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WHO WILL BUILD THE ARK?

WHAT FOLLOWS IS rather like the famous courtroom scene in Orson Welles's *The Lady from Shanghai* (1947).¹ In that noir allegory of proletarian virtue in the embrace of ruling-class decadence, Welles plays a leftwing sailor named Michael O'Hara who rolls in the hay with *femme fatale* Rita Hayworth, and then gets framed for murder. Her husband, Arthur Bannister, the most celebrated criminal lawyer in America, played by Everett Sloane, convinces O'Hara to appoint him as his defence, all the better to ensure his rival's conviction and execution. At the turning point in the trial, decried by the prosecution as 'yet another of the great Bannister's famous tricks', Bannister the attorney calls Bannister the aggrieved husband to the witness stand and interrogates himself in rapid schizoid volleys, to the mirth of the jury. In the spirit of *Lady from Shanghai*, this essay is organized as a debate with myself, a mental tournament between analytic despair and utopian possibility that is personally, and probably objectively, irresolvable.

In the first section, 'Pessimism of the Intellect', I adduce arguments for believing that we have already lost the first, epochal stage of the battle against global warming. The Kyoto Protocol, in the smug but sadly accurate words of one of its chief opponents, has done 'nothing measurable' about climate change. Global carbon dioxide emissions rose by the same amount they were supposed to fall because of it.² It is highly unlikely that greenhouse gas accumulation can be stabilized this side of the famous 'red line' of 450 ppm by 2020. If this is the case, the most heroic efforts of our children's generation will be unable to forestall a radical reshaping of ecologies, water resources and agricultural systems. In a warmer world, moreover, socio-economic inequality will have a meteorological mandate, and there will be little incentive for the rich northern hemisphere countries, whose carbon emissions have

destroyed the climate equilibrium of the Holocene, to share resources for adaptation with those poor subtropical countries most vulnerable to droughts and floods.

The second part of the essay, 'Optimism of the Imagination', is my self-rebuttal. I appeal to the paradox that the single most important cause of global warming—the urbanization of humanity—is also potentially the principal solution to the problem of human survival in the later twenty-first century. Left to the dismal politics of the present, of course, cities of poverty will almost certainly become the coffins of hope; but all the more reason that we must start thinking like Noah. Since most of history's giant trees have already been cut down, a new Ark will have to be constructed out of the materials that a desperate humanity finds at hand in insurgent communities, pirate technologies, bootlegged media, rebel science and forgotten utopias.

I. PESSIMISM OF THE INTELLECT

Our old world, the one that we have inhabited for the last 12,000 years, has ended, even if no newspaper has yet printed its scientific obituary. The verdict is that of the Stratigraphy Commission of the Geological Society of London. Founded in 1807, the Society is the world's oldest association of earth scientists, and its Stratigraphy Commission acts as a college of cardinals in the adjudication of the geological time-scale. Stratigraphers slice up Earth's history as preserved in sedimentary strata into a hierarchy of eons, eras, periods and epochs, marked by the 'golden spikes' of mass extinctions, speciation events or abrupt changes in atmospheric chemistry. In geology, as in biology and history, periodization is a complex, controversial art; the most bitter feud in nineteenth-century British science—still known as the 'Great Devonian Controversy'—was fought over competing interpretations of homely Welsh greywackes and English Old Red Sandstone. As a result, Earth science sets extraordinarily rigorous standards for the beatification of any new geological division. Although the idea of an 'Anthropocene' epoch—defined by the emergence of urban-industrial society as a geological force—has long circulated in the literature, stratigraphers have never acknowledged its warrant.

¹ This paper was given as a talk at the UCLA Center for Social Theory and Comparative History in January 2009.

² The Cato Institute's execrable Patrick Michaels in the *Washington Times*, 12 February 2005.

At least for the London Society, that position has now been revised. To the question, 'Are we now living in the Anthropocene?', the twenty-one members of the Commission have unanimously answered 'yes'. In a 2008 report they marshalled robust evidence to support the hypothesis that the Holocene epoch—the interglacial span of unusually stable climate that allowed the rapid evolution of agriculture and urban civilization—has ended, and that the Earth has now entered 'a stratigraphic interval without close parallel' in the last several million years.³ In addition to the build-up of greenhouse gases, the stratigraphers cited human landscape transformation, which 'now exceeds [annual] natural sediment production by an order of magnitude', the ominous acidification of the oceans, and the relentless destruction of biota.

