The Prophet Misarmed: Trotsky, Ecology and Sustainability

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Leon Trotsky showed great insight on many issues but, argues Sandy Irvine, his biggest blind spot concerned ecological sustainability, now the greatest issue of our times. His thinking reflected the technological cornucopianism that bedevils the socialist tradition. Unless addressed it threatens to render the movement unable to address today's primary challenge.

IT IS a tribute to Leon Trotsky's standing that his ideas are still widely discussed. If the number of ex-members as well as actual supporters of avowedly and quasi-Trotskyist groups were to be counted, the total would reveal an army of people who, to some extent at least, have been influenced by his thought and deeds. It is not a question of numbers per se. Many leading figures in contemporary anti-globalisation, anti-racism and "stop the war" movements are Trotskyists in the broadest sense of the word. Many apolitical citizens are aware of his struggle with Stalin and subsequent fate. The David and Goliath quality of this battle only adds interest.[1]

However, discussion of his life and legacy tends to stick to well-worn contours of debate. Hostile critics focus on his alleged role in building a Bolshevik dictatorship which, it is further argued, was ready and waiting for Stalin to take over. Sometimes the criticism focuses specifically on his role in the Russian Civil War and his desire to militarise the workforce. His role in the suppression of the 1921 Kronstadt mutiny invites particular condemnation. Admirers, however, praise his role in the Bolshevik seizure of power, his leadership of the Red Army in defence of the Revolution and his relentless opposition to not just Stalin himself but also the state bureaucracy on which Stalinism rested.

Trotsky's intellectual endeavours also arouse passionate disputation. Some object to his rather hagiographical writings on Lenin and his sometimes crude evocation of materialist dialectics. Amongst Marxists of a more independent hue, there has been considerable criticism of his theorising about the nature of Stalinist Russia (a "workers' state", albeit much degenerated). The same goes for the wishful thinking that led Trotsky to believe it opportune to declare a new international movement, the so-called Fourth International. His tendency to see every political setback as but a crisis of leadership is also much disparaged for its oversimplicity.

It is argued here that Trotsky both reflected and encouraged an even worse tendency amongst the radical Left, namely an almost total myopia about the most significant of all developments in the 20th century, the ecological crisis. It is the most serious, all-embracing challenge of our times. Global overwarming is only one of many symptoms of dangerous planetary disorder. Not only did Trotsky fail to anticipate the most serious failing in the dominant social and economic order, he actually endorsed technologies, lifestyle choices and policy goals that could only serve to increase the unsustainable impact of humankind on the Earth's life-support systems. (The threat from nuclear war will not be discussed since, fortunately, it remains only a possibility whereas ecological meltdown is an actuality.)

Trotsky as case study

The following study focuses on one person. In doing so, it also comments on the more general socialist tradition, especially its Marxist variant of which he was a leading representative. Trotsky provides a particularly good case study. Whatever his failings, he was a very intelligent man. His writings on literature and other arts show great subtlety. He demonstrated immense foresight on many issues, especially the threat from Fascism. In his early political career, he perceptively warned of the dangers of excessive centralism in political organisations. In short, Trotsky combined re-

markable erudition with often sharp perception.

His ecological blind spot was not some personal failing but the product of a whole political tradition that, in this respect at least, was gravely flawed. Unless corrected, this ecological blinkeredness will make it as irrelevant as more conventional politics, no matter what sensible things socialist activists might say about specific matters such as the better funding of public services, job security, protection of citizen rights, militarism and the closing of the wealth-poverty gap.

Any discussion of Trotsky's thinking must start from what, realistically, he could have known at the time. It needs to be noted immediately that there was already a body of thought that recognised the dangerous road down which humankind was travelling in his own lifetime. Those who did not see this must, therefore, be judged myopic. There are no grounds for the rather lame excuse that people back then could not have known what only now we are able to understand. There were prescient individuals who certainly managed to see what Trotsky did not.

Some came from the socialist movement itself. Actually, back in the 19th century, Karl Marx had spotted some danger signs of human abuse of the environment. He particularly highlighted the threat from soil erosion. Marx also criticised the Gotha Programme of the German Social Democrats for treating human labour as the only source of wealth. Marx was not alone. Trotsky's contemporary the Polish-born revolutionary Rosa Luxemburg was a keen student of botany and ornithology. She spotlighted the utterly ruinous effects of imperialism in particular. The German Marxist Karl Kautsky had noted the destructive impacts of agrochemical-intensive farming in his *Agrarian Question* (1899). Leaders of the British Socialist League (1885-1901) were particularly vocal in condemning not just human exploitation but also the environmental costs of the Industrial Revolution.

Yet these were exceptions to the dominant socialist tradition. Most alarm about the effects of environmental abuse as well as understanding of its causes has come from outside the ranks of socialism, reformist or revolutionary. By Trotsky's birth, there was already a strong literature on the matter.[2] Furthermore, in his lifetime, there was ample evidence of the grave risks attendant on increased human pressure on the planet. Symptomatic of the human impact was the death in 1914 of the last surviving Passenger Pigeon, once the most populous bird on the planet. The year before, William Hornaday had published *Our Vanishing Wildlife* in the wake of the near destruction of American buffalo and other assaults on biodiversity.

In fact environmental concern has a very long history. Amongst the first settled "civilisations" there were those sensitive to human damage to the web of life. Back in the 5th century BC, for example, Herodotus observes that "man stalks across the landscape and deserts follow in his footsteps". Not long after, Plato had bemoaned the tide of human destructiveness. There was also Epicurus who clearly enunciated the conservation principles that make a nonsense of the still widely held delusion that we can get more from less, or that technology will create resources out of thin air or make wastes magically disappear.

In Trotsky's own lifetime, the American dust-bowl disaster of the 1930s had affected millions. It was widely publicised through studies like *Deserts on the March* by Paul Sears (1935) and by "New Deal" photographers such as Dorothea Lange and Arthur Rothstein (who snapped the famous "Father and sons in dust storm" image). Geographers such as Carl Sauer were also charting human destruction of wildlife, while human depletion of resources was being highlighted by ornithologist William Vogt and zoologist Fairfield Osborn. There was growing awareness, amongst historians at least, of much older human "own goals", as marked by the ecological suicide of civilisations as diverse as ancient Sumeria, the Roman Empire, Angkor Wat and Easter Island.

Conversely, efforts to protect environmental systems were already being made, albeit ones too weak to resist the tide of further destruction. It is even said that wildlife protection can be traced as far back as the (Buddhist) Maurya Empire in southern Asia (some two hundred and fifty years BC). Perhaps it was the Taoists of ancient China who as a group first articulated a systematic ecological perspective.

From the Middle Ages and the Early Modern era, voices with a distinctly ecological timbre can be heard. They included St Francis of Assisi, who anticipated the rise of a sensibility that showed greater respect for other lifeforms, and the Englishman John Evelyn from the Late Stuart period, who denounced pollution. In the 18th century, the Scottish physician James Hutton clearly enunciated an organic and cyclical view of the Earth and its life processes. The year of the French Revolution also saw the publication in England of a landmark in nature writing, *The Natural History of Selbourne* by Reverend Gilbert White (1720-1793), who displayed an attunement to the particularities and beauties of his locality which bioregionalists are advocating some two hundred years later.

Public measures against pollution and environmental despoliation date back several centuries. The burning of sea coal was banned back in medieval England while, in Victorian times, the 1858 "Great Stink" in London led to action over sewage disposal. In 1872 the first National Park (Yellowstone) had been created (though the foundations of Yosemite National Park were actually laid by Lincoln in 1864). Indeed individuals such as William Wordsworth in England and George Catlin

in the USA had been campaigning for such systems of protection much earlier in the 19th century. By mid-century, there were individuals such as Henry Thoreau who were questioning the whole industrial order.

Scientific awareness had also developed. Thomas Malthus had raised the issue of environmental constraints on population growth in his *An Essay on the Principle of Population* (1798). In the same period, Jean Baptiste Lamarck developed the science of biology. Whatever the merits of his views on heredity, he correctly perceived the Earth as an interconnected system, in which its living and non-living parts dynamically shaped one another. Human rootedness in ecological systems had been spotlighted by Charles Darwin amongst others. George Marsh had spelled out in detail ecological constraints on human activity, especially in his *Man and Nature* (1864).

The German biologist Ernst Haeckel popularised the word "ecology" in the 1860s, a word based on the Greek "oikos" or home, terminology which carries connotations of something to protect and cherish. Another word, "biosphere", introduced by Eduard Suess in 1875, also encouraged a holistic appreciation of the living world, thus challenging the dominant reductionist approach. Understanding of thermodynamic constraints on energy conversion had been deepened by a string of researchers such as Sadi Carnot (1796-1832), Rudolf Clausius (1822-1888) and Lord Kelvin (1824-1907). Alfred Lotka (1880-1949) and others had linked population dynamics and energetics. The idea that geology would set constraints on resource availability had been highlighted by economists such as Stanley Jevons (1835-1882). John Stuart Mill had advocated a "steady-state economy" in the same year the *Communist Manifesto* was published.

Actually scientists inside the young Soviet Union had been working towards an ecological view of the world. In 1926 Vladimir Vernadsky, for example, published his *Biosphere*, whose very title evokes a picture of humans as but one part of a bigger system. His work further spotlights the limit capacity of ecosystems to underwrite human activity, not least full-speed industrialisation. Nature was not some limitless, free asset, there to be used and abused at will.

The purpose of this potted history is to demonstrate that the intellectual and aesthetic "wherewithal" was already in place for an intelligent and well-read man like Leon Trotsky to grasp the ecological message ... had not other values and perceptions got in the way. It may be objected that, most of his life, Trotsky had his head and hands somewhat full with other pressing matters. Yet he did find time to address ecological issues such as land use, technology and consumption choices – but, it will be argued, analysed them from an unsustainable perspective.

Ecoview

The following critique of Trotsky will draw upon what the British political scientist Andrew Dobson has called "ecologism", others "ecocentrism". The kernel of this tradition is the view of people, not as conquerors of nature, but as "plain members and citizens of it", in the words of the American forester Aldo Leopold, a near contemporary of Trotsky. Concepts like interdependence, balance and especially limits provide the framework through which we would think about, value and do things.[3]

Ecologism puts first the Earth and its life-support systems, on which depend many species, not just people. The key perspective in analytical terms might be called "limits-to-growth" theory, while the practical conclusion to be drawn from it is that humans must all learn to tread more lightly and to "share smaller pies" as the American writer Tom Bender once put it. The conventional goal of universal affluence-for-all (defined in terms of physical consumption in the manner of the typical citizen of a country like Britain) is, viewed in this paradigm, an impossible goal. Furthermore, sustained attempts to achieve it can only be suicidal, given the unavoidable side-effects.

