MAX AJL: Israel BDS—A Movement on the Rise → p. 54

MONTHLY REVIEW

VOL. 67
NO. 2

JUNE
2015

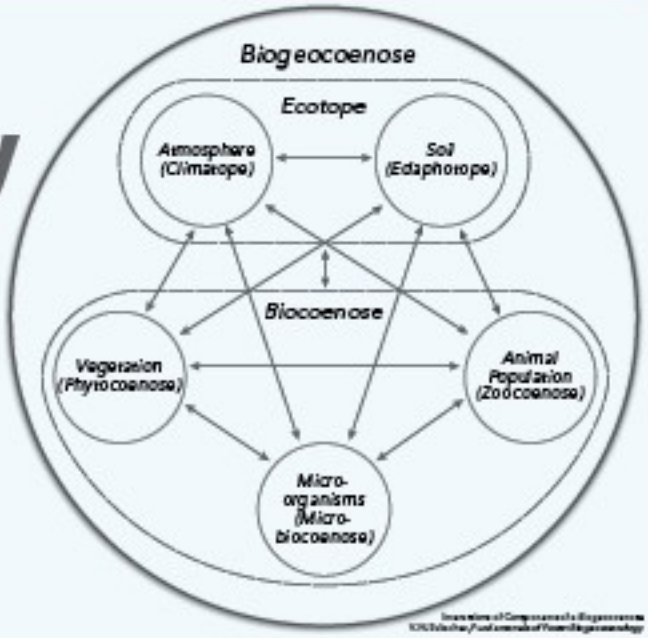
AN INDEPENDENT SOCIALIST MAGAZINE

The 'New Turkey': Fetishizing Growth with Fatal Results

ZUHAL YEŞILYURT GÜNDÜZ

The Planetary Crisis & Late Soviet Ecology

JOHN BELLAMY FOSTER



Today's South Africa: Rage, Self-Doubt & Socialist Potential

PATRICK BOND

Monthly Review online http://monthlyreview.org
MR ZINE http://mrzine.monthlyreview.org
US$6 / CAN$6 / €4.50 / £4.00

Late Soviet Ecology and the Planetary Crisis

By John Bellamy Foster
June 1, 2015

Soviet ecology presents us with an extraordinary set of historical ironies. On the one hand, the USSR in the 1930s and '40s violently purged many of its leading ecological thinkers and seriously degraded its environment in the quest for rapid industrial expansion. The end result has often been described as a kind of "ecocide," symbolized by the Chernobyl nuclear accident, the assault on Lake Baikal, and the drying up of the Aral Sea, as well as extremely high levels of air and water pollution.1 On the other hand, the Soviet Union developed some of the world's most dialectical contributions to ecology, revolutionizing science in fields such as climatology, while also introducing pioneering forms of conservation. Aside from its famous *zapovedniki*, or nature reserves for scientific research, it sought to preserve and even to expand its forests. As environmental historian Stephen Brain observes, it established "levels of [forest] protection unparalleled anywhere in the world." Beginning in the 1960s the Soviet Union increasingly instituted environmental reforms, and in the 1980s was the site of what has been called an "ecological revolution." A growing recognition of this more complex reality has led scholars in recent years to criticize the "ecocide" description of Soviet environmental history as too simplistic.2

From the 1960s on, Soviet ecological thought grew rapidly together with the environmental movement, which was led primarily by scientists. In the 1970s and '80s this evolved into a mass movement, leading to the emergence in the USSR of the largest conservation organization in the world. These developments resulted in substantial changes in the society. For example, between 1980 and 1990 air pollutants from stationary sources fell by over 23 percent.3

More significant from today's standpoint was the role the Soviet Union played from the late 1950s on in the development of global ecology. Soviet climatologists discovered and alerted the world to the acceleration of global climate change; developed the major early climate change models; demonstrated the extent to which the melting of polar ice could create a positive feedback, speeding up global warming; pioneered paleoclimatic analysis; constructed a new approach to global ecology as a distinct field

based on the analysis of the biosphere; originated the nuclear winter theory; and probably did the most early on in exploring the natural-social dialectic underlying changes in the earth system.4

Soviet ecology can be divided into roughly three periods: (1) early Soviet ecology, characterized by revolutionary ecological theories and key conservation initiatives from the 1917 revolution up to the mid-1930s; (2) the middle or Stalin period, from late 1930s to the mid-1950s, dominated by purges, rapid industrialization, the Second World War, the onset of the Cold War, and aggressive reforestation; and (3) late Soviet ecology from the late 1950s to 1991, marked by the development of a dialectical "global ecology," and the emergence of a powerful Soviet environmental movement—responding in particular to the extreme environmental degradation of the decade following Stalin's death in 1953. The end product was a kind of negation of the negation in the ecological realm; but one that was to be superseded finally by the wider forces leading to the USSR's demise.

Although much has been written about the early and middle periods of Soviet ecology, relatively little has been written about late Soviet ecology. Western ecological Marxism emerged largely in ignorance of rapidly developing Soviet ecological science and philosophy. Yet late Soviet ecology remains of extraordinary importance to us today, representing a valuable legacy that can potentially aid us in our efforts to engage with the present planetary emergency.

Soviet Ecology under Lenin and Stalin

Early Soviet ecology was extraordinarily dynamic. Lenin had strongly embraced ecological values, partly under the influence of Marx and Engels, and was deeply concerned with conservation. He read Vladimir Nikolaevich Sukachev's *Swamps: Their Formation, Development and Properties* and was, Douglas Weiner has speculated, "affected by the holistic, ecological spirit of Sukachev's pioneering text in community ecology." Immediately after the October 1917 Revolution, Lenin supported the creation of the People's Commissariat of Education under the leadership of Anatolii Vasil'evich Lunacharskii, which was given responsibility for conservation. In 1924 the All-Russian Conservation Society (VOOP) was created with an initial membership of around one thousand. The Education Commissariat with Lenin's backing set up the celebrated ecological reserves, known as zapovedniki, of relatively pristine nature, set apart for scientific research. By

1933 there were thirty-three zapovedniki encompassing altogether some 2.7 million hectares.5

Key Soviet ecological thinkers, besides Sukachev, included Vladimir Vernadsky, who published his epoch-making *The Biosphere* in 1926; Alexander Ivanovich Oparin, who in the early 1920s (simultaneously with J.B.S. Haldane in Britain) developed the main theory of the origins of life; and the brilliant plant geneticist Nikolai Ivanovich Vavilov, who discovered the primary sources of germplasm or genetic reservoirs (known as Vavilov areas) tied to the areas of earliest human cultivation around the world—in locations such as Ethiopia, Turkey, Tibet, Mexico, and Peru. Others, such as leading Marxian theorist and close Lenin associate Nikolai Bukharin, and historian of science Y. M. Uranovsky, generalized such discoveries in terms of historical materialism. Bukharin, following Vernadsky, emphasized the human relation to the biosphere and the dialectical interchange between humanity and nature. Zoologist Vladimir Vladimirovich Stanchinskii pioneered the development of energetic analysis of ecological communities (and trophic levels), and was a leading promoter and defender of the zapovedniki. Stanchinskii was the editor of the USSR's first formal ecology journal. Physicist Boris Hessen achieved worldwide fame for reinterpreting the history and sociology of science in historical materialist terms.