This new age, they explained, is defined both by the heating trend—whose closest analogue may be the catastrophe known as the Paleocene Eocene Thermal Maximum, 56 million years ago—and by the radical instability expected of future environments. In sombre prose, they warned:

The combination of extinctions, global species migrations and the widespread replacement of natural vegetation with agricultural monocultures is producing a distinctive contemporary biostratigraphic signal. These effects are permanent, as future evolution will take place from surviving (and frequently anthropogenically relocated) stocks.⁴

Evolution itself, in other words, has been forced into a new trajectory.

Spontaneous decarbonization?

The Commission's recognition of the Anthropocene coincided with growing scientific controversy over the Fourth Assessment Report issued by the Intergovernmental Panel on Climate Change. The IPCC, of course, is mandated to assess the possible range of climate change and establish appropriate targets for the mitigation of emissions. The most critical baselines include estimates of 'climate sensitivity' to increasing accumulations of greenhouse gas, as well as socio-economic tableaux that configure different futures of energy use and thus of emissions. But an impressive number of senior researchers, including key participants in the IPCC's own working groups, have recently expressed unease or disagreement

³ Jan Zalasiewicz et al., 'Are We Now Living in the Anthropocene?', *GSA Today*, vol. 18, no. 2, February 2008.

⁴ Zalasiewicz, 'Are We Now Living in the Anthropocene?'

with the methodology of the four-volume Fourth Assessment, which they charge is unwarrantedly optimistic in its geophysics and social science.⁵

The most celebrated dissenter is James Hansen from NASA's Goddard Institute. The Paul Revere of global warming who first warned Congress of the greenhouse peril in a famous 1988 hearing, he returned to Washington with the troubling message that the IPCC, through its failure to parameterize crucial Earth-system feedbacks, has given far too much leeway to further carbon emissions. Instead of the IPCC's proposed red line of 450 ppm carbon dioxide, his research team found compelling paleoclimatic evidence that the threshold of safety was only 350 ppm or even less. The 'stunning corollary' of this recalibration of climate sensitivity, he testified, is that 'the oft-stated goal of keeping global warming below two degrees Celsius is a recipe for global disaster, not salvation'.⁶ Indeed, since the current level is about 385 ppm, we may already be past the notorious 'tipping point'. Hansen has mobilized a Quixotic army of scientists and environmental activists to save the world via an emergency carbon tax, which would reverse greenhouse concentrations to pre-2000 levels by 2015.

I do not have the scientific qualifications to express an opinion on the Hansen controversy, or the proper setting on the planetary thermostat. Anyone, however, who is engaged with the social sciences or simply pays regular attention to macro-trends should feel less shy about joining the debate over the other controversial cornerstone of the Fourth Assessment: its socio-economic projections and what we might term their 'political unconscious'. The current scenarios were adopted by the IPCC in 2000 to model future global emissions based on different 'storylines' about population growth as well as technological and economic development. The Panel's major scenarios—the A1 family, the B2, and so on—are well known to policymakers and greenhouse activists, but few outside the research community have actually read the fine print, particularly the IPCC's heroic confidence that greater energy efficiency will be an 'automatic' by-product of future economic growth. Indeed all the scenarios, even the 'business as usual' variants, assume that almost 60 per cent of

⁵ Indeed, three leading contributors to Working Group 1 charged that the Report deliberately understated the risks of sea-level rise and ignored new research on instability in the Greenland and West Antarctic ice sheets. See the debate in 'Letters', *Science* 319, 25 January 2008, pp. 409–10.

⁶ James Hansen, 'Global Warming Twenty Years Later: Tipping Point Near', Testimony before Congress, 23 June 2008.

future carbon reduction will occur independently of explicit greenhouse mitigation measures.⁷

The IPCC, in effect, has bet the ranch, or rather the planet, on a market-driven evolution toward a post-carbon world economy: a transition that requires not only international emissions caps and carbon trading, but also voluntary corporate commitments to technologies that hardly exist even in prototype, such as carbon capture, clean coal, hydrogen and advanced transit systems, and cellulosic biofuels. As critics have long pointed out, in many of its ‘scenarios’ the deployment of non-carbon-emitting energy-supply systems ‘exceeds the size of the global energy system in 1990.’⁸

Kyoto-type accords and carbon markets are designed—almost as analogues to Keynesian ‘pump-priming’—to bridge the shortfall between spontaneous decarbonization and the emissions targets required by each scenario. Although the IPCC never spells it out, its mitigation targets necessarily presume that windfall profits from higher fossil-fuel prices over the next generation will be efficiently recycled into renewable energy technology and not wasted on mile-high skyscrapers, asset bubbles and mega-payouts to shareholders. Overall, the International Energy Agency estimates that it will cost about \$45 trillion to halve greenhouse gas output by 2050.⁹ But without the large quotient of ‘automatic’ progress in energy efficiency, the bridge will never be built, and IPCC goals will be unachievable; in the worst case—the straightforward extrapolation of current energy use—carbon emissions could easily triple by mid-century.

