for generations. Just look to history. Our past is littered with examples of climatic shifts acting as harbingers of governmental destabilization. Researchers have found links between changes in climate and the collapse of societies across time and geography, from the Akkadian empire of ancient Mesopotamia, to the Maya of Central America, to the Norse societies of Greenland in the 1500s.

Many argue that the last major change in climate led directly to the end of the feudal system across much of Europe. Commonly known as the Little Ice Age, the period stretched from the start of the 14th century until roughly the mid-19th, and coincided with drops as great as 2 degrees Celsius in global temperatures. These changes led to a swath of adverse impacts, from sudden frosts, to dry summers and bitter winters. As a result, harvests turned increasingly erratic and food stocks declined. Desperate from hunger, populations rioted and eventually rebelled. Through it all, the importance of market economies for buying and selling ever more precious food continued to mount. Together, the argument goes, these shifts sowed the fall of feudalism and laid the foundations of the modern world we know today.

The lesson of the Little Ice Age is clear -- climate change changes everything. Given the speed and scope of current changes, we are likely heading into a period far more intense and long lasting, with impacts liable to harm not just harvests, but decrease fresh water access and spark more conflict. As sea levels rise and climate patterns grow more inconsistent, the numbers of environmental refugees will spike. Already many island-based and low lying areas of the world, such as Tuvalu and Kiribati, are strategizing how to move their citizens to other countries, effectively accepting that their nation states will no longer exist in the near future.

So what systems might arise if the sway of nation states starts to shift? While it's impossible to say with certainty, migration patterns may provide some helpful clues. These growing numbers of refugees will likely head to where people have long flocked when displaced -- to cities. They will swell already burgeoning numbers. Urban populations are bigger than they have ever been in human history, with 55% of the world's population living in developed areas. By 2050 those numbers are slated to be as high as 68%, nearly 2/3^{rds} of all human life.

The trajectory is a necessary one. As populations grow, space to live compresses and resources grow scarcer, with access to essentials like potable water becoming increasingly hard to manage. Only in dense urban environments can we hope to house our burgeoning populations, particularly as climatic impacts and associated strife intensify refugee movement across the

globe. Megacities, currently defined as cities with over 10 million residents, will become home to more of the global population than ever before.

Many believe that as megacities grow in size, the dominance of the nation state – with its emphasis on collective identity and shared sense of cultural self - may decline. Think of Shanghai, Sao Paolo, Lagos or New York City. These urban environments hold increasingly large economic and cultural sway in their respective countries. Political and governmental influence often follows those factors. As megacities grow, they are likely to become bigger engines of growth, innovation and culture.

The potential shift of power from nation states to megacities and their associated regions could happen because of factors beyond climate change. Conflicting values between urban areas and the national systems and populations in which they operate all have impact here. Yet the tension underwritten by climatic issues serves to augment such tensions. When uncertainty increases and resource scarcity and change is on the rise, our willingness to adhere to systems that don't directly apply to our concerns and direct circumstances can start to wane.

Nation states were founded as entities whose citizens were relatively homogenous in language, culture or descent. When the make-up of a state grows more diverse, at what point do its denizens stop accepting norms and regulations that don't reflect their values? The rising impacts of climate change will bring such questions increasingly to the fore.

What kinds of conflict stem from resource scarcity?

When resources dwindle, conflict soon follows. This is as true today as it was thousands of years ago, when the Roman Empire invaded Egypt in 30 AD largely to secure more grain. The colonial subjugation of peoples in the Americas, India and Africa was partly rationalized as a means to augment declining resource stocks, in everything from timber to enslaved human labour. In this century, the drought in Syria and the famine that followed laid the groundwork for one of the most violent civil wars in living memory.

If current climate change trajectories are not proactively addressed, environmental instability will spark greater resource strain and conflict will spread. These strains will likely take two forms - what researchers call supply-induced scarcity and structural scarcity. The former typically stems from environmental degradation, when the overall amount of a limited resource drops. In the northeast Atlantic Ocean and the Sea of Japan, for example, the combined impacts of rising temperatures and overfishing between 1930 and 2010 have diminished fish populations by as much as 35 percent. Structural scarcity, on the other hand, occurs when governmental dysfunction or systemic discrimination leads to the unequal distribution of necessary goods. Think of the ways corruption and mismanagement have compounded the effects of drought in Zimbabwe in recent years, creating an economic crisis that is quickly threatening to morph into famine. It's the rare government that becomes more just and effective when instability spikes.