Before assessing Trotsky's thoughts, it may be helpful to clarify the meaning of "ecology" and "ecological". It is most useful to use the term broadly. Thus "ecocentrism" embraces:

1. Appreciation of the diversity of landforms and lifeforms ecosystems contain, in terms of utilitarian, aesthetic and, above all, intrinsic value;

2. Awareness of ecological systems and their dynamics, i.e. ecology in its narrowest "scientific" sense;

3. Understanding of human dependence on what is the "real wealth of nations", not just specific resources but the wide variety of "life-support" services delivered by ecosystems, from specific ones such as mangrove swamps and coral reefs to, say, the entire atmosphere;

4. Comprehension of the magnitude and range of human impacts on the rest of nature and its consequences for humans and other species alike;

5. Analysis of the sources of those pressures, specifically a) human population growth, b) per capita consumption and c) the technologies used to deliver a given range of goods and services to a given number of people, including the institutional framework through which such choices are mediated;

6. Prescription of policies that can put the relationship between humanity and the rest of nature on a less destructive and more durable footing: "tread lightly".

Point 1 above must be particularly stressed. Without some sense of respect for the intrinsic merit of non-human nature, including a corresponding willingness to constrain human activity, there will always be some immediate and seem-

ingly unanswerable case to take one "bite" out of the planet. After all, it often seems as if anthropogenic extinction of wildlife is "cost-free" or that an extra dollop of pollution will make no difference, at least in the here and now. Further, it is impossible to put a precise figure on how much this wetland or that old-growth woodland is financially worth. Purely utilitarian calculations are, then, likely to encourage further steps down the road of ecological suicide.

Thus ecologism spans both science and morality. It rests itself on what steady-state economist Herman Daly calls the "ultimate means" (i.e. high quality and readily available energy and matter, both the means of and conditions for production without which human or any other form of life is not possible) and the "ultimate ends" (i.e. the goals of an ethically responsible life). Given that Trotsky was proud to place himself in the tradition of scientific socialism, it is rather ironic that he based so little of his thought on the teachings of geology, thermodynamics and ecology. At the same time of course, he had little time for "bourgeois" ethics (see his writings on the suppression of the Kronstadt mutiny, for example).

It is important here to underline the dangers inherent in a related word: "environment." It is a term that almost invites its own marginalisation. It can be taken to mean everything around an individual, not just air, water, soil and so forth but also bad housing, poor schooling, unsatisfactory domestic circumstances and the like. It can mean just about everything ... and therefore nothing much in particular. Sight is thereby lost of the critical issue: the Earth's life-support systems and the fact that on their well-being humankind is utterly and inescapably dependent. Furthermore, the issue is not just the damaging impact of resource depletion, pollution and environmental degradation. That in itself is scarcely a radical insight. It is that ecological protection is all important; no matter how pressing or worthy, all else is secondary.

On ecology

It must noted immediately that Trotsky wrote no books or pamphlets nor, as far as can be traced, made a single speech directly on any of the themes just listed. Instead there are a number of passing references, largely on certain technologies but also lifestyle expectations. It must be admitted that Trotsky wrote so extensively on a quite remarkable range of topics that it would be easy to miss other comments he may have made. However the real issue is not so much specific points of analysis but rather the whole framework through which he perceived what was wrong with the world and how things might be put right. It is here that there are the most glaring contradictions with an ecologically guided and, therefore, sustainable perspective.

Trotsky's longest statement is to be found in his study *Literature and Revolution* (1924). It reads thus:

"The present distribution of mountains and rivers, of fields, of meadows, of steppes, of forests, and of seashores, cannot be considered final. Man has already made changes in the map of nature that are not few nor insignificant. But they are mere pupils' practice in comparison with what is coming. Faith merely promises to move mountains; but technology, which takes nothing 'on faith', is actually able to cut down mountains and move them. Up to now this was done for industrial purposes (mines) or for railways (tunnels); in the future this will be done on an immeasurably larger scale, according to a general industrial and artistic plan. Man will occupy himself with re-registering mountains and rivers, and will earnestly and repeatedly make improvements in nature. In the end, he will have rebuilt the earth, if not in his own image, at least according to his own taste. We have not the slightest fear that this taste will be bad....

"The poetry of the earth is not eternal, but changeable, and man began to sing articulate songs only after he had placed between himself and the earth implements and instruments which were the first simple machines.... Through the machine, man in Socialist society will command nature in its entirety, with its grouse and its sturgeons. He will point out places for mountains and for passes. He will change the course of the rivers, and he will lay down rules for the oceans....

"Of course this does not mean that the entire globe will be marked off into boxes, that the forests will be turned into parks and gardens. Most likely, thickets and forests and grouse and tigers will remain, but only where man commands them to remain. And man will do it so well that the tiger won't even notice the machine, or feel the change, but will live as he lived in primeval times. The machine is not in opposition to the earth. The machine is the instrument of modern man in every field of life."

It can seen that there were conservation strains in Trotsky's thinking. In fact, the early Bolshevik regime had set aside the Zapovednik, a nature conservation system, starting with a site on Lake Baikal in 1917. Presumably Trotsky agreed with this strategy whose main purpose was scientific study so that lessons could be learned for agriculture and other human production systems. Its very real value notwithstanding, the plan had more in common with the enlightened resource managerialism of Gifford Pinchot of the American Forestry Service than with his conservationist opponents, in particular John Muir. More importantly, the system quickly came under assault during the Industrialisation drive, many state planners deeming it to be of no value, merely a wasted asset. (In that respect, they pre-echoed the so-called Wise

Use movement in the USA.)

The compatibility of Trotsky's economic vision with environmental conservation will be discussed later. For now, it can be recognised that Trotsky is prepared to concede some space to non-human nature but it is equally clear that such an allocation is courtesy of human tolerance which may permit flora and fauna to exist ... or may not. There is no element of "intrinsic value" (compare his views with those of John Muir, Aldo Leopold or Arne Naess).

More significantly, he seems to perceive ecological systems as so much stuff, simply there to be reshaped in any way people want. That such manipulation might easily become unsustainable and counter-productive clearly eludes him. Nor is there any appreciation that ecological "health", including biodiversity, depends on the maintenance of a dense network of large-scale reserves and corridors linking them, free from any direct human exploitation (see the modern work of groups like the American Wildlands project). Similarly he shows no sign of understanding the ecological significance of, say, old-growth forests compared with monocultural plantations or that rearranged hydrology is likely to trigger disastrous blowbacks (more severe flooding etc). It would be absurd to criticise Trotsky for not knowing this or that aspect of ecology. The subject is the most complex of all intellectual disciplines. But it is fair to suggest that not only did he not know about such perspectives, he also, and more importantly, did not care to know, glibly endorsing all kinds of human gambling with ecological systems.

To underline the point: a certain mindset misled his thinking.

The new god

Trotsky was a genuinely radical thinker in many ways but, with regards to the issues being discussed here, it must also be stressed just how conventional was his thought. The quote from *Literature and Revolution* conceivably could have been written by people across the political spectrum, all of whom shared the same underlying vision of "Progress", albeit one defined in particular ways.

This worldview was forged in the technological, economic, intellectual and political upheavals of the British Industrial Revolution and the European Enlightenment (though it was in the newborn USA that "theory" was to be most quickly turned into "practice"). Marxism was but one of its heirs, with Trotsky as a particularly loyal follower. Belief in Progress and attendant activity on the ground have proved to be a development of unprecedented explosive force. As William Woodruff once put it, "no civilisation prior to the European had occasion to believe in the systematic material progress of the whole human race; no civilisation drove itself so relentlessly to an ever-receding goal; no civilisation was so passion-charged to replace what is with what could be; no civilisation had striven as the West has done to direct the world according to its will".

At the heart of this particular concept of Progress is a mentality of "moreness": more people consuming more things, courtesy of more powerful technologies and more control over every aspect of life. This constitutes, in the words of Christopher Lasch, "the only true heaven". As American biologist Garrett Hardin puts it, "growth, change, 'development', spending, rapid turnover [are] viewed as goods without limits. Anything else is archaic or at best undeveloped, waiting to be developed or 'take off' in the direction of those societies blessed with the widest array of consumer goods and technological devices."[4]

In *Ninety Years of the Communist Manifesto*, Trotsky duly refers to the lands of Asia, Latin America and Africa as "backward countries". Not for him any pause to consider whether their cultures – or at least aspects of them – might offer equally valid paths of development and perhaps more sustainable ones. Not surprisingly, then, he refers to Ghandi as "a fake leader and a false prophet" (*Open Letter to the Workers of India*, 1939). Indeed, his writings often display a deep contempt for non-urban ways. "The entire future work of the Revolution will be directed towards ... uprooting the idiocy of village life", he writes in *Literature and Revolution*. He similarly sneers at "peasant-singing intelligentsia". Urbanism is the only future: "the city lives and leads." (For some reason, he even takes a swipe at "home-brew": presumably the only politically correct pint is one served from giant state breweries!)

Trotsky followed the tradition of thinkers like Sir Francis Bacon who argued that the reason for trying to understand nature better is to command it the more. Trotsky agreed. As he put it in 1918: "The proper goal of communism is the domination of nature by technology and the domination of technology by planning, so that raw materials of nature will yield to mankind all that it needs and more besides" (cited by Deutscher in *The Prophet Unarmed: Trotsky, 1921-1929*, OUP). He frequently returned to this theme. Thus: "men ... need to subordinate nature to themselves" (speech at a centennial celebration of Mendeleyev in 1925).

Here Trotsky was echoing Engels. The latter's ideas on "scientific socialism" rested on a vision of post-capitalism in which "the whole sphere of the conditions of life, which environ man, and which hitherto ruled man, who [under the new socialism] for the first time becomes the real, conscious lord of Nature". There is no room for any doubt that humankind might be a reckless and feckless boss or for any recognition that humans would still depend on nature, no matter how powerful human technologies. Engels and Trotsky were too steeped in what Ehrenfeld calls

"the arrogance of Humanism". They could not see that human lordship might be no more than a "fleeting supremacy", as John Livingston once put it.

Essentially, Mother Earth is an inefficient, disorderly indeed treacherous bitch. In his *In Defence of October*, for example, Trotsky sneers at the "demons and furies of nature" over which, he then says, "now reigns ever more courageously the industrious will of man". Nature, it seems, must be brought to heel and harnessed to the fulfilment of open-ended and indiscriminate human demands. In *Literature and Revolution*, he even predicts, with evident enthusiasm, that "man will learn to ... build peoples' palaces on the peaks of Mont Blanc and at the bottom of the Atlantic".

In his *In Defence of October*, Trotsky makes no mention of ecology, despite the rapid growth of the discipline, even though he was at the time head of all Soviet scientific institutions. Moreover, his thinking seems shaped by reductionist and mechanistic approaches whose weaknesses scientists such as Fritjof Capra have been at pains to demonstrate. He does, however, refer to Darwin, though Trotsky's purpose is to enrol him as an unwitting advocate of dialectical materialism. To his great credit, Trotsky does make a passing critique of that gross distortion of evolutionary science which today uses biology to justify socially created inequality.