Critics have cited the dismal carbon record of the last—lost—decade to demonstrate that the IPCC baseline assumptions about markets and technology are little more than leaps of faith. Despite the EU’s much-praised adoption of a cap-and-trade system, European carbon emissions continued to rise, dramatically in some sectors. Likewise there has been scant evidence in recent years of the automatic progress in energy efficiency

⁷ Scientific Committee on Problems of the Environment (SCOPE), *The Global Carbon Cycle*, Washington, DC 2004, pp. 77–82; and IPCC, *Climate Change 2007: Mitigation of Climate Change: Contribution of Working Group III to the Fourth Assessment Report*, Cambridge 2007, pp. 172 and 218–24.

⁸ SCOPE, *The Global Carbon Cycle*, p. 82.

⁹ International Energy Agency, *Energy Technology Perspectives: In support of the G8 Plan of Action—Executive Summary*, Paris 2008, p. 3.

that is the *sine qua non* of IPCC scenarios. Much of what the storylines depict as the efficiency of new technology has in fact been the result of the closing down of heavy industries in the United States, Europe and the ex-Soviet bloc. The relocation of energy-intensive production to East Asia burnishes the carbon balance-sheets of some OECD countries but deindustrialization should not be confused with spontaneous decarbonization. Most researchers believe that energy intensity has actually risen since 2000; that is, global carbon dioxide emissions have kept pace with, or even grown marginally faster than, energy use.¹⁰

Return of King Coal

Moreover the IPCC carbon budget has already been broken. According to the Global Carbon Project, which keeps the accounts, emissions have been rising faster than projected even in the IPCC's worst-case scenario. From 2000 to 2007, carbon dioxide rose by 3.5 per cent annually, compared with the 2.7 per cent in IPCC projections, or the 0.9 per cent recorded during the 1990s.¹¹ We are already outside the IPCC envelope, in other words, and coal may be largely to blame for this unforeseen acceleration of greenhouse emissions. Coal production has undergone a dramatic renaissance over the last decade, as nightmares of the 19th century return to haunt the 21st. In China 5 million miners toil under dangerous conditions to extract the dirty mineral that reportedly allows Beijing to open a new coal-fuelled power station each week. Coal consumption is also booming in Europe, where 50 new coal-fuelled plants are scheduled to open over the next few years,¹² and North America, where 200 plants are planned. A giant plant under construction in West Virginia will generate carbon equivalent to the exhaust of one million cars.

In a commanding study of *The Future of Coal*, MIT engineers concluded that usage would increase under any foreseeable scenario, even in the face of high carbon taxes. Investment in CCS technology—carbon-capture and sequestration—is, moreover, ‘completely inadequate’; even assuming it is actually practical, CCS would not become a utility-scale alternative until

¹⁰ Josep Canadell et al., ‘Contributions to Accelerating Atmospheric CO₂ Growth’, *Proceedings of the National Academy of Sciences* 104, 20 November 2007, pp. 18,866–70.

¹¹ Global Carbon Project, *Carbon Budget 2007*, p. 10.

¹² Elisabeth Rosenthal, ‘Europe Turns Back to Coal, Raising Climate Fears’, *New York Times*, 23 April 2008.

2030 or later. In the United States, ‘green energy’ legislation has only created a ‘perverse incentive’ for utilities to build more coal-fired plants in the ‘expectation that emissions from these plants would potentially be “grandfathered” by the grant of free CO₂ allowances as part of future carbon emission regulations.’¹³ Meanwhile a consortium of coal producers, coal-burning utilities and coal-hauling railroads—calling themselves the American Coalition for Clean Coal Electricity—spent \$40 million over the 2008 election cycle to ensure that both presidential candidates sang in unison about the virtues of the dirtiest but cheapest fuel.

Largely because of the popularity of coal, a fossil fuel with a proven 200-year supply, the carbon content per unit of energy may actually rise.¹⁴ Before the American economy collapsed, the US Energy Department was projecting an increase of national energy production by at least 20 per cent over the next generation. Globally the total consumption of fossil fuels is predicted to rise by 55 per cent, with international oil exports doubling in volume. The UN Development Programme, which has made its own study of sustainable energy goals, warns that it will require a 50 per cent cut in greenhouse gas emissions worldwide by 2050, against 1990 levels, to keep humanity outside the red zone of runaway warming.¹⁵ Yet the International Energy Agency predicts that, in all likelihood, such emissions will actually increase over the next half-century by nearly 100 per cent—enough greenhouse gas to propel us past several critical tipping points. The IEA also projects that renewable energy, apart from hydropower, will provide only 4 per cent of electricity generation in 2030—up from 1 per cent today.¹⁶

A green recession?

