SMALL IS BEAUTIFUL

SOVIET CLASSICAL AND AMERICAN ИИVEЯTED TOTALITARIANISM IN THE MALTHUSIAN CENTURY AND THE POST-GROWTH PARADIGM

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28 FEBRUARY 2017

DECLARATION

I declare that, to the best of my knowledge and belief in accordance with the policies of the University of Auckland, this dissertation is my own work, all sources have been properly acknowledged to the full extent of my indebtedness, and the assignment contains no plagiarism. I further declare that I have not previously submitted this work or any version of it for assessment in any other Department of Faculty or for any award offered by the University of Auckland, its partner institutions, or any other institution. I further declare that I understand the plagiarism policy of the University of Auckland and the Department of Political Studies, including the penalties for which I am liable should my work be found to contain plagiarised material.

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ABSTRACT

Experts warn that agro-techno-industrial civilisation has overshot the planetary carrying capacity, and that further growth is therefore undesirable, and will soon become impossible as the limits to growth and technological development are reached around mid-century, whereafter civilisation will contract or collapse as crises of growth and development emerge and converge, absent the unforeseeable, hence the Malthusian Century. This thesis aims to answer the research question of which inversion of totalitarianism delineated by Sheldon Wolin's inverted totalitarianism framework, Soviet classical or American inverted totalitarianism, is more advantageous, if not more viable or appealing, in terms its relative ability to avoid or mitigate the unmanageable, and prepare for and manage the unavoidable in the Malthusian Century, as well as its inherent compatibility with, and ability to adapt to, the post-growth paradigm of the new millennium, as assessed through the lenses of neo-Malthusianism, environmental and happiness economics. Its findings are that Soviet classical totalitarianism failed to produce growth and development remotely comparable to American inverted totalitarianism, and collided with structural and organisational limitations long before hitting planetary boundaries, tending to stagnate in the vicinity of the thresholds above which further development is unsustainable and additional wealth does not correlate with increased wellbeing, and would consequently have generated such crises more gradually, if at all, allowing additional time to avoid the unmanageable and manage the unavoidable both rapidly and totalistically; moreover, many of its systemic failings turned into paradoxical advantages during collapse; finally, the post-Cold War trajectories of Cuba and North Korea demonstrate that Soviet classical totalitarianism is capable of surviving crises comparable to those expected during the Malthusian Century, and of contracting into comparatively sustainable, collapse-proof, and stationary states well-adapted for the post-growth paradigm, the like of which American inverted totalitarianism has no obvious parallel. The central conclusion of this thesis is that Soviet classical totalitarianism is the overwhelmingly more advantageous inversion of totalitarianism considered within its framework for the Malthusian Century and the post-growth paradigm, as assessed through its applied theoretical optics, even if it is not the most viable or appealing of the dyad, nor the only advantageous development model available, or indeed the best, most viable, or most appealing.

PREFACE

I wish to acknowledge and express my gratitude for the support, encouragement, and patience of my supervisor, Dr Geoff Kemp, without whose insight and counsel these ideas would not have evolved into their final form, and without whose confidence and faith this thesis would never have materialised. I would also like to express my deepest gratitude and thanks to my mother and father, Jillian and Linus Kent, without whose faith, encouragement, and support, these ideas would not have been put to paper at all. I also wish to extend a hand of gratitude to the rest of my family, Elliot, Jon, and everyone else whose invaluable support helped pull me through this project.

The thesis that agro-techno-industrial civilisation will reach the limits to growth and collapse in the current century, and that the Soviet Union now offers a more advantageous development model than the United States for the post-growth paradigm of the new millennium, is tantamount to heresy in most academic and social circles, no doubt on account of its iconoclastic implications, and the process of forming and articulating this hypothesis has been an uphill battle. The riddles of the Malthusian Century have wrapped my thoughts in nihilistic paradoxes inside eschatological *enigmata* which I have long laboured to unravel and decipher, with mixed success. The psychological tribulations of reconciling the interdependent and intersecting paradoxes, counterfactuals, counterintuitions, contradictions, inversions, incongruities, anomalies, and Catch-22s of Soviets in the Malthusian Century, over and above the spiritual endeavour of coming to terms with the iconoclasm and nihilism of my conclusions, have exceeded the limitations of both my sanguinity and intelligence; regrettably, the pessimism of my intellect has surmounted the optimism of my will. At the same time, this intro- and extrospection has expanded my mind and horizons to include new concepts and possibilities, and I am very proud to attach my name to their culmination. My only regret is that so much had to be left out for the sake of brevity, but of course, *small is beautiful*. The reader is urged not to overlook the figures, maps, and photographs located in the Appendix: they tell the story of the Malthusian Century for more compellingly than me. The conclusions of this thesis were reached with great reluctance, and I hope that history will someday, somehow prove me wrong.

For Gaia *and* Uranus
Mother Earth and Father Sky
Your children have gone astray
May ours forgive us….

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One path leads to despair and utter hopelessness; the other, to total extinction.
Let us pray we have the wisdom to choose correctly.

— *Woody Allen*[1]

INTRODUCTION

Following their conjoint defeat of fascism in the Second World War, the Cold War was waged between the victorious ideologies of democracy and capitalism on the one hand, championed by the liberal democratic capitalist United States (US), and communism and central planning on the other, championed by the totalitarian Marxist-Leninist Soviet Union (SU).[1] The Autumn of Nations and the dissolution of the SU marked a paradigmatic shift in the academic discourse on political and economic theory: at one end of the spectrum, Francis Fukuyama declared that liberal democracy had become the final, perfected form of human government, and 'the end of history' had arrived; at the other, Ravi Batra upheld that both communism *and* capitalism would eventually collapse, and the political theorist Sheldon Wolin began to contrast 'collapsed communism' with 'uncollapsed capitalism'.[2]

In his inverted totalitarianism thesis, Wolin conceptualises the emerging forms of corporate capitalism and managed democracy in the post-Cold War US, and elsewhere in the West, as the symmetrical 'inversion' of Soviet and Nazi classical totalitarianism, wherein economic actors dominate their political counterparts instead of the reverse, and aspirations to totality are driven by the ideology of the cost-effective rather than communism or fascism.[3] This thesis applies the inverted totalitarianism theoretical framework to distinguish, compare, and contrast SU-style communism and central planning from contemporary US-style democracy and capitalism (referred to as Soviet classical totalitarianism and American inverted totalitarianism, or some variant thereof, unless otherwise indicated, hereafter), as well as to assess their relative advantages and disadvantages in the current millennium. Current political and economic theories were formulated during an anomalous and transient historical period of stratospheric growth and technological revolution which is now coming to an end, and agro-techno-industrial civilisation is set to face a very different

[1] Opening quotation from: Woody Allen, *Side Effects* (New York: Random House, 1980), 35; James R. Arnold and Roberta Wiener, eds. *Cold War: The Essential Reference Guide* (Santa Barbara, CA: ABC-CLIO, 2012), ix-xxxi.
[2] Francis Fukuyama, *The End of History and the Last Man* (New York: Free Press, 1992), *et al.*; Ravi Batra, *The Coming Revolution Against Political Corruption and Economic Chaos* (New York: St. Martin's Press, 2007), *et al.*; Ravi Batra, *The Downfall of Capitalism and Communism: A New Study of History* (London: Macmillan, 1978), *et al.*; Ravi Batra, *The Downfall of Capitalism and Communism: Can Capitalism Be Saved?* (Dallas, TX: Venus Books, 1990), *et al.*; Sheldon Wolin, *Politics and Vision: Continuity and Innovation in Western Political Thought* (Princeton, NJ: Princeton University Press, 2004), 565-566.
[3] Ibid., Wolin, 590-636; Sheldon S. Wolin, *Democracy Incorporated: Managed Democracy and the Specter of Inverted Totalitarianism* (Princeton, NJ: Princeton University Press, 2010), *et al.*

set of challenges in the present century.[4] Whereas democracy and capitalism were well-adapted to thrive in this brief epoch of sustained growth, they fare poorly in times of crisis, contraction, or collapse, as many of their advantages devolve into inadvertent liabilities. Contrariwise, communism and central planning were ill-adapted to compete in this era of growth, but proved well-prepared and well-adapted to function in times of crisis, contraction, and collapse, such as during the Second World War, and following the dissolution of the SU itself, when many of the system's systemic failures turned into paradoxical advantages.

Political and economic theorists, environmentalists, agronomists, climate scientists, biologists, oceanographers, geologists, astronomers, trends forecasters, futurists, neo-Malthusians, and others warn that the human population and agro-industrial civilisation have overshot the planetary carrying capacity, and will collide with the limits to growth and development sometime around mid-century, beginning to contract or collapse thereafter as emerging crises of exponential growth and development culminate and converge, absent some unforeseeable paradigm shift such as wartime mobilisation, or a technological miracle like free energy. These include the breakdown of the Green Revolution and a Malthusian catastrophe, the depletion of planetary non-renewable mineral and energy reserves, and the consequent breakdown of globalisation, irreversible or runaway dangerous climate change and mass extinction, the increased potential for pandemics, global conflict, or nuclear Armageddon, as well as a host of other hypothesised technological and cosmic global catastrophic risks, hence the 'Malthusian' century. By now, many, if not most of these prognoses are alarmingly mainstream not only within the scientific community, but also in public and political discourse, and although there are many proposals to address or separately mitigate these crises, just a small handful of cornucopians and technological optimists such as Julian Simon and Bjørn Lomborg even attempt to mollify trepidation by downplaying the gravity and urgency of the human predicament.[5]

These impending crises have been and are being largely triggered by the actions and inaction of the inverted totalitarian US-led capitalist world order, which is poised to bear the brunt of their consequences this century. This raises the counterfactual and hypothetical questions of the relative

[4] Richard Heinberg, *The End of Growth: Adapting to Our New Economic Reality* (Gabriola Island, BC, Canada: New Society Publishers, 2011), 1-2, 10-11.

[5] Ibid., 186; for further discussion of such proposals, see p. 74-75; for further reading on the conclusions of Simon and Lomborg, see: Bjørn Lomborg, *The Skeptical Environmentalist: Measuring the Real State of the World* (Cambridge, UK: Cambridge University Press, 2001), *et al.*; Julian L. Simon, *The Ultimate Resource* (Princeton, NJ: Princeton University Press, 1981), *et al.*; Julian L. Simon, *The Ultimate Resource 2* (Princeton, NJ: Princeton University Press, 1996), *et al.*

extent to which the foremost ideological competitor of US democracy and capitalism in the last century, Soviet classical totalitarian communism, would or could (have) produce(d) the global catastrophic risks posed by unchecked growth and development. Would Soviet classical totalitarianism, either by design or perchance, (have) be(en) more capable of avoiding the unmanageable, managing the unavoidable, preparing for the Malthusian Century, and adapting to the post-growth paradigm of the new millennium than American inverted totalitarianism has been and will be? Counterfactuals and hypotheticals like these have been criticised, yet any discussion of historical causality contains inherent counterfactuals, since arguments for and against historical actions must be implicitly or explicitly contrasted with alternatives and inaction, oftentimes with real world implications, though speculative historiography is academic for the most part.[6] It is necessary to consider counterfactuals in addition to hypotheticals for the purposes of this analysis, however, since past actions such as greenhouse gas emissions or resource overexploitation have already contributed to the cumulative crises of growth and development expected to intersect in the Malthusian Century. Nevertheless, despite the inherent complexity and abstraction of counterfactuals and hypotheticals, the research question of this thesis can be condensed and simplified to: Between the two totalitarian candidates considered within its applied framework, Soviet classical totalitarianism and American inverted totalitarianism, which is the more *advantageous*, if not the more viable or appealing, in view of the causes and expected conditions of the Malthusian Century, and the realities of the post-growth paradigm?

Its aim is to determine the relative advantageousness of each development model in the context of the Malthusian Century and the new millennium, as assessed through the optics of neo-Malthusianism, environmental and happiness economics, with a view to identifying the better 'Malthusian candidate' therefrom, in terms its societal blueprint's comparative ability to avoid or mitigate the unmanageable, and prepare for and manage the unavoidable in the Malthusian Century, as well as its inherent compatibility with, and ability to adapt to, the post-growth paradigm. The crux of its arguments is straightforward: the human population and agro-industrial civilisation have *already* exceeded the carrying capacity of this planet by some margin; consequently, the ability of any given socioeconomic or -political system to produce further growth and development, the traditional indicators of success, is no longer relevant since additional growth is no longer desirable, and will

[6] For further reading, see: Aviezer Tucker, "Historiographical Counterfactuals and Historical Contingency" *Theory and History*, Vol. 38, Issue No. 2 (May, 1999): 145-279, http://www.onlinelibrary.wiley.com/.

inevitably become impossible, sooner rather than later. Instead, what is now needed is a development model that embraces the objective of growth, which is evidently central to *Homo Sapiens*' evolutionary psychology, yet fails to produce it past a sustainable threshold, above which further increases in income and consumption do not translate into consequent increases in wellbeing, and one which also excels at controllably and equitably managing crises, contraction, and collapse. It is for this reason that this thesis takes its name from the *small is beautiful* movement of the economist, jurist, and political scientist Leopold Kohr, who opposed what he described as the 'cult of bigness', of which American inverted totalitarianism has been perhaps the most loyal, and certainly the most successful follower and devotee.[7]

Its findings are that Soviet classical totalitarianism produced an initial burst of rapid industrialisation, growth, and development, which invariably stagnated in the vicinity of the abovementioned threshold for sustainability, above which additional income and wellbeing no longer correlate, long before the emergence and convergence of crises of exponential growth and development on a national or global scale due to the inherent structural and organisation limitations of its development model, which could not produce anything comparable to the stratospheric growth and development which are the hallmarks of American inverted totalitarianism. Moreover, Soviet classical totalitarianism is better-prepared and better-adapted for the conditions expected during the Malthusian Century, as many of its failures become counterintuitive advantages during collapse; finally, its authoritarian political structures and centrally-planned economic model are better-equipped to recognise and rapidly address oncoming crises by totalistically diverting labour and resources by swift decree, and without the prerequisite of popular or bipartisan support. In view of these findings, and the preponderance of evidence, the central conclusion of this thesis is that Soviet classical totalitarianism is the overwhelmingly better Malthusian candidate, and far more advantageous for the conditions of the Malthusian Century than American inverted totalitarianism, if for the sole reason that it produced less growth and development, as assessed through the optics of neo-Malthusianism and environmental economics, but also because it was inadvertently better-prepared for collapse, and could operate in a sustainable, stationary state, the like of which American inverted totalitarianism has no equal, which is highly-adaptive in the context of the post-growth paradigm.

[7] E. F. Schumacher, *Small Is Beautiful: A Study of Economics As If People Mattered* (London: Blond & Briggs, 1973), *et al.*; Leopold Kohr, *The Breakdown of Nations* (London: Routledge & Kegan Paul, 1986), *et al.*

At this juncture, it must be emphasised that living under American inverted totalitarianism would no doubt be more appealing than living under Soviet classical totalitarianism for most, and no ends can justify such horrors as the Great Purge, the gulag archipelago, or the Holodomor.[8] Nevertheless, as Clive Hamilton analogises, 'An alcoholic would prefer more drinks, but we don't measure their wellbeing by the number of drinks they have.'[9] In the context of neo-Malthusianism, environmental and happiness economics, it cannot be assumed that what individuals, societies, states, or ideologies prefer, or what is practical and realistic, is necessarily *advantageous* for these same individuals, communities, states, or even for the planet itself, as the tyranny of small decisions and the tragedy of the commons phenomena caution. What may appear advantageous in the short-term can be unsustainable and cumulatively catastrophic in the long-run, and when comparing the unthinkable and the impossible, which the framing and parameters of this thesis are in general terms, the former is axiomatically the most advantageous, and indeed the *only* option of that particular dyad, even if it is not the most advantageous option among all of the others that may be available. It is not, therefore, the contention of this thesis that Soviet classical totalitarianism is either more appealing or viable, in terms of its realistic implementation, than American inverted totalitarianism in the Malthusian Century and beyond, but rather that it is the more *advantageous* of this particular dyad, as assessed through the abovementioned theoretical optics, even if it is not the *only* or the *most* advantageous economic and/or political system for the Malthusian Century and the post-growth paradigm. The conclusions drawn herein should thus be taken more as an indictment of American inverted totalitarianism than as an endorsement of Soviet classical totalitarianism, which has a definite dark side, and is by no means the ideal system for the new millennium, yet does stand out for its historical prominence, its crisis-management abilities, and its failure to produce growth and development in the long-run, particularly in juxtaposition with American inverted totalitarianism.

The central prescription of this thesis is as straightforward as it is not: agro-industrial civilisation must immediately begin to contract into a sustainable, stationary state as rapidly as possible, by any humane means necessary, perhaps selectively drawing upon the experiences and lessons of the communist *Götterdämmerung* for insight and guidance, though by no means exclusively. Its central prediction, however, is that human civilisation in general, and the inverted totalitarian

[8] For further reading, see: Anne Applebaum, *Gulag: A History of the Soviet Camps* (New York: Doubleday, 2003), *et al.*; Halyna Hryn, ed., *Hunger by Design: The Great Ukrainian Famine and Its Soviet Context* (Boston, MA: Harvard University Press, 2005), *et al.*; Robert Conquest, *The Great Terror: A Reassessment*, 40th Anniversary Edition (Oxford: Oxford University Press, 2008), *et al.*

[9] Hamilton, *Growth Fetish*, 12.

world in particular, will continue on their present trajectory, which has essentially been set in stone since the 1980s, or even earlier, and will therefore accelerate into the inevitable limits to growth and development on this planet full-throttle, depleting its natural resources and devastating its biosphere, perhaps irrecoverably for all human intents and purposes, absent the unforeseeable.[10] Historians and archaeologists of the future may thus reflect upon the Cold War triumph of American inverted totalitarianism over Soviet classical totalitarianism as the pivotal error of human history.

The remainder of the content of this thesis is organised as follows. The first chapter outlines the inverted totalitarianism thesis, which is applied herein as a theoretical optic through which to distinguish and juxtapose the objects of its comparative analysis in order to focus upon and assess their relative advantageousness in the context of the Malthusian Century and the post-growth paradigm; critical engagement with Wolin as a political theorist extends beyond the scope and purposes of this thesis, however. The subsequent chapter outlines the origins, nature, scope, and scale of the crises of growth and development, as well as other potential global catastrophic risks, which are either expected to, or have the potential to emerge and/or converge during the Malthusian Century, and explores *Homo Sapiens*' unshakeable fixation with growth in view of the reality that infinite growth in a finite environment is fundamentally unsustainable, and the human population and agro-industrial civilisation are already in overshoot. This chapter draws upon the work of neo-Malthusians such as Dennis Meadows, Richard Duncan, Albert Bartlett, and Richard Heinberg, peak oil theorists and commentators like M. King Hubbert, Colin Campbell, Matthew Simmons, and Kenneth Deffeyes, environmentalists such as William Catton and Richard Manning, social critics and activists like Clive Hamilton, James Kunstler, Lierre Keith, and Michael Ruppert, economists such as Jeff Rubin and Timothy Jackson, scientists like James Hansen and Donald Kessler, and many others from a wide variety of fields and backgrounds.[11]

The next chapter explores the economic and demographic trajectories of Soviet classical and American inverted totalitarianism in the context of overshoot and the post-growth paradigm, concluding that the SU and its satellites collided with structural and organisational limits to growth and development long before hitting national or planetary limits, and tended to stagnate at the threshold above which further increases in income no longer correlate with wellbeing, and increased consumption rates are no longer sustainable; moreover, Soviet classical totalitarianism could operate

[10] Heinberg, *End of Growth*, 152.
[11] For further details, see the Bibliography.

in a stationary or even collapsing state, whereas growth is prerequisite for the success of American inverted totalitarianism, and crises of its making are systemic culminations rather than mere fortuity; accordingly, such crises would (have) emerge(d) more gradually under Soviet classical totalitarianism, if they did so at all, allowing additional time for the development and implementation of prevention, preparation, and mitigation measures; finally, the chapter concludes that Soviet classical totalitarianism is better-equipped to address emerging crises of growth and development by totalistically diverting resources by decree, and without the prerequisite of popular support, making it the overwhelmingly more advantageous inversion of totalitarianism for the Malthusian Century as such.

The penultimate chapter investigates the case study of the SU collapse, concluding that Soviet classical totalitarianism was more self-sufficient, resilient, better-prepared, and better-adapted for crises, contraction, collapse, and the post-growth paradigm than American inverted totalitarianism, and would likely have had a softer landing in the Malthusian Century, as many of its systemic failures became inadvertent and paradoxical advantages in such contexts, whereas the advantages held by American inverted totalitarianism during the growth era are poised to become equally inadvertent and paradoxical liabilities in the post-growth paradigm. The content and conclusions of this chapter overlap with the work of engineer and social critic Dmitry Orlov on superpower collapse theory; however, whereas Orlov's research focuses upon the hypothetical experience of a future US economic, political, and societal collapse in juxtaposition with the SU's historical experience, this thesis takes a more holistic approach, assessing the relative advantageousness of each system, as delineated by the inverted totalitarianism framework, not only during the experience of collapse itself, but also their comparative capability and likelihood of producing the preconditions for collapse in the first place, as well as their relative long-term potential as development models in the post-growth paradigm of the new millennium.[12]

The final chapter examines the case studies of Cuba and North Korea, the final bastions of the Soviet classical totalitarian sociopolitical *and* -economic model, in the post-Cold War era. Following the Soviet collapse, each regime endured a succession of crises broadly comparable to those expected during the Malthusian Century, without undergoing consequent societal, political, or

[12] For an overview of Orlov's work on superpower collapse theory, see: Dmitry Orlov, *Reinventing Collapse: The Soviet Experience and American Prospects* (Gabriola Island, BC, Canada: New Society Publishers, 2008), *et al.*; Dmitry Orlov, *The Five Stages of Collapse: Survivors' Toolkit* (Gabriola Island, BC, Canada: New Society Publishers, 2013), *et al.*

demographic collapse. The chapter concludes that Soviet classical totalitarianism proved capable not only of surviving such catastrophes relatively intact in Cuba and North Korea, compared to the dire predictions of neo-Malthusians and other futurists, but also of contracting into a sustainable, stationary, and collapse-proof state well-adapted for the post-growth paradigm. For these reasons, the experiences of the SU, Cuba and North Korea, during and following their respective collapses, as well as Soviet classical totalitarianism in general, may be re-examined, re-assessed, or even emulated by imploding and collapsed societies in the Malthusian Century and beyond. This thesis develops its arguments cumulatively, and closes with a summary of its conclusions and prescriptions. Supplementary figures, tables, maps, and photographs are located in the Appendix, where they are numbered in order of their reference, and the Bibliography contains a list of sources.

CHAPTER I

SOVIET CLASSICAL AND AMERICAN INVERTED TOTALITARIANISM

The American, Soviet and Nazi ideologies and societal blueprints have been compared and contrasted between and among one another extensively in the literature. Hannah Arendt, Francois Furet, Richard Pipes, Michael Geyer, Daniel Singer, and others have implicitly or explicitly described communism and fascism in general, and the Nazi and Soviet regimes in particular, as totalitarian twins.[13] The inverted totalitarianism thesis, which was first outlined by Wolin in his 2004 work of political theory *Politics and Vision: Continuity and Innovation in Western Political Thought*, and further expanded upon in his award-winning 2008 book *Democracy Incorporated: Managed Democracy and the Specter of Inverted Totalitarianism*, underscores the combinations of contrasting, yet not conflicting, totalising dynamics shared between the classical totalitarian twins, the SU and Nazi Germany, on the one hand, and the emerging postmodern form of totalitarian government in the US, and elsewhere in the Western World: corporatocracy and managed democracy, on the other.[14] At this juncture, it must be underscored that critical engagement with Wolin as a political theorist extends beyond the scope and purposes of this thesis, which applies his inverted totalitarianism framework as a system of nomenclature and theoretical lens through which to focus on the similarities and differences, and thereby the relative advantages and disadvantages, of the Soviet and American varieties of democratic capitalism and centrally-planned communism in the context of the Malthusian Century and the new millennium, which is its central objective, and the application of the inverted totalitarianism theoretical framework herein is justified as such.

At one end of the totalitarian spectrum, the SU employed a top-down, centrally-planned, single-party classical totalitarian communist system, which dominated all economic actors, maintaining a rigid command economy with direct and totalistic control over every facet of social and economic life from top to bottom, aspiring to the total political mobilisation of the population, emphasising democratic centralism over pluralism, egalitarianism over élitism, investment over

[13] Daniel Singer, "The Sound and the Furet" *The Nation* (Jan. 1, 1998), http://www.thenation.com/; Michael Geyer and Sheila Fitzpatrick, eds., *Beyond Totalitarianism: Stalinism and Nazism Compared* (Cambridge: Cambridge University Press, 2009), *et al.*; Pipes, *Communism*, 103-105.
[14] Wolin, *Politics of Vision*, 590-636, *et al.*; Wolin, *Democracy Incorporated*, *et al.*

consumption, industry over agriculture, farming over services, employment over productivity, and prioritising rapid industrialisation and heavy industry by means of long-term, centralised and scientific economic planning. On the other end of the spectrum, the US employs a free market, bipartisan, capitalist system, dominated from the bottom up by its predominant economic actors, the corporatocracy, which seeks totalistic commoditisation, economic rationalisation, and privatisation, emphasising democratic pluralism over centralism, élitism over egalitarianism, consumption over investment, services over agriculture and industry, productivity over employment, and prioritising globalisation, downsizing, immigration, outsourcing, insourcing, and the progressive dismantlement of the welfare state; political apathy is fostered and democracy managed.[15]

Counterintuitively, this emergent postmodern synergy of political and economic power, Wolin argues, is not the antithesis of classical totalitarianism, but rather its totalitarian antipode, or even its inversion. 'It is Nazism turned upside-down, "inverted totalitarianism",' according to Wolin, who defines this concept as:

> … an expansive system of powers that accepts no limits other than those it chooses to impose on itself. Its system blends the political authority of the 'democratic state', *de jure* power, with the powers represented by the complex of modern science-technology and corporate capital. The distinctive element that these *de facto* powers contribute to [it] is a dynamic (from the Greek *dynameis*, or powers), a driving force. They are cumulative, continually evolving into new forms, self-revivifying. Their effect is to change significantly the lives not only in the 'homeland' but in near and distant societies as well.[16]

Whereas politics trumped economics in the classical totalitarian SU and Nazi Germany, where economic actors were controlled by the central government, Wolin argues the opposite to be the case in inverted totalitarianism:

> The economic rules all domains of existence, while governance is concentrated upon stabilising functions and political containment at home and abroad. The unity of theory and practice is ironically realised in the optical illusion of all utopias: in uncollapsed and totalising capitalism, no-one seems able to see a 'beyond'. Consequently the notion of an alternative appears irrational.[17]

The subordination of economic actors to state control was by far the most totalistic in the centrally-planned SU, which employed a sequence of Five-Year Plans and various sub-plans to

[15] Wolin, *Politics and Vision*, 590-636.
[16] Ibid., 23, 622.
[17] Ibid., 597.

mastermind every aspect of the formal economy; nevertheless, big landowners and industrialists in Nazi Germany were analogously subservient to the framework of the Four Year Plan in peacetime and the total war economy in the years that followed.[18] In the inverted totalitarian US, on the other hand, Wolin reflects that politics and the national agenda are increasingly dominated by economic actors:

> The most revealing inversion lies in the relationship of organised capitalism to the regime. German 'big business' was eventually subordinated to state control. In the US, however, corporate power has become predominant in the political establishment, in the ideology that permeates upper echelons, in the making of policy, and in the councils of the major political parties. While Nazi ideology, epitomised in the demand for Lebensraum, was the driving force behind the quest for empire (Reich), inverted totalitarianism is powered by the ever-expanding power made available by the integration of science and technology into the economy of capitalism.[19]

Wolin points out the irony that:

> Life in the highly integrated advanced capitalist societies became more economically determined and its politics, popular culture, education, and intellectual life more subordinate to economic mandates and imperatives, in short, more 'Marxist' than allegedly Marxist states…. Uncollapsed capitalism embodies many of the features that Marx had assumed to be peculiarly communist while reversing others….[20]

In this vein, the private ownership of property, production and investment (but not personal property) was replaced with collective ownership in the SU, and the middle classes were crushed. Private property remained a revocable, non-inherent right in Nazi Germany, and, quite the inverse, the right to own property is a basic human right in the US.[21]

The domination of political actors by their economic counterparts in inverted totalitarianism is achieved through the 'technologisation of politics': the strategic deployment of special interest and focus groups, lobbyists, political contributions, and scientific PR techniques by the corporatocracy, whose interests and objectives are further growth, profit, privatisation, immigration, government subsidies, tax breaks, and the continuation of the business-as-usual *status quo*.[22] This has further malformed the arts of political manipulation into a corporate science, all in the apparent context of

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[18] John P. McKay, Bennett D. Hill, and John Buckler, *A History of Western Society, Volume I* (Boston, MA: Houghton Mifflin, 2006), 957; Philippe J. Bernard, *Planning in the Soviet Union* (Oxford: Pergamon Press, 1966), 66-67.
[19] Wolin, *Politics and Vision*, 623-624.
[20] Ibid., 597.
[21] Pipes, *Communism*, 103-105.
[22] Wolin, *Politics and Vision*, 591.

liberal democracy and *laissez faire* capitalism.[23] Where the classical totalitarian SU and Nazi Germany embraced the ideologies of Marxist-Leninist communism and Nazi fascism as their respective philosopher's stones, the ideology of profit has been erected into the sacred cows of US inverted totalitarianism, which views natural resources and human lives alike through the prisms of economic rationalisation and totalistic commoditisation.[24] Wolin concludes that although inverted totalitarianism 'is [also] a system that aspires to totality, it is driven by an ideology of the cost-effective rather than of a "master race" *(Herrenvolk*), by the material rather than the "ideal".'[25] The US consequently achieved much higher rates of economic growth, and a far higher average standard of living than the SU, but although neither system was able to eradicate poverty (where the SU had breadlines, the US has food stamps), only the Soviet welfare state managed to essentially eradicate unemployment and destitution.[26] Nevertheless, Soviet classical and American inverted totalitarianism both aspired to accelerate economic and technological growth to the limits of their development by depleting their natural resource bases as rapidly as possible (David Brower describes this strategy as 'strength through exhaustion'), and the Cold War was first and foremost an ideological conflict over which system could produce more growth, as Hamilton observes:

> Socialist countries too were smitten by growth. The Cold War ideological divide was not about the desirability of economic growth. On that all agreed. What they disagreed about was which system of economic organisation … could generate more growth. 'Scientific socialists' set out to prove that a properly planned and managed economy based on collective ownership of the means of production could surpass capitalism in improving the standard of living of ordinary people. It could do so because the people would be working for themselves, rather than being exploited, and because a socialist system could avoid the crippling economic crises that were integral to capitalism.[27]

Needless to say, history has proven that it could not.

Pursuant to their common objective of sustained growth, the classical totalitarian SU and inverted totalitarian US pursued diametrically-opposing economic policies, which produced radically-different outcomes for their respective labour forces.[28] Prior to the emergence of

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[23] Phrasing adapted from: Wolin, *Politics and Vision*, 591.
[24] Wolin, *Democracy Incorporated*, 27, 44-69, 134-142, 195; Wolin, *Politics and Vision*, 591, 622.
[25] Ibid., *Politics and Vision*, 622.
[26] Dmitry Orlov, "Post-Soviet Lessons for a Post-American Century" *From the Wilderness* (Jun. 1, 2005): 13, http://www.fromthewilderness.com/. Paginated in single-space 12-point Times New Roman font.
[27] David Brower quoted in: Albert A. Bartlett, "Arithmetic, Population and Energy: Sustainability 101," Department of Physics, University of Colorado, Boulder, Boulder, CO (2002), Lecture; Hamilton, *Growth Fetish*, 6.
[28] Orlov, *Reinventing Collapse*, 60-61.

neoliberal inverted totalitarianism in the US, its Gilded Age wealth gap had narrowed during the mid-twentieth century Great Compression, before widening dramatically in the post-1980 Great Divergence, and now exceeds the Pareto distribution, ranking among the most unequal developed societies in modern times (see fig. 1. Wealth Shares in the US, 1913-2012).[29] The domination of the corporatocracy and the short-termist inverted totalitarian ideal of the cost-effective have had the effect of concentrating wealth, incentivising downsizing, outsourcing, and mass immigration as a source of cheap labour, as well as the progressive dismantlement of the residual Great Society era welfare state with pension reductions and the privatisation of social security.[30] In contrast, the SU adopted a more long-term, self-reliant, and egalitarian approach: wealth inequality was minimal (although a ruling élite, the *nomenkalutra*, did exist, and should not be deemphasised), money could buy little of value, and housing, healthcare, and education were all free.[31] The workforce was entirely self-sufficient, with a surplus of skilled labour for export, and the education system was commendable. At the primary and secondary levels, the SU achieved in eight years what the US' education system does in twelve; moreover, students were not burdened by crippling student loan debt at the tertiary level, and higher education oftentimes even paid a stipend alongside free room and board; nor was tertiary education prerequisite for employment, as qualification inflation is gradually making so in the US.[32]

The SU had low rates of immigration and emigration, and overseas travel was exceptionally difficult for most until *perestroika* and *glasnost*; at times, entire categories of the population were systemically transferred and resettled, and entire nationalities, ethnic groups, and social classes were deported in some cases.[33] Foreign broadcasts were jammed, and, like the prototypical Berlin Wall, much of the border was heavily-fortified with everything from walls, electric fences, barbed wire, motion sensors and alarms to anti-vehicle ditches, watchtowers, Czech hedgehogs, fakir beds,

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[29] Fig. 1. Wealth Shares in the US, 1913-2012. Graph adapted from: --, "Wealth Inequality" *Institute for Policy Studies* (2017), http://inequality.org/; Claudia Goldin and Robert A. Margo, "The Great Compression: The Wage Structure in the United States at Mid-Century" *The Quarterly Journal of Economics*, Vol. 107, No. 1 (Feb., 1992): 1-3, http://www.jstor.org/; Timothy Noah, "The Great Divergence" *Slate* (Oct. 9, 2014), http://www.slate.com/.

[30] Wolin, *Politics and Vision*, 591, 622.

[31] Orlov, *Reinventing Collapse*, 28, 54-55, 64-66, 70.

[32] Ibid., 24, 28, 60-61, 64, 74-77.

[33] George Ginsburgs, *The Citizenship Law of the USSR* (The Hague, Netherlands: Martinus Nijhoff Publishers, 1983), 301-305; Jessica Reinisch and Elizabeth White, *The Disentanglement of Populations: Migrations, Expulsion and Displacement in Postwar Europe, 1944-9* (New York: Palgrave Macmillan, 2011), 29-41; Nikolai Bougai, *The Deportation of Peoples in the Soviet Union* (New York: Nova Science Publishers, Inc., 1996), *et al.*; Philip M. Taylor, *Global Communications: Internal Affairs and the Media since 1945* (London: Routledge, 1997), 51; Vladimir Shlapentokh, Eric Shiraev, and Eero Carroll, eds., *The Soviet Union: Internal and External Perspectives on Soviet Society* (New York: Palgrave Macmillan, 2008), 119, 130.

mantraps and minefields.[34] In contrast, the US has the fastest-growing population in the industrialised world, mostly on account of immigration, despite every major survey since the 1940s finding a majority in favour of its reduction.[35] During this time, illegal immigration has more than quadrupled, particularly during both Bush administrations, becoming a central theme of the 2016 presidential election, one outcome of which will be the erection of a barrier along stretches of the hitherto largely-unprotected US-Mexican border.[36] High-wage manufacturing jobs have been outsourced while low-wage service jobs and skilled-labour positions have been insourced.[37] There is freedom of internal and international movement, the recent Executive Order 13769 notwithstanding, and the US boasts the world's largest tourism industry by gross earnings, and second-largest by number of visitors.[38]

Whereas the SU and Nazi Germany sought to totalistically politicise every aspect of their populations' lives with mass games, rallies, parades, propaganda films, artwork, music, and so forth, the inverted totalitarian US political elite and corporatocracy collude to depoliticise the electorate and foster a state of political apathy.[39] In contrast with the extensive political participation and mobilisation expected of Soviet and Nazi citizens, even voting is not mandatory in the US, and voter turnout rates have been in decline since the late nineteenth century, and particularly since the 1960s (see fig. 2. US Voter Turnout Rates, 1828-2012).[40] Wolin concludes that:

> Where the Nazis strove to give the masses a sense of collective power and confidence … the inverted totalitarian regime promotes a sense of weakness, collective futility that culminates in the erosion of the democratic faith, in political apathy and the privatisation of the self. Where the Nazis wanted a continuously mobilised society that would support its masters without complaint, and

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[34] Taylor, *Global Communication*, 51; Gordon L. Rottman, *The Berlin Wall and the Intra-German Border, 1961-69* (London: Bloomsbury Publishing, 2012), 32-42.
[35] Heinberg, *End of Growth*, 214; Robert W. Fox and Ira H. Mehlman, *Crowding Out the Future: World Population Growth, U.S. Immigration, and Pressures on Natural Resources* (Washington, DC: Federation for American Immigration Reform, 1992), 3.
[36] Ibid., Heinberg, 214; Julie Hirschfeld Davis, "Trump Orders Mexican Border Wall to Be Built and Is Expected to Block Syrian Refugees" *The New York Times* (Jan. 25, 2017), http://www.nytimes.com/.
[37] Orlov, "Post-Soviet Lessons," 13; Paul Davidson, *Interpreting Keynes for the 21st Century: Volume 4: The Collected Writings of Paul Davidson* (New York: Palgrave Macmillan, 2007), 296.
[38] --, "UNWTO Tourism Highlights, 2016 Edition" *United Nations World Tourism Organisation* (2016): 6, http://www.e-unwto.org/; Stephen Crowley, "Full Executive Order Text: Trump's Action Limiting Refugees Into the U.S." *The New York Times* (Jan. 27, 2017), http://www.nytimes.com/.
[39] Wolin, *Democracy Incorporated*, 92-96; Wolin, *Politics and Vision*, 584-586, 624.
[40] Fig. 2. US Voter Turnout Rates, 1828-2012. Graph adapted from: Thomas Plank, "They Marched with Torches: Getting out the Vote, 1840-1900" *The National Museum of American History* (Feb. 29, 2016), http://americanhistory.si.edu/; Wolin, *Democracy Incorporated*, 92-94; Wolin, *Politics and Vision*, 584-586.

> enthusiastically vote 'yes' at the managed plebiscites, the elite of inverted totalitarianism wants a *politically* demobilised society that hardly votes at all.[41]

Whereas the corrupt, entrenched, and sometimes even dynastic communist and Nazi parties held a constitutional monopoly on political power in classical totalitarian Nazi Germany, the SU and its socialist allies, the arguably corrupt, entrenched, and sometimes even dynastic Democratic and Republican parties hold a *de facto* duopoly on political power in the inverted totalitarian US, which has been compared to a choice of placebos versus a bitter pill.[42] Each party is often indistinguishable from the other on matters of policy, save for 'safe' and comparatively inconsequential issues, often sexual or reproductive, such as abortion, birth control, stem-cell research, and gay marriage, but also immigration and gun control, yet seldom national geopolitical and -strategic grand strategy, energy policy, or sustainable development, and absolutely never population control.[43] Politicians are beholden to their corporate sponsors, whose objectives they further: economic growth, wealth concentration, downsizing, outsourcing, and the progressive dismantlement of the welfare state; short-term planning and self-interest dominate the inverted totalitarian system.[44] In contrast to the SU and Nazi Germany, where political dissent was harshly repressed, US inverted totalitarian democracy is so well-managed by its symbiotic political and economic actors, that dissent is mostly inconsequential and is therefore allowed.[45]

One notable direct similarity between classical and inverted totalitarianism is their parallel deployment of gigantic and totalistic propaganda apparatuses (which in the US corporatocracy includes scientific-industrial commercial advertising) in order to inculcate their populations with their respective ideologies, and each erected its national flag, anthem, colours, symbology, iconography and ethos into something of a fetish.[46] The trio progressively homogenised and genericised their landscapes with distinct brands of totalitarian architecture: Soviet constructivist and Stalinist architecture, Nazi neoclassical architecture, and corporate architecture in what has been

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[41] Quoted in: Chris Hedges, "Shut Down the Democratic National Convention" *Truthdig* (Jun. 5, 2016): 2, http://www.truthdig.com/.
[42] Dmitry Orlov, "Closing the 'Collapse Gap': The USSR Was Better Prepared for Collapse than the US" *Energy Bulletin* (Dec. 4, 2006): 20, http://www.energybulletin.net/; Orlov, *Reinventing Collapse*, 84-86.
[43] Ibid., Bartlett, "Arithmetic, Population and Energy," Lecture.
[44] Orlov, "Closing the 'Collapse Gap'," 20; Orlov, *Reinventing Collapse*, 85; Wolin, *Democracy Incorporated*, 27, 64-54, 195; Wolin, *Politics and Vision*, 591, 623-624.
[45] Ibid., Orlov, "Closing the 'Collapse Gap'," 20.
[46] Orlov, "Post-Soviet Lessons," 10; Wolin, *Politics and Vision*, 594-595.

termed the 'United States of Generica'.[47] In contrast with the classical totalitarian SU and Nazi Germany, where this propaganda effort was highly-centralised and state-controlled, highly-concentrated media corporations hold an analogous monopoly on political discourse in the inverted totalitarian US, where just six corporations control 90 per cent of all media output, down from fifty in 1983.[48] This is a microcosm of the broader concentration of corporate wealth and political power into fewer and fewer hands in inverted totalitarianism, which places the national agenda and grand strategy in the hands of a small handful of economic entities, which dominate the political élite.[49] If such trends continue, their inevitable culmination would seem to be the emergence of a single megacorporation in coalition with a single entrenched political party holding a joint total monopoly on every aspect of economic and political life; parallels with the SU and Nazi Germany hardly need labouring.

The trio employed distinctive carrot-and-stick approaches to keeping their populations motivated and compliant. In the inverted totalitarian US, housing is mostly privatised, healthcare is not universal, and prices and salaries fluctuate with the national and global economic climate; furthermore, because everything is commoditised, it is virtually impossible to live outside the formal economy (as any Freegan can no doubt attest), and employment is effectively mandatory.[50] In inverted totalitarian meritocracies, and, to a lesser extent in Nazi Germany, the dreams of avarice and fame realised through hard work serve as carrots, while the spectres of unemployment, destitution and homelessness are the stick which keeps the totalitarian behemoth going and growing. Whereas classical totalitarianism maintained order with force, inverted totalitarianism does so with fear.[51] In contrast with the US, the SU provided social security in an absolute sense with universal healthcare, free education and housing, fixed salaries and prices, as well as guaranteed employment and pensions.[52] The not insignificant material rewards and prestige of joining the *nomenklatura*, in concert with a comprehensive system of medals and awards, served as this classical totalitarian

[47] For further reading, see: Alexei Tarkhanov, Sergei Kavtaradze, and Mikhail Anikst, *Architecture of the Stalin Era* (New York: Random House Incorporated), *et al.*; Jochen Thies, *Hitler's Plans for Global Domination: Nazi Architecture and Ultimate War Aims* (New York: Berghahn Books, 2014), 99-103; Orlov, *Reinventing Collapse*, 32.
[48] Ashley Lutz, "These 6 Corporations Control 90% Of The Media In America" *Business Insider Australia* (Jun. 14, 2012), http://www.businessinsider.com.au/; Wolin, *Democracy Incorporated*, 92-96; Wolin, *Politics and Vision*, 584-586, 624-625.
[49] Wolin, *Democracy Incorporated*, 92-96; Wolin, *Politics and Vision*, 584-586, 591, 622-625.
[50] For further reading, see: Frederic P. Miller, Agnes F. Vandome, and John McBrewster, *Freeganism: Anti-consumerism, Dumpster Diving, Portmanteau, Veganism, Anti-globalization Movement, Environmentalist, Diggers (Theatre), Anarchism, Street Theatre, Simple Living, Permaculture* (Saarbrücken, Germany: Alphascript Publishing, 2009), *et al.*
[51] Phrasing adapted from: Orlov, *Reinventing Collapse*, 143.
[52] Ibid., 24, 54-57, 72, 74-77; Orlov, "Post-Soviet Lessons," 13.

system's much less enticing carrot.[53] As their stick, the Stalinist SU and Nazi Germany made full use of the spectres of detention, slavery, violence, torture, and execution. In the post-Stalin era, however, this was mostly restricted to ritual *samokritika* (self-criticisms), as well as the political abuse of psychology; nevertheless, each totalitarian triplet utilised mass incarceration and the death penalty to ensure order and mass conformity to its social norms.[54]

Broadly speaking, the classical totalitarian SU was radically progressive for its time, and was an early trailblazer and innovator in most fields of the totalitarian endeavour, yet Nazi Germany and later the US eventually caught up with, and in many cases even surpassed it in scope and scale.[55] From a feminist perspective, the SU pioneered the dual wage-earner household in lieu of the male breadwinner model, to which Nazi Germany and the US grudgingly turned a blind eye during the Second World War, yet which eventually became the wage norm in the postwar US parallel with the emergence of the feminist movement (see fig. 3. The Rise of Dual Income US Households, 1960-2012).[56] Divorce, abortion, and birth control were made widely available during the 1920s, when the SU underwent its sexual revolution; in contrast, abortion was a capital offence in Nazi Germany except in eugenic contexts, and was not fully-legalised in the US until the landmark 1973 *Roe v. Wade* decision.[57] Soviet women were able to serve in the military in all capacities and combat roles, whereas they served only as auxiliaries in Nazi Germany; in the US, women were permitted to serve

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[53] Gordon Tullock, *Economic Hierarchies, Organization and the Structure of Production* (New York: Spring Science+Business Media, LLC, 1992), 166-167; Pipes, *Communism*, 65-66, 78-79, 85-86.

[54] Tullock, *Economic Hierarchies*, 166-167; Eliot Slater, "Russia's Political Hospitals: The Abuse of Psychiatry in the Soviet Union" *Journal of Medical Ethics*, Vol. 4, No. 2 (Jun., 1978): 100-101, http://www.ncbi.nlm.nih.gov/; Gregory S. Parks and Matthew W. Hughey, eds., *The Obamas and a (Post) Racial America?* (Oxford: Oxford University Press, 2011), 18; Juliane Fürst, *Stalin's Last Generation: Soviet Post-War Youth and the Emergence of Mature Socialism* (Oxford: Oxford University Press, 2010), 105-106; Pipes, *Communism*, 82.

[55] Orlov, *Reinventing Collapse*, 25.

[56] Fig. 3. The Rise of Dual Income US Households, 1960-2012. Graph adapted from: --, "The Rise in Dual Income Households" *Pew Research Center* (Jun. 18, 2015), http://www.pewresearch.org/; Bernard A. Cook, ed., *Women and War: A Historical Encyclopedia from Antiquity to the Present, Volume 1* (Santa Barbara, CA: ABC-CLIO, 2006), 227-229; Emily Yellin, *Our Mothers' War: American Women at Home and at the Front During World War II* (New York: Free Press, 2004), 377-384; Richard Stites, *The Women's Liberation Movement in Russia: Feminism, Nihilism, and Bolshevism, 1860-1930* (Princeton, NJ: Princeton University Press, 1978), 392-400; Stanislaw J. Frankowski and George F. Cole, eds., *Abortion and Protection of the Human Fetus: Legal Problems in a Cross-Cultural Perspective* (The Hague, Netherlands: Martinus Nijhoff Publishers, 1987), 243.

[57] Homosexuality was legalised, but was subsequently recriminalised during the Stalin era. Frankowski and Cole, *Abortion and Protection*, 241-243; Henry W. Morton and Robert C. Stuart, *The Contemporary Soviet City* (Armonk, NY: M. E. Sharpe, Inc., 1984), 73; Jane E. Hodgson, *Abortion and Sterilization: Medical and Social Aspects* (London: Academic Press, 1981), 9; Jeffrey Weeks, *Sex, Politics and Society: The Regulations of Sexuality Since 1800*, Third Edition (London: Routledge, 2012), 236; for further reading, see: Marian Faux, *Roe v. Wade: The Untold Story of the Landmark Supreme Court Decision That Made Abortion Legal*, Updated Edition (New York: Cooper Square Press, 2001), *et al.*

in all combat roles only as recently as 2016.[58] Further to gender equality, the internationalist Marxist-Leninist SU embraced full racial equality and miscegenation from its inception, in contrast with the genocidal white supremacism of Nazi Germany, and the institutionalised racism of slavery and segregation in the US. Unlike the Russian Empire or even other American colonies such as Brazil, the US maintained comprehensive anti-miscegenation laws until 1964, and it remains relatively uncommon to this day.[59] Institutionalised racism continues unofficially yet systemically, as civil rights litigator and legal scholar Michelle Alexander contends in her 2010 book *The New Jim Crow: Mass Incarceration in the Age of Colorblindness*, and many communities continue to segregate themselves along racial (and often ethnic) as well as socioeconomic lines, evidently, at least in part, as a matter of preference.[60]

In his own juxtaposition of the postwar totalitarian antipodes, Orlov notes that 'the SU and US were either the winner or first runner-up of the Space Race, arms race, jails race, hated evil empire race, squandering of natural resources race, and bankruptcy race.'[61] In the Space Race, both the SU and US expanded upon the Nazis' wartime innovations in rocket and missile technology: *Sputnik* and Yuri Gagarin gave the SU an early lead, which was eventually eclipsed by the US' Apollo moon landings; nevertheless, Russia and China have held a duopoly on manned-spaceflight since the retirement of the US Space Shuttle in 2011.[62] In the prewar arms race, the SU was first to begin rearming with its military-oriented Five-Year Plans, followed by Nazi Germany and its military-oriented Four Year Plan, and finally by the US, which abstained from rearmament until as late as 1940.[63] Despite this, its military-industrial complex was second-to-none by the war's end, and held a total monopoly on atomic weaponry. In the Cold War nuclear arms race that followed, the US held

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[58] Anna Krylova, *Soviet Women in Combat: A History of Violence on the Eastern Front* (Cambridge: Cambridge University Press, 2010), *et al.*; Gordon Williamson, *World War II German Women's Auxiliary Services* (New York: Bloomsbury, 2012), 3-4; John E. Bowlt and Olga Matich, eds., *Laboratory of Dreams: The Russian Avant-garde and Cultural Experiment* (Stanford, CA: Stanford University Press, 1996), 64; Matthew Rosenberg and Dave Philipps, "All Combat Roles Now Open to Women, Defense Secretary Says" *The New York Times* (Dec. 3, 2015), http://www.nytimes.com/.

[59] Orlov, *Reinventing Collapse*, 76-78.

[60] Michelle Alexander, *The New Jim Crow: Mass Incarceration in the Age of Colorblindness* (New York: The New Press, 2010), *et al.*; Orlov, *Reinventing Collapse*, 22.

[61] Ibid., Orlov, 24.

[62] Annie Jacobsen, *Operation Paperclip: The Secret Intelligence Program to Bring Nazi Scientists to America* (New York: Little, Brown and Company, 2014), ix; Deborah Cadbury, *Space Race: The Epic Battle Between America and the Soviet Union for Dominion of Space* (London: HarperCollins, 2005), *et al.*; John Cromwell, *Hitler's Scientists: Science, War, and the Devil's Pact* (New York: Viking Press, 2003), *et al.*; Pasquale M. Sforza, *Manned Spacecraft Design Principles* (Amsterdam, Netherlands: Elsevier, 2015), 9.

[63] Joshua Muravchik, *Heaven on Earth: The Rise and Fall of Socialism* (New York: Encounter Books, 2002), 165; Mark Harrison, "Resource mobilization for World War II: the U.S.A., U.K., U.S.S.R., and Germany, 1938-1945" *Economic History Review*, Vol. 41, No. 2 (1998): 174-175, http://onlinelibrary.wiley.com/.

a substantial initial lead until its nuclear stockpile and delivery systems were eventually worsted by the SU in the mid-1970s (see fig. 4. Estimated Global Nuclear Warhead Inventories, 1945-2016).[64] In the conventional arms race, the US' air and naval forces generally retained a numerical and technological advantage over the Soviets', whose ground forces were correspondingly superior, at least numerically. Although the SU's nuclear and conventional forces declined precipitously following its collapse, Russia retains a slight lead over the US in the ongoing nuclear arms race, and their combined arsenals constitute 93.4 per cent of the global nuclear stockpile (see fig. 5. Estimated Global Nuclear Warhead Inventories, 2017).[65]

In the jails race, the SU was first and Nazi Germany the worst in the endeavour of mass incarceration: each constructed an archipelago of internment and even concentration camps, and employed forced and slave labour.[66] Wolin addresses the obvious objection to his framework that inverted totalitarianism has no parallel to the Soviets' and Nazis' use of torture, concentration camps, and other instruments of terror.[67] Notwithstanding the US' ongoing use of torture, as well as its historical experiences with slavery, segregation, genocide, and unethical human experimentation, it is true that its partially-privatised prison-industrial complex does not approach the brutality or mortality rates of its SU and Nazi counterparts, yet is comparable in scale, with more than 7.2 million Americans in jail, on probation, or on parole, including 2.2 million behind bars, nearly one-quarter of the global prison population, at the highest documented rate in the world (Russia ranks a distant second).[68] The US' incarceration rate of 738 per 100,000 (see fig. 6. The Imprisoner's Dilemma: The Growth of US Mass Incarceration, 1880-2014) is comparable to the Nazis' prewar rate of 793 per 100,000, as well as the Soviets' peak rate of roughly 800 per 100,000 at the apex of the Great Purge, and dwarfs Apartheid South Africa's rate of 368 per 100,000.[69] Wolin cautions that

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[64] Fig. 4. Estimated Global Nuclear Warhead Inventories, 1945-2016. Graph adapted from: Hans M. Kristensen and Robert S. Norris, "Status of World Nuclear Forces" *Federation of American Scientists* (Jan. 31, 2017), http://fas.org/.

[65] Fig. 5. Estimated Global Nuclear Warhead Inventories, 2017. Graph adapted from: Ibid.; Michael Shermer, *The Moral Arc: How Science and Reason Lead Humanity Toward Truth, Justice, and Freedom* (New York: Henry Holt and Company, 2015), 65.

[66] Applebaum, *Gulag: A History*, *et al.*; Richard J. Evans, *The Third Reich at War* (New York: Penguin Group, 2008), 87-90.

[67] Wolin, *Politics and Vision*, 622.

[68] The incarceration rate of North Korea may be higher, but is unknown. Oliver Roeder, "The Imprisoner's Dilemma" *FiveThirtyEight* (Feb. 12, 2015), http://fivethirtyeight.com/; Parks and Hughey, eds., *(Post) Racial America?*, 18.

[69] Fig. 6. The Imprisoner's Dilemma: The Growth of US Mass Incarceration, 1880-2014. Graph adapted from: Ibid., Roeder; Heather MacDonald, *The War on Cops: How the New Attack on Law and Order Makes Everyone Less Safe* (New York: Encounter Books, 2016), 45; Parks and Hughey, eds., *(Post) Racial America?*, 18; Roy Walmsley, "World Prison Population List" *International Centre for Prison Studies*, Tenth Edition (Nov. 21, 2013): 3, 5, http://www.prisonstudies.org/. For further reading on the Native American genocide and what has been described as the US' genocide in the Philippines, as well as instances of unethical human experimentation in US history, see: David E. Stannard, *American Holocaust: The Conquest of*

inverted totalitarianism 'may, and will, exploit its workers without duplicating the Nazi system of inefficient slave labour,' yet parallels may be drawn between slave labour in the SU and Nazi Germany, and the exploitation of inmates as a source of near slave-wage labour by the US' prison-industrial complex.[70]

The SU, and later Nazi Germany, pioneered bugging, wire-tapping, secret police forces, and mass surveillance, yet the US' modern surveillance state makes their efforts look amateurish by comparison. East Germans would joke: 'How can you tell that the *Stasi* has bugged your apartment?' 'There's a new cabinet in it, and a trailer with a generator in the street!'[71] Whereas even the avant-garde *Stasi* could only wiretap four-thousand telephone lines simultaneously in the mid-1970s, the Edward Snowden revelations and Cablegate have exposed the US National Security Agency's efforts to record and index not only all domestic telephone and email correspondence, but the rest of the world's as well, up to and including UN officials and foreign leaders.[72] While video surveillance was rare in the classical totalitarian Soviet *bloc*, closed-circuit television is becoming increasingly prevalent in the inverted totalitarian West, and there is now one surveillance camera for every eleven citizens in the trailblazing UK.[73]

In the hated-evil-empire race, Nazi Germany was the first and worst champion, followed by the SU during the Cold War, and finally by the US in its absence. The SU, US, and Nazi Germany each engaged in overt and covert foreign regime change actions in furtherance of their ideological and geostrategic ambitions, which in each case included the world domination of their respective ideologies and societal blueprints, and much of which has been widely resented worldwide.[74] Anti-American sentiment has predictably increased in the post-Cold War era, and international polling regularly places the US ahead of North Korea as the greatest threat to world peace.[75] During the

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the New World (Oxford: Oxford University Press, 1992), *et al.*; E. San Juan, Jr, *U.S. Imperialism and Revolution in the Philippines* (Hampshire, UK: Palgrave Macmillan, 2007), xiv-xvi; Susan E. Lederer, *Subjected to Science: Human Experimentation in America before the Second World War* (Baltimore, MD: The Johns Hopkins University Press, 1995), *et al.*

[70] Orlov, "Post-Soviet Lessons," 7; Wolin, *Politics and Vision*, 622.

[71] Hans-Ulrich Stoldt and Klaus Wiegrefe, "Humor Under Communism: East German Jokes Collected by West German Spies" *Spiegel Online* (Oct. 14, 2009), http://www.spiegel.de/.

[72] Andrei Soldatov and Irina Borogan, *The Red Web: The Struggle Between Russia's Digital Dictators and the New Online Revolutionaries* (New York: PublicAffairs, 2015), 82; Robert Booth and Julian Borger, "US diplomats spied on UN leadership" *The Guardian* (Nov. 28, 2010), http://www.theguardian.com/.

[73] David Barrett, "One surveillance camera for every 11 people in Britain, says CCTV survey" *The Telegraph* (Jul. 10, 2013), http://www.telegraph.co.uk/.

[74] Wolin, *Politics and Vision*, 592-594, 622-623.

[75] Eric Brown, "In Gallup Poll, The Biggest Threat To World Peace Is ... America?" *International Business Times* (Jan. 2, 2014), http://www.ibtimes.com/; Orlov, *Reinventing Collapse*, 24.

Cold War, and against all odds, the SU managed to spread its Marxist-Leninist ideology to Eastern Europe, and later to China, Southeast Asia, Africa, and elsewhere; by the 1980s, more than one-third of the human population lived in the communist *bloc*.[76] Wolin argues that the declaration of the *Global* War on Terror was a watershed event in the inverted totalitarian US' embrace of the idea of empire, concluding that its worldwide establishment of military bases in exchange for financial aid and economic reconstruction imitates the Soviets' earlier efforts, and its eponymously global scope invites comparisons to the totalistic Marxist objective of the world revolution.[77]

One notable difference, however, is that the SU was the first and only colonial empire in the history of civilisation to run its operation at a net loss, pouring aid, low-interest or interest-free loans, blueprints and schematics, specialists and scientists, as well as modern technology and weaponry into its failing satellites and allies.[78] Lawrence Weschler has observed that 'Soviet dominion was in fact that unique historical perversity, an empire in which the centre bled itself for the sake of its colonies, or rather, for the sake of tranquillity in those colonies. Muscovites always lived poorer lives than Varsovians.'[79] Wolin observes that the dynamics of inverted totalitarianism are 'far stronger than those of earlier empires [*i.e.*, the SU and Nazi Germany] because it is conjoined with the dynamics of globalising capitalism. … [It] represents a drive towards totality that draws from the setting where liberalism and democracy have been established for more than two centuries.'[80]

In the squandering-of-natural-resources race, materialistic US consumerism is the all-time world champion: the average American consumes 90 kilogrammes of products and nearly 7,000 litres of freshwater each day, and with just five per cent of the world population, the US accounts for roughly one-quarter of global resource and energy consumption.[81] The second section of the third chapter will contend that these historically unprecedented high levels of consumption have failed to make the US population any happier or more satisfied, perhaps even the reverse, and can only but be described as the greatest squandering of natural resources in human history, not to mention the proximate cause of the crises of growth and development expected during the Malthusian Century. In the bankruptcy race, the SU finished first when the burden of maintaining

[76] Nicholas Eberstadt, "Population Aspects of Communist Countries" *Encyclopedia of Population* (Jan. 1, 2003), http://www.aei.org/.
[77] Wolin, *Politics and Vision*, 593.
[78] Noam Chomsky, *Deterring Democracy* (New York: Random House, 2011), 366; Orlov, "Post-Soviet Lessons," 13.
[79] Quoted in: Chomsky, *Deterring Democracy*, 366.
[80] Wolin, *Politics and Vision*, 622.
[81] Anthony D. Barnosky and Elizabeth A. Hadly, *End Game: Tipping Point for Planet Earth?* (London: William Collins, 2015), 24, 89; Ben Mah, *China and the World: Global Crisis of Capitalism* (Bloomington, IN: iUniverse, 2011), 22, 97.

its overseas empire, surveillance state, and massive military- and prison-industrial complexes racked up unsustainable foreign debts and trade deficits against the backdrop of low oil prices and peak domestic production, which eventually drove the nation to financial insolvency.[82] Today, cheap credit, low savings rates, a falling currency, trade deficits, declining energy security, overseas interventions, nation-building, and its expensive military- and prison-industrial complexes, have stricken the US with mounting and unsustainable debts and structural deficits, which are slowly but surely bankrupting the greatest debtor nation in history.[83] Archetypically, whereas the SU had one bankrupt government-owned airline, the US has a fleet of perpetually bankrupt government-subsidised airlines.[84] The US' national debt has passed the US$20 trillion mark, or 120 per cent of its GDP, and total debt, including private and business debt, has surpassed $66 trillion.[85] It has been argued that these debts are now mathematically impossible to repay, and since, by their very nature, debts cannot forever outgrow the incomes that service them, as they have done since 1965 in the US, President Reagan's 'shining city on a hill' is on track to make history for the largest default ever.[86]

In summary, Sheldon Wolin's inverted totalitarianism hypothesis postulates that, although their inversion and symmetry are not absolute, communism and capitalism in general, and their Soviet and American incarnations in particular, represent the antipodes of the same totalitarian agro-techno-industrial civilisation: classical and inverted totalitarianism, respectively.[87] This thesis applies the inverted totalitarianism theoretical framework to distinguish SU-style communism and central planning from the emerging forms of US-style democracy and capitalism, as well as to assess their relative advantages and disadvantages. The following chapter will explore the origins, nature, scope, and scale of the emerging crises of growth and development which are set to intersect during the Malthusian Century.

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[82] Orlov, "Post-Soviet Lessons," 3, 7, 12-14.
[83] Orlov, *Reinventing Collapse*, 24-25.
[84] Ibid., 25.
[85] Jeff Cox, "With Dow 20K passed, $20 trillion on the national debt is next" *CNBC* (Jan. 25, 2017), http://www.cnbc.com/; John Mauldin, "This Looming Crisis Could Ruin Many" *Forbes* (Nov. 23, 2016), http://www.forbes.com/.
[86] Heinberg, *End of Growth*, 58-59. Orlov, *Reinventing Collapse*, 25.
[87] Wolin, *Democracy Incorporated*, 44-69, 134-142; Wolin, *Politics and Vision*, 590-636.

CHAPTER II

THE MALTHUSIAN CENTURY

SECTION I

EXPONENTIAL GROWTH AND THE GROWTH FETISH

In his 1798 *magnum opus*: *An Essay on the Principle of Population*, Thomas Malthus observed that population growth tended to be exponential, whereas food production growth tended to be arithmetical, or linear.[88] Malthus's consequent calculations and predictions of overpopulation proved inaccurate in the short- and medium-term: he did not anticipate the new hybrid crop varieties, mechanisation, or scientific-industrial agriculture of the Green Revolution.[89] Nevertheless, just because one calculation is wrong, it does not follow that all calculations are wrong, or that the central premise of Malthusianism is unsound: exponential growth *cannot* be sustained against a finite or even linearly growing resource base, or in a finite or linearly growing environment.[90] The physicist Albert Bartlett posited that 'The greatest shortcoming of the human race is our inability to understand the exponential function,' which Benjamin Franklin, John Maynard Keynes, and Albert Einstein all (at least allegedly) called 'the eighth wonder of the world'.[91]

Homo Sapiens instinctively tend to assume that change occurs linearly, whereas societal, macroeconomic, and global changes tend to develop exponentially, where each increment of growth is a percentage of all the preceding growth (see fig. 7. Linear vs. Exponential Growth).[92] Eventually, after a constant increment of time determined by the rate of growth, the growing quantity doubles, and the resulting quantity doubles yet again after another equal increment of time, if the growth rate can be sustained; though the rate may be low, the cumulative total eventually passes the 'knee' of its growth curve, and, like a sorcerer's apprentice, rapidly becomes stratospheric.[93] In a real-world scenario, if a non-renewable resource base like oil were steadily exponentially depleted to its halfway

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[88] Thomas Malthus, *An Essay on the Principle of Population* (London: J. Johnson, 1798), *et al.*
[89] Heinberg, *End of Growth*, 156.
[90] Ibid.; Bartlett, "Population, Arithmetic and Energy," Lecture.
[91] Ibid., Bartlett; Suzy Black, *Faith & Finance: Creating Godly Wealth in a Worldly System* (Camarillo, CA: Xulon Press, 2009), 93.
[92] Fig. 7. Linear vs. Exponential Growth. Graph adapted from: Ivo P. Janecka, "Cancer control through principles of systems science, complexity, and chaos theory: A model" *International Journal of Medical Sciences*, Vol. 4, No. 3 (Feb., 2007): 169, http://www.researchgate.net/; *Earth Days*, Dir. and Prod. Robert Stone, Zeitgeist Films, 2009, Documentary.
[93] Ibid., Janecka; Bartlett, "Arithmetic, Population and Energy," Lecture.

mark, which has generally been the case, the entire resource would deplete after just one more doubling time of sustained exponential growth.[94] This would take seventy years if production grew at a constant one per cent *per annum*, or fourteen years at five per cent, and just seven years at ten per cent (see table 1. Doubling Time of Exponential Growth).[95] Bartlett employs the following thought experiment to illustrate the crescive nature of unchecked exponential growth in finite environments:

> Suppose we had bacteria that doubled in number … every minute. Suppose we put one of these bacteria into an empty bottle at 11 in the morning, and then observe that the bottle is full at 12 noon…. At [what] time was the bottle half full? Well, would you believe 11.59, one minute before 12, because they double in number every minute? … If you were an average bacterium in that bottle, at what time would you first realise that you were running of space? … At 12 noon it is full, one minute before it is half-full, two minutes before it is one-quarter full, then one-eighth, then one-sixteenth.… At five minutes before 12, when the bottle is only 3 per cent full and 97 per cent is open space just yearning for development, how many of you would realise there is a problem?[96]

Two bottles would be required to host the bacteria one minute past mid-day, followed by four bottles the following minute, then eight, sixteen, and so on; by ten past noon, more than one thousand bottles would be required. The practical lessons of this thought experiment are that no amount of exponential growth can be sustained, and that when a resource base has been exponentially depleted to the halfway mark, which Jeremy Leggett, Rob Hengeveld, Richard Heinberg, and others argue is broadly the case for non-renewable resources on this planet, the time is not 11.30, but rather 11.59: the final minute of the eleventh hour on the countdown to zero.[97] Will *Homo Sapiens* prove smarter than yeast in the Malthusian Century?[98]

Daly's Impossibility Theorem takes a more holistic approach to Malthusianism, stating that infinite compounding growth *cannot* occur on the finite surface of this (or any) planet; notions of 'sustainable growth' are therefore oxymoronic, since growth itself is *un*sustainable.[99] If this is still difficult to accept, it is useful to consider the following thought experiment: if the global economy

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[94] Bartlett, "Arithmetic, Population and Energy," Lecture; Heinberg, *Peak Everything*, 85; Jeremy K. Leggett, *Half Gone: Oil, Gas, Hot Air and the Global Energy Crisis* (London: Portobello Books, 2005), title, *et al.*; Rob Hengeveld, *Wasted World: How Our Consumption Challenges the Planet* (Chicago, University of Chicago Press, 2012), 67.

