ce-manifesto-ch1-0425.docx

ce-ch2-risk-land-intro-0324-part1

ce-ch3-eco-overshoot-0324-part1

ce-ch4-hum-syst-0324-part1

latest-ce-ch5-nat-disaster-0525-part1

Chapter 6: Advanced Tech_ZAK_DRAFT

near-final-ce-ch7-violent-conflict-0324-part1

ce-ch8-two-attrct-threshold-0324-part1

Chapter 5: Natural Disasters

At least five times in the last 550 millions years, rapid, cataclysmic changes to the natural environment have killed 75% or more of the species living on the earth. All previous *mass extinction events* are from natural disasters like asteroids, super volcanoes, and various major earth systems changes, almost all of which involved massive injections of carbon dioxide into the atmosphere leading to warming, ocean acidification, and other conditions inhospitable to life[1]. Flood myths and the worship of entities like the sun are also deeply interwoven in humanity's stories about itself and its cultural rituals, being nearly ubiquitous across the world's religions. The need to survive natural forces outside of your direct control (e.g., extreme weather, earthquakes, tsunamis, wildfires, asteroids, comets, and solar flares) is a primordial predicament shared by all humans and other life forms.

Natural disasters are the only category of risk that is not directly caused by human action (as the name implies). However the boundary between natural disasters, ecological overshoot, and

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[1] Davis, W. J. (2023). *Mass Extinctions and Their Relationship With Atmospheric Carbon Dioxide Concentration: Implications for Earth's Future.* Earth's Future 11. doi:10.1029/2022EF003336.
Benton, M. J. (2023). *Extinctions: How Life Survives, Adapts and Evolves.* Thames & Hudson.
Benton, M. J. (2018). Hyperthermal-driven mass extinctions: killing models during the Permian–Triassic mass extinction. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences 376, 20170076.
Kump, L. R., Pavlov, A. & Arthur, M. A. (2005). *Massive release of hydrogen sulfide to the surface ocean and atmosphere during intervals of oceanic anoxia.* Geol 33, 397. https://doi.org/10.1130/G21295.1

human systems failure is blurry. Human action can contribute to “natural disasters,” and our increasing dependence on the built world (and the ways it is designed) can affect the severity of a disasters’ outcome. Both of these have been true for millenia. Past civilizations were often designed in ways that caused catastrophic flooding, for example[2]. Civilizations located by a river would cut down trees up river in order to use the downstream current to more easily transport the lumber. An innovative solution in the short term, but it eventually led to disastrous flooding from the loss of trees that were previously constraining the flow of water. We continue with similar patterns today, building a fragile global civilization on the basis of misunderstandings and misuse of the biosphere. Natural disasters are relevant to our discussion here for two related reasons: for one, humans are increasingly causing “natural disasters” as we push past critical planetary boundaries, and second, these events can be more consequential and catastrophic in a globally interdependent civilization, where disasters have the potential to hit more densely populated areas, cause cascading failures, and raise the cost of civilization to the point of economic and institutional overwhelm.

Throughout the 1970s, there were 660 disasters reported globally, such as floods, extreme temperature events (heat waves), droughts, wildfires, and storms. From 2010-2019 there were roughly 3,750 – over five times as many[3]. While humans cannot be held responsible for every disaster, there is little question that our actions have played a role in increasing their frequency and severity. The red skies and “Black Summers” of wildfires are now relatively commonplace and have been tightly linked to poor forest management practices alongside drier and warmer conditions from increased greenhouse gas emissions[4]. In an analysis of 504 extreme weather

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[2] Chew, S. C. (2001). *World Ecological Degradation: Accumulation, Urbanization, and Deforestation, 3000 B.C.-A.D. 2000.* Rowman Altamira.
Yan, X. et al. (2022). *Human deforestation outweighed climate as factors affecting Yellow River floods and erosion on the Chinese Loess Plateau since the 10th century.* Quaternary Science Reviews 295, 107796. https://doi.org/10.1016/j.quascirev.2022.107796
Diamond, J. (1994). *Ecological Collapses of Past Civilizations.* Proceedings of the American Philosophical Society. 138(3), 363–370. https://www.jstor.org/stable/986741
Ponting, C. (2007). *A New Green History of the World: The Environment and the Collapse of Great Civilizations.* Random House.
[3] EMDT
[4] The frequency and severity of fire weather has increased in recent decades and is projected to escalate with each added increment of warming. Increased autumn fuel aridity and warmer temperatures during dry wind events increased the likelihood of extreme fire weather in 2017 and 2018 indices by 40% – large-scale wildfires exacerbated by climate change and forest mismanagement like the Australian Black Summer Fires; Texas fires, 2023 Canada fire season.
Hawkins, L. R., Abatzoglou, J. T., Li, S., & Rupp, D. E. (2022). *Anthropogenic influence on recent severe autumn fire weather in the west coast of the United States.* Geophysical Research Letters, 49, e2021GL095496. https://doi.org/10.1029/2021GL095496

