INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA

UMI®
800-521-0600

NOTE TO USERS

Page(s) missing in number only; text follows.
Microfilmed as received.

87

This reproduction is the best copy available.

UMI

University of Alberta

Unnatural Union: Soviet Environmental Policies, 1950-1991

by

David Freeland Duke 

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

History

Department of History and Classics

Edmonton, Alberta

Spring 1999

National Library of Canada
Acquisitions and Bibliographic Services
395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque nationale du Canada
Acquisitions et services bibliographiques
395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

Our file Notre référence

The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of this thesis in microform, paper or electronic formats.

The author retains ownership of the copyright in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de cette thèse sous la forme de microfiche/film, de reproduction sur papier ou sur format électronique.

L'auteur conserve la propriété du droit d'auteur qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

0-612-39522-7

Canada

University of Alberta

Library Release Form

Name of Author: David Freeland Duke

Title of Thesis: Unnatural Union: Soviet Environmental Policies, 1950-1991

Degree: Doctor of Philosophy

Year this Degree Granted: 1999

Permission is hereby granted to the University of Alberta Library to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly, or scientific research purposes only.

The author reserves all other publication and other rights in association with the copyright of this thesis, and except as hereinbefore provided, neither the thesis nor any substantial portion thereof may be printed or otherwise reproduced in any material form whatever without the author's prior written permission.

David Duke.

10806 - 62 Avenue,
Edmonton, Alberta,
CANADA, T6H 1N1

16/IV/99.

Date Submitted

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled *Unnatural Union: Soviet Environmental Policies, 1950-1991* in partial fulfillment of the requirements for the degree of Doctor of Philosophy in History.

David C. Mills, Chair

David R. Marples, Supervisor

Lawrence Aronsen, Committee Member

R. Julian Martin, Committee Member

David J. Moss, Committee Member

Clifford G. Hickey, Committee Member

Craig ZumBrunnen, Committee Member

June 29, 1998.
date

For KJD

Come, my beloved, hear from me
Tales of the woods or open sea.
Let our aspiring fancy rise
A wren's flight higher toward the skies;
Or far from cities, brown and bare,
Play at the least in open air.
In all the tales men hear us tell
Still let the unfathomed ocean swell,
Or shallower forest sound abroad
Below the lonely stars of God;
In all, let something still be done,
Still in a corner shine the sun,
Slim-ankled maids be fleet of foot,
Nor man disown the rural flute.
-- Robert Louis Stevenson

ABSTRACT

This study examines the environmental history of the USSR in the Cold War, theorizing that there were various distinct but interrelated causes of the Soviet environmental degradation that occurred in that period.

An examination of the plan to divert part of the flow of Siberian rivers southwards into Soviet Central Asia finds that there was considerable divergence of opinion among the Soviet scientific community concerning economic viability and environmental impact of the project. The study demonstrates that the Soviet scientific community attempted to halt the project, but were only sufficiently powerful to slow its implementation. The project was ultimately cancelled because of economics and the politics of *glasnost'*.

An analysis of Soviet nuclear submarine policy demonstrates that bureaucratic incoherence, and the disadvantages of operating within a shortage economy, led to a situation within which nuclear submarines, high value and complex items, were constructed imperfectly. Inadequacies in support and maintenance facilities for the burgeoning nuclear submarine fleet were institutionalized within the Soviet naval force structure. These problems produced the current Russian situation: the submarines now pose a severe environmental threat as they decay at anchor.

An analysis of Soviet environmental legislation of the 1960s and 1970s concludes that laws ostensibly intended to protect the environment were weakened, during their formulation, by administrative

interference. The application of environmental law in this period was uneven but was nevertheless a response to increasingly critical public opinion.

It is concluded that Soviet scientists demonstrated a remarkable degree of ideological flexibility and theoretical sophistication in their ecological analyses, and were in the process of developing a methodology to combat Soviet environmental dislocation that may have proven successful.

The thesis concludes that the postwar environmental problems of the USSR cannot be attributed to a single cause: they are a consequence of bureaucratic and administrative incoherence; the constraints imposed by a shortage economy; the inability of non-empowered groups (the scientific community and the general public) to compel the Soviet political and administrative elite to accept policy alternatives; and the faith in technological progress so characteristic of Marxist-Leninist doctrine all contributed to the environmental dislocation of the USSR.

Acknowledgements

Writing in the April 1993 issue of *New Scientist*, Dave Mitchell wondered why "apparently sane people go through all the blood, sweat, tears and heartache involved in getting a PhD?" I'm not sure that he answers the question, so I'll offer one here: because we have little or no clue about what it is we're getting ourselves into. If we did, we'd run like water down a steep hill. It is delusional to think that people can complete PhD dissertations *on their own*: there is always a small army of people giving guidance, support, and -- if necessary -- remonstrance to the unfortunates engaged in the hellish process known as "writing up." My case is no exception; I have not a scintilla of a doubt that I would still be on chapter II (the first one I wrote) were it not for the following people:

My greatest debt of academic gratitude, and second greatest debt of personal gratitude, is owed to my supervisor, Dr. David Marples. Never there when I didn't need him, always when I did, he guided me through a degree change and then a topic change with skill, compassion, and ready insight. It was his own work on Chernobyl that got me hooked on this topic, even when I didn't realize it myself, and it is a measure of his academic style that not once did he encourage me to make the switch from political history to "his" environmental history until I came to the choice myself; but when I did, he willingly shared his research notes, files and funding and, in doing so, opened up new avenues of inquiry that, I am sure, I would never have thought of myself. He invited me to contribute to an article he was writing for a major journal, and then gave me full co-authorship, a rarity in the individualistic world of history. That article was -- and always will be -- my first major publication. It is also a measure of him as a man and as a friend that, six-odd years ago, he hosted a surprise pre-wedding party for myself and my fiancee and, as an encore, lent me a cool $1,000 to help defray the costs of our wedding. For this and other kindnesses, both personal and professional, I thank you David.

I owe debts of deep gratitude to the other members of my supervisory committee who, in different ways, contributed to the completion of this project. Dr. Julian Martin's intellectual incisiveness and command of the arcana of bureaucratic theory challenged me to theoretically conceptualize what otherwise would have remained a narrative account. Perhaps I failed to go as far as he would have liked, but I certainly went further than otherwise would have been the case, had I not benefitted from his ideas, his time, and his library. Dr. Cliff Hickey encouraged me to examine environmental issues from a non-historical perspective, and this definitely broadened my understanding of my own work. My external reviewer, Dr. Craig ZumBrunnen, of the University of Washington, treated me with perhaps more kindness than I deserved, especially -- as was pointed out at my defence, and not by him -- in light of the fact that I ignored a good chunk of his work on the USSR. I thank him for looking beyond that egregious error and for his supportive and generous comments on my work. Thanks go also to Dr. Lawrence Aronsen for stepping into the breach and for many confrontational but nevertheless highly enjoyable discussions over beer and coffee (for the record, and in writing, I am not, nor do I recall being, an NDP type); and to Dr. David Moss, who was the first person to tell me I wrote well enough to get published. Fuel like that stokes the furnace.

I would be ungrateful and remiss if I did not thank two institutions: the University of Alberta, and the Social Sciences and Humanities Research Council of Canada who provided generous funding for much of the period in which this project was being researched and written; without that funding, the project would not be complete.

PhDs don't get finished solely as a consequence of academic or financial support and guidance, however, a fact with which the aforementioned will agree, I'm sure. Without the constant support and friendship of the two Bobs (Dr. Robert Irwin and Dr. Robert Cole) I know I would not be finished. I watched Bob Cole go through exactly the same process approximately nine months in advance of my own writing up,

and his perseverance, determination and, ultimately, completion was more important to me than he may ever realize. Bob Irwin, on the other hand, never gave the appearance of persevering at *anything* -- and yet he manages to complete mind-bogglingly vast amounts of excellent work, in addition to teaching and being involved in the raising of two of the smartest kids I've ever seen. Figuring out how he does it helped me finish: he doesn't worry, he just *does*. I have agonized over the structure of a chapter for days, and in five minutes he's told me exactly how it should be done: no pretence of superiority, just straightforward common sense (that belies a very sophisticated mind) -- and very rarely was he wrong. My heartfelt thanks also go out to Dr. Carolee Pollock who, especially in the latter stages of the project, always had time for my moaning, and who reacted with a cheerfulness and optimism that was just the tonic I needed.

Perhaps a first in a PhD acknowledgement, I must thank my mother-in-law, Linda Bridges. As Secretary to the Chair of the Department of History and Classics ("it is no accident," as Stalin used to say), I see Linda on an almost daily basis and can happily report that, in my case at least, all the popular muminlaw horror stories are completely untrue. Linda never once kicked me out of her office when I was at my maungy finest and her mantra, repeated to me, that "this too shall pass", has a delightful *double entendre* quality when applied to a dissertation. And, hey, thanks for giving me your daughter's phone number!

My brother, John, geochemist and operator of nuclear reactor not only bought me more coffee than I bought him, he also listened to my complaints, ideas, and wilder schemes with an indulgence that was critical. In addition, on several occasions he flung sources my way that proved invaluable; and -- without fail -- found answers to my questions concerning everything from radioactive transport in the environment to the most elementary aspects of inorganic chemistry. As a consequence of his knowledge several of my wilder -- and scientifically ridiculous --

claims completely failed to rear their heads in the pages that follow. Thank you, John.

Thanks also goes to my wife's and my house-mate, Nathan, who is preparing for medicine but who argues and drinks like a historian. He moved in at almost exactly the wrong time: just as I was beginning to write up. God help him. Still, he left me alone when I needed it and -- as a smoker -- represented companionship and a thoughtful listener on the deck in mid-winter. My wife is no tyrant, but there's no smoking in the house.

Which brings me to the debt of gratitude beside which all others pale into insignificance (apologies to all the aforementioned but, for those of you who know her, you know what I mean). It's perhaps fitting that these acknowledgements, the last words of this dissertation, are being written after an all-nighter in my office. It was the pattern for much of the work here. Not always driven by deadlines either; it's just the way I work. The vast majority of this dissertation was written in three, three-week fevers at which time I regressed from being merely difficult to bear, to becoming completely impossible to live with. My wife Karen steadfastly and gently goaded me to completion in these times of impossibility, with kind words, lunches, and support -- all at a time (and this was especially true in the final period) when she was desperately rushing to complete her thesis in Theological Studies. It is no accident, to paraphrase the Russians again, that she is working in that field: her courage, forbearance and immense wellsprings of spirituality, that serve her so well in her chosen profession of youth ministry, also granted her the strength to endure two theses, and me, all at once (she lifted the elephant off my chest repeatedly and effortlessly). It is an accomplishment that leaves me awestruck, in the most spiritual sense of the word. Along with the faithful promise that we can enjoy life again, it is to her that this thesis is dedicated; for without her, there would be nothing at all *to* dedicate.

Table of Contents

Chapter I

Introduction and Statement of the Problem

We cannot wait for favours from nature;
our task is to seize them from her.
-- Soviet industrialization slogan popular in the 1930s,
originally attributed to geneticist I. V. Michurin.

The Soviet Union maintained the most complete environmental protection record of any advanced industrial nation in the twentieth century. At least, this is the conclusion one would reach if it were based on the number, scope, and breadth of environmental statutes and miscellaneous laws passed by the Soviet state almost from its inception until its collapse in 1991. Soviet scholars can rightly boast that the creation of natural preserves and parks to maintain and protect populations of rare and delicate wildlife dates back to the earliest days of Bolshevik rule: as one Soviet source notes, "In the first five years after the 1917 Revolution, more than 200 decrees and regulations for the conservation of nature came into force, most of them on Lenin's initiative".[1] Yet the gulf between Soviet environmental protection legislation and actual environmental practice was extremely wide.

Nowhere is this gulf better exemplified than in a 1990 report prepared by the USSR State Committee for the Protection of Nature (*Goskompriroda*) that concluded that the environmental situation in the Soviet Union was "unsatisfactory" in 290 Soviet regions covering 16 percent of Soviet territory. In 1988, the report noted, 26 percent of the Soviet population lived in these regions. Raising even more concern was the report's identification of "seriously affected areas" of pollution (*slozhnye arealy*) that were characterized by environmental degradation either at or beyond the point of irreversibility. Large concentrations of industrial activity combined with major primary resource extraction

---

[1] Algirdas Knystautas, *The Natural History of the USSR* (New York: McGraw-Hill, 1987), 51. See also A.G. Bannikov, "Ot zapovednika do prirodnogo parka" [From preserve to natural park], *Priroda* (April 1968): 89-96.

undertakings accounted for the bulk of this category, which encompassed 3.3 percent of Soviet territory (i.e., an area larger than Scandinavia or Alaska).[2] Within these regions were pollution "hotspots" of extraordinary magnitude. One such example is represented by the Russian city of Noril'sk where, in the 1980s, annual sulfer dioxide emissions from the city's industries exceeded those of the entire nation of Italy.[3] Nor was such contamination restricted to industrial wastes: the Tomsk-7 nuclear reprocessing site in western Siberia is responsible for the world's largest releases of radioactive material into the environment. Since its construction in the mid-1950s, Tomsk-7 has released or discharged approximately 1130 million curies of radioactive material into the environment (this may be compared with the estimated 50-100 million curies released by the 1986 Chernobyl accident).[4]

These examples of environmental damage are by no means extraordinary in the Soviet experience. These and a litany of other such examples, the magnitude of which has only become apparent since the collapse of the USSR in 1991, speak of a state which managed, in a remarkably short period of time, to pollute rapidly, to damage, and to dislocate its environment more thoroughly than any other state, industrialized or otherwise. Since the collapse of the USSR a series of monograph-length works by western historians, sociologists, geographers, and scientists have described and catalogued the record of environmental mismanagement in the Soviet period. Added to this is a growing body of monograph and article literature describing various aspects of the environmental problems faced by the successor states of the Soviet Union. The mere cataloguing and description of these environmental problems is an enormous task that represents a major

---

[2]USSR Goskompriroda, *Sostoyanie prirodnoi sredy v SSSR v 1988 godu* [State of the Soviet Natural Environment in 1988], (Moscow: Lesnaya Promyshlennost, 1990).

[3]D. J. Peterson, *Troubled Lands: The Legacy of Soviet Environmental Destruction* (Boulder, CO: Westview Press, 1993), 13.

[4]Don J. Bradley, Clyde W. Frank, and Yevgeny Mikerin, "Nuclear Contamination from Weapons Complexes in the Former Soviet Union and the United States", *Physics Today* (April 1996): 43.

scholarly undertaking, the value of which cannot be underestimated. But few of these studies have sought to explain the basis of the phenomenon of environmental destruction in the USSR in a systematic or thematic manner. To a great extent, they have focussed on efforts by the Soviet government in the 1980s to come to terms with the massive outpouring of popular discontent with the state of the environment that was unleashed by the Chernobyl accident and the Soviet policy of *glasnost'*. Yet there are clearly deeper, systemic factors responsible for the policies of the Soviet state that led to the phenomenon of environmental destruction.

This study is based upon the operative assumption that the Soviet political leadership and governing bureaucracy responsible for the creation and implemention of policy were fundamental factors in the environmental degradation of the Soviet state. To explore the viability assumption two interrelated questions must be asked: First, to what extent did the environment enter into the political and economic calculations of the political and bureaucratic elite? Second, what factors in the policy making and policy implemention process were responsible for the environmental degradation that followed?

The Soviet strategy for economic development was based on the premise that collective ownership of the means of production coupled with the tool of central planning free from selfish parochial interests would provide an "optimum solution" for the protection of the environment in the same way it provided maximum opportunities for economic growth.[5] Among theorists and planners there was an overt faith in the scientific planning of socialism to resolve problems as they arose -- and in any case, since a socialist utopia was the stated creative goal of the Soviet state, by definition such problems that could not be solved immediately would certainly be soluble once the mature socialist state finally evolved. (A classic example of this attitude arose in 1963

---

[5]V. Granov, "The Ideological Struggle and Ecological Problems", *International Affairs* No. 12 (1980): 93.

during heated discussions of the All-Union Academy of Sciences Commission dealing with the future of Lake Baikal: one "old academician" in favour of regional development of the lake stated, "But why are we going on about this Baikal? Pollute it if we have to. Now we have nuclear energy, and if later we have to, we can easily make a big pit and fill it with water, and that's it. We'll make Baikal again."[6] This was evidently majority opinion, since development of the Lake Baikal region went ahead.)

Yet coupled with the (at least publicly expressed) boundless faith in the capacities of socialism to guide and direct economic and environmental planning of the state, there are still the Russian attitudes towards "the environment" as expressed in the concept of *Rodina*. The *Rodina*-Motherland as expressed in Russian politics and culture is not only the political state; instead it is a dual representation of the political state linked with the natural environment. And it is an extremely deep-seated cultural concept. The extent to which this concept entered into the collective consciousness of the political and bureaucratic elite must also be explored. An accurate appraisal of the importance of environmental factors in the decision making process is critical to understanding the environmental degradation that resulted: was this degradation a *conscious* product of decision making (i.e., was the environment factored into the political and economic calculations and then discarded as unimportant), or was it was an unexpected and unanticipated consequence? It is an important point to resolve because there are clear examples of popular resistance to various plans to "transform nature", which suggests that the environmental calculations of the bureaucratic elite were incongruent with the environmental sensibilities of the population as a whole. What are the origins of these divergences of opinion and thought? To put it simply: what was it about

---

[6]Boris Komarov (pseud.), *The Destruction of Nature in the Soviet Union* (White Plains, NY: M.E. Sharpe, 1980), 9.

being a Soviet bureaucrat or political leader that made one forget the environment?

Answers to the question concerning the factors in the policy making and policy implemention process that were responsible for the environmental degradation which followed must be found in an examination and description of the planning and implementation process itself. As economist Jan Winiecki has noted, a planning preoccupation among the Soviet political and bureaucratic elite arose out of their holding "grandiose Marxian dreams of an economy as a single factory."[7] This view held that bigger was better than smaller, and more was better than less; it led to the conception of "projects of the century" such as Stalin's Great Plan to Transform Nature, Khrushchev's Virgin Lands Program, or the Sibaral Project to divert Siberian rivers to Central Asia and Kazakhstan.[8] This planning conception was definitively output-oriented, as evidenced by the industrial and agricultural targets set by the Five-Year Plans. Planners generally sought to increase output by extensive methods, by increasing the flow of resources into the system, rather than the employment of intensive methods involving more efficient utilization of existing resources. As D. J. Peterson points out, this policy exacerbated the strain on the environment.[9]

More critical for the environment was the Soviet propensity to create "agricultural" or "industrial" complexes which tended to grow very large indeed. One of the main features of the Soviet economy was precisely these large industrial enterprises, which were often clustered closely together (as at Sverdlovsk, now Yekaterinburg, in the Urals or Zaporozh'e in Ukraine). Almost all of these industrial concentration points now enjoy the unhappy status of being the *slozhnye arealy* -- the irreversibly damaged areas of the post-Soviet environment. Thus, the very nature of the Soviet economic policy making and implementation process

---

[7]Jan Winiecki, "Large Industrial Enterprises in Soviet-Type Economies: The Ruling Stratum's Main Rent-Seeking Area," *Communist Economies* 1, no. 4 (1989): 365.

[8] D.J. Peterson, *Troubled Lands*, 11.

[9]*Ibid.*, 12.

was a cause of environmental degradation. As such, an appreciation and understanding of the process itself must be reached to explain the environmental degradation which followed.

The exploration of these questions will be effected through a case study analysis based on three case-studies that explore different aspects of the decision making process. The particular perceptions of the environment held by the political elite, and the role those perceptions played in the creation of an economic policy, will be examined in the first case-study. The case under investigation is the plan, initially proposed by N. S. Khrushchev in 1961 (but stretching back in various forms to the 1930s), to divert Siberian rivers from their natural northward course into the Arctic Ocean. The rivers diverted by this "project of the century" would instead flow south for approximately 2,500 km into the Aral Sea. Trunk canals leading off the main canal would divert part of the flow to irrigate northern Kazakhstan, Uzbekistan, and the *oblasti* of Chelyabinsk, Orenburg, and Kustanai.

The Siberian river diversion scheme is interesting for a variety of reasons. It was envisioned primarily as a means of increasing Soviet agricultural production (always a disappointing sector of the Soviet economy). But the plan's supporters, at least by the 1970s, also indicated that the river diversion could produce beneficial side-effects, primarily in raising and stabilizing the water levels in the Aral Sea. As a result of pesticide and fertilizer pollution, combined with over-use for irrigation of land brought under agricultural cultivation by Khrushchev's Virgin Lands scheme in northern Kazakhstan, the Aral Sea had suffered severe environmental degradation by the mid to late 1970s. (It is worth noting that a counterpart to the Siberian scheme in European Russia also envisioned similar beneficial effects for the Caspian Sea and lower reaches of the Volga River, which also experienced severe environmental problems as a result of agricultural and industrial practices.)

By advocating the importance of the Siberian river diversion plan in solving these other environmental problems, the plan's boosters were

unwittingly placing themselves in a difficult position: they were forced to admit that large-scale tranformational schemes had in the past been environmentally detrimental. This naturally suggested that those schemes had either been improperly planned or implemented: in the self-referential world of bureaucracies, admission of past misjudgments is a dangerous policy.[10]

Another reason why the Siberian river diversion plan is so intriguing arises from what the plan's supporters decided to do once it ran into trouble in the late 1970s. Rather than simply force through the programme, which had been the common response to any external criticism of large-scale industrial or environmental plans in the past, the supporters of the programme commissioned a series of environmental impact assessments, conducted by a large group of scientific and technical research establishments, to prove that the river diversions were environmentally sound. Not surprisingly, the environmental impact assessments returned a positive judgment, and were consequently publicized in the Soviet press. Then, remarkably, the assessments were attacked as unsupported and inconclusive by other Soviet scientists and members of the *intelligentsia*. This in turn stirred public opinion to protest against the plan. In response to this rising tide of public protest, the plan's supporters set all the machinery of state propaganda in motion to defend the plan and attack its detractors, but to no avail. Because of mounting public protest over the plan's environmental impact, and because of increasingly withering attacks on its economic viability, the Siberian river diversion scheme was formally abandoned in early 1986. This is (to my knowledge) the first case of a large-scale economic plan being cancelled in the USSR because of public protest

---

[10]As Mary Douglas points out in her *How Institutions Think* (Syracuse, NY: Syracuse University Press, 1986), 112: "An institution...starts to control the memory of its members; it causes them to forget experiences incompatible with its righteous image, and it brings to their minds events which sustain the view of nature that is complementary to itself. It provides the categories of their thought, sets the terms for self-knowledge, and fixes identities." In this view admission of previous institutional misjudgment can directly undo the creation of the institutional infallibility so necessary for survival.

arising from environmental concerns. What makes it even more unusual is the fact that most of the protest was generated in the late 1970s and early 1980s, that is, in the pre-*glasnost'* era.

As such, the Siberian river diversion plan and its ultimate demise represents a valuable means of examining the environmental perceptions of the bureaucratic-elite as a calculation in policymaking. Because of the widespread public dissatisfaction engendered by the plan, it is also possible to examine closely the variance that arose between public perceptions of the environment and those held by the decision making elite. Doubts concerning the plan's viability impelled the policymaking elite to "go public" with scientific studies (why this should be so is also instructive and will be examined in the case-study), but a completely unanticipated outcome resulted. An analysis of the way the policymaking elite reacted when it became clear that *their* perceptions of public attitudes were so completely out of touch with reality is important to understanding the way in which policy was enacted on the one hand, and how it was made palatable to the public on the other.

The second case-study will examine the formulation of national security policy and its impact on the environment: military and national security decision making was the most secretive, closely-guarded area of bureaucratic activity in the Soviet state. It was correspondingly exempt from many of the purely "economic" calculations that were present in other areas of policy formulation, though the policies that resulted often looked similar (the concept of "bigger is better" and "more is better" is strikingly obvious in many areas of Soviet military activity), and the military enjoyed the dictum that no expense was to be spared in the protection of the Soviet state. But the process of protection did not reflect an especially long-term view: short-term but rapid solutions to problems of military technology were central in the national security process.

This is well demonstrated in the case of Soviet nuclear submarine policy in the Arctic basin. In the 1950s and 1960s it was necessary to

construct a large nuclear submarine force to counter a perceived -- and rapidly growing -- naval threat from the United States. The requisite nuclear-support infrastructure necessary for the long term maintenance of the Soviet submarine force was not constructed, however, and this produced severe environmental consequences as the Soviet nuclear submarine fleet aged, approached, and subsequently passed obsolescence. The question of why the infrastructure was not constructed must be asked. Was it a product of financial inability, or of political and bureaucratic inattention? This case-study argues that the answer is found in a combination of these two factors: on the one hand, the money was simply unavailable for infrastructural construction (especially given the Soviet "more is better" attitude which was certainly reflected in the size but not the quality of the nuclear submarine fleet). But on the other hand, it stretches the bounds of credibility to believe that the Soviet political leadership did not know about or anticipate the tremendous problems of nuclear and toxic waste, of submarine support and resupply, and -- most critical of all -- of nuclear submarine decommissioning that would have to be faced in the future. Yet the nuclear submarine construction programmes were instituted anyway.

This case study of the Soviet nuclear submarine fleet will demonstrate that the construction of policy derived from various interrelated factors. The defence of the Soviet state was clearly the most important of these. But so was intense interservice rivalry among the military.[11] So, also, was the belief that future problems would be faced by future, better-equipped generations, that no problem (no matter how great) could defeat the maturing socialist state. In these calculations the capacity of the environment to absorb the insults of nuclear waste ranked very low indeed.

---

[11]The Soviet Navy, even its much-heralded Red Banner Northern Fleet, has traditionally been viewed as a "poor relative" of the army and, later, air force. The ability to develop a large-scale striking force (nuclear attack and ballistic missile submarines) that could *directly* attack the military and economic assets of the United States was therefore eagerly seized upon by naval leaders in the 1950s.

Various systemic dimensions of the Soviet economy were responsible, by the 1970s, for producing a situation where most of Soviet heavy industry was in a state of antiquation and disrepair. This was a consequence of the distortions caused by Soviet planning and price systems: it was simply more profitable for firms and managers to invest in new projects than to modernize existing plants and equipment.[12] Because of the Soviet economy's propensity to have things break down or simply fall apart due to poor maintenance, shoddy construction, or basic misuse and overuse, production suffered. But so did the environment, for three main reasons: first, it is one thing to have a nut or bolt break; it is of an entirely different magnitude to have a gas or oil pipeline burst.[13] The environmental insult arising from such large-scale breakdowns was usually correspondingly serious. Another reason why the environment suffered was that when funds were made available for the modernization of industrial plants, and when those funds were actually used for this purpose, environmental devices -- such as atmospheric scrubbers at coal- and oil-fired power stations -- were the last items to be attended to. After all, they did not have a direct bearing on industrial output. Most environmental protection technology designed for use on an industrial scale is very sensitive and requires constant and consistent maintenance for it to perform properly. If such maintenance is not carried out, then the utility of environmental protection devices is small indeed.

The third reason for the environmental degradation caused by the Soviet economy lay in the application, or lack thereof, of environmental law to polluters. As stated above, there was a wide range of Soviet legal statutes covering most aspects of the environment, including protection of state reserves containing unique and important ecosystems, penalties

---

[12]Alec Nove, "The Investment Process in the USSR", *Bericht des Bundesinstituts fur ostwissenshafliche und internationale studien*, No. 53 (1989): 13.

[13]According to President Yeltsin's environmental advisor, Alexei Yablokov, this was happening a great deal by the late 1980s. He indicated that over 700 breaks were occurring annually in the Soviet gas and oil pipeline system, with losses totalling an estimated 7-20 percent of overall production -- i.e., tens of millions of tons. See his "Zayavlenie dlya pressy" [Announcement for the Press], *Tsentr Obshchestvennoi Informatsii po Atomnoi Energii Informatsionnyi Byulleten'*, No. 3 (1992): 5.

for misuse of environmental resources, and punishments for polluters. But in reality the application of those statutes was haphazard, and tended to affect individuals far more than industrial enterprises. Individuals apprehended for poaching, for example, invariably received stiff legal penalties as a consequence of their actions, while the managers of industrial enterprises polluting the environment, when they were actually charged, received only token punishment, if they received any at all.[14] Indeed, in the case of industrial managment, the structure of punishments actually operated as an incentive to pollute, since the fines imposed were usually far lower than the bonuses paid for the fulfillment of production targets. The third case-study will therefore examine the formulation and application of environmental law in the Soviet Union. It will seek to explain the haphazard nature of that legislation, and to conceptualize the thinking underlying the inherent legislative problems. Was Soviet environmental law intentionally weak, thus indicating an administrative dismissal of the environment as an entity that required protection? Or was there a sincere attempt to develop a corpus of Soviet environmental legislation that would protect the environment, an attempt that failed as a consequence of institutional but fundamentally unintentional factors?

After these three case studies there follows a chapter that discusses both the efforts of the Soviet scientific community to describe and analyze the environmental degradation of the USSR and their attempts to offer policy alternatives to ameliorate the situation. This chapter also highlights the factors that were at work in the Soviet social and planning system: an overall disregard for the environment in economic or political calculations; a boundless faith in the capacity of developing Soviet science to solve current problems at some unspecified

---

[14]Craig ZumBrunnen reports a case involving the head of the Borislav Drilling Operations Administration who was fined just 25 rubles after being found culpable in the release of 2,000 m^3 of contaminated water into the Shchepilsk River causing the death of thousands of fish. ZumBrunnen, "Water Pollution in the Black and Azov Seas," in Fred Singleton, ed., *Environmental Misuse in the Soviet Union* (New York: Praeger, 1976), 35.

time in the future; the fundamental imbalances created by an overwhelmingly output-oriented extensive planning system, which emphasized increasing outputs by increasing inputs and not more efficient use of those inputs; the lack of public knowledge about the environment as a factor in Soviet economic and military plans (and the remarkable impact public opinion *did* have when it was mobilized against the bureaucratic elite); and finally the system-wide dilapidation of the Soviet economy which created and exacerbated the widespread environmental problems as a product of its own antiquity.

This represents an integrated approach to the problem of environmental degradation in the USSR, which emphasizes the role of the bureaucratic and political elite as a causal factor in the environmental degradation of the USSR, and allows for an appreciation of the stark environmental situation facing the peoples of the successor states of the USSR. But it will also demonstrate that these peoples are very much the inheritors of a state which systematically and ruthlessly did not "wait for the favours from Nature", and instead took what it wanted without regard to the consequences.

Review of the Literature on the Soviet and Post-Soviet Environment

Western literature on the subject of the condition of the Soviet environment was initially motivated by the high-profile issue of Lake Baikal. As indicated above, in the late 1950s and early 1960s the Soviet Union announced plans to develop the Lake Baikal Basin, internationally recognized as an ecosystem of unique beauty and ecological value.[15] Because of this global recognition, the controversy brewing within the USSR itself on the wisdom of developing the region attracted the interest of Western scholars, most notably Marshall Goldman,[16] Philip Micklin,[17] and Theodore Shabad.[18]

---

[15]For a penetrating discussion of the history of this development, and the problems associated with it, see Grigori Galazii, "Lake Baikal Reprieved," *Endeavour* 15, no. 1 (1991): 13-17.

[16]Marshall Goldman, "Our Far-Flung Correspondents: The Pollution of Lake Baikal," *The*

The Lake Baikal issue acted as a springboard for a more general appraisal of the environmental situation in the USSR, and several volumes devoted to the new area of study appeared in the early 1970s. Goldman produced the first such work, *The Spoils of Progress: Environmental Pollution in the Soviet Union*,[19] which served as a warning to the burgeoning Western environmental movement: the latter believed that the environmental degradation so apparent in Western societies in the post-war era was a consequence of capitalist economics, and that socialist societies possessed the tools to develop advanced industrial economies without the chimera of pollution.[20] Goldman rather conclusively showed that this was not true; socialization of property and state ownership of the means of production did not necessarily act as a powerful lever against environmental degradation. Indeed, Goldman identified several critical dimensions of the Soviet polity that actively mitigated against rational utilization of the environment: the dearth of attention devoted to the environment by the ideological forebears of the Soviet state;[21] the industrial planning model in the USSR based on the mechanism of the Five Year Plan which set production targets, rewarded producers for meeting or exceeding those targets, and failed to provide disincentives to the cutting of corners or the irrational use of resources;

New Yorker (19 June 1971): 58-66; Marshall Goldman, "The Convergence of Environmental Disruption," *Science* 170 (2 October 1970): 37-42.

[17]Philip P. Micklin, "The Baykal Controversy: A Resource Use Conflict in the U.S.S.R.," *Natural Resources Journal* 7 (October 1967): 485-98

[18]Theodore Shabad, "Soviet Moves to Halt the Pollution of Lake Baikal," *New York Times*, 8 February 1969, sec. 1, p. 8.

[19]Cambridge, MA: M.I.T. Press, 1972.

[20]A view from a communist sympathizer may be found in Gus Hall, *Ecology: Can We Survive Under Capitalism?* (New York, 1972). More balanced treatments that still questioned the ability of capitalist economic systems to solve ecological problems include Barry Commoner, *The Closing Circle: Confronting the Environmental Crisis* (London: Jonathan Cape, 1972); and D. H. Meadows *et al.*, *The Limit to Growth: a Report for the Club of Rome's Project on the Predicament of Mankind* (NY: Universe Books, 1972).

[21]This was especially true of Marx and Lenin. Goldman does point out that Engels wrote perceptively on the human relationship with the environment. Goldman, The Spoils of Progress, 13-14. Nevertheless, all three writers were products of their times, more concerned with the redistribution of social wealth and combatting the social ills of industrialization. No doubt, if they were alive today, all three would have much to say on the subject of environmental degradation.

and, most importantly in Goldman's view, state ownership of all property, coupled with the belief inherited from Marx that only labour produces value. In this conception natural resources possess no intrinsic value of their own and can therefore be distributed by their owner (the state) to producers (also state institutions) free of charge. This policy, not surprisingly, encouraged the irrational and wasteful use of resources.

Goldman nevertheless was challenged for overstating the extent of environmental disruption in the USSR.[22] In addition, he failed to appreciate the *purely* political factors involved: while noting that priceless resource policy was a major contributing factor in environmental degradation, and recognizing that fixing non-zero prices for those inputs would strongly encourage their more rational use, Goldman wondered why the political leadership in the USSR failed to institute such an obvious policy. In his view, the political leadership acted at the highest levels as a relatively unified and essentially untrammelled decision making group: free to do as it chose, implementing a pricing policy for natural resources was an eminently reasonable course of action. He appreciated neither the external pressures on the political leadership, nor the fact that they might be unwilling to jeopardize industrial growth by increasing the input costs of economic production.

Ivan Volgyes recognized the limitations imposed on the freedom of the Soviet political leadership in relationship to environmental policy.[23] While accepting that the Soviet political leadership enjoyed great political freedom, Volgyes nevertheless identified the external pressures bearing on their decision making ability. Public demands for the benefits of a Western-style consumer society was, in Volgyes's view, one such pressure; another was the leadership's perceived inexperience in

---

[22]Particularly on the subject of Lake Baikal. See Craig ZumBrunnen, "The Lake Baikal Controversy: A Serious Water Pollution Threat or a Turning Point in Soviet Environmental Consciousness," in Ivan Volgyes, ed., *Environmental Deterioration in the Soviet Union and Eastern Europe* (New York: Praeger, 1974): 81.

[23]Ivan Volgyes, "Introduction," in Volgyes, ed., *Environmental Deterioration in the Soviet Union and Eastern Europe*, 1-7.

operating within the framework of interest-group politics. Volgyes concluded that "although monocratic regimes theoretically are more able to influence the control of a deteriorating environment, the practical limitations on government enforcement are going to be considerable."[24] Thus, to a great extent, Volgyes falls into the same trap as Goldman: in identifying constraining factors that prevent effective Soviet environmental policy, Volgyes nevertheless assumes that the political leadership does not implement such policy because it *cannot*. The possibility that it simply may not want to is overlooked.

Keith Bush identified additional causes of the environmental mismanagement in the USSR.[25] Agreeing with Goldman's analysis of the systemic factors involved, Bush concluded that the situation was poor because it went essentially unchecked. He argued that the organizations responsible for monitoring and preventing pollution were "a plethora of uncoordinated, largely advisory, bodies plus a large but seemingly impotent network of concerned citizens," which effectively precluded their ability to carry out their pollution control functions.[26] Lenore Shever Taga concurred with Bush's argument that administrative inefficiency was the primary factor preventing rational management of the environment in the Soviet economy,[27] but neither she nor Bush provided a detailed analysis of the inefficiencies of the administrative system.

Most of these early works on the Soviet environment represented "statements of the problem" rather than in-depth analyses. As such, they were overwhelmingly narrative and descriptive in character, not a critical deficiency in view of the novel nature of the subject they addressed. This narrative style was overwhelmingly true of *The Destruction of Nature in the*

---

[24]*Ibid.*, 6.

[25]Keith Bush, "Environmental Problems in the USSR," *Problems of Communism* 21, no. 4 (July-August 1972): 21-31; Keith Bush, "The Soviet Response to Environmental Disruption," in Volgyes, ed., *Environmental Deterioration in the Soviet Union and Eastern Europe*, 8-36.

[26]*Ibid.*, 21.

[27]Lenore Shever Taga, "Externalities in a Command Economy," in Singleton, ed., *Environmental Misuse in the Soviet Union*, 75-100.

Soviet Union, which appeared in the West in 1980,[28] but this book was remarkable because it was written by a then-unknown figure within the Soviet planning establishment, under the pseudonym Boris Komarov. Komarov's explicit intent was to act as a "whistle-blower" revealing the true state of the environmental dislocation in the Soviet state. The situation was far worse than any Western writer had speculated: Komarov provided a litany of examples that demonstrated the catastrophic damage already inflicted on the environment in the USSR. In addition, he provided new insights into the planning and implementation process that contributed to the damage. He, for example, revealingly described the conflict of interest that existed in the administration responsible for environmental policy by pointing out that the same institution was responsible for the pollution: the State Planning Commission (*Gosplan*) was responsible for both activities, in addition to being responsible for ensuring the growth of output in the Soviet economy. Furthermore, Komarov noted, the official agency responsible for pollution control, the State Committee for Hydrometeorology (*Gidromet*) possessed neither the political nor the legislative strength to affect the situation. Not surprisingly, Komarov was extraordinarily pessimistic about the future of the Soviet environment: until the Soviet leadership expressed a willingness to admit the true environmental situation, meaningful steps to remedy the situation could not occur. As one reviewer perceptively noted:

> The current Soviet leadership grew up learning that environmental mismanagement was possible only under capitalism, not socialism, and that any local environmental problems were due to the ineptness of the administrative bureaucracy. Thus, middle management takes the blame for environmental problems in the Soviet Union, rather than those at the policymaking level who more than likely set the stage for them. Since socialism is not supposed to prey on nature, political leaders neither want to hear pessimistic

[28]Boris Komarov, *The Destruction of Nature in the Soviet Union*, (White Plains, NY: M. E. Sharpe, 1980).

reports not have any incentive to institute basic changes. Thus, the future is dubious.[29]

The Destruction of Nature in the Soviet Union represented a "bridge" of sorts in the Western literature on the Soviet environment. While Komarov's true identity was not established until the late 1980s, it was clear that the book presented an authentic portrayal of the situation in the USSR. It was also known that the book had circulated widely in the underground *samizdat* press within the country in the later 1970s and had provoked widespread though guarded public discussion. The fact that the situation was apparently much worse that had hitherto been realized by Western scholars, coupled with the seeming interest that Komarov's work generated within the Soviet general public and in intellectual circles,[30] impelled a new generation of researchers to investigate more vigorously the environmental status of the USSR. Joan DeBardeleben's superb work is an early example of this new generation of scholarship.[31] DeBardeleben specifically contextualized the environment within the ideological framework of Marx and Lenin; closely analyzing the evolution of Marxist-Leninist thought on the environment since the 1960s she found that the ideology was far more flexible than previously thought. She agreed with earlier writers' assertions that ideology acted as a constraint on environmental policy but suggested not only that the power of that constraint was far less than hitherto believed, but that environmental deterioration as a phenomenon had stimulated a re-evaluation of Marxism-Leninism in the USSR. Thus, DeBardeleben saw ideology as both a moulder of policy and as a mutable

---

[29]Philip R. Pryde, "Review," *The Annals of the American Academy of Political and Social Science* 460 (March 1982): 168.

[30]Yuri Shcherbak recalled that the publication of *Destruction of Nature in the Soviet Union* "aroused great interest and was praised by Aleksandr Solzhenistyn and Andrei Sakharov....[M]y parliamentary colleague Aleksei Yablokov and I discussed the book with then Senator Al Gore (now vice President of the United States) during his visit to Moscow as a guest of the Environmental Committee of the USSR Supreme Soviet." See Yuri Shcherbak, "Foreword," to Ze'ev Wolfson, *The Geography of Survival: Ecology in the Post-Soviet Era* (Armonk, NY: M. E. Sharpe, 1994), x-xi.

[31]Joan DeBardeleben, *The Environment and Marxism-Leninism: The Soviet and East German Experience* (Boulder, CO: Westview Press, 1985).

tool which could be used to legitimize policy adopted for reasons beyond the purely ideological. In other words, she discerned that the Soviet leadership could react *pragmatically* to the environmental situation facing the USSR.

By engaging in a comparative study of environmental policies in the USSR and the German Democratic Republic (GDR), DeBardeleben also highlighted differences in those policies that derived from external factors: in the GDR environmental policy tended to be more effective and flexible than that of the USSR, a fact that she attributes in part to the much lower availability of natural resources in the GDR. This suggests that the more profligate wastage of resources in the USSR is a function of an expansionist mentality more related to geography and resource wealth than ideology.

The Environment and Marxism-Leninism appeared just before the seminal event of Soviet environmental history: the April 1986 accident at Chernobyl. More than any other single event, the accident focussed worldwide attention on the Soviet environmental record and, at the same time, produced an eruption of popular environmentalism within the USSR itself. This was reflected in Western literature as an outpouring of mostly poor-quality sensationalist accounts that contributed little to a meaningful understanding of either Soviet environmental mismanagement generally, or the nuclear disaster in particular. Notable exceptions to this included the work of David Marples on the causes of Chernobyl, as well as the environmental, social, and national impact of the accident.[32] Marples emphasized the remarkable explosion of environmental sentiment engendered by the accident, especially in the Ukrainian SSR and, to a lesser but still significant level, in the RSFSR and the Belorussian SSR. The response to Chernobyl catalyzed the remarkable popular discontent that had been roiling within the

---

[32]David R. Marples, *Chernobyl and Nuclear Power in the USSR* (London: Macmillan, 1986); David R. Marples, *The Social Impact of the Chernobyl Disaster* (London: Macmillan, 1988); David R. Marples, *Ukraine Under Perestroika: Ecology, Economics and the Workers' Revolt* (Edmonton, AB: University of Alberta Press, 1991).

consciousness of the Soviet public, and provided a focus for anger and disillusionment that had hitherto remained hidden.

This outpouring of discontent was directed at the Soviet government which, remarkably, provided an avenue for its release -- the policy of *glasnost'*. The new generation of Western scholars writing on the Soviet environment suddenly faced an extraordinary situation in Soviet studies: a very large and ever-growing body of source materials upon which new work could be based. The literature which appeared fell into two categories: that which sought to explain the changing policies and challenges of the Soviet government under Mikhail Gorbachev; and that which took advantage of the new materials to enumerate more fully the extent of environmental disruption in the USSR.

The former category is exemplified by writers such as Philip Pryde,[33] Charles Zeigler,[34] Barbara Jancar,[35] Eric Green,[36] and Jane Dawson.[37] The common thread that bound these analyses together was the authors' identification, thanks in part to *glasnost'*, that the "evolved Soviet line" on environmental mismanagement in the USSR had been a lie. Environmental mismanagement was not the fault merely of incompetent middle-managers, as Soviet sources had suggested. Nor were economic or ideological factors the force that drove the Soviet state to pollute and degrade its environment. The problems of the environment in the USSR stemmed directly from bureaucratic secrecy, parochialism and incompetence on a vast, administration-wide scale. Compounded by rampant and cynical corruption of the bureaucratic elite, these factors hindered any meaningful restructuring of environmental policy even, it

---

[33]Philip R. Pryde, *Environmental Management in the Soviet Union* (Cambridge: Cambridge University Press, 1991).

[34]C. E. Zeigler, *Environmental Policy in the USSR* (Amherst, NJ: University of Massachusetts Press, 1987).

[35]Barbara Jancar, *Environmental Management in the Soviet Union and Yugoslavia: Structure and Regulation in Federal Communist States* (Durham, NC: Duke University Press, 1987).

[36]Eric Green, *Ecology and Perestroika* (Washington, D.C.: American Committee on U.S.-Soviet Relations, 1990).

[37]Jane I. Dawson, *Eco-Nationalism: Anti-Nuclear Activity and National Identity in Russia, Lithuania, and Ukraine* (Durham, NC: Duke University Press, 1996).

seems, when the political leadership specifically directed that such a restructuring must occur.

The latter category in effect turns the historiographic wheel full circle: many of the works on the Soviet and post-Soviet environment that have appeared since the collapse of the USSR in 1991 are descriptive and narrative, much as the earliest books on the subject were in the early 1970s.[38] This is in part because of the increased attention afforded the subject among general readerships internationally, primarily a continuing consequence of the Chernobyl disaster but more recently widening in scope to encompass more aspects of the environment of the former Soviet Union. The narrative character of these works also stems from the very fact that there is such a great deal to tell: the availability of information concerning the state of the environment in the former Soviet Union has grown almost exponentially since the collapse of the USSR in 1991. Unfortunately, almost all of that information is negative: not only had Western scholars misjudged the causes of environmental degradation in the Soviet period, they had also seriously underestimated its effects.

The narrative works on the state of the post-Soviet environment are all too often lacking in meaningful analysis. There are exceptions: David Marples' recent history of Belarus' under Soviet rule is both narrative and analytical, and argues that the recently emerged republic will be forced to suffer the effects of Soviet domination certainly for years and probably for generations to come.[39] But Marples also discusses in detail the response of the Belarusians to their situation and even suggests and evaluates future policy alternatives that the Belarusian people and political leadership will sooner or later face. Jane Dawson, too, provides a close analysis of the linkages between environmental

---

[38]See, for example, D. J. Peterson, *Troubled Lands: The Legacy of Soviet Environmental Destruction* (Boulder, CO: Westview Press, 1993); Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR: Health and Nature under Siege* (New York: Basic Books, 1992); and Ze'ev Wolfson (Boris Komarov), *The Geography of Survival: Ecology in the Post-Soviet Era* (Armonk, NY: M.E. Sharpe, 1994).

[39]David R. Marples, *Belarus: From Soviet Rule to Nuclear Catastrophe* (Edmonton, AB:

politics in the Gorbachev period and the flowering of nationalist sentiment in Russia, Lithuania, Ukraine, Armenia, Tatarstan, and the Crimea. Although she focuses primarily on issues of nuclear power in the wake of the Chernobyl accident, Dawson nevertheless suggested that a growing awareness of environmental problems forced "the convergence of environmentalism and nationalism in many regions of the former USSR [and] created the potential for the emergence of powerful mass movements during the perestroika period" -- mass movements that the Soviet government failed to understand and consequently feared greatly.[40]

At this point, however, this kind of research represents the minority of Western scholarship and yet, I would suggest, this is precisely the form that current and future Western scholarship on the subject of the Soviet and post-Soviet environmental history must take for it to be meaningful. As mentioned above, the successor states of the USSR face environmental difficulties that would tax the resources of the most prosperous and mature Western states; yet they possess neither the capital nor the resources to solve adequately the problems they face. Nor will the problems solve themselves; and so, paradoxically, the West now finds itself in the position that Ze'ev Wolfson, writing under the pseudonym Boris Komarov, identified for the Soviet leadership in the 1970s. In order for the environmental situation in the former Soviet republics to be remedied even in part, considerable Western aid will be required. In order to assess accurately the level, form, and utility of that aid, a complete and accurate assessment of the current situation is likewise required. But so too, and more importantly, is a complete and accurate assessment of the manner in which the current situation evolved. This study does not pretend to represent a complete assessment. As part of an overall body of scholarship concerned with the

---

University of Alberta Press, 1996).

[40]Dawson, *Eco-Nationalism*, 162.

environmental history and environmental situation of the USSR and its successor states, however, it can perhaps make a contribution.

Chapter II

The Environment versus Economic Security: The Case of the Sibaral Project

Evolution Of Planning

"We are building Communism, we are transforming life on earth." With these words Leningrad hydrologist M. M. Davydov offered his plan to transform the water regime of the Soviet Union by diverting Siberian river water southward to Soviet Central Asia.[1] Large-scale water diversion schemes such as Davydov's exemplify the Soviet relationship with the environment. The justification for such schemes, and their planning and implementation, typify the Soviet tendency to be seduced by engineering projects on a vast scale, and reflect a similar faith in technology as a panacea for economic and environmental ills.

Davydov's plan, though huge, was merely a component of a larger, two-part water diversion programme intended "to correct the mistakes of nature" and to rationalize fully the productive forces of the Soviet economy. The other component, designed to divert water from the northern part of European Russia via a series of canals to the Volga River and thence to the Caspian Sea, has been extensively analysed by American geographer Philip P. Micklin.[2] The Siberian component of the programme was, however, quantitatively different from its European cousin. First, in final form, the Siberian diversions would have been much larger than the European schemes, and thus represent the Soviet

---

[1]M. M. Davydov, "The Ob' Will Enter the Caspian: The Yenisey-Ob'-Aral-Caspian Water Connection and the Energy Problem," *Sibirskiye ogni*, No. 2 (1949), 102-110. Reprinted in *Soviet Geography: Review and Translation*, XIII, no. 9 (November 1972), 603-617.

[2]The European component of the water diversion scheme was to have diverted approximately 43 km^3 of water from the Arctic-flowing Pechora and Vychegda rivers southward into the Volga watershed. See Philip P. Micklin, "Soviet Plans to Reverse the Flow of Rivers: The Kama-Vychegda-Pechora Project," *The Canadian Geographer*, 13 (1969), 199-215; Philip P. Micklin, "Large-Scale Interbasin River Diversions in the USSR: Implications for the Future," in W. A. Douglas Jackson, ed., *Soviet Resource Management and the Environment* (Columbus, OH: American Association for the Advancement of Slavic Studies, 1978). For an early Soviet criticism of the Kama-Vychegda-Pechora Project on environmental and economic grounds, see N. I. Shishkin, "On the Diversion of the Vychegda and Pechora Rivers to the Basin of the Volga,"

tendency toward "gigantomania" more fully. Second, and more importantly, the location of the Siberian schemes was critical. In the Soviet period Siberia represented the new frontier: a vast, harsh, inhospitable region where the construction of Communism would be tested to its limits. It was the task of Soviet engineers and workers to bend nature, here at its most dangerous and difficult, to their will.[3] The environment of the European USSR did not share this mystique; one could say that it was already "domesticated" in the minds of the Soviet planners. It is not surprising, then, that the utopian tendencies of Soviet planning were expressed to their fullest in describing the Siberian river diversion schemes and their impact on the environment. It is in this context that Soviet catch phrases such as "the transformation of nature", "the rationalization of nature's resources", or "the project of the century" were most often heard. Third, precisely because Siberia was a new frontier, the competing economic interests variously engaged in developing the region were expressed, and this affected the course of the Siberian river diversion projects profoundly.

Davydov's grandiose scheme was not the first to moot the transfer of water from Siberia to Central Asia. In prerevolutionary Russia Iakov Demchenko published his work *Concerning the Flooding of the Aral-Caspian Lowlands* in which he advanced the idea.[4] He was forced to publish the book at his own expense, since the Russian Geographical

---

Soviet Geography: Review and Translation III, no. 5 (May 1962), 46-57.

[3]As one Soviet propaganda booklet put it,

> Siberia, once a desolate and forbidding land the mere mention of which struck terror into the hearts of many, has been transformed beyond recognition in the Soviet period by the dedicated labour of Soviet people who, led by the Communist Party, have lifted Siberia out of its age-old darkness and put it on the highway of modern progress. So today Siberia is not only a place of marrow-chilling frosts and violent blizzards. It is a giant construction site and a vast research laboratory where man has every opportunity for free and inspired labour and creative search. It is here that man has begun changing the face of the earth on a scale unparalleled in human history.

Nikolai Meissak, *This Warm Siberia!* (Moscow: Novosti Publishing House, 1973), 2.

[4]Ia. G. Demchenko, *O navodnenii Aralo-Kaspiiskoi nizmennosti* [Concerning the Flooding of the Aral-Caspian Lowlands] (n.p., 1900).

Society refused to do so on the grounds that it was the work of a heedless optimist.[5] Shortly after the Russian Revolution new proposals were suggested but, as Davydov himself noted, they all "lacked a sound economic and engineering basis."[6]

The same criticism could be leveled at Davydov's own scheme. Working within the Leningrad section of the Hydrotechnical Design and Planning Institute (*Gidroproyekt*), Davydov advanced his proposal in 1949 as part of the "Great Stalin Plan for the Transformation of Nature." It envisioned damming the Ob' River just below its confluence with the Irtysh River: a dam 78 metres in height would have been required, according to Davydov. This single dam would have created a reservoir hundreds of kilometres in length, and with an area approaching 270,000 km^2, or four times greater than that of the Aral Sea at that time.[7] One finger of this reservoir, spreading up the Tobol River, a tributary of the Irtysh, would approach relatively close to the watershed dividing the Western Siberian basin from that of the Aral and Caspian Seas. The water would be transported from the Tobol through the watershed by means of an enormous canal, some 800 km in length.[8] Davydov proudly called the canal "the world's largest engineering structure."[9] The watershed divide, known as the Turgay Gates, was critical to Davydov's scheme, and to all schemes developed later. The Gates rise to a height of only 124 metres -- a comparatively low divide -- and water diversion

---

[5]Peter Rostankowski, "Transformation of Nature in the Soviet Union: Proposals, Plans and Reality," *Soviet Geography: Review and Translation* XXII, no. 6 (June 1982), 381-82.

[6]M. M. Davydov, "The Ob' Will Enter the Caspian," 609.

[7]M. M. Davydov, "The Water Resources of the Ob' River Basin," from *Kompleksnoye osvoyeniye vodnykh resursov Obskogo basseyna* [Multipurpose Development of the Water Resources of the Ob' Basin], (Novosibirsk, 1970), 237-240. Reprinted in *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972), 618-621. In the 1950s the area of the Aral Sea was approximately 66,000 km^2. See V. M. Kotlyakov, "The Aral Sea Basin: A Critical Environmental Zone," *Environment* 33, no. 1 (January/February 1991), 5.

[8]V. L. Shul'ts, "The Aral Sea Problem," *Trudy Sredneaziatskogo nauch. -issled. gidrometeorol. inst.* [Transactions of the Central Asian Hydrometeorological Scientific Research Institute], No. 32: 47 (1968), 3-7. Reprinted in *Soviet Hydrology: Selected Papers*, No. 5 (1968): 489-493.

[9]M. M. Davydov, "The Ob' Will Enter the Caspian," 610.

proponents from Davydov onward were confident that such a "simple" obstacle could be overcome.[10]

A further sense of the breadth of Davydov's grand vision may be seen in his description of the route to be taken by the transferred water once in the Aral-Caspian watershed:

> After crossing the drainage divide the water would enter the Aral Sea via the channel of the Turgay River and across Lake Chelkar-Tengiz.
>
> From the Aral Sea it would pass to the Sarykamysh Depression via a connecting canal and the dry channel of the Daryalyk. Having flooded the depression, the water would flow along the dry channel of the Uzboy to the Caspian Sea. The distance from the Belogor'ye Dam [on the Ob'] to the Caspian Sea is about 4,000 kilometres.[11]

In all, Davydov envisioned an annual transfer of 300 to 500 cubic kilometres of water from the Siberian watershed to the Aral-Caspian region. This is, in fact, approximately the entire annual discharge of the Ob' River into the Arctic Ocean, and so Davydov proposed a second stage for his scheme, whereby the water transferred from the Ob' would be further augmented by water diverted within Siberia from the Yenisey River to the Ob' reservoir. This component would require the construction of a dam on the Yenisey, below the confluence of the river with its tributary, the Podkamennaya Tunguska River. A second large reservoir would thereby be created, and from here water could be transferred by canal from the Yenisey drainage basin to that of the Ob'.[12]

The sheer scale of the Davydov scheme is remarkable. As an engineering project it is without parallel, and Davydov envisioned similarly unparalleled economic benefits arising from it. Supplied by the

---

[10]See for example *Ozbekiston Adabiyoti Va San'ati* [Literature and Art of Uzbekistan], (1 April 1983). Translated in Joint Publications Research Service [Hereinafter referred to as JPRS] - 84563. USSR Report. Political and Sociological Affairs No. 1467 (19 October 1983), 34-41, as "River Diversion Boosted at Tashkent Roundtable." When Viktor Dukhovniy, one of the participants in the discussion, described the pumping-station scheme for the raising of the diverted water to the Turgay Gates, another participant, Abbosjon Usmonov, responded "That means this work will be quite easy. It's well-known that water in the Karshi Canal, which is not so long, is elevated 130 metres." *Ibid.*, 36.