[95] Table 1. Doubling Time of Exponential Growth. Self-made (Feb. 7, 2017).

[96] Quoted in: Brian Hicks and Chris Nelder, *Profit from the Peak: The End of Oil and the Greatest Investment Event of the Century* (Hoboken, NJ: John Wiley & Sons, 2008), 56-57; Bartlett, "Arithmetic, Population and Energy," Lecture.

[97] Ibid., Bartlett; Heinberg, *Peak Everything*, 85; Hengeveld, *Wasted World*, 67; Leggett, *Half Gone*, title, *et al.*

[98] Question adapted from: Hicks and Nedler, *Profit from the Peak*, 57.

[99] Herman E. Daly and Kenneth N. Townsend, eds., *Valuing the Earth: Economics, Ecology, Ethics*, Second Edition (Cambridge, MA: The MIT Press, 1993), i-x; E. Wayne Nafziger, *Economic Development*, Fifth Edition (Cambridge: Cambridge University Press, 2012), 440-441.

remained static in size, and the planet began to contract exponentially, for how long would it be possible to sustain the current $78 trillion gross world product (GWP)?[100] On a planet the size of the moon? A football? Of course, this is an impossibility on face value, yet it follows that infinite growth on this planet is equally impossible; nonetheless, sustained growth is the root cause of the perfect storm of crises set to culminate in the Malthusian Century, not to mention the fundamental objective of modern economic theory, as well as the cornerstone of contemporary political discourse, which have erected growth into a sacred cow, and end unto itself.[101] The neoclassical and neoliberal schools of economics, like their Marxist, Ricardian, and Keynesian rivals, embrace growth without reservation, and only the Institutionalist school raises fundamental objections. Neoclassical and neoliberal economists see growth as philosopher's stone, with the power to transmute any material obstacle into an asset, yet this has not always been its conceptualisation. Such pioneering economists as John Stuart Mills and Adam Smith recognised the central objective of civilisation to be the progress of nations and exploration of the human condition.[102] Mills wrote that 'It must always have been seen, more or less distinctly, by political economists, that the increase in wealth is not boundless: that at the end of what they term the progressive state lies the stationary state….'[103] In his 2003 book *Growth Fetish*, Clive Hamilton argues that growth has become enshrined in the collective human consciousness as 'an inanimate object worshipped for its apparent magical powers': a fetish.[104] From height and the size of reproductive organs to property and income, *Homo Sapiens* would indeed appear to have a pseudo-Freudian evolutionary preference or 'fetish' for ever more gigantic objects and quantities, and more never seems to be enough. The following sections will address the physical and conceptual limits to growth and development on this planet.

SECTION II

THE LIMITS TO GROWTH, THE OLDUVAI THEORY, AND PEAK EVERYTHING

In 1972, the Club of Rome global think tank commissioned *The Limits to Growth* study, authored by Donella Meadows, Dennis Meadows, Jørgen Randers, and William Behrens III, which remains the best-selling environmental book of all time.[105] The study's computer simulations made

[100] --, "World" *The World Factbook*, Central Intelligence Agency (2017), http://www.cia.gov/.
[101] Hamilton, *Growth Fetish*, 8-9.
[102] Ibid., 7-13.
[103] John Stuart Mill, Stephen Nathanson, ed., *Principles of Political Economy with Some of Their Applications to Social Philosophy* Abridged (Indianapolis, IN: Hackett Publishing Company, Inc., 2004), 188.
[104] Hamilton, *Growth Fetish*, 3, *et al.*
[105] Donella H. Meadows, *et al.*, *The Limits to Growth* (New York: Signet, 1972), *et al.*; Heinberg, *End of Growth*, 4.

use of exponential reserve indices in lieu of static reserves-to-production ratios to extrapolate the trajectory of agro-industrial civilisation using such indicators as non-renewable resources, population, food production, industrial output, services *per capita,* and pollution to conclude, much as Malthus had, that whereas populations and consumption increase exponentially, the technology used to generate these increases tends to progress arithmetically; moreover, finite, non-renewable resources also deplete exponentially.[106] The study's standard run 'business-as-usual' simulation envisaged structural problems emerging in the 2010-30 period, with economic growth coming to an end by mid-century, followed by a paradigm shift culminating in calamity and collapse thereafter in the post-growth paradigm (see: fig. 8. *The Limits to Growth* Standard Run Scenario and Historical Trend, 1900-2100).[107] Fig. 8. illustrates that these 45-year-old projections have been largely validated by historical trends, with one recent study concluding that: '… thirty years of historical data compares favourably with key features of [*The Limits to Growth*] business-as-usual scenario….'[108] Ugo Bardi cautions that 'The warnings that we received in 1972 ... are becoming increasingly more worrisome as reality seems to be following closely the curves that the ... scenario had generated.'[109]

In spite of an intensive effort undertaken by economists and cornucopians to discredit the study by casting its projections as predictions when they were explicitly not so, the study has yet to be credibly debunked or discredited, and numerous updates over the subsequent decades have further corroborated its initial conclusions.[110] It must also be emphasised that problems in the vein of those envisaged by the study first *did* emerge during the Great Recession, which saw GWP growth go negative for the first time since the Second World War in 2009, after decades of steady decline (fig. 9. Gross World Product Growth Rate, 1961-2015).[111] The forecast that significant crises of growth and development will emerge by 2030 has been further corroborated by more recent

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[106] Meadows, *et al.*, *Limits to Growth*, 88-155.

[107] Fig. 8. *The Limits to Growth* Standard Run Scenario and Historical Trend, 1900-2100. Diagramme adapted from: Mark Strauss, "Looking Back on *The Limits of Growth*: Forty years after the release of the groundbreaking study, were the concerns about overpopulation and the environment correct?" *Smithsonian Magazine* (Apr., 2012), http://www.smithsonianmag. com/. Meadows, *et al.*, *Limits to Growth*, 122-128.

[108] Graham Turner, "A Comparison of the Limits to Growth with Thirty Years of Reality" *CSIRO*, Socio-Economics and the Environment in Discussion CSIRO Working Paper Series, 2008-09 (Jun., 2008): abstract, http://www.ecsim.org/.

[109] Ugo Bardi, *The Limits to Growth Revisited* (New York: Springer, 2003), 3.

[110] Donella Meadows, Jorgen Randers, and Dennis Meadows, *The Limits to Growth: The 30-Year Update* (London: Earthscan, 2004), *et al.*; Jorgen Randers, *2052: A Report to the Club of Rome Commemorating the 40th Anniversary of* The Limits to Growth (White River Junction, VT: Chelsea Green Publishing, 2012), *et al.*; Heinberg, *End of Growth*, 4-6.

[111] Fig. 9. Gross World Product Growth Rate, 1961-2015**.** Graph adapted from: --, "GDP growth (annual %)" *The World Bank Group*, National Accounts Data (2016), http://data.worldbank.org/.

analyses such as Colin Mason's 2003 book *The 2030 Spike: Countdown to Global Catastrophe* and the 2016 book *2030, the Coming Tumult: Unlimited Growth on a Finite Planet* by Richard Mosey.[112]

Robert Duncan expanded upon the *Limits to Growth* thesis with his 1989 transient-pulse theory of human civilisation, which he later rechristened the Olduvai theory in reference to Tanzania's Olduvai Gorge: *Homo Sapiens*' point of origin, and a metaphor for its inevitable final destination.[113] The theory delineates human history into three periods: the pre-industrial (−1930), industrial (1930-2030), and de-industrial (2030−) phases, postulating that the industrial phase of human civilisation, as delineated from the point at which global energy consumption *per capita* first attained 30 per cent of its peak value to the time it is projected to decline back below 30 per cent of this value, will have a lifetime approximately equal to one century, roughly spanning the 1930-2030 period (see: fig. 10. The Olduvai Theory, 1930-2030).[114] In his 1996 essay "The Olduvai Theory: Sliding Towards a Post-Industrial Stone Age," Duncan determined peak energy production *per capita* to have occurred in 1979, and later projected its subsequent gradual decline (the Olduvai 'slope') to continue until 1999, followed by a more rapid decline (the Olduvai 'slide') until the 2008-12 period, and finally a precipitous collapse (the Olduvai 'cliff') in the years leading to 2030.[115] He further delineated the theory into four postulates in 2005: (1) the exponential growth of world energy production ended in 1970; (2) average energy production *per capita* will show no growth from 1979 to circa 2008; (3) the rate of change for *per capita* energy production will go steeply negative circa 2008 (once again recalling the Great Recession); (4) world population will decline proximate with energy production *per capita* (see fig. 11. The Olduvai Theory: 2005 Update, 1950-2050).[116]

When the global *per capita* energy production peak attained in 1979 was surpassed in 2005 due to unexpectedly-strong growth in non-OECD countries (contradicting the theory's second postulate), Duncan published a 2009 update to the theory, in which he delineated worldwide *per*

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[112] Colin Mason, *The 2030 Spike: Countdown to Global Catastrophe* (London: Earthscan, 2003), title, *et al.*; Richard M. Mosey, *2030, the Coming Tumult: Unlimited Growth on a Finite Planet* (New York: Algora Publishing, 2009) title, *et al.*

[113] Richard C. Duncan, "Evolution, Technology and the Natural Environment: A Unified Theory of Human History" *Proceeds of the American Society of Engineering Education: Science & Technology* (1989): 14B1-11−14B1-20, http://www.unizar.es/; Richard C. Duncan, "World Energy Production, Population Growth, and the Road to the Olduvai Gorge" *Population and Environment*, Vol. 22, No. 5 (May-June 2001): 1-3, *et al.*, http://www.jstor.org/.

[114] Fig. 10. The Olduvai Theory, 1930-2030. Graph adapted from: Ibid, 18. Ibid., 15-18.

[115] Ibid., 3, 9, 18-22, 26; Richard C. Duncan, "The Olduvai Theory: Sliding Towards a Post-Industrial Stone Age" *Institute on Energy and Man* (27 June 1996): 9, http://www.dieoff.org/.

[116] Fig. 11. The Olduvai Theory: 2005 Update, 1930-2030. Graph adapted from: Richard C. Duncan, "The Olduvai Theory: Energy, Population, and Industrial Civilization" *The Social Contract*, Vol. 16, No. 2 (Winter 2005-06): 7, http://www.energycrisis.com/. Ibid., 1.

capita energy production among the US, the OECD, and non-OECD countries.[117] He concluded that global energy production *per capita* had peaked in the US in 1973, in the OECD in 2005, and projected its imminent peak in non-OECD countries, with a global peak around 2010, followed by a precipitous decline to its 1930 level by 2030, as per his original projections.[118] In line with its final postulate, which predicts the emergence of a Malthusian catastrophe in tandem with declining global energy production *per capita*, the theory forecasts a steep decline in the human population to around two billion by mid-century − considerably more pessimistic than *The Limits to Growth* standard run scenario (fig. 12. *The Limits to Growth* and Olduvai Theory Malthusian Catastrophes, 1950-2050).[119] Cheap and abundant energy is the edifice upon which agro-techno-industrial civilisation is based; without it, nothing happens: no economy, no food, no us.[120] The precise timeframe of the Olduvai theory is subject to dispute; nonetheless, like the original *Limits to Growth* study, more recent independent extrapolations of *per capita* global energy production have produced broadly comparable curves (see: fig. 13. The Olduvai Curve: Peak Conventional Fossil Fuels *per Capita*, 1900-2100).[121]

The Olduvai theory is grounded in Hubbert peak theory, which postulates that non-renewable resource extraction tends to follow a bell-shaped production curve: increasing exponentially at first, then plateauing, before reaching a production peak somewhere in the vicinity of the halfway mark, and symmetrically declining to depletion thereafter.[122] In 1956, the eponymous M. King Hubbert observed that individual oil wells and fields tended to follow a bell-shaped 'Hubbert' production curve, peaking four decades subsequent to their discovery, which led him to conclude that the same would be true at the national and even global level. Since oil discoveries peaked in 1930 in the US (the 'Saudi Arabia' of the time), Hubbert predicted that domestic oil production would peak in the 1965-71 timeframe.[123] Sure enough, production peaked in December 1970, exactly forty years after peak discovery, and began its symmetrical decline thereafter (see: fig.

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[117] Richard C. Duncan, "The Olduvai Theory: Toward Re-Equalizing the World Standard of Living" *The Social Contract*, Vol. 19, No. 4 (Summer 2009): *et al*., http://www.thesocialcontract.com/.
[118] Ibid., 1-3.
[119] Fig. 12. *The Limits to Growth* and Olduvai Theory Malthusian Catastrophes, 1950-2050. Graph adapted from: Richard C. Duncan, "The Olduvai Theory: Energy, Population, and Industrial Civilization" *The Social Contract*, Vol. 16, No. 2 (Winter 2005-06): 8, http://www.energycrisis.com/. Duncan, "Energy, Population, and Industrial Civilization," 7-10.
[120] Heinberg, *End of Growth*, 106.
[121] Fig. 13. The Olduvai Curve: Peak Conventional Fossil Fuels *per Capita*, 1900-2100. Graph adapted from: Luis de Sousa, "Olduvai Revisited 2008" *The Oil Drum: Europe* (Feb. 28, 2008), http://europe.theoildrum.com/.
[122] Thomas Homer-Dixon, *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization* (Toronto, Canada: Random House of Canada, 2006), 85-87.
[123] Ibid.

14. US Domestic Oil Discoveries and Production, 1900-2008).[124] The area of fig. 14. shaded exclusively in green, marking the period during which discoveries exceeded production, must ultimately be exactly the same as that shaded exclusively in blue, which marks the ongoing period during which production has exceeded discoveries; needless to say, oil must first be discovered before it can be produced and then consumed. Viewed in this light, it is obvious that the long-term trajectory of neither the discovery nor production curves is going to change direction in the future. The recent shale oil and gas boom in the US, which has produced a considerable uptick in production, has exploited the low-hanging fruit of its resource base − easy to access reserves such as the Baaken and Eagle Ford formations − and the International Energy Agency (EIA) predicts that even these will reach their production peaks around 2017.[125] The SU experienced an artificial oil production peak following the sharp decline of oil prices during the 1980s Oil Glut, and it is hardly a coincidence the system collapsed shortly thereafter (see fig. 15. Former SU Oil Production and Consumption, 1965-2013).[126]

Peak oil, in a global sense, refers to the time when worldwide oil production reaches its all-time maximum, and can no longer be sustained at this level.[127] It is not synonymous with oil depletion, as roughly half of the resource base still remains; nevertheless, the halfway mark recalls Bartlett's thought experiment: when the bottle is half-full, or in this case half-empty, it is not half-past eleven, but rather one minute to midnight, if the rate of growth can be sustained.[128] Of course, the principle of the low-hanging fruit means that this will not be the case for oil production, since the 'sweet', easy-to-find and -extract, and energy dense oil is discovered and/or produced first, leaving the 'heavy', difficult-to-access oil to be extracted last, which will require advanced technology, as well as a larger proportion of the workforce, at a time when industrial agriculture, which is heavily dependent upon petrochemicals, will also require more labour, in part to offset the losses dangerous climate change is set to cause.[129] Global oil production will therefore not abruptly terminate following its peak; rather, like US oil production, it will decline gradually, more steeply, then

[124] Fig. 14. US Domestic Oil Discoveries and Production, 1900-2008. Graph adapted from: Doug Robbins, "Peak Oil" *Wonky Thoughts* (Nov. 10, 2011), http://dougrobbins.blogspot.co.nz/. Homer-Dixon, *The Upside of Down*, 85-87.
[125] Richard Heinberg, *Snake Oil: How Fracking's False Promise of Plenty Imperils Our Future* (Santa Rosa, CA: Post-Carbon Institute: 2013), 55, 69-73, 101.
[126] Fig. 15. Former SU Oil Production and Consumption, 1965-2013. Graph from: Gail Tverberg, "The Real Oil Extraction Limit, and How It Affects the Downslope" *Our Finite World* (Dec. 18, 2013), http://ourfiniteworld.com/; Orlov, "Post-Soviet Lessons," 3.
[127] Heinberg, *End of Growth*, 15-19, 106-113.
[128] Ibid., 107-108; Bartlett, "Population, Arithmetic and Energy;" Lecture.
[129] Ibid., Heinberg, 109-113.

gradually once again, all the way to the end of the line in a roughly symmetrical bell-shaped production curve, with incremental and cumulative consequences, punctuated by economic, geopolitical, and energy crises. Oil importers such as the US will endure the worst consequences as oil available for the export market is increasingly allocated to domestic consumption.[130]

The 'Alligator Graph', so called on account of the resemblance, charts historical and projected world oil discoveries against production up to 2013 (see: fig. 16. Global Oil Production and Discoveries: Observed and Projected, 1930-2050); once again, it is obvious that the long-term trajectory of neither the discovery nor production curve is going to tick upwards: the state of affairs is permanent, as Hubbert's favourite graph compellingly illustrates (see: fig. 17. The Transient Age of Oil, 5000 BCE-5000 CE).[131] The First Law of Thermodynamics states that energy can neither be created nor destroyed; the Second states that energy converts in only direction: from usable to unusable − the law of entropy.[132] Non-renewable resources are not abiogenic, and their extraction rates will peak and begin to decline until further extraction becomes uneconomical: what goes up must come down. As fig. 16. illustrates, global conventional oil discoveries peaked in 1964; moreover, less oil has been discovered than has been consumed each year since 1980.[133] This fact alone makes a mockery of official 'proven' global oil reserves statistics, which show an impossible increase of nearly one *trillion* barrels since 1980, primarily because most countries do not subtract produced oil from their proven reserves estimates (?!), and because OPEC began basing its quotas on proven reserves in the late 1980s, which incentivised exaggeration (see fig. 18. Global Proven Oil Reserves, 1960-2010).[134]

More and more countries are seeing their extraction rates peak and begin to decline despite efforts to maintain production levels by using expensive 'enhanced oil recovery' methods to inject water, nitrogen, and CO_2 into the ground and force out the remaining oil.[135] As oil producers move from easy, energy-dense petroleum towards more difficult-to-exploit resources further down the

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[130] Homer-Dixon, *Upside of Down*, 85-87.
[131] Fig. 16. Global Oil Production and Discoveries: Observed and Projected, 1930-2050. Graph adapted from: Richard Heinberg, "This Is What Peak Oil Looks Like" *Resilience* (Sept. 25, 2013), http://www.resilience.org/. Fig. 17. The Transient Age of Oil, 5000 BCE-5000 CE. Graph reproduced from: M. King Hubbert, "Exponential Growth as a Transient Phenomenon in Human History" *Focus*, Vol. 902, No. 1909 (1998): 83, http://www.hubbertpeak.com/.
[132] Phrasing adapted from: *Collapse*, Dir. Chris Smith, Perf. Michael Ruppert, Bluemark Productions, 2009, Documentary.
[133] Homer-Dixon, *Upside of Down*, 89.
[134] Fig. 18. World Conventional Oil Reserves, 1980-2012. Graph adapted from: Rasoul Sorkhabi, "How Much Oil in the Middle East?" *GEOExPro*, Vol. 11, No. 1 (2014), http://www.geoexpro.com/.
[135] --, "Enhanced Oil Recovery" US Department of Energy, Office of Fossil Energy (2017), http://energy.gov/; *A Crude Awakening: The Oil Crash*, Dir. and Prod. Basil Gelpke and Ray McCormack, Lava Productions AG, 2006, Documentary.

resource pyramid (see fig. 19. The Resource Pyramid), more energy will be required to find, extract, and refine these lower-quality resources until their continued extraction eventually becomes uneconomical, and this is a microcosm of all non-renewable energy resource production.[136] According to the EIA, by 2020, almost two-fifths of global oil production will come from offshore rigs, which, in view of the low-hanging fruit principle and the law of diminishing returns, suggests than oil reserves beneath dry land are depleting rapidly.[137] Whereas the energy returned on energy invested ratio (EROEI, *i.e.*, the amount of energy yielded for each unit of energy invested in its production, as a proportion) for oil was 100:1, or even more, at the turn of the nineteenth century, and 30:1 only a couple decades ago, it has since fallen to just 10:1, or in some cases, such as the Canadian tar sands, 5:1, and its EROEI is continuing to decline in tandem with the rising environmental costs associated with fracking, and other enhanced recovery methods (see fig. 20. Comparison of EROEI for Various Energy Sources Relative to Firewood).[138] This trend is particularly worrisome given that agro-techno-industrial civilisation requires a net EROEI of at least between 5:1 and 10:1 merely to continue operating in its present form.[139] If its overall EROEI declined from 12:1 to 3:1, for example, this would mean the difference between business as usual and collapse, and an exponentially larger proportion of the remaining half of the oil (and whatever is left of other non-renewable resources as well), the production of which will be in decline, will be required simply to extract the remaining oil, until this proportion drops below the abovementioned threshold for the functioning of modern civilisation in its present condition, which will axiomatically case to function as such, and eventually to the break-even point, following which, although its further extraction may have economical applications as a feedstock for fertiliser or plastics, for instance, oil ceases to be an energy *source*.[140]

It must be emphasised that should production rise to even higher levels in the short-term, a positive outcome on face value, the inevitable production cliff would consequently be even steeper, and the collapse even more severe in the long-run, and the same applies to other non-renewable resource production curves. The consensus figure among petroleum geologists is that there were 1.9

[136] Fig. 19. The Resource Pyramid. Diagramme reproduced from: Richard Heinberg, "Technology to the Rescue" *Resilience* (Oct. 2, 2013), http://www.resilience.org/. Heinberg, *End of Growth*, 109-113.
[137] Heinberg, *End of Growth*, 3; *The Oil Factor: Behind the War on Terror*, Dir. Gerard Ungerman and Audray Brohy, Narr. Ed Asner, Free-Will Productions, 2005, Documentary.
[138] Fig. 20. Comparison of EROEI for Various Energy Sources Relative to Firewood. Bar chart reproduced from: Miodrag Zlatic, ed., *Precious Forests - Precious Earth* (InTech, 2015): Chapter 7, http://www.intechopen.com/. Heinberg, *End of Growth*, 112, 119, 158.
[139] Ibid., Heinberg, 112, 119, 158.
[140] Ibid., 118-120, 158.

trillion barrels of ultimately recoverable conventional crude oil available at the dawn of the fossil fuels age, or somewhere thereabouts, and regression models corroborate these findings, indicating that 96 per cent of all the remaining conventional oil on the planet will come from existing fields.[141] By 2006, agro-industrial civilisation had consumed approximately 970 billion barrels of oil, and has consumed roughly 30 billion more each year since.[142] If this rate of production could be sustained (it cannot be), global conventional oil reserves would deplete in about two decades. Writing in 1998, Lomborg reassured that 'today, we have oil for at least forty years at present consumption.'[143] By today, his timeframe has essentially *halved*. The timing of peak oil is impossible to predict with any exactitude, and Matthew Simmons describes it as 'one of th[o]se fuzzy events that you only know clearly when you see it through a rear view mirror, and by then, an alternate resolution is generally too late.'[144] Nonetheless, there is a general consensus on the shape of the arc which global oil and gas liquids production is set to follow, at least in general terms (see: fig. 21. Peak Oil and Gas Liquids, 1930-2050).[145]

The EIA's 2010 liquid fuels forecast seemed to concede that conventional oil production had reached its all-time global peak in 2006 by ascribing all future increases thereafter to 'fields yet to be found' − 42 years after the global peak in oil discoveries, and at the approximate midway point of its depletion curve, just as Hubbert had predicted would occur at the turn of the millennium nearly half a century earlier (see: fig. 22. Global Liquid Fuels Forecast, 1990-2035).[146] At best, we are now on an undulating production plateau, boosted by paltry unconventional, and sometimes even uneconomical oil production, and output is poised to begin its precipitous terminal decline in the near future, if it has not already.[147] Approximately half of the planetary reserves of oil have been depleted, roughly half of which has been produced in the last four decades, during which time the human population has nearly *doubled*.[148] At the individual level, it is the *per capita* peak of global oil

[141] Homer-Dixon, *The Upside of Down*, 87-88; Kenneth S. Deffeyes, "Peak Oil: Here and Now" 2007 Nobel Conference, Gustavus Adolphus College, St Peter, MN (Oct. 2, 2007), http://www.youtube.com/.
[142] Ibid., Homer-Dixon, 88; Don Bongaards, *Hydrogen* (Bloomington, IN: Xlibris, 2012), 16.
[143] Lomborg, *Environmental Skeptic*, 135.
[144] Quoted in: Liz Gogerly, *A World After… Fossil Fuels* (London: Raintree, 2013), 9.
[145] Fig. 21. Peak Oil and Gas Liquids, 1930-2050. Graph adpated from: Richard Heinberg, *Powerdown: Options and Actions for a Post-Carbon World* (Gabriola Island, BC, Canada: New Society Publishers, 2004), 25.
[146] Fig. 22. Global Liquid Fuels Forecast, 1990-2035. Graph adapted from: Heinberg, *End of Growth*, 109. Ibid., 106-111; Homer-Dixon, *The Upside of Down*, 85-87; Mason Inman, "The World has Passed Peak Oil, says Top Economist" *National Geographic* (May 5, 2011), http://voices.nationalgeographic.com/; Ripudaman Malhotra, *Fossil Energy: Selected Entries from the Encyclopedia of Sustainability Science and Technology* (New York: Spring, 2013), 11.
[147] Jeremy J. Wakeford, *Preparing for Peak Oil in South Africa: An Integrated Case Study* (New York: Springer, 2013), 5-6.
[148] *Crude*, 2005, Documentary.

production, rather than its aggregate maximum, which is significant. This macrohistorical milestone occurred immediately prior to the 1979 Oil Crisis, and passed by unmarked and unnoticed (see: fig. 23. Peak Oil *per Capita*: Global Oil Production *per Capita*, 1920-1999).[149]

At this juncture, the potentially catastrophic consequences of peak oil must be addressed. Oil is the edifice upon which agro-industrial civilisation has been based for the past century and a half, as well as for the Green Revolution for the past half-century, and globalisation for the last three or four decades; when oil depletes, these strategies will collapse spectacularly.[150] In the decentralised, interconnected, and globalised modern world, oil supplies 95 per cent of global transportation energy, and is directly or indirectly involved in the production of 90 per cent of all manufactured goods; it is the exclusive energy source for some $150 trillion of infrastructure, and quintessential to globalisation and the Green Revolution.[151] In his 2009 book *Why Your World Is about to Get a Whole Lot Smaller: Oil and the End of Globalization*, the economist Jeff Rubin argues that globalisation will collapse in the wake of peak oil, and long-distance motoring, as well as international travel, will become rare luxuries reserved for the privileged and the élite.[152] Further to transportation infrastructure, oil is also of critical importance to industry, and essential in the production of plastics, pesticides, fertilisers, solvents, pharmaceuticals, and countless other indispensable products and materials.[153]

One 2010 report on peak oil commissioned by the German *Bundswehr* concluded that declining oil production is incompatible with economic growth, and warned that 'A shrinking economy over an indeterminate period presents a highly unstable situation which *inevitably leads to system collapse*.... The risks to security posed by such a development *cannot even be estimated*' (emphasis supplied).[154] The 2005 Hirsch Report for the US Department of Energy portended that:

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[149] Fig. 23. Peak Oil *per Capita*: Global Oil Production *per Capita*, 1920-1999. Graph adapted from: Richard C. Duncan, "World Energy Production, Population Growth, and the Road to the Olduvai Gorge" *Population and Environment*, Vol. 22, No. 5 (May-June 2001): 7, http://www.jstor.org/.

[150] Phrasing adapted from Bradley Manning, as quoted in: *What a Way to Go*, 2007, Documentary.

[151] --, "Armed Forces, Capabilities and Technologies in the 21st Century: Environmental Dimensions of Security: Sub-study 1: Peak Oil: Security Policy Implications of Scarce Resources" *Bundeswehr Transformation Centre*, Future Analysis Brach (Nov., 2010): 12, www.permaculturenews.org/; *Crude*, 2005, Documentary.

[152] Jeff Rubin, *Why Your World Is About to Get a Whole Lot Smaller: Oil and the End of Globalization* (London: Virgin Books, 2009), title, *et al.*; Heinberg, *End of Growth*, 184.

[153] Yaşar Demirel, *Energy: Production, Conversion, Storage, Conservation, and Coupling*, Second Edition (New York: Springer, 2016), 40.

[154] --, "Armed Forces, Capabilities and Technologies," 12-13; Heinberg, *End of Growth*, 236.

> The peaking of world oil production presents the US and the world with an *unprecedented* risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be *unprecedented* (emphasis supplied).[155]

The report delineates three possible scenarios: (1) starting a crash programme two decades before the peak occurs could avert an energy shortage; (2) starting a crash programme one decade before the peak occurs would leave the world with an energy supply shortfall for a decade; (3) waiting until the peak oil occurs would leave the world with an energy shortage for two decades.[156] As discussed, agro-industrial civilisation almost certainly does not have two decades, very probably does not have one more decade, and may even have no time left at all to implement such a crash course. Heinberg outlines the expected post-peak oil scenario:

> Stagnant or falling oil supplies would lead to soaring and more volatile oil prices, which would precipitate a global economic crash. This rapid economic contraction would in turn lead to sharply curtailed energy demand, so oil prices would then fall; but as soon as the economy regained strength, demand for petroleum would recover, prices would again soar, and as a result of that the economy would relapse. This cycle would continue, with each recovery phase being shorter and weaker, and each crash deeper and harder, until the economy was in ruins. Financial systems based on the assumption of continued growth [*i.e.*, debt-based] would implode, causing more social havoc than the oil price spikes would themselves directly generate. Meanwhile, volatile oil prices would frustrate investments in energy alternatives: one year, oil would be so expensive that almost any other energy source would look cheap by comparison; the next year, the price of oil would have fallen far enough that energy users would be flocking back to it [the situation at the time of writing], with investments in other energy sources looking foolish. But low oil prices would discourage exploration for more petroleum, leading to even worse fuel shortages later on. Investment capital would be in short supply in any case because the banks would be insolvent due to the crash, and governments would be broke due to declining tax revenues. Meanwhile, international competition for dwindling oil supplies might lead to wars between petroleum importing nations, between importers and exporters, and between rival factions within exporting nations.[157]

To make matters worse, oil is not the only non-renewable energy resource which is depleting. In their 2010 book *A Cubic Mile of Oil: Realities and Options for Averting the Looming Global Energy Crisis*, Ed Kinderman and Ripudaman Malhotra use the cubic mile of oil equivalent (CMO) unit of energy

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[155] Robert L. Hirsch, "Peaking of World Oil Production and Its Mitigation" *AIChE Journal*, Vol. 52, No. 1 (January 2006): 2, http://misi-net.com/.
[156] Ibid., 50-59.
[157] Heinberg, *End of Growth*, 16-17.

to illustrate the gravity of the global energy crisis (see fig. 24. One Cubic Mile of Oil Equivalent).[158] In 2006, industrial civilisation consumed 1.1 CMO, as well as 0.6 CMO of natural gas and 0.8 CMO of coal, for a total of 2.5 CMO of energy from the 'big three' fossil fuels; by comparison, solar-photovoltaic and wind energy together produced a meagre 0.02 CMO.[159] In the same year, there were roughly 43 CMO, as well as 42 CMO of natural gas, and 121 CMO of coal still left in the ground, for a total of 206 CMO of planetary fossil fuel energy reserves.[160] If agro-industrial civilisation could continue to consume these fossil fuels at its 2006 rates until their depletion, which of course it cannot, oil would deplete around 2045, natural gas around 2075, and coal around 2150 (although the depletion of any of these fossil fuels would undoubtedly shorten the lifespans of those remaining).[161] To complicate matters, however, oil production is not the only application for Hubbert peak theory. Hubbert linearisation can be applied to the production of other essential non-renewable resources such as coal, natural gas, phosphate, uranium, copper, helium, gold, and countless other minerals.[162] The Energy Watch Group expects peak coal to occur around 2025, peak gas around 2020, and peak uranium by 2040, if current trends continue (see fig. 25. Peak Coal: World Coal Production: Observed and Projected, 1980-2100).[163]

Given that oil, coal, and natural gas together constitute the vast majority of global energy production − the essence of electro-magnetic industrial civilisation − both in *per capita* terms and in aggregate, the post-peak fossil fuels era will be 'unprecedented' indeed (see fig. 26. World *per Capita* Energy Consumption by Source, 1820–Present and fig. 27. World Energy Consumption by Source, 1820–Present).[164] When observed and projected oil, coal, and natural gas production are amalgamated, a kind of 'peak fossil fuels' or even 'peak everything' (no energy, no economy, no food, no us) emerges sometime around 2020-30 (see fig. 28. Peak Fossil Fuels: Conventional Fossil Fuels

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158 Fig. 24. One Cubic Mile of Oil Equivalent. Diagramme reproduced from: Adam Rogers, "Why we love oil" *Wired* (Jan. 16, 2007), http://www.wired.com/. Hewitt D. Crane, Edwin M. Kinderman, and Ripudaman Malhotra, *A Cubic Mile of Oil: Reality and Options for Averting the Looming Global Energy Crisis* (Oxford: Oxford University Press, 2010), 5-7, *et al.*

159 Ibid., Crane, Kinderman, and Malhotra, 7.

160 Ibid., 107-108, 114.

161 Calculation based on: Ibid.

162 Heinberg, *Peak Everything*, title, *et al.*

163 Fig. 25. Peak Coal: World Coal Production: Observed and Projected, 1980-2100. Graph reproduced from: Heinberg, *End of Growth*, 114. Heinberg, *End of Growth*, 113-115, 143; Thomas Seltmann, "Nuclear Power: The Beginning of the End," *Energy Watch Group*, Sun & Wind Energy (Nov., 2009), http://www.inis.iaea.org/.

164 Fig. 26. World *per Capita* Energy Consumption by Source, 1820–Present. Graph adapted from: Gail Tverberg, "World Energy Consumption Since 1820 in Charts" *Our Finite World* (Mar. 12, 2012), http://ourfiniteworld.com/. Fig. 27. World Energy Consumption by Source, 1820–Present. Graph from: Ibid.

Production: Observed and Projected, 1900-2100).[165] Of course, peak fossil fuels does not take population growth into account; rather, it is peak energy *per capita* which most accurately reflects energy scarcity on the individual level. *Per Capita* fossil fuels production, like aggregate production, will eventually peak and decline along the abovementioned Olduvai curve (see fig. 13.). US Geological Survey data reveals that many important mineral resources have already peaked domestically, including bauxite (1943), tin (1945), iron ore (1951), titanium (1964), magnesium (1966), potash (1967), zinc (1969), phosphate rock (1980), rare earth metals (1984), and copper (1998).[166] Even overexploited renewable resources, such as aquifers, fisheries, forests, and topsoil follow Hubbert linearisation theory, and consequently so does food production, which, in the aggregate, paints a very grim picture indeed of the post-peak everything world of the new millennium.[167] Growth is unlikely to continue after the depletion of fossil fuel and mineral reserves, when negative environmental impacts lead to snowballing costs and financial disruptions.[168] Hubbert wrote that: 'The exponential phase of the industrial growth which has dominated human activities during the last couple of centuries is now drawing to a close. Yet during the last two centuries of unbroken industrial growth, we have evolved what amounts to an exponential-growth culture.'[169] The prospect of marching down the backside of Hubbert's peaks is particularly worrying given the unprecedented crises and catastrophes endured by agro-industrial civilisation on the way up; even more ominous, however, is the expected impact of peak fossil fuels on scientific-industrial agriculture and the Green Revolution in the context of dangerous global climate change.

SECTION III

THE GREEN REVOLUTION, CLIMATE CHANGE, AND THE HOLOCENE EXTINCTION

Agriculture has been described as the single most destructive act inflicted upon the planet by *Homo Sapiens*; in the words of Derrick Jensen, 'Forests precede us and deserts dog our heels.'[170] Indeed, the cradle of civilisation and agriculture itself, the once-Fertile Crescent, was a lush forest

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[165] Fig. 28. Peak Fossil Fuels: Conventional Fossil Fuels Production: Observed and Projected, 1900-2100. Graph adapted from: Luis de Sousa, "Olduvai revisited 2008" *The Oil Drum: Europe* (Feb. 28, 2008), http://europe.theoildrum.com/.
[166] Heinberg, *End of Growth*, 139.
[167] Ibid., 185-189; Heinberg, *Peak Everything*, title, *et al.*
[168] Ibid., Heinberg, *End of Growth*, 1-25. .
[169] M. King Hubbert, "On the Nature of Growth, National Energy Conversation Policy Act of 1974" Hearings before the Subcommittee on the Environment of the Committee on Interior and Insular Affairs, House of Representatives (6 June 1974), http://www.technocracy.org/.
[170] Derrick Jensen, *A Language Older Than Words* (Chelsea, VT: Chelsea Green Publishing, 2004), 84; Keith, *Vegetarian Myth*, 3, 134-137.

12,000 years ago, in contrast with the bone-dry Middle East of today.[171] Yet the biosphere has not been the only victim of agriculture: as *Homo Sapiens* settled into agriculture, it settled into *Homo Sapiens*.[172] The agrarian lifestyle, which is antithetical to the evolutionary nature of our hunter-gatherer species, and requires substantially greater investments of time and back-breaking manual labour, contributes to stunted growth and small frames, poor health, including conditions such as arthritis, diabetes, heart disease, hypertension, stroke, cancer, schizophrenia, and depression, as well as crooked and decayed teeth, poor eyesight, and a host of autoimmune and inflammatory conditions; women tend to ovulate earlier and more frequently, and populations inflate accordingly.[173] Even so, perhaps the most devastating consequences of agriculture have been wrought on the very fabric of human society itself, as Toby Hemenway reflects:

> The damage done by agriculture is social and political as well. A surplus, rare and ephemeral for foragers, is a principle goal of agriculture. A surplus must be stored, which requires technology and materials to build storage, people to guard it, and a hierarchical organisation to centralise the storage and decide how it will be distributed. It also offers a target for local power struggles and theft by neighbouring groups, increasing the scale of wars. With agriculture, power thus begins its concentration into fewer and fewer hands. He who controls the surplus controls the group. Personal freedom erodes naturally under agriculture.[174]

Eric Sevareid's law states that 'The chief cause of problems is solutions;' and if so, *Homo Sapiens*' solution to the problem of food security ten millennia ago, agriculture, is the great-grandfather of all of the problems of growth and development being faced today, and more of the same can only save us for so long.[175]

The population of *Homo Sapiens* took nearly a quarter of a million years to pass the one billion mark in 1804; yet by 1927, this number had doubled, and by 1974, had doubled once again, exponentially increasing to 7.4 billion at the time of writing (see fig. 29. Human Population, 8000 BCE−Present).[176] The UN estimates that the human population will increase to 11.2 billion by the

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171 Keith, *Vegetarian Myth*, 37-38.
172 Phrasing adapted from: Ibid. 141.
173 Ibid., 145-146; *What a Way to Go*, 2007, Documentary.
174 Quoted in: Keith, *Vegetarian Myth*, 34; Toby Hemenway, "Is Sustainable Agriculture an Oxymoron?" *Permaculture Activist*, Vol. 60 (May 2006), http://www.resilience.org/.
175 Phrasing adapted from: Ibid., Keith, 3. Bartlett, "Arithmetic, Population and Energy," Lecture; Albert A. Bartlett, "Thoughts on Immigration Into the United States: An NPG Forum Paper" *Negative Population Growth Inc.* (2007), http://www.albartlett.org/.
176 Fig. 29. Human Population, 8000 BCE−Present. Graph adapted from: --, "Waste from human activity" *BBC*, GCSE Bitesize (2014): 1, http://www.bbc.co.uk/. Sigurd N. Skirbekk, *Dysfunctional Culture: The Inadequacy of Cultural Liberalism as a Guide to Major Challenges of the 21st Century* (New York: University Press of America, Inc., 2005), 168n.

turn of the century, and even optimistic scenarios such as half a child below replacement rate would only stabilise the population at its present level by that time, after demographic momentum had raised it to nearly ten billion around mid-century (see fig. 30. Human Population Scenarios, 1950-2100).[177] Although the rate of population growth has slowed from its peak of 2.1 per cent in 1964 to 1.2 per cent in 2015 (see fig. 31. Human Population Growth Rate: Observed and Projected, 1950-2050), the population has more than doubled in the interim, meaning that the net population increase *per annum* is higher now than it was then, with some 82 million new additions each year, making economic growth all the more essential from a *per capita* standpoint.[178]

The doubling of the human population since the 1960s has been enabled primarily by Norman Borlaug's Green Revolution: a series of agricultural reforms utilising mechanisation, high-yield single-use hybridised crop varieties, the expansion and electrification of irrigation infrastructure, as well as synthetic fertilisers, pesticides and herbicides, which doubled global crop yields between 1963 and 1997.[179] Prior to the Green Revolution, agricultural production was essentially limited by the energy output of the Sun; however, scientific-industrial agriculture has since found a multitude of ways to convert finite hydrocarbon energy into food.[180] Fossil fuels and petrochemicals are part and parcel of the Green Revolution: oil-powered vehicles plough, plant, harvest, and crop-dust with petrochemical fertilisers and pesticides; monocrops (which are particularly vulnerable to plant diseases such as Ug99 wheat stem rust) are mechanically irrigated with electricity predominantly generated from coal or natural gas; food is transported by fossil-fuelled machines to processing and distribution centres, where it is packaged in petroleum products, and often refrigerated; products are then transported to warehouses and eventually to supermarkets or even abroad, before being

[177] Fig. 30. Human Population Scenarios, 1950-2100. Graph adapted from: Damian Carrington, "World population to hit 11bn in 2100 − with 70% chance of continuous rise" *The Guardian* (Sept. 18, 2014), http://www.theguardian.com/. Barnosky and Hadly, *End Game*, 41-42.

[178] Fig. 31. Human Population Growth Rate: Observed and Projected, 1950-2050. Graph adapted from: --, "International Data Base World Population Growth Rates: 1950-2050" *U.S. Census Bureau*, International Programs, International Data Base (Sept. 27, 2016), http://www.census.gov/; Barnosky and Hadly, *End Game*, 22; Mason, *Doomsday Scenarios*, 70; Matthew R. Foster, *The Human Relationship to Nature: The Limit of Reason, the Basis of Value, and the Crisis of Environmental Ethics* (London: Lexington Books, 2016), 115.

[179] Keith, *Vegetarian Myth*, 107; for further reading, see: John H. Perkins, *Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War* (Oxford: Oxford University Press, 1997), *et al.*; Susan Dworkin, *The Viking in the Wheat Field: A Scientist's Struggle to Preserve the World's Harvest* (London: Walker Books, 2009), *et al.*

[180] Ibid., Keith, 104.

transported once again to the dinner table, by which time they have travelled between 2,000 and 2,500 kilometres, on average, in the US.[181]

In 1940, typical US farms produced two calories of food for each calorie of energy invested in agriculture; by 1974, this proportion was roughly even; today, between four and *ten* calories of primarily hydrocarbon energy input are required for each calorie of food produced.[182] This negative energy balance is entirely contingent upon the abundance and availability of 'free' fossilised energy; without it, any agricultural society producing food at a net energy loss would gradually starve to death. In the contemporary US, one hectare of corn requires over one-thousand litres of petroleum to produce; in Iowa alone, maize production consumes the equivalent of more than 5,000 Hiroshima bombs of hydrocarbon energy.[183] The quintessential Haber-Bosch process, without which it is estimated that two-fifths of the human population would not be alive, converts natural gas into the feedstock for nitrogen fertilisers.[184] Equally essential is rock phosphate, which is used as a base for inorganic fertilisers, and which has already peaked in production in the US, with a global peak expected by 2033 (see fig. 32. Global Phosphorus Production: Observed and Projected, 1900-2100).[185] Unfortunately, finite fossil fuels and minerals are not the only depleting inputs of modern scientific-industrial agriculture.

The increased yields of Green Revolution monocrops require titanic volumes of fresh water, as well as extensive and energy-intensive irrigation infrastructure.[186] Agro-industrial civilisation monopolises roughly three-fifths of the available global freshwater supply, yet water withdrawal has begun to plateau worldwide, suggesting that its global peak may be fast-approaching (see fig. 33. Global Water Withdrawal, 1900-2010).[187] The UN warns that 'By 2025, about 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world population

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[181] *Collapse*, 2009, Documentary; Mary Jane Angelo, Jason J. Czarnezki, and William S. Eubanks II, *Food, Agriculture, and Environmental Law* (Washington, DC: Environmental Law Institute, 2013), 127-128; for further reading on Ug99 wheat stem rust, see: Ravi P. Singh, *et al.*, "The Emergence of Ug99 Races of the Stem Rust Fungus is a Threat to World Wheat Production" Annual Review of Pathology, Vol. 49 (Sept., 2011): 465-481, http://www.annualreview.org/.
[182] Keith, *Vegetarian Myth*, 107-108.
[183] Keith, *Vegetarian Myth*, 108.
[184] Ibid., 104-106.
[185] Fig. 32. Global Phosphorus Production: Observed and Projected, 1900-2100. Graph reproduced from: Heinberg, *End of Growth*, 137. Ibid., 136-137.
[186] Ibid., 124-129.
[187] Fig. 33. Global Water Withdrawal, 1900-2010. Graph adapted from: --, "Water uses" *Food and Agriculture Organization of the United Nations,* AQUASTAT website (2016), http://www.fao.org/. Heinberg, *End of Growth*, 124-129.

could be under conditions of water stress….'[188] Water wars have already emerged between the US and Mexico and Syria and Israel, as well as among Mali, Niger, Nigeria and Guinea, within China, and among Iraq, Syria and Turkey.[189] Much of the global freshwater supply takes the form of essentially non-renewable fossil water from depleting underground aquifers such as the enormous Ogallala Aquifer beneath the US' Great Plains, which ranks among the planet's largest, and which is being depleted at thrice its rate of replenishment.[190] Further to its unsustainable dependence on fossil water and fuels, Green Revolution irrigation infrastructure sinks water tables and exsiccates rivers and lakes; fertiliser and pesticide runoff further poison water sources, as the dissolved salts present in water from wells and dams accelerate soil salinisation, and more than ten million hectares of arable land are lost each year in this manner.[191] The eponymous revolution which once greened deserts is now creating more than its fair share.[192]

In addition to non-renewable energy, mineral, and water supplies, planetary reserves of fossil topsoil are being rapidly depleted by scientific-industrial agriculture, which is based on the cultivation of annual monocrops in lieu of perennial polycultures, and does the very opposite of natural processes by destroying topsoil.[193] Topsoil is an essentially non-renewable resource for all human intents and purposes, regenerating at the rate of roughly three centimetres every thousand years (for reference, seasonal flooding or high winds can raze two thousand years of topsoil in one fell swoop).[194] Peak topsoil occurred at the dawn of the Agricultural Revolution, and planetary reserves have been depleting ever since.[195] Whereas natural processes replenish topsoil at the rate of some 2-4 tonnes per hectare *per annum*, scientific-industrial agriculture erodes it at 20-125 times this rate (see map 1. Global Status of Human-Induced Soil Degradation), and global topsoil *per capita* has declined precipitously from 4,000 tonnes *per capita* in 1900 to just 800-900 tonnes at the turn of the millennium; arable land is also declining on both a *per capita* basis, and in aggregate (see fig. 34. Arable Land *per Capita*: Observed and Forecast, 1950-2020).[196] Like fossil fuels, whose production

[188] Quoted in: Heinberg, *End of Growth*, 125.
[189] Barnosky and Hadly, *End Game*, 24.
[190] Patrick J. Bohlen and Gar House, eds., *Sustainable Agroecosystem Management: Integrating Ecology, Economics, and Society* (Boca Raton, FL: CRC Press, 2009), 80-81.
[191] Heinberg, *End of Growth*, 124-129; Keith, *Vegetarian Myth*, 46-47.
[192] Phrasing adapted from: Ibid., Keith, 48.
[193] Ibid., 35, 56..
[194] Ibid., 44, 127.
[195] Ibid., 256.
[196] Map 1. Global Status of Human-Induced Soil Degradation. Map reproduced from: --, "Dimensions of need − An atlas of food and agriculture" *Food and Agriculture Organization of the United Nations*, Agriculture and Consumer Protection Department, Corporate Document Repository (2017), http://www.fao.org/. Fig. 33. Arable Land *per Capita*: Observed

will gradually decline after peaking, available topsoil has gradually declined since its peak ten millennia ago; yet unlike fossil fuels, *top*soil will be there one day, then gone the next. By way of analogy, a car either has enough fuel to drive, or not; similarly, there will either be enough topsoil to support industrial agriculture, or there will not once it has hit bedrock and rock bottom.[197]

By mid-century, scientific-industrial agriculture will somehow need to produce 70 per cent more food than today in order to feed these two-to-four billion extra mouths, yet 'peak food' transpired more than a quarter-century ago on a *per capita* basis.[198] Peak grain occurred in 1984, followed by peak fish in 1988, peak wheat in 1990, and peak seafood in 1994 (see fig. 35. Peak Food: Global Grain Production *per Capita*, 1950-2006 and fig. 36. Peak Fish: Fisheries Capture and Aquaculture Production, 1950-2012).[199] We have a food race on our hands, between production and consumption, whereby innovation and technology facilitate increased food production, which in turn facilitates population growth. This, in turn, necessitates the further expansion of food production, which requires still more technological development and innovation, and so on.[200] We have already begun to lose this food race, and demand for food has gradually begun to outstrip supply, and the consequent gap has had to be filled by tapping into carryover grain stocks, which peaked in 1986, and now have less than two months' reserves remaining (see fig. 37. Global Grain Stocks, 1960-2010).[201]

Worse, the transient Green Revolution has enabled the doubling of the human population, which William Catton describes as 'phantom carrying capacity', since agriculture (and particularly its modern scientific-industrial incarnation) is inherently unsustainable, because it erodes its own ecological support systems, and is dependent upon finite inputs; when these begin to deplete, the

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and Projected, 1950-2020. Bar graph reproduced from: --, "Global Development Story: Pressure to Increase Productivity on Existing Land" *PotashCorp* (Aug. 31, 2014), http://www.potashcorp.com/. Brian Douglas Skinner, *The Gumption Memo: An Open Letter About What to Do Next*…. (Menlo Park, CA: Gumption, 1996): 17, http://www.gumption.org/; Keith, *Vegetarian Myth*, 44.

197 Ibid., Keith, 256.

198 Barnosky and Hadly, *End Game*, 113; Heinberg, *End of Growth*, 129-135.

199 Fig. 35. Peak Food: Global Grain Production *per Capita*, 1950-2006. Graph reproduced from: Heinberg, *End of Growth*, 131. Fig. 36. Peak Fish: Fisheries Capture and Aquaculture Production, 1950-2012. Graph adapted from: Michael Renner, "Aquaculture Continues to Gain on Wild Fish Capture" *Vital Signs* (Apr. 24, 2014), http://vitalsigns.worldwatch.org/. Heinberg, *The End of Growth*, 131, 133-135.

200 Ibid., Heinberg, 133-135; Russell Hopfenberg and David Pimentel, "Human Population Numbers as a Function of Food Supply" *Environment, Development and Sustainability*, Vol. 3 (2001): 1-15, http://www.bioinfo.rpi.edu/; Russell Hopfenberg, "Human Carrying Capacity Is Determined by Food Availability" *Population and Environment*, Vol. 25, No. 2 (Nov. 2003): 109-117, http://www.jstor.org/.

201 Fig. 37. Global Grain Stocks, 1960-2010. Graph reproduced from: Heinberg, *End of Growth*, 131. Ibid., 131-135.

Green Revolution will collapse.[202] It is estimated that without Borlaug or the Haber-Bosch process, one and three billion people would not be alive today, respectively, leading Howard Kunstler to reflect that:

> The cheap oil age created an artificial bubble of plenitude for a period not much longer than a human lifetime, … [but] as oil ceases to be cheap and the world reserves are toward depletion, we will indeed suddenly be left with an enormous surplus population ... that the ecology of the Earth will not support. No political program of birth control will avail. The people are already here. The journey back to non-oil population homeostasis will not be pretty. We will discover the hard way that population hypergrowth was simply a side effect of the oil age. It was a condition, not a problem with a solution. That is what happened and we are stuck with it.[203]

In the same vein, Richard Manning concludes that, 'With the possible exception of the domestication of wheat, the Green Revolution is the worst thing that has ever happened to the planet.'[204] Borlaug himself cautions that:

> The Green Revolution has won [only] a temporary success in man's war against hunger and deprivation; it has given man a breathing space. If fully implemented, the Revolution can provide sufficient food for sustenance during the next three decades. But the frightening power of human reproduction must also be curbed; otherwise the success of the Green Revolution will be ephemeral only. Most people still fail to comprehend the magnitude and menace of the 'Population Monster'.[205]

The Green Revolution has not solved but merely deferred the problems of mass starvation and famine; yet in doing so, it has also facilitated the continued and unprecedented expansion of the human population, ultimately leaving several billion more in the lurch with the added spectres of dangerous climate change and an ecological cascade of extinctions once its inputs and feedstock deplete and its ecological support systems collapse.[206] As goes the adage, the revolution devours its children, and the Green Revolution, like the Agricultural Revolution before it, will be no different in the Malthusian Century.[207]

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[202] Keith, *Vegetarian Myth*, 104; William R. Catton, *Overshoot: The Ecological Basis of Revolutionary Change* (Champaign, IL: University of Illinois Press, 1980), 36-55.
[203] James Howard Kunstler, *The Long Emergency: Surviving the End of Oil, Climate Change, and Other Converging Catastrophes of the Twenty-First Century* (New York, NY: Grove Press, 2005), 7-8.
[204] Richard Manning, "The Oil We Eat" *Harper's Magazine*, Vol. 308, Issue No. 1845 (Feb., 2004): 41, http://harpers.org/.
[205] Quoted in: Mohan K. Wali, Fatih Evrendilek, and M. Siobhan Fennessy, *The Environment: Science, Issues, and Solutions* (Boca Raton, FL: CRC Press, 2010), 257n.
[206] Barnosky and Hadly, *End Game*, 112-113.
[207] Deborah Kennedy, *Helen Maria Williams and the Age of Revolution* (London: Associated University Presses, 2002), 113.

Among the converging crises of the Malthusian Century, potentially-irreversible or runaway dangerous climate change and mass extinction are poised to be the *coups de grâce* of agro-industrial civilisation, devastating the biosphere and wiping out the very ecological systems upon which scientific-industrial agriculture depends. The consequences of climate change may haunt our descendents for thousands of centuries, potentially affecting hundreds or even thousands of future generations; yet, despite this foreknowledge, agro-industrial civilisation has so far elected to continue on its current trajectory so that a small fraction of its present generations can live beyond the planet's ecological means for a few more *decades*.[208] Whereas classical totalitarian Stalinism and Nazism were prepared to sacrifice generations of the present for the sake of their future utopias, inverted totalitarian neoliberal capitalism is evidently prepared to jeopardise and sacrifice untold future generations, potentially hundreds of billions or even *trillions* of individuals, for its contemporary yet transient fossil-fuelled dystopia: transgenerational genocide. It is difficult to determine which Faustian bargain is the more short-sighted, irrational, and pathological, or which antipode of totalitarianism future generations will judge most harshly.

The scientific consensus on climate change is that the planet is unequivocally warming, predominantly due to the anthropogenic greenhouse effect.[209] This consensus long held that 2°C of anthropogenic warming relative to pre-industrial levels was the threshold below which dangerous climate change could be averted; unfortunately, more recent climate models now put this redline at no higher than 1.5°C.[210] The planet has warmed rapidly since 1975, and in spite of the concurrent solar minimum, 16 of the 17 hottest years on record have been in the new millennium, with 2016 being the hottest yet, at 0.94°C above the twentieth-century mean (see fig. 38. Global Land-Ocean Temperature Index, 1880−Present and fig. 39. The Hockey Stick: Global Surface Temperature Variations, 1000−Present).[211] Yet, even with just 0.9°C of warming above preindustrial levels hitherto, extreme weather disturbances are already occurring: 14 out of 28 extreme weather events

[208] Jörg Friedrichs, *The Future Is Not What It Used to Be: Climate Change and Energy Scarcity* (Cambridge, MA: MIT Press, 2013), 46; *What a Way to Go*, 2007, Documentary.
[209] Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Hnadful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (London: Bloomsbury, 2010), 10-36.
[210] Mark Hertsgaard, *Hot: Living Through the Next Fifty Years on Earth* (New York: First Mariner Books, 2012), 66-70.
[211] Fig. 38. Global Land-Ocean Temperature Index, 1880−Present. Graph adapted from: Makiko Sato, "GISS Surface Temperature Analysis" *NASA Goddard Institute for Space Studies* (Oct. 13, 2016), http://data.giss.nasa.gov/. Fig. 39. The Hockey Stick: Global Surface Temperature Variations, 1000–Present. Graph adapted from: Fred Pearce, "Controversy behind climate science's 'hockey stick' graph" *The Guardian* (Feb. 2, 2010), http://www.theguardian.com/. Andrea Thompson, "2016 Was the Hottest Year on Record" *Scientific American* (Jan. 18, 2017), http://www.scientificamerican.com/.

surveyed in 2014 were linked to climate change − *half* − and the 2003 European and 2010 Northern Hemisphere heat waves, as well as the 2010-13 Southern US and Mexico and 2012-13 North American droughts, were more than three standard deviations outside climatic norms.[212] Weather-related natural disasters causing in excess of US$1 billion damage have been increasing at the rate of roughly five per cent *per annum* since 1980, and 44 such natural calamities occurred between 2008 and 2012 − twice as many as during any previous *ten*-year period (see fig. 40. Global Natural Disaster Costs, 1950−Present).[213] In 2010, it was estimated that natural disasters and industrial accents consumed 8.6 per cent of the US' GDP growth.[214]

The atmospheric concentration of CO_2 already exceeds 400 parts per million (ppm), far higher than the preindustrial average of 280 ppm, and higher than at any point in *Homo Sapiens*' evolutionary history, some 800,000 years, and is expected to surpass 500 ppm by 2050 (see fig. 41. The Keeling Curve: Atmospheric Concentration of CO_2 at Mauna Loa, 1960-2016 and fig. 42. The Hockey Stick II: Planetary Surface Temperature Variations, 1000−Present).[215] NASA climate scientist and activist James Hansen underscores that this level must be reduced to 350 ppm in order to avoid dangerous climate change, a threshold surpassed by industrial civilisation in the late 1980s (see fig. 41.).[216] This alone is unequivocal evidence that agro-industrial civilisation has *already* overshot the planetary carrying capacity. The planet is currently gaining net energy from the Sun at the rate of 400,000 Hiroshima bombs *every day*; if this continues for the next six decades, the Earth will become hotter than it has been at any point in the last 15 million years.[217]

Even if all anthropogenic greenhouse gas emissions were to somehow abruptly cease, the thermal inertia of the climate system would cause the cumulative changes triggered by gases already

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[212] Randy Lee Loftis, "Half of Weather Disasters Linked to Climate Change" *National Geographic* (Nov. 5, 2015), http://news.nationalgeographic.com/.

[213] Fig. 40. Global Natural Disaster Costs, 1950−Present. Graph adapted from: Holli Riebeek, "The Rising Cost of Natural Hazards" *NASA Earth Observatory* (Mar. 28, 2005), http://earthobservatory.nasa.gov/. Barnosky and Hadly, *End Game*, 92.

[214] Heinberg, *End of Growth*, 148.

[215] Fig. 41. The Keeling Curve: Atmospheric Concentration of CO_2 at Mauna Loa, 1960-2016. Graph adapted from: --, "The Keeling Curve: Carbon Dioxide Measurements at Mauna Loa" *American Chemical Society National Historic Chemical Landmarks* (Apr. 30, 2015), http://www.acs.org/. Fig. 42. The Hockey Stick II: Planetary Surface Temperature Variations, 1000−Present. Graph adapted from: Fred Pearce, "Controversy behind climate science's 'hockey stick' graph" *The Guardian* (Feb. 2, 2010), http://www.theguardian.com/. Andrew Freedman, "The Last Time CO_2 Was This High, Humans Didn't Exist" *Climate Central* (May 3, 2013), http://www. climatecentral.org/.

[216] William Hickey, *Energy and Human Resource Development in Developing Countries: Towards Effective Localization* (London: Palgrave Macmillan, 2017), 104.

[217] Andrew Y. Glikson and Colin Groves, *Climate, Fire and Human Evolution: The Deep Time Dimensions of the Anthropocene* (Switzerland: Springer International Publishing, 2016), 146; Barnosky and Hadly, *End Game*, 93-96.

emitted to manifest themselves over a quarter- to half-century period.[218] The surge in natural calamities observed thus far therefore reflects the cumulative effects of greenhouse gas emissions prior to the 1990s; consequently, further to the observed 0.9°C of warming relative to the pre-industrial average, at least another 0.6°C of warming is guaranteed by historical anthropogenic activity for a minimum net increase of 1.5°C − assuming the impossible scenario of immediate emissions cessation.[219] Climate scientists warn that industrial civilisation can only emit another 565 gigatonnes of carbon before crossing the prematurely-optimistic 2°C redline, or four more decades at current emissions rates, which are increasing exponentially.[220] Worse, it seems reasonable to assume that industrial civilisation will eventually deplete the planetary reserves of economically recoverable fossil fuels (or else why bother keeping track of them?), which contain even more carbon than the sum total of all that has been emitted in all of human history. Some 2,795 gigatonnes of carbon would be emitted in this worst-case scenario, warming the planet by an apocalyptic 8°C by 2300, and eventually by 10°C, or even 12°C, since feedbacks in the climate system are immensely long-lasting.[221] As Hansen puts it, 'Burning all fossil fuels would produce a different, practically uninhabitable, planet,' yet this seems to have been the master plan of both classical and inverted totalitarian societies.[222]

The 2006 New Economics Foundation study *Growth Isn't Possible: Why We Need a New Economic Direction* concludes that 'Economic growth in the OECD cannot be reconciled with a 2°C, 3°C, or even 4°C characterisation of dangerous climate change.'[223] Kevin Anderson concludes that 4°C of warming is 'incompatible with any reasonable characterisations of an organised, equitable, and civilised global community.'[224] With 6°C of warming (for reference, the global mean temperature during the last ice age was 5°C cooler than at present), the planet would be hotter than at any point in the past 60 million years, when the largest mammals were rodent-sized because anything bigger would have had difficulty thermo-regulating.[225] Half of all species would go extinct

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[218] James Hanson, *et al.*, "Earth's Energy Imbalance: Confirmation and Implications" *Science*, Vol. 308 (Jun. 3, 2005): 1, http://pubs.gis.nasa.gov/.
[219] Hertsgaard, *Hot*, 70.
[220] Benjamin K. Sovacool, Marilyn A. Brown, and Scott V. Valentine, *Fact and Fiction in Global Energy Policy: Fifteen Contentious Questions* (Baltimore, MD: Johns Hopkins University Press, 2016), 89.
[221] Ibid.
[222] Quoted in: Ibid., 91.
[223] Quoted in: Heinberg, *End of Growth*, 248.
[224] Quoted in: Naomi Klein, *This Changes Everything: Capitalism Vs. The Climate* (New York: Simon & Schuster, 2014), 13.
[225] *An Inconvenient Truth*, Dir. Davis Guggenheim, Perf. Al Gore, Paramount Classics, 2005, Documentary; Barnosky and Hadly, *End Game*, 92; *Collapse*, 2007, Documentary.

by the turn of the century, and drought would cover two-fifths of all inhabited land, primarily in the tropics, where the majority of the human population is projected to be living by mid-century.[226] With 12°C of warming, more than half of all currently-inhabited land would be too hot upon which for *Homo Sapiens* to survive.[227]

Crops and plants will grow in new areas, though not as well, and agricultural output will decline, particularly in tropical and subtropical regions (see map 2. Percentage Change in Global Agricultural Output, 2010-50).[228] According to one prominent 2014 computer study published in *Nature Climate Change*, 2°C of warming would cause maize production in temperate and tropical regions to decrease by two and seven per cent, respectively, while wheat production would drop five per cent regardless, and rice would remain unaffected. At 5°C of warming, wheat production would decrease by ten and forty per cent in temperate and tropical regions, respectively, while maize and rice production would fall by ten and five per cent, respectively, regardless; in the US, however, maize yields are expected to drop by 15-30 per cent. Rice-growing areas will also suffer from sea level rise, which will further reduce yields by 10-15 per cent.[229] The sea level will gradually rise: even in the best-case scenarios, major cities including Amsterdam, Cairo, London, Miami, Mumbai, New Orleans, New York, Shanghai, and Tokyo will face flooding from storm surges or be partially submerged by 2050. In the worst-case scenarios, the Greenland and Antarctic ice sheets would melt completely over a period of centuries, causing the sea level to rise 4-6 metres and submerging areas currently populated by more than one billion people.[230]

Rising heat, precipitation and humidity will extend the ranges of tropical insects carrying diseases such as West Nile virus, dengue, and typhoid fever.[231] Larger populations are particularly susceptible to disease, and given that the total number of airline passengers worldwide increased ten-fold to three billion in the 1970-2013 period, epidemics like swine and avian influenza, the Ebola

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[226] Barnosky and Hadly, *End Game*, 105; S. L. Pimm, *et al.*, "The biodiversity of species and their rates of extinction, distribution, and protection" *Science*, Vol. 344, Issue No. 6187 (May 30, 2014): 987-995, http://www.sciencemag.org/; *What a Way to Go*, 2007, Documentary.

