

The culture gap and its needed closures

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The development of an enormous culture gap, in which no individuals of advanced societies possess even a billionth of the non-genetic information possessed by their entire society, has threatened a global collapse of civilisation. Critical parts of that gap must be rapidly bridged so that problems such as climate disruption, toxification of the Earth, loss of biodiversity and ecosystem services, and the decay of the epidemiological environment can be satisfactorily attacked. The essential need is to alter human behaviour to put society on a route to sustainability; one cheering development is a growing interest in the Millennium Assessment of Human Behaviour (MAHB), whose goal is to do just that.

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The biggest environmental ‘event’ since Hurricane Katrina has been the Gulf of Mexico oil spill disaster that began in late April 2010. It was a return to readily visible symptoms of environmental problems such as the build-up of Los Angeles smog in the 1940s, the London killer ‘Great Smog’ (1952), the burning of the Cuyahoga River (1969), the Union Carbide Bhopal gas tragedy (1984), the Chernobyl nuclear disaster (1986), and the Santa Barbara (1969) and Exxon Valdez (1989) oil spills. Such suddenly appearing symptoms, along with the near disappearance of the US national symbol, the bald eagle, in part from DDT poisoning (1960s), generated much of the early and continuing concern over the environment. Sadly, that concern has tended to dissipate as these obvious symptoms of anthropogenic environmental deterioration have faded away. In rich nations, air and water have been largely cleaned of visible pollutants, beaches are often free of visible oil a few years after a spill, and the bald eagle has returned.

Yet as these symptoms have declined, the disease itself, overall environmental deterioration, is becoming catastrophically worse. To detect that change, however, one must be able to do such things as interpret a graph of CO₂ concentrations in the atmosphere, track the fates of populations of non-human organisms, do relatively complex calculations of flows of energy and water, be aware that endocrine disrupting synthetic chemicals may have nonlinear dose-response curves, understand how the scientific enterprise works, and be accustomed to thinking about such things as risk analysis, fat-tailed probability distributions, population externalities, resilience, synergisms, tipping points, and complex adaptive systems.

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The culture gap

That few people think about or do many of those things is the result of a vast 'culture gap'. In modern societies, knowledge has become deliberately and excessively divided into even smaller units – 'siloes' – and isolated from related information. Knowledge and information are so compartmentalised that even brilliant leaders do not see (or choose for political reasons not to point out) obvious and crucial connections. Because of the culture gap and a public education system that fails to make important connections and draw important inferences, few people in our society are able to describe how the climate works, the significance of the second law of thermodynamics, how biodiversity is related to ecosystem services, or why population growth increases the threat of novel pandemics; all of which a responsible citizen needs to understand in a world faced with a possible collapse of civilisation.

The culture gap began with the agricultural revolution, which first enabled people to specialise in different occupations – farmers, warriors, priests, traders, etc. – in which expertise was largely confined to the practitioners. This specialisation greatly increased and proliferated with the industrial revolution in the eighteenth and nineteenth centuries and by the twenty-first century has ended up creating a civilisation that is maladapted to the biophysical realities of Earth.

In hunter-gatherer groups, virtually all members possessed the same non-genetic information, the same 'culture' [1]. The exceptions were few: perhaps a hunter with a favourite productive spot for placing rabbit snares, women who knew the medicinal properties of certain plants, a canoe-builder who had a special way of lashing on an outrigger support, a shaman whose mentor had taught him a secret incantation. One might guess that all adults possessed most of the group's significant culture, as did the Aivilikmiut Inuit when one of us, Paul, lived with them more than a half-century ago.

Contrast that with a European, Japanese, or American today. Even the most educated individual can't possibly possess more than a miniscule part of their society's non-genetic information. How many people in an advanced society, given the correct pile of computer parts, could describe their provenance and assemble a computer? How many know how their refrigerators work? Where their food comes from and how it was grown/processed? How many have read even a few thousand of the millions of books in libraries? In a recent year, one in four Americans read none [2]. A symbol of the scale of the culture gap is the 2008 Republican nominee for vice-president of the United States, Sarah Palin, whose vast ignorance of almost everything included thinking Africa was a country [3]. The growth of the culture gap may be the single most important change in several hundred thousand years of human history, a change that has occurred most dramatically over the last two centuries.

