# 1AC

## Util

#### The standard is maximizing expected well-being.

#### 1] Only pleasure and pain are intrinsically valuable – all other frameworks collapse.

Moen 16 [Ole Martin Moen, Research Fellow in Philosophy at University of Oslo “An Argument for Hedonism” Journal of Value Inquiry (Springer), 50 (2) 2016: 267–281] TDI

Let us start by observing, empirically, that a widely shared judgment about intrinsic value and disvalue is that **pleasure is intrinsically valuable and pain is intrinsically disvaluable**. On virtually any proposed list of intrinsic values and disvalues (we will look at some of them below), pleasure is included among the intrinsic values and pain among the intrinsic disvalues. This inclusion makes intuitive sense, moreover, for **there is something undeniably good about the way pleasure feels and something undeniably bad about the way pain feels**, and neither the goodness of pleasure nor the badness of pain seems to be exhausted by the further effects that these experiences might have. “Pleasure” and “pain” are here understood inclusively, as encompassing anything hedonically positive and anything hedonically negative.2 **The special value statuses of pleasure and pain are manifested in how we treat these experiences in our everyday reasoning about values.** If you tell me that you are heading for the convenience store, I might ask: “What for?” This is a reasonable question, for when you go to the convenience store you usually do so, not merely for the sake of going to the convenience store, but for the sake of achieving something further that you deem to be valuable. You might answer, for example: “To buy soda.” This answer makes sense, for soda is a nice thing and you can get it at the convenience store. I might further inquire, however: “What is buying the soda good for?” This further question can also be a reasonable one, for it need not be obvious why you want the soda. You might answer: “Well, I want it for the pleasure of drinking it.” If I then proceed by asking “But what is the pleasure of drinking the soda good for?” the discussion is likely to reach an awkward end. The reason is that the **pleasure is not good for anything further**; it is simply that for which going to the convenience store and buying the soda is good.3 As Aristotle observes: “We never ask [a man] what his end is in being pleased, because we assume that pleasure is choice worthy in itself.”4 Presumably, a similar story can be told in the case of pains, for if someone says “This is painful!” we never respond by asking: “And why is that a problem?” We take for granted that if something is painful, we have a sufficient explanation of why it is bad. If we are onto something in our everyday reasoning about values, it seems that **pleasure and pain are both places where we reach the end of the line in matters of value.**

#### 2] Extinction first --- moral uncertainty.

**Bostrom 12** [(Nick Bostrom, Faculty of Philosophy & Oxford Martin School University of Oxford) “Existential Risk Prevention as Global Priority.” Global Policy, 2012] TDI

These reflections on moral uncertainty suggest an alternative, complementary way of looking at existential risk; they also suggest a new way of thinking about the ideal of sustainability. Let me elaborate. **Our** present **understanding** of axiology **might** well **be confused**. We may not now know — at least not in concrete detail — what outcomes would count as a big win for humanity; we might not even yet be able to imagine the best ends of our journey. **If we are** indeed profoundly **uncertain about our** ultimate aims, **then we should** recognize that there is a great option **value** in preserving — and ideally improving — **our ability to** recognize value and to **steer the future accordingly. Ensuring** that there will be **a future** version **of humanity** with great powers and a propensity to use them wisely is plausibly the best way available to us to increase the probability that the future will contain a lot of value. To do this, **we must prevent any existential catastrophe**.

#### 3] Actor specificity: A] Governments must aggregate since every policy benefit some and harms others, which also means side constraints freeze action. B] States lack wills or intentions since policies are collective actions. C] Actor-specificity comes first since different agents have different ethical standings.

### Plan

#### The government of the Republic of Kazakhstan ought to recognize an unconditional right of workers to strike.

### Adv – Investment

#### Anti-strike crackdowns deck foreign investment.

**Williamson, 17** **(Hugh Williamson, director of HRW's Europe and Central Asia Division, 2-2-2017, accessed on 11-1-2021, *Human Rights Watch*, "Kazakhstan: The Labor Crackdown and Possible Unintended Consequences", https://www.hrw.org/news/2017/02/02/kazakhstan-labor-crackdown-and-possible-unintended-consequences) //D.Ying**

The government’s heavy-handed control of society, including on labor issues, has certainly been intensifying. This causes lots of experts to ask why Kazakhstan is taking such an approach, given that it appears to clash with the government’s best interests? While clamping down on union activity, the government is also prioritizing its openness to international investment and readiness to take responsibility on the international stage, as this month’s Syria talks in Astana show. Its international plans could be undermined, if its abusive approach to labor rights persists. Many foreign investors, in Kazakhstan and elsewhere, recognize the importance of upholding international labor standards. This approach sits awkwardly with Kazakhstan’s blatant labor restrictions. Foreign companies, like local ones, have their own problems with Kazakhstan’s laws, which force them to join a state-controlled employers’ association – a concern also highlighted by the ILO. Kazakhstan has been a member of the UN Security Council since January 1. In his speech marking the country’s council membership, President Nursultan Nazarbayev listed human rights promotion as a key priority. Yet now, Astana is facing renewed sanction from the ILO, another part of the UN. In 2015 and again in 2016, the ILO’s top decision-making body, the International Labor Conference, reprimanded Kazakhstan over violations of core ILO conventions, relating to the 2014 trade union law. In both years, it demanded that Astana change the law. Astana refused, irritating many governments active in the ILO. The ILO concerns closely echoed the conclusions of a January 2015 country visit by the UN’s top expert on free association, who sharply criticized restrictions on nongovernmental organizations and trade unions. January’s intensified labor crackdown could mean Kazakhstan will again be in the ILO’s spotlight this year – hardly a positive prospect for a country determined to impress a global audience. Kazakhstan’s top priority in the economic sphere is to join the Organization for Economic Cooperation and Development (OECD), the Paris-based club of rich nations. President Nazarbayev’s mantra – that Kazakhstan should be among the world’s top 30 economic powers by 2050 – hinges on hitting OECD targets. Kazakhstan hopes this year to be allowed to join several OECD committees as a stepping stone to future membership. Yet this will also come at a price: respect for labor and social standards is judged important for OECD members, as is consultation with independent trade unions – so heavy restrictions on labor rights could count against Astana’s ambitions. Kazakhstan may soon experience negative international blowback as a consequence of its crackdown on independent union organizing. Let’s hope the country’s leaders change course, to one that respects basic labor and human rights.