[11]M. M. Davydov, "The Ob' Will Enter the Caspian," 610.

[12]*Ibid.*, 610-611; V. L. Shul'ts, "The Aral Sea Problem," 491.

water an entire agricultural-energy complex would grow up which, by itself, would exceed entire sectors of capitalist economies. Indeed, it is to this aspect of the scheme that Davydov continually returns in his description of its benefits:

> The diversion to Central Asia of more than 300 cubic kilometres of water per year would make it possible to irrigate about 25 million hectares of desert and semidesert land....
>
> Central Asia's irrigated land would equal the total area of irrigated land in China, Japan, and Egypt....
>
> The implementation of all the projected measures would increase agricultural output by five to seven times compared with present production in Central Asia and Kazakhstan. In particular the cotton problem would be fully solved, and we would obtain more than the United States now produces....
>
> The annual generation of electrical energy by [the project's] hydroelectric stations would exceed the prewar output of hydroelectricity of the world's four greatest capitalist countries -- USA, Germany, Britain, and France.[13]

Direct production would not be the only economic activity to receive a stimulus from the diversion scheme. Davydov foresaw the emergence of "unlimited transport" along the water routes created by the project, and this transportation network would play a major role in the opening up of Western Siberia for economic exploitation.[14]

In addition to these purely economic benefits, Davydov also projected that environmental amelioration would occur. He saw the diverted water as a means to stabilize the level of the Caspian Sea, a subject of investigation by Soviet hydrologists and geographers that had been initiated prior to World War II.[15] As he described it, "with the construction of the Yenisey-Ob'-Aral-Caspian Water Connection the maintenance of a certain water level in the Caspian Sea would be fully

---

[13]M. M. Davydov, "The Ob' Will Enter the Caspian," 612-613.

[14]*Ibid.*, 614.

[15]B. A. Apollov, K. K. Gyul', and V. G. Zavriyev, eds. *Materialy Vsesoyuznogo soveshchaniya po probleme Kaspiyskogo morya* [Materials of the All-Union Conference on the Caspian Sea Problem], (Baku: Akademiya Nauk Azerbaidzhan SSR, 1963). By 1945 the sea's level had become a cause for concern, having fallen approximately two metres since 1929. See Philip P. Micklin, "The Dimensions of the Caspian Sea Problem," *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972), 589.

regulated by man."[16] Additional environmental benefits would accrue from climatic change in Siberia and Central Asia: by increasing the water resources of Central Asia, evaporation would increase, atmospheric humidity would rise, precipitation would become more common, and temperatures would be moderated. Davydov even perceived climatic benefits occurring on a continental scale: "The results of climatic change in these regions would be favourably reflected in the climate of sizable parts of Europe and Asia, particularly in the moderation of droughts and *sukhovei* [dry desert winds] in European Russia and Western Siberia."[17] This would have a positive feedback effect on agricultural production: as the climate became milder (warmer in the north, cooler in the south), greater expanses of land could be brought under the plough.

Thus, for Davydov, even the environmental benefits that would develop as a consequence of the diversion schemes were primarily economic. The stabilization of the Caspian Sea level was essential not for the maintenance of a particular ecosystem, but rather to ensure the profitability of the sea's fisheries; the diverted water would be used to make the Central Asian desert bloom and to produce vast amounts of hydroelectricity which could be used for the development of "resource-rich regions of the USSR from the Arctic Ocean on the north to the Soviet-Iranian border on the south and from the western foothills of the Urals to the middle reaches of the Yenisey";[18] the watercourses would provide a transportation network for these developing regions; and the climatic consequences would have been, in Davydov's mind, a means to yet further economic development. In essence then, the water diversion scheme was not intended to solve an environmental problem, but an economic one.

But today there is no sea in western Siberia. Davydov's plan never received the high-level government support necessary for its implementation. Some scholars have argued that this was a consequence

---

[16]M. M. Davydov, "The Ob' Will Enter the Caspian," 614.
[17]*Ibid.*, 615.

of environmental concerns among the Soviet leadership, but this is doubtful for several reasons. In the early 1960s the European diversion schemes *did* garner support from the highest levels of Soviet government: they were seriously discussed at those levels and even received support from Nikita Khrushchev, who advanced the plans at a January 1961 plenum of the Central Committee.[19] It is true that the schemes were reconsidered -- but not cancelled -- after Khrushchev's fall in 1964, based upon concerns expressed by scientists of the Academy of Sciences of the Komi ASSR (whence most of the European water would be diverted). But these concerns were both environmental *and* economic: this is exemplified by the criticisms of N. I. Shishkin that emphasized the deleterious effects of the European river diversion schemes on the agriculture, fishing, and logging enterprises of the Komi region.[20] But Shishkin did not recommend the project's abandonment; he merely suggested ways in which it could be modified to lessen the economic and environmental impact. These modifications were, however, "expected to double the cost of the project compared with the [initial] calculations of *Gidroproyekt*."[21] Rather than adopt these expensive modifications, in 1966 *Gidroproyekt* planners chose instead to scale back the proposed scheme, reducing both the amount of water to be diverted and the area of flooding in the Komi ASSR.[22]

---

[18]*Ibid.*, 612-613.

[19]S. Zhuk and G. Russo, "Now This is Within Our Capabilities," *Ekonomicheskaya gazeta*, No. 44 (21 February 1961), 3; Nicolai N. Petro, "'The Project of the Century': A Case Study of Russian National Dissent," *Studies in Comparative Communism* XX, nos. 3/4 (Autumn/Winter 1987), 236.

[20]N. I. Shishkin, "On the Diversion of the Vychegda and Pechora Rivers to the Basin of the Volga," 53-54.

[21]*Ibid.*, 55.

[22]Komi Filial, Akademiya Nauk SSSR, *O vliyanii perebroski stoka severnykh rek v basseyn Kaspiya na narodnoye khozyaystvo Komi ASSR* [Concerning the Influence of the Diversion of the Flow of Northern Rivers into the Caspian Basin on the Economy of the Komi ASSR.] (Leningrad: Nauka, 1967). Cited by Philip P. Micklin, "The Dimensions of the Caspian Sea Problem," 598. See also G. G. Gangardt, "On the Question of Diverting Part of the Unused Runoff of Northern and Siberian Rivers into Regions Suffering from a Shortage of Water Resources," *Gidrotekhnicheskoye stroitel'stvo*, No. 8 (1970), 10-13. Reprinted in *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972), 622-628.

There is also direct evidence that Davydov's Siberian scheme fell victim to competing economic interests, not environmental concerns. The Siberian Sea would have flooded an area that, by 1980, provided half of the USSR's crude oil production.[23] Peter Rostankowski has argued, however, that the reason why Davydov's scheme was never implemented was "not because of the prospective oil and gas development in West Siberia, which was not yet in sight in 1950. At that time, coal and water power were still the focus of Soviet interest in the energy sphere."[24] This is undoubtedly true, but Davydov's scheme was under consideration well after 1950.[25] Indeed, when it clearly was the object of increasingly sceptical scrutiny, in the mid-1960s, Davydov chose to defend it at a 1965 conference on the multipurpose use of water in the Ob' basin in the following terms:

> From an economic point of view, water should be used in those places that benefit from a great deal of sunshine and where one hectare of irrigated land yields five to six times as much as a nonirrigated hectare.
>
> The determination of the water-management balance of the Ob' thus requires investigation of basic economic problems associated with changes in the environment. *It would be a mistake to limit the use of the water resources of the Ob' and its tributaries to local needs, based on the interests of the oil and gas industry.* Oil and gas can also be extracted through offshore wells. The question of which approach *is in the national interest* requires further study.[26]

Davydov also targetted other opponents: "the fishery people", who "object to the construction of hydroelectric stations...." He rejected their concerns that flooding damage would result as hydroelectric reservoirs filled by arguing that "only the regulation of runoff by reservoirs will enable us to make fullest use of rivers and the benefit accruing from use

---

[23]Peter Rostankowski, "Will there be a Siberian Sea?" *Geographische Rundschau*, No.12 (1977), 403.

[24]Peter Rostankowski, "Transformation of Nature in the Soviet Union: Proposals, Plans and Reality," 382.

[25]The opening up of the Western Siberian natural gas fields only began in earnest in this decade also. See Thane Gustafson, *The Soviet Gas Campaign: Politics and Policy in Soviet Decisionmaking*, Rand Publications Series R-3036-AF, (June 1983), 27.

[26]M. M. Davydov, "The Water Resources of the Ob' River Basin," 620. Emphasis added.

of the waterbodies and their water surface will exceed the benefit that could be derived from the flood lands...."[27]

These are clearly not responses to environmental criticisms. Davydov is engaging critics who objected to his scheme on economic and developmental grounds, a suggestion borne out by the views of another supporter of water diversion, G. G. Gangardt, who noted that "the great water surplus in the northern part of Tomsk Oblast hampers resource development and requires regulation of river discharge." Gangardt further criticized the view that Western Siberian resources should be considered as local:

> It would be a mistake to view water management in Western Siberia in isolation from Kazakhstan and Central Asia, which have huge reserves of unused land...suitable for irrigation, but no water....
>
> At the same time, Siberia disposes of huge water resources; the mean annual runoff in the Ob'-Irtysh and Yenisey basins is...almost seven times the runoff in the interior basins of Central Asia and Kazakhstan.
>
> It has been calculated that even significant economic expansion in Western Siberia will still leave the required amount of water for diversion to the south. Moreover the associated regulations of the discharge of Siberian rivers would greatly improve the water regime of the West Siberian lowland and make possible the complete development of the region's natural resources.
>
> The water-management problems of Western Siberia, Central Asia and Kazakhstan can be properly resolved only when the conditions of development of productive forces in this vast territory are viewed against the background of the Soviet economy as a whole. Only such an approach will insure the most effective programme for the use of water resources.[28]

Gangardt's arguments, which appeared in the influential journal *Gidrotekhnicheskoye stroitel'stvo* (Hydrotechnical Construction) in 1971, were a defence of Davydov's scheme but they also represented a significant departure from the older engineer's vision. Whereas Davydov attempted simply to attack and dismiss those who objected to his

---

[27]*Ibid.*, 621.

[28]G. G. Gangardt, "On the Question of Diverting Part of the Unused Runoff of Northern and Siberian Rivers into Regions Suffering from a Shortage of Water Resources," 626.

scheme on the grounds that it would be economically damaging to the development of Siberian resources, Gangardt chose to integrate those concerns as far as possible into a revised water diversion scheme. He still argued that water diversion would be required in some form, in order to correct the perceived geographical imbalance in the USSR's water distribution. But he also indicated that such a scheme was necessary to utilize properly *both* the productive forces of Siberia and the Central Asian and Kazakh regions. As will be seen, these concepts -- the "correction" of nature's mistakes, the creation of a sharply expanded agricultural complex in Central Asia, and an amelioration of the difficulties encountered in the production complexes in Siberia -- became critically important to the supporters of the Siberian river diversion schemes of the 1970s and 1980s.

Gangardt, who became water diversion's standard-bearer following the abandonment of Davydov's grandiose variant, realized that a recognition of Siberian needs was critical to the success of the project. Accordingly, in 1970 he proposed a scheme for evaluation which consisted of two separate variants, and which curtailed the amount of water to be diverted to "only" 200 km^3 per annum, of which approximately 50 km^3 per annum would be required by the year 2000 in order to properly expand Central Asian agriculture.[29] Gangardt's variants were more attractive than Davydov's original plan because they dispensed with the need for the creation of a single, vast reservoir along the upper courses of the Siberian rivers from which water would be withdrawn. Instead, in the first of his two variants, Gangardt posited the creation of a series of small reservoirs and associated pumping stations that would divert water from the Yenisey river near the city of Krasnoyarsk via the Chulym river to the Ob' below the city of Tomsk. From there a canal 2,000 km in length would run roughly east to west, transporting the water across the course of the Irtysh and Ishim rivers,

[29]*Ibid.*, 627. According to Gangardt, these volumes of water would allow for the "ultimate expansion of of the irrigated area [in Central Asia and Kazakhstan] to 35-40

and delivering it to the Turgay Gates watershed. In all, eleven pumping stations would be required to move the water this vast distance, but the cascade created would enable the construction of no less than eight major hydroelectric power stations.[30] Cheap and readily available power could therefore be supplied to nascent economic enterprises in the Siberian watershed, and this was only one of several benefits that would accrue in the region; others included a reduction of "the threat of floods in the middle course of the Ob' with its oil and gas producing areas", according to Gangardt.[31]

The second variant of the plan called for the creation of a reservoir on the lower reaches of the Ob', well outside the region of oil and gas production complexes then under development. The headwaters of the reservoir would reach to the confluence of the Ob' and Irtysh rivers, and a canal would be built from there to the city of Tobolsk. This canal, running parallel to but in reverse of the course of the Irtysh, would carry water back up the river, to the city, where a small catchment reservoir and associated pumping stations would send it on its way across the desert to the Turgay Gates. Gangardt noted that this variant possessed benefits both of cost and simplicity: the length of the diversion canal would be reduced by one-half compared to the canal envisioned in the first variant, and would therefore greatly reduce the construction costs and time of the project.[32] But the Ob' reservoir anticipated by Gangardt possessed problems of its own. As early as 1965, and in a different context, a planned reservoir on the lower Ob' had been harshly criticized based on cost estimates that the flooded land (some 52,700 km^2) represented at least 1.6 billion rubles of productive value which would be lost to the Soviet economy. Furthermore, this figure was based on the minimum possible reservoir area; if a more realistic size was accepted,

---

million ha [hectares]."

[30]*Ibid.*, 627. See especially Gangardt's drawing of the proposed variants.

[31]*Ibid.*, 628.

[32]*Ibid.*

the costing rose to over nine billion rubles.[33] Thus, Gangardt's proposals, careful as they might be, still could not disguise the fact that they would be enormously disruptive in both an environmental and an economic sense.

In the early 1970s the somewhat desultory pace of water diversion planning received a boost as a consequence of several different events. One was the promulgation of a series of decrees by the CPSU Central Committee and the USSR Council of Ministers.[34] These decrees were a response to two growing perceptions among the central administration in Moscow: that land reclamation efforts (of which irrigation and water supply was a critically important component) were not being carried out with sufficient energy; and that the water supply situation -- and hence the agricultural situation -- in Kazakhstan and Central Asia was deteriorating. The decrees were seized upon particularly by scientists and economic planners based in those regions as evidence of the absolute necessity of water diversion.[35] But the intentions of these planners were clearly at variance with those based in Moscow and Leningrad. For example, the schemes offered by Kazakh planners all envisioned diverted Siberian water being used *exclusively* for the expansion of irrigation in Kazakhstan and Central Asia: an original component of the concept, the use of the water to stabilize the falling level of the Caspian Sea, was absent. Indeed, the Kazakh planners' schemes would have exacerbated

---

[33]S. L. Vendrov, "A Forecast of Changes in Natural Conditions in the northern Ob' basin in case of construction of the lower Ob' hydro project," *Soviet Geography: Review and Translation* VI, no. 10 (December 1965), 3-10.

[34]The most important of these were "The Immediate Tasks of the Party in the Area of Agriculture" and "On Amelioration of the Land Reclamation System and the Utilization of Irrigated and Reclaimed Land." Both were issued as a result of the July 1970 Plenum of the Central Committee CPSU. The first emphasized increased effort in the areas of land reclamation, mechanical infrastructural development for greater efficiency in land reclamation, and the role of science in improvements in agricultural productivity. The second was a criticism of land reclamation efforts during the Eighth Five Year Plan and an exhortation for improvements in the area in the Ninth Five Year Plan (1971-1975). See *Kommunisticheskaya Partiya Sovetskogo Soyuza v resoliutsiyakh i resheniyakh s"ezdov, konferentsii i plenumov TsK*, 9th ed., XI, 1966-1970 (Moscow: Politizdat, 1986), 531-39; 542-48.

[35]Sh. Chokin and N. Kalachev, "Pay Us a Visit, Rivers of Siberia," *Kazakhstanskaya Pravda*, (20 June 1972). Reprinted in *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972), 642-647.

the problem of the Caspian, since they called for the diversion of water not only from the Siberian watershed, but also the annual diversion of approximately 25 km^3 of water from the Volga River, the major supplier of the Caspian, to western Kazakhstan.[36] Planners at central design institutes in Moscow and Leningrad were at this time heavily engaged in revising the planning for the European water diversion schemes -- which were designed to ameliorate the problem of the falling level of the Caspian Sea: in other words, the exact opposite!

In order to produce some form of coherence among the various planning agencies engaged in *ad hoc* investigations of Siberian water diversion schemes, an All-Union Conference at Pushchino-on-the-Oka was held on the subject in 1973.[37] It was this conference that finally settled on a single, less economically disruptive scheme which involved components of both of Gangardt's proposed variants. The canal called for in his second variant -- from the confluence of the Ob' and Irtysh rivers to the city of Tobolsk -- was selected as an object of serious study for the first stage of the transfer route. No large reservoir would be built on the Ob'; instead water would be withdrawn directly from the river just below the Ob'-Irtysh confluence and pumped "backwards" up the canal paralleling the course of the Irtysh (hence the project's early name -- the "Anti-Irtysh Scheme"). The lack of a reservoir meant that water withdrawals would be reduced very sharply: planners at the conference envisioned only 25 km^3 per annum being transferred in the first stage of the scheme, with this amount rising to approximately 80 km^3 per annum in later stages.[38] The scaling back of the scheme was an indication of a shift in the philosophy of Soviet water-management philosophy. A team of researchers from the Institute of Geography in Moscow described this new philosophy when they pointed out that large-scale nature transformation projects (including water-management schemes)

---

[36]*Ibid.*, 644.
[37]G. E. Hollis, "The Falling Levels of the Caspian and Aral Seas," *The Geographical Journal* 144, part 1 (March 1978), 74-75.
[38]*Ibid.*, 75.

undertaken in the USSR had paved the way for rapid industrial development, but at the same time had created severe environmental problems:

> The creation of large lowland reservoirs, for example, flooded huge areas...and large zones around reservoirs were threatened with erosion and waterlogging. The regulation of natural streamflow had an adverse impact on fisheries by disrupting spawning and migration of fish along streams. Finally, the increase in "stagnation" of river water along the major streams (the Dnieper, Don, Volga), produced by the construction of reservoirs, reduced the natural capacity of streams for self-purification from the pollutants introduced by industrial and municipal effluents.[39]

The team concluded that in light of these problems water-management and water diversion programmes could no longer be "limited to a particular alignment." In connection with possible water diversion schemes in the European USSR, the authors noted that "we will have to create a unified water-management system...consisting of several regional systems (somewhat analogous to electric power grids), that would enable us to manoeuvre with seasonal and low-stage streamflow, using the [disparity of] time between surplus water supply in some basins and shortages in other basins...."[40] In other words, rather than focus on a single, vast scheme to control the water resources of the European USSR, emphasis should be placed on a series of smaller-scale (though still significant) programmes designed to manage local watersheds, which would be connected via a series of relatively short canals that could be used to shift water to areas where it was needed.

It would, of course, have been far more difficult to implement these principles in connection with the Siberian scheme. For one thing, the proposed development of a "water-grid" in the European USSR was based on the existence of a series of well-developed industrial and agricultural

---

[39]I. P. Gerasimov *et al.*, "Large-Scale Research and Engineering Programs for the Transformation of Nature in the Soviet Union and the Role of Geographers in their Implementation," *Materialy VI s"ezda Geograficheskogo obshchestva SSSR* [Proceedings of the Sixth Congress of the Geographical Society USSR]: Papers of Plenary Sessions (Leningrad: Nauka, 1975), 3-18. Reprinted in *Soviet Geography: Review and Translation* XVII, no. 4 (April 1976), 235-245.

consumer areas that all required water in greater or lesser amounts. In the case of Siberia and Central Asia, the situation was more analogous to a long-distance telephone line: at one end were the Siberian consumers, only utilising a fraction of their water resources, and at the other were the intended Kazakh and Central Asian consumers, desperate for more water. In between, there was very little apparent potential for development. But experience with large reservoirs in Siberia had made it clear that their utility was more limited than originally thought,[41] and the proposal advanced by the participants of the conference at Pushchino-on-the-Oka, by deleting the large reservoir, did reflect the new thinking to a great extent.

This proposal was submitted to the government for consideration. At the same time an aggressive campaign in support of Siberian river diversion was instituted in the popular and scientific press. This campaign highlighted the positive aspects of the concept, both for Siberia and Central Asia and Kazakhstan.[42] Articles that comprised the campaign included those which noted the high-level support that the project had attracted from the scientific and planning community.[43] And finally, the campaign raised the issue of the Aral Sea whose shrinkage

---

[40]*Ibid.*, 237.

[41]B. Petrov, "After the Sea Was Created," *Izvestiya*, (21 January 1975), 5, discussed problems of inundation, soil waterlogging and productive losses associated with the Krasnoyarsk Reservoir, completed in 1972.

[42]Aleksandr Prokhanov, "At the Approaches to the Floodlands," *Pravda*, (2 November 1973), 2, described the difficulties faced by land reclamation workers in their battle to control the middle reaches of the Ob'. He states: "A vast territory, ungovernable actions of natural processes -- that is what land reclamation in Tomsk Province must contend with. It is felt here that the work the reclamation workers are now doing is to a great extent experimental, a first cautious step. But the next, major step is inevitable" -- a pointed reference to "governance" of the Ob' itself by artificial means. See also Yuri Shebalin, "The Ob' Will Flow to the South," *Vodny Transport*, (11 September 1973), 4, translated in*Current Digest of the Soviet Press* [Hereinafter referred to as *CDSP*] XXVI, no. 10 (3 April 1974), 17.

[43]See L. Shelest, "Utilization of the USSR's Natural Resources," *Voprosy ekonomiki*, No. 9 (1973), 148-49; T. Khachaturov, "The Role of Natural Resources in the Economy," *Voprosy ekonomiki*, No. 8 (1973), 16-29. Both articles condensed and translated in *CDSP* XXV, no. 49 (2 January 1974), 5-6. Shelest notes that the proposal to divert "part of the flow of Siberian rivers to the Aral Sea basin" had received attention and approval by members of the State Committee for Science and Technology, while Khachaturov argues that river diversions are necessary to combat the "water deficit, which will become more acute in the future, particularly in regions that are now

had become a matter of increasing concern since the early 1960s. River diversion, according to articles published at this time, offered the best long term hope for stabilizing the sea as a viable water body.[44]

After examination, the proposal met with cautious approval from the highest levels of the Soviet government, because the subject of Siberian water diversion was broached in March 1976 at the 25th Party Congress by no less a dignitary than N. A. Kosygin who, in his report on the Tenth Five Year Plan (1976-1980) included a reference to the scheme. Noting that special environmental protection and amelioration measures would be introduced during the Plan, Kosygin stated that water conservation projects would be undertaken, including study of the possible redirection of Northern and Siberian rivers to the Volga basin, Kazakhstan, and Central Asia. This statement elicited strong support from the First Secretaries of the Communist Party of Uzbekistan, Kazakhstan, and Turkmenistan, the republics that would ultimately benefit from the diversion.[45] This support must nevertheless have been tinged with some disappointment, however: two days prior to Kosygin's speech, Sharaf Rashidov, First Secretary of the Party Central Committee of Uzbekistan, had called for a definitive statement of purpose from Kosygin, proposing in his speech to the Congress that the CPSU Central Committee and Council of Ministers USSR "resolve the question of the completion [of the research and design] *in the current Five Year Plan* of installations to divert part of the water from Siberian rivers into the Aral Sea basin and Central Asia."[46] Kosygin, on the other hand, merely expressed the opinion that "during the Tenth Five-Year Plan period we must *begin research* into a major problem such as the redirection of part

---

experiencing shortages."

[44]See, for example, V. Kovalev and N. Gladkov, "Why the Aral Sea is Drying Up," *Pravda*, (4 February 1975), 2, and A. N. Voznesenskiy *et al.*, "Principal Trends and Prospects in the Use of Water Resources in the USSR," *Vodnyye resursy*, No. 3 (1974), 3-14. Reprinted in *Soviet Geography: Review and Translation* XVI, no. 5 (May 1975), 291-302.

[45]Violet Conolly, "Turning the Rivers of Siberia in their Courses," *Radio Liberty Research Bulletin*, RL 189/78 (29 August 1978), 2.

[46]*Pravda*, (27 February 1976). Cited in Henry Krisch, "Diverting Soviet Rivers: Controversies and Prospects," *Radio Liberty Research Bulletin*, RL 251/76 (10 May 1976), 4. Emphasis added.

of the flow of Northern and Siberian rivers to the Volga basin, Kazakhstan and Central Asia."[47]

Thus a resolution as bold as that required by Rashidov was unlikely to come at the 25th Party Congress. As one researcher noted, Leonid Brezhnev "'missed' several good opportunities" to mention river diversion in his speech to the Congress.[48] Not only did Kosygin merely express the government's interest in examining the feasibility of river diversion proposals: he also cautioned that

> the implementation of plans for interregional transfers of water not only requires substantial capital investments but also takes a very long time. For this reason, more attention should be paid to measures for the economical consumption of water. There are large potentials for saving water resources in agriculture, where exceptionally large quantities of water are used for irrigation[49]

This was a significant and pointed reference to perceived shortcomings in irrigation work in Kazakhstan and Central Asia, which was held to be extremely wasteful of water resources, even by Soviet standards,[50] and was indicative of the future strategy that the government intended to pursue in the matter of water diversion: a programme of investigation and evaluation would be initiated, while at the same time water conservation measures would be instituted in Central Asia and Kazakhstan.

This "dual track" policy had important consequences for the future planning and implementation of the diversion schemes, because it set river diversion proponents and Central Asian interests travelling in opposite directions. River diversion planners recognized that the work they were engaged in was long-term, and would take decades to complete. In the meantime they too emphasized the importance of water conservation in Central Asia and Kazakhstan. Yet the Central Asian and

---

[47]*Materialy XXV s"ezda KPSS* (Moscow: Politizdat, 1976), 143.
[48]Krisch, "Diverting Soviet Rivers: Controversies and Prospects," 8.
[49]*Materialy XXV s"ezda KPSS*, 143.
[50]Articles scoring the inefficient use of water in irrigation were becoming increasingly common in the popular press at this time. See, for example, A. Imamaliyev, "Programming the Harvest," *Pravda*, (6 January 1975), 2.

Kazakh planners were reluctant to institute such expensive and labour-intensive measures while the prospect of "unlimited" water supplies from Siberia were on the horizon. In the end this conflict of opinion would lead to a disastrous intensification in the mismanagement of water resources in the Central Asian region, and the full consequences of this mismanagement have multiplied over time. But the true extent of the divergence of opinion between the two groups would only become fully apparent once the planning for the implementation of the diversion scheme entered its final phase in the late 1970s and early 1980s.

River Diversion Planning In The Tenth Five-Year Plan Period

After the 25th Party Congress the planning for Siberian river diversion rapidly gathered momentum. This phase of planning was very different from that which had gone before: it was distinguished by a concerted effort involving a large number of scientists, engineers, and economists operating within a network of design and analysis institutes specially linked for the purpose. This was in contrast to earlier planning efforts which were characterized by individuals within individual institutes proposing designs, rationales, and variants haphazardly. Operating on the basis of a fixed concept -- the Anti-Irtysh Scheme -- those engaged in planning could begin the refinement of the plan and initiate detailed studies of the economic, environmental, and social impacts that it would represent.

The effort was major by any standard. Over the period 1976-1980, under the aegis of the State Committee for Science and Technology, more than 120 agencies worked on preparing aspects of socioeconomic and environmental impact assessments of the river diversion scheme for consideration by *Gosplan*, the State Planning Commission.[51] These

[51]G. V. Voropayev, "A forecast of the impact of partial diversion of Siberian rivers on natural conditions," *Gidrotekhnika i melioratsiya*, No. 1 (January 1983), 27; and G. V. Voropayev, I. P. Gerasimov, O. A. Kibal'chich and N. I. Koronkevich, "The Problem of Redistribution of Water Resources in the Midlands Region of the USSR," *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya*, No. 6 (1982), 24-32. Reprinted in *Soviet Geography: Review and Translation* XXIV, no. 10 (December 1983), 713-723.

studies were coordinated by the Institute of Water Problems in Moscow and the institute's director, G. V. Voropayev, assumed direction of the overall socioeconomic and environmental impact assessment programme.[52] Simultaneously, a research and design effort investigating the project's technical and economic feasibility was undertaken by the All-Union Institute for Water Management (*Soyuzgiprovodkhoz*), which was subordinate to the Ministry for Land Reclamation. This effort, like that undertaken by the Institute of Water Problems investigating the socioeconomic and environmental impact of the project, also involved a large number of agencies -- some 40 in total, of which the most important was *Gidroproyekt*, the Hydrotechnical Design and Planning Institute.[53] Thus, two parallel research programmes were initiated as a result of the 25th Party Congress directive, but the programmes were not necessarily reciprocal or even complementary. On the one hand, the engineering and technical studies undertaken under the auspices of *Soyuzgiprovodkhoz* reflected a very strong desire from the engineering point of view to begin construction, or pre-construction infrastructural development, of the Anti-Irtysh Scheme as soon as possible. In this, not surprisingly, they were supported by Central Asian interests eager for the water to begin to flow. On the other, the scientists involved in the socioeconomic and environmental impact assessments headed by the Institute of Water Problems generally counselled caution and careful investigation of all aspects of the scheme prior to commencing construction. This difference of opinion led, not unnaturally, to a considerable amount of friction between the two groups, with the engineers accusing the scientists of dragging their feet, thus delaying construction of the scheme.[54] The scientists responded by pointing to the

---

[52]Philip P. Micklin, "Water Diversion Proposals for the European USSR: Status and Trends," *Soviet Geography: Review and Translation* XXIV, no. 7 (September 1983), 481.

[53]Philip P. Micklin, "The Status of the Soviet Union's North-South Water Transfer Projects Before Their Abandonment in 1985-86," *Soviet Geography: Review and Translation* XXVII, no. 5 (May 1986), 294. As Micklin points out, "since 1978 this institute [*Soyuzgiprovodkhoz*] has specialized in planning, design, and research related to large-scale water transfer programmes." *Ibid.*

[54]*Ibid.*

complexity of their research programme, noting correctly the fact that a research effort of this magnitude had not been undertaken before,[55] and that the penalties for failing to anticipate problems associated with the scheme would be grave. What, then, were the main characteristics of this research effort?

Soviet geographers formulated a framework for research even before the 25th Party Congress directive of 1976. At the Sixth Congress of the Geographical Society USSR, held in 1975, a series of papers presented at plenary sessions outlined a set of principles for the investigation of the environmental impact of large-scale transformational schemes, and water diversion schemes in particular.[56] One of the most important papers, by a team of geographers from the Institute of Geography in Moscow,[57] first discussed the rationales advanced by the supporters of Siberian river diversion schemes which, the authors stated, were twofold:

> First, Central Asia and southern Kazakhstan have inadequate water resources of their own to irrigate all the potential desert land, estimated at 20 to 30 million ha, and, second, there will gradually be a need for irrigating the former virgin lands of northern Kazakhstan.[58]

The authors proceeded to offer a critique of these assertions. They pointed out that the declaration that Central Asia and Kazakhstan suffered from a lack of water resources was an incorrect and unconditional statement. They noted that the overall hydrological cycle of the region had never been properly investigated: those who claimed that there was insufficient water only considered streamflow waters in their calculations. The geographers suggested that the hydrological cycle

---

[55]G. V. Voropayev, "To Give the South Water," *Izvestiya* (13 August 1978). Translated in JPRS - 71939. Translations on USSR Resources, No. 828 (27 September 1978), 44-47.

[56]*Materialy VI s"ezda Geograficheskogo obshchestva SSSR* [Proceedings of the Sixth Congress of the Geographical Society USSR]: Papers of Plenary Sessions (Leningrad: Nauka, 1975).

[57]I. P. Gerasimov *et al.*, "Large-Scale Research and Engineering Programmes for the Transformation of Nature in the Soviet Union and the Role of Geographers in their Implementation," *Materialy VI s"ezda Geograficheskogo obshchestva SSSR* [Proceedings of the Sixth Congress of the Geographical Society USSR]: Papers of Plenary Sessions (Leningrad: Nauka, 1975), 3-18. Reprinted in *Soviet Geography: Review and Translation* XVII, no. 4 (April 1976), 235-245.

[58]*Ibid*, 241.

was in fact much broader, pointing to subsurface runoff originating in the mountain areas of the eastern part of the region, the evaporative and precipitation process that cycled water from the Aral Sea back to those areas, and local aquifer resources. They argued that, while their preliminary calculations were undeniably general, it was clear that the Central Asian and Kazakh region possessed much greater water resources than claimed, and they concluded this point by noting that "any predictions and recommendations for future water management in Central Asia and southern Kazakhstan, as well as the question of the future of the Aral Sea and the interbasin transfer from Siberia, must be based on investigation of the entire regional hydrological cycle."[59] Thus, a close examination of the hydrological regime of the ultimate consumer region was one important aspect of the study framework investigating Siberian river diversion and, as this paper hinted, the conclusions of that examination would question the Central Asian and Kazakh consumers' assertions that they were running out of water.

Another factor that entered into the socioeconomic and environmental analysis framework proposed by the geographers at the conference was the matter of the Aral Sea. Both the Aral and Caspian seas had suffered a drop in water level in the Soviet period. Unlike the Caspian Sea, whose level had dropped markedly over a fairly long period beginning in 1929,[60] the Aral's drop was precipitous. In the seven years after 1960, the sea's level fell by 1.76 metres, and this drop was expected to accelerate based on plans to intensify irrigation in the region up to 1980 using water withdrawn from the sea's only major inflow streams, the Syr Dar'ya and Amu Dar'ya rivers.[61] One researcher projected that such a severe sea level drop would cause a decrease in the sea's area from 64,000 km^2 to 25,000-15,000 km^2 and suggested that "if

---

[59]*Ibid*, 242.

[60]Marshall Goldman, *The Spoils of Progress: Environmental Pollution in the Soviet Union* (Cambridge, MA: MIT Press, 1972), 216-217.

[61]V. L. Shul'ts, "The Aral Sea Problem," *Trudy Sredneaziatskogo nauch. -issled. gidrometeorol. inst.* [Transactions of the Central Asian Hydrometeorological Scientific Research Institute], No. 32: 47 (1968), 3-7. Reprinted in *Soviet Hydrology: Selected*

appropriate measures are not taken, the further development of water resources in the republics of Central Asia will lead to the complete drying out of the Aral Sea."[62]

The question remained: what were these appropriate measures, and should they even be implemented? At the Sixth Congress of the Geographical Society in 1975 a paper was presented by hydrologist Aleksey Sokolov, who argued that the Aral Sea should not be maintained in its then-present form. He particularly suggested that, from an economic point of view, it would be simply too expensive and difficult to stabilize the sea, even using water from river diversions:

> [A]ny attempt to maintain the level of the Aral Sea through an interbasin transfer would seem to be highly dubious. If the water resources of the Amu Dar'ya and Syr Dar'ya drainage basins continue to be fully used, it would require a transfer of 50 to 60 km^3 to preserve the Aral Sea. Since the cost of interbasin transfers is now estimated at 100 to 200 million rubles per km^3 of water, such an undertaking would cost 5 to 10 billion rubles, which is 100 to 200 times more than the average annual income derived from the Soviet economy from the Aral Sea....[I]t would be a big waste of resources to try to preserve such a giant evaporating waterbody as the Aral Sea in the middle of a desert.[63]

In contradistinction to the view expressed by Sokolov was that presented by N.T. Kuznetsov the following year. Kuznetsov specifically attacked environmental analyses that reduced issues to economic conditions, arguing that the calculations involved could at best be described as "very rough." In addition, he pointed out that such economically-based analyses were simply too narrow in focus: as he put it, "now that the prospects of the sea's turning into a brine pond are becoming more real, more and more people realize that any resolution if

---

Papers No. 5 (1968), 489-492.

[62]*Ibid.*, 490. The projection offered by Shul'ts was overly pessimistic, but not by a large margin. In 1989 the Aral Sea level had fallen by a total of 14.3 metres compared to 1960 levels, and its area had fallen to 37,000 km^2. See D. B. Oreshkin, "Aral'skaya Katastrofa," [The Aral Catastrophe], *Nauka o Zemle*, No. 2 (1990), 41.

[63]Aleksey A. Sokolov, "The World Water Balance," *Materialy VI s"ezda Geograficheskogo obshchestva SSSR* [Proceedings of the Sixth Congress of the Geographical Society USSR]: Papers of Plenary Sessions (Leningrad: Nauka, 1975), 91-105. Reprinted in *Soviet Geography: Review and Translation* XVII, no. 8 (October 1976), 513-514.

the future of the Aral Sea cannot be based purely on economic calculations...but must also be based on ecological considerations involving the uniqueness of the sea."[64] As will be seen below, the matter of the Aral Sea was a difficult one for the boosters of the river diverson scheme, and their public attitude toward it was marked by indecision and obfuscation.

The environmental and socioeconomic analysis also encompassed the route and structure of the enormous Main Diversion Canal that would be required to transport the water from the Irtysh to the consumer region in Central Asia. In final engineering plans, it was envisioned that the canal would run for over 2,200 km from Tobol'sk to the Amu Dar'ya river; it would vary in width from 108 to 212 metres and its depth would be 12-15 metres.[65] Those involved in engineering feasibility studies concluded that, although the construction of such a canal would be a major undertaking, it would not be impossible. What was worrying for the scientists engaged in environmental impact assessments, however, was not the canal itself, but its impact on the lands through which it passed. In order to keep costs manageable, engineering planners decided that only short segments of the canal would be lined with concrete to prevent water losses. This meant that a considerable amount of water passing along the canal would be lost to filtration, especially given the dry, semi-desert terrain through which the canal would run.[66] It was projected that these losses would represent some 10 per cent of the total amounts transferred, and this was held to be an acceptable amount by the engineers involved in planning the canal. Environmental projections

---

[64]N. T. Kuznetsov, "Geographical Aspects of the Future of the Aral Sea," *Problemy Osvoyeniya Pustyn'*, No. 1 (1976), 3-11. Reprinted in *Soviet Geography: Review and Translation* XVIII, no. 3 (March 1977), 163-171.

[65]G. V. Voropayev, "A forecast of the impact of partial diversion of Siberian rivers on natural conditions," *Gidrotekhnika i melioratsiya*, No. 1 (January 1983), 28. Cited in Philip P. Micklin, "The Vast Diversion of Soviet Rivers," *Environment* 27, no. 2 (March 1985), 19.

[66]Voropayev reported in 1982 that average water losses due to filtration would be approximately 2.2 to 2.7 km^3 per year. See G. V. Voropayev, "The problem of water supply for the country and the territorial redistribution of water resources," *Vodnyye resursy*, No. 6 (1982), 18.

suggested that the exfiltrated water would produce a rise in local watertables either approaching or reaching the surface in the zone running along either side of the canal. This was disturbing to the scientists because soils along the proposed canal zone tended to be quite saline at a depth of several metres. Since this was the stratum into which the exfiltrated water would pass, it was feared that secondary surface salinization would occur, as the water leached the salts and carried them to the surface.[67] Interestingly, Central Asian scientists were far less worried about this phenomenon than their Moscow-based counterparts: one group in Alma-Ata using "high-speed computers" and "mathematical modelling" showed that "creation of a new large water mainline...will lead to a rise of underground water in a small band up to 20 kilometres wide."[68] They concluded that this finding would put to rest fears of a "universal rise of ground water". (It should be pointed out that, if such salinization occurred along the length of the Main Diversion Canal, almost nine million hectares would be affected. Given that the most optimistic predictions projected that the diverted water would allow the irrigation of 4.5 million hectares of land in Kazakhstan and Central Asia, this would appear to be a heavy price to pay for the opening up of that new territory.[69])

The final area of environmental and socioeconomic investigation with which the scientists concerned themselves was the region of western Siberia from which the water would be withdrawn. This, like other aspects of the investigation, also provoked sharp debate among river diversion supporters and the scientists and became a focus for those who came to oppose the scheme in the 1980s. Two main issues

---

[67]M. Ye. Gorodestkaya, "Forecast of possible changes in the natural environment along the proposed transfer canal for West Siberian streamflow," *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya*, No. 1 (1982), 53-59. Reprinted in *Soviet Geography: Review and Translation* XXII, no. 6 (June 1982), 406-413.

[68]*Gudok*, (19 December 1978), 4. Reprinted and translated in JPRS - 72710. Translations on USSR Resources, No. 849 (29 January 1979), 90.

[69]See *Izvestiya*, (22 June 1984), 2. Reprinted and translated in Foreign Broadcast Information Service [Hereinafter referred to as FBIS] SOV-84-128. FBIS Daily Report. Soviet Union (2 July 1984), T4-T6, as "Polad-Zade Interviewed on River Diversion Plan."

were topics of examination in western Siberia: the effect of the withdrawals on the local watershed, and the effect of reduced riverflows into the Arctic Ocean in the region of the Ob' Gulf. Supporters of the project repeatedly emphasized that withdrawals would be small in relation to the overall flow volumes of the Irtysh and Ob' rivers, arguing that withdrawals of 25 km^3 per annum represented only a small percentage of those rivers' annual flow, and therefore posed no threat to the west Siberian environment.[70] They also argued that the water withdrawals would in fact be beneficial to the region's environment, since they would aid in the drainage of swamps and would thus facilitate land reclamation efforts.[71]

The scientists investigating this problem were less sanguine about the "beneficial" consequences of water withdrawals from the Ob' and Irtysh rivers. One researcher from the Institute of Geography in Moscow specifically challenged the assertions made by the scheme's supporters that it would assist land reclamation efforts by serving to speed the drainage of swamplands. His findings were presented at a national review conference of water diversion research held in Moscow in June 1977, and included the statement that

> The withdrawal of part of the streamflow from West Siberia would, of course, foster a reduction in swamp cover. But that in itself would not resolve the problem of swamp drainage. Most of the upland swamps of the watershed areas, the swamps on stream terraces and some of the...lowland swamps are at relatively high elevations compared to the low-water level of the streams passing through West Siberia....[The rivers] drain the peat bogs over a distance of only a few dozen metres. At greater distance...the swamps remain in their natural state.[72]

---

[70]See, for example, *Qazaq Adebiyeti*, (28 January 1983), 3, reprinted and translated in JPRS - 83928. USSR Report. Political and Sociological Affairs, No. 1430 (19 July 1983), 14-15; *Ozbekiston Adabiyoti Va San'ati*, (1 April 1983). Translated in JPRS - 84563. USSR Report. Political and Sociological Affairs No. 1467 (19 October 1983), 34-41, as "River Diversion Boosted at Tashkent Roundtable"; *Bakinskiy Rabochiy*, (3 August 1979), 4. Translated in FBIS-SOV-79. FBIS Daily Report. Soviet Union (23 August 1979), S11-S12.

[71]G. V. Voropayev, I. P. Gerasimov, O. A. Kibal'chich and N. I. Koronkevich, "The Problem of Redistribution of Water Resources in the Midlands Region of the USSR," 716.

[72]M. I. Neyshtadt, "The Contemporary Swampiness of West Siberia and the Problems Likely to Arise in Connection with the Withdrawal of Part of the Streamflow and the

In addition, researchers questioned the claims that the "small" percentage of water diverted would not affect the conditions of the Arctic Ocean around the Ob' Gulf. Their work demonstrated that diversions, compounded by increasingly intensive use of Ob' river water within the west Siberian watershed itself would, by the year 2000, produce significant environmental changes in the local Arctic region. These changes would result primarily from a lessened thermal and liquid discharge into the Ob' Gulf, which would emerge as a thickening of winter ice cover and a consequent delay in spring thaw and breakup.[73] An extended ice cover would not only adversely affect sea transport routes in the region: as a result of changing oceanographic conditions, it would also seriously affect the Gulf's valuable fisheries.[74]

It was not only preliminary conclusions such as these but the very research process itself and the attitude of the scientists engaged in that process that began to generate difficulties for proponents of Siberian river diversion in the late 1970s. The report outlining the general propositions of the technical-engineering feasibility study undertaken by *Soyuzgiprovodkhoz* was completed and forwarded to *Gosplan* in 1978 for consideration by a State Expert Committee specially struck for the purpose.[75] Shortly thereafter the technical and engineering aspects of the project were granted preliminary government approval,[76] almost certainly on the basis of the preparatory *Soyuzgiprovodkhoz* study. By 1980 the

---

Amelioration of Swampy Land." Paper presented at Conference on Likely Environmental Changes Associated with the Territorial Redistribution of Water Resources, Moscow, June 1977. *Izvestiya Akademii Nauk, seriya geograficheskaya*, No. 5 (1977), 23-48. Reprinted in *Soviet Geography: Review and Translation* XIX, no. 10 (December 1978), 706-707.

[73]Philip P. Micklin, "The Vast Diversion of Soviet Rivers," 42.

[74]L. A. Gavrilova, "The possible change of climate in regions of the Ob' north under the influence of water management measures," *Problemy Arktiki i Antarktiki* vyp. 55 (1980), 103-110. Cited in Philip P. Micklin, "The Vast Diversion of Soviet Rivers," 42.

[75]G. V. Voropayev, I. P. Gerasimov, O. A. Kibal'chich and N. I. Koronkevich, "The Problem of Redistribution of Water Resources in the Midlands Region of the USSR," 714.

[76]P. M. Kelly *et al.*, "Large-Scale Water Transfers in the USSR," *GeoJournal* 7, no. 3 (1983), 207. See also Sergei Voronitsyn, "The Plan to Divert Siberian Rivers and Pressure from the Central Asian Lobby," *Radio Liberty Research Bulletin*, RL 400/80 (27 October 1980), 2.

completed technical-engineering feasibility study was submitted to another State Expert Committee of *Gosplan* for analysis.[77]

No similar document covering the environmental and socio-economic aspects of the project was forthcoming in the late 1970s, nor did it appear that one was even remotely close to completion.[78] This was not because of a lack of activity on the part of the scientists engaged in research toward the production of such a study: on the contrary, the Tenth Five-Year Plan period was marked by an enormous research effort. Conference after conference on the subject was held between 1976 and 1980, each presenting not only the results of a growing body of research, but also proposing more and increasingly varied avenues of further investigation.[79] Of fundamental importance was the attitude of the scientists towards the project; always cautious and sceptical, by the late 1970s they clearly viewed the probable negative environmental and socioeconomic impact of Siberian river diversion with considerable alarm.

---

[77]G. V. Voropayev, I. P. Gerasimov, O. A. Kibal'chich and N. I. Koronkevich, "The Problem of Redistribution of Water Resources in the Midlands Region of the USSR," 714. The technical-engineering feasibility study was apparently a massive document: in addition to the "basic" material of the study itself, ten volumes of appendices comprising some 40 books of data were submitted for evaluation by *Gosplan*. See *Pravda Vostoka*, (3 April 1982), 3. Translated in *CDSP* XXXIV, no. 17 (26 May 1982), 12-13. It is important to note that one of the members of the State Expert Committee was none other than Voropayev himself. See Yu. Yudin, "A River Will Flow From Siberia," *Sovetskaya Rossiya*, (29 August 1984), 3.

This indicates a serious conflict of interest in the planning process: Voropayev was head of the Institute of Water Problems and responsible for the overall coordination of the socioeconomic and environmental impact assessment study of the Siberian river diversion project, and at the same time he was a member of the committee responsible for evaluating and assessing the technical and engineering study. In other words, it would be very difficult for Voropayev to accept the technical-engineering study without accepting the socioeconomic-environmental assessment -- which he was responsible for producing!

[78]In fact, it appears as if *no* environmental and socioeconomic report was ever submitted by the scientists involved in this research. Instead it would seem that research favourable to the position that little or no negative environmental or socioeconomic impacts would result from Siberian river diversion was included in the technical-engineering study in the form of appendices. See *Pravda Vostoka*, (3 April 1982), 3. (n. 77, above).

[79]According to Philip Micklin, at least 14 such conferences, dealing with the environmental and socioeconomic impact of both European and Siberian river diversion schemes, were held between 1976 and the end of 1980. See Micklin, "Water Diversion Proposals for the European USSR: Status and Trends," 482.

Their investigations were guided by the general principle that the risks of failing to anticipate all the negative impacts of such a major transformational project could be catastrophic. It was a long-standing principle, having been articulated by the head of the USSR Academy of Sciences, M. V. Keldysh, who emphasized in June 1973 the importance of "scientifically assessing the expediency" of large-scale transformational schemes.[80] Upon scientifically assessing the expediency of the Siberian river diversion project it became obvious to many of the scientists that the scheme's negative impacts far outweighed its benefits, and that its supporters and designers were willing to overlook that fact. In his opening remarks to a conference on the environmental effects of water diversion held in Moscow in June 1977, M. I. L'vovich, one of the senior scientists involved in research coordination, noted that

> [W]e must be very clear about the fact that such an undertaking, like the transformation of water resources in general, is inevitably fraught with certain costs. I am stressing this point because there is a widespread, generally unfounded and I would say idealized view that hydrologic transformations can be effected without negative consequences. These are unfortunately unavoidable and, if they are not taken into consideration, [scientists] would have to reject the possibility of any undertaking whatsoever designed to transform water resources.[81]

What is remarkable about this statement is not its content but that it was made at all. In his previously published work on large-scale water management schemes, L'vovich had contended that engineers and planners had traditionally ignored or marginalized their noneconomic (i.e., environmental) consequences, and he strongly argued that these noneconomic consequences "should be given the same weight as economic impacts." He maintained that "maximum cost-effectiveness may be achieved if all positive and negative environmental impacts are

---

[80]"Work Has Started on the Diversion of Water from the Northern Rivers to the South." *Radio Liberty Research Bulletin*, RL 394/73 (12 December 1973).

[81]M. I. L'vovich, "Introductory Remarks to Conference on Likely Environmental Changes Associated with the Territorial Redistribution of Water Resources, Moscow, June 1977." *Izvestiya Akademii Nauk, seriya geograficheskaya*, No. 5 (1977), 23-48. Reprinted in *Soviet Geography: Review and Translation* XIX, no. 10 (December 1978),

investigated ahead of time [and] project designs should take account of all possible consequences."[82] It was one thing, however, for L'vovich to argue these points in the pages of the journal of the Academy of Sciences; it was an entirely different matter to accuse the engineers of shortsightedness so bluntly in a nationally-reported forum.

L'vovich's concerns were reflected in an article published by a group of his colleagues from the Institute of Geography in Moscow.[83] The authors of the article specifically attacked engineers and construction agencies involved in the development of transformational schemes. They stated that such agencies "often ignore environmental protection measures, causing harm to natural landscapes," and concluded that it would therefore "be desirable to set up a special control commission, made up of representatives of interested ministries, environmental protection agencies and local authorities, to insure that construction agencies observe environmental regulations."[84] This was a remarkable and novel demand that signalled the desire of scientists engaged in environmental impact assessments of the Siberian river diversion scheme to have their work form a long-term guide for construction practices if the plan went ahead. It is also entirely probable that this demand, coupled with other, unusual demands by the scientists represented an attempt to delay the scheme's commencement.

This suggestion is based on the reservations similar to those expressed by L'vovich and his colleagues that began to appear in the Soviet popular press under the authorship of prominent scientists. I. Rusinov, Director of the West Siberian Branch of the Research Institute for Hydraulic Engineering and Land Reclamation, wrote in a December 1977 article in the newspaper *Trud* that the preliminary engineering

---

698-701.

[82]M. I. L'vovich, "Geographical Aspects of a Territorial Redistribution of Water Resources in the USSR," *Izvestiya Akademii Nauk, seriya geograficheskaya*, No. 2 (1977), 22-37. Reprinted in *Soviet Geography: Review and Translation* XVIII, no. 8 (October 1977), 564.

[83]N. I. Mikhaylov, V. A. Nikolayev, and I. Ye. Timashev, "Environmental Protection Issues and the Southward Diversion of Siberian Rivers," *Vestnik Moskovskogo Universiteta, Seriya Geografiya*, No. 5 (1977), 50-56.

[84]*Ibid.*, 53.

study produced by *Soyuzgiprovodkhoz*, which had been forwarded to his institute for discussion, was "unacceptable" for a variety of reasons, but primarily because it did not take into account the environmental dislocation that the scheme would create in the region of water withdrawal on the Irtysh river. Riverine transport would be affected, and the plan as drafted would exacerbate water shortages affecting southern parts of western Siberia.[85] Rusinov criticized the planning process where

> most of the research on river diversion in Siberia is done in Moscow and Leningrad, far from the actual site. Maybe this has something to do with the fact that as yet we have seen no truly rational solutions. We think it is essential to set up a major research centre in Siberia. The diversion of the waters of the Ob' and the Irtysh to Central Asia is an extraordinarily complex task that affects all branches of Siberia's economy and could mean radical changes in its environment and climate. Therefore, it should be approached with the utmost caution and with a sense of responsibility for the possible negative consequences.[86]

Two senior members of the Academy of Sciences, Academician N. Nekrasov and Corresponding Member N. Razin, took the opportunity to echo Rusinov's concerns some six months later in the party flagship *Pravda*. They pointed out that "many questions of fundamental significance to the practical implementation of a national-economic task as immense in its scale as the diversion of part of the flow of northern and Siberian rivers over long distances still remain unresolved," and argued that

> The question of the possibility of withdrawing part of the flow of the Ob' can be resolved only on the basis of authoritative scientific conceptions, corroborated by research, concerning its impact on the natural complex of Western Siberia....This is especially true because a mighty all-Union national-economic complex is being built here. However, so far very little study has been given to problems of the ecological organization of this territory....[87]

---

[85]*Trud*, (6 December 1977), 3. Translated in *CDSP* XXIX, no. 48 (28 December 1977), 17.
[86]*Ibid.*
[87]*Pravda* (11 June 1978), 3.

Like Rusinov, they too called for the intensification and broadening of research efforts into the possible environmental consequences of river diversion:

> From our standpoint, the scientific substantiation of such a highly important state decision as the territorial redistribution of the country's water resources calls for the organization of a highly authoritative scientific committee under the guidance of the USSR Academy of Sciences....The committee's chief task should be a comprehensive examination of the impact that the projected long-distance water diversions will have on the environment.[88]

These calls for an expanded research programme, for the creation of control commissions to deal with further research or construction oversight, and for the devolution of the research effort from Moscow and Leningrad into Siberia, were all attempts by scientists to delay the implementation of Siberian river diversion. They were based on the scientists' preliminary data that indicated that the environmental and socioeconomic impact of the scheme would be generally negative. The evidence also suggests that their delaying tactics were successful.

The most audacious example of this campaign of delay came at a 1980 conference on the environmental impact of river diversion, held at the Institute of Geography in Moscow. The conference participants stressed that

> it would be a mistake to limit the impact study to the first stage [of the Siberian river diversion scheme] since that stage alone would not achieve the ultimate purpose of the entire proposed interbasin transfer....As a result, some of the research done during the 1976-80 period was concerned in part with issues that would arise beyond the initial first-stage timeframe. These issues [will] be considered in greater detail during the 1981-85 period, when the ultimate impact of the *entire proposed transfer project* [is] to be investigated.[89]

In making such a statement, the scientists were, in effect, altering the mandate provided at the 25th Party Congress in 1976, which had limited

---

[88]*Ibid.*

[89]G. V. Voropayev, I. P. Gerasimov, O. A. Kibal'chich and N. I. Koronkevich, "The Problem of Redistribution of Water Resources in the Midlands Region of the USSR," 714-715. Emphasis added.

the environmental impact analyses to an assessment of only the first stage of the water diversion scheme. Future stages, which called for the diversion of up to 60 km^3 of water per annum (as opposed to the first stage amounts of 25 km^3) were, even by proponents' accounts, unlikely to be initiated until well into the twenty-first century.[90] It therefore seemed unnecessary in the 1970s to investigate their possible environmental impact. The only reason for the scientists insisting that such an investigation *was* necessary was to delay the implementation of the first stage.