The significance of the culture gap was starkly illuminated by the Gulf oil spill, when it became clear that the highly technological activity of deep sub-sea drilling for oil was the exclusive domain of big oil companies and a few academic petroleum engineers. The government clearly did not possess that expertise or the equipment to fix the leak, and it previously had been incompetent at regulating the drilling operations. At the same time, the business of containing and cleaning up a massive spill was clearly a neglected field, in which the responsible oil company displayed little expertise or even much motivation to do well.

In all the vast media coverage of the 2010 Gulf oil spill, the point was often made that the wellhead was under a mile of ocean, and the well itself was planned to extend another three miles or so beneath the sea floor. But little mention was ever made of the overall resource situation that drilling so deep indicates. A century and a half earlier the original commercial oil well drilled in 1859 in Pennsylvania penetrated a mere 70 feet. Since then the history of

oil has been one of exploiting resources that were ever more remote and difficult and dangerous to extract.

When the Gulf of Mexico disaster struck, a golden opportunity to close part of the culture gap was lost. It could have been used to call attention to civilisation's (especially the United States') ludicrous, costly, and potentially lethal continued dependence on petroleum (and, of course, other fossil fuels). President Obama did weakly attempt to draw the connections, especially in his 15 June 2010 address from the White House. He did not, however, underline the scale of American oil dependency by pointing out that if the Gulf gusher had been pure gasoline flowing into the tanks of cars, huge as it was, it could have powered less than 1% of American road traffic. That is, the total flow of petroleum into the US economy to run surface vehicles is the equivalent of a hundred or more Gulf disasters.

The need to bridge the culture gap

H.G. Wells had it just right when in his classic *Outline of History* (1921) he said 'History is more and more a race between education and catastrophe.' Humanity is clearly losing that race. The need to speed our pace greatly and bridge the culture gap in environmental understanding is clear, and in the areas of energy and the drivers of climate disruption it has never been more obvious. Yet, despite the increasing difficulty, huge cost, and risk of maintaining oil flows to the United States, it seems almost impossible politically to educate people about the nation's fossil-fuel addiction, cure it, and reduce the chances of catastrophe. Similarly, the serious air pollution and resultant human health penalties that attend the extraction and burning of coal have done little to spur even increased efficiency, let alone a rapid conversion to substitutes. Worse, coal's role as one of the greatest contributors of carbon dioxide to the atmosphere has yet to lead to its rejection.

The siloing of information and expertise is the major feature of the culture gap and one prime cause for the public's relative lack of concern over crucial environmental problems. Consider some ominous trends that are largely unknown or unappreciated by most human beings, rarely dealt with in education systems (including, outside of specialised courses, at the university level), and poorly covered in the media. The concentrations of greenhouse gases in the atmosphere have continued to increase because of human activities, especially over the past half-century; the feedbacks recently discovered in the climate system have mostly been positive [4]; and ever more signs of climate disruption have appeared, from thinning polar ice to a rising incidence of unusual weather events. Extinctions of populations and species, already occurring at a rate thousands or more times beyond baseline levels (rates during periods outside of the five 'mass extinctions'), make it continually clearer that humanity is causing a sixth mass extinction episode [5]. Over a billion people have too little food, twice as many as when the Green Revolution technology was first deployed. That indicates that the number of immune-compromised individuals is also at record levels, furthering the decay of our epidemiological environment. Along with the other epidemiological consequences of the population explosion, the emergence of deadly pandemics is becoming ever more likely [6].

The Himalayan 'water tower', the ice and snow of the Himalayas and the Tibetan Plateau, is melting [7], although not at rates suggested in one erroneous report. The melting is part of a general loss of Earth's ice cover on both land and sea, which among other things will affect patterns of climate disruption, sea-level rise, and seismic events in ways that are difficult to predict. The loss of the 'water tower' is likely first to cause a complex pattern of flooding and

then drying of some of the rivers that supply agricultural water to much of southern and eastern Asia [8]. That's the home of 1.6–2.0 billion people, with more being added all the time. Worse, rising temperatures further threaten the food supply of those nations [9], three of which are nuclear powers. A 'small' nuclear exchange, say between India and Pakistan, could end civilisation [10].