#### Scenario 1 is climate.

#### Foreign investment key to green energy which prevents climate change.

**Sanchez, 20** **(Wilder Alejandro Sanchez, Senior Research Fellow at the Council on Hemispheric Affairs, 2-26-2020, accessed on 11-1-2021, *The Diplomat*, "The Green Steppe? Kazakhstan and Its Green Energy Future", https://thediplomat.com/2020/02/the-green-steppe-kazakhstan-and-its-green-energy-future/) //D.Ying**

New data provided by the Kazakhstani government shows that the Central Asian state is continuing its trend toward green energy to meet the demands of its 18 million citizens. While the country will continue to rely on gas and oil for the foreseeable future, even slow switches to green energy are noteworthy at a time when the global effects of climate change become more and more alarming (case in point, the ongoing heat wave in Antarctica). Approximately 504.5 MW of electricity were produced by Kazakhstan in 2019, according to the country’s Ministry of Energy. The Kazakhstani government has stated that its goal is to obtain 3 percent of total electricity production from green technology in 2020, and eventually reach 30 percent by 2030 – though some analyses highlight how Nur-Sultan’s official policy toward green energy have sometimes announced different objectives. The Central Asian state is among major emitters of greenhouse gases (GHG) in the Europe and Central Asia region, with total annual national emissions of 300.9 MtCO2e in 2015 – the energy sector accounts for 82 percent of total GHG emissions, according to the World Bank. The attitude of international organizations, partners and the private industry will be a key factor in determining whether the country can continue to detach itself from non-renewable energy. One key player will be Europe. The European Union’s new strategy toward Central Asia highlights Kazakhstan’s commitment for green energy. “Kazakhstan has ambitious plans to generate more electricity from wind and solar power,” it states, even though “excluding hydropower, renewable energy makes a negligible contribution to the region’s energy mix.” The document adds how European Investment Bank and European Bank for Reconstruction and Development (EBRD) “loans are supporting renewable energy (for example, a new wind power plant in Kazakhstan).” The EBRD announced this past September that it had approved a 300 million Euro “extension of Kazakhstan Renewables Framework” in order to “support solar, wind, hydro, biogas, distribution and transmission projects.” The EBRD seems to be particularly keen in promoting wind energy in Central Asia, as it is supporting the implementation of wind auctions in Kazakhstan, particularly for 50-150 MW wind power projects. One of the projects under consideration is a wind power station in the Shelek corridor in Almaty region. As for the United States, Washington’s long-awaited strategy toward Central Asia for 2019-2025, “Advancing Sovereignty and Economic Prosperity,” published in February 2020, does not mention climate change or green energy directly. Nevertheless, the document does explain how Washington’s “support for a unified electric grid across Central Asia will help facilitate the trade of surplus electricity to reduce costs for consumers, generate revenues for suppliers, improve regional energy security, and reduce reliance on external actors.” In other words, there is a clear link between energy, security and also development. The move to renewable energy comes at a time when Nur-Sultan is similarly trying to reduce its economic dependency on a handful of industries, particularly the production and export of uranium via KazAtomProm. President Kassym-Jomart Tokayev has pushed for the diversification of the country’s economy, with more attention given to livestock, crop, and grain production. The country is also looking to have a stronger presence in the auto-manufacturing market.

#### Kazakhstan's uniquely important – it’s the ninth largest country, has unique renewable potential, and raises climate ambition.

**British Embassy Nur-Sultan, 11-3** **(British Embassy Nur-Sultan, British embassy in Kazakhstan, 11-3-2021, accessed on 11-3-2021, *GOV.UK*, "Joint Statement of The Republic of Kazakhstan and The United Kingdom on Strategic Partnership and Joint Efforts to Respond to Climate Change", https://www.gov.uk/government/news/joint-statement-of-the-republic-of-kazakhstan-and-the-united-kingdom-on-strategic-partnership-and-joint-efforts-to-respond-to-climate-change) //D.Ying**

We are committed to tackling climate change through ambitious domestic action, as well as close cooperation at the bilateral and multilateral levels. The UK’s Net Zero Strategy will accelerate its green energy transition, decarbonising power generation by 2035 and achieving net zero emissions by 2050. Kazakhstan has committed to reach net zero by 2060 in its upcoming carbon neutrality strategy which will involve major reforms in every sector of the economy, with special focus on energy, manufacturing, agriculture, forestry, transport, utilities, and waste management. The Government of Kazakhstan is also setting key midterm targets within its updated Nationally Determined Contribution: increasing the share of renewables to 15% by 2030 with further potential to grow and reducing greenhouse gas emissions unconditionally by 15% by 2030 (compared to the base year) with a conditional target of 25% (subject to international support and assistance). Kazakhstan, the ninth largest country in the world and a guardian of the steppe ecosystem, also fully supports the COP Presidency statement on forests and sustainable land use, committing to plant 2 billion trees by 2025. As we develop and enhance our national plans, we recognise that the Conference of Parties to the UNFCCC is the key multilateral vehicle to deliver the ambition and action we so urgently need. We intend to take increasingly bold action to meet and where possible exceed the targets set in our Paris Agreement Nationally Determined Contributions (NDCs) and Long-Term Strategies. We will also drive forward implementation of the policy changes needed to meet our respective pledges to reach carbon neutrality. In this context, we also welcome the recent Central Asia/US C5+1 statement which underlined the imperative to submit ambitious NDCs for the COP26 Glasgow Climate Summit. It pledged that the NDCs of the countries of Central Asia would include specific targets to reduce greenhouse gas emissions and concrete actions to reach those targets; and that those targets and actions would be in line with the goal of keeping a 1.5 degree Celsius above pre-industrial levels temperature limit within reach. UK and Kazakhstan will continue working together to realise this important commitment and to help raise climate ambition across Central Asia and the wider region. In addition, we will look to strengthen our cooperation on environmental matters, as well as exploring the opportunities that exist in the transformation to a green economy that may benefit both our countries. We will ensure that our existing Ministerial intergovernmental structures - the Strategic Dialogue and the Intergovernmental Commission on Trade and Investment – prioritise cooperation in these areas. Investment in a sustainable and clean recovery from the Covid 19 pandemic will create employment in the industries of the future, while ensuring that we address the linked challenges of public health, climate change and biodiversity. Such cooperation will prioritise energy efficiency, economic diversification away from fossil fuels, and in particular the imperative to transition from the use of coal for power generation, as well as developing Kazakhstan’s considerable renewable potential. It will also look to develop our countries’ green finance offers in support of this transition.

#### Extinction.

**Spratt and Dunlop, 19 (David Spratt and Ian Dunlop, Research Director at the Breakthrough National Centre for Climate Restoration, senior member of the Breakthrough Advisory Board, 5-22-2019, accessed on 5-6-2020, Breakthrough - National Centre for Climate Restoration, "Existential climate-related security risk: a scenario approach", https://52a87f3e-7945-4bb1-abbf-9aa66cd4e93e.filesusr.com/ugd/148cb0\_90dc2a2637f348edae45943a88da04d4.pdf) //lex dy**