Much to the fury of the scheme's proponents, the scientists' call for continued analysis, rather than actual construction, of Siberian river diversion was included in the Draft Guidelines for the Eleventh Five Year Plan.[91] In Section V of the Basic Guidelines, under the rubric "The Development of the Agro-Industrial Complex," it was stated that the 26th Party Congress would discuss the resolution only "to begin preparatory work on diverting part of the flow of northern rivers into the Volga River basin, and also to continue research and design studies on diverting the water of Siberian rivers to Central Asia and Kazakhstan."[92] This draft statement drew a predictable and rapid response from the Central Asian consumers eager to hasten the diversion process. In January 1981, a month before the 26th Party Congress, an article entitled "Speed Up Work to Solve the Problem of Diverting Parts of the Flow of Siberian Rivers Into Central Asia and Kazakhstan" appeared in the journal *Ekonomicheskaya gazeta*. The author, S. Ziyadullayev, Chairman of the Uzbek Republic Academy of Sciences' Council for the Study of Productive Forces, harshly criticized the slow pace of the environmental and socioeconomic impact assessment programme, noting that the project's general design institute had already "finished drawing

---

[90]G. V. Voropayev, "A forecast of the impact of partial diversion of Siberian rivers on natural conditions," *Gidrotekhnika i melioratsiya*, No. 1 (January 1983), 28.
[91]*Pravda*, (2 December 1980).
[92]*Ibid.*

up a technical and economic feasibility study for the diversion plan."[93] Arguing that "postponing the diversion of part of the flow of Siberia's rivers could create a difficult economic situation in the Central Asian republics," Ziyadullayev proposed that the Basic Guidelines statement on river diversion be modified to include the draft resolution "to complete scientific and design studies on the diversion of water from Siberian rivers into Central Asia and Kazakhstan and, *during the 11th Five Year Plan*, begin preparatory work on top-priority facilities of the diversion project."[94] This proposal was mirrored in the Central Asian press: articles appearing in *Turkmenskaya iskra* and *Pravda Vostoka* in December 1980 and January 1981 also expressed concern at the Draft Guidelines statement and called for it to be changed to reflect an acceleration of river diversion planning and implementation.[95]

This move on the part of the Central Asian lobby to speed up the implementation of the Siberian river diversion scheme failed, however. The Draft Guidelines for the 26th Party Congress remained unchanged and Leonid Brezhnev did not mention river diversion at all during his report to the Congress,[96] nor did N. A. Tikhonov, the Prime Minister of the USSR, nor Mikhail Solomentsev, the Premier of the RSFSR, in their speeches.[97] The First Secretary of the Kazakh Communist Party Central Committee, D. M. Kunayev, fought a rearguard action against this apparent disinterest in river diversion: arguing that the scheme was essential for achieving stable development of the economies of Central Asia, he insisted that "it will be necessary to complete preparatory work during the Eleventh Five Year Plan on the diversion of part of the flow of

---

[93]S. Ziyadullayev, "Speed up Work to Solve the Problem of Diverting Parts of the Flow of Siberian Rivers Into Central Asia and Kazakhstan," *Ekonomicheskaya gazeta*, No. 5 (January 1977), 7. Translated in *CDSP* XXXIII, no. 7 (18 March 1981), 6-7.

[94]*Ibid.*, 7. Emphasis added.

[95]For a discussion of these articles, see Bess Brown, "Turkmen Aviators Express Concern About Siberian Rivers Diversion Project," *Radio Liberty Research Bulletin*, RL 4/81 (2 January 1981); and Sergei Voronitsyn, "Will the Efforts of the Uzbek 'Lobby' Speed Up the Diversion of Siberia's Rivers?" *Radio Liberty Research Bulletin*, RL 76/81 (20 February 1981).

[96]*Pravda*, (23 February 1981).

[97]Peter Rostankowski, "Transformation of Nature in the Soviet Union: Proposals, Plans

Siberian rivers to Kazakhstan and Central Asia."[98] Sharaf Rashidov chose to be more direct in his attempt to sway the Congress, noting that

> In his report to the Party Congress, Leonid Ilyich Brezhnev put special emphasis on the need to work out a special food programme for the country....A positive resolution of the question of beginning work to divert part of the flow of Siberian rivers...would make it possible to create a new, unique and highly productive region for irrigated farming and would be a major contribution to the implementation of the food programme.[99]

On the surface, this would seem to be an excellent argument. However, the food programme of the Eleventh Five Year Plan outlined by Brezhnev in his report to the Congress said little on the subject of the products that a Central Asian farming region would yield. Traditionally, proponents of river diversion emphasized the increased production of cotton, fruits, and vegetables that would be created by the water.[100] The food programme as described by Brezhnev would concentrate not on these goods, but instead on increasing the production of meat and associated animal-husbandry products.[101] It was therefore difficult for Rashidov to argue that river diversion was essential for the Central Asian republics to make a contribution to the programme. In any case, the food programme was relatively short-term in its scope; even the most fanatical supporters of Siberian river diversion admitted that, at the very earliest, water would begin to flow only in the late 1990s. It is doubtful, then, that Siberian river water would be a factor in any Central Asian contribution to the food programme.

The conclusion of the 26th Party Congress, and the defeat of the Siberian river diversion proponents there, did not mean an end either to the project's planning or to the debate concerning its feasibility or

---

and Reality," 385.

[98]*Pravda*, (25 February, 1981), 2.

[99]*Ibid.*, 3-4.

[100]A. Babayev, "Science and Technology: Vistas of the Twenty-First Century," *Krasnaya Zvezda* (26 March 1983). Translated in FBIS-SOV-83-069. FBIS Daily Report. Soviet Union (8 April 1983), as "Scientist Discusses Siberian River Diversion," U1. See also Sergei Voronitsyn, "The Plan to Divert Siberian Rivers and Pressure from the Central Asian Lobby," *Radio Liberty Research Bulletin*, RL 400/80 (27 October 1980), 4.

merits, however. Indeed, stung by their defeat, in the Eleventh Five Year Plan period (1981-85) the project's supporters fought back in the republican and national press, as well as in scientific and technical journals. They were met by resistance from the scientists who had successfully delayed the advancement of the project. Moreover, the debate was widened and crucially changed by the involvement of economists and, for the first time, the Soviet public.

Debates And Cancellation: The Eleventh Five-Year Plan And Beyond

The period from the conclusion of the 26th Party Conference to the cancellation of all large-scale river diversion schemes in the USSR in August 1986 was a confused one in relation to the status of the Siberian river diversion project. The political and economic leadership at the upper echelons of the CPSU in Moscow alternatively warmed and cooled to the project, approving various aspects of it at some times and either studiously ignoring it or criticising it at others. Some scholars writing on the status of the project in the early 1980s have admitted to being perplexed by the apparent vacillation of the central leadership.[102] This perplexity was no fault of the researchers: in the early and mid-1980s it was extraordinarily difficult to discern accurately exactly what was transpiring in regards to Siberian river diversion. It has since been possible to unravel the complicated and labyrinthine chain of events leading to the ultimate cancellation of the project in 1986. When one considers the tenor of the debate leading up to the 26th Party Congress in 1981, it would be natural to assume that environmental concerns would have figured largely in the final cancellation of Siberian river diversion in 1986. In fact, this was hardly the case at all.

In the year after the 26th Party Congress, Central Asian proponents of river diversion were, with only a few exceptions, relatively subdued. Sharaf Rashidov, in particular, noted in a speech to a plenum

---

[101] *Pravda*, (23 February 1981).

[102] See, for example, Bess Brown, "Whatever Happened to 'Sibaral?'", *Radio Liberty Research Bulletin*, RL 420/85 (13 December 1985).

of the Uzbek Central Committee in September 1981 that while river diversion would have "enormous significance for the economic and social development of the republic and of all the Central Asian region," it was clearly a solution for the far future. In the short term, he said, "one of the urgent tasks is the maximum economy and rational use of irrigation water."[103] In this Rashidov was supported by the rector of the Samarkand Agricultural Institute, K. Khamatov, who also argued that better utilization of existing water supplies in the republic and Central Asian region could largely overcome shortfalls projected for the future.[104] In opting for a conservationist policy emphasising reconstruction and the improvement of the region's existing irrigation systems, these individuals were essentially in agreement with the statements of the critics of river diversion who had spoken up prior to the 26th Party Congress.

Not all Central Asian supporters of river diversion agreed with this policy, however. In a November 1981 issue of *Ekonomicheskaya gazeta* an article by a group of Central Asian scientists and "honoured irrigation workers" appeared which strongly attacked the concept of irrigation modernization as being a panacea for the region's water shortages.[105] The authors stated that measures aimed at improving the efficiency of irrigation practices in Uzbekistan were already well under way, and criticized the expectations of "some optimists" that this work would eventually lead to systems with a 90-95 per cent efficiency rate (the then-current rate was approximately 60 per cent), suggesting that such a level was "an unreachable goal." Pointing out that whatever savings achieved through efficiency improvements would immediately need to be used to

---

[103]*Pravda Vostoka*, (12 September 1981). Cited in Bess Brown, "Discussion of Siberian Rivers Diversion Continues," *Radio Liberty Research Bulletin*, RL 478/81 (1 December 1981).

[104]Brown, "Discussion of Siberian Rivers Diversion Continues," 2.

[105]B. Korzhavin, A. Bostandzhoglo, A. Pugachev, and E. Rakhimov, "Once More About Water Resources and Southern Farming," *Ekonomicheskaya gazeta*, No. 45 (18 November 1981). For a complementary point of view, see Ye. Fyodorov, "Nothing is Free!", *Literaturnaya gazeta*, No. 47 (18 November 1981).

fulfill the republic's commitments to expand irrigation efforts in the Eleventh and Twelfth Five-Year Plans, the authors declared that

> In the long term increases in irrigated land through the use of the republic's own water resources will fall off drastically. When we consider the fact that the population will grow sharply and that requirements for foodstuffs -- taking into account shipments to other parts of the country -- will increase, we get a clear picture of the enormous social and economic difficulties that await us if water from Siberia fails to arrive in time.[106]

In any case, the authors said, a complete reconstruction of the republic's irrigation systems would take an extremely long time -- up to thirty years -- and would result in only small water savings. Well before the time the process would be completed, the region's water supply would have passed critical levels. It is for this reason that they concluded that "it is inadmissible to counterpose internal work on reconstructing the irrigation network to the diversion of the flow of Siberian rivers to solve problems connected with the depletion of water resources of the Aral Sea basin."[107] For the authors of this article, the only possible solution was to speed up the implementation of the Siberian river diversion project.

In March 1982 there appeared an extraordinary pair of articles in the journal *Literaturnaya gazeta* which brought the debate on Siberian river diversion into new focus. One of the articles, an interview with the project's chief engineer, I. A. Gerardi of the All-Union Ministry for Land

---

[106]Korzhavin *et al.*, "Once More About Water Resources and Southern Farming." This statement is remarkable for the number of challenges it contains to policymakers. By emphasizing the shipment of foodstuffs, the authors are highlighting the agricultural importance of the republic in a none-too-subtle fashion. Even more obvious is the reference to the sharply rising population of Central Asia; regional proponents of river diversion had argued that the project was important because of the employment it would provide for this growing population. In his speech to the 26th Party Congress earlier that year, Brezhnev had repudiated this view by stating that excess Central Asian labour should be prepared to take a more active role in the development and exploitation of new territories (i.e., Siberia). In other words, the excess population should be willing to relocate to other areas of the USSR to find work. *Pravda*, (24 February, 1981). On this point see also Bess Brown, "Setback for the Central Asian Lobby over the Siberian Rivers Diversion Scheme," *Radio Liberty Research Bulletin*, RL 103/81 (6 March 1981).

[107]Korzhavin *et al.*, "Once More About Water Resources and Southern Farming." Note that this is simply a reiteration of earlier arguments by Central Asian proponents of river diversion.

Reclamation and Water Resources, described the plans for the scheme in some detail.[108] Gerardi systematically addressed criticisms of Siberian river diversion, stating that only a small portion of the flow of the Ob' and Irtysh rivers would be redirected; that there were no plans to build large reservoirs on the courses of these rivers that would inundate large areas of western Siberian land; that water losses along the main trunk canal transferring the water from the Irtysh to Central Asia would be very low (lower, in fact, than water losses in other, shorter irrigation canals); and that the project would produce no effect whatsoever on conditions along the Arctic coast. He accused those who demanded that "the project be thoroughly substantiated ecologically, down to trifling matters" of "belittling knowledge that has already been accumulated, confusing the problem and burying its tremendous socioeconomic essence under an excess of detail."[109]

Gerardi specifically contradicted assertions by other supporters of Siberian river diversion who had argued that the project was essential for the maintenance of the Aral Sea; instead he said that "the Aral will get nothing from the first stage. Only the second stage may give the sea some support."[110] Considering that "saving the Aral" was a central theme of the campaign to implement Siberian river diversion in the late 1970s,[111] this assertion by the project's chief designer was a notable reversal of policy.

Gerardi was then asked whether the project might be too costly, and whether measures to improve Central Asian irrigation might not be more economical. In a reply which totally failed to address the question as posed, Gerardi repeated the argument advanced by the Central Asian proponents that "the one [irrigation improvements] cannot be counterposed with the other [river diversion]." The only thing that was said about the project's cost was that "outlays should be recouped in ten

---

[108]"The Calculations are Convincing: Interview with I. A. Gerardi," *Literaturnaya gazeta*, No. 10, (10 March 1982), 11.
[109]*Ibid.*
[110]*Ibid.*

years" and that the main diversion canal -- in the project's second stage -- would be connected to the Caspian Sea, thus providing a direct waterway from Siberia to Europe.[112] This failure to discuss in detail the economics of the project was a significant evasion on Gerardi's part, especially when viewed in light of the other *Literaturnaya gazeta* article on river diversion.

Entitled "The Idea is Intriguing But...", the article was by Candidate of Economics V. Perevedentsev, an economist working at the Institute of Economics and Organization of Industrial Production (a notably progressive institute), in the Siberian city of Novosibirsk.[113] Although he began by describing the deep divisions that existed between the project's engineers and planners on the one hand, and the scientists concerned about environmental and economic problems on the other, Perevedentsev spent the balance of the article engaged in a devastating analysis of the economics of the project. His calculations, which he admitted were rough, were based on a costing of the project provided by the State Expert Committee which had reviewed and approved the *Soyuzgiprovodkhoz* technical-engineering feasibility study from 1978-1980. Perevedentsev clearly showed that the capital investment in the project could not possibly be recouped in ten years,[114] suggesting instead

---

[111]On this point, see note 44 above.

[112]*Ibid.* On the importance of the canal as a water transport route, see A. Antonnikov, "Interbasin River Reversal," *Vodnyy Transport*, (27 December 1977), 3. Translated in JPRS - 70720. Translations on USSR Resources, No. 781 (2 March 1978), 157-158.

[113]V. Perevedentsev, "The Idea is Intriguing But...," *Literaturnaya gazeta*, No. 10 (10 March 1982), 11.

[114]*Ibid.* Perevedentsev based his calculations on the following assumptions: 1. That the project would require 14 billion rubles of capital investment, the figure announced by the State Expert Committee of *Gosplan*; 2. That the project would supply the Central Asian republics with 17 km^3 of water per annum (this figure is based on the annual holding capacity of the proposed distribution point, the Tegizskoye Reservoir, to be constructed at the dry Lake Chelkar-Tengiz north of the Aral Sea); 3. That the efficiency of irrigation systems in the region would be at 75-80 per cent, so for a given amount of water supplied, 75-80 per cent of it would actually reach the fields.

Based on these assumptions, Perevedentsev supposed, "for simplicity's sake", that 14 billion cubic metres of water would reach the fields per annum. (In this he is being generous: at an efficiency rate of 75-80 per cent, one would expect only 12.75-13.6 billion cubic metres of water to reach the fields. Nevertheless, Perevedentsev's generosity simplifies the calculation to mean that, in terms of capital investment on the canal, each cubic metre of water delivered to the fields will cost 1 ruble.)

that "it is highly doubtful that it would pay for itself in thirty years even." Sarcastically he stated that "I have often heard Igor Andreyevich Gerardi, the project's chief engineer, talk about the canal's great economic advantageousness. I hope that the project also has a chief economist. It's his views on the economic aspects of the project that I would like to hear." In concluding his argument concerning the scheme's economic dimension, Perevedentsev wrote:

> Given the indices we have today and the present level of production, the construction of an Ob'-Amu Dar'ya canal would lead to a substantial decline in the effectiveness of capital investments in agriculture and would do immense economic damage to the country....
>
> I think that this project should be considered not in and of itself but as part of the comprehensive specific-purpose food programme, as a hypothetical alternative by which specific tasks can be accomplished. I think that, for the present, this alternative is not competitive: there are more advantageous ways of achieving the same results [and] some of them have been mentioned during the discussion of the canal project.[115]

Perevedentsev's article was notable not only because it raised in the popular press the issue of the economics of the project in detail for the first time, but also because of the degree of fury that it provoked among Central Asian river diversion proponents. In Bess Brown's words, "irrigation specialists in Uzbekistan countered with an article that dismissed Perevedentsev's doubts, stated repeatedly that he did not know what he was talking about, even sniping at him with the title of the piece: 'The Project of the Century Does Not Tolerate Dilettantism.'"[116] If anything, Brown has understated the situation: the article, by S.

Proceeding from this, it would be necessary to generate a net output of 100 rubles of product per 1,000 cubic metres of water supplied per hectare per year in order for the project's capital costs to be recouped in ten years.

But Perevedentsev notes that "the cotton sovkhozes of Andizhanskaya Oblast [some of the most profitable in the region] obtain only 8-50 rubles of net income per 1,000 cubic metres of water. Even with an income of 50 rubles per 1,000 cubic metres of irrigation water (which is unlikely) expenditure on the canal (only on the canal!) would be recouped in 20 years. And we are not yet taking into consideration considerable current expenditure on the operation of the canal."

[115]*Ibid.*

[116]Bess Brown, "Criticism of Siberian River Diversion Scheme Gets Hot Retort from

Ziyadullayev, A. Bostanzhoglo, and A. Pugachev, accuses Perevedentsev of "tendentiousness" and a "distortion of the actual situation."[117] In attacking Perevedentsev's criticisms of Central Asian irrigation practices, the authors state that "if he knew just a little of the history of irrigation and the measures adopted by the CPSU Central Committee and Vladimir Il'yich Lenin in the solution of problems of irrigation in our region, the author would not express such baseless judgments"[118] -- a truly astounding statement, since Lenin was not involved in "solving any problems" of Central Asian irrigation!

What is interesting about the article is not simply the harshness with which it treats Perevedentsev and his arguments, but that it completely fails to engage his economic analysis whatsoever. Indeed, the only time this point is mentioned, it is as follows: "Nor is there any doubt as to the unsubstantiated nature of the author's arguments concerning the time that will be taken for the canal to pay for itself. According to the scientists' and planners' calculations, this will take 8-10 years. And these are entirely correct calculations."[119] The fact that the authors of this article could come up with no rebuttal more substantial suggests that no such rebuttal existed.

The March 1982 debate in the pages of *Literaturnaya gazeta* was an interesting one because it focused the debate on Siberian river diversion on the economics of the project for the first time, and at a time when one of the strongest supporters of the scheme was coming under direct political pressure. Sharaf Rashidov had held the position of First Secretary of the Uzbek CP since 1959, and over the years had created an intricate political machine far removed from Moscow control. But it was in the latter stages of Brezhnev's leadership, the period of "stagnation,"

Uzbekistan," *Radio Liberty Research Bulletin*, RL 167/82 (20 April 1982), 1.

[117]S. Ziyadullayev, A. Bostanzhoglo, and A. Pugachev, "The 'Project of the Century' Will Not Brook Dilettantism," *Pravda Vostoka*, (3 April 1982). Translated in JPRS - 80842. USSR Report. Political and Sociological Affairs. No. 1253 (18 May 1982), 61-65. Bostanzhoglo and Pugachev were also coauthors of the November 1981 article from *Ekonomicheskaya gazeta*, (see n. 105 above) and this article generally repeats the arguments made there.

[118]*Ibid.*, 63.

that Uzbekistan became the focus for a web of political and economic corruption that reached staggering proportions. Between 1976 and 1983 the political and economic leadership of Uzbekistan defrauded the Soviet government out of approximately 3 billion rubles by falsely inflating the yields of the Uzbek cotton harvests. In his study of political corruption in the USSR, William Clarke describes Rashidov as "a candidate member of the central Politburo [who] exercised considerable power at the national level. In Uzbekistan, he was a god. In addition, he enriched himself and his republic from Moscow coffers at mind-boggling levels. The problem, of course, was that each of these wonders was based on a chimera, a conscious lie: make-believe cotton."[120]

After Brezhnev's death in November 1982 his successor as General Secretary of the CPSU, Yuri Andropov, determined to get to the bottom of the "cotton scandal." This was a continuation and component of the anticorruption drive he had instituted while KGB chief, as a political tool to undermine Brezhnev in the latter's declining months. But assaulting the "kleptocracy,"[121] especially where it was so deeply entrenched in Central Asia, was a difficult business: Andropov could not rely on either KGB or police reports from the republic since most of the republican security officials were part of the conspiracy. Clarke outlines the bizarre scenario which followed: "Andropov rerouted spy satellites usually focusing on the country's external enemies and aimed them at the Uzbek cotton fields. This represented the degree to which the Uzbek mafia controlled events in the republic; the Soviet head of state was forced to use spy satellites to garner accurate estimates of the real Uzbek cotton harvest!"[122] Hard, irrefutable evidence of Uzbek corruption was slow to accumulate and, indeed, it was not until after Andropov's death in February 1984 that sufficient evidence was gathered to allow for a

---

[119]*Ibid.*, 64.

[120]William A. Clarke, *Crime and Punishment in Soviet Officialdom: Combating Corruption in the Political Elite, 1965-1990.* (Armonk, NY: M. E. Sharpe, 1993), 188.

[121]This apt term was coined by Konstantin Simis in his article "The Machinery of Corruption in the Soviet Union," *Survey* 23, no. 4 (1977-78), 35-55.

[122]Clarke, *Crime and Punishment in Soviet Officialdom*, 188-189.

public accusation to occur. But the knowledge that Andropov was intent on destroying the political corruption of Brezhnev cronies who had outlived their patron meant that Rashidov was forced to be extremely circumspect in his dealings with the highest echelons of the CPSU in Moscow.[123]

The fact that Rashidov was preoccupied by matters other than lobbying for the implementation of Siberian river diversion is apparent from the fact that, after Brezhnev's death, Rashidov's name ceases to be associated with the project. At the time, this did not seem to be a blow to the supporters of the scheme, especially given the events to come, but in the long term the loss of so powerful and secure a lobbyist as Rashidov, first to distraction and then to death in November of 1983, seriously harmed the boosters' cause.

Nevertheless, 1983 and 1984 appeared to be banner years for the supporters of Siberian river diversion. First there appeared a flurry of articles in late 1982 and early 1983 in the Kazakh press calling for the implementation of the scheme.[124] Then a major report of a round-table discussion of Uzbek scientists, irrigators, and writers appeared in the Uzbek newspaper *Ozbekiston Adabiyoti va San'ati* [Literature and Art of Uzbekistan], the occasion for which was "the happy news from Moscow" that "*Gosplan* has endorsed the findings of a state commission of experts that a portion of the waters of the rivers of Siberia can be directed to Central Asia and Kazakhstan."[125] The participants were more sanguine about the economic viability of the project than had previously been seen: they suggested that the canal itself would cost 12.5 to 13 billion

---

[123]*Ibid.*, 189.

[124]See, for example, Mazhit Madenov, "Twelve Months of the Year," *Qazaqstan Ayyelderi*, No. 10 (October 1982), 22-23. Translated in JPRS - 83117. USSR Report. Political and Sociological Affairs, No. 1387. (23 March 1983), 5; Shapyq Shokiuly Shokin, "Questions to Look Into," *Qazaq Adebiyeti*, (28 January 1983), 3. Translated in JPRS - 83928. USSR Report. Political and Sociological Affairs, No. 1430. (19 July 1983). For a discussion of the latter article, see Roostam Sadri, "Possible Environmental and Demographic Problems from Diversion of Siberian Rivers," *Radio Liberty Research Bulletin*, RL 196/83 (17 May 1983).

[125]*Ozbekiston Adabiyoti va San'ati*, (1 April 1983). Translated in JPRS - 84563. USSR Report. Political and Sociological Affairs. No. 1467 (19 October 1983), 34-41, as "River Diversion Boosted at Tashkent Roundtable."

rubles, and a further 20 to 22 billion rubles would be required for the construction of "general structures" to support it. But since the project would return an annual income of 4.6 to 4.9 billion rubles, it would pay for itself in only five or six years.[126] As Sergei Voronitsyn has suggested, the article is interesting because "it is possible to detect not only a feeling of satisfaction at the signs of change in attitudes at the top, but a sense of firm confidence in the timely realization of a project that has now been approved."[127]

It is possible that the participants in the Tashkent roundtable had been provided with advanced notice of the approval of Siberian river diversion; it is also possible that they were simply reading general signs from Moscow that hinted at the imminence of the event. Radio Moscow reported on 15 March on a collegium of the USSR Ministry of Land Reclamation and Water Resources that had met recently "to discuss the the importance of timely measures for redirecting water from Siberian rivers to irrigate the lands under cultivation in the Central Asian republics."[128] But in the event, a general go-ahead for the construction of the project was not in fact issued by the authorities. In an interview broadcast on Moscow domestic radio service in July 1983, N. F. Vasilyev, the USSR Minister of Land Reclamation and Water Resources, hinted that construction on the Siberian project was a more remote possibility than the Central Asian interests suspected when he was purposefully vague concerning its schedule.[129] Thus, instead of announcing a formal initiation of construction, in August 1983 the Expert Committee of *Gosplan* merely declared its recommendations concerning the

---

[126]*Ibid.*, 36. There is no supporting evidence given for these figures.

[127]Sergei Voronitsyn, "Go-Ahead About to be Given for Siberian River Diversion Project?" *Radio Liberty Research Bulletin*, RL 184/83 (4 May, 1983), 3.

[128]*Ibid.*

[129]Moscow Radio Domestic Service, 0910 GMT, 5 July 1983. Translated in FBIS-SOV-83-134. FBIS Daily Report. Soviet Union. (12 July 1983), T1. Vasilyev discussed both the European and Siberian transfer schemes in the interview. In regard to the former, he was very specific, providing a timeline for construction and implementation; but in regard to Siberian river diversion all he said was that "another major water economy task is also in line, comrades. This is the transference of part of the flow of Siberian rivers to Central Asia."

Soyzugiprovodkhoz technical-economic feasibility study that had been under consideration since 1980.

The Expert Committee was generally in agreement with the feasibility study: the only major recommendation appended by the committee was an increase in the volume of water to be transferred, from 25 km^3 to 27.2 km^3 per annum.[130] (It should be noted that this increase of 2.2 km^3 per annum corresponds suspiciously with the amount of water expected to be lost by filtration and evaporation along the Main Diversion Canal, and it is reasonable to suggest that the Expert Committee sought to make up that loss by simply increasing the amount to be diverted.) The *Gosplan* recommendations were then submitted to the Council of Ministers USSR for review and approval.[131] It should be emphasized that this did *not* mean that the project itself had been approved, merely that the general plans for the project were considered acceptable by *Gosplan*. It would thus appear that the celebration evident in Central Asian circles concerning the "happy news from Moscow" was perhaps premature.

In January 1984, however, the recommendations of the *Gosplan* expert committee were accepted by the USSR Council of Ministers, and the Council issued a directive to the USSR Ministry of Land Reclamation and Water Resources to draw up detailed plans and engineering designs necessary for construction of the Siberian river diversion project.[132] These plans were to be completed by 1986, and submitted to the Council of Ministers for examination. Following the January 1984 acceptance of the *Gosplan* recommendations, a series of interviews with and articles by senior individuals responsible for the planning and design of the project were published in the Soviet press, in an attempt to raise the profile of Siberian river diversion among Soviet citizens.

---

[130]Philip P. Micklin, "Recent Developments in Large-Scale Water Transfers in the USSR," *Soviet Geography: Review and Translation* XXV, no. 4 (April 1984), 262.

[131]*Ibid.*

[132]Yu. Yudin, "A River Will Flow From Siberia," *Sovetskaya Rossiya*, (29 August 1984), 3.

The first of these was an interview with G. V. Voropayev in the Tashkent newspaper *Lenin Bayraghy* in February 1984. Voropayev noted that the population of the Central Asian region was growing rapidly and would reach 50 million by the turn of the century.[133] It would be impossible to supply this population with water on the basis of locally available resources, and for this reason "the diversion of Siberian river water remains the only possibility of solving the water problem in Central Asia." Also, according to Voropayev, the matter was one of some urgency and, given the fact that the construction phase would last ten to twelve years, it was "necessary that the work of planning [the project] be completed in 1986."[134]

These arguments were mirrored to a great extent by Polad Polad-Zade, the first deputy minister of the Ministry of Land Reclamation and Water Resources and chairman of the USSR State Committee for Science and Technology's Scientific and Technical Commission for the Territorial Reallocation of Water Resources. In an interview conducted by a correspondent from *Izvestiya* in June 1984,[135] Polad-Zade argued, like Voropayev, that the only solution to the water shortages experienced in Central Asia was the diversion of Siberian water, and reassured readers that "there is no threat of any climatic changes on a global scale, and...adverse effects on nature and economic activity in the regions from which the water is taken can be minimized and even eliminated entirely."[136] Significantly, however, Polad-Zade refused to offer an explicit timetable for the project, noting only that "specific planning and survey work still has to be carried out." He pointed out that this meant that there was still time to draft correct plans which would make use of "the best Soviet and world experience of water diversion and land reclamation construction."

---

[133]*Lenin Bayraghy*, (15 February 1984), 4. Translated in JPRS - 84049. USSR Report. Political and Sociological Affairs. (25 May 1984), 63.
[134]*Ibid.*
[135]V. Zakharko, "Northern Water for the South; Interview with P. Polad-Zade," *Izvestiya*, (22 June 1984), 2.
[136]*Ibid.*

In another interview with Voropayev, conducted in August 1984 by the newspaper *Sovetskaya Rossiya*, the topic of the economics of the project was raised. Voropayev stated that Siberian river diversion would "start working for the country's benefit while still at the stage of construction. The many complexes due for commissioning, which will be included in the project, will become operational as soon as they are ready for use -- to supply water to new fields, industrial enterprises, and the settlements and cities that will rise along the project's course."[137] This is an important point, because it was repeatedly stated by proponents of the scheme that it would pay for itself in a certain period of time (as suggested previously, the figures offered by these individuals vary from as low as five years up to ten years) measured from its *completion*. If, as Voropayev and Polad-Zade suggest, the canal would be supplying water prior to completion, then it would have been generating income as soon as the first construction stage was completed (presumably the Belogor'ye-Tomsk cascade). The Central Asian claims ignore this fact, and therefore overemphasize the economics of the project.

The appearance of these articles reporting the views of such high-profile members of the Siberian river diversion programme indicated that the project was the object of serious study in Moscow, and the October 1984 Plenum of the Central Committee CPSU and Council of Ministers confirmed this fact when it issued a resolution on land reclamation that included references to river diversion projects.[138] The resolution must have been a disappointment to the supporters of Siberian river diversion because it stated that the Ministry of Land Reclamation and Water Resources was directed to complete the construction of European river diversion projects in the 1986-2000 period, but the ministry was directed

---

[137]Yu. Yudin, "A River Will Flow From Siberia," *Sovetskaya Rossiya*, (29 August 1984), 3. Polad-Zade also indicated that the scheme would begin supplying water on an interim basis prior to its overall completion (see n. 131).

[138]"On the Long-Term Programme of Land Reclamation and Increasing the Effectiveness of the Use of Reclaimed Land With a View to the Steady Buildup of the Country's Food Stocks." *Pravda*, (27 October 1984). Reprinted in *CDSP* XXXVI, no. 45 (5 December

only "to complete the drafting of a design for the construction of a Siberia-Central Asia Canal" in the same period.[139]

Central Asian proponents of Siberian river diversion did not, however, let their disappointment show. In January 1985 a curious article appeared in *Pravda Vostoka* which detailed the arrival of Uzbek irrigation and construction crews in Tyumen Oblast to begin the construction of infrastructures required for the overall construction of the first stage of the Main Diversion Canal.[140] It is not entirely clear how these workers from Uzbekistan were welcomed, however. In December 1984 a major article detailing Siberian fears for the River Irtysh appeared in the Moscow magazine *Oktyabr'*. The author, Vladimir Cheshegorov, detailed his experiences travelling down the entire length of the river from its source at Lake Kaysan to the point where it converges with the Ob', at Khanty Mansiysk.[141] Much of the article details the environmental damage that the river has already suffered, and describes the fears of those who live along its course that their way of life will be irreparably harmed by the diversion of its water to Central Asia. Cheshegorov apparently shared these concerns, because he asked

> Are we doing the right thing by overworking such a depleted river? Should we then be surprised that the Irtysh grows noticeably shallower each year? [T]hey are working out plans to divert part of the flow of the Siberian rivers to the south. And this will affect the Irtysh. In the region where it discharges into the Ob' they plan to take 25 cubic kilometres of water for the first phase of the diversion, and for the second -- up to 60. But to this enormous figure one must

---

1984), 11.

[139]*Ibid.* This distinction between the status of the two projects was reinforced by a Radio Moscow international broadcast of 24 October 1984 which stated, in response to a "listener's question" from Britain, that "work has begun on the first stage of [the Siberian] project -- the planning and routing of the canal that is to carry water from the River Ob' southwards to the Amu Darya." No mention was made of anything beyond planning. Radio Moscow International Service, 2000 GMT, 24 October 1984. Translated in FBIS-SOV-84-208. FBIS Daily Report. Soviet Union. (25 October 1984), S6.

[140]*Pravda Vostoka*, (9 January 1985). Translated in *CDSP* XXXVII, no. 2 (6 February 1985), 12. Judging by the photographs accompanying the article, the construction was very small-scale.

[141]V. Cheshegorov, "We Live on the River," *Oktyabr'*, No. 12 (December 1984), 173-185. Translated in JPRS-85023. USSR Report. Political and Sociological Affairs. (15 March 1985).

> unfortunately continue to add more and more, because the use of water for the industrial and everyday needs of cities and villages near the Irtysh will grow; nearby sovkhozes will also expand their network of irrigation systems; and besides that, water is needed to fill the reservoir of the Shul'binskaya Hydroelectric Station already under construction. In this event, what will remain of the Irtysh itself?[142]

Cheshegorov's article demonstrated for the first time the level of fear and resentment harboured by Siberians faced with the prospect of river diversion. In interviewing a land reclamation engineer, Cheshegorov found these fears most fully expressed. The engineer, F. I. Shilyayev, said that he had followed the 1982 debate between I. A. Gerardi and V. Perevedentsev in the pages of *Literaturnaya gazeta* and, while he understood Gerardi's position as an engineer, he was on Perevedentsev's side "in spirit". Shilyayev characterized the debate as between "the so-called conquerer of nature and her defender" and said that "in the argument the truth will come out."[143]

The appearance of Cheshegorov's article, and others like it, indicated that public debate over Siberian river diversion was forming along a new, geographical axis. It is true that scientists had expressed doubts concerning the negative impact of river diversion on the Siberian withdrawal zone in the 1970s, but by the mid-1980s Siberians themselves had found a voice with which to protest. Proponents of the scheme were therefore faced with hostility from two different directions: from those who doubted its economic viability, and from those who feared its consequences. Even so, this did not seem to be a serious problem because, remarkably, in the summer of 1985 it was formally announced that the Siberian river diversion scheme had moved from the planning stage to the initial stages of construction.

---

[142] *Ibid.*

[143] *Ibid.* It should be noted that, at approximately the same time, similar fears began to be expressed by residents of the areas of northern Russia from which the European schemes would draw their water. See, for example, "Man and Nature: Northern Waters Will Flow South," *Trud*, (29 August 1985), 2.

The announcement was remarkable because it was made by N. F. Vasilyev at a news conference attended by major international news organizations.[144] It was also remarkable because of the date on which the announcement was made, 5 June -- International Environmental Protection Day.[145] The announcement followed several months of speculation in the Western press that the Siberian scheme had been shelved indefinitely and, indeed, following Vasilyev's announcement the most rapid expression of concern came not from within the USSR but from Canada.[146]

Unlike the announcement of the acceptance of the *Soyuzgiprovodkhoz* feasibility study in 1983, and unlike the campaigns surrounding Siberian river diversion waged at the 25th and 26th Party Congresses, Vasilyev's announcement was not preceded by articles in the Soviet press, nor did it draw much response afterwards. It is true that a series of articles appeared primarily in the Central Asian press in the later summer of 1986, but they were mostly "stock" articles that covered the well-tilled territory of population increases; the impossibility that local resources could last, even with better management; that the project would have little or no negative environmental consequences; and so on.[147] More curious was the fact that *none* of these articles referred to Vasilyev's news conference -- a remarkable omission given the tendency of river diversion proponents to seize on the merest of straws to indicate that the project enjoyed support in Moscow.

Most strange of all were the events of the autumn of 1985. The first indication that something was amiss was the abrupt disappearance

---

[144]See Bess Brown, "The USSR is Going Ahead With 'Sibaral'," *Radio Liberty Research Bulletin*, RL 194/85 (7 June 1985).

[145]*Ibid.*, 1. Bess Brown wryly noted that this was an ironic coincidence.

[146]For comments on Siberian river diversion in the Western press, see for example *The Economist*, (28 July 1984). On Canadian reaction to Vasilyev's announcement, see Brown, "The USSR is Going Ahead With 'Sibaral'," 1; and *Radio Free Europe/Radio Liberty Special Report*, (6 June 1985).

[147]See, for example, "Will the Siberian Rivers Come? Yes!"*Ozbekiston Adabiyoti Va San'ati*, (9 August 1985). Translated in JPRS-85080. USSR Report. Political and Sociological Affairs. (19 November 1985); "River of Brotherhood: What the 'Siberia-Central Asia Canal' Will Provide," *Pravda Vostoka*, (21 August 1985). Translated in

of all articles on the subject of Siberian river diversion at the end of August. This was followed by the total omission of the project in the Draft Guidelines of the Twelfth Five-Year Plan, published in *Izvestiya* and *Pravda* in early November 1985.[148] Bess Brown points out that deputies from Uzbekistan who spoke at the November 1985 session of the USSR Supreme Soviet also failed to mention the project in their speeches, an utter departure from the norm, and concluded from this that "it would seem that further discussion of the project has been forbidden, but it is not clear why."[149] She offers the possibility that the demise of the project was somehow connected with the then two-year-old anticorruption drive against the Uzbek CP and republic, and opines that the new First Secretary of the Uzbek Party Committee, I. Usmankhodzhayev, "may have been told to clean up his republic...and show that the Uzbeks can make efficient use of what resources they now have before asking for an expenditure on the scale of the Siberian river diversion."[150] There is undoubtedly some merit to this analysis: Usmankhodzhayev was clearly a far weaker First Secretary than his predecessor, crippled as he was by Rashidov's corruption, and was therefore unable to act with the same surety.[151] But in order to appreciate fully the demise of Siberian river diversion, a return to the economics of the scheme is required.

JPRS-85084. USSR Report. Political and Sociological Affairs. (26 December 1985).

[148]*Pravda* (9 November 1985); *Izvestiya*, (9 November, 1985). The latter reprinted in *CDSP* XXXVII, no. 48 (25 December 1985). The Draft includes the draft resolution, under Section VI, The Development of the Agro-Industrial Complex and the Implementation of the Food Programme, merely "to significantly increase the scientific substantiation of the regional redistribution of water resources" and "to begin work connected with the diversion of part of the flow of northern rivers into the Volga Basin." This is a reference to European river diversion only.

[149]Bess Brown, "Whatever Happened to 'Sibaral?'", 1.

[150]*Ibid.*, 4.

[151]At the Uzbek Party Congress held just prior to the 27th CPSU Congress in February 1986, Usmankhodzhayev was forced to admit contritely that "I and a number of other senior personnel had been unable to act in a principled manner against Rashidov's erroneous practices and had sometimes humoured him. All this was a breeding ground for violation of the rule of law and for all manner of abuses of official position." *Pravda*, (2 February 1986). Cited in Baruch A. Hazan, *From Brezhnev to Gorbachev: Infighting in the Kremlin* (Boulder, CO: Westview Press, 1987), 198.

In his 1982 *Literaturnaya gazeta* article, Perevedentsev made the following revealing statement concerning the economics of Siberian river diversion: "At a meeting in Novosibirsk in the autumn of 1979 Academician A. G. Aganbegyan said plainly that the canal had no economic substantiation. As far as I can judge, it still has none."[152] A. G. Aganbegyan was at that time director of the Institute of Economics and Organization of Industrial Production (IEiOPP), a post he had held since 1966. He was also editor of the institute's journal *EKO*, one of the most popular and respected economics journals in the USSR.[153] Indeed, it is surprising that Aganbegyan himself was not the author of the *Literaturnaya gazeta* article instead of his junior, Perevedentsev, especially given the stature of I. A. Gerardi, Perevedentsev's disputant. Still, it must be admitted that as head of a Siberian economics institute, Aganbegyan did not enjoy the same level of trust or authority as did his Moscow-based counterparts -- and in any case, in the late 1970s, the closed circle of economists and planners that had grown up as Brezhnev's advisory circle was difficult to penetrate.

Following Brezhnev's death, however, the political situation in Moscow changed dramatically, with the rise of Andropov to General Secretary; the Chernenko *interregnum*; and the concomitant rise in the power and stature of M. S. Gorbachev. Gorbachev first met Aganbegyan in 1982 through the Siberian sociologist Tat'yana Zaslavskaya, who also worked at IEiOPP,[154] and the junior Politburo member was apparently much impressed by the economist's ideas. When Gorbachev assumed the General Secretaryship of the CPSU in March 1985, he quickly brought Aganbegyan from Novosibirsk to Moscow to act as his principal economic advisor.[155]

---

[152]Perevedentsev, "The Idea is Intriguing But...," 11.

[153]A. Aslund, "Gorbachev's Economic Advisors," *Soviet Economy* 3, no. 3 (July-September 1987), 259.

[154]Archie Brown, *The Gorbachev Factor* (Oxford: Oxford University Press, 1996), 60.

[155]A position that was confirmed first by the fact that Gorbachev used Aganbegyan as a speechwriter for an important speech given at a June 1985 Central Committee conference on scientific-technical progress, and second by the fact that Aganbegyan was the only economist with an academic background to give a speech at the same

As a reformist architect of the policy of *perestroika*, Aganbegyan was highly critical of prior Soviet investment policy, which had emphasized new construction over modernization and overall productive output over that output's quality.[156] For Aganbegyan, it was critical for the "whole structure of capital investment...to be fundamentally changed, reorienting it from extensive development, i.e. focusing extra resources on intensive methods of production and increased efficiency in resource use."[157] As such he was a strong supporter of the introduction of a resource-pricing policy in the USSR, particularly for water consumption. A water-pricing policy was introduced in January 1982, but it applied only to industry: agriculture and households were exempt.[158] One Western observer sees the debate in late 1985 and early 1986 as based on the struggle to expand water-pricing to include agriculture, noting that reformist economists such as Otto Lacis and Nikolai Petrov sought to set a price for water consumption by agriculture "in order to achieve a more rational usage of natural resources."[159] In this they were opposed by the Ministry of Water Economy and Central Asian interests: "The Ministry had a vested interest in the construction of [water diversion] projects, and the Central Asians in the water. The [economists] had close links with the new men in the Kremlin, while the latter camp was Brezhnevian in every sense. What was most surprising was how long the latter camp managed to hold out."[160]

In addition to this aspect of the struggle was the issue of the wisdom of investing in large-scale projects generally. It is clear that the performance of the last such giant project, the Baikal-Amur Mainline (BAM), was far below expectations, and that the project's capital

---

conference. See Aslund, "Gorbachev's Economic Advisors," 259-260.

[156]For a description of Aganbegyan's attitude concerning the importance of renewing investment policy in the USSR, see his *The Economic Challenge of Perestroika* (Bloomington, IN: Indiana University Press, 1988), especially Chapter 5.

[157]*Ibid.*, 99.

[158]*Ekonomicheskaya gazeta*, No. 2 (January 1982), 10.

[159]Anders Aslund, *Gorbachev's Struggle for Economic Reform* (London: Pinter, 1991), 133.

[160]*Ibid.*

investment would not be recouped for much longer -- perhaps decades longer -- than had been anticipated by its planners.[161] The experience of the BAM produced a reluctance among the architects of *perestroika* to invest in such huge projects without a more thorough costing being performed in advance. This reluctance, coupled with Aganbegyan's arguments concerning the required shift in investment policy, led to an extremely sharp debate concerning the Draft Guidelines of the Twelfth Five-Year Plan in the autumn of 1985. As Anders Aslund describes it:

> Initially the new leaders devoted great effort to changing the investment plans for 1986-90. Investment resources were considered both carriers of scientific-technical progress and the most easily controlled economic levers. The strife over investment plans appears to have been intense, as evidenced by the retirement of Nikolai Baybakov in October 1985, on the eve of the CC Plenum devoted to the next five-year plan. Later, Gorbachev revealed that the plan had been sent back to *Gosplan* three times. Despite bureaucratic resistance, the five-year plan was significantly altered....
>
> [In this debate] re-equipment was regarded as more efficient than new investment, with a 50 per cent higher output-to-capital ratio. The age-old Soviet inclination towards mastodontic projects was to be overcome. Consequently the projects on the turning of northern and Siberian rivers were abandoned, and no new gigantic project was launched.[162]

The fact that the Draft Guidelines were evaluated and found wanting three times, and that the situation cost Baybakov (appointed by Brezhnev to the Chairmanship of *Gosplan* in 1965) his job indicates the severity of the debate.[163] It also shows the reason why the Central Asian interests remained so quiet on the subject of Siberian river diversion at

---

[161]For an analysis of the economic performance of the Baikal-Amur Mainline, see Victor L. Mote, "BAM, Boom, Bust: Analysis of a Railway's Past, Present, and Future," *Soviet Geography: Review and Translation* XXXI, no. 5 (May 1990), 321.

[162]*Ibid.*, 73-74.

[163]See Hazan, *From Brezhnev to Gorbachev: Infighting in the Kremlin*, 181. Hazan notes that Baybakov's days were clearly numbered prior to the October Plenum. He relates an event that occurred on 6 September when, in a televised speech, Gorbachev made highly critical remarks concerning the work of *Gosplan* while Baybakov was seated on the platform nearby: "Above all, we have to ask what kind of an economic mechanism we have, Nikolay Konstantinovich, that makes it possible for both leaders and labour collectives to carry on unperturbed while resources are being used in such a way?" *Ibid.*, 182.

the November Supreme Soviet session. Brown's analysis was partially correct: the topic was almost certainly declared off-limits for discussion, but primarily because of economic reasons, not reasons of corruption.

Thus, after being included in the Tenth and Eleventh Five-Year Plans, the Siberian river diversion project was dropped from the Twelfth,[164] and there was little or no protest from Central Asian interests.[165] However, its exclusion from the Twelfth Five-Year Plan did not mean that Siberian river diversion had been officially abandoned; it was not until 20 August 1986 that an official joint resolution of the CPSU Central Committee and the USSR Council of Ministers was issued, halting work on both Siberian and European river diversion projects.[166] The six-month period between the end of the 27th Party Congress in February and the cancellation of river diversion projects was, nevertheless, a busy one for critics of the schemes, and this has led some commentators to suggest that the victory of the critics was less than complete at the time of the Party Congress.[167] The suggestion is that the economic justifications for cancelling the projects were not sufficient to terminate them in actuality, and it was a campaign led by Russian writers and artists, waged in particular at the VIII Congress of the USSR Union of Writers in July 1986, that finally tipped the scales.[168]

This ignores the fact that the Russian writers and artists were primarily concerned with halting the European diversion which, they felt, would destroy not only "cultural and national monuments" but would irrevocably change the "cultural heartland of the Russian

---

[164]The mention of the European scheme, which had appeared in the Draft Guidelines, was also dropped from the Plan approved at the 27th Party Congress. See Philip P. Micklin, "The Status of the Soviet Union's North-South Water Transfer Projects Before Their Abandonment in 1985-86," 291.

[165]For the reaction of Kazakh and Uzbek leaders at the 27th Party Congress, see Bess Brown, "Scheme to Divert Siberian Rivers Seems to Have Been Deferred," *Radio Liberty Research Bulletin*, RL 119/86 (6 March 1986).

[166]*Pravda*, (20 August 1986). The decree had been approved by the Politburo five days earlier. *Pravda* (15 August 1986).

[167]Robert G. Darst, Jr., "Environmentalism in the USSR: The Opposition to the River Diversion Projects," *Soviet Economy* 4, no. 3 (1988), 223-252.

[168]*Ibid.*, 229. Darst erroneously identifies the 1986 Congress as being the seventh.

nation."[169] Indeed, as Sergei Voronitsyn points out, *direct* criticism of Siberian river diversion was absent at the Writers' Congress: the project was only mentioned obliquely and in reference to the European project.[170] The inhabitants of the Ob'-Irtysh basin could not stake the claim of historical inviolability, nor was there a concentration of cultural and national monuments to protect -- except, perhaps, the rivers themselves.

The theory also ignores the activities of those opposed to river diversion -- and Siberian river diversion in particular -- on economic grounds. Especially important in this regard is a major article penned by Aganbegyan and several other academicians which appeared in *Pravda* in February 1986.[171] The authors explicitly state that

> it would be a good idea to abandon the implementation of the costly projects involving the interbasin redistribution of water resources. The ideas for this redistribution arose out of the notion that farming would continue to develop along the extensive [pattern], which inevitably generates growing requirements for water. Hence the conclusions concerning a shortage of water resources and the need to divert part of the flow of northern rivers to the south.[172]

Aganbegyan reported later that it was because of the relaxation of censorship that he and his colleagues were able to publish this article, but this is probably somewhat disingenuous: as Iain Elliot argues on this point, based on a comparison of press articles before and after the cancellation of the water diversion projects it is possible to conclude that the subject was closely managed in the media.[173] The article by

---

[169]Nicolai N. Petro, "The Project of the Century': A Case Study of Russian National Dissent," *Studies in Comparative Communism* XX, nos. 3/4 (Autumn/Winter 1987), 238.

[170]Sergei Voronitsyn, "The River Diversion Scheme: Is the Public Debate Only Obscuring the Real Problems?" *Radio Liberty Research Bulletin*, RL 310/86 (28 July 1986).

[171]A. Aganbegyan, G. Golitsyn, V. Tikhonov, T. Eneyev, and A. Yanshin, "Land is the Chief Resource," *Pravda*, (12 February 1986). Translated in *CDSP* XXXVIII, no. 7 (19 March 1986), 1-3.

[172]*Ibid.*

[173]Iain Elliot, "The Consolidation of Gorbachev's Political Power -- a Springboard for Reform?" in David A. Dyker, ed., *The Soviet Union Under Gorbachev: Prospects for Reform* (London: Croom Helm, 1987), 52. It should be pointed out, however, that in 1997 Mikhail Gorbachev remembered the cancellation of the river diversion project thus: "I

Aganbegyan and the other academicians in *Pravda* was probably published because it reinforced an already growing body of opinion that the river diversion schemes were simply anachronistic.

Aganbegyan's description of the meeting at which it was finally decided to cancel the river diversion projects formally is compelling, however. He states that the decision was reached at a meeting of the Presidium of the Council of Ministers, chaired by Prime Minister Nikolai Ryzhkov, and describes the situation as follows:

> Supporters of the project put up bright posters, mobilized their forces and filled a large part of the room. They spoke at length, supporting each other, trying to convince everyone of the rightness of their case; but their speeches were dogmatic rather than convincing. The huge figures given for the outlay and the relatively low figures for the results were more effective than words could be.....
>
> The members of the Presidium realized that Ryzhkov did not support diversion and therefore came up with compromises. For instance, they spoke against diverting Siberian rivers, *since this was a particularly unpopular idea*, but supported the partial diversion of the flow of European rivers into the Volga.
>
> The meeting went on for many hours. Twenty, maybe thirty people spoke at it. Finally the decision was taken to stop all work on diverting rivers and to write off the 100 million rubles spent on the Siberian project and not return to the subject again. Shortly afterwards the decision was published in the newspapers.[174]

It is noteworthy that Aganbegyan chose to include the observation on the unpopularity of the Siberian scheme: this meeting occurred on August 15, that is, several weeks *after* the VIII All-Union Writers' Congress which has been held by some to have been the final blow for river diversion. One would have expected, were this to be true, that the *European* scheme's unpopularity would have been emphasized at the meeting. Furthermore, it is surprising that the river diversion proponents

---

was involved in the debate over redirecting the waters of Russia's northern rivers to the south. Our reform policies -- *perestroika* -- gave scientists and activists a chance to challenge this project and show that it would not work. That put a stop to it." Mikhail Gorbachev, "What Made Me a Crusader," *Time Special Issue: Our Precious Planet*, (November 1997), 74.

[174]Abel Aganbegyan, *Inside Perestroika: The Future of the Soviet Economy* (New York:

chose to attempt to sacrifice the Siberian project in order to save the European project, since it was the latter that had drawn the brunt of the criticism from all sides in the previous months: it would, one suspects, have been easier to attempt the opposite.[175]

In the final analysis, then, it must be said that the cancellation of the Siberian river diversion scheme was primarily due to shifting political conditions in Moscow which provided economic critics of the scheme with the necessary correlation of forces to succeed in their campaign to halt it. The rise of a reformist General Secretary in Mikhail Gorbachev, and his willingness to adopt a new economic policy markedly different from his forebearers meant that the economic contradictions inherent in the project could be targetted by its critics as a fulcrum upon which the entire scheme could be dismantled.

At the same time the same shifting political conditions deprived the scheme's proponents of their most powerful political allies. In the 1970s and early 1980s scientists who harboured doubts concerning the project's environmental impact could only delay the project; they could not force its termination. The Central Asian proponents of the scheme were simply too strong and, in the late Brezhnev period, could not be unseated. Once those individuals were weakened by the post-Brezhnev anticorruption drives it was far more difficult for them to force the adoption, or even continuation, of policies amenable to them.

There are, however, issues that arise from this case-study which relate to a discussion of Soviet environmental history. These will be discussed in more detail elsewhere. They include ideology and culture: the writers and artists who so vociferously opposed the European diversion scheme in its final months did not do the same in regard to

---

Harper and Row, 1989), 98-99. Emphasis added.

[175]Especially since one of the major rationales underlying the European scheme -- maintenance of the Caspian Sea -- had recently been called into question by data that showed that the sea's level had not merely stabilized in the previous decade, but had in fact begun to rise. It now appears that at least part of the fluctuations in the sea's level are due in part to a long-term cyclical phenomenon that is natural. See Philip P. Micklin, "The Status of the Soviet Union's North-South Water Transfer Projects Before Their Abandonment in 1985-86," *Soviet Geography: Review and Translation* XXVII, no.

Siberian river diversion. Why was this? To a great extent their opposition to river diversion was culturally-based: it was the destruction of cultural monuments, whether they were brick or ways of life, that was particularly infuriating (and perhaps terrifying) for these individuals. The concept of nature divorced from acculturation and ideology did not, apparently, enter into their calculations. These opponents could reject "progress" -- but in favour of what? Why did they not reject the mismanagement of nature and natural resources as a fundamentally flawed policy that required reform *in and of itself*?

Another point that arises from this discussion is that of nationalism. The cleavage between Central Asian interests and those of Western Siberia are particularly apparent, especially in the final years of river diversion planning. Lamenting the demise of the Siberian river diversion scheme, a Central Asian writer noted that if V. Rasputin, one of the leaders of the Siberian critics of the project, had been born in Nukus, the capital of the Karakalpak ASSR rather than in Siberia, then he might have defended river diversion rather than seeking to kill it.[176] Siberian critics of the scheme retorted that if only Central Asians had used their resources more wisely, then they would not have had to go begging for resources elsewhere. Indeed, in the post-cancellation situation, it is possible to discern the same centrifugal forces in Central Asia that were formed in Ukraine following the Chernobyl' disaster, forces that worked to erode the cohesion of the USSR as a viable political entity. Like the people of Ukraine and Belarus', the peoples of Central Asia are now forced to live with the environmental dislocation created by years of Soviet misrule: it is not for no reason that one team of writers dubbed the Aral Sea basin the "quiet Chernobyl'" of Asia.[177] The response of the people in the region was remarkably similar to that of their European cousins: disaffection and dislocation.

---

5 (May 1986), 299.

[176]Bess Brown, "What Will Cancellation of the Siberian River Diversion Project Mean to Central Asia?" *Radio Liberty Research Report*, RL 334/86 (26 August 1986), 2-3.