[227] Louise Gray, "Climate change could make half the world uninhabitable" *The Telegraph* (May 12, 2010), http://www.telegraph.co.uk/.

[228] Map 2. Percentage Change in Global Agricultural Output, 2010-50. Map from: --, "World Development Report 2010: Development and Climate Change" *The World Bank* (2010): 6, http://siteresources.worldbank.org/; for further reading, see: Shyam S. Yadav, *Crop Adaptation to Climate Change* (Hoboken, NJ: John Wiley & Sons, 2011), *et al.*

[229] Barnosky and Hadly, *End Game*, 99, 122-123.

[230] Ibid., 94.

[231] Meg Ross, "Mosquito-borne Diseases on the Uptick-Thanks to Global Warming" *Scientific American* (2017), http://www.scientificamerican.com/.

and Zika viruses, and SARS are likely to increase in frequency and severity during the Malthusian Century, particularly in view of the fact that antibiotic resistance, according to one 2014 WHO report, is: '... no longer a prediction for the future, it is happening right now in every region of the world and has the potential to affect anyone, of any age, in any country. Antibiotic resistance … is now a major threat to public health,' and pandemics on the scale of the Plague of Justinian, Black Death and Spanish Flu are obviously not without historical precedent.'[232]

Global dimming also has the potential to intensify the future effects of dangerous climate change. Due to an increase in atmospheric particulates from aircraft contrails, black carbon, sulphate aerosols, and other air pollution, global surface direct irradiance decreased by 4-8 per cent in the Northern Hemisphere over the 1961-90 period alongside more modest decreases in the Southern Hemisphere, with a slight reversal in the Northern Hemisphere trend observed since.[233] Arctic Haze and the Asian Brown Cloud, which is visible from space (see photograph 1. Arctic Haze and photographs 2-3. The Asian Brown Cloud), are vivid manifestations of the global dimming phenomenon.[234] This dimming has reduced pan evaporation rates, disturbing the hydrological cycle, reducing rainfall in certain areas, and may have contributed to the 1983-85 Ethiopian famine.[235] The crux of the dilemma, however, is that while the greenhouse effect has been warming the planet, global dimming has been cooling it down.[236] When civil air traffic was shut down in the US following the 11 September 2001 terrorist attacks, diurnal temperature variation increased by 1°C nationwide; by implication, the solar dimming caused exclusively by aircraft contrails, just one source of atmospheric particulates, was significantly lowering the national temperature.[237] Unfortunately, this cooling effect will continue only so long as we have fossil fuels still to burn; once they have

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[232] --, "WHO's first global report on antibiotic resistance reveals serious, worldwide threat to public health" *World Health Organisation* (Apr. 30, 2014), http://www.who.int/; Barnosky and Hadly, *End Game*, 182; J. N. Nays, *Epidemics and Pandemics: Their Impacts on Human History* (Santa Barbara, CA: ABC-CLIO, Inc., 2005), 23-30, 41-68, 385-396; Mason, *Doomsday Scenarios*, 158.

[233] Ben Booth, "What is global dimming?" *The Guardian* (May 11, 2002), http://www.theguardian.com/.

[234] Photograph 1. Arctic Haze. Photograph by: J. Cozic, "Photos: NASA P3B Intercomparison" *U.S. Department of Commerce*, National Oceanic & Atmospheric Administration, Earth System Research Laboratory: Chemical Sciences Division (2008), http://www.esrl.noaa.gov/. Photographs 2-3. The Asian Brown Cloud. Left photograph from: Lloyd Vries, "'Brown Cloud' Stifles Asia" *CBS News* (Aug. 12, 2002), http://www.cbsnews.com/. Right photograph from: Sid Perkins, "'Asian Brown Cloud' Threatens U.S." *Science* (May 25, 2012), http://www.sciencemag.org/. National Oceanic and Atmospheric Administration, "Why Is Arctic Sea Ice Melting Faster Than Predicted? NOAA Probing Arctic Pollution" *ScienceDaily* (Apr. 9, 2008), http://www.sciencedaily.com/.

[235] *Global Dimming*, Dir. David Sington, Narr. Jack Fortune, *BBC Horizon*, 2005, Documentary; Stefan Brönnimann, *et al.*, *Climate Variability and Extremes during the Past 100 Years* (Berlin: Springer, 2008), 163-165.

[236] Phrasing adapted from: Ibid., *Global Dimming*.

[237] David J. Travis, Andrew M. Carleton, and Ryan G. Lauritsen, "Contrails reduce daily temperature range" *Nature*, Vol. 418, Issue No. 6898 (Aug. 8, 2002): 601, http://www.nature.com/.

been depleted or abandoned, and their spent particulates eventually settle, the cooling effect of global dimming will give way to the full and hitherto obfuscated force of global warming. The precise relative impact on the climate system of global warming and dimming is unknown; clearly the greenhouse effect is the more powerful, but may become still more powerful yet if the considerable cooling effect of global dimming begins to settle in tandem with atmospheric particulates.[238]

Even worse, global climate change can and has happened abruptly, when the climate system passed tipping points, and the cascade effect rapidly shifted it into a new state. Systems exhibit 'hysteresis' when these thresholds of no return are breached and the cascade effect takes over, often with irreversible or runaway consequences, and as systems grow more interdependent and complex, the likelihood of crossing such redlines increases accordingly.[239] The palaeontological and geological records are replete with past examples of abrupt global climate change, including the Younger Dryas event, the Carboniferous Rainforest Collapse, and possibly the Permian-Triassic extinction event and the Palaeocene-Eocene Thermal Maximum.[240] The global climate system has several known tipping points beyond which positive feedback mechanisms engage, and climate change takes on a momentum of its own, spiralling out of anthropogenic control.[241] One such positive feedback is the melting of polar sea ice, which exposes large patches of dark water that absorb more heat from the Sun than sea ice, which in turn melts more ice, and so on.[242] The volume and extent of Arctic sea ice have been decreasing exponentially for decades, with particularly precipitous drops observed in 2007, 2012, and 2016; already, the polar ice cap has contracted by an area the size of India (see fig. 43. Summer Arctic Sea Ice Extent, 1870-2013).[243] Further to sea ice, the melting of the Greenland and West Antarctic ice sheets is accelerating, suggesting that irreversible feedback runaway may already have begun (see fig. 44. Antarctic and Greenland Mass Variation, 2002-13).[244] If this melting

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238 *Global Dimming*, 2005, Documentary.
239 Barnosky and Hadly, *End Game*, 16.
240 Ibid.; Mason, *Doomsday Scenarios*, 57-60.
241 Barnosky and Hadly, *End Game*, 16.
242 Carlos M. Duarte and Paul Wassmann, ed., *Arctic Tipping Points* (Madrid, Spain: Fundación BBVA, 2011), 17-20.
243 Fig. 43. Summer Arctic Sea Ice Extent, 1870-2013. Graph adapted from: --, "Arctic sea ice 'recovers' to its 6th-lowest extent in millennia" *Skeptical Science* (Sept. 19, 2013), http://skepticalscience.com/. Alister Doyle, "Polar sea ice the size of India vanishes in record heat" *Reuters*, Global Energy News (Dec. 5, 2016), http://www.reuters.com/. R. E. Hester and R. M. Harrison, eds. *Carbon Capture: Sequestration and Storage* (London: The Royal Society of Chemistry, 2010), 289-290.
244 Fig. 44. Antarctic and Greenland Mass Variation, 2002-13. Graph adapted from: --, "Climate change threats to the polar regions: ice sheets and ice shelves" *Pole to Pole Campaign* (2017), http://www.poletopolecampaign.org/. Michael P. Byron, *Infinity's Rainbow: The Politics of Energy Climate, and Globalization* (New York: Algora Publishing, 2006), 96-97.

ice sufficiently alters the salinity of the ocean, thermohaline circulation, or the oceanic 'conveyor belt', will shut down, with catastrophic consequences.[245] Yet another tipping point is the release of carbon, and much more potent methane stored within the melting Siberian permafrost, which further intensifies the greenhouse effect, melting still more permafrost in a self-sustaining vicious feedback cycle.[246] The related calthrate gun hypothesis suggests that methane deposits in the seabed could be released with sufficient oceanic warming, creating yet another feedback runaway.[247] The scientific consensus on these climatic tipping points is that they exist; however, there is enormous uncertainty about where they lie.[248] If there is a silver lining of the black cloud of anthropogenic climate change, however, it is that it makes one worry less about fossil fuel depletion.[249]

The ongoing Holocene extinction, which began 11,700 years ago concurrent with the rise of *Homo Sapiens* following the last ice age, is by far the most severe extinction event of the planet's six, save for the cosmic Cretaceous-Palaeogene event.[250] Half of all large-bodied species, 170 out of 350, have already gone extinct, and it is believed that between 150 and 200 more species join their ranks each day at a rate between 20,000 and 200,000 times higher than the natural background extinction rate, although Lomborg reassures that the true rate is 'only' about 1,500 times higher than the natural background rate.[251] It is estimated that one-quarter of all Holocene animal species are already extinct, with half of the remainder to follow suit by the turn of the century, and one recent study concluded that one in five plant species now faces extinction on account of climate change, deforestation, and urban growth.[252] The precipitous decline of honeybee populations worldwide, known as colony collapse disorder, is particularly troubling since honeybees pollinate 9.5 per cent of global agricultural products worth an estimated US$200 billion.[253] It has been theorised that

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[245] Amy Mathews-Amos and Ewann A. Berntson, *Turning Up the Heat: How Global Warming Threatens Life in the Sea* (Collingdale, PA: Diane, Publishing Co, 1999), 4, 14; Mason, *Doomsday Scenarios*, 10-11.
[246] Byron, *Infinity's Rainbow*, 74-75.
[247] Hester and Harrison, eds. *Carbon Capture*, 289.
[248] Veronika Meduna, *Towards a Warmer World: What Climate Change Will Mean for New Zealand's Future* (Wellington, New Zealand: Bridget Williams Books, 2015), 2.
[249] Phrasing adapted from: *What a Way to Go*, 2007, Documentary.
[250] David Biello, "Fact or Fiction?: The Sixth Mass Extinction Can Be Stopped" *Scientific American* (Jul. 25, 2014), http://www.scientificamerican.com/; for further reading, see: Elizabeth Kolbert, *The Sixth Extinction: An Unnatural History* (New York: Henry Holt and Company, 2014), *et al.*
[251] Barnosky and Hadly, *End Game*, 18; Lomborg, *Skeptical Environmentalist*, 255-256; *What a Way to Go*, 2007, Documentary.
[252] Robin Lincoln Woord, *The Trouble with Paradise* (Bloomington IN: AuthorHouse UK Ltd, 2014), 348; Heinberg, *End of Growth*, 150; Juliette Jowit, "One in Five Plant Species Face Extinction," *The Guardian* (Sept. 29, 2010), http://www.theguardian.com/.
[253] N. Gallai, *et al.*, "Economic valuation of the vulnerability of world agriculture confronted with pollinator decline" *Ecological Economics*, Vol. 68, No. 3 (Jan. 15, 2009): 810-821, http://www.sciencedirect.com/.

agricultural insecticides, fungicides, miticides, and antibiotics, as well as climate change and electromagnetic radiation from mobile phone networks, which interferes with the ability of worker bees to navigate back to their hives, are among the causes of the disorder.[254] Agro-industrial civilisation now monopolises two-fifths of the planet's net primary productivity and three-fifths of its freshwater runoff, while *Homo Sapiens* and its domesticated animals make up 96-98 per cent of the net land mammalian zoomass: up from 10-12 per cent at the dawn of the Industrial Revolution, and less than 0.1 per cent at the dawn of the Agricultural Revolution.[255]

More than one-third of the oceans' total seafood production is captured merely to sustain current demand, and most large predatory fish populations have been reduced to less than ten per cent of their historic maximum catch levels.[256] The 2006 Impacts of Biodiversity Loss on Ocean Ecosystem Services Report warned that the oceans will run out of wild seafood by 2048, and found that 29 per cent of all commercial fisheries had already collapsed with many more on the brink; at the same time, global seabird populations have declined by 70 per cent over the last six decades.[257] Climate change and ocean acidification are also on track to kill most coral reefs by 2070, and one-quarter to one-third of all ocean species will eventually go extinct.[258] Mercury levels at the ocean's surface have tripled since the Industrial Revolution and seeped into the marine food chain.[259] Vast hypoxic 'dead zones' devoid of marine life litter the oceans, and the Great Pacific, North Atlantic, and Indian Ocean garbage patches are well-known.[260] By mid-century, there will be more plastic than fish in the oceans by weight.[261] Atomic halogens from refrigerants, solvents, propellants, and aerosols have catalysed ozone depletion, and created continent-sized ozone holes in the Arctic and

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[254] Jeffrey S. Pettis, *et al*., "Crop Pollination Exposes Honey Bees to Pesticides Which Alters Their Susceptibility to the Gut Pathogen *Nosema ceranae*" *PLOS ONE* (Jul. 24, 2013), http://journals.plos.org/; M. M. Khan and M. R. Islam, *Zero Waste Engineering* (Hoboken, NJ: John Wiley & Sons, 2012), 171-172.

[255] Eric W. Sanderson, *et al*., "The Human Footprint and the Last of the Wild: The human footprint is a global map of human influence on the land surface, which suggests that human beings are stewards of nature, whether we like it or not" *BioScience*, Vol. 52, No. 10 (2002): 891, https://academic.oup.com/; Sharon Ede, "The Bomb is Still Ticking..." *The Post Growth Institute* (Nov. 8, 2010), http://www.postgrowth.org/.

[256] Ibid., Sanderson; Barnosky and Hadly, *End Game*, 19; Heinberg, *End of* Growth, 135.

[257] Ibid., Heinberg; Boris Worm, *et al*., "Impacts of Biodiversity Loss on Ocean Services" *Science*, Vol. 314, Issue No. 5800 (Nov. 3, 2006): 787-790, http://www.science.sciencemag.org/; Jeremy Hance, "After 60 million years of extreme living, seabirds are crashing" *The Guardian* (Sept. 22, 2015), http://www.theguardian.com/.

[258] Barnosky and Hadly, *End Game*, 96-98. Peter Dauvergne, *Handbook of Global Environmental Politics*, Second Edition (Cheltenham, UK: Edward Elgar Publishing Limited, 2012), 443.

[259] Ibid., Barnosky and Hadly, 18.

[260] Heinberg, *End of Growth*, 131, 133; Richard A. Lovett, 'Huge Garbage Patch Found in Atlantic Too" *National Geographic News* (Mar. 2, 2010), http://news.nationalgeogrpahic.com/; Victor Paine, "What Causes Ocean 'Dead Zones"' *Scientific American* (2017), http://www.scientificamerican.com/.

[261] --, "The New Plastics Economy: Rethinking the future of plastics" *World Economic Forum* (Jan. 19, 2016), http://www.newplasticseconomy.org/.

Antarctic (see fig. 45. Antarctic Ozone Hole, 2015).[262] Not only does the consequent increase in solar irradiance cause sunburn, skin cancer, and cataracts, it also damages plants and reduces plankton populations.[263] Increased atmospheric levels of CO_2 are absorbed into the ocean to form carbonic acid, altering its acidity and making it even more difficult for plankton to form their shells.[264] Plankton populations have consequently declined by two-fifths since 1950, lowering global atmospheric oxygen levels and further raising CO_2 levels.[265] Plankton die-off threatens the very base of the marine food chain, and, like colony collapse disorder, risks producing an ecological cascade effect, whereby extinctions triggered by previous extinctions cascade up and down the aquatic food chain (and eventually the terrestrial food chain), culminating in an oceanic anoxic event: the depletion of the ocean's oxygen and its asphyxiation and death.[266] Although these have not occurred for millions of years, the geological record is replete with past examples in the Jurassic, Cretaceous, Mesozoic, and Palaeozoic periods, several of which coincided with and contributed to ozone depletion, global warming, and mass extinction.[267]

In their 2015 book *End Game: Tipping Point for Planet Earth?*, Anthony Barnosky and Elizabeth Hadly estimate that a global reduction in greenhouse gas emissions of 5.2 per cent *per annum* (6 per cent in the G20 developed nations) until 2060 will be required to limit warming to within 2°C; eventually, economic activity will need to be *removing* carbon from the atmosphere rather than adding to it if the atmospheric concentration of CO_2 is to be reduced to 350 ppm, in line with Hansen's prescriptions.[268] Not only is further economic growth exceedingly unlikely in this scenario, it also seems that even a gradual or moderate reduction in greenhouse gas emissions is no longer compatible with climate stability. In short, global civilisation has long since overshot the climatic and ecological boundaries of this planet, and preventing irreversible or runaway dangerous climate change at this eleventh hour essentially requires the immediate and total shutdown of agro-industrial

[262] Fig. 45. Antarctic Ozone Hole, 2015. False-colour image reproduced from: Audrey Haar and Monica Allen, "Annual Antarctic Ozone Hole Larger and Formed Later in 2015" *NASA TV* (Oct. 30, 2015), http://www.nasa.gov/. Rolf Muller, ed., *Stratospheric Ozone Depletion and Climate Change* (London: Royal Society of Chemistry Publishing, 2012), 149-165.
[263] Arjun Makhijani and Kevin R. Gurney, *Mending the Ozone Hole: Science, Technology, and Policy* (Cambridge, MA: The MIT Press, 1995), 80-84.
[264] Heinberg, *End of Growth*, 150-151.
[265] Ibid.; Richard Black, "Plankton decline across oceans as waters warm" *BBC* (Jul. 28, 2010), http://www.bbc.com/.
[266] Lambert M. Surhone, Miriam T. Timpledon, and Susan F. Marseken, *Cascade Effect (Ecology)* (Saarbrücken, Germany: VDM Publishing, 2010), *et al.*; Mason, *Doomsday Scenarios*, 9-12, 17-18; *What a Way to Go*, 2007, Documentary.
[267] Ibid., Mason, 9-12.
[268] Barnosky and Hadly, *End Game*, 104-105.

civilisation, upon which the fate and very survival of billions hinges, assuming that tipping points have not already been passed.[269]

SECTION IV
OVERPOPULATION AND OVERSHOOT

Overpopulation occurs when a species overshoots the carrying capacity of its host environment. By definition, this state is ephemeral; as Christopher Hitchens warned, 'Nature is pitiless, and if humans will not themselves limit population, then they will have it done for them".[270] The crux of the arguments presented in this thesis is that, like the deer of St Matthew Island, the number of *Homo Sapiens* now exceeds the carrying capacity of its host environment, in this case, the planet: the human race is overpopulated, agro-industrial civilisation is in overshoot, and like the deer of St Matthew Island, both will eventually return to a state of equilibrium with the natural world.[271] The Global Footprint Network has developed the concepts of 'biocapacity' and the 'ecological footprint': a measure of the sum total of natural capital required to support one person for one year, expressed in global hectares.[272] The total planetary biocapacity is 1.7 global hectares *per capita* at current population levels, yet the ecological footprint of agro-industrial civilisation works out at 2.8 global hectares *per capita* (for reference, the US' footprint is 8.2 global hectares).[273] This means that civilisation now uses the equivalent of 165 per cent of the global biocapacity to regenerate and replenish the resources it consumes and absorb the waste it produces, and this figure is expected to rise to 280 per cent by mid-century (see fig. 46. How Many Earths Does It Take to Support Humanity? 1960-2030).[274] If the global ecological footprint *per capita* were equivalent to the US', this figure would be 480 per cent! To make matters worse, between one- and three-quarters of all bioproductive land must be set aside to protect biodiversity and species viability.[275] It is possible to exceed carrying capacity for a limited time by drawing down natural base capital, but not indefinitely,

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[269] Hertsgaard, *Hot*, 66-70; Hamilton, *Requiem for a Species*, *et al.*; *What a Way to Go*, 2007, Documentary.
[270] Windsor Mann, eds. *The Quotable Hitchens: From Alcohol to Zionism – The Very Best of Christopher Hitchens* (Philadelphia, PA: Da Capo Press, 2011), 224.
[271] For further reading, see: David R. Klein, "The Introduction, Increase, and Crash of Reindeer on St. Matthew Island" *Wildlife Management*, Vol. 32 (1968): 350-367, http://dieoff.org/.
[272] N. F. Gray, *Facing Up to Global Warming: What is Going on and How You Can Make a Difference* (New York: Springer, 2015), 161-165.
[273] --, "Ecological Wealth of Nations" *Global Footprint Network* (2016), http://www.footprintnetwork.org/.
[274] Fig. 46. How Many Earths Does It Take to Support Humanity? 1960-2050. Graph reproduced from: Gray, *Facing Up to Global Warming*, 161. Ibid., 161-163.
[275] Keith, *Vegetarian Myth*, 53; Jim Merkel, *Radical Simplicity: Small Footprints on a Finite Earth* (Gabriola Island, BC, Canada: New Society Publishers, 2003), 55, 58.

and this unsustainable limbo in which agro-industrial civilisation has landed itself is unequivocal evidence of overshoot (see map 3. National Ecological Footprints and the Global Biocapacity).[276] The human population and civilisation will therefore return to a state of equilibrium with the severely-depleted planetary biocapacity, the only questions are how and when?

In 2009, Johan Rockström of the Stockholm Resilience Centre developed the planetary boundaries framework, encompassing land-system change, biosphere integrity, climate change, novel entities, stratospheric ozone depletion, atmospheric aerosol loading, ocean acidification, biochemical flows, and freshwater use (see fig. 47. The Nine Planetary Boundaries).[277] According to the framework, civilisation has already overshot the safe margins for three of these boundaries, including climate change, as discussed in the previous section, and is poised to exceed those of another two in the near future – more unequivocal evidence of overshoot.[278] Albert Bartlett's Great Challenge riddles the question: 'Can you think of any problem in any area of human endeavour on any scale, from microscopic to global, whose long-term solution is in any demonstrable way aided, assisted, or advanced by further increases in population, locally, nationally, or globally?'[279] My research has failed to uncover any, and in view of the fact that four-fifths of the human population lives in poverty, one-seventh lacks adequate access to water and one-eighth to food, while one-third lacks basic sanitation services, it is difficult to see how *Homo Sapiens* can be anything but overpopulated.[280] Growth has become both the cause of and solution to all of our problems, and this game can only go on for so long. Laid bare in these terms, the futility of further growth in populations and consumption is self-evident: we have met the enemy and he is us.[281]

In 1978, both the US' and the world's GPI indices peaked, and it can hardly be a coincidence that peak oil *per capita* occurred the following year (see fig. 48. Global GDP and GPI *per Capita*,

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[276] Map 3. National Ecological Footprints and the Global Biocapacity. Map reproduced from: --, "Ecological Deficit/Reserve" *Global Footprint Network* (2016), http://www.footprintnetwork.org/.
[277] Fig. 47. The Nine Planetary Boundaries. Diagramme reproduced from: Johan Rockström, *et al.*, "Planetary Boundaries: Exploring the Safe Operating Space for Humanity" *Ecology and Society*, Vol. 14, No. 2 (1 January 2009): 24, http://www.stockholmresilience.org/. Ibid.: 32-53.
[278] Ibid., 53.
[279] Bartlett, "Arithmetic, Population and Energy," Documentary; Valorie Allen, *Growing Pains: A Planet in Distress* (Houston, TX: Strategic Book Publishing, 2011), 45.
[280] The best riposte to Bartlett's Great Challenge I have come across is a manhunt. Barnosky and Hadly, *End Game*, 23-24.
[281] Phrasing adapted from: Walt Kelly, as quoted in: Ralph Keyes, *The Quote Verifier: Who Said What, Where, and When* (New York: St. Martin's Griffin, 2006), 57. New York: St. Martin's Griffin, 2006

1950-2005 and fig. 49. US GDP and GPI *per Capita*, 1950-2005).[282] GPI, or genuine progress indicator, is an alternative metric of economic growth which incorporates environmental and social factors, and its steady decline both in the US and worldwide over the past four decades is further evidence of overshoot.[283] The ecological footprint framework indicates that agro-industrial civilisation went into overshoot circa 1970 (see fig. 47.): the dawn of the unsustainable and therefore ephemeral Green Revolution, when the human population stood at roughly 3.5 billion.[284] Earth Overshoot Day has marked the calendar date on which the ecological footprint of civilisation exceeded the annual planetary biocapacity since this time, when it was commiserated in late December; now, three decades later, it falls in mid-August.[285] On the other hand, if the dawn of equally transient fossil fuels era circa 1800 is considered, the global population was less than one billion. At the dawn of the ephemeral Agricultural Revolution, and the beginning of the transient fossil soil age, *Homo Sapiens* numbered just *eight* million.[286] Jim Merkel calculates a maximum sustainable global population of 600 million, and William Catton concludes that at present consumption levels, the planet was overpopulated by the mid-nineteenth century.[287] Isaac Asimov cautioned that:

> ... democracy cannot survive overpopulation. Human dignity cannot survive overpopulation. Convenience and decency cannot survive overpopulation. As you put more and more people into the world, the value of life not only declines, it disappears. It doesn't matter if someone dies, the more people there are, the less one individual matters….[288]

The exact planetary carrying capacity and precise timeframe of overshoot extend beyond the scope of this thesis, but enough should be written here to unequivocally demonstrate that the human population and agro-industrial civilisation have exceeded the limits of sustainable development on this planet, and are in overshoot. This conclusion comes as no surprise to most, and Hamilton reflects that:

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[282] Fig. 48. Global GDP and GPI *per Capita*, 1950-2005. Graph adapted from: Rachel Reilly, "Why 1978 was the year the world never had it so good: We had the perfect balance of wealth, work and happiness" *The Daily Mail* (Jul. 13, 2013), http://www.dailymail.co.uk/. Fig. 49. US GDP and GPI *per Capita*, 1950-2005. Graph adapted from: Ibid.
[283] Hamilton, *Growth Fetish*, 58-59.
[284] The Global Footprint Network estimates the precise day of overshoot to be 29 December 1970. Andrea Collins and Andrew Flynn, *The Ecological Footprint: New Developments in Policy and Practice* (Cheltenham, UK: Edward Elgar Publishers, 2010), 138; Skirbekk, *Dysfunctional Culture*, 168n.
[285] Collins and Flynn, *The Ecological Footprint*, 138.
[286] Ibid.; Keith, *Vegetarian Myth*, 126, 128-129.
[287] Ibid., Keith, 12, 129.
[288] Isaac Asimov in interview by Bill Moyers, *Bill Moyers' World of Ideas* (17 October 1988), https://www-tc.pbs.org/; Bartlett, "Arithmetic, Population and Energy," Documentary.

> It is commonplace to observe that the current pattern of material consumption is environmentally-unsustainable.... For the most part, the general public's reaction to declarations by scientists and environmental activists that the expansion of the economy cannot be sustained physically is one of short-lived alarm followed by passivity, as if the problems are too overwhelming to dwell on. The implication of the unsustainability of material consumption levels − that we may need to transform our ways of living − challenges some of the most fundamental beliefs about how we live and how the future will unfold, a worldview in which growth is assumed. The political aspirations of environmentalism are hamstrung by growth fetishism: however much people may agree that we need to change our lifestyles so that we tread more lightly on Earth, when put to the test, most people go cold.[289]

In consequence, global civilisation is following in the footsteps of at least two dozen powerful, literate, sophisticated, and complex historical civilisations, which produced levels of social, economic, and technological complexity that they could no longer support and coordinate, and collapsed into the ash heap of history accordingly; unlike its forebears, however, agro-techno-industrial civilisation is poised to take the natural world order along with it.[290] As Jared Diamond emphasises in his 2005 book *Collapse: How Societies Choose to Fail or Succeed*, societal collapse is a choice, and one which global civilisation in general, and the developed world in particular, made in the 1970s or '80s.[291] Now, 47 years after Earth Overshoot Day, 49 years after the Ehrlichs' *Population Bomb*, and 55 years after Rachel Carson's *Silent Spring*, it is final minute of the eleventh hour: 'later' is finally here.[292]

SECTION V

TECHNOLOGICAL AND COSMIC GLOBAL CATASTROPHIC RISKS

Further to the abovementioned, agro-techno-industrial civilisation may face additional, more hypothetical crises, some of which also stem from exponential growth and development, in the Malthusian Century. In spite of arms reduction treaties, the spectres of thermonuclear and biological warfare remain, with the potential to annihilate the human race and raze civilisation and the planet many times over. These anthropogenic existential risks to civilisation stem from the exponential growth in the production of nuclear weapons and weaponised pathogens by the SU and

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[289] Hamilton, *Growth Fetish*, 174-175.
[290] Barnosky and Hadly, *End Game*, 16; Colin Renfrew and Paul Bahn, eds., *Archaeology: The Key Concepts* (London: Routledge, 2005), 54-55; Jared Diamond, *Collapse: How Societies Choose to Fail or Succeed* (New York: Viking Press, 2005), 252.
[291] Ibid., *et al.*; Heinberg, *End of Growth*, 152.
[292] Collins and Flynn, *The Ecological Footprint*, 138; Paul R. Ehrlich, *The Population Bomb* (San Francisco, CA: Sierra Club Books, 1968), *et al*; Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin Company, 1962), *et al.*

US during the early Cold War (see fig. 4.).[293] Thermonuclear war is an improbable event on any given year; nevertheless, this is the eighth decade of the Nuclear Age, and even highly improbable events become near certainties with the sufficient passage of time.[294] *The Bulletin of the Atomic Scientists*' Doomsday Clock countdown to global catastrophe is now set at two and a half minutes to midnight, its closest since 1953 (see fig. 50. Doomsday Clock: Minutes to Midnight, 1947-2017), and former US Defence Secretary William Perry, Noam Chomsky, and others argue that nuclear war is even *more* likely in the post-Cold War era, particularly in the context of nuclear terrorism and the souring of Russo-American relations.[295] Indeed, historians and archaeologists of the future may reflect that nuclear Armageddon was an historical inevitability, and the Three Mile Island accident, as well as the Chernobyl and Fukushima nuclear disasters, both of which will continue to release substantial amounts of radioactive material for tens of thousands of years, are grim reminders of the inherent uncertainties and transgenerational dangers of nuclear technology.[296] More generally, Michael Klare applies the Malthusian theory of war to contemporary geopolitics in his 2001 book *Resource Wars: The New Landscape of Global Conflict*, concluding that increasing demand for vital resources will soon exceed their decreasing supply, resulting in resource wars between major energy consumers such as the United States and China.[297]

To make matters worse, electromagnetic-industrial civilisation is set to face another coronal mass ejection on the scale of the 1859 Carrington event sometime during the Malthusian Century, which is estimated to be a once-in-a-century occurrence with a 12 per cent probability each decade, and we are overdue.[298] The Carrington event fried electrical infrastructure across the world and

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[293] Peak nuclear warheads circa 1985 is a rare example of a positive production peak. Carl Sagan, "To preserve a world graced by life" *Bulletin of Atomic Scientists*, Vol. 39, No. 1 (Jan. 1983): 3, http://www.books.google.com/; Luke Oman, "Consequences of a large nuclear war" *Nuclear Darkness, Global Climate Change & Nuclear Famine: The Deadly Consequences of Nuclear War* (2017), http://www.nucleardarkness.org/; for further reading, see: Raymond A. Zilinskas, ed., *Biological Warfare: Modern Offense and Defense* (Boulder, CO: Lynne Rienner Publishers, Inc., 2000), *et al.*

[294] *Countdown to Zero*, dir. Lucy Walker, narr. Gary Oldman, Magnolia Pictures, 2010, Documentary.

[295] Fig. 50. Doomsday Clock: Minutes to Midnight, 1947-2017. Timeline reproduced from: Dave Mosher, "*Bulletin of Atomic Scientists* advance their 'Doomsday Clock' as Trump takes office" *Business Insider Australia* (Jan. 27, 2017), http://www.businessinsider.com.au/. --, "Timeline: It Is Two and a Half Minutes to Midnight" *Bulletin of the Atomic Scientists* (2017), http://thebulletin.org/; Noam Chomsky, *Nuclear War and Environmental Catastrophe* (New York: Seven Stories Press, 2013), *et al.*; Rupert Cornwell, "Nuclear war is no longer the stuff of dystopian novellas − it's a very real and immediate threat" *Independent* (Jan. 29, 2017), http://www.independent.co.uk/; William J. Perry, "William J. Perry on nuclear war and nuclear terrorism" *Bulletin of the Atomic Scientists* (Dec. 8, 2015), http://thebulletin.org/.

[296] Mark Tran, "Nuclear crises: How do Fukushima and Chernobyl compare?" *The Guardian* (Apr. 12, 2011), http://www.theguardian.com/; for further reading, see: Walker J. Samuel, *Three Mile Island: A Nuclear Crisis in Historical Perspective* (Berkeley, CA: University of California Press, 2004), *et al.*

[297] Michael Klare, *Resource Wars: The New Landscape of Global Conflict* (New York: Owl Books, reprint edition, 2002), *et al.*

[298] Tony Phillips, "Near Miss: The Solar Superstorm of July 2012" *NASA Science* (Jul. 23, 2014), http://science.nasa.gov/.

aurorae borealis were observed in the tropics; nonetheless, its economic and societal impacts were minimal given the embryonic state of electromagnetic infrastructure at the time.[299] The solar storm of 2012 produced a coronal mass ejection of comparable size, which missed the planet by a margin of just *nine days*.[300] It is estimated that its impact would have taken four to ten years to recover from, and caused US$0.6-$2.6 trillion of damage worldwide, disabling communications, food distribution and refrigeration infrastructure, as well as vehicles, aircraft, and medical equipment, with appalling consequences.[301] There is also the ever-present possibility of another impact event on the scale of the 1908 Tunguska event, which levelled an area the size of Moscow in central Siberia, and would have destroyed St Petersburg had it impacted just a few hours later.[302] Even smaller yet far more frequent air bursts from superbolides such as the 1930 Curuçá River event or the 2013 Chelyabinsk meteor could have disastrous consequences.[303] The 2002 Eastern Mediterranean event, which produced an air burst the size of a small nuclear bomb, occurred during the 2001-02 India-Pakistani standoff at the same latitude as Kashmir, and could have triggered a nuclear exchange in a counterfactual scenario.[304]

Kessler Syndrome is yet another emerging crisis of exponential growth, and could render space inaccessible for all future human intents and purposes, cutting off our only route of escape from the other crises of the Malthusian Century. The theory was proposed by the NASA scientist Donald Kessler in 1978, and posits that the substantial amounts of orbital debris produced by hypervelocity satellite collisions like the 2009 Iridium 33-Kosmos-2251 collision, or the 1985 American and 2007 Chinese anti-satellite missile tests, would cause further collisions in an exponential ablative cascade; eventually, feedback runaway would reduce everything in orbit to tiny

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[299] E. W. Cliver and L. Svalgaard, "The 1859 Solar-Terrestrial Disturbance and the Current Limits of Extreme Space Weather Activity" *Solar Physics*, Issue No. 224 (Sept. 21, 2004): 407-422, http://www.leif.org/; Freddy Moreno Cardenas, *et al.*, "The grand *aurorae borealis* seen in Colombia in 1859" *Advances in Space Research*, Vol. 57, Issue No. 1 (Jan. 1, 2016): 257-267, http://www.sciencedirect.com/; --, "Southern *Aurora*" *The Moreton Bay Courier* (Sept. 1859): 2, http://trove.nla.gov.au/;.

[300] Brid-Aine Parnell, "Massive Solar Superstorm Narrowly Missed Blasting The Earth Back Into The Dark Ages" *Forbes* (Mar. 19, 2014), http://www.forbes.com/.

[301] Richard Horne, *et al.*, "Solar Storm Risk to the North American Electric Grid," Lloyd's and the Atmospheric and Environmental Research, Inc. (2013), http://www.lloyds.com/; Robert Sanders, "Fierce solar magnetic storm barely missed Earth in 2012" *Berkeley News* (Mar. 18, 2014), http://news.berkeley.edu/.

[302] Peter T. Bobrowsky and Hans Rickman, *Comet/Asteroid Impacts and Human Society, An Interdisciplinary Approach* (New York: Springer-Verlag, 2013), 303-330; --, "'Largest since Tunguska': Chelyabinsk meteorite take second place for size in over a century" *RT* (Feb. 15, 2013), http://www.rt.com/.

[303] Ibid., "'Largest Since Tunguska';" T. Gehrels, "Collisions with comets and asteroids" *Scientific American*, Vol. 274, No. 3 (Mar. 1996): 34-39, http://www.nationalgeographic.com/.

[304] A. J Bosker, "Near-Earth Objects Pose Threat, General Says" *Space Daily* (Sept. 17, 2002), http://www.spacedaily.com/.

projectiles travelling at dozens of times the speed of sound (see fig. 51. Countdown to the Kessler Syndrome).[305] Space flotsam and jetsam are already increasing exponentially in quantity (see fig. 52. Monthly Number of Objects in Earth Orbit by Object Type, 1957-2010), which indicates that this process may already have unstoppably started.[306] Were Kessler Syndrome ever to materialise, orbital and interplanetary spaceflight would become impossible, and communications and navigation systems would be thrown into chaos until the orbit of the Kessler debris cloud decayed after hundreds or even thousands of years.[307]

The Technological Singularity and Grey Goo Scenario are examples of hypothesised existential crises of exponential technological growth and development in the vein of Moore's law and the law of accelerating returns.[308] The technological singularity hypothesis postulates that the future development of artificial superintelligence could abruptly trigger runaway exponential technological growth, which would rapidly surpass collective human intelligence with unknown and potentially catastrophic consequences; Ray Kurzweil projects that the Technological Singularity will emerge around 2045 in his 2006 book *The Singularity is Near: When Humans Transcend Biology*.[309] In his 1986 book *Engines of Creation*, nanotechnology pioneer Eric Drexler coined the term 'grey goo' to describe a hypothetical existential ecophagic crisis of exponential technological growth, wherein out-of-control self-replicating molecular nanobots rapidly consume all matter on the planet:

> Imagine such a replicator ... making copies of itself … the first replicator assembles a copy in one thousand seconds, the two replicators then build two more in the next thousand seconds, the four build another four.... In less than a day, they would weigh a ton; in less than two days, they would outweigh the Earth; in another four hours, they would exceed the mass of the Sun and all the planets combined....[310]

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[305] Fig. 51. Countdown to the Kessler Syndrome. Diagramme reproduced from: Stuart Clark, "Space junk: Hunting zombies in outer space" *New Scientist*, Issue No. 2777 (Sept. 8, 2010), http://www.newscientist.com/. Donald J. Kessler and Burton G. Cour-Palais, "Collision Frequency of Artificial Satellites: The Creation of a Debris Belt" *Journal of Geophysical Research*, Issue No. 83 (1978): 2637-2646, http://adsabs.harvard.edu/; Paul Marks, "Satellite collision 'more powerful than China's ASAT test'" *New Scientist* (Feb. 13, 2009), http://www.newscientist.com/; Marc Kaufman and Dafna Linzer, "China Criticized for Anti-Satellite Missile Test" *The Washington Post* (Jan. 19, 2007), http://www.washingtonpost.com/.

[306] Fig. 52. Monthly Number of Objects in Earth Orbit by Object Type, 1957-2010. Graph adapted from: Dustin Buccino, "Ablative Laser Propulsion for Space Debris Removal: A project for ASEN 5050 − Spaceflight Dynamics" University of Colorado at Boulder (2011), http://ccar.colorado.edu/.

[307] Kessler and Cour-Palais, "Collision Frequency of Artificial Satellites" 2637-2646.

[308] For further reading, see: David C. Brock, ed., *Understanding Moore's Law: Four Decades of Innovation* (Philadelphia, PA: Chemical Heritage Foundation, 2006), *et al.*

[309] Ray Kurzweil, *The Singularity Is Near: When Humans Transcend Biology* (New York: Viking Books, 2006), *et al.*

[310] Eric Drexler, *Engines of Creation: The Coming Era of Nanotechnology* (New York: Doubleday, 1986), 123-124.

Such hypothetical future scenarios are instinctively dubious, yet it must be emphasised that technological civilisation is heading into uncharted territories; since compounding growth is 'the most powerful force in the universe,' according to Einstein, the realm of possibilities is vast.[311] There are many other hypothesised technological, geological, and cosmic global catastrophic risks and existential threats to human civilisation and the planet in the Malthusian Century and beyond, such as an experimental technology accident, supervolcanic eruption, megatsunami, geomagnetic reversal, gamma-ray burst, vacuum metastability event, nearby hypernova, extraterrestrial invasion, interplanetary back contamination, and so on, all of which extend beyond the scope of this thesis either on account of their excessively improbable, unquantifiable, unprecedented, and/or speculative nature, or their inherent futility.[312]

SECTION VI

ALTERNATIVE ENERGY AND FUTURE TECHNOLOGY

The cornucopian Pandora's Box of future technologies and energy sources set to replace fossil fuels and ameliorate climate change, while allowing for continued exponential economic and population growth, has been described as 'the sideshow at the end of the universe'.[313] Home entertainment, communications, microprocessor, and semiconductor technology have undergone revolutions in recent decades, leading many to assume that development and progress are proceeding much more rapidly than is actually the case; even so, most people would be hard-pressed to name any truly new and significant invention or innovation of the past quarter-century. Many critical technologies have failed to develop beyond token or cosmetic enhancements in the last few decades, and basic energy, transportation, water, and waste infrastructure is rapidly becoming obsolete in the US and elsewhere.[314] The last major breakthrough in energy technology was nuclear power in the 1950s, which has never generated more than a tiny fraction of global energy production, and has caused more than its fair share of problems (see fig. 26. and fig. 27).[315] Substitution has been widely hailed as the panacea for the global energy crisis, yet it is incrementally less economically efficient, as substitutes tend to be economically inferior; moreover, they must be obtained with

311 David M. Malone, Peter T. Hoffman and Anthony J. Bocchino, *Effective Deposition: Techniques and Strategies That Work*, Revised Third Edition (Louisville, CO: National Institute for Trial Advocacy, 2007), 336.
312 For further reading, see: Mason, *Doomsday Scenarios*, *et al.*
313 Orlov, *Reinventing Collapse*, 15.
314 Heinberg, *End of Growth*, 177-179.
315 *A Crude Awakening*, 2006, Documentary.

energy which must be obtained with additional resources and energy, and so on.[316] Further to this, any gains in energy and resource efficiency enabled by technological development tend to be erased by consequently increased demand and population growth in the long-run (this phenomenon, known as Jevons Paradox, will be further discussed in the following chapter).[317]

Alternative energy sources put forward as replacements for fossil fuels, such as hydroelectric, wind, solar-photovoltaic, nuclear, ethanol, geothermal, and biomass energy, tend to have relatively low EROEIs, oftentimes lower than the 5:1 to 10:1 primary energy minimum threshold below which industrial civilisation cannot function. The EROEIs for alternative energy sources are 40:1 for hydroelectric, 25:1 for wind, 15:1 for nuclear, 10:1 for solar-photovoltaic, 5:1 for sugar ethanol, 3:1 for biodiesel and gasohol, and somewhere in the vicinity of 1:1 for corn ethanol; by comparison, oil yielded a 100:1 or more energy return early last century (see fig. 20.).[318] Hydroelectricity has a high EROEI; however, it is estimated that one-third of the planetary hydropower capacity is already being utilised to produce a paltry 2.4 per cent of the global energy supply (see fig. 26. and fig. 27.), and 16.2 per cent of global electricity generation.[319] Wind and solar-photovoltaic energy yield relatively high EROEIs; unfortunately, there is virtually no possibility whatsoever that they, or any other combination of the above, will be able to replace the edifice of fossil fuels.[320] Replacing *just* the oil industry with biomass would require up to one-quarter of currently available cultivatable land at the opportunity cost of food production; to do the same with wind energy, at least one thousand 2-MW wind turbines would need to be installed each week for half a century: 2.5 million turbines altogether at a capital cost of US$5 trillion; using solar-photovoltaic, nearly five billion 2-kW panels would need to be installed over a fifty-year period at a cumulative cost in excess of US$80 trillion.[321] The contributions of wind and solar-photovoltaic power to global energy production would have to expand nearly one-thousand-fold to provide just one CMO of renewable energy, yet many of the

[316] Heinberg, *End of Growth*, 157-162.
[317] John M. Polimeni, *et al.*, *The Jevons Paradox and the Myth of Resource Efficiency Improvements* (London: Earthscan, 2008), ix-xi.
[318] Heinberg, *End of Growth*, 112, 119, 158.
[319] Hans-Joachim Schellnhuber, *World in Transition: Towards Sustainable Energy Systems* (London: Earthscan, 2004), 52; Crane, Kinderman, and Malhotra, *Cubic Mile of Oil*, 14; Xavier Moya and David Munoz-Rojas, eds., *Materials for Sustainable Energy Applications: Conversion, Storage, Transmission, and Consumption* (Boca Raton, FL: Pan Stanford Publishing, 2016), 6.
[320] Robert Lyman, "Why Renewable Energy Cannot Replace Fossil Fuels by 2050: A Reality Check" *Friends of Science* (May, 2016): 21-25, http://www.friendsofscience.org/.
[321] Crane, Kinderman, and Malhotra, *Cubic Mile of Oil*, 14.

rare earth metals essential to the construction of solar panels and wine turbines have already peaked in production.[322]

To replace oil with nuclear energy, which is dangerous, non-renewable, energy-intensive, and produces toxic, non-biodegradable waste, 2,500 average-sized 900-MW reactors would need to be constructed over a fifty-year period at the cost of US$5-10 trillion.[323] Needless to say, if such plans could be realised, peak uranium would occur much earlier than the Energy Watch Group's 2040 forecast.[324] Furthermore, aside from their cost ineffectiveness and low energy returns relative to fossil fuels, most alternative energy sources, including wind, solar-photovoltaic, hydroelectric, and nuclear power, can only produce electricity (and even then, generally only intermittently, in certain parts of the world), which loses considerable energy in transmission, and is incompatible with hundreds of trillions of dollars of existing infrastructure, as well as more than one billion internal combustion engines.[325] Ethanol has been widely hailed as a potential substitute for petrol, yet it requires vast swathes of the shrinking global agricultural demesne at the opportunity cost of food production, accelerates soil degradation, and increases fertiliser pollution; moreover, the process of planting, harvesting, and distilling corn, sugar, and other grains is incredibly energy-intensive.[326] One USDA study found a positive energy balance of 1.34:1 for corn ethanol, while another concluded the energy balance is in fact negative. If corn ethanol is an energy sink, though it may be viable for non-energy purposes, it ceases to be an energy *source*.[327] If the US' entire cultivatable land area were used to grow corn for ethanol, production would offset only *half* of its gasoline needs.[328] Sugar ethanol yields a higher EROEI of roughly 4:1; unfortunately, sugar is grown in the tropics, which will bear the brunt of dangerous climate change.[329]

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322 Heinberg, *End of Growth*, 142-143; Nicola Jones, "A Scarcity of Rare Metals Is Hindering Green Technologies" *Yale Environment 360* (Nov. 18, 2013), http://e360.yale.edu/.
323 Crane, Kinderman and Malhotra, *Cubic Mile of Oil*, 14-15.
324 Heinberg, *End of Growth*, 143; Seltmann, "Nuclear Power," 2009.
325 Daniel Sperling and Deborah Gordon, *Two Billion Cars: Driving Toward Sustainability* (Oxford: Oxford University Press, 2009), xvi, 1.
326 Heinberg, *End of Growth*, 157-158.
327 Ibid., 158; Hosein Shapouri, James Duffield, and Michael Wang, "The Energy Balance of Corn Ethanol: An Update" *U.S. Department of Agriculture*, Office of Energy Policy and New Uses, Report No. 813 (2002), http://greet.es.anl.gov/.
328 Crane, Kinderman and Malhotra, *Cubic Mile of Oil*, 14.
329 Richard Heinberg and David Fridley, *Our Renewable Future: Laying the Path for One Hundred Percent Clean Energy* (Santa Rosa, CA: Post Carbon Institute, 2016), 88.

Since the 1960s, nuclear fusion power has been touted as the 'holy grail' of boundless clean energy available in the next three decades, with little modification to that timetable hence.[330] By current estimates, the first prototype nuclear fusion power station, PROTO, will be operational no sooner than 2050, and the technology will require many more decades of development beyond then to become practical and economical.[331] The decades-old concept of a 'hydrogen economy' has been proposed as a future replacement for fossil-fuelled infrastructure, yet it must be underscored that hydrogen atoms can only be formed by means of fossil fuel reformation or electrolysis, which require a greater net energy input than the direct use of hydrogen can yield because of conversion and distribution losses. Like a battery, hydrogen is a means of storing energy, but is *not an energy source* itself.[332] One recent study of market trends concluded that 'At the current pace of research and development, global oil will run out 90 years before replacement technologies are ready,' yet the only contingency plans seem to be blind faith in technology and the invisible hand, as well as the *folie à plusieurs* that further growth will somehow resolve the problems created by prior growth, which borders upon magical thinking.[333]

In his 2004 book *The Limits of Business Development and Economic Growth*, Mats Larsson argues that recent inventions and breakthroughs have merely made timeless human activities such as communication and transportation faster, more convenient, and more economical; moreover, the limits to which these processes can be further improved are fast approaching from a business standpoint.[334] Indeed, the peak of global technological innovation occurred in 1870, according to physicist Jonathan Huebner, and patent registration *per capita* peaked in 1914 in the US (see fig. 53. Peak Innovation: Patented Inventions *per Capita* in the US by Year Granted, 1790-2011).[335] By Larsson's estimate, the limits to business growth development would begin to emerge in the 2005-15 period, which Heinberg observes:

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330 Nathaniel Scharping, "Why Nuclear Fusion Is Always 30 Years Away" *Discover Magazine* (Mar. 23, 2016), http://discovermagazine.com/.
331 --, "Fusion Electricity: A roadmap to the realisation of fusion energy" *European Fusion Development Agreement* (2012): 1, 6-7, 11, 16, 37-38, 47, http://www.euro-fusion.org/.
332 Heinberg, *Powerdown*, 124-128.
333 Heinberg, *End of Growth*, 159; Helen Knight, "Green Machine: Markets Hint at 100-Year Energy Gap" *New Scientist Online* (Nov. 11, 2010); Kat Kerlin, "New Forecast Warns Oil Will Run Dry Before Substitutes Roll Out" *University of California Davis News Service* (Nov. 9, 2010), http://www.ucdavis.edu/.
334 Ibid., 174-176; Mats Larsson, *The Limits of Business Development and Economic Growth: Why Business Will Need to Invest Less in the Future* (New York: Palgrave MacMillan, 2004), *et al.*
335 Fig. 53. Peak Innovation: Patented Inventions *per Capita* in the US by Year Granted, 1790-2011. Graph adapted from: Stephen F. DeAngelis, "Urbanization, Innovation, and Wealth" *Enterra Solutions* (Feb. 15, 2013), http://www.enterrasolutions.com/. Peter Murphy, *Universities and Innovation Economies: The Creative Wasteland of Post-Industrial Society* (London: Routledge, 2015), 63-64.

> … points to an expiration date for global growth that coincides with forecasts based on credit and resource limits. This convergence of trends may not be merely coincidental: after all, automation is fed by cheap energy and business growth by debt. Limits in one area tighten further the restrictions in others.[336]

Such technological pessimism may evoke the debunked urban legend that the head of the US Patent Office proclaimed it could be closed in 1899, in view of the fact that everything that could be invented already had been.[337] Needless to say, this is still not the case; nonetheless, it is equally short-sighted to pin the hopes of humanity and civilisation on magical future technologies when, even conjointly, all foreseeable developments will scarcely make a dent in the problems of the Malthusian Century.

SECTION VII

THE HUMAN PREDICAMENT

This chapter paints a grim picture of the post-growth paradigm in the pipeline. The abovementioned crises of growth and development will converge on the rapidly ageing industrialised world: the number of people over sixty worldwide will virtually double by mid-century, and in Western Europe, Japan, and elsewhere, nearly one-third of the population will be over sixty.[338] In the US, infrastructure and the electrical grid, which were awarded a D+ by the American Civil Society of Engineers, are rapidly ageing alongside the population.[339] Over and above the physical limits to growth and development, the US will also reach the conceptual limits to debt in the Malthusian Century, which will further constrain crucial investments in infrastructure and technological innovation.[340] The American inverted totalitarian economic system, which is driven by credit and debt, has made the collective assumption that the future will be larger than the present, when the preponderance of evidence and expert consensus strongly suggests the opposite.[341]

Further to surging debts, the post-1980 period has seen an ever-widening wealth gap in the inverted totalitarian US known as the Great Divergence, and the 'top one per cent' now own 35 per cent of the national wealth − twice as much as in 1979 − while the bottom half own a meagre 2.5

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336 Heinberg, *End of Growth*, 176.
337 Ibid., 187.
338 Barnosky and Hadly, *End Game*, 23.
339 Ashley Halsey III, "U.S. Infrastructure gets D+ in annual report" *The Washington Post* (Mar. 19, 2013), http://www.washingtonpost.com/.
340 Heinberg, *End of Growth*, 178; Larsson, *Limits of Business Development*, *et al.*
341 Ibid., Heinberg, 94.

per cent: the same amount as the richest *dozen* Americans do conjointly.[342] On a global scale, one 2017 Oxfam report determined that the world's richest *eight* billionaires control more wealth than the poorest *half* of the human population combined, down from 62 in 2015, and 388 in 2010.[343] Parallels have been drawn with the socioeconomic conditions immediately preceding the French and Russian revolutions, and the Occupy Wall Street movement, Brexit, as well as the unprecedented rise of Donald Trump and Bernie Sanders in US politics, are telling indicators of the mounting popular dissatisfaction with established economic and political élites in the inverted totalitarian US and many of its allies, and these are still early days. The widening wealth gap produced by American inverted totalitarianism will surely collide with limits of its own in the Malthusian Century, with the potential to cause social unrest, class warfare, and even revolution or societal collapse, if history is any indication. In short, politics has the potential to considerably exacerbate the converging crises of the Malthusian Century.[344]

The literature is littered with detailed proposals for avoiding the unmanageable and managing the unavoidable during the Malthusian Century, with examples including: *Plan B 4.0: Mobilizing to Save Civilization*, *World on the Edge: How to Prevent Environmental and Economic Collapse*, *The Oil Depletion Protocol: A Plan to Avert Oil Wars*, *Terrorism and Economic Collapse*, *Transport Revolutions: Moving People and Freight Without Oil*, *The Biochar Solution: Carbon Farming and Climate Change*, and countless others.[345] Nonetheless, such analyses tend to be far too narrow in scope, and fail to consider the interconnectedness and synergy of the oncoming crises in aggregate, thereby missing the forest through the trees. This thesis takes a more holistic approach, concluding that although these crises of civilisation are separately amenable to resolution in theory, they are far too

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[342] David Cay Johnston, "The wealthiest dozen Americans own more than the bottom half" *Al Jazeera* (Dec. 2, 2015), http://america.aljazeera.com/; *Inequality for All*, Dir. Jacob Kornbluth, Perf. Robert Reich, *et al.*, 72 Productions, 2015, Documentary; Robert Pear, "Top Earners Doubled Share of Nation's Income, Study Finds" *The New York Times* (Oct. 25, 2011), http://www.nytimes.com/; Timothy Noah, *The Great Divergence: America's Growing Inequality Crisis and What We Can Do About It* (New York: Bloomsbury Press, 2012), 1-10.

[343] Deborah Hardoon, Ricardo Fuentes-Nieva, and Sophia Ayele, "An Economy For the 1%: How privilege and power in the economy drive extreme inequality and how this can be stopped" *Oxfam Briefing Paper* (Jan. 18, 2016): 2, http://www.oxfam.org/; Gerry Mullany, "World's 8 Richest Have as Much Wealth as Bottom Half, Oxfam Says" *The New York Times* (Jan. 16, 2017), http://www.nytimes.com/.

[344] Orlov, *Reinventing Collapse*, 84-85.

[345] Heinberg, *End of Growth*, 259-260; Albert Bates, *The Biochar Solution: Carbon Farming and Climate Change* (Gabriola Island, BC, Canada: New Society Publishers, 2010), *et al.*; Lester R. Brown, *Plan B 4.0: Mobilizing to Save Civilization* (New York: W. W. Norton & Company, 2009), *et al.*; Lester R. Brown, *World on the Edge of Collapse: How to Prevent Environmental and Economic Collapse* (New York: W. W. Norton & Company, 2011), *et al.*; Richard Gilbert and Anthony Perl, *Transport Revolutions: Moving People and Freight Without Oil* (Gabriola Island, BC, Canada: New Society Publishers, 2010), *et al.*; Richard Heinberg, *The Oil Depletion Protocol: A Plan to Avert Oil Wars*, *Terrorism and Economic Collapse* (Gabriola Island, BC, Canada: New Society Publishers, 2006), *et al.*

unprecedented, immense, complex, enmeshed, and systemic for industrial civilisation to realistically manage each successfully. For instance, increased chemical fertiliser use and desalinisation projects may ameliorate the food and water crises, yet they also hasten fossil fuel depletion and intensify environmental degradation. Overcoming just one of these challenges, such as peak oil or climate change, would be a spectacle of human innovation and achievement, but overcoming them all unscathed at this eleventh hour would essentially require nothing short of a miracle. The following chapter offers a comparative analysis of the extent to which Soviet classical and American inverted totalitarianism would or could (have) produce(d) the oncoming crises of growth and development, if at all, as well as their relative institutional capacity for avoiding or mitigating the unmanageable, preparing for and managing the unavoidable, and adapting to the post-growth paradigm of the new millennium.

CHAPTER III

AVOIDING THE UNMANAGEABLE AND MANAGING THE UNAVOIDABLE

PREPARING FOR THE MALTHUSIAN CENTURY AND ADAPTING TO THE POST-GROWTH PARADIGM

SECTION I

SOVIET CLASSICAL AND AMERICAN INVERTED TOTALITARIANISM ASSESSED THROUGH THE OPTICS OF NEO-MALTHUSIANISM AND ENVIRONMENTAL ECONOMICS

In this chapter, Soviet classical and American inverted totalitarianism are juxtaposed with a view to determining the relative level of causation between the implementation of each system and the converging crises of growth and development outlined in the previous chapter, as well as their relative ability and preparedness to anticipate, mitigate, adapt to, or prevent them. As mentioned in the previous chapter, like the inverted totalitarian capitalist world, the classical totalitarian communist world was stricken by the Growth Fetish, and enjoyed some mixed successes in the endeavour of growth production.[346] The Stalinist economic model produced tremendous amounts of growth in its formative decades, constructing an industrial base (from scratch, in many cases), and accelerating national development by decades or even a century.[347] Following the conclusion of the Russian Civil War and Lenin's New Economic Policy, Stalin consolidated his power in 1928, and embarked the SU upon a series of Five-Year Plans, emphasising heavy and military industries with a view to preparing the nation for a second world war.[348] On 4 February 1931, Stalin declared: 'We are fifty or a hundred years behind the advanced countries. We must make good this distance in ten years. Either we do it, or they will crush us.'[349] Ten years and four months later, Nazi Germany, with which the SU had entered into a treaty of non-aggression, committed the critical error of Charles XII and Napoleon Bonaparte by invading Russia, whose newly-built-up military and

[346] Hamilton, *Growth Fetish*, 4.
[347] Meisner, *Mao's China and After*, 417-418.
[348] Pipes, *Communism*, 55-58.
[349] J. V. Stalin, *Problems of Leninism* (Peking: Foreign Languages Press, 1976), 519-31.

industrial juggernaut overwhelmed them almost single-handedly by sheer weight of numbers in the Great Patriotic War.[350]

In its early decades, the SU attained unprecedented levels of economic growth, with a decadal increase of 54 per cent over the 1928-58 period, to a large extent without foreign assistance, loans, support, or investments − higher than Imperial Germany's 33 per cent per decade between 1880 and 1914, or even Meiji Japan's decadal increase of 43 per cent for the 1874-1929 period. In Maoist China, the rate of growth was even higher, at 64 per cent per decade over the 1952-72 period.[351] Nevertheless, by the 1980s, the SU's initial burst of rapid industrialisation, growth, and development had lost momentum and stalled, and the Soviet *bloc* burnt itself out soon thereafter. Bogged down by military spending consuming roughly one-third of its GDP, ongoing warfare in Afghanistan, stagnant 'growth', low oil prices compounded by slumping production (see fig. 15.), and straitjacketed by the inherent limitations of its centrally-planned economy, the Soviet leviathan exhausted itself and imploded decades before national or planetary limitations constricted either its growth or development.[352]

The collapse of communism produced three distinct outcomes for the former communist world: much of the former SU and Eastern Europe pursued varieties of capitalism and liberal democracy, often deepening their economic and geostrategic ties with the US and its allies, though most quickly degenerated into crony capitalist illiberal managed democracies.[353] The regimes in China, Vietnam, and Laos survived the Autumn of Nations, and retained their single-party rule and Soviet-style political apparatuses; nevertheless, beginning with Deng Xiaoping's Socialism with Chinese Characteristics in 1978, and followed by Vietnam's *Đổi Mới* and Laos's New Economic Mechanism in 1986, each abandoned the economic model of Soviet classical totalitarianism for *de*

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[350] Thean Potgieter and Ian Liebenberg, eds., *Reflections on War: Preparedness and Consequences* (Stellenbosch, South Africa: Sun Press, 2012), 38-39.
[351] Meisner, *Mao's China and After*, 417-418.
[352] Archie Brown, *The Rise and Fall of Communism* (London: The Bodley Head, 2009), 398-420; French, *North Korea*, 82; Gail Tverberg, "The Real Oil Extraction Limit, and How It Affects the Downslope" *Our Finite World* (Dec. 18, 2013), http://ourfiniteworld.com/; Pipes, *Communism*, 81; for further reading on the Soviet War in Afghanistan, see: Gregory Feifer, *The Great Gamble: The Soviet War in Afghanistan* (New York: HarperCollins Publishers, 2009), *et al.*
[353] For further reading, see: David Lane and Martin Myant, *Varieties of Capitalism in Post-Communist Countries* (New York: Palgrave MacMillan, 2007), *et al.*; Gale Stokes, *The Walls Came Tumbling Down: The Collapse of Communism in Eastern Europe* (Oxford: Oxford University Press, 1993), *et al.*; Peter Cipkowski, *Revolution I Eastern Europe: Understanding the collapse of Communism in Poland, Hungary, East Germany, Czechoslovakia, Romania and the Soviet Union* (New York: John Wiley & Sons, Inc., 1991), *et al.*

facto capitalism.[354] Only the regimes in Cuba and North Korea survived the collapse of communism with their Soviet-style political *and* economic systems intact.[355] In sum, Soviet classical totalitarianism went through an initial period of rapid industrialisation, growth, and development, yet had invariably begun to stagnate or decline by the 1980s, essentially entering a no-growth, stationary state more than half a century prior to the emergence and convergence of the aforementioned crises of the Malthusian Century, before collapsing either into variants of inverted totalitarianism like the Eastern *bloc*, or into post-growth Soviet classical totalitarianism like Cuba and North Korea, or developing into capitalistic Soviet classical totalitarianism like China, Vietnam, and Laos. Conversely, its inverted totalitarian counterparts were able to maintain high rates of growth, development, and consumption throughout the Cold War and beyond.

At this juncture, it must be conceded that the greatest shortcoming of the central conclusion of this thesis, that Soviet classical totalitarianism offers a more advantageous development model than American inverted totalitarianism in the post growth paradigm of the new millennium, is the abovementioned tendency of the former to undergo political revolution and collapse *into* the latter. Of course, this has not invariably been the case, as Cuba and North Korea, and to a lesser extent, China, Vietnam, and Laos demonstrate; more to the point, however, the post-Cold War transformation of Soviet classical totalitarianism into American inverted totalitarianism in Eastern Europe occurred during the era of growth in which inverted totalitarianism has prospered to a far greater extent. In the event of its collapse during the Malthusian Century, which the following chapter contends would be even more calamitous than for a hypothetical Soviet classical totalitarian state, it would no longer hold any relative appeal, and such a Soviet-style state and its population would have no incentive to take on any of its relatively failed attributes. In this sense, the collapse of Soviet classical totalitarianism into American inverted totalitarianism during the era of growth would not necessarily portend its collapse during the Malthusian Century, and by the same token, the growth of American inverted totalitarianism in the growth era does not necessarily portend its continued growth during the Malthusian Century. The central conclusion that the former offers a more advantageous development model in the new millennium is therefore not incompatible with its collapse into the less advantageous, but more appealing latter in the last millennium, particularly if

[354] French, *North Korea*, 91; for further reading, see: Geoffrey Murray, *Vietnam: Dawn of a New Market* (New York: St. Martin's Press, 1997), *et al.* and Meisner, *Mao's China and After*, 449-482.
[355] Clifford L. Staten, *The History of Cuba* (London: Greenwood Press, 2003), 135-154; French, *North Korea*, 91, 93-137.

American inverted totalitarianism proves unable to maintain this relative appeal when the apparent advantages it held during the growth era degenerate into critical liabilities in the Malthusian Century.

On a more conceptual level, however, this objection extends beyond the scope and purposes of this thesis, which aims to determine the comparative *advantageousness* of each development model in the new millennium, rather than their relative viability, appeal, or the frequency of their implementation, and certainly not their relative appeal or frequency of implementation in the *last* millennium. Moreover, its scope is limited to the *direct* implications of the implementation of each form of totalitarianism in the Malthusian context, rather than the *in*direct implications of whatever new form of government might be implemented in their place. Such cases either extend beyond the limitations of the inverted totalitarianism theoretical framework, and therefore the scope of this thesis, altogether, or remain within its scope and that of the applied framework, only this time at the opposite end of its theoretical spectrum of totalitarianism, where they are reassessed separately and accordingly, as in the case of Soviet classical totalitarian Russia of the Cold War era and American inverted totalitarian post-Soviet Russia of the 1990s, which are treated as separate entities within the framework of this analysis despite being the same nation.