The current world recession—a non-linear event of the kind that IPCC scenarists ignore in their storylines—may provide a temporary respite, particularly if depressed oil prices delay the opening of the Pandora’s box of new mega-carbon reservoirs such as tar sands and oil shales. But the slump is unlikely to slow the destruction of the Amazon rainforest

¹³ Stephen Ansolabehere et al., *The Future of Coal*, Cambridge, MA 2007, p. xiv.

¹⁴ Pew Center on Global Climate Change, quoted in Matthew Wald, ‘Coal, a Tough Habit to Kick’, *New York Times*, 25 September 2008.

¹⁵ UN *Human Development Report 2007/2008: Fighting Climate Change: Human Solidarity in a Divided World*, p. 7.

¹⁶ IEA report quoted in *Wall Street Journal*, 7 November 2008.

because Brazilian farmers will rationally seek to defend gross incomes by expanding production. And because electricity demand is less elastic than automobile use, the share of coal in carbon emissions will continue to increase. In the United States, in fact, coal production is one of the few civilian industries that is currently hiring rather than laying off workers. More importantly, falling fossil-fuel prices and tight credit markets are eroding entrepreneurial incentives to develop capital-intensive wind and solar alternatives. On Wall Street, eco-energy stocks have slumped faster than the market as a whole and investment capital has virtually disappeared, leaving some of the most celebrated clean-energy start-ups, like Tesla Motors and Clear Skies Solar, in danger of sudden crib death. Tax credits, as advocated by Obama, are unlikely to reverse this green depression. As one venture capital manager told the *New York Times*, ‘natural gas at \$6 makes wind look like a questionable idea and solar power unfathomably expensive’.¹⁷

Thus the economic crisis provides a compelling pretext for the groom once again to leave the bride at the altar, as major companies default on their public commitments to renewable energy. In the United States, Texas billionaire T. Boone Pickens has downscaled a scheme to build the world’s largest wind farm, while Royal Dutch Shell has dropped its plan to invest in the London Array. Governments and ruling parties have been equally avid to escape their carbon debts. The Canadian Conservative Party, supported by Western oil and coal interests, defeated the Liberals’ ‘Green Shift’ agenda based on a national carbon tax in 2007, just as Washington scrapped its major carbon-capture technology initiative.

On the supposedly greener side of the Atlantic, the Berlusconi regime—which is in the process of converting Italy’s grid from oil to coal—denounced the EU goal of cutting emissions by 20 per cent by 2020 as an ‘unaffordable sacrifice’; while the German government, in the words of the *Financial Times*, ‘dealt a severe blow to the proposal to force companies to pay for the carbon dioxide they emit’ by backing an almost total exemption for industry. ‘This crisis changes priorities’, explained a sheepish German foreign minister.¹⁸ Pessimism now abounds. Even Yvo de Boer, Director of the UN Framework Convention on Climate Change,

¹⁷ Clifford Krauss, ‘Alternative Energy Suddenly Faces Headwinds’, *New York Times*, 21 October 2008.

¹⁸ Peggy Hollinger, ‘EU Needs Stable Energy Policy, EDF Warns’, *Financial Times*, 5 October 2008.

concedes that, as long as the economic crisis persists, ‘most sensible governments will be reluctant to impose new costs on [industry] in the form of carbon-emissions caps.’ So even if invisible hands and interventionist leaders can restart the engines of economic growth, they are unlikely to be able to turn down the global thermostat in time to prevent runaway climate change. Nor should we expect that the G7 or the G20 will be eager to clean up the mess they have made.¹⁹

Ecological inequalities

Climate diplomacy based on the Kyoto–Copenhagen template assumes that, once the major actors have accepted the consensus science in the IPCC reports, they will recognize an overriding common interest in gaining control over the greenhouse effect. But global warming is not H. G. Wells’s *War of the Worlds*, where invading Martians democratically annihilate humanity without class or ethnic distinction. Climate change, instead, will produce dramatically unequal impacts across regions and social classes, inflicting the greatest damage upon poor countries with the fewest resources for meaningful adaptation. This geographical separation of emission source from environmental consequence undermines pro-active solidarity. As the UN Development Programme has emphasized, global warming is above all a threat to the poor and the unborn, the ‘two constituencies with little or no political voice’.²⁰ Coordinated global action on their behalf thus presupposes either their revolutionary empowerment—a scenario not considered by the IPCC—or the transmutation of the self-interest of rich countries and classes into an enlightened ‘solidarity’ with little precedent in history.