There are also frightening symptoms traceable to the release of hormone-disrupting chemicals and other toxic substances, increasing reasons for concern as more is learned about the ways in which early exposure to bioactive chemicals can influence development and survival [11]. Besides assaulting many species that make up our life-support systems, toxics could be shifting the human sex ratio [12], causing developmental problems in children, and possibly reducing sperm counts. But these trends also remain mostly unrecognised. And finally, although many educated people know that racism and sexism are nonsensical, that they also are drags on reaching sustainability is rarely mentioned in the media or by politicians, and progress in eradicating them has been far too slow and uneven.

Environmental impact: a key area where the gap must be closed

It is clearly impossible (and unnecessary) to close the entire culture gap, but society could do a much better job at bridging key parts of it – parts that are retarding efforts to deal with the human predicament. We need to find ways to change human attitudes so that more essential aspects of how the world works become part of everyday assumptions – the same as that the sun will rise in the morning or that water runs downhill. Everyone should immediately be able to recognise the basic drivers of environmental deterioration and how they relate to one another, and they should understand that everlasting growth of the physical economy is impossible.

Homo sapiens's negative impact on its own life-support systems can be approximated by the I=PAT equation, in which the size of the population (P) is multiplied by the average affluence, or consumption per capita (A), and that in turn is multiplied by a measure of the technology and socio-political-economic arrangements (T) employed to supply the consumption [13]. The product is impact (I), a rough index of how much humanity is degrading the natural ecosystems whose services it depends upon. The concept is elementary. Two billion people, all else being equal, put more greenhouse gases into the atmosphere than one billion people would. Two billion rich people release more toxic substances into the environment than do two billion poor people. Three hundred million Americans consume more petroleum than do thirteen hundred million Chinese. And driving an SUV is using a far more environmentally malign technology for transport than is riding a bicycle. The factors in the equation, of course, are not independent – but that complication does not seriously lessen I=PAT's value as a way of thinking about environmental impacts.

The technological/economic/political dimensions of our predicament – such as the need to deploy alternatives to fossil fuel energy quickly – are frequently discussed in the technical community, but plainly are not well understood by decision-makers in business, politics, or the media. To the degree that environmental problems are recognised in those communities, it is still widely believed that they can be rapidly solved by minor technological 'fixes' and more recycling (T).

Silence on the overconsumption (Affluence) factor in the I=PAT equation is readily explained. Consumption is still viewed as an unalloyed good by many economists, along with business leaders and politicians, who tend to see increasing consumption, even among the

super-rich, as a cure-all for economic ills. Too much unemployment? Give government support to the automobile industry when humanity should be moving toward people-centred, rather than car-centred cities. Hardly a day goes by without the spectacle of some economic 'expert' in the US mass media discussing the degree of success in getting the economy growing.

Most of humanity does not realise that expanding consumption among the already rich is a recipe for more environmental deterioration. Indeed, in rich countries, there is no thought even of trying to control advertising – a 'need-creation' industry that successfully promotes consumption as a status builder [14]. Advertising perpetuates the idea that one's worth is measured by how much 'stuff' has been acquired. That free rein given to Madison Avenue is especially appalling when at least two billion people are in dire need of the most basic goods and services – food, clothing, shelter, health care, and education – just to allow them to lead decent lives. But it is a sad fact, mostly unrecognised, that giving today's 6.9 billion people the consumption patterns of Western Europe is a biophysical impossibility – to say nothing of supplying such a lifestyle to 9 billion or more people by the middle of this century.

Fortunately not everyone is so ignorant as to believe the physical economy can grow in perpetuity. For example, in an interview in 2010, Indian Environment and Forests Minister Jairam Ramesh replied to the question, 'Do you think that India can adopt the Western pattern of consumption?' by saying 'I don't think so. It will be a recipe for suicide' (<http://www.financialexpress.com/news/-When-BASIC-countries-negotiate--we-re-one-voice-/571224/>).