Already powerful disruptors, food and water access are poised to become increasingly significant sources of tension. Researchers have found that roughly two thirds of the world's existing population live without sufficient access to fresh, safe water for at least one month per year. The extreme weather events and ecosystem collapse that come with our changing climate will exacerbate those numbers. The rise of new diseases, another significant consequence of climate change, could spark greater disruptions in supply chains, leading to rising agricultural vulnerability and economic volatility. Without meaningful intervention, food security is slated to rapidly deteriorate in poorer regions. Already, supply chain disruption from the current coronavirus pandemic is creating a hunger emergency from Sudan to Mozambique that threatens the lives of millions.

The types of conflicts that arise from these resource-constrained conditions will differ depending on location and circumstance. In wealthier nations, trade wars may well be the first step. While technically non-violent, trade wars often lead to increased tension, which can easily grow into larger conflict or outright war. Among other tragedies, warfare creates more refugees. If environmental instability continues as many climate models predict, the amount of places torn apart by aggression will grow, exponentially multiplying the number of humans in need of safe haven.

Which brings us back to the core of the issue -- when population levels are high and resource levels are low, conflict isn't far away. Rather than isolated incidents, these resource-related conflicts often spark associated tensions. As refugees fleeing aggression migrate to other countries, factors like border disputes and institutional instability can instigate new hostilities, augmenting what becomes an increasingly vicious cycle. In today's interconnected world, the chain effects of resource-induced conflict cannot be discounted.

How does climate change lead to border tensions?

As the climate emergency grows in scope and scale, the world's refugee crisis is slated to explode. While finding precise statistics is difficult, the UNHCR estimates that conflicts associated with climate change have created at least 9 million refugees in the last decade alone. By 2050, that number is likely to grow much higher. Among the many issues that stem from such scales of forced migration – from spikes in human rights violations to mounting economic hardships – border tensions are among the most aggressive and complex.

Climate change is a key driver in this dynamic. As we've explored previously, drought and famine resulting from climatic shifts have been directly linked to violent civil wars in Syria, Somalia and beyond, wars that have created millions refugees. If not ameliorated, such numbers will only increase. Researchers project that within the African continent, 250 million people live in regions that will be vulnerable to food and water insecurity in the coming decades. Three-quarters of the Sahel's arable land will likely be lost by the end of the century, forcing many millions more to move. In low-lying areas – coastal zones support roughly 12

percent of the continent's population - rising sea levels will increase pressures on African states, compounding existing governmental instabilities and sparking mass migrations at scales not seen before in human history.

When so many are on the move, conflicts follow. In recent years, Europe has become a flashpoint for such tensions. Over the past decade, millions of people fleeing war, climate-induced crises and chronic poverty from Africa, the Middle East and South Asia have sought refuge in European countries. Those who survive their often-dangerous journeys have found increasingly dark welcomes, as political groups and media sources progressively portray migration as a kind of invasion of people from different cultures. Themes of threat - to welfare systems, cultural norms and more - have been particularly prevalent in Italy, Spain and Britain. This trend of relating to refugees as 'other' harkens back to the racist overtones used to justify colonialism and its systems of subjugation, abuse and enslavement.

Many countries have responded by electing leaders who oppose immigration and shut down borders. Bulgaria and Hungary – primary routes into the rest of the European continent for refugees fleeing war in Iraq, Syria and Afghanistan - have erected barbed wire fencing in recent years. Norway, Latvia and Estonia have likewise constructed new barriers within the past decade. In 2017 then-interior minister of Italy, Marco Minniti, made an agreement with Libya to supply technical support to the Libyan coastguard to fend African refugees away from Italian coastlines. Farther north, the UK has pressured France to build walls around the port of Calais on the tunnel connecting the two countries. Immigration and tensions around refugee resettlement have become such massive issues across the continent that previously unthinkable geopolitical shifts like Brexit are now reality.

As these border issues show, no place in our modern world is exempt from the impacts of climate change. When refugees escape aggression – increasingly instigated by climate related instabilities - they move, shifting the makeup, history, norms and trajectories of the places to which they flee. Border tensions are a significant part of our current responses to those changes.