[177]Michael H. Glantz and Igor Zonn, "A Quiet Chernobyl," *The World and I* 6, no. 9

The final point concerns problems of bureaucratization: one of the staunchest critics of river diversion planning in its final stages was the writer and editor of the journal *Novyi mir*, Sergei Zalygin, who pilloried "a homegrown Soviet socialist bureaucratic conservatism" that was obstructionist and locked in a "state of emergency mentality."[178] The argument advanced by critics like Zalygin was that, untrammeled by appropriate political control, and largely outside the spotlight of public opinion, the economic ministries of the USSR had evolved into self-referential organisms that required only budgetary input to thrive. This characterization is an accurate one, and it is fundamental to the severe environmental dislocation that occurred in the postwar USSR. Of cardinal importance in this process was the ability of the planning ministries to carry out their policies unheralded and unobserved. When it suited them to do so, publicity could be sought and engineered. But in other ministries, absolute secrecy was the norm, with the result that it was not until after the collapse of the USSR that the full magnitude of their mismanagement became apparent. The defence sector was one such group of ministries, and their activities have left a legacy that will quite possibly outlast that of Chernobyl'. It is to this issue that we now turn.

(September 1991), 324-330.

[178]S. Zalygin, "Lessons from a Discussion," *Novyi mir*, No. 1 (January 1987), 3-18.

Chapter III

The Environment versus National Security: The Case of Nuclear Submarine Policy

> The reactor in the atomic submarine is a miracle of Soviet atomic science and technology.
> -- *Izvestiya*, 1961.

> "Look, I've been on submarines for 21 years and it hasn't affected me. A little bit of radiation is good for you -- it makes things grow nice and big."
> -- Admiral I. Shumanin,
> Soviet Submarine Fleet Commander, 1991.

Introduction

In the late 1980s, while *glasnost'* was at its height in the Soviet Union, a play entitled *Dal'she, Dal'she, Dal'she* (Go further, Go further, Go further!) appeared in a popular Soviet journal.[1] The play, by Mikhail Shatrov, is set at the time of the October Revolution, with all the major protagonists reflecting, through the use of "flash-forwards" rather than flashbacks, the part they are playing, and will play, in history. The major historical actors are all there: Kerensky, Kornilov, Martov, Dan, Plekhanov, Trotsky, Stalin and -- of course -- Lenin, and the play revolves around the impressions that these leaders, especially Stalin and Lenin, have when viewing the future development of the Soviet state. Shatrov's characters see the "mistakes" of Soviet development as inevitable necessities in the creation of socialism in the Soviet Union, and conclude that the problems produced by the rapid drive to create and maintain Soviet power are acceptable in the larger context of the Soviet experiment -- hence the title of the play.

This attitude is particularly resonant in the philosophy of nuclear submarine development held by Soviet designers, naval personnel, and political leaders during the Cold War. The shortcomings of the nuclear submarines that were being constructed, and the environmental problems that their existence created, were apparent to these individuals, and were deemed to be an acceptable risk in the race to maintain and extend Soviet power and prestige in the Cold War world. The necessary support facilities to maintain the submarine fleet were secondary

---

[1] *Dal'she, Dal'she, Dal'she* appeared in *Novyi mir*, No. 3 (1987).

considerations, and were never afforded the high priority of the fleet itself. Consequently, following the collapse of the Soviet Union in 1991, its successor states, especially Russia, found themselves facing an environmental problem without the necessary resources to solve it. This case study describes the general practice and philosophy of weapons development and acquisition in the USSR during the Cold War, the course that Soviet submarine designers followed as the various generations of nuclear submarines were constructed and deployed, the decision making involved in designing and creating facilities to support the growing fleet, and provides a detailed examination of the environmental and engineering problems now faced by Russia as it attempts to decommission that fleet.

Soviet Weapons Design And Procurement In The Cold War

The Soviet process of weapons design and procurement, and the policies underlying that process, have generated considerable interest, initially in Western academic and political circles and later in the Gorbachev-era USSR. In the former case, the attention was motivated by an interest in gauging "the threat" and defining the appropriate Western political response to Soviet military spending; in the latter case military spending increasingly became an issue of interest for Soviet economists, politicians, and commentators operating within the twin policies of *glasnost'* and *perestroika*. The purpose of reviewing Soviet weapons acquisition practice and philosophy here is twofold: first, to provide a context within which Soviet nuclear submarine development can be placed and clearly understood; and second, to emphasize the factors inherent in Soviet military policies that marginalized considerations of the environmental aspects of those policies.

The introduction of new weapons systems into the Soviet military was a complex process, with correspondingly complex planning dimensions. Depending on the magnitude and technological novelty of the weapons system, the process could be either integrative (i.e., the "grafting" of the new system onto already-existing platforms, with little or no modification of tactical or strategic doctrine regarding the employment of that weapon), or revolutionary (requiring not only entirely new productive and operational systems, but new tactical and strategic

doctrine also). In all cases, however, the formulation of weapons acquisition and employment policy was constrained by a set of essentially immutable criteria.

The first of these was economic: in the USSR there existed a constant tension between the military and civilian sectors of the economy. Western scholars encapsulated this tension in the Dual Economy Theory of weapons acquisition, which held that the Soviet defence sector was "insulated from the civilian economy" and received "uniformly high priority treatment in obtaining resources."[2] Within this relationship there were repeated interventions by the political elite to ensure that sufficient resources were released to the defence industry to facilitate the design and production of the most technologically advanced and competitive weapons systems possible.[3] The fundamental reason why such interventions were necessary was also economic: operating within the constraints of a shortage economy, Soviet planners concerned with defence allocations generally were forced to prioritize those allocations according -- supposedly -- to a well-established and extraordinarily delicate set of criteria.[4] In reality, however, the consequences of economic choices in military policy commonly led to gross and quite clumsy investment plans which simply shifted resources from one project or defence sub-sector to another, a practice that became the subject of harsh criticism by Soviet economists and planners in the period of *perestroika*.[5]

In the post-Stalin era the responsibility for Soviet military-economic planning fell to a diffuse and not necessarily coherent group of political, administrative, and military actors. Stephen Meyer has characterized this group as representing three policy formulation levels. At the uppermost echelon were the top political elite of the USSR, represented by the Politburo and the Defence Council.[6] Meyer states that

---

[2]Christopher M. Davis, "The High-Priority Military Sector in a Shortage Economy," in Henry S. Rowen and Charles Wolf, Jr., eds., *The Impoverished Superpower: Perestroika and the Soviet Military Burden* (San Francisco: Institute for Contemporary Studies Press, 1990), 155.

[3]*Ibid.*, 155-56.

[4]For a detailed description of these criteria, or "policy instruments", see *ibid.*, 167-79.

[5]See, for example, E. Ivanov, "Problema prioritetov v sotsialisticheskom planirovanii" [Problems of priority in socialist planning], *Planovoe khoziaistvo*, No. 11 (1987).

[6]Stephen M. Meyer, "Economic Constraints in Soviet Military Decision-Making," in Rowen and Wolf, eds., *The Impoverished Superpower*, 203.

this group was responsible for addressing the basic question of military sufficiency which it did "principally by approving or rejecting major weapons programmes and force-structure changes, and ultimately by approving a specific correlation between expected economic output and defence demand."[7]

The second decision making echelon consisted of intermediate-level institutions that supported and implemented the decisions of their superiors. The locus of these institutions was the Ministry of Defence, whose fundamental task was the preparation and implementation of the defence subsections of the Five Year Plans. In this task the ministry was assisted by *Gosplan* which, in this context, was responsible for ensuring that the economic demands of the military were fulfilled. The lowest level of military-economic decision making was occupied "on the defence side, by the armed services...and other combat and support commands. On the economic-industrial side, [this level] is composed of the various industrial ministries. These organizations convert [higher] decisions on how to utilize defence resources into concrete programmes."[8]

Based on this tri-level model, Meyer then investigated the question of where defence policy was actually formulated -- at the highest level, or at the intermediate level immediately below.[9] He concluded that, since the death of Stalin, key defence policies oscillated between the two, a conclusion borne out by a consideration of Soviet defence policy over that period. Under Khrushchev, for example, the political leadership in general, and Khrushchev in particular, dominated Soviet naval policy at all levels from naval doctrine, to force-structure composition, even down to the acceptance of individual weapons systems.[10] In the 1970s, by comparison, the Ministry of Defence, under the leadership first of A. A. Grechko and then D. A. Ustinov, became the focus of defence decision making.[11]

---

[7] *Ibid.*

[8] *Ibid.*

[9] Meyer did not consider the possibility that defence policy could be formulated at the lowest decision making level, preferring to see these actors as functionaries enacting higher-level directives. As will be seen below, this was almost certainly an oversight.

[10] For a discussion of this point, see below.

[11] Significantly, however, it should be pointed out that the lines of demarcation between top-level and mid-level decision making were blurred in this period by the promotion of Grechko to full Politburo membership in April 1973 and, on Grechko's death immediately after the 25th Party Congress, the similar promotion of Ustinov on his

NOTE TO USERS

Page(s) missing in number only; text follows.
Microfilmed as received.

87

This reproduction is the best copy available.

UMI

While Meyer's model explains in general terms the military-economic decision making process it does not properly encompass specific aspects of that process. The procurement of new weapons systems was, for example, commonly a "bottom-up" process which cannot be adequately explained using Meyer's decision making criteria. Working within the Dual Economy theoretical framework, Arthur J. Alexander has constructed a persuasive and complete analysis of weapons procurements which, he notes, operated not only within constraints imposed by economic shortage but also within those imposed by bureaucratic compartmentalism and parochialism and the attendant culture of secrecy that such a system created.[12]

Alexander identified organizational conservatism as the most critical constraining factor not only in weapons production but in new weapons development also. Further aggravating this problem was the Soviet policy of secrecy which was even more vigorously applied in military affairs.[13] This latter policy affected Soviet military research and development at the most fundamental level:

> Engineers typically work on a small piece of a mechanism, often without knowing the identity or use of the final product. Only a chief designer has the overall project in clear enough view to be able to make many of the design decisions that in other countries are normally delegated to lower levels. Secrecy retards the flow of scientific information and the efficient management of R[esearch] and D[evelopment] since details have to be continually referred upward for consideration.[14]

---

assumption of the post of Minister of Defence. See John H. Miller, "Putting Clients in Place: the Role of Patronage in Cooption into the Soviet Leadership," in Archie Brown, ed., *Political Leadership in the Soviet Union* (Bloomington, IN: Indiana University Press, 1989), 74; Davis, "The High-Priority Military Sector in a Shortage Economy," 180.

[12]Arthur J. Alexander, "Decision-Making in Soviet Weapons Procurement," *Adelphi Papers*, Nos. 147 and 148 (Winter 1978-79).

[13]*Ibid.*, 26.

[14]*Ibid.* That this situation places an onerous administrative burden on the shoulders of the chief designer is suggested by an anecdote related by Alexander elsewhere: "In 1959, while on a trip to the United States, [aircraft designer Andrei] Tupolev was shocked when told that Lockheed had 10,000 engineers in the Los Angeles area. He responded, 'How do you *manage* 10,000 engineers!'" Arthur J. Alexander, *R&D in Soviet Aviation*, R-589-PR (Santa Monica, CA: RAND, 1970), 37n. Emphasis original.

In addition to problems of micro-management such as this, the bureaucratic compartmentalism and ubiquitous secrecy so fractionated the flow of personnel and information within the Soviet military-economic establishment that it led some Western commentators to question whether it could be termed a unified "establishment" at all.[15]

Alexander concluded that a Soviet Military-Industrial Complex did exist, but only by dint of the existence of coordinating bodies such as the Military-Industrial Commission (*Voenno-promyshlennaia Kommissiia*, or VPK) which "cut...across organizational boundaries [and broke] through the barriers erected by secrecy and departmentalism."[16] The VPK was far more than a body responsible for coordination of the activities of other military-economic actors, however: it controlled the budget for all military and space research and development,[17] as well as the Soviet efforts to acquire foreign technology through "special information" programmes.[18] It was also the responsibility of the VPK to coordinate the activities of the various ministries engaged in defence production and facilitate the availability of the necessary resources for those activities.[19] Nevertheless, even though bodies such as the VPK wielded enormous

---

[15]On this point, see Vernon V. Aspaturian, "The Soviet Military-Industrial Complex -- Does it Exist?" *Journal of International Affairs*, 26, no. 1 (1972): 18-19.

[16]Alexander, "Decision-Making in Soviet Weapons Procurement," 26.

[17]Norbert D. Michaud, "The Paradox of Current Soviet Military Spending," in Rowen and Wolf, eds., *Impoverished Superpower*, 123-24.

[18]VPK activities related to "special information" programmes are discussed in D. Buchan, "Western Security and Economic Strategy Towards the East," *Adelphi Papers*, No. 192 (1984); U.S. Department of Defense, *Soviet Military Power, 1987* (Washington, DC: U.S. GPO, 1987); U.S. Department of Defense, *Soviet Military Power, 1989* (Washington, DC: U.S. GPO, 1989); see also Central Intelligence Agency, *Soviet Acquisition of Western Technology* (Langley, VA: Central Intelligence Agency, 1984), especially the Congressional statement of Richard Perle.

[19]The ministries in question evolved via a complex series of administrative changes during the postwar Stalin, Khrushchev, and Brezhnev periods. During the latter's tenure as General Secretary, they were fixed in the form that endured throughout the rest of the Soviet period. See David Holloway, *The Soviet Union and the Arms Race* (London: Yale University Press, 1984); David Holloway, "The Soviet Union," in N. Ball and M. Leitenburg, eds., *The Structure of the Defence Industry: An International Survey* (London: Croom Helm, 1983); John McDonnell, "The Soviet Defence Industry as a Pressure Group," in Michael McGwire, Ken Booth, and John McDonnell, eds., *Soviet Naval Policy: Objectives and Constraints*. Praeger Special Studies in International Politics and Government. (New York: Praeger, 1975); Central Intelligence Agency, National Foreign Assessment Center, *Evolution of the Central Administrative Structure of the USSR, 1917-1979; A Reference Aid*. CR-79-10123 (August 1979).

power, as planning and coordinating bodies they created "little incentive for attention to be paid to related matters beyond the periphery of defined organizational responsibilities."[20] This is a crucial point, because it suggests that bureaucratic parochialism was a powerful, possibly insurmountable, force within the Soviet military-industrial complex. It is therefore reasonable to posit that parochialism would have been even more strongly magnified across the lines that separated direct military programmes from their associated support and maintenance programmes.

Bureaucratic parochialism, secrecy, and the inflexibility of the decision making process was, according to Alexander, most clearly apparent in weapons procurement. Unusually for the Soviet economy, the procurement process favoured the buyer rather than the seller: most new weapons systems proposals originated in design bureaux (that is, at the lowest level of Meyer's model) and would then be vetted, amended, or rejected through a vertical system of bodies responsible for evaluating the doctrinal, economic, and technological desirability and/or feasibility of the proposed system.[21] The process of vetting was also a dual one, with administrative and military bodies largely duplicating one another's activities. It was only at the highest levels -- the VPK, Defence Council, and Politburo -- that a single, comprehensive decision was made. At any step in this "ladder of acceptability" the design could be altered to reflect military, economic, or even administrative exigencies, and sent back to the proposing design bureau for modification and resubmission. Not surprisingly, this process caused a great deal of resentment among chief designers,[22] especially since, in many cases (and, again, uniquely in the Soviet experience) final Politburo approval did not mean series production, only the construction of a prototype for competitive testing

---

[20]Alexander, "Decision-Making in Soviet Weapons Procurement," 26.

[21]For a detailed discussion of the mechanics of this process, see *ibid.*, 31-39.

[22]Aircraft designer Aleksandr Yakovlev acidly described the process endured by chief designers of bureaux thus: "After considerable negotiations with the customer as to *what* will be produced, the designer signs the contract and symbolically hands over his testicles with the contract. When the aircraft is delivered as specified, he gets his

against other bureaux' designs.[23] It is therefore unsurprising that designers tended towards conservatism, offering designs for new weapons systems that were merely evolutionary developments rather than potentially revolutionary breakthroughs. It was simply an easier means to secure acceptance for a design and keep the bureau working.[24]

Significantly for the naval procurement process, when the weapons system under consideration was a new class of ship or submarine, prototypes were constructed very rarely. In the case of naval platforms a prototypical stage imposed unacceptable economic burdens and very long programme delays as the prototype was constructed and shaken down. Thus, the Soviet Navy developed without the use of prototypes, opting instead for immediate series production of new designs. This led to a curiously Soviet naval phenomenon: the abrupt cancellation of ship or submarine construction programmes well prior to their project termination date. In some cases these cancellations occurred while uncompleted units were still on the slipways: Khrushchev relates in his memoirs that the cancellation of large cruiser production after Stalin's death led to the Navy physically melting down uncompleted units "in order to extract a valuable alloy which we then used to build other kinds of boats."[25] The absence of prototypical testing in Soviet naval procurement also led to other, peculiarly Soviet naval design phenomena. One was the modification of already-existing platforms as test beds for new weapons systems intended for use in combatants at the design stage, as a means to minimize risks associated with the new

---

testicles back." *Ibid.*, 60, n. 149.

[23]David Holloway, "The Soviet Style of Military R&D," in Franklin A. Long and Judith Reppy, eds., *The Genesis of New Weapons: Decision Making for Military R&D* (New York: Pergamon, 1980), 144-45.

[24]*Ibid.* Holloway also points out that economic factors, such as securing supplies of new resources, or reliance on the production of novel subcomponents by different, perhaps untried, enterprises also tend to militate against revolutionary weapons systems designs.

[25]N. S. Khrushchev, *Khrushchev Remembers: The Last Testament*, ed. and trans. Strobe Talbott (Boston: Little, Brown, 1974), 31-32. Interestingly, Khrushchev notes that mothballing the ships was discussed and rejected on cost grounds; mothballing was (and remains) a common cost-saving practice in both the U.S. Navy and Royal Navy. The fact that the political leadership in the USSR rejected this option suggests that

combatants.[26] Another was the construction of "grab-bag" platforms mounting weapons systems left over from production of earlier classes: a probable example of this practice was the *Slava* class of guided missile cruisers in the early 1980s, which received excess surface-to-surface missiles remaining from the production of *Kiev* class aircraft carriers, and surface-to-air missiles from the production of *Kirov* class guided missile battle cruisers.[27]

Soviet naval development after World War II tended towards conservatism and incrementalism because of the factors discussed above. The naval procurement process was very expensive, and the costs of failure were correspondingly high. Design philosophy was marked by a conservative attitude, not only because of the immediate penalties for failure that could potentially be imposed on the design bureau, but also because of designers' unwillingness to rely on subcontractual production beyond their direct control. In naval construction this last problem was magnified by the necessity of combining a large number of systems (weapons, electronics, habitation, propulsion, and so on) within a single design. Because of the constraints imposed by the Soviet economy, it was extremely difficult to hedge against general design failure through the utilization of prototypes for testing. The Soviet solution to this problem was the incremental adaptation of new weapons systems for testing purposes initially and, if this testing was successful, the further deployment of those new systems. This evolutionary policy of naval development strongly indicates that the Soviet Navy was operating in

---

budgetary allocations to the Soviet Navy were very restrictive. *Ibid.*

[26]An example of this was the conversion of a single *Kotlin* class destroyer to accept a new naval surface-to-air missile system (SAM), the SA-N-1, in 1962. Tests of the new missile were judged to be successful, and it became the standard Soviet naval SAM for classes launched in the 1960s, and was refitted to seven other *Kotlins* from 1966 onwards. John E. Moore, *The Soviet Navy Today* (London: Macdonald and Jane's, 1975), 115-16, 101-103. Other, more clumsy and less successful conversions occurred: in 1960 the *Sverdlov* class light cruiser *Dzerzhinsky* was converted to carry the SA-N-2 missile system; the missile tests were unsatisfactory, no other conversions occurred, and the SA-N-2 never entered production. John Jordan, *An Illustrated Guide to the Modern Soviet Navy* (New York: Arco, 1982). Reprinted as Section II of Ray Bonds, ed., *The Illustrated Directory of Modern Soviet Weapons* (New York: Prentice Hall, 1986), 240.

[27]Michael MccGwire, "Gorshkov's Navy, Part I," *United States Naval Institute Proceedings*

circumstances of extremely restricted budgetary allocation,[28] a suggestion that is supported by an examination of Soviet submarine design and procurement.

The History Of Soviet Nuclear Submarine Development

Throughout the Soviet period, the submarine was viewed as the most important fleet naval weapon, whose employment was to be supported by the use of surface ships and not, as was the case in the world's other major navies, the other way around. The reasons for this different view of naval strategy are not difficult to fathom: unlike the United States or Britain, where the navy has always been seen as equivalent to land-based forces, in the Soviet Union the navy traditionally occupied a decidedly junior role. Consequently, budgetary allocations to the navy were small in comparison to the rest of the armed forces, and strategic roles were difficult to secure.[29] As a result of this situation, Soviet naval strategists turned to the submarine which, in the interwar period, had advantages of cost and "budgetary stealth" -- that is, it was less noticeable than a major surface combatant such as a cruiser or battleship on the accounting register. Soviet naval strategists argued that the submarine could protect the seaborne approaches to the Soviet Union by sinking enemy shipping, thus preventing a troop landing intended to "outflank" the armed forces on land. Through this strategy, in the interwar period the navy was therefore seen very much as an

---

(August 1989), 51.

[28]The expansion of the capabilities of the Soviet Navy was certainly constrained by budgetary factors throughout the Cold War. The debate over the cost, utility, and prestige offered by large aircraft carriers is a case in point, from Khrushchev's early "nagging desire to have some in our own fleet," through the hotly-contested arguments of the late 1960s and 1970s: the common issue in all these discussions was not doctrine or tactics but cost. Khrushchev, *Khrushchev Remembers*, 31; Charles C. Petersen, "Aircraft Carrier Development in Soviet Naval Theory," *Naval War College Review*, 37, no. 1 (January/February 1984): 4-13; Douglas L. Clarke, "The Soviet Navy's First Aircraft Carrier," *Radio Liberty Report on the USSR* RL 284/91 (16 August 1991): 7-17.

[29]Steven J. Zaloga, *Target America: The Soviet Union and the Strategic Arms Race, 1945-1964* (Novato, CA: Presidio Press, 1993), 169-70.

adjunct to land forces and naval campaigns were seen only as support for more important campaigns ashore.[30]

The Soviet Union entered the Great Patriotic War with the largest submarine fleet in the world, larger even than the much-vaunted German U-Boat fleet. Yet the submarine force performed very poorly during the war, missing several opportunities to inflict severe blows on German shipping in the Baltic and Black Seas.[31] Given this poor performance, it would be natural to expect that the Soviet leadership would have curtailed submarine production and employment after World War II, but in fact this was not the case. In 1945-46 a twenty-year "anti-amphibious" programme was drawn up, designed to counter the perceived threat of an amphibious assault by United States forces. Central to this programme was the construction of approximately 1,200 submarines.[32] Despite the vulnerability of the United States to submarine attack on shipping off the eastern and western seaboards (which had been demonstrated by the effective campaign waged by the German U-Boat fleet off the eastern seaboard during World War II), the Soviet submarines were not designed for this role. Instead they were to provide local defence of the Soviet coastline by establishing, in the Soviet lexicon, "mine-artillery" positions relatively close to the shore.[33] This policy indicates a lack of confidence in the long-range striking potential of the Soviet submarine fleet among the Soviet leadership, and reinforced the junior role that the navy was envisioned to play in any future conflict.[34]

---

[30]For an excellent discussion of Soviet naval policy prior to World War II, see Robert W. Herrick, *Soviet Naval Strategy: Fifty Years of Theory and Practice* (Annapolis, MD: United States Naval Institute Press, 1968).

[31]See Friedrich Ruge, *The Soviets as Naval Opponents, 1941-1945* (Annapolis, MD: Naval Institute Press, 1979), for a German assessment of Soviet naval performance in World War II. The most notable success of the war for the Soviet submarine fleet was the 1945 sinking of three German troop ships in the Baltic, with the loss of 15,000 lives. See Ernest Louis Schwab, *Undersea Warriors: Submarines of the World* (Lincolnwood, IL: Publications International, 1991), 127.

[32]Milan Vego, "The Role of the Attack Submarine in Soviet Naval Theory," *Naval War College Review* 36, no. 2 (March-April 1983): 3.

[33]*Ibid.*

[34]Zaloga, *Target America*, 170.

The threat of amphibious assault from the United States evaporated in the late 1940s, however, as the US military underwent a massive demobilization of personnel who were reintegrated into the civilian economy.[35] Nevertheless, the general threat of attack on the Soviet Union did not dissipate, as the United States continued the development of atomic weaponry and a strategy for its use. Because of a confluence of factors, both technical and political, the Soviet Union was able to respond, and that response produced the naval force structure that was to endure for the rest of the Cold War.

In the naval sphere, the threat of nuclear attack materialized in the early 1950s as a consequence of the U.S. decision to embark on the construction of "supercarriers" incorporating jet-powered fighter-bombers able to carry nuclear weapons onto Soviet territory.[36] This decision was abetted by the improved miniaturization of U.S. nuclear weapons: by 1952 the most modern atomic weapons in the U.S. arsenal weighed less than 1,650 kilogrammes, approximately one-third the weight of earlier such weapons.[37] This meant that smaller, carrier-capable aircraft could be employed in the delivery of nuclear weapons against Soviet territory. The elimination of these aircraft carriers as they closed on the Soviet coastline was critical for Soviet defence -- critical because American air strikes could be launched from outside the envelope patrolled by Soviet land-based aircraft. The submarine was the natural weapon to combat the carrier threat, but a submarine radically different from the short-range, coastal submarines then under construction was required. Instead of a slow, relatively static submarine patrolling a small area in concert

---

[35]Immediately after World War II the U.S. Bureau of Ships cancelled the construction of almost 10,000 ships, mothballed over 2,000 and declared some 7,000 other vessels to be surplus to naval needs. Personnel numbers in the U.S. Navy fell precipitously also: in June 1945 the number of active duty naval personnel stood at almost 3.4 million; in June 1950 that number had fallen to 381,538. See George W. Baer, *One Hundred Years of Sea Power: The U.S. Navy, 1890-1990.*(Stanford: Stanford University Press, 1993), 278.

[36]For a discussion of the "supercarrier" construction programme and the strategy that underlay the use of such carriers against the Soviet Union, see Norman Friedman, *U.S. Aircraft Carriers: An Illustrated Design History* (Annapolis, MD: Naval Institute Press, 1983), especially Chapter 12, "The *Forrestal* Class and Its Successors."

[37]Baer, *One Hundred Years of Sea Power*, 335.

with a large number of sister vessels, a fast, long-range submarine able to operate independently and seek out and destroy the carriers on the open ocean was necessary. Such a submarine would need powerful weapons and would need to remain undetected until the moment of attack. The only technology that offered such capabilities was nuclear propulsion.

As early as the late 1940s Soviet scientists and engineers had investigated the possibility of applying nuclear power to submarines. Initially, work on the project was banned by Lavrentii Beria, who was in charge of the Soviet atomic bomb project, in an attempt to "prevent dilution" of the atomic bomb effort,[38] and it was not until September 1952, as the American supercarrier threat moved from possibility to reality, that the Soviet naval reactor programme formally got underway.[39] Initial studies concentrated on a uranium-graphite reactor similar to the RBMK reactor then under construction for the nuclear weapons industry, but it soon became clear that such a reactor was simply too large and heavy for any form of naval propulsion, and a pressurized-water reactor (PWR), smaller and lighter but more complex and technologically advanced, was chosen instead. This PWR, designated VM-A, was designed by Research Institute No. 8 and constructed at the Physics and Energy Institute in Obninsk,[40] and achieved initial criticality in March 1956.[41]

As reactor development was proceeding, the submarine into which the reactor would be installed was also being developed. Unlike the

---

[38]Oleg Bukharin and Joshua Handler, "Russian Nuclear-Powered Submarine Decommissioning," *Science and Global Security*, 5 (1995): 246.

[39]A. M. Antonov, "The Birth of Red November," *United States Naval Institute Proceedings*, 121, no. 12 (December 1995): 79.

[40]*Ibid.*, 81.

[41]The maximum power output of the VM-A was designed to be 70 megawatts (17,500 shaft horsepower) using ^{235}uranium fuel enriched to 21 percent. This maximum level was never achieved in practice, however, because the designers quickly realized that the reactor could only be operated safely at a maximum of 80 percent of its intended power output. Thomas Nilsen, Igor Kudrik, and Aleksandr Nikitin, *The Russian Northern Fleet: Sources of Radioactive Contamination*, Bellona Report No. 2. (28 August 1996). See Section 2.3.7, "Russian Submarine Fuel," Table 5, "Russian Naval Reactors, Types, Degree of Enrichment and Power."

United States' nuclear submarine programme, which emphasized slow, careful development and evaluation of several different prototypes before series production occurred,[42] the Soviet designers concentrated on rapidly designing and constructing a submarine that would not be prototypical, but would instead be the first of several production vessels. The design process was highly compartmentalized and secretive: only technical and design engineers were allowed access to the plans, and naval personnel were completely excluded. The submarine, known as Project 627 (more familiarly known in the West by its NATO designation of "November"), was initially designed in 1953-54 to carry nuclear weapons in the form of a massive nuclear-armed torpedo called the T-15. The T-15 was 1.5 metres in diameter, over 24 metres long, weighed 40 tonnes, and carried a thermonuclear warhead.[43] From the perspective of the Soviet leadership, the T-15 was an attractive option because it could be employed against coastal targets in the United States, as well as against U.S. aircraft carriers. The strategic option of nuclear attack on the United States was an important one for the Soviet leadership at a time when there were no other viable delivery means for Soviet strategic nuclear weapons.[44] But when naval personnel finally saw the Project 627 blueprints in July 1954, they were horrified. The major problem lay in the

---

[42]On this point, see Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon & Schuster, 1982), chapter 16; and Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), especially chapters six and seven. This latter monograph was the U.S. Atomic Energy Commission's official history of the development of nuclear propulsion for the United States Navy.

[43]Antonov, "The Birth of Red November," 79.

[44]Andrei Tupolev rejected Stalin's request that his design bureau construct a bomber capable of reaching the continental United States, delivering a nuclear weapon, and returning to the USSR, on the grounds that, with then-available technology, such an aircraft was impossible. Khrushchev, *Khrushchev Remembers*, 39. The prototype of the first Soviet intercontinental bomber capable of carrying nuclear weapons to the continental United States was therefore completed by the design bureau headed by Tupolev's pupil, V. M. Myasishchev, in 1953. Bill Gunston, *An Illustrated Guide to the Modern Soviet Air Force* (New York: Arco, 1982). Reprinted as Section III of Ray Bonds, ed., *The Illustrated Directory of Modern Soviet Weapons* (New York: Prentice Hall, 1986), 408-11. The Myasishchev aircraft could reach the United States, but did not have the range to return, and according to Khrushchev, Myasishchev stated that this was not a critical problem: the aircraft could land in Mexico! Khrushchev's response was derisive: "What do you think Mexico is -- our mother-in-law? You think we can go calling any time we want? The Mexicans would never let us have the plane back." Khrushchev, *Khrushchev Remembers*, 39.

fact that the submarine firing the torpedo would have to manoeuvre within a very short detection range in the case of a carrier battlegroup, or would be required to take a series of radar bearings in the case of a coastal attack. The latter procedure would leave the submarine extremely vulnerable to detection, and in either case the submarine would be placed well within the lethal radius of the T-15 torpedo's thermonuclear blast, consigning the submarine and its crew to what amounted to a kamikaze mission. As the head of the Soviet Navy, Admiral N. G. Kuznetsov, drily commented when he saw the plans of the Project 627, "I don't need that kind of boat."[45] Based on these naval reservations, the Project 627 was completely redesigned to a more conventional layout, carrying conventional torpedoes. The redesign fixed the submarine's role as a purely tactical vessel designed solely to attack U.S. carriers at sea. This, however, still left the Soviet Union without a viable delivery system for its growing strategic nuclear arsenal.

The redesign of the Project 627 delayed its completion and entry into service, but the first boat, the *K-3*, was launched on 9 August 1957 and carried out its first round of sea trials in July 1958. Although the trials were successful, it soon became apparent that there were serious shortcomings in the submarine's propulsion system. Unreliable and leaky steam generators were a problem that necessitated a complete redesign of the heat exchange system from the reactor to the generators, but the redesign could not be allowed to interrupt the launching and commissioning of new submarines. Because of the propulsion problem, the regular operation of the new nuclear submarines was very restricted, and they could only make short cruises at sea. The Soviet nuclear submarine programme had run into a problem that, according to one designer, made the situation "extremely tense."[46]

The critical problem was that the Project 627 attack submarines were not the only nuclear submarines being designed and launched by

---

[45]S. Bystrov, "A Reactor for Submarines," *Krasnaya Zvezda*, (21 October 1989).
[46]Antonov, "The Birth of Red November," 81.

the Soviet Union in the late 1950s. Even before the naval rejection of the T-15 "super torpedo" as a viable strategic weapon, Soviet scientists and engineers had been investigating the possibility of using ballistic missiles as a means of delivering nuclear weapons. Indeed, it is possible that this is the reason why the naval reservations concerning the T-15 were accepted so readily. As Soviet forces overran Germany in the closing stages of World War II, a major portion of the facilities for the development and construction of the German V-2 missile fell into their hands, as did many of the German scientists and technicians engaged in the work. This booty was transferred to the Soviet Union, as were the scientific personnel, and an intensive programme of research and development into ballistic missile technology was initiated.[47] In 1950 the U.S. Navy's Office of Naval Intelligence concluded that it would take at least ten years for the Soviet Union to develop ballistic missile technology for naval use: in fact, aided by the captured German *materiel* and personnel, it took only half that time.[48] At the time of the Soviet naval rejection of the submarine armed with the T-15, development of the first Soviet submarine-launched ballistic missile (SLBM) was in its final stages. The missile, the R-P (*Raketnaya Podvodnaya*, or Submarine Rocket), achieved successful launch from a submarine in September 1955, and for the first time afforded the Soviet Union a viable means of striking targets within the United States with nuclear weapons.[49]

---

[47]See the "Introduction" to Mikhail Turetsky, *The Introduction of Missile Systems into the Soviet Navy, 1945-1962* (Falls Church, VA: Delphic Associates, 1983). Turetsky was a former missile engineer intimately associated with submarine ballistic missile development.

[48]Zaloga, *Target America*, 169. Other U.S. intelligence services were more sanguine in their projections. In late 1946 the Central Intelligence Group's Office of Research and Evaluations (ORE) projected that "the USSR is capable of developing by 1956 a guided missile launching device for use on...submarines." While it was considered unlikely by the ORE that the USSR would possess long-range missiles by the same date, it was forecast that V-1 and V-2 type missiles "with increased ranges and some improvement in accuracy" would probably be within Soviet capabilities by 1950. Central Intelligence Group. Office of Research and Evaluations, "Soviet Capabilities for the Development and Production of Certain Types of Weapons and Equipment," ORE 3/1 (31 October 1946).

[49]Turetsky, *The Introduction of Missile Systems into the Soviet Navy*, 65-72. Turetsky refers to the missile as the R-11FM, which was the classified designation of the R-P.

The first submarines to carry the R-P were conventional diesel-electric submarines of the Project 611 (NATO designation Zulu) Class which were adapted to carry two missiles in vertical launch tubes installed in the submarine's sail.[50] These conversions were quickly followed by the construction of a purpose-built ballistic missile carrier derived from an earlier conventional submarine class. The new submarine, the diesel-electric Project 629 (NATO designation Golf) class, carried three updated R-P missiles, bearing the Soviet classified designation R-13. In the West these missiles were known by their NATO classification SS-N-4 "Sark."[51] The Project 611 and 629 submarines suffered from inherent tactical limitations resulting from their diesel-electric propulsion plants and from the short range of the missiles they carried. Such submarines need to surface or at least gain access to the atmosphere to recharge the batteries which provide power when running submerged. Running on the surface or engaging in a process known as "schnorkelling" to run the diesel engines leaves diesel-electric submarines extremely vulnerable to detection and attack by hostile antisubmarine forces. Coupled with this was the problem of the submarine missile's very short range -- less than 650 km. This meant that the submarines had to transit to positions relatively close to the United States to strike coastal targets, and very close to strike targets inland.[52] All these factors increased the vulnerability of the missile submarines, a vulnerability that could only be lessened through a completely submerged transit to launch sites. The only way in which such a transit would be possible would be through the use of nuclear propulsion.

---

[50]All six of the Project 611 submarines were commissioned between August 1956 and August 1959.

[51]Jan Breemer, *Soviet Submarines: Design, Development and Tactics* (Coulsdon, Surrey: Jane's Information Group, 1989), 93, 95.

[52]It is certain that strategic strike was the intended role of the Project 629 submarines: given the R-13's poor accuracy, it could only be usefully employed against static targets such as cities or industrial targets. Turetsky, *The Introduction of Missile Systems into the Soviet Navy*, 72.

The above tactical limitations were immediately apparent to Soviet naval personnel and designers, and work was quickly undertaken to produce a nuclear-powered ballistic missile submarine, called Project 658 by its designers, the "Hotel" Class by NATO. Because rapid deployment was of the essence, the designers followed the traditional Soviet development practice of borrowing as much as possible from technology already available. The Project 627 hull form was adopted and modified to act as the basis of the Project 658 submarine, which was nevertheless much larger than the Project 627 submarines. The Project 627 propulsion plant was also adopted to power the new submarines, but because of the larger size of the "Hotels" with their attendant greater power requirements, two reactors rather than one were installed in each hull. The problems with the steam generation and heat exchange systems had not been resolved by the time that the "Hotels" were constructed, and consequently the new submarines inherited the propulsion limitation of the Project 627. The first of the "Hotel" nuclear-powered ballistic missile submarines was launched in 1960 but the entire class was plagued with problems.

At the same time that the Project 627 "November" attack class and the Project 658 "Hotel" ballistic missile class were being constructed, yet a third type of nuclear powered submarine was under construction in the Soviet Union. This was a submarine designed to carry cruise missiles, which had been under serious development since 1954.[53] The major

---

[53]Prior to the construction of a purpose-built cruise missile carrier, several crude conversions of existing diesel-electric submarines were effected to deploy these weapons. In 1956 and 1957 several "Whiskey" class submarines were fitted with two external launchers for P-5 cruise missiles. These containers adversely affected the submarine's underwater stability and, according to Mikhail Turetsky, one of the first such converted submarines was lost on its maiden voyage. *Ibid.*, 60-61. Between 1960 and 1962 a further "Whiskey" modification was undertaken to carry four improved P-5 missiles, dubbed the P-6/P-7 series. These conversions were slightly more successful, but by this point purpose-built cruise missile submarines had put to sea. Breemer, *Soviet Submarines: Design, Development and Tactics*, 92-93. There is a delightful -- though incorrect -- retouched photograph of one of these "Whiskey" conversions launching a missile in a Soviet naval history of 1967; the missile is firing *vertically*, an attitude that these submarine launchers were incapable of achieving. See N. A. Piterskii *et al.*, *Boevoi put' Sovetskogo Voenno-Morskogo Flota* [*Battle Method of the Soviet Navy*] (Moscow: Izdatel'stvo, 1967), 547.

impetus for the development of cruise missiles came from Nikita Khrushchev, who is alleged to have said that a naval vessel incapable of launching a missile was not worth having.[54] The ballistic missile programmes encountered difficulties as the weapons were developed, and it is likely that the cruise missile submarine was envisioned as a backup for the "Hotel" ballistic missile submarines. The first nuclear-powered cruise missile submarine, designated the "Echo" by NATO,[55] was completed in 1960, and four more were completed by 1962. The "Echo" class again used the same propulsion plant as the Project 627 "November," and again suffered as a consequence.

Because the same VM-A pressurized water reactor was used in the "Hotel," "Echo," and "November" classes, it is commonly referred to as the HEN reactor. A reactor group very similar to the HEN was installed in the Soviet Union's first nuclear-powered surface ship, the icebreaker *Lenin*, and during an inspection tour of the *Lenin* in the summer of 1959, the father of the US Navy's nuclear propulsion programme, Admiral Hyman G. Rickover, was not impressed by the reactor design. He later stated that the entire engineering section including the reactor itself was an extremely "sloppy job."[56] In the 1960s and early 1970s a series of catastrophic reactor accidents suffered by "November" and "Hotel" class submarines, and a partial meltdown of the *Lenin*'s reactor plant in 1966 or 1967, served to reinforce Rickover's assessment.[57] Direct evidence that

---

[54]John Jordan, *Soviet Submarines: 1945 to the Present* (London: Arms and Armour Press, 1989), 65.

[55] The Soviet designation for the "Echo" class was Project 659. Many of these vessels were refitted with new, longer-range and more accurate cruise missiles in the 1960s and received the new designation Project 675, with subdesignations 675M and 675MKV.

[56]Breemer, *Soviet Submarines: Design, Development and Tactics*, 101.

[57]In 1961 a "Hotel" Class ballistic missile submarine suffered a reactor accident (probably a coolant circuit failure) off the coast of Britain leading to the "serious contamination" of crew members, parts of the boat, and of the submarine's ballistic missiles. Turestky, *The Introduction of Missile Systems into the Soviet Navy*, 79. An "unidentified" submarine (probably a "November") suffered a reactor leakage while at Polyarnyy naval base, leading to a number of her crew being hospitalized for radiation sickness. See Breemer, *Soviet Submarines: Design, Development and Tactics*, Appendix 1. On 11 April 1970, a "November" Class submarine suffered an internal fire and nuclear propulsion failure 350 nautical miles southwest of Britain and sank, possibly with all hands. James E. Oberg, *Uncovering Soviet Disasters: Exploring the Limits of Glasnost*

the safety problem aboard Soviet submarines extended beyond reactor design to include general construction practices came in 1974 with the CIA-sponsored recovery of sections of a "Golf" Class ballistic missile submarine that sank off Hawaii in April 1968. The modular sections were found to be poorly welded together, hull thickness (a "criticality one" variable of construction) varied widely, and -- remarkably -- two-by-four wooden beams were found to have been used for internal structural bracing.[58]

It is doubtful that the design flaws inherent in the HEN reactor were ever solved by Soviet engineers. The second generation of Soviet nuclear submarines which appeared in the 1960s, also used pressurized water reactors, but of a different design from the VM-A. These reactors, designated VM-4, which powered the "Yankee" and "Delta" Class ballistic missile submarines, the "Victor" Class attack submarines, and the "Charlie" Class cruise missile submarines,[59] represented a leap forward in reactor design and appear to have been far more reliable and powerful than their forebear. The appearance of the new class of submarines marked an advance in general nuclear submarine technology in the Soviet Union. The "Yankee" Class ballistic missile submarine, and its more capable follow-on, the "Delta," could launch their missiles while submerged, a practice that was impossible for all earlier Soviet missile submarines. The "Yankee" and "Delta" advances were coupled with advances in missile technology, particularly in terms of range: although the "Yankees" still had to move relatively close to the United States to strike targets there, the range of the "Delta's" missiles was such that the submarines could remain on patrol close to Soviet shores and still

---

(New York: Random House, 1988), 70. In February 1972 a "Hotel" Class submarine suffered a "serious propulsion malfunction, possibly involving several deaths." *Ibid.*, 71.

[58]*Ibid.*

[59]The Soviet designation for the "Yankee" was Project 667A. The "Delta" was a long-lived class that went through four incarnations, known in the West as Delta I, II, III and IV. The Soviet designation for these subclasses was Project 667B, 667BD, 667BDR, and 667 BDRM. This designation series indicates how close the "Delta" and "Yankee" designs were. The "Victor" Class was known as Project 671; the "Charlie" as Project 670A.

deliver nuclear weapons on targets within the continental United States. This operational strategy, dubbed the "bastion" concept by the U.S. Navy, remains the submarine-borne ballistic missile strategy of the Russian Navy today.[60]

While the VM-4 reactor was undergoing testing and installation in the second generation of Soviet nuclear submarines, a parallel reactor design was installed in one test-platform "November" Class submarine and evaluated from 1963-1968. Based on these tests the reactor was installed in the remarkable "Alfa" Class attack submarines from 1969 onwards.[61] The reactor was based on an entirely different technology from the PWR: instead of water as a medium of heat exchange, a liquid metal mixture of lead and bismuth was used. The reactor design was very powerful and compact, but was also inherently unstable: if the liquid metal cooled too much, it solidified in the coolant loop, producing the conditions for a rapid reactor meltdown.[62] An "Alfa" Class submarine suffered just such a meltdown while on sea trials in the Barents Sea in the late 1970s,[63] and the inherent instability of the liquid metal reactor led to a shortening of the "Alfa" Class run, terminating in only five or six vessels. It should be noted, however, that the "Alfa" Class is a unique example in Soviet naval development, because it suggests a willingness of Soviet "Alfa" designers and engineers to accept risks in their design philosophy in the hopes of producing a quantum leap forward in submarine technology. This is clearly unlike the more conservative design philosophy evidenced by other Soviet examples of surface and submarine combatant development and construction; it is possible that the liquid

---

[60]"Russian subs still patrol Arctic ice packs despite US pullout" Agence France-Presse, 6:04 PST, 22 November 1997.

[61]O. Bukharin, "Nuclear Fuel Management in the Russian Navy," Staff Paper Prepared for the U.S. Government, Office of Technology Assessment, November 1994. The Soviet designation for the "Alfa" was Project 705.

[62]*Nuclear Wastes in the Arctic: An Analysis of Arctic and Other Regional Impacts from Soviet Nuclear Contamination*, OTA-ENV-623 (Washington, DC: U.S. Government Printing Office, September 1995), 134.

[63]Oberg, *Uncovering Soviet Disasters*, 73. Oberg states that "news of this accident...comes from U.S. naval intelligence sources, but the accident is not on official U.S. lists," suggesting that information concerning the accident was derived from sensitive

metal reactor offered such a vast technical advantage that it overwhelmed traditional conservatism. Considering that the design specifications of the "Alfa" and its propulsion plant must have been initiated in the late 1950s or early 1960s, it demonstrates a very early willingness among Soviet designers to combine a large number of very advanced technologies in one untried package.

In the late 1970s and early 1980s the Soviet Union introduced a series of new classes of submarines, designed to replace the aging first generation submarines of the HEN group, and to complement the "Victor," "Delta," "Yankee," and "Charlie" Classes. These new submarines represented the very quantum leap forward in technology sought by the designers of the "Alfa" submarines. Two new ballistic missile submarines appeared, one an evolutionary development of earlier "Delta" designs, the other a radical departure from previous design philosophy. The radical new submarine was initially dubbed the "Severodvinsk Monster" when its construction was revealed by satellite imagery in the late 1970s. Over 170 metres in length, and displacing over 26,000 tonnes when submerged, the new submarine was and remains the largest in the world, and was not given an arbitrary NATO designation, but was instead called *Taifun*, the name used by the Soviet Navy itself.[64] The colossal size of the submarine created engineering problems in and of itself: a new reactor design, the pressurized water OK-650, producing more than twice the output of the VM-4, was required, and the installation of dual reactors was necessary to produce the requisite power to manoeuvre the submarine effectively.[65] The *Taifun*'s ballistic missiles are carried forward of the sail, in variance of every other ballistic missile submarine design in the world. The missiles are set forward of the sail in order to counterbalance the weight

---

sources, possibly a U.S. nuclear submarine shadowing the "Alfa" on its trials.

[64]Breemer, *Soviet Submarines: Design, Development and Tactics*, 139. The official designation of the *Taifun* is Project 941.

[65]Schwab, *Undersea Warriors*, 130.

of the propulsion plant, which indicates that the reactors and associated machinery must be massive.[66]

A pair of OK-650 reactors were also installed in the other Soviet "giant" to appear in the early 1980s, the Project 949 "Oscar" Class cruise missile submarine. This submarine is also extremely large considering its mission: displacing over 12,000 tonnes submerged, it was more than twice as massive as boats of the "Charlie" Class that it was intended to replace. The "Oscar's" primary role, like that of the "Charlie" Class, was to attack U.S. aircraft carriers. Whereas the "Charlie" Class submarines carried only eight relatively short-range missiles, the "Oscar" carries 24 long-range cruise missiles, and it is this that necessitates its large size. The large number of missiles mounted in a single submarine is the product of two factors. The first is cost: it is cheaper to construct a smaller number of large nuclear submarines carrying a large number of missiles than a large number of small ones carrying fewer missiles apiece. The second factor is the improvements achieved in air-defence technology by the U.S. Navy since the 1960s. The "Oscar's" design requirements almost certainly called for a large number of missiles to "swamp" the missile defence systems aboard the ships protecting U.S. aircraft carriers.

The high power of the OK-650 reactor has also been used in the new generation of Soviet nuclear attack submarines which appeared in the 1980s. Three different classes of submarine -- the "Sierra" (Project 945), the "Akula" (Project 971) and the "Mike" (Project 685) all appeared within months of each other in 1983-1984, and all were powered by a single OK-650 reactor. The almost simultaneous appearance of three different but apparently analogous submarine classes confounded Western observers, but it now appears that the "Akula" was a follow-on from technology explored in the "Victor" Class submarines, whilst the "Sierra" was a follow-on from the "Alfa," utilizing the same hull material -- titanium -- as its predecessor. The "Mike" Class was far more difficult

---

[66]*Ibid.*, 132.

to quantify: it was a one-off vessel (i.e., not part of a production series), and was long thought to be a test platform for a new generation of liquid metal reactor.[67] But it is now clear that the "Mike" possessed the same reactor as the "Sierra" and "Akula," so some other explanation for its purpose is required.[68]

By the late 1980s Soviet submarine technology had progressed to the point where it had almost achieved parity with that of the United States. Advances in weapons systems and propulsion technology were purely indigenous, and rapid advances in the critical area of submarine quieting were achieved through a combination of domestic technical advances, and the legitimate appropriation of capitalist technology coupled with foreign espionage.[69] There is considerable independent evidence that by 1990 the most modern submarines of the Soviet fleet were as quiet as existing U.S. boats, and it seemed as though, for the first time since the beginning of the race between the United States and the Soviet Union to build the best nuclear submarines, the Soviet Union might be winning.

The Legacy of Competition

Throughout the Cold War race to build better, more advanced nuclear submarines the Soviet designers were, on an overall technological level, struggling to catch up to the lead enjoyed by the United States. Occasionally through daring leaps they would construct a weapons

---

[67]Breemer, *Soviet Submarines: Design, Development and Tactics*, 153.

[68]O. Bukharin, "Nuclear Fuel Management in the Russian Navy," Staff Paper Prepared for the U.S. Government, Office of Technology Assessment, November 1994.

[69]Reportedly, the dramatic improvements in Soviet submarine quieting since the mid-1970s is a direct result of material supplied to the Soviet Union by Chief Warrant Officer John A. Walker, who betrayed U.S. secrets to the Soviets beginning in 1968. See Norman Polmar, "The Quest for the Quiet Submarine," *United States Naval Institute Proceedings*, 121, no. 10 (October 1995): 120. In addition, quieting techniques were facilitated by the legitimate acquisition of capitalist technology. In particular, microscopically-accurate milling machines for the production of submarine propellors were acquired from the Norwegian firm Köngsberg, and the computers necessary to operate these machines were purchased from Toshiba in Japan. Japan served as a common source of legitimate Soviet technological acquisition in the 1970s and 1980s, much to the irritation of the United States. On this latter point, see Miron Rezun, *Science, Technology, and Ecopolitics in the USSR* (Westport, CT: Praeger, 1996), 34.

system that allowed a brief lead over certain aspects of U.S. submarine development but, because the development of Soviet nuclear submarines was not integrated and carefully planned, with contingencies for possible failures incorporated in the overall design philosophy, leads -- when they existed -- soon evaporated. An example of this is the early development of ballistic missile technology and its linkage to the submarine. In the Soviet case, as has been seen, development was rapid, and compromises were accepted in order to produce a viable weapons system at the earliest possible opportunity. But inherent -- and apparent -- flaws in reactor design, missile technology, and operational practice combined to squander whatever lead existed in missile technology -- and in the mid- to late-1950s there is no doubt that the Soviet Union held the lead in the race to construct ballistic missile submarines. The U.S. choice was to follow a rapid but careful and integrated solution to the problem of constructing a ballistic missile submarine. Although the Soviet Union was first to launch a missile from a submarine, and although it was a Soviet submarine that first set out on patrol with ballistic missiles aboard, the U.S. response, the first boat of the *George Washington* Class, set sail only a few months later, and represented a technological level that required eight years' work by Soviet designers to match. The design philosophy of the United States was centred upon a submarine integrated with its missiles as a unit, rather than an attempt to hurriedly mate one with the other.

The Soviet design and construction policy can best be described as build rapidly and solve problems as they arise, rather than anticipating problems in advance, and this policy has led to a situation in which the vast majority of the nuclear submarine fleet that was constructed in the post-war Soviet Union is now utterly nonviable, and the facilities for solving the problem are stretched beyond capacity -- or simply do not exist. The economic decline of the Soviet Union in the 1980s, its collapse in 1991, and the concomitant economic dislocation which followed has resulted in a situation which threatens to become catastrophic. The

Russian state that inherited the nuclear submarine fleet is incapable of maintaining that fleet, or even of decommissioning it. The rest of this chapter discusses the situation in the Russian Navy's Northern Fleet submarine force, and indicates currently-existing and future areas of serious concern for the environmental impact that the nuclear submarine fleet represents.

The major Russian naval force, the Northern Fleet, is centred on a complex of naval bases along the coast of the White Sea, from Murmansk in the West to Arkhangelsk in the South-East.[70] Currently the Northern Fleet operates 88 active nuclear submarines, but there are many more submarines that are inoperative, either laid up awaiting decommissioning or sunk. The Russian Navy is faced with sharply contracted budgetary resources, and consequently has undertaken a massive naval decommissioning programme. In the case of conventional submarines and conventional surface vessels this is a simple procedure involving dismantling the vessels for scrap, or of beaching them at remote locations along the coast of the White Sea until such time as the scrapyards can accommodate them. The situation with nuclear submarines is far more complex, however. Unable to find the funds necessary to maintain even half of the Soviet fleet of nuclear submarines at operational readiness, the Russian Navy has withdrawn 121 nuclear submarines from service; 70 of these vessels are Northern Fleet submarines.[71]

Such a rapid decommissioning was never anticipated by Soviet planners, and the facilities available for the task are utterly inadequate. To a great extent, the facilities used in the required periodic refuelling of nuclear submarine reactor cores are the same facilities that are used in

---

[70]The major bases are Zapadnaya Litsa, Vidyayevo, Gadzhiyevo, Severomorsk, and Gremikha.

[71]All first generation submarines were paid off in the late 1980s; all ballistic missile submarines up to the *Taifun* and "Delta IV" classes have been paid off; all submarines of the "Victor I" and "Victor II" classes have been paid off, as have all "Charlie I" submarines. Only one of the six "Alfa" Class submarines remains, and it is engaged in light trials work and rarely leaves port. See David Miller, "Navy Mourns End of Sea Power Dream," *Jane's Defence Weekly*, (4 November 1995): 42, 47.

the final defuelling and decommissioning of the submarines; these facilities did not develop simultaneously with submarine construction, and instead were set up when the need to refuel the first of the Soviet nuclear submarines initially arose. As one report investigating the conditions at one of the Northern Fleet's bases, Zapadnaya Litsa, notes:

> The development of infrastructure at the bases along with service functions and shipyards for the nuclear submarines themselves lagged behind the rate at which the vessels themselves...were being built. Often there was a lapse of five to eight years from the time that the new submarines were launched before technical facilities for the servicing and maintenance of these vessels were ready for use. The first nuclear submarine of the Soviet Northern Fleet...was launched in 1958 [*sic*], yet the first facilities for the handling of radioactive waste and spent nuclear fuel were not ready for use until the early 1960s.[72]

Unlike the United States, where reactor core defuelling and refuelling has always been done with specialized equipment while the submarine is in dry dock, in the Soviet era and now in Russia the submarine is almost always refuelled afloat, in a process that one analyst describes as a "push-pull" procedure.[73] In a typical refuelling operation, the submarine is sandwiched between the dockside and a specialized submarine service tender which carries out the actual refuelling. A portion of the submarine's hull is removed and the reactor lid lifted, after which a special "sleeve" is placed over the reactor and it is through this that cranes aboard the submarine service tender remove spent fuel assemblies from the submarine's reactor core, store them in the tender's hold, and replace them with new assemblies pre-positioned in another hold. The submarine's reactor compartment is then cleaned, and the reactor lid replaced. Finally the hull sections are replaced. The entire procedure

---

[72]Thomas Nilsen, Igor Kudrik, and Aleksandr Nikitin, *Sources to Radioactive Contamination -- Submarine Bases on the Kola Peninsula, Zapadnaya Litsa.* Bellona Working Paper No. 5 (1995), 2. One assumes that the authors are confusing the date of the *K-3*'s sea trials with that of its launch.