However, with Lenin's death and the rise of Stalin, issues of Soviet conservation and genetics were politicized and bureaucratized within a repressive state. This led to the elimination of many leading scientists and intellectuals, particularly those who questioned Trofim Denisovich Lysenko, a dominant figure in Soviet biology for three decades from the mid-1930s to the late 1950s—first through his directorship of the Lenin All-Union Academy of Agricultural Sciences and then the Institute of Genetics of the USSR Academy of Sciences. Noted scientists who resisted Lysenko's often exaggerated claims that by various techniques, such as vernalization and hybridization, it was possible to speed up plant growth and generate greater productivity in agriculture, were purged. As a result the USSR in this period lost some of its most creative ecological thinkers. Bukharin, viewed by Stalin as a rival, and Hessen, who was closely associated with Bukharin and Vavilov, were both executed. Vavilov, who had opposed Lysenko on genetics, was imprisoned, where he died a few years later of malnutrition—to be dumped into an unmarked grave.6

In 1927, the issue of using the zapovedniki for "acclimatization" research (i.e., removal of wild and/or domestic animals and plants from their original

habitat and placement in new habitats in an attempt to transform nature) arose in Soviet biology. Sukachev and Stanchinskii strongly defended the zapovedniki against those promoting the acclimatization agenda, arguing that they should remain inviolable. In 1933, Stanchinskii came directly into conflict with Lysenko (and his chief ally Issak Izrailovich Prezent) regarding the zapovedniki and acclimatization, leading to Stanchinskii's 1934 arrest, imprisonment, and torture. He was to die in prison (after a second arrest) in 1942.7

The consequences for Soviet ecological science, particularly in areas related to agriculture, were disastrous. Membership in VOOP, which had risen to 15,000 by 1932, declined to around 2,500 in 1940. The zapovedniki were converted more and more from reserves for the scientific study of pristine nature into a new role as transformation-of-nature centers.8

Nevertheless, in two major areas, forestry and climatology, Soviet ecology continued to develop. One of the key intellectual achievements was Sukachev's first introduction in 1941, developed more fully in 1944, of the concept of biogeocoenosis (alternatively biogeocoenose), which was to be extraordinarily influential both in the USSR and in the wider world, and was the main rival to Arthur Tansley's ecosystem category.9 A botanist and ecologist, Sukachev had been influenced by Georgii Fedorovich Morozov, considered the founder of Russian scientific forestry, who died in 1920. Morozov helped introduce systemic thinking into Russian ecology by making extensive use of the concept of biocoenosis (or biological community), coined by the German zoologist Karl Möbius in 1877.

Sukachev's concept of biogeocoenosis was a further development on biocoenosis, intended to incorporate the abiotic environment. It was conceived in dialectical-energetic terms as a more unified and dynamic category than the notion of the ecosystem. The concept of biogeocoenosis grew out of and had an integral connection to Vernadsky's notions of the biosphere and biogeochemical cycles. According to Sukachev in his landmark 1964 work *Fundamentals of Forest Biogeocoenology* (written with N. Dylis), "The idea of the interaction of all natural phenomena…is one of the basic premises of materialistic dialectics, well proved by the founders of the latter, K. Marx and F. Engels."10 "A Biogeocoenose," as Sukachev famously defined it,

> is a combination on a specific area of the earth's surface of homogeneous natural phenomena (atmosphere, mineral strata, vegetable, animal, and microbiotic life, soil, and water conditions), possessing its own specific type of interaction of these components and a definite type of interchange of their

> matter and energy among themselves and with other natural phenomena, and representing an internally-contradictory dialectical unity, being in constant movement and development.11

In a 1960 article he further explained,

> Since the existence of mutual influences or interaction of the components is the most characteristic feature of the [integrative ecological] concept in question, we believe that "biogeocoenosis" (from the Greek words *koinos* "common" and the prefixes bio "life" and geo "earth," which emphasize the participation in this general unity of living things and inert elements of the earth's surface) is the more accurate and descriptive term [as compared with all alternatives]….

A biogeocoenosis may be defined as any portion of the earth's surface containing a well-defined system of interacting living [biotic] (vegetation, animals, microrganisms) and dead [abiotic] (lithosphere, atmosphere, hydrosphere) natural components, i.e., a system of obtaining and transforming matter and energy and exchanging them with neighboring biogeocoenoses and other natural bodies that remain uniform.

The continuous interaction of all the components among themselves and with surrounding natural objects means that each biogeocoenosis is a dynamic phenomenon, constantly moving, changing, and developing.12

Hence, "each organism and each specimen," Sukachev argued, "is in dialectical unity with the environment." Nevertheless, a key aspect of the ecological condition was that multicellular organisms higher on "the evolutionary ladder"—i.e., characterized by a wider range of adaptive mechanisms and specialization in relation to their environment—experienced a "growth of relative autonomy." The biogeocoenosis could then be seen as dialectically evolving in complex ways, with organisms actively changing their environments—a reality that demanded specific investigations. "The biogeocoenosis as a whole," he wrote, "develops through the interaction of all its variable components and in accordance with special laws. The very process of interaction among the components constantly disrupts the established relationships, thereby affecting the evolution of the biogeocoenosis as a whole."13 Like dialectical frameworks in general, Sukachev's biogeocoenosis (even more than its main conceptual rival, ecosystem) emphasized internal dynamics, contradictory changes, and instability in ecological processes.

The dialectical, integrative approach in Soviet ecology promoted by figures like Morozov and Sukachev, which was rooted in detailed empirical research

into specific conditions, led to the recognition of the extent to which forest-ecological-system health was essential to hydrology and the control of climate. This broad ecological understanding helped give rise in 1948 to the Great Stalin Plan for the Transformation of Nature, which was conceived as a grand attempt to reverse anthropogenic regional climate change in deforested areas, with an emphasis on the promotion of watersheds. Already in 1936 the Soviet government had created the Main Administration of Forest Protection and Afforestation, which established "water-protective forests" in wide belts across the country. While forests in parts of the Soviet Union were exploited relentlessly as industrial forests, the best old growth forests of the Russian heartland were protected, with ecological concerns given priority, eventually creating a total "forest preserve the size of France, which grew over time to an area the size of Mexico" (roughly two-thirds of the contiguous United States).14

The Great Stalin Plan for the Transformation of Nature, introduced in the context of attempts at ecological restoration following the Second World War, was the most ambitious plan of afforestation in all of history up to that point. It sought to create some 6 million hectares (15 million acres) of entirely new forest in the forest-steppe and steppe regions, and constituted "the world's first explicit attempt to reverse human-induced climate change." The trees were planted in shelterbelts along rivers (and roads) and around collective farms, with the goal of staving off the drying influence of winds emanating from Central Asia, while protecting watersheds and agriculture. Although the plan had not been realized at the time of Stalin's death (when it was discontinued), a million hectares of new forest were planted, with 40 percent surviving.15 Yet, even while this afforestation plan was being carried out, some 85 percent of the territory of the zapovedniki was formally liquidated in 1951 (to be reestablished under the leadership of Sukachev and others during the resurrected conservation movement of the late 1950s).16

One reason for the limited success of the Great Stalin Plan was Lysenko's entry into forestry and his battle for control of Soviet afforestation. In 1948, Lysenko had achieved his greatest victory, with the Lenin All-Union Academy of Agricultural Sciences' declaration that Mendelian genetics was a form of bourgeois idealism. With the introduction of the Great Stalin Plan for the Transformation of Nature, Lysenko turned his attention to forestry, taking direct control of the Main Administration for Field-Protective Afforestation. He concocted a "nest method" of planting trees based on the notion that tree seedlings planted in dense formations would collectively defend themselves from other species, reducing the amount of labor required to clear areas for

planting. Here, however, Lysenko was opposed at every step by Sukachev, who countermanded his orders on the ground several times and reported to the Ministry of Forest Management in 1951 that 100 percent of the forest seedlings planted in the Ural territorial administration with Lysenko's nest method had died.17