Mass migration is both our present and, increasingly, our future. But it is also our past. Migration is a natural response to environmental change, one that humans have taken throughout our history. Migration is what allowed our ancestors to spread across the globe, creating the diverse cultures and societies that we know today. To summarize the writer Sonia Shah, migration has not been the response to crisis in our collective past, but rather the solution. If our go-to answers are to keep newcomers out and current border conditions continue, tensions between countries will only increase. However, if we can envision a future more akin to our history, in which migration serves as a source of hope rather than fear, we can write a different story.

How might climate refugees trigger conflict?

Unrest often leads to unrest. It's a truth that's playing out again today as protests for racial and social equity accelerate across the United States, Europe, India, Brazil and beyond. While these demonstrations stem from longstanding anger over a status quo built on the legacies of colonialism and white supremacy, the impacts of Covid-19 have arguably augmented their intensity. This movement erupted after the world was gripped for months by isolation, fear, sickness and economic shutdown. Such intense strife lays fertile ground for frustration to transform into action.

Now imagine a world where Covid-19 is not an isolated incident but one of many progressively disastrous events. That is where we're currently headed. Experts warn that raging wildfires like those that devastated Australia in 2019 will recur and grow. Superstorms like Hurricane Sandy will no longer be anomalies. When they strike, these events will wreak mounting costs, from loss of homes and habitats and jobs, to widespread loss of life. Longer term, systemic changes like sea level rise stand to spark more severe political instability, resource competition and forced migration than we as a species have ever seen.

The risks associated with the climate crisis are mounting so quickly that groups beyond the scientific community are now sounding the alarm. Last year's Worldwide Threat Assessment from the U.S. intelligence community stated that "Global environmental and ecological degradation, as well as climate change, are likely to fuel competition for resources, economic distress, and social discontent through 2019 and beyond. Climate hazards … are intensifying, threatening infrastructure, health, and water and food security."

The numbers of refugees that could arise from such degrees of instability are staggering. Hundreds of millions of people across the globe currently live in low-lying coastal areas. If seas rise just a couple of meters – which scientists predict could happen by or before the end of this century – tens of millions of people, if not hundreds, will be forced to flee. Such a change would create more environmental refugees than ever seen before. To put such numbers in perspective, the refugee crisis created by the Syrian Civil War, one of the major humanitarian disasters of this century and a source of widespread geopolitical tension across Europe, involved the relatively small amount of five million refugees. Imagine what conflicts might arise when hundreds of millions of people are on the move.

That is the reality we're facing. Even if our most ambitious climate mitigation goals are met, we are still looking at futures with roughly 2.7 degrees Celsius of warming and 1.4 meters of sea level rise. These kinds of changes would spark a wide array of environmental discord, from drastic swings in precipitation patterns to increasingly intense coastal floods, threatening the lives and livelihoods of millions around the world. That's a best-case scenario. Given the lack of international cooperation and global leadership, we're slated to deal with situations far direr.

As the Covid-19 pandemic is making abundantly clear, none of these shifts will unfold in a geopolitical vacuum. Coronavirus has spread rapidly since it first appeared in December of

2019, posing enormous challenges to the entire human population, from death and long-term health impacts to economic implosion. The myriad consequences of the climate crisis – mounting numbers of refugees, spikes in forced migration, border conflicts and increasing resource scarcity – will have similarly widespread impacts beyond their immediate origins.

Unrest, however, isn't inherently evil. Current demands for racial and social justice are direct reminders that rapid action can cause positive change. Yet the pendulum can always swing quickly back in opposing directions. Adolf Hitler's rise to power followed a period of progressive development during the Weimar Republic, characterized by growing support for reformist taxation, social welfare programs, labor unions, and economic opportunity for women. It also coincided with one of the worst depressions in modern German history, where the value of the German mark decreased so precipitously that residents needed wheelbarrows to carry enough paper money to buy single loaves of bread.

The international fallout of the coronavirus is creating similarly precarious repercussions. The growing impacts of the climate emergency will bring even more. Faced with such pressures, we can go the direction of Germany under Hitler, vilifying those who are different and taking solace in cultures of fear. Or we can learn from history and carve a more inclusive path.

Where are key conflict flashpoints likely to be?