Instead of redesigning the staggering economic system to become more environmentally sustainable, the US government's stimulus funds have largely been used to fire up the old Earth-destroying growth machine and maintain or increase consumption. The funds provided some temporary relief for millions of people left unemployed, homeless, or otherwise afflicted as a result of the actions of corporate criminals in the financial 'industry'. But more employment could be provided over the long term by a rapid economy-wide mobilisation to switch from fossil fuels to renewable energy, redesign cities and transport systems away from automobiles, revamp an environmentally disastrous agricultural system, and change the overall character of consumption. Perpetual growth is the creed of the cancer cell, but third-rate economists can't imagine anything else. Some leading economists *are* starting to tackle the issue of overconsumption, but that problem and its cures are tough to analyse [15,16]. Scientists have yet to develop consumption condoms or morning-after-shopping pills.

Even if it succeeded, restarting the outdated consumption machine would just expose everyone to much more severe future risks when that apparatus eventually runs out of steam. The end of the Petroleum Age seems already in sight, as shown by indications that civilisation has passed the peak of global oil production (although consumption continues rising), by the extremes to which oil companies must go to find new reserves, and by the environmental risks carried by extracting and using it. Efforts to obtain natural gas are trending in the same direction, as gas companies resort to 'fracking' shale-bearing deposits, an expensive and environmentally damaging process, in heavily populated eastern US states as well as in much of the intermontane West. And the increasingly damaging 'side-effects' of obtaining and burning coal point in the same direction. Yet the culture gap makes it easy to overlook the serious problems that attend continuing to do things the same old familiar way.

But if key parts of the culture gap were bridged, decision-makers and the public might realise that one very good way to revitalise the sagging economies of the United States and other developed nations would be to make rapid and massive investments in converting their energy systems away from dependence on fossil fuels (and, in most cases, biomass),

transforming humanity's entire energy infrastructure and transportation system in the next few decades. They might also conclude that the investment also would result in mitigating an array of costly environmental damages. While this understanding has been reached by sizable portions of the public and governments of many countries, the culture gap and vested interests in the status quo combine to resist the needed changes at a multitude of decision points.

Keeping the gap open: the very scale of the challenges

Taking up the urgent task of transformation, including taking dramatic steps to reduce greenhouse gas emissions, is being delayed now because inevitable uncertainties (which can never be fully removed) are used in well-funded and carefully orchestrated campaigns by industries and the media networks and politicians they own to create phony excuses not to take action [17]. The public has been confused by these disinformation campaigns, which have served to delay serious action on climate change for at least a decade. Moreover, politicians are by nature reluctant to engage in what they perceive as drastic action unless the public demands it unequivocally.

Pledges made so far by world leaders to reduce greenhouse gas emissions at international conferences have been pronounced woefully inadequate to solve the problem. Yet those pledges were made for the short term (10 years), and no one familiar with the negotiations and interested in solving the problem assumes that nothing further will be done. Even so, regardless of progress in reducing emissions, the world is committed to significant changes in climate because of past and continuing emissions and the lag times involved in their manifestation. Such changes are already visibly underway in many regions. Of course, the scale of the challenges that must be met is daunting even to those who understand the need, and flimsy excuses for denial appear likely to continue to retard the required changes.

Moreover, totally revising our systems for mobilising and distributing energy is not the only massive challenge humanity faces in this general area. Another challenge on which the culture gap tends to prevent action is that humanity must simultaneously attempt to rebuild its deteriorated water/waste handling infrastructures, while it continues to strive to supply clean water and sanitation to the billions of people who still lack them. If leading climatologists are correct [18], it is likely that Earth's precipitation patterns will be changing continually for a millennium or more. Among other things, that implies that dams, pipelines, and canals vital to agriculture will need to be rethought, redesigned for flexibility, and rebuilt. Replacing decaying water pipes and sewers in many cities is necessary, but insufficient – it will not, for instance, solve the problem of watering vast areas of crops as they desiccate in newly forming drought regions. Nor will even massive and costly switching to drip irrigation, although that could help.

A related undertaking must be to adapt agriculture to changing climate regimes. Farmers grow crops that thrive under the weather and climate conditions they have always experienced, but within a few decades a quite different array of crops might be more suitable in any given place, for example, northern China [19]. And in some areas, the climate might become too unfavourable to grow any crops at all. Agriculture, among the most conservative of human endeavours, will have to learn to be flexible, even as it must become more productive to meet the needs of an increased population and do everything possible to limit the environmental degradation it inevitably causes. Research in plant genetics, key to producing crop

strains that may be able to tolerate coming environmental stresses, should receive much more attention and funding.