From 1951, two years before Stalin's death, and continuing until 1955, Sukachev, as the dean of Soviet botany—director of the Academy of Science's Institute of Forests, head of the Academy Presidium's Commission on Zapovedniki, and editor of the *Botanical Journal*—courageously launched an intellectual war against Lysenko. In article after article that he wrote and edited for the *Botanical Journal* and the *Bulletin of the Moscow Society of Naturalists* (the journal of Russia's oldest and most prestigious scientific society) Sukachev, in what Weiner has called a "monumental battle against Lysenko," sharply criticized Lysenko's theories and methods. Later, in 1965, Sukachev was to accuse Lysenko of fraudulent practices. Young biologists viewed Sukachev as a hero and secretly flocked to his banner. In 1955 Sukachev was elected president of the Moscow Society of Naturalists (MOIP), a position he occupied until his death in 1967. This symbolized a dramatic decline in Lysenko's power and a shift in Soviet ecology (although Lysenko's final removal as head of the Institute of Genetics was not until 1965, under Brezhnev). Following Sukachev's election as president of the MOIP, a concerted campaign to reestablish the zapovedniki began. At that point the Soviet conservation movement began to rise out of the ashes. Membership in VOOP grew to 136,000 in 1951, and by 1959 had topped 910,000. The 1960s saw the spectacular rise of student conservation brigades nurtured by the MOIP under Sukachev.18

Meanwhile, Soviet climatology had been making extraordinary advances through the work of figures such as E.K. Fedorov (Y.K. Fyodorov), famous for his work on the Arctic, and Mikhail Ivanovich Budyko, who specialized initially in the emerging field of energetics, focusing on exchanges of energy and matter in a global context. Budyko's pathbreaking *Heat Balance of the Earth Surface*, published in 1958, earned him the prestigious Lenin Prize. In this work he developed a method for calculating the various components of the heat balance of the entire earth system. This was crucial in opening the way to the founding of physical climatology as a field. Appointed in 1954 as director of Leningrad's Main Geophysical Observatory, at age thirty-four, Budyko played a crucial role in delineating multiple aspects of "the global ecological system." He was to be awarded the Blue Planet Prize in 1998 (the same year as David Brower in the United States) for founding physical

climatology, early warnings on the accleration of global warming, developing the nuclear winter theory, and pioneering global ecology. Budyko built his theoretical and empirical analysis on Vernadsky's biosphere concept and saw Sukachev's work on the biogeocoenosis as "essential in developing modern ideas of interrelations between organisms and the environment." (Sukachev was to rely in turn on Budyko's energy flow analysis in his own work.)19

Late Soviet Ecology

One of the tragedies of Soviet ecology is that the USSR's degradation of its environment worsened in the first decade after Stalin's death in 1953, with the discontinuation of the Great Stalin Plan for the Transformation of Nature and the more rapacious exploitation of resources. Six days after Stalin's death the Ministry of Forest Management was abolished and forest conservation was reduced to a much lower priority. (Yet it was not until the post-Soviet era that Vladimir Putin was finally to sign altogether out of existence Stalin's Group I of protected forests—those under the highest level of protection and preservation.)20

The USSR obtained high rates of growth through a form of extensive development, drawing constantly on more labor and resources. By the end of the 1950s the weaknesses of this approach, and the need to develop more intensive forms of development which took into account resource limits, were already becoming apparent. However, inertia within the system, and an accelerating Cold War, prevented a transition to a more rational economic development path.21

The worst damage was done during the Malenkov and Khrushchev years. Partly as a result, these years saw the rise of what was to be an immense environmental movement growing initially out of the scientific community. Khrushchev's "Virgin Lands" program, beginning in 1954, targeted the plowing up of 33 million hectares of so-called "virgin land" for the expansion of agriculture. Initial successes were obtained, but these were soon followed by dust bowls. In the late 1950s the Soviet leadership decided for the first time to interfere with the ecology of Lake Baikal, the oldest and deepest freshwater lake in the world. In the early 1960s the Soviet Presidium ordered the diversion of the two main rivers feeding into the Aral Sea, the Amu Darya and the Syr Darya, in order to provide irrigation for cotton farming in Soviet Eurasia. The Aral Sea consequently shrank to a tenth of its original size.22

These developments were met with a powerful response from scientists and conservationists. In 1964 Sukachev, as head of the MOIP, sent a letter to Soviet geographers in order to draw them into the fight to save Lake Baikal. Two years later he was one of a group of scientists who signed a collective letter to the media demanding protection of Lake Baikal. Baikal became a symbol of ecological destruction, leading to the extraordinary growth of the Soviet environmental movement. By 1981, VOOP membership had risen to 32 million, and by 1985 to 37 million, constituting the largest nature protection organization in the world. During the Brezhnev to Gorbachev years, the Soviet leadership introduced more and more environmental measures.23

Fedorov, one of the leading climatologists, became a member of the Presidium of the Supreme Soviet of the USSR and headed the Institute of Applied Geophysics of the State Committee of the USSR on Hydrometeorology and Control of the Natural Environment. In the early 1960s Fedorov's views with respect to the environment could be described as human exemptionalist (though in 1962 he raised the critical issue of sea level rise with a melting of the Greenland ice sheet). But a decade later he had clearly shifted in an ecological direction. His 1972 *Man and Nature* presented a Marxian environmental perspective explicitly linked to that of Barry Commoner in the West. Like most Soviet ecologists at the time, Fedorov accepted some aspects of the Club of Rome's 1972 *Limits to Growth* argument, which focused on natural-resource limits to economic growth. But he insisted on an approach that more fully accounted for social and historical factors. Moreover, he argued that the authors of *The Limits to Growth* had erred in failing to consider the crucial challenge represented by climate change. Fedorov's arguments relied directly on Marx's theory of socio-ecological metabolism: "The authors of the materialist theory of social development," he wrote, "regarded interaction (metabolism) between people and nature as a vital element in human life and activity and showed that the socialist organization of society would have every possibility to ensure optimal forms of such interaction." With respect to climate, he pointed to Marx and Engels's early discussions of anthropogenic climate change on a regional basis (and the threat of desertification) in relation to the writings of Karl Fraas. Fedorov represented the USSR at the first World Conference on Climate in Geneva in 1979, where he stressed the urgency of action, declaring that "future climate changes are unavoidable. They will become probably irreversible during the nearest decades"—if an international plan were not soon worked out.24

However, the scientific revolutions in climatology and global ecology in the Soviet Union had their main origins in the work of Budyko, who was the

acknowledged world leader in the study of the heat balance of the earth. He was also the world's primary analyst of the effect of the polar ice on the climate, and was the first to delineate the ice-albedo effect as a global warming feedback mechanism. Budyko was also the first to point to the dangerous acceleration in global average temperature that would result from such positive feedbacks. He went on to pioneer studies of paleoclimatic changes in earth history and to develop "global ecology" as a distinct field, based on a dialectical, biospheric analysis, in the tradition of Vernadsky and Sukachev. Budyko promoted a theory of "critical epochs" in the earth's history, which were characterized by "ecological crises" and "global catastrophes," and he extended this analysis to the growing threat of "anthropogenic ecological crisis."25

In 1961 Fedorov and Budyko called the All-Union Conference on the Problem of Climate Modification by Man in Leningrad to address the emerging problem of climate change—the first such conference in the world. That same year Budyko presented his paper "The Heat and Water Balance Theory of the Earth's Surface" to the Third Congress of the Geographical Society of the USSR, in which he arrived at his famous conclusion that anthropogenic climate change was now inevitable under business as usual, and that human energy usage needed to be addressed. In 1962, he published his landmark article "Climate Change and the Means of Its Transformation" in the USSR's *Bulletin of the Academy of Sciences*, in which this conclusion was again advanced, together with the observation that the destruction of ice cover could generate "a significant change in the regime of atmospheric circulation." By 1963 Budyko compiled an atlas of the world's heat balance system. "Budyko energy balance models" soon became the basis of all complex climate modeling. In 1966 he published (together with colleagues) an article on "The Impact of Economic Activity on the Climate," describing the history of anthropogenic climate change. In it he indicated that human beings—through actions such as deforestation, swamp drainage, and city construction—had long affected "the microclimate, i.e. local changes in the meteorological regime of the surface layer of the atmosphere." What was new, however, was that anthropogenic climate change was now occurring over large territories and globally.