[73]John Large, quoted in "Russia's Deep Secrets," Text of British Broadcasting Corporation television programme *Horizon* (originally transmitted 16 January 1995), 7.

takes three to four months to complete.[74] From the service tender the spent reactor fuel is then transferred to storage sites ashore, where it awaits shipment by rail to Mayak, the major nuclear reprocessing plant in Russia, located near Chelyabinsk in the Urals.

From an operational standpoint, this process has now broken down completely: throughout the process critical equipment is inoperative or inadequate. There are two submarine service tenders and three submarine service barges operational in the Northern Fleet, but they have been stretched well beyond their designed lifetime. The service tenders, of the *Malina* Class, have the capacity to store 1,400 fuel assemblies (approximately six reactor cores) in specialized holds aboard, while each of the support barges can store 560 fuel assemblies (approximately two reactor cores).[75] New *Malina* submarine service tenders were on order at the time of the breakup of the Soviet Union but since they were under construction at the Nikolayev Shipyard in southern Ukraine their completion and delivery was interrupted and no future delivery date has been set. Plans to construct *Malina* Class tenders at shipyards on Russian soil have stalled due to lack of funds.[76]

Under standard operating procedure, as indicated above, spent nuclear fuel should be transferred from the service ships to land-based storage sites temporarily, and then transferred to the Mayak reprocessing plant. The economic dislocation created by the collapse of the Soviet Union has interrupted this process and has thus created the principal bottleneck in the submarine defuelling and decommissioning programme. Spent nuclear fuel from Northern Fleet submarines is quite literally piling up and the Russian Navy is rapidly running out of places to put it. The bottleneck occurs in the shipping of spent nuclear fuel to Mayak itself: in the past this was done by rail, with the spent nuclear fuel sealed in special casks, but in October 1993 the Russian nuclear

---

[74]*Nuclear Wastes in the Arctic: An Analysis of Arctic and Other Regional Impacts from Soviet Nuclear Contamination*, OTA-ENV-623 (Washington, DC: U.S. Government Printing Office, September 1995), 131.
[75]*Ibid.*, 130.

regulatory agency, *Gosatomnadzor*, banned the use of such casks on safety grounds. Agency approval has not yet been forthcoming on a new generation of transport casks to replace those banned.[77]

As a result of the general collapse of the reprocessing industry in Russia, the Russian Navy is expected to have a backlog of some 300-350 naval reactor cores of spent nuclear fuel by the year 2000. Current and past practice has seen the local land-based storage sites used as *temporary* repositories for this fuel while it awaits shipping to reprocessing facilities, but fuel is now being stored locally for extended, possibly undefinable, periods of time. As of 1993, according to a reliable estimate, there were some 30,000 spent fuel units, equal to approximately 140 reactor cores, scattered throughout the various storage facilities of the Northern and Pacific Fleets.[78] This is a dangerous situation: spent nuclear fuel should not be stored for long periods of time and it requires a careful process of monitoring and cooling in order to be maintained safely. In 1986, corrosion of fuel handling and storage equipment led to a serious accident at the Zapadnaya Litsa storage facility on the Kola Peninsula, less than 45 kilometres from the Norwegian border. Because of corrosion several containers of spent fuel fell to the bottom of a storage tank and some of them broke open. The accident resulted in a severe contamination problem at the facility and had the potential for a "nuclear criticality event."[79]

The Russian Navy is exploring several options for the remediation of the problem of fuel storage but, faced with shrinking budgets, it is not in the position to inject the capital necessary to initiate any of them. The defuelling of nuclear submarines is an essential prerequisite for their decommissioning and, for the reasons outlined above, decommissioning cannot occur until the problem of defuelling is solved. Even if there was

---

[76]Bukharin and Handler, "Russian Nuclear-Powered Submarine Decommissioning," 258.
[77]*Ibid.*
[78]Sergei Leshkov, "Lies and Incompetence," *Bulletin of the Atomic Scientists*, 49, no. 5 (June 1993): 13.
[79]*Nuclear Wastes in the Arctic*, 141, n. 14. A "nuclear criticality event" is the initiation of a chain reaction. It would have led, in this case, to a meltdown of the spent fuel.

no defuelling problem and the defuelling infrastructure could operate at full capacity, perhaps six submarines could be fully decommissioned per annum. Currently there are 70 such submarines awaiting decommissioning in the Northern Fleet alone and they are being decommissioned at the rate of only one or two per annum. At present rates, it will take decades to decommission and scrap these submarines. Added to this is the fact that the money required to undertake decommissioning is simply unavailable: in 1994, for example, less than a quarter of the funds earmarked for decommissioning nuclear submarines in the Russian State Defence Budget were actually disbursed.[80]

The Russian Navy's current solution to this problem is to leave the submarines tied up at anchorages in port and at remote locations along the Kola Peninsula. This solution is unacceptable for several reasons. First, these submarines have had their reactors shut down, but the nuclear fuel within still generates heat necessitating the operation of the reactor cooling systems at low levels. Power to run the cooling systems is supplied by dockside apparatus (for submarines in port) or mobile generators (for submarines at remote anchorages). Portside apparatus is in turn supplied with its power from the civilian electrical grid. On 20 September 1995 the Kola Power Company shut off the electricity to one of the naval bases on the Kola Peninsula because of non-payment of a naval electrical bill. Bereft of power to keep their cooling systems operational, several docked submarines -- including a *Taifun* -- came within minutes of simultaneous reactor meltdowns.[81] Given the

---

[80]Admiral F. Gromov, "The Navy Last Year," *Morskoi Sbornik*, No. 12 (December 1994).

[81]*Jane's Defence Weekly*, (25 November 1995), 11. Even ITAR-TASS, the Russian news agency, admitted that at least one reactor "in an obsolete nuclear-powered submarine in the Northern Fleet began to overheat after the local power authorities cut off electrical power to the submarine base and the back-up local system failed to function properly." According to the Open Media Research Institute, "a potentially disastrous reactor meltdown was only avoided when the base authorities were able to convince the power authorities to restore power to the base" and noted that the power supply to the base was cut off because the Defence Ministry owed power suppliers more than 20 billion rubles. Doug Clarke, "Power Cut-Off Nearly Causes Nuclear Submarine Disaster," OMRI Daily Digest No. 185, Part I, (22 September 1995). Rather than attempt to ameliorate the situation of several tens of nuclear submarines docked uselessly in port, the Russian government's response to this near-catastrophe was instead to

precarious state of the civilian power grid in Russia, especially in the North, the likelihood of a repeat interruption in electricity, either through failure or simple cutoff, is high.

Second, the nuclear reactors of these submarines require constant and consistent maintenance, even though they are shut down. Cooling system maintenance is especially critical, given the fact that, in the past, Soviet-designed reactor cooling systems have demonstrated a marked tendency to fail and that well-maintained cooling systems are extremely important in the prevention of reactor accidents. Only skeleton crews are currently engaged in reactor maintenance: morale among the crews is low because of irregular pay, and equipment is lacking due to a shortage or replacement parts and maintenance tools.

Third is the problem of submarine hull integrity. Not only the reactors require expensive maintenance; the submarines themselves -- especially older submarines of the first and second generation -- require maintenance to ensure that they do not sink at anchor. Already several hulls require the regular pumping of compressed air into their ballast tanks to keep them afloat.[82] The longer these submarines remain exposed to harsh Arctic conditions the greater the likelihood is that they will simply sink in port.[83]

If any of these submarines does suffer some form of reactor accident, any foreseeable Russian effort to decommission them will be impossible. The decommissioning facilities are insufficiently

---

introduce a resolution banning local power companies from cutting off power to its military customers, calling such actions "irresponsible and detrimental to national security." Doug Clarke, "Government Bans Shut Down Of Power To Military," OMRI Daily Digest No. 186, Part I, (25 September 1995). This report also noted that ITAR-TASS revealed "that the Northern Fleet had sent armed soldiers to force the engineer on duty at a Kola power plant to restore power to a Russian submarine base, thus averting a potential nuclear disaster."

[82]Nikolai Zlaman, "Seventy Nuclear 'Bombs' Near Murmansk: Submarine Decommissioning Cannot be Postponed," *Krasnaya Zvezda* (17 December 1994).

[83]In May 1997 an "Echo" Class cruise missile submarine belonging to the Pacific Fleet sank at its moorings in the port of Petropavlovsk-Kamchatsky while awaiting decommissioning. "Scrapped [*sic*] Russian nuclear sub sinking in Pacific," Reuter's, 9:02 PDT, 30 May 1997. The submarine, which sank in 15-20 metres of water, was not raised until October 1997. See "Sunk nuclear sub refloated, set for breakers' yard," Agence France-Presse, 3:55 PDT, 23 Oct 1997.

sophisticated nor are they safe enough for the decommissioning of a damaged reactor. In the past, damaged reactors have been removed as a unit, sealed in steel and concrete vessels, and dumped into the Arctic Ocean. In the Soviet era, wanton mismanagement of the nuclear propulsion industry produced radioactive wastes that are impossible to reprocess. An example of this "impossible" waste is stored aboard the barge *Lepse* moored at the *Atomflot* base just north of Murmansk.[84] Frederick Hauge, head of the Norwegian group investigating nuclear waste on the Kola Peninsula, explained the situation as follows:

> The *Lepse* is the result of an accident on the ice-breaker *Lenin* in 1967, where you got fuel rods that expanded. They should [have placed] these on the *Lepse* -- the problem was that the canals they should put them into were not quite big enough. They took a quite practical solution -- they took a sledgehammer and tried to knock them down, and the fuel elements crushed. They were panicking a little bit, and they filled [the *Lepse*'s hold] up with concrete. If you are going to remove the fuel rods from the *Lepse* now, you need to use about 5,000 people, that will all get a maximum dose. So the whole ship is highly radioactive waste.[85]

The situation on board the *Lepse* is serious, but not as serious as the situation of other damaged nuclear reactors from the Soviet era. Between 1968 and 1988 the Soviet Navy dumped a total of thirteen submarine reactors and three reactors from the icebreaker *Lenin* off the south coast of Novaya Zemlya. The full scale of this dumping became clear in 1993,[86] and since then Norwegian politicians and scientists concerned over radioactive contamination of the Norwegian fishing industry pressured the Russian government to organize an expedition to inspect the sunken

---

[84]*Atomflot* is a civilian division of the Murmansk Shipping Company, itself a subdivision of the Northern Fleet. The company operates the Russian nuclear-powered icebreaker fleet, consisting of six vessels. It has a well-deserved reputation for dumping liquid and solid radioactive waste in the Arctic Ocean, despite repeated statements to the contrary. See Abigail Schmelz, "'Bad Guys' Of Arctic Seas Say Fleet Safe," Reuters, 20 October 1997.

[85]Frederick Hauge, Head of "Bellona" Organization, quoted in "Russia's Deep Secrets," 9.

[86]Administratsiya Prezidenta Rossiiskoi Federatsii, *Fakty i problemy, svyazannye s zakhoroneniyem radioaktivnykh otkhodov v moryakh, otmyvayushikh territoryu Rossiiskoi Federatsii* (Moscow, 1993). This report, prepared by Aleksei Yablokov, President Yeltsin's Advisor on Ecological Matters, detailed for the first time the full extent of nuclear dumping practices at sea during the Soviet period.

waste. In the summer of 1994 a joint Russian-Norwegian survey discovered the reactor containers -- all but one of which is dumped in less than 50 metres of water -- are so corroded and fragile that they cannot be raised or otherwise moved without destroying them.[87] Although the containers are now leaking nuclear material into the surrounding environment, radiation levels are high in only a very localized area around the dump sites and -- as yet -- there is no evidence of transportation of radioactivity into the surrounding ecosystem. Of particular concern is the fact that six of the reactors were dumped with their nuclear fuel intact and consequently represent the possibility of a severe environmental insult should they leak these contents into their surroundings.

It is perhaps inappropriate to speak of individual examples of the general condition of nuclear management in the Russian Navy's Northern Fleet as representing "concerns." As Aleksei Yablokov, Chairman of the Russian Ecological Safety Commission and advisor to President Yeltsin put it, the entire area along the Kola Peninsula is an "environmental catastrophe." A series of NATO studies undertaken from 1993-1995 concluded that a serious reactor accident aboard one of the submarines awaiting decommissioning at the bases along the Kola Peninsula would result in severe health consequences for the local population in the port where the accident occurred.[88] Large-scale cross-border contamination would probably not occur, the studies concluded, and the environmental damage would remain localized. However, it should be pointed out that the study failed to take into account the possibility of a "domino effect" among the submarines at anchor. While there is no possibility of one submarine's accident "setting another off," *indirectly* this is feasible: the localized contamination and disruption of such maintenance routines as currently exist resulting from a reactor

---

[87]"Russia's Deep Secrets," 12.

[88]North Atlantic Treaty Organization, Committee on the Challenges of Modern Society, *Cross-Border Environmental Problems Emanating from Defense-Related Installations and Activities, Final Report, Volume I: Radioactive Contamination, Phase I: 1993-1995* (Kjeller,

accident on one submarine would seriously complicate maintenance efforts on others moored nearby. Without this maintenance the possibility of a reactor accident aboard *those* submarines would be heightened considerably.

The likelihood of some sort of reactor accident among the Russian Navy's nuclear submarines is high. The NATO studies adopted a somewhat arbitrary probability of one per cent per submarine per annum. Given the fact that there are 70 such submarines scattered along the Kola Peninsula, that this number will rise to over 100 vessels by the turn of the century and that it will require decades to decommission them all, the question should probably not be "if" but "when?"[89] Without immediate technical and financial assistance from the West, the situation will continue to deteriorate but, so far, the West had been reluctant to help, with the exception of Norway which has an obvious and vested interest in implementing a solution to the problem as soon as possible. The Norwegian government has donated food aid to the populations of the cities along the Kola Peninsula, most of whom are naval or naval support personnel that are paid irregularly, if at all. The traditional economic infrastructure so necessary to keep Northern communities supplied has all but broken down, and consequently the food aid is extremely important.[90]

Nevertheless, in the final analysis, more important than food aid, more important than infrastructural or technical assistance or financial commitment, is a willingness to deal with the consequences of the Cold War nuclear submarine fleet and the environmental and human threats

---

Norway: NATO, 1995).

[89]In September 1997 Pavel Steblin, the director of the Nerda scrapyard, admitted that, while there were about 100 such submarines awaiting decommissioning, his yard could process only two per annum. See "Russia's decommissioned submarines pose growing threat," Agence France-Presse, 9:41 PDT, 19 Sep 1997. The Nerda scrapyard remains the sole yard working on scrapping Northern Fleet nuclear submarines.

[90]It should be noted that, while Norway and other Scandinavian countries have been sending massive food packages, especially in winter, the contributions of the United States extended only to a shipment of surplus Gulf War military rations -- complete with plastic utensils and sunglasses! See Joshua Handler, "Send Help, Not Charity," *Bulletin of the Atomic Scientists*, 48, no. 4 (May 1992).

it represents. But if the willingness is not evident among Russian naval and technical personnel, then the problem cannot be effectively solved. And there is evidence that, along with all the other shortages suffered by the Russian Navy, a willingness to cooperate with international efforts is in short supply. British nuclear consultant John Large has described the situation thus:

> The Russian Navy is just not in a position to be able to decommission its submarines now, or in the immediate future. It doesn't have the resources, it doesn't have the planning, and quite frankly, I think it doesn't have the willpower to do that. The Russians are bringing their submarines home, they are leaving the fuel inside them, and they're just going to sit there and rot. And that's a concern for everyone, not just the Russians, but us in the West as well.[91]

"More" meant "Better" for the Soviet Union during the Cold War, and so the world's largest nuclear submarine fleet was designed and built by that nation. Because of the perceived threat from a nuclear-armed United States after World War II, and the political and strategic necessity of creating some means of responding to that threat, nuclear submarines were designed and constructed rapidly. Those submarines were flawed and were not of the best design to complete their missions, but in the minds of the designers and political leadership these flaws and shortcomings were acceptable provided that the strategic situation was balanced by the appearance of the submarine fleet. So important and expensive was the construction of the fleet that the facilities necessary to maintain it were relegated to secondary status. But Soviet designers, naval personnel and political leaders failed to stop and think that with the construction of the biggest nuclear submarine fleet some day they would have the biggest mess to clean up. The present nuclear submarine decommissioning crisis is symptomatic of Soviet Cold War planning and philosophy and its legacy will outlast the state that created it by decades, and possibly centuries. Perhaps the ultimate irony of the situation is that the uncertain legacy of the Soviet-era nuclear

---

[91] John Large, quoted in "Russia's Deep Secrets," 3.

submarine fleet will have to be borne by the very people that it was supposed to protect -- the population of the former Soviet Union.

Chapter IV
The Environment versus the State:
The Case of Environmental Law, 1957-1978

Introduction

The very wide range of legislation enacted to protect the Soviet environment is a phenomenon that was noted by both Western and Soviet scholars though, generally speaking, they drew different conclusions on the subject. Most Western scholars, although they admitted that Soviet environmental legislation was largely ineffective, nevertheless saw its expansion as evidence of an increased awareness of environmental issues among the Soviet All-Union and Republic leadership, beginning in the late 1950s. Soviet scholars, meanwhile, saw the expansion of environmental legislation not as evidence of a maturing environmental awareness, but as a codification of already existing and well-established environmental principles. As will be seen below, however, both these interpretations are flawed: not only was concern for the environment at best fragmentary among the political, economic, and administrative elites of the USSR, it appears that the lofty environmental protection laws enacted from the late 1950s onwards were intentionally drafted in such a way as to make them almost impossible to enforce meaningfully. Add to this fact opportunities for non-compliance created by a tangled web of administrative competition, bureaucratization, and the emasculation of oversight bodies and it becomes clear that not only could deeds not match words in the realm of environmental protection legislation in the USSR, it is unlikely that deeds were the focus of the legislation at all.

The period 1957-1978 has been selected as the temporal frame for this case study because it is in this period that the majority of Soviet environmental legislation was framed. It was also in this period that the fiercest policy debates were fought regarding the conservation and the use of the natural environment, and the prevention of practices that

polluted and despoiled it. These debates were sanctioned and managed by the state to a great extent, and the state media, jurists, scientists, literary figures and politicians all participated. The popular discontent with environmental policy, exhibited most strongly after the 1986 Chernobyl' accident, is a quantitatively different phenomenon that has been carefully and comprehensively examined by Western and post-Soviet scholars.[1] This study in primarily concerned with describing and analyzing official Soviet ideology on and responses to problems of environmental degradation; the popular discontent with Soviet environmental policies occurred at a time when the Soviet political structure was not as secure in its position of ultimate arbiter and executor of environmental policy. To examine its actions within that context would therefore avoid the question that closely concerns this case study: what were the official (and, to a very significant extent, unofficial) ideological, administrative, economic, and political foundations upon which Soviet environmental legislation was based.

Interpretations of Soviet Environmental Legislation

As suggested above, Western scholars writing on the environment in the USSR pointed to the growth of Soviet environmental protection legislation as indicative of an increasing willingness among the Soviet leadership to tackle issues of pollution and the misuse of natural resources directly. At the same time, these scholars confronted the issue of the legislation's general ineffectiveness, reaching different conclusions

---

[1]Most notably by David R. Marples in his *Ukraine Under Perestroika: Ecology, Economics and the Workers' Revolt* (Edmonton, AB: University of Alberta Press, 1991); and David R. Marples, *Belarus: From Soviet Rule to Nuclear Catastrophe* (Edmonton, AB: University of Alberta Press, 1996); by Jane I. Dawson, *Eco-Nationalism: Anti-Nuclear Activism and National Identity in Russia, Lithuania, and Ukraine* (Durham, NC: Duke University Press, 1996); by Hilary F. French, *Green Revolutions: Environmental Reconstruction in the Soviet Union and Eastern Europe.* Worldwatch Paper No. 99. (Washington, DC: Worldwatch Institute, 1990); by Tatiana Zaharchenko, "The Environmental Movement and Ecological Law in the Soviet Union: the Process of Transformation," *Ecology Law Quarterly* 17, no. 3 (1990), 455-475. The 1991 Bellagio Conference on U.S.-U.S.S.R. Environmental Protection Institutions also held a major symposium on "Environmentalism and Ethnic Awakening," the proceedings of which may be found in *Boston College Environmental Affairs Law Review* 19 (Spring 1992).

as to why this was so.

Marshall Goldman suggested that the plethora of environmental legislation passed in the USSR, dating as far back as the nascent years of Bolshevik rule, indicated that the political authorities believed "that respect for Soviet authority is such that the mere passage of highly desirable laws is all that is necessary to induce compliance."[2] If a law failed to function as intended, a new law, highly publicized and praised, was introduced. Criticizing this attitude, Goldman argued that the Soviet policy of repeatedly enacting stringent environmental legislation while at the same time failing to provide the means to enforce it was an artifact of the years of Soviet rule under Lenin. The latter, Goldman stated, set extremely high goals for environmental protection at a time when the state was simply too weak to enforce them; because of Lenin's almost deific stature, this practice was consequently "built in" to all subsequent Soviet environmental legislation. This is, however, a dubious assertion: it is very clear that Lenin was willing to adopt extremely harsh measures to enforce Soviet policies when he felt they were required. It is therefore difficult to accept Goldman's suggestion that the Soviet leadership under Lenin somehow lacked the authority to impose meaningful restrictions on misuse of the environment; it is far more likely that the will to impose such sanctions was lacking.

This unwillingness to actually impose penalties as provided by legislation produced another legal effect, according to Goldman: the duplication of laws designed to protect the environment. In this assertion he was substantially supported by other Western writers who discussed the problem.[3] Legislative duplication occurred when a second law was passed in lieu of the application of one that was already part of the legal code. The situation was further complicated by the passage of very similar laws at the All-Union and Republic levels, leading to

---

[2]Marshall Goldman, *The Spoils of Progress: Environmental Pollution in the Soviet Union* (Cambridge, MA: Massachusetts Institute of Technology Press, 1972), 24.

[3]*Ibid.*, 32. Keith Bush also raises this specific point in his "Soviet Response to Environmental Disruption," in Ivan Volgyes, ed., *Environmental Deterioration in the*

considerable confusion over which law should be applied in a given circumstance. Finally, Goldman identified bureaucratic duplication and compartmentalization as complicating factors in the rational application of environmental law:

> Among the agencies responsible for implementing pollution control in the USSR are the Council of Ministers USSR as well as the Councils of Ministers of the various republics, *Gosplan* at the All Union and republic level, the Ministry of Agriculture, the Ministry of Health, Committees for the Protection of Nature in several of the republics, the Ministry of Land Reclamation and Water Management [*sic*], the Ministry of Fisheries and the Ministry of Electrical Energy.[4]

Goldman's identification of administrative and bureaucratic factors mitigating against a rational application of environmental law in the USSR is substantially correct, although he did not provide exhaustive evidence in support of his argument, nor did he state whether such factors were recognized within the Soviet system as important in the degradation of the environment. This chapter will demonstrate, however, that there is considerable evidence that problems of administering environmental law were apparent to Soviet political leaders, jurists, scientists, and early environmental activists, and that this evidence was used as the foundation upon which Soviet critics of their state's environmental policy based their arguments.

In addition to these administrative, bureaucratic, and legal factors that contributed to the process of environmental degradation in the USSR, Keith Bush also added economics. He pointed out that the unevenness of economic development in the USSR, a legacy of the Stalinist emphasis on heavy industry, produced a situation where

> key sectors were accorded priority and recorded impressive growth, while the remaining sectors were treated as residual claimants. Together with consumer services, trade, and other "nonproductive" spheres, environmental protection has been one of those residual claimants. Such ordering of priorities

---

Soviet Union and Eastern Europe (New York: Praeger, 1974), 23.

[4]Goldman, *The Spoils of Progress*, 39. The ministry Goldman refers to as the Ministry of Land Reclamation and Water Management is more properly titled the Ministry of Land Reclamation and Water Resources, more than a merely semantic difference.

> has led to the allocation of insufficient resources for research and development on pollution control technology, little capacity devoted to its production, and a low status accorded to its specialists. The citizen has been relegated to second place not only in the mix of industrial output but also as a consumer of the benefits of the natural environment.[5]

There are, clearly, two interrelated points under discussion here: the relative importance of pollution control equipment in the Soviet economy, and the relationship between the state and citizen as "consumers" of the environment. But Bush's argument concerning pollution control equipment, its development and application, is not, however, altogether correct. While it was certainly true that a branch of engineering science such as this could not hope to compete with high-priority fields possessing direct military and economic application (such as applied physics, nuclear physics, agronomy, or metallurgy, for example), it is nevertheless incorrect to suggest, as Bush did, that insufficient resources were allocated to the development of pollution control equipment because of this reason alone. Indeed, as will be demonstrated in this chapter, Soviet scientists developed some remarkably clever and subtle methods of pollution control involving, for example, gel-barriers, microbial scrubbing, and physical filtration both with and without catalytic agents. Moreover, such breakthroughs were widely and regularly reported in both technical journals and the popular media.

What was lacking in the Soviet polity and economy, however, was the ability to apply these techniques in actual industrial processes. This is not, in itself, *direct* evidence of low priority being accorded to pollution control: numerous examples exist of new technological processes being developed in the USSR, processes that offered substantial progress in terms of productivity or resource conservation, that were nevertheless

---

[5]Keith Bush, "The Soviet Response to Environmental Disruption," in Ivan Volgyes, ed., *Environmental Deterioration in the Soviet Union and Eastern Europe* (New York: Praeger, 1974), 32.

implemented only sporadically, or not at all.[6] The reason why innovative techniques and equipment were inefficiently applied in the Soviet economy derived from a combination of inability (arising from untenable costs or insufficient material resources) and unwillingness (arising from bureaucratic inertia).[7] The fact that the introduction of pollution control equipment followed this pattern of unevenness suggests only that it was an endeavour that suffered several of the same afflictions of planning that were characteristic of many other industrial and technological innovations in the Soviet system. It should not be construed as evidence of it being a low-priority programme, as Bush suggested. Clearly, though, there were severe problems associated with the application of pollution control devices and methods to industrial production processes in the USSR, and an examination of the Soviet response to these problems is an effective method whereby the actual priority of pollution control in the Soviet economic structure may be determined.

Bush's second point, dealing with the relationship between state and citizen in the utilization of the environment is both important and complex. Indeed, Bush did not accord this idea the importance it deserved, because the question of who should be prime beneficiary of the natural environment -- state enterprise or individual citizen -- permeated the debate on environmental legislation and environmental utilization in the USSR.[8] Some Western scholars have argued that this question

---

[6]On this point, see Bruce Parrott, *Politics and Technology in the Soviet Union* (Cambridge, MA: Massachusetts Institute of Technology Press, 1983), 225-228, 278-291. Although efficient electric blast furnaces had been developed in the USSR after World War II, at the time of the collapse of the state in 1991 more than half the country's blast furnaces were of the older, inefficient open-hearth type and, in addition, were over fifty years old. D. J. Peterson, *Troubled Lands: The Legacy of Soviet Environmental Destruction* (Boulder, CO: Westview Press, 1993), 13; see also V. N. Bol'shakov and O. F. Sadykov, "Kontseptsiya formirovaniya regional'noi systemy ekologicheskoi bezopasnosti (na primere Urala)" [Conceptual formation of a regional system of ecological security (in the Ural example)], *Vestnik Akademii Nauk SSSR*, No. 11 (1988), 97. David Marples discusses the chronic problems encountered in the application of new technology in Donbass coal mining operations in his *Ukraine Under Perestroika: Ecology, Economics and the Workers' Revolt* (Edmonton, AB: University of Alberta Press, 1991), chapter 6.

[7]Ronald Amann, "Industrial Innovation in the Soviet Union: Methodological Perspectives and Conclusions," in Ronald Amann and Julian Cooper, eds., *Industrial Innovation in the Soviet Union* (New Haven, CT: Yale University Press, 1982), 1-38.

[8]The terms of the debate were frequently one-sided. At the same time that newspapers

represents the fulcrum upon which Soviet environmental practice balanced or fell: Barbara Jancar has gone so far as to suggest that it was primarily the lack of public input in the environmental policy process in the USSR that produced that state's woeful environmental protection record.[9] This was a controversial argument, especially since Jancar added the corollary that the environmental protection record in democratic societies was better because of significant public involvement in policy-making.[10]

It is, however, relatively simple to test the accuracy of Jancar's argument in one area at least: in the formulation of environmental legislation. Neither Jancar nor other Western scholars analyzed Soviet environmental legislation in any depth: they failed, for example, to study the changes made to the legislation between the issuance of preliminary drafts and their formal adoption into the legal code. In the USSR this process comprised several stages, the first being the promulgation of a draft document in the major newspapers intended to "stimulate public discussion." Over the following few months (usually the period was approximately six months) the newspapers would publish selected letters and commentaries on the draft document supplied by members of the public, industrial and other economic enterprises, nature protection societies, scientists, and jurists. These commentaries and suggestions could be incorporated into the draft legislation prior to its final ratification, or they could be ignored.

In addition to this public input, an examination of the differences between draft legislation and its ultimate legal form makes it is clear

---

such as *Izvestiya* and *Pravda* were only grudgingly acknowledging that industrial activity was systematically damaging the Soviet environment, the latter issued a grumbling missive concerning the contribution of recreational swimmers on the Moskva River to pollution of the capital's water supply! Irina Volk, "A Drop of Water," *Pravda*, (21 July 1967), 3.

[9]Barbara Jancar, *Environmental Management in the Soviet Union and Yugoslavia: Structure and Regulation in Federal Communist States* (Durham, NC: Duke University Press, 1987), 262, 271-279.

[10]For a critique of this point, see Judith Pallot's review of Jancar's *Environmental Management in the Soviet Union and Yugoslavia* in *International Affairs* 64, no. 4 (Autumn 1988), 714-715.

that there were other, private inputs involved in the process. The types of changes that occurred make it possible to identify with reasonable confidence the sources of these private inputs. The extent to which legislation evolved between the draft and final stages, and the basis of that evolution -- whether public input, or administrative and economic pressure exerted outside the public realm -- therefore allows for an appreciation not only of the importance of public input in the environmental policy formulation process (thus testing Jancar's theory), but also of the ability of bureaucratic interests to shape and direct that process to their own benefit.

It is also possible to determine more about the state-individual relationship with the environment through reference to the manner in which environmental legislation was applied, again an avenue of investigation not adequately explored in western scholarship. This is a peculiar omission, given the general level of agreement among scholars concerning the ineffectiveness of Soviet legislation to curb misuse of the environment. Were there differences, for example, between the way individual polluters were treated, compared to pollution generated by industrial enterprises? How severe were the penalties in each case, and what state measures, if any, were enacted to ensure that repeat offences were minimized? As a continuation of this point, it is interesting to examine the Soviet attitude toward poaching, for a variety of salient reasons. First, poaching was almost always a crime committed by individual citizens acting on their own volition, not as part of some administrative or economic corporate entity. It is therefore useful to compare the application of anti-poaching legislation with the application of legislation designed to prevent pollution by industrial enterprises. Second, poaching was viewed quite differently in the USSR than it was and is in Western nations: in the latter it is viewed primarily as an environmental crime, whereas in the USSR it was *exclusively* seen as an economic crime against the state, regardless of the rarity or natural value of the species being poached. This speaks, therefore, to the Soviet

conception of the environment as an economic input to be exploited and suggests that wildlife management was undertaken primarily to ensure that the viability of an economic resource was maintained. Third, reports of poaching often emphasized the difficulties encountered by fisheries- and wildlife-protection officers as they attempted to enforce anti-poaching legislation. These difficulties included generally minimal penalties which failed to deter the practice; poor support for protection officers from other legal bodies and Party organizations as they attempted to pursue cases, especially if the offender enjoyed an important Party or administrative station (as was more than occasionally the case); and poor economic support for their activities. Poaching encapsulates to a considerable degree the debate within the USSR over who, the state or the individual, should be the prime beneficiary of the environment.

The theoretical foundations of this debate were laid in the early 1960s, with the appearance in the USSR of the first major collection of writings on the environment.[11] The collection reflected a growing awareness of the problems that had been created by more than three decades of rapid industrialization, emphasizing not the environmental impact of that process, but resource-utilization flaws that had arisen during its course. The fundamental thrust of the writings was to propose new methods of resource conservation and rationality of use, not the maintenance of environmental quality: thus, the editors could write in the collection's preface that:

> Today, within Soviet science, a new, wider conception of the term "conservation of nature" has developed. It is no longer interpreted as simply the establishment of natural preserves, where all activity that disturbs the uninterrupted course of natural processes is prohibited; or as the preservation of separate types of plant and animal life. Rather, the term now means, above all, the organization of the proper utilization

[11] I. P. Gerasimov, D. L. Armand, and K. M. Yefron, eds., *Natural Resources of the Soviet Union: Their Use and Renewal* [*Prirodnyye resursy Sovetskogo Soyuza, ikh ispolzovaniye i vosproizvodstvo*] (Moscow: Nauka, 1963). Translated and reprinted as W. A. Jackson, ed., *Natural Resources of the Soviet Union: Their Use and Renewal* (San Francisco: W. H. Freeman, 1971).

> and renewal of natural resources in the national economy, occupancy of new areas, and enhancement of the natural endowment leading to an increase in productivity.[12]

It is clear from this that the theory underlying environmental protection in the USSR was not primarily concerned with the maintenance of ecological balance, but with the efficient use of natural resources, and Soviet environmental legislation reflected this theoretical understanding. In their 1967 collection and commentary on Soviet environmental laws, K. N. Blagosklonov, A. A. Inozemtsev, and V. K. Tikhomirov argued that those laws were founded on the precept that "conservation" was embodied in "a complex of governmental, international, and social measures directed towards the rational use of nature, [and the] renewal, increase, and protection of natural resources for the benefit of human society."[13] As Joan DeBardeleben pointed out, definitions such as this signified that "the maintenance of ecological balance [in the USSR] is not of value in itself, but only as a means to assure that natural resources will be available for human use."[14]

This suggests the existence of a fundamental contradiction in Soviet interpretations of the environment: on the one hand, theorists argued that the USSR possessed "the necessary political and economic prerequisites for planning the use and renewal of natural resources", and that this must represent the key direction of Soviet environmental policy.[15] What is less clear, however, is whether at this early stage it was apparent to environmental theorists that maintaining the viability of the environment was essential to the process of regulating its use. To a great extent, the flaws inherent in Soviet environmental legislation were a product of this contradiction, a contradiction that, as will be seen, was

---

[12]*Ibid.*, xii.

[13]K. N. Blagosklonov, A. A. Inozemtsev, and V. K. Tikhomirov, *Okhrana Prirody* [*Nature Protection*]. (Moscow: Vyshaya Shkola, 1967), 7.

[14]Joan DeBardeleben, *The Environment and Marxism-Leninism: The Soviet and East German Experience*. Westview Special Studies on the Soviet Union and Eastern Europe (Boulder, CO: Westview Press, 1985), 44.

[15]D. L. Armand and I. P. Gerasimov, "Economic Significance and Basic Principles of Natural Resource Use," in I. P. Gerasimov, D. L. Armand, and K. M. Yefron, eds.,

never adequately solved.

The Formulation of Soviet Environmental Legislation

Various pieces of legislation designed to protect individual components of the environment were passed in the USSR from Lenin's time onward, but the first law to protect the environment in a general sense was passed by the Estonian SSR on 7 June 1957.[16] By March of 1963 all fifteen constituent republics of the USSR had passed similar legislation.

These republic laws were general in tone and failed to establish properly which bodies were responsible for ensuring environmental protection. The Moldavian SSR's law "On the Conservation of Nature" is a case in point: it stated that

> The local responsibility for nature conservation is placed on rural, district and city Soviets and also on state and public organizations, the militia, state farms, collective farms and other cooperative institutions, and enterprises on whose territory there are natural landmarks subject to state conservation. In border areas the responsibility falls on border guards.[17]

This extreme generality, common to most of the early republic legislation, raised serious questions of effective enforcement: while responsibility for conservation was defined, responsibility for enforcement of the law's penalties was not. In addition, although republic laws such as that of the Moldavian SSR comprehensively defined penalties for environmental damage,[18] it was, as Boris Komarov pointed out, difficult (if not impossible) for republic agencies to enforce those penalties when dealing with all-Union actors: "it happens that the

---

Natural Resources of the Soviet Union, 6.

[16]Goldman, *The Spoils of Progress: Environmental Pollution in the Soviet Union*, 30; N. D. Kazantsev, *Pravovaia okhrana prirody v SSSR* [The Legal Protection of Nature in the USSR]. (Moscow: Znanie, Series 17, 1967), 16, 37.

[17]*Izvestiya*, (1 April 1959). Reprinted and translated in *Current Digest of the Soviet Press* [Hereinafter *CDSP*], XI, no. 13 (29 April 1959), 28. Note that the language of the statute referred to "nature conservation" and not prevention of pollution or environmental protection.

[18]*Izvestiya* reported that "The law establishes that anyone guilty of destroying or harming natural landmarks subject to state conservation will be punished by deprivation of freedom for up to three years or corrective labour for up to one year, or

largest industrial enterprises -- and *they* are the polluters of the environment more than anyone -- are accountable only to the central government. Such a factory is subject only to Moscow, and the laws of the republic where it is located are not binding on it."[19]

The October 1960 law of the RSFSR "On Conservation in the Russian Republic" neatly evaded dealing with this jurisdictional problem. It, like prior republic laws, cast an extremely wide net over *what* was to be protected,[20] named the actors responsible for carrying out that protection,[21] but did not enumerate specific penalties for failing to carry out conservation measures or those actively involved in environmental degradation. Article 20 of the law, "Liabilities of Directors of Agencies and Enterprises" stated only that "for unlawful destruction or damage of natural resources the directors of institutions, enterprises, and organizations as well as other persons directly guilty of committing such damage are held liable under the procedure established by law." Similarly, Article 21, "Liability of Citizens Guilty of Unlawful Use or Damage of Natural Resources" held those citizens to be "subject to administrative or criminal liability under the procedure established by law, with the recovery from them of losses caused."[22]

Although not specifically stated, the procedure established by law rested almost solely on the application of fines. Although some republic

---

by a fine of up to 2,000 rubles." *Ibid.*

[19]Boris Komarov, *The Destruction of Nature in the Soviet Union* (White Plains, NY: M. E. Sharpe, 1980), 64. Emphasis original.

[20]Article 1 of the legislation, "Natural Resources Subject to Conservation" stated that land, mineral resources, waters (both surface and underground), forests, natural vegetation, green plantings in urban centres, typical landscapes and those containing "rare and natural objects", resort areas, forest shelter belts, the animal world, and the atmosphere were all "subject to state protection and regulated use in the territory of the RSFSR." *Pravda*, (28 October 1960), 2. Reprinted and translated in *CDSP* XII, no. 44 (30 November 1960), 3.

[21]Article 15, "Supervision of Conservation" reads

> The RSFSR Council of Ministers, autonomous-republic Councils of Ministers, territory, province, district, city, settlement and rural Soviet executive committees, ministries, agencies and economic councils shall ensure supervision over the observance by institutions, enterprises, organizations, state and collective farms and citizens of existing conservation laws and over fulfillment of measures for the preservation and restoration of natural resources. *Ibid.*, 5.

legislation included provisions for the imprisonment of violators of conservation laws there are almost no early instances of the implementation of those provisions. The administrative and legal application of fines was a much more common practice, although the policy's inadequacies were increasingly a target of criticism in the Soviet press in the late 1950s and early 1960s.

One critic, for example, suggested in 1959 that there was active collusion between the Belorussian SSR's Ministry of Finance and the republic's Power Administration. The latter, responsible for the application and collection of fines from republic enterprises, generated more than 700,000 rubles from this source in 1958 alone. Of this total, 500,000 rubles were transferred to the Ministry of Finance, while the remainder was factored into the Power Administration's general profits.[23] Administrations in other republics were guilty of similar overzealousness: in 1957 and 1958 the RSFSR Chief Scrap Metals Administration fined plants and enterprises a total of forty-five million rubles; perhaps the most remarkable record of all belonged to the USSR State Sanitation Inspection Service (also known as the State Sanitary-Epidemiological Service) which, in the course of only one year, managed to collect 243,000 individual fines![24] In their Stakhanovite zeal to generate income, administrative agencies often fined enterprises several times for the same offence: in the case of violations of environmental legislation

> the communal economy agencies mechanically impose[d] fines for the discharging of unpurified wastes. At the same time, the sanitation service and the fishing inspection service impose[d] juridicial fines on enterprises and personal fines on officials for violations of the schedules for building purification installations and for polluting bodies of water.[25]

---

[22]*Ibid.*

[23]M. Savelyev, "From Pocket to Pocket," *Izvestiya* (29 May 1959), 2.

[24]*Ibid.* It must be noted that the State Sanitation Service, generally speaking, was committed to combatting pollution and environmental mismanagement. It had very few effective weapons in this task apart from the application of fines.

[25]*Ibid.*

Furthermore, according to critics of the system, fines did not act as a deterrent to malpractice:

> Even this "planned" imposition of fines is not effective. The fish protection service fined a coke-chemicals plant of the Zaporozh'e Economic Council 5,000 rubles, but that did not stop the plant from polluting and poisoning the waters of the Dniepr.
>
> The flow of polluted waste water is increasing, and this proves the ineffectiveness of fines. The facts show that the present system of fines for the discharge of unpurified industrial wastes does not motivate enterprise officials to speed up the construction of purification installations....It should also be pointed out that in general the imposition of fines contributes little to the strengthening of state discipline. Many fines are of no help at all in eliminating the shortcomings for which they were imposed; on the contrary, they disrupt the financial operations of enterprises, weaken cost accounting and raise production costs.[26]

The uses to which collected fines were put was also the subject of critical attention: arguing that fines paid by polluters should be used solely to ameliorate problems caused by pollution, some commentators suggested that, if the monies generated by fines were not used to this end, then the result could be insidious:

> The fines are handed over to the local Soviets. With these funds they pave the streets of settlements, build clubhouses and lay water mains. This becomes a peculiar kind of redistribution of state budget funds. The local Soviets begin to regard pollution indulgently, if not favourably. The fines thus ward off the striking power of public influence.[27]

Despite criticism such as this, there was nevertheless a marked reluctance to abandon fines as a state policy intended to punish transgressors. As T. Nizovtseva, an inspector with the Kharkov Sanitary Inspection Service, pointed out, "adequate or not, they are nevertheless a weapon. The fines are reflected in production costs. And a director doesn't get a pat on the back for raising production costs."[28] But how true was this statement in reality? It was certainly true that fines levied

---

[26]*Ibid.*

[27]I. Demin and D. Bilenkin, "A River Calls for Help," *Komsomolskaya pravda*, (27 April 1960), 2.

against managers and directors of enterprises were extracted not from the pockets of guilty individuals but from the enterprise's operating funds (thus, one suspects, considerably lessening the impact of the judgement on those individually culpable),[29] but frequently the fines for acts of pollution were lower than the bonuses paid for the overfulfillment of plan targets.[30] Thus, managers of polluting plants were often financially more secure if they continued to pollute, paying fines for polluting, if they could maintain high production rates. Furthermore, in contradistinction to Inspector Nizovtseva's statement above, the directors of polluting enterprises *did* receive a surreptitious bureaucratic "pat on the back," providing their enterprise remained productive: as D. L. Armand pointed out, it was common practice for higher administrative levels to factor monies required for fine payment into an enterprise's annual operating budget.[31] In adopting this practice, higher administrative agencies were condoning two irrational practices: first, the continuation of methodical pollution as a means to promote short-term high economic productivity; and, second, the fulfillment of "planned production targets" by those agencies responsible for levying and extracting fines. In a self-referential bureaucratic sense, everyone was happy with this arrangement: production quotas could be set and exceeded by all sides. But the problem of pollution was not solved.

---

[28]*Ibid.*

[29]M. Vitt, "Ob ekonomicheskikh stimulakh ratsional'nogo ispol'zovaniya prirodnykh resursov" [Concerning the economic stimulus for the rational use of natural resources], *Planovoe khoziaistvo*, (July 1970), 78.

[30]Goldman, *The Spoils of Progress: Environmental Pollution in the Soviet Union*, 35-36. In the forest industry, fines for misuse of timber resources were also ineffective for this reason. As a group of scientists writing on wastefulness in the timber industry noted,

> the managers [of lumber combines] pay fines for violating the regulations on forest cutting. And they pay them quite willingly. Why not pay a 500 ruble fine, if at the same time you receive a 10,000 ruble bonus for overfulfilling the plan?! Unfortunately, there are a great many such cases of an antistate attitude on the part of directors of lumbering enterprises toward the work entrusted to them.

P. Verkhunov, S. Dmitrevsky, P. Kutuzov, S. Shanin, and I. Armatov, "The Taiga is Our Wealth," *Pravda*, (9 April 1961), 3.

[31]D. L. Armand, *Nam i vnukam* [For Us and Our Grandchildren]. (Moscow: Mysl', 1966),

In an attempt to rectify problems identified with the application of administrative fines to deter violators of environmental legislation, the USSR Supreme Soviet issued a 21 June 1961 Decree "On Further Limiting the Application of Administrative Fines."[32] The decree comprised three essential legal elements: the first was the termination of the policy of applying fines to corporate entities (institutions, enterprises, or production organizations); the second was the limitation of the number of agencies legally empowered to impose fines; and the third was the setting of an upper limit on the monetary amount of fines.

In principle, these provisions made a great deal of sense, though at first glance this may not be apparent. The termination of the policy of fining organizations was enacted in order to prevent the practice of those organizations "assuming" the fines imposed on individuals guilty of legislative violations. Preventing this, it was stated in the decree's preamble, would "increase...the personal responsibility of officials."[33] By shielding guilty individuals from pecuniary punishment through the assumption of fines, organizations were ensuring that "the officials actually responsible for violations go unpunished."

By dissociating violators from their organizations, the decree exposed guilty parties to proper measures of administrative compulsion. But it was also recognized that individuals did not possess the financial resources of economic organizations; therefore, persons committing offences in violation of republic and all-Union legislation were subject to maximum fines in normal circumstances of ten rubles for individuals and fifty rubles for administrative officials. In certain, unspecified, "special need" cases these limits could be doubled.

In order to limit duplication (or, in some cases, multiplication) of fines the decree also imposed limitations on the number of agencies legally empowered to exact them. This sharply reduced the number of all-

---

71.

[32]*Vedomosti Verkhovnogo Soveta SSSR*, No. 35 (1 September 1961), 830-834. Reprinted and translated in *CDSP* XIII, no. 34 (4 October 1961), 23-25.

[33]*Ibid.*, 23.

Union and republic agencies responsible for enforcing environmental legislation: agencies of the State Sanitary Inspection Service retained sole right to impose fines related to violations of hygiene and anti-epidemic regulations, while all-Union and republic agencies of water, fisheries, and forestry conservation services retained the sole right to impose fines on violators "of regulations on the conservation and utilization of water resources, fishing regulation and forest-fire prevention regulations."[34] (Note that this meant, in effect, that no agency was responsible for the enforcement of extant laws covering air pollution or soil despoliation, both of which represented widespread problems at the time.)

The fundamental thrust of the decree, then, was to streamline a cumbersome and generally ineffective process, modernize it (the 1961 decree superseded four old pieces of Soviet legislation, the most recent of which had been passed in 1937), and increase its effectiveness. At first glance, the reduction in the maximum allowable fine for violators of environmental legislation to only fifty rubles for officials (or 100 rubles in extraordinary cases) may seem to reduce penalties to a point where their deterrent effect was minimal. Indeed, Marshall Goldman, referring to similar legislation, with identical limits, passed by the RSFSR Council of Ministers in February 1963, calls the penalties "not very intimidating" and suggests that "it is hard to see how such fines could have any impact."[35] In reality, however, the sum of fifty rubles represented a significant percentage of a worker's monthly wage at the time, and so it is entirely possible that, properly applied, a fine of this amount could have acted as a reasonable discouragement to those contemplating transgressing environmental legislation.

Critical for the decree's success, however, was the effective dissociation of a polluting enterprise from the individual or individuals responsible for allowing pollution to occur. If such cleavage could not be

---

[34]*Ibid.*

[35]Goldman, *The Spoils of Progress: Environmental Pollution in the Soviet Union*, 35.

ensured, then the new fines scheme would be laughably minute in comparison to even the most modest organizational operating budget. Although -- as indicated above -- the decree explicitly forbade enterprises from assuming fines imposed on individuals, it did not specify any penalty for doing so, nor did it make reference to any other legislation whereby an organization guilty of shielding its staff could be brought to justice. This legal loophole proved to be catastrophic because, even in cases where it could be proved that enterprises were paying fines for culpable individuals, nothing could be done to censure the offending organization; and so the practice continued unchecked.

Ultimately then, the effect of the 1961 decree was not to streamline the fines imposition and collection system, but actually to cripple it still further: the amount of administrative fines was reduced, and enormous gaps appeared in the abilities of supervisory bodies to police properly violations of environmental regulations. Finally, because there was no compelling reason not to, ministries at both the all-Union and republic level continued to openly include funds for the payment of fines for pollution offences in the operating budgets of their enterprises.

It appears that, in the RSFSR Supreme Soviet at least, it was clear almost immediately that measures encompassed not only by the USSR decree "On Further Limiting the Application of Administrative Fines" but also by the RSFSR law "On Conservation in the Russian Republic" were inadequate to prevent the mismanagement of the environment. In a speech to the Supreme Soviet in April 1963, G. I. Voronov noted that "much work must be done to prevent the pollution of the air and of rivers and lakes with industrial wastes. Strict order must be introduced in this matter, and officials who violate the sanitation regulations must be made liable."[36] Slightly more than a year after Voronov's speech, the RSFSR Supreme Soviet heard a report from V. V. Trofimov, the republic's

---

[36]*Pravda* (5 April 1963), 2. Note that Voronov's speech occurred less than three years after the introduction of the RSFSR's nature conservation law, which was supposed to introduce "strict order" into the delineation of environmental offences, and less than two years after the passage of the USSR Supreme Soviet decree designed to rationalize

Minister of Public Health, that sharply criticized "the economic councils and enterprises that permit the pollution of the air and bodies of water."[37] This *pro forma* criticism disguised the fact that, in cases of air pollution at least, there was no body legally empowered to prevent the practice. It is also noteworthy that Trofimov chose to attack the polluters of water, and not the bodies responsible for the prevention of such pollution. One of these bodies was the RSFSR Sanitary Inspection Service, responsible for the hygienic integrity of water sources and subordinate to Trofimov's own Ministry of Health.

There were other official condemnations of the failure of Party and economic bodies to implement properly the measures laid down by the 1960 RSFSR Law on Conservation,[38] but it was not until the end of 1965 that the RSFSR Supreme Soviet attempted to rectify these problems through recourse to the force of law. On 26 October 1965 the Presidium of the RSFSR Supreme Soviet adopted the resolution "On Fulfillment of the 27 October 1960 RSFSR Law 'On Conservation in the Russian Republic.'"[39] The preamble of the resolution enumerated the systematic failure of RSFSR ministries, local soviets, and state and collective farms to apply conservation measures as required by the 1960 conservation law. It pointed out that fully one quarter of the funds allocated to economic organizations for the implementation of anti-pollution measures over the period 1960-1964 had not been spent and concluded that, in cases where violations of the conservation law had been so severe that they required the intervention of criminal investigators, those agencies, "the militia, prosecutors and the courts [did] not take all the necessary steps against violations of the Law on Conservation and

---

the system of penalties for those offences.

[37]*Pravda*, (11 June 1964), 3.

[38]See, for example, the report of RSFSR Prosecutor V. M. Blinov to the Presidium of the Republic Supreme Soviet, following which the Presidium "instructed Ministries, departments, and local Soviet agencies...to improve radically the work done on the conservation and renewal of natural resources." *Sovetskaya rossiya*, (13 December 1965), 1.

[39]*Vedomosti Verkhovnogo Soveta RSFSR*, No. 44 (370) (4 November 1965), 923-927. Reprinted and translated in *CDSP* XVII, no. 46 (8 December 1965), 3-5.

tolerate[d] red tape in the hearing of this category of cases."[40]

In an attempt to improve the situation, Article 6 of the resolution specifically directed the RSFSR Ministry of Land Reclamation and Water Resources to "intensify control over the protection of water resources from pollution, with a view to their full use in the interests of the population and branches of the national economy," while the RSFSR Ministry of Public Health was instructed in Article 7 to "intensify the control of the agencies of the state sanitary inspection service over the condition of the soil, bodies of water and the atmosphere."[41] The republic State Sanitary Inspection Service was therefore empowered to investigate occurrences of air pollution and soil depletion, thus sealing the legal loophole that had existed previously.

The 1965 Resolution is noteworthy because it addresses the issue of pollution far more extensively than the 1960 Law on Conservation. Articles 6 and 7, quoted above, were only two of six articles that specifically directed individually-named ministries, city Soviets, and state committees to institute active measures to combat pollution then occurring within their administrative purview. The resolution was flawed, however, by the fact that not only did it fail to deal with potential jurisdictional conflicts, it actually exacerbated them. Both the Ministry of Land Reclamation and Water Resources and the Ministry of Health's Sanitary Inspection Service were instructed to combat water pollution making, in effect, neither solely responsible for ensuring that the task was carried out. In addition, the resolution did not address the problem of economic and supervisory duality within ministries, of which the Ministry of Land Reclamation and Water Resources was but one example. Essentially, in instructing the ministry responsible for the economic development of water resources to intensify its efforts for their protection, the resolution perpetuated the danger that the ministry's anti-pollution activities would be guided not by environmental principles

---

[40]*Ibid.*, 3.
[41]*Ibid.*, 4.

but by narrow bureaucratic interests. Two examples may illustrate this point.

The first was raised by B. Ye. Kabaloyev, a deputy of the USSR Supreme Soviet, speaking on the subject of the state plan and budget for 1965. As a deputy from the North Ossetian Autonomous Republic, Kabaloyev noted that the most pressing problem facing his ASSR was the prevention of water pollution and the maintenance of clean water supplies for human consumption. In the near future, he said, the situation threatened to become alarming:

> An especially abnormal situation is being created for the inhabitants along the Fiagdon River. The trouble is that the Fiagdon lead-and-zinc ore-enriching enterprise...is being built on the upper reaches of the river and will be opened in 1966. But the industrial water and wastes of this enterprise will be dumped into the Fiagdon, and as a result the river's water will become unfit for economic and drinking needs and the population living for almost 50 kilometres along the river will find itself in a difficult situation.
>
> We called attention to this earlier, but apparently it was not possible at the time to decide this question favourably. Now the construction of a Fiagdon water pipeline has become urgently necessary.[42]

As the North Ossetian ASSR was a component of the RSFSR, responsibility for ensuring that, upon completion, the ore-enriching enterprise did not pollute the Fiagdon River devolved upon the RSFSR Ministry of Land Reclamation and Water Resources. If, however, pollution *did* occur, and the Fiagdon Water Pipeline was required to bring fresh water from above the ore-enriching enterprise's outflows to those downstream, then the contract for the construction project -- and at 50 kilometres in length, the project would be significant and the contract therefore lucrative -- would also fall to the same ministry. There was therefore little incentive for the ministry to prevent the pollution of the river; indeed, there was a powerful bureaucratic incentive to see that such pollution occurred.[43]

---

[42]*Izvestiya*, (12 December 1964), 5.

[43]It is interesting to note that, in calling for the construction of a pipeline more than a

The second example is provided by Boris Komarov who, in his *Destruction of Nature in the Soviet Union* discussed the problem of water supply and the prevention of water pollution in the Ukrainian SSR. One of the major sources of pollution of the southern reaches of the Dniepr River was saline shaft water pumped from coal mines in the Krivoi Rog region and discharged into the river. According to Komarov, these mines were a major source of the "more than one million tonnes of various salts" that were discharged into the river annually.[44] At the same time, central and southern Ukraine's water requirements were rising rapidly: the administrative solution to this problem was to develop a scheme to divert 30-35 km^3 of water from the Danube River to replenish the Dniepr and to provide for the irrigation of Ukrainian agriculture.[45] Noting that "promising experiments have...been carried out on the use of brackish water for irrigation" and that those experiments, carried out in the Zaporozh'e region, showed "with skillful watering brines do not [further] salinize the soils," Komarov pointed out that, after partial desalinization, the Krivoi Rog mine shaft waters would provide an excellent source for irrigation in Southern Ukraine.[46] These local resources enjoyed enormous advantages of cost: each cubic metre of diverted water was costed at 1.5 to 2.0 rubles; the desalinized shaft waters only cost 0.2 to 0.5 rubles per cubic metre, however.[47] Why was this scheme not implemented? According to Komarov, it was because

> The Ministry of the Coal Industry and the Ministry of Ferrous Metallurgy are supposed to desalinize these [shaft]

---

year in advance of the opening of the ore-enriching enterprise, Kabaloyev demonstrated an overt lack of faith in the abilities of the RSFSR Ministry of Land Reclamation and Water Resources to prevent the pollution from occurring. In addition, it should be pointed out that the existence of such a plant was a legal impossibility: according to Article 4 of the RSFSR Law on Conservation of 1960, it was "forbidden to put into operation enterprises, shops and installations that discharge sewage without carrying out measures that will ensure its purification." *Pravda*, (28 October 1960), 2. Reprinted and translated in *CDSP* XII, no. 44 (30 November 1960), 3.