2020–2030: Policy-makers fail to act on evidence that the current Paris Agreement path — in which global human-caused greenhouse emissions do not peak until 2030 — will lock in at least 3°C of warming. The case for a global, climate-emergency mobilisation of labour and resources to build a zero-emission economy and carbon drawdown in order to have a realistic chance of keeping warming well below 2°C is politely ignored. As projected by Xu and Ramanathan, by 2030 carbon dioxide levels have reached 437 parts per million — which is unprecedented in the last 20 million years — and warming reaches 1.6°C. 18 2030–2050: Emissions peak in 2030, and start to fall consistent with an 80 percent reduction in fossil-fuel energy intensity by 2100 compared to 2010 energy intensity. This leads to warming of 2.4°C by 2050, consistent with the Xu and Ramanathan “baseline-fast” scenario. However, another 0.6°C of warming occurs 19 — taking the total to 3°C by 2050 — due to the activation of a number of carbon-cycle feedbacks and higher levels of ice albedo and cloud feedbacks than current models assume. [It should be noted that this is far from an extreme scenario: the low-probability, high-impact warming (five percent probability) can exceed 3.5–4°C by 2050 in the Xu and Ramanathan scheme.] 2050: By 2050, there is broad scientific acceptance that system tipping-points for the West Antarctic Ice Sheet and a sea-ice-free Arctic summer were passed well before 1.5°C of warming, for the Greenland Ice Sheet well before 2°C, and for widespread permafrost loss and large-scale Amazon drought and dieback by 2.5°C. The “hothouse Earth” scenario has been realised, and Earth is headed for another degree or more of warming, especially since human greenhouse emissions are still significant. 20 While sea levels have risen 0.5 metres by 2050, the increase may be 2–3 metres by 2100, and it is understood from historical analogues that seas may eventually rise by more than 25 metres. Thirty-five percent of the global land area, and 55 percent of the global population, are subject to more than 20 days a year of lethal heat conditions, beyond the threshold of human survivability. The destabilisation of the Jet Stream has very significantly affected the intensity and geographical distribution of the Asian and West African monsoons and, together with the further slowing of the Gulf Stream, is impinging on life support systems in Europe. North America suffers from devastating weather extremes including wildfires, heatwaves, drought and inundation. The summer monsoons in China have failed, and water flows into the great rivers of Asia are severely reduced by the loss of more than one-third of the Himalayan ice sheet. Glacial loss reaches 70 percent in the Andes, and rainfall in Mexico and central America falls by half. Semi-permanent El Nino conditions prevail. Aridification emerges over more than 30 percent of the world’s land surface. Desertification is severe in southern Africa, the southern Mediterranean, west Asia, the Middle East, inland Australia and across the south-western United States. Impacts: A number of ecosystems collapse, including coral reef systems, the Amazon rainforest and in the Arctic. Some poorer nations and regions, which lack capacity to provide artificially-cooled environments for their populations, become unviable. Deadly heat conditions persist for more than 100 days per year in West Africa, tropical South America, the Middle East and South-East Asia, contributing to more than a billion people being displaced from the tropical zone. Water availability decreases sharply in the most affected regions at lower latitudes (dry tropics and subtropics), affecting about two billion people worldwide. Agriculture becomes nonviable in the dry subtropics. Most regions in the world see a significant drop in food production and increasing numbers of extreme weather events, including heat waves, floods and storms. Food production is inadequate to feed the global population and food prices skyrocket, as a consequence of a one-fifth decline in crop yields, a decline in the nutrition content of food crops, a catastrophic decline in insect populations, desertification, monsoon failure and chronic water shortages, and conditions too hot for human habitation in significant food-growing regions. The lower reaches of the agriculturally-important river deltas such as the Mekong, Ganges and Nile are inundated, and significant sectors of some of the world’s most populous cities — including Chennai, Mumbai, Jakarta, Guangzhou, Tianjin, Hong Kong, Ho Chi Minh City, Shanghai, Lagos, Bangkok and Manila — are abandoned. Some small islands become uninhabitable. Ten percent of Bangladesh is inundated, displacing 15 million people. Even for 2°C of warming, more than a billion people may need to be relocated and In high-end scenarios, the scale of destruction is beyond our capacity to model, with a high likelihood of human civilisation coming to an end. 21

#### Scenario 2 is agriculture.

#### Ag declining due to climate but it’s not too late.

**Zhao et al., 17** **(Chuang Zhao, Bing Liu, Shilong Piao, Xuhui Wang, David B. Lobell, Yao Huang, Mengtian Huang, Yitong Yao, Simona Bassu, Philippe Ciais, Jean-Louis Durand, Joshua Elliott, Frank Ewert, Ivan A. Janssens, Tao Li , Erda Lin, Qiang Liu, Pierre Martre, Christoph Müller, Shushi Peng, Josep Peñuelas, Alex C. Ruane, Daniel Wallach, Tao Wang, Donghai Wu, Zhuo Liu, Yan Zhu, Zaichun Zhu, and Senthold Asseng, \*Sino-French Institute for Earth System Science at Peking University, \*\*National Engineering and Technology Center for Information Agriculture at Nanjing Agricultural University, \*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*Department of Earth System Science Center on Food Security and the Environment at Stanford, State Key Laboratory of Vegetation and Environmental Change at the Chinese Academy of Sciences, \*\*\*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*\*\*\*Desertification Research Centre at University of Sassari, \*\*\*\*\*\*\*\*\*Laboratoire des Sciences du Climat et de l’Environnement at Université de Versailles Saint-Quentin, \*\*\*\*\*\*\*\*\*\*Unité de Recherche Pluridisciplinaire Prairies et Plantes Fourragères at Institut National de la Recherche Agronomique, \*\*\*\*\*\*\*\*\*\*\*\*University of Chicago Computation Institute at UChicago, \*\*\*\*\*\*\*\*\*\*\*\*\*Institute of Crop Science and Resource Conservation at University of Bonn, \*\*\*\*\*\*\*\*\*\*\*\*\*\*Department of Biology at University of Antwerp, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*International Rice Research Institute, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Agro-Environment and Sustainable Development Institute at Chinese Academy of Agricultural Sciences, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*UMR Laboratoire d’Ecophysiologie des Plantes sous Stress Environementaux at Institut National de la Recherche Agronomique, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Climate Impacts and Vulnerabilities at Potsdam Institute for Climate Impact Research, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Centre de Recerca Ecològica i Aplicacions Forestals, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*National Aeronautics and Space Administration Goddard Institute for Space Studies, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*UMR 1248 Agrosystèmes et Développement Territorial at Institut National de la Recherche Agronomique, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Key Laboratory of Alpine Ecology and Biodiversity at Chinese Academy of Sciences, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*National Engineering and Technology Center for Information Agriculture at Nanjing Agricultural University, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Sino-French Institute for Earth System Science at Peking University, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Agricultural and Biological Engineering Department at University of Florida, 8-29-2017, accessed on 11-3-2021, *Proceedings of the National Academy of Sciences of the United States of America*, "Temperature increase reduces global yields of major crops in four independent estimates", https://www.pnas.org/content/114/35/9326#sec-1) //D.Ying**

