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Recent main publications:

1. Books

Quanli yu Ziben (Power and Capital, Author: Ernest Mandel), translation from English into Chinese. Beijing: *Zhongyang Bianyi Chubanshe* (The CCP Central Committee Compilation and Translation Press 2002). (with Meng Jie)

2. Chapters in Books

'Capitalism with Zero Profit Rate? Limits to Growth and the Law of the Tendency for the Rate of Profit to Fall," in Growth and Crisis: Social Structure of Accumulation Theory and Analysis (2006, E-book: http://www.cisc.ie/documents/00024ciscwp.pdf).

'China: Hyper-Development and Environmental Crisis,' in Leo Panitch and Colin Leys, eds., Coming to Terms with Nature (Socialist Register 2007) (London: The Merlin Press 2006), pp. 130-146. (with Dale Wen)

Climate Change, Limits to Growth, and the Imperative for Socialism

[CN] Minqi Li

The United Nations Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report confirms that it is virtually certain that human activities (mainly through the use of fossil fuels and land development) have been responsible for global warming that has taken place since the industrial revolution. Under the current economic and social trends, the world is on the path to unprecedented ecological catastrophes.[1] As the IPCC report was being released, new evidence emerged suggesting that the climate change is taking place at a much faster pace and the potential consequences are likely to be far more dreadful than is suggested by the IPCC report.

The current evidence suggests that the Arctic Ocean could become ice free in summertime as soon as 2013, about one century ahead of what is predicted by the IPCC models. With the complete melting of the Arctic summer sea ice, the disintegration of the Greenland ice sheets becomes largely unavoidable, threatening to raise the sea level by five meters or more within this century. About half of the world's 50 largest cities are at risk and hundreds of millions will become environmental refugees.

The world is currently about 0.8 degrees Celsius warmer than the pre-industrial times and is within one degree of the highest temperature over the past one million years. The world is warming at a rate of 0.2 degrees per decade and given the greenhouse gases

1 Intergovernmental Panel on Climate Change, "Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report," November 2007.

already in the atmosphere, there will be a further long-term warming of 0.6 degrees. Moreover, now with the certain loss of Arctic summer sea ice, the Arctic Ocean will absorb rather than reflect back solar radiation, implying an additional warming of 0.3 degrees. Taking into account these developments, the world is already committed to a 2-degree warming relative to the pre-industrial times, widely considered to be a critical threshold in climate change.

A 2-degree warming is likely to result in widespread drought and desertification in Africa, Australia, Southern Europe, and Western US; major glacial losses in Asia and South America; large-scale polar ice sheet disintegration; and the extinction of 15-40 percent of the plant and animal species. Worse, with 2-degree warming, substantial climate feedbacks, such as dangerous ocean acidification, significant tundra loss and methane release, and soil and ocean carbon cycles, will be initiated, taking the course of climate change beyond human control.

If the global average temperature rise approaches three degrees (relative to the pre-industrial times) and the atmospheric concentration of carbon dioxide equivalent rises above 500 parts per million (ppm), both the world's oceans and the rainforests will turn into net emitters of greenhouse gases. In that event, the global average temperature could suddenly rise by six degrees, making the greater part of the earth uninhabitable for human beings, raising the sea level by at least 25 meters, and causing the extinction of 90 percent of the species and a possible reduction of the world population by 80 percent.[1]

It is quite obvious that the very survival of the humanity and human civilization is at stake. Given the gravity of the situation, many people (including some who claim to have the socialist political perspective) put their hope on an ecological reform of the global capitalist system, insisting that such a reform is within the technological and institutional

1 David Spratt and Philip Sutton, "Climate Code Red: the Case for a Sustainability Emergency," February 2008, Published by Friends of the Earth. Website: www.climatecodred.net.

feasibilities of the existing social system. The urgent and unavoidable political questions are: is it at all possible for the existing social system—the system of global capitalism, in all of its conceivable forms—to effectively address the crisis of global climate change and avoid the most catastrophic consequences? If not, what would be the minimum requirements for an alternative social system that will have the institutional capacity to prevent the crisis or if the crisis cannot be prevented, to help the human civilization to survive the crisis? These are the questions that anyone who is seriously concerned with the global ecological crisis will have to confront one way or the other.