However, it was the discovery of ice-albedo feedback and its dynamic effect on global warming that was to change everything. Budyko had presented his basic analysis on this as early as 1962, in an article on "Polar Ice and Climate." But the extent that the global climate, and not just the climate of the Arctic, would be affected was not yet clear. It was in his 1969 article, "The Effect of

Solar Radiation Variation on the Climate of the Earth," that he was to provide a full and concrete assessment of the polar sea ice/albedo feedback mechanism and its relation to climate change. The observations were startling. Similar results on climate sensitivity pointing to catastrophic global climate change were presented that same year by William Sellers at the University of Arizona. From that point on, climate change moved from being a peripheral concern to an increasingly urgent global issue. Meanwhile, Budyko's explorations of the effects of aerosol loading led him to introduce the possibility of using planes to dump aerosols (sulfur particles) in the stratosphere as a possible geoengineering counter to climate change, given his belief that capitalist economies, especially, would not be able to limit their growth, energy use, or emissions. All of these conclusions were driven home in his 1972 book, *Climate and Life*. Although anthropogenic global warming had first been described by Guy Stewart Callendar as early as 1938, the discovery of significant feedback effects and greater climate sensitivity now posed the question of a potential runaway global ecological crisis in approaching decades.26

For Soviet climatologists, such as Fedorov (a Soviet delegate to the Pugwash conferences who also served as Vice President of the World Council of Peace) and Budyko, the issue of peace was closely related to the environment.27 It was Soviet climatologists, primarily based on the work of Budyko and G.S. Golitsyn, who first developed the nuclear winter theory in the case of a full-scale nuclear exchange—whereby over a hundred gargantuan firestorms set off by nuclear weapons would increase the aerosol loading in the atmosphere sufficiently to bring temperatures across whole continents down by several degrees and possibly several tens of degrees, thereby leading to the destruction of the biosphere and human extinction. The basis of this analysis was developed by the Soviets a decade before their counterparts in other countries. It was to play a big role in the development of the anti-nuclear movement and the eventual backing away from the brink of nuclear holocaust during the later stages of the (first) Cold War.28

The enormous range and comprehensiveness of Budyko's ecological contributions were particularly evident in his later work, where he sought to define "global ecology" as a distinct field. He played a foundational role in the development of paleoclimatic analysis, examining the history of "global catastrophes" in earth history, associated with alterations in the climate—using this to develop further insights into the significance of anthropogenic climate change. In describing global ecology as a distinct area of analysis he emphasized that previous ecological work had been directed overwhelmingly

at local conditions, or at most an "aggregate of local changes." Global ecology, in contrast, was that area of ecology concerned with the operation of the biosphere as a whole, and had arisen as a result of the sudden increase in the human capacity to alter atmospheric and ocean systems. Here again the emphasis was on the dialectical interaction between organisms and the environment. Budyko stressed Oparin's crucial observation (associated with the theory of life's origins) that organisms had generated the atmosphere as we know it, extrapolating this to a consideration of the human role with respect to the atmosphere. In his various analyses of the evolution of *Homo sapiens*, Budyko invariably went back to Engels's exploration in "The Part Played by Labour in the Transformation from Ape to Man" of what is now known as "gene-culture coevolution." Likewise, Budyko's *Global Ecology* pointed to Marx's comment in a letter to Engels on the desertification tendencies of civilization. All ecological analysis, Budyko indicated, was modeled on metabolism, the process of material exchange between life and the environment.29

Some of Budyko's early heat balance work had been carried out together with leading Soviet geographers A.A. Grigoriev and Innokenti P. Gerasimov. The goal was a more integral dialectical science capable of addressing the evolution of the biosphere. Budyko and Gerasimov postulated that it was paleoclimatic change that had created the dynamic conditions millions of years ago in Africa for the evolution of the early hominids, including the australopithecines and the genus *Homo*. In *Geography and Ecology*, a collection of his essays from the 1970s, Gerasimov provided an elegant theoretical merger of the notion of the geographic landscape with Sukachev's biogeocoenosis.

Scarcely less important was Budyko's analysis of the social aspects of what he considered to be the approaching "global ecological crisis." Here he emphasized the difficulties posed by the system of capital accumulation. All economic expansion was constrained by the fact that "the stability of the global ecological system is not very great." There was no way out of this dilemma except through economic and ecological planning, namely a "socialist planned economy" aimed at the realization of Vernadsky's "noosphere," or an environment ruled by reason.30

Crossing the intellectual boundaries represented by C.P. Snow's "two cultures," Budyko connected his analysis to the ideas of Soviet social and environmental philosophers, specifically those of Ivan T. Frolov, the dynamic editor in chief from 1968 to 1977 of the USSR's leading philosophy

journal *Problems of Philosophy* (*Voprosy filosofi*). It was largely owing to Frolov's efforts that Soviet social philosophy in the 1970s and '80s began to revive, based on the conscious reintegration of ecological and humanistic values into dialectical materialism. In this new analysis, inspiration was drawn from Marx's deep humanism and naturalism in the *Economic and Philosophical Manuscripts* and the *Grundrisse*, as well as from his later ecological critique in *Capital*. This emerging Soviet ecological Marxism deliberately circumvented the Frankfurt School in the West with its less materialist emphasis and suspicion of science—though accepting the analysis of Antonio Gramsci. Frolov and others called for the development of a "dialectical integral unity" on materialist-ecological grounds. The resulting critical philosophy and social science was rooted in the whole Soviet tradition of scientific ecology from Vernadsky to Sukachev to Budyko.31

Frolov's *Global Problems and the Future of Mankind*, published in 1982, represented an important first attempt in the creation of a new ethic of global ecological humanism. Moreover, a second work that he published that same year, *Man, Science, Humanism: A New Synthesis*, went still further in developing this new dialectical humanism-naturalism. Although Frolov's vision showed traces of technologism (especially in his treatment of food production), the overall perspective was deeply humanist in its analysis and its values. The human relation to nature, he indicated, quoting from Marx's *Economic and Philosophical Manuscripts*, needed to be governed not simply by the laws of sustainable production, but the "laws of beauty." He argued in these years for "moving away from the illusion of anthropocentrism and rejecting the traditional hegemonistic relationship to nature."32

But perhaps the most astonishing product of this revival of Soviet critical ecological thinking was the 1983 collection *Philosophy and the Ecological Problems of Civilisation*, edited by A.D. Ursul.33 This volume was remarkable in that it brought together leading ecological philosophers, like Frolov, with such major natural-scientific figures as Fedorov and Gerasimov. The understanding of Marx and Engels's ecological thought demonstrated here—though still treated in a somewhat fragmented way—was profound. As Gerasimov explained, "Marx characterized labour as a process in which man 'starts, regulates, and controls the material re-actions [metabolism] between himself and nature'…. Man's interaction with nature needs to be subordinated to the general principles of metabolic processes." Similarly, Frolov, in criticizing the historically specific ecological depredations of capitalist society wrote: "The danger of an ecological crisis has become real

not because the use of technical mechanisms and devices in the 'metabolism' of man and nature in itself…but primarily because this industrial development is realised on the basis of the socio-economic, spiritual, and practical set-ups of the capitalist mode of production." It was essential, he argued, for society to focus on "ecodevelopment" or "ecologically justified development," taking into account "the objective dialectic and inner contradictoriness of the interaction of society and nature."34