For wheat, the average estimate from all four methods is a 6.0 ± 2.9% loss in global yield with each degree-Celsius increase in temperature (Fig. 2A). Results from the four methods agree more closely on the impact on wheat (−7.8 to −4.1% per degree Celsius) than on maize yields (Fig. 2A). The results from different methods are also generally consistent for the top five wheat-producing countries (Fig. 3A) that harvest >50% of the world’s wheat. Spatially, however, the impacts are highly heterogeneous. Estimated wheat yield losses for the United States (−5.5 ± 4.4% per degree Celsius) and France (−6.0 ± 4.2% per degree Celsius) are similar to the global average, while those for India (−9.1 ± 5.4% per degree Celsius) and Russia (−7.8 ± 6.3% per degree Celsius) are more vulnerable to temperature increase. The large yield reductions for Russia are mainly due to the contribution of a markedly higher negative result from the statistical method (−14.7 ± 3.8% per degree Celsius; Fig. 3A), which did not account for in-season variations in temperature impact (10). By contrast, for China, the largest wheat producer in the world, the multimethod estimate indicates that only 2.6 ± 3.1% of yield would be lost for each degree-Celsius increase in global mean temperature. Rice is a main source of calories in developing countries. The analysis from the multimethod ensemble indicates that a global increase in temperature of 1 °C will reduce global rice yield by an average of 3.2 ± 3.7%, much less than for maize and wheat (Fig. 2A). Grid- and point-based simulations and field-warming experiments indicate a negative impact of temperature of approximately −6.0% per degree Celsius, but some statistical regressions suggest almost no impact. Similar disparities in estimates between the statistical regressions and other methods are found for several major rice-producing countries (Fig. 3B), including China, which produces ∼30% of the world’s rice (14). Similar regression methods produce quite different estimates for Indonesia, Bangladesh, and Vietnam, which, when averaged across all methods, lead to small estimated impacts on rice production for each country. For India, however, estimates from all methods predict large temperature impacts, with a multimethod average of −6.6 ± 3.8% per degree Celsius. Soybean is the fourth most important commodity crop (14). Results of just three studies using only two methods are available for global-scale estimates of the impacts of temperature on soybean yield. The global average reduction in soybean yield is 3.1% per degree-Celsius rise (Fig. 2A), but the estimates are not statistically significant due to large uncertainties in each method (the 95% CIs go through zero). Similar effects are estimated with both methods for the United States, Brazil, Argentina, and Paraguay (Fig. 3D), which produce 84% of the global soybean harvest (14). The largest expected reduction is −6.8 ± 7.1% per degree Celsius for the United States, the largest soybean producer. The overall results for China, the fourth largest producer, however, do not indicate statistically significant effects of temperature on soybean yield. We compared different methods for a total of 10 sites and found that method estimates are similar for most site–crop combinations (Fig. 4). Estimates from grid- and point-based simulations are more similar to each other than to field-warming observations (Fig. 4 and SI Appendix, Fig. S4). This is not unexpected, as the two types of simulation have some methodological similarities, such as model structure, assumptions, and parameters. The grid- and point-based models both tend to project greater yield loss with increasing temperature at warmer locations and less yield loss at cooler locations, a distinction not identified in the field experiments (SI Appendix, Fig. S4). Some of the impact differences between simulations and field experiments could be due to the fact that field experiments were only carried out over a few years and might not represent the entire variability of climate at this location, while the simulations represent 30 y. Simulation parameters are also based on the properties of cultivars that differ from those grown in field experiments. For example, the field experiment in Wageningen (The Netherlands) indicated a large negative impact of temperature rise on wheat yield (−11.6% per degree Celsius), but used a spring wheat that is not representative of the region (15). Positive impacts (11.2 ± 1.2% per degree Celsius) were observed in wheat-warming experiments in Nanjing, China, where rising temperatures reduce damage from frost and heat stress during the early and late experimental wheat growing seasons, respectively (16) —factors that are captured less well in crop models (17). For maize grown in Jinzhou (China), a field experiment and a regression analysis produced very large negative estimates of impact, but were not accompanied by margins of error to aid interpretation. We assumed the temperature response of impact on yield would be linear and multiplied projected temperature changes (Fig. 1B) with our multimethod impact estimates to give an average projected decrease in the global crop yields of 5.6% (95% CI, 0.1–14.4%) due to temperature change alone under the scenario of lowest emissions (RCP2.6) going up to 18.2% (95% CI, 0.7–38.6%) under the scenario of highest emissions (RCP8.5) (Fig. 2B). The estimated responses in yield are primarily from approximately +2 °C warming simulations, regressions, and experiments (Materials and Methods), so the estimates of impact for a global warming scenario near +4 °C (RCP8.5) are likely to be conservative due to the nonlinear impact of rising temperatures in the real world (4, 18). A nonlinear response to temperature has also been suggested in simulations (1, 7, 10). To prepare for adaptation to climate change, it is necessary to isolate the effects of individual factor for possible impacts on yield, as changes in different factors usually require different adaptation strategies. While elevated atmospheric CO2 concentration can stimulate growth when nutrients are not limited, it will also increase canopy temperature from more closed stomata (19). Also, changes in precipitation can have an effect on crops, but projections on precipitation change are often uncertain. The focus of our study is on temperature change, one of the most direct negative impacts from climate change on crops, and does not include other possible climate change effects from elevated atmospheric CO2 concentration or changes in rainfall, and possible deliberate adaptation taken by farmers. Farmers have increased yields through adapting new technologies during the last half-century, but yield has been also lost through increases in temperatures already (9). Yield increase has slowed down or even stagnated during the last years in some parts of the world (20, 21), and further increases in temperature will continue to suppress yields, despite farmers’ adaptation efforts. The direct negative temperature impact on yield could be additionally affected via indirect temperature impacts. For instance, increasing temperature will increase atmospheric water demand, which could lead to additional water stress from increased water pressure deficits, subsequently reducing soil moisture and decreasing yield (22, 23). However, an accelerated phenology from increased temperatures leads to a shorter growing period and less days of crop water use within a cropping season. Such indirect temperature effects are taken into account in each of the methods, but are not explicitly quantified. Other indirect temperature impacts include more frequent heat waves and possible temperature impact on weeds, pests, and diseases (18, 24⇓–26). Increases in management intensity and yield potential could also unintentionally increase yield sensitivity to weather (27). By combining four different methods, our comprehensive assessment of the impacts of increasing temperatures on major global crops shows substantial risks for agricultural production, already stagnating in some parts of the world (20, 21). However, differences in temperature responses of crops around the world suggest that some mitigation could be possible to substantially affect the magnitude (or even direction) of climate change impacts on agriculture. These impacts will also vary substantially for crops and regions, and may interact with changes in precipitation and atmospheric CO2, so a reinvigoration of national research and extension programs is urgently needed to offset future impacts of climate change, including temperature increase on agriculture by using crop- and region-specific adaptation strategies.

#### Foreign investment is key to sustainable precision ag – solves soil depletion and water overuse.

* Precision ag – way of doing agriculture that maximizes outputs while preserving as much resources as possible.

**Turp-Balazs, 20** **(Craig Turp-Balazs, Editor of Emerging Europe, 2-20-2020, accessed on 11-3-2021, *Emerging Europe*, "How technology, and Kusto Group, are making Kazakhstan a global leader in agriculture", https://emerging-europe.com/business/how-technology-and-kusto-group-are-making-kazakhstan-a-global-leader-in-agriculture/) //D.Ying**