From a rational-actor perspective, the latter outcome only seems realistic if it can be shown that privileged groups possess no preferential ‘exit’

¹⁹ The shameful charade in Copenhagen, crowned by Obama’s desperate deceit of an agreement, exposed less the political gulf between nations than the moral abyss between governments and humanity. In the meantime, the famous 2°C of additional warming, which president and premier have vowed to prevent, is already working its way through the world ocean: a future that will happen even if all carbon emissions ceased tomorrow. (On ‘committed’ warming and the underlying illusion of Copenhagen, see the harrowing, if awkwardly titled article by Scripps Institution researchers V. Ramanathan and Y. Feng: ‘On Avoiding Dangerous Anthropogenic Interference with the Climate System: Formidable Challenges Ahead’, *Proceedings of the National Academy of Science* 105, 23 September 2008, pp. 14,245–50.)

²⁰ *UN Human Development Report 2007/2008*, p. 6.

option, that internationalist public opinion drives policy-making in key countries and that greenhouse gas mitigation can be achieved without major sacrifices in northern hemispheric standards of living—none of which seem likely. Moreover, there is no shortage of eminent apologists, like Yale economists William Nordhaus and Robert Mendelsohn, ready to explain that it makes more sense to defer abatement until poorer countries become richer and thus more capable of bearing the costs themselves. In other words, instead of galvanizing heroic innovation and international cooperation, growing environmental and socio-economic turbulence may simply drive elite publics into more frenzied attempts to wall themselves off from the rest of humanity. Global mitigation, in this unexplored but not improbable scenario, would be tacitly abandoned—as, to some extent, it already has been—in favour of accelerated investment in selective adaptation for Earth’s first-class passengers. The goal would be the creation of green and gated oases of permanent affluence on an otherwise stricken planet.

Of course, there would still be treaties, carbon credits, famine relief, humanitarian acrobatics, and perhaps the full-scale conversion of some European cities and small countries to alternative energy. But worldwide adaptation to climate change, which presupposes trillions of dollars of investment in the urban and rural infrastructures of poor and medium-income countries, as well as the assisted migration of tens of millions of people from Africa and Asia, would necessarily command a revolution of almost mythic magnitude in the redistribution of income and power. Meanwhile we are speeding toward a fateful rendezvous around 2030, or even earlier, when the convergent impacts of climate change, peak oil, peak water, and an additional 1.5 billion people on the planet will produce negative synergies probably beyond our imagination.

The fundamental question is whether rich countries will ever actually mobilize the political will and economic resources to achieve IPCC targets, or help poorer countries adapt to the inevitable, already ‘committed’ quotient of global warming. More vividly: will the electorates of the wealthy nations shed their current bigotry and walled borders to admit refugees from predicted epicentres of drought and desertification—the Maghreb, Mexico, Ethiopia and Pakistan? Will Americans, the most miserly people when measured by per capita foreign aid, be willing to tax themselves to help relocate the millions likely to be flooded out of densely settled mega-delta regions like Bangladesh? And will North

American agribusiness, the likely beneficiary of global warming, voluntarily make world food security, not profit-taking in a seller's market, its highest priority?

Market-oriented optimists, of course, will point to demonstration-scale carbon-offset programmes like the Clean Development Mechanism which, they claim, will ensure green investment in the Third World. But the impact of CDM is thus far negligible; it subsidizes small-scale reforestation and the scrubbing of industrial emissions rather than fundamental investment in domestic and urban use of fossil fuels. Moreover, the standpoint of the developing world is that the North should acknowledge the environmental disaster it has created and take responsibility for cleaning it up. Poor countries rightly rail against the notion that the greatest burden of adjustment to the Anthropocene epoch should fall on those who have contributed least to carbon emissions and drawn the slightest benefits from two centuries of industrial revolution. A recent assessment of the environmental costs of economic globalization since 1961—in deforestation, climate change, overfishing, ozone depletion, mangrove conversion and agricultural expansion—found that the richest countries had generated 42 per cent of environmental degradation across the world, while shouldering only 3 per cent of the resulting costs.²¹

The radicals of the South will rightly point to another debt as well. For thirty years, cities in the developing world have grown at breakneck speed without counterpart public investments in infrastructure, housing or public health. In part this has been the result of foreign debts contracted by dictators, with payments enforced by the IMF, and public spending downsized or redistributed by the World Bank's 'structural adjustment' agreements. This planetary deficit of opportunity and social justice is summarized by the fact that more than one billion people, according to UN Habitat, currently live in slums and that their number is expected to double by 2030. An equal number, or more, forage in the so-called informal sector—a first-world euphemism for mass unemployment. Sheer demographic momentum, meanwhile, will increase the world's urban population by 3 billion people over the next forty years, 90 per cent of whom will be in poor cities. No one—not the UN, the World Bank, the G20: no one—has a clue how a planet of slums with growing food and

²¹ U. Srinivasan et al, 'The Debt of Nations and the Distribution of Ecological Impacts from Human Activities', *Proceedings of the National Academy of Science* 105, 5 February 2008, pp. 1,768–73.

energy crises will accommodate their biological survival, much less their aspirations to basic happiness and dignity.