I. Stabilizing the Climate: Technical Options

To prevent or alleviate further global warming, greenhouse gases emissions from human activities (especially the carbon dioxide or CO_2 emissions resulting from the burning of fossil fuels) will have to be greatly reduced. The emissions of carbon dioxide in turn depend on the emissions intensity of energy consumption, the energy intensity of economic output, and the level of economic output:

CO^2 Emissions = Economic Output * Energy Consumption Per Unit of Output * Emissions Per Unit of Energy Consumption

Capitalism is an economic system based on the pursuit of profit and capital accumulation. Individual capitalists, corporations, and nation-states engage in constant and intense competition against one another in the capitalist world market. To survive and prevail in the competition, and driven by the desire for greater profits (or more rapid economic growth), individual capitalists, corporations, and nation-states are all pressured and motivated to expand production and accumulate capital on increasingly larger scales. Thus, under capitalism, economic output normally tends to grow, unless in periods of economic crisis.

On paper, if energy intensity falls rapidly to offset economic growth, then the level of energy consumption does not have to grow. However, all economic activities inevitably involve certain physical or chemical transformations and must consume some energy (this is true not only for the material production sectors but also for the so-called services sectors). There is a physical limit to how much energy intensity can fall given any economic activity.

Given the way the capitalist markets operate, any decline of energy intensity tends to make energy products cheaper, as short-term demand for energy falls relative to supply. Cheaper energy products, however, encourage people to consume more energy in the long run. Thus, falling energy intensity (or rising energy efficiency) is simply translated into

more rapid capital accumulation (economic growth) and rarely leads to absolute declines in energy consumption.[1]

In reality, capitalist economic growth is usually accompanied by rising energy consumption. Since 1973, despite relatively sluggish world economic growth, world energy consumption has been growing at 2 percent a year. At this rate, world energy consumption will increase by 130 percent between now and 2050. Given these trends, the emissions intensity of world energy consumption will have to be cut drastically if there is to be any hope for the carbon dioxide emissions to be reduced to an appropriate level.

Fossil fuels account for about three-quarters of the primary energy consumed in electricity generation. To reduce carbon dioxide emissions from electricity generation, there are three technical possibilities: carbon capture and storage; nuclear electricity; and electricity generation from the renewables (such as geothermal, wind, solar, tides, waves, ocean currents, etc.).

Emissions from power plants using fossil fuels can be reduced if the carbon emitted in the process of electricity generation can be captured and then stored underground without being released into the atmosphere. Carbon capture and storage is likely to substantially increase the capital cost of electricity generation and reduce energy efficiency (as the process of capturing and storing carbon costs energy). There may not be enough good, leak-proof sites to store the very large amounts of carbon. The technology remains untested and unproven, and cannot be applied to existing power stations. This means that, at best, it will take decades before carbon capture and storage is applied to a substantial portion of the world's power plants.[2]

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1 This is known as the Jevons Paradox, named after the 19th century British economist William Stanley Jevons who first took note of this perverse effect. See: http://en.wikipedia.org/wiki/Jevons_paradox.

2 Ted Trainer, Renewable Energy Cannot Sustain A Consumer Society, pp.110-111. Dordrecht, Netherlands: Springer (2007).

Nuclear electricity has very serious environmental and safety problems. Nuclear electricity uses uranium, which is a nonrenewable mineral resource. The German Energy Watch Group points out that the world's proved and possible reserves of uranium would be able to support the current level of demand for uranium for at most 70 years and the world could face uranium supply shortages after about 2020. Moreover, given the long lead time to plan and construct nuclear reactors, there will be great difficulty to replace about half of the existing nuclear power plants that will retire in the coming one or two decades.[1]

Electricity generation from renewables is not an environmental panacea. The equipment and buildings required for "renewable" electricity need to be built by the industrial sector using fossil fuels and nonrenewable mineral resources. Relative to conventional electricity, electricity generated from renewables remains expensive. Wind and solar—the two most important renewable energy sources—are variable and intermittent, and cannot serve as the "base-load" electricity and need substantial conventional electricity capacity as backup.[2]