A core aspect of Frolov's stance was his argument that although struggles to create a more ecologically rational world ran the risk of utopianism, since they necessarily got ahead of the development of material-social forces, the severity of the global ecological threat nevertheless demanded a "rational realism" that was utopian-like in character.35

The various essays in *Philosophy and the Ecological Problems of Civilisation* displayed signs of the characteristic Soviet faith in progress and technology and the overcoming of ecological constraints. Yet, the "ecological problems of civilization" were nonetheless presented with considerable depth and sophistication—particularly where the more radical and scientific thinkers were concerned. For Fedorov, arguing from the standpoint of climate science, the challenge was that "the scale of society's activity" now made it "necessary to take into account the quantities of all our planet's elements" and the "anthropogenic impact" on them. He illustrated this by reference to global warming, citing the work of Budyko. Turning to "the production of forest biogeocoenosis," philosopher N. M. Mamedov emphasized the need for a restoration ecology that would reestablish the integrity of ecosystems. Ursul pointed out that Vernadsky had long ago taught that humanity was becoming a geological force, and emphasized that "the extension of the scale of the ecological problem from a regional to a global, and even a cosmic one" represented a new challenge to society, and in effect a new geological epoch.36

Late Soviet ecological analysis was well ahead of most ecological socialism in the West in understanding the new planetary dynamic, associated with climate change in particular, and in the construction of a distinct global ecology. To be sure, by focusing their critique on the global ecological problem and on capitalism Soviet thinkers often skirted the ecological problems of the USSR itself. Still, Frolov had gained his reputation in the late 1960s through a major critical assessment of the whole sorry history of Lysenkoism, in which he openly contested the very idea of "party science." Gerasimov's *Geography and Ecology* was remarkable in its direct confrontation

(in an essay written in 1977) with major Soviet ecological problems. Thus he explicitly, if somewhat schematically, highlighted in the Soviet context: (1) the history of the destruction of the Aral Sea, (2) the controversial diversion of rivers, (3) the causes of desertification, (4) the imperative of protecting Lake Baikal, (5) the need to restore the taiga forests, (6) destructive forms of timber exploitation, (7) irrational, non-scientific mining practices, (8) controlling air pollution in cities, (9) removal of industrial wastes from urban areas, and (10) actions to limit new forms of radioactive and toxic waste. What was needed, he insisted, was "an *ecologization* of modern science." As the preeminent Soviet geographer, Gerasimov took the huge step of arguing that ecology (not economy) should become the focal point of geography as a field.37

Soviet economists in this period were engaged in a fierce debate over the proper relation of economic growth calculations to social welfare. P.G. Oldak took a leading role in the 1970s and '80s in arguing for the replacement of the standard economic growth calculations with a new approach focusing on "gross social wealth" as the basis for socioeconomic decisions. Lenin, Oldak pointed out, had made it clear that the goal of socialism should be the free development of each member of the population on the widest possible (i.e., not narrowly economistic or mechanistic) basis, taking account of qualitative factors. With this as the justification, Oldak proposed a new accounting that would directly incorporate into the main planning criteria not only accumulated material wealth, but also services, the knowledge sector, the condition of natural resources, and the health of the population. Given an "excess of the anthropogenic load on natural systems over their potential for self-regeneration," it might even be rational, he suggested, to choose to curtail production altogether for a time in order to transition to "a new [and more sustainable] production level."38

In 1986–1987, Frolov became the editor in chief of *Kommunist*, the Communist Party's main theoretical organ; from 1987–1989 (after Chernobyl) he was one of Gorbachev's key advisors; and in 1989–1991 he was editor in chief of *Pravda*. Frolov was responsible for much of the ecological cast that Gorbachev gave to his public pronouncements, which were accompanied by a speeding up of environmental reform measures.

Nevertheless, the much wider shift in power relations in the Soviet state and the destabilization of the society that Gobachev had introduced with *glasnost* and *perestroika* led to a deepening of Soviet political-economic contradictions, the rapid dismantling of its hegemony in Eastern Europe,

splits in the top echelons of the Soviet *nomenklatura*, and a dissolution of the whole power system—leading to the demise of the USSR itself in 1991.

Soviet Ecology in the Twenty-First Century

The foregoing argument points to a complex historical reality not captured in the hegemonic depiction of the course of Soviet environmental history from the mid-1930s on as one continuous story of extreme ecological degradation, even ecocide. From an ecological perspective, the USSR can be seen as a society that generated some of the worst ecological catastrophes in history but that also gave birth to some of the most profound ecological ideas and practices, based on materialist, dialectical, and socialist intellectual foundations. Characterized by the growth of repressive bureaucratic control and the emergence of new class relations, the USSR by the late 1930s had ceased to be meaningfully socialist in the sense of moving in the direction of a society governed by the associated producers, and instead is best described as a post-revolutionary society of a distinct type, neither capitalist nor socialist.39 Yet the existence of economic planning and a wide sphere of social property ownership, plus the intellectual legacies of Marxian theory in terms of materialist, dialectical, and socialist thinking, all ran deep. However distorted the development of the Soviet Union became in terms of its original socialist objectives, it did promote alternative forms of socialization. The purges of ecological thinkers and various environmental depredations in the Stalin or middle period gave way in the end to enormous achievements in the development of a distinct global ecology—in a kind of negation of the negation. It was in the Soviet Union, based on the theories of the biosphere and biogeocoenosis, that the analysis of accelerated climate change began, and it was from Moscow and Leningrad, not Washington and New York, that the first warnings of runaway global warming and the theory of nuclear winter first emanated.

The historic turning point in the reemergence of Soviet environmentalism took place in the early 1950s with Sukachev's struggle against Lysenko, the growing role of the Moscow Society of Naturalists, the rise of student conservation brigades, and the eventual emergence of VOOP as the largest conservation organization in the world. In the 1960s, beginning with Brezhnev, significant environmental legislation was passed, but implementation was generally ineffective due to conflict with plant managers, class-economic barriers, failure to disseminate information (remaining cloaked in secrecy), and the still-nascent development of the

environmental movement. Joan DeBardeleben's remarkably balanced assessment of "The New Politics in the USSR" contends that, despite important environmental initiatives, "pro-development forces on the whole were considerably stronger than the pro-environmental forces in the Brezhnev period." Still, environmental progress was discernible. Thus the number of zapovedniki by 1983 had gradually expanded to 143, beyond the 128 that existed in 1951, before the great bulk were liquidated under Stalin (and well beyond the thirty-three originally established under Lenin).40

In the Gorbachev era, beginning in 1985, everything changed. What followed has been characterized by Laurent Coumel and Marc Elie in *The Soviet and Post-Soviet Review* as a "tragic ecological revolution"—the tragedy lying mainly in the fact that the demise of the Soviet Union cut it short, leading to a dramatic decline both in the environmental movement and in the state's responsiveness to ecological issues in the post-Soviet years, as capitalism resumed control.41

Following Chernobyl in 1986, the Soviet environmental movement became more powerful. In addition to VOOP, some 300 major environmental organizations were operating throughout the USSR. "From 1987 to 1990, all across the USSR, plants were closed, planned projects were re-sited or re-tooled for a less polluting type of production, or projects were canceled altogether. The most prominent examples included the cessation of work on the planned river diversion projects, cancellation of the Volga-Chograi canal, closing of biochemical plants, and plans to convert the Baikalsk Pulp and Paper Plant to furniture production." Environmental movement pressure resulted in the closing down of over a thousand large enterprises in these years.42