The most sophisticated research to date into the likely impacts of global warming on tropical and semi-tropical agriculture is summarized in William Cline's country-by-country study, which couples climate projections to crop process and neo-Ricardian farm-output models, allowing for various levels of carbon-dioxide fertilization, to look at possible futures for human nutrition. The view is grim. Even in Cline's most optimistic simulations, the agricultural systems of Pakistan (minus 20 per cent of current farm output) and Northwestern India (minus 30 per cent) are likely devastated, along with much of the Middle East, the Maghreb, the Sahel belt, parts of Southern Africa, the Caribbean and Mexico. Twenty-nine developing countries, according to Cline, stand to lose 20 per cent or more of their current farm output to global warming, while agriculture in the already rich North is likely to receive, on average, an 8 per cent boost.²²

This potential loss of agricultural capacity in the developing world is even more ominous in the context of the UN warning that a doubling of food production will be necessary to sustain the earth's mid-century population. The 2008 food affordability crisis, aggravated by the biofuel boom, is only a modest portent of the chaos that could soon grow from the convergence of resource depletion, intractable inequality and climate change. In face of these dangers, human solidarity itself may fracture like a West Antarctic ice shelf, and shatter into a thousand shards.

2. OPTIMISM OF THE IMAGINATION

Scholarly research has come late in the day to confront the synergistic possibilities of peak population growth, agricultural collapse, abrupt climate change, peak oil and, in some regions, peak water, and the accumulated penalties of urban neglect. If investigations by the German government, Pentagon and CIA into the national-security implications of a multiply determined world crisis in the coming decades have had a Hollywoodish ring, it is hardly surprising. As a recent UN Human Development Report observed: "There are no obvious historical analogies

²² William Cline, *Global Warming and Agriculture: Impact Estimates by Country*, Washington, DC 2007, pp. 67–71, 77–8.

for the urgency of the climate change problem.’²³ While paleoclimatology can help scientists anticipate the non-linear physics of a warming Earth, there is no historical precedent or vantage point for understanding what will happen in the 2050s when a peak species population of 9 to 11 billion struggles to adapt to climate chaos and depleted fossil energy. Almost any scenario, from the collapse of civilization to a new golden age of fusion power, can be projected on the strange screen of our grandchildren’s future.

We can be sure, however, that cities will remain the ground zero of convergence. Although forest clearance and export monocultures have played fundamental roles in the transition to a new geological epoch, the prime mover has been the almost exponential increase in the carbon footprints of urban regions in the northern hemisphere. Heating and cooling the urban built environment alone is responsible for an estimated 35 to 45 per cent of current carbon emissions, while urban industries and transportation contribute another 35 to 40 per cent. In a sense, city life is rapidly destroying the ecological niche—Holocene climate stability—which made its evolution into complexity possible.

Yet there is a striking paradox here. What makes urban areas so environmentally unsustainable are precisely those features, even in the largest megacities, that are most anti-urban or sub-urban. First among these is massive horizontal expansion, which combines the degradation of vital natural services—aquifers, watersheds, truck farms, forests, coastal eco-systems—with the high costs of providing infrastructure to sprawl. The result is grotesquely oversized environmental footprints, with a concomitant growth of traffic and air pollution and, most often, the downstream dumping of waste. Where urban forms are dictated by speculators and developers, bypassing democratic controls over planning and resources, the predictable social outcomes are extreme spatial segregation by income or ethnicity, as well as unsafe environments for children, the elderly and those with special needs; inner-city development is conceived as gentrification through eviction, destroying working-class urban culture in the process. To these we may add the socio-political features of the megapolis under conditions of capitalist globalization: the growth of peripheral slums and informal employment, the privatization of public space, low-intensity warfare between police

²³ *UN Human Development Report 2007/2008*, p. 6.

and subsistence criminals, and bunkering of the wealthy in sterilized historical centres or walled suburbs.