[44]Komarov, *The Destruction of Nature in the Soviet Union*, 41.

[45]For a description of the rise and fall of the Danube-Dniepr project, see David R. Marples, *Ukraine Under Perestroika: Ecology, Economics and the Workers' Revolt.* (Edmonton, AB: University of Alberta Press, 1991), 105-113.

[46]Komarov, *The Destruction of Nature in the Soviet Union*, 41.

[47]*Ibid.*, 42.

> waters, and the cost of desalinization makes each tonne of coal and steel 20 to 50 kopecks more expensive. Naturally, neither ministry wants this. The funds for channeling the waters from the Danube [were allocated to] another government pocket --...the Ministry of Land Reclamation and Water Resources, which maintains that shaft waters are not its concern.[48]

The shaft waters, once they entered the Dniepr watershed were, however, the responsibility of the USSR Ministry of Land Reclamation and Water Resources, since those saline waters represented a source of pollution which the ministry, like its RSFSR counterpart, was legally charged to prevent. Again, a ministry responsible for the maintenance of a resource and for the prevention of its pollution was faced with an administrative choice: implement a programme to utilize saline waters locally, which would both ameliorate the pollution of the Dniepr River and reduce the pressure on the Ukrainian SSR's water supply system; or support the Danube-Dniepr Canal scheme, the construction of which would be the ministry's responsibility. The USSR Ministry of Land Reclamation and Water Resources chose the latter option, which promised extremely lucrative budgetary returns.

The problem of ministries and other state entities being responsible for the prevention of pollution, while at the same time being influenced by administrative or economic considerations that tended to militate against the fulfillment of their anti-pollution duties was not unrecognized by Soviet journalists, jurists and scientists. In July 1967 *Izvestiya* carried an article by Academician B. Bykhovsky and N. Gladkov, a member of the USSR Academy of Science's Council who was responsible for investigating the "scientific principles of conservation."[49] The article concentrated on describing the factors that hampered the proper observance of existing conservation laws at both the all-Union and republic levels. The authors concluded that, first and foremost, "the cause of conservation is everywhere impeded by departmentalism."

---

[48]*Ibid.*

[49]B. Bykhovsky and N. Gladkov, "The Rights of Nature," *Izvestiya*, (5 July 1967), 5.

Industrial plants that polluted inland waterways, creating fish-kills that damaged local fishing industries and complicated the problem of supplying urban areas with clean water, did so not only because it was economically expedient to do so, but also because such activity did not affect the polluting enterprise in a negative economic or administrative sense. Economic and planning entities persisted in such practices "because it is not the general state interests that figure in the calculation of economic measures, but a 'narrow range' of one's own concerns."[50] The authors observed that "control over the fulfillment of decisions on conservation also lies within the purview of various departments," and asked rhetorically, "can such control be effective?"[51] The solution to the problem, according to Bykhovsky and Gladkov, was to prosecute polluters and impose sanctions that were economically and legally meaningful. But the most serious obstacles to such a policy were administrative redundancy and an inability to prosecute all-Union economic entities under republican laws.[52]

To facilitate the elimination of these problems, the authors insisted that an all-Union conservation law was essential:

> A rather large number of all-Union resolutions exists.... However, there is an acutely felt need for a single law. Only such a law can remove the contradictions that constantly arise between the requirements of the republic laws and the actions of the all-Union ministries and institutions. And, of course, we need not only departmental but all-Union control over the observance of all conservation requirements.[53]

Bykhovsky and Gladkov's call for all-Union legislation was but one example of an increasing awareness among scientists, jurists, journalists and conservationists that such measures were necessary to rein in an increasingly ubiquitous practice of industrial pollution that proceeded

---

[50] *Ibid.*

[51] *Ibid.*

[52] To this may be added the point that not all republics treated conservation in the same manner: in the conservation laws of the Uzbek, Georgian, Azerbaidzhan, Lithuanian, Kirgiz and Estonian SSRs it was not a criminal offence to deliberately pollute the atmosphere, whereas in the other Union republics it was considered a felony. See I. Shiryayev, "Give the Cities Clean Air," *Izvestiya*, (29 December 1967), 3.

unchecked because it could be perpetuated within the very mass of competing, widely unrelated and confusing legislation that was intended to protect and conserve the environment.[54]

Although such calls were supported by senior all-Union administrative actors,[55] the government was slow to act. The "General Statute on USSR Ministries" issued in August 1967 reinforced the policy of ministerial responsibility for the prevention of pollution.[56] Critics openly suggested that such compartmentalized and ministry-specific legislation was anachronistic and therefore incongruent with developed principles of socialist legality:

> Until recently,...questions [of democracy and law] have been studied by jurists as applied chiefly to the protection of citizens' rights and legal interests and also to the activity of administrative and judicial bodies. But...it cannot be

---

[53]Bykhovsky and Gladkov, "The Rights of Nature," 5.

[54]Other calls appeared in the mid-the-late 1960s and intensified in the early 1970s. See for example, Oleg S. Kolbasov, *Zakonodatel'stvo o vodpol'zovanii v SSSR* [Legislation on Water Use in the USSR]. (Moscow: Iurizdat, 1965). Reprinted in its entirety in Irving K. Fox, ed., *Water Resources Law and Policy in the Soviet Union.* (Madison, WI: University of Wisconsin Press, 1971), 93-218; N. P. Lesnikova, "Pravovye problemy okhrany prirody v SSSR" [Legal Protection of Nature in the USSR], *Priroda*, No. 1 (January 1970), 119. In a series of letters published in the 19 March 1971 edition of *Pravda*, both nature conservation experts and scientists stressed the then-present state of confusion and duplication of conservation inspectorates that produced conditions whereby those inspectorates "are not in a position to work together." In one of these letters N. D. Kazantsev, an expert on Soviet environmental law at Moscow State University, stated that the only possible way to rectify this situation was to pass a single all-Union code of environmental protection that included provisions establishing a single-entity oversight and protection body.

[55]V. D. Denisov, the Director of the USSR Ministry of Agriculture's State Inspection Service for Conservation, in a speech to the First All-Union Seminar-Conference on Conservation held in Moscow in November 1967, noted that, although state bodies for nature conservation did exist, they failed to perform their functions properly because of impediments imposed by often irreconcilable differences in republic legislation. He therefore argued that there was "an urgent necessity for the creation of state agencies vested with full responsibility for the integrated utilization of natural resources." *Pravda*, (14 November 1967), 6.

[56]*Ekonomicheskaya gazeta*, No. 34 (August 1967), 7-9. Article 26 of the legislation, in the section covering "Functions of the USSR Ministry," stated that

> [The Ministry] ensures the rational use and restoration of natural resources, taking into account in their exploitation the interests of other branches [ministries] and the national economy as a whole, and it implements the necessary measures for the protection of air, soil, and bodies of water from pollution by industrial and other economic refuse, sewage, radioactive substances and production wastes, and for the conservation of flora and fauna.

> forgotten that the principle of legality embraces all spheres of life in a society that are regulated by law, including the national economy. *In this regard, violation of legality entails not only violations of citizens' rights but also the inflicting of damage on the country's economy (for example, violation of conservation laws).*[57]

Senior administration members responsible for conservation wondered whether legislation such as the General Statute on USSR Ministries was a practical way of ensuring environmental protection, asking in one case, "how can a water inspection service, for instance, control the work of the Ministry of Land Reclamation and Water Resources, to which it is subordinated? The situation is also similar for other subdivisions [of the national economy]."[58]

The first indication that the USSR government was willing to develop more sweeping legislation that covered entire ecological systems, and that treated the protection and conservation of those ecosystems as an all-Union rather than a ministerial or republic concern was the appearance of the "Draft Principles of Land Legislation of the USSR and Union Republics." Promulgated by the Presidium of the USSR Supreme Soviet on 26 July 1968, the Draft Principles represented an attempt to define comprehensively the legal principles for the use and environmental protection of land, and measures to increase soil fertility.[59] Based on the legal principle that all land in the USSR was owned by the state which granted the use of that land to state, corporate or individual entities in usufruct, the Draft Principles defined conditions under which land usufruct was granted and conditions under which it

---

[57]V. Chkhikvadze, "Questions of theory: the jurisprudence of socialism," *Pravda*, (10 January 1968), 2-3. Emphasis added.

[58]B. Voltovsky, "We and Nature," *Izvestiya*, (12 October 1968), 2. Voltovsky was the Chairman of the Ukrainian SSR Council of Ministers' State Committee for Nature Conservation. He also used this article to state that "the practice of our committee confirms the need to create a single integrated agency for nature conservation....Only then will it be possible to coordinate the activities of all the republics," and pointed out that the establishment of an all-Union committee for nature conservation and protection would eliminate problems of departmentalism and administrative barriers that hampered the protection of nature at both the all-Union and republic level.

[59]"Draft Principles of Land Legislation of the USSR and Union Republics," *Izvestiya*, (26 July 1968), 3-4. Reprinted and translated in *CDSP* XX, no. 30 (14 August 1967), 11-15.

could be revoked. Interestingly, Article 14 of the Draft Principles, which defined the grounds on which the right of enterprises, organizations and state institutions could be revoked, included no provisions under which polluters of land could lose their rights to use that land. On the other hand, Article 15, which defined similar grounds for individual users, *did* contain provisions whereby pollution could lead to the individual user's loss of rights to use of the land. It is true that enterprises were charged under Article 11 of the Draft Principles to return land to a state "suitable for use in agriculture, forestry or fishing" when the period of usufruct ended. However, the only legal inducement to comply with this regulation was the anodyne statement that "failure to fulfill these obligations entails liability for the...enterprises and organizations, as well as for officials, in accordance with procedures to be established by Union-republic legislation."[60] In other words, the Draft Principles contained no compulsion for enterprises that despoiled land to reconstitute it and, ultimately, transferred the responsibility for drafting legislation that would provide such compulsion back to the constituent republics of the USSR. But, as described previously, the ability of the republics to enforce the provisions of environmental legislation when dealing with all-Union actors was questionable. This was a well-publicized and much-discussed problem, and it is difficult to believe that those responsible for composing the Draft Principles on Land Legislation were unaware of its existence. One must therefore conclude that the Draft Principles were not, in fact, intended to place legal restrictions on the ability of all-Union actors to despoil land under their control.

In the public discussion which followed the promulgation of the Draft Principles, the issue of legal responsibility for conservation and correct use of the granted land was hotly debated. The general tenor of the respondents' comments was that the Draft Principles had failed to define legal and economic mechanisms that would ensure rational usage and protection of land. Professor of Economics M. Bronshtein suggested

---

[60] *Ibid.*

that the oversight of those who composed the Draft Principles would exacerbate irrational land-use practices by ministries, would perpetuate existing problems in inter-ministerial relationships, and would establish incorrect procedures for the transfer of agricultural land to industrial users:

> It is known that many instances of excessive, and not always rational, removal of fertile land from agricultural use occur when industrial, powerstation, urban, or other construction takes place. This is primarily because when construction organizations use land free of charge they seek first to develop the land that is convenient for them -- level ploughland, which has the most agricultural value.[61]

It was therefore necessary, in Bronshtein's view, to introduce effective economic and legal instruments to combat this problem as well as the issue of irrational land use by corporate tenants. Legally, existing mechanisms, if properly applied, could reduce problems of land despoliation, according to Bronshtein. He concluded that, for establishing effective methods whereby meaningful liability for misuse of land could be determined, an "economic-accountability" procedure was required.[62] An unwritten but obvious component of this argument was the fixing of a real economic valuation on land, because only in that way could a proper accounting of financial liability for damaging that land be achieved. This is, as will be seen below, an ideologically dangerous suggestion.

Some commentators of the Draft Principles focused their discussion on the unequal provisions for dealing with polluters, noted above. (The reader will recall that under the Draft Principles individual users could face revocation of land-use rights if they polluted land under their control, whereas corporate entities such as industrial enterprises or state and collective farms did not.) Doctor of Jurisprudence S. Biasalov complained that the Draft Principles failed to enumerate properly types of activity damaging to the fertility or utility of land, nor did they provide

---

[61]M. Bronshtein, "Economic Responsibility," *Izvestiya*, (5 September 1968), 3.
[62]*Ibid.*

legally binding compulsion for oversight agencies to exercise their authority properly. As Biasalov pointed out,

> There would seem to be no doubt that according to the legal statute of the land-supervision agencies, it is they that are primarily supposed to ensure strict observance of land legislation. Unfortunately, these agencies are not always exacting. In some places...a so-called "mutual amnesty" between them and the land users has even taken root....It must be said outright that the agencies of the court and the prosecutor's office do not combat land law violations, but regard them as minor infractions. Even cases of unauthorized take-overs of land do not attract their attention, and they do not always give the necessary support to the land-supervision agencies.[63]

Biasalov concluded that, with only minor emendation, the Draft Principles represented a potentially decisive weapon in the campaign to combat such harmful practices. He proposed that Article 20 of the Draft Principles, which described the practical basis of state control over all land, be amended to include the statement that "the instructions of state land-control agencies on questions of ensuring rational use and proper conservation of land are binding on all enterprises, institutions and organizations, *regardless of their departmental jurisdiction.*"[64] This last point is fascinating: in essence, Biasalov was arguing that organizations, regardless of ministerial affiliation, should be bound by the dictates of *any* supervisory agency, regardless of *their* ministerial affiliation. Had it been accepted, there is a good chance that this may have proved to be a revolutionary policy. It is rare to find a case in which a supervisory body (for any environmental sphere; land, water, or air) criticized the activities of the ministry to which it was subordinated, a problem discussed above; it is, however, far more common to find even lower-level representatives of such agencies harshly criticizing the activities of other ministries.[65] But, lacking the jurisdictional authority

---

[63]S. Biasalov, "A Sensible Balance," *Izvestiya*, (12 September 1968), 3.

[64]*Ibid.* Emphasis added.

[65]One of the most common practices that provoked such complaints deals directly with issues addressed by the Principles of Land Legislation of the USSR and Union Republics -- that of industrial enterprises and mining combines failing to return land

to act, these agencies could do little except complain publicly. Under Biasalov's proposal, these agencies could have imposed legislative or economic sanctions on violators of land laws, which potentially could have produced sweeping changes in the manner in which land use was monitored.

Other commentators of the Draft Principles suggested that land required a system of valuation to rationalize its use. Unlike Bronshtein's suggestion noted above, which was implicit, these commentators were quite explicit in their suggestions. P. Loiko, a hydrotechnical engineer working on preparations for the flooding project associated with the creation of the reservoir of the Kama Hydroelectric Station, addressed the question of land valuation in relation to the loss of productive agricultural land inundated by such hydroelectric schemes.[66] He suggested that a charge should be imposed for agricultural land that was allocated to non-agricultural users: such a charge could "be included in the production cost of facilities and [would] serve as economic protection of arable land and other areas against wastefulness." According to Loiko, such measures were necessary because large-scale engineering schemes and industrial and other economic complexes tended towards irrational management and misuse of the land allocated to them. The project on

---

under their control back to the state in a condition suitable for agricultural or other non-industrial purposes. See, for example, the speech by V. P. Mzhavanadze to the Central Committee of the Georgian SSR. *Zarya vostoka*, (7 April 1970), 1-2. Reprinted and translated in *CDSP* XXII, no. 14 (5 May 1970), 5-7. B. Bodganov, Director of the USSR Ministry of Agriculture's Chief Administration for Conservation, Preserves, and Hunting pointed out that the illegal practice of enterprises failing to revivify land was widespread and economically damaging. He stated that mining combines were especially reckless in this regard: "very little land is restored following opencut operations, and restoration is a very slow process at best. For example,...in the Moscow coal basin, only a little more than 600 hectares has been reclaimed for agricultural crops or forests, out of the 8,000 hectares despoiled." B. Bogdanov, "Conservation and Economics," *Ekonomika sel'skogo khoziaistva*, No. 2 (February 1970), 7-11. The situation was so bad in the Ukrainian SSR that one writer termed the region around Krivoi Rog a "lunar landscape" of waste heaps and tailings dumps. Only a tiny fraction of the land had been revivified -- partly because there was little interest on the part of the management of most combines to do so, and partly because, in the cases where restoration efforts were sincerely being undertaken, failure resulted. As one specialist engaged in the campaign noted, the failures tended to occur simply because "no one had any idea of how to breathe new life into the mine dumps." V. Travinsky, "Terrestrial Landscape," *Literaturnaya gazeta*, No. 22 (31 May 1972), 10.

[66]P. Loiko, "Give the Field Economic Protection," *Izvestiya*, (29 September 1968), 2.

which he was employed, the Nizhnaya Kama Hydroelectric Station was, Loiko stated, an example of a project whose completion would eliminate large amounts of agriculturally productive land.[67]

Of course, in a rapidly expanding economy, sacrifices must inevitably occur. Loiko resented the fact that, in the case of the Nizhnaya Kama reservoir, since the value of the land to be flooded was not factored into the costs of the project, an artificially low value was derived for the costs of the electricity to be generated by the station. If this had been a consideration then, Loiko argued, "the production cost of one kilowatt-hour of electric power would have been substantially higher. This would have compelled the planners to seek a variant with minimum flooding." Furthermore, this situation was not restricted to the Nizhnaya Kama example alone. The fact that many of the hydroelectric reservoirs in the USSR were characterized by shallow, fast-silting margins indicates that a cavalier attitude towards conservative land use was widespread among the schemes' planners. Indeed, the practice was so widespread, and its proponents so powerful, that Loiko doubted that even the economic proposals he advanced would be sufficient to curb the tendency; he stated that legislative measures were additionally required. He called for the creation of "an extradepartmental State Land Inspection Service, which would be guided in its actions by long-range plans for use of the country's resources and by a land cadastre."[68]

Loiko's call for an intrinsic value to be placed on land mirrored not only the arguments of other discussants of the Draft Principles on Land Legislation; it also reflected the growth of a general belief among academics, engineers, journalists, and conservationists that all natural

---

[67]Loiko reported that the station's reservoir would "flood 125,000 hectares of bottomlands and agricultural land adjacent to them, of which 31,400 hectares are arable land, 77,100 are hay fields, 16,900 are pastures, and 100 are orchards." This area encompassed land cultivated by over 160 collective and state farms which, not surprisingly, would suffer "a substantial reduction in agricultural output." *Ibid.*

[68]*Ibid.*

resources required such a valuation to promote their rational use.[69] The concept was an ideologically challenging one, because it contradicted Marx's labour theory of value: since natural resources were, by definition, untouched and unworked by human hands, they could possess no intrinsic economic value until they were incorporated into some economic process involving human labour. And even then, the resources still possessed no value until they were worked. Thus, land possessed no value in and of itself, and (for example) the agricultural use of land -- the ploughing, irrigation, sowing and reaping of crops -- added no value to the land itself: all economic value created by these human inputs was bound up in the product (in this case, the crops harvested). Similarly, mineral resources possessed no value until the application of human labour in the form of mining and processing.[70] Within the Soviet context, the debate over the valuation of natural resources was both protracted and bitter;[71] it is therefore unsurprising to find that, in their analysis of the public comments concerning the Draft Principles on Land Legislation, the legal and political authorities responsible for reviewing and possibly incorporating public suggestions into the final legislation viewed land valuation proposals dimly indeed. According to an *Izvestiya* special report published in the final days of the discussions of the legislation, the preparatory commission working on the Draft Principles

---

[69]The concept of natural resource valuation was suggested in the context of water (see K. Radchenko and F. Bokhin, "How Much Does Water Cost?" *Izvestiya*, (21 June 1967), 4; N. Melnikov, "Before Reversing the Rivers," *Literaturnaya gazeta*, No. 28 (12 July 1967), 11); to natural resources generally (see, for example, Yu. Sukhotin, "Evaluation of Natural Resources," *Voprosy ekonomiki*, No. 12 (December 1967), 87-98; V. Shkatov, "Prices for Natural Riches and the Perfecting of a Planned Price Formation," *Voprosy ekonomiki*, No. 9 (September 1968), 67-77); and to land (V. Dobrovolsky, "Do We Know How to Take Care of the Land?" *Pravda*, (10 March 1970), 2).

[70]For an excellent discussion of the Marxist labour theory of value and its impact on natural resource pricing, see Joan DeBardeleben, "Marxism-Leninism and Economic Policy: Natural Resources Pricing in the USSR and GDR," *Soviet Studies* 35 (1983), 36-52. It should be pointed out that western scholars concerned with Soviet environmental policy early identified the impediments that the Marxist labour theory of value imposed on nature conservation and environmental protection in the USSR. See Goldman, *The Spoils of Progress*, 47-48, 171-173; Philip R. Pryde, *Conservation in the Soviet Union* (Cambridge: Cambridge University Press, 1972), 42-44; John M. Kramer, "Prices and the Conservation of Nature in the Soviet Union," *Soviet Studies* 24 (1973), 364-373.

[71]See Chapter 5 of the present study for further discussion of this debate.

examined approximately 3,000 suggestions and comments from members of the public, as well as from concerned land-reclamation, agricultural, and other specialists.[72] Unfortunately,

> In the opinion of the preparatory commission, some of the proposals are unacceptable because they contradict the basic principles of Soviet law. Other proposals and comments are essentially correct, but involve matters of Union-republic jurisdiction and must therefore be reflected in Union-republic legislation. Certain proposals cannot be made part of the Draft Principles of Land Legislation of the USSR and the Union Republics, since they apply to other branches of the Soviet economy.[73]

Land valuation proposals were rejected from the final Principles, on the basis of their incongruity with "the basic principles of Soviet law." But it was not only these proposals that were rejected on the basis of one or more of these conditions. It is clear from an editorial breakdown of the suggestions considered by the preparatory commission that the central focus of the public discussion "was occupied by questions of the rational utilization of land and its protection."[74] The editorial commentary emphasized the public discussants' repeated calls for the establishment

---

[72]G. Ustinov, "A Law is Born," *Izvestiya*, (5 December 1968), 1.

[73]*Ibid.* This is an example of bureaucratic life imitating comedic satire uncomfortably closely. The theme of irrational policies being enacted under the cover of perfectly rational language and within a perfectly rational context was a focus of the popular British television series "Yes, Minister." In one episode a muck-raking newspaper requested, under public-access laws, a file that contained information embarrassing to one of the Civil Service characters. According to the law, the file should have been handed over in its entirety. The file *was* released to the newspaper, bearing a sheet of paper that read:

> This file contains the complete set of papers except for:
> (a) a small number of secret documents.
> (b) a few documents which are still part of active files.
> (c) some correspondence lost in the floods of 1967.
> (d) some records which went astray in the move to London.
> (e) other records which went astray when the War Office was incorporated into the Ministry of Defence.
> (f) the normal withdrawal of papers whose publication could give grounds for an action of libel or breach of confidence or cause embarrassment to friendly governments.

Apart from this single sheet of paper, the "complete" file was empty, and the career of the erring character was saved. Jonathan Lynn and Antony Jay, *Yes Minister: The Diaries of a Cabinet Minister, By the Rt Hon. James Hacker, MP.* Volume III (London: British Broadcasting Corporation, 1983), 175.

of state agencies to manage land and protect it from predation by users; it also pointed out that

> Readers have expressed the desire to have the rights and obligations of land users formulated in a more clear-cut manner....A good many proposals deal with the role of economic measures in regulating land relations. These proposals call attention to the necessity of increasing the land users' material stake in making the most effective use of all the land they have.[75]

Given the fact that proposals involving the environmental protection of land comprised such a major proportion of the overall suggestions on the Draft Principles, that such proposals were published widely in the press, and that the major newspapers supported them editorially (by discussing them at length, without criticism, at the time when the preparatory commission was engaged in its evaluation), it appears that there was reasonable cause for optimism that the final Principles of Land Legislation would incorporate environmental protection provisions to a considerable degree.

However, such optimism would have been misplaced. In announcing the passage of the Draft Principles of Land Legislation of the USSR and Union Republics from draft document to enacted legislation, F. A. Surganov, chairman of the Agricultural Committee of the Council of the Union of the Supreme Soviet USSR stated that "the committees [responsible for enacting the law] deemed it impossible to agree to the proposals on establishing payment for land use. Use of land free of charge is one of the greatest achievements of the Great October Socialist Revolution."[76] Because land was only a means of production, and therefore economically valueless, the Principles of Land Legislation recorded that all users -- corporate and individual alike -- enjoyed the

---

[74]*Izvestiya*, (3 December 1968), 2.

[75]*Ibid.*

[76]The Final Principles of Land Legislation of the USSR and Union Republics, as well as Surganov's opening comments, were published in *Pravda*, (14 December 1968), 2-3. Reprinted and translated in *CDSP* XXI, no. 1 (22 January 1969), 12-20.

use of land free of charge and without economic restriction.[77]

Nevertheless, Article 13 of the Principles, "Protection of the Land and Increasing Soil Fertility," charged land users to protect land under their control from natural degradation (such as wind and water erosion, choking by weeds, and so on) and from despoliation arising from incorrect human practices. The article also included a clause that stated "industrial and construction enterprises, organizations and institutions are obligated to prevent contamination of agricultural and other land by production or other wastes, as well as by sewage." Finally, the article outlined a series of "material incentive measures" to ensure that users would improve and safeguard land under their control. Nowhere in the article is there mention of specific *deterrent* measures to punish those who failed in the task.[78]

Of tremendous significance for the purposes of land management, Articles 14 and 15 of the Principles delineated conditions under which corporate entities and individual citizens, respectively, could lose their rights to land use. Only Article 15, dealing with the termination of individual citizens' rights, included the provision that rights would be lost "if a citizen commits the actions specified in Article 50 of these Principles." For the purpose of what is to follow, it must be emphasized again that Article 14, dealing with loss of land-use rights by corporate entities, contained *no such reference to Article 50.*

This is an important point of consideration because Article 50, encompassing "Liability for Violation of Land Legislation" reads, in part, as follows:

> ...spoilage of agricultural and other land or contamination of it with production or other wastes and sewage [is impermissible]....In cases to be established by USSR and Union-republic legislation, incorrectly used land sections can be expropriated from land users *that permit systematic violations of regulations* for the use of land. Enterprises,

---

[77]Article 8 of the Principles, "Use of Land Free of Charge," reads in part, "Use of the land is granted free of charge to collective and state farms and other state, cooperative and public enterprises, organizations and institutions and USSR citizens."

[78]*Ibid.*

> organizations, institutions and citizens are obligated to compensate the damage they cause as a result of violating land legislation.[79]

Article 50 therefore appears to encompass comprehensively a system whereby *all* land users were equally liable for damages caused to land under their control and could face expropriation of that land as a punishment. Not so. Consider the following: because individual rights to land use could be terminated according to the conditions of Article 15 *which was a reference to the provisions of Article 50*, the violation of *any* of the provisions of Article 50 by individual land users meant that they could lose their land-use rights *under Article 15*. Corporate entities, on the other hand, could only lose their land-use rights by specifically violating the conditions which triggered expropriation contained in Article 50. Therefore, the only circumstance under which enterprises, organizations and other corporate entities could face expropriation was when systematic violations of regulations occurred.

(An idealized example may be required to illustrate this admittedly labyrinthine but nevertheless important point. Suppose, for the sake of argument, a city-dweller visiting her *dacha* for the weekend empties a bucket of nightsoil onto the ground behind her plot. This act of pollution is reported and she is prosecuted under laws framed within the Principles of Land Legislation. She has broken Article 50 of the Principles by contaminating the land with "other wastes and sewage." This transgression can now trigger the provisions of Article 15, conditions under which land-use rights of individuals may be lost, because Article 15 states that those rights *could be lost* "if a citizen commits the acts specified in Article 50 of these Principles." Now suppose that a retaining wall of a purification pond at a chemical combine burst through inattention, spreading contaminated water over an area of highly productive agricultural land. Under these circumstances the combine is in no danger of losing its land: the only violations are of Article 13

---

[79] *Ibid.* Emphasis added.

(which, it will be recalled, contained no legal mechanisms to punish the combine for failing to maintain its ponds) and of Article 50, which states that expropriation can only occur in cases of *systematic violations* of land use regulations. The purification pond breach is not a systematic violation; it is merely a single, isolated occurrence.)

Therefore, corporate entities faced expropriation in situations that were far more difficult to prove than those in which individual citizens could lose their rights to land: the salinization of soil, or the dumping of acidic mine-tailings are certainly violations of land-use regulations. But are they systematic? Can they be thus proven? And what is the penalty for these violations, if it can only be demonstrated that they are single-instance violations? According to the provisions of Article 50 of the Principles of Land Legislation, a compensatory fine is the answer to this last question, the very limited utility of which as a deterrent to degradatory practices has already been demonstrated above.

Marshall Goldman related an anecdote which has become well-known in the field of Soviet environmental studies. In discussing the stringent anti-pollution standards contained in many pieces of Soviet environmental legislation, he asked "one candid Soviet authority" whether such standards were enforced. The response was "No, enforcement of such standards would cripple all industrial production and municipal life." Why, asked Goldman, were such laws instituted? He was greeted with the reply: "As a sign of what a socialist system can do."[80] Goldman, and many other western scholars that followed him, took this as exemplary of the Soviet propensity to enact laws that were stringent in principle but unenforced in practice, thereby laying the responsibility for environmental degradation on the shoulders of the agencies tasked to prevent such degradation from occurring. Thus, within this conception, the Soviet failure to protect the environment arose from bureaucratic parochialism, administrative chaos and simple neglect. There is nothing directly incorrect in this assertion: it is

---

[80]Goldman, *The Spoils of Progress*, 27

certainly true, as this study demonstrates,[81] that administrative and bureaucratic interests were strong contributors to Soviet environmental dislocation. But implicit in the above thesis is the idea that, somehow, these destructive practices continued *in spite of* Soviet environmental legislation, that if only the legislation could be properly enforced, then the Soviet despoliation of the environment would be alleviated.

The example of the life and content of the Draft Principles of Land Legislation of the USSR and Union Republics and their evolution into legal principles representing the force of law suggests that the framers of the legislation were guilty of one of two things: either they were consciously drafting and enacting legislation specifically designed to permit the continuation of wasteful, environmentally crippling economic policies; or they were guilty of monumental stupidity. If one were especially uncharitable, one would accuse them of culpability on both counts. If this was an isolated legal example, one could accord Soviet legislators the benefit of the doubt and accept that the unequal provisions for termination of land-use rights contained within the Principles of Land Legislation was an oversight -- although of enormous proportions. But this was not an isolated example: there are other, clear cases where provisional legislation (that, by its nature, could have been easily applied to prosecute and punish those guilty of environmental mismanagement) was diluted in order to make its successful application far more complex, difficult and uncertain.

One such case arose in late 1969, with the promulgation of another set of Draft Principles, these covering "Legislation of the USSR and Union Republics on Public Health."[82] Article 21 of these Draft Principles, on "The Provision of Measures to Purify and Render Harmless Industrial, Communal, and Service Effluents, Waste Products and Refuse," included directives that mandated the incorporation of measures to prevent pollution in the design of new plants and in the

---

[81]See especially Chapters 2 and 3.
[82]Printed in *Izvestiya*, (5 November 1969), 2-3.

operation of plants already commissioned. In addition, the article stated that "agencies of the Sanitary-Epidemiological Service are authorized to prohibit the opening of new enterprises, shops, individual installations and other facilities and the permanent or temporary operation of existing ones if harmful effluents, waste products and refuse are not effectively trapped, purified and made harmless."[83] This is a remarkable clause, not because of its breadth (many Soviet environmental laws were characterized by extraordinarily sweeping statements, within their purview), but because of its directness and simplicity. As written, this draft clause contains specific legal instructions that would empower all agencies of the Sanitary-Epidemiological Service effectively to prohibit practices that resulted in pollution, either by shutting down the facilities responsible, or by preventing potentially polluting facilities from initiating production at all. As the wording stands, any Sanitary-Epidemiological Service agency could involve itself in the process: thus, the traditional reticence of such agencies to inhibit polluting practices undertaken by the ministries to which they were subordinated would be circumvented. Other Sanitary-Epidemiological Service agencies, that were often more willing to become involved, could do so. As written, this was an excellent legislative clause, especially since the definition of "harmful" pollution levels were derived by the agencies themselves and not by those who created the pollution.

However, the final adoption and enactment of the Public Health Principles saw a considerable emendment of Article 21, the core anti-pollution measure of the legislation. The changes were so significant that the entire article is worth quoting in full:

> Executives of enterprises and of institutions and of design, construction and other organizations, as well as collective farm boards, are obliged, in designing, building, reconstructing or operating enterprises or communal and service facilities, to provide for and carry out measures to prevent the contamination of the atmosphere, bodies of water, underground water or the soil; if these executives fail

---

[83] *Ibid.*

> to fulfill these obligations, they are held responsible in conformity with USSR and Union-republic legislation. *The opening of new or reconstructed enterprises, shops, sectors, installations or other facilities is prohibited unless provision has been made for effective purification, rendering harmless and trapping of harmful effluents, waste products and refuse.* Agencies of the Sanitary-Epidemiological Service are authorized to prohibit *or temporarily stop the operation of existing facilities if their effluents, waste products and refuse can cause harm to people's health.*[84]

Thus, in its final form, the wording contained in the enacted Principles of Legislation of the USSR and Union Republics on Public Health effectively emasculated any legal authority of the Sanitary-Epidemiological Service agencies. First, their proposed power to prevent the opening of polluting enterprises was withdrawn: now it was the Principles themselves that prohibited the opening of such installations. But which state agencies would police the regulations? The legislation studiously avoids the issue. Second, Sanitary-Epidemiological Service agencies in the final Principles only retained the authority to temporarily suspend the operation of polluting plants, whereas the Draft Principles envisioned the authority to close permanently such installations if necessary. Finally, whereas in the Draft Principles Sanitary-Epidemiological Service agencies could exercise their authority in cases where industrial effluents were not "purified and made harmless," in the final Principles this could only occur if the agencies could show that the effluents "can cause harm to people's health." This is a significant difference: in the former case, pollution practices that were harmful to the environment fell within the purview of Sanitary-Epidemiological Service agencies; in the latter case they could only become involved when a direct threat to human health existed. If, then, pollution of a body of water not used for drinking-water supplies was detected by a Sanitary-Epidemiological Service agency, it could do nothing meaningful to

---

[84]"Principles of Legislation of the USSR and Union Republics on Public Health," *Izvestiya*, (20 December 1969), 3-4. Reprinted and translated in *CDSP* XXII, no. 1 (3 February 1970), 7-13. The emphasis is employed to demonstrate significant changes that were incorporated in the final legislation, as opposed to the Draft Principles.

terminate the practice. Nor could agencies prevent pollution that threatened drinking-water supplies unless they could prove that a health threat existed: it is far more difficult to prove that a particular instance of pollution represents a threat to public health than it is to prove that the pollution is occurring in the first place. Under the provisions of the Draft Principles, this latter case is all that was required for the Sanitary-Epidemiological Service agencies to exercise their authority.

From where, then, could the impetus for this sweeping change of wording and intent of the Principles have derived? Certainly not from public discussion and input following the publication of the Draft Principles; it was overwhelmingly positive.[85] Nor did it come from officials within the all-Union or republic health bureaucracy. Well before discussions of the Draft Principles were initiated, N. N. Blokhin, the Chairman of the Council of the Union's Committee on Public Health and Social Security argued that it was "imperative" that the anti-pollution directives of the Sanitary-Epidemiological Service be observed fully by the management of enterprises and industrial installations.[86] Later, when commenting on the provisions contained in the Draft Principles that would have granted Sanitary-Epidemiological Service agencies the legal power to permanently close polluting enterprises and prevent the commissioning of new ones, Blokhin noted that "by establishing this right in legislation, we wish to see to it that all executives of the country's industrial enterprises feel a sense of responsibility for people's health."[87] The environmental provisions of the Draft Principles were likewise pointedly and strongly endorsed by B. Petrovsky, the USSR

---

[85]See, for example, the selection of letters published in *Izvestiya* on 13 November 1969; strong support was also evinced for the Draft Principles by medical specialists writing in the *Meditsinskaya gazeta*. See Yu. Lisitsyn, "An Outstanding Document," *Meditsinskaya gazeta*, (14 November 1969), 3; and V. Samsonov, "For a Unified Management!" *Meditsinskaya gazeta*, (18 November 1969), 2. These latter two letters are reprinted and translated in *CDSP* XXI, no. 50 (13 January 1970), 17-18.

[86]N. N. Blokhin, "On the Status of Medical Aid to the Population and Measures to Improve the Public Health System in the USSR," *Izvestiya*, (27 June 1968), 6.

[87]N. N. Blokhin, "Our Principal Wealth," *Izvestiya*, (12 November 1969), 3.

Minister of Public Health,[88] a point of view that was mirrored by at least one of his ministerial counterparts on the republic level.[89]

While there is no direct evidence, there are nonetheless clues that suggest the powers of the Sanitary-Epidemiological Service were hobbled as a consequence of interference by the powerful industrial ministries whose enterprises were most commonly associated with activities that polluted the environment widely. Relations between these ministries and the Sanitary-Epidemiological Service were poor, in the case of the USSR Ministry of the Chemical Industry, extraordinarily so: in June 1965 Yuri Danilov, then the USSR Deputy Minister of Public Health, took the remarkable step of individually naming the worst chemical polluters in the USSR. While naming polluting enterprises was common practice among journalists, whistle-blowers, and administrative personnel engaged in intraministerial disputes, it was very rare to find a senior official complaining about the environmental mismanagement of another ministry in anything but the most general of terms. Danilov, on the other hand, named several polluting enterprises, describing the ministerial organization of the Rubezhnoye Chemical Combine in Ukraine as "totally unsatisfactory....As a result the waters of the Northern Donets are regularly polluted."[90] There were also direct complaints concerning battles that had erupted between Sanitary-Epidemiological Service inspectors and all-Union industrial ministries: these covered the spectrum from the general,[91] to the very specific.[92] In

---

[88]B. Petrovsky, "The Health Code," *Izvestiya*, (16 November 1969), 1.

[89]N. Savchenko, the Belorussian SSR Minister of Health, even advocated broader powers for Sanitary-Epidemiological Service agencies, noting that, "the word of a sanitary-service inspector has still not been raised to the status of law." If a temporary closure order was issued to a polluting organization, Savchenko stated that "pressure is brought to bear on [the inspector] from all quarters. Moreover, at times local Soviet organizations follow the lead of the economic managers in such situations." N. Savchenko, "The People's Health is Public Wealth," *Meditsinskaya gazeta*, (21 November 1969), 2. Reprinted and translated in *CDSP* XXI, no. 50, (13 January 1970), 18.

[90]Yu. Danilov, "Let Us Protect the Water, Air, and Soil from Pollution," *Pravda*, (21 June 1965), 2.

[91]"[T]he state has set up a wide sanitation-inspection service and given extensive rights to an entire army of sanitation doctors. If the directors of enterprises keep ignoring the instructions of the sanitation inspectors, something must be wrong." B. Svetlichny,

almost every case where disputes arose between polluters and agencies of the Sanitary-Epidemiological Service, the former triumphed because, in the words of one commentator, "when a serious and sharp conflict occurs, the culprits find patrons and defenders. There are delays, excuses, and promises. Often a physician or jurist must have great courage to obtain public or administrative action, not to mention a ruling of criminal liability."[93]

But these battles were usually drawn out and, in many instances, uncomfortably public processes. The provisions embodied by the Draft Principles on Health represented what must have been for the industrial ministries a disturbing codification and legislative establishment of Sanitary-Epidemiological Service agency powers. It is clear from the statements of Blokhin and other senior health administration officials at both the all-Union and republic levels that Sanitary-Epidemiological Service agencies intended to use those powers to campaign aggressively against polluting enterprises. Thus, had the Draft Principles been accepted, then the difficulties of the industrial ministries with the irksome attentions of the Sanitary-Epidemiological Service agencies would have been compounded. It must be assumed that it was pressure from these ministries that produced the legislative changes in the health

---

"The City Awaits a Reply," *Oktyabr'*, No. 10 (1966), 157-169. Reprinted and translated in *CDSP* XVIII, no. 48 (21 December 1966), 11-17.

[92]See, for example, the exchange in *Pravda*, (15 November 1966), 2; (23 December 1966), 3, between the fisheries protection agency of the Sanitary-Epidemiological Service and N. N. Chistyakov, the USSR Deputy Minister of the Lumber, Pulp-and-Paper and Wood-Processing Industry. The exchange concerned the activities of the ministry's Syas Pulp-and-Paper Combine situated on Lake Ladoga, activities that polluted the lake around the combine so heavily that the local fisheries protection inspector called it "a dead zone" for fish. Chistyakov responded to this criticism by stating that a major programme of purification installations would be instituted at the ministry's enterprises on Lake Ladoga, in order to comply with Sanitary-Epidemiological Service directives. But, at the same time, *Pravda* reported, Chistyakov ordered the expansion of the Syas Combine's production capabilities: in order to keep the costs of this expansion low, Chistyakov himself "recommended that the construction of the [Syas Combine] purification installations be delayed." *Pravda* editorialized that the ministry "is not deterred by the resolute objections of Party organizations, the hygiene and fisheries inspection services, the builders [of the purification installations], or even the combine's personnel themselves," and that it would therefore continue its polluting activities.

[93]Vladimir Chilivikhin, "How is Your Breathing, City Dwellers?" *Literaturnaya gazeta*, No.

principles, especially since there is no other conceivable political or economic group that could have benefited from the changes that occurred.

These and other cases (for example, the enacting of the Principles of Water Legislation of the USSR and Union Republics[94]), indicate that the process of creating environmental legislation in the USSR was subject to insidious influences not hitherto recognized by western scholars. As indicated previously, these scholars have adopted a generally indulgent attitude toward the failures of Soviet environmental legislation, preferring to see it as a sincere but misguided, naïve and flawed attempt to create a corpus of environmental statutes that would not only demonstrate the superiority of the socialist system but which might possibly be observable, if only in a general sense. This theory thus allowed the western scholarship to concentrate on more familiar themes to explain Soviet environmental degradation, primarily those of administrative confusion, mismanagement, and active circumvention of the legislation through the exploitation of its loopholes. But it is apparent that administrative factors entered into the equation of environmental legislation in a more direct and malevolent way: not only were the polluting ministries willing to ensure that public input in the formation was marginalized and even excluded completely, they also campaigned directly against the creation of a situation wherein other government agencies, legally constituted and empowered to combat environmental despoliation and misuse were prevented from carrying out their tasks. It is therefore reasonable to suggest that the polluters were not guilty merely of opportunistic behaviour, taking advantage of a confusing situation, characterized by a bewildering array of not-quite-adequate legislation, supposedly enforced by a wide but again not-quite-adequate system of inspection and control agencies. It may be suggested that they also had a real hand in creating the very system itself.

---

32 (9 August 1967), 10.

[94]See *Izvestiya*, (28 April 1970), 3, for the text of the Draft Principles and compare with

The Application of Environmental Law

If, as suggested above, interference in the process of formulating environmental law was undertaken to ensure that state economic entities could continue their policies of environmental despoliation unmolested, then the effort would hardly be worthwhile if the enacted legislation, though crippled, was still applied as rigorously and forcefully as circumstances allowed. To what extent, if any, was administrative and bureaucratic interference an operative factor in the application of environmental law? The following seeks to describe and analyze the manner in which transgressors of Soviet environmental legislation were apprehended and prosecuted in the 1960s and 1970s, in order to provide an answer to this question. Such an examination is also useful because it serves as an indicator of the prevailing attitudes toward the environment held by the administrative, economic, and political elite, and can therefore shed light on the fiercely contested ideological and political debates, ongoing in the USSR at that time, concerning the nature of the human-environment relationship.

One group that was habitually guilty of transgressing environmental legislation was the rural citizenry. Poaching was an endemic problem in the Soviet experience, as common folk sought to improve their own dietary intake by supplementing it with illegally-taken game; a second pursuit was the generation of some extra income *na levo* (literally, "on the left" but colloquially, "under the table") through the illegal sale of poached meat. In the region around the Caspian and Black Seas such black-marketeering took the form of poaching and selling sturgeon and sturgeon caviar. Poaching was often masked by the existence of the extremely widespread and popular pastime of legal hunting: organized into state-sanctioned clubs, a great many Soviet citizens -- far more, both in terms of numbers and percentage of population, than in other European countries -- owned guns and

---

the final Principles, published in *Pravda*, (12 December 1970), 2-3.

engaged in hunting.[95] It is clear that members of legitimate hunting societies and clubs were directly guilty of excesses in their activities: as early as 1963 the RSFSR Supreme Soviet considered it necessary to limit those activities by issuing a decree that stiffened the penalties for violations of hunting regulations; this decree proved ineffective and was replaced by a broader and more rigorous decree a decade later.[96] There were also calls for greater responsibility on the part of the hunting clubs in the management and conservation of hunting areas.[97] Officials in charge of the clubs responded that such control was beyond their jurisdictional purview, arguing that the maintenance of hunting areas and oversight of hunters was the task of wildlife protection officers.

But such a task was beyond the capabilities of the wildlife protection services. Indeed, it is a measure of the inability of state agencies to oversee hunting and fishing in the USSR that hunting societies would be called upon to police their own activities. This inability of state regulatory agencies to control poaching derived from two sources: first, the wildlife protection agencies were never supplied

---

[95]Boris Komarov reported that, by the mid-1970s, these legitimate clubs consisted of a membership totalling 1.1 percent of the total Soviet population; he reckoned that some six to eight million Soviet citizens, all gun owners, belonged to such societies and regularly hunted. According to Komarov, "the life of entire families depended on the meat of wild animals." Komarov, *The Destruction of Nature in the Soviet Union*, 77.

[96]The decree, "On Increasing Liability for Violations of Hunting Regulations," issued by the Presidium of the RSFSR Supreme Soviet, dealt specifically with registered hunters who violated the regulations governing their sport. It added an administrative penalty for violations not covered by extant laws, and reinforced the relevant section (Article 166) of the RSFSR Criminal Code, toughening that legislation's penalties for hunting violations. *Vedomosti Verkhovnogo Soveta RSFSR*, No. 41 (263), (17 October 1963), 810. The decree was ineffective, because it dealt exclusively with violations of hunting regulations and failed to address offences such as the possession of restricted animal parts and products (pelts, ivory, caviar, and so on). It was repealed in December 1972 and replaced with a broader statute that more than doubled the penalties for illegal hunting, and added new ones covering the illegal trade in wildlife. These latter penalities were extremely stringent: illegal possession of valuable pelts was punishable by fines and prison terms of up to one year. *Vedomosti Verkhovnogo Soveta RSFSR*, No. 51 (741), (21 December 1972), 820-821.

[97]See, for example, the letter by A. Sukikh, "Hunting Requires Regulation," *Pravda*, (5 June 1968), 3, in which he stated that the hunting societies "must bear not only a moral but also material responsibility for the state of the hunting areas." A further letter prompted by this one called for more specific action, including the introduction of hunting inspectors within the clubs' structures and strict observance by those clubs of regional hunting moratoria established to allow the recovery of wildlife populations. B. Prokofyev, "Dangerous Barrier," *Pravda*, (7 July 1968), 3.

with sufficient resources to carry out their duties; and second, judicial bodies were disinclined to prosecute those poachers apprehended in the act by the wildlife protection agencies.

Lack of resources was a continually-reported and widely known problem afflicting the wildlife protection services, and it affected the ability of the services to effectively discharge their responsibilities in two different ways. First, there were simply not enough agency officers to police the petty poachers, primarily individual fishermen or small groups of hunters, who represented the bulk of the problem. Second, agency officers often faced highly organized and ruthless poaching bands who were better equipped and more heavily armed than they.

The dearth of wildlife protection officers was repeatedly scored in the popular press, which reported some alarming, even tragicomic, cases. In the Keret River basin on the Karelian isthmus, for example, there was only one fisheries warden patrolling over 300 kilometres of rivers, lakeshores and coastline which, according to a report that appeared in *Komsomolskaya pravda*, "[made] it easy for poachers to elude him." The warden's already difficult tasks were further complicated by the fact that "local residents [were] hostile to him, although he [was] a native of the district."[98] In the late 1960s on the lower reaches of the Volga there was only one large riverine fisheries protection vessel assigned to the agency, but it was laid up for want of a crew, in particular a captain: the pay rates were simply too low to attract men from the vessels that plied the transportation routes along the river.[99] The protection officers were therefore forced to rely on small motor launches that possessed neither the range nor the speed to adequately patrol the section of the river below Kazan that included the Kuibyshev Reservoir, some 350 km in length. Even if they had possessed suitable equipment, it is unlikely that the officers could have effectively discharged their duties: in the Kazan

---

[98]V. Yakush, "Duel on the Keret," *Komsomolskaya pravda*, (13 March 1968), 2. Similar complaints appeared in the press concerning poorly-patrolled rivers and lakes in Gorky Province. K. Pogodin, "Confessions of a poacher," *Pravda*, (28 September 1960), 6.

[99]B. Klimov, "We go after poachers," *Izvestiya*, (22 August 1971), 6.

region there were only 60 fisheries protection officers registered -- on a volunteer basis. Of these, only 20 were active at any given time, in a region that boasted over 20,000 privately owned boats.[100] This situation was by no means unique: in the Astrakhan region on the Volga delta, repeatedly identified "as a centre of illegal trade in caviar", there were approximately 50,000 registered private boats, and only 250 inspectors available to patrol the area. Furthermore, these inspectors were hobbled by insufficient material support: according to a published report, "in most cases the inspection boats cannot keep up with the poachers. Often they have to give up the chase for lack of gasoline, which is strictly rationed to them."[101]

It is also doubtful that wildlife protection officers would have successfully curtailed poaching in a general sense, even if they had been better equipped for the task. In those cases where arrests were made, common practice dictated that poachers faced at worst a minor fine for their activities, and it was extraordinarily difficult for officers to bring cases to a satisfactory conclusion. The wildlife protection agencies were accorded little respect, both by the poachers,[102] and by local judicial bodies responsible for pursuing cases filed by the wildlife protection officers. In the former case, this lack of respect derived from a combination of factors. One was the aforementioned inadequacy of the penalties that could be applied by the officers against small-scale poachers: limited to fines of 100-200 rubles or less and the potential confiscation of equipment, such penalties possessed little deterrence to those engaging in a practice that could net even the most modest of

---

[100] *Ibid.*

[101] *Komsomolskaya pravda*, (18 August 1968), 4. The report concluded that the Astrakhan fisheries inspection service was "hopelessly inadequate."

[102] One extended newspaper article included a description of a conversation between individuals suspected of poaching and the inspectors who had apprehended them. The senior man in the poachers' boat reportedly told the others in response to a request from the officers, "Do not show them your documents. Do not sign anything. Do not give them your net. An inspector is not a militiaman." The reporter noted that, although the inspectors cited the men for poaching, they did not confiscate their equipment, because "it would have been risky to take the net away from these drunken men." Klimov, "We go after poachers."

poachers several hundred rubles' income for a night's work.[103] A second factor involved the almost total inability of wildlife protection officers to prosecute successfully party officials and economic managers who engaged in poaching. These individuals, protected by their social status, regarded the officers with barely-concealed contempt, a fact that provoked much criticism in the popular press.[104] Furthermore, it was this social status that allowed members of the *nomenklatura* to engage in some of the most destructive poaching activities recorded: their rank granted access to trucks, cross-country vehicles and, in some cases, aircraft that were used to facilitate the slaughter of enormous numbers of animals.[105] More senior members of the *nomenklatura* exploited their

---

[103]As early as 1960 a discussion of the disappearing stocks of Baikal whitefish noted that even the small-scale poacher "laughs at the fine. If nothing else, he can count; so he pays his 100 rubles now and then, but his illegal catch earns him several thousands." V. Barayev, "Drive Poachers out of the Glorious Sea," *Komsomolskaya pravda*, (30 September 1960), 2. An investigation of petty poaching in the Krasnodar region concluded much the same: poachers interviewed claimed "they could make good money for little effort," with one stating he made 75 rubles for three hours' work. The local fisheries inspection officer with whom the reporter travelled lamented that "there are three paid wardens and 80 volunteers; we confiscated 150 traps, 50 nets and 11 rowboats. We drew up some 20 warrants for poachers. We fined them, of course. But what is a fine to a poacher? It is child's punishment, equivalent to standing a hardened thief in a corner. We need different, more effective measures." P. Tyazhelnikov, "Interview with poachers," *Izvestiya*, (5 July 1962), 3.

[104]See, for example, L. Toporkov, "Get a grip on anger," *Izvestiya*, (22 May 1963), 3, which described the difficulties of wildlife protection officers along the Kara-Kum Canal. One poacher charged for violating hunting regulations revealed himself to be a professor at the Turkmenian State University; the inspector who cited him was forced to visit the professor's home, rescind the citation, and formally apologize for his overzealousness. According to the article, the professor's activity "was discussed at a session of the university's party bureau," where his "attention was directed to the need for obeying Soviet laws on hunting." Local officials then considered the case closed. See also V. Davydchenko, "Battles at the Salair Ridge," *Izvestiya*, (12 January 1966), 4, concerning the travails of a wildlife protection officer in bringing charges against party officials engaged in poaching in the Permyaki region of Siberia. There was no satisfactory resolution of the officer's difficulties: the party official leading the poachers' group, a provincial secretary of the Young Communist League, was merely "called to party account for violation of conservation procedures, for fishing by prohibited means and for failing to obey a game warden's demands." No other punishment was forthcoming, according to Z. Kuzmin, Secretary of the Kemerovo Party Committee. *Izvestiya*, (2 March 1966), 3.

[105]One 1963 report discussed the night-hunting practices common on the Golodnaya Steppe in Kazakhstan: teams of hunters in cross-country vehicles equipped with dazzle-lights targetted antelope herds. A well-organized team could bring down several hundred animals in a single night. Only the best bags were transported out of the hunting zones, leaving the unhappy spectacle of "torn carcasses of antelopes...strewn about by the roadsides. And not one, not two but thousands." A. Karyakin and A. Omelin, "Profiteer with a gun," *Izvestiya*, (27 February 1963), 4. Further evidence of

position to hunt illegally in state nature reserves, a problem that was particularly acute in Soviet Central Asia, where hunting was a high-profile and extremely popular entertainment of the powerful. In these cases the game taken was only rarely sold to generate income: more commonly it appeared on officials' banquet tables.[106]

There was, in fact, little need for concern on the part of any poacher. In addition to inadequate penalties and the difficulties encountered by wildlife protection officers in curtailing the activities of poachers drawn from the ranks of the elite, there was a general disinclination on the part of the courts to treat the matter as serious business. This was especially true in the period prior to 1970, when large-scale and economically damaging poaching activities were usually winked at by the judiciary. In these cases it appears that the status of the poacher was of little relevance: not only did poachers from the *nomenklatura* avoid significant punishment,[107] so too did "common criminals" engaged in the practice.[108] The breakdown occurred as cases

---

such "mechanized poaching" practices was provided in a bitter letter to *Pravda* in 1966. Preying on the saiga antelope, senior members of the Kara-Kalpak ASSR DOSAAF [Volunteer Society for Assistance to the Army, Air Force, and Navy] Committee, in company with a local collective farm chairman, employed DOSAAF and collective farm vehicles in their hunt. From these vehicles, equipped with powerful searchlights, the hunters "slaughter[ed] the animals by the dozen." A. Khakiyev, "Letter to the editors: Mechanized Poaching," *Pravda*, (2 December 1966), 6.

[106]Emil Agayev and R. Bakhtamov, "Distortions of 'natural selection'," *Literaturnaya gazeta*, No. 42 (18 October 1972), 11.

[107]A widely reported incident involving the attempted murder of several fisheries protection officers occurred at the Volga Dam in 1960. The poachers, well-equipped and organized, were protected by local officials. Indeed, the vessel used by the poachers on the night of the attempted murder belonged to the Volga Hydroelectric Service. A web of corruption based on an illegal caviar trade and involving senior party officials and management of the Volga Hydroelectric Station was exposed. The organizer of the poaching ring (though not a poacher himself), was revealed to be the Director of the hydroelectric station. The facts in the case were proven (including the attempted murder, in which the director was complicitous), but no criminal charges were ever laid. The director himself received only a reprimand for his activities, as did other personnel at the station. See *Literaturnaya gazeta*, (10 September 1960), 6; *ibid.*, (24 September 1960), 6; and *ibid.*, (22 November 1960), 4.