Technologically, Progress is equated with ever more powerful machines and intricate production systems. Economically, success has been perceived in terms of more and more physical output. Not surprisingly, hugely optimistic targets were at the heart of Soviet planning. Like Lenin, Trotsky was an enthusiastic advocate of scientific management ("Taylorism") and, more generally, assembly-line production or "Fordism" (Lenin: "American efficiency is that indomitable force which neither knows nor recognises obstacles").[5] This worldview is intimately linked to the industrialisation of farming and forestry, round-the-clock assembly line manufacturing and, more recently, genetic engineering. Even the building blocks of Life are to be made more productive. The connecting thread is an unsustainably narrow concept of efficiency, which in reality are only attained at the unsustainable cost of bigger "inefficiencies", once all human and environmental costs and risks are taken into account.

The new USSR proudly displayed its new symbols of this model of Progress. They included lines of electricity pylons striding over hill and dale (Lenin once defined socialism as "Soviets plus electrification"). It was also embodied in massive dams that sought to tame once wild rivers. The virtually useless White Sea-Baltic Canal, opened in 1933, was another such symbol, one costing tens of thousands of lives. The towering skyscraper building too symbolises this model of Progress (many Russian and East European cities are still scarred with giant emblems of Soviet Gothic architecture). Trotsky did strongly criticise certain means used by Stalin but he made fewer criticisms of the goals.

Though it has become fashionable to spotlight allegedly "green" elements in Nazism (experiments in organic farming, etc), Hitler's dictatorship followed a similar agenda to that of the Soviet government. They too enthusiastically embraced all that was modern in such forms as autobahns and aeroplanes, including proto-computers like the Hollerich calculating machine. Nazi hostility to groups like the Bauhaus was based on hostility to its proponents rather than a questioning of advanced industrial technology per se. The Reich Food Estate Exhibitions celebrated the industrialisation of farming as much as Soviet "poets" of collectivisation like Dovzhenko (director of *Earth*) and Eisenstein (especially his *The General Line*). The Nazis also backed huge schemes to destroy wetlands. Most significantly, the Nazis propagated a cult of motherhood and of procreation, i.e. human population growth, a decidedly anti-Earth position and one mimicked under Stalinist Communism (Romanian dictator Ceausescu being one of the worst exponents).

Perhaps the most enthusiastic embrace of Industrial Progress was to be the Chinese Communist Party both in its Maoist and especially later pro-Market guises. Vicious Stalinist and therefore anti-Trotskyist thug though he was, Chinese dictator Mao Zedong thoroughly agreed with Trotsky on one thing: "Man Must Conquer Nature".[6] The vast Three Gorges scheme on the Yangtze continues the tradition under his successors. The key point, then, is that "technocentric" perceptions of progress had a very wide range of subscribers of which Trotsky was a particularly uncritical adherent.

Regress of nature

Trotsky's views on the environment and land use conform to the dominant mindset of the last two hundred years. "Non-human nature" has been perceived as mere raw material, there to be managed and manipulated, as people see fit. Wild rivers, for example, are waiting to be "harnessed" and virgin forests "harvested" or otherwise "put to work". This worldview came to dominate the minds of many of society's critics, not just defenders of the status quo.

To take one example: "Hail, glorious Science! For thou can'st impart a charm to humanise the savage heart; If not for thee, this beauteous earth had been a wilderness – a den of savage men; Without a language, and without a mind – With bodies naked, lashed by every wind. Had not fair Science worked out Nature's plan, the brute had held dominion over man." These were the words of Allen Davenport, a 19th century shoemaker and follower of the radical reformer Robert Owen but,

stylistically amended, they could have been written by a wide range of thinkers.

The conception of Progress consists, then, of transforming nature into forms that are imposed by human beings – which, in practice, meant industrialised farms, factories and cities. Thus, in the Soviet Union, the semi-arid steppes were viewed as wastelands to be put under the plough (with disastrous results due to soil erosion). In the more far-fetched visions of Soviet planners festered gigantic schemes to divert whole river systems from the Arctic north to dry zones of the south.

The practical implications of the vision expressed by Trotsky in *Literature and Revolution* and elsewhere is little different to what was done by the Tennessee Valley Authority of Roosevelt's New Deal era, the American Bureau of Land Management and the of Army Corps of Engineers.[7] They are no more different than that of many, many development agencies, ranging from international bodies such as the United Food and Agriculture Organisation, national bodies such as Britain's Forestry Commission and Drainage Boards as well as a myriad regional and local development agencies.

The World Bank could have been quoting Trotsky in its statement on dam construction and development: "It is difficult to conceive of a scenario in which India can afford to let the waters of a major river such as the Narmada run wasted to the sea" (1987). So too could have been Canadian politician Robert Bourassa: "Quebec is a vast hydroelectric plant in the bud, and every day millions of potential kilowatt-hours flow downstream and out to sea. What a waste!" (*Power from the North*, 1985). The radical singer Woody Guthrie was another who penned hymns to hydrological rearrangement, especially in the song commissions from Department of the Interior and the Bonneville Power Administration (e.g. *Grand Coulee Dam* which hailed this ecologically destructive construction as the "greatest wonder" of the world).

Such ideas of nature as nothing more than raw material, wasted if not exploited to satisfy human wants, were circulating inside the Soviet Union. In his *Soviet River*, for example, Leonid Leonov created a new kind of hero, engineer Uvadiev. His mission is to put Mother Earth to work. "From the moment when Uvadiev stepped on the bank, a challenge was cast at the River Sot ... and it seemed as though the very earth beneath his feet was his enemy." Another character, manager Sergei Potemkin, dreams of turning forests into newsprint.

In *Belomor* Maxim Gorky favourably depicts Stalin thus: "Before him lies a map of the region. Deserted shores. Remote villages. Virgin soil, covered with boulders. Primeval forests. Too much forest as a matter of fact; it covers the best soil. And swamps. The swamps are always crawling about, making life dull and slovenly. Tillage must be increased. The swamps must be drained...." (quoted in Douglas Weiner's *Models of Nature: Ecology, Conservation, and Cultural Revolution in the Soviet Union*, Indiana University, 1988). Trotsky was prepared to take to task false thinkers in the Soviet government and radical circles around it. He rightly opposed, for example, the vulgar ideas of Proletarian Art. But he does not seem to have thought it worthwhile to address anti-environment ideas that such authors were propagating.

The paradigm of industrial cornucopia

Trotsky saw the fundamental problem facing humanity in terms of an economic system, capitalism, acting as a limitation on the forces of production which had been unleashed since the Industrial Revolution. His essential standpoint was a cornucopian one. Once capitalist fetters had been removed, nationalisation and state planning could be the midwife to a world of unlimited plenty. In *If America Should Go Communist* (1935), for example, he claims that under Communism "control over individual consumption – whether by money or administration – will no longer be necessary when there is more than enough of everything for everybody". He was far from being alone in this perception. Robert Tressell's famous novel *The Ragged Trousered Philanthropists* (1914), for example, envisaged a future with such abundance that people would simply take what they wanted from giant warehouses.

As a loyal Marxist, Trotsky saw industrialisation, albeit capitalist-led, as a massive step forward, breaking the chains of feudalism whilst creating the necessary preconditions for the subsequent advance to socialism (built on what Trotsky calls "the inevitable and progressive work of capitalism", Deutscher, p.348). Or, as he put it in *The Permanent Revolution* (1930), "industrialisation is the driving force of the whole of modern culture and by this token the *only* conceivable basis for socialism" (emphasis added).

Beyond those gains, capitalism, he famously argued, could only offer crisis and collapse. It was a system in its "death agony" as the Fourth International Manifesto put it. History was to show that capitalism had plenty of life. Indeed a long economic boom followed the ending of World War Two. The issue here is not Trotsky's erroneous diagnosis of the prospects for capitalism but rather his assumption that there should and could be a massive and sustained increases in throughput in the human economy. Thus his attack on Roosevelt's economic policies in the 1930s was partly based on what he saw as its small ambition. He argues thus: "on the basis of a unified socialist plan, the productive calculations could be considerably surpassed and a high comfortable standard of living, on the basis of an extremely short labour day assured to all the people" (*Marxism in Our*

Time, 1939).

Within that overall growth paradigm, he seems to have also believed in a globalised economy. In the same passage he praises capitalism for "having bound all parts of the world with economic ties". After its overthrow (just around the corner!) Trotsky predicts that "the thoroughly rotted customs toll-gates will fall". Such an economic system, no matter how carefully planned, would mean, by its very nature, more transportation and correspondingly more roads, railways, docks and airports ... as well as more fuel consumption to power the transportation systems.

The god that failed

In the late 1920s, breakneck expansion became the goal of economic planning in the USSR. The first Five Year Plan (1928), for example, sought or, rather, demanded a 111% increase in coal production, a 200% increase in iron production and a 335% increase in electricity supply (hence huge HEP projects such as the giant Dnieper dam). Giant cars were built in Moscow and tractor plants in Stalingrad, with enormous steel plants at Magnitogorsk, Gorky, and Kuznetsk.

These were just the highlights of a huge "battle for production". Chemical and other plants making artificial fertiliser, synthetic rubber and man-made fibres sprouted in areas such as the Urals. Oil production in the Caucasus region was rapidly increased. Vast housing complexes were almost literally thrown up to give some shelter to the new workforce. Collectivisation similarly sought to transform agriculture (with the additional aim of destroying actual and potential oppositional elements in the countryside).

Trotsky's main criticism was of the "zig-zag" nature of the then Stalin-Bukharin leadership and what he called "adventurism", especially with regard to the scale and degree of violent coercion. Yet many of his comrades in the Left Opposition saw sufficient continuity between their programme and that of Stalin to make their peace with the Soviet leadership. Leading Left Oppositionist Christian Rakovsky noted in 1928 that Stalin had stolen "Trotsky's clothes". Other leaders such as Smilga and Smirnov now took a conciliatory position towards the Stalinist leadership. After all, their platform had denounced "the chronic lagging of industry, and also of transport, electrification and building, behind the demands and needs of the population, of public economy and the social system as a whole, holds as in a vice the entire economic turnover of the country".

Trotsky was quick to savage anyone who dared to suggest that the USSR had ceased to be socialist (e.g. his *Defence of the Soviet Republic and the Opposition*, 1929). His criticism of Stalinist economic planning was more about means than ends. His other policies, namely increased export of primary goods through trade deals with what he hoped would be left-wing governments in Europe, arguably would have put more pressure on the Soviet environment, especially her forests (industrialised clear-cutting became the norm there in the 1930s).

Numerous studies have recorded the horrendous ecological consequences of Soviet policy under Stalin and after.[8] The impact ranged from acute air and water pollution (including the once pristine Lake Baikal) to severe soil erosion, and deforestation. One result was that toxic contamination came to blight the country. Mercury pollution, for example, poisoned several waterways. The world's worst nuclear disaster took place in 1957-8 at Kyshtym in the Urals while several Russian rivers have suffered routine radioactive pollution. Arguably the world's single worst ecological disaster in modern times happened in Soviet central Asia – the destruction of the Aral Sea due to in-tensive irrigation projects.