“We felt there was huge potential to transform Tambour from a national champion into a global leader, and if another Tambour-type opportunity came up we would certainly look to seize it,” says Kunin. “But we’re finding that joint ventures and partnerships can be equally effective. We’ve recently launched some very exciting projects with US agricultural leaders to bring cutting-edge technology to Kazakhstan and the figures involved in those ventures are even larger than the size of the Tambour deal. These are transformative projects, and that’s what makes them so exciting.” Beyond energy: Diversifying the Kazakh economy While now very much a global company, with turnover in 2018 topping one billion US dollars for the first time, Kusto remains committed to Kazakhstan, whose economy, Kunin admits, remains dependent on the extractive sectors, which leaves it vulnerable to commodity shocks. “Economic diversification is a priority,” he says, “and I’m glad to say it is one that the government is serious about addressing.” Kusto Group is playing its part and has the stated aim of making Kazakhstan a global leader in agriculture. Kunin is convinced that technology is best way to make this happen. “Our recent projects with Tyson Foods, Valmont Corporation and others to bring state-of-the-technology to Kazakhstan are, as the Kazakh Prime Minister Askar Mamin himself has said, a major step forward for the country. They bring jobs, know-how, increased efficiency, better yields, enhanced predictability and, perhaps most importantly, a commitment to sustainability that is fundamental for agriculture to succeed. By better managing and using water for example, not only do crop yields have better performance, but the entire resource is better utilised. The future in agriculture is all about sustainability and if this is not on the top of the list, this business cannot succeed. “Kazakhstan is already a major exporter of wheat – a legacy of the Soviet period – and the next step is to diversify crop exports and expand and develop Kazakhstan’s protein production, particularly beef and lamb. What is required is capital, hard work and entrepreneurs who are willing to deploy it effectively. That’s where we come in, together with our partners and the other stakeholders.” Kunin believes that technology has enormous potential to improve yields to meet growing demand, to effectively manage natural resources, and to build new jobs in Asia and elsewhere, while also making food production more sustainable. It can also help prevent and combat some of the diseases that put protein supply chains at threat, he says, before explaining why precision agriculture in particular will be paramount to Kusto’s, and Kazakhstan’s future. “Precision agriculture, which we’re championing in Kazakhstan, helps to cut down on water use and doesn’t deplete the land in the way that mechanised agriculture elsewhere does. Kazakhstan’s natural advantage of land also means its more sustainable. No forests need be cut down to support agriculture in Kazakhstan! Rather, the culture has a unique strength in land management, animal husbandry and sustainable practices towards nature,” says Kunin. Kazakhstan climbed eight places in the World Bank’s latest Ease of Doing Business Index and now sits 28th on the list. Inward investment is increasing, and Kunin believes that the country may have reached a watershed moment. “As our agriculture efforts demonstrate, the signs are positive that international investors are placing their trust in the country,” he says. “In my experience, emerging economies discover there is a threshold they need to cross before investors will place their capital in the country long-term. This requires institutional maturity in the country’s governance structures and a predictability around the rule of law that comes after long periods of stability. Kazakhstan has reached that stage. It is now the stand-out leader in this neighbourhood.”

#### Food insecurity's the most likely cause of global war.

**Lehane, 15** **(Sinéad Lehane, Research Manager at Future Directions International, 1-16-2015, accessed on 11-7-2021, *BRINK*, "Shaping Conflict in the 21st Century — The Future of Food and Water Security", https://www.brinknews.com/shaping-conflict-in-the-21st-century-the-future-of-food-and-water-security/) //D.Ying**

In his book, The Coming Famine, Julian Cribb writes that the wars of the 21st century will involve failed states, rebellions, civil conflict, insurgencies and terrorism. All of these elements will be triggered by competition over dwindling resources, rather than global conflicts with clearly defined sides. More than 40 countries experienced civil unrest following the food price crisis in 2008. The rapid increase in grain prices and prevailing food insecurity in many states is linked to the outbreak of protests, food riots and the breakdown of governance. Widespread food insecurity is a driving factor in creating a disaffected population ripe for rebellion. Given the interconnectivity of food security and political stability, it is likely food will continue to act as a political stressor on regimes in the Middle East and elsewhere. Addressing InsecurityImproving food and water security and encouraging resource sharing is critical to creating a stable and secure global environment. While food and water shortages contribute to a rising cycle of violence, improving food and water security outcomes can trigger the opposite and reduce the potential for conflict. With the global population expected to reach 9 billion by 2040, the likelihood of conflict exacerbated by scarcity over the next century is growing. Conflict is likely to be driven by a number of factors and difficult to address through diplomacy or military force. Population pressures, changing weather, urbanization, migration, a loss of arable land and freshwater resources are just some of the multi-layered stressors present in many states. Future inter-state conflict will move further away from the traditional, clear lines of military conflict and more towards economic control and influence.

#### Independently, causes refugee crises – nuclear war.

**Cribb, 19** **(Julian Cribb, distinguished science writer with more than thirty awards for journalism, 8-23-2019, accessed on 7-2-2020, *Food or War*, "6 - Food as an Existential Risk", https://sci-hub.se/https://www.cambridge.org/core/books/food-or-war/food-as-an-existential-risk/8C45279588CD572FE805B7E240DE7368) //lex dy**

In early 2018 the hands of the ‘Doomsday Clock’, maintained by the Bulletin of the Atomic Scientists, were re-set at two minutes to midnight, the highest risk to humanity that it has ever shown since the clock was introduced in 1953. This was due not only to the state of the world’s nuclear arsenal, but also to irresponsible language by world leaders, the growing use of social media to destabilise rival regimes, and to the rising threat of uncontrolled climate change (see below).12 In an historic moment on 17 July 2017, 122 nations voted in the UN for the first time ever in favour of a treaty banning all nuclear weapons. This called for comprehensive prohibition of “a full range of nuclear-weapon-related activities, such as undertaking to develop, test, produce, manufacture, acquire, possess or stockpile nuclear weapons or other nuclear explosive devices, as well as the use or threat of use of these weapons.”13 However, 71 other countries – including all the nuclear states – either opposed the ban, abstained or declined to vote. The Treaty vote was nonetheless interpreted by some as a promising first step towards abolishing the nuclear nightmare that hangs over the entire human species. In contrast, 192 countries had signed up to the Chemical Weapons Convention to ban the use of chemical weapons, and 180 to the Biological Weapons Convention. As of 2018, 96 per cent of previous world stocks of chemical weapons had been destroyed – but their continued use in the Syrian conflict and in alleged assassination attempts by Russia indicated the world remains at risk.14 As things stand, the only entities that can afford to own nuclear weapons are nations – and if humanity is to be wiped out, it will most likely be as a result of an atomic conflict between nations. It follows from this that, if the world is to be made safe from such a fate it will need to get rid of nations as a structure of human self-organisation and replace them with wiser, less aggressive forms of self-governance. After all, the nation state really only began in the early nineteenth century and is by no means a permanent feature of self-governance, any more than monarchies, feudal systems or priest states. Although many people still tend to assume it is. Between them, nations have butchered more than 200 million people in the past 150 years and it is increasingly clear the world would be a far safer, more peaceable place without either nations or nationalism. The question is what to replace them with. Although there may at first glance appear to be no close linkage between weapons of mass destruction and food, in the twenty-first century with world resources of food, land and water under growing stress, nothing can be ruled out. Indeed, chemical weapons have frequently been deployed in the Syrian civil war, which had drought, agricultural failure and hunger among its early drivers. And nuclear conflict remains a distinct possibility in South Asia and the Middle East, especially, as these regions are already stressed in terms of food, land and water, and their nuclear firepower or access to nuclear materials is multiplying. It remains an open question whether panicking regimes in Russia, the USA or even France would be ruthless enough to deploy atomic weapons in an attempt to quell invasion by tens of millions of desperate refugees, fleeing famine and climate chaos in their own homelands – but the possibility ought not to be ignored. That nuclear war is at least a possible outcome of food and climate crises was first flagged in the report The Age of Consequences by Kurt Campbell and the US-based Centre for Strategic and International Studies, which stated ‘it is clear that even nuclear war cannot be excluded as a political consequence of global warming’. 15 Food insecurity is therefore a driver in the preconditions for the use of nuclear weapons, whether limited or unlimited.