[108]In a letter prompted by the events described in the previous note, V. Persianov, a fisheries protection officer from Krasnodar, reported that for two years he had tried to secure militia support for his anti-poaching duties but to no avail: "Only recently I tried, with the aid of a member of a rural Soviet and a people's volunteer, to apprehend a small group of malicious poachers. They put up furious resistance. Militia were summoned....And, if you can believe it, when the militia officers reached the spot they refused to apprehend the poachers." *Literaturnaya gazeta*, (24 September 1960), 6.

were passed from wildlife protection agencies to local courts: in 1961, for example, the Urals State Fisheries and Water Administration issued 1,137 citations for poaching, but only three of these cases went to trial.[109] This is representative of a common and persistent policy: citations issued by wildlife protection agencies were routinely cancelled by the courts or by local party organs, a practice that wildlife protection officers were powerless to prevent.[110] Members of the judicial system simply refused to prosecute cases that, to them, were not particularly serious.[111]

Despite problems such as this, in the early 1970s the campaign against poaching suddenly and sharply intensified. Generally stiffer penalties, including prison sentences, began to be handed down, and poachers were pursued more aggressively and successfully, concluding with high-profile "show trials" that resulted in exceedingly harsh sentences. Paradoxically, this change of policy was largely brought about by the poachers themselves. In the late 1960s and early 1970s they became more brazen in their activities, in particular committing violence as a matter of course against the ill-equipped and poorly-supported wildlife protection officers ranged against them. The popular press furiously reported several instances where the helpless officers were murdered or grievously wounded in pursuit of poachers,[112] and used

---

[109]G. Tolmachev, "Poachers' arithmetic," *Pravda*, (10 June 1962), 2. In two of those trials the defendants, after freely admitting that they were engaged in large-scale poaching, received the maximum allowable penalty for their activity: a fine of 200 rubles.

[110]L. Toporkov, "Get a grip on anger," *Izvestiya*, (22 May 1963), 3.

[111]A discussion of the problems encountered in protecting endangered species in the Turkmenian SSR pointed out that local justice agencies were "carefree" in their prosecution of illegal hunters. The reporter asked one official why hunters preying on endangered and valuable species such as the Persian Gazelle received were treated so leniently by the courts. "How can you try a man for killing an animal? What if he did kill a Persian Gazelle?" was the reply. R. Esenov, "Man and nature: shots along the river," *Pravda*, (12 October 1970), 4.

[112]See, for example, *Izvestiya*, (30 December 1969), 6, which reported a trial of two poachers charged in the attempted murder of a fishing inspector in Dorogobuzh near Smolensk. The two were found guilty and sentenced to twelve and eight years in prison, respectively. Interestingly, a third member of the poaching gang, not implicated in the crime against the officer, was nevertheless convicted of poaching and received a three-year term. In Primorsko-Akhtarsk two poachers were charged in the shooting of

these cases as a springboard to launch a campaign against poaching in general.

One case followed by the press in early 1972 was indicative of the new "tough line" applied against poachers and the party and judicial officials who refused to take the matter of poaching seriously. Two poachers, apprehended by three fisheries protection officers along the Yenisey River near Krasnoyarsk, shot and seriously wounded two of the officers and knifed the third. They were arrested: one was found guilty of attempted murder and sentenced to death; the other was convicted of poaching and received a four-year prison term.[113] Appeals for clemency were denied, and the poacher sentenced to death was executed by firing squad in August 1972.[114] The matter did not rest there, however. In its original report on the incident, *Pravda* had pointed out that officers of the Krasnoyarsk wildlife protection agencies were the target of repeated attacks and intimidation by poachers, but that local judicial bodies failed to take action when presented with evidence on these crimes. Some two months after this initial report appeared it was announced that the officials in question had been disciplined for their inactivity. It may be assumed that at least some of the judicial officials were relieved of their duties, because *Pravda* noted that new district prosecutors had been appointed, "with specific instructions to bring the guilty parties to trial."[115] The message was clear: both poachers and those who shielded them would be targets of a high-profile anti-poaching campaign which, if not dedicated to rooting out the problem, was certainly geared to successfully prosecuting show-trial cases.[116]

---

two fisheries protection officers. One officer died, the other was severely wounded. The poacher who fired the fatal shot was sentenced to death; the other, found guilty of concealing a crime, received a five-year prison term. "Courtroom sketch: shot in an estuary," *Izvestiya*, (2 June 1972), 4.

[113]I. Kiryanov, "Shot in the back," *Pravda*, (11 February 1972), 6.

[114]"Clemency appeal denied," *Pravda*, (18 August 1972), 3.

[115]"After criticism: put a firm stop to poaching," *Pravda*, (24 April 1972), 2.

[116]The campaign was evidently persistent. In 1973 a hunting inspector and his student assistant were shot and killed while attempting to apprehend two venison poachers near Ust-Ordynsky, Irkutsk. The poacher who fired the fatal shots was sentenced to death. His accomplice, the Director of the Bozoi State Stable, was convicted of

Nor were harsh penalties restricted only to cases involving violence against wildlife protection officers. There was a general move after 1970 to increase sentences against poachers, especially those involved in large-scale activity. No longer was the standard penalty a 200-ruble fine with the possible confiscation of equipment: fines of several thousand rubles, in addition to prison sentences, became the norm for poachers deemed to have "inflicted damage" on economically important fishing and hunting stocks.[117] One such case was widely reported in mid-1972, involving sturgeon poaching on the Yenisey river below the city of Igarka. The group of three culprits, apprehended with 150 sturgeon in their possession, were fined 8,154 rubles "for damage done to the state," their nets and outboard motors were confiscated, and two of the three received three-year jail sentences. The third member of the group, a pensioner "enlisted as a helper" received three years' probation.[118] It may be that this case received such attention, and the poachers received such heavy sentences, because it occurred within months of the case of attempted murder near Krasnoyarsk, described above, but it is more likely that it was a consequence of poaching being treated more seriously by the state. The language employed in cases against poachers changed: no longer were they "filchers" or "loafers" who lounged in the courts awaiting their mandatory 200-ruble fine. Instead they were treated as criminals who were guilty not only of the theft of state property, but of damaging environmentally important species. Thus, the reportage of the trial of a dredge captain accused of poaching near Berdyansk pointedly referred to the discovery in the dredge's hold of "4,780 kilogrammes of sturgeon, sevruga and beluga-sturgeon fish which have become unique on our

---

poaching and sentenced to five years' imprisonment. "Shots near Bozoi," *Pravda*, (4 February 1973), 6.

[117]In Vladivostok in July 1970 the leader of a group of poachers taking fish with explosive charges was sentenced to four years' deprivation of freedom at a strict-regime labour colony and fined 5,000 rubles "for damages inflicted on the fishing industry." N. Kolpakov, "They went fishing," *Pravda*, (11 July 1970), 6. Some months earlier a poaching threesome operating around Cheleken in the Turkmenian SSR were found guilty of illegally taking sturgeon. Each received an eighteen-month prison term. K. Magomedov, "A lesson for poachers," *Pravda*, (23 October 1969), 6.

[118]"They went fishing," *Pravda*, (25 July 1972), 6.

planet *and which are protected by law.*"[119] In citing this particular case, Keith Bush noted that the court "hammered" the captain of the dredge with a five year jail sentence, and concluded that "the wider use of jail sentences for environmental offences may be attributed partly to legislation with more teeth and also to the intensified emphasis upon labour discipline since the December 1969 Central Committee plenum."[120] But Bush's analysis of this case was incorrect: the new laws of which he spoke only came into effect *after* this case was concluded,[121] and so the transgressors must have been convicted under different legislation.

Indeed, this was apparently the case, because such legislation did exist, and had been part of the RSFSR Criminal Code for several years: covering poaching specifically, it was formulated on the basis of the 1960 RSFSR Law on the Conservation of Nature (but was not part of that legislation itself). According to the USSR First Deputy Prosecutor General the legislation contained provisions that dealt with large-scale poaching activities, and specifically noted that

> [i]f the poaching is the result of the abuse of power or official position and has entailed grave consequences, the culprits are brought up on criminal charges for criminal malfeasance and punished by deprivation of freedom for a maximum term of eight years. In the absence of grave consequences, the culprits may be sentenced to deprivation of freedom for a maximum term of three years.[122]

---

[119]Ye. Ognev, "Poacher mans a seiner," *Izvestiya*, (24 July 1970), 6. Emphasis added. This is the first case (1970) that the author has uncovered in which the court reportage refers to a species' protected status as evidence of the seriousness of the poaching offence.

[120]Keith Bush, "The Soviet Response to Environmental Disruption," in Ivan Volgyes, ed., *Environmental Deterioration in the Soviet Union and Eastern Europe* (New York: Praeger, 1974), 24. Bush failed to mention that the dredge's first mate received a four-year prison term for his part in the crime. Ognev, "Poacher mans a seiner," *Izvestiya*, (24 July 1970), 6.

[121]See note 96 above. The December 1972 decree was prompted by a Resolution of the USSR Council of Ministers issued the previous month. Entitled "On Intensifying the Struggle Against Violators of Hunting Regulations," the resolution covered poaching activities as well, and instructed Republic Councils of Ministers to include in their new legislation measures that provided for the ability of conservation officers to levy on-the-spot fines against poachers without consulting an administrative committee, and for the mandatory confiscation of poaching equipment. *Izvestiya* (1 November 1972), 3.

[122]M. Malyarov, "People, nature and the law," *Pravda*, (16 March 1968), 3. The captain of

Why were these provisions applied in this case, and in subsequent cases? As suggested above, it is likely that harsher treatment of poachers was symptomatic of the larger anti-poaching campaign that arose from the popular view that poachers were simply getting out of hand. But is it possible, as Bush suggests, that this renewed vigilance against poachers was merely a reflection of an increasingly vigorous environmental protection policy coupled with an "intensified emphasis upon labour discipline since the December 1969 Central Committee plenum"? If Bush's theory is correct, then one would expect to see a corresponding shift around 1970 in the treatment of other "environmental criminals" such as the polluters of waterways, the atmosphere, and the soil.

No such shift is apparent, however, especially in the always-critical case of industrial water pollution. It is true that occasional high-profile trials of officials responsible for polluting waterways were widely reported in the popular press (indeed, it is one of these reports that Bush incorrectly cites as evidence of the wider use of jail sentences for environmental offences),[123] but such cases were neither new nor were they characteristic of Soviet antipollution policy in this period. That policy was generally lax, despite complaints from journalists, environmentalists and scientists.

Throughout the 1960s reports appeared detailing problems associated with the industrial pollution of rivers, lakes, and coastal regions of the USSR. Not only the popular press and academic journals called attention to the problem: it was clearly recognized within senior administrative levels of government. In late 1963 I. S. Senin, the Chairman of the Budget Committee of the Council of the Union pointed

---

the dredge was indeed guilty of abusing his official position in using his vessel as a poaching platform.

[123]Bush noted that "the assistant chief engineer of a sugar refinery was given one year of corrective labour for polluting a local river with untreated waste," citing a report appearing in *Sel'skaya zhizn*, (18 January 1970). See Keith Bush, "The Soviet Response to Environmental Disruption," 24. It should be pointed out that "corrective labour" sentences, by definition, were almost always served at the transgressor's place of work (as was the case in this example) and therefore did not represent a jail

out that

> measures to protect water sources from pollution are still unsatisfactory, particularly those for purifying industrial sewage. According to available data, about 8,000,000 cubic metres of unprocessed sewage are dumped into the Volga basin every day, 1,000,000 cubic metres into the Northern Donets and about 500,000 cubic metres into the Moscow River. Year after year the funds allocated by the state for building purification installations go unutilized.[124]

It was also recognized that such pollution had a severe economic impact on inland fisheries.[125] In his speech to the XXIII Congress of the CPSU in 1966, the writer Mikhail Sholokhov described the case of a Volgograd industrial combine responsible for dumping polluted effluent into the Volga River. The consequences were disastrous for local fishing organizations:

> Dead fish were found floating on the surface [of the river] for a distance of 400 kilometres the site of the plant. Control posts took stock: 842,000 sturgeon and 735,000 smaller fish [were estimated to have died]; no count was made of the dead fry, larvae and eggs. According to rough calculations, the loss borne by the country's national economy comes to eleven million rubles. But if we consider that a good half of the sturgeon sank rather than floated, then the figure can be at least doubled.[126]

Sholokhov did not mention whether action was taken against those

---

sentence. See note 129 below.

[124]*Izvestiya*, (17 December 1963). Reprinted and translated in *CDSP* XV, no. 52 (22 January 1964), 9-10. Yuri Danilov, the USSR Deputy Minister of Public Health suggested in 1965 that the problem in the Volga basin was far worse than Senin had admitted. He stated that "according to tentative estimates, about 18,000,000 cubic metres of waste water enters the basin of the Volga alone every 24 hours" -- 250 percent more than Senin suggested eighteen months earlier. Danilov may have included municipal sources of pollution in his total, but even this fails to account for the difference. Yu. Danilov, "Let us protect the water, air and soil from pollution," *Pravda*, (21 June 1965), 2.

[125]See, for example, I. Dudenkov, "Burning Problems of Volgo-Caspia," *Ekonomicheskaya gazeta*, No. 9 (27 February 1968), 19. The article analyzed the impact of industrial development and wastes on the fishing industry of the lower Volga and Northern Caspian. Dudenkov stated that there had been an approximately 50 per cent decline in catches of economically valuable species between 1961 and 1967 and attributed this to the direct effects of industrial pollution on fish stocks.

[126]*Pravda*, (2 April 1966), 5. Reprinted and translated in *CDSP* XVIII, no. 16 (11 May 1966), 26-27.

responsible for this particular fish-kill,[127] but in similar cases when the careless treatment of industrial waste products either produced direct fish-kills or harmed local fisheries by destroying habitat and spawning grounds, it is difficult to term the penalties imposed as "punishments." Thus, in 1966 the director of the Mary Alcohol Plant was merely "held legally accountable" for dumping large amounts of chemical wastes into the Kiya River, a tributary of the Ob';[128] the same year the acting director of the Kotlass Pulp-and-Paper Combine and the assistant chief engineer of an associated wood-alcohol plant were convicted of polluting the Vychegda River with effluents that absorbed dissolved oxygen, effectively suffocating the river's fish. Each defendant was sentenced to one year of corrective labour at their places of work.[129] In the autumn of 1966 a group of engineers were held responsible for an effluent release that killed "tonnes of fish" on the Vorskla River in eastern Ukraine. They were sentenced to varying periods of corrective labour at their places of work, and were ordered to cover the court costs incurred by "a panel of legal and technical experts" that testified in the case. The sum amounted to 165 rubles.[130]

Unlike the sentences imposed on poachers, the punishments meted out to industrial polluters did not become more stringent over

---

[127]It is possible that the case described by Sholokhov was one that occurred in July 1965 when untreated effluent discharged from the Kirov Chemical Combine in Volgograd produced the "mass destruction of fish" downstream. Criminal proceedings in the case were instituted against the former director of the plant, the assistant chief engineer, the head of the plant's waste treatment installations, and two shop floor chiefs. No report concerning the conclusion of the proceedings ever appeared, however. See "In the USSR prosecutor's office," *Pravda*, (17 December 1965), 3.

[128]See V. Davydchenko, "Battles at the Salair Ridge," *Izvestiya*, (12 January 1966), 4; Z. Kuzmin, "Follow-up to 'Battles at the Salair Ridge,'" *Izvestiya* (11 February 1966), 3.

[129]"From the Courtroom: Crime on the Vychegda," *Pravda*, (30 June 1966), 4. The sentence of "corrective labour" is not as onerous as it may sound: the offender retained both liberty and employment, with punishment taking the form of a deduction of a certain percentage of their monthly wage. Only rarely was the amount of the deduction reported. However, it was commonly ten to twenty percent of the monthly wage. In other words, a corrective labour sentence was a fine, and it therefore was burdened with all the problems associated with that particular form of punishment. On the range of sentences available to Soviet courts, see Harold J. Berman, "The Educational Role of the Soviet Court," in Joseph L. Nogee, ed., *Man, State, and Society in the Soviet Union* (New York: Praeger, 1972), 279-287.

[130]"From the Courtroom: Poisoners of the river," *Izvestiya*, (22 January 1967), 6.

time. The case reported by Bush as evidence of an intensified vigilance against polluters is, in fact, evidence of a continued indulgence towards industrial pollution. The case concerned the assistant chief engineer of the Kalinin Sugar Refinery who, in 1970, was held responsible for releasing unprocessed waste waters into the Seim River near Kursk, an action that "caused fish deaths on a wide scale." The investigation determined that the engineer "was careless about his duties and ignored repeated warnings from the fish-protection agencies who had turned up serious shortcomings and drawn up appropriate complaints." Nevertheless the engineer was sentenced to only one year of corrective labour, with a deduction of twenty percent of his monthly earnings for that period.[131]

Even the major trials of industrial polluters, analogous to the "show trials" of poachers, produced markedly different results. In 1967 one such trial arose from a People's Control Committee campaign against pollution of the Volga between Saratov and Volgograd. The Saratov Oil Refinery complex was identified as a major source of the river pollution, and the refinery's director and chief engineer were charged, as was the director of the Middle Volga Basin Inspectorate for the Use and Protection of Water Resources, a department of the RSFSR Ministry of Land Reclamation and Water Resources. During the trial it transpired that the officials of the refinery, although fully aware of the amounts of polluted wastes being discharging into the Volga river by their installation, nevertheless did nothing to rectify the situation. The director of the water resources inspectorate was found to have been lax in his duties and lenient toward the offences committed at the Saratov Oil Refinery. All three defendants were found guilty: the two directors were dismissed from their posts, on the orders of their respective ministries, and the refinery's chief engineer was handed a reprimand. Officially, the case was then handed over to the RSFSR Prosecutor's

---

[131]"From the Courtroom: Held responsible for killing fish," *Sel'skaya zhizn*, (18 January 1970), 4.

Office for investigation and the institution of criminal proceedings against the guilty parties, but nothing further occurred.[132] A year later, in 1968, a case was brought against the management of several industrial combines found responsible for polluting the Volga. The management officials were issued strict reprimands: the worst instances of pollution, emanating from the Kamenskoye Pulp and Paper Combine, led to the issuance of a reprimand against the chief engineer of the combine. In addition, "the USSR Ministry of the Pulp and Paper Industry was instructed to consider the question of whether he should remain in the post he now occupies."[133]

In the early 1970s, when the campaign against poachers was intensifying, the high-profile trials of industrial polluters continued to result in lenient sentences.[134] The most remarkable of these indulgent acts occurred in late 1972, when the Novo-Ukraina Sugar Refinery released effluents into the Tashlyk River in central Ukraine, killing an estimated 500,000 carp, 60,000 perch, and 10,000 white carp. No immediate charges were filed against those responsible, identified by *Izvestiya* as the refinery's director and chief engineer.[135] As a consequence of *Izvestiya*'s reportage, however, the Kirovograd Province Prosecutor's office instituted criminal proceedings[136] -- only to drop the case two months later. Why was the case dropped? Because the director and chief engineer of the plant were veterans of the Great Patriotic War and thus qualified for amnesty under the conditions of the 28 December

---

[132]"Called to account for polluting water," *Pravda*, (5 August 1967), 3. Dismissal of the guilty officials is the harshest penalty found in any industrial pollution case in this period.

[133]"Polluters of the Volga are punished," *Izvestiya*, (3 September 1968), 4.

[134]In February 1970 *Sovetskaya Rossiya* reported the case of a director of a wooden-crafts factory found guilty of dumping wood scrap into the Gorky Reservoir at Gorodets. The director was fined but appealed his sentence to the Gorodets City Party Committee. The committee concurred with the director and ordered that the fine be rescinded. Almost simultaneously with this decision, however, the director *again* ordered the dumping of wood scrap into the Volga. For this latter transgression he was sentenced to one year of corrective labour with a deduction of 10 percent of his monthly earnings for that period. See *Sovetskaya rossiya*, (15 February 1970), 2; and *Sovetskaya rossiya*, (26 April 1970), 2.

[135]"Black river," *Izvestiya*, (25 November 1972), 6.

[136]*Izvestiya*, (6 January 1973), 6.

1972 Decree of the Presidium of the USSR Supreme Soviet "On Amnesty in Connection with the 50th Anniversary of the Formation of the Union of Soviet Socialist Republics."[137]

These acts of magnanimity continued in spite of an aggressive campaign carried on by republic and national newspapers against industrial polluters. The most significant of these was conducted by *Izvestiya* in 1968: under the rubric "So that the Volga Will be Clean," the newspaper's reporters produced a series of aggressive whistle-blowing articles on pollution of the river, coordinated with the judicious use of letters by outraged readers and the careful inclusion of stories of industrial enterprises that had successfully conquered their waste problems.[138] Press efforts such as this were mirrored by political action, culminating in the issuance of at least one statute that specifically addressed the problem of industrial water pollution in the Volga and Ural River basins.[139] On the basis of this statute scientific expeditions were organized by the USSR Academy of Sciences to investigate closely the problem of water pollution on the Volga. It was intended that the results of the studies would be used to "draw up a unified plan for protecting the river basin against pollution."[140]

In light of these press and political campaigns to the contrary, and in light of the increased harshness with which poachers were treated, the question arises: why did industrial water polluters continue to be treated

---

[137]*Izvestiya*, (3 March 1973), 2.

[138]The campaign began in May 1968 and continued unabated until November of that year. The most important reportage may be found in "Transparent water is flowing," *Izvestiya*, (25 May 1968), 1, 2, 6; "The great service of the tributaries," *Izvestiya*, (31 May 1968), 3; "So the Volga will be clean," *Izvestiya*, (5 June 1968), 3; "Now that the mess has been made, what is the answer?" *Izvestiya*, (8 June 1968), 2; "The Volga will be clean: Demand from whom?" *Izvestiya*, (22 June 1968), 2; "So that the Volga will be clean," *Izvestiya*, (19 July 1968), 3; "The Volga must be clean," *Izvestiya*, (11 August 1968), 2; "The Volga must be clean," *Izvestiya*, (14 August 1968), 3; "Follow-up: Demand from whom?" *Izvestiya*, (9 October 1968); and "Follow-up: The Volga must be clean!" *Izvestiya*, (3 November 1968), 2.

[139]The statute took the form of a Resolution of the CPSU Central Committee and the USSR Council of Ministers "On Measures to Prevent the Pollution of the Volga and Ural River Basins with Untreated Sewage," *Pravda*, (1 April 1972), 1. Reprinted and translated in *CDSP* XXIV, no. 11 (12 April 1972), 5-6.

[140]"The Yanka Kupala Expedition on the Volga," *Vodnyy transport*, (20 July 1972), 3. Reprinted and translated in *CDSP* XXIV, no. 32 (6 September 1972), 7-8.

so leniently by the courts? The answer lies in a combination of factors, the most important of which was the status of the polluters themselves. Unlike poaching, which was publicly perceived as an activity that harmed the Soviet economy without returning anything of value, the industrial pollution was a byproduct of a productive process. Consequently, those who polluted the environment with industrial wastes generally enjoyed the support and protection of economic agencies tasked to ensure that productivity was maintained.[141] The ability to pollute was viewed by these economic agencies as an intrinsic part of the production process. As Ya. Grushko, the Chairman of the Committee on the Use and Conservation of Water Resources subordinated to the Irkutsk Province Council of Scientific and Technical Societies, pointed out in 1966,

> excessive, in my opinion, "privileges" for industrial enterprises do much to promote intense pollution of rivers. It is now permitted to dump a large quantity of sewage into our waterways on the assumption that they will purify themselves....[T]he norms established...for discarding sewage and harmful substances have, to a significant extent, become dated and certain diffuse calculations make it possible for enterprises to circumvent these rules.[142]

The editors of *Izvestiya* went further in 1968, specifically linking prevailing economic attitudes to pollution problems. As the editorial pointed out, "many economic managers take a narrowly departmental approach to the purity of bodies of water, reasoning as follows: 'We produce the goods, all the rest is unimportant.' This is an incorrect and harmful view."[143] *Pravda* also weighed into the debate, charging that ministerial irresponsibility was leading to the pollution of the Ural River by enterprises of the USSR Ministry of the Petroleum-Refining and Petrochemical Industry, the USSR Ministry of Ferrous Metallurgy, and of

---

[141]On this point, see the complaints of Yuri Danilov, the USSR Deputy Minister of Public Health and USSR Chief Sanitary Physician, reported in *Pravda*, (21 June 1965), 2. Danilov specifically charged that pollution was a consequence of "local, narrowly departmental interests,...a basic lack of discipline and poor production standards" and warned that his sanitary inspection officials were routinely pressured by economic officials to overlook incidents of pollution.

[142]Ya. Grushko, "Mismanagement according to the rules," *Izvestiya*, (24 September 1966), 3.

the USSR Ministry of Nonferrous Metallurgy. The editors noted that, even after thorough reports on the problem had been printed by the newspaper, they still had not received any answer to their criticism from the named ministries, and wondered whether they "intend[ed] to adopt measures on the questions raised by *Pravda*."[144]

Another target of the newspapers' anger was the practice of transporting lumber in loose-log bundles along major Soviet waterways. The situation was particularly serious on the Volga, where sunken logs posed a navigation hazard and, as they decayed, ruined the spawning grounds of valuable fish species.[145] M. Kanevsky, the Deputy Minister of the USSR Ministry of the Lumber and Wood-Processing Industry replied to the charges: noting that steps would be taken to minimize lumber losses, Kanevsky nevertheless stated regretfully that the problem could not be eliminated completely, and that the fault did not lie with his ministry. The ministry had long planned to transport all lumber within the holds of specially-constructed transport vessels, but unfortunately

> the RSFSR Ministry of Inland Shipping has failed to fulfill the instructions of the USSR Council of Ministers on changing over to the hauling of logs by ship. In the past three years such haulage has not increased, but, on the contrary, has decreased. It should be noted at the same time that the existing high charges for hauling logs by ship create no material interest for the shippers and receivers of logs in this type of haulage and impede its large-scale introduction.[146]

Thus, two different arguments were advanced by the deputy minister in defence of the practice: on the one hand, the problem of pollution associated with log-floating was not his ministry's fault but the fault of another in the production chain; and on the other, even if the requisite

---

[143]"The Volga must be clean," *Izvestiya*, (15 May 1968), 1.

[144]"Alarm about the river," *Pravda*, (20 June 1968), 3.

[145]V. Rostovshchikov, "What captains are afraid of," *Izvestiya*, (27 July 1967), 2. The article described the seriousness of the problem in Volgograd Province, noting that "The picture was an ugly one. Sunken trunks stuck out of the water like artillery for many kilometres along the shore. You see giant shapeless heaps of logs. Waves wash off logs and chips, which float with the current."

[146]"Follow-up on an *Izvestiya* report: What captains are afraid of," *Izvestiya*, (3 November

coordination had existed, the method of shipping logs internally was economically inexpedient. This attitude guaranteed the persistence of the problem, a point that was sharply criticized by a *Pravda* editorial the following year:

> As early as June 1966 a resolution of the CPSU Central Committee and the USSR Council of Ministers required ministries and departments in 1966-1970 to discontinue not only log floating but also the rafting of timber in all bodies of water used as commercial fishing grounds and to clear the waterways of scraps from log rafts and sunken logs. The Ministry of the Lumber and Wood-Processing Industry has done a poor job of carrying out this resolution, claiming insufficient funds [as the reason]. However, the trouble lies not so much in funds as it does in unwillingness to part with customary methods of delivery.[147]

Ministerial entreaties for understanding such as Kanevsky's were a ubiquitous tactic in responding to criticism of the most common and chronic source of industrial pollution: inadequacy of waste purification installations. The ineffectiveness of pollution control equipment was long identified as a severe problem in Soviet industry and several pieces of legislation were passed in an attempt to solve the problem.[148] Progress in the field of purification control was hampered, however, not by a lack of funds but by difficulties encountered in the design and production of viable equipment in suitable quantities.[149] In the field of gas purification, for example, the responsibility for the development, testing and production of atmospheric scrubbers devolved on the All-Union Gas Purification and Dust Removal Association. Despite this grandiose title, the association was in fact a division of the USSR Ministry of the

---

1968), 2.

[147]"Returning to what was printed," *Pravda*, (31 August 1969), 2. Over a year later *Izvestiya* reported that the cleanup campaign was proceeding slowly. "A proprietry interest in rivers," *Izvestiya*, (25 September 1970), 5.

[148]See n. 39 above.

[149]It was pointed out, for example, that a new Pulp and Paper Combine due for commissioning at Komsomolsk-on-the-Amur was bereft of purification installations because the Chief Far Eastern Construction Administration, responsible for their construction, failed not only to complete the project on time, it failed to supply blueprints in the first place! Zh. Chesnokov, "Promises will not purify the murky stream," *Pravda*, (14 February 1965), 2.

Petroleum-Refining and Petrochemical Industry. This led to problems in the construction of purification installations appropriate for non-petrochemical use and, in any case, the association possessed production facilities restricted to

> only one solitary plant, whose production capacity by no means corresponds to industry's requirements for gas-purification equipment. The production of gas-purification equipment, which is very specialized in design, is dispersed over dozens of enterprises belonging to various departments. An enormous amount of equipment is manufactured by local forces, in poorly equipped shops. As a result, the quality of gas-purification equipment sent to construction sites quite often proves beneath criticism.[150]

Various proposals were advanced as solutions to this problem, including the creation of "anti-pollution combines." These installations, intended to handle the industrial wastes of a disparate group of industrial clients, would be financed by several ministries acting in concert, thus spreading the costs. Although they were supported by the scientific community, which had tested and analyzed the feasibility of such installations, the concept was ultimately rejected.[151]

Combines and other industrial enterprises were therefore required to deal with the problem of effective waste purification on their own initiative. It should be pointed out that some remarkable successes did occur,[152] but in general the field of pollution control languished. Senior Party officials condemned the failure of the industrial ministries to solve

---

[150]N. Gulin, "The industry of clean air," *Pravda*, (24 March 1969), 3.

[151]A. Palm, "Clouds over the city," *Komsomolskaya pravda*, (29 January 1971), 2.

[152]See, for example, the description of successful pollution control installations constructed at the Novo-Gorky Oil Refinery. *Pravda*, (11 October 1961), 6. The story in this case is far from simple, however: the initial purification installations, designed and constructed by an independent organization proved to be both unwieldy and ineffective. The refinery's engineers took the initiative, experimenting with new, more appropriate methods, securing the funding for their implementation, and supervising the construction of the new installations themselves. Based on a biological purification system, the installations produced clean but warm water that was allowed to cool in external holding ponds before being released back into the river. The refinery's engineers had introduced mirror carp into the ponds as a supplement to their diet. Another successful case of pollution control was reported from the Novo-Yaroslavl Refinery. See K. Solovyev, Ye. Sapozhnikova and V. Kurapin, "Guarding the Purity of Bodies of Water," *Izvestiya*, (17 September 1970), 3. This system also used microbial processes to "digest" oil waste products.

the problem adequately: in his report to the USSR Supreme Soviet on the status of the Ninth Five Year Plan, for example, the Chairman of the Planning and Budget Committee, K. M. Gerasimov, pointed out that

> The Soviet state allocates substantial funds to implement conservation measures. Technological processes making it possible to decrease sharply, and in a number of cases to eliminate completely, discharges of substances that pollute the environment are being worked out and introduced. But, unfortunately, there are still some enterprise executives who...fail to see to it that appropriations allocated for the construction of purification installations are completely utilized and that these installations are to be put into operation on time. Enterprise executives of this sort can be found in the USSR Ministry of the Pulp and Paper Industry, the USSR Ministry of the Building Materials Industry and certain other ministries.
>
> To a considerable degree, the blame for this situation also rests with individual construction organizations that fail to take the necessary steps to accelerate the construction and commissioning of devices preventing the pollution of the environment....[153]

It was also repeatedly pointed out that the economic benefits of effective pollution control were enormous, because it was possible to recover valuable materials that would otherwise be lost in the effluents.[154]

Despite the fact that potential benefits of functional purification control installations were considerable, and that funds were continually released at both the All-Union and Republic level for their construction and maintenance, there was apparent reluctance on the part of industrial managers to undertake the addition of such installations to their plants. It was continually pointed out that the funds made available for purification installations went unutilized[155] and that

---

[153]"On the State Five-Year Plan for the Development of the USSR National Economy in 1971-1975, Co-Report of the Planning and Budget Committee and Branch Committees of the Council of Nationalities," *Izvestiya*, (26 November 1971), 2. Reprinted and translated in *CDSP* XXIII, no. 48, (28 December 1971), 14-15. The problem of inadequacies in design bureaux had been noted earlier. See B. Semenov, "Unhurried designers," *Pravda*, (9 December 1968), 3.

[154]On this point see Grushko, "Mismanagement according to the rules," 3; Solovyev, Sapozhnikova and Kurapin, "Guarding the Purity of Bodies of Water," 3; B. Khramov, "Not into the sky but into the job," *Pravda*, (9 December 1972), 3.

[155]See, for example, the report on efforts to fulfill the measures of the RSFSR Council of Ministers' Resolution "On Measures to Stop the Pollution of the Volga and Don Rivers

pollution control officers were harassed when they attempted to force plants to close until such equipment was functional.[156] As suggested above, one of the reasons why purification installations were not installed as widely as possible lay in the problems of design, construction and supply. But why did individual plant managers not emulate the success stories that did exist, by seizing the initiative and constructing purification equipment on a local enterprise basis? And why was it so common to find combines equipped with putatively efficient purification installations operating with the equipment idle or running below capacity?[157]

Economic managers claimed that the problems arose from poor coordination between trusts responsible for the construction of industrial enterprises and those responsible for the construction of pollution control equipment. As pointed out above, such poor coordination existed, but it is not a complete answer to the problem.[158] The major reason why there existed such a cavalier attitude towards pollution control on the part of economic managers lay in the fact that

---

by Unpurified Sewage" carried in *Izvestiya*, (15 April 1969), 3; see also "A year late," *Izvestiya*, (30 October 1969), 1; "Complete purification facilities on time," *Izvestiya*, (14 June 1973), 3.

[156]See n. 142 above; see also the remarkable events reported in "Sleight of hand under the canopy," *Izvestiya*, (6 August 1971), 3 in which pollution control officers attempting to close a cement factory in Fergana were not once but twice bodily ejected from the premises.

[157]Yuri Danilov pointed out that "of 150 purification installations at enterprises of the Western Urals Economic Council, on the construction of which more than 26 million rubles was spent, only 25 percent are working normally. Some 30 percent of the installations are being used below planned capacity; 45 percent are not used at all or are working unsatisfactorily." *Pravda*, (21 June 1965), 2.

[158]In Safonovo, Smolensk Province, an extended battle was fought between pollution control officers and the management of a municipal bakery scheduled to begin operation even though it lacked the required purification installations. The article describing the events pointed out that "the Dorogobuzh Chemical Industry Construction Trust, which built the bakery, and the Specialized Construction and Mechanization Trust, which builds purification plants, both belong to the same department: the USSR Ministry of Construction. The ministry's officials knew very well that a bakery cannot operate without purification facilities. They nevertheless took no measures to synchronize completion of the two construction projects. Apparently what they want is not a functioning bakery but the fact of having completed it ahead of schedule. Such a position is hardly in the interest of the state." An editorial comment attached to the report noted that, as the paper went to press, information was received indicating the bakery was operational, and that "sewage is running down the drainage ditches." *Izvestiya*, (12 July 1972), 3.

there was no compelling reason to take the matter seriously. As discussed above, the courts failed to exercise their responsibility and issue the stiff penalties allowed by law, as they had done in the campaign against poachers. Funds released by the state for the construction of pollution control equipment were not used because in some cases they could not be, as a consequence of bottlenecks in equipment design and supply. At newly constructed enterprises frequently two different construction organizations were responsible for construction: one for the physical plant itself, the other for the associated purification facilities. Like other Soviet economic actors, construction organizations operated on a plan-fulfillment basis, and so the organization responsible for constructing the plant was loath to delay operational handover because of incomplete purification facilities, since this represented a delay in the construction schedule and therefore a failure to meet plan targets. The organizations responsible for the construction of purification facilities either built what they could (usually poorly functional or nonfunctional) and transferred operational control to the plant management (along with the associated problems that poor construction engendered), or they failed to build the facilities at all, citing insufficient coordination of supplies and blueprints.

Faced with barely functional purification installations, the economic management of enterprises only rarely devoted resources to their maintenance and repair. Again, there was no compelling reason to do so and, in any case, if they were called to account, they could throw up their hands and cite problems of supply beyond their control as a reason for the non-functional state of their purification installations. There was also a more insidious reason not to maintain purification installations: money. The funds provided by the government for the construction, modernization, and maintenance of pollution control devices at existing industrial combines were disbursed to the enterprises directly. Even if they were not used for the intended purpose, those funds still could be factored into the general operating budget of the enterprise.

At the end of a particular plan period they could then be accounted as a budgetary saving -- especially since the condition of purification installations was rarely checked (and if it was, it was by essentially powerless pollution control officers who could do little to prevent the practice).

Some time ago in this present study the question was posed: To what extent, if any, was administrative and bureaucratic interference an operative factor in the application of environmental law? The answer to that question must be that only circumstantial evidence exists to suggest that *direct* administrative and bureaucratic interference occurred. Given the considerable public pressure in the form of antipollution campaigns in the popular press, coupled with the repeated complaints of political and scientific personnel, the lax attitude of the legal system towards industrial pollution is, however, highly suspicious. This suspicion is reinforced by the contemporaneous and successful drive for stiffer penalties against poachers. In the final analysis, however, it must be stated that there was little reason for direct interference to occur. The problem of industrial pollution -- encompassing, as it did, so many fundamentally intractable problems -- was so complex and unmanageable, that polluters could conveniently explain away their actions on the basis of any number of difficulties. In other words, bureaucratic and administrative interference in the application of environmental law to industrial polluters is difficult to find, simply because it was unnecessary.

Chapter V

Soviet Conceptions of the Environment

Language most shows a man;
speak, that I may see you.
-- Ben Jonson, *Explorata*

Introduction

The policies described in the previous three case studies were not formulated and enacted in a philosophical and ideological vacuum. Of course, in the initial stages of the processes described, an appreciation that the impact of human activity on the environment could produce negative consequences was not well developed and there was therefore little reason to consider it as a material factor in the planning process. But Soviet economic, military, and legislative activities were nevertheless guided by value-inputs that were neither immutable nor especially prescient. Once the realization crystallized that Soviet activity inherently possessed potentially negative consequences these value-inputs were called into question.

In the Soviet experience the pre-eminent value-input was the Marxist conception of the construction of communism; it was held that this, in and of itself, encompassed the correct solution to the set of problems identified as extant in human social, technical and cultural relations. Although Marxist thought was not the only functional value-input in the process of policy formulation, it was nevertheless very important, because it represented the fundamental basis of socialist action on the one hand, and it also formed an ideological patina overlain on Soviet policies on the other, a patina that is sometimes difficult to scour. Thus, for example, it may be argued persuasively that the Soviet decision to construct nuclear submarines had more to do with fears of national security and a conscious effort to compete with the navies of Western states (primarily those of the United States and Britain) than with Marxist dialectics, though -- unsurprisingly -- the policy was publicly couched in Marxist-Leninist theories of hostile capitalist

encirclement.[1] It is clear that in pursuing the construction of a technologically advanced striking force of nuclear submarines, the USSR was acting upon a group of presumptions that derived far more from elements of Great-Power rivalry than Marxist thinkers may care to admit.[2]

The great strength of Marxism-Leninism as a guiding principle of Soviet activity was its flexibility and scientific character: in essence Soviet thinkers could adapt the theories of Marx, Engels and Lenin to explain, and form the basis of, responses to social and technological challenges as they arose, and to explicate Soviet actions within a

---

[1]Sergei G. Gorshkov, the Commander-in-Chief of the Soviet Navy from 1956-1988, could therefore write in his seminal *Sea Power of the State* that

> in determining the lines of development of the navy in the nuclear age, one could not fail to take into account, for example, the fact that the imperialist states opposing us possess[ed] an enormous surface fleet and a powerful shipbuilding industry. . . . The priority given to the development of the submarine forces made it possible in a very short time to increase sharply the strike possibilities of our fleet, . . . to multiply the growth of the sea power of our country, thereby depriving an enemy of the advantages which could accrue to him in the event of war against the Soviet Union and the countries of the socialist community.

Yet despite this Marxist analysis, Gorshkov immediately stated with pride that the development of the submarine fleet gave the Soviet navy

> the ability to open up new directions of warfare for the armed forces, including those which from ancient times have been considered inaccessible to us....All this radically altered the situation built up over the centuries in the oceanic expanses where the fleets of the imperialist powers had hitherto enjoyed unshared dominance. This was an invasion into the holy of holies of imperialism, where it strove not to admit even its companions in aggressive military alliances.

S. G. Gorshkov, *The Sea Power of the State* (Oxford: Pergamon Press, 1979), 190, 191. This edition is a translation of the Russian *Morskaya moshch gosudarstva.* 2nd revised ed. (Moscow: Voenizdat, 1976).

[2]The similarities between, say, the Imperial German decision to acquire a high-seas fleet to contest British mastery of the sea at the close of the nineteenth century, as embodied particularly in the Navy Law of 1898, and the calculations underlying the Soviet decision to construct a naval force capable of breaking Western sea lines of communication are striking. In discussing the communist uprising in Greece in 1947, Milovan Djilas reported Stalin's appraisal of the situation thus: "They have no prospect of success at all. What do you think, that Great Britain and the United States -- the United States, the most powerful state in the world -- will permit you to break their line of communication in the Mediterranean Sea! Nonsense. *And we have no navy.* The uprising in Greece must be stopped, and as quickly as possible." Milovan Djilas, *Conversations With Stalin* (New York: Harcourt, Brace and World, 1962), 182. Emphasis added.

consciously constructed, scientifically-based political and social framework. As Joan DeBardeleben points out, "In terms of function, the Soviets [saw] Marxism-Leninism as a guide to state and party action and as the embodiment of science serving the interests of the proletariat."[3] Nor was the ideology of Marxism-Leninism static in character: instead it was an evolutionary process that constantly shifted depending on particular interpretations of Marx's and Lenin's writings at given moments in time.[4] Indeed, it was precisely this aspect of the ideology that provided Marxism-Leninism with much of its flexibility.

But deficiencies of the system could be exposed in cases where little or nothing of guiding principle could be derived and appropriated from Marxist-Leninist thought. The disruption of the environment by industrial and other economic activities was just such a case: in a manner completely unforeseen by Marx and Lenin, the very process of constructing communism in the USSR progressively unleashed environmental and, consequently, economic stresses that threatened to undo the achievements of socialism. The Soviet political elite, ideologists, and scientists were therefore faced with the problem of defining, describing, and analyzing these contradictions within an ideological framework marked by a paucity of theoretical evidence. Thus, an understanding of the manner in which they endeavoured to come to terms with the problem, and of the conclusions that they reached, is essential to an appreciation of Soviet -- as opposed to narrowly Marxist -- attitudes towards the environment. It is important for two reasons: first, because the process exposed fractures between Marxism-Leninism as an ideology and the activities enacted in its name; and, second, because it also exposed fractures between those who dogmatically insisted that only a proper formulation of Marxism-Leninism could solve the problem of environmental degradation, and those who insisted that what was required to solve the problem was, in fact, a fundamental

---

[3]Joan DeBardeleben, *The Environment and Marxism-Leninism: The Soviet and East German Experience* (Boulder, CO: Westview Press, 1985), 7.
[4]*Ibid.*

ideological reformulation. The aim of this chapter is *not* to catalogue what Marx, Engels, and Lenin said, or did not say, about the environment: that has been done elsewhere, with varying degrees of success.[5] Instead, this chapter outlines and describes the manner in which Marxism-Leninism was employed by scientists and ideologists in their search to construct a persuasive and applicable model of the human-environment relationship that would provide a basis for Soviet environmental policy.

This examination of the environmental debate will be considered on the basis of its appearance in the published media in the USSR. This is necessary because of the simple fact that an appraisal of the wellsprings of elite environmental policy based on high-level planning documents is essentially impossible: despite the collapse of the Soviet state in 1991 and the relaxation of state control over official documents, almost the entire corpus of ministry-level planning documentation remains inaccessible. It is therefore necessary to rely on published sources to describe the Soviet environmental debate. These sources are generally constituted by two groups: the first is mass-circulation newspapers which, to a significant extent, reflected not only official attitudes toward the problem of environmental degradation but also public responses to the problem. The second source is represented by the group of scholarly, technical, and specialist journals that analyzed both the scientific and ideological dimensions of environmental degradation.

---

[5]See, for example, Howard L. Parsons, *Marx and Engels on Ecology* (Westport, CT: Greenwood Press, 1977); Reiner Grundmann, *Marxism and Ecology* (Oxford: Clarendon, 1991); and Kenneth M. Stokes, *Man and the Biosphere: Toward a Coevolutionary Political Economy* (Armonk, NJ: M. E. Sharpe, 1994). Stokes attempts to link Marxist thought with the theories of Pierre Teilhard de Chardin and Vladimir Vernadsky in an effort to formulate a modern ecological synthesis based on the concept of the "NoÖsphere"; Grundmann analyzes Marxist thought in light of environmental problems facing human society at the end of the twentieth century, to suggest possible avenues of interpretation of the environmental crisis on a broad ideological and philosophical basis. Parsons, the earliest of the three, is guilty of fundamentally poor analysis: the monograph is little more than an attack on Capitalist activities that, he argues, are responsible for the grossest violations of the natural world. In the Soviet case, Parsons admits, environmental problems do exist but, thanks to the public ownership of the means of production, the solutions to

This source is particularly valuable because it indicates the willingness of Soviet scholars to grapple with what (for them) must have been extraordinarily thorny issues of doctrinal legitimacy. Furthermore, the lengths to which they were prepared to go in pursuit of answers to that problem speaks volumes about their understanding (or lack thereof) of the importance of environmental protection as a factor in the success of the socialist experiment.

The Origins of the Human-Environment Debate in the USSR

It was the realization that problems existed in the use and exploitation of resources by Soviet planning and economic activity, not a perception of environmental degradation, that provided the initial stimulus for an examination of the character of the human-environment relationship within the USSR. Because the debate derived from terms of natural resource utilization, in its early stages (approximately from 1960 to 1970) it was characterized by a relatively pedestrian approach. Initially, it was the simple evaluation of natural resources -- their volume, availability, quality, and ease of utilization -- that was considered to be the primary task of scientists. In doing so, they would be engaged in quantifying the material basis for the transition to communism. This task would, through the development of scientific techniques of resource management, ensure the maintenance of sufficient resources for future generations to serve their efforts in the construction of communism.

Another factor that contributed to the cautious nature of the early scientific approach to environmental problems in the Soviet Union derived from the character of some of the scientists involved. The leader of the initial efforts to formulate an understanding of the human-environment relationship in the USSR was undoubtedly Stanislav Semenovich Shvarts, the director of the Institute for the Ecology of Plants and Animals. The Institute, founded in 1955, was located in the Urals city of Sverdlovsk (Yekaterinburg) and was attached to the Ural

---

those problems "come with relative ease" -- an utterly fallacious claim. Parsons, *Marx*

Scientific Centre of the USSR Academy of Sciences.[6] Shvarts, recognized as the *doyen* of Soviet environmental studies in the Khrushchev period, used his position as director of the Institute for the Ecology of Plants and Animals to popularize problems of resource depletion and misuse as a consequence of industrial activity not only in the Soviet Union but in capitalist states as well. However, Shvarts' work avoided even the merest hint of dissension with established Marxist-Leninist ideology: according to Douglas Weiner this was a result of the arrest of Shvarts' father, an Old Bolshevik, in 1937. The event deeply traumatized the young scientist and pervaded his work for the rest of his life.[7] Thus, Shvarts tenaciously argued that the ultimate goal of interaction between humanity and its natural surroundings was not some form of pastoral harmony but "the ability to direct natural processes." Consequently, in his view, the science of ecology could not restrict itself to merely descriptive activities; instead it must actively and aggressively seek to transform itself into a discipline concerned with the development of "ecological engineering."[8] Furthermore, Shvarts argued that it was not the responsibility of the scientific community to define its own analytical tasks: for him, "the process of the framing of economic and developmental strategies [was] the proper preserve of the political authorities, not of scientists with technocratic aspirations."[9]

In maintaining this view, Shvarts stood resolutely and almost completely alone in the scientific community investigating the potentialities of Soviet natural resources. Although they were instructed to undertake a primarily enumerative programme of research, the scientists involved nevertheless conceptualized their work as offering scientifically-substantiated proposals for the development of a "rational

---

and Engels on Ecology, 92.

[6]Douglas R. Weiner, "Prometheus Rechained: Ecology and Conservation," in Loren R. Graham, ed., *Science and the Soviet Social Order* (Cambridge, MA: Harvard University Press, 1990), 71-93.

[7]*Ibid.*, 79.

[8]S. S. Shvarts, *Tekhnicheskii progress i okhrana prirody: Lektsiia* [Technical Progress and the Protection of Nature: a Lecture] (Sverdlovsk, 1974), 15; quoted in *ibid.*, 79.

[9]Weiner, "Prometheus Rechained," 80.

organization of national economic planning and renewable resource use." These proposals could then be adopted by economic managers as the basis of just such an organizational model: it was argued by the scientific community that only in this way would it be possible "to achieve a fuller productivity that would satisfy the growing needs of the state while maintaining a continuous quantitative and qualitative resource improvement", adding that

> National planning can be considered rational only when the country possesses a stable, positive balance in all types of renewable resources; the achievement of such a balance is an important task of the planning organs of a socialist state and a prerequisite for transition to a Communist society.[10]

Despite such lofty ambitions, in their attempts to quantify natural resources the scientists quickly encountered a major problem: their methodology was inadequate for the task. As geographers quickly pointed out, merely calculating the amount of a particular resource did little to produce a situation wherein rational resource management could be achieved. One group of geographers writing in 1970 argued that, even at that advanced stage (the debate over the rational use of resources had been developing for approximately a decade by that point), much still needed to be done methodologically to arrive at a proper evaluation of the natural environment. In particular they asserted that a system of definitions was required that would allow for comparability between evaluations of particular elements and of integrated environments and resource complexes; that would identify the commensurability of various categories of evaluation (social, economic, and technological) of a particular type of environment or resource; that would address the problem of weighting individual elements in integrated evaluations; and that would provide an answer to the question of converting physical

---

[10]D. L. Armand and I. P. Gerasimov, "Economic Significance and Basic Principles of Natural Resource Use," in I. P. Gerasimov, D. L. Armand, and K. M. Yefron, eds. *Natural Resources of the Soviet Union: Their Use and Renewal* [*Prirodnyye resursy Sovetskogo Soyuza, ikh ispolzovaniye i vosproizvodstvo*]. (Moscow: Nauka, 1963). Translated and reprinted as W. A. Jackson, ed., *Natural Resources of the Soviet Union: Their Use and Renewal*. (San Francisco: W. H. Freeman, 1971), 5.

measurements into evaluations on a "point scale" that could be readily appreciated by economic planners and factored into their policy choices.[11]

The fact that such a wide range of methodological questions were raised, by this group in particular but reflected by geographers elsewhere, suggests an awareness that environmental evaluation processes were deficient in several different ways.[12] The fledgling nature (and consequent difficulties) of the effort to provide an evaluation of natural resources that would be meaningful in an economic sense was underscored by the final report of a conference held at the Institute of Geography in Moscow in February 1970, which stated that

> Methods of evaluating resources and the environment have attracted the attention of a growing number of geographers working in a variety of disciplines. Systematic research on the theory and method of technological and economic evaluation has developed only in the last 10 to 15 years, and work on the social evaluation of the environment and resources even more recently. The most significant advances, both in method and in practice, have been made in the evaluation of land and mineral resources. But even in these research areas, not to speak of integral evaluations of entire territories or of territorial combinations of resources, we find major discrepancies in method, in terminology, and in the parameters used. While a variety of approaches was to be welcomed in the early stages of evaluation research, the existence of several different schools of thought now tends to slow further progress.[13]

The report of the conference concluded that concrete and experimental research was needed, as opposed to the formulation of general principles. Also required was a greater exchange of information among scholars working in the field. Perhaps most interesting was the resolution of the

---

[11]Ye. B. Lopatina, A. A. Mints, L. I. Mukhina, O. R. Nasarevskiy, and V. S. Preobrazhenskiy, "The Present State and Future Tasks in the Theory and Method of an Evaluation of the Natural Environment and Resources," *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya* No. 4 (1970), 45-54. Reprinted and translated in *Soviet Geography: Review and Translation* [Hereinafter *SGRT*] XII, no. 3 (March 1971), 142-151.

[12]As Lopatina *et al.* concluded, "experience so far accumulated in this field...should be viewed only as preliminary in the light of present practical needs." *Ibid.*, 151.

[13]*Izvestiya Akademii Nauk SSSR, seriya geograficheskaya* No. 4 (1970), 95-96. Reprinted and translated in *SGRT* XII, no. 3 (March 1971), 173-75.

conference that "recommended closer collaboration between research institutions and the operating agencies that make use of the evaluations of the environment and of natural resources; [and] the formation of special research teams in the tables of organization of institutions working in the evaluation field."[14] This latter point in particular suggested that the work of scientists engaged in resource evaluation had been undertaken up to that point on an *ad hoc* and informal basis, a surprising circumstance considering the publicly-stated weight attached to the programme.

The problems expressed by scientists concerning methodological inadequacies are comprehensible when the larger structure of Soviet science at this time is considered. Peter Kneen has pointed out that the configuration of scientific research in the USSR was different from that of other scientifically-active states: there was, to a great extent, a conscious bifurcation of scientific activity between theoretical and applied research.[15] The institutions of the USSR Academy of Sciences, and of the academies of the constituent republics, were concerned almost exclusively with theoretical and so-called "fundamental" research, and -- especially at the All-Union level -- those engaged in research for the USSR Academy of Sciences were more closely under party supervision than was the case elsewhere. Therefore, the scientists attached to the central institutions of the USSR Academy of Sciences tended to reflect and incorporate Marxist-Leninist ideology into their research and results, far more so than did scientists working at more "independent" institutions located far from Moscow or Leningrad.

The status of applied science in the USSR is more complex. Following a pair of administrative reforms of the USSR Academy of Sciences in 1961 and 1963,[16] the tasks of applied science were placed under the jurisdiction of research institutes affiliated with the

---

[14]*Ibid.*, 175.

[15]Peter Kneen, *Soviet Scientists and the State: An Examination of the Social and Political Aspects of Science in the USSR* (London: Macmillan, 1974), 10-11.

appropriate industrial ministries. Naturally, the applied science undertaken at these so-called "branch establishments" tended to be technologically parochial, being concerned with the exploration and solution of problems of interest defined by the supervisory ministry.[17] There was, however, another locus of applied science in the USSR: the "far-flung" branches of the Academy of Sciences, located at considerable distances from the capital or from Leningrad, the two major centres of the Academy of Sciences' research activity. Branches of particular importance undertaking applied research were those of the Siberian Division located in Novosibirsk and the Urals Division based in Sverdlovsk (Yekaterinburg).[18] The institutions affiliated with these branches also enjoyed greater freedom from administrative control, and the scientists working there therefore tended to attach less importance to the ideological factor in their research than did other scientists.[19]

This "division of scientific labour" would, in part, shape the debate over the human-environment debate in the Soviet Union. But a second, equally-important factor that shaped the debate was the party leadership's attitudes towards and responses to the scientific community in the 1960s and 1970s. It is no accident that the political call for a more intense scientific effort to investigate the problems of resource-management in the USSR corresponded not only with the economic and administrative reforms instituted by Brezhnev, Kosygin and Podgorny, but also with a concerted effort by the Communist Party to reassert its control over the Soviet scientific establishment. Following Khrushchev's

---

[16]For a discussion of the administrative reforms, see Bruce Parrott, *Politics and Technology in the Soviet Union* (Cambridge, MA: MIT Press, 1983), 162-171.

[17]It has been estimated that approximately 85 percent of applied research was carried out at these ministry-controlled branch establishments. The remainder was undertaken by the academies of sciences (10 percent) and universities (5 percent). L. Nolting, *The Financing of Research, Development and Innovation in the USSR, by Type of Performer.* US Department of Commerce Foreign Economic Report No. 9 (Washington DC: US Government Printing Office, 1976), 3-4.

[18]Ronald Amann, "Technical Progress and Soviet Economic Development: Setting the Scene," in Ronald Amann and Julian Cooper, eds. *Technical Progress and Soviet Economic Development* (Oxford: Basil Blackwell, 1986), 17-18.