The impact on other species has been disastrous as habitats have been destroyed or despoiled (loss of forests, wetland drainage, water diversion schemes etc). It is symbolised by the fate of bear and big cat populations (Siberian tigers etc) but many humble plants have become extinct or are endangered. Many fisheries have been destroyed due to pollution and disruption of spawning routes. By the mid-80s, some 23 species of mammals, 21 of birds, 7 of reptiles, 7 of fish, 9 of insects were listed under immediate threat of extinction (A. Borodin, *Krasnaya Kniga*, USSR, 1985). To be fair, in terms of direct threats to wildlife from hunting and poaching, the problem has got worse post-Stalin, though, from the start, corruption of state officials undermined genuine nature conservation efforts launched in the early Bolshevik period.

The human health costs have been terrible too. One legacy is that 40 percent of the Russian people live in areas where air pollutants are three to four times the maximum allowable levels. In St Petersburg, nearly half of the children have intestinal disorders caused by drinking contaminated water from what was once famously clean supply system.

It is interesting to note how little space has been devoted to these matters by left-wing critics of Stalin. They preferred to continue to debate whether the USSR was a degenerated or deformed workers' state, a species of state capitalism or something called bureaucratic collectivism. Arguments about whether the bureaucracy was a class or a caste interested them more than what Soviet leaders and their planners were doing to the environment. There were some exceptions. The biologist Zhores Medvedev drew attention, amongst other things, to the Urals nuclear disaster and its cover-up. In the 1979 *The Destruction of Nature in the Soviet Union*, Boris Komarov (Ze'ev Wolfson) blew the whistle on assorted ecological crimes (he followed up with his 1994 study, *The Geography of Survival:*

Ecology in the Post-Soviet Era).

The big issue is, of course, whether such consequences were the inevitable by-product of the model of economic development pursued by Stalin or sought by Trotsky and the Left/United Opposition groupings. Poor planning and inadequate management combined with wasteful and faulty production methods partly explain the havoc wreaked on the Soviet environment by economic development. But the root cause lies in inherent limits to all physical growth.

Limits to growth

Debate about "limits-to-growth" is bedevilled by language. It is perhaps best to drop the word "growth" and instead use "throughput". The real issue, then, is total throughput of physical space, energy, raw materials and information in the human economy, with all stages of a given "life cycle" taken into account. Accounting thus must cover exploration and extraction, refining, manufacture, distribution and consumption right through to final disposal. Transportation of people and artefacts occurs at most stages and so too must be taken into the total reckoning.

Such a perspective shifts the argument away from vague and subjective terms like "living standards", "quality of life", and, that particularly fuzzy concept, "human development". In reality, there is no escaping biogeophysical realities, no matter in what "non-material" ways progress is couched. Even such personal self-improvement as greater music appreciation requires physical things like instruments, CD players and concert halls. An intangible like "privacy" still depends on some (limited) private physical space, if not walls and/or screens of vegetation. The most ascetic community of monks still needs some basic things. Certainly one can inhabit a world of seemingly limitless imagination but not without worldly goods like food and water, which, like all things in the real world, are subject to the limits. There is no ecological free lunch and that truth becomes clearer when the whole picture of production, consumption and disposal is taken into account.

It might have been noted that "information" has been added to the ingredients of economic activity. This is usually seen as limitless by those who concede (often reluctantly) that there might just be limits to, say, oil supply. Certainly human knowledge has exploded exponentially in recent centuries. Yet information needs physical receptacles to be used. Our brains seem prone to "overload", while person-to-person and group communication has its own constraints that also limit the circulation and usefulness of information, as humorously demonstrated in the old game of Chinese whispers.

Bureaucracy adds its own delays and distortions to the generation and application of "knowledge". No wonder the old adage has it that a camel is a horse designed by a committee. Given the high expectations placed on planning by Trotsky and many others, its potential perhaps ought to be treated with a bit more caution. Computers might seem to transcend such limits on storage and processing, yet their manufacture, operation and disposal consume a great deal of energy and raw material, some of them very hazardous. The fast rising mountain of "silicon trash" is but one sign that computerisation is not free from ecological constraints. The quality of computer-based "knowledge" is similarly limited.[9] Even when it helps with know-how, it sheds less light on "know-why".

Information technology is, then, subject to biophysical limits just like all other specific technologies and general land usage. These constraints are inherent, absolute and insuperable. That bald statement needs to be qualified by the rider that there are seldom, if ever, precise boundaries and exact timescales, given the complex interactions within ecosystems and the possibility of trade-offs (i.e. more resources of one kind made available at the cost of the diminution of others). Nonetheless, the fundamental reality of life is finitude.

The outer limits

Life on Earth is constrained by what might be called the 3 E's – the Earth and its finite size, Entropy with its penalties on any energy and raw material conversion, and, last but not least, Ecology with the constraining checks and balances that sustain ecosystems. In a geologically finite, entropy bound and ecologically interconnected system, sustaining more of one thing must mean sustaining less of something else. Thus the finite geology of the Earth limits not only the amount of energy and raw materials available for economic activity but also the environment's capacity to absorb the waste generated by production and consumption.

These losses from the economy to the "sink" of air, land and water are not simply the product of bad management but rather the product of the basic laws of energy and matter, in particular the entropy law. Against these constraints, there is no technological appeal. According to the entropy law, every process, from the generation of electricity to the refining of raw materials, inevitably must create wastes, as high quality energy and matter are disordered and dispersed. No-one has made a car, for example, that can be powered from its exhaust fumes or lit a fire from yesterday's ashes. These entropic barriers are further compounded by ecological limits.

Ecology is the third external limit. The interaction of abiotic and biotic components of both specific biomes and the global ecosystem as a whole is the foundation for every aspect of human existence. Yet most people see the human-created

economy as something above and apart from the rest of nature or, at the most, reluctantly concede that economics and environment are interdependent. In reality, ecology is the basis for the human economy. The latter is utterly and unavoidably dependent on the former.

Ecosystems and the "services" they provide are not just the "means" of production (i.e. specific resources without which there would be no factories, offices, homes and so forth) but also the conditions for economic and any other activity. The latter point might become clearer if one compares difficulties of survival on the moon with the habitability of the Earth. Like all species, humans depend on others for our existence. At the very least, we need them to produce the oxygen we breathe, absorb the carbon dioxide we exhale, decompose our sewage, provide our food, maintain the fertility of the soil we cultivate. We similarly depend on certain biogeochemical cycles (water, carbon, nitrogen, etc) as well as continual inputs of energy (it might be noted that a degree of "global warming" is rather a good thing, though not its anthropogenic forcing beyond a certain sustainable point).

The planet's tree cover highlights what "life-support" means. Forests act as buffers against excess carbon dioxide in the atmosphere and stabilise climate; they enhance rainfall; they protect soil and act as sponges against excess downhill flow of water; they purify and cool the air; they absorb noise; they provide habitats for an incredible variety of wildlife; they convert solar energy into a host of specific resources of which lumber is just one ... and, to many eyes, they are beautiful. Wetlands provide a further illustration. They are nature's kidneys, processing the nutrients in waterways. Furthermore, they protect shorelines, recharge ground water, moderate flooding and climate whilst, of course, providing habitat for many other species, including, in the USA, over 180 endangered species.

All living species, of course, affect their surroundings. Beavers, for instance, create dams across rivers. But their impoundments scarcely change hydrological systems or eliminate other species in the manner of human interventions in the water cycle. Today the scale and kind of human impact has gone beyond what can be sustained. The Earth's life-support capacities are, then, being reduced in toto by human additions (not just individual pollutants but a complex cocktail of interacting contaminants), abstractions (soil erosion, deforestation, wetland drainage, direct species elimination) and other alterations such as changing the course of waterways) to ecosystems. Thus the further "natural" large-biomass, diverse and multiple-age forests are replaced by single-species, even-aged and short-rotation plantations or are simply cleared, the more these priceless and irreplaceable life-support functions are lost. Ecology is, then, the third constraint on human activity.

Ecological foundation of all value

The nature of the above limits has been clouded by the way debate over the human-environment issue has developed. Clarity has been lost in due course. In the early 1970s, there was a rash of media speculation about resources running out. However, the real environmental crisis is not so much the absolute shortage in the near future of specific resources, though, already, there are signs of conflicts to come over the sheer availability of sufficient water in some regions and of certain key minerals. In the short term, greater efficiency and the substitution of more abundant resources for scarcer ones mean that factories are not going to run out of raw materials.

The more formidable resource barrier is the depletion that would result from attempts to spread across all countries the lifestyles prevalent in regions like western Europe. If the rest of Asia, for example, were to achieve the same ratio of cars to people as Japan (not high compared with America), the number of cars in the world would double. Yet the earth is choking on present, let alone projected, traffic levels. The fundamental ecological problem is, however, the side-effects of resource extraction, processing, and manufacture as well as impacts of consuming and discarding those products. limited waste absorption capacities of the environment constitute a formidable limit to growth.

Furthermore, it is vital to distinguish different threats to the Earth's "health". The danger from specific pollutants (addition of harmful substances to ecosystems) is compounded by the hazards of environmental degradation and simplification (removal of ecological richness and diversity of lifeforms and landscapes). Seemingly "clean" activities – clear-cutting of forests, dams, tillage, the paving over of land etc – can be just as, if not more, damaging as "dirty" ones. Yet there is a very strong tendency to focus one-dimensionally on the problem of pollution, overlooking the sometimes greater dangers from soil erosion and other adverse changes to the land and waterways.

The fundamental ecological limit, however, is at the same time the very reason for nature's resilience. Any system, be it a human body or an ecosystem, uses a lot of the resources available simply to maintain and repair itself. The surplus yield is necessarily small if the "producer" is to function sustainably. The corollary of this "number one rule of life" is that the Earth's life-support systems can only cater for limited demands, be it in terms of energy supply, food production, or any other human need.

Ecology would seem to defy the "entropic" losses discussed above. After all, the Earth is still here and, down the millennia, life has evolved in more complex and diverse ways. Put simply:

things have got more ordered, contrary to the laws of thermodynamics. It has managed to absorb and transcend freezing ice ages, gigantic volcanic eruptions and even the impact of meteors from outer space. At one level, the Earth and the mix of abiotic and biotic elements that compose it does seem to transcend entropy. This happens because evolution has fine-tuned ecological systems and life within, making them resilient. Individual species come and go but, overall, life has continued to flourish. Thus nature "heals" land devastated by volcanoes, quickly recovering it with vegetation.

More generally, the "waste" outputs from one part of the ecological system become the life-giving inputs to other flora and fauna, creating a level of total efficiency that human technology cannot match. Complex checks and balances usually prevent any one part of the system growing out of proportion to the rest and thus threatening the whole. Thus not only is the dissipation of energy and raw materials counteracted but the tendency to disorder and disintegration is checked.