events, roughly 71% had greater likelihood or severity as a result of increased carbon output since the industrial revolution[5]. Extreme heat, flooding and drought events are all more likely and more intense as a result of humanity's effect on the biosphere (reflecting the transition to a new geological epoch - *the Anthropocene*)[6].

Before the industrial revolution there were only around half a billion people alive. Most of them were living rurally and were able to provide for their basic needs locally. Humanity's effect on the earth was therefore relatively limited, and barring another asteroid or supervolcano, the damage of most natural disasters was generally constrained by there being less people who were more widely distributed, more locally self-sufficient, and less interdependent. In contrast, today there are single provinces in China and India which house hundreds of millions of people. An earthquake in Haiti can kill over 200,000 people[7] in a few days. The global population is now somewhere around 8 billion, most of whom are living in densely populated cities that heavily rely on six-continent supply chains. Extreme weather events hitting critical supply chains or

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Jones, M. W., Abatzoglou, J. T., Veraverbeke, S., Andela, N., Lasslop, G., Forkel, M., et al. (2022). *Global and regional trends and drivers of fire under climate change.* Reviews of Geophysics, 60, e2020RG000726. https://doi.org/10.1029/2020RG000726
Bo Zheng *et al.* (2021). *Increasing forest fire emissions despite the decline in global burned area.* Sci. Adv.**7**,eabh2646. doi:10.1126/sciadv.abh2646

[5] The potential for intensifying greenhouse gas emissions to cause profound earth system changes is not unprecedented, nearly every mass extinction event in the past 550 million years likely involved rapid increases in atmospheric CO2 (e.g., from a volcanic eruption).
Pidcock, R., McSweeney, R. (2022). *Mapped: How climate change affects extreme weather around the world.* Carbon Brief.
https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world/
World Weather Attribution. (2022). *Climate Change made devastating early heat in India and Pakistan 30 times more likely.* World Weather Attribution.
https://www.worldweatherattribution.org/climate-change-made-devastating-early-heat-in-india-and-pakistan-30-times-more-likely/
Wang C-C, Tseng L-S, Huang C-C, *et al*. (2019). *How much of Typhoon Morakot's extreme rainfall is attributable to anthropogenic climate change?* Int J Climatol. 39: 3454–3464.
https://doi.org/10.1002/joc.6030
Christidis N, McCarthy M, Cotterill D, Stott PA. (2021). *Record-breaking daily rainfall in the United Kingdom and the role of anthropogenic forcings.* Atmos Sci Lett. 22:e1033.
https://doi.org/10.1002/asl.1033
Davis, W. J. (2023). *Mass Extinctions and Their Relationship With Atmospheric Carbon Dioxide Concentration: Implications for Earth's Future.* Earth's Future 11. doi:10.1029/2022EF003336
Benton, M. J. (2023). *Extinctions: How Life Survives, Adapts and Evolves.* Thames & Hudson.
Benton, M. J. (2018). *Hyperthermal-driven mass extinctions: killing models during the Permian–Triassic mass extinction.* Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences 376, 20170076.

[6] Are more likely or severe in 93%. Human activity made 56% of the 126 studied rainfall or flooding events more likely or severe, and 68% of the 81 studied droughts.

[7] United Nations. (2022). *UN marks anniversary of devastating 2010 Haiti earthquake.* United Nations. https://news.un.org/en/story/2022/01/1109632

infrastructure can be more costly and globally consequential where their effects would have been more limited in the past.