With the exception of biomass, the renewables can only be used to generate electricity. Table 1 presents the world energy balance for 2005. Electricity generation accounts for less than 40 percent of the world's total primary energy supply and only 20 percent of the total final consumption. About one-third of the primary consumption of fossil fuels is

1 Energy Watch Group, "Uranium Resources and Nuclear Energy," EWG-Series No.1/2006, December 2006.

2 Michael H. Heusemann, "The Limits of Technological Solutions to Sustainable Development," Clean Technology and Environmental Policy 5:21-34(2003). A recent experiment sponsored by the Germany government intends to show that a network with 61 percent of electricity from wind, 14 percent from solar photovoltaics, and 25 percent from biomass, can meet up to 100 percent of electricity demand (The Guardian, February 26, 2008, "Renewed Energy," see: http://commentisfree.guardian.co.uk/jeremy_leggett/2008/02/renewed_energy.html). But as is to be discussed below, biomass is very problematic and could emit more greenhouse gases than fossil fuels. Thus, the experiment actually seems to suggest a 75 percent limit to de-carbonization of electricity generation.

used for electricity consumption, but two-thirds are used as liquid, gaseous, and solid fuels in transport, industrial, agricultural, services, and residential sectors.

[Table 1 is about here]

Out of the total final consumption of fossil fuels, about 40 percent is used in the transport sector, 24 percent in the industrial sector, 23 percent in the agricultural, services, and residential sectors, and 13 percent is used as raw materials for chemical industries. Electricity obviously cannot replace the fossil fuels as chemical industrial inputs. In addition, it would be very difficult or impossible for electricity to replace the fossil fuels in their uses in sea and air transportation, freight transportation on roads, high-temperature industrial processes, and the powering of heavy equipment in industrial, construction, and agricultural sectors. While it might be technically feasible to replace the gasoline-fueled passenger cars with electric cars (and the passenger cars might be said to be the crux of the modern capitalist consumerist culture), the technology remains immature and it could take decades before the electric cars dominate the market.

Moreover, as currently about three-quarters of the primary energy used in electricity generation derives from fossil fuels and about three units of coal are required to generate one unit of electricity, an electrification of transport, industry, and other sectors would tend to increase rather than decrease carbon dioxide emissions. For the purpose of climate stabilization, electrification of these sectors would not make much sense unless the bulk of the electricity generation has been "de-carbonized" (that is, to replace the conventional fossil fuels electricity with carbon-captured, nuclear, and renewable electricity).

Even if all of the economic and technical difficulties discussed above were to be overcome, it is likely to take decades before the world's electricity generation is largely transformed and it could take several more decades to electrify much of the world's

industrial and transportation infrastructure. By then global ecological catastrophes would be all but inevitable.

Biomass is the only renewable energy source that can be used to make liquid and gaseous fuels. However, limited by the available productive land and fresh water, biomass cannot provide more than a small fraction of the world's demand for liquid and gaseous fuels. Worse, recent studies reveal that taking into account emissions in land development and soil erosion, fuels made from biomass actually emit more greenhouse gases than conventional petroleum.[1]

II. Climate Change and Limits to Growth

According to the IPCC report, to limit global warming to 2-2.4 degrees Celsius (relative to the pre-industrial temperature), it is necessary to stabilize the carbon dioxide equivalent in atmosphere at 445-490 ppm. This would in turn require that global carbon dioxide emissions peak between 2000 and 2015, and fall by 50-85 percent by 2050 from the 2000 levels.

Global carbon dioxide emissions have been growing at about 3 percent a year since 2000. If the current trend continues, by 2010 global emissions would be 34 percent greater than the 2000 levels. It follows that to stabilize the carbon dioxide equivalent at 445-490 ppm, global emissions need to fall by 63-89 percent from the 2010 levels.

Table 2 presents the alternative scenarios of emissions reduction and economic growth that are consistent with a 63 percent reduction of emissions, assuming global emissions peaking in 2010 and declining thereafter. In all scenarios, it is assumed that 50 percent of the fossil fuels final consumption is electrified by 2050. In different scenarios, 50, 75, or 100 percent of the electricity generation currently using fossil fuels is assumed to be

1 George Monbiot, "Apart from Used Chip Fat, There Is No Such Thing as a Sustainable Biofuel," The Guardian, Comment and Debate Section, p.27, February 12, 2008.

de-carbonized by 2050 (corresponding to average decline of emissions intensity of 1, 1.7, or 2.7 percent a year respectively). Energy intensity is assumed to fall by 33, 45, or 55 percent by 2050 (corresponding to average decline of 1, 1.5, and 2 percent a year respectively).