When you follow the links between climate change, refugee migration and conflict, North Africa, the Middle East, the US Mexican border, and the Andean regions of South America continually arise. All are likely to be key flashpoint areas for conflict. While they in no way constitute a comprehensive list, they share a few common characteristics, in particular their vulnerability to water scarcity.

In North Africa, climate shifts are creating increasingly arid conditions. As the Sahel grows drier, more subsistence-based communities are forced to leave for urbanized areas in other regions, to destinations that are not always welcoming. Geopolitical instability in Sudan, for example, on the northern edge of the Sahel, has created huge numbers of refugees since its most recent civil war began in 2013, with nearly 2.3 million people fleeing to neighboring countries. Rather than providing active safe haven, many of these nations, from Kenya to Ethiopia, have grown progressively hostile, with ethnic enmities and resource strains creating mounting tensions.

On the North American continent, the last two decades have seen mounting militarization of the US border with Mexico. Climatic shifts across Honduras, Nicaragua, El Salvador and portions of Mexico have created an increasingly dry corridor, pushing more rural farmers into urban areas, exacerbating political instability and inequality and motivating more humans to migrate north. The governmental upheaval and climatic pressures driving these movements will likely grow. Depending on the warming scenarios and adaptation levels assumed,

researchers anticipate that by 2080 up to 6.5 million adults will attempt to emigrate to the United States from Mexico alone, as a result of water scarcity and agricultural declines.

The Middle East has long been both an area of limited water and site of bitter conflict. With climate change bringing increasingly hot and arid conditions to the region, these water issues will only become more severe. Such mounting scarcity will compound existing instabilities, long-standing enmities and strife into conditions far direr.

While often overlooked in international media, the Andean region of South America is also particularly vulnerable to the interplay of climate change, refugee migration and conflict. This is a region where water security, agricultural production and power generation all rely on glacial cover and snowfall. As climatic patterns change, those conditions are beginning to disappear. According to the World Glacier Monitoring Service, glacial melt has doubled just in the past few years. Refugees fleeing countries reliant on these ecosystems will migrate to neighboring countries, many of which – such as Colombia -- are already experiencing huge refugee crises already. Adding millions more to these mass departures will make tensions across the region spike.

Researchers have emphasized these specific areas as particularly vulnerable for years. Yet the current and continuing impacts of the Covid-19 pandemic are broadening the geographic spans about which warning signs are beginning to sound. As a result of the coronavirus and its associated economic, social, environmental and geopolitical devastations, many developing areas of the world are under direct and more long-term threats. From Djibouti to Venezuela, countries across the world are already stressed from poor waste management, pollution, and weakened governmental oversight. All these factors threaten their chances of recovering from the direct and indirect impacts of the virus.

A recent UN report predicts an increasingly dire situation playing out the globe. Nearly half of all jobs in Africa could be lost because of Covid-19. The crisis and its fallout are slated to disproportionately affect developing nations, particularly in Africa, severely impacting education, human rights, basic food security and nutrition – all factors that contribute to stable, healthy populations.

These are the same factors that enable communities and governments to weather the increasingly stressful conditions that climate instability brings. Without them, these countries will be left weaker and their populations more vulnerable to the conflicts that will soon arise, creating larger numbers of refugees, greater degrees of forced migration and augmenting the likeliness of ensuing conflict in the spaces towards which they flee.

To navigate these shifts in humane, equitable ways, mediating factors like economic opportunity, infrastructural investment, access to health services and legal protections must be investigated and supported. Doing so demands an essential shift in our understanding of why migration occurs. Rather than viewing climate refugees as direct threats, we can promote a

different take, one where those forced to move are seen as proactively adapting to dangerous environmental change, and the conflicts that arise as a result.

How could we ensure a conflict free future?

Big shocks create big change. 66 million years ago, the impact of the Chicxulub Asteroid sparked the fifth great extinction and the end of the age of dinosaurs. While exponentially smaller, the current coronavirus pandemic is likewise cataclysmic, unleashing a virulent contagion across the globe with no country left immune. Of the many issues illuminated by its continuing fallout, that lesson could be the most significant. In our modern world, problems in one region lead to problems in another - no country, no economy, no society is exempt.

This understanding of trans-boundary connection could shock us into a new era of multilateral cooperation, one that could serve as both a source of international development and a bulwark against increasing conflict. With our current international institutions falling deeper into disinvestment, however, such a trajectory might sound farfetched. Nearly 80 years after their creation, the UN and WHO are losing influence by the day. Indeed, the United States, with the pandemic still raging, pulled out of the WHO in early June 2020, sending a blunt message to the world about the importance of global institutions.