Natural Disasters and Human Action

Like other animals, humans meet their needs by modifying their environment. Beavers can build dams that significantly influence their surrounding ecosystem, but humans can remove the tops of mountains and induce tsunamis and earthquakes with nuclear weapons[8]. We are very much unlike other animals in the ways we use technologies to change our environments. Our technical achievements often provide us with a false sense of mastery over nature. But our methods usually cause more complex problems in the long term, even as they satisfy our immediate goals in the short term.[9]

Consider groundwater extraction and irrigation systems. These technologies are used by countries who need to compensate for water scarcity and unpredictable rainfall. Groundwater accounts for at least a quarter of all freshwater use globally[10], with over 2 billion people relying on it as their primary water source[11]. This is most notably true of India, who used groundwater

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[8] Kuar, S. (2023). *One nuclear-armed Poseidon torpedo could decimate a coastal city. Russia wants 30 of them.* Bulletin of the Atomic Scientists. https://thebulletin.org/2023/06/one-nuclear-armed-poseidon-torpedo-could-decimate-a-coastal-city-russia-wants-30-of-them/
USGS. *Can nuclear explosions cause earthquakes?* USGS. https://www.usgs.gov/faqs/can-nuclear-explosions-cause-earthquakes
[9] IPCC. *Chapter 11: Weather and Climate Extreme Events in a Changing Climate.* IPCC. https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-11/ Pidcock, R., McSweeney, R. (2022). *Mapped: How climate change affects extreme weather around the world.* Carbon Brief. https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world/
National Academies of Sciences-Engineering-Medicine. (2016) *Attribution of Extreme Weather Events in the Context of Climate Change.* National Academies of Sciences-Engineering-Medicine. https://nap.nationalacademies.org/catalog/21852/attribution-of-extreme-weather-events-in-the-context-of-climate-change
Perkins-Kirkpatrick, S. E. *et al*. (2022). *On the attribution of the impacts of extreme weather events to anthropogenic climate change.* Environ. Res. Lett. 17 024009 doi:10.1088/1748-9326/ac44c8
Giorgia Di Capua, G., Rahmstorf, S. (2023). *Extreme weather in a changing climate.* Environ. Res. *Lett.* 18 102001. doi:10.1088/1748-9326/acfb23
[10] Food and Agriculture Organization. 2023. *Aquastat dissemination system.* Food and Agriculture Organization. https://data.apps.fao.org/aquastat/?lang=en
[11] Famiglietti, J. S. (2014). *The global groundwater crisis.* Nature Clim Change 4, 945–948. doi:10.1038/nclimate2425

extraction to usher in a green revolution and support the needs of a 1.4 billion person population, with their groundwater use increasing by 500% over the past 50 years[12]. Over half of the country is at risk of severe drought[13]. To make up for this, the Indian population extracts more groundwater than the United States and China combined[14]. However, when groundwater is over-exploited (i.e., extracting faster than the aquifer replenishes), it depletes reserves in times of drought exacerbating the damages[15]. At least 40% of the districts in India have significantly falling groundwater levels[16], in large part due to unsustainable extraction. Climate change and environmental pollution then further compound the situation. Further warming is projected to triple groundwater depletion by 2040[17]. Over 400 million people are also exposed to polluted groundwater, including widespread arsenic and fluoride contamination, and a third of all states in India have unsafe levels of uranium in groundwater[18]. Toxic water, higher temperatures, drier conditions and unpredictable rainfall increase the need to extract groundwater to meet immediate demand in unfavorable conditions, further depleting reserves that will be existentially necessary to survive a hotter, drier, and more unstable climate.

The recent increases in wildfires are caused by a similar pattern of prioritizing immediate goals over long-term risks. They are both the result of drier and warmer conditions from climate change and poor infrastructure design and forest management. We are notorious for cutting down the larger trees that are the most fire-resistant (e.g., for lumber or clearing land for industrial agriculture). We are quick to suppress smaller fires that would have thinned the forest and reduced the woody debris that provides fuel for larger fires. Then we build electrical infrastructure into environments that are essentially optimized for raging wildfires – six of the 10

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[12] Garduño, H., & Foster, S. (2010). *Sustainable Groundwater Irrigation.* Strategic Overview Series 4, World Bank. http://sa.indiaenvironmentportal.org.in/files/Sustainable%20Groundwater%20Irrigation.pdf