Dramatic results were apparent in relation to carbon dioxide emissions as well. Already in the 1960s the country had begun to shift from coal as its main energy source to natural gas. In 1988 carbon emissions peaked. They fell dramatically in the two years after that, due chiefly to the aggressive switchover from coal to natural gas.43

Implying falsely that a critical-scientific Soviet ecology was non-existent, U.S. historian Paul Josephson observed in 2010 that there were "no Soviet counterparts to Rachel Carson's *Silent Spring* or the Club of Rome's *Limits to Growth*."44 Yet, late Soviet ecology did generate such works as Sukachev's *Fundamentals of Forest Biogeocoenology*, Federov's *Man and Nature*, Budyko's *Climate and Life*, *Global Ecology,* and *The Evolution of the Biosphere*, and Frolov's *Man, Science, Humanism* (like Carson's later work these were all

influenced by Vernadsky's *The Biosphere* and Oparin's theory of the origins of life).45 These contributions enormously advanced ecological science and thinking, and pointed to the need for a rapid ecological restructuring of human society throughout the globe. In the twenty-first century a recognition of the positive achievements of Soviet ecology is obviously crucial if we are to create the Great Transition now called for by environmentalists worldwide.

Late Soviet ecology, moreover, left a legacy of economic planning (and, at the end, signs of an emergent ecological planning) that, for all of its weaknesses and false turns, represented in many ways a massive human achievement from which we need to learn today if we are to find a way to regulate the human metabolism with nature and to surmount the present global ecological crisis. It began a process of ecological transition that, if carried out fully, could have had immeasurable positive effects.

Writing on "Socialism and Ecology" in 1989, Paul Sweezy argued that unless "the planning system" represented by such societies could somehow be preserved "and adapted to serve the needs of the new situation," and unless the potential of so-called actually existing socialist societies to operate, unlike capitalism, on other bases than the pursuit of economic riches, were somehow harnessed, it might simply be "too late for civilized humanity to restore the necessary conditions for its own survival."46 This is a specter that haunts us today more than ever. The answer to our present problems requires some sort of convergence with the notion of the planned regulation of the environment in accordance with human needs: the primary message of late Soviet ecology.

Notes

1. Murray Feshbach and Alfred Friendly Jr., *Ecocide in the USSR* (New York: Basic Books, 1992); D.J. Peterson, *Troubled Lands: The Legacy of Soviet Environmental Destruction* (Boulder: Westview Press, 1993); Stephen Brain, *Song of the Forest: Russian Forestry and Stalinist Environmentalism, 1905–1953* (Pittsburgh: University of Pittsburgh Press, 2011), 2–3; Joan DeBardeleben, *The Environment and Marxism-Leninism* (Boulder: Westview Press, 1985); John Bellamy Foster, *The Vulnerable Planet* (New York: Monthly Review Press, 1994), 96–101. The use of the term "ecocide" to describe Soviet conditions was heavily colored by the previous widespread international use of the term, beginning in the early 1970s, to criticize the U.S. employment of defoliants such as agent orange in its war on Vietnam.
2. Brain, *Song of the Forest*, 116; Laurent Coumel and Marc Elie, "A Belated and Tragic Ecological Revolution: Nature, Disasters, and Green Activists in the

Soviet Union and Post-Soviet States, 1960s–2010s," *The Soviet and Post-Soviet Review*40 (2013): 157–65.

3. Douglas R. Weiner, "Changing Face of Soviet Conservation," in Donald Worster, ed., *The Ends of the Earth* (Cambridge: Cambridge University Press, 1988), 258; Peterson, *Troubled Lands*, 42–44. See also Philip R. Pryde, "The 'Decade of the Environment' in the USSR," *Science* 220 (April 15, 1983): 274–79.
4. M.I. Budyko, G.S. Golitsyn, and V.A. Izrael, *Global Climatic Catastrophes* (New York: Springer-Verlag, 1988), v–vi, 39–46; Vladimir I. Vernadsky, *The Biosphere* (New York: Springer-Verlang, 1998).
5. Douglas R. Weiner, *Models of Nature* (Bloomington: Indiana University Press, 1988), 23; "The Changing Face of Soviet Conservation," 252–56.
6. See John Bellamy Foster, *Marx's Ecology* (New York: Monthly Review Press, 2000), 121, 240–44; Roy Medvedev, *Let History Judge: The Origins and Consequences of Stalinism* (New York: Columbia University Press, 1989), 441; Peter Pringle,*The Murder of Nikolai Vavilov* (New York: Simon and Schuster, 2008), 310; Léon Rosenfeld, *Physics, Philosophy, and Politics in the Twentieth Century* (Hackensack, NJ: World Scientific Publishing, 2012), 143; Frank Benjamin Golley, *A History of the Ecosystem Concept* (New Haven: Yale University Press, 1993), 171–73; Kunai Chattopadhyay, "The Rise and Fall of Environmentalism in the Early Soviet Union," *Climate and Capitalism*, November 3, 2014, http://climateandcapitalism.com. Many of the concepts promoted by Lysenko (and by Lysenkoist thinkers in general) were perfectly rational, and even anticipated in some cases future scientific developments. Consequently, Lysenko originally had the support of Vavilov, who helped him gain a position in the scientific establishment. However, Lysenko's research methods were shoddy, if not duplicitous, and his claims regarding his research results were exaggerated. The influence of the Lysenkoism derived from the Soviet Union's pressing need to develop solutions for agriculture, given its climatic difficulties, which led to a tendency to give more credence to such ideas than their results deserved. Worse still, Lysenko and his associates took advantage of their backing from Stalin to level political accusations and promote purges in the scientific community, in violation of all scientific ethics. On the science see Richard Levins and Richard Lewontin, *The Dialectical Biologist* (Cambridge, MA: Harvard University Press, 1985), 163–96. It should be noted that recent scientific discoveries in the field of epigenetics have shown that inheritance of a number of acquired characteristics is possible, as a result of changes in the coatings on genes. This further suggests that some of the "Lysenkoist" research in the Soviet Union was rational—even if the methods and ethics were not.
7. Weiner, *Models of Nature*, 179, 213–23; Golley, *A History of the Ecosystem Concept*, 172. According to Weiner, "Sukachev had unmistakably declared to the Third All-Union Congress of Botanists that under no circumstances should the introduction of exotic plants or animals into *zapovedniki* be allowed." Weiner, *Models of Nature?*, 281; Loren R. Graham,*What Have We Learned About*

Science and Technology from the Soviet Experience? (Stanford: Stanford University Press, 1998), 152. See also Douglas R. Weiner, *A Little Corner of Freedom: Russian Nature Protection from Stalin to Gorbachev*(Berkeley: University of California Press, 1999), 44–52; Kunal Chattopadhyay, "The Rise and Fall of Environmentalism in the Early Soviet Union," *Climate and Capitalism*, November 3, 2014, http://climateandcapitalism.com.