By contrast, those qualities that are most ‘classically’ urban, even on the scale of small cities and towns, combine to generate a more virtuous circle. Where there are well-defined boundaries between city and countryside, urban growth can preserve open space and vital natural systems, while creating environmental economies of scale in transportation and residential construction. Access to city centres from the periphery becomes affordable and traffic can be regulated more effectively. Waste is more easily recycled, not exported downstream. In classic urban visions, public luxury replaces privatized consumption through the socialization of desire and identity within collective urban space. Large domains of public or non-profit housing reproduce ethnic and income heterogeneity at fractal scales throughout the city. Egalitarian public services and cityscapes are designed with children, the elderly and those with special needs in mind. Democratic controls offer powerful capacities for progressive taxation and planning, with high levels of political mobilization and civic participation, the priority of civic memory over proprietary icons and the spatial integration of work, recreation and home life.

The city as its own solution

Such sharp demarcations between ‘good’ and ‘bad’ features of city life are redolent of famous twentieth-century attempts to distil a canonical urbanism or anti-urbanism: Lewis Mumford and Jane Jacobs, Frank Lloyd Wright and Walt Disney, Corbusier and the CIAM manifesto, the ‘New Urbanism’ of Andrés Duany and Peter Calthorpe, and so on. But no one needs urban theorists to have eloquent opinions about the virtues and vices of built environments and the kinds of social interactions they foster or discourage. What often goes unnoticed in such moral inventories, however, is the consistent affinity between social and environmental justice, between the communal ethos and a greener urbanism. Their mutual attraction is magnetic, if not inevitable. The conservation of urban green spaces and waterscapes, for example, serves simultaneously to preserve vital natural elements of the urban metabolism while providing leisure and cultural resources for the popular classes. Reducing suburban gridlock with better planning and more public transit turns traffic sewers back into neighbourhood streets while reducing greenhouse emissions.

There are innumerable examples and they all point toward a single unifying principle: namely, that the cornerstone of the low-carbon city, far more than any particular green design or technology, is the priority given to public affluence over private wealth. As we all know, several additional Earths would be required to allow all of humanity to live in a suburban house with two cars and a lawn, and this obvious constraint is sometimes evoked to justify the impossibility of reconciling finite resources with rising standards of living. Most contemporary cities, in rich countries or poor, repress the potential environmental efficiencies inherent in human-settlement density. The ecological genius of the city remains a vast, largely hidden power. But there is no planetary shortage of ‘carrying capacity’ if we are willing to make democratic public space, rather than modular, private consumption, the engine of sustainable equality. Public affluence—represented by great urban parks, free museums, libraries and infinite possibilities for human interaction—represents an alternative route to a rich standard of life based on Earth-friendly sociality. Although seldom noticed by academic urban theorists, university campuses are often little quasi-socialist paradises around rich public spaces for learning, research, performance and human reproduction.

The utopian ecological critique of the modern city was pioneered by socialists and anarchists, beginning with Guild Socialism’s dream—inspired by the bio-regionalist ideas of Kropotkin, and later Geddes—of garden cities for re-artisanized English workers, and ending with the bombardment of the Karl Marx-Hof, Red Vienna’s great experiment in communal living, during the Austrian Civil War in 1934. In between are the invention of the kibbutz by Russian and Polish socialists, the modernist social housing projects of the Bauhaus, and the extraordinary debate over urbanism conducted in the Soviet Union during the 1920s. This radical urban imagination was a victim of the tragedies of the 1930s and 1940s. Stalinism, on the one hand, veered toward a monumentalism in architecture and art, inhumane in scale and texture, that was little different from the Wagnerian hyperboles of Albert Speer in the Third Reich. Postwar social democracy, on the other hand, abandoned alternative urbanism for a Keynesian mass-housing policy that emphasized economies of scale in high-rise projects on cheap suburban estates, and thereby uprooted traditional working-class urban identities.

Yet the late nineteenth and early twentieth century conversations about the ‘socialist city’ provide invaluable starting points for thinking

about the current crisis. Consider, for example, the Constructivists. El Lissitzky, Melnikov, Leonidov, Golosov, the Vesnin brothers and other brilliant socialist designers—constrained as they were by early Soviet urban misery and a drastic shortage of public investment—proposed to relieve congested apartment life with splendidly designed workers' clubs, people's theatres and sports complexes. They gave urgent priority to the emancipation of proletarian women through the organization of communal kitchens, day nurseries, public baths and cooperatives of all kinds. Although they envisioned workers' clubs and social centres, linked to vast Fordist factories and eventual high-rise housing, as the 'social condensers' of a new proletarian civilization, they were also elaborating a practical strategy for leveraging poor urban workers' standard of living in otherwise austere circumstances.