[13] Shah, D. & Mishra, V. (2020). *Integrated Drought Index (IDI) for Drought Monitoring and Assessment in India.* Water Resources Research 56, e2019WR026284. doi:10.1029/2019WR026284

[14] Salas, E. B. (2023). *Global groundwater withdrawals 2020, by main country.* Statista. https://www.statista.com/statistics/1257895/total-fresh-groundwater-withdrawals/

[15] 1. Loaiciga, H. A. & Doh, R. (2023). *Groundwater for People and the Environment: A Globally Threatened Resource*. Groundwater. doi:10.1111/gwat.13376

[16] Panda, D. K., Tiwari, V. M. & Rodell, M. Groundwater Variability Across India, Under Contrasting Human and Natural Conditions. Earth's Future 10, e2021EF002513 (2022) doi:10.1029/2021EF002513.

[17] Bhattarai, N. et al. (2023). *Warming temperatures exacerbate groundwater depletion rates in India.* Science Advances 9, eadi1401. doi:10.1126/sciadv.adi1401

[18] Groundwater Yearbook India 2021-2022. (2023). *Central Groundwater Board.* Groundwater Yearbook India 2021-2022.
http://www.indiaenvironmentportal.org.in/content/474312/ground-water-year-book-india-2021-22/
Bala, R., Karanveer & Das, D. (2022). *Occurrence and behaviour of uranium in the groundwater and potential health risk associated in semi-arid region of Punjab, India.* Groundwater for Sustainable Development 17, 100731. doi:10.1016/j.gsd.2022.100731.

most destructive fires in California's history were started by electrical equipment. Our efforts to transform the environment to be immediately suitable for our lifestyles and commercial purposes have unintended consequences that accumulate and compound overtime.

This is also true of clearing forests for large-scale agricultural practices like grazing land and monoculturing (growing a single crop in the same place repeatedly). Monoculturing is one of the most dominant agricultural practices in use today, but it is widely known to cause a litany of unintended harms . Monoculturing drives us towards deforestation tipping points and exacerbates environmental toxicity from the use of agricultural chemicals like herbicides, pesticides and fertilizers. It leads to a loss of micronutrients in the soil causing detrimental effects on human health like increased susceptibility to complex chronic health conditions. Clearcutting and monoculturing increase risk of animal and plant borne disease and pandemics. Biodiverse ecosystems protect against the spread of disease whereas environmental homogenization and simplification (e.g., monoculture) promote it. A diverse population of organisms serves as a buffer for pathogen propagation, and large wild habitats like forests keep disease carrying organisms farther away from human habitats.

Much of this is well understood, but "*ecosystem services*" remain significantly undervalued. Biodiverse ecosystems provide value to humans even if we are not directly economically exploiting them. By serving a critical regulatory function in the earth system, they support the stability and hospitality of the planet – basic and assumed conditions for a desirable human life. However, at present there is little-to-no economic incentive to promote ecosystem services, so the motivation remains to continuously extract and repurpose nature to satisfy our immediate economic goals.

Natural disasters, human systems failures, and ecological overshoot are often inseparable. Humans build industrial energy and agricultural systems that increase the risk of natural disasters, but we can also design response systems to try and mitigate their worst harms. As mentioned, since the 1970s the number of weather-related disasters has increased roughly five-fold. The economic costs of damage from these events has also increased by roughly a factor of eight. At the same time, however, there have been less deaths from these events, in part explained by increased efforts at disaster preparation and response[19]. This finding is worth

[19] Rowlatt, J. (2023). *Why is extreme weather killing fewer people?* BBC. https://www.bbc.com/news/science-environment-65673961

an acknowledgement, but is not necessarily cause for unbridled optimism. For one, the radical increase in economic costs should remind us of the risk of gradual civilization collapse – or boring apocalypse – we spoke about in the last chapter. More disasters steadily increase the cost and complexity of operating this civilization, threatening us with institutional overwhelm, popular discontent, and the cumulative costs reaching the point of unmanageability.