With a 33 percent reduction of energy intensity, the world in average would approach the average level of "energy efficiency" of the advanced capitalist countries today. With a 45 or 55 percent reduction, the world in average would have the same level of "energy efficiency" as Western Europe today. The observed levels of "energy efficiency" in the advanced capitalist countries result not only from some advanced technologies, but also from the massive relocation of energy-intensive industries to the periphery. This raises the question whether these "efficiency" levels can ever be accomplished by the peripheral countries.

Given the assumed declines in emissions intensity and energy intensity, one can then calculate the maximum economic growth rate that is consistent with the emissions reduction objective. It is clear from Table 2 that the assumed declines in emissions intensity and energy intensity compare favorably with the historical performance of the global capitalist economy and the assumptions for some scenarios are very optimistic. Nevertheless, in most of the scenarios, the world economy would have to virtually stagnate and in one scenario, the world economy actually needs to contract absolutely. Considering that the world population growth rate is about 1 percent a year, only the most optimistic scenarios would result in positive growth of per capita GDP.

[Table 2 is about here]

The IPCC report fails to take into account many of the latest developments. Considering that the Arctic summer sea ice is now certain to disappear and the Arctic Ocean will absorb more heat, an atmospheric concentration of carbon dioxide equivalent of 490 ppm would lead to a global warming of 2.7 degrees (rather than the 2.4 degrees suggested by the IPCC report), taking the world dangerously close to the 3-degree threshold, which would amount to a global collective suicide by the humanity. If the goal is to stabilize atmospheric concentration of carbon dioxide equivalent at 445 ppm, then the global emissions need to fall by 89 percent. At 445 ppm, global temperature would still rise by more than two degrees. Some major ecological catastrophes would be unavoidable and dangerous climate feedback cycles could be initiated. Far more drastic cuts in global emissions would be required if the goal is to truly stabilize the climate and create a sufficiently large safety margin.

Table 3 presents the alternative scenarios of emissions reduction and economic growth that are consistent with a 89 percent reduction of emissions. The rest of the assumptions

are the same as Table 2. It turns out that the world economy would have to contract in all scenarios. For scenario 1 to 3 (the assumed declines in emissions intensity and energy intensity are by no means pessimistic in comparison with the historical performance of global capitalism), the world economy would have to fall by two-thirds to three-quarters after 2010 to accomplish the objective of emissions reduction.

[Table 3 is about here]

The results presented in Table 2 and 3 suggest that under no plausible circumstances, could the objective of climate stabilization be compatible with the endless expansion of the global capitalist economy. However, the capitalist economic system is inherently incapable of operating with a non-growing (not to say contracting) economy.

III. The Politics of Climate Change and the Imperative for Socialism

Could this author be too pessimistic? Should the "ingenuity," "innovativeness," "adaptability," and "resilience" of capitalism not be underestimated? The spokespersons of the mainstream environmentalist movement, such as Lester R. Brown (the author of *Plan B* and the director of Earth Policy Institute) and Amory Lovins (the author of *Natural Capitalism*), try to convince us that magical technologies will come to the rescue. Solar panel costs will fall to the floor, as energy efficiency surges by ten-fold. Greenhouse gases emissions and other pollutions can be reduced drastically, while Gross Domestic Product will keep growing explosively. There is no inherent conflict between production for profit and capital accumulation on the one hand, and ecological sustainability on the other.

Their typical line of argument is that "the technology is already available" and "all that is needed is political will." By "political will," they are of course not referring to anything like fundamental social transformation. Instead, they are talking about some legislative reforms and international agreements within the basic capitalist framework. At most, they would demand some limited changes in personal consumer behavior.