In the context of global environmental emergency, this Constructivist project could be translated into the proposition that the egalitarian aspects of city life consistently provide the best sociological and physical supports for resource conservation and carbon mitigation. Indeed, there is little hope of mitigating greenhouse emissions or adapting human habitats to the Anthropocene unless the movement to control global warming converges with the struggle to raise living standards and abolish world poverty. And in real life, beyond the IPCC's simplistic scenarios, this means participating in the struggle for democratic control over urban space, capital flows, resource-sheds and large-scale means of production.

The inner crisis in environmental politics today is precisely the lack of bold concepts that address the challenges of poverty, energy, biodiversity and climate change within an integrated vision of human progress. At a micro-level, of course, there have been enormous strides in developing alternative technologies and passive-energy housing, but demonstration projects in wealthy communities and rich countries will not save the world. The more affluent, to be sure, can now choose from an abundance of designs for eco-living, but what is the ultimate goal: to allow well-meaning celebrities to brag about their zero-carbon lifestyles or to bring solar energy, toilets, pediatric clinics and mass transit to poor urban communities?

Beyond the green zone

Tackling the challenge of sustainable urban design for the whole planet, and not just for a few privileged countries or social groups, requires a

vast stage for the imagination, such as the arts and sciences inhabited in the May Days of Vkhutemas and the Bauhaus. It presupposes a radical willingness to think beyond the horizon of neo-liberal capitalism toward a global revolution that reintegrates the labour of the informal working classes, as well as the rural poor, in the sustainable reconstruction of their built environments and livelihoods. Of course, this is an utterly unrealistic scenario, but one either embarks on a journey of hope, believing that collaborations between architects, engineers, ecologists and activists can play small, but essential roles in making an alter-monde more possible, or one submits to a future in which designers are just the hireling imagineers of elite, alternative existences. Planetary 'green zones' may offer pharaonic opportunities for the monumentalization of individual visions, but the moral questions of architecture and planning can only be resolved in the tenements and sprawl of the 'red zones'.

From this perspective, only a return to explicitly utopian thinking can clarify the minimal conditions for the preservation of human solidarity in face of convergent planetary crises. I think I understand what the Italian Marxist architects Tafuri and Dal Co meant when they cautioned against 'a regression to the utopian'; but to raise our imaginations to the challenge of the Anthropocene, we must be able to envision alternative configurations of agents, practices and social relations, and this requires, in turn, that we suspend the politico-economic assumptions that chain us to the present. But utopianism is not necessarily millenarianism, nor is it confined just to the soapbox or pulpit. One of the most encouraging developments in that emergent intellectual space where researchers and activists discuss the impacts of global warming on development has been a new willingness to advocate the Necessary rather than the merely Practical. A growing chorus of expert voices warn that either we fight for 'impossible' solutions to the increasingly entangled crises of urban poverty and climate change, or become ourselves complicit in a *de facto* triage of humanity.

Thus I think we can be cheered by a recent editorial in *Nature*. Explaining that the 'challenges of rampant urbanization demand integrated, multi-disciplinary approaches and new thinking', the editors urge the rich countries to finance a zero-carbon revolution in the cities of the developing world. 'It may seem utopian', they write,

to promote these innovations in emerging and developing-world megacities, many of whose inhabitants can barely afford a roof over their

heads. But those countries have already shown a gift for technological fast-forwarding, for example, by leapfrogging the need for landline infrastructure to embrace mobile phones. And many poorer countries have a rich tradition of adapting buildings to local practices, environments and climates—a home-grown approach to integrated design that has been all but lost in the West. They now have an opportunity to combine these traditional approaches with modern technologies.²⁴

Similarly, the UN Human Development Report warns that the ‘future of human solidarity’ depends upon a massive aid programme to help developing countries adapt to climate shocks. The Report calls for removing the ‘obstacles to the rapid disbursement of the low-carbon technologies needed to avoid dangerous climate change’—‘the world’s poor cannot be left to sink or swim with their own resources while rich countries protect their citizens behind climate-defence fortifications.’ ‘Put bluntly’, it continues, ‘the world’s poor and future generations cannot afford the complacency and prevarication that continue to characterize international negotiations on climate change.’ The refusal to act decisively on behalf of all humanity would be ‘a moral failure on a scale unparalleled in history’.²⁵ If this sounds like a sentimental call to the barricades, an echo from the classrooms, streets and studios of forty years ago, then so be it; because on the basis of the evidence before us, taking a ‘realist’ view of the human prospect, like seeing Medusa’s head, would simply turn us into stone.

²⁴ ‘Turning blight into bloom’, *Nature*, 11 September 2008, vol. 455, p. 137.

²⁵ *UN Human Development Report 2007/2008*, pp. 6, 2.