Seen in this light, processes like photosynthesis are not "inefficient" as some people, usually economists, suggest. The Earth's living systems take what is necessary. A more "efficient" capture of incoming solar energy would trigger disruptive growth to the detriment of the whole system and therefore be highly "inefficient". Similarly it might seem as if many species play no vital and irreplaceable role (thus can be safely eliminated). Yet it is the presence of plenty of "spare parts" and other possible lines of development that, again, has enabled life to flourish over time.

So ecosystems could be said to overcoming entropy, generating, instead, what might be called "negentropy". It is for this reason, above all others, that it is fallacious to think it possible to turn a living Earth into a planet totally covered by human artefacts. Trotsky could not have been more wrong when he claimed that "the machine is not in opposition to the earth". The living Earth has a degree of self-order and regenerative capability that "dead" machinery cannot match. Actually entropy can never be overcome. The Earth itself depends upon external input of solar energy as the driveshaft that enables all other systems to keep functioning. Crudely: no Sun, no living Earth.

Some implications

These issues are extremely complex, though, fortunately, there is a strong literature on them.[10] But some points need to be underlined since they are widely misunderstood. One has been mentioned above, namely that "clean" is not necessarily "green". Hydroelectricity, for example, has, to date, done far more damage than nuclear power (though that situation could literally change tomorrow, such is the potential hazard of what is, in any case, a finite and in other ways highly polluting energy source). Irrigation is another "clean" activity, yet amongst its many unsustainable impacts has been greatly increased salinisation in warmer regions. So too is the deliberate and accidental introduction of "alien" plants and animals, but its impacts have often been disastrous for indigenous species. Indeed that "greenest" of land use, the lawn, is often a virulent form of ecological cancer, not least in the form of golf courses.

"Renewability" is also not the same thing as sustainability. Harvesting from large-scale biomass plantations might be replaceable with new plantings but, in toto, such land use would be ecologically disastrous. Indeed it is vital to see things as a whole. This is why talk of "green cars" is such nonsense. A large part of the unsustainable impact of car usage is actually at the manufacturing stage. Other negative impacts come from the roads, parking lots and other infrastructure that solar electric or any other kind of vehicle would still need. Such observations also apply to rail transport (whose land consumption, power demands and very limited capacity to absorb people and goods switched from the roads is often overlooked by alternative transport buffs).

It is essential to judge things in terms of total life cycles and net efficiency, not just what one worker produces or how much of a particular thing (be it wheat, eggs, logs, oil, bricks, refrigerators, or garden gnomes) is yielded. Overall, sustainable yield will be low output in the short-term, even if longer lasting than the output from today's superficially productive farms and factories. Claims that nuclear power is sustainable or an answer to global overwarming can only be seen to be fraudulent if judged in terms of "cradle-to-grave" costs and impacts.

Mention has been made of golf. It is important to note that many leisure activities are just as unsustainable as manufacturing. Too often ecological damage is seen in term of "smokestack economies". In actuality, Homo Rapiens is nothing if not wanton in the havoc it wreaks. Skiing has trashed many mountain sides while much water pollution is created by leisure craft. Hospitals have been a significant source of toxic wastes while crematoria add their own contribution to total pollution loads.

Finally, it must be stressed that these issues are about the real wealth of nations: a stable climate, an intact ozone layer, fertile soil, potable water and so forth. It is not about money. Cash is merely a token, a claim on the goods and services fashioned from the Earth's specific resources and general life-support systems. Yet most Marxists are as guilty as conventional economists of monetary fetishism, failing to start from the productive forces embodied in land, sea and air. Typically, then, Marxists tot up the money squandered on, say,

armaments and simply assume that it, the money, is the means to build more houses and hospitals; diabolical materialism indeed.

Overshoot

The above observations are central to the concept of limits-to-growth and to what over the course of the 20th century has become a general crisis of human "overshoot". The scale of human activity is now progressively decreasing the self-renewing, self-regulating and self-repairing capacities unique to ecosystems. It does so in many ways: each and every time more old-growth forests are felled, more monocultures planted, bigger herds of domesticated animals grazed, more wetlands drained, more waterways channelled and dammed, more mines dug, and more land buried beneath concrete and tarmac. Sometimes, the destruction happens on a large scale, for example the destruction of rainforests to make way for cattle ranches and mines. More often, however, it is the cumulative consequence of a myriad of otherwise insignificant developments, from new housing estates and hospitals to new marinas and ski resorts.

For many people, however, "limits" are synonymous with oppressive restraints. Actually, it provides a positive framework for decision-making. It provides guidelines for long-lasting satisfaction and fulfilment. The various limits to growth should be seen as brakes and crash barriers. Operational and behavioural limits are central to the processes of self-regulation that prevent excess and failure. Any system – plant, animal, community, institution, machine or ecosystem – must have limits to its functioning. Otherwise it would cease to be an ordered entity and fail. To quote the great ecologist, Eugene Odum: "growth beyond the optimum is cancer."

As the "steady-state" economist Herman Daly once put it, overdevelopment occurs when human numbers and artefacts grow "so large to the total environment that they obstruct the natural ecological processes which form the biophysical foundations of wealth. [They] become a cancer which kills the total organism". Global over-warming, water shortages, eroded soil, depleted fisheries are all but symptoms of that lethal sickness. Overdevelopment is the only appropriate term to describe a situation in which just one single species, humankind, has taken over some 40% of net primary productivity (some estimates put the figure higher). In other words, so much of the real economic cake is being consumed by Homo Rapiens that, if not reduced, it can only destroy the very "bakery" on which all living, not just economic activity, depends.

A truly sustainable economy will only cater for limited demands. The fundamental reason is this: any system, be it a human body or an ecosystem, uses a lot of the resources available simply to maintain and repair itself. The surplus yield is necessarily small if the "producer" is to function sustainably. The introduction of high-yielding hybrids, for example, means that more is taken out of the soil (necessitating more fertiliser use), more water is required (leading to expensive irrigation and possibly problems of water-logging and salinisation) and resistance to pests and disease is reduced (with attendant need for more biocides).

Forestry illustrates why long-term sustainability is about, as the American writer Tom Bender put it, "sharing smaller pies". To conserve species like the spotted owl in areas like Oregon, sufficient old trees and snags must be left. To protect soil and water, trees have to be cut selectively, maintaining a largely continuous canopy. To maintain soil fertility, sufficient dead trees have to be left to decay. To protect wildlife and human health, pesticides must be prohibited. To conserve employment, mechanisation must be limited. These and other criteria rule out certain practices and permit others. A truly sustainable economics, then, would be that economic framework which makes such a forestry possible. From such system, we would get a sustainable and high quality yield of timber – but, in the short-term (i.e. decades), it would be greatly lower in volume than the output of plantation "tree farms", quite inadequate to feed today's giant pulp mills, for instance. Again, the message is "think shrink", not dream of more.

This orientation is not an attempt to "pull up the ladder" so that the poor cannot join the rich. The socialist expansionist strategy, advocated by Trotskyists and non-Trotskyists alike, is in the long run, pie-in-the-sky. In fact, abandonment of the goal of global affluence offers the best hope for those being crushed under the wheels of industrial expansion. Across the "Third World", outside the citadels of western-style luxury, the people with secure food supplies, clean water, social stability and a basic sense of identity tend to be those living in regions not yet harnessed to the treadmill of development.

In short: Trotsky's dream of universal affluence for all is an infantile disorder. It is well nigh impossible to even make crude estimates of what might be a sustainable society. It is easier and more useless to spotlight and try to stop activities that are unsustainable. But a rough guess might be that a total human population of around 1 billion might be sustained in a satisfactory degree of comfort and conviviality. The contrast with the current circumstances needs no comment, though it should be noted that with smaller size of population each person's voice gains extra weight. In other words, real social democracy is also potentially greater.

Flawed fixes

Radical critics of the dominant social order like Trotsky often see the magic wand of technological wizardry as the means to bring into existence the

world of material abundance deemed to be the necessary basis for the abolition of exploitation and oppression. But life is not so simple. As Paul Ehrlich and John Holdren once observed, "technological rabbits" pulled out of the magic hat of science usually have "large appetites and leave noxious droppings". Such "fixes" either fail to solve the original problem, create new problems of their own or, at the very best, provide only a temporary respite before on-going growth in human numbers and artefacts swallows up any savings in resource consumption and pollution levels.

To be fair, there are some specific fixes like energy conservation and other resource-saving measures that can significantly reduce the human "footprint" on Planet Earth. So too would a switch to a less meat-centred diet. Some basic fixes like clean running water and adequate sanitation can dramatically improve human health. Indeed a few day's rest is a wonderful fix for many ailments. A localisation of production could significantly cut the impacts from vehicle manufacture and the operation of transport systems. Many more examples will spring to mind of quite simple steps that yield positive gains. But once easily available savings have been made and other such alterations effected, limits quickly reassert themselves.

Trotsky probably would have replied to the ecological argument that it is the drive to make profits that pushes things to breaking point. Conversely the replacement of commodity production by production for social use would (or, more precisely, might) ease the pressure. In many cases, he would have had a valid point. Yet the fundamental problem is not abolished. Usage is a separate issue. The fundamental problem resides in the actual production, conversion, distribution, use and disposal of capital and consumer goods. Motives and uses are another matter, whatever their role in shaping human economic and non-economic activity.

Take the human diet, for example. Demand for meat products is currently soaring. In Trotsky's socialist society, one might imagine continued popular demand for meat and fish products that the economy would be then planned to satisfy. It would remain a ruinous way of eating. According to University of Chicago researchers, for example, an average meat burger consumer creates the equivalent of 1.5 tonnes more CO2 every year than the standard vegan one when one product "life cycle" is set against the other.

Meat production is also a massive resource depleter. It takes 7kg of feedstuff input for 1 kg of beef (the ratio is worse for lean cuts of meat). Meat production also consumes huge quantities of water and oil or its by-products. On average, it takes 9,680 litres of water for 1kg of beef compared to 1,790 litres to grow 1kg of wheat. Between 1,100 to 4,400 gallons of water are used per live weight ton of slaughtered animal in the USA, for example. American agriculture consumes 40% of the water used whereas all domestic water consumption by private individuals is less than 5% of the total of water consumed in the country. In global terms, meat-eaters consume the equivalent of about 5,000 litres of water a day compared to the 1,000-2,000 litres typically used by people on vegetarian diets.