By way of analogy, if the objective of a clinical study was to determine the relative safety of caffeine and nicotine consumption for pregnant women, any observed tendency of caffeine consumption to elicit or increase nicotine consumption (a known correlation) in subjects would not undermine the fundamental conclusion that caffeine is the relatively safer alternative, even if it is not the best, the only, or the most appealing one.[356] This dynamic parallels that of Soviet classical and American inverted totalitarianism in the Malthusian Century context, and this thesis concludes that the former is the relatively more advantageous alternative in the new millennium, even if it is not the best, the only, or the most appealing one, and even if it is simply the better of this particular dyad by default because American inverted totalitarianism is perhaps the most disadvantageous system ever conceived, as assessed through the optics of neo-Malthusian and environmental economics, due to its relative and superlative ability to produce the growth and development that are at the core of the forthcoming crises outlined in the previous chapter, which this section will contend.

[356] For further reading on the correlation between caffeine and nicotine, see: C. R. Brown and N. L. Benowitz, "Caffeine and cigarette smoking: behavioural, cardiovascular, and metabolic interactions" *Pharmacology, Biochemistry and Behavior*, Vol. 34, No. 3 (Nov., 1989):565-570, http://www.ncbi.nlm.nih.gov/.

In short, although Soviet classical totalitarianism had a tendency to collapse into American inverted totalitarianism in the last millennium, thereby becoming part of the greater problem from the standpoint of neo-Malthusianism and environmental economics, it was not *itself* the greater problem, and Soviet classical totalitarianism is axiomatically therefore the more advantageous of this particular dyad in the context of the crises of growth and development previously outlined, as well as the post-growth paradigm of the new millennium, much as caffeine, while certainly not 'good' for pregnant women *per se*, is vastly far more 'advantageous' than nicotine, given the alternative, simply because little else is worse. Perceived through these prisms, virtually any system which fails to produce growth on the prodigious scale of American inverted totalitarianism, such as neo-primitivism or theocratic asceticism, is 'advantageous', and Soviet classical totalitarianism is no exception, yet as the following chapters will contend, it does lend itself to the post-growth paradigm in many ways which the other major political and economic ideologies of the last millennium in general, and American inverted totalitarianism in particular, do not, making it the overwhelmingly more advantageous of the inverted totalitarian twins for the Malthusian Century and the post-growth paradigm.

As a general observation, the Russian nation has always played a better game of chess than Monopoly, despite the Soviets' early streak of beginner's luck, and its superpower status has never been anchored in its economic prowess.[357] Even at their apex, the Soviet *bloc*'s most advanced and developed economies, Czechoslovakia, Hungary, Poland, and East Germany, failed to expand much past a *per capita* GDP of Intl.$6,000, and the SU attained a maximum figure of Intl.$7,112 in 1989 (see fig. 54. Soviet *bloc* GDPs *per Capita*, 1950-2010).[358] Incomes in the Soviets' Asian and African satellites were significantly lower than in the Eastern *bloc*, yet they too had begun to stagnate or contract by the late 1980s (see fig. 55. Various Cold War Soviet Satellites' GDPs *per Capita*, 1950-2010 and fig. 56. Cuba and North Korea GDPs *per Capita*, 1950-2005).[359] By contrast, *per capita* GDP continued to exponentially increase in China, Vietnam, and Laos, which had each abandoned the Soviet economic model by the mid-1980s (see fig. 56. China, Vietnam, and Laos GDPs *per Capita*,

[357] Phrasing adapted from Jeanne Kirkpatrick, as quoted in: --, *United States of America Congressional Record Proceedings and Debates of the 110th Congress, Second Session*, Vol. 154, Part 13 (Washington, DC: US Government Printing Office, 2008), 18,449.

[358] Fig. 54. Soviet *bloc* GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: J. Bolt and J. L. van Zanden, "The Maddison Project: collaborative research on historical national accounts" *The Economic History Review*, Vol. 67, No. 3: 627-651, http://www.ggdc.net/maddison/maddison-project/data.htm. Fig. 56. Cuba and North Korea GDPs *per Capita*, 1950-2005. Self-made. Data adapted from: Ibid.

[359] Fig. 55. Various Cold War Soviet Satellite States' GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: Ibid. Fig. 56. Cuba and North Korea GDPs *per Capita*, 1950-2005. Self-made. Data adapted from: Ibid.

1950-2010).[360] The central objective of sustained exponential growth, apparently somehow essential for the human evolutionary psyche, continued to be (un)scientifically striven for in the Soviet *bloc* economies, yet statistical sleight of hand, propaganda of success, and ostentatious megaprojects had to be deployed with increasing regularity in order to sustain the illusion of sustained growth, and mask the system's paucity of results.[361] Eventually, as fig. 54. illustrates, the political revolutions of 1989 caused the Soviet *bloc* economies to precipitously collapse alongside communism, before gradually recovering in the 1990s as varieties of capitalism began to take hold.

At the same time, population growth rates in Eastern Europe plateaued, peaked, and became among the first in the world to go negative in the 1990s (see fig. 58. Eastern Europe Rate of Natural Population Increase, 1955-2015 and fig. 59. Population Trend in Eastern Europe, 1951-2015).[362] This peacetime population decline, unprecedented in modern times, occurred in spite of generally pronatalist policies, most notably in Nicolae Ceauşescu's Romania, and was largely due to a combination of high death rates, including many from alcoholism and tobacco, low birth rates, demographic momentum, and to some extent, emigration.[363] Birth rates have been shown to decline in tandem with increased economic development, which usually increases aggregate consumption in consequence, and intensifies the consequences of overpopulation accordingly; yet, Soviet classical totalitarianism proved capable of constraining population growth at a low level of development relative to other stagnating or declining populations in Japan, Western Europe, and elsewhere, considerably easing the combined ecological impacts of exponentially increasing populations *and* consumption levels by comparison.[364]

In contrast with the Soviet *bloc*, both the developed and developing economies of the US-led capitalist *bloc* attained high levels of economic and population growth in the postwar era, and although growth rates declined in the developed world consequent to the 1970s oil crises, economic growth has continued at lower yet still relatively high level (see fig. 60. The Capitalist and (Former)

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360 Fig. 57. China, Vietnam, and Laos GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: J. Bolt and J. L. van Zanden, "The Maddison Project: collaborative research on historical national accounts" *The Economic History Review*, Vol. 67, No. 3: 627-651, http://www.ggdc.net/maddison/maddison-project/data.htm.

361 Hamilton, *Growth Fetish*, 6.

362 Fig. 58. Eastern Europe Rate of Natural Population Increase, 1955-2015. Graph adapted from: Valentina Romel, "Eastern Europe has the largest population loss in modern history" *FT Data* (May 27, 2016), http://blogs.ft.com/ftdata/. Fig. 59. Population Trend in Eastern Europe, 1951-2015. Graph adapted from: Ibid.

363 Ibid.; for further reading on pronatalism in Nicolae Ceauşescu's Romania, see: Gail Kligman, *The Politics of Duplicity: Controlling Reproduction in Ceausescu's Romania* (Berkeley, CA: University of California Press, 1998), *et al.*

364 G. Nargund, "Declining birth rate in Developed Countries: A radical policy re-think is required" *Facts, Views & Vision: Issues in Obstetrics, Gynaecology and Reproductive Health*, Vol. 1, No. 3 (2009): 191-193, http://www.ncbi.nlm.nih.gov/.

Communist *bloc*s' GDPs *per Capita*, 1950-2010).[365] In spite of declining birth rates, high and often highly-unpopular rates of immigration have kept the populations of the inverted totalitarian US and many of its allies expanding.[366] Whereas *per capita* economic growth in the classical totalitarian SU was arithmetic prior to its stagnation in the 1980s and collapse in the 1990s, the inverted totalitarian US has essentially maintained exponential *per capita* growth since the Gilded Age, with the prominent exception of the Great Depression, and its *per capita* GDP was Intl.$30,491 in 2010, and has continued to expand exponentially since:[367] As fig. 60. illustrates, the economic trajectories of the Soviets' Eastern European satellites and the US' Western European allies closely shadowed those of their respective patrons, and specific Cold War rivalries such as East and West Germany, and North and South Korea, exhibit the same pattern. Such comparisons are microcosms of the failure of Soviet classical totalitarianism to produce growth on the scale of American inverted totalitarianism in the long-run, if at all, as fig. 60. demonstrates. If GWP *per capita* at the time of writing were $7,112 − identical to the Soviets' 1989 peak − it would be roughly two-thirds of its actual value; the previous chapter concluded that the global ecological footprint of agro-industrial civilisation now exceeds the planetary biocapacity by two-thirds, suggesting that if the current human population lived at the maximum Soviet income level attained in 1989, civilisation just *might* be able to operate within the planetary carrying capacity, and of course most Soviet satellites states had vastly lower incomes than the Soviets, who in turn had lower population growth rates than most.[368] On the other hand, if GWP *per capita* were $53,000 − identical to the US' at the time of writing − it would be roughly *five times* its present level, which is already *far* too high.[369]

Perceived through the lenses of neo-Malthusianism and environmental economics, this observed 'glass ceiling' of economic development and population growth in the Soviet *bloc* is significant: if Soviet classical totalitarianism is systemically incapable of attaining further growth in populations and consumption rates beyond an ecologically sustainable threshold, the limits to growth are unreachable, and the myriad crises of growth and development previously outlined would never materialise since the system invariably stagnated and eventually contracted or collapsed

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[365] Fig. 60. The Capitalist and (Former) Communist *bloc*s GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: J. Bolt and J. L. van Zanden, "The Maddison Project: collaborative research on historical national accounts" *The Economic History Review*, Vol. 67, No. 3: 627-651, http://www.ggdc.net/maddison/maddison-project/data.htm.
[366] Heinberg, *End of Growth*, 214.
[367] --, "United States GDP per capita (current US$)" *The World Bank Group*, National Accounts Data and OECD National Accounts Data Files (2016), http://data.worldbank.org/.
[368] US$7,112 GWP *per capita* x 7.4 billion people = US$52.6 trillion GWP ÷ $78 trillion actual GWP = 67.4 per cent.
[369] US$53,000 GWP *per capita* x 7.4 billion people = US$392.2 trillion GWP ÷ $78 trillion actual GWP = 502.8 per cent.

long before their emergence. The economic and demographic stagnation of the ailing Soviet *bloc* in the 1980s, as well as of Cuba and North Korea thereafter, demonstrates something quite remarkable: not only did the Soviet classical totalitarian economic model fail to produce growth beyond a relatively low threshold, it also proved capable of sustained functioning in a steady, no-growth, stationary state. During the 1980s, the Soviet *bloc* economies continued to groan on much as before in spite of little or no growth (see fig. 54.), and it was ultimately political revolution rather than economic or societal collapse which relegated them to President Reagan's ash heap of history before the capitalist *bloc*. As the following chapter will further investigate, Cuba and North Korea have managed to retain Soviet classical totalitarianism in the quarter-century since the Autumn of Nations in either a declining or stationary state, for the most part, without any concomitant political or societal collapse (see fig. 56.). In contrast, sustained growth is *prerequisite* for the American inverted totalitarian economic model, which Heinberg explains has:

> … created monetary and financial systems that require growth. As long as the economy is growing, that means more money and credit are available, expectations are high, people buy more goods, businesses take out more loans, and interest on existing loans can be repaid. But if the economy is not growing, new money isn't entering the system, and the interest on existing loans cannot be paid; as a result, defaults snowball, jobs are lost, incomes fall, and consumer spending contracts − which leads businesses to take out fewer loans, causing still less new money to enter the economy. This is a self-reinforcing destructive feedback loop that is very difficult to stop once it gets going. In other words, the existing market economy has no 'stable' or 'neutral' setting; there is only growth or contraction. And 'contraction' can be just a nicer name for recession or depression − a long period of cascading job losses, foreclosures, defaults, and bankruptcies.[370]

In his 2009 book *Prosperity Without Growth: Economics for a Finite Planet*, Tim Jackson echoes the conclusion that the economic, monetary, and financial systems of the inverted totalitarian capitalist model invariably produce either expansionary or contractionary, yet never stationary states.[371] Jackson notes that capitalist economies emphasise cost-effectiveness, and the efficiency with which labour and capital inputs to production are utilised: rapid technological development facilitates increased output for each unit of input, and greater efficiency stimulates demand by lowering prices, contributing to a positive cycle of economic growth; nonetheless, unemployment consequently increases in tandem if economic growth cannot offset increases in labour productivity

[370] Heinberg, *End of Growth*, 6.
[371] Tim Jackson, *Prosperity Without Growth: Economics for a Finite Planet* (London: Earthscan, 2009), *et al.*

and efficiency gains from automation, technologisation, downsizing, outsourcing, and so forth.[372] Jackson rationalises that:

> If the economy slows for any reason − whether through a decline in consumer confidence, through commodity price shocks or through a managed attempt to reduce consumption − then the systemic trend towards improved labour productivity leads to unemployment. This in turn leads to diminished spending power, a loss of consumer confidence and further reduces demand for consumer goods. From an environmental point of view this may be desirable because it leads to lower resource use and fewer polluting emissions. But it also means that retail falters and business revenues suffer. Incomes fall. Investment is cut back. Unemployment rises further and the economy begins to fall into a spiral of recession. Recession has a critical impact on the public finances. Social costs rise with higher unemployment. But tax revenues decline as incomes fall and fewer goods are sold. Lowering spending risks real cuts to public services. Cutting spending affects people's capabilities for flourishing − a direct hit on prosperity. Governments must borrow more not just to maintain public spending but to try and re-stimulate demand. But in doing so, they inevitably increase the national debt. Servicing this debt in a declining economy ... is problematic at best. Just maintaining interest payments takes up a larger proportion of the national income. The best that can be hoped for here is that demand does not recover and it's possible to begin paying off the debt....[373]

In addition to economic factors, population growth, often from immigration and itself often a product of economic expansion, necessitates even higher levels of aggregate economic growth just to maintain *per capita* incomes. On a psychosociological level, the collective embrace of the Growth Fetish by inverted totalitarian consumer societies with high levels of income disparity and scientific-industrial advertising saturation even further pushes their economies towards an expansionary state. Jackson concludes that:

> Crucially, there is little resilience within this system. Once the economy starts to falter, feedback mechanisms that had once contributed to expansion begin to work in the opposite direction, pushing the economy further into recession.... In short, modern [capitalist] economies are driven towards economic growth. For as long as the economy is growing, positive feedback mechanisms tend to push this system towards further growth. When consumption growth falters, the system is driven towards a potentially damaging collapse with a knock on impact on human flourishing. People's jobs and livelihoods suffer. There is, of course, something of an irony here. Because at the end of the day the answer to the question of whether growth is functional for stability is this: in a growth-based economy, growth is functional for stability. The capitalist model has no easy route to a steady state

[372] Paraphrased from: Jackson, *Prosperity Without Growth*, 62-63.
[373] Ibid., 63-64.

> position. Its natural dynamics push it towards one of two states: expansion or collapse.[374]

Inverted totalitarian capitalist economies must therefore expand to thrive, and fail to do so in a neutral, steady, and stationary state, to which their monetary and financial systems, as well as their natural dynamics, have no obvious course. Moreover, they appear capable of expanding until the limits to growth and development are reached, and are therefore systemically *guaranteed* to produce crises of their making in the long-run by their very nature and design, with even greater and more permanent consequences than the temporary and localised conditions of the Soviet collapse, when the socialist system encountered its structural and organisational, rather than physical limitations to further growth and development. In contrast, following an initial burst of expansion and development, which failed to produce growth or consumption remotely comparable to that of the inverted totalitarian US' and most of its allies', Soviet classical totalitarian economies (and sometimes even populations) invariably degenerated into a zero-growth, stationary state, the like of which American classical totalitarianism has no equal, or collapsed due to political revolution before the emergence of substantial crises of growth and development at the national level, for the most part, and nearly half a century before such crises are expected to achieve critical mass on a global scale during the Malthusian Century, and would therefore (have) be(en) *less* likely to generate these crises in the first place, or would (have) do(ne) so more gradually, if they could (have) do(ne) so at all. The counterfactual and hypothetical questions of whether or not Soviet classical totalitarianism could or would (have) eventually generate(d) each emerging crisis of growth and development outlined in the previous chapter is open to speculation, but extends beyond the scope and purposes of this thesis, whose central objective is to identify the *more* advantageous inversion of totalitarianism for the Malthusian Century and the new millennium, as perceived through the optics of neo-Malthusian and environmental economics in a relative sense, which in this case means the one least capable of producing growth and development themselves: *small is beautiful*.[375]

As established in the previous chapter, agro-industrial civilisation has exceeded the carrying capacity of its planetary host environment; growth has become the cause of, rather than solution to the human predicament, and civilisation must therefore contract immediately and substantively in order to avert catastrophe, if it is not too late already; *ergo*, whichever political and/or economic

[374] Jackson, *Prosperity Without Growth*, 64.
[375] Schumacher, *Small Is Beautiful*, title, *et al.*

system produces the most growth and development is no longer relevant in the Malthusian Century and the new millennium: civilisation is *already too big*, and must contract post haste. Paradoxically, the best political and economic system, as assessed through the optic of neoclassical economic theory, may in fact be the worst when viewed through the lenses of neo-Malthusianism and environmental economics, and *vice versa*. American inverted totalitarianism would appear to be superlative in either regard in the former permutation, and likewise for Soviet classical totalitarianism in the latter, though only for this particular dyad. Whether or not Soviet classical totalitarianism would or could (have) produce(d) the global catastrophic risks posed by unchecked growth and development, it seems clear that at the very least, these cumulative exponential processes would have emerged and developed at a slower pace than under American inverted totalitarianism; moreover, although crises of growth and development are certainly a theoretical and hypothetical possibility under Soviet classical totalitarianism, they are not its *systemic* culmination, as they are in the case of American inverted totalitarianism.

A more gradual manifestation of these crises, if Soviet classical totalitarianism could manifest them at all, would gift the scientific community, political leadership, and population at large more time to form a consensus on the nature, scale, scope, and origin of the human predicament, and consequently more time to avoid the unmanageable, manage the unavoidable, prepare for the Malthusian Century, and adapt to the post-growth paradigm of the new millennium. Furthermore, as concluded in the second section of the second chapter, the later and higher the peaks of resource production and consumption, enabled by high rates of growth and technological development *à la américain*, the more precipitous and calamitous the eventual production cliffs will be, accelerating the timeframe of collapse, and narrowing the window of opportunity for successfully making the transition to the post-growth era. In contrast, stagnant or declining growth and technological development *à la russe* not only slows the ascent up Hubbert's peaks in the growth era, but also slows the symmetrical descent down their latter faces in the post-growth paradigm, dulling the economic and societal impacts of declining production and consumption, lengthening the timeframe for transition, and making for a softer landing overall.

In spite of its eventual collapse, and further to the abovementioned, the activities of the SU during the Cold War had yet another macrohistorical consequence: although its prognosticated communist world revolution never materialised, the SU succeeded in preventing liberal democracy and free-market capitalism, as well as the hard and soft power of American inverted totalitarianism,

from achieving world domination in its aftermath. Following the dissolution of the SU, the remaining Marxist-Leninist states and the Soviets' residual Cold War allies like Iraq, Libya, Syria, and its frenemy Yugoslavia, at different times and to differing extents, carried on the torch of defiance against US economic, political, and cultural imperialism, if not colonialism, which Soviet classical totalitarianism had brandished during the Cold War, even as most of the former Soviet *bloc* drew closer to the US and its allies in the 1990s. It is said that the Russian bear never dies, but hibernates, and true to form, post-Soviet Russia entered into a *de facto* military alliance and later self-described 'special relationship' with its former Cold War pupil, communist China, in 2001.[376] The subsequent Shanghai Cooperation Organisation and BRICS initiatives have further recrafted the unipolar world of the immediate post-Cold War period into the multipolar, and increasingly bipolar world of today.[377] Russia has re-emerged as a major player in the international arena over the course of the ongoing decade, culminating in what has been christened 'Cold War II', which has been drawn along much the same geostrategic, if not ideological lines as the original Cold War (see map. 4. Cold War II, 2017).[378]

Without the ideological, nuclear, or conventional counterbalance of Soviet power in the Cold War era, or its lingering influence in China and elsewhere in the post-Cold War period, it seems reasonable to deduce that virtually the entire planet, with possible exceptions such as Iran and Venezuela, would have gravitated towards the ideologies of liberal democracy and free-market capitalism, under the dominion of American inverted totalitarian hard and soft power, in the postwar era. Soviet classical totalitarianism has therefore had the effect of stunting global growth and development hitherto not only by retarding its progress in the Soviets' own sphere of influence with failed socioeconomic policies, but also by preventing the much more economically successful inverted totalitarian US-led capitalist *bloc*, and its materialistic ideology of consumerism, from achieving global domination and supremacy. It is unlikely that the Soviets' mark on history has been

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[376] Joseph S. Nye, "A New Sino-Russian Alliance?" *Project Syndicate* (Jan. 12, 2015), http://www.project-syndicate.org/; Nicholas Confessore and Matt Flegenheimer, "Vice-Presidential Debate: What You Missed" *The New York Times* (Oct. 4, 2016), http://www.nytimes.com/.

[377] For further reading, see: Cedric de Coning, Thomas Mandrup, and Liselotte Odgaard, eds., *The BRICS and Coexistence: An alternative vision of world order* (New York: Routledge, 2016), *et al.*; Michael Fredholm, *The Shanghai Cooperation Organisation and Eurasian Geopolitics: New Directions, Perspectives, and Challenges* (Copenhagen, Denmark: NIAS Press, 2013), *et al.*

[378] Map 4. Cold War II, 2017. Self-made (Feb. 7, 2017). Map adapted from: --, "Blank Map of World with Country Borders" *Wikimedia Commons* (Jul. 13, 2010), http://commons.wikimedia.org/. For further reading, see: Douglas E. Schoen and Melik Kaylan, *The Russia-China Axis: The New Cold War and America's Crisis of Leadership* (New York: Encounter Books, 2014), *et al.* and Edward Lucas, *The New Cold War: Putin's Russia and the Threat to the West* (New York: St. Martin's Press, 2014), *et al.*

and will be sufficient to avert the crises of growth and development set to intersect in the Malthusian Century; nevertheless, solace may be taken from the fact that the historical actions of the SU not once, but twice spared humanity from the spectre of global domination by a single ideology, in all probability. During the Second World War, there is every reason to believe that not only could the SU have defeated the Axis on its own, but also that the Allies could not have defeated the Axis without the SU, and its contribution to the defeat of Nazi and Japanese fascism was critical and macrohistorical as such, just as its role in preventing the universalisation of American inverted totalitarianism has been equally critical and macrohistorical.[379] In the following section, Soviet classical and American inverted totalitarianism will be assessed through the optic of happiness economics in the context of the crises of growth and development expected during the Malthusian Century and the post-growth paradigm.

SECTION II

SOVIET CLASSICAL AND AMERICAN INVERTED TOTALITARIANISM ASSESSED THROUGH THE LENS OF HAPPINESS ECONOMICS

It is often observed that communism 'does not work' in the sense that it fails to produce rates of growth and consumption comparable to those of its economic and political competitors.[380] As the previous section and chapter concluded, however, further growth, in aggregate, is no longer desirable in view of the human predicament; at the same time, this is certainly not invariably the case on an individual, local, national, or even continental level. Although agro-industrial civilisation is set to reach the limits to growth and development by mid-century, this will not be the case for *all* economic actors, communities, states, and regions; rather, the global economy will be a zero-sum game thenceforward, in which only relative growth will be possible.[381] At this junction, it must be underscored that limited growth and development are not necessarily bad things, and are often quite the reverse. Hamilton emphasises that:

> There are powerful arguments for more economic growth in countries where a large proportion of the populace lives in poverty…. When a nation is above the threshold

[379] Matt Steinglass, "Would the USSR have beaten Hitler without us?" *The Economist* (May 10, 2010), http://www.economist.com/.
[380] For example: John Graham, *Obama's Change: Communism in America* (Pittsburgh, PA: RoseDog Books, 2010), 3.
[381] Heinberg, *End of Growth*, 2.

> below which increasing income does improve wellbeing, it is no longer persuasive to argue that more growth is needed to conquer residual poverty.[382]

As discussed in the previous section, the Soviet classical totalitarian economic model proved capable of rapidly producing an industrial base, often from scratch in undeveloped, pre-industrial, agrarian states like China, and accelerating national development by decades, or perhaps even longer. Moreover, with respect to its advantageousness as a development model, the Marxist-Leninist SU embraced egalitarianism, internationalism, racial and gender equality, and opposed tribalism, racism, sexism, and theocracy, which are common socio-cultural obstacles to development in the developing world. In addition, the SU showered its Second- and Third-World allies with generous aid, subsidies, loans and resources, not to mention blueprints, schematics, specialists, and advanced technologies, which greatly accelerated their nascent economic development, all at the Soviets' expense, as discussed in the first chapter.[383] Assessed through the optics of neo-Malthusianism and environmental economics, the greatest advantage of Soviet classical totalitarianism as a development model is that the rapid growth and development which typified the initial stages of its implementation petered out before reaching the redline for sustainable development; on the other hand, perceived through the lens of happiness economics, its greatest advantage is that this initial burst of economic development stagnated somewhere in the vicinity of the threshold above which further increases in income no longer improve wellbeing.

Research has concluded that the threshold beyond which increases in income correlate with increased quality of and satisfaction with life is somewhere in the vicinity of a *per capita* GDP of US$10,000 − broadly comparable to the most advanced Soviet *bloc* economies when they struck structural and organisational, rather than physical or conceptual limitations to further growth, and began to stagnate, then decay, and finally collapse.[384] This may, in part, explain the growing phenomena of Ostalgie in Germany, Yugo-nostalgia in the Balkans, Ceauşescu nostalgia in Romania, Soviet nostalgia in the former SU, as well as the MaoCraze in China, since increasing incomes in the post-communist era beyond the abovementioned threshold no longer produced accompanying improvements in wellbeing (needless to say, *Homo Sapiens*' penchant for *memoria praeteritorum bonorum*

[382] Hamilton, *Growth Fetish*, 27.
[383] Chomsky, *Deterring Democracy*, 366; Orlov, "Post-Soviet Lessons" 12-15.
[384] Bolt and van Zanden, "The Maddison Project," 627-651; Hamilton, *Growth Fetish*, 26.

and the rosy retrospection bias are surely also considerable yet equally unquantifiable causal factors).[385]

In his 2010 book *The Politics of Happiness: What Government Can Learn from the New Research on Wellbeing*, Derek Bok reflects that although incomes in the US grew nearly 60 per cent, new homes doubled in size, and the national automobile fleet expanded by 160 million vehicles over the 1975-2010 period, the percentage of people describing themselves as either 'very happy' or 'pretty happy' has remained relatively steady since peaking in 1956.[386] In spite of these enormous increases in consumption achieved in the inverted totalitarian world, Hamilton reports that these societies are no happier today than they were half a century ago:

> Despite high and sustained levels of economic growth in the West over a period of fifty years − growth that has seen average real incomes increase several times over − the mass of people are no more satisfied with their lives now than they were then. If growth is intended to give us better lives, and there can be no other purpose, it has failed.[387]

One survey of centimillionaires and billionaires, the kings and queens of inverted totalitarianism, found only marginally higher levels of subjective wellbeing than the control sample in spite of their enjoyment of incomes hundreds or even *tens of thousands* of times larger.[388] Viewed through the prism of environmental *and* happiness economics, American inverted totalitarian consumer capitalism can only be described as the greatest squandering of resources in all recorded human history, given that the tremendous increases in gross national product that it has enabled have not consequently increased, on average, what King Wangchuck of Bhutan famously described as 'gross national happiness,' and have statistically produced only marginal increases in wellbeing for the *eight* multibillionaires who now own more of this wealth than the poorest *half* of the human population

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[385] For further reading, see: Brenda Luthar and Marusa Puznik, *Remembering Utopia: The Culture of Everyday Life in Socialist Yugoslavia* (Washington, DC: New Academia Publishing, 2010), *et al.*; Daphne Berdahl, "'(N)Ostalgie' for the Present: Memory, Longing, and East German Things" *Ethnos*, Vol. 6412 (1999): 192-211, http://www.researchgate.net/; Geremie R. Barmé, *Shades of Mao: The Posthumous Cult of the Great Leader* (New York: M.E. Sharpe, Inc., 1996), *et al.*; John Borneman, ed., *Death of the Father: An Anthropology of the End in Political Authority* (New York: Berghahn Books, 2004), 125; Seth Mydans, "20 Years After Soviet Fall, Some Look Back Longingly" *The New York Times* (Aug. 18, 2011), http://www.nytimes.com/.

[386] Derek Bok, *The Politics of Happiness: What Government Can Learn from the New Research on Wellbeing* (Princeton, NJ: Princeton University Press, 2010), 261-262.

[387] Hamilton, *Growth Fetish*, 3.

[388] Ibid., 29.

combined, to say nothing of the catastrophic global consequences of its making outlined in the previous chapter.[389]

Although happiness, wellbeing, and satisfaction with life in the inverted totalitarian US have not increased during the last six decades of the transient growth era, a *mélange* of social woes and crises have emerged and/or intensified. Parallel with the broken families and endemic alcoholic escapism of Soviet society, the US now has the highest rates of illegal drug use and substance addiction worldwide, with some 38 million regular drug users, 40 million irregular users, and 18 million alcohol abusers.[390] By the 1980s, the SU was second only to the US in rates of divorce, with 3.6 compared to 5.1 per 100,000, and the US single-person household rate is now 27.4 per cent, up from 17 per cent in 1970; furthermore, the teenage pregnancy rate is substantially higher than anywhere else in the industrialised world; once again, Russia is the distant second.[391] More than one-quarter of a billion prescriptions for antidepressants are filled for over 30 million Americans each year − a four-fold increase over the last three decades.[392] According to one 2014 survey, 52.3 per cent of Americans reported being unhappy at work, and 70 per cent said they are neither engaged nor inspired by their jobs.[393] Untold millions of American children are drugged rather than intimidated into compliance with stimulants like *Ritalin*, and Hamilton notes that 'It is difficult to avoid the parallel with the SU's use of psychiatry as a device for controlling political dissidents.'[394] The US obesity rate has more than doubled since 1980, and two-thirds of American adults are now overweight, and one-fifth obese − by far the highest such rates in the world.[395] Isolation and

[389] Phrasing adapted from: James Howard Kunstler, *The Geography of Nowhere: The Rise and Decline of America's Man-made Landscape* (New York: Simon & Schuster, 2004), 233; Hamilton, *Growth Fetish*, 29; Robert Biswas-Diener, ed., *Positive Psychology as Social Change* (New York: Springer, 2011), 73-87.

[390] Alex Thio and Jim Taylor, *Social Problems* (Burlington, MA: John & Bartlet Learning, 2012), 222; Anderson Spickard, Jr and Barbara R. Thompson, *Dying for a Drink: What You and Your Family Should Know About Alcoholism* (Nashville: Thomas Nelson, 2005), 11, 198; Guadalupe Gonzalez and Marta Tienda, *The Drug Connection in U.S.-Mexican Relations* (Collingdale PA: Diane Publishing Co., 1996), 99; Orlov, "Post-Soviet Lessons," 7-8; Pipes, *Communism*, 82.

[391] Frankowski and Cole, *Abortion and Protection,* 243; Morton and Stuart, *The Contemporary Soviet City*, 73. Lisa Mahapatra, "Living Alone: More US Residents Forming Single-Person Households Than Before" *International Business Times* (Aug. 29, 2013), http://www.ibtimes.com/; M. S. Kearney and P. B. Levine, "Why is the teen birth rate in the United States so high and why does it matter?" The *Journal of Economic Perspectives*, Vol. 26, Issue. No. 2 (Spring 2012): abstract, http://www.ncbi.nlm.nih.gov/.

[392] Maia Szalavitz, "What Does a 400% Increase in Antidepressant Use Really Mean?" *TIME* Magazine (Oct. 20, 2011), http://time.com; Thomas Insel, "Antidepressants: A complicated picture" *National Institute of Mental Health* (Dec. 6, 2011), http://www.nimh.nih.gov/.

[393] Ben Chang, *et al.*, "Job Satisfaction: 2014 Edition" (June 2014) *The Conference Board*, http://www.conference-board.org/.

[394] Hamilton, *Growth Fetish*, 45; Lawrence H. Diller, *Running on Ritalin: A Physician Reflects on Children, Society, and Performance in a Pill* (New York: Bantam Books, 1998), *et al.*

[395] Christopher J. Clark, *Nutritional Grail: Ancestral Wisdom, Breakthrough Science, and the Dawning Nutritional Resistance* (Extropy Publishing, 2014), 278; Debasis Bagchi and Harry G. Preuss, eds. *Obesity: Epidemiology, Pathophysiology, and*

loneliness can be unfortunate by-products of expediency and convenience, and each American now has just two confidantes, on average, down from three a quarter-century ago.[396] In 2014, the US' suicide rate of 13 per 100,000 was broadly comparable to the Soviet rate of 17.1 per 100,000 in 1965.[397]

It is impossible to empirically qualify or quantify the comparative happiness or satisfaction with life of *Homo Sovieticus* and *Homo Economicus*, since opinion polling was not conducted in the SU; nevertheless, the ecological footprint of Soviet happiness can only have been orders of magnitude smaller than its American counterpart, and was therefore relatively eco-friendly, as well as resource- and energy-efficient, when perceived and assessed through the lenses of environmental and happiness economics. In their 2010 book *The Spirit Level: Why Equality is Better for Everyone*, Richard Wilkinson and Kate Pickett argue that more egalitarian societies tend to be happier ones, with greater trust, community life, and child wellbeing, better educational, physical, and mental health outcomes, as well as lower rates of violence, suicide, drug abuse, incarceration, teenage pregnancies, obesity, and other socioeconomic indicators.[398] These findings echo Richard Easterlin's hedonic treadmill concept, which reveals income equality to be a stronger predictor of satisfaction with life than income itself, since people tend to judge their subjective wellbeing in relative rather than absolute terms; further to this, income inequality has been correlated with increased ill-health.[399] Statistics are unavailable for the Soviet period; however, Russia had a Gini coefficient of 0.26 in 1991, considerably more equal than the US' Gini coefficient of 0.45 in 2011.[400] Assessed through the lens of happiness economics, the Soviet classical totalitarian socioeconomic model undoubtedly produced more gross national happiness per unit of gross national product or energy input than its American inverted totalitarian counterpart. The SU propaganda apparatus also went to great lengths to conceal the population's relative penury, both in national and international terms, from itself, which can only have reduced its need to 'keep up with the Joneses' on the hedonic treadmill; as

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Prevention, Second Edition (Oxfordshire, UK: Taylor & Francis Group, 2013), 180; Eric Schlosser, *Fast Food Nation: The Dark Side of the All-American Meal* (London: HarperCollins Publishers, 2002), 240.

396 Dino Grandoni, "Americans Now Only Have Two Close Friends" *The Atlantic* (Nov. 11, 2011), http://www.theatlantic.com/.

397 A. Värnik and D. Wasserman, "Suicides in the former Soviet republics" *Acta Psychiatrica Scandinavica*, Vol. 86, Issue No. 1 (Jul. 1992): 76, http://www.ncbi.nlm.nih.gov/; Sabrina Tavernise, "U.S. Suicide Rate Surges to a 30-Year High" *The New York Times* (Apr. 22, 2016), http://www.nytimes.com/.

398 Richard Wilkinson and Kate Pickett, *The Spirit Level: Why Equality is Better for Everyone* (London: Penguin Books, 2010), *et al.*

399 Hamilton, *Growth Fetish*, 28.

400 John M. Letiche, *Russia Moves Into the Global Economy* (London: Routledge, 2007), 77*n*; Max Fisher, "Map: U.S. Ranks Near Bottom on Income Inequality" *The Atlantic* (Sept. 19, 2011), http://www.theatlantic.com/.

Simone Signoret bemoaned after visiting the SU, 'Those happy Russians don't know how badly they live!'[401]

On the other hand, consumer capitalism enabled by cheap credit and energy, and driven by scientific-industrial advertising designed to manufacture desire and seed discontentment, has counterproductively enmeshed happiness with materialism in the American popular consciousness.[402] In the SU, by contrast, happiness was associated with such pleasures as nature, camaraderie, cuisine, sewing, poetry, literature, holidays, house and home, in addition to Stakhanovite praise and awards, as well as the collective sense of achievement produced by successful mass movements and megaprojects.[403] Whereas human identity was defined by whom or what one was in Nazi classical totalitarianism, and by what one did or was going to do in Soviet classical totalitarianism, it is defined by what one owns in American inverted totalitarianism.[404] President Carter lamented in his 1979 Crisis of Confidence speech that:

> In a nation that was proud of hard work, strong families, close-knit communities, and our faith in God, too many of us now tend to worship self-indulgence and consumption. *Human identity is no longer defined by what one does, but by what one owns.* But we've discovered that owning things and consuming things does not satisfy our longing for meaning. We've learned that piling up material goods cannot fill the emptiness of lives that have no confidence or purpose. The symptoms of this crisis of the American spirit are all around us.... This is not a message of happiness or reassurance, but it is the truth, and it is a warning (emphasis supplied)....[405]

In their 2001 book *Affluenza: The All-Consuming Epidemic*, David Wann and Thomas Naylor characterise 'affluenza' as 'a painful, contagious, socially-transmitted condition of overload, debt, anxiety, and waste, resulting from the dogged pursuit of more,' which has weakened social cohesion and reduced satisfaction with life, corroding character, corrupting tradition, and bankrupting morality in the process, in many cases, in the inverted totalitarian world and beyond.[406] Hamilton echoes these conclusions in his 2005 book *Affluenza: When Too Much is Never Enough*.[407] In the words

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401 Orlov, *Reinventing Collapse*, 24.
402 Richard Heinberg, *The Party's Over: Oil, War and the Fate of Industrial Societies* (Gabriola Island, Canada: New Society Publishers, 2003), 68; for further reading, see: Naomi Klein, *No Logo* (London: HarperCollins Publishers, 2000).
403 Howard Y. F. Choy, ed., *Discourses of Disease: Writing Illness, the Mind and the Body in Modern China* (Leiden, The Netherlands: Brill Publishers, 2016), 72; Orlov, *Reinventing Collapse*, 96.
404 Philip Short, *Mao: A Life* (London: John Murray, 2004), 632.
405 Jimmy Carter, "Crisis of Confidence" The Carter Center (Jul. 14, 1979), https://www.cartercenter.org/.
406 John de Graaf, David Wann and Thomas H. Naylor, *Affluenza: The All-Consuming Epidemic* (Oakland, CA: Berrett-Koehler Publishers, 2005), 2, *et al.*
407 Clive Hamilton and Richard Denniss, *Affluenza: When Too Much Is Never Enough* (Sydney, Australia: Allen & Unwin, 2005), *et al.*

of Mahatma Gandhi, 'There is more to life than increasing its speed.'[408] In conclusion, Soviet classical totalitarianism is more advantageous for the Malthusian Century and the post-growth paradigm of the new millennium from a neo-Malthusian, environmental *and* happiness economics perspective, primary because it failed to produce growth beyond the threshold above which further growth is unsustainable and increases in income do not correlate with increased wellbeing. As concluded in the previous chapter, agro-industrial civilisation is already in overshoot, and further economic growth is no longer desirable; as such, the economic policies and mechanisms by which American inverted totalitarianism has been able to produce such tremendous amounts of economic expansion and development in the growth era extend beyond the scope and purposes of this thesis; on the other hand, the Soviet classical totalitarian policies and mechanisms which failed to produce growth and development in the long-run are very much within its purview, particularly given its central prescription that the agro-industrial civilisation must contract into a sustainable, stationary state as rapidly as possible to avert catastrophe.

SECTION III

THE FAILURE OF SOVIET CLASSICAL TOTALITARIANISM TO PRODUCE GROWTH AND DEVELOPMENT

There is any number of reasons for the systemic failure of Soviet classical totalitarianism to produce economic or population growth beyond these relatively low thresholds of societal and industrial complexity, yet perhaps the most obvious and fundamental is that the interconnected complexity of modern agro-industrial economies is inherently unsuited to, and exceeds the limitations of, centralised economic planning. The SU was not an organic development: it was envisioned by intellectuals and constructed from the bottom up according to a scientific-materialist plan.[409] Nevertheless, even with the aid of supercomputers, a relatively basic industrial economy simply cannot be planned or coordinated to the extent envisaged by the Soviet model; to take one example, the rolled steel sector of a medium-sized economy alone has over one million dependent and interdependent variables.[410] This may explain why the Soviet model was capable of producing considerable growth at the outset, when economic complexity was minimal, yet invariably failed to expand beyond the thresholds of economic complexity established in the previous two sections.

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[408] Sandy Foster, *Living an Abundant Life: Inspirational Stories from Entrepreneurs* (New York: Morgan James Publishing, 2009), 82.
[409] David Horowitz, *The Politics of Bad Faith: The Radical Assault on America's Future* (New York: Simon & Schuster, 1998), 105.
[410] French, *North Korea*, 82.

The Russian economist Grigory Yavlinsky concluded that 'Socialist systems do not work because their workers do not work.'[411] Indeed, by eliminating profit motive and micro-incentive systems, Soviet classical totalitarianism systemically incentivised foot-dragging and mediocrity; without fear of unemployment, destitution, or draconian punishment (in the post-Stalin era, at least), workers had no motivation to work. Hard workers could even find themselves accused of 'provocation', and risked being abused or manhandled by resentful colleagues; the slang term '*sovok*', derived 'Soviet' and literally meaning 'little shovel' or 'dustpan', was used among workers as a pejorative for tall poppies and other 'tools' of the Soviet machine.[412] Orlov observes that Soviet culture had room for both normal and heroic activity:

> Normal activity was expected, and there was never any reason to do it harder than expected … that sort of thing tended to be frowned upon by 'the collective'….. Heroic activity was celebrated, but not necessarily rewarded financially…. Russians tend to look in bemused puzzlement on the American compulsion to 'work hard and play hard'. The term 'career' was in the Soviet days a pejorative term − the attribute of a 'careerist' − someone greedy, unscrupulous, and overly 'ambitious' (also a pejorative term). Terms like 'success' and 'achievement' were very rarely applied on a personal level, because they sounded overweening and pompous. They were reserved for bombastic public pronouncements about the great successes of the Soviet people. Not that positive personal characteristics did not exist: on a personal level, there was respect given to talent, professionalism, decency, sometimes even creativity. But 'hard worker', to a Russian, sounded a lot like 'fool'.[413]

The Stakhanovite rewards system offered only praise, medals and awards, whose social capital as status symbols gradually eroded (this phenomenon is known as 'medal inflation').[414] Indifferent to individual responsibility and the fruits of labour, alcohol came to be the opiate (or in this case the depressant) of the Soviet masses, for whom 'the only pleasures were little ones,' as Pipes puts it.[415] Alcohol, the poster child of the false economy, was consumed at rates five times pre-Revolution levels by the 1980s, by which time the SU led the world in hard liquor consumption at the rate of 44 litres of vodka, or 17.4 litres of pure alcohol, *per capita per annum*, which caused some three million deaths each year, by far the highest alcoholic death rate in the world at the time or since, and

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411 Thayer Watkins, "The Economic Collapse of the Soviet Union" *San José State University* Department of Economics (2014), http://www.sjsu.edu/.
412 Dmitri N. Shalin, *Russian Culture at the Crossroads: Paradoxes of Postcommunist Consciousness* (Boulder, CO: Westview Press, 1996), 193; Pipes, *Communism*, 81-82; Robert Legvold, ed., *Russian Foreign Policy in the Twenty-first Century and the Shadow of the Past* (New York: Columbia University Press, 2007), 76*n*.
413 Orlov, *Reinventing Collapse*, 95.
414 French, *North Korea*, 78; Orlov, *Reinventing Collapse*, 95.
415 Pipes, *Communism*, 82, 86.

alcoholism wrought untold devastation upon Soviet society, stunting economic and population growth alike.[416]

Further to offering no profit motive or incentives system beyond empty honours, Soviet classical totalitarian economics inadvertently yet systemically *discouraged* managers and workers from producing at full capacity, despite forcing them to maintain the charade of doing so. Were full-capacity production to be realised, government planners would simply raise the quotas and targets for the subsequent plan period: the ratchet effect; moreover, periodic 'storming' campaigns to increase production would be impossible to actualise if state-owned enterprises (SOEs) were already operating at full capacity, and in any case, future increases in production would be more attainable if present levels were sub-capacity.[417] The inefficiency, waste, and discrepancies of the distribution system also meant that raw materials and energy were often unavailable, disrupting supply chains and causing slowdowns, shortages, stoppages, and shutdowns at every stage of production. Despite producing more than one-fifth of global steel output in its heyday, the SU suffered a shortage, and one popular joke speculated that if the SU had been established in the Sahara, it would have run out of sand![418] The unreliability of the procurement and distribution systems forced managers to over-order in order not only to ensure the availability of the materials and resources necessary to fulfil their plan targets, but also to guarantee a surplus in case of wastage or an unanticipated storming campaign, which incentivised stockpiling and hoarding to the wider detriment of national economic growth and development.[419]

Government planners, who were well-aware of such duplicity, invariably presumed a lie, and consequently allocated fewer resources than requested, effectively producing a system wherein demand was always unlimited regardless of use, sale or need, and lies were universally assumed.[420] In such a system, the concept of cost was lost, producing farcical situations such as youth playing badminton with titanium racquets cheaper than their wooden counterparts, or using bread as impromptu footballs because its price had been fixed below that of the grain used to produce it in order to satiate the demands of social equity, which David Horowitz describes as '… a microcosm

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[416] David Zaridze, *et al.*, "Alcohol and cause-specific mortality in Russia: a retrospective case - control study of 48, 557 adult deaths" *The Lancet*, Vol. 373, Issue No. 9682 (Jun. 27, 2009): 2201-2214, http://www.thelancet.com/; David Horowitz, "The Road to Nowhere: The Destructive Consequences of the Progressive Idea" *FrontPage Mag* (Oct. 12, 2013), http://www.frontpagemag.com/; 74-85; Pipes, *Communism*, 82.
[417] French, *North Korea*, 83.
[418] Ibid., French, 83; Martin McCauley, *The Rise and Fall of the Soviet Union* (London: Routledge, 2008), 339.
[419] Ibid., French, 83-84.
[420] Ibid., 84.

of the socialist economy. Irrational prices, bureaucratic chaos, and generalised public cynicism (the actually existing socialist ethos in all Marxist states) had created an environment in which 40 per cent of the food crop was lost to spoilage before ever reaching the consumer.'[421] Petty corruption and bribery were endemic, and political connections further distorted the procurement and distribution systems, leading to a wasteful and counterproductive system of bargaining between managers and planners in place of active cooperation; in the end, some SOEs were left holding a surplus while others suffered shortages, and many became the Soviet equivalent of zombie corporations.[422]

Distribution was determined by the central plan, and because no inter-SOE payment or trading systems existed, SOEs were forced to accept raw materials produced by other SOEs regardless of their quality or suitability.[423] Moreover, such materials could not be rerouted to other SOEs, which led to waste and hoarding, and produced low-quality products laced with broken or defective parts that disrupted later stages of production and consumption, frequently reducing the final product to a state of utter uselessness in need of replacement at the opportunity cost of expanded production in other industries and sectors.[424] These internationally-substandard products could seldom be exported outside the Soviet *bloc*, and by the time of its collapse, the likes of Switzerland, South Korea, Taiwan, and Hong Kong each exported more manufactured goods than the SU.[425] SOEs were also either forbidden from importing products or lacked the hard currency to do so, which mandated a high degree of self-sufficiency, and forced SOEs to maintain repair shops, which diverted considerable labour, capital, materials and resources away from production.[426] The following description of one Magnitogorsk steel plant in 1988 is typical of these Soviet zombie corporations:

> Plaintive calls for the total overhaul of the ... plant began more than 25 years ago. But reconstruction was perennially postponed, and the factory was called upon to make do with what it had: shore up a bit here, patch things together there, in short, give itself a sort of artificial respiration. The factory complex employs many more repair workers than steel smelters….[427]

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421 French, *North Korea*, 82, 84; Horowitz, "The Road to Nowhere," 2013.
422 French, *North Korea*, 83-84; Orlov, *Reinventing Collapse*, 58; Pipes, *Communism*, 82-83.
423 Ibid., French, 82, 84.
424 Ibid., 83-85.
425 Ibid., 83; Horowitz, "The Road to Nowhere," 2013.
426 French, *North Korea*, 83-85.
427 Ibid., 91.

The enormous scope and scale of Soviet SOEs, which Lenin described as the 'commanding heights' of the command economy, and Stalin referred to as 'industrial crown jewels', inevitably led to overstaffing and staff underutilisation, and such 'production for employment's sake' wasted untold time and resources.[428] Paul French emphasises that 'The impact of this wastefulness and squandering of [time, energy, and] materials in the command economy cannot be overestimated' since underutilisation of capital, mismanagement and misdistribution, overstaffing and staff underutilisation, waste and inefficiency, broken and defective parts, as well as slowdowns, shortages, stoppages, and shutdowns during one phase of production inevitably constrain and stunt later stages, reducing overall production and productivity, choking investment in other industries and sectors, and unquantifiably yet significantly impeding the growth and development of the broader national economy.[429]

The Soviet classical totalitarian socioeconomic model was riddled with additional contradictions and imbalances which stunted growth and arrested development: it neglected the trade, service, and consumer goods industries in favour of ever higher rates of capital accumulation for investment in heavy industry, arms production, and expensive megaprojects which produced innovations and technology seldom applicable for civilian use at an incalculable opportunity cost to other sectors of the economy and popular living standards, all of which contributed to the system's eventual collapse.[430] It has been said that the SU was essentially a national military-industrial complex, with at least one-quarter and perhaps even up to two-fifths of its national income invested in its armed forces, compared to just five or six per cent in the contemporary US, which eventually bankrupted the country and further contributed to its collapse.[431] Agriculture was perhaps the most notoriously inefficient sector of the SU economy: in 1977, 26.5 million Soviet farmers produced US$33 billion of food, slightly less than the US$36.7 billion of food produced by just 4.2 million American farmers; despite massive state subsidies on the order of 90 billion rubles *per annum* by the late 1980s, the entire enterprise operated at a loss.[432] Soviet agriculture aspired to the social ownership of the means of production, coordinated in large-scale centrally-planned collective farms,

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[428] French, *North Korea*, 84-85; Meisner, *Mao's China*, 416.
[429] Ibid., French, 82.
[430] Ibid., 90, 92-93; Meisner, *Mao's China and After*, 416; Pipes, *Communism*, 81.
[431] Ibid., Pipes; Allen C. Lynch, *How Russia Is Not Ruled: Reflections on Russian Political Development* (Cambridge: Cambridge University Press, 2005), 53.
[432] Joseph E. Medley, "Soviet Agriculture: A Critique of the Myths Constructed by Western Critics" *University of Southern Maine* (1992), http://www.soviet-empire.com/.

and without private ownership, market mechanisms, micro-incentive systems or profit motive.[433] The centralisation and planning that had been so effective at industrial and capital goods production proved incapable of successfully coordinating agricultural production, as far more flexibility was required than the rigid system could provide (meteorological conditions cannot be planned, for instance). With no market mechanism allowed to coexist, resources were invariably misallocated and underutilised, producing large volumes of waste at every level of production, and running up enormous trade and budget deficits. Collectivisation had revoked *kolkhoz* peasants' stake in their land and interrupted time-tested rural routines, while de*kulak*isation had deported the most enterprising farmers, all to the detriment of the Soviet agricultural system.[434]

By the 1980s, the SU had become the world's largest importer of grain, red meat consumption had halved since the Revolution, staples such as meat and sugar were rationed, and McDonald's was obliged to manage its own farms since Soviet produce was subject to periodic shortages and considered too substandard.[435] Robert Campbell lambasted Soviet collective farming as 'unreliable, irrational, wasteful, unprogressive … almost any pejorative adjective one can call to mind would be appropriate,' while Campbell McConnell labelled it 'something of a monument to inefficiency.'[436] Indeed, famine seems to have had an uncanny affinity for communist states, and some of the worst such examples in human history have occurred in the Ukraine, China, Cambodia, Ethiopia, North Korea, and elsewhere in the communist world.[437] Soviet collective farming proved to be not only a significant barrier to overall economic development, since it required such a large proportion of the workforce to be tied down in largely seasonal work at enormous opportunity cost to other economic sectors with a corresponding paucity of results, but also to population growth, which is axiomatically contingent upon growth in food production, of which there was progressively little in the Stagnation era SU.[438] Furthermore, the decline of Soviet collective agriculture also

[433] Medley, "Soviet Agriculture," 1992.
[434] Ibid., Medley; Horowitz, "The Road to Nowhere," 2013; Pipes, *Communism*, 62.
[435] Ibid., Horowitz; Michael Marrese, "Hungarian Agriculture: Lessons for the Soviet Union" (1990) *Comparative Economic Studies*, Vol. 32, No. 2: 156, http://www.jstor.org/.
[436] Campbell R. McConnell, *Economics: Principles, Problems and Policies* (New York: McGraw-Hill, 1975), 900; Medley, "Soviet Agriculture," 1992; Robert W. Campbell, *The Soviet-Type Economies: Performance and Evolution* (Boston: Houghton-Mifflin, 1974), 65.
[437] Kees Boterbloem, *A History of Russia and Its Empire: From Mikhail Romanov to Vladmir Putin* (Lanham, MD: Rowman & Littlefield, 2013), 226.
[438] Medley, "Soviet Agriculture," 1992.

triggered a rural mass exodus to the cities, which further exacerbated the already chronic housing shortage, and placed additional institutional and systemic constraints on population growth.[439]

Further to and on account of its abovementioned inadequacies, the Soviet classical totalitarian economic model produced poor fuel economies, and the Soviet *bloc* and China had considerably higher levels of overall energy intensity than the *developing* world, to say nothing of the US and the rest of the industrialised world (see fig. 61. Global Energy Intensity by Region: Observed and Projected, 1970-2025).[440] Paradoxically, however, reduced energy and resource efficiency tends to *reduce* net energy and resource consumption rather than increase it; conversely, lean and efficient systems with low levels of waste and energy intensity like the inverted totalitarian US tend to consume energy and resources at much higher rates. In 1865, William Stanley Jevons observed that as technological development increased energy efficiency and improved fuel economies, aggregate rates of energy and resource consumption tended to increase even more rapidly on account of consequently increased demand.[441] The eponymous and previously referenced Jevons Paradox is the most well-known in the field of environmental economics: greater efficiency lowers relative costs, which increases demand, thereby accelerating growth in consumption rates, and eventually creating even more demand than existed prior to the efficiency gains: the rebound effect.[442] The follow-on Khazzoom-Brookes postulate, supported by neoclassical growth theory, narrows the paradox exclusively to energy efficiency and consumption, positing that: 'Energy efficiency improvements that, on the broadest considerations, are economically justified at the micro-level, lead to higher levels of energy consumption at the macro-level.'[443] If efficiency gains increase consumption and accelerate economic growth and development, it follows that increased waste and inefficiency decrease consumption, and stunt economic growth and development, as the stagnation and collapse of the wasteful and inefficient Soviet *bloc* economies compellingly illustrates.

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[439] French, *North Korea*, 84-85; Gail Tverberg, "Is it really possible to decouple GDP Growth from Energy Growth?" Figure 10a. Energy intensities for the world, the Former Soviet Union, and China, *Our Finite World* (Nov. 15, 2011), http://ourfiniteworld.com/; Medley, "Soviet Agriculture," 1992; Meisner, *Mao's China*, 416.

[440] Fig. 61. Global Energy Intensity by Region: Observed and Projected, 1970-2025. Graph adapted from: --, "International Energy Outlook, 2004" *Energy Information Agency* (Apr., 2004): 6, http://www.eia.doe.gov/.

[441] John M. Polimeni, *et al.*, *The Jevons Paradox and the Myth of Resource Efficiency Improvements* (London: Earthscan, 2008), ix-xi; William Stanley Jevons, The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal-Mines, Second Edition (London: Macmillan and Co., 1866), http://www.econlib.org/.

[442] Ibid., Polimeni, ix-xii, 79-81.

[443] Ibid., 79; Cutler J. Cleveland and Robert U. Ayres, *Encyclopedia of Energy: Ph-S* (Cambridge, MA: Elsevier Academic Press, 2004), 238; Harty D. Saunders, "The Khazzoom-Brookes Postulate and Neoclassical Growth" *The Energy Journal*, Vol. 13: 131-148, No. 4 (1992), http://www.iaee.org/.

Jevons Paradox and the Khazzoom-Brookes postulate play an unquantifiable yet undoubtedly significant role in these relative outcomes: the Soviet classical totalitarian economies failed to match the growth and consumption rates of their inverted totalitarian counterparts, in part because they were systemically more energy-intensive, inefficient, and wasteful. Further to this, the preponderance of this waste occurred during the production and distribution stages in the classical totalitarian SU, where two-fifths of all the food produced was lost to spoilage before reaching the consumer, and this retarded growth and development at every subsequent stage of production, distribution, and/or consumption.[444] In the inverted totalitarian US, by contrast, consumers throw away nearly *half* of all the food produced, and waste occurs largely during the consumption stage, and does not thereby constrain the further growth of the production process itself; yet, as the example of food waste illustrates, the absolute volume of waste produced by lean and efficient economies such as the inverted totalitarian US' can ultimately exceed that of their more wasteful and inefficient competitors, such as the classical totalitarian SU.[445] Finally, as outlined in the previous section, Soviet classical totalitarianism produced *per capita* gross national happiness comparable to the US' in the most general terms, yet for a fraction of its resource and energy investments, and the SU is therefore the less wasteful and more efficient of the pair when assessed through the prism of happiness economics.

Like gains in efficiency, and growth in general, technological development and innovation often amplify the very problems they were intended to solve, and can even spawn entirely new problems in need of their own technological fixes. At this juncture, it is useful to consider the law of intended consequences, which states that 'Intervention in a complex system tends to create unanticipated and often undesirable outcomes;' as well as Murphy's law, which warns that 'Whatever can go wrong, will go wrong;' and Eric Sevareid's above-referenced law that 'The chief cause of problems is solutions.'[446] In his 2004 book *A Short History of Progress*, Ronald Wright argues that *Homo Sapiens* has fallen into a succession of 'progress traps' over the course of its evolution and development, whereby human ingenuity and creativity produce technology and innovations that humankind lacks the ingenuity or drive to regulate, and which unwittingly generate additional

[444] Horowitz, "The Road to Nowhere," 2013.
[445] Jonathan Bloom, *American Wasteland: How America Throws Away Nearly Half of Its Food (and what We Can Do about It)* (Cambridge, MA: Da Capo Press, 2010), title, *et al.*
[446] Albert A. Bartlett, "Thoughts on Immigration Into the United States: An NPG Forum Paper" *Negative Population Growth Inc.* (2007), http://www.albartlett.org/; James E. Atwood, *Gundamentalism and Where It Is Taking America* (Eugene, OR: Cascade Books, 2017), 51; Seema Kedar, *GUI and Database Management*, First Edition - 2008 (Pune, India: Technical Publications, 2008), 7-2.

unintended and unforeseen consequences further down the line, often more severe than those that preceded the innovation, which in turn necessitate still more innovation, *ad nauseam*, perhaps even *ad mortem*, but of course, growth and development cannot continue *ad infinitum*.[447]

Previously referenced examples of progress traps could include mobile phone technology, which is believed to be a causal factor of colony collapse disorder, anti-satellite missile technology, which may or might already have catalysed Kessler Syndrome, and of course, nuclear technology and weaponry, which led to the Hiroshima, Nagasaki, Chernobyl and Fukushima tragedies, and which poses by far the greatest existential threat to human civilisation and the planet that mankind has ever faced. Looking forward, progress in artificial intelligence and nanotechnology may someday trap techno-industrial civilisation in a grey goo scenario, or under the Technological Singularity. Furthermore, growing dependence on technology is an inevitable corollary of its development, and overdependence can be a critical liability in the event of shortages and breakdowns caused by accidents, war, natural calamities, and other risk factors. In wartime, energy, materials, and/or spare parts may become scarce or otherwise unobtainable, and electromagnetic technology can be neutralised by graphite bombs, electromagnetic pulses, or cyber attacks.[448] In the inevitable and statistically centennial event of a coronal mass ejection on the scale of the Carrington event, dependence on electromagnetic technology for critical functions and services would be an incalculable liability.[449]

The Soviet classical totalitarian command economy, with its rigid hierarchy, bureaucratic inertia, minimal personnel rotation, and systemic compartmentalisation and suppression of information (including information technology), stifled creativity, initiative, and innovation at every level. In consequence, the SU missed out on such crucial innovations as plastics, synthetic fibres, and computers, excelling almost exclusively in the fields of aerospace and arms production. The Soviet juggernaut could merely continue producing the same capital goods, and failed to keep pace with the US and the rest of the industrialised world in the Technology Revolution.[450] By the early 1980s, Japan boasted thirteen times as many large computers *per capita*, and sixty times as many

[447] Ronald Wright, *A Short History of Progress* (Toronto, Canada: House of Anansi Press, 2004), *et al.*
[448] Edward Amoroso, *Cyber Attacks: Protecting National Infrastructure* (Burlington, MA: Elsevier, 2010), *et al.*; Patrick Barriot and Chantal Bismuth, eds., *Treating Victims of Weapons of Mass Destruction: Medical, Legal and Strategic Aspects* (Hoboken, NJ: John Wiley & Sons, 2008), 7.
[449] Horne, *et al.*, "Solar Storm Risk;" 2013; Robert Sanders, "Fierce solar magnetic storm barely missed Earth," 2014.
[450] McAuley, *Soviet Politics*, 82-84; Horowitz, "The Road to Nowhere," 2013.

industrial robots as the SU, and could itself boast only one-third of the US' computer capacity.[451] In a rare moment of candour from a Soviet official, Chief-of-Staff Nikolai Ogarkov lamented in 1983 that:

> We cannot equal the quality of US arms for a generation or two. Modern military power is based on technology, and technology is based on computers. In the US, ... small children − even before they begin school − play with computers. Computers are everywhere in America. Here, we don't even have computers in every office of the Defence Ministry. And for reasons you know well, we cannot make computers widely available in our society. We will never be able to catch up with you in modern arms until we have an economic revolution. And the question is whether we can have an economic revolution without a political revolution.[452]

History demonstrates that the Soviet classical totalitarian economic system simply could not. In 1989, Premier Gorbachev bemoaned: 'We were among the last to understand that in the age of information sciences, the most valuable asset is knowledge, springing from human imagination and creativity…. We will be paying for our mistake for many years to come.'[453] On the contrary, it may be the inverted totalitarian US and the rest of techno-industrial civilisation that someday pays for its mistake of falling into the various progress traps of growth and technological development outlined in the preceding chapter, which would be less likely to occur, or would materialise more gradually, with increased opportunity for prevention and mitigation, under Soviet classical totalitarianism, whose systemic limitations, inefficiencies, wastefulness, imbalances, and many other failings collectively failed to produce either growth or development on the scale of that produced by American inverted totalitarianism; it is therefore the more advantageous of the dyad, as perceived and assessed through the neo-Malthusian and environmental economics optics.

SECTION IV

AVOIDING THE UNMANAGEABLE AND MANAGING THE UNAVOIDABLE

Regardless of whether or not Soviet classical totalitarianism would or could (have) produce(d) the crises of growth and development outlined in the previous chapter, if it had been or were faced with their inevitable cumulative consequences in a counterfactual or hypothetical scenario, its socio-economic-political structure would (have) better-enable(d) it to take swift political action to avoid

[451] Horowitz, "The Road to Nowhere," 2013.
[452] Leslie H. Gelb, "Foreign Affairs; Who Won the Cold War?" *The New York Times* (Aug. 20, 1992), http://www.nytimes.com/.
[453] Horowitz, "The Road to Nowhere," 2013.

the unmanageable, manage the unavoidable, and prepare for and adapt to the inevitable: the post-growth paradigm of the new millennium.[454] On the other hand, American inverted totalitarianism has proven systemically incapable of doing the same on account of the toxic synergy between its economic and political actors. The failed state of the global climate regime is archetypical of this dynamic: in spite of nearly half a century of forewarning, modern eco-technology, and near-universal public awareness, inverted totalitarian societies and élites have been disinclined to make even the paltriest of sacrifices in the present to avert known cataclysmic consequences in the future. The US may have jeopardised the future of humanity and the planet by refusing to ratify the Kyoto Protocol in 1998, and rejecting it altogether in 2001 on the grounds that its implementation would constrict economic growth, despite pessimistic forecasts projecting a consequent reduction in GDP of just *one* per cent over fifteen years![455] Hamilton underscores the patent absurdity of such decisions, which are antithetical to prevailing institutional liberalist frameworks' conception of states as rational actors in the international arena:

> If nothing is done and the economy grows at 3 per cent a year over the period, GNP will be about 40 per cent higher by 2012. According to the models … GNP would be 39 percent higher by 2012 … instead of GNP reaching a level 40 percent higher by, say, 1 June 2012, it will not reach that level until 1 October 2012 … the richest people on the planet … are unwilling to wait an extra four months to increase their incomes by 40 percent [despite the consequent potential for global catastrophe].[456]

The ethical dilemma at work is a trade-off between actions and consequences: the unethical act produces cost-effective short-term gains for the inverted totalitarian corporatocracy, with costly long-term consequences for society and the planet, whereas the ethical act forces the corporatocracy to make expensive investments in the short-term for intangible and ethereal returns for society and the planet in the long-run.[457]

Paul Ehrlich and Robert Ornstein's 1989 book *New World, New Mind: Moving Toward Conscious Evolution* proposes that *Homo Sapiens*' evolutionary psychology is wired to avoid costly short-term behavioural variations on both the individual and group level, even to avert calamity in the long-run,

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[454] Phrasing of section and chapter titled adapted from: Hertsgaard, *Hot*, 70, 258.
[455] Ibid., 66-70, 233-258; Aaron M. McCright and Riley E. Dunlap, "Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy" *Social Problems*, Vol. 50, Issue No. 28 (2003): 349, http://stephenschneider.stanford.edu/; Hamilton, *Growth Fetish*, 181-183.
[456] Ibid., Hamilton, 183; Peter Newell and Matthew Paterson, "A Climate for Business: Global Warming, the State and Capital" *Review of International Political Economy*, Vol. 5, No. 4 (Winter 1998): 680, 695, http://www.jstor.org/.
[457] Marc Le Menestrel, *et al.*, "Processes and Consequences in Business Ethical Dilemmas: The Oil Industry and Climate Change" *Journal of Business Ethics*, Vol. 41: 251-256 (2002), http://www.sciencemag.org/.

and instead emphasises quick reflexes in response to limited immediate threats, and in pursuit of short-term objectives.[458] Further to being ill-adapted for long-term thinking and planning, human psychology is also prone to magical thinking, denialism, and the psychology of previous investment; moreover, as Bartlett observes, comprehending the exponential function and its real-world implications approaches the limitations of many, if not most humans' intelligence.[459] On the groupthink scale, human communities and societies are vulnerable to the collective action problem, the paradox of tolerance, the tyranny of small decisions, the tragedy of the commons, and the tyranny of the majority. The Orphean hypothesis even posits that speakers of languages with obligatory future-time reference like English and Russian engage in less future-oriented behaviours than those of languages without it because they do not connect their present and future 'selves' at the subconscious level.[460] H. L. Mencken observed that 'It is the nature of the human species to reject what is true but unpleasant, and to embrace what is obviously false but comforting,' and Hamilton concludes that 'Sometimes facing up to the truth is just too hard. When the facts are distressing, it is easier to reframe or ignore them.... It's the same with our own deaths; we all "accept" that we will die, but it is only when our death is imminent that we confront the true meaning of our mortality.'[461]

Needless to say, 'Facts do not cease to exist because they are ignored,' as Aldous Huxley put it; unfortunately, however, the toxic synergy of the proto-fascistic union of political and economic élites within the American inverted totalitarian corporatocracy enables and amplifies many of the most environmentally destructive patterns of human thought, behaviour, and decision-making, resulting in the policy actions and inaction which are at the heart of the human predicament. Conversely, Soviet classical totalitarianism represses, minimalises, or marginalises many of these same tendencies and behaviours.[462] The American inverted totalitarian ideologies of democracy, individual freedom, profit, prosperity, progress, development, consumerism fuelled by cheap credit and scientific-industrial advertising, and so forth, conspire to prevent any kind of a checks or

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458 Heinberg, *End of Growth*, 261-262; Robert Evan Orstein and Paul R. Ehrlich, *New World, New Mind: Moving Toward Conscious Evolution* (New York: Doubleday, 1989), *et al.*

459 Bartlett, "Arithmetic, Population, and Energy," Lecture.

460 Keith Chen, "The Effect of Language on Economic Behavior: Evidence from Savings Rates, Health Behaviors, and Retirement Assets" *American Economic Review 2013*, Vol. 103, Issue No. 2 (Apr., 2013): 690-731, http://www.anderson.ucla.edu/.