#### Nuclear war causes extinction.

Hellman 08 [Martin E. Hellman, Professor Emeritus of Electrical Engineering. Ph.D. Stanford University Electrical Engineering “Risk Analysis of Nuclear Deterrence” THE BENT OF TAU BETA PI. Spring 2008] CT [ recut by Lex CH]

Former Secretary of Defense Robert McNamara ex- pressed a similar view: “If deterrence fails and conflict develops, the present U.S. and NATO strategy carries with it a high risk that Western civilization will be destroyed” [McNamara 1986, page 6]. More recently, George Shultz, William Perry, Henry Kissinger, and Sam Nunn 4 echoed those concerns when they quoted President Reagan’s belief that nuclear weapons were “totally irrational, totally inhumane, good for nothing but killing, possibly destructive of life on earth and civilization.” [Shultz 2007] Official studies, while couched in less emotional terms, still convey the horrendous toll that World War III would exact: “The resulting deaths would be far beyond any precedent. Executive branch calculations show a range of U.S. deaths from 35 to 77 percent (i.e., 79-160 million dead) ... a change in targeting could kill somewhere between 20 million and 30 million additional people on each side .... These calculations reflect only deaths during the first 30 days. Additional millions would be injured, and many would eventually die from lack of adequate medical care ... millions of people might starve or freeze during the following winter, but it is not possible to estimate how many. ... further millions ... might eventually die of latent radiation effects.” [OTA 1979, page 8] This OTA report also noted the possibility of serious ecological damage [OTA 1979, page 9], a concern that assumed a new potentiality when the TTAPS report [TTAPS 1983] proposed that the ash and dust from so many nearly simultaneous nuclear explosions and their resultant firestorms could usher in a nuclear winter that might erase homo sapiens from the face of the earth, much as many scientists now believe the K-T Extinction that wiped out the dinosaurs resulted from an impact winter caused by ash and dust from a large asteroid or comet striking Earth. The TTAPS report produced a heated debate, and there is still no scientific consensus on whether a nuclear winter would follow a full-scale nuclear war. Recent work [Robock 2007, Toon 2007] suggests that even a limited nuclear exchange or one between newer nuclear-weapon states, such as India and Pakistan, could have devastating long-lasting climatic consequences due to the large volumes of smoke that would be generated by fires in modern megacities.

#### Water shortages cause extinction.

**Barlow, 10 (Maude Barlow, co-founder of the Blue Planet Project, 11-8-2010, accessed on 6-17-2020, *YES! Magazine*, "Advice for Water Warriors", https://web.archive.org/web/20181116072249/https://www.yesmagazine.org/planet/advice-for-water-warriors/) //lex dy**

We all know that the Earth and all upon it face a growing crisis. Global climate change is rapidly advancing, melting glaciers, eroding soil, causing freak and increasingly wild storms, and displacing untold millions from rural communities to live in desperate poverty in peri-urban slums. Almost every human victim lives in the global South, in communities not responsible for greenhouse gas emissions. The atmosphere has already warmed up almost a full degree in the last several decades and a new Canadian study reports that we may be on course to add another 6 degrees Celsius (10.8 degrees Fahrenheit) by 2100. Half the tropical forests in the world—the lungs of our ecosystems—are gone; by 2030, at the current rate of harvest, only 10 percent will be left standing. Ninety percent of the big fish in the sea are gone, victim to wanton predatory fishing practices. Says a prominent scientist studying their demise “there is no blue frontier left.” Half the world’s wetlands—the kidneys of our ecosystems—were destroyed in the 20th century. Species extinction is taking place at a rate one thousand times greater than before humans existed. According to a Smithsonian scientist, we are headed toward a “biodiversity deficit” in which species and ecosystems will be destroyed at a rate faster than nature can create new ones. We are polluting our lakes, rivers, and streams to death. Every day, 2 million tons of sewage and industrial and agricultural waste are discharged into the world’s water, the equivalent of the weight of the entire human population of 6.8 billion people. The amount of wastewater produced annually is about six times more water than exists in all the rivers of the world. A comprehensive new global study recently reported that 80 percent of the world’s rivers are now in peril, affecting 5 billion people on the planet. We are also mining our groundwater far faster than nature can replenish it, sucking it up to grow water-guzzling chemical-fed crops in deserts or to water thirsty cities that dump an astounding 200 trillion gallons of land-based water as waste in the oceans every year. The global mining industry sucks up another 200 trillion gallons, which it leaves behind as poison. Fully one third of global water withdrawals—enough water to feed the world—are now used to produce biofuels. A recent global survey of groundwater found that the rate of depletion more than doubled in the last half century. If water was drained as rapidly from the Great Lakes, they would be bone dry in 80 years. The global water crisis is the greatest ecological and human threat humanity has ever faced. Vast areas of the planet are becoming desert as we suck the remaining waters out of living ecosystems and drain remaining aquifers in India, China, Australia, most of Africa, all of the Middle East, Mexico, Southern Europe, U.S. Southwest, and other places. Dirty water is the biggest killer of children; every day more children die of water-borne disease than HIV/AIDS, malaria, and war together. In the global South, dirty water kills a child every 3.5 seconds. And it is getting worse, fast. By 2030, global demand for water will exceed supply by 40 percent—an astounding figure foretelling of terrible suffering. Knowing there will not be enough food and water for all in the near future, wealthy countries and global investment, pension and hedge funds are buying up land and water, fields and forests in the global South, creating a new wave of invasive colonialism that will have huge geo-political ramifications. In Africa alone, rich investors have already bought up an amount of land double the size of the United Kingdom. I do not think it possible to exaggerate the threat to our Earth and every living thing upon it. Quite simply, we cannot continue on the path that brought us here. Einstein said that problems cannot be solved by the same level of thinking that created them. While mouthing platitudes about caring for the Earth, most of our governments are deepening the crisis with new plans for expanded resource exploitation, unregulated free trade deals, more invasive investment, the privatization of absolutely everything, and unlimited growth. This model of development is literally killing the planet. Unlimited growth assumes unlimited resources, and this is the genesis of the crisis. Quite simply, to feed the increasing demands of our consumer-based system, humans have seen nature as a great resource for our personal convenience and profit, not as a living ecosystem from which all life springs. So we have built our economic and development policies based on a human-centric model and assumed either that nature would never fail to provide or that, where it does fail, technology will save the day.