Second, there are still several concerning instances of inadequate safety precautions against potentially radically consequential disasters. The nuclear reactor failure in Fukushima, Japan was one such example. Brought about by the Tōhoku earthquake, the most powerful in Japan's recorded history, and the tsunami which followed, the reactor meltdown caused radioactive material to be released into the atmosphere and groundwater leading to unknown ecological harm and forcing over 100,000 people to evacuate their homes. Radionuclides from the Fukushima meltdown are now distributed throughout ocean ecosystems and can be found in the bodies of marine-life, such as bluefin tuna, on the West Coast of the United States[20]. In the investigations which followed the Fukushima disaster, it was shown that five years prior to the event, the Tokyo Electric Power Company (TEPCO) and the Nuclear and Industrial Safety Agency (NISA) were both well aware that safety improvements were needed to the reactor[21]. There was mutual knowledge that an earthquake and tsunami of that size were possible, and that the plant was likely to fail under such circumstances. A model of the latest safety measures was available to them at the time, but the necessary improvements were never implemented[22].

When deciding how to allocate one's national or corporate budget, rare but massively consequential disasters are easy to push off. This is also true for ongoing efforts to protect electrical infrastructure from solar flares and associated geomagnetic storms that can cause grid failures. It is known that such solar activity can cause significant problems because it has happened in the not-so-distant past. In 1859 the most intense geomagnetic storm and solar flare in recorded history (the "Carrington event") caused sparking, and in some cases fires, in telegraph stations and led to telegraph network failure across Europe and North America. A

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[20] National Oceanic and Atmospheric Administration. *Fukushima Radiation in U.S. West Coast Tuna.* National Oceanic and Atmospheric Administration. https://www.fisheries.noaa.gov/west-coast/science-data/fukushima-radiation-us-west-coast-tuna

[21] Fukushima Nuclear Accident Independent Investigation Commission. (2012). *The National Diet of Japan*. Fukushima Nuclear Accident Independent Investigation Commission. https://www.nirs.org/wp-content/uploads/fukushima/naiic_report.pdf

[22] Action, J. M., Hibbs, M. (2012). *Why Fukushima Was Preventable.* Carnegie Endowment for International Peace. https://carnegieendowment.org/2012/03/06/why-fukushima-was-preventable-pub-47361

solar storm of similar magnitude occurring in today's deeply entangled, technology-dependent world would disrupt all human systems that require electricity (which is pretty much everything): healthcare, agriculture, refrigeration, shipping, transportation, banking, satellites, emergency systems, security and defense[23]. And in fact, a solar storm of similar magnitude did occur, in 2012, only narrowly missing the earth. If the eruption had occurred only one week sooner, large swaths of our electricity addicted civilization would have lost power. Many of today's electrical grids, such as those in the United States, are not prepared for these events – despite the fact that the odds of a Carrington-like solar storm hitting the Earth in the next ten years is roughly 12% (a 1 in 10 chance of near complete energy shutdown within a decade).

There are strong incentives to put off the cost of additional safety measures, as it is not a trivial expense to protect a nuclear reactor from rare earthquakes and tsunamis, nor an electrical grid from a solar flare. These events are viewed as mere probabilities, unlikely to occur in the next quarter or next election cycle even if they are very likely over the span of decades. An increase on a profit-loss statement is an immediate and visible reward, a higher number on a balance sheet. Whereas increased safety measures for unlikely events are added costs (losses) where the "success" is mostly invisible, merely an absence of catastrophe.

Globally Consequential Natural Disasters

If you imagine the chaos of the United States in a nationwide blackout, you can get a decent sense of how a natural disaster can be more consequential in a technologically dependent, global civilization. However, imagining future scenarios is not completely necessary, as recent historical events, such as the situation in Syria in 2011, have already demonstrated this. Local natural disasters, such as a poorly managed drought, can cause cascading system failures that are profoundly consequential at a global scale.

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[23] Lloyd's. (2013). *Solar Storm Risk to the North American Electrical Grid.* Lloyd's. https://www.lloyds.com/news-and-insights/risk-reports/library/solar-storm
Redmon, R. J., Seaton, D. B., Steenburgh, R., He, J., & Rodriguez, J. V. (2018). *September 2017's geoeffective space weather and impacts to Caribbean radio communications during hurricane response.* Space Weather, 16, 1190–1201. https://doi.org/10.1029/2018SW001897
Love, J. J., Hayakawa, H., & Cliver, E. W. (2019). Intensity and impact of the New York Railroad superstorm of May 1921. Space Weather, 17, 1281–1292. https://doi.org/10.1029/2019SW002250
NERC. (2011). *Industry Advisory. Preparing for Geo-Magnetic Disturbances.* NERC.
NPCC. (2007). *Procedures for Solar Magnetic Disturbances Which Affect Electric Power Systems.* NPCC.
JASON. (2011). *Impacts of Severe Space Weather on the Electric Grid.* JASON.