Obviously, to avoid the direst consequences of climate change, the safest course is to reduce the flux of greenhouse gases (carbon dioxide, methane, and nitrous oxide) related to energy production and land-use change as rapidly and as far as possible. To do that will require a World War II-type mobilisation, possibly lasting several times longer and on a much larger scale. But we know from experience that consumption patterns can be changed virtually overnight when the need is compelling. For example, in 1941 the US produced 3,779,682 passenger cars, then switched almost entirely to production of tanks and vehicles for the military, but then at the end of the war in 1946 produced 2,148,699 cars and by 1948 automobile production was greatly exceeding pre-war volumes. US war production between 1942 and 1945 consisted of some 325,000 military aircraft, 88,000 tanks, 240,000 military trucks, 22 aircraft carriers, eight battleships, 2580 Liberty Ships, 250,000 artillery pieces, and 287,000 machine guns. These stunning shifts in production and consumption occurred in some four to five years; during those years Americans accepted gasoline, sugar, and meat rationing and the deaths and wounding of millions of their fellow citizens. If civilisation is to persist, such earth-shaking adaptation will need to become normal.

Given the right incentives and public understanding of the need, challenges can be met and economies can be changed with extreme rapidity. Obviously, to make a similar (if a little more gradual) change now, with much of the public and many politicians perched on the far side of the culture gap, would likely create considerable social disruption and thus would take political courage – a resource in very short supply but fortunately renewable. Even with courageous leadership, making the change without some social disruption might prove impossible. It is important to remember that all of these challenges are massively more difficult and complex than the one global environmental challenge that so far has been more or less successfully met – protection of the stratospheric ozone layer. Yet that success can still serve as a partial model for more difficult global actions.

The culture gap in demography

Of course, one of the saddest parts of the human predicament is that even if consumption patterns were dramatically changed, unstemmed population growth alone could eventually bring down civilisation. And bringing that growth under control and gradually starting to shrink the global population humanely would take several decades, even though population shrinkage in some over-consuming rich societies has already begun. But globally no five- or ten-year program could do the job. Today the focus is too much on the costs of such a profound demographic change, which won't be negligible, and too little on what we have to gain: a civilisation on a path to sustainability instead of oblivion, with far less environmental damage to human health and to our life support systems. In discussing climate disruption, indeed in all environmental discourse, the neglect of the contribution of increasing human numbers to the worsening situation has already been costly.

Nonetheless, some observers still welcome population growth. Recently a conservative *New York Times* columnist, David Brooks, expressed 'a great luscious orgy of optimism ... because the fact is, despite all the problems, America's future is exceedingly bright. Over the next 40 years, demographers estimate that the U.S. population will surge by an additional 100 million people, to 400 million over all' [20]. Clearly, nobody ever introduced David Brooks, evidently a smart and educated person, to the simple $I=PAT$ equation. Just think about one

hundred million more people trying to get both seafood and oil from the Gulf of Mexico, deal with the likely increasingly horrific effects of climate disruption, exacerbated by the added emissions of greenhouse gases they will produce, and possibly (but we hope not!) serve in the military of an American empire still largely organised to capture petroleum from other people!

Despite many similarly complacent statements from commentators, there recently has been some resurgence in recognition that population size and growth are key factors in humanity's ever more serious problems. But international support for family planning programs has faltered in the last decade, while governments in many struggling poor countries with high birth rates fail adequately to support them. Meanwhile leaders in the rich countries of Europe are irrationally encouraging further worsening of their overpopulation problems by trying to prevent the inevitable changes in age composition that accompany ending population growth. Those governments are actually promoting a population Ponzi scheme – one to which they are oblivious because of the culture gap.

It is crystal clear, *ceteris paribus*, that the more people there are, the greater the environmental impacts will be. Furthermore, each person added to the population in the future on average will cause more damage to humanity's critical life-support systems than did the previous person [13,21]. People are smart. Farmers didn't first till marginal soils where water was scarce, but rather the most productive, well-watered soils they could find. Near such soils is where most cities developed, leading to the paving over of the best land and the pollution or overexploitation of the most convenient freshwater supplies. China is regrettably following this pattern today. It cannot be beneficial.