Yet their revitalization could pave the way for renewed cooperation capable of facing the large-scale climatic changes headed our way. Indeed, researchers insist that international coordination and true sharing of power is our only hope. Richard Danzig, former Secretary of the US Navy, summarized the problem in 2018, writing “Twenty-first century technologies are global not just in their distribution, but also in their consequences. Pathogens, AI systems, computer viruses, and radiation that others may accidentally release could become as much our problem as theirs. Agreed reporting systems, shared controls, common contingency plans, norms, and treaties must be pursued as means of moderating our numerous mutual risks.” Danzig’s message is clear. Piecemeal strategies can’t address the magnitude of these transformations. Coordinated action is imperative.

This does not mean that international institutions should be remade as mirrors of their current forms. Systems capable of negotiating the increasing scope and scales of global uncertainty must reflect lessons learned from our more recent past. Current calls for racial and social equality, for example, have been given new energy in the wake of coronavirus. International systems can be reshaped to reflect and respond to those calls, reconciling their structures with the systems of white supremacy from which they were originally created.

Doing so can create profound positive impact for climate adaptation and conflict avoidance, particularly in the areas of social resilience. Increasingly identified by researchers as essential in ameliorating adverse climate impacts, social resilience depends in part on increasing trust between people and institutions. When governing bodies and those they serve operate with attitudes of mutual faith and respect, plans move faster from idea to action. When hazards strike, proactive response strategies are more likely to be in place, helping protect those in need

and allowing communities to more quickly begin to heal. Rebuilding international institutions by addressing long-standing issues of racial and social inequality could have massive ramifications for improved social resilience across governmental and community scales, helping to ensure more conflict free futures for us all.

How will climate reshape world order by 2050?

There's no way to know how climate change will reshape world order in the next 30 years. If 2020 has taught us anything, it's that nothing is certain. Yet amidst that uncertainty, one factor remains consistent -- climate change will create momentous, grave change.

Global temperatures will continue to rise. With hotter temperatures will come rising seas, with hundreds of millions of people potentially displaced as a result. The climatic changes that bring sea level rise also result in stronger hurricanes, more intense rainfall, greater flooding, and storm surge. Droughts will last longer. Raging fire seasons, such as the one that recently ravaged the western coast of North America, will become the norm. Intense, unpredictable and dangerous environmental change will be our collective reality.

The myriad consequences of these changes – mounting numbers of refugees and spikes in forced migration, border conflicts and increasing resource scarcity – will have similarly widespread impacts beyond their immediate locales. Just look to what has been happening across Europe in the years since the start of the Syrian Civil War to see what 2050 could like across the globe.

These changes are likely to spur increasing fragility in the nation state paradigm. When conditions turn volatile, many leaders move to concentrate power through emergency restrictions and crisis management policies, such as restrictive trade regulations, travel limits, and stronger immigration controls. Harsher punishment for protesters and political dissidents frequently go hand in hand, creating inward-looking cultures skeptical about the value of multilateral action. With climate change an inherently international issue, the lack of cooperative, long-term vision that characterize these kinds of regimes can easily create a vicious cycle of increasing environmental degradation and tightening despotic response. Such moves are rarely reversed over time, often aggravating political polarization and paving the way for more dictatorships and authoritarian rule, trajectories that are already taking place in countries from Brazil to Turkey.

Potential options for a more conflict free future could be sourced from more effective international cooperation, technological innovation and declines in carbon emissions. Yet collective will and human hubris are significant hurdles to overcome. Rebuilding global institutions like the UN to reflect and repair the longstanding scars of colonialism and address the rapid changes already affecting economies, public health and geopolitical standing across the world, could continue to be viewed as a pipe dream well out of reach. Yet the coronavirus

pandemic of the past year has revealed how broken our systems already are, how quickly change is coming, and just how much is at stake.

Now is the time for imagination. To address the many, dangerous and rapidly approaching impacts of climate change head on, we need different kinds of global systems, ones that do not operate on the assumption that certain parts of the world can be disposable and that certain populations can be left to die. Only by cultivating our connections to each other can we find ways to take shelter in our rapidly shifting ground.

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