The mainstream environmentalist movement, as far as its social composition is concerned, mainly consists of people who belong to the upper middle class in a capitalist society (or, to use a more traditional Marxist terminology, the urban pretty bourgeoisie). They include the university professors, engineers, technicians, managers, financial analysts, and other professionals. Although they typically do not own significant amounts of means of production, they play important managerial and technical functions for the capitalists and enjoy substantial material privileges relative to the working class.

In periods of revolutionary upsurge, such as in the 1960s, some of them could be rapidly radicalized and become various "ultra-leftists." In periods of counter revolution, they could become the most important ally of the ruling class in the offensive against the working people. In the 1980s and 1990s, the upper middle class was an important social base for neoliberalism in many countries and they played a crucial role in the restoration of capitalism in the former Soviet Union, Eastern Europe, and China.

As the global ecological crisis deepens, some among the upper middle class recognizes or senses that the existing capitalist "life style" is in serious trouble and cannot be sustained indefinitely. Yet, they are unable or unwilling to imagine anything beyond the capitalist system, on which their relatively privileged material life depends. They are not yet ready to give up their implicit political support for the capitalist class. Their living conditions and experiences are very much detached from those of the working class. It is therefore difficult for them to see that only with a massive mobilization and organization of the working class, could there be any hope for the social transformation required for ecological sustainability to be accomplished. The upper middle class environmentalists, as a result, have to put their desperate hope (or faith) on technological miracles on the one hand, and the power of moral persuasions on the other hand (which they hope would convince the capitalist class to behave morally and rationally).

However, the laws of motion of capitalism will keep operating so long as the capitalist system remains intact, independent of the individual wills and against the best wishes of the upper middle class environmentalists. Sooner or later, those truly conscientious environmentalists will have to choose between the commitment to ecological sustainability and the commitment to an exploitative and oppressive social system. Furthermore, with the deepening of the global ecological crisis and the crisis of global capitalism in general, it may soon become increasingly difficult for the capitalist system to accommodate the material privileges of the upper middle class while simultaneously meeting the requirements for production for profit and accumulation.

As is discussed earlier, there are many technical obstacles to the de-carbonization of the world's energy system. Brown and Lovins have greatly exaggerated the potentials of technical change. But even if many of the proposed highly efficient energy technologies using renewables become available right away, their application will be delayed by the inherent obstacles to technological diffusion of the capitalist system. In an economic system based on production for profit, a new technology is an "intellectual property." People or countries that cannot afford to pay are denied access. Even today hundreds of millions of people in the world have no access to electricity. How many decades would it take before they start to have access to solar or nuclear fusion-powered electric cars?

Moreover, unlike consumer novelties such as cell phones or laptops, which can be readily manufactured with the existing industrial system, the de-carbonization of the

world's energy system requires fundamental transformation of the world's economic infrastructure. This basically means that the pace of de-carbonization, even under the most ideal conditions, cannot really be faster than the rate of depreciation of long-lasting fixed assets. Considering that many building and other long-lasting structures would stand for half a century or even longer, the assumed rates of de-carbonization presented in Table 2 and 3 must be seen as quite optimistic.

From a purely technical point of view, the most simple and straightforward solution to the crisis of climate change is to immediately stop all economic growth and start to downsize world material consumption in an orderly manner until the greenhouse gases emissions fall to reasonable levels. This can obviously be accomplished with the existing technology. If all the current and potentially available de-carbonization technologies are introduced to all parts of the world as rapidly as possible, the world should still have the material production capacity to meet the basic needs of the entire world's population even with a much smaller world economy (scenario 1 to 3 in Table 3 would roughly correspond to a return to the 1960s material living standards).

However, under a capitalist system, so long as the means of production and surplus value are owned by the capitalists, there are both incentives and pressures for the capitalists to use a substantial portion of the surplus value for capital accumulation. Unless surplus value is placed under social control, there is no way for capital accumulation (and therefore economic growth) not to take place. Moreover, given the enormous inequality in income and wealth distribution under capitalism, how could a global capitalist economy manage an orderly downsizing while meeting the basic needs for billions of people? Economic growth is indispensable for capitalism to alleviate its inherent social contradictions.