461 Clive Hamilton, *Requiem for a Species: Why We Resist the Truth about Climate Change* (London: Routledge, 2010), viii; quoted in: John Gibbons, "Population surge difficult to hat and almost impossible to reverse" *The Irish Times* (Oct. 31, 2011), http://www.irishtimes.com/.

462 Quoted in: Bartlett, "Arithmetic, Population and Energy," Lecture.

balances on economic or population growth, which are its fundamental objectives, as continued mass immigration and the preoccupation with growth in political discourse compellingly illustrate. Moreover, given that American inverted totalitarianism has proven superlatively capable of actualising these objectives, crisis of their making are its inevitable systemic culmination, making it all the more fundamentally and cumulatively dangerous than Soviet classical totalitarianism, where the nature and scope of individual freedom was dictated by the state, along with the national grand strategy, and where consumerism, credit, and advertising had no obvious parallels.

The self-interest and inherent limitations of human individual and collective nature, psychology, intelligence, and altruism discussed above must surely affect policy and the national grand strategy in any democracy, which is a form of government particularly prone to the collective action problem, tragedy of the commons, and tyranny of the small decisions; moreover, short election cycles incentivise short-termism, and long-term planning faces considerable obstacles accordingly in the inverted totalitarian US, where incoming presidential administrations can overturn the policies, pacts, and projects of the outgoing administration, much as the incumbent Trump Administration is doing at the time of writing. In American inverted totalitarianism, politicians pander to both the corporatocracy and the electorate, and are therefore reluctant to pursue unpopular policies in order to get themselves re-elected. Subjects of critical importance like sustainable development are elephants in the room, and population control is virtually taboo in American political discourse. Orlov reflects that:

> ... in a consumer society, anything that puts people off their shopping is dangerously disruptive, and all consumers sense this. Any expression of the truth about our lack of prospects for continued existence as a highly developed, prosperous industrial society is disruptive to the consumerist collective unconscious. There is a herd instinct to reject it, and therefore it fails, not through any overt action, but by failing to turn a profit, because it is unpopular.[463]

In his 2011 book *The Price of Civilization: Reawakening the American Virtue and Prosperity*, Jeffrey Sachs echoes Wolin's conclusion that the US has become a corporatocracy dominated by its military-industrial complex, agro-industrial complex, and Wall Street-Washington axis, as well as the Big Pharma and carbon lobbies.[464] This toxic dynamic systemically deters preventative action on such issues as overpopulation and climate change from being taken, because such policies are not

[463] Aldous Huxley, *Proper Studies: The Proper Study of Mankind Is Man* (London: Chatto & Windus, 1927), 205; Orlov, *Reinventing Collapse*, 143.
[464] Jeffrey Sachs, *The Price of Civilization: Economics and Ethics After the Fall* (New York: Random House, 2011), *et al.*

pursuant to, and may even conflict with, the interests of corporations and business élites, whose fundamental objectives are economic growth, cheap labour, cost-effectiveness and profit; corporations therefore push for advantageous and beneficial policies of mass immigration, environmental deregulation, tax breaks, subsidies, privatisation, and so on, by way of scientific-industrial PR efforts, astroturfing, intensive lobbying, and the revolving door.[465]

Fossil fuels are the edifice upon which agro-industrial civilisation stands, as the second chapter concluded, and the US' fossil fuel lobby, or 'carbon club', consisting of Big Oil, Coal, Gas, Chemicals, Auto, utilities, and their subsidiaries, are consequently norm entrepreneurs in a variety of spheres extending well beyond policy-making.[466] In 1971, the total number of registered lobbyists in Washington was 175, before rising exponentially to nearly 2,500 in 1982.[467] By 1998, nearly 1,700 lobbyists and $160 million were invested in energy and natural resources lobbying *alone*; by 2012, these figures had ballooned to over 2,200 and $380 million, respectively, and at the time of writing, Washington lobbyists number more than 35,000 and counting.[468] Moreover, the concentration of media corporations in the US discussed in the first chapter has left the media beholden to the whims of corporations, lobbyists, and political élites; consequently, climate change denial and other fringe cornucopian positions are given coverage in the name of fairness and balance: the paradox of tolerance.

The government is forced to consult with the fossil fuels lobby *vis-à-vis* energy development and production, and many NGOs are forced to go along with its agenda lest their funding or charity tax status be revoked; in addition, its vast sphere of influence extends to the developing world, where the carbon lobby has forged coalitions with local and national energy producers as well.[469] The fossil fuels lobby has also conspired to suppress technological innovation and development in the renewable and clean energy sector by buying up patents for green technology and inventions such as the electric car.[470] The structural power of capital in American inverted totalitarianism has enabled the fossil fuels lobby to gradually construct social norms to enmesh 'capital-in-general' with its own capital accumulation, limiting the scope and effectiveness of the global climate regime, as

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[465] Aaron M. McCright and Riley E. Dunlap, "Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy" (2003) *Social Problems*, Vol. 50, No. 28: 367-368, http://stephenschneider.stanford.edu/.
[466] Hertsgaard, 258.
[467] McCright and Dunlap, "Defeating Kyoto," 367-368.
[468] Senate Office of Public Records, "Energy & Natural Resources Sector Profile" *Centre for Responsive Politics* (Oct. 28, 2013): 226-227, http://www.opensecrets.org/.
[469] Nancy Lindisfarne, "Cochabamba and climate anthropology" (August 2010) *Anthropology Today*, Vol. 26, No. 4: 2.
[470] *Who Killed the Electric Car?* Dir. Chris Paine, Perf. Mel Gibson, *et al.*, Electric Entertainment, 2006, Documentary.

well as the development of alternative energies and technologies, thereby.[471] Corporations and policymakers alike are therefore likely to do what is required to avert or mitigate the forthcoming crises of the Malthusian Century only when all alternatives have been exhausted, and by then it may be too late, if it is not already.

Levy, Egan, Newell, Gelbspan, and others conclude that carbon club lobbying and scientific-industrial PR strategies in the US best explain the demise of the global climate regime.[472] Naomi Klein echoes these conclusions in her 2014 book *This Changes Everything: Capitalism vs. the Climate*, concluding that 'There is still time to avoid catastrophic warming, but not within the rules of capitalism as they are currently constructed. *Which is surely the best argument there has ever been for changing those rules*' (emphasis supplied).[473] The dominance of the carbon lobby is largely responsible for the US' fossil-fuel dependency, as well as the nascence of its embryonic clean and renewable energy industries.[474] Likewise, the majority of agribusiness is controlled by just twenty food corporations in the US, whose lobbying efforts have entrenched Green Revolution scientific-industrial agriculture and factory farming into the US' agriculture and food systems for the foreseeable future; at the same time, the pharmaceutical lobby promotes legislation favourable to drug companies at the expense of patients, and to the broader detriment of the national healthcare system.[475] Heinberg concludes that:

> It is in this light that we can appreciate the true dimensions of the tragedy of current US political corruption and disintegration. Investments in the *status quo* on the part of corporations and governmental bureaucracies are preventing efforts that are advocated by everyone who is familiar with the facts. Meanwhile, those with the will even to *begin* to change the system are excluded from decision-making positions.[476]

Unlike the American inverted totalitarian corporatocracy, in Soviet classical totalitarian democratic centralism, the bureaucratic élite arrived at a consensus on the basis of the scientific-materialist principles and doctrine of Marxism-Leninism, whereafter policies and decisions were implemented post haste, without question, and with the full support and mobilisation of Soviet

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471 Peter Newell and Matthew Paterson, "A Climate for Business: Global Warming, the State and Capital" (Winter 1998) *Review of International Political Economy*, Vol. 5, No. 4: 691-696, http://www.jstor.org/; Wolin, *Politics and Vision*, 591.
472 Newell and Paterson, "A Climate for Business," 680; Aaron M. McCright and Riley E. Dunlap, "Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy" *Social Problems*, Vol. 50, No. 28 (2003), http://stephenschneider.stanford.edu/.
473 Naomi Klein, *This Changes Everything: Capitalism Vs. The Climate* (New York: Simon & Schuster, 2014), 88.
474 Newell and Paterson, "A Climate for Business," 680, 695.
475 *Food, Inc.*, Dir. Robert Kenner, Perf. Eric Schlosser, *et al.*, Magnolia Pictures, 2008, Documentary; Jacky Law, *Big Pharma: How the World's Biggest Drug Companies Control Illness* (London: Constable, 2006), *et al.*; Wenonah Hauter, *Foodopoly: The Battle Over the Future of Food and Farming in America* (New York: The New Press, 2012), ii, 5.
476 Heinberg, *Powerdown*, 112-113.

society (or at least its professed support, and at least in theory). In his 2006 book *Is War Necessary for Economic Growth?: Military Procurement and Technology Development*, Vernon Ruttan argues that government and military investment in research, development and infrastructure has been essential for, or has significantly accelerated, many innovations and megaprojects over the past century such as nuclear technology.[477] Faced with the oncoming crescive crises of the Malthusian Century, the Soviet classical totalitarian centrally-planned economic model would have been better-equipped and better-adapted to combat these threats swiftly by decree, according to a scientific-materialist master plan or blueprint the like of those outlined in the final section of the second chapter, including the development of technological megaprojects such an asteroid-deflection strategy, or a laser broom to deorbit space debris in the event of Kessler Syndrome. Social cohesion and the top-down nature of the Soviet command economy meant that labour and resources could be rapidly and totalistically diverted to megaprojects regardless of market forces or price mechanisms; moreover, the constitutional entrenchment of the ruling communist party was well-suited to long-term planning, and policymaking was not held unaccountable to public opinion. The astrophysicist Lord Martin Rees submitted that 'only an enlightened despot could push through the measures needed to navigate the twenty-first century safely,' and it is also for this reason that Soviet classical totalitarianism is more advantageous than American inverted totalitarianism in the context of the Malthusian Century and the post-growth paradigm.[478]

The expansive SU was not overpopulated at the time of its collapse, so any discussion of its reactions or responses to such crises of growth and development must be speculative in nature; nevertheless, it is clear from the implementation of draconian family planning policies (inaccurately better-known as the 'one-child policy') in communist China in 1979, which have since prevented in excess of 400 million births, as well as the *một hoặc hai con* 'one-or-two-child' policy of communist Vietnam beginning in the 1960s, that the Soviet classical totalitarian political apparatus is certainly capable of imposing population planning, and other such unpopular yet necessary policies, on politically powerless populations in order to prevent or mitigate future crisis of growth and

[477] Heinberg, *End of Growth*, 181; Vernon W. Ruttan, *Is War Necessary for Economic Growth? Military Procurement and Technology Development* (Oxford: Oxford University Press, 2006), *et al.*
[478] Quoted in: Jonathan Boston, *Governing for the Future: Designing Democratic Institutions for a Better Tomorrow* (Bingley, UK: Emerald Group Publishing, 2016), 36.

development, such as overpopulation.[479] It is unclear what the Soviet position on climate change would have been, as the scientific consensus had yet to emerge at the time of its collapse; nonetheless, it is taken as fact in the Soviets' remaining socio-political successors, China, Vietnam, and Laos, as well as in its residual socio-economic-political successors, Cuba and North Korea, the latter of which has an atypical record of stringent compliance with its obligations to the UN Framework Convention on Climate Change.[480] Yet another systemic disadvantage of American inverted totalitarianism is that market economies also tend to externalise costs, passing on healthcare, disaster management and/or defense costs to individuals, communities, nations, and the environment; as Kim Robinson observes, 'When it comes to the environment, the invisible hand never picks up the cheque.'[481] In her 2008 book *The Shock Doctrine: The Rise of Disaster Capitalism*, Naomi Klein contends that capitalism increasingly *thrives* on disasters, as natural calamities and wars are used by political and economic actors to justify unpopular privatisation, free trade agreements, and decreased social security, as well as to glean profit and produce economic growth, hence the rise of 'disaster capitalism'.[482]

Finally, in regards to nuclear and other weapons of mass destruction, as well as conflict in general, it must be noted that the SU showed far more restraint with its nuclear arsenal relative the US (bureaucratic élites have as much to lose as anyone), even if the controversial atomic bombings of Hiroshima and Nagasaki are discounted. During the Cold War, humanity was brought to the brink of nuclear Armageddon on several occasions, most notably during the Korean War, the Cuban Missile Crisis, the Yom Kippur War, and Able Archer 83.[483] In each doomsday scenario, the SU backed down, made concessions, and refrained from launching a thermonuclear attack or counterattack, even when the crew of the Soviet submarine B-59 believed they were under bombardment by US depth charges, and that nuclear war had already broken out during the Cuban

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[479] Daniel M. Goodkind, "Vietnam's One-or-Two-Child Policy in Action" *Population and Development Review*, Vol. 21, No. 1 (Mar. 1995): 85-111, http://www.jstor.org/; Malcolm Potts, "China's one child policy: The policy that changed the world" *BMJ*, Vol. 333, Issue No. 7564 (Aug. 19, 2006): 361-362, http://www.ncbi.nlm.nih.gov/.

[480] Benjamin Habib, "North Korea: an unlikely champion in the fight against climate change" *The Guardian* (May 20, 2014), http://www.theguardian.com/.

[481] Quoted in: Rob Nixon, "Naomi Klein's 'This Changes Everything'" *The New York Times* (Nov. 6, 2014), http://www.nytimes.com/.

[482] Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism* (Toronto, Canada: Knopf Canada, 2007), *et al.*

[483] Avner Cohen, "The Last Nuclear Moment" *The New York Times* (Oct. 6, 2003), http://www.nytimes.com/; Don Munton and David A. Welch, *The Cuban Missile Crisis: A Concise History* (Oxford: Oxford University Press, 2007), *et al.*; Mark J. White, *The Cuban Missile Crisis* (New York: New York University Press, 1995), *et al.*; Nina Tannenwald, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945* (Cambridge: Cambridge University Press), 115-155; Stephen J. Cimbala, *The Dead Volcano: The Background and Effects of Nuclear War Complacency* (Westport, CT: Praeger Publishers, 2002), 92-93.

Missile Crisis, or when Soviet early-warning systems incorrectly indicated a pre-emptive US nuclear strike during NATO's 1983 Able Archer 83 military exercises.[484] Whereas the Soviet classical totalitarian SU and China, as well as their respective allies, India and Pakistan each undertook no first use pledges for their nuclear arsenals, the US and its allies the UK, France, Israel (as well as North Korea) have each refused to do the same, reserving the right to launch a nuclear first strike.[485] Furthermore, the SU extended an olive branch and attempted to diffuse the Cold War four times: Stalin and later Beria made peace overtures in 1953, followed by Khrushchev during the eponymous Thaw of the early 1960s, and finally by Gorbachev during *Perestroika* in the late 1980s.[486] These attempts at *détente* and rapprochement were invariably met with a new arms race pursuant to the US' policy of 'containment' of the SU.[487] Despite the sharp decline of the Russian economy and military following the Soviet collapse, the US has maintained its Cold War levels of arms spending, withdrawing from the 1972 ABM Treaty in 2001, and continuing to develop its nuclear arsenal.[488]

SECTION V
CONCLUSIONS

In conclusion, Soviet classical totalitarianism was systemically incapable of producing economic growth past the thresholds below which higher incomes improve wellbeing and ecological boundaries are not surpassed, hitting structural and organisational limitations to growth and development long before planetary limits, and was capable of operating in a stationary or even collapsing state, unlike American inverted totalitarianism, where growth is prerequisite, and crises of its making are systemic culminations rather than theoretical possibilities, making Soviet classical totalitarianism more advantageous and adaptive for the Malthusian Century and the post-growth paradigm, as assessed through the optics of neo-Malthusianism, environmental and happiness economics. Crises of growth and development would (have) be(en) less likely to emerge, or would (have) do(ne) so more gradually under Soviet classical totalitarianism, which would (have) allow(ed)

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[484] Stephen J. Cimbala, *The Dead Volcano: The Background and Effects of Nuclear War Complacency* (Westport, CT: Praeger Publishers, 2002), 92-93; Noam Chomsky, *Hegemony or Survival: America's Quest for Global Dominance* (New York: Henry Holt and Company, 2007), 74; Edward Wilson, "Thank you Vasili Arkhipov, the man who stopped nuclear war" *The Guardian* (Oct. 27, 1962), http://www.theguardian.com/.

[485] Sarah J. Diehl and James Clay Moltz, *Nuclear Weapons and Nonproliferation*, Second Edition (Santa Barbara, CA: ABC-CLIO, Inc., 2008), 1-31.

[486] John Lewis Gaddis, *Strategies of Containment: A Critical Appraisal of American National Security Policy during the Cold War*, Revised and Expanded Edition (Oxford: Oxford University Press, 2005), 362-379.

[487] Diehl and Moltz, *Nuclear Weapons and Nonproliferation*, 16-17, 25, 85, 89.

[488] Keir A. Lieber and Daryl G. Press, "Superiority Complex: Why America's growing nuclear supremacy may make war with China more likely," *The Atlantic Monthly* (July/August 2007), http://www.theatlantic.com/.

additional time to avoid or mitigate the unmanageable, as well as manage and prepare for the unavoidable. Furthermore, Soviet classical totalitarian authoritarianism and economic planning are better-equipped and better-adapted to rapidly and totalistically divert labour and resources to such endeavours by swift decree, coordinated by means of long-term planning, and implemented without the prerequisite of popular support, whereas American inverted totalitarianism enables many destructive human behaviours, externalises environmental costs, and submits political processes and the national agenda to the whims and domination of corporatist élites, which conjointly contrive to maintain the toxic *status quo* and business-as-usual.

CHAPTER IV

COLLAPSE

SOVIET CLASSICAL AND AMERICAN INVERTED TOTALITARIANISM IN THE MALTHUSIAN CENTURY

SECTION I

OVERVIEW

This chapter investigates the case study of the SU collapse, concluding that Soviet classical totalitarianism was more self-sufficient, resilient, better-prepared, and better-adapted than American inverted totalitarianism for crises in the same vein as those expected during the Malthusian Century. Counterintuitively and paradoxically, the centralisation, compartmentalisation, bureaucratic inertia, redundancy, inefficiency, and petty corruption endemic throughout the bloated and sluggish classical totalitarian Soviet leviathan − among the causes of its eventual passing − came to be blessings in disguise during its collapse. This came in the form of self-sufficiency (often by necessity), urban planning, dispersed system control points, balancing feedback loops, high levels of inventory and stockpiles, systemic redundancy in critical systems such as food, energy, water, and transportation infrastructure, as well as the ability to absorb shocks, and function at the local level even as the central government withered away.[489] By contrast, the decentralisation, globalisation, privatisation, competition, specialisation, efficiency, and fossil-fuel-dependent infrastructure and transportation systems of the the lean and streamlined inverted totalitarian US − the keys to its economic success hitherto − are poised to become inadvertent liabilities during the Malthusian Century and the new millennium.[490] The remainder of this chapter will juxtapose the Soviet experience of collapse with the expected experience of the inverted totalitarian US during the Malthusian Century, from the perspectives of agriculture and food systems, housing and transportation, psychology and religion, as well as demographic, security, and overall geostrategic circumstances of each.

[489] Richard Heinberg, "Why Resource Depletion, Climate Change, and Debt Spell the End of Economic Growth" *Praxis Peace Institute*, The Economics of Sustainability: Emerging Models for a Healthy Planet, San Francisco, CA (Oct. 6, 2014), Lecture.
[490] Heinberg, *End of Growth*, 181-185; Orlov, *Reinventing Collapse*, 59, 79.

SECTION II

AGRICULTURE AND FOOD SYSTEMS

The postwar SU and US both went to great pains to replace family farms with unsustainable fossil-fuelled scientific-industrial agriculture: although US corporate farming managed to produce more than SU collective farming with an agricultural workforce less than one-sixth the size, neither would have produced much of anything without cheap and abundant energy and petrochemicals.[491] Paradoxically, however, decades of failed collective farming had unwittingly prepared the Soviet rural and urban populations for the conditions they endured during the SU collapse by forcing them to become largely self-sufficient for food beforehand. Soviet agriculture was so unproductive and inefficient that roughly one-quarter of national agricultural output, including a substantive proportion of meat, milk, eggs, and vegetables, was produced in 42.8 million private, organic permaculture 'kitchen gardens', which collectively accounted for a mere three per cent of the total agricultural demesne.[492] In 1978, *kolkhoz* families obtained 19 per cent of their wool, 29 per cent of their vegetables, 34 per cent of their eggs, and 61 per cent of their potatoes from these private plots and farm animals; moreover, it is likely that the relative success of these kitchen gardens was underrepresented by official statistics.[493] Soviet matchbox apartment complexes were generally positioned on large vacant lots with abundant wasteland, which could be converted into organic kitchen gardens for supplementary food.[494] Mushroom and berry picking are also traditional in Russian culture, with autumn being the peak season; mushrooms are dried or pickled then stored, and consumed in wintertime.[495] After the collapse of the centrally-planned agricultural sector, these *ad hoc* institutions, routines, and traditions continued on much as before, and most people had access to housing and its attendant kitchen gardens during the collapse, or else knew someone who did. In this sense, neither money nor access to the formal economy was prerequisite for survival in most cases.[496]

On the other hand, US corporate farming is poised to become a victim of its own success during the Malthusian Century, and many of its fossil-fuelled achievements will turn into unintended liabilities. Inverted totalitarianism places heavy emphasis upon cost-effectiveness, which is achieved

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[491] Medley, "Soviet Agriculture," 5; Orlov, "Post-Soviet Lessons," 7-8.
[492] Ibid., Medley, 10; --, *Soviet Analyst*, Vol. 11, No. 19 (Sept. 29, 1982): 27, http://books.google.com/.
[493] Ibid., *Soviet Analyst*, 27.
[494] Orlov, "Post-Soviet Lessons," 15, 18.
[495] Ibid., 18.
[496] Orlov, *Reinventing Collapse*, 28, 54-55, 64-66, 70.

by way of globalisation, as well as increased specialisation, mechanisation, and efficiency: if corn can be grown cheaply and efficiently in Iowa, grow all corn in Iowa and grow nothing there but corn. Its short-term economic advantages notwithstanding, this approach reduces resilience in food systems: if the Iowa corn crop fails, nobody has corn, and Iowa has no economy.[497] Globalisation is vulnerable to energy and resource scarcity and depletion, infrastructure breakdowns, political instability, credit and currency crises, as well as any loss of satellite communications in the event of war or Kessler Syndrome.[498] If croplands, farmers, or farm machinery are too highly- or narrowly-specialised, or too dependent upon globalisation for energy, tools, products, materials, or spare parts, any disruption in global energy supplies or transportation infrastructure could be catastrophic to the integrity of the entire agricultural system, which is a microcosm of the broader vulnerability and irresilience of the American inverted totalitarian economic model.[499] The breakdown of globalisation on top of the collapse of the Green Revolution and dangerous climate change will be especially problematic in the heavily oil-dependent US, and unlike their Soviet counterparts, most Americans will have no alternate sources of food to turn to in the event of collapse, since the US agro-industrial complex is controlled by a small handful of corporations, and comparatively little is produced privately outside of the formal economy.[500]

SECTION III

HOUSING AND TRANSPORTATION

In the SU, housing was state-owned, substandard, and in short supply: overcrowded and notoriously shabby yet self-sufficient matchbox apartment blocks with communal kitchens, bathrooms, and hallways were the norm in cities.[501] According to one government publication, a typical working class family of four was made to live in a single 2.5-by-2.5-metre room for eight years before slightly larger accommodations became available, and 17 per cent of Soviet families had to be separated for lack of space.[502] Nevertheless, it was *free*: when the SU collapsed, people simply continued living where they had been, and no-one paid rent or utilities.[503] Accommodations were generally part of SOEs, which employed 90 per cent of the population, and operated as virtual states

[497] Heinberg, "End of Economic Growth," Lecture.
[498] Heinberg, *End of Growth*, 184-185.
[499] Ibid., 181-184.
[500] *Food, Inc.*, Dir. Robert Kenner, Perf. Eric Schlosser, *et al.*, Magnolia Pictures, 2008, Documentary; Wenonah Hauter, *Foodopoly: The Battle Over the Future of Food and Farming in America* (New York: The New Press, 2012), 5.
[501] Orlov, *Reinventing Collapse*, 54-56.
[502] Horowitz, "The Road to Nowhere," 2013.
[503] Orlov, *Reinventing Collapse*, 54.

unto themselves, with schools, hospitals, shops, libraries, holiday resorts, and other facilities and amenities, which were invariably serviced by public transportation. The very same bureaucratic inertia that had bogged down the productivity and development of SOEs prior to the Soviet collapse had the unintended yet constructive side effect of bogging down the development of the collapse process itself, and with no mechanism for their bankruptcy, many SOEs continued to function on some level for some time following the dissolution of the SU.[504] By way of comparison, in the inverted totalitarian US, insolvent corporations can lay off employees *en masse*, auction off capital equipment, and dissolve almost overnight.[505] One practical corollary of the chronic stockpiling and hoarding of inventory by Soviet SOEs discussed in the third section of the previous chapter was that most inherited a surplus of *something* during the collapse, which could be bartered with other imploding SOEs for various necessities. By contrast, American inverted totalitarianism emphasises cost-effective just-in-time manufacturing to increase efficiency and decrease waste by reducing inventory to a necessary minimum, making it less resilient and more vulnerable to crises on account of its lack of systemic redundancy and emergency reserves of materials and supplies.[506]

In the SU, one's accommodations could also be used as a source of income since anything valuable or reusable could be sold or bartered (this kind of asset stripping was endemic throughout the post-collapse SU), or as a base of operations from which to establish some kind of commercial venture during the post-collapse transition to private enterprise.[507] Those unfortunate enough to be without access to state housing occupied vacant strips of land, virtually all of which was public (the term 'loitering' does not translate into Russian).[508] Orlov describes the so-called *BOMZh* phenomenon:

> After the collapse, Russia experienced a swelling of the ranks of people described by the acronym 'BOMZh', ... [which] stands for 'persons without a definite place of residence or employment'. The *bomzhies*, as they came to be called, often inhabited unused bits of the urban or rural landscape, where, with nobody to tell them to 'move along,' they were left largely in peace. Such an indefinite place of residence was often referred to as *bomzhatnik*. ... But because most of the Russian population was able to keep their place of residence in spite of a collapsing economy, the

[504] Orlov, *Reinventing Collapse*, 54-59; French, *North Korea*, 83-85.
[505] Orlov, "Post-Soviet Lessons," 14.
[506] Orlov, *Reinventing Collapse*, 58-60.
[507] Ibid., 59, 105.
[508] Ibid., 56.

> percentage of *bomzhies* in the general population never made it into the double digits.[509]

By forcing several generations to live together in close quarters, the SU housing shortage had also inadvertently built an invaluable security net which survived the collapse (and forced countless broken families to stick it out).[510] Tasks could be delegated and labour divided: grandparents normally cultivated the kitchen gardens and looked after children while working-age people went into the private sector or the black market.'[511] Moreover, since most Soviet citizens spent their whole lives living and working in one location, they were familiar with their neighbours and surroundings during the collapse.

Yet another adaptive by-product of the failed command economy was its necessitation of an informal network of *ad hoc* favours, social agreements, and institutions, known as *blat* in Russian, simply to keep the ailing system afloat and functioning.[512] From managers' and workers' attempts to actualise the goals and targets of the national plan despite its inherent limitations, as well as citizens' efforts to secure access to basic necessities and essential services, there emerged a shadow *blat*-based gift economy parallel with the formal command economy. Honed by millennia of trial and error, gift economics − *Homo Sapiens*' primary economic model for 95 per cent of its evolution − proved to be an adaptive and invaluable collapse-proof cultural trait following the Soviet collapse, when these extemporised institutions survived the disintegration of the command economy, and created a safety net in its absence.[513] The pervasive network of bribery and corruption in the SU also remained largely in place following its collapse, and many of the services it had secured continued to be available even after the formal economy had fallen away. Soviet healthcare, for instance, was called 'the freest in the world' because satisfactory treatment could be obtained merely through private arrangements, many of which survived the collapse, and hospitals and clinics continued to operate as the Soviet medical establishment slowly disintegrated over the course of the 1990s, to the extraordinary detriment of public health in the former SU.[514] The housing shortage and mostly

[509] Orlov, *Reinventing Collapse*, 56.
[510] Ibid., 54-46; Orlov, "Post-Soviet Lessons," 7-8.
[511] Ibid., *Reinventing Collapse*, 55; "Post-Soviet Lessons," 15-16.
[512] Ibid., *Reinventing Collapse*, 95.
[513] Ibid.; Heinberg, *End of Growth*, 28-30.
[514] Orlov, "Post-Soviet Lessons," 13; Orlov, *Reinventing Collapse*, 71-74.

immobile population meant that most had considerable *blat* upon which to call, and a wide network of family and friends upon whom to depend for support.[515]

The SU had notoriously poor and underdeveloped road infrastructure, with generally dirt roads outside major cities. In the mid-1970s, the Soviet car ownership rate was lower than that of blacks in contemporary Apartheid South Africa, with just two per cent of the population owning a car compared to 42.6 per cent in the contemporary US.[516] This not only constrained and stunted economic growth prior to the collapse, but also meant that petrol rationing and fuel shortages had minimal impact on everyday life in its aftermath.[517] Centralised urban planning had managed to avoid the sprawl, decentralisation, and petrochemical dependency of the US suburban model by designing communities to be self-sufficient, walkable, or otherwise accessible by public mass transport, which was extensive, infinitely maintainable, and continued to operate much as before during and following the collapse.[518]

By contrast, the US' transportation infrastructure is heavily-dependent on oil, and its predominantly foreign-built car fleet, which must be replaced every decade or two at the most, requires a steady stream of imported parts. Since most Americans commute to and from work by car, skyrocketing petrol prices, rationing, and fuel shortages are likely to have a considerably more devastating impact on the US' economy than they had on the Soviets', as the oil crises of the 1970s indicate.[519] In this vein, Kunstler argues that the US suburban model is a living arrangement with no future, branding it 'the greatest misallocation of resources in human history'.[520] The 2004 documentary *The End of Suburbia: Oil Depletion and the Collapse of the American Dream* and its 2007 sequel *Escape From Suburbia: Beyond the American Dream* make the compelling case that the suburbs will become the slums of the US' post-peak oil and -globalisation future.[521] In contrast with the largely immobile Soviet population and its collective living and working arrangements, Americans are also less likely to have contact with neighbours, particularly in urban areas, and frequent relocations for

[515] Orlov, *Reinventing Collapse*, 54-55, 95.
[516] Ibid., 57-60; Horowitz, "The Road to Nowhere," 2013; Lewis H. Siegelbaum, *Cars for Comrades: The Life of the Soviet Automobile* (Ithaca, NY: Cornell University Press, 2008), 239.
[517] Orlov, *Reinventing Collapse*, 57.
[518] Ibid., 57-60.
[519] Ibid.
[520] Kunstler, *Geography of Nowhere*, 233.
[521] *The End of Suburbia: Oil Depletion and the Collapse of the American Dream*, Dir. Gregory Greene, Perf. Barrie Zwicker, *et al.*, The Electric Wallpaper Co., 2004, Documentary; *Escape from Suburbia: Beyond the American Dream*, Dir. Gregory Greene, Perf. Ed Schreyer, *et al.*, Sundance Channel, 2004, Documentary.

work or study mean fewer familiar faces, and a weaker support network in the event of economic, political, or societal collapse.[522]

To make matters worse, the US homeownership rate is 67.3 per cent, and those who do own properties likely require an income to pay real estate taxes, property fees, or association costs, while those that lease accommodations likewise require an income to pay rent on pain of eviction and homelessness.[523] In the event of economic collapse, mass layoffs and rising unemployment would swiftly produce a whirlwind of foreclosures, evictions, homelessness, and vagrancy.[524] Economic collapse generally entails hyperinflation, which wipes out savings overnight; even so, the majority of Americans are only a few paycheques away from the street: nearly 70 per cent of Americans have less than US$1,000 in personal savings, and 66 million have no savings at all.[525] Finally, in contrast with the classical totalitarian SU, most land in the inverted totalitarian US has been privatised, including many ostensibly 'public' spaces.[526] Residential areas are often structured and subdivided in order to both exclude the homeless and maintain property values, while public parks are often closed at night, and loitering is prohibited in many places.[527] American *bomzhies* of the future will likely have a harder time than their post-Soviet counterparts.

SECTION IV

PSYCHOLOGY AND RELIGION

Soviet classical totalitarianism did indeed mould a 'new Soviet man', yet one quite unlike anything its leaders had envisioned.[528] *Homo Sovieticus* was dispassionate, apathetic, passive, obedient, and indifferent to individual responsibility and the fruits of labour: 'We pretend to work and they

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[522] Orlov, "Post-Soviet Lessons," 15-16.
[523] --, "Quarterly Residential Vacancies and Homeownership, Fourth Quarter 2016" *U.S. Census Bureau* (Jan. 31, 2017), http://www.census.gov/; Orlov, *Reinventing Collapse*, 55-56.
[524] Ibid., Orlov, 54-56.
[525] Alexandra Talty, "66 Million Americans Have No Emergency Savings" *Forbes* (Jun. 21, 2016), http://www.forbes.com/; Niall McCarthy, "Survey: 69% Of Americans Have Less Than $1,000 In Savings" *Forbes* (Sept. 23, 2016), http://www.forbes.com/; Orlov, *Reinventing Collapse*, 19, 42, 64-66; Quentin Fottrell, "Most Americans are one paycheck away from the street" *Market Watch* (Jan. 31, 2015), http://www.marketwatch.com/.
[526] Ibid., Orlov, 56-57.
[527] Orlov, "Post-Soviet Lessons," 14-15.
[528] Sergei Khodorovich, "1917-1987: Uncuccessful and Tragic Attempt to Create a 'New Man'," reprinted with permission from *Samizdat Bulletin* (Dec., 1987) and translated by Larissa Vilenskaya and Jim Reister, http://www.roca.org/; for further reading, see: Aleksandr Zinovyev, *Homo Sovieticus* (New York: Grove Atlantic, 1986), *et al.*

pretend to pay us!' went the adage.[529] The new Soviet man was also disrespectful of common property; in the ironic words of one slogan: 'Everything belongs to the *kolkhoz*, everything belongs to me!' and Soviet conventional wisdom cautioned that 'If you don't steal from the government, you're stealing from your family.'[530] Pipes points to the irony that 'a regime that wanted everyone to sacrifice his private advantage to the common good ended up with a situation where everyone looked out only for himself because he could count on no-one else.'[531] Paradoxically, however, these negative yet adaptive character traits inadvertently prepared *Homo Sovieticus* for the SU collapse and its aftermath by managing expectations, and inculcating a measure of apathy, self-reliance, and survival instinct.

Life in the SU was characterised by breadlines and waiting lists, shortages and rationing, rude and non-punctual service, subpar quality, and sporadic blackouts. One-third and two-thirds of Soviet households had no running or hot water whatsoever, respectively, and many rural areas were off the grid.[532] Nevertheless, the penury of everyday life in the SU had the unwitting advantage of steeling the population by preparing it for the uncertainty and deprivation that came part and parcel with the system's eventual collapse. Unlike inverted totalitarianism's *Homo Economicus*, *Homo Sovieticus* was comparatively well-adjusted to sporadic or non-existent heating, air-conditioning, electricity, hot and cold running water, flush toilets, private or public transportation, paved roads, street lighting, and so forth.[533] Furthermore, the strict control of information and communications technology in the pre-Internet SU meant that the population was relatively well-prepared to make do and coordinate its activities in their absence, which would present a much greater challenge for the more developed and interconnected US, with its mobiles, emails, social networking, and so on, in the event of blackouts, war, Kessler Syndrome, another Carrington event, or some other disruption to global trade networks, or its ageing electrical grid and transportation infrastructure.

The abysmal quality of Soviet consumer goods also conferred some paradoxical advantages during the collapse: with the exception of industrial equipment and military hardware, virtually nothing could be exported outside the Soviet *bloc*, which forced the national economy into a state of

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[529] William Steiner, *Stealing America's Future: The Unintended Consequences of Progressive Liberalism* (Indianapolis, IN: Dog Ear Publishing, 2010), 72.
[530] Donald J. Raleigh, *Soviet Baby Boomers: An Oral History of Russia's Cold War Generation* (Oxford: Oxford University Press, 2012), 184; James Nolan, *Interpretation: Techniques and Exercises* (Clevedon: Multilingual Matters Ltd, 2005), 164; Martha Lampland, *The Object of Labour: Commodification in Socialist Hungary* (Chicago: University of Chicago Press, 1995), 260.
[531] Pipes, *Communism*, 70.
[532] Horowitz, "The Road to Nowhere," 2013.
[533] Orlov, "Post-Soviet Lessons," 11-12.

self-sufficiency and -reliance for most basic necessities.[534] By contrast, globalisation has made the inverted totalitarian US dependent upon international markets and trade, with no contingency plan should these systems and institutions break down.[535] Further to this, the absence of a maintenance industry or even concomitant spare parts in the SU paradoxically incentivised the production of durable and maintainable equipment and infrastructure, and further imbued *Homo Sovieticus* with practical DIY skills which proved invaluable during the collapse, as Orlov explains:

> Soviet consumer products were always an object of derision − refrigerators that kept the house warm − and the food, and so on. You'd be lucky if you got one at all and it would be up to you to make it work once you got it home. But once you got it to work, it would become a priceless family heirloom, handed down from generation to generation, sturdy and almost infinitely-maintainable.... Soviet-made stuff generally wore incredibly hard.[536]

On the other hand, products consumed in the US are often purpose-built with keyed screws or fused seams so as to be irreparable, and are regularly designed to break or fail after a given period of time, necessitating the purchase of a replacement item. This counterproductive and wasteful marketing strategy of the US inverted totalitarian corporatocracy is known as 'planned obsolescence'.[537] Because economic collapse constricts domestic production as well as access to imports, professionals and specialists, survival skills and practical DIY knowledge, further to durable and maintainable equipment, are essential. In this vein, it can also be deduced that the generally high quality of Soviet education was a considerable asset to the population during the collapse.

From a psychosociological perspective, the enshrinement of apathy, malaise, and patience into the national character and public consciousness during the Soviet era offered yet another advantage during the collapse: psychological insurance. 'Dofenism' − from the Russian term '*dofen*' or 'Why bother?' − came to be the *zeitgeist* of the Brezhnev Stagnation. Many held the Soviet system in disdain, and did the bare minimum expected of them and nothing more; predictably, furnace stoker and night watchman were prized jobs among the well-educated. Many turned instead to poetry and literature, family and friends, nature, and even alcohol for pleasure and meaning, and most viewed the Soviet collapse with detachment and indifference.[538] Apathy and patience can be invaluable in the event of catastrophe, and in the vein, it is notable that there were no mass riots or

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534 French, *North Korea*, 85; Orlov, *Reinventing Collapse*, 65-68.
535 Heinberg, *End of Growth*, 181-184.
536 Orlov, *Reinventing Collapse*, 65-66.
537 Dan Martin, *Apocalypse: How to Survive a Global Crisis* (ECKO Publishing, 2011), 58; Orlov, *Reinventing Collapse*, 66-67.
538 Orlov, *Reinventing Collapse*, 95-97.

protests of significance following the dissolution of the SU.[539] By contrast, the American Dream *ethos* of faith, exceptionalism, progress, growth, development, expansion, and the frontier, to say nothing of the scientific-industrial-advertising-fuelled materialism, consumerism, and sensationalism central to the American way of life, are very much enshrined in the national psyche, and the American dreamers will no doubt cling to the Dream far longer in the Malthusian Century and the new millennium than *Homo Sovieticus* ever clung to Marxism.[540] Heinberg reflects that:

> If the observation that growth is ending is in fact valid, and if policymakers and citizens don't see or understand that economic expansion is no longer possible, they will continue to assume the impossible − that growth can and will continue indefinitely. In doing so, they will increasingly be operating in a delusional state. People who are deluded this way may do things that make no sense in terms of the actual economic environment that is emerging, and will likely fail to do things that could help themselves and others adapt to new conditions. Opportunities will be wasted and human suffering will be increased unnecessarily.[541]

Arthur Shopenhauer described the process of denialism as follows: 'All truth passes through three stages: first, it is ridiculed; second, it is violently opposed; third, it is accepted as being self-evident.'[542] This individual and collective psychological process is likely to be more prolonged and painful in the post-collapse US than it was in the post-collapse SU, where most people happily picked up the pieces and moved on; moreover, the expectations of the post-Soviet population were so low that they can only have been more difficult to disappoint relative to their contemporary American counterparts in general, and the Snowflake Generation in particular.[543]

Like politics, religion has the potential to considerably exacerbate the catastrophes of the Malthusian Century. By this logic, the suppression of religion in the scientific-materialist SU, however brutal and inhumane, may have conferred some unfortunate advantages during and following its collapse. The state atheism of the SU failed to eliminate religion, yet did succeed in moderating it to a large extent; for instance, polling has revealed Muslims in post-Soviet Central Asia and the Caucuses to hold the most moderate and progressive values and beliefs in the Islamic

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539 Orlov, *Reinventing Collapse*, 87.
540 Ibid., 95.
541 Heinberg, *End of Growth*, 228.
542 Mitch Battros, *Solar Rain: The Earth Changes Have Begun* (Earth Changes Press, 2005), xiv.
543 Orlov, *Reinventing Collapse*, 94-97; for further reading, see: Claire Fox, *'I Find That Offensive!'* (London: Biteback Publishing, 2016), *et al.*

world.[544] It is also noteworthy that religious extremists did not come to power in any of the post-Soviet states. Nonetheless, doomsday cults and millenarian religious groups did experience something of a resurgence in the post-Soviet vacuum, and the eschatological aspects of religion often come to the fore in hard times; for this reason, religious cults in the vein of Heaven's Gate and the Branch Davidians seem likely to proliferate in the Malthusian Century, particularly in the relatively religious US.[545]

It must also be noted that the doctrine and dogma of Russian Orthodox Christianity are far more psychologically compatible with the everyday realities of economic and societal collapse than those of the dominant monotheisms in the US: Protestantism, Catholicism, Judaism, and Islam.[546] Whereas Russian Orthodox Christianity, in spite of its opulence and grandeur, emphasises asceticism as the path to salvation on the grounds that rewards are either in this world or the next but seldom both, Orlov argues that Protestantism in the US has:

> ... made the dramatic shift to considering wealth as one of God's blessings.... Conversely, poverty became associated with laziness and vice, robbing poor people of their dignity. Thus, a Russian is less likely to consider sudden descent into poverty as a fall from God's grace, and economic collapse as God's punishment upon the people, while the religions that dominate America … all feature the temporal success of their followers as a key piece of evidence that God is well-disposed toward them.[547]

The values, teachings, and culture of Russian Orthodox Christianity thereby proved to be yet another piece of psychological insurance for much of the Soviet population before, during, and following the collapse, although this advantage was unrelated to Soviet classical totalitarianism itself.

SECTION V

DEMOGRAPHICS, SECURITY, AND CIRCUMSTANCES

Marxism aspired to create a classless, atheist, and internationalist society devoid of racism, xenophobia, and religion. Pursuant to these objectives, the classical totalitarian SU forcibly integrated and homogenised its population by means of mass transfers, resettlement, and

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[544] Frederick Starr, "Moderate Islam? Look to Central Asia" *The New York Times* (Feb. 26, 2014), http://www.nytimes.com/; Sabrina Petra Ramet, *Religious Policy in the Soviet Union* (Cambridge: Cambridge University Press, 1993), 4-S.
[545] Orlov, *Reinventing Collapse*, 78.
[546] Ibid., 78-79.
[547] Ibid., 78.

deportations, negligible immigration or emigration, state atheism, and cultural Sovietisation, as outlined in the first chapter. This unprecedented experiment in social constructivism, however tragically, generated a sense of comradery and fraternity among the Soviet population, even if only in solidarity against the regime, over which many fondly reminisce to this day, and this can only but have abated and ameliorated, however unquantifiably, the kinds of internecine, interracial, interethnic, interclass, intercultural, and interreligious tensions which can be expected to flare up in the inverted totalitarian US during the Malthusian Century; nevertheless, such tensions were significant throughout the post-collapse former SU, and should not be deemphasised.[548] Incidence of racism and hate crimes has declined considerably in the heterogeneous US since Jim Crow; nonetheless, racial, ethnic, class, cultural, and religious tensions remain substantial, as evidenced by recent social and political mass movements and macro-trends, such as the Occupy Wall Street and Black Lives Matter movements, rising Islamophobia, as well as the Sanders and Trump phenomena. Indeed, it is often observed in contemporary American political discourse that the US is a 'divided nation', and in this sense, its social environment, which has been shaped by the embrace of mass immigration, multiculturalism, élitism, and freedom of worship, as well as haunted by the legacies of slavery and Jim Crow, can be expected to be less placid, amicable, and harmonious than it was in most of the former SU, and perhaps more akin to the experiences of the more multiethnic corners of the post-communist world, such as the Fergana Valley, the Caucuses or the Balkans.[549] In contrast with the other five systems transformations in the modern state paradigm identified by Charles Doran's power cycle theory, only the collapse of the SU led to a peaceful implosion.[550]

Like the former SU, the US seems likely to experience a decline in security during the Malthusian Century. In post-collapse Russia, the crime rate increased by 27 per cent in the 1991-92 period, with property crimes accounting for a full two-thirds of the increase; rates of violence, homicide, theft, counterfeiting, money laundering, as well as drug, arms, and human trafficking rose significantly, and organised crime made a resurgence.[551] With no salaries, budget or equipment, police and security forces broke down over a period of years and oftentimes entered into Faustian

[548] Seth Mydans, "20 Years After Soviet Fall, Some Look Back Longingly" *The New York Times* (Aug. 18, 2011), http://www.nytimes.com/.
[549] Orlov, *Reinventing Collapse*, 77; Jeffrey J. Mones, "Record high 77% of American Perceive Nation as Divided" *Gallup* (Nov. 21, 2016), http://www.gallup.com/.
[550] Charles Doran, "Power Cycle Theory, the Shifting Tides of History, and Statecraft: Interpreting China's Rise" *The SAIS Europe Journal* (Apr. 1, 2012), http://www.saisjournal.org/; power cycle theory was first articulated in: Charles F. Doran, *The Politics of Assimilation: Hegemony and Its Aftermath* (Baltimore, MD: Johns Hopkins University Press, 1971), *et al.*
[551] Ninel F. Kuznetsova, "Crime in Russia Causes and Prevention" *Demo-kratizatsiya*; Journal of Post-Soviet Democratization, Volume 2: 442-452.

bargains with organised crime syndicates. Like the former SU, the US has a surplus of battle-hardened, psychologically-traumatised soldiers and veterans, many of whom (and by extension their dependants) will find themselves without unemployment or pensions in the likely event that the US is forced to downsize its military-industrial complex, with untold and wide-ranging social ramifications. If the Soviet experience is any indication, the US can expect an increase in crime rates concurrent with the breakdown of law and order during the Malthusian Century, particularly with the highest rates of (constitutionally-protected) gun ownership in the world by far, for a total of some 360 million guns − more than one each.[552]

The US is also likely to face a more acute labour shortage in the Malthusian Century than did the former SU following the Soviet collapse. As mentioned, the SU workforce was entirely self-sufficient with a surplus of skilled labour, whereas the US has progressively outsourced its high-wage manufacturing jobs and insourced its low-wage service jobs, as well as a significant proportion of its skilled-labour positions.[553] This process of extracting talent from abroad to the US' advantage and to foreign detriment − 'brain drain' − is likely to reverse direction in the event of economic or societal collapse in the US, which will deprive vital sectors of the economy such as renewable energy research and development of the crucial talent needed to overcome or mitigate the oncoming crises of growth and development in the Malthusian Century.[554] The minimal immigration and strict control of movement in the Soviet *bloc*, meanwhile, reduced the potential for epidemics and major terrorist attacks. Finally, in addition to the abovementioned, circumstances gifted the post-collapse former SU several further advantages its US counterpart will be less likely to enjoy: it was surrounded by functioning economies with which entrepreneuring *chelnoki* − literally 'shuttles' − could exchange stripped assets for unavailable basic necessities, price controls kept a firm lid on hyperinflation, dangerous climate change was a non-issue, and most regions of the former SU were net energy exporters; consequently, most recovered fairly rapidly as energy prices increased in the 1990s.[555] Nevertheless, the uneven recovery of the Russian economy took more than a decade, and some post-Soviet states such as Ukraine and Moldova have yet to fully recover.[556]

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[552] Christopher Ingraham, "There are now more guns than people in the United States" *The Washington Post* (Oct. 5, 2015), http://www.washingtonpost.com/.
[553] Orlov, *Reinventing Collapse*, 60.
[554] Ibid., 61.
[555] Ibid., 50.
[556] Ibid., 50-52.

SECTION VI

CONCLUSIONS

By way of conclusion, many of the greatest failings of Soviet classical totalitarianism, such as its over-centralisation, inefficiency, redundancy, wastefulness, sluggishness, corruption, as well as its bloated welfare state, became inadvertent and paradoxical advantages during and following the Soviet collapse, largely because neither money nor an income were prerequisite for survival, which gifted the former SU a relatively soft landing. On the other hand, the greatest successes of the inverted totalitarian US: its decentralisation, efficiency, competition, privatisation, and specialisation, are poised to become equally inadvertent and paradoxical liabilities during the Malthusian Century and the post-growth paradigm of the new millennium. Furthermore, the ostensibly negative traits of the new Soviet man unwittingly better-prepared him (or her) for collapse than American citizens will be when the oncoming crises of growth and development reach critical mass. Finally, unlike the SU, which experienced economic collapse in consequence of its political collapse, the inverse is poised to occur in the less-prepared US, which will likely experience more internecine, interracial, interethnic, interclass, intercultural, and interreligious conflict than the post-collapse former SU, which further benefited from several circumstantial advantages relative to what the US can expect during the Malthusian Century. In short, the SU was paradoxically better-prepared for and more resilient during and following its collapse than the US is poised to be during and following its own hypothetical collapse, and would likely have had a softer landing in similar circumstances, making Soviet classical totalitarianism the more advantageous of the duo in the context of the Malthusian Century and the post-growth paradigm.

CHAPTER V

AFTERMATH:

SOVIET CLASSICAL AND AMERICAN INVERTED TOTALITARIANISM IN THE MALTHUSIAN CENTURY AND BEYOND

SECTION I

SOVIET CLASSICAL TOTALITARIANISM IN THE POST-COLD WAR ERA

As discussed in the previous chapter, the collapse of communism produced three distinct outcomes: the former Soviet *bloc* pursued varieties of capitalism and liberal democracy with mixed success, and only the regimes in China, Vietnam, Laos, Cuba, and North Korea survived the Autumn of Nations; yet, whereas the former trio pursued free-market capitalist economic policies, even while maintaining their Soviet-style political systems, only the latter duo have maintained the Soviet classical totalitarian socioeconomic *and* -political model.[557] The disintegration of Comecon and US-led sanctions and trade embargoes isolated Cuba and North Korea from most of the international community, and simulated the kinds of crisis conditions expected during the Malthusian Century.[558] In Cuba, the immediate post-Cold War era is euphemistically referred to as 'The Special Period in Time of Peace' or simply 'The Special Period'; in North Korea, it is remembered as 'The Arduous March'.[559] As the only remaining cases of Soviet classical totalitarianism in practice, and on account of the considerable parallels between the Special Period and Arduous March on the one hand, and the crises of growth and development set to intersect in the Malthusian Century on the other, the post-Cold War trajectories and experiences of Cuba and North Korea warrant further examination.

This chapter will briefly examine this pair of instructive case studies, which conjointly demonstrate that Soviet classical totalitarianism is capable not only of surviving such catastrophes largely intact relative to the dire predictions outlined in the second chapter, but also of collapsing into a sustainable, steady, and relatively stationary state, the like of which inverted totalitarian

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[557] Clifford L. Staten, *The History of Cuba* (London: Greenwood Press, 2003), 135-154; French, *North Korea*, 91; Meisner, *Mao's China and After*, 449-482.
[558] Oliver Inderwildi and Sir David King, eds., *Energy, Transport & the Environment* (London: Springer, 2012), 55-75.
[559] The Arduous March nomenclature was later reformulated as the 'Forced March to Final Victory', and finally the 'March to Paradise'. French, *North Korea*, 115-116; Staten, *History of Cuba*, 125-139.

capitalism has no equal, as concluded in the third chapter; finally, both Cuba and North Korea are relatively well-prepared and -adapted to weather the kinds of conditions and crises expected during the Malthusian Century, in part because many of the Soviet model's failures become paradoxically advantageous during crises and collapse, as outlined in the previous chapter, but also because each faced its own Malthusian decade in the immediate post-Cold War period, and both have been forced to adapt to the post-growth paradigm ahead of the global curve; as such, their instructive and cautionary experiences, along with the Soviets', may be re-examined, re-assessed, or even imitated by collapsing societies in the Malthusian Century and beyond.

SECTION II

CUBA IN THE SPECIAL PERIOD

The collapse of the SU had an immediate and severe impact on the Cuban economy: Cuba lost four-fifths of its foreign trade, including food, medicine, animal feed, steel, petrochemicals, and other ore-based supplies, which paralysed the transportation system as well as the industrial and agricultural sectors, eliminating millions of jobs.[560] Lavish Soviet subsidies and aid to the tune of $8 billion per year were cut off, and the regime was forced to appeal to the international community for aid in 1993; between 1991 and 1994, GDP fell by more than one-third as blackouts, shortages, and rationing became the norm.[561] Compounding the colonial legacy of extensive deforestation and soil degradation, Cuba had fully committed to the Green Revolution, employing large-scale Soviet-style collective farming, which consumed petrochemical fertilisers, pesticides, and herbicides at rates even higher than those in the US.[562] Oil consumption declined by one-fifth over the 1990-92 period, although this reduction was partially offset by later increases in domestic production, as well as imports from Venezuela and elsewhere (see fig. 62. Cuban Oil Consumption by Source, 1980-2013).[563] Fuel shortages forced most of the country's tractors, combines, harvesters, and hydroponic equipment to lay idle, fertiliser and pesticide imports declined by four-fifths, and overall agricultural

[560] Danaher, *et al*, *Building the Green Economy*, 101; Usula Oswald Spring, *et al*., "Peace Studies, Public Policy and Global Security: Volume III," EOLSS Publications, 2010), 239.
[561] Archibald R. M. Ritter, ed., *The Cuban Economy* (Pittsburgh, PA: University of Pittsburgh Press, 2004), 69; *The Power of Community: How Cuba Survived Peak Oil*, Dir. Faith Morgan, Perf. Bruce Cromer, *et al*, AlchemyHouse Productions, Inc., 2006, Documentary; Staten, *The History of Cuba*, 6, 126.
[562] Miguel A. Altieri and Fernando R. Funes-Monzote, "The Paradox of Cuban Agriculture" *Monthly Review*, Vol. 63, Issue No. 8 (Jan. 2012), http://monthlyreview.org/.
[563] Fig. 62. Cuban Oil Consumption by Source, 1980-2013. Graph adapted from: Gail Tverberg, "Cuba: Figuring Out Pieces of the Puzzle (Full Text)" *Our Finite World* (May 26, 2015), http://ourfiniteworld.com/..

output plunged by nearly *half*.[564] The fossil fuel-intensive meat and dairy industries collapsed, cattle and other livestock were slaughtered, pets and strays alike were eaten, and even some zoo animals disappeared.[565] Food rations intended to guarantee a basic caloric minimum were reduced to one-fifth of their former level, protein consumption fell two-fifths, and malnutrition, oedema and epidemics became more common.[566] Daily *per capita* caloric intake dropped from 3,052 kcal in 1989 to 2,099 kcal in 1993, with estimates ranging as low as 1,863 kcal for the elderly, whose death rate increased by one-fifth over the 1982-93 period, and just 1,450 kcal for children.[567] By the time anti-government protests erupted in Havana in 1994, the average Cuban citizen had lost 9-14 kilogrammes, and thousands had fled the country.[568] Nevertheless, Cuba benefited from the expansion of its tourism industry, as well as its alignment with Hugo Chavez's Venezuela, which came to supply one-third of the island's oil, and by 1996 the worst of the Special Period was over.[569]

SECTION III

NORTH KOREA ON THE ARDUOUS MARCH

The Arduous March has been described as 'the most dramatic example of a modern industrial society falling into an energy-led collapse.'[570] North Korea was even more dependent upon the SU for trade, subsidies, and aid than Cuba, and consequently suffered more terribly and for longer in the post-Cold War era.[571] Prior to its collapse, half of North Korea's foreign trade and two-fifths of its imports, including one-third of its steel and such crucial inputs as oil and coal, came from the SU.[572] By 1993, the former SU supplied less than one-tenth of North Korean imports, and

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564 Heinberg, *Powerdown*, 106; Mick Winter, *Cuba for the Misinformed: Facts from the Forbidden Island* (Napa, CA: Westsong Publishing, 2013), 207.
565 Kevin Danaher, Shannon Biggs, and Jason Mark, *Building the Green Economy: Success Stories from the Grassroots* (New York: Routledge, 2007), 101.
566 Ibid.; *The Power of Community*, 2006, Documentary.
567 Anonymous, "Health consequences of Cuba's Special Period" *Canadian Medical Association Journal*, Vol. 179, No. 3 (Jul. 29, 2008): 257, http://www.ncbi.nlm.nih.gov/; Jorge Duany, *Blurred Borders: Transnational Migration between the Hispanic Caribbean and the United States* (Chapel Hill, NC: University of North Carolina Press, 2011), 154; William E. Kost, "'Cuban Agriculture: To Be or not to Be Organic?' Cuba in Transition, Paper Presented on the Annual Conference for the Association for the Study of the Cuban Economy" Vol. 14 (2004): 274-275. http://www.ascecuba.org/.
568 Louis A. Pérez, *Cuba: Between Reform and Revolution* (Oxford: Oxford University Press, 2015), 327; Winter, *Cuba for the Misinformed*, 207.
569 Ibid., Heinberg, 108; Rory Carroll, *Comandante: Myth and Reality in Hugo Chaáez's Venezuela* (New York: Penguin Press, 2013), 98-100; Staten, *History of Cuba*, 130.
570 Heinberg, *Powerdown*, 113.
571 Ibid., Heinberg, 112-113; French; *North Korea*, 97-137.
572 Ibid., French, 98-99.

energy subsidies declined from 506,000 tonnes of oil equivalent in 1989 to just 30,000 in 1992.[573] North Korean Soviet-style collective farming, like its Cuban counterpart, was heavily-dependent upon Soviet material and energy inputs, and food production likewise collapsed in their absence: farm machinery lay idle, and just two-fifths of national fertiliser needs were met.[574] Daily grain rations fell by ten per cent following the Soviets' termination of aid in 1987, and had dropped another ten per cent by 1992.[575]

To make matters worse, North Korea was stricken by a succession of devastating natural calamities in the first decade of the post-Cold War period, with obvious parallels to dangerous climate change in the Malthusian Century. Flooding between 1995 and 1996 deluged cropland, leaving nearly one-quarter of the population homeless, and damaged coal mines, power plants, and transmission lines; the following year, drought exsiccated 70 per cent of the maize crop, and tidal waves inundated vast swathes of the agricultural demesne in 1997 and 2001.[576] Record drought *halved* crop yields in the 2000-01 period, reducing reservoir levels to below the minimum threshold necessary for the generation of hydroelectricity, and the national capacity plunged by 85 per cent in consequence.[577] By the turn of the millennium, the national electricity generation capacity and volume of road and rail freight transportation had both fallen to less than two-fifths of their 1990 levels.[578]

By 2005, the North Korean economy had contracted by 55 per cent since the collapse of the SU to a mere 32 per cent of its peak size, and the output of the civilian industrial economy had declined to below one-quarter and possibly even one-tenth of its former capacity.[579] Oil consumption plummeted by roughly 70 per cent between 1991 and 2000, and 80 per cent altogether hitherto − far more precipitous than the Cuban experience, and even sheerer and more abrupt than the direst predictions of peak oil theorists and commentators, with most forecasts indicating that oil production will not halve until at least 2040 (see fig. 63. Cuban and North Korean Oil Consumption,

[573] French, *North Korea*, 103; Oliver Inderwildi and Sir David King, eds., *Energy, Transport & the Environment: Addressing the Sustainable Mobility Paradigm* (London: Springer, 2012), 60.
[574] Ibid., Interwildi and King, 59-61; French, 101.
[575] Ibid., French, 99.
[576] Heinberg, *Powerdown*, 112-113
[577] Ibid.; French, *North Korea*, 101.
[578] Ibid., French, 106.
[579] Ibid., 133-34, 138.

1980-2012 as well as fig. 20.).[580] Like Cuba, North Korea was slapped with sanctions and trade embargoes by the US-led international community, to which it was forced to appeal for emergency aid and food in 1995.[581] Unlike Cuba, however, further to economic and industrial collapse, North Korea eroded into mass starvation and famine beginning in 1994, peaking in the 1996-97 period, and mostly subsiding by the turn of the millennium.[582] Recent studies put the hecatombs of the North Korean famine at roughly 500,000-600,000, or 2.3 per cent of the population; nevertheless, although population growth rates stalled, there was no net population decline (see: fig. 64. Populations of North and South Korea, 1960-2010).[583]

SECTION IV

LESSONS OF THE SPECIAL PERIOD AND ARDUOUS MARCH

The radically more severe outcome for North Korea in the immediate post-Cold War period can largely be ascribed to its much colder climate and shorter growing season, as well as the concurrent succession of natural calamities it endured; furthermore, North Korea had poorer-quality cropland than Cuba, less arable land *per capita*, and was even more dependent on the SU for resources, energy, and aid.[584] Nevertheless, Jorg Friedrichs accurately describes North Korea as 'dysfunctional only when measured against Western humanitarian standards. On its own (considerably more cynical) terms, the regime has been incredibly successful.'[585] Indeed, whereas the political revolutions of 1989 had caused the Soviet *bloc* economies, and their socialist society itself, to collapse, the consequent collapse of the North Korean and Cuban economies did not consequently trigger political revolutions or societal collapse. Moreover, in spite of the breakdown of their international trade networks, which resulted in *extreme* peak oil events (particularly in the case of North Korea), and the collapse of industrial agriculture, neither Cuba nor even North Korea experienced the substantial net population decline expected by the Meadows, Duncan, Manning,

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[580] Fig. 63. Cuban and North Korean Oil Consumption, 1980-2012. Graph adapted from: Gail Tverberg, "The Real Oil Extraction Limit, and How It Affects the Downslope" *Our Finite World* (Dec. 18, 2013), http://ourfiniteworld.com/.
[581] French, *North Korea*, 106.
[582] French, *North Korea*, 120-125; Holly E. Reed and Charles B. Keely, eds., *Forced Migration and Mortality* (Washington, DC: National Academies Press, 2001), 34-43.
[583] Fig. 64. Populations of North and South Korea, 1960-2010. Data adapted from: --, "Global Population" *The World Bank Group*, National Accounts Data (2016), http://data.worldbank.org/; Daniel Goodkind, Loraine West, and Peter Johnson, "A Reassessment of Mortality in North Korea, 1993-2008" *U.S. Census Bureau*, Population Division (Mar. 28, 2011): 13, http://www.princeton.edu/.
[584] Heinberg, *Powerdown*, 112.
[585] Inderwildi and Sir David King, eds., *Energy, Transport & the Environment*, 61.

Bartlett, and other neo-Malthusians. In fact, Cuba has been widely hailed as an energy famine and collapse success story and exemplar.