Today therefore, to support the expanding population, it is necessary to farm ever poorer lands, use more dangerous and expensive agricultural inputs, drill wells deeper or tap increasingly remote or more contaminated sources to obtain water, and then spend more energy to transport that water ever greater distances to farm fields, homes, and factories. Our ancestors six thousand years ago could pick up nearly pure copper on Earth's surface; now people must use vast amounts of energy to mine and smelt copper ore of increasingly poorer quality, some of it containing less than 1% copper.

All of the additional mining, harvesting, building, manufacturing, paving, drilling, pumping, refining, transporting, and so on needed to provide for the support of expanding populations increases emissions of greenhouse gases and synthetic chemicals and thus tightens the connections between population, overconsumption, climate disruption, and global toxification. The severity of future impacts on natural systems will depend on how today's people and future generations behave toward the environment – and by the sizes of populations to come. But what must be made utterly clear, despite the culture gap, is that the additional two billion people the demographers expect by 2050 will cause much more environmental damage than did the last two billion added to our population – a classic nonlinearity. Many past human societies have collapsed [22,23], with overpopulation playing a significant role. But today, for the first time, a *global* civilisation is in peril.

The need for the MAHB

There is growing consensus among environmental scientists that the scholarly community has amply detailed the chief issues of the human predicament – from climate disruption to economic inequity – that impede solutions to escalating environmental problems. They are less sanguine about the way these issues have been transmitted to the rest of society [24].

Scientists believe humanity must take rapid steps to ameliorate them and have indicated what those steps should be. But the public and the political system are slow to understand and react, and too little of substance is being done. The central need clearly is not for more natural science (although in many areas it would be helpful) but rather for better understanding of human behaviours and how they can be altered to direct humanity onto a course toward a sustainable society before it is too late.

That's why a group of natural scientists, social scientists, and scholars from the humanities decided to inaugurate a *Millennium Assessment of Human Behaviour* (MAHB – pronounced 'mob') [25]. It was so named to emphasise that it is human *behaviour*, toward the planet that sustains us all and toward one another, that requires rapid modification. The idea is that a MAHB might become a basic mechanism to expose society to the full range of population-environment-resource-ethics-power issues, and sponsor a broad global discussion involving the greatest possible diversity of people. It would, we hope, serve as a major tool for altering the course of cultural evolution by, among other things, helping to close vital parts of the culture gap. The MAHB would differ from the previous important global issue forums (the Intergovernmental Panel on Climate Change [IPCC] and the Millennium Ecosystem Assessment [MEA]) by having a more dominant role played by outreach and public input, essentially to generate a global discussion of what people desire and what goals are possible to achieve in a sustainable society. The MAHB could become a focus of badly needed, new, coordinated efforts by social scientists and scholars in the humanities to help solve the human predicament. These scholars can bring their expertise to bear on how to change behaviour on environmental issues; some have already begun to do so. The MAHB is now at a preliminary stage; its web site has recently been opened to the public. The need for input from people accustomed to working in the social sciences and humanities, in the media, in the business community, etc. is obvious. If you are interested in being involved, go to: <http://mahb.stanford.edu/>. There you can join the effort to get humanity to do what is obviously required but too often deemed impossible.

A basic problem faced by the nascent MAHB is how best to proceed. How can critical parts of the culture gap be closed? The global discussion should include such questions as 'what are people for?' and 'how should we treat each other and the environment that supports us all?' 'What do today's people owe to future generations?' 'What can be done to make the needed changes on a time scale of years, not decades?' How can a small-group animal reorganise itself to satisfactorily solve the problems of global governance of a society of billions? [26]. All of the really critical questions have profound ethical implications [27].

Two things seem certain. First, efforts like the MAHB should start multiplying and promoting respect for a resource that today is in very short supply: people who have the capabilities of gap-bridging generalists; individuals willing to put in the time to learn what they need to know rather than restrict themselves to disciplines whose origins trace to Aristotle and the Royal Society of the seventeenth century. Our society is replete with tunnel-visioned specialists with little expertise or insight into even related fields. In contrast, there is a shortage of individuals who know enough to pose vital interdisciplinary questions and help assemble and direct the competent multidisciplinary teams needed to address our most critical problems. Second, the changes must be accomplished with new or highly altered institutions. Those we have today, even ones such as charitable foundations with totally beneficent goals, are fixed only on incremental change in the existing institutions that have been steadily driving our civilisation toward collapse.