Meat production further consumes land. Over 90% of the agricultural land area in the United States, over 50% of the total land area of the country, is devoted to livestock rearing and meat production. The link between meat production and deforestation in particular is well established. In Mexico, for example, 37 million acres of forest have been destroyed since 1987 to provide additional grazing land for cattle. Much of what cows eat comes from soya by-products whose production is now a major force for tropical forest clearance. On present trends (2005) 16 million more square hectares of savannahs and 4 million more square hectares of tropical forest will be destroyed by the combined effects of more soya growing and cattle ranching. It should be noted that genetically modified crops figure prominently here. The production of soybeans in Argentina expanded from 9,500 hectares in the early 1970s to 5.9 million in 1996, 10.3 million in 2000-1 and 14.1 million in 2003-4, almost all of which is GM (some estimates are as high as 97%).

It would be unfair to pick on cows and beef production. It should not be forgotten how many environments have been worn away by sheep and goats. John Muir rightly called them "four-legged locusts". Artificially high populations of deer, kept for the entertainment of "slob hunters" seeking easy kills, also cause great damage. There is surely no need to underline the even higher levels of resource consumption and effluent that inevitably accompany dense populations of pigs, hens and other creatures kept on "factory farms".

Slurry from farm livestock as well as stockyard washdowns, slaughter, evisceration, boning, rendering and so forth also create massive water pollution. Refrigeration not only requires large amounts of electricity (thus depleting fossil fuels and adding more greenhouses gases) but also is a source of CFC loss to the atmosphere (with consequent damage to the protective ozone layer). Many of these impacts are shared by fish harvesting and processing, with added safety risks to workers on trawler fleets.

Moral and health considerations apart, vegetarian or, at least, a very low meat and fish diet would reduce grazing (resulting in less erosion and methane generation), fishing (reduced depletion of fisheries and destruction of other species in trawl nets), crop cultivation (less soil nutrient loss and erosion, more land for wildlife habitat etc), fertiliser usage (less eutrophication) etc. Yet the scale of current consumption levels means that the impact of meat consumption is only one part

of the food equation. After all, most of the increased soya cultivation, whose disastrous effects have just been noted, is for oil, much of which ends in basic household products like mayonnaise (the same arguments hold for palm oil).

In other words, values and lifestyle choices remain the fundamental issues, ones which Trotsky at best left "for the future". It may be remembered that Marx himself wrote very little about the nature of a socialist/communist society. But it is silly indeed to assume that on the morrow of the long awaited revolution, the mass of people would suddenly change the habits that their leaders have done nothing to discourage.

Certainly greater regulation and planning of the economy in the future may make conversion of the production/consumption mix easier (e.g. switch to less meat-centred diets). But, today, the average consumer, certainly in richer countries, is perfectly free to transform today his/her lifestyle. Poverty is no excuse, given that low meat diets are not only healthier but also cheaper, as can be seen on most restaurant price lists. Of course withdrawal of the enormous subsidies to the livestock industry would encourage such change. If just water use by the industry were not subsidised by American taxpayers, the cost of a common hamburger would be over $30 while the cost of one pound of beefsteak would be well over $80, a massive incentive to eat less meat (and be healthier, not just reduce environmental damage). Avoidance of such issues does not help their resolution.

Capitalism and the causes of ecological crisis

Of course, like many others, Trotsky was aware of the downside of "progress", especially the way the new layer of factory workers suffered in the blighted cities and towns created by industrialisation. However, as noted above, he blamed these on the capitalist form of organisation, not the productive forces themselves, as do all faithful Marxists. Yet many of these problems predate capitalism or have no necessary connection to it or indeed any particular social and economic order.

Plato, for example, bemoaned deforestation in ancient Greece while, across in China, the seemingly innocent art of calligraphy and associated charcoal burning deforested huge areas. Back further in pre-history, essentially classless societies drove many species into extinction. In more recent times, De Toqueville pointed out how the destruction of North America's fauna and flora by white people went way beyond any rational calculation of private profit, stemming, he argued, from an almost pathological fear of the "wilderness" they found. If anything, it was a capitalist desire to husband resources under Teddy Roosevelt's administration that introduced some modicum of environmental protection.

The various development bodies listed above are public agencies, not private capitalist firms. To some extent, their work subsidises individual capitalists such as ranchers, timber mill owners, fossil fuel corporations and the like. Yet much of their work has been opposed by capitalist interests and done in the name, rightly or wrongly, of the public good. In other words, their unsustainable practices reflect something deeper – anti-environmental values and goals that have no necessary connection to any particular economic system.

Some of our biggest problems in fact stem not from capitalist profiteering but from more benign motivations. Innovations such as high-yielding hybrid plants and CFCs were the product of scientists working for what they conceived to be the common good. Indeed, there are countless examples of bad consequences resulting from good intentions. For example, tourism, which is now fast degrading areas that have escaped the worst ravages of industrialised farming and factory development, is driven by the fact that millions simply want to sun themselves on Mediterranean beaches or ski down Alpine slopes. The destruction it is causing is primarily the result of the scale and nature of these activities, not simply because it is managed by capitalist tourist operators.

Look at the ugly and unsustainable urban redevelopments that took place in Britain after 1945. Many were the product of high-minded public planners and architects ("from Bauhaus to our house" as Tom Wolfe once put it). They were not the work of capitalist entrepreneurs. In the same period, quite stunning reconstruction took place in towns and cities as diverse as St. Malo in France, Freiburg in Germany and Warsaw in Poland under quite different political and economic systems. It is vulgar indeed to coach explanations of such activity in terms of just private profit.

The point is not to minimise the opprobrium rightly heaped on transnational corporations and assorted other profiteers. Rather it is stress the need for a fuller picture. Central to a more rounded analysis is the concept of "The Tragedy of the Commons". It spotlights the cumulative effect of individual actions and the great harm they cause, no matter how well-intended or harmless in themselves. There are many examples of the dynamic, especially in today's anonymous, mass societies, where the sanctions exercised in small-scale communities upon the actions of their members no longer apply.

For all kinds of reasons – convenience, laziness, comfort, entertainment, safety, security etc – things are done whose bottom line is resource depletion, pollution, and the extermination of wildlife. A driving force in overpopulation, for example, has been humanitarian attempts to reduce infant mortality, extend life spans and overcome limits to child-bearing. It would be perverse indeed to see such efforts as merely a capitalist plot to increase the number of consumers. At the more mundane

level of energy conservation in buildings, many people, especially women working at night, are glad to see lights wastefully left on in empty corridors, simply because they feel safer.

Take a small example: the modern kettle. Most people use them without a second's thought. Yet kettles account for almost a third of the electricity used by cooking appliances. Some 7m were sold last year. In 2006 it was estimated that the nationwide rush for fast boiling and keep-warm kettles would increase UK carbon dioxide emissions by 220,000 tonnes a year. The problem is not one individual household but countless individuals using such devices. When they all do so at the same time (e.g. during half-time in a televised Cup Final), there is huge pressure put on the national grid by the mass simultaneous decision to have a cup of tea or coffee. It might be added that if these viewers are watching one of the new plasma TV screens, they are helping to create electricity demand equal to two nuclear power stations.[11]

Actually the obsession that gripped Trotsky and his followers, namely the search for signs that capitalism was about to reach its "death agony" (i.e. a return to a catastrophic 30s-style slump) may have helped to blind them to the real contradiction of capitalism. It is in the very nature of the system to seek further growth. Thus even recessions function as a "clearing house" before the imperative to expand again reasserts itself. The competitive drive to increase profits, including the compulsion to produce and sell more to pay off interest on borrowed monies, forces all would-be "players" in the system to expand. Given the biogeophysical limits to growth, capitalism is an inherently unsustainable form of economic organisation. This is the deepest anti-capitalist argument and the biggest one in favour of some form of planned economy. It is here that Trotskyism really missed the ideological boat.

Overpopulation

Trotsky only seems to have made odd passing comments on the population issue. In *Our Revolution* (i.e. 1905), for example, he criticises the Tsarist autocracy for "inhibiting population growth" though this seems more of a throwaway remark. At other times, when discussing the Soviet economy, he makes rather vague references to "rural overpopulation" (*Vital Questions for the German Proletariat*, 1932) and "agrarian overpopulation" (*On China*, 1927).

It would seem safe to assume that, following Marx himself, Trotsky used such terms in simply a relative sense. At a given level of technological development and in specific economic situations, there could be said to be overpopulation. Conversely, change in those circumstances would dispel the spectre of excess human numbers. It is hard to imagine that Trotsky would have conceded that human population growth might lead to a general state of overshoot.

One would imagine that Trotsky would have echoed Friedrich Engels who did not hesitate to claim the progress of science "is just as limitless and at least as rapid as that of population.... We are forever secure from the fear of overpopulation". At the most he might have admitted that population growth could become an issue in the extreme long-term. For all intents and purposes, he would have most likely seen the issue as a smokescreen used by defenders of inequality to draw attention away from inequitable ownership of land and other resources as well as inadequate development of productive forces.

Yet the key dimension to the ecological crisis is not "bad" technology nor "maldevelopment"/ "maldistribution". It is human numbers. Given that mere survival depends upon a certain level of consumption of water, food, heat, and shelter, it is perfectly reasonable to base discussion of the issue in quantitative terms, although in actuality the vast majority of people want more than just the basic necessities. But those very basics, just like the trappings of more affluent lifestyles, all come from the environment whose capacity to supply them as well as absorb waste by-products is not infinite.

When Trotsky reached the age of 21 (1900), the total human population was, on the lower estimate, 1,550 million. When he died, the world's population had reached some 2,300 million people. Thus, in his adult lifetime, 750 million extra members were added to what, quite appropriately, is called the human race. By mid-summer 2005, a mere 65 years after he was assassinated, the figure had shot up to 6,450 million. In this short period, less than the Bible's three score and ten years, there was an increase of well over 4 billion extra people to feed, water, shelter, clothe, educate, employ, entertain and so forth.

Some 20% of all humans in the last six thousand years are alive today and their number continues to increase (see the US Census Bureau Popclock website for the current figure). Over the next 60 seconds, the number will go up by 150 (births over deaths), though there are, of course, huge regional disparities. In some countries, notably the USA, inward migration is a large part of overall growth.

To say that there is no difference in environmental (as well as social and economic effects) between a population of 1,550 million, 2,300 million or 6,450 million is to say that numbers do not count. Yet that is precisely what those who ignore the population dimension do say, and they could not be more mistaken since every extra member of the total population puts additional demands on environmental systems whose capacity to cope is decreasing.

As noted, most people want more than the bare necessities of life. They want push-of-a-button

energy, turn-of-a-tap water, flush toilet systems, comfortable and spacious accommodation, different clothes and shoes, labour-saving gadgetry, primary and at least secondary education, health care from cradle to grave, rapid means of transport, varied sources of entertainment and much more, including somewhere to be buried or cremated. The effects of a greater head count are, then, multiplied by higher per capita consumption, with an even heavier burden placed on those wilting ecosystems.