8. Weiner, "The Changing Face of Soviet Conservation," 255–56.
9. Sukachev first used the term geocoenosis in 1941 and then changed it to biogeocoenosis in 1944. Today biogeocoenosis is also often spelled as biogeocenosis. V.N. Sukachev, "Forest Types and their Significance for Forestry," in Institute of Forests, The Academy of Sciences of the USSR, ed., *Questions of Forest Sciences* (Moscow: Academy of Sciences of the USSR, 1954), 44–54; V. Sukachev and N. Dylis, *Fundamentals of Forest Biogeocoenology* (London: Oliver and Boyd, 1964), 9. Sukavev and Dylis in recounting the history of the concept of biogeocoenosis refer briefly to the role of Stanchinskii, thereby departing from the common practice in Soviet intellectual circles of remaining silent with regard to the contributions of those who had fallen prey to the purges of the 1930s and '40s.
10. Sukachev and Dylis, *Fundamentals of Forest Biogeocoenology*, 6.
11. Sukachev and Dylis, *Fundamentals of Forest Biogeocoenology*, 26; I.P. Gerasimov, *Geography and Ecology* (Moscow: Progress Publishers, 1983), 64–65; Golley, *A History of the Ecosystem Concept*, 173–74. Golley contends that despite the brilliance of the Vernadsky tradition and Sukachev's biogeocoenosis analysis, Soviet ecologists were so weakened by the purges and the effects of Lysenkoism that they ended up "tending local gardens" and had little effect. It is all the more ironic, then, that the Soviets with their "local gardens" revolutionized climatology and pioneered in the development of global ecology. In fact, it was the "local gardens," and not global thinking, which ecologists in the USSR were compelled to pursue with caution. Compare Golley's view of the signiificance of Sukachev's work with that of the molecular geneticist Valery N. Soyfer in *Lysenko and the Tragedy of Soviet Science* (Brunswick, NJ: Rutgers University Press, 1994), who contends that Sukachev "was the first to formulate the goals and tasks of the new discipline dealing with the interrelated and interacting complex of living and inanmiate nature—the discipline that has since come to be known as ecosystem ecology" (228).
12. V.I. Sukachev, "Relationship of Biogeocoenosis, Ecosystem, and Facies," *Soviet Soil Scientist* 6 (1960): 580–81.
13. Sukachev, "Relationship of Biogeocoenois, Ecosystem, and Facies," 582–83.
14. Brain, *Song of the Forest*, 139, "The Great Stalin Plan for the Transformation of Nature," *Environmental History* 15 (October 2010): 670–700.
15. Brain, *Song of the Forest*, 1–2, 116–17, 139–40, 164–67; David Moon, *The Plough that Broke the Steppes* (Oxford: Oxford University Press, 2013), 292.
16. Weiner, "Changing Face of Soviet Conservation," 257.

17. Brain, *Song of the Forest*, 157–59; David Moon, *The Plough that Broke the Steppes* (Oxford: Oxford University Press, 2013), 292–93.
18. Weiner, *A Little Corner of Freedom*, 205–7, 211–17, 250–52; Weiner, "Changing the Face of Soviet Conservation," 255–56, 260–61; Loren R. Graham, *Science and Philosophy in the Soviet Union* (New York: Alfred A. Knopf, 1993), 239–40, 244; Laurent Coumel, "A Failed Environmental Turn?: Khruschev's Thaw and Nature Protection in Soviet Russia," *The Soviet and Post–Soviet Review* 40 (2013): 167–68, 170–71; Alexander Vucinich, *Empire of Reason: The Academy of Science of the USSR, 1914–1970* (Berkeley: University of California Press, 1984), 253–54, 260–62, 337–38, 359, 398; Zhores Medvedev, *Soviet Science* (New York: W.W. Norton, 1978), 89. Sukachev's criticisms of Lysenko and his associates displayed a strong grasp of both Marxian and Darwinian theory. See V.N. Sukachev and N.D. Ivanov, "Toward Problems of the Mutual Relationships of Organisms and the Theory of Natural Selection," *The Current Digest of the Russian Press* 7, no. 1 (February 16, 1955): 6–11.
19. M.I. Budyko, S. Lemeshko, and V.G. Yanuta, *The Evolution of the Biosphere* (Boston: D. Reidel Publishing Co., 1986), x; "Budyko, Michael I," *Encyclopedia of Global Warming and Climate Change*, vol. 1 (Thousand Oaks, CA: Sage Publishing, 2008), 143–44; Spencer Weart, "Interview with M.I. Budkyko: Oral History Transcript," March 25, 1990, http://aip.org; "Blue Planet Prize, The Laureates: Mikhail I. Budyko (1998)," http://af-info.or.jp/en; Sukachev and Dylis, *Fundamentals of Forest Biogeocoenology*, 615–16.
20. Brain, *Song of the Forest*, 170–71.
21. Harry Magdoff and Paul M. Sweezy, "Perestroika and the Future of Socialism—Part One," *Monthly Review* 41, no. 11 (March 1990): 1–13; Harry Magdoff and Paul M. Sweezy, "Perestroika and the Future of Socialism—Part Two," *Monthly Review* 41, no. 12 (April 1990): 1–17.
22. Douglas Weiner, "The Changing Face of Soviet Conservation," 257, 264–68, *A Little Corner of Freedom*, 368–70; Philip Micklin, "The Aral Sea Disaster," *Annual Review of Earth Planet* 35 (2007): 47–72.
23. Paul Josephson, "War on Nature as Part of the Cold War: The Strategic and Ideological Roots of Environmental Degradation in the Soviet Union," in John Robert McNeil and Corinna R. . Unger, eds., *Environmental Histories of the Cold War (*New York: Cambridge University Press, 2010), 43; Joan DeBardeleben, "The New Politics in the USSR: The Case of the Environment," in John Massey Stewart, ed., *The Soviet Environment* (Cambridge: Cambridge University Press, 1992), 64–68; Weiner, "The Changing Face of Soviet Conservation," 258, 267; Coumel and Elie, "A Belated and Tragic Ecological Revolution."
24. E.K. Federov, *Man and Nature* (Moscow: Progress Publishers, 1972), 6, 15–19, 57–58, 74–75, 145–47, 173, "Climate Change and Human Strategy," *Environment* 21, no. 4 (1979): 25–31, "We Have only Begun to Mine Our Riches," *Saturday Review*, February 17, 1962, 17–19; Budyko, et al., *The Evolution of the Biosphere*, 371; M.I. Budyko and Yu. A. Izrael,*Anthropogenic Climate Change* (Tucson: University of

Arizona Press, 1987), xi–xii; Moon, *The Plough that Broke the Steppes*, 293; E.K. Fedorov and I.B. Novick, *Society and Environment: A Soviet View* (Moscow: Progress Publishers, 1977), 43–44; DeBardeleben, *The Environment and Marxism-Leninism*, 201; Barry Commoner, *The Closing Circle* (New York: Bantam, 1971).