Major institutions today do not call for forcing big corporations (including big agriculture) to give up their 'destroy the environment for profit' programs, or for governments to take

steps to stop the growth of per capita consumption in rich nations, stop the worldwide trend of stealing from the poor in aid of the rich, supported even by putatively 'democratic' governments (exemplified by the 2010 'G20 Summit' which did nothing to ameliorate the horrendous rich-poor gap – <http://the-reaction.blogspot.com/2010/06/vandalism-violence-and-deficit.html>), and face the need to reduce the scale of the physical economy. There is no call for much stricter controls (and benefit–cost analyses) on the manufacture and release of synthetic toxins – chemicals whose synergistic impacts might eventually exceed climate disruption as a threat to sustainability [28]. And, of course, no one points out that if capitalism depends on perpetual growth of the physical economy, like it or not capitalism will simply cease to exist.

The MAHB and the Gulf spill

Many of the behavioural issues central to the MAHB have been dramatically highlighted by the 2010 Gulf of Mexico oil spill. First was the 'discovery' that those in government, the Minerals Management Service (MMS) responsible for regulating the oil industry, were actually in bed, figuratively, with those they were supposed to regulate [29]. This is expected in a small-group animal whose individuals normally cannot resist affiliating with anyone with whom they are in constant contact [27], and one that has not yet solved the problems of governance in societies of millions or even billions. Without special controls to prevent such alliances from forming, regulation is frequently doomed, even if effective ways can be found to deal with the problems of controlling specialised enterprises that possess concentrations of highly technical expertise.

Second was the persistent lying by the agents of the corporation responsible for the spill? It is standard operating procedure for these human-like entities that singly and in collusion operate effectively to conceal unpleasant environmental facts from the public and decision-makers (e.g. [17,30]). The already disproportionate power of corporations to control politics in the United States was greatly enhanced by a 2009 Supreme Court Decision [31] that granted them First Amendment rights equal to citizens in election campaigns.

Third, was the natural response of the political system to immediate pressures and its failure to respond intended to protect the long-term social good? The Obama administration, as we indicated earlier, at first utterly missed what might have been the best opportunity in decades to start closing key parts of the culture gap and educate the public about the nation's population/resource predicament. The President did not immediately point out the preposterous situation in which a nation facing the likelihood of adding 100 million people in the next 40 years is still scrambling for oil when it should be moving as rapidly as possible away from a fossil-fuel-based economy. Not only are relatively accessible supplies of petroleum dwindling and the costs of obtaining them in financial and military terms escalating, but the threats of climate disruption appear increasingly severe. Yet the silos of the culture gap persist in keeping appropriate connections from being made and actions being taken. Immediate concerns over the loss of jobs in offshore drilling, the desire of Americans to keep driving their big private vehicles, and the dismal ignorance of science among the general public and decision-makers at the moment makes more drilling for oil in wildlife reserves or other environmentally sensitive areas seem more attractive and reasonable than facing humanity's massive challenges.

A global consensus on the most crucial behavioural issues is unlikely to emerge promptly from the MAHB or any other international forum. But the MAHB is envisioned as an

ongoing effort. Not every part of the culture gap needs to be bridged tomorrow, and not all of the MAHB's goals would need to be reached immediately. Yet certain crucial issues do need to be addressed promptly.

The human enterprise simply must be constrained if it is to persist. Ethically, civilisation's persistence will require some redistribution of wealth to help the people suffering from under-consumption, and doubtless that redistribution will need to continue until the population and its total consumptive impact have both declined substantially. Such truths are more than inconvenient, they are unpalatable or unbelievable to many, but that does not make them less true or less vital to the lives of our grandchildren. Most of our colleagues believe the scientific diagnosis of humanity's approaching collision with the natural world is accurate. As a result, we and many others [29–30, 32] are pessimistic about humanity's chances of avoiding a collapse of civilisation. But what alternative is there to trying?

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