Cuba is ranked as a 'high human development' state, with a human development index score of 0.8 according to the Human Development Report, highly atypical for a small, developing country with an ecological footprint of just 1.8 global hectares *per capita*, as determined by the Global Footprint Network, which led the World Wide Fund for Nature to single out Cuba as the *only* sustainable state in the world in its 2006 Sustainability Index Report.[586] Because 'sustainable systems are the only ones that are sustainable,' as George Draffan puts it, and systems which are unsustainable must inevitably contract or collapse, Cuba could be said to be the most successful state in the world today (or perhaps even the only one), as assessed through the optics of neo-Malthusianism and environmental economics, according to the findings of the report.[587] In addition, the Happy Planet Index, which measures ecological efficiency in supporting human wellbeing, ranked Cuba sixth in the world in 2006, and *The Economist*'s Where-to-be-born Index ranked it fortieth worldwide in 2013.[588]

The 2006 documentary *The Power of Community: How Cuba Survived Peak Oil* chronicles the crisis-management strategies developed and pursued by the Cuban regime in its efforts to mitigate the long-term economic, food, and energy crises that emerged in the wake of the Soviet collapse, which have received widespread international recognition and acclaim from environmentalist and sustainable-development circles.[589] Like the post-collapse former SU, Cuba benefited from a well-educated population and a surplus of doctors, scientists, and other trained specialists. With just two per cent of the Caribbean region's population, Cuba was home to eleven per cent of its scientific community, and education, along with housing and healthcare, remained free and at a relatively high standard during the Special Period.[590] Echoing the Soviet kitchen garden economy outlined in the previous chapter, the Cuban Ministry of Agriculture, with the assistance of Australian

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[586] Chris Hails, ed., "Living Planet Report 2006" *Global Footprint Network* (2006): 19, http://www.researchgate.net/; Juan Jose Cabello, *et al*., "An approach to sustainable development: the case of Cuba" *Spring Science+Business Media* (Feb. 19, 2012: abstract, *et al*., http://www.academica.edu/.

[587] Chuluun Togtokh and Owen Gaffney, "2010 Human Sustainable Development Index" *Our World* (Nov. 5, 2010), http://ourworld.unu.edu/.

[588] Economist Intelligence Unit, "The where-to-be-born index, 2013" *The Economist* (2013), http://www.economist.com/; Peter McManners, *Green Outcomes in the Real World: Global Forces, Local Circumstances, and Sustainable Solutions* (Surrey, UK: Gower Publishing Limited, 2010), 158.

[589] Heinberg, *Powerdown*, 106; *The Power of Community*, 2006, Documentary.

[590] Ibid.

permaculturalists, trained urban farmers (*parceleros*) to set up sustainable urban organic permaculture market gardens (*organopónicos*) on unused plots of land (*parcelas*) in locations ranging from sugarcane fields, vacant lots, and abandoned building sites to rooftops, patios, and the roadside, which substantially reduced the dependence of Cuban agriculture on synthetic and/or imported fertilisers, pesticides, and herbicides, as well as farm machinery;.[591] By 1998, 30,000 *parceleros* were cultivating 8,000 *organopónicos* covering one-third of Havana.[592] The Cuban diet shifted towards a more vegan pattern of eating, with some long-term health benefits, including reduced fat consumption and increased fibre intake and fresh produce consumption.[593] According to the American Journal of Epidemiology: 'During 1997-2002, there were declines in deaths attributed to diabetes (51 per cent), coronary heart disease (35 per cent), stroke (20 per cent) and all causes (18 per cent).'[594] Alternative modes of transport emerged: Cuba purchased 1.2 million bicycles from China, and produced another half-million domestically for a twenty-five-fold increase in the bicycle ownership rate.[595] Official policies encouraged hitch-hiking, while walking, cycling, carpooling, and even oxen-, mule- and horse-drawn carriages made a resurgence; so-called 'camels' − 18-wheeler semi-truck flatbeds converted into *ad hoc* buses − carried up to 300 passengers *en masse*.[596] Heinberg concludes that:

> Cuba offers us a vision of what our own energy-constrained future *might* look like – given a fairly optimistic scenario. Cuba managed to power down dramatically and quickly, relocalising its economy with little increase in internal violence, and with relatively little sacrifice in terms of many basic measures of social welfare.[597]

SECTION V
CONCLUSIONS

In view of overshoot, the limits to growth and development, the Malthusian Century, and the post-growth paradigm, what is now needed is a development model which can rapidly, controllably, and equitably contract or collapse, economically, into a sustainable, zero-growth,

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[591] Jason Mark, "Growing it alone" *Earth Island Journal* (Spring 2007), http://www.earthisland. org/; Sinan Koont, "The Urban Agriculture of Havana" *Monthly Review*, Vol. 60, No. 8 (Jan., 2009), http://monthlyreview.org/.
[592] Heinberg, *Powerdown*, 107.
[593] Mark, "Growing it alone;" *The Power of Community*, 2006, Documentary.
[594] Manuel Franco, *et al.*, "Impact of Energy Intake, Physical Activity and Population-wide Weight Loss on Cardiovascular Disease and Mortality in Cuba, 1980-2005" *American Journal of Epidemiology*, Vol. 166, Issue No. 12 (Dec. 15, 2007): abstract, http://aje.oxfordjournals.org/.
[595] Irving Louis Horowitz, ed., *Cuban Communism, 1959-1995*, Eighth Edition (London: Transaction Publishers, 1995), 189; *The Power of Community*, 2006, Documentary.
[596] Christopher Baker, "Cuba's Two-Wheel Revolution" *Americas* (Nov.-Dec., 1995), http://search.proquest.com/; Heinberg, *Powerdown*, 107.
[597] Ibid., Heinberg, 108.

stationary state, with rates of consumption below the threshold above which further increases no longer correlate with increased wellbeing, while continuing to function on some basic level, and without experiencing consequent political, societal, or demographic collapse, continuing to embrace the objective of sustained growth as a sacred cow to be venerated in consideration of human evolutionary psychology, yet never actualised or attained due to its structural and systemic limitations. From this perspective, Soviet classical totalitarianism in general, and Cuba (and perhaps even North Korea) in particular, have proven capable of relatively successfully weathering catastrophes broadly comparable to those expected during the Malthusian Century and adapting to the post-growth paradigm, functioning in sustainable, and essentially stationary states (see fig. 56.), operating within the physical limitations of their host environments, even as the objective of growth is retained and striven for despite the obvious paucity of results, which are either scapegoated, or obscured by statistical sleight of hand, propaganda of success, and the suppression of information. Future collapsing societies may therefore look to and draw upon the collapse of communism in general, and the experiences of Cuba and North Korea in particular, for guidance, experience, and practical lessons during the Malthusian Century and the new millennium.

CONCLUSION

This thesis aims to unambiguously answer the research question of which inversion of totalitarianism delineated by Wolin's inverted totalitarianism thesis considered within its framework, Soviet classical or American inverted totalitarianism, is more advantageous, if not more viable or appealing, in terms its relative ability to avoid or mitigate the unmanageable, and prepare for and manage the unavoidable in the Malthusian Century, as well as its inherent compatibility with, and ability to adapt to, the post-growth paradigm of the new millennium, as assessed through the optics of neo-Malthusianism, environmental and happiness economics. In the first chapter, the content and scope of the inverted totalitarianism theoretical framework were outlined, and its application herein qualified and justified; the second chapter concluded that the human population and agro-industrial civilisation are in overshoot, and, absent some unforeseeable paradigm shift or technological miracle, will collide with the limits to growth and development on this planet sometime around mid-century, as roughly one dozen interconnected and interdependent crises and catastrophes of their making achieve critical mass, the origins, nature, scale, and scope of which, along with other potential future technological and cosmic global catastrophic risks, are outlined therein.

The next chapter found that Soviet classical totalitarianism produced an initial burst of rapid industrialisation, growth, and development, which collided with structural and organisational limits long before hitting national or planetary boundaries, and tended to stagnate in the vicinity of the thresholds above which further development is unsustainable, and additional wealth does not correlate with increased wellbeing, as assessed through the lenses of environmental and happiness economics, respectively, and could not generate rates of growth, consumption, or development remotely comparable to those produced by American inverted totalitarianism; moreover, Soviet classical totalitarianism could operate in a stationary or even collapsing state, whereas growth is prerequisite for the success of American inverted totalitarianism, and crises of its making are systemic culminations rather than potentialities, making it more adaptive for the post-growth paradigm, and more advantageous from a neo-Malthusian perspective; finally, Soviet classical totalitarianism was found to be better-prepared and better-equipped than American inverted totalitarianism to address emerging crises of growth and development rapidly and totalistically.

The penultimate chapter concluded that Soviet classical totalitarianism was paradoxically better-prepared for and more resilient during and following its collapse than the inverted totalitarian US is poised to be during and following its own hypothesised collapse, and would likely have had a softer landing in similar circumstances, as many of its systemic failings turned into inadvertent and paradoxical advantages during times of crisis and collapse, whereas the advantages held by American inverted totalitarianism in the growth era are likely to become equally inadvertent and paradoxical liabilities during the Malthusian Century and the post-growth paradigm. The final chapter examined the case studies of Cuba and North Korea, the last hold-outs of political and economic Soviet classical totalitarianism in the post-Cold War era, both of which weathered a succession of crises broadly comparable to those expected during the Malthusian Century in the immediate post-Cold War period, without undergoing consequent societal, political, or demographic collapses, indicating that Soviet classical totalitarianism would be capable of surviving the oncoming crises of growth and development relatively intact in the Malthusian Century; moreover, the post-Cold War trajectories of Cuba and North Korea prove that Soviet classical totalitarianism is capable of contracting into comparatively sustainable, collapse-proof, and stationary states well-adapted for the post-growth paradigm, the like of which American inverted totalitarianism has no obvious parallel; as the only state in the world today with a sustainable economy and a high level of human development (and among its happiest), Cuba exemplifies the conclusions and prescriptions of the final chapter in particular, and this thesis in general.[598]

In view of these findings, conclusions, as well as the preponderance of evidence, the central conclusion of this thesis is that, between the Soviet and American inverted totalitarian twins considered within its framework, Soviet classical totalitarianism is the overwhelmingly more advantageous inversion of totalitarianism for the Malthusian Century and the post-growth paradigm of the new millennium, as assessed through the lenses of neo-Malthusianism, environmental and happiness economics, even if it is not the most viable or appealing of the dyad, nor the only advantageous political, economic and/or societal blueprint available, or indeed the best, most viable, or most appealing. There is a definite dark side to Soviet classical totalitarianism, which is by no means purpose-built or perfectly ideal for the Malthusian Century or the post-growth paradigm, yet among the classical and inverted totalitarian development models to emerge in the last millennium,

[598] Cabello, *et al.*, "The case of Cuba," 2012; Hails, ed., "Living Planet Report," 2006; Togtokh and Gaffney, "Human Sustainable Development Index," 2010.

Soviet classical totalitarianism stands out for its failure to produce growth in the long-run and its crisis-management abilities, making it inadvertently and paradoxically, yet superlatively well-prepared and adaptive for the post-growth paradigm of the new millennium. In the mid-1980s, only a few years before its collapse, almost no-one in academia or the media had predicted the sudden demise of the SU, and the same will likely be the case up until immediately prior to the American inverted totalitarian *Götterdämmerung*; although Soviet classical totalitarianism was the first loser of the Cold War, American inverted totalitarianism is on track to become its biggest.[599] Maurice Meisner cautions that:

> Revolutions do not easily lend themselves to balanced appraisals, great social upheavals typically arouse great and unattainable expectations, and when those high hopes are dashed long periods of disillusionment and cynicism inevitably follow, while the actual historical achievements are ignored or forgotten. It usually takes several generations, far removed from the political and ideological battles of the revolutionary epoch, to bring the historical picture back into focus.[600]

The details and appraisal of this forthcoming historical picture are speculation for the time being. Heinberg identifies Soviet classical totalitarianism, as practised in present-day Cuba, as one possible future direction for human civilisation in the post-growth era, yet Pipes deduces that '… it is quite certain that even if the quest for perfect social equality that had driven utopian communists since antiquity ever resumes, it will not take the form of Marxism-Leninism,' and that much seems certain for now.[601] Nonetheless, even though it is counterintuitive and paradoxical that the apparent political, economic, and societal failure and loser of the Cold War might have something to teach the apparent success story and winner about the limits to growth and development, environmental and happiness economics, sustainable development, collapse, and the post-growth paradigm of the future, perhaps Soviet classical totalitarianism will be re-examined, re-assessed, or even emulated in the future by imploding, exploding, or collapsed inverted totalitarian societies, and others in search of practical lessons to draw and wisdom to reap from its experiences, both constructive and cautionary, much as Cuba and the Special Period are being today.[602] E. H. Carr warned that 'The danger is not that we shall draw a veil over the enormous blots on the record of the [Russian] Revolution, over its cost in human suffering, over the crimes committed in its name. The danger is

[599] Phrasing adapted from: Orlov, *Reinventing Collapse*, 24.
[600] Meisner, *Mao's China and After*, 419.
[601] Heinberg, *Powerdown*, 102-114; Pipes, *Communism*, 2.
[602] Orlov, *Reinventing Collapse*, 24.

that we shall be tempted to forget altogether, and to pass over in silence, its immense achievements.'[603]

The central prescription of this thesis is that the human population and agro-techno-industrial civilisation must immediately begin to contract into a sustainable, stationary state by any humane means necessary in order to avert near-certain catastrophe during the Malthusian Century, if it is not too late already, perhaps cherry-picking from, drawing on, developing and improving upon the Soviet *bloc*'s experiences with development, stagnation, contraction, collapse, and the post-growth paradigm. Parallel with the words of Woody Allen in the opening preface of this thesis, the hypothetical choice of Soviet classical and American inverted totalitarianism in the new millennium could well be one between hopeless despair and total extinction; alas, it is unlikely that *Homo Sapiens*, for all its flaws, will have the collective wisdom or foresight to choose correctly, not only between the options presented by the dyad considered herein, but also from among all of the other countless alternatives, meticulous and studied proposals, and development strategies tailored for the Malthusian Century; rather, it will more likely become yet another victim of its own success no different from bacteria happily multiplying away in a closed bottle.[604] The vicious paradox at work here is that everything human nature, morality, society, and civilisation holds dear: procreation, motherhood, families, medicine, public health, scientific agriculture, peace, law and order, accident prevention, sanitation, immigration, and so on, all facilitate the exponential growth of populations, consumption, and development that is the root cause of the crises of growth set to intersect during the Malthusian Century; conversely, the bane of human nature, morality, society, and civilisation: abstention, contraception, abortion, population control, murder, violence, famine, drug addiction, accidents, and so forth, ease or even reverse these very same trends.[605] Bartlett describes this catch-22 as 'a dilemma if ever there were one.'[606]

In the future, historians and archaeologists may someday reflect upon the triumph of American inverted totalitarianism over Soviet classical totalitarianism in the Cold War, and its indulgence of the materialism and freedoms of several living generations at the conscious expense of essentially all future ones, as the pivotal error of human history if the Malthusian Century devastates

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603 Quoted in Tarik Ali, ed., *The Stalinist Legacy: Its Impact on Twentieth-Century World Politics* (Harmondworth, UK: Penguin Books, 1984), 9; Meisner, *Mao's China and After*, 419.
604 Woody Allen, *Side Effects* (New York: Random House, 1980), 35.
605 Bartlett, "Arithmetic, Population and Energy" Lecture.
606 Ibid.

modern agro-techno-industrial civilisation and the planet irrecoverably for all human intents and purposes. During the Autumn of Nations, Soviet protesters raised a banner in Red Square which read: 'Seventy years on the road to nowhere!'[607] Today, the human population and civilisation in general, and the American inverted totalitarian world in particular, have overshot the carrying capacity of our one and only planet, and are accelerating towards the limits to growth and a dead end on the road to hell, taking everything else along with them, and as one Chinese proverb cautions, 'If we do not change our direction, we are likely to end up where we are headed.'[608] The hall is rented, the orchestra engaged; only time will tell whether or not American inverted totalitarianism can dance in the Malthusian Century and the post-growth paradigm of the new millennium.

[607] Horowitz, "The Road to Nowhere," 2013.
[608] UN-Habitat, "Building Bridges through Managing Conflicts and Differences − Part 1: Concepts and Strategies" (2001): 22, http://unhabitat.org/.

APPENDIX

SECTION I

FIGURES

Fig. 1. Wealth Shares in the US, 1913-2012[609]

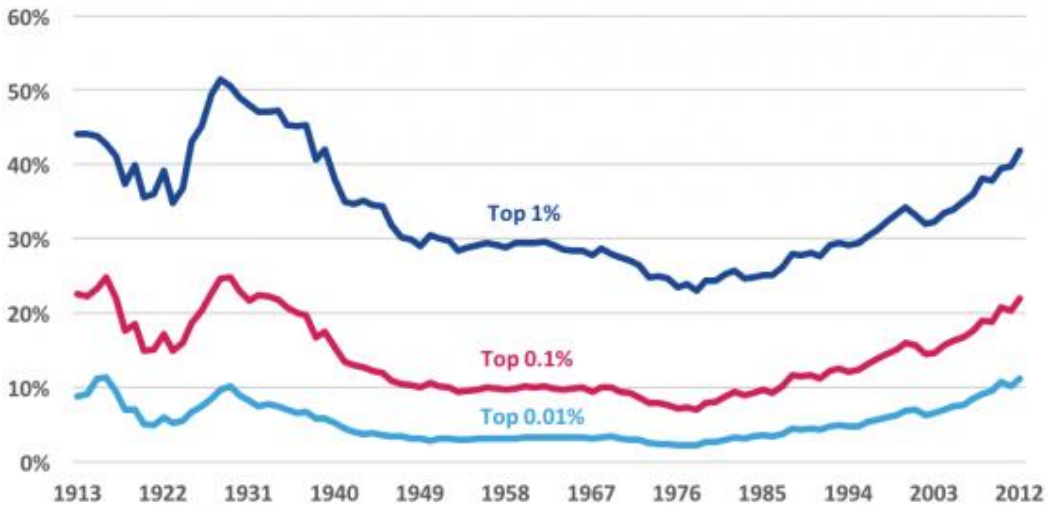
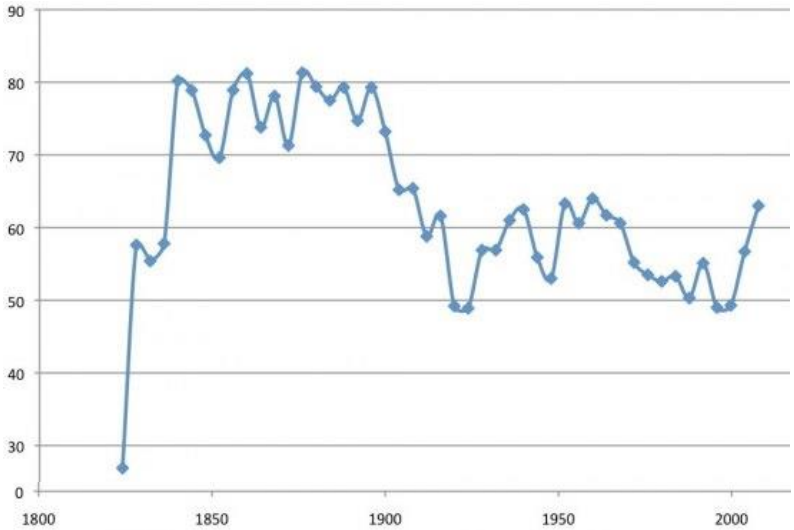


Fig. 2. US Voter Turnout Rates, 1828-2012[610]
(% of the voting-eligible population)



Note: figures, tables, maps, and photographs are numbered in order of their reference in the body text.

[609] Fig. 1. Wealth Shares in the US, 1913-2012. Graph adapted from: --, "Wealth Inequality" *Institute for Policy Studies* (2017), http://inequality.org/.

[610] Fig. 2. US Voter Turnout Rates, 1828-2012. Graph adapted from: Thomas Plank, "They Marched with Torches: Getting out the Vote, 1840-1900" *The National Museum of American History* (Feb. 29, 2016), http://americanhistory.si.edu/.

Fig. 3. The Rise of Dual Income US Households, 1960-2012[611]
(% of married couples with children under 18)

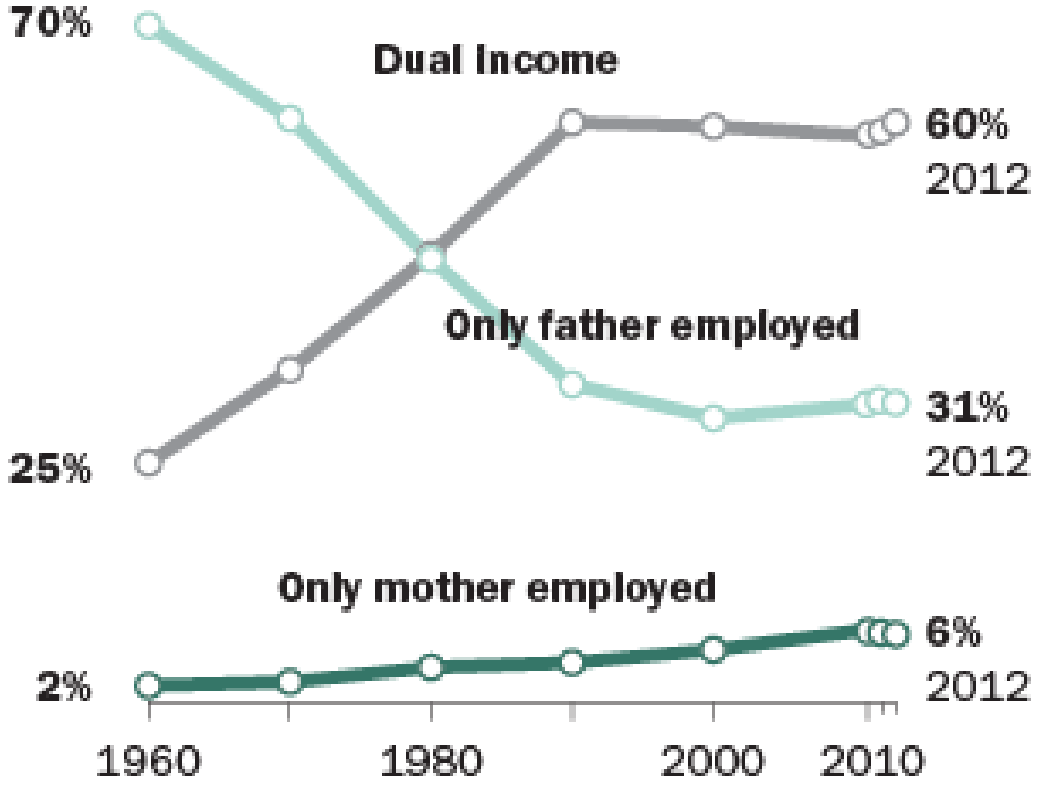
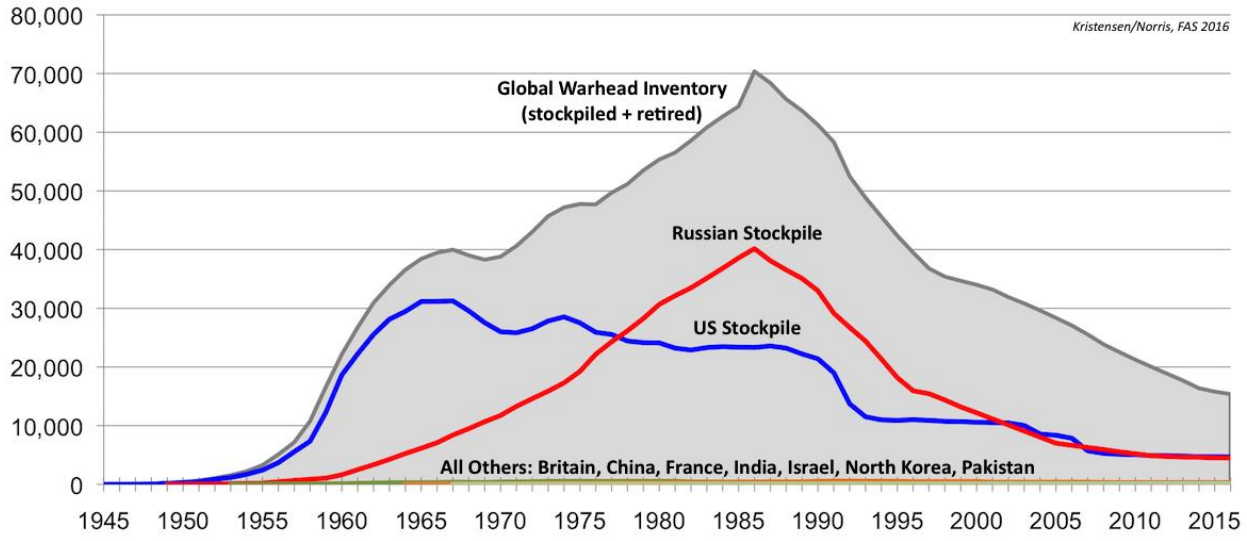


Fig. 4. Estimated Global Nuclear Warhead Inventories, 1945-2016[612]



[611] Fig. 3. The Rise of Dual Income US Households, 1920-2012. Graph adapted from: --, "The Rise in Dual Income Households" *Pew Research Center* (Jun. 18, 2015), http://www.pewresearch.org/.
[612] Fig. 4. Estimated Global Nuclear Warhead Inventories, 1945-2016. Graph adapted from: Hans M. Kristensen and Robert S. Norris, "Status of World Nuclear Forces" *Federation of American Scientists* (Jan. 31, 2017), http://fas.org/.

Fig. 5. Estimated Global Nuclear Warhead Inventories, 2017[613]

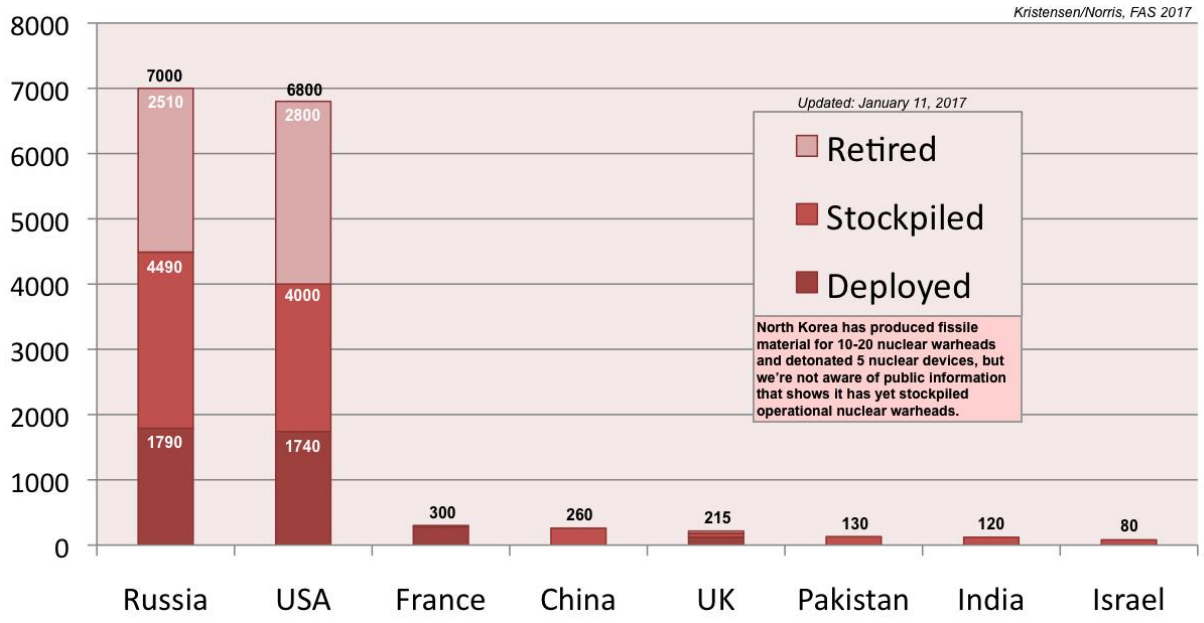
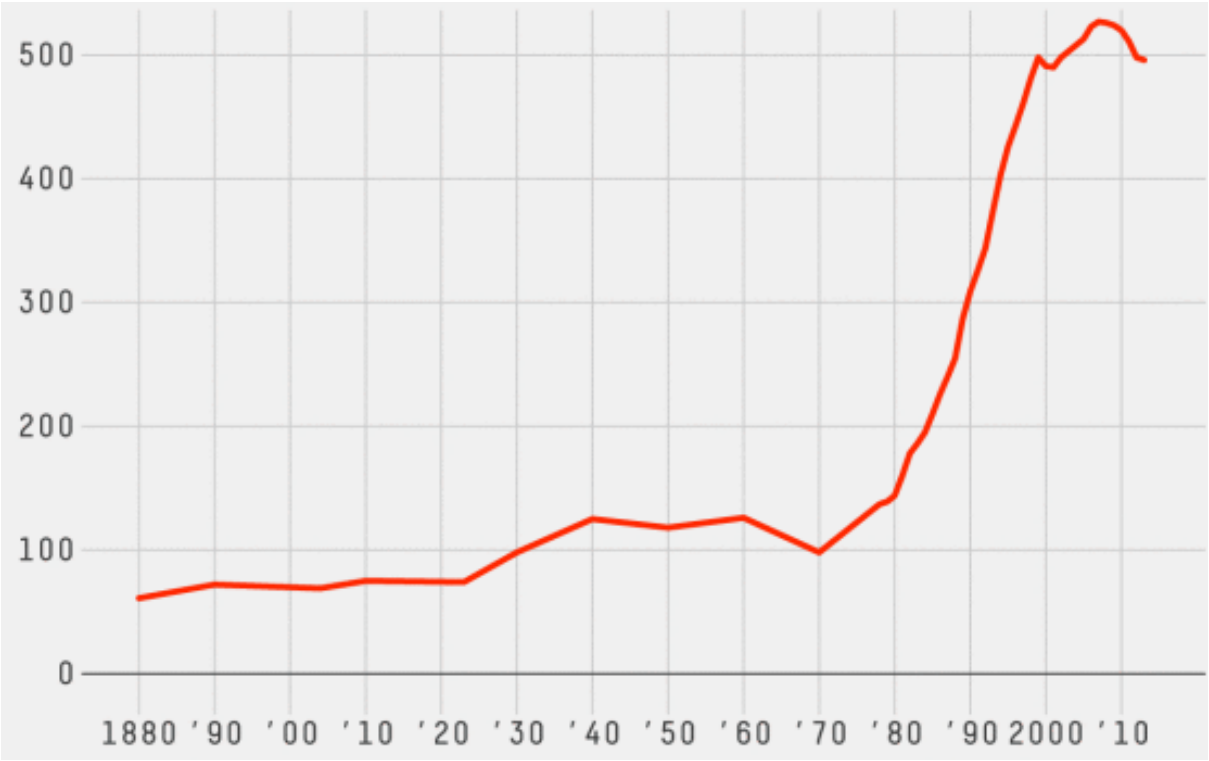
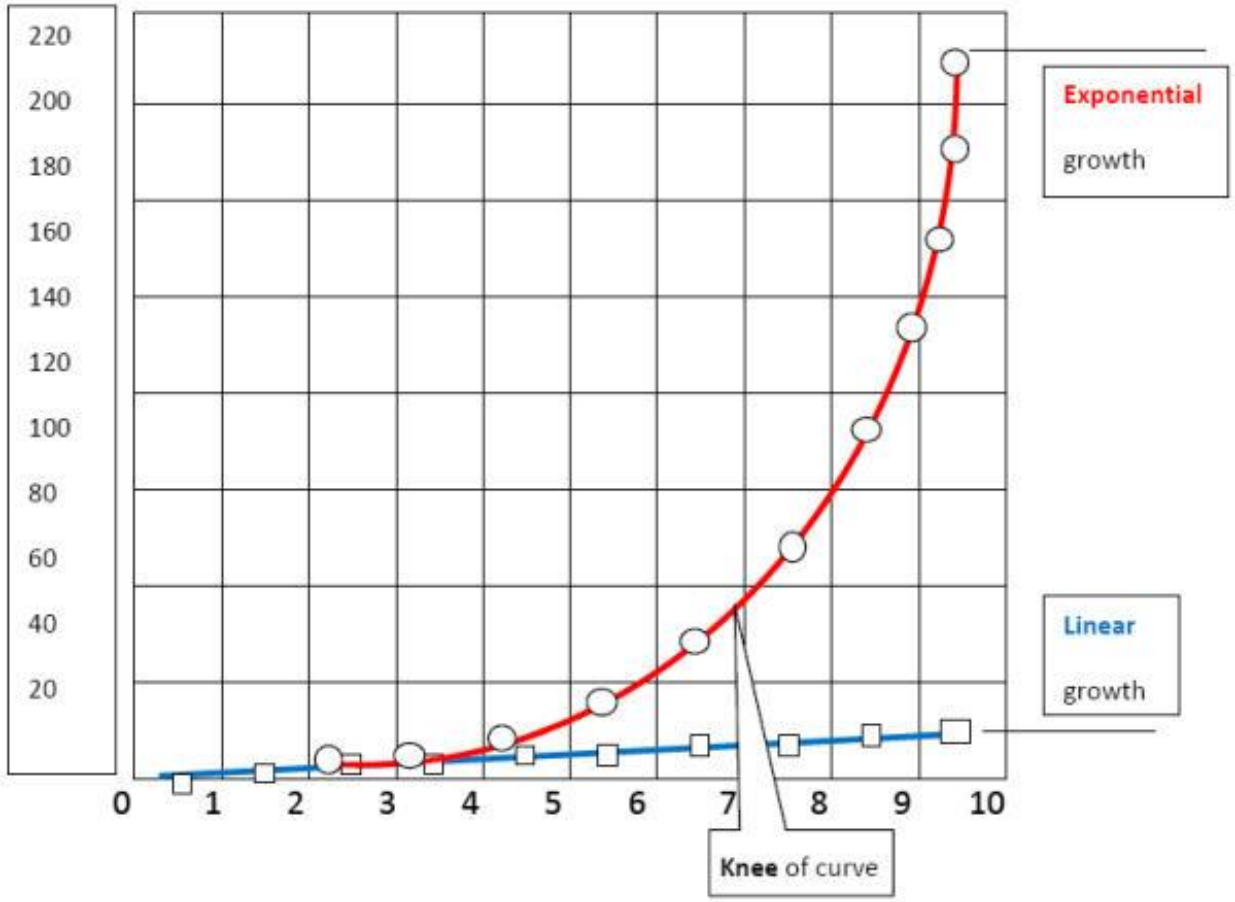


Fig. 6. The Imprisoner's Dilemma: The Growth of US Mass Incarceration, 1880-2014[614]
(incarceration rate of inmates per 100,000 population)



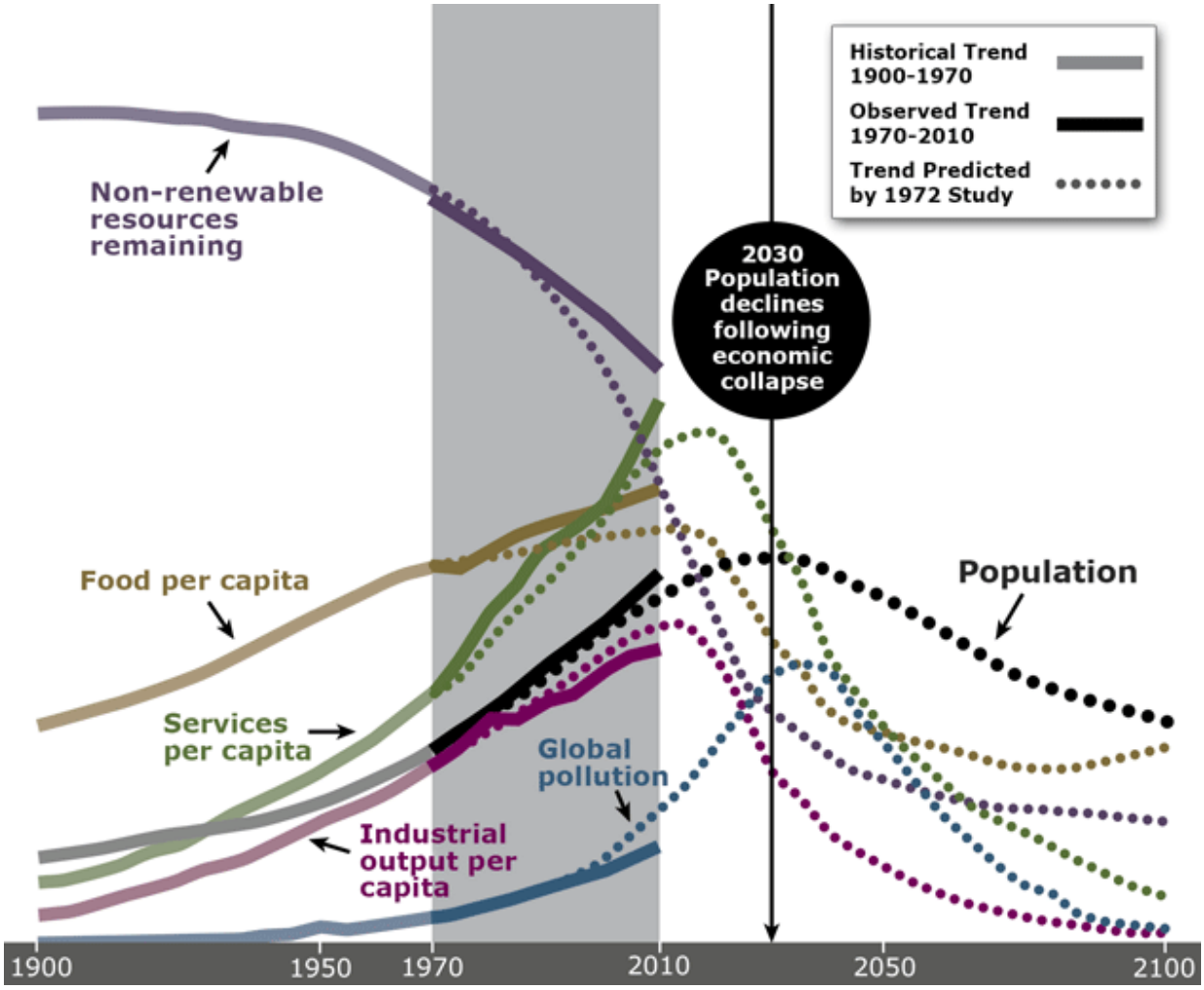
[613] Fig. 5. Estimated Global Nuclear Warhead Inventories, 2017. Graph adapted from: Hans M. Kristensen and Robert S. Norris, "Status of World Nuclear Forces" *Federation of American Scientists* (Jan. 31, 2017), http://fas.org/.
[614] Fig. 6. The Imprisoner's Dilemma: The Growth of US Mass Incarceration, 1880-2014. Graph adapted from: Oliver Roeder, "The Imprisoner's Dilemma" *FiveThirtyEight* (Feb. 12, 2015), http://fivethirtyeight.com/.

Fig. 7. Linear vs. Exponential Growth[615]



[615] Fig. 7. Linear vs. Exponential Growth. Graph adapted from: Ivo P. Janecka, "Cancer control through principles of systems science, complexity, and chaos theory: A model" *International Journal of Medical Sciences*, Vol. 4, No. 3 (Feb., 2007): 169, http://www.researchgate.net/.

Fig. 8. *The Limits to Growth* Standard Run Scenario and Historical Trend, 1900-2100[616]



[616] Fig. 8. *The Limits to Growth* Standard Run Scenario and Historical Trend, 1900-2100. Diagramme adapted from: Mark Strauss, "Looking Back on *The Limits of Growth*: Forty years after the release of the groundbreaking study, were the concerns about overpopulation and the environment correct?" *Smithsonian Magazine* (Apr., 2012), http://www.smithsonianmag. com/.

Fig. 9. Gross World Product Growth Rate, 1961-2015[617]
(% growth)

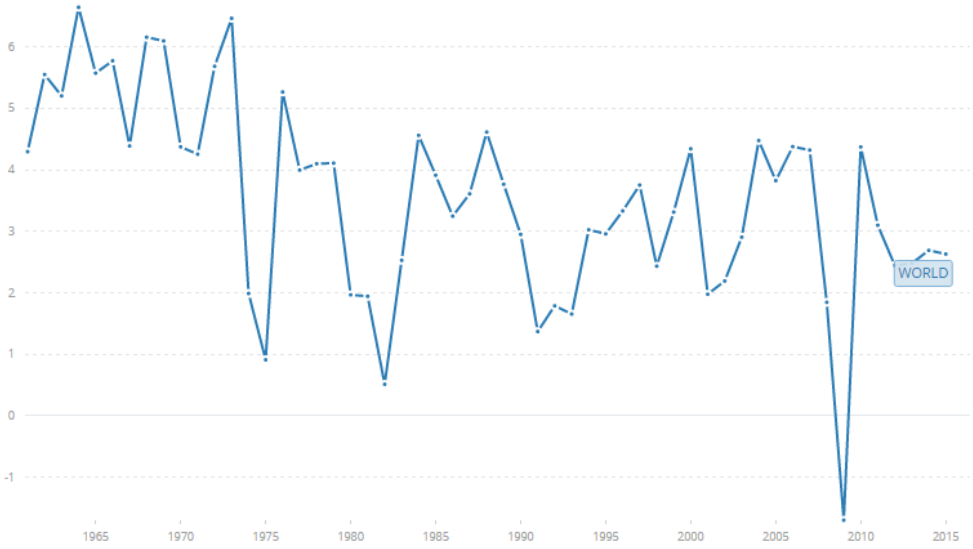
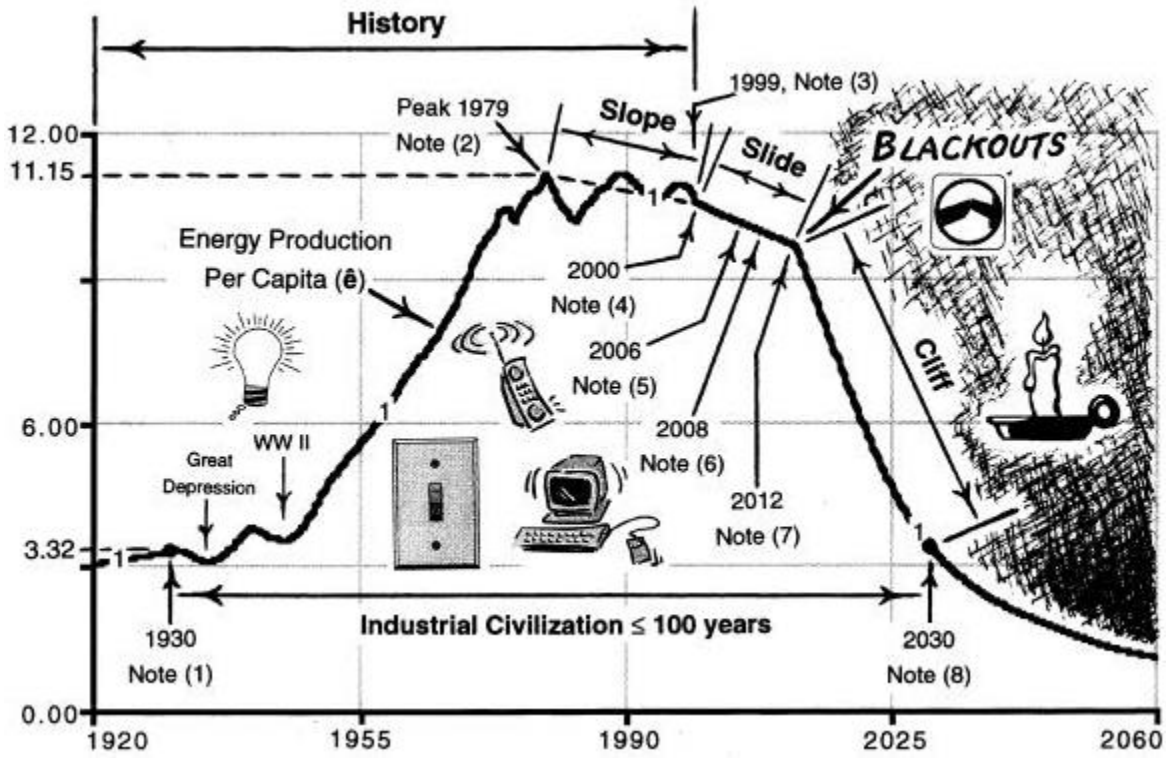


Fig. 10. The Olduvai Theory, 1930-2030[618]
(global energy production *per capita* in barrels of oil equivalent *per capita per annum*)



[617] Fig. 9. Gross World Product Growth Rate, 1961-2015**.** Graph adapted from: --, "GDP growth (annual %)" *The World Bank Group*, National Accounts Data (2016), http://data.worldbank.org/.
[618] Fig. 10. The Olduvai Theory, 1930-2030. Graph adapted from: Richard C. Duncan, "World Energy Production, Population Growth, and the Road to the Olduvai Gorge" *Population and Environment*, Vol. 22, No. 5 (May-June 2001): 18, http://www.jstor.org/.

Fig. 11. The Olduvai Theory: 2005 Update, 1930-2030[619]
(global energy production *per capita* in barrels of oil equivalent *per capita per annum*)

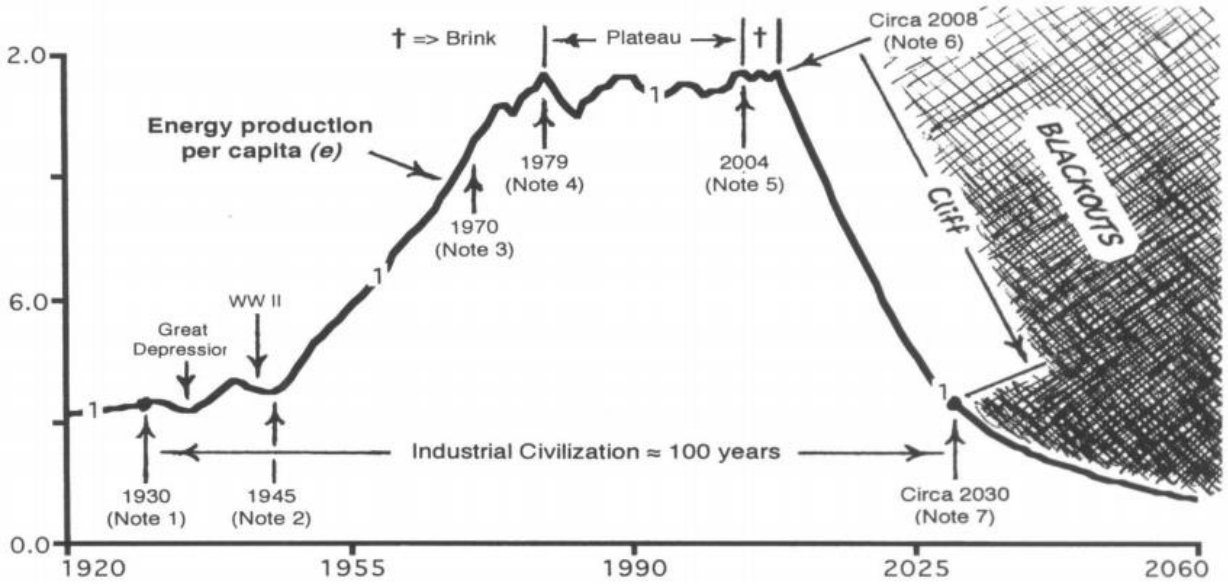
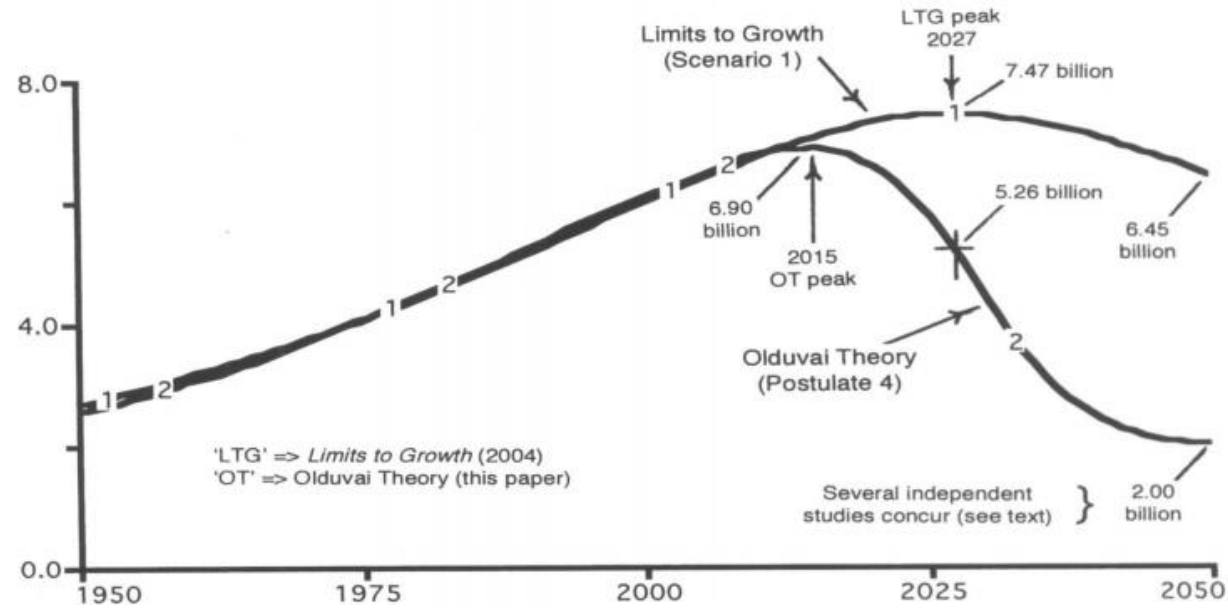


Fig. 12. *The Limits to Growth* and Olduvai Theory Malthusian Catastrophes, 1950-2050[620]
(billions of humans)



[619] Fig. 11. The Olduvai Theory: 2005 Update, 1930-2030. Graph adapted from: Richard C. Duncan, "The Olduvai Theory: Energy, Population, and Industrial Civilization" *The Social Contract*, Vol. 16, No. 2 (Winter 2005-06): 7, http://www.energycrisis.com/.
[620] Fig. 12. *The Limits to Growth* and Olduvai Theory Malthusian Catastrophes, 1950-2050. Graph adapted from: Ibid., 8.

Fig. 13. The Olduvai Curve
Peak Conventional Fossil Fuels *per Capita*, 1900-2100[621]
(barrels of oil equivalent *per capita per anuum*)

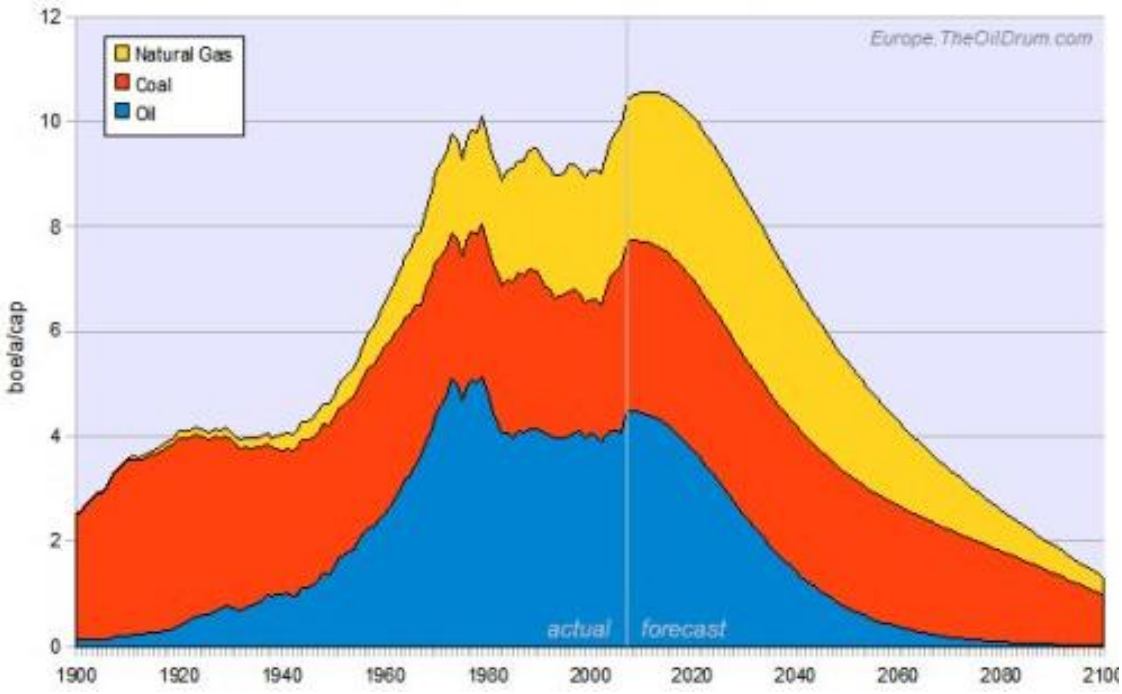
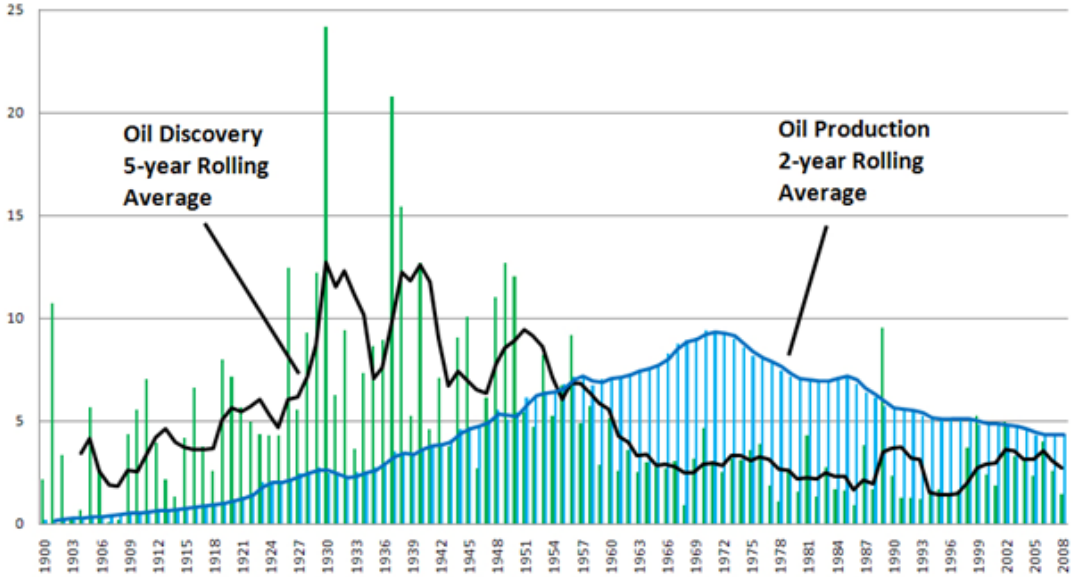


Fig. 14. US Domestic Oil Discoveries and Production, 1900-2008[622]
(billions of barrels of oil)



[621] Fig. 13. The Olduvai Curve: Peak Conventional Fossil Fuels *per Capita*, 1900-2100. Graph adapted from: Luis de Sousa, "Olduvai Revisited 2008" *The Oil Drum: Europe* (Feb. 28, 2008), http://europe.theoildrum.com/.
[622] Fig. 14. US Domestic Oil Discoveries and Production, 1900-2008. Graph adapted from: Doug Robbins, "Peak Oil" *Wonky Thoughts* (Nov. 10, 2011), http://dougrobbins.blogspot.co.nz/. Source: Jean Laherrere and Gail Tverberg, *The Oil Drum*, http://www.theoildrum.com/.

Fig. 15. Former SU Oil Production and Consumption, 1965-2013[623]
(million tonnes of oil equivalent *per annum*)

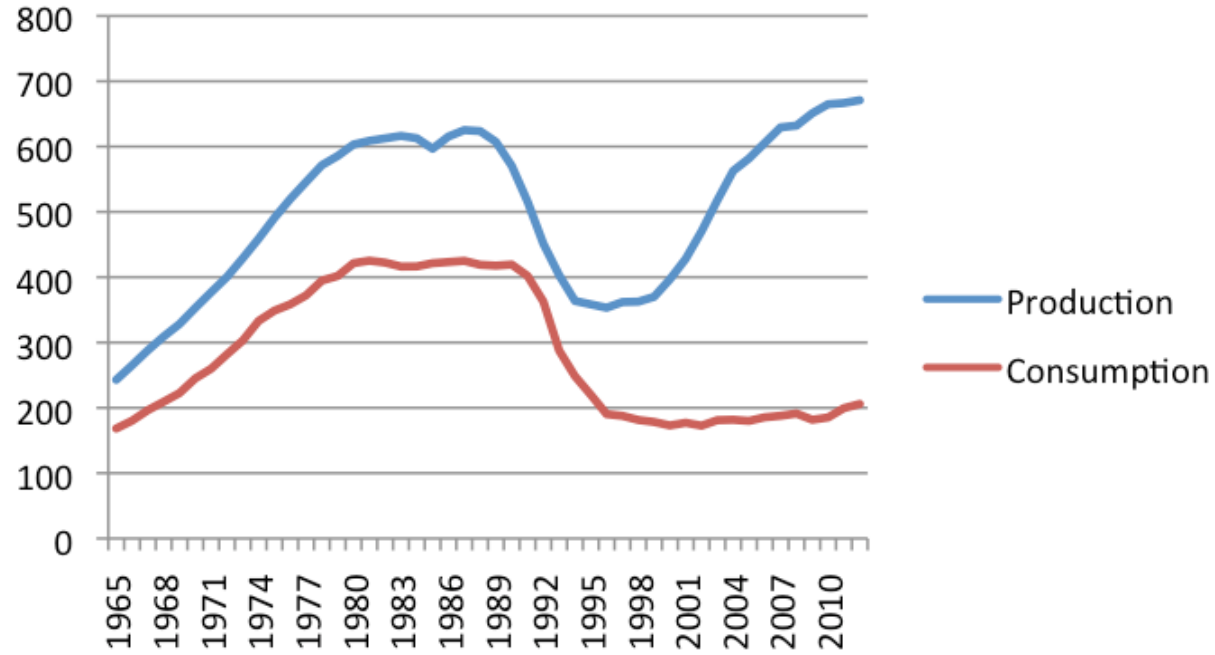
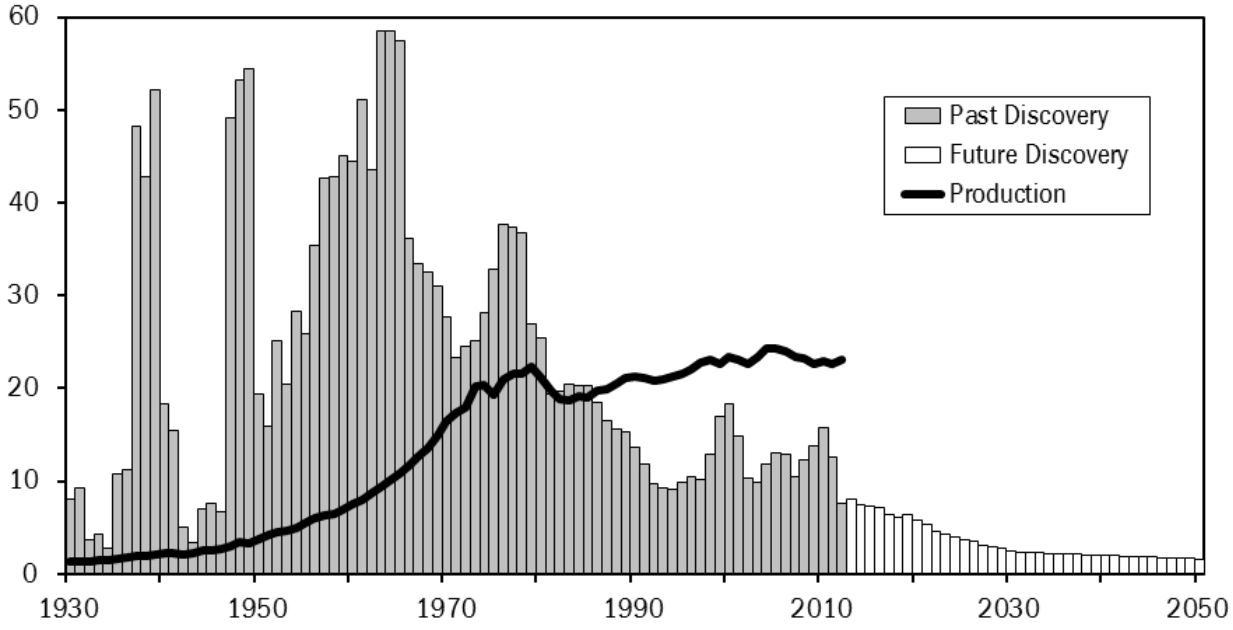


Fig. 16. Global Oil Production and Discoveries: Observed and Projected, 1930-2050[624]
(billions of barrels of oil *per annum*)



[623] Fig. 15. Former SU Oil Production and Consumption, 1965-2013. Graph adapted from: Gail Tverberg, "The Real Oil Extraction Limit, and How It Affects the Downslope" *Our Finite World* (Dec. 18, 2013), http://ourfiniteworld.com/.
[624] Fig. 16. Global Oil Production and Discoveries: Observed and Projected, 1930-2050. Graph adapted from: Richard Heinberg, "This Is What Peak Oil Looks Like" *Resilience* (Sept. 25, 2013), http://www.resilience.org/.

Fig. 17. The Transient Age of Oil, 5000 BCE-5000 CE[625]
(hundreds of millions of barrels of oil *per annum*)

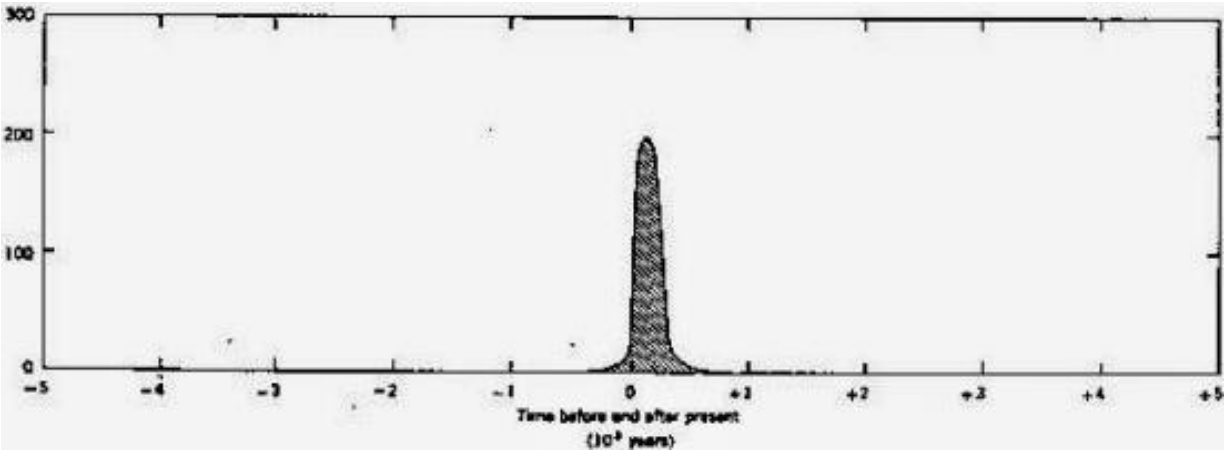


Fig. 18. Global Proven Oil Reserves, 1980-2012[626]
(billions of barrels of oil)

[625] Fig. 17. The Transient Age of Oil, 5000 BCE-5000 CE. Graph reproduced from: M. King Hubbert, "Exponential Growth as a Transient Phenomenon in Human History" *Focus*, Vol. 902, No. 1909 (1998): 83, http://www.hubbertpeak.com/.

[626] Fig. 18. Global Proven Oil Reserves, 1980-2012. Graph adapted from: Rasoul Sorkhabi, "How Much Oil in the Middle East?" *GEOExPro*, Vol. 11, No. 1 (2014), http://www.geoexpro.com/.

Fig. 19. The Resource Pyramid[627]

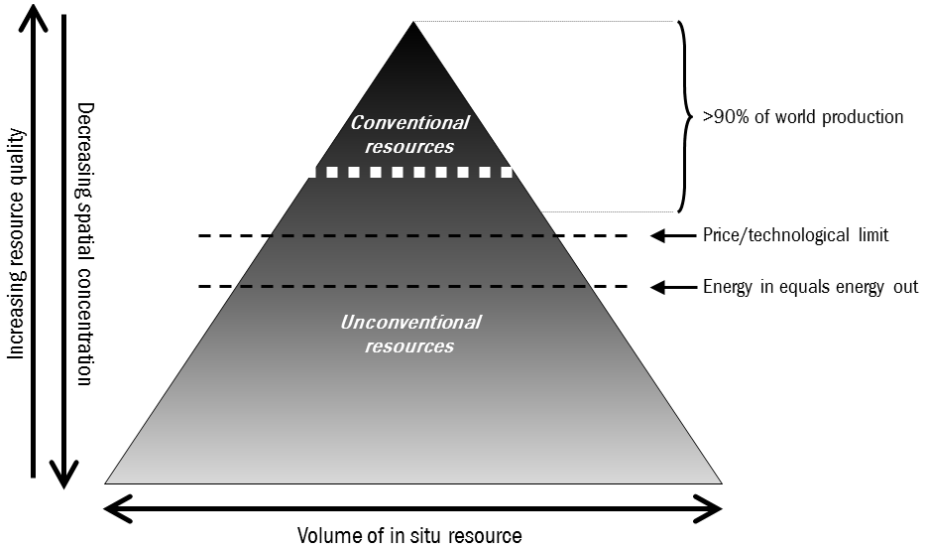
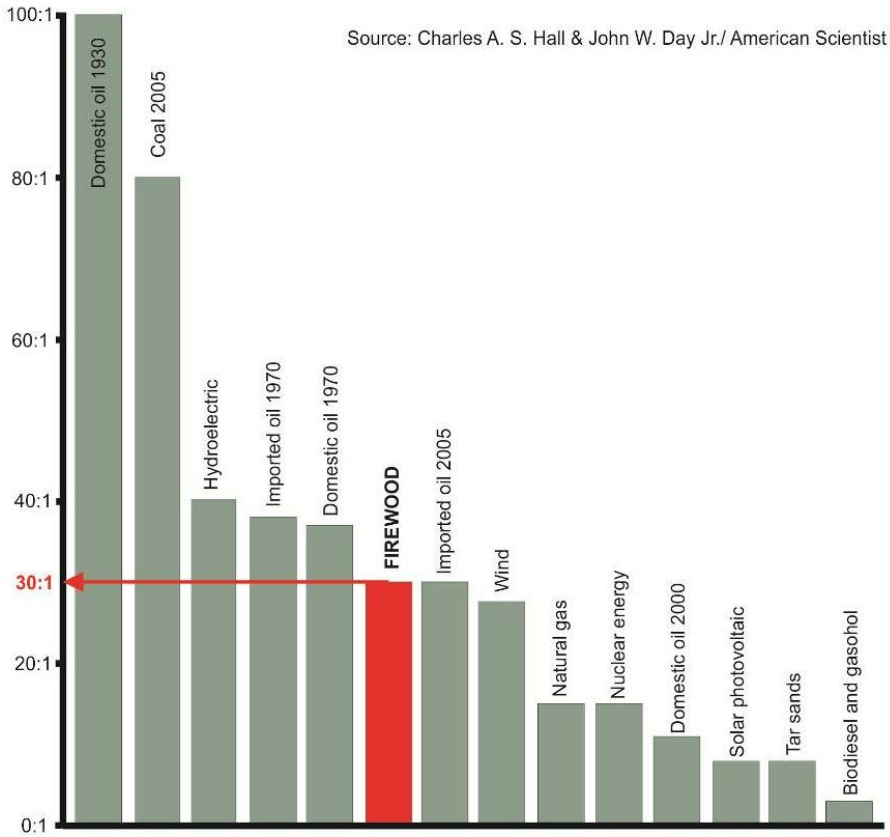


Fig. 20. Comparison of EROEI for Various Energy Sources Relative to Firewood[628]
(maximum EROEI)



[627] Fig. 19. The Resource Pyramid. Diagramme reproduced from: Richard Heinberg, "Technology to the Rescue" *Resilience* (Oct. 2, 2013), http://www.resilience.org/.
[628] Fig. 20. Comparison of EROEI for Various Energy Sources Relative to Firewood. Bar chart reproduced from: Miodrag Zlatic, ed., *Precious Forests - Precious Earth* (InTech, 2015): Chapter 7, http://www.intechopen.com/.