25. M.I. Budyko, *Global Ecology* (Moscow: Progress Publishers, 1980), 7–14, 249; Budyko, et al., *Evolution of the Biosphere*, ix–x, 163–84, 262–85, 321–30. Dismissingly, Douglas Weiner depicted Budyko as someone who had given up on conservation/ecology for "the theoretical universe of mathematical models." He thus failed to see the broad character and importance of Budyko's work. Weiner, *A Little Corner of Freedom*, 388.
26. Spencer Weart, "Interview with M.I. Budkyko"; Jonathan D. Oldfield, "Climate Modification and Climate Change Debates Among Soviet Physical Geographers, 1940s–1960s," *Advanced Physical Review* 4 (November/December 2013): 513–21; Peter E. Lydoph, "Soviet Work and Writing in Climatology," *Soviet Geography* 12, no. 10 (1971): 637–66; M.I. Budyko, O.A. Drozozdov, and M.I. Yudin, "The Impact of Economic Activity on Climate," *Soviet Geography* 212 (1971): 666–79; I.P. Gerasimov, *Geography and Ecology* (Moscow: Progress Publishers, 1975), 64–76; Spencer R. Weart, "The Discovery of Global Warming (Bibliography)," http://aip.org, accessed April 12, 2015, *The Discovery of Global Warming* (Cambridge, MA: Harvard University Press, 2003), 85–88; M.I. Budyko, "The Effect of Solar Radiation on the Climate of the Earth," 21, no. 5 (October 1969): 611-14, *Climate and Life* (New York: Academic Press, 1974), 493, *Climatic Changes* (Washington, DC: American Geophysical Union, 1977), 219–47, *Global Ecology*, 295–304, "Polar Ice and Climate," in J.O. Fltecher, B. Keller, and S.M. Olenicoff, *Soviet Data on the Arctic Heat Budget and Its Climatic Influence* (Santa Monica, CA: Rand Corporation, 1966), 9–23; "Budyko, Michael I," *Encyclopedia of Global Warming and Climate Change*, vol. 1, 143–44; Thayer Watkins Department of Economics, San Jose State University, "Mikhail I. Budyko's Ice-Albedo Feedback Model," http://sjsu.edu, accessed April 20, 2015; James Lawrence Powell, *Four Revolutions in the Earth Sciences* (New York: Columbia University Press, 2015), 258–64.
27. See Ye. K. Fyodorov (E.K. Fedorov) and R.A. Novikov, *Disarmament and Environment* (Moscow: Nauka, 1981).
28. Budyko, Golitsyn, and Izrael, *Global Climatic Catastrophes*, v–vi, 39–46; Budyko, *Climatic Changes*, 241; R.P. Turco and G.S. Golitsyn, "Global Effects of Nuclear War," *Environment* 30, no. 5 (June 1988): 8–16.
29. Budyko, *Global Ecology*, 5–15, 185, 230, 248, 258, 310, *Climatic Catastrophes*, 26, 39, 220; Budyko, et al., *The Evolution of the Biosphere*, 303–7, 323–96. See also A.I. Oparin, *Life: Its Nature, Origin, and Development* (New York: Academic Press, 1962); M.I. Budyko, A.B. Ronov, and A.L. Yanshin, *History of the Earth's Atmosphere* (New York: Springer-Verlag, 1987), 121–30; Karl Marx and Frederick Engels, *Collected Works* (New York: International Publishers, 1975), vol. 25, 452–

64, vol. 42, 558–59. On Engels see Stephen Jay Gould, *An Urchin in the Storm* (New York: W.W. Norton, 1987), 111–12.

30. Budyko, *Global Ecology*, 14–15, 258, 303; Budyko, et al., *Evolution of the Biosphere*, xiii, 294, 329–30; Gerasimov,*Geography and Ecology* (Moscow: Progress Publishers, 1983), 53–76; Oldfield, "Climate Modification and Climate Change Debates," 517–18.
31. C.P. Snow, *The Two Cultures* (Cambridge: Cambridge University Press, 1959); Ivan Frolov, *Man, Science, Humanism: A New Synthesis* (Buffalo, NY: Prometheus Books, 1990), 9, 38.
32. I. Frolov, *Global Problems and the Future of Mankind* (Moscow: Progress Publishers, 1982), *Man, Science, Humanism*, 19–21, 38, 103, 114–15; "I.T. Frolov," in Stuart Brown, Diane Collinson, and Robert Wilkson, eds., *Biographical Dictionary of Twentieth-Century Philosophers* (London: Routledge, 2002), 257–58; Graham, *Science and Philosophy in the Soviet Union*, 254; Karl Marx, *Early Writings* (London: Penguin, 1974), 329. Weiner deprecatingly treats Frolov and other environmental philosophers and social scientists of this period, despite their "constructive engagements," as opportunists engaged in a "double scoop: professional advancement and maintaining the appearance (not least for themselves) of engagement in 'clean' work." Much the same, though, could be said for many Western thinkers. To attack these Soviet analysts in this way is to deride what were important and theoretically engaged analyses, rooted in the traditions of Marx and Vernadsky. Frolov's role in promoting environmentalism under Gorbachev and his 1982 *Man, Science, Humanism: A New Synthesis* are not easily dismissed. See Weiner, *A Little Corner of Freedom*, 399–401.
33. A.D. Ursul, ed., *Philosophy and the Ecological Problems of Civilisation* (Moscow: Progress Publishers, 1983). Arran Gare referred to this book, but mentions only Ursul (hardly the most important thinker) saying that "some Soviet ideologists such Ursul attempted to use environmental destruction in the West as instrument of ideological struggle," dismissing the real ecological concerns. Oddly the passage from a footnote that Gare cites from Ursul is not to be found in the book itself. Arran Gare, "Soviet Environmentalism: The Path Not Taken," in Ted Benton, ed., *The Greening of Marxism* (New York: Guilford, 1996), 111–12.
34. Ursul, ed., *Philosophy and the Ecological Problems of Civilisation*, 37–42, 212, 221, 387–88.
35. Ursul, ed., *Philosophy and the Ecological Problems of Civilisation*, 41.
36. Ursul, ed., *Philosophy and the Ecological Problems of Civilisation*, 79–97, 265–68, 369.
37. Gerasimov, *Geography and Ecology*, 26–36; Graham, *Science and Philosophy in the Soviet Union*, 253–56; DeBardeleben,*The Environment and Marxism and Leninism*, 115–16, 127–30, 135; Vucinich, *Empire of Reason*, 362.
38. DeBardeleben, *The Environment and Marxism and Leninism*, 108, 190, 214–15, 234; P.G. Oldak, "Balanced Natural Resource Utiliztion and Economic Growth," *Problems of Economic Transition* 28, no. 3 (1985): 4. It is worth noting that Gerasimov's piece from the late 1970s referred to here, in which he pointed

to various ecological crises and problems in the USSR, was preceded (in the same essay) by a blank statement that the state and party in the Soviet Union, especially when contrasted with capitalist societies, protected its citizens from environmental hazards. From this it is apparent that he felt that he was walking a fine line.

39. Paul M. Sweezy, *Post-Revolutionary Society* (New York: Monthly Review Press, 1980).
40. Douglas R. Weiner, "A Little Reserve Raises Big Questions," *The Open Country* no. 4 (Summer 2002): 9, *A Little Corner of Freedom*, 395; DeBardeleben, "The New Politics in the USSR," 67.
41. Coumel and Elie, "A Belated and Tragic Ecological Revolution."
42. DeBardeleben, "The New Politics in the USSR," 67, 73, 78, 80–81, 85; Peterson, *Troubled Lands*, 197.
43. "CO2 Emissions from the USSR," Carbon Dioxide Emissions Analysis Center, http://cdiac.ornl.gov, accessed April 15, 2015; U.S. Congress, Office of Technology Assessment, *Change by Degree: Steps in Reducing Greenhouse Gases* (Washington, DC: Government Printing Office, 1991), 295; Peterson, *Troubled Lands*, 49–50; UNCSTADstat, "Real GDP Growth Rates, Total and Per Capita, Annual, 1970–2013, USSR," http://unctadstat.unctad.org. The fact that economic growth continued in these years (see the data cited above) leads us to the conclude that the drop in carbon emissions was primarily a result of the shift to natural gas.
44. Josephson, "War on Nature as Part of the Cold War," 43.
45. See Rachel Carson, *Lost Woods*, 230–31; John Bellamy Foster, *The Ecological Revolution* (New York: Monthly Review Press, 2009), 78–79.
46. Paul M. Sweezy, "Socialism and Ecology," *Monthly Review* 41, no. 4 (September 1989): 7–8.

Source:

MR Monthly Review, 2015, Volume 67, Issue 02 (June)

monthlyreview.org/2015/06/01/late-soviet-ecology-and-the-planetary-crisis