As various quotes throughout this piece reflect, Trotsky advocated higher per capita consumption, including, as we shall see, more cars and cigars, while not taking a stand on family planning and the number of consuming "bodies". It might be noted that revolutionaries like Elizabeth Gurley Flynn and Emma Goldman did support birth control (though more from a women's liberation perspective). So too did Margaret Sanger, avowed socialist and author of material like *Will Birth Control Help the Cause of Labor?* and founder of the American Birth Control League (whose questionable attitude to eugenics went further than Trotsky). Thus there were activists in left-wing circles who were raising the issue, albeit for non-ecological reasons, but Trotsky, like most Marxists, was looking the other way.

These are intensely personal matters yet they are also ones pregnant with social and environmental consequences. To be crudely blunt: Trotsky fathered four children. In effect, he was saying that the planet could not only cope with existing human numbers but twice their number. Of course, from a human perspective and given the cruel fate of all his family, this seems a harsh thing to say. But as the singer Paul Simon once wrote in his lyrics to *Born at the Right Time*, "the planet groans, every time it registers another birth".

Hans Magnus Enzensberger has argued these points well. He notes, for example "the connection between the ease with which totalitarian regimes were able to implement their murderous schemes and the population explosion with its ensuing homelessness and landlessness. It is as if the value they place on the lives of others depreciates as the birth rate increases". He continues: "Joblessness, homelessness, inner-city decay, refugee camps, all prove that there are simply too many of us. And we react psychotically by striking out in all directions. The tendency is at work everywhere."

Last but not least, he observes why population figures leave so many people cold. "Statistics, whether referring to the starving, the unemployed or refugees, express everything in millions. Such numbers paralyse the imagination...." While it is possible to respond to individual, limited suffering, "the terror of big numbers is without eyes. Empathy breaks down before such excessive demand, and reason is made aware of its impotence".

Of course there will be many who rush to point out that poor people often parent more children to have more hands with which to work the fields or simply beg. The American scientist Louis Pascal has addressed this dilemma. "In such a situation, I myself would most carefully refrain from having children. There are at least three reasons.... The wish to avoid inflicting so great a pain upon myself; the wish to avoid inflicting so great a pain upon my spouse and the surviving children; and the wish to avoid inflicting death upon my child. Between ten and twenty million people starve to death every year. If you take the smaller figure and make the ridiculous assumption that it will not get any larger in the future, then you get the figure of 500 million deaths in the next 50 years. But it will get larger because in 35 years there will be twice as many people trying to find food in a world which today is so overpopulated that half of all human beings are hungry."

To repeat, numbers do count. In the words of Anne and Paul Ehrlich, "individuals who oppose mild and humane restrictions on reproduction now are encouraging an enormous further loss of both human freedom and human lives in the future.... Anyone who is fighting the provision of people with contraception and getting family sizes down is simply fighting very hard to get millions or hundreds of millions to die early, in very nasty ways".

Trotsky on technology

There are two common ideas about technology. One is the almost religious faith that technology is the answer, believers thinking that social and environmental problems can be made to disappear simply by waving the magic wand of applied science (the "technofix" mentality). The second is the belief that technology is simply a neutral tool, its impacts dependent upon the identity and purposes of its controllers.

Trotsky combined both. He would surely have agreed with John Molyneux in his "Teach Yourself Marxism" column (*Socialist Worker*, 17 October 1987) that "it is not industry, but capitalist industry that destroys the environment". Trotsky sees technology becoming unbounded in the hands of "liberated mankind" (speech quoted below). In his Copenhagen speech of 1932, *In Defence of October*, he claims, for example, that "the hour is not far when science will easily solve the task of the alchemists, and turn manure into gold and gold into manure". He viewed technology and its by-products in terms of social use versus private profit. In actuality, armoured cars and ambulances still clock up the same thermodynamic and ecological bills, regardless of their different human value. In other words, Trotsky lacked any ecological understanding of technology.

In terms of specific technologies, Trotsky had some perhaps surprising views. From his remarks on nuclear science, it seems fair to deduce that he

would have been a supporter of nuclear power programmes. In *Radio, Science, Technique and Society* (1926), for example, he predicts with evident enthusiasm: "the atom contains within itself a mighty hidden force, and the greatest task of physics consists of pumping out this energy ... atomic energy, which will also become the basic motive force."

To be fair, this was years before the many downsides of nuclear energy became clearly known. Yet there is more than a whiff of technological hubris here (later in the same piece he talks of "unbounded technical possibilities") and correspondingly scant appreciation of what today is called the "precautionary principle". At the end of the 19th century scientists such as the American physicist Elihu Thomson were warning of the risk from X-rays. By 1925 the idea of tolerance levels and exposure dose was being discussed by the American Roentgen Ray Society. In 1934 scientist Marie Curie was to die from leukaemia brought on by her contact with radioactive substances. More sober reflection, even in 1926, could have told Trotsky that there is a limit to how much uranium can be extracted from the Earth, regardless of other dangers posed by its mining and milling. An ecological perspective would also have advised extreme caution about the creation of elements not found in nature, in this case plutonium.

The ecology of urbanism, by contrast, was a subject on which Trotsky commented indirectly. Though the use of fire and the creation of farmland might be said to be the most revolutionary of technological developments, the creation of built environments, leading to the modern megalopolis, stands in greatest contrast to non-human nature. Trotsky made only passing comments about urbanisation. In his tribute to the work of Marx and Engels, *Ninety Years of the Communist Manifesto* (1937), he does not note any failings with its programme. One is germane at this point, the demand to abolish "all the distinction between town and country by a more equable distribution of the populace over the country". This is of course what is properly called urban sprawl, the biggest destroyer of productive farmland in countries like the USA and, indirectly, a major cause of greenhouse gas generation due to the need for greater travel.

Another area of applied design, textiles and fashion, illustrates the limits of an "anything-goes" perspective. Related industries do immense harm to ecological systems (pesticides in cotton cultivation, overgrazing by sheep and other animals used for wool, fur and hides, manufacture of man-made fibres, use of industrial dyes, bleaches and other treatments, packaging, post-consumer waste etc). Cheap clothes are intimately connected to sweatshop labour as well. Thus, there is a need to spell out in detail criteria for what is ecologically and socially appropriate in clothes manufacture – source of raw materials, production methods, design for adaptability, durability and reparability of the products, use of recycled materials and so forth.

Similar criteria need to be used in construction of the built environment (e.g. as in the German Baubiologie architectural movement) and all other design. It can also be applied to land use planning. Of course comparative life cycle and impact assessment of one method or ingredient against another is far from easy. But at least it sets an agenda. At the least it offers hope of something more sustainable than purely subjective choices, commercial criteria and, last but not least, decisions made on the basis of "class analysis" (or as Trotsky put it, "the social conditions in historic human society are, first of all, the conditions of class affiliation").

On farming

Agriculture has, so far, changed the face of the Earth more than any other technological system. The unsustainable impact of large-scale, heavily mechanised and chemical-intensive farms was already being attacked, especially after the American dust bowl storms. Critics included ecologists like Paul Sears. Indeed George Marsh was warning farmers in the USA about their practices as early as 1847. More sustainable alternatives were being canvassed in the inter-war years by pioneers such as Rudolf Steiner (Germany) Masanobu Fukuoka (Japan) and Lady Eve Balfour (UK). The American agronomist F.H. King and British agricultural advisor in India Sir Albert Howard were also demonstrating that traditional practices had many advantages over seemingly more "progressive" industrialised agriculture.

Trotsky seems to have been oblivious to such work. He generally endorsed farm collectivisation, though, to be fair, there is no evidence to suggest that he endorsed Stalin's brutal methods. In *If America Should Go Communist*, he talks about "gigantic farm enterprises". Similarly his *Programme of Action for France* (1934) focuses mainly on inequitable land ownership, though it does promise cheap machinery and fertiliser for poor farmers (this was recycled into the 1938 *Transitional Programme* for the Founding Conference of the Fourth International). Nothing is said about sustainable agriculture.

Perhaps more alarmingly, Trotsky enthused over the possibilities of genetic engineering to an extent that put him firmly in the camp of eugenics. In *The Russian Revolution*, he predicts that "Man will set to work on himself, in the pestle and retort of the chemist. For the first time, mankind will regard itself as raw material, or at best as a physical and psychic semi-finished product". In *If America Should Go Communist*, he goes further: (people) "will apply genuine scientific methods to the problem of eugenics."

If one puts together Trotsky's general thoughts

on farming practices with what appears to be an enthusiasm for genetic manipulation, it might be fair to conclude that he would have become a supporter of the development of genetically modified crops and transgenic animals. The fact that, in 2005, 70% of products on U.S. grocery shelves include GM ingredients presumably would not have bothered him.

Trotsky on lifestyles

Like most Marxists, Trotsky had little to say about consumption patterns and lifestyle choices. He did denounce drunkenness and swearing but otherwise he kept off the subject of how individuals should lead their lives, despite the cumulative impact of those decisions on individual mental and physical health, on social services such as health care and, most significantly, the resultant demands placed on environmental systems. Thus he has little to say about matters such as personal diet, exercise, sexuality, consumer goods spending or leisure options, though at one point he does mock "vegetarian-Quaker prattle" (*Terrorism and Communism*, 1920).

Yet, in his time, such issues were being widely discussed. In industrial countries like Britain, for example, vegetarian publications had circulated since the middle of the 19th century. In its final two decades bodies like The Fellowship of the New Life raised other lifestyle issues. In the 1930s George Orwell felt driven to denounce folk such as fruit-juice drinkers, nudists, sandal-wearers, and "Nature Cure" supporters.

For the purposes of this discussion only the ecological aspects of such matters will be discussed. For example, though there are strong health and animal welfare grounds for a vegetarian diet, it is the inefficient and degrading use of land and resources that, ecologically speaking, condemns high meat consumption. Trotsky did once comment (in *If America Should Go Communist*) on how a Communist government must "deliver the concrete goods which the average man desires". He went on to define these thus: "his food, cigars, amusements, his freedom to choose his neckties, his own house and his own automobile." The health effects of cigars can be left to one side but it must be noted that tobacco cultivation is a peculiarly ruinous land use whose long-term consequences on soil quality and on neighbouring forests (via tobacco curing) may well overshadow its short-term impact on human health. Henry Ford, for one, would certainly have agreed with Trotsky's enthusiasm for motor car ownership. Its ecological consequences have been disastrous, both in terms of oil depletion, pollution and land sterilisation (highways, car parks etc) and in more indirect ways through the encouragement of suburban sprawl (which, of course, necessitates more car usage).

Trotsky had few worries about the lifestyle choices and tastes of the ordinary citizen. He had not "the slightest fear that this taste will be bad" and, as also quoted above, he looked forward to the day when "man will learn to ... build peoples' palaces on the peaks of Mont Blanc and at the bottom of the Atlantic". Of course it is foolish to generalise about mass culture and the factors that shape it. Yet there may be grounds for some reservations.

At many entrances to American National Parks, for example, squat hideous "gateway" towns into which tourists enthusiastically throng. They also pile into places like Las Vegas, which blends gross vulgarity with extreme unsustainability. Many people positively prefer the identikit concrete hotel blocks that sprawl across alpine meadows and along Mediterranean and other beaches to environmentally friendlier alternatives. Millions of people think it fun and fulfilling to shop until they drop. To some extent at least, leisure and entertainment industries prosper because they give their customers what they want. Trotsky is, at the very least, cavalier to wish away potential problems.