In the span of twelve years, Syria experienced two of the most severe droughts in its history, the first from 1998-2001, the second from 2006-2010 (the longest lasting drought in the region in nearly 1000 years).[24] Following the first drought, a series of agricultural practices and political arrangements increased the environmental fragility of the area with poor management of water resources, failed irrigation methods, the digging of illegal wells, the over consumption of groundwater, and the deterioration of soil[25]. As a result of these and other compounding factors, the second drought caused 75% total crop failure, the death of 85% of livestock, and the loss of income for 800,000 people.[26] 1.5 million people moved from rural to urban areas, increasing resource pressures on those areas and social proximity driving ethnic conflict.[27] Eventually war broke out in March of 2011 – the result of a complex interplay between ecological overshoot, natural disasters, and the human system failure of ineffective governance and lack of foresight. These events became the center of an ongoing humanitarian disaster, an arena for proxy warfare between major world powers, and the source of the largest refugee crisis in recent history (with around 13 million people displaced). A surge in political tensions over refugee policy followed, contributing to a rise in populist nationalism, bitter political polarization, and one of the most significant acts of political disintegration of our time – Britain's exit from the European Union.

Most environmental modeling forecasts an increase in the frequency and severity of droughts and natural disasters moving forward, with the associated expectation of increased refugee crises and resulting geopolitical tensions. About 32.6 million people were internally displaced in 2022 due to natural disasters – a 45% increase from the year prior. An additional 28.3 million were displaced from violent conflict.[28] The number of forcibly displaced people has doubled over the past decade and is at an all-time high.[29] If natural disasters simply continue to occur at the rate we've already seen in recent years, 1.2 billion people could be displaced globally within

[24] Cook, B. I., K. J. Anchukaitis, R. Touchan, D. M. Meko, and E. R. Cook. (2016). *Spatiotemporal drought variability in the Mediterranean over the last 900 years. J*. Geophys. Res. Atmos., 121, 2060–2074, doi:10.1002/2015JD023929
[25] Daoudy, M. (2022). *The Syrian Revolution, A Story of Politics, Not Climate Change.* RUSI. https://rusi.org/explore-our-research/publications/commentary/syrian-revolution-story-politics-not-climate-change
[26] Holleis, J. (2021). *How climate change paved the way to war in Syria.* DW. https://www.dw.com/en/how-climate-change-paved-the-way-to-war-in-syria/a-56711650?ref=okdoomer.io
[27] (such as the Kurds, Arabs, Alawites and Sunnis)
[28] iDMC. *IDMC Data Portal*. iDMC. https://www.internal-displacement.org/database/displacement-data
[29] UNHCR. (2023). *Five Takeaways from the 2022 UNHCR Global Trends Report.* UNHCR. https://www.unrefugees.org/news/five-takeaways-from-the-2022-unhcr-global-trends-report/
iDMC. *IDMC Data Portal*. iDMC. https://www.internal-displacement.org/database/displacement-data

thirty years .[30] The current world system is not prepared to handle this wave.[31] The amount of political turmoil following the Syrian refugee crisis is hard to overstate, and it was the result of only 13 million refugees. Hundreds of millions to billions of people are expected to be displaced in the coming decades, and the wider population's willingness to accept them has been destroyed by the culture wars and political polarization which followed in the wake of past refugee crises.

The most severe impacts of environmental degradation and forced displacement are, in many cases, projected to hit those regions that are already the most fragile and conflict prone[32]. Southern Asia, for example, is a region facing globally consequential water scarcity issues. The three neighboring, nuclear armed nations of Pakistan, India, and China, constitute the most densely populated area on the planet. To satisfy their growing water needs, they all rely upon the Himalayan Watershed. This watershed is currently at risk of depletion due to rising temperatures, drier conditions, and over-exploitation[33]. In the midst of depleting reserves, rapidly increasing demand, and conflict between countries, each nation is putting forth claims to contested territory and water rights. Rather than cooperating towards equitable distribution and the stabilization of the watershed, they are implementing competitive large-scale hydro-power schemes and water-transfer projects (e.g., diverting rivers).[34] These three nations already have