The Kyoto protocol requires the advanced capitalist countries reduce their carbon dioxide emissions by 5 percent from 1990 to 2012. Figure 1 presents the carbon dioxide

emissions of the world's largest economies from 1990 to 2005.[1] The US refused to sign the protocol and the US emissions grew by 22 percent from 1990 to 2005. Among the signatories of the Kyoto protocol, Japan's emissions grew by 16 percent and the Euro-zone emissions had tended to grow since the mid-1990s. The UK emissions had been on a flat trend.

[Figure 1 is about here]

Ironically, Russia is the only large economy that has reduced emissions substantially since 1990, thanks to the neoliberal shock therapy. Russia's emissions fell by one-third from 1990 to 2005, with an annual rate of reduction of 2.7 percent. If the world economy were to repeat the Russian experience *for three times*, that is, to experience the kind of economic collapse that Russia experienced in the 1990s *for three times* with a comparable reduction of emissions, then by 2050 the world emissions would fall by two-thirds. This would only allow the atmospheric concentration of carbon dioxide equivalent to stabilize at about 490 ppm. As is discussed above, this would still fall short of what is necessary.

Since 1990, China's emissions and India's emissions have more than doubled, and China is now overtaking the US to become the world's largest greenhouse gases emitter. At the current rates, China's emissions will double in ten years and India's will double in less than fifteen years. The European Union is currently committed to a reduction of emissions by 20 percent (from the 1990 levels) by 2020. All of this reduction would be offset by just one year of China's economic growth. With the great Chinese capitalist boom, China now builds two coal-fired power plants every week. This means that in every three years China will build as many coal-fired power plants as all that currently exist

1 Data for Figure 1 are from World Bank, World Development Indicators Online 2008.

in the US. What hope for climate stabilization with this kind of fanatical drive for accumulation? What magical technology can make this kind of capitalism sustainable?

It should be pointed out that the Chinese workers and peasants have not at all benefited from this relentless search for capitalist profit. It is the transnational corporations (who use China as the world's "workshop") and the Chinese capitalist elites that have reaped enormous profits from this. To a less extent, the upper middle classes in the advanced capitalist countries have also benefited from the cheap consumer goods and "services" produced by the workers in China, India, and other parts of the periphery.

On June 14, 2007, *Financial Times* published a quite bizarre article ("What is at risk is not the climate but freedom") by Vaclav Klaus, the President of the Czech Republic and the former leader of the anticommunist "velvet revolution":

We are living in strange times. One exceptionally warm winter is enough … for environmentalists and their followers to suggest radical measures to do something about the weather … Rational and freedom-loving people have to respond. The dictates of political correctness are strict and only one permitted truth, not for the first time in human history, is imposed on us. …

[Global] warming hysteria has become a prime example of the truth versus propaganda problem. It requires courage to oppose the "established truth" … As someone who lived under communism for most of his life, I feel obliged to say that I see the biggest threat to freedom, democracy, the market economy and prosperity now in ambitious environmentalism, not communism. This ideology wants to replace the free and spontaneous evolution of mankind by a sort of central (now global) planning.

The freedom-loving President Claus (who is apparently a good student of Friedrich Hayek) then demanded that the scientists "have an obligation to declare their political and value assumptions and how much they have affected their selection and interpretation of scientific evidence." Claus then assured us that "advances in technology" and "increases in disposable wealth" will continue and "will solve any potential consequences of mild climate changes."

One has to admit that it does take some courage for Klaus to defend "freedom" at a time when an important political consensus is being formed among the international bourgeoisie that the issue of climate change cannot be ignored any more. Given my own political experience and being one from China (a former socialist state like Czechoslovakia), I do feel some strange familiarity with Klaus's position.

Frankly, only an extremely reactionary bourgeois politician who has deep-in-the-heart hatred of the working class and socialism could have made such outlandish comments. In one respect, however, Claus is closer to truth than all the mainstream environmentalists. It does take a global "central" planning for the humanity to overcome the crisis of climate

change, if by "central" one is talking about self-conscious, rational coordination by democratic institutions.

The technical requirements for climate stabilization are clear. The global energy infrastructure needs to be fundamentally transformed to be based on the renewables. Much of the world's economic infrastructure will have to be transformed accordingly. Agriculture will need to be transformed in accordance with sustainable principles and to be freed from dependence on fossil fuels for fertilizers and machineries. The entire transportation system will have to be re-built, with railways and public transportation operated by renewable electricity playing prominent roles. The scale of the world economy will need to be reduced in accordance with the emissions reduction objectives. All of these need to be accomplished without undermining the basic needs of the world's population.