What was to be done?

This discussion has concentrated on Trotsky's ideas and policies insofar as they relate to the ecological dimension and related issues. Nothing has been said about the general crisis that faced the Bolsheviks after 1917. They had seized power, with considerable popular support in the big cities and amongst certain sections of the army and navy. They quickly became isolated, losing popularity within Russia and facing a White counter-revolution supported by foreign intervention. The revolutionary wave in Europe subsided, intensifying Soviet isolation. The country they ruled was in a state of chaos and desperate poverty rife.

It is far from clear whether there was any way out of this situation. Non-Bolshevik critics like Martov had long predicted that it would all end in tears, with a return to crude economic exploitation and repressive political despotism. Stalin's policies certainly laid waste to huge sections of the Soviet environment and brought hell to millions. But both Trotsky and Bukharin's alternatives had major drawbacks too, which Party rivals were quick to spotlight. Trotsky, for example, was characterised by Krasin at the 1923 Party Congress as a would-be plunderer in the manner of British industrialists and imperialists decades before. Bolsheviks of all hues were firmly lodged between a rock and a hard place.

Yet that was only the case because none of the competing factions was prepared to consider other means and other destinations beyond that of across-the-board industrialisation and material abundance. Another road might have been one based on a decentralised, village-based system built around co-operatives, with modest development of carefully selected industrial technologies and an

equitable distribution of resources. This might have offered both an ecologically sustainable and socially tolerable system. However, the urban-industrial paradigm shared by not just the Bolsheviks but also the Mensheviks and others precluded its adoption as a possible way forward.

But that is past history. What counts now are lessons that can be drawn from the experience for the future. Most serious socialists today are probably "Trotskyist" in the very loosest sense of the word. It would seem that Trotsky's (and, to a lesser extent, Marx's) legacy is partly the reason why that movement has failed to address the ecological crisis. Even at the most basic level, most serious journals and newspapers in the movement have treated the biggest challenge facing humanity as something quite marginal or, at best, one issue amongst many and one readily put down the agenda.[12]

In the 1970s the Left, with few exceptions, simply sneered at the warnings issued by the Club of Rome and the Blueprint for Survival team, dismissing them as reactionary elitists seeking to keep the workers from their just deserts. In actuality the "ecodoomsters" were spotlighting issues that demanded a across the board rethink of analysis, goals, and policy. Failure to do so can only lead to that dustbin of history into which Trotsky once metaphorically cast the Mensheviks.

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Evidence of "overshoot" is continually changing. Websites tend to be more up-to-date than traditional publishing. See, for example:

- The Millennium Ecosystem Assessment, a project launched by the World Bank @ http://www.millenniumassessment.org/en/index.aspx
- The Global Environmental Outlook from the United Nations Environment Programme @ http://www.unep.org/Geo/index.htm
- The Living Planet reports from the World Wide Fund for Nature @ http://www.panda.org/news_facts/publications/general/livingplanet/index.cfm
- The Vital Signs and State of the World series of reports from the WorldWatch Institute @ http://www.worldwatch.org/pubs/vs/ and http://www.worldwatch.org/pubs/sow/
- Reports from the Intergovernmental Panel on Climate Change @ http://www.ipcc.ch/about/about.htm
- Reports from Global Biodiversity Outlook @ http://www.biodiv.org/gbo/

Notes

1. There is now a vast literature on Trotsky's life and time. Most studies suffer from the same blindspots criticised in this essay. The most famous biography, the trilogy by Isaac Deutscher, is very well written but flawed by the concessions it makes to Stalinism. For a study of Trotsky from a perspective that has viewed Stalinist Russia as a form of state capitalism, try *Trotsky's Marxism and Other Essays* by Duncan Hallas (Abstract Sounds, 2005). It shares the fundamental cornucopianism of more conventional Trotskyism, e.g. Ernest Mandel's *Trotsky as Alternative* (Verso, 1995). A range of views can be sampled in *The Ideas of Leon Trotsky* edited by Hillel Ticktin and Michael Cox (Porcupine Press, 1995). A very sympathetic but not too hagiographical biography which refutes many calumnities about its subject is *The Life and Death of Leon Trotsky* by Victor Serge and Natalia Sedova Trotsky (Wildwood, 1975) while a short, readable and fair introduction is available in *Trotsky* by Irving Howe (Fontana, 1978).
See also http://www.trotskyana.net and http://www.marxists.org/archive/trotsky/index.htm
2. Good histories of ecological thought include Marshall (1992) and, with more specific focus on "limits-to-growth" theory, Kassiola (1990). For histories of the environmental movement, see Shabecoff (2003) and Spowers (2002). Human destruction of the environment down the centuries is charted in Broswimmer (2002), Diamond (1998 and 2006), McNeil (2000) and Ponting (1991).
3. Curry (2006) is a succinct and readable guide to Ecocentrism. There are some useful anthologies, notably Butler (2002), Drengson and Inoue (1995) and Sessions (1995). Marshall (1992) gives a more historical perspective. The writings of the Canadian scientist Stan Rowe remain an outstanding example of how ecology as a science (and one treated holistically not in the reductionist manner now dominant) can be blended with ecologically informed ethics. The best on-line collection of ecocentric documents is probably http://www.ecospherics.net
4. For an overview, see Wright (2005). Also pertinent are Gray (2004), Gomer (1968), Lasch (1991) and Bury (1932). The best study of the link between the dominant notion of Progress and environmental despoliation remains Leiss (1994).
5. It is difficult to determine the extent that associated measures were a pragmatic response to desperate circumstance. It might be noted that as early as 1916, before he came to power, Lenin was enthusing about American methods. Trotsky's hyper-enthusiasm scarcely suggests a reluctant swallowing of a bitter pill (he had a penchant for bending the stick to the limits, as in his remark that "Compulsory slave labour was in its time a progressive phenomenon"). It might be further noted that there was much articulate opposition, which included the Bolshevik faction of the All-Russian Central Council of Trade Unions. It is interesting to contrast the ideas of Harry Braverman (*Labor and Monopoly Capitalism*, Monthly Review Press, 1998, first published 1974) and his critique of work under capitalism with the positions of Lenin and Trotsky.
6. See studies by Economy (2004), Smil (1993) and Shapiro (2001). The extremely violent, gangsterish nature of his regime has now been well and truly

established: see, for example, Jang and Halliday (2005).
7. See Chandler (1984) for evidence of the unsustainable impacts of the TVA's works. Worster (1985) documents the disastrous works of the Army Bureau of Engineers.
8. See, for example Goldman (1975), Feshbach and Friendly (1992), Peterson (1993) and Feshbach (1995).
9. See the work of critics such as Weizenbaum (1984), Reinecke (1984), Roszak (1988), Shallis (1984), Shenk (1997), Stoll (1995) and Slouka (1995).
10. Perhaps the best starting points are Daly (1992), Georgescu-Roegen (1971), Glasby (1988) and Trainer (1985). Ophuls (1993) provides an excellent summary in the first half in his book.
11. The actual estimate is that, if 50% of British homes were to watch via a plasma screen TV, two such plants would be needed to meet the extra energy demand, according to researchers at Fujitsu Siemens.
12. In the 2001 *General Election Manifesto of the Socialist Alliance* in the UK, for example, "save the planet" was point 12 out of 15, as if it were not the precondition of all other goals. Such idiocy is simply staggering. It is sad to note that such a sharp thinker as Jim Higgins, who played a leading role in the renaissance of the Marxist Left in the 60s and early 70s in Britain, can only sneer at what he calls "zero-growth Greens ... and Jonathon-Pol-Porritt" ('Trotskyist Bears and Working Class Stars', *What Next?* No.22). Witty though this might be, the remark betrays not just ignorance but also intellectual laziness in someone so keen to chastise others for lack of fresh thinking. Actually the issue is not "zero-growth" but a steady-state, a quite different concept. The writings and films of popular campaigners like Michael Moore are replete with similar ignorance. The more intelligent theorists like Alex Callinicos seem to realise that due mention of environmental issues is necessary but study of works like his *Against the Third Way* shows that it amounts to little more than a passing nod not a serious engagement. Those trying to forge an ecoMarxism often seem unwilling to make the break with old habits of thought. Thus Enrique Leff in a presentation called "Marxism and the Environmental Question", stresses that "Marxism opposes naturalist, biological, and energy-centred approaches". This is a bit like condemning someone standing at the edge of a skyscraper roof for being preoccupied about gravity. Leff repeats another fallacy, namely that the environmentalist perspective "denaturalizes and desubjectivizes social processes". Au contraire! There is a strong literature in which ecological writers address not just inequality within society but also the cultural and social roots of the environmental crisis. Most significantly, they do not reduce it to simply economic causation as do most anti-capitalists, anarchist or socialist.

To be fair, though, there are some avowedly socialist writers who avoid this nonsense, including Saral Sarkar, an Indian writer resident in Germany, and the American academic Andrew McLaughlin. Another example is the work of David Orton and the Green Web network in Canada. See http://home.ca.inter.net/~greenweb/ which propagates "Left Biocentrism", a bit of a tongue-twister but which nonetheless manages to blend a necessary anti-capitalism with a realisation that the ecological crisis means that anti-capitalist politics in itself will not suffice. The work of Andre Gorz might seem to fit the bill but on closer examination it lacks deep ecological insight.

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Lubitz ' TrotskyanaNet The Prophet Misarmed â€" Trotsky , Ecology and Sustainability by Sandy Irvine. S. Irvine, L. Trotsky. 2012. It is a tribute to Leon Trotskyâ€™s standing that his ideas are still widely discussed. If the number of ex-members as well as actual supporters of avowedly and quasi-Trotskyist groups were to beâ€¦ Expand. View PDF. From "The Prophet Misarmed: Trotsky, Ecology and Sustainability: It is argued here that Trotsky both reflected and encouraged an even worse tendency amongst the radical Left, namely an almost total myopia about the most significant of all developments in the 20th century, the ecological crisis. It is the most serious, all-embracing challenge of our times. Global overwarming is only one of many symptoms of dangerous planetary disorder. Not only did Trotsky fail to anticipate the most serious failing in the dominant social and economic order, he actually endorsed technologies, lifestyle cho The Prophet Misarmed: Trotsky, Ecology and Sustainability. Sandy Irvine. Read more.Â But, in this age when the very sustainability of the Earth and its critical ecosystems are in question, it is important to communicate the key findings of environmental science and be used by those who make decisions about the future of [Show full abstract] the Earth. The challenge is how the scientists can effectively impart appropriate and useful information to decision-makers. Science is an integral part of decision making, as scientific results and model predictions are rarely expressed in terms of end points that have direct meaning or inherent value to decision makers. A number of qu