Fig. 21. Peak Oil and Gas Liquids, 1930-2050[629]
(billions of barrels of oil equivalent *per annum*)

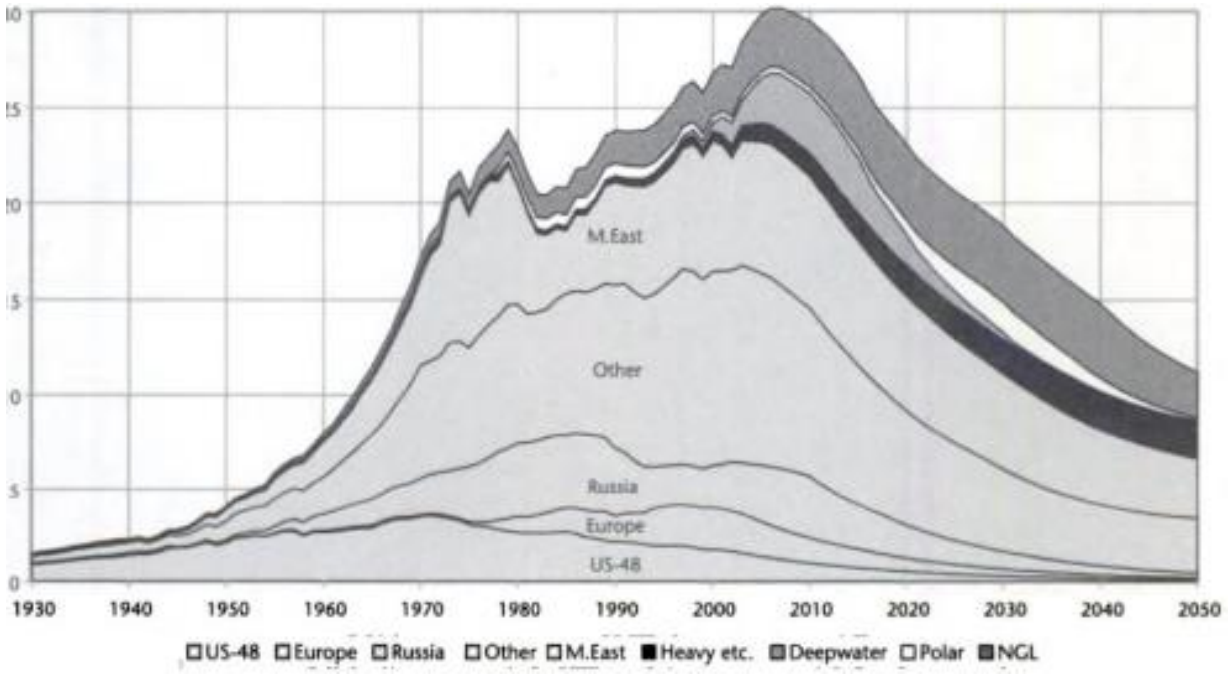
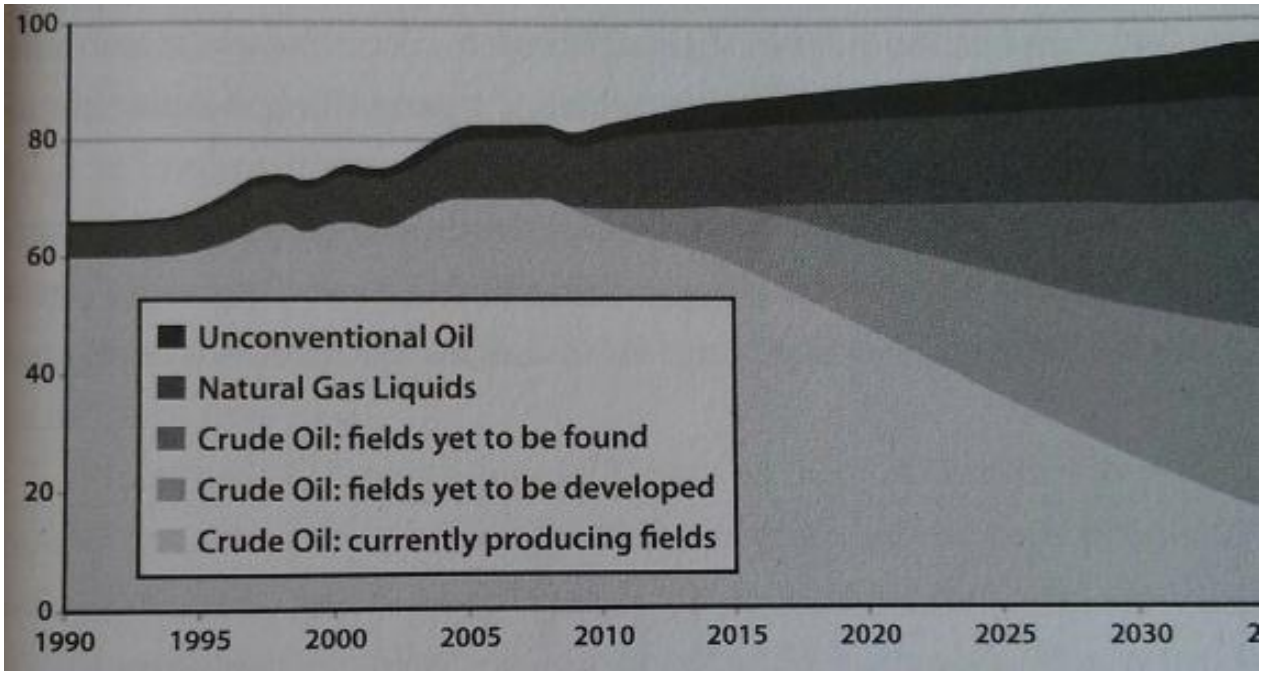


Fig. 22. Global Liquid Fuels Forecast, 1990-2035[630]
(millions of barrels of oil per day)



[629] Fig. 21. Peak Oil and Gas Liquids, 1930-2050. Graph adapted from: Richard Heinberg, *Powerdown: Options and Actions for a Post-Carbon World* (Gabriola Island, BC, Canada: New Society Publishers, 2004), 25.
[630] Fig. 22. Global Liquid Fuels Forecast, 1990-2035. Graph adapted from: Heinberg, *End of Growth*, 109. Source: International Energy Agency, World Energy Outlook 2010.

Fig. 23. Peak Oil *per Capita*: Global Oil Production *per Capita*, 1920-1999[631]
(barrels of oil *per capita per annum*)

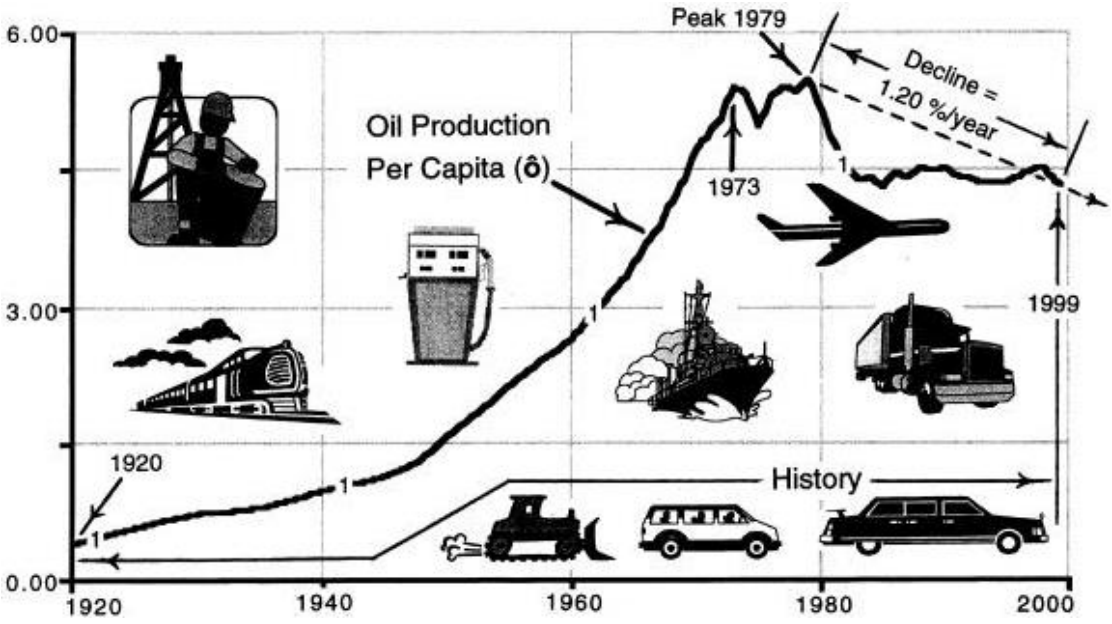
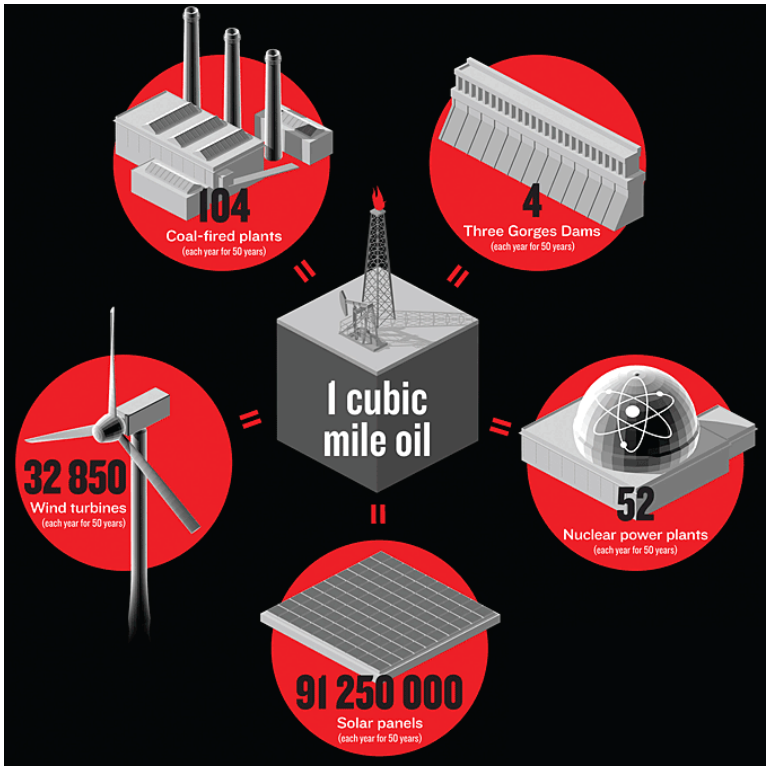


Fig. 24. One Cubic Mile of Oil Equivalent[632]



[631] Fig. 23. Peak Oil *per Capita*: Global Oil Production *per Capita*, 1920-1999. Graph adapted from: Duncan, "Road to the Olduvai Gorge," 7.
[632] Fig. 24. One Cubic Mile of Oil Equivalent. Diagramme reproduced from: Adam Rogers, "Why we love oil" *Wired* (Jan. 16, 2007), http://www.wired.com/.

Fig. 25. Peak Coal: World Coal Production Forecast, 1980-2100[633]
(megatonnes of coal *per annum*)

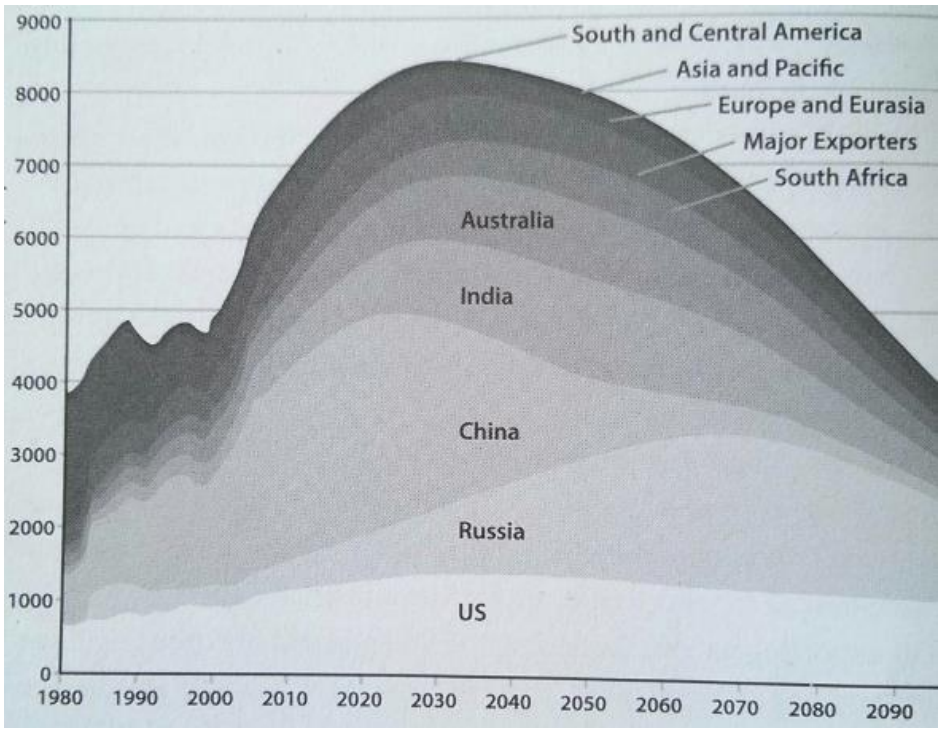
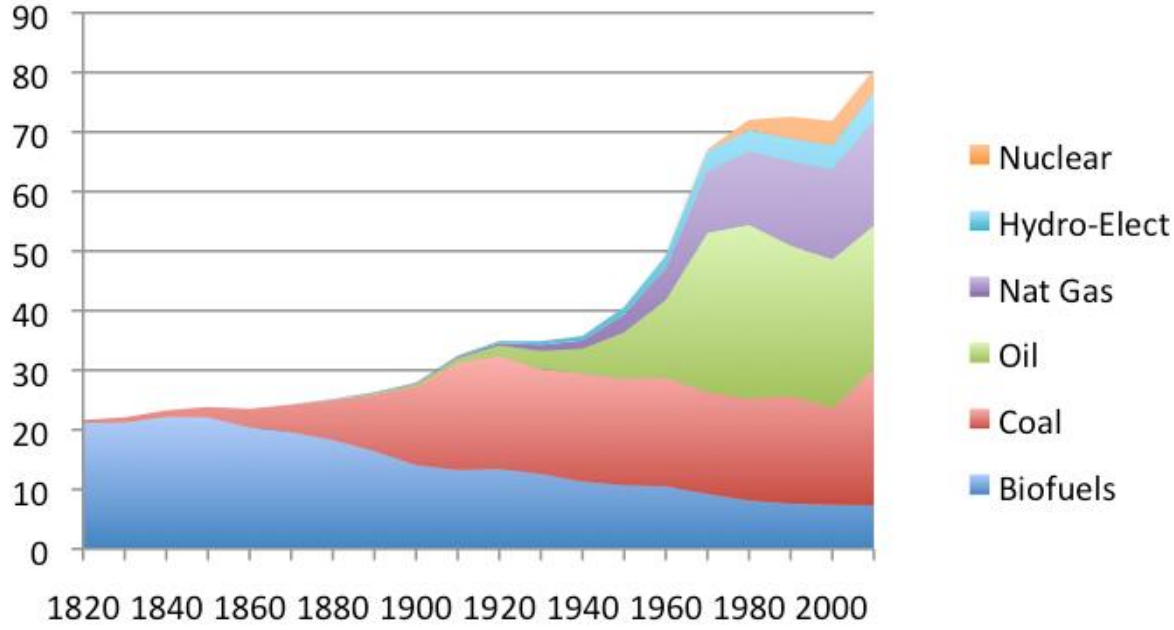


Fig. 26. World *per Capita* Energy Consumption by Source, 1820-Present[634]
(gigajoules *per capita per annum*)



[633] Fig. 25. Peak Coal: World Coal Production: Observed and Projected, 1980-2100. Graph reproduced from: Heinberg, *End of Growth*, 114. Source: Energy Watch Group, 2007.
[634] Fig. 26. World *per Capita* Energy Consumption by Source, 1820-Present. Graph adapted from: Gail Tverberg, "World Energy Consumption Since 1820 in Charts" *Our Finite World* (Mar. 12, 2012), http://ourfiniteworld.com/.

Fig. 27. World Energy Consumption by Source, 1820-Present[635]
(exajoules *per annum*)

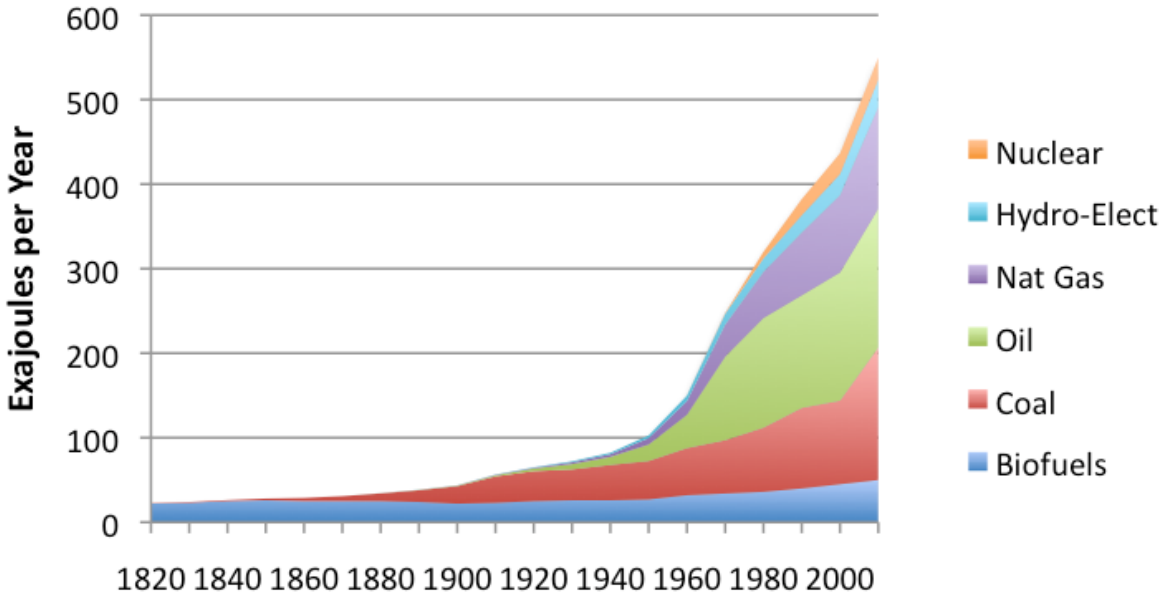
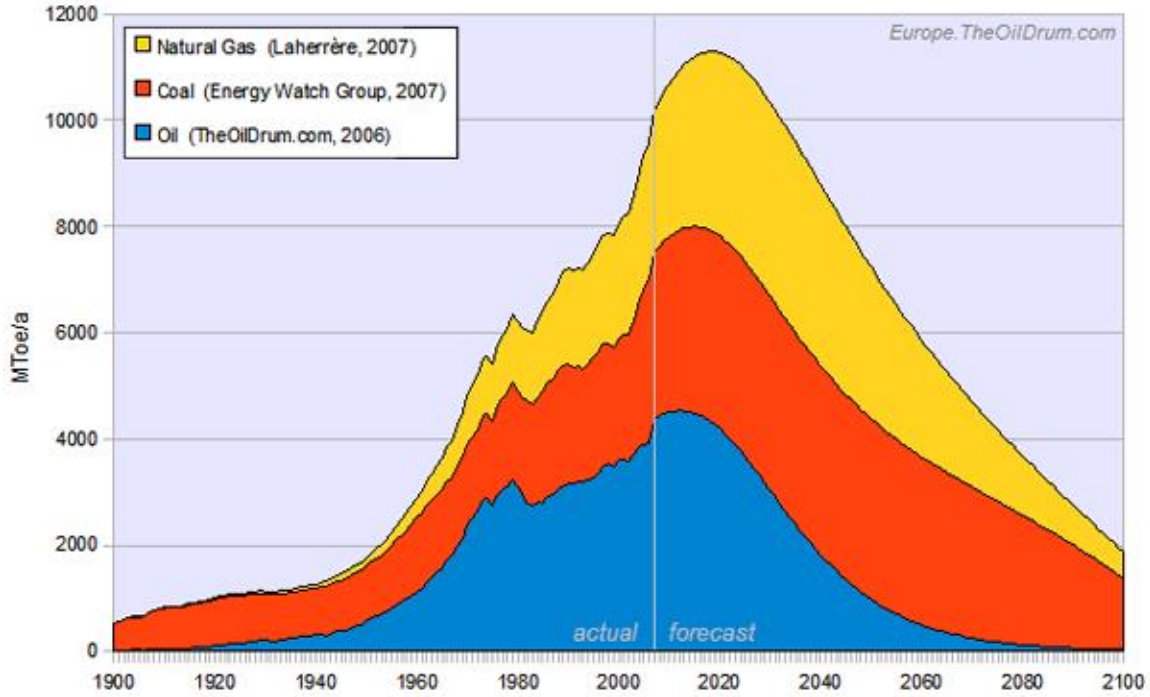
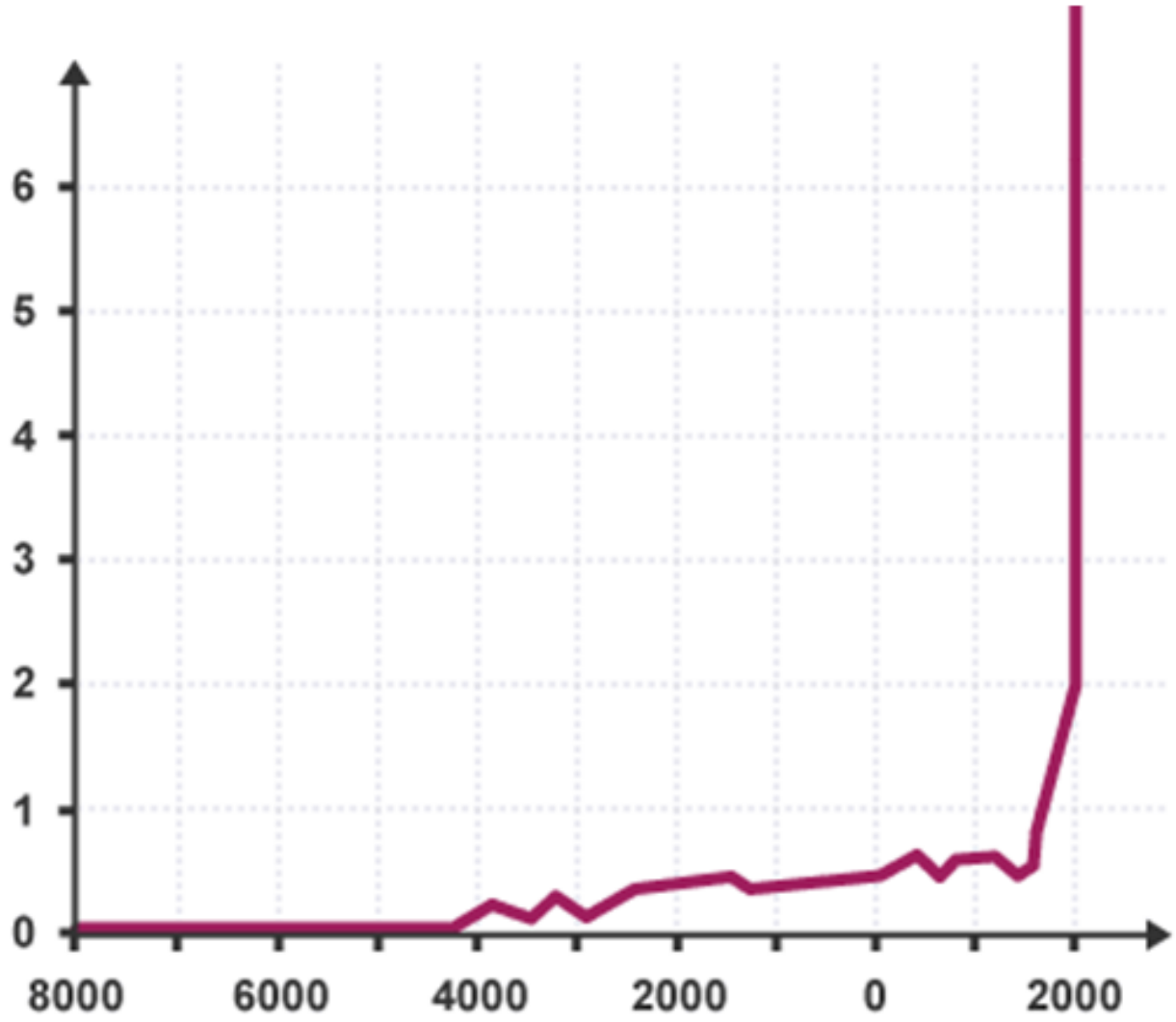


Fig. 28. Peak Fossil Fuels[636]
Conventional Fossil Fuels Production, 1900-2100
(million tonnes of oil equivalent *per anuum*)



[635] Fig. 27. World Energy Consumption by Source, 1820-Present. Graph adapted from: Gail Tverberg, "World Energy Consumption Since 1820 in Charts" *Our Finite World* (Mar. 12, 2012), http://ourfiniteworld.com/.
[636] Fig. 28. Peak Fossil Fuels: Conventional Fossil Fuels Production: Observed and Projected, 1900-2100. Graph adapted from: Luis de Sousa, "Olduvai revisited 2008" *The Oil Drum: Europe* (Feb. 28, 2008), http://europe.theoildrum.com/.

Fig. 29. Human Population, 8000 BCE–Present[637]
(billions of *Homo Sapiens*)



[637] Fig. 29. Human Population, 8000 BCE–Present. Graph adapted from: --, "Waste from human activity" *BBC*, GCSE Bitesize (2014): 1, http://www.bbc.co.uk/.

Fig. 30. Human Population Scenarios, 1950-2100[638]
(billions of *Homo Sapiens*)

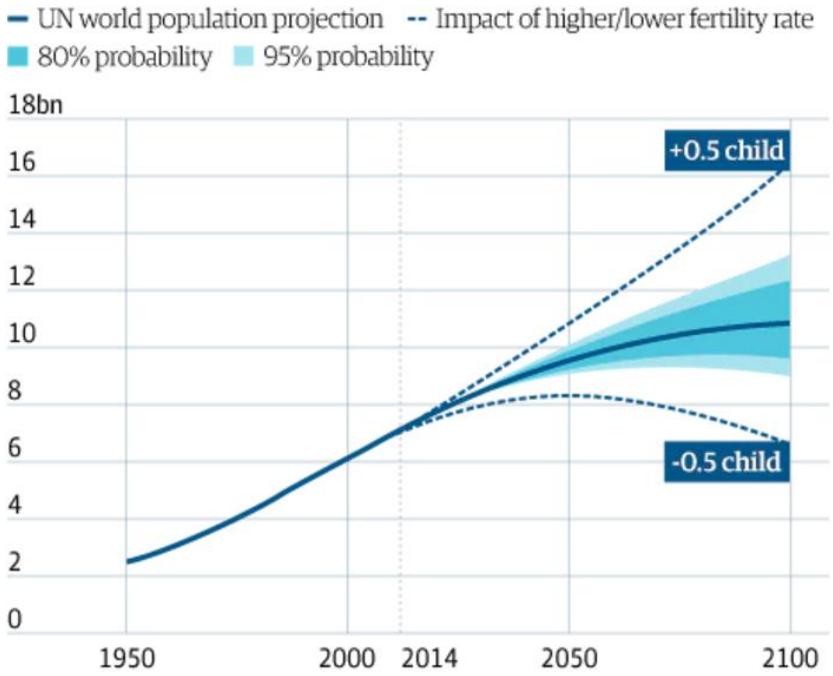
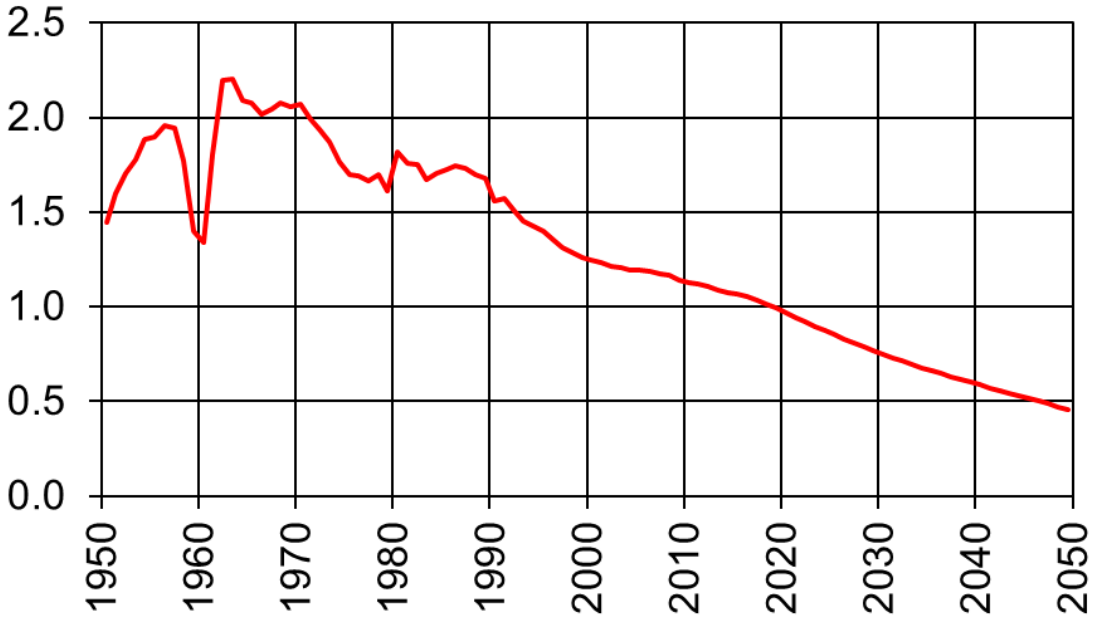


Fig. 31. Human Population Growth Rate: Observed and Projected, 1950-2050[639]
(% growth rate)



[638] Fig. 30. Human Population Scenarios, 1950-2100. Graph adapted from: Damian Carrington, "World population to hit 11bn in 2100 – with 70% chance of continuous rise" *The Guardian* (Sept. 18, 2014), http://www.theguardian.com/.
[639] Fig. 31. Human Population Growth Rate: Observed and Projected, 1950-2050. Graph adapted from: --, "International Data Base World Population Growth Rates: 1950-2050" *U.S. Census Bureau*, International Programs, International Data Base (Sept. 27, 2016), http://www.census.gov/.

Fig. 32. Global Phosphorus Production: Observed and Projected, 1900-2100[640]
(megatonnes of rock phosphate *per annum*)

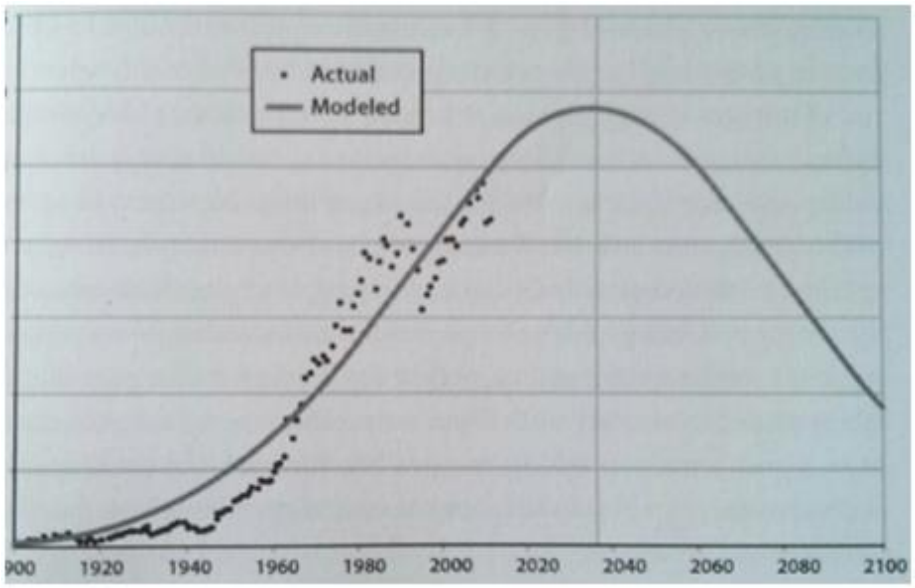
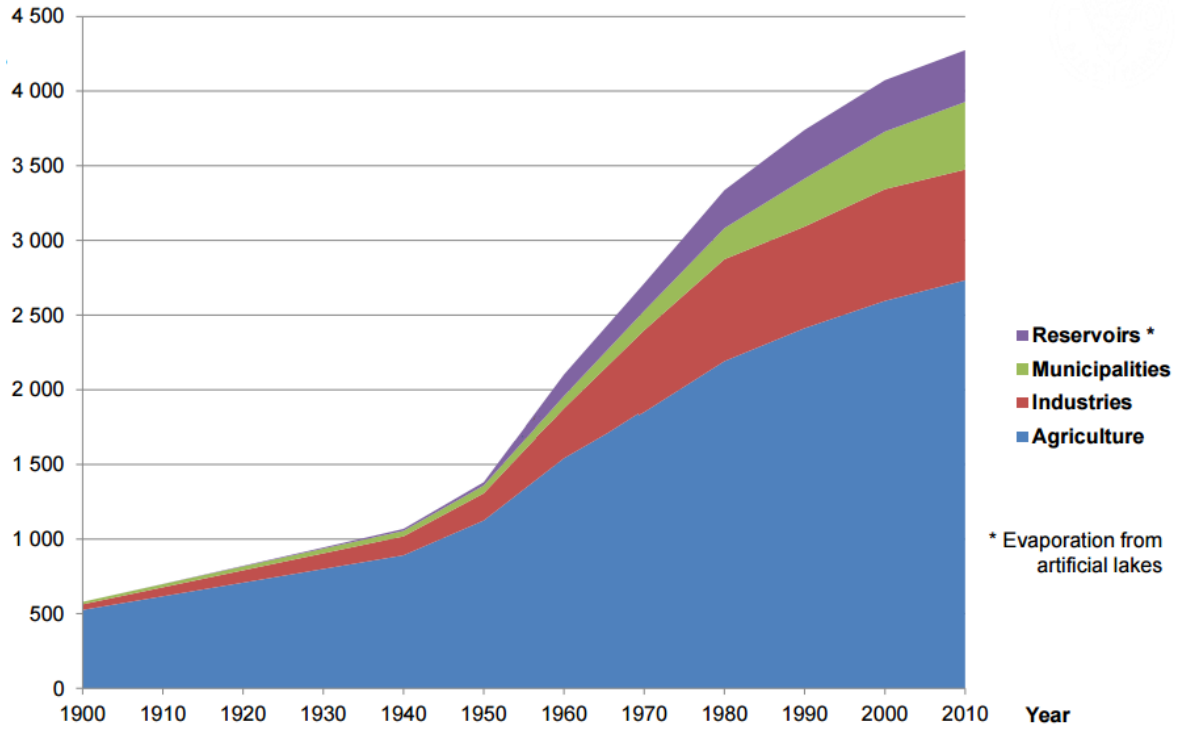


Fig. 33. Global Water Withdrawal, 1900-2010[641]
(cubic kilometres *per annum*)



[640] Fig. 32. Global Phosphorus Production: Observed and Projected, 1900-2100. Graph reproduced from: Heinberg, *End of Growth*, 137. Source: Dana Cordell, *et al.*, 2009, "The Story of Phosphorus: Global Food Security and Food For Thought" *Global Environmental Change*, Vol. 19 (2009): 292-305, http://www.sciencedirect.com/.

[641] Fig. 33. Global Water Withdrawal, 1900-2010. Graph adapted from: --, "Water uses" *Food and Agriculture Organization of the United Nations,* AQUASTAT website (2016), http://www.fao.org/.

Fig. 34. Arable Land *per Capita*: Observed and Projected, 1950-2020[642]
(hectares)

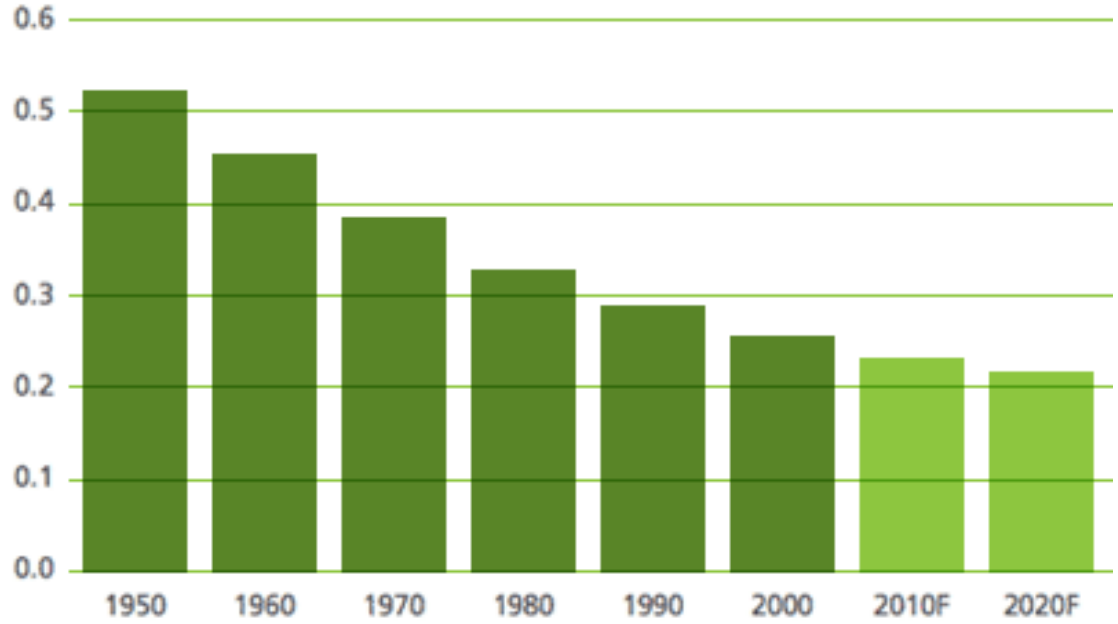
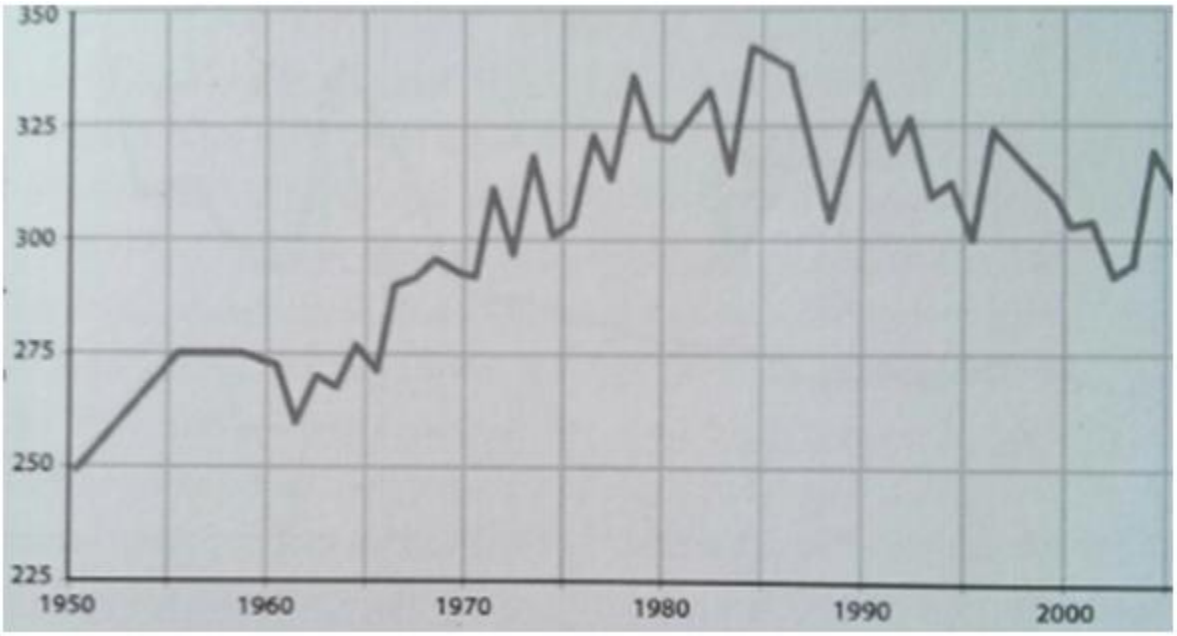


Fig. 35. Peak Food: Global Grain Production *per Capita*, 1950-2006[643]
(kilogrammes *per capita*)



[642] Fig. 34. Arable Land *per Capita*: Observed and Projected, 1950-2020. Bar graph reproduced from: --, "Global Development Story: Pressure to Increase Productivity on Existing Land" *PotashCorp* (Aug. 31, 2014), http://www.potashcorp.com/.
[643] Fig. 35. Peak Food: Global Grain Production *per Capita*, 1950-2006. Graph reproduced from: Heinberg, *End of Growth*, 131. Source: Earth Policy Institute.

Fig. 36. Peak Fish: Fisheries Capture and Aquaculture Production, 1950-2012[644]
(million tonnes of seafood)

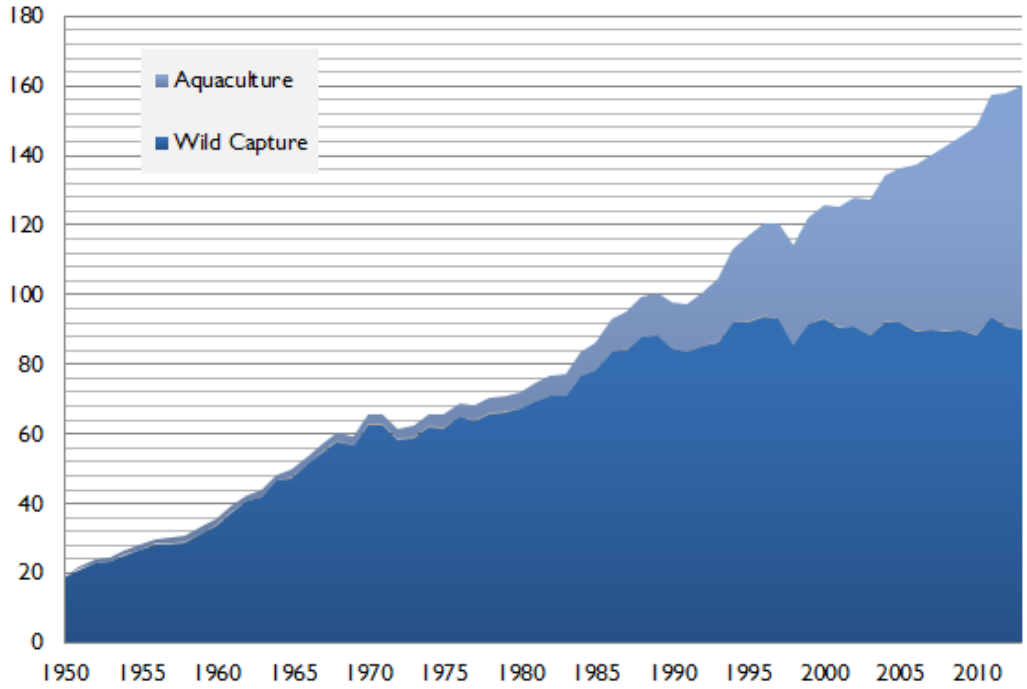
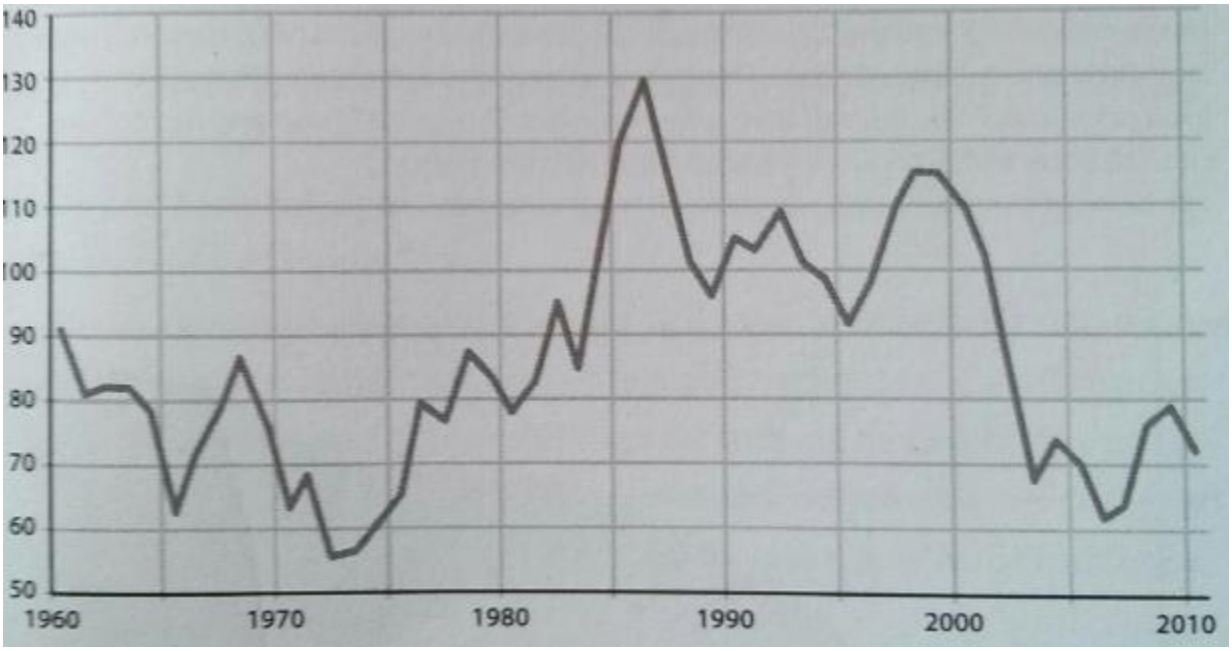


Fig. 37. Global Grain Stocks, 1960-2010[645]
(days of consumption)



[644] Fig. 36. Peak Fish: Fisheries Capture and Aquaculture Production, 1950-2012. Graph adapted from: Michael Renner, "Aquaculture Continues to Gain on Wild Fish Capture" *Vital Signs* (Apr. 24, 2014), http://vitalsigns.worldwatch.org/. Source: Food and Agriculture Organisation of the United Nations.
[645] Fig. 37. Global Grain Stocks, 1960-2010. Graph reproduced from: Heinberg, *End of Growth*, 131. Source: Earth Policy Institute.

Fig. 38. Global Land-Ocean Temperature Index, 1880−Present[646]
(temperature anomaly °C)

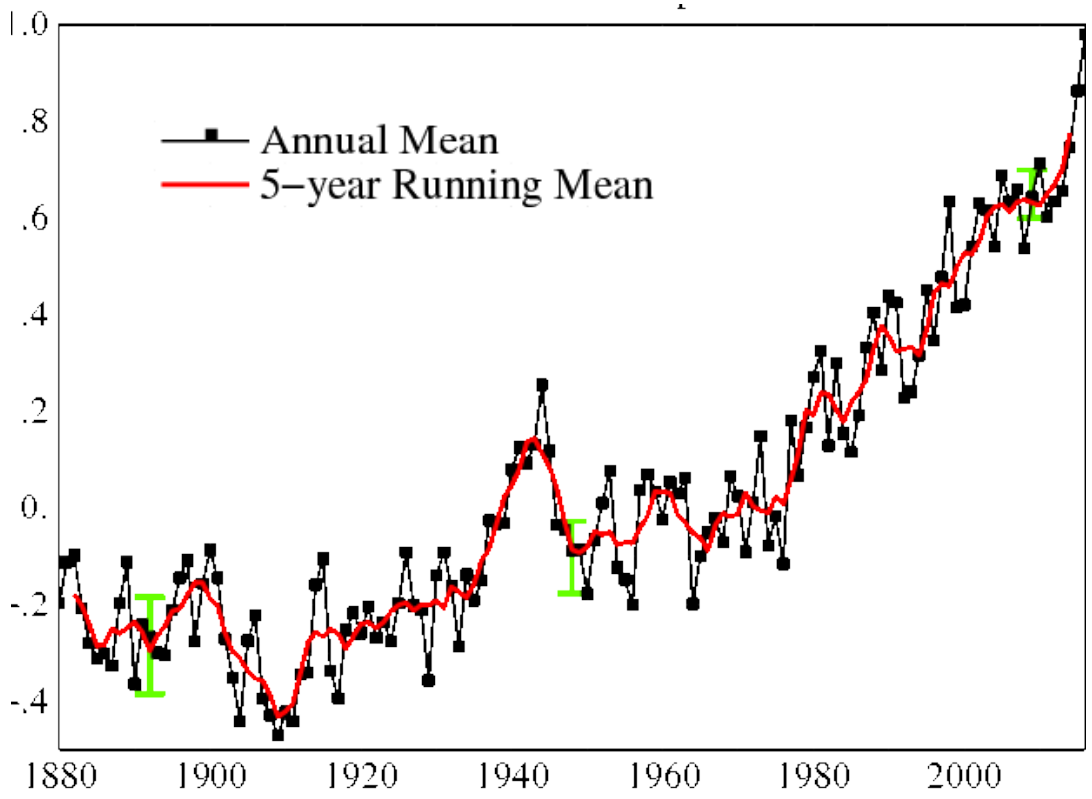
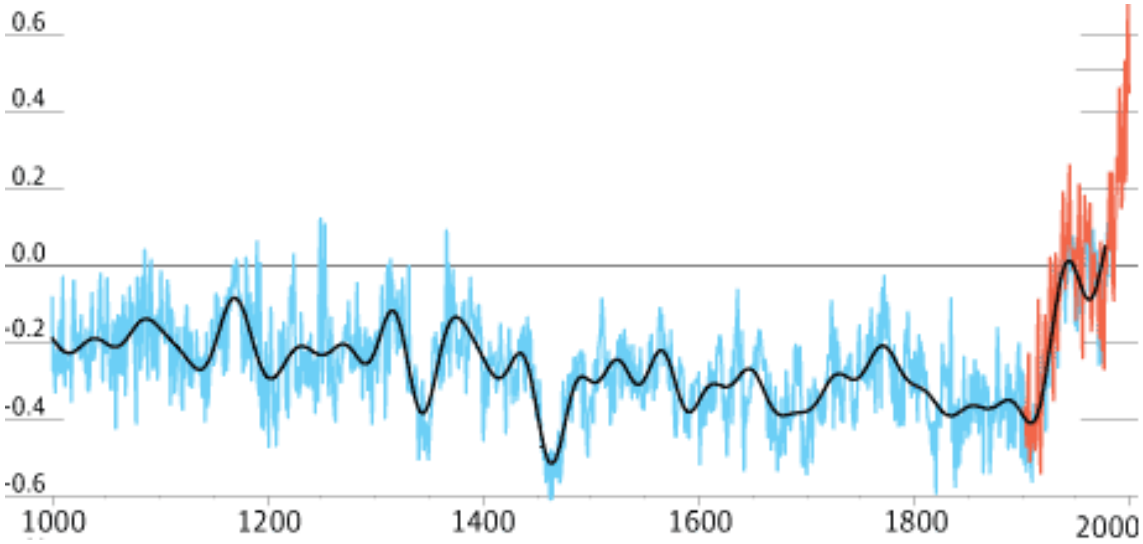


Fig. 39. The Hockey Stick: Global Surface Temperature Variations, 1000–Present [647]
(Northern Hemisphere temperature variation from the 1961-90 mean °C)



[646] Fig. 38. Global Land-Ocean Temperature Index, 1880−Present. Graph adapted from: Makiko Sato, "GISS Surface Temperature Analysis" *NASA Goddard Institute for Space Studies* (Oct. 13, 2016), http://data.giss.nasa.gov/.
[647] Fig. 39. The Hockey Stick: Global Surface Temperature Variations, 1000–Present. Graph adapted from: Fred Pearce, "Controversy behind climate science's 'hockey stick' graph" *The Guardian* (Feb. 2, 2010), http://www.theguardian.com/. Source: Mann, Bradley, and Hughes, *Nature*, 1998.

Fig. 40. Global Natural Disaster Costs (1950−Present)[648]
(billions of $US)

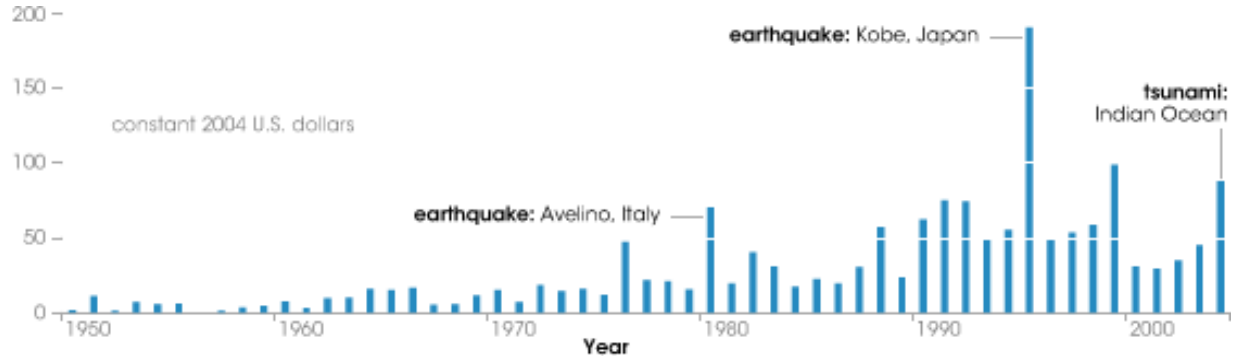
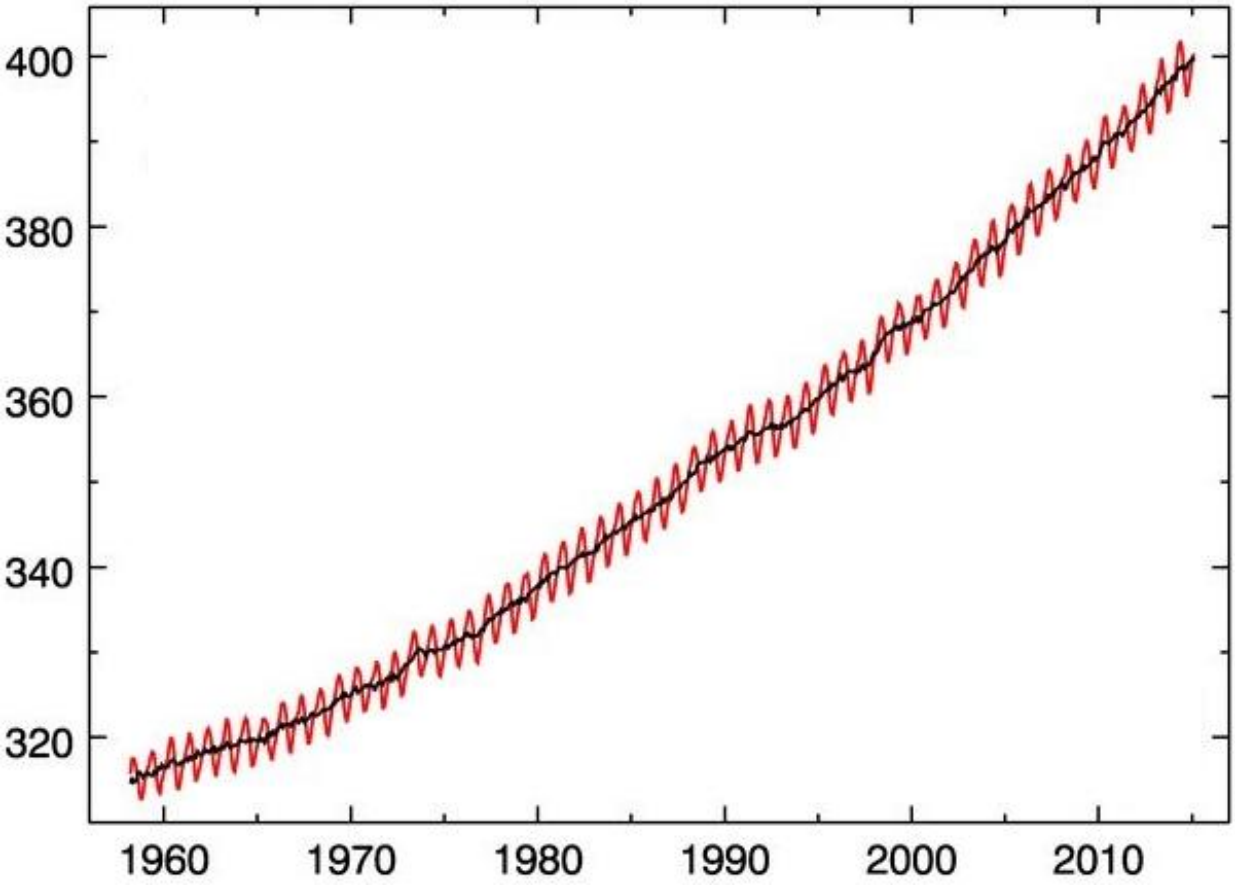


Fig. 41. The Keeling Curve: Atmospheric Concentration of CO_2 at Mauna Loa, 1960-2016[649]
(parts per million of CO_2)



[648] Fig. 40. Global Natural Disaster Costs (1950−Present). Graph adapted from: Holli Riebeek, "The Rising Cost of Natural Hazards" *NASA Earth Observatory* (Mar. 28, 2005), http://earthobservatory.nasa.gov/.
[649] Fig. 41. The Keeling Curve: Atmospheric Concentration of CO_2 at Mauna Loa, 1960-2016. Graph adapted from: --, "The Keeling Curve: Carbon Dioxide Measurements at Mauna Loa" *American Chemical Society National Historic Chemical Landmarks* (Apr. 30, 2015), http://www.acs.org/.

Fig. 42. The Hockey Stick II: Planetary Surface Temperature Variations, 1000−Present[650]
(Northern hemisphere: departures in temperature [°C] from the 1961-90 average)

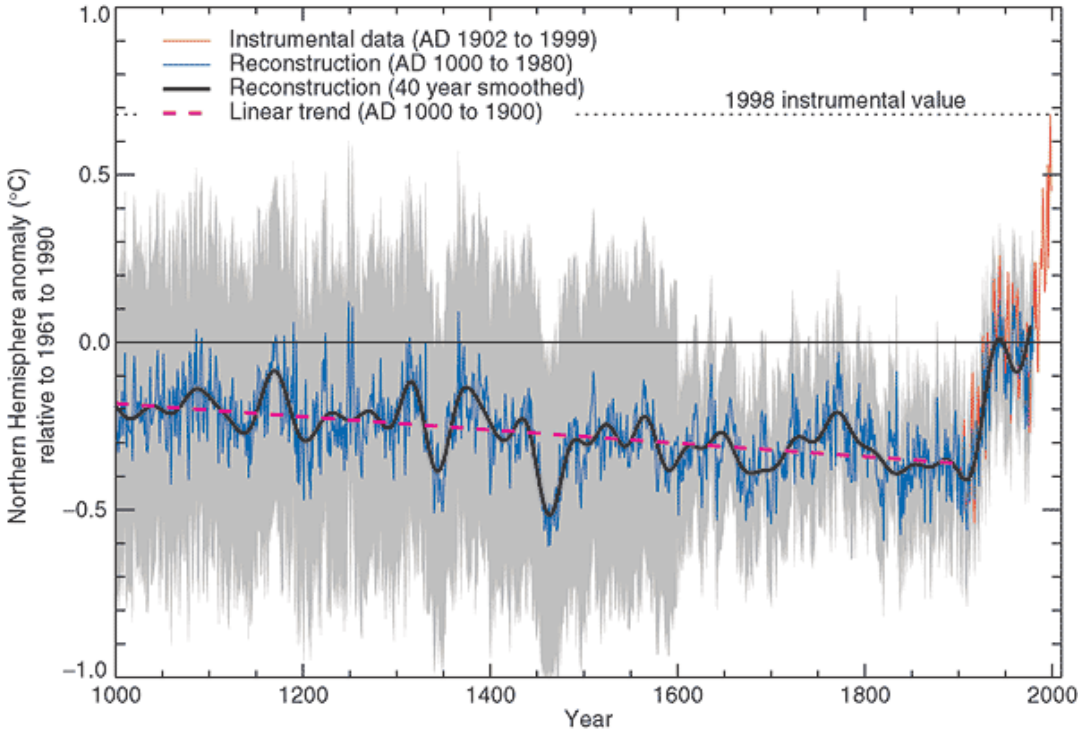
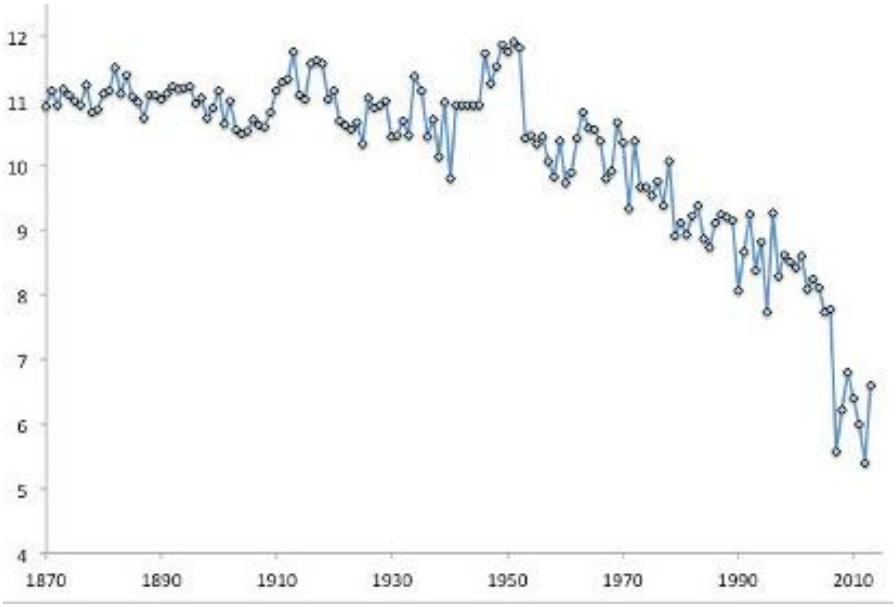


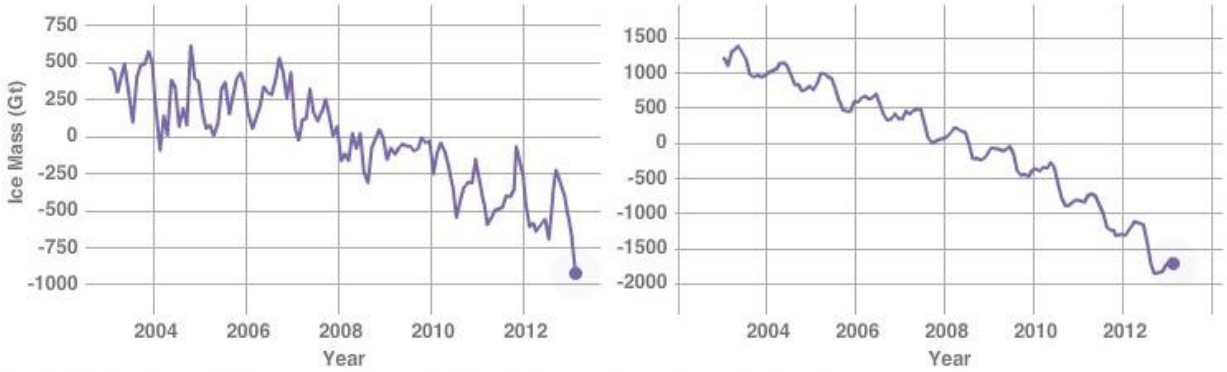
Fig. 43. Summer Arctic Sea Ice Extent, 1870-2013[651]
(millions of square kilometres)



[650] Fig. 42. The Hockey Stick II: Planetary Surface Temperature Variations, 1000−Present. Graph adapted from: Fred Pearce, "Controversy behind climate science's 'hockey stick' graph" *The Guardian* (Feb. 2, 2010), http://www.theguardian.com/. Source: Mann, Bradley, and Hughes, *Nature*, 1998.
[651] Fig. 43. Summer Arctic Sea Ice Extent, 1870-2013. Graph adapted from: --, "Arctic sea ice 'recovers' to its 6th-lowest extent in millennia" *Skeptical Science* (Sept. 19, 2013), http://skepticalscience.com/.