It is clear that capitalism cannot accomplish these. If we do not want to go back to feudalism, what else can accomplish these other than socialism with public ownership of the means of production and democratic planning?

The so-called "market socialism" is not an option. Both theory and historical experience have demonstrated that "market socialism" inevitably leads to capitalism. Those who object socialist planning might argue that the experience of historical socialisms suggested that socialist planning would be "inefficient."

Leave aside the question that the future socialism would no doubt do better than the historical socialisms in democracy and economic efficiency, given the extreme gravity of the global ecological crisis, "efficiency" is simply not a relevant issue. The real question is: can socialism provide food, education, and health care, to everyone on the earth? We know that historical socialisms were able and Cuba is still able to accomplish this, with quite limited material resources.

Capitalism has always failed to provide food, education, and health care to at least hundreds of millions of people. If the global ecological crisis is not overcome, then capitalism will eventually fail the entire humanity. Is the choice not clear enough?

Table 1 World Energy Balance Table, 2005 (million tons of oil equivalent)[a]

	Primary Supply	Electricity Generation	Intermediate Losses	Total Final Consumption	Industry	Transport	Other	Non-energy
Coal	2892	1954	279	659	514	4	113	28
Oil	4002	298	273	3431	325	2067	496	542
Gas	2362	911	218	1233	432	71	598	132
Nuclear	722	722						
Hydro	251	251						
Renewables[b]	59	59						
Other[c]	1147	75	53	1019	179	19	821	
Electricity		4270	2701	1569	642	22	905	
Total	11435		3524	7911	2092	2183	2933	702
Fossil Fuels	9256	3163	770	5323	1271	2142	1207	702

[a] Total primary energy supply is distributed between electricity generation, intermediate losses, and total final consumption. Total final consumption is in turn distributed between industry, transport, other (agriculture, services, and residential) sectors and non-energy use. Electricity includes heat and note that electricity is not a primary source of energy.

[b] Renewables include geothermal, solar, wind, etc.

[c] Other includes wood and other biomass, animal products, municipal waste, and industrial waste.

Source: International Energy Agency, *Key World Energy Statistics* 2007.

Table 2 Scenarios of Emissions Reduction and World Economic Growth

(Stabilizing CO_2-equivalent in atmosphere at 490 ppm, 2010-2050, annual rate of change)

	Decline in Emissions Intensity	Decline in Energy Intensity	Economic Growth Rate
Historical: 1973-2005	0.3%	0.9%	3.0%
Scenario 1	1.0%	1.0%	-0.4%
Scenario 2	1.0%	1.5%	0.1%
Scenario 3	1.0%	2.0%	0.6%
Scenario 4	1.7%	1.0%	0.3%
Scenario 5	1.7%	1.5%	0.8%
Scenario 6	1.7%	2.0%	1.3%
Scenario 7	2.7%	1.0%	1.3%
Scenario 8	2.7%	1.5%	1.8%
Scenario 9	2.7%	2.0%	2.3%

Source: Historical data for world economic growth, energy consumption, and emissions are from World Bank, *World Development Indicators Online* 2008.

Table 3 Scenarios of Emissions Reduction and World Economic Growth

(Stabilizing CO_2-equivalent in atmosphere at 445 ppm, 2010-2050, annual rate of change)

	Decline in Emissions Intensity	Decline in Energy Intensity	Economic Growth Rate
Historical: 1973-2005	0.3%	0.9%	3.0%
Scenario 1	1.0%	1.0%	-3.4%
Scenario 2	1.0%	1.5%	-2.9%
Scenario 3	1.0%	2.0%	-2.4%
Scenario 4	1.7%	1.0%	-2.7%
Scenario 5	1.7%	1.5%	-2.2%
Scenario 6	1.7%	2.0%	-1.7%
Scenario 7	2.7%	1.0%	-1.7%
Scenario 8	2.7%	1.5%	-1.2%
Scenario 9	2.7%	2.0%	-0.7%

Source: Historical data for world economic growth, energy consumption, and emissions are from World Bank, *World Development Indicators Online* 2008.