#### Soil erosion causes extinction.

**Monbiot, 15 (George Monbiot, British writer known for his environmental and political activism., 3-25-2015, accessed on 6-17-2020, *the Guardian*, "We’re treating soil like dirt. It’s a fatal mistake, because all human life depends on it", https://www.theguardian.com/commentisfree/2015/mar/25/treating-soil-like-dirt-fatal-mistake-human-life) //lex dy**

Imagine a wonderful world, a planet on which there was no threat of climate breakdown, no loss of freshwater, no antibiotic resistance, no obesity crisis, no terrorism, no war. Surely, then, we would be out of major danger? Sorry. Even if everything else were miraculously fixed, we’re finished if we don’t address an issue considered so marginal and irrelevant that you can go for months without seeing it in a newspaper. It’s literally and – it seems – metaphorically, beneath us. To judge by its absence from the media, most journalists consider it unworthy of consideration. But all human life depends on it. We knew this long ago, but somehow it has been forgotten. As a Sanskrit text written in about 1500BC noted: “Upon this handful of soil our survival depends. Husband it and it will grow our food, our fuel and our shelter and surround us with beauty. Abuse it and the soil will collapse and die, taking humanity with it.” The issue hasn’t changed, but we have. Landowners around the world are now engaged in an orgy of soil destruction so intense that, according to the UN’s Food and Agriculture Organisation, the world on average has just 60 more years of growing crops. Even in Britain, which is spared the tropical downpours that so quickly strip exposed soil from the land, Farmers Weekly reports, we have “only 100 harvests left”. To keep up with global food demand, the UN estimates, 6m hectares (14.8m acres) of new farmland will be needed every year. Instead, 12m hectares a year are lost through soil degradation. We wreck it, then move on, trashing rainforests and other precious habitats as we go. Soil is an almost magical substance, a living system that transforms the materials it encounters, making them available to plants. That handful the Vedic master showed his disciples contains more micro-organisms than all the people who have ever lived on Earth. Yet we treat it like, well, dirt. The techniques that were supposed to feed the world threaten us with starvation. A paper just published in the journal Anthropocene analyses the undisturbed sediments in an 11th-century French lake. It reveals that the intensification of farming over the past century has increased the rate of soil erosion sixtyfold. Another paper, by researchers in the UK, shows that soil in allotments – the small patches in towns and cities that people cultivate by hand – contains a third more organic carbon than agricultural soil and 25% more nitrogen. This is one of the reasons why allotment holders produce between four and 11 times more food per hectare than do farmers. Whenever I mention this issue, people ask: “But surely farmers have an interest in looking after their soil?” They do, and there are many excellent cultivators who seek to keep their soil on the land. There are also some terrible farmers, often absentees, who allow contractors to rip their fields to shreds for the sake of a quick profit. Even the good ones are hampered by an economic and political system that could scarcely be better designed to frustrate them. This is the International Year of Soils, but you wouldn’t know it. In January, the Westminster government published a new set of soil standards, marginally better than those they replaced, but wholly unmatched to the scale of the problem. There are no penalities for compromising our survival except a partial withholding of public subsidies. Yet even this pathetic guidance is considered intolerable by the National Farmers’ Union, which greeted them with bitter complaints. Sometimes the NFU seems to me to exist to champion bad practice and block any possibility of positive change. Few sights are as gruesome as the glee with which the NFU celebrated the death last year of the European soil framework directive, the only measure with the potential to arrest our soil-erosion crisis. The NFU, supported by successive British governments, fought for eight years to destroy it, then crowed like a shedful of cockerels when it won. Looking back on this episode, we will see it as a parable of our times. Soon after that, the business minister, Matthew Hancock, announced that he was putting “business in charge of driving reform”: trade associations would be able “to review enforcement of regulation in their sectors.” The NFU was one the first two bodies granted this privilege. Hancock explained that this “is all part of our unambiguously pro-business agenda to increase the financial security of the British people.” But it doesn’t increase our security, financial or otherwise. It undermines it. The government’s deregulation bill, which has now almost completed its passage through parliament, will force regulators – including those charged with protecting the fabric of the land – to “have regard to the desirability of promoting economic growth”. But short-term growth at the expense of public protection compromises long-term survival. This “unambiguously pro-business agenda” is deregulating us to death. There’s no longer even an appetite for studying the problem. Just one university – Aberdeen – now offers a degree in soil science. All the rest have been closed down. This is what topples civilisations. War and pestilence might kill large numbers of people, but in most cases the population recovers. But lose the soil and everything goes with it. Now, globalisation ensures that this disaster is reproduced everywhere. In its early stages, globalisation enhances resilience: people are no longer dependent on the vagaries of local production. But as it proceeds, spreading the same destructive processes to all corners of the Earth, it undermines resilience, as it threatens to bring down systems everywhere. Almost all other issues are superficial by comparison. What appear to be great crises are slight and evanescent when held up against the steady trickling away of our subsistence.

#### Current ag kills bio-d.

**Raven and Wagner, 1-12** **(Peter H. Raven and David L. Wagner, \*George Engelmann Professor of Botany at Washington University, \*\*professor of ecology and evolutionary biology at the University of Connecticut, 1-12-2021, accessed on 11-3-2021, *Proceedings of the National Academy of Sciences of the United States of America*, "Agricultural intensification and climate change are rapidly decreasing insect biodiversity", https://www.pnas.org/content/118/2/e2002548117#sec-4) //D.Ying**