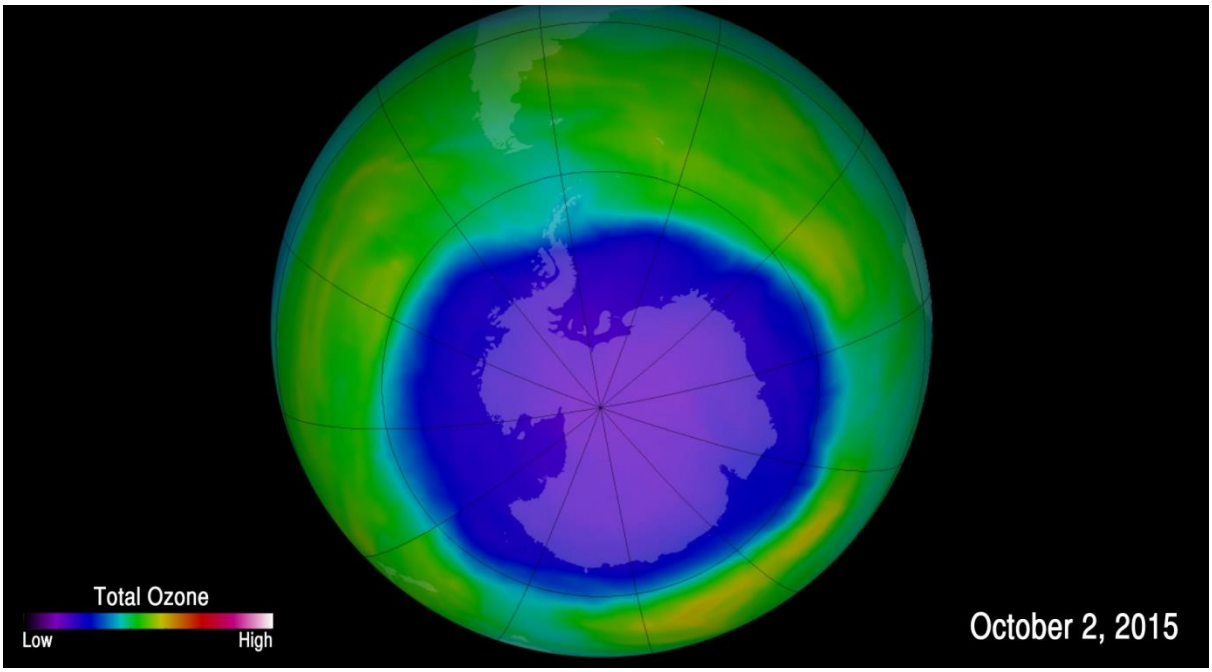
Fig. 44. Antarctic and Greenland Mass Variation, 2002-13[652]

(left: Antarctica; right: Greenland)



Note: mass change is relative to the average during the entire period.

Fig. 45. Antarctic Ozone Hole, 2015[653]



[652] Fig. 44. Antarctic and Greenland Mass Variation, 2002-13. Graph adapted from: --, "Climate change threats to the polar regions: ice sheets and ice shelves" *Pole to Pole Campaign* (2017), http://www.poletopolecampaign.org/.

[653] Fig. 45. Antarctic Ozone Hole, 2015. False-colour image reproduced from: Audrey Haar and Monica Allen, "Annual Antarctic Ozone Hole Larger and Formed Later in 2015" *NASA TV* (Oct. 30, 2015), http://www.nasa.gov/.

Fig. 46. How Many Earths Does It Take to Support Humanity? 1960-2050[654]
(number of Earths)

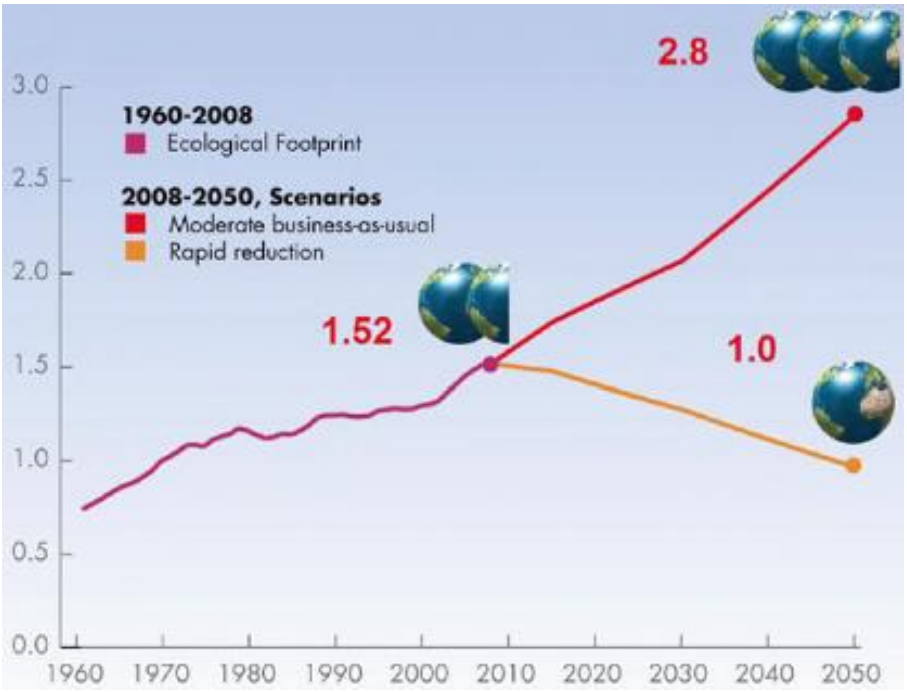
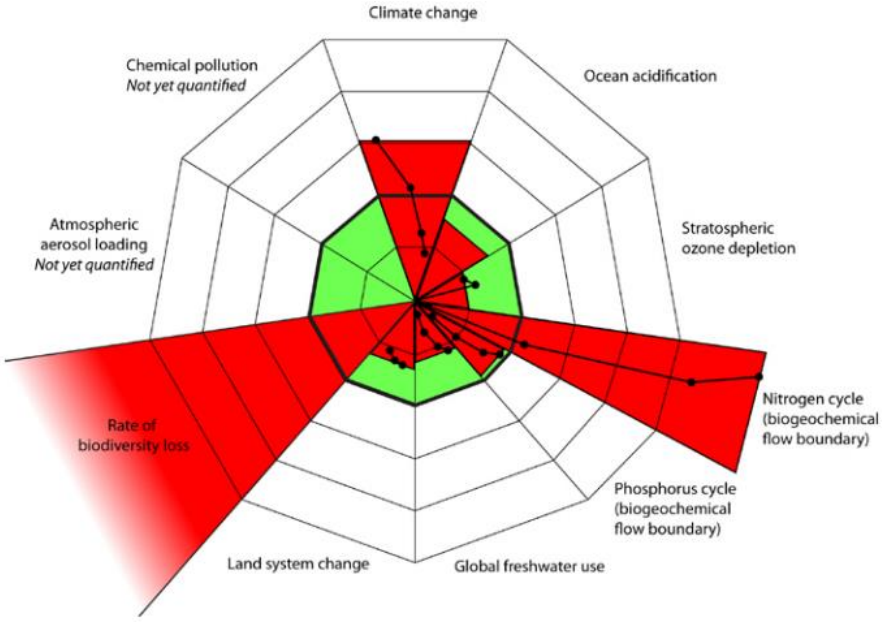


Fig. 47. The Nine Planetary Boundaries[655]



Note: The inner (green) nonagon represens the safe operating space with the proposed boundary levels at its outer contour.

[654] Fig. 46. How Many Earths Does It Take to Support Humanity? 1960-2050. Graph reproduced from: N. F. Gray, *Facing Up to Global Warming: What is Going on and How You Can Make a Difference* (New York: Springer, 2015), 161.
[655] Fig. 47. The Nine Planetary Boundaries. Diagramme from: Johan Rockström, *et al.*, "Planetary Boundaries: Exploring the Safe Operating Space for Humanity" *Ecology and Society*, Vol. 14, No. 2 (Jan. 1, 2009): 24, http://www.stockholmresilience.org/.

Fig. 48. Global GDP and GPI *per Capita*, 1950-2005[656]
(2005 $US)

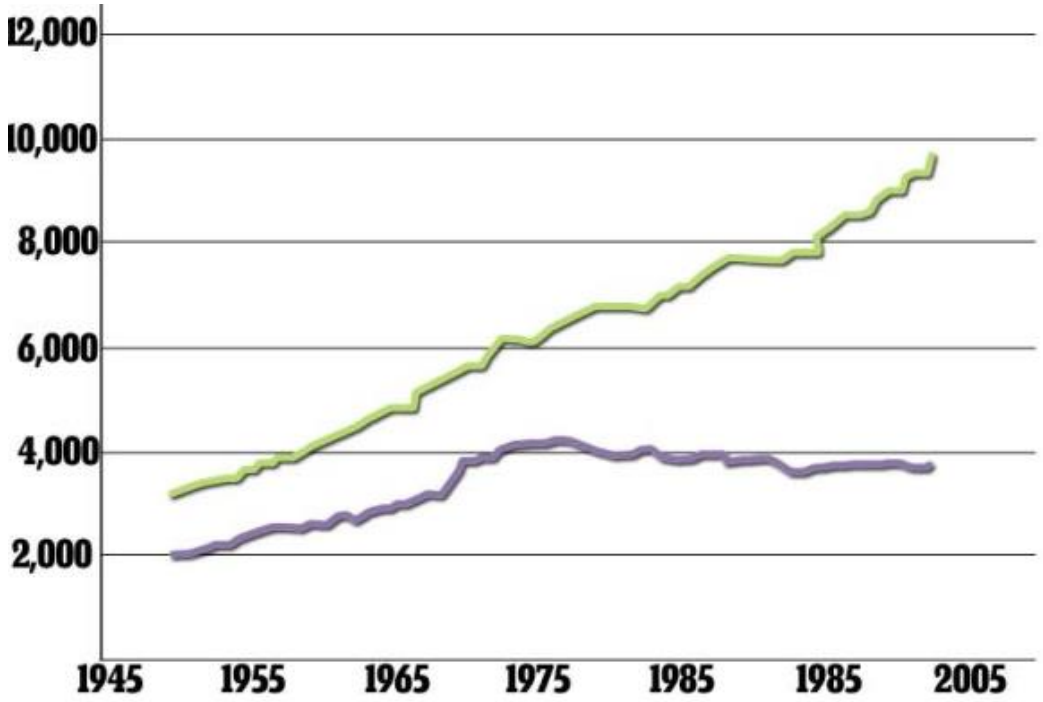
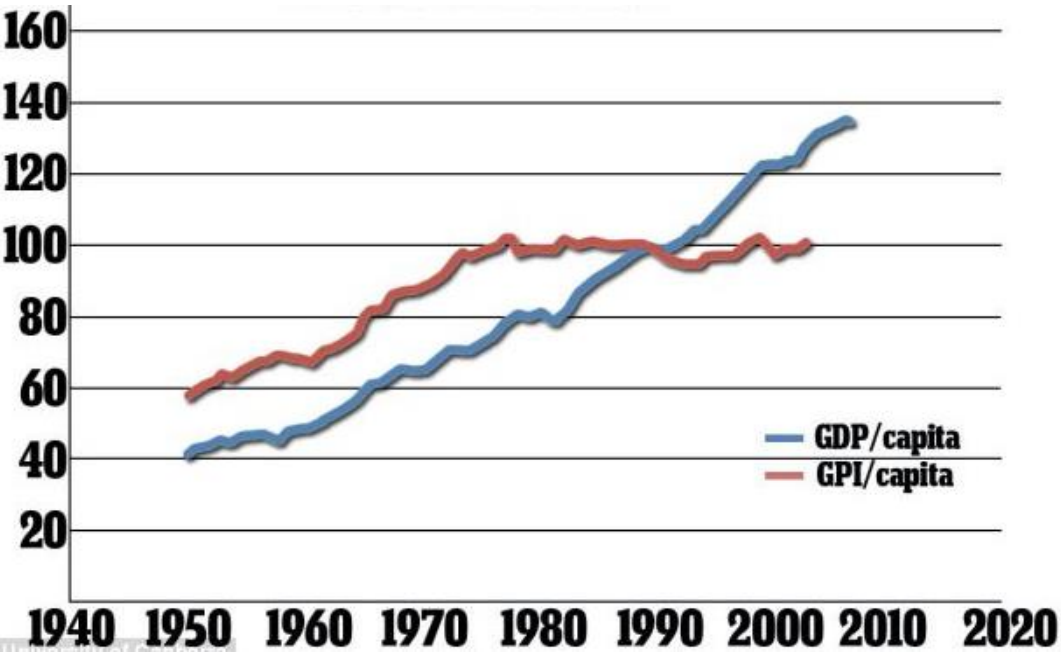


Fig. 49. US GDP and GPI *per Capita*, 1950-2005[657]
(2005 $US)



[656] Fig. 48. Global GDP and GPI *per Capita*, 1950-2005. Graph adapted from: Rachel Reilly, "Why 1978 was the year the world never had it so good: We had the perfect balance of wealth, work and happiness" *The Daily Mail* (Jul. 13, 2013), http://www.dailymail.co.uk/.
[657] Fig. 49. US GDP and GPI *per Capita*, 1950-2005. Graph adapted from: Ibid.

Fig. 50. Doomsday Clock: Minutes to Midnight, 1947-2017[658]

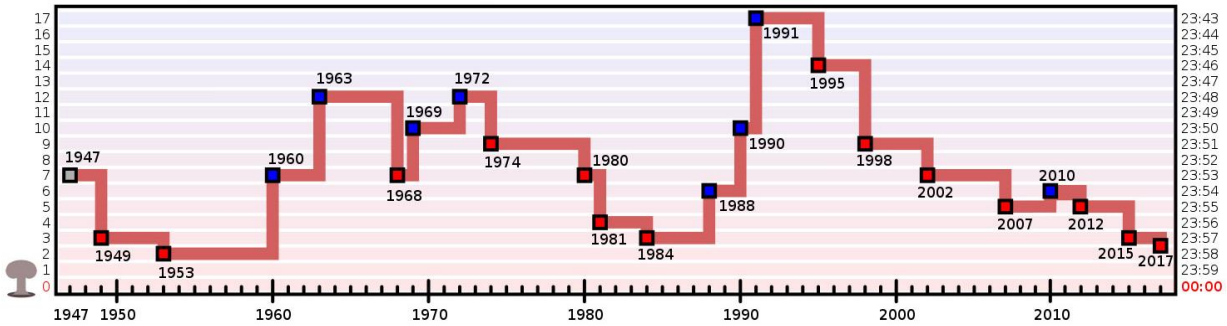
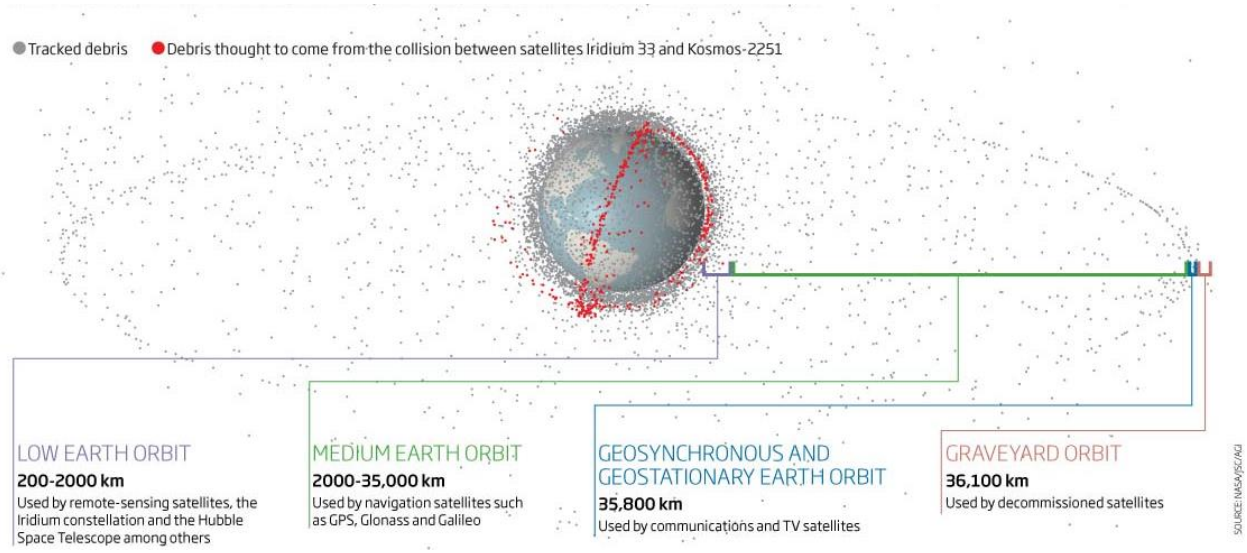


Fig. 51. Countdown to the Kessler Syndrome[659]



[658] Fig. 50. Doomsday Clock: Minutes to Midnight, 1947-2017. Timeline reproduced from: Dave Mosher, "*Bulletin of Atomic Scientists* advance their 'Doomsday Clock' as Trump takes office" *Business Insider Australia* (Jan. 27, 2017), http://www. businessinsider.com.au/.

[659] Fig. 51. Countdown to the Kessler Syndrome. Diagramme reproduced from: Stuart Clark, "Space junk: Hunting zombies in outer space" *New Scientist*, Issue No. 2777 (Sept. 8, 2010), http://www.newscientist.com/.

Fig. 52. Monthly Number of Objects in Earth Orbit by Object Type, 1957-2010[660]
(number of objects)

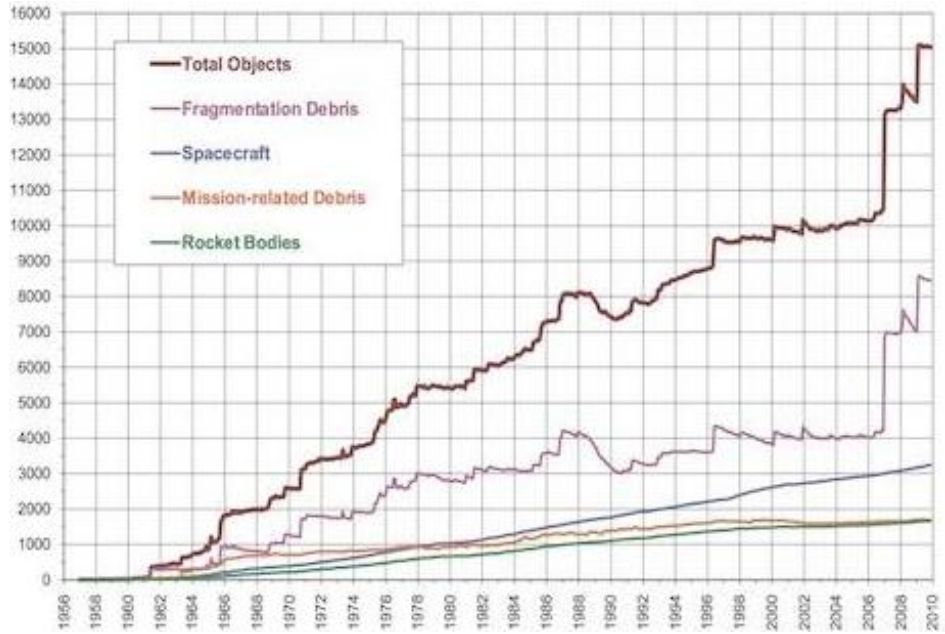
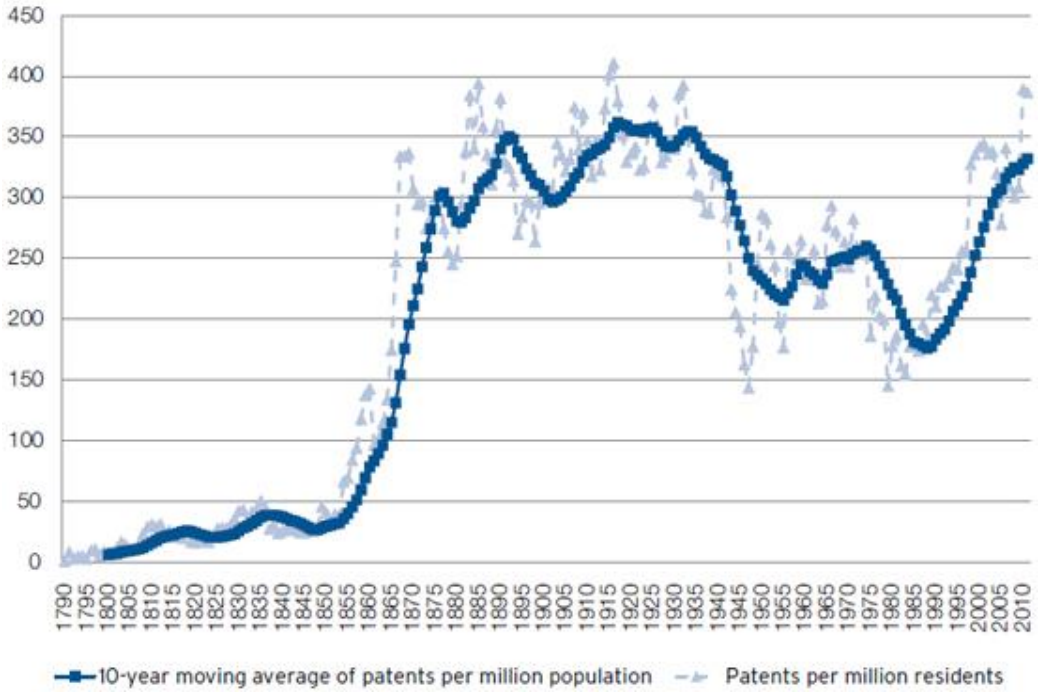


Fig. 53. Peak Innovation: Patented US Inventions *per Capita* by Year Granted, 1790-2011[661]
(patents per million)



[660] Fig. 52. Monthly Number of Objects in Earth Orbit by Object Type, 1957-2010. Graph adapted from: Dustin Buccino, "Ablative Laser Propulsion for Space Debris Removal: A project for ASEN 5050 − Spaceflight Dynamics" University of Colorado at Boulder (2011), http://ccar.colorado.edu/.

[661] Fig. 53. Patented US Inventions *per Capita* by Year Granted, 1790-2011. Graph adapted from: Stephen F. DeAngelis, "Urbanization, Innovation, and Wealth" *Enterra Solutions* (Feb. 15, 2013), http://www.enterrasolutions.com/.

Fig. 54. Soviet *bloc* GDPs *per Capita*, 1950-2010[662]
(1990 Geary-Khamis dollars *per capita*)

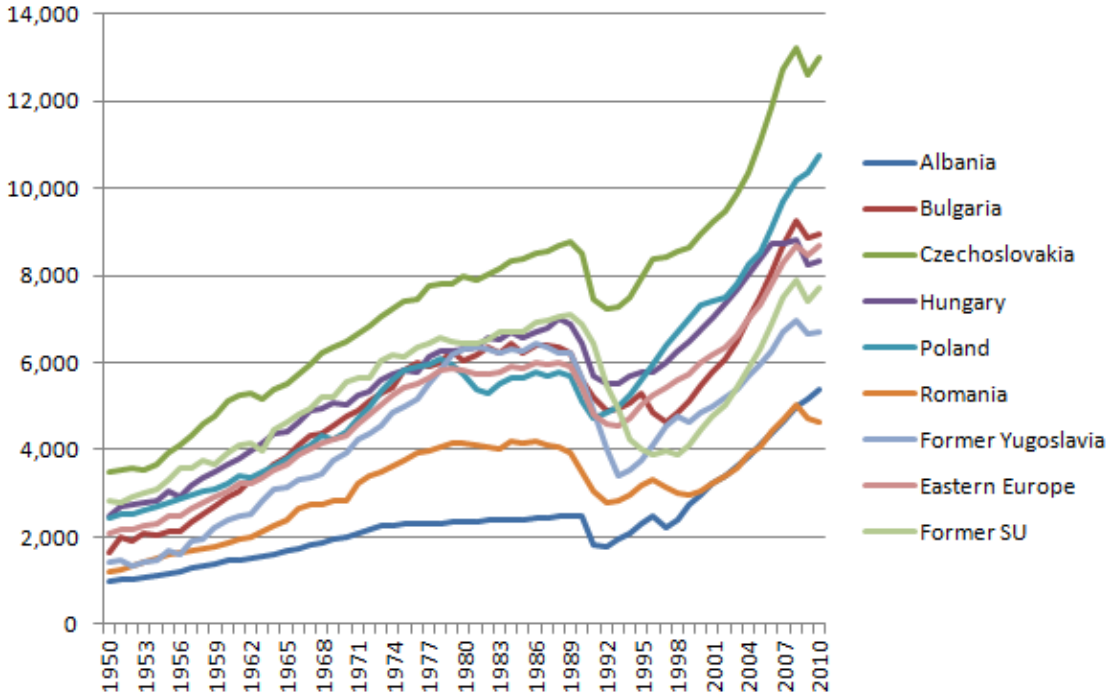
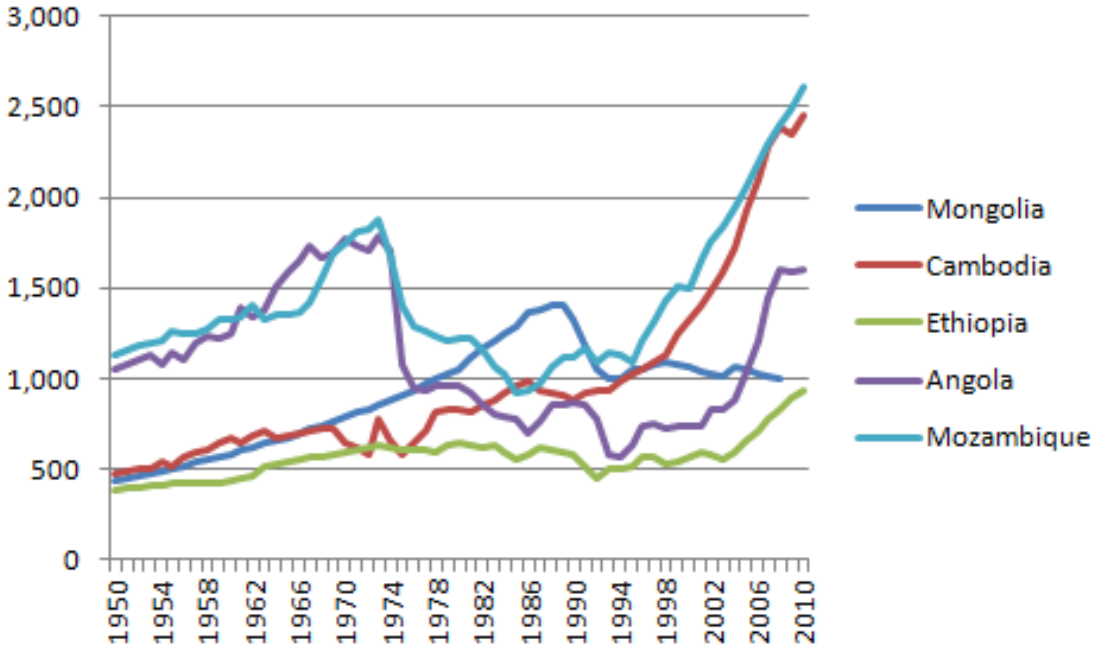


Fig. 55. Various Cold War Soviet Satellite States' GDPs *per Capita*, 1950-2010[663]
(1990 Geary-Khamis dollars *per capita*)



[662] Fig. 54. Soviet *bloc* GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: J. Bolt and J. L. van Zanden, "The Maddison Project: collaborative research on historical national accounts" *The Economic History Review*, Vol. 67, No. 3: 627-651, http://www.ggdc.net/maddison/maddison-project/data.htm.
[663] Fig. 55. Various Cold War Soviet Satellite States' GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: Ibid.

Fig. 56. Cuba and North Korea GDPs *per Capita*, 1950-2005[664]
(1990 Geary-Khamis dollars *per capita*)

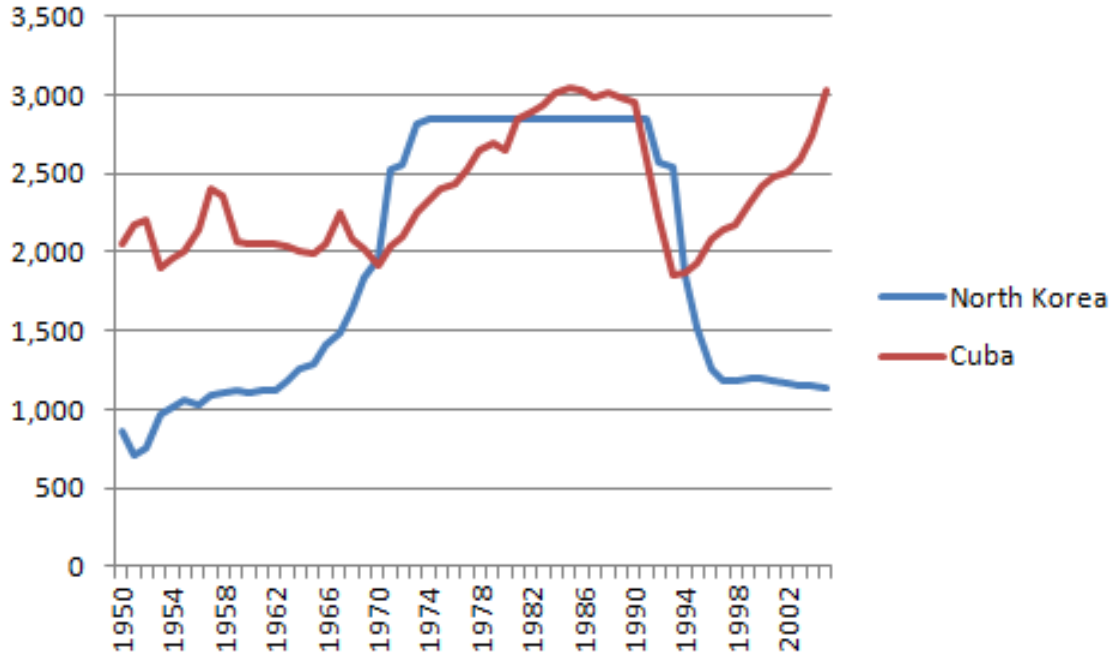
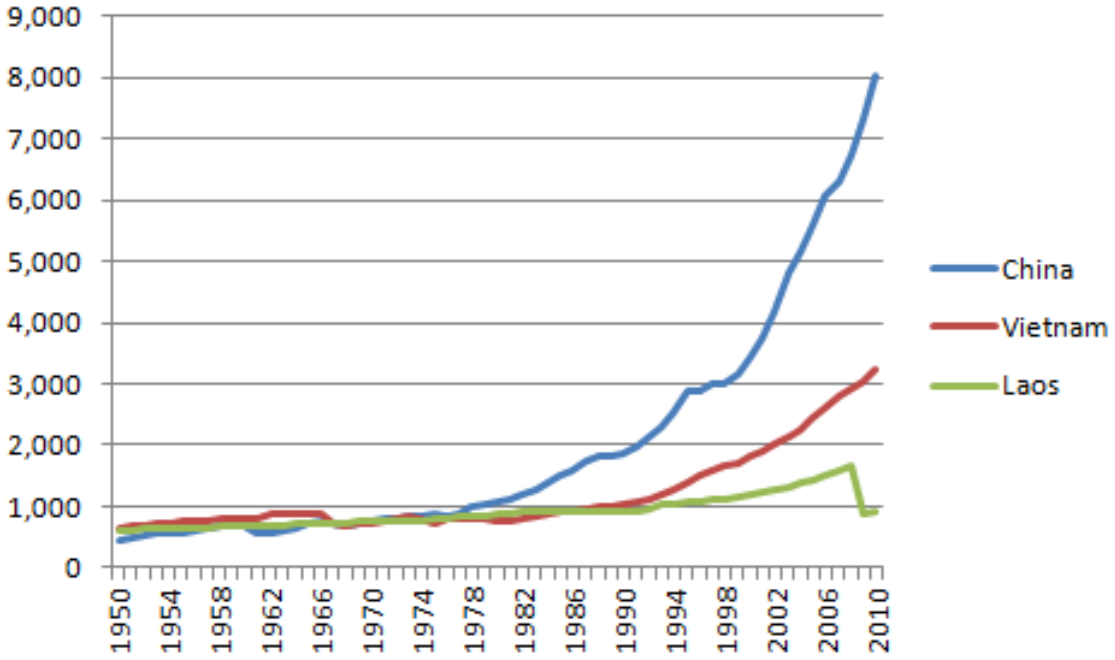


Fig. 57. China, Vietnam, and Laos GDPs *per Capita*, 1950-2010[665]
(1990 Geary-Khamis dollars *per capita*)



[664] Fig. 56. Cuba and North Korea GDPs *per Capita*, 1950-2005. Self-made. Data adapted from: J. Bolt and J. L. van Zanden, "The Maddison Project: collaborative research on historical national accounts" *The Economic History Review*, Vol. 67, No. 3: 627-651, http://www.ggdc.net/maddison/maddison-project/data.htm.
[665] Fig. 57. China, Vietnam, and Laos GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: Ibid.

Fig. 58. Eastern Europe Rate of Natural Population Increase, 1955-2015[666]
(per 1,000 population *per annum*)

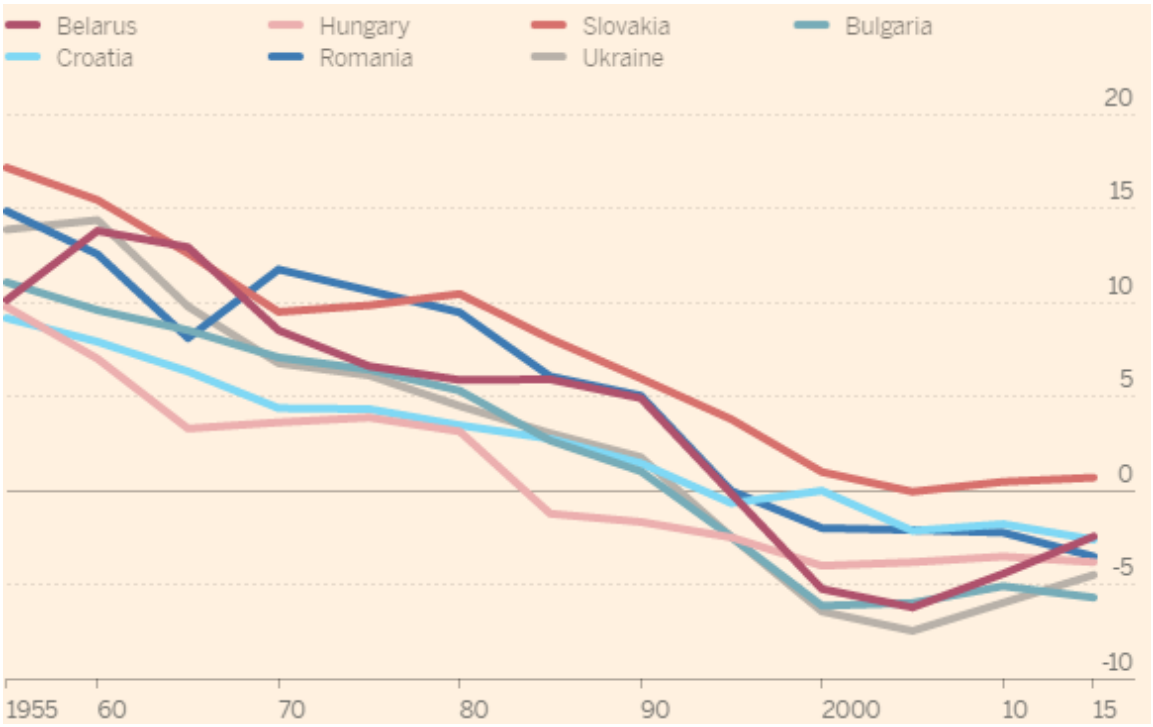
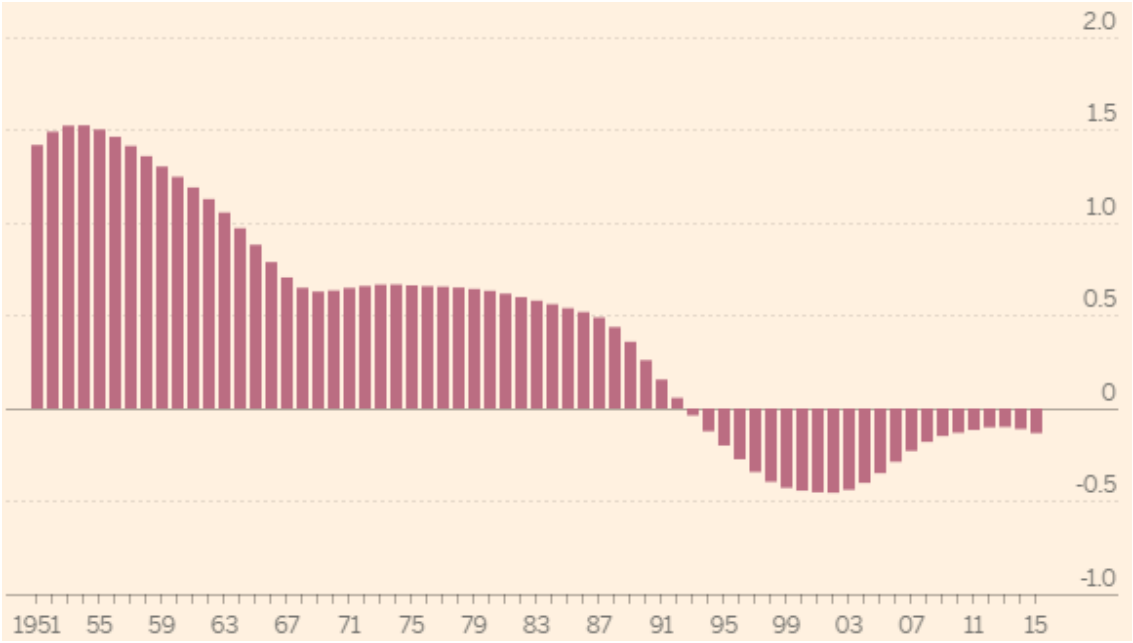


Fig. 59. Population Trend in Eastern Europe, 1951-2015[667]
(% change *per annum*)



[666] Fig. 58. Eastern Europe Rate of Natural Population Increase, 1955-2015. Graph adapted from: Valentina Romel, "Eastern Europe has the largest population loss in modern history" *FT Data* (May 27, 2016), http://blogs.ft.com/ftdata/.
[667] Fig. 59. Population Trend in Eastern Europe, 1951-2015. Graph adapted from: Ibid.

Fig. 60. The Capitalist and (Former) Communist *bloc*s' GDPs *per Capita*, 1950-2010[668]
(1990 Geary-Khamis dollars *per capita*)

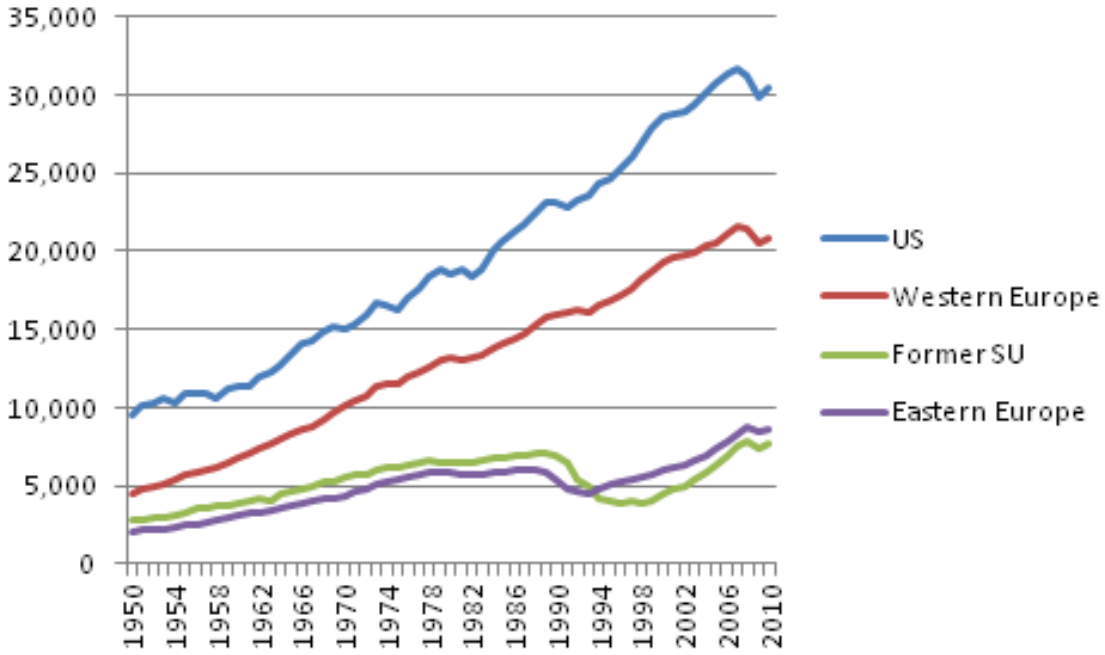
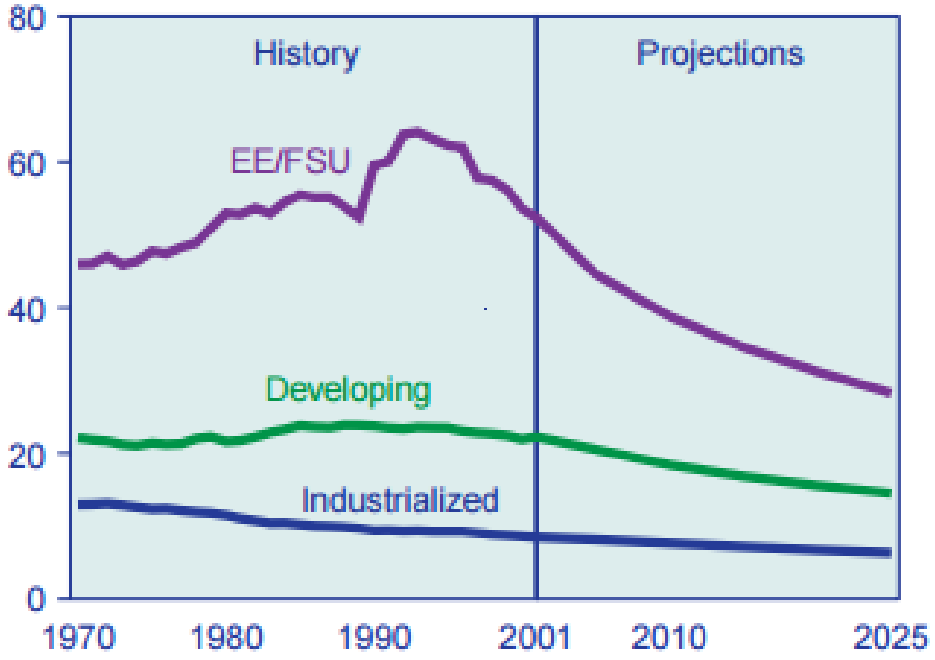


Fig. 61. Global Energy Intensity by Region: Observed and Projected, 1970-2025[669]
(thousands of BTUs of energy input per 1997 $US of GDP output)



[668] Fig. 60. The Capitalist and (Former) Communist *bloc*s GDPs *per Capita*, 1950-2010. Self-made. Data adapted from: J. Bolt and J. L. van Zanden, "The Maddison Project: collaborative research on historical national accounts" *The Economic History Review*, Vol. 67, No. 3: 627-651, http://www.ggdc.net/maddison/maddison-project/data.htm.
[669] Fig. 61. Global Energy Intensity by Region: Observed and Projected, 1970-2025. Graph adapted from: --, "International Energy Outlook, 2004" *Energy Information Agency* (Apr., 2004): 6, http://www.eia.doe.gov/.

Fig. 62. Cuban Oil Consumption by Source, 1980-2013[670]
(thousands of barrels of oil per day)

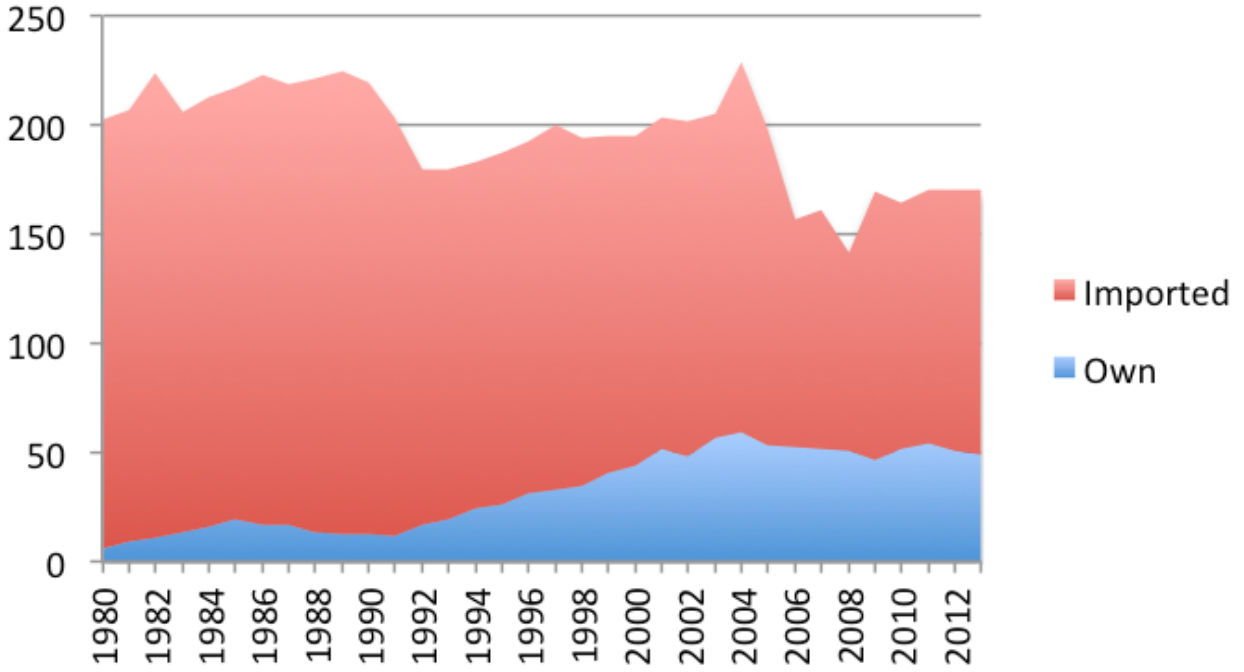
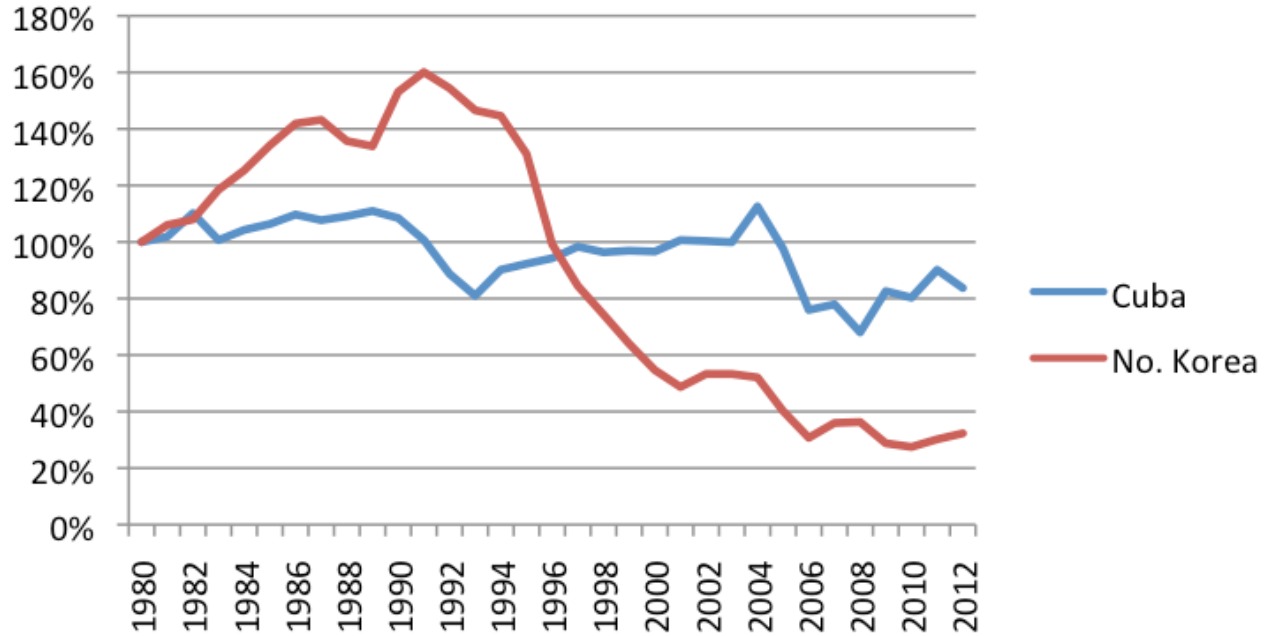
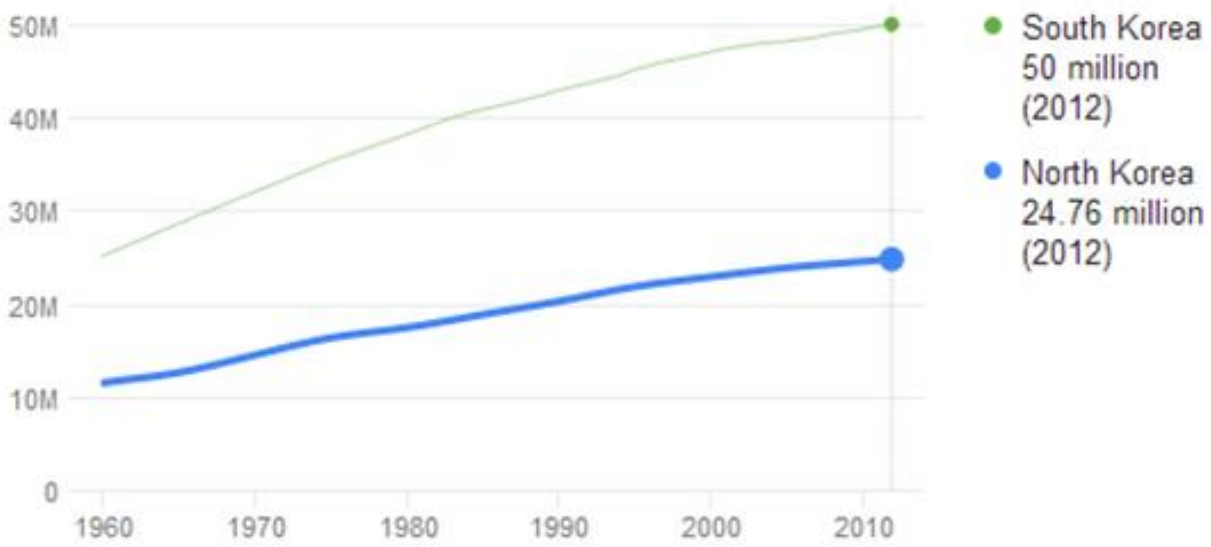


Fig. 63. Cuban and North Korean Oil Consumption, 1980-2012[671]
(% of 1980 consumption)



[670] Fig. 62. Cuban Oil Consumption by Source, 1980-2013. Graph adapted from: Gail Tverberg, "Cuba: Figuring Out Pieces of the Puzzle (Full Text)" *Our Finite World* (May 26, 2015), http://ourfiniteworld.com/.
[671] Fig. 63. Cuban and North Korean Oil Consumption, 1980-2012. Graph adapted from: Gail Tverberg, "The Real Oil Extraction Limit, and How It Affects the Downslope" *Our Finite World* (Dec. 18, 2013), http://ourfiniteworld.com/;

Fig. 63. Cuban and North Korean Oil Consumption, 1980-2012[672]
(% change *per annum*)



SECTION II: TABLES

Table 1. Doubling Time of Exponential Growth[673]

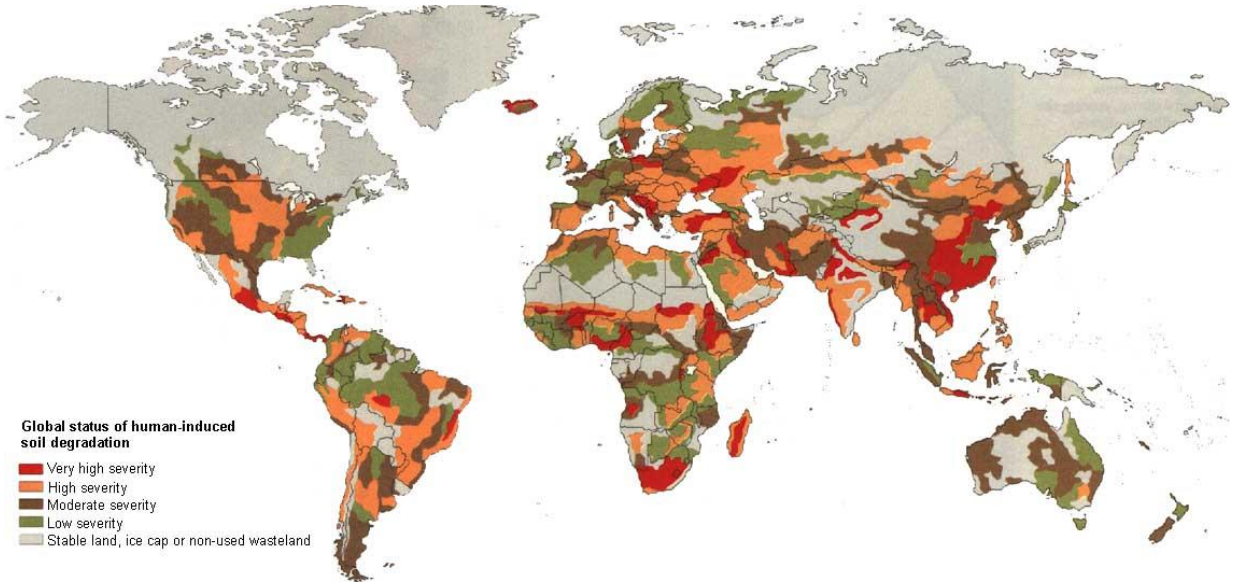
*Growth Rate (*per cent per annum*)*	*Approximate Doubling Time (years)*
1	72
2	36
3	24
4	18
5	14
6	12
7	10
8	9
9	8
10	7

[672] Fig. 63. Cuban and North Korean Oil Consumption, 1980-2012. Graph adapted from: Gail Tverberg, "The Real Oil Extraction Limit, and How It Affects the Downslope" *Our Finite World* (Dec. 18, 2013), http://ourfiniteworld.com/;
[673] Table 1. Doubling Time of Exponential Growth. Data from: Donella H. Meadows, Jorgen Randers, Dennis Meadows and William Behrens III, *The Limits to Growth: The 30-year Update* (New York: Earthscan, 2005), 23.

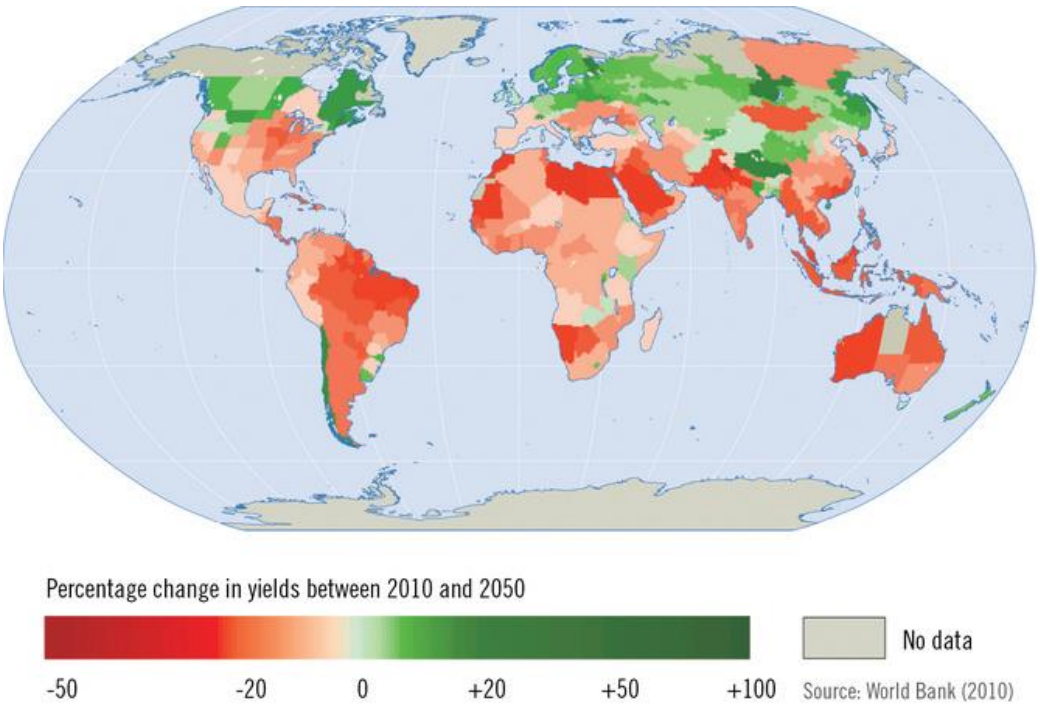
SECTION III

MAPS

Map 1. Global Status of Human-Induced Soil Degradation[674]



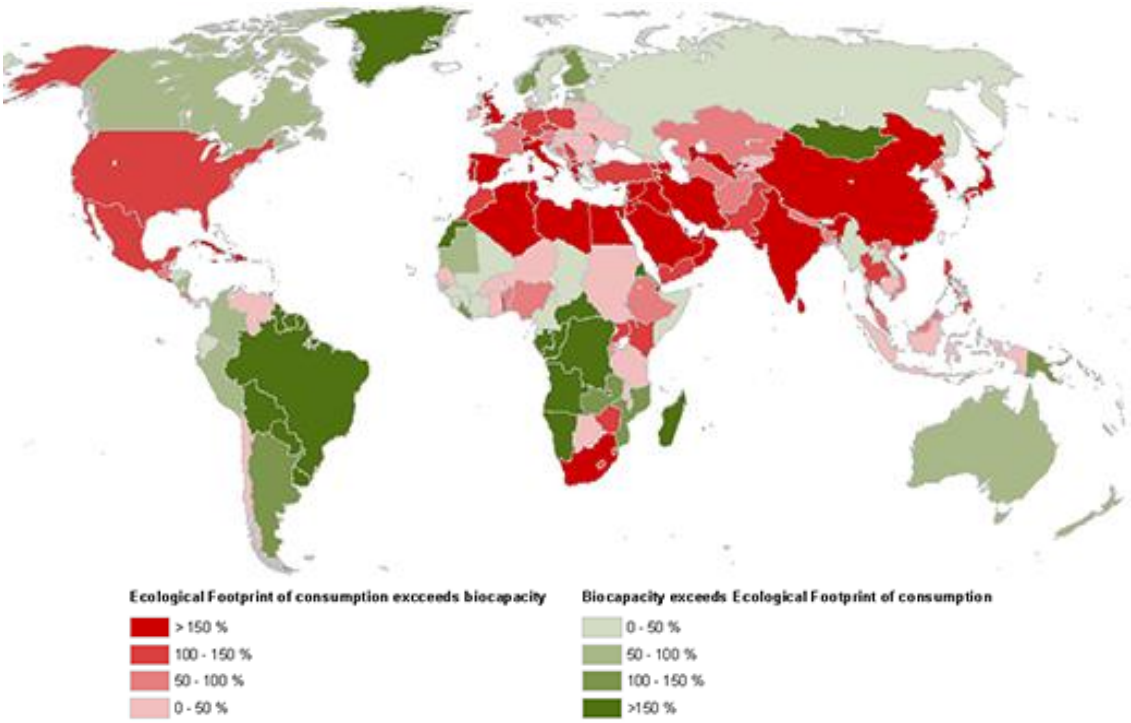
Map 2. Percentage Change in Global Agricultural Output, 2010-50[675]



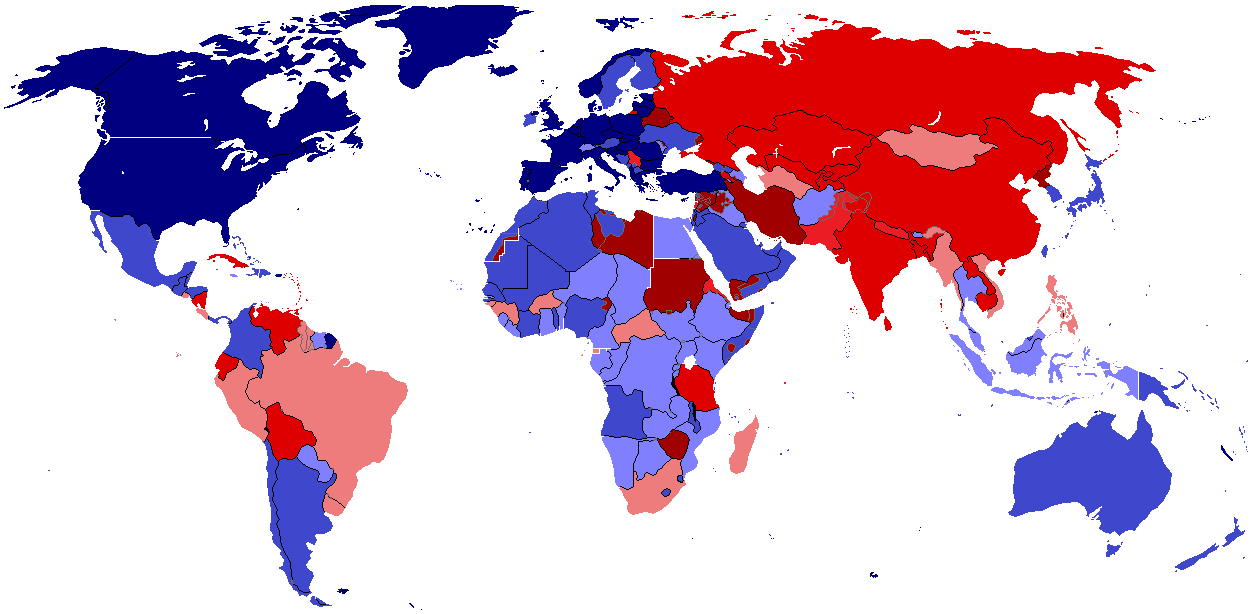
[674] Map 1. Global Status of Human-Induced Soil Degradation. Map from: --, "Dimensions of need − An atlas of food and agriculture" Agriculture and Consumer Protection Department, Food and Agriculture Organization of the United Nations, Corporate Document Repository (2017), http://www.fao.org/.

[675] Map 2. Percentage Change in Global Agricultural Output, 2010-50. Map from: --, "World Development Report 2010: Development and Climate Change" *The World Bank* (2010): 6, http://siteresources.worldbank.org/.

Map 3. National Ecological Footprints and the Global Biocapacity[676]



Map 4. Cold War II, 2017[677]



Note: royal blue: closest US allies (*i.e.*, NATO/EU, *etc.*); deep blue: close US allies (*i.e.*, top non-NATO allies, *etc.*); light blue: US-aligned; red: Russia- and China-aligned (*i.e.*, SCO, CSTO, ALBA, *etc.*); salmon: non-US aligned (*i.e.*, BRICS, *etc.*); maroon: rogue or pariah states and non-state actors.

[676] Map 3. National Ecological Footprints and the Global Biocapacity. Map from: --, "Ecological Deficit/Reserve" *Global Footprint Network* (2016), http://www.footprintnetwork.org/.

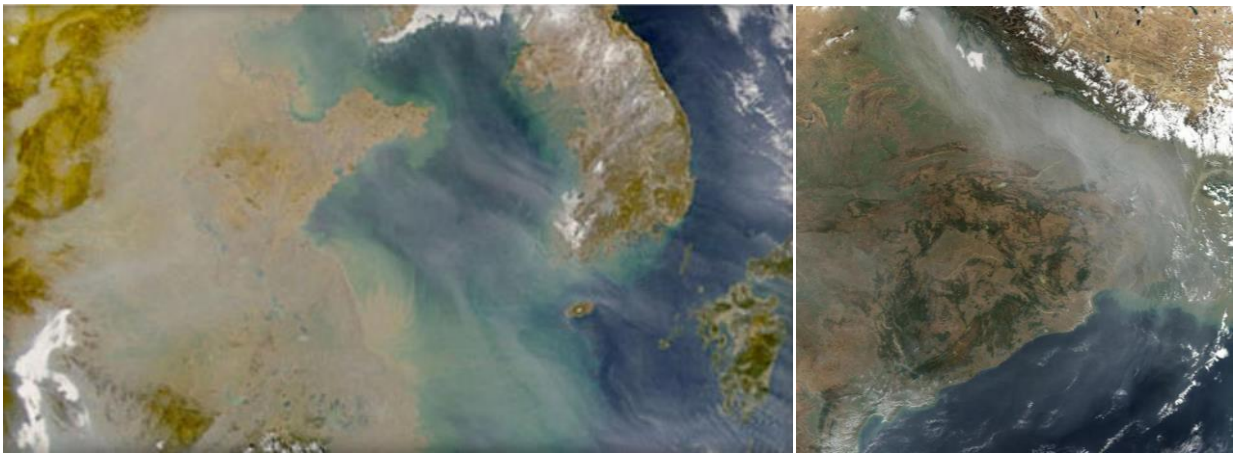
[677] Map 4. Cold War II, 2017. Self-made (Feb. 7, 2017). Map adapted from: --, "Blank map of World with country borders" Wikimedia Commons (Jul. 13, 2010), http://commons.wikimedia.org/.

SECTION IV

PHOTOGRAPHS

Photograph 1. Arctic Haze[678]

Photographs 2-3. The Asian Brown Cloud[679]
(left: East Asia; right: the Bay of Bengal)



[678] Photograph 1. Arctic Haze. Photograph by: J. Cozic, "Photos: NASA P3B Intercomparison" *U.S. Department of Commerce*, National Oceanic & Atmospheric Administration, Earth System Research Laboratory: Chemical Sciences Division (2008), http://www.esrl.noaa.gov/.

[679] Photographs 2-3. The Asian Brown Cloud. Left photograph from: Lloyd Vries, "'Brown Cloud' Stifles Asia" *CBS News* (Aug. 12, 2002), http://www.cbsnews.com/. Right photograph from: Sid Perkins, "'Asian Brown Cloud' Threatens U.S." *Science* (May 25, 2012), http://www.sciencemag.org/.

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