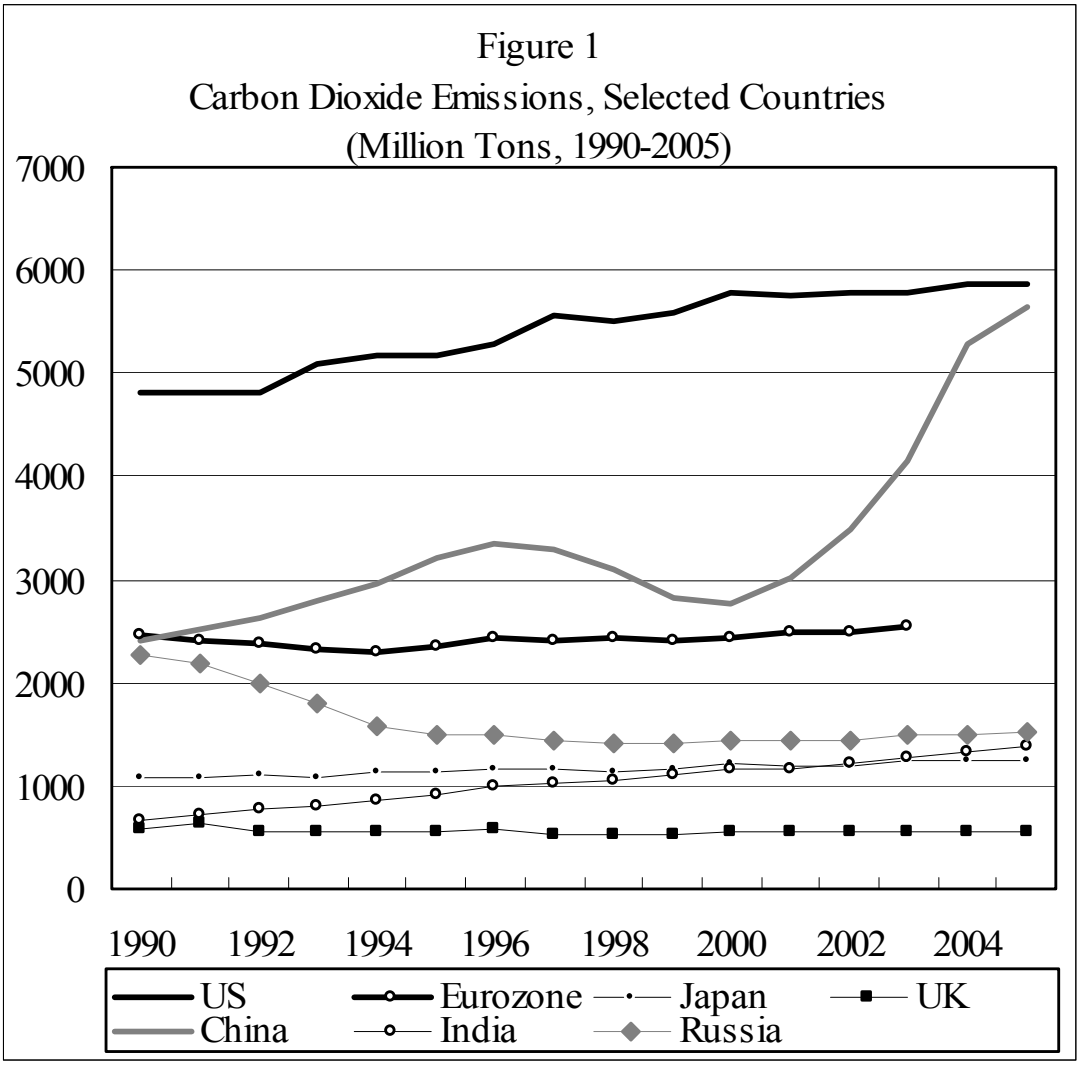
Figure 1
Carbon Dioxide Emissions, Selected Countries
(Million Tons, 1990-2005)
7000
6000
5000
4000
3000
2000
1000
0
1990
1992
1994
1996
1998
2000
2002
2004
US
Eurozone
Japan
UK
China
India
Russia