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[30] Institute for Economics and Peace. (2020). *Over one billion people at threat of being displaced by 2050 due to environmental change, conflict, and civil unrest.* Institute for Economics and Peace. https://www.economicsandpeace.org/wp-content/uploads/2020/09/Ecological-Threat-Register-Press-Release-27.08-FINAL.pdf

[31] UNHCR. (2011). *The 1951 Convention Relating to the Status of Refugees and its 1967 Protocol.* UNHCR. https://www.unhcr.org/sites/default/files/legacy-pdf/4ec262df9.pdf

[32] Food stores – Simple example is how much food storage an area has. Areas that have no production but a lot of stores (break of supply chain danger) vs no stores but a lot of production (droughts dangerous).

[33] Davis, A., Gawne, L., Roche, G., Gamble, R. (2018). *Thawing tensions in the Himalaya.* theinterpreter. https://www.lowyinstitute.org/the-interpreter/thawing-tensions-himalaya
Ching Leung, K. (2023). *Tackling China's Water Shortage Crisis.* Earth.org. https://earth.org/tackling-chinas-water-shortage-crisis/
Chandrashekar, V. (2022). *As Himalayan Glaciers Melt, a Water Crisis Looms in South Asia.* YaleEnvironment360. https://e360.yale.edu/features/himalayas-glaciers-climate-change
Albinia, A. (2020). *A water crisis looms for 270 million people as South Asia's glaciers shrink.* National Geographic. https://www.nationalgeographic.com/magazine/article/water-crisis-looms-for-270-million-people-south-asia-perpetual-planet-feature

[34] Gamble, R. (2019). *How dams climb mountains: China and India's state-making hydropower contest in the Eastern-Himalaya watershed.* Thesis Eleven 150, 42–67 doi:10.1177/0725513619826204
Engelke, P., Michel, D. (2019). *Ecology Meets Geopolitics: Water Security in Himalayan Asia.* Atlantic Council. https://www.atlanticcouncil.org/wp-content/uploads/2020/03/AC_ECOLOGY_032719B_FINAL_int-1.pdf

a history of conflict, for example, in 2022 violent conflict broke out between Indian and Chinese soldiers stationed in the Tibetan plateau region which controls the watershed. Intense pressures towards economic growth push all nations towards increasing resource extraction, but the growing water scarcity and ongoing environmental crises will only exacerbate interstate tensions, threatening catastrophic escalations in violence between nuclear powers.

The Problems of a "Mature Civilization"

Imagine a civilization who only faced global catastrophic risks from "pure" natural disasters – those with little trace of human influence. It would have resolved all major issues with war and failures of diplomacy, ecological destruction, dangerous technologies, and faulty human systems (all self-induced or "anthropogenic" catastrophic risks). This might reasonably be called a "Mature Civilization," given that it had essentially transitioned from its adolescence and could behave in ways that were no longer self-destructive. Its major responsibilities in dealing with catastrophic risks would be, for example, monitoring for potential volcanic eruptions and redirecting asteroids on course with Earth.

Our civilization is still in the midst of adolescent growing pains. Maturity would require us to be in the right relationship with the natural world: understanding the language of ecological resilience and building accordingly, rather than simply seeking to shape the earth for narrow purposes of economic and political advantage. Our economic and political systems would need to implement safety precautions that protected against rare but massively consequential events like solar flares and tsunamis, even if they were costly in the near term. We wouldn't base our choices on quarterly reviews and four year election cycles when the risks we faced could only be addressed by planning on the timescales of decades and centuries. There remains a great distance between our current civilization and that of a mature one. There has been for quite some time. As a result, we must address the cumulative backlog of negative consequences of our immaturity – such as impending refugee crises and resource conflicts which risk violence on a scale not seen since the World Wars. If we are to have any chance for a desirable future, we

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Donnellon-May, G. (2022). *China's Super Hydropower Dam and Fears of Sino-Indian Water Wars.* The Diplomat.
https://thediplomat.com/2022/12/chinas-super-hydropower-dam-and-fears-of-sino-indian-water-wars/

will need to preemptively mitigate these impending catastrophes, while simultaneously redesigning the institutional structures that enabled them in the first place.