We have been slow to recognize that insects, too, are declining rapidly. Their losses have been documented by numerous reports from western and northern Europe (e.g., refs. 33⇓⇓⇓⇓–38)—most of which identify agricultural spread and intensification as a principal stressor. Agriculture is also the primary contributing factor in insect losses reported in California and Ohio (39, 40). Four of the papers in this collection link agriculture to insect declines. Two reports, both concerning butterflies (41, 42)—the most familiar and best assessed terrestrial insects—indicate clearly that the declines in Europe began long ago, and that they were linked to agriculture as their primary driver. Butterfly diversity in southwest Germany began declining as much as two centuries ago, and the rate of decline remained more or less constant until after World War II, when steeper rates of loss developed (35). For moths in Great Britain over the past half century, there have been increases and decreases, but two-thirds of the widespread, common species are decreasing in number (43). The long-term abundance trends in the same region have been analyzed by Bell et al. (44), who documented that moth abundances had decreased by 31% over the past five decades. Agriculture has changed greatly since World War II, when pesticides, fertilizers, and tractors became available, allowing greatly increased industrialization of farming methods. Following the war, traditional family farms gave way to commercial operations. Today’s farmlands are larger in scope than their predecessors, more apt to be monocultures, and more reliant on fertilizer, insecticide, and herbicide input. Greater emphasis is now placed on the elimination of weeds, filling ditches, and cutting down hedgerows. Low-lying wet areas are tiled to increase arable acreage. These sweeping reductions in habitat diversity and heterogeneity have left little room for wildlife in many modern-day farming operations. To a degree, Europe has maintained the traditional character of its farms by importing a great deal of its food, while North America, where large fields are the mode, is a major food exporter. As Europe moves forward with agricultural “reform,” however, the preservation of biodiversity is likely to become increasingly difficult (45). In all parts of the world, agricultural intensification seems to be a prime driver in insect population declines (9, 10), although climate change is also playing an increasingly important role in the process of extinction. As this situation develops, we should keep in mind the reciprocal importance of biodiversity for successful agriculture in providing pollination services, and many other ways as well (ref. 46 provides a timely review of this area). Grasslands and prairies worldwide have been converted into croplands and plantations. As a result of this extensive conversion, grassland habitats and their autochthonous biota have become one of the most threatened biomes on the planet. The tallgrass prairie of central North America once extended from Manitoba to northern Texas, covering some 60 million hectares. Less than a tenth of this ecosystem remains; virtually all of the remainder has been given to agriculture. The grasslands, open fields, and vernal pools of the Central Valley of California have been converted into some of the most productive farmlands anywhere in the world. Parallels occur across Europe’s anthropogenic grasslands—the product of centuries of unmechanized, low intensity agriculture—following their post-World War conversion to industrialized agriculture. The insect faunas of grasslands are experiencing elevated rates of loss. Taxa that are especially diverse in these ecosystems include butterflies and noctuid moths (Lepidoptera); ants, bees, and wasps (Hymenoptera); scarab and ground beetles (Coleoptera); crickets, grasshoppers, and katydids (Orthoptera); leaf and plant hoppers, seed bugs, and their kin (Heteroptera). Of these, only butterflies have been well studied; across Europe, grassland butterflies rank among the most imperiled insects (35, 36, 47, 48). There also have been increasing numbers of reports of declines of wild bees, again mostly from northwestern Europe (33, 38, 49, 50). The importance of maintaining pollinator diversity can scarcely be overexaggerated: The value of wild and managed bee pollination to global crop production was estimated as $518 billion per annum (51). Agricultural intensification was identified as the principal threat to bees and their ecosystem services in the studies cited above. Likely the fate of butterflies and bees is indicative of most grassland lineages. Grasshoppers in particular (52), perhaps because of their susceptibility to tilling practices, appear to be faring poorly. Ironically, the Rocky Mountain locust, at one time believed to be one of the most abundant and destructive insects on the planet, was the first insect known to have been driven to extinction in the New World (53). Two recent studies also link bat declines to modern agriculture (54, 55). Not surprisingly, the insectivorous birds of grasslands are among the most rapidly declining bird guilds (56, 57). In general, it is clear for birds in the United States and worldwide that populations and species are disappearing rapidly, with decreases in insect abundance potentially contributing to their declines (58, 59). In the tropics, the clearing of forests for crops, pasture, and wood fuel is proceeding at alarming rates in Central Africa, Central America, many parts of South America, and Southeast Asia (Fig. 1). Between 2001 and 2015, an average of 5 million acres of tropical forest were lost annually to industrial-scale agriculture (16, 60). In 2018, 12 million acres of tropical forest were cleared, one-third of which mapped as previously intact primary forest (61). Deforestation on larger scales has the potential to change local and regional weather and, in particular, alter rainfall patterns (62, 63). Given that the great majority of insect species diversity is found in tropics (64), deforestation there surely ranks among the greatest threats to the world’s insect biodiversity. With probably less than 15% of tropical insects named as yet, it seems certain that the tropical insect species that are being driven to extinction by anthropogenic stressors will never be seen by any human before they pass into oblivion. Where spreading and increasingly intense agriculture is not a significant factor, climate change is starting to play a primary role in driving insects, along with most other kinds of organisms, to extinction. Two recent reports from Costa Rica document steep declines of Lepidoptera from lowland and cloud forests (65, 66). Given the apparent fragility of many ecosystems, including tropical rainforests, in the face of climate change, we may expect widespread extinction there even where forests remain standing. It is urgent that we find ways to come together and collectively arrest climate change soon if we are to stem losses from the Earth’s great cradles of diversity and global ecosystem function; e.g., the planet’s tropical forests.

#### Bio-d loss causes extinction and acts as a threat multiplier.

**Torres, 16** **(Phil Torres, affiliate scholar at the Institute for Ethics and Emerging Technologies, 4-11-2016, accessed on 12-2-2020, *Bulletin of the Atomic Scientists*, "Biodiversity loss: An existential risk comparable to climate change", https://thebulletin.org/2016/04/biodiversity-loss-an-existential-risk-comparable-to-climate-change/) //lex dy**

Such considerations warrant decoupling biodiversity loss from climate change, because the former has been consistently subsumed by the latter as a mere effect. Biodiversity loss is a distinct environmental crisis with its own unique syndrome of causes, consequences, and solutions—such as restoring habitats, creating protected areas (“biodiversity parks”), and practicing sustainable agriculture. The sixth extinction. The repercussions of biodiversity loss are potentially as severe as those anticipated from climate change, or even a nuclear conflict. For example, according to a 2015 study published in Science Advances, the best available evidence reveals “an exceptionally rapid loss of biodiversity over the last few centuries, indicating that a sixth mass extinction is already under way.” This conclusion holds, even on the most optimistic assumptions about the background rate of species losses and the current rate of vertebrate extinctions. The group classified as “vertebrates” includes mammals, birds, reptiles, fish, and all other creatures with a backbone. The article argues that, using its conservative figures, the average loss of vertebrate species was 100 times higher in the past century relative to the background rate of extinction. (Other scientists have suggested that the current extinction rate could be as much as 10,000 times higher than normal.) As the authors write, “The evidence is incontrovertible that recent extinction rates are unprecedented in human history and highly unusual in Earth’s history.” Perhaps the term “Big Six” should enter the popular lexicon—to add the current extinction to the previous “Big Five,” the last of which wiped out the dinosaurs 66 million years ago. But the concept of biodiversity encompasses more than just the total number of species on the planet. It also refers to the size of different populations of species. With respect to this phenomenon, multiple studies have confirmed that wild populations around the world are dwindling and disappearing at an alarming rate. For example, the 2010 Global Biodiversity Outlook report found that the population of wild vertebrates living in the tropics dropped by 59 percent between 1970 and 2006. The report also found that the population of farmland birds in Europe has dropped by 50 percent since 1980; bird populations in the grasslands of North America declined by almost 40 percent between 1968 and 2003; and the population of birds in North American arid lands has fallen by almost 30 percent since the 1960s. Similarly, 42 percent of all amphibian species (a type of vertebrate that is sometimes called an “ecological indicator”) are undergoing population declines, and 23 percent of all plant species “are estimated to be threatened with extinction.” Other studies have found that some 20 percent of all reptile species, 48 percent of the world’s primates, and 50 percent of freshwater turtles are threatened. Underwater, about 10 percent of all coral reefs are now dead, and another 60 percent are in danger of dying. Consistent with these data, the 2014 Living Planet Report shows that the global population of wild vertebrates dropped by 52 percent in only four decades—from 1970 to 2010. While biologists often avoid projecting historical trends into the future because of the complexity of ecological systems, it’s tempting to extrapolate this figure to, say, the year 2050, which is four decades from 2010. As it happens, a 2006 study published in Science does precisely this: It projects past trends of marine biodiversity loss into the 21st century, concluding that, unless significant changes are made to patterns of human activity, there will be virtually no more wild-caught seafood by 2048. Catastrophic consequences for civilization. The consequences of this rapid pruning of the evolutionary tree of life extend beyond the obvious. There could be surprising effects of biodiversity loss that scientists are unable to fully anticipate in advance. For example, prior research has shown that localized ecosystems can undergo abrupt and irreversible shifts when they reach a tipping point. According to a 2012 paper published in Nature, there are reasons for thinking that we may be approaching a tipping point of this sort in the global ecosystem, beyond which the consequences could be catastrophic for civilization. As the authors write, a planetary-scale transition could precipitate “substantial losses of ecosystem services required to sustain the human population.” An ecosystem service is any ecological process that benefits humanity, such as food production and crop pollination. If the global ecosystem were to cross a tipping point and substantial ecosystem services were lost, the results could be “widespread social unrest, economic instability, and loss of human life.” According to Missouri Botanical Garden ecologist Adam Smith, one of the paper’s co-authors, this could occur in a matter of decades—far more quickly than most of the expected consequences of climate change, yet equally destructive. Biodiversity loss is a “threat multiplier” that, by pushing societies to the brink of collapse, will exacerbate existing conflicts