[19]One exception to this statement was, of course, S. S. Shvarts. But he was motivated by factors other than ideology.

fall in 1964, his successors were faced with what has been termed a "potentially dangerous situation": the massive increase in the number of scientific workers that had occurred under Khrushchev made it difficult for the party to exercise effective political control over this highly educated and demonstrably independent-minded group.[20] It was therefore convenient for the party to merge these two imperatives -- the involvement of the scientific community in solving problems of economic efficiency and the close party supervision of that community -- into a single policy. As Kneen suggests,

> In line with economic strategy as a whole, policy towards science and technology began to shift away from the *extensive* to the *intensive* use of resources in the pursuit of economic growth. In science and technology this change was signified by a deceleration in the rate of expansion of trained personnel, together with an increase in the stress placed on the technical potential of scientific advances as the most significant criterion by which to judge the effectiveness of fundamental research.[21]

The increased stress on the technical potential of scientific advances was communicated to the scientific community through the organization of a new party-directed programme of ideological education and political discipline, aimed primarily at younger scientists who had matured during the Khrushchev "thaw."[22]

It is evident, however, that these efforts at increased party discipline met with limited success among the scientific community. One measure of this fact was the growth of political interest groups within the Soviet system from the 1960s onwards: the most prominent of these were societies whose formation represented "a response to technology [and] a protest against the damage to the environment caused by

---

[20]Kneen, *Soviet Scientists and the State*, 82.

[21]*Ibid.*, 82-83. Emphasis original.

[22]*Ibid.* On this point, see also O. Yamolovich, "Ideinaya zakala nauchno-tekhnicheskoi intelligentsii" [The ideological tempering of the scientific-technical intelligentsia], *Partiinaya zhizn'* No. 7 (1974), 48.

industry."[23] Many of these groups counted concerned scientists as among their most consistent and high-profile members, a phenomenon that was rarely apparent in other cases of organized or semi-organized opposition to Soviet policies.

Further evidence of the inefficiency of party efforts to control the Soviet scientific community is found in the latter's involvement in the human-environment debate itself. In particular, the geographical sciences in the USSR were markedly affected by their participation in the natural resource evaluation programme.[24] Based on the call for methodological restructuring that emanated from geographers themselves, an attempt was made to amalgamate the philosophical foundations of the formerly distinct geographical fields of economic geography and physical geography. It was felt by the geographers engaged in the actual research on natural resources that such a commingling was necessary to avoid the trap of producing scientifically accurate but socially and economically irrelevant data.[25] In advancing such an argument geographers echoed concerns advanced by the scientific community as a whole. As discussed earlier, it was clear to those involved in the resource-evaluation programme that the task was complicated by the participation of scientists operating individually or as members of disparate groups that communicated only rarely. What was

---

[23]Loren R. Graham, "The Impact of Science and Technology on Soviet Politics and Society," in Loren R. Graham, ed., *Science and the Soviet Social Order* (Cambridge, MA: Harvard University Press, 1990), 13.

[24]The Geographical Society of the USSR became formally involved in the analysis of natural resources and their use as a consequence of a decision reached at the XXIII Party Congress in April 1966. The decision called for the completion of a General Outline for the economic development of the USSR, covering the period 1971-1980. The development of the General Outline represented a massive effort on the part of scientific and planning organizations: according to the head of the Council for the Study of Productive Forces, the body responsible for completing the final draft of the General Outline, no less than 560 such organizations, encompassing more than 20,000 scholars and specialists, were directly involved in the project. See N. N. Nekrasov, "Scientific Principles of the General Outline for the Location of Productive Forces of the USSR for the Period up to 1980," *Materialy V s"ezda Geograficheskogo obshchestva SSSR* (Leningrad, 1970). Reprinted and translated in *SGRT* XII, no. 4 (April 1971), 219-226.

[25]On this point, see V. A. Anuchin, *On the Problems of Geography and the Tasks of Popularizing Geographical Knowledge* [*O problemakh geografii i zadachakh propagandy geograficheskikh znanii*]. (Moscow: Znaniye RSFSR, 1968).

essential, in short, was a multidisciplinary approach to the investigation of the human-environmental relationship, one that blended aspects of methodology, scientific philosophy and disciplinary expertise to provide an overall appraisal of the problem.

This sensible concept was nevertheless viewed dimly on ideological grounds. In the field of geography, for example, S. V. Kalesnik, the head of the USSR Geographical Society, outlined the ideological objections to a "unified" geography in his keynote speech to the society's Fifth Congress in 1970. During the speech he stated that

> Some of our geographers have been suggesting that social laws are beginning to play an increasing role in the evolution of the geographical environment, and that social elements are entering into the composition of the environment. Such an approach is in no way in accord with the philosophy of Leninism. Nature cannot include social elements, i.e., elements evolving according to the laws of society. Objects made by man out of natural substances do not acquire social properties, and no social laws will help explain the evolution of lakes, of the soil cover, of climate, etc.
>
> Nor can we agree with the view that the extraordinary potentialities for transforming the geographical environment that are opened up by science and technology under socialism will make mankind the determining factor in the evolution of nature.[26]

According to Kalesnik, the separation of geographical disciplines had to be maintained because

> Qualitatively different things evolve according to laws that are specific for each particular qualitative category. Therefore nature and society, though they coexist within the same space and interact with one another, *yet exist and evolve according to different sets of laws.* That is why natural and productive areal complexes are studied by different disciplines: the former by physical geography, in the light of the effect of society upon nature; the latter by economic geography, in the light of the effect of the environment on the course of the economy and the evolution of society.[27]

Kalesnik therefore offered members of the Geographical Society little option but to remain rigidly confined within their own subdisciplines,

---

[26]*SGRT* XII, no. 4 (April 1971), 203.
[27]*Ibid.*, 199. Emphasis added.

fields that were artificially demarcated on the basis of Marxist-Leninist ideology,[28] and it was within these confines that he urged Soviet geographers to bring the discipline "into a constructive engineering stage designed to work out ways of adapting landscapes to the needs of man. The main focus will be on the prediction of changes in the geographical environment and on the elaboration of principles for a planned, rational transformation of nature."[29] But, by insisting that geography remain rigidly constrained by Marxist-Leninist thought, Kalesnik and other ideologists complicated that task enormously.

The consequences of this externally imposed restriction, and the limitations on research parameters it implied, were explicitly stated by the head of the Council for the Study of Productive Forces, N. N. Nekrasov. In outlining the future tasks of scientists engaged in the study of Soviet natural resources and their integration into the economic structure of the state, Nekrasov admitted that research into problems of environmental degradation was still in its nascent stages, but noted that "From our standpoint, a resolution of the pollution problem will require changes in production technology, improved waste treatment installations, and correct location of production establishments. First, enterprises with the most noxious waste products must be dispersed. Second, enterprises consuming especially large quantities of water should be located in zones that are best supplied with water resources."[30] Thus, from the government's point of view, the solution to the problem of industrial pollution was not identified as being one of reduction of pollutants from individual enterprises, but rather the dispersal of those enterprises to lessen local pollution levels. More

---

[28]It is for ideological reasons such as these that Soviet scholars generally reacted with great hostility toward the tentative moves in American geography to incorporate an ecological appraisal into the discipline through a convergence of physical geography and economic geography. For a discussion of the two different concepts of this ecological dimension of geography at this time, see John E. Chappell, "The Ecological Dimension: Russian and American Views," *Annals of the Association of American Geographers* 65, no. 2 (June 1975), 144-162.

[29]*SGRT* XII, no. 4 (April 1971), 204.

[30]Nekrasov, "Scientific Principles of the General Outline for the Location of Productive Forces of the USSR for the Period up to 1980," 225.

careful use of resources, or the recycling of those resources as much as possible was likewise ignored: instead, more extensive natural resource input was advocated. Yet this proposal was directly contradictory to the stated aim of the natural resource enumeration programme, which was for scientists to calculate reserves and to provide a plan for their more effective use. For economic planners, then, more effective use of natural resources meant their greater exploitation and utilization; for scientists, on the other hand, it meant something entirely different.[31]

The fact such differences of philosophical opinion existed even in the relatively simple programme of resource evaluation, between scientists on the one hand and those who directed scientific inquiry on the other, posed challenges that became increasingly severe as the terms of the environmental research effort were broadened. In the late 1960s and early 1970s a series of measures were enacted by the Central Committee of the CPSU and the USSR Council of Ministers that were intended to address issues of environmental pollution and the misuse of resources in the USSR.[32] These measures culminated with an intensive discussion of the human-environment relationship in the Soviet Union at the Fourth Session of the USSR Supreme Soviet in September 1972. The Supreme Soviet issued its most sweeping environmental resolution to date as a consequence of those discussions: entitled "On Measures for the Further Improvement of Conservation and the Rational Utilization of

---

[31]Compare Nekrasov's arguments with the contemporary views of hydrogeographers V. I. Kudelin, V. N. Kunin, M. I. L'vovich and A. A. Sokolov who, in their "Freshwater-Supply Problems of Mankind," a paper presented to the Fifth Congress of the Geographical Society of the USSR, strongly argued for the conservation of water resources through the employment of effective techniques for the recycling of industrial waste water, the better treatment of waste water not recycled, and more intensive use of water resources generally. The article is reprinted and translated in *SGRT* XII, no. 6 (June 1971), 329-346.

[32]These resolutions included: "On Measures for Preventing the Pollution of the Caspian Sea," issued by the USSR Council of Ministers in October 1968. *Pravda* (3 October 1968), 2; a special resolution to protect Lake Baikal, *Izvestiya* (8 February 1969), 2; a second resolution to this effect, "On Additional Measures to Ensure the Rational Utilization and Conservation of the Natural Resources of the Lake Baikal Basin," issued by the Central Committee of the CPSU and the USSR Council of Ministers. *Pravda* (24 September 1971), 1; and a resolution issued by the Central Committee of the CPSU and the USSR Council of Ministers aimed at lowering pollution of the Volga

Natural Resources," the resolution directed the scientific community to expand its research "on the most important problems of conservation and the rational utilization of natural resources."[33]

It is clear from the discussions that occurred at the session of the Supreme Soviet that, in terms of scientific research, the purpose of the resolution was to intensify that research along already-established lines. Thus, better methods of pollution control were to be sought, more efficient methods for the utilization of the state anti-pollution budget were to be defined, and new waste-free production and technological processes were to be developed.[34] The scientific community, on the other hand, viewed the commands of the resolution quite differently. They chose to interpret it to mean all the things that the Supreme Soviet intended but, in addition, they used the resolution as an inducement to examine the fundamental philosophical basis of the human-environment relationship on a global scale.

Why the Soviet scientific community chose to do so is a matter of speculation, but evidence exists that is suggestive of the calculations through which they reached their decision. First, in undertaking a *general* exploration of the human-environment relationship, the scientific community would be better able to offer general economic and social policy alternatives to the political leadership, rather than simply act as problem-solving minions of that leadership. Soviet scientists were increasingly aware of the contradictions and complications represented by the intensified scientific and technological character of not only Soviet development but industrial development generally, and they were desirous of a stronger voice in the direction and management of those forces.[35] The investigation of the human-environment relationship on its

---

and Ural rivers, "On Measures to Prevent the Pollution of the Volga and Ural River Basins with Untreated Sewage," *Pravda* (17 March 1972), 1.

[33]*Pravda* (21 September 1972), 1.

[34]On this point, see the report of V. A. Kirillin, the Vice-Chairman of the USSR Council of Ministers, to the Supreme Soviet Session. *Pravda* (20 September 1972), 2-3.

[35]The rapidity of industrial and economic change in the postwar period was, according to Soviet science, a consequence of the "Scientific-Technological Revolution" [*nauchno-tekhnicheskaia revoliutsiia*] that is more familiar in western thought as the "Second

most fundamental level provided the scientific community with a potential opportunity to secure such a voice.

Second, the Soviet scientific community chose to conceptualize the human-environment relationship in global terms because there was a general recognition that problems of environmental degradation were, quite simply, global in character. It was important, as I. T. Frolov, editor of the journal *Voprosy filosofii* (Questions of Philosophy) noted, that the investigation of the problems of the human-environment relationship must be directed "not so much in emphasizing their general and traditional aspects but in finding a scientific and practical solution to new problems of the interaction of man and nature that can now be solved only on a *global* scale."[36] This suggests a third reason why the Soviet scientific community was so keen to conceptualize the problem in global terms: at this time they were campaigning for the expansion of international scientific contacts, a policy that encountered dogged resistance from the Soviet political leadership.[37]

Finally, the investigation of the nature of the human-environment relationship promised to be very broad indeed, requiring the large-scale participation of many in the scientific community. It is highly probable that Soviet scientists were seduced by the prospect of large research programmes requiring a major effort on their part; nor were they immune to the potential benefits represented by the injection of significant funding by the government. In short, they were susceptible to naked self-interest. That much is speculative. What is not is the realization by the

---

Industrial Revolution." An excellent appraisal of the impact of the Scientific-Technological Revolution on Soviet thinking may be found in Erik P. Hoffmann and Robbin F. Laird, *Technocratic Socialism: The Soviet Union in the Advanced Industrial Era.* Duke Press Policy Studies. (Durham, NC: Duke University Press, 1985). On the question of increasing the involvement of the scientific community in planning the future direction of scientific and technological innovation in the Soviet Union, see the remarks of USSR Academy of Sciences' President M. V. Keldysh in *Vestnik Akademii Nauk*, No. 7 (1971), 22.

[36]I. T. Frolov, "The Global and Interdisciplinary Character of Ecological Problems," *Voprosy filosofii*, No. 1 (1973). Reprinted and translated in *Soviet Studies in Philosophy* XIII, No. 2-3 (Fall-Winter 1974-75), 7. Emphasis original.

scientific community that participation in such a major programme of research, evaluation, and policy formulation would require a unified, integrative approach. M. I. Budyko, the director of the Central Geophysical Observatory in Leningrad, argued that "under the kind of specialization now existing in the sciences, individual institutes are unable to provide for treatment of interdisciplinary problems of global ecology. There is a need for interagency guidance of such research, lacking which the mounting of broad projects in this area will be impossible."[38] Thus, by participating in the research programme, the Soviet scientific community could, by bringing about greater integration between the scientific disciplines -- and controlling the means of that integration themselves[39] -- maintain and perhaps even extend their autonomy.

It is clear, then, that there existed manifold differences of opinion between the political and economic leadership of the Soviet Union and the state's scientific community. These differences of opinion derived from a combination of the factors outlined above. There was a fundamental, though not specifically addressed, difference of opinion over the parameters of investigation into the human-environment relationship: the Soviet leadership required scientists to provide not a broad understanding of the problems inherent in the relationship but a set of specific recommendations encompassing methods to increase Soviet economic productivity and technological sophistication. The

---

[37]On the difficulties encountered by Soviet scientists in their attempts to secure permission to travel abroad in this period, see Parrott, *Politics and Technology in the Soviet Union*, 208, 268.

[38]M. I. Budyko, "On the Threshold of a New Science-- Global Ecology," *Voprosy filosofii*, No. 1 (1973). Reprinted and translated in *Soviet Studies in Philosophy* XIII, No. 2-3 (Fall-Winter 1974-75), 18.

[39]In response to a question from Academician P. L. Kapitsa on the form of the "interagency guidance" of research, Budyko suggested that "it would probably be difficult to handle this problem in any single division [of the Academy of Sciences].... [I]t would apparently be essential to establish a special council or commission toward that end. Perhaps such a council should be organized under the Presidium of the USSR Academy of Sciences." *Ibid.*, 19. In fact, this is *not* the natural location of such a coordinating body: the State Committee for Science and Technology, set up as a division of *Gosplan* in 1965, would have been a more rational choice from almost any point of view -- except that of the scientists themselves.

scientists clearly felt that such recommendations could only be advanced on the basis of a firm understanding of the character of what they defined to be a very complex and global problem. The political leadership assumed that the programme of research would be undertaken within the established Soviet scientific order; the scientific community insisted that a fundamentally different structure was required in order to produce a meaningful and complete understanding of the problem. This structure would require heightened scientific contacts both within the Soviet Union and internationally. These differences of opinion were not merely semantic: they were crucial to the course of the debate that followed; they would bring the scientific community into conflict with the political leadership of the Soviet Union, and would sow more than professional dissent within the ranks of the scientists themselves.

The Human-Environmental Debate: Whose First Principles?

The philosophical foundation of the investigation of the human-environment relationship by Soviet science necessarily rested on Marxist-Leninist ideology. As the pervasive doctrine within which all state-directed intellectual activity was framed, Marxism-Leninism provided an essential set of first principles from which all consequent scientific, philosophical, and humanistic thought was derived, and intellectuals who failed to present their ideas within that framework did so at their own peril. If, however, Marxist-Leninist ideology failed to offer logically viable first principles from which to operate, then those engaged in intellectual activity would be faced with a choice: either integrate such pieces of the ideology as made sense into their investigations and theories; attempt to reformulate the ideology in an evolutionary way; or, most challenging of all, reject the utility of the ideology in its entirety. Those investigating the human-environment relationship in the Soviet Union faced just such a choice because, as described previously, Marxism-Leninism provided almost nothing of ideological substance upon which the investigation could be based.

Clearly the political leadership expected the investigation to proceed along a Marxist-Leninist course, with the incorporation of new findings into the ideology. Unfortunately such a process was difficult, if not impossible, given the character of the problem under study. Quite simply, environmental assumptions based on Marxist-Leninist ideology were clearly incorrect, so much so that it quickly proved impossible for the scientific community to integrate ideology with scientific reality in any meaningful way.

One of the first ideological problems encountered by the scientists investigating the nature of global environmental degradation was that Marxism-Leninism stated that problems of environmental mismanagement *could not happen* in a state-directed socialist system like that of the Soviet Union. To this was added the ideological corollary that pollution and environmental dislocation could therefore only occur in capitalist states. Yet, demonstrably, the USSR faced environmental problems of considerable magnitude, a fact that was not only recognized by the political leadership of the state but which was the subject of major discussion in the popular press and among the intellectual elite.[40] How could these two disparate threads, one ideological, the other veritable, be reconciled?

Initially the scientific community tried to ignore the direct problem itself, choosing instead to focus on the creation of a set of laws that could describe the human-environment relationship in general terms only. The appearance of a collection of articles discussing the relationship between nature and society, for example, chose to evade the question of differences in the treatment of the environment between capitalist and socialist systems by circumventing the issue entirely.[41] This did not, however, prevent the collection from being received negatively: indeed, it was considered sufficiently seditious for a round-table discussion to be convened at the 1969 meeting of the USSR

---

[40]See Chapter IV.

[41]I. P. Gerasimov, ed., *Priroda i Obshchestvo* [Nature and Society] (Moscow, 1970).

Geographical Society in Leningrad to pillory the authors' conclusions.[42] Especially difficult for the critics participating in the discussion was the assertion that a set of laws may exist that described *in general terms* the nature of the human-environmental relationship. In the words of one discussant, I. I. Ivanov-Omskii, this concept

> would divert us from a concrete understanding of the fundamental difference in the relationship under capitalism and under socialism: it would certainly not help us understand in more concrete terms the narrow, despoiling attitude toward the natural environment under the capitalist mode of production, and the superiority of the socialist mode of production in its attitude towards nature. Such a theory would enable opponents of a Marxist solution of this problem to argue that there are no grounds for distinguishing the man-nature relationship under capitalism and under socialism.[43]

Therefore, the investigation into the human-environment relationship, in the implied opinion of this particular critic, should not focus on an attempt to formulate some basic theoretical precepts upon which an understanding of the relationship could be based. Instead it should demonstrate, first and foremost, the superiority of the socialist system in dealing with the problem.

One unfortunate contributor to the volume, Yu. P. Trusov, whose article "The Concept of the Noösphere" represented an attempt to describe the historical impact of human activity on the environment, was savaged for suggesting that this was a new, unexplored question. M. I. Al'brut, an academician attached to the Soviet Finance-Economics Correspondence Institute in Chelyabinsk, attacked Trusov for expressing such an incorrect and ideologically naïve opinion. Not only had the impact of human activity been thoroughly explored already, Al'brut stated, but

> there is even a periodization of that evolution, expressed in the periodization of economic history generally accepted in

---

[42]The report of this round-table appeared in *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva*, No. 4 (1969), 383-390. Reprinted and translated in *SGRT* XI, no. 2 (February 1970), 127-138.

[43]*Ibid.*, 131-132.

> Marxist science. It goes as follows: savagery, barbarism, antiquity (representing the slaveholding system), then feudalism, capitalism, [and] socialism. The age of steam, the age of electricity, nuclear energy, the old industrial revolution, the present scientific and technological revolution, all these eras have been studied within the framework of that periodization. Yet Trusov constructed his own periodization of the man-nature relationship, distinguishing three stages: ancient, pre-industrial and industrial, which he views outside of the social context.[44]

Al'brut thus missed the point entirely. Trusov was forced to construct his periodization in an attempt to describe the historical human-environment relationship and, in turn, explain the current environmental situation precisely because the Marxist interpretation failed to do so. Furthermore, the exact periodization selected by Trusov to conceptualize the relationship between human activity and the environment was considered at that time to be generally acceptable by most environmental historians.[45] Nevertheless, Trusov was attacked for failing to adhere sufficiently closely to Marxist thought.

Further proof of Al'brut's narrow-mindedness and frankly strange world view appeared in his discussion of K. Yefremov's article "The Landscape Sphere and the Geographical Environment." Yefremov had attempted to demonstrate that humans could not be divorced from (and therefore treated separately from) the natural environment: in Yefremov's view to do so was to miss the fundamental nature of the human-environment relationship. He argued that the two were interrelated, that one acted upon the other equally. Al'brut regarded this proposal with particular distaste:

> There is no doubt that man is a biological individuum, but attempts to divorce him as a social being from his productive relations are not new. We still attribute great importance in the struggle against "social physics" and similar theory to Marx's acid comment, directed against the "true socialist" Matten, to the effect that Matten had equated man "to any

---

[44]*Ibid.*, 135-136.

[45]On this point see the excellent overview of the historiography of environmental history provided by Ian G. Simmons in his *Environmental History: A Concise Introduction.* New Perspectives on the Past Series. (Oxford: Blackwell, 1993).

> flea, any dust mop, any stone." [Quoting Marx again, Al'brut continued] "The essence of man," Marx wrote "is not an abstraction inherent in every individuum. In its reality it is the aggregate of all social relations." It is in this capacity, and only in this capacity, that man, people, and society interrelate with nature. It only remains to be added that in outer space people are geometrically related to the sphere of outer space and not to the landscape sphere, thus offering convincing proof that they cannot be a component of the landscape sphere or geographical environment.[46]

The logical inconsistency of this argument notwithstanding, it is clear that Al'brut was unremittingly hostile to any suggestion that classical Marxist thought could bear any form of modification in an attempt to explain a phenomenon that Marx himself had utterly (and blamelessly) failed to anticipate.

The point of describing this discussion is not to demonstrate the intellectual eccentricities of Ivanov-Omskii or Al'brut. It is to demonstrate the difficulties encountered by Soviet scientists as they attempted to analyze and describe the negative impact of human activity on the environment, and as they struggled to produce a philosophical foundation upon which further avenues of research could be based. The critical reaction of dogmatic Marxist-Leninist thinkers like Ivanov-Omskii or Al'brut was neither especially excessive, nor was it a phenomenon unique to this situation.[47] In other cases too, the findings of environmental researchers were rejected on the basis of ideological unacceptability.

The Marxist-Leninist ideologists were angered also by the reluctance of scientists to reject out of hand environmental concepts advanced by westerns scholars. In the early 1970s environmental

---

[46]*SGRT* XI, no. 2 (February 1970), 136. It is difficult to argue with such a unique brand of logic.

[47]Other examples include the attacks on V. A. Anuchin for the ideological errors apparent in his *On the Problems of Geography and the Tasks of Popularizing Geographical Knowledge* [*O problemakh geografii i zadachakh propagandy geograficheskikh znanii*]. (Moscow: Znaniye RSFSR, 1968). One of the most poisonous emanated from B. N. Semevskii of Leningrad University, who described Anuchin's work as "a rehash of generally accepted truths;...the expression...of anti-Marxist ideas," and "facile and simple". See *SGRT* XI, no. 6 (June 1970), 501-509.

literature in the United States in particular could be described as "environmentally pessimistic." Building on Rachel Carson's seminal 1962 work *Silent Spring*, western scholars criticized the concept that unrestricted technological advancement could continue without placing an untenable strain on the environment.[48] They urged that some curtailment was required on the growth of the mass consumer society and the burgeoning attempts to industrialize the Third World based on then-current western experiences. As such ideas were at variance with the technological positivism of the Soviet Union, it is not surprising that they were poorly received there.

What is remarkable, however, is not the fact that they were poorly received but that they were considered at all. Rather than reject the works out of hand, the Soviet scientific community chose to examine and criticize them on unusually sophisticated and considered grounds. Thus, M. I. Budyko could challenge the conclusions of western writers but still warn that

> it is necessary to avoid onesidedness and oversimplification in evaluation of these works....It is easy to criticize studies of this kind: they contain many postulates that prompt justified objections. Furthermore, evaluation is hindered by the somewhat sensational character of their conclusions, which is perhaps due to the authors' efforts to attract attention to the problems of ecology....
>
> However, one must not fail to note that these books contain an attempt, interesting in many respects, at mathematical modelling of the natural and economic conditions of the future. *It would be very dangerous to reject such an approach to the study of problems of global ecology only because the authors of the American works made a number of mistakes. We should organize our own investigations in this field, which could yield results important in practice.*[49]

Other Soviet scholars, though less charitable than Budyko in their analysis of the methodological mistakes committed by the western

---

[48]Examples of this body of literature include Barry Commoner, *The Closing Circle: Confronting the Environmental Crisis* (London: Jonathan Cape, 1972); D. H. Meadows *et al.*, *The Limits to Growth: a Report for the Club of Rome's Project on the Predicament of Mankind* (NY: Universe Books, 1972); and J. W. Forrester, *World Dynamics* (Cambridge, MA: Wright-Allen Press, 1971).

ecological writers, still chose to engage those works on the basis of scientific debate, rather than in rigidly Marxist-Leninist terms. In doing so, they produced some very subtle critiques that demonstrated the thoughtfulness of the Soviet environmental scientists, and their willingness to tackle difficult issues of ecological theory on the basis of their scientific merit alone.

One of the most revealing of these assessments appeared in *Voprosy filosofii* at the end of 1972.[50] The authors of the article, E. K. Fedorov and I. B. Novik, began by tracing the development of environmental consciousness in both the Soviet Union and around the world, noting that

> Only two or three decades ago, the most acute problems were an unending list of "shortages" of one type or another, while the environment in which man lived was regarded primarily as a set of resources without which things could not be produced. Today it is the threat of excessive human influences on nature that has taken centre stage. The biosphere is beginning to be perceived on the level of its capacity to assimilate what has been produced, and the growing question is how best to combine the scientific-technological creations of man with the objective processes occurring in nature.[51]

It is on this basis -- that there exists a question concerning the relationship between humans and the environment, and not simply a predefined Marxist-Leninist answer to that question -- that the authors proceeded to criticize those who advanced the concept of environmental pessimism. They attacked the application of systems analysis to the forecasting of environmental dislocations, found in ecologically pessimistic works:[52] pointing out that a proper appraisal of the interactivity of a variety of disparate factors is necessary for an accurate

---

[49]Budyko, "On the Threshold of a New Science," 18-19. Emphasis added.

[50]E. K. Fedorov and I. B. Novik, "Man and His Natural Environment," *Voprosy filosofii*, No. 12 (1972). Reprinted in *Soviet Studies in Philosophy*, XII, No. 2 (Fall 1973), 3-25. Fedorov was an academician and head of the Hydrometeorological Service of the USSR Council of Ministers. Novik was a professor at the Institute of Philosophy of the USSR Academy of Sciences in Moscow.

[51]*Ibid.*, 3.

[52]Meadows' *Limits of Growth* is particularly guilty in this respect.

forecasting of the environmental future, Fedorov and Novik questioned whether systems analysis was a sufficiently sophisticated tool to use in the production of an accurate forecast. In particular, they challenged the ecologically pessimist view that

> if people were able to increase significantly the effectiveness of the utilization of natural resources, then this, while removing the threat of hunger and shortages, would produce so marked a rise in production that the resulting increase in environmental pollution would bring about conditions intolerable for the existence of man on earth.[53]

Fedorov and Novik did not see the increase of human numbers as the major threat to the environment; instead, they argued the reverse: "the major threat to humanity arises in connection with the exhaustion of natural resources and pollution of the environment, which are *an inevitable consequence* of the rise in numbers of the population and an increase in production anticipating this growth."[54] If these consequences could be properly managed, Fedorov and Novik argued, then the environmental threat posed by rising population numbers could be ameliorated to a significant extent.

Perhaps the most telling criticism of the ecological pessimists dealt with the latter's assertions that the finite quantities of natural resources accessible to humans would impose a catastrophic limit on social and technological growth in the very near future. Fedorov and Novik suggested that

> There is no justification for elevating to an absolute an approach to natural resources (as the source of all that man needs) from the standpoint of *the present*. It must be taken into consideration that every specific viewpoint about whether a given element in the environment is a natural resource and about the means of utilizing it changes -- a fact to which history bears witness, and in the most fundamental fashion.
>
> The total volume of each nonrenewable form of natural wealth can only decline. However, this does not mean a decline in the capacity to satisfy various needs of humanity associated with it. On the contrary, in the course of the

---

[53]Fedorov and Novik, "Man and His Natural Environment," 5.
[54]*Ibid.*, 6.

> progress of science and change in the modes of production, these capacities will increase both through a rise in the effectiveness of the utilization of each given resource, through the involvement of new natural resources in regular use, and through seeking fundamentally new approaches to satisfaction of the given human need.[55]

Thus, if Fedorov and Novik are to be accused of anything, it should be of unabashed technological positivism. They cannot, however, be accused of dogmatically and inconsiderately rejecting a differing viewpoint out of hand simply because it failed to correspond to the precepts of Marxist-Leninist ideology. Indeed, their last criticism of the ecological pessimists -- that limits to natural resource availability *as calculated then* would produce a near-immediate and potentially catastrophic interruption of technological advancement -- has proven accurate.[56]

The technological positivism exhibited by Soviet scientists such as Budyko, Fedorov, and Novik derived primarily, of course, from tenets of Marxist-Leninist thought. They were also technologically positivist because they were intellectually inclined to be so -- they were, after all, scientists.[57] Nevertheless, the ideological underpinnings were not as firm as might be suspected: members of the Soviet scientific community were

---

[55]*Ibid.*, 7-8. Emphasis original.

[56]This is not to say that the exploitation of those resources has not been environmentally harmful. That, however, was not Fedorov and Novik's point.

[57]An example of such scientific-technological positivism divorced from purely Marxist-Leninist tenets is provided by the physicist P. L. Kapitsa. In 1972 he argued that

> Science can forestall the global crisis resulting from exhaustion of resources of raw materials by converting industrial processes to what are called "closed-cycle processes," as is the case in nature, where nothing is discarded because everything is reutilized. From the standpoint of science, closed-cycle processes are entirely realizable, although of considerably increased complexity. The principal task in implementing closed-cycle processes will be the need to increase energy expenditure. Therefore, the introduction of these processes on a global scale will be possible only when people have at their disposal a virtually unlimited source of energy, which only thermonuclear energy is presently capable of providing.

P. L. Kapitsa, "Three Aspects of the Global Problem of the Relation Between Man and Nature," *Voprosy filosofii*, No. 2 (1973). Reprinted and translated in *Soviet Studies in Philosophy* XIII, No. 2-3 (Fall-Winter 1974-75), 47. Kapitsa was at that time closely involved with Soviet efforts to construct a thermonuclear ("fusion") reactor, so it is

willing to modify the foundational basis of their thought if the situation required. Thus, in 1973 Academician T. Khachaturov could reject the theories of western environmental writers on ideological grounds, noting that the natural resource wealth of the Soviet Union, coupled with national economic planning directed by the Communist Party, "plays a key role in the success of socialist construction."[58] As such the Soviet state was largely immune to the environmental problems faced by capitalist economies. But Khachaturov nonetheless agreed with the contention of western environmentalists that it was essential to maintain rational use and conservation of resources to the greatest possible extent. On this point he stated that

> It is necessary to place particular emphasis on the importance of the economic appraisal of natural resources as one of the means for their more rational use. At the present time such an appraisal does not exist, and what with the existence of parochial interests, it does not promote the rational use of resources....[T]his does not mean that all natural resources should be offered solely for payment. For example, the question of payments by collective farms for land and water must be resolved in such a way as not to cause a worsening of their economic situation and not to infringe upon their constitutional rights.[59]

This is a very cautious reappraisal of the Marxist argument concerning the valueless character of natural resources. But it is a reappraisal nevertheless, and as such it represents a tentative modification of a fundamental ideological theorem.

Several years later, Khachaturov had modified his views still further. In discussing the viability of purification installations as a means of reducing the economic impact of pollution on the construction of socialism in the Soviet Union, he pointed out that

> Stricter purification standards and large allocations for purification plants are required. Nonetheless, even now these

---

natural that he would emphasize its importance as a solution to global environmental problems.

[58]T. Khachaturov, "Natural Resources and National Economic Planning," *Voprosy ekonomiki*, No. 8 (1973). Reprinted and translated in *Problems of Economics*, XVI, no. 11 (March 1974), 3-28.

[59]*Ibid.*, 11-12.

> allocations are not sufficiently utilized. Yet capital investments required for the purification of sewage are in some cases as high as 20-30 percent of the value of the fixed capital of enterprises. It is expedient to introduce local purification systems that recover valuable components rather than to channel sewage into a single flow that hinders subsequent purification and makes it more costly.[60]

In other words, Khachaturov suggested a policy at variance with the standard Marxist conception of the economy as a single factory, within which large-scale industrial activity should be organized on the basis of major territorial production complexes. Instead he advocated localized measures to deal with the problem of pollution, implying that the economies of scale fundamental to Soviet production practices were outweighed by the economies of local purification.

The problem of purification installation valuation was a difficult one for Soviet economists analyzing the impact of pollution on the economy. It was complicated by two factors: first, the importance of purification installations as a means to combat pollution reflected the Soviet faith in the ability of the scientific-technological revolution to solve the negative consequences of economic and industrial activity as they arose. If purification installations failed to solve such problems, then it was at least debatable whether the scientific-technological revolution could be used as a tool to solve problems that its employment created. The second problem arose as a consequence of "parochial interests" in the Soviet economy. Purification installations could successfully deal with pollution problems only if they were accorded the highest priority by all economic actors: it was, for example, of little use if the water-purification facilities at a particular industrial combine were functioning superbly, if at the same time a neighbouring complex was busy pumping unprocessed wastes into the local water supply.

---

[60]T. Khachaturov, "Economic Problems of Ecology," *Voprosy ekonomiki*, No. 6 (1978), 3-14. Reprinted and translated in *Problems of Economics*, XXII, no. 1 (May 1979), 19-20.

Both of these questions were addressed by A. Arakelian, an academician of the Armenian SSR Academy of Sciences.[61] In an influential paper he identified what can only be described as basic contradictions in the employment of purification installations in the Soviet economy. Arguing that the misapplication of purification technology threatened the ability of the scientific-technological revolution to solve environmental problems, Arakelian suggested that three factors existed that prevented the application of a simple policy of environmental protection: an increase in the number and capacity of purification installations to lessen the amount of industrial pollution. He wrote that an increased emphasis on purification installations diverted financial resources that could be used to further the course of the scientific-technological revolution in other ways (the development of waste-free or closed-cycle production techniques, for example); he pointed out that it would be extremely expensive to design and implement purification strategies that approach one hundred percent effectiveness (a target that was increasingly necessary as advanced production processes utilized ever more toxic compounds -- and discharged them into the environment); and finally he suggested that the very existence of industrial effluents represented a "squandering of natural wealth." In metallurgical processes for example, the final product represented only two percent of the gathered raw materials; the rest went to the tailings heap. Thus, according to Arakelian, "98 percent of the basic raw materials are not used, are transformed into waste material, and pollute the environment."[62]

Furthermore, difficulties were encountered in attempts to bring the full capabilities of the scientific-technological revolution to bear to solve these problems. Attempts were hampered, in Arakelian's view, by administrative parochialism; thus, it was necessary to work towards

---

[61]A. Arakelian, "The Scientific-Technological Revolution and the Biosphere," [Nauchno-tekhnicheskaia revoliutsiia i biosfera] *Voprosy ekonomiki*, No. 5 (1976), 15-24. Reprinted in *Problems of Economics* XIX, no. 11 (March 1977), 68-85.
[62]*Ibid.*, 74-75.

> the elimination of departmental barriers to the total utilization of raw materials and...the strengthening of the interbranch (national economic) approach to the prospective development of branches of production....[I]n the majority of instances the [polluting] enterprises are subordinate to various agencies whose sphere of business interests includes only the production of certain "specialized" products. Everything else that can be extracted from the raw material through total processing is in the sphere of interests of an "alien" agency.[63]

In the final analysis, however, Arakelian admitted that the elimination of departmental barriers presented a daunting task: only through the introduction of radical "economic levers" could the more rational use of resources and the elimination of needless waste be achieved. In his view, the only such economic lever that could serve this end was a valuation system for resources. This would discourage the "parasitical attitude" common among enterprises that competed for the lion's share of high-quality natural resources which they used profligately in their pursuit of planned production targets, the fulfillment of which would be, in Arakelian's words "hampered by [pollution control] measures that produce an effect only after the lapse of several years and that promote a solution of ecological problems."[64] In concluding his argument, Arakelian lamented the "logical" conclusion of the resource-profligacy problem in the Soviet economy: the most successful industrial enterprises and organizations were also those that were the biggest polluters and despoilers of the environment. He identified the worst as the USSR Ministry of Power and Electrification, the Ministry of Ferrous Metallurgy, and the Ministry of the Chemical Industry -- all members of the traditional industrial core of the Soviet economic system, and acknowledged leaders in the implementation of the new production techniques offered by the scientific-technological revolution.

The recognition of this last fact was important in furthering the development of the investigation of the human-environment relationship

---

[63]*Ibid.*, 78.
[64]*Ibid.*, 80.

by Soviet science. The realization that bureaucratic interests could hinder the logical and scientifically-validated policy of efficiency in resource utilization produced a series of geographical studies that examined the pollution and other environmental impact problems of particular Soviet industrial complexes and geographical regions. The investigations of industrial concentration points increasingly emphasized the importance of environmental planning *in advance* of the location and construction of these new projects.[65] In this they were significantly different from technical-engineering analyses produced by economic and engineering planners; these tended to stress the problems of construction and the economic benefits that would accrue from new industrial activity.[66]

Another aspect of these geographical studies was their increasing emphasis on the value of comparative methods as a tool of investigation. These comparisons occurred between "target" complexes or regions and "control" areas. Geographers engaged in such studies admitted that this technique was imperfect but, nevertheless, they suggested that it could provide new appraisals of the environmental impact of industry in the Soviet Union. Some of these investigations produced surprising results: an examination of metallurgical industries around Monchenogorsk in the Soviet north based on a comparison with smelting complexes located in Sudbury, Canada, found that the Soviet industrial activity had a greater environmental impact, despite the fact that its emissions were

---

[65]V. V. Vorob'yev and A. T. Naprasnikov, "Prediction of Environmental Change Under the Impact of Construction and Operation of the Baikal-Amur Mainline," *Geografiya i Prirodnyye Resursy*, No. 1 (1980), 7-17. Reprinted and translated in *SGRT* XXII, no. 5 (May 1981), 312-324.

[66]The analysis of the Baikal-Amur Mainline (BAM) is a case in point. Economic planners emphasized the benefits that would result from the construction of the project: new areas of the Soviet Far East would be opened up for exploitation, and the transshipment of goods would be facilitated. See V. Biryukov, "The Baikal-Amur Mainline: A Major National Construction Project," *Planovoe khoziaistvo*, No. 10 (1974), 6-11; N. P. Belen'kii and V. S. Maslennikov, "The Baikal-Amur Mainline Railroad: Its Area of Influence and Its Projected Freight Flows," *Zheleznodorozhnyy Transport*, No. 10 (1974), 39-46. Reprinted and translated in *SGRT*, XVI, no. 8 (October 1975), 503-513. Discussions such as these only rarely addressed the environmental impact of construction, engineering and industrial projects.

lower.[67] Based on this analysis the authors concluded that merely limiting emissions did not necessarily ameliorate the environmental impact of industries: they therefore suggested that Soviet environmental impact assessments required modification. Up to that point assessments were based simply on a calculation of the level of effluents from a particular industry; the authors of this particular study advocated the inclusion of a calculation, based on field observations and experimentation, in the assessment process, that would quantify "the resistance of natural complexes to the particular type of pollutant [under investigation]."[68] It is likely that conclusions such as these would have been very difficult to achieve without the use of comparative methodology that treated the comparative system objectively. Thus, in cases where the comparative structure was based in a capitalist economy, it was essential to approach the data impartially.

Research efforts extended to a general investigation of the environmental impact of economic sectors, particularly those identified as among the more serious polluters. The mineral industry was one such example: T. B. Denisova of the Institute of Geography in Moscow proposed a methodological framework for the study of this industrial activity based on the precept that the environment represented "a single self-regulating system whose components are related by a set of forward and backward linkages; human activity would be regarded as an external influence tending to disturb the stable state in the dynamic equilibrium of that system by modifying the states of particular components."[69] Based on her investigation, Denisova concluded that modifications in the policy of environmental impact assessment were required, including:

---

[67]A. V. Doncheva and V. N. Kalutsov, "Prediction of the Environmental Impact of Mining and Metallurgical Production in the Taiga Zone," *Vestnik Moskovskogo Universiteta, geografiya*, No. 5 (1975), 65-72. Reprinted and translated in *SGRT* XVIII, no. 4 (April 1977), 223-229.

[68]*Ibid.*, 223.

[69]T. B. Denisova, "The Environmental Impact of Mineral Industries," *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya*, No. 6 (November-December 1976), 55-66. Reprinted and translated in *SGRT* XVIII, no. 9 (November 1977), 646-659.

a) [an] estimation and prediction of the negative environmental impact of the industry, as viewed from various standpoints, including the economic, the social, the sanitary-hygienic and the aesthetic point of view.
b) elaboration of a uniform system of statistical indicators for the impact and damage caused by the mineral industry in light of given natural-climatic conditions;
c) elaboration of a system of recommendations for using scientific-methodological, technological and organizational techniques to reduce the environmental damage in a given set of circumstances;
d) coordination of environmental protection measures being taken at different structural-management levels by individual production establishments, by the industry and on a national scale;
e) organization of a unified watchdog agency that would control the condition of the environment and predict environmental change.[70]

Finally, geographical investigations extended to the particular set of stresses produced on individual ecosystems by economic activity. These, too, produced some surprising conclusions. In a study of the nature-management activities in the Soviet Union, a regional methodology was employed to determine the limitations of those activities.[71] In examining these activities, the authors discovered that in sensitive zones, the policy of environmental protection tended to break down because it failed to appreciate sufficiently the fragility of the ecosystems under management. They therefore suggested that economic activity in those zones be carefully managed: indeed, according to the authors, in some cases the economic development of sensitive regions was inadvisable and therefore such development should be reviewed and possibly sharply curtailed.[72]

It appears, then, that the investigations of the environmental impact of economic activity in the Soviet Union increasingly turned to

---

[70] *Ibid.*, 658.

[71] N. A. Gvozdetskiy *et al.*, "Physical-Geographical Fundamentals of Nature Management," *Materialy VI s"ezda Geograficheskogo Obshchestva SSSR* [Materials of the Sixth Congress of the Geographical Society USSR]: Papers at plenary sessions. (Leningrad, 1975), 19-36. Reprinted and translated in *SGRT* XVII, no. 5 (May 1976), 291-303.

[72] *Ibid.*, 299.

the suggestion of policy alternatives in the formulation of that activity and to a modification of the ideological basis of the human-environment relationship. Thus, international comparative studies developed methodologies of study based on a relatively impartial analysis of economic structures within capitalist systems: only in this way could a more accurate and substantial appreciation of the environmental impact of Soviet economic activity be achieved. There was an implicit admission that the socialist system may perhaps suffer from problems of resource mismanagement and environmental pollution similar to those experienced in capitalist economies. Furthermore, it was suggested more daringly that the basis of those problems was similar: that they derived from an uncaring attitude toward environmental degradation exhibited by some Soviet industrial groups. It was for this reason that Denisova proposed the creation of an environmental "watchdog" that could effectively monitor the use of natural resources and the management of the environment. The message was clear: the industrial ministries are failing to exhibit a solicitous attitude towards the environment, and so they require supervision.

Most striking of all was the suggestion that, although exploitation of virgin ecosystems was well within Soviet technical and economic capabilities, it was not necessarily an advisable policy. In addition, researchers suggested that it might be prudent actually to restrict current economic activity in several regions, including the taiga, until such time as the attainment of a better understanding of the capacity of fragile ecosystems to tolerate economic activity. Within the Soviet context, this suggestion was radical. It called into question several fundamental principles that guided Soviet economic activity. The exploitation of natural resources was seen as essential to the construction of communism; provided that those resources were employed wisely, there was never a suggestion that exploitation could be negative. From an official point of view, this was true even in high-

profile and fractious cases such as the debate over the development of Lake Baikal.

Suggestions that economic activity be limited until such time as their consequences were better understood struck at the heart of the concept of heroic socialism, of the bending of nature's resources to the will of the New Soviet Man. Armed with the tools of Marxist-Leninist thought and the scientific-technological revolution, economic development in the Soviet Union was publicly stated to be an ever-accelerating process. Of course, problems would be encountered, but these would be of an ancillary nature: the fundamental soundness of the construction of communism through the ever-increasing development of the natural world was never questioned. It was considered irrational to do so. For such suggestions to emanate from scientists represented a double blow; after all, science was the primary tool of the advancement of socialist man. The scientific-technological revolution by definition would provide not only an increasing material standard of living, but would solve whatever fundamental problems arose as that goal was pursued. But environmental scientists were increasingly critical of the forces unleashed by the scientific-technological revolution; as its pace accelerated ever faster, it was becoming more and more difficult to control.

By the late 1970s these arguments were stifled by political reaction, as the ideological dogmatists reasserted their control in the final years of the Brezhnev gerontocracy.[73] The ebb of advocacy-based environmental science in the Soviet Union was not simply a consequence of ideology, however. As economic performance inexorably declined in the latter part of the decade and into the 1980s, traditional Soviet economic priorities began to reassert themselves:[74] as Ann-Mari Åhlander points

---

[73]Stephen R. Bowers, "Soviet and Post-Soviet Environmental Problems," *Journal of Social, Political, and Economic Studies* 18, no. 2 (Summer 1993), 133.

[74]Thus, emphasis on the transmission of new technology to industry fell sharply in the late 1970s, as capital investment -- the critical factor in the diffusion of the products of research and development -- fell from approximately 13 percent per annum in the 1950s to only 3.6 percent in the late 1970s. Amann, "Technical Progress and Soviet

out, these priorities -- of heavy industrial production, of support for large-scale economic activity -- were particularly detrimental in the Soviet economic system, especially in light of the complications offered by the scientific-technological revolution. In Stalin's industrialization drive of the 1930s the pollution, though massive and harmful, was relatively simple in character. It was the product of simple industrial processes. On the other hand, the environmental degradation produced by the application of the scientific-technological revolution in the Soviet Union was far more complex and threatening to the environment. Industrial processes involving petrochemicals, inorganic chemicals, nuclear programmes, and so on required extremely close management and supervision to ensure their minimal environmental impact. But as the Soviet economy declined, such supervision proved impossible, because state budgets for the purpose declined. In addition, fewer resources were applied to the development of pollution control technology, because in the declining Soviet economy, "environmental programmes were more likely to suffer from the general shortage of resources as resources were normally allocated to more 'important' tasks first."[75]

The painful irony in this situation is that, thanks to the foundations established in difficult circumstances in the 1960s and early 1970s, the Soviet scientific community was better equipped intellectually than it had ever been to formulate environmental protection strategies. Manipulating Marxist-Leninist ideology when possible, divorcing themselves from it when not, the environmental scientists constructed for themselves -- but for the service of the Soviet state -- a sophisticated and useful methodological framework that could analyze and predict the environmental impact of Soviet economic activity and could, if required, provide policy alternatives that represented optimal solutions to

---

Economic Development," 20. Amann notes that by the 1980s this investment rate had fallen to two percent, less that the planned rate of growth of national income.

[75]Ann-Mari Åhlander, *Environmental Problems in the Shortage Economy: The Legacy of Soviet Environmental Policy* (Aldershot: Edward Elgar, 1994), 36.

problems of economic growth. Yet, at the very time when those methods could have been employed to their maximal utility, they were ignored.

If the political refusal to employ the environmental assessment schemes provided by the scientists was the first act of a desperate government facing an economic crisis and evaporating policy alternatives, then the second act was the clamp-down on the release of information on the true state of the environment in the Soviet Union. By regressing into traditional habits of secrecy, while at the same time presenting a public policy of environmental soundness,[76] the political leadership was reinforcing the conditions within which environmental mismanagement flourished. But worse: as the economic situation worsened, then the "parasitical tendencies" of Soviet industries, identified as dangerous by Soviet environmental scientists, were allowed untrammelled free rein.

In pursuit of centrally-mandated production targets ever more divorced from reality, and operating within ever-tightening constraints of capital investment and resource availability, the industrial ministries adopted progressively harmful environmental policies. Indiscriminate pollution rose, pollution control facilities lay unrepaired and idle, and new sources of natural resource wealth were pillaged more voraciously than before. Indirectly, too, the industrial ministries polluted by failing to construct goods that functioned as they should: what little investment that was devoted to pollution control and environmental protection was essentially wasted because of poor construction practices. Finally, in utter desperation the Soviet government fell back on the classic technique of Stalinist industrialization in order to stimulate the economy: the shock programme. But these were not shock programmes building mighty furnaces to smelt iron; they were centred on the

[76]The Soviet Constitution of 1977, for example, included statements in Article 18 that the USSR was committed to "preserve the purity of air and water, ensure reproduction of natural wealth, and improve the human environment." Thanks to the scientific basis of socialism, the Soviet government could commit itself to "the scientific, rational use of the land." *The Constitution of the USSR* (Moscow: Novosti Publishing House, 1977), 27-28.

construction of the very epitome of the scientific-technological revolution: furnaces designed to split the atom. The adoption of shock construction to build nuclear power was the ultimate act of Soviet folly, because it successfully incorporated all the factors that produced environmental degradation in the USSR: the wasteful use of resources, the inextinguishable faith in the power of technical progress to overcome economic difficulty, the guiding belief in man's superiority over nature, and -- most deadly of all -- the willingness to construct barely-adequate machinery employing technology of questionable efficiency.[77] Along the path chosen there lay a static-laden *Radio Moscow* announcement:

> An accident has occurred at the Chernobyl nuclear power plant. One of the reactors has been damaged. Measures are being taken to liquidate the consequences of the accident. Those affected are being given aid, and a government commission has been created.[78]

[77]For a discussion of the use of shock programmes in the Soviet nuclear energy programme in the 1970s and 1980s, see David R. Marples, *Chernobyl and Nuclear Power in the USSR* (London: Macmillan, 1986), Chapter Four, "Ukraine in the Soviet Nuclear Energy Programme."

[78]*Radio Moscow* in English, 2100 GMT (28 April 1986).

Chapter VI:
Conclusion: Millennial Dreams, Faustian Bargains

The future transformation of our land suggest[s]
colossal, unusual, and splendid work,
thrilling in its scale and prospect,
and the creativity and joy that lie ahead.
-- M. M. Davydov, 1949.

We need to rebuild 70 per cent of
our industry using a bulldozer.
-- Olga Andrakhanova,
Environmental Protection Official,
Kemerovo, Siberia, 1993.

The island of Novaya Zemlya, "New Land," lies off the Arctic coast of Russia. It is an apt historical name, because in its wild, windswept and forbidding aspect it must have seemed to the daring explorers who navigated it in the sixteenth century an entirely alien and threatening place: indeed, in 1596 its inhospitality claimed the life of Willem Barents, perhaps the greatest of Arctic explorers. But the name "New Land" is also suitable today. In the years of Soviet rule, the island was remade into a new and alien place, as threatening to human life today as it must have been to travellers of centuries past. But to those brave souls, the perils were tangible: terrible cold, the ever-present threat of starvation, and the madness of isolation. The modern dangers are more insidious, however.

From 1955 until the collapse of the USSR in 1991 no fewer than 132 nuclear weapons tests were conducted on Novaya Zemlya, including the largest weapons test ever, a fifty-eight megatonne device with a power almost four *thousand* times greater than the atomic bomb that destroyed Hiroshima. In addition to weapons testing, the Soviet government used Novaya Zemlya as a dumping ground for radioactive waste. It has been estimated (no one really knows for certain; records were not carefully maintained) that some 11,000 containers of highly radioactive material, as well as 15 damaged reactors from nuclear submarines and the icebreaker *Lenin* (once the showcase of Soviet nuclear engineering), now lie rotting on the frozen tundra of the island, or quietly disintegrating in the shallow waters off its coast. The radioactive contamination of the

region is manifold, and includes plutonium and strontium from the weapons testing, and a cocktail of other persistent radioactive isotopes, including uranium and caesium, from the nuclear waste dumping. Since the 1950s, the indigenous people of the area, the Nenets, have dwindled into a shadow existence, victims of radiation poisoning, disease, and suicide. The reindeer herders that live farther south, inland from the northern coast of Russia, are exposed to radiation levels a thousand times higher than the background radiation of an already-contaminated region: according to Aleksei Yablokov, President Yeltsin's advisor on ecological matters, the lifespan of these northern reindeer herders is a paltry 46-50 years.[1] Most sobering of all is the fact that, as a consequence of Soviet activity, there are other areas of the former USSR that are more contaminated than the New Land.

The factors that converged to produce the dislocation of the Soviet environment may best be conceptualized as the reality of "Bureaucratized Development." Within this conception, the development of a state, economy, region, industrial infrastructure, or engineering project proceeds on an administrative basis, in order to produce a theoretically maximally-efficient development process. Within this idealized process, administrative control over raw-materials inputs (i.e., natural resources), the means of production, and the allocation of finished products eliminates the individual self-interest that tends to impede the rational development of society. Bureaucratized development is a scientifically-based phenomenon, and the Soviet experience demonstrates its limits.

According to Garrett Hardin, in dealing with the division of natural resources, human nature is fundamentally selfish. In his "Tragedy of the Commons" he employed the model of a tract of commonly-owned pasturage in an English village to demonstrate this fact. He described how such common land was used by the villagers to graze their livestock, and how the villagers would continue to add livestock to the land even when it became clear that it was becoming exhausted by overuse. Why this situation persisted, said Hardin, derived from the fact that, because profits from the use of the land accrued to

[1]Quoted in Lev Korsunsky, "Novaya Zemlya -- An Arctic Chernobyl," *Chas Pik* (10 November 1992), 3. These life expectancies are only slightly higher than those of Mali (45 years), Haiti (45 years), and Chad (41 years), the poorest nations in the world.

individual villagers while the losses represented by the damage to the common land were spread among the entire community, those environmental losses concerned individuals far less than the maintenance of their profits. The opportunities for solicitous land management were therefore minimized.[2]

Hardin suggested a variety of alternatives that could be followed in order to prevent this form of environmental degradation that was characteristic, as he noted, of capitalist economic structures. He posited a series of situations that would lead to more rational resource management: one in which the villagers acted responsibly, encouraging one another to not stress the common land beyond its capacity; another where the land was divided into parcels and assigned to individual villagers for their own use; and a third which saw an administrative agency -- in this case, a "village government" -- assume responsibility for the common land. In this latter alternative the village government regulated use of the common land, imposing restrictions on the maximum number of livestock that each villager could pasture on the common land.[3]

There was, however, a fourth alternative not suggested by Hardin: rather than have individual villagers own livestock, use of the pasture would be limited to a publicly-owned herd, managed by an individual appointed by the village, with profits being divided equally amongst the villagers.[4] This alternative is, of course, social ownership, and it holds considerable advantages of environmental supervision in comparison to the other three because, "rather than being a private entrepreneur driven by the personal profit motive, the [herd] manager would be a civil servant directed by the community to maximize production at a level the pasture could sustain without its being degraded by overgrazing."[5] Furthermore, within this alternative the division of wealth among the entire community also promises to increase the material well-being of each

---

[2]Garrett Hardin, "The Tragedy of the Commons," *Science* 168, no. 3859, (12 December 1968): 1243-1248.
[3]*Ibid.*
[4]Natalia Mirovitskaya and Marvin S. Soros, "Socialism and the Tragedy of the Commons: Reflections on Environmental Practice in the Soviet Union and Russia," *Journal of Environment and Development* 4, no. 1 (Winter 1995): 77-110.
[5]*Ibid.*

individual member of that community and to do so at minimal environmental cost.

This was the theoretical strategy selected in the Soviet experience, and it was implemented through the use of the command-administrative system to direct state economic activity in what was held to be the most efficient manner. The command-administrative system identified social and economic requirements, developed economic techniques for the achievement of those requirements, and organized a basis of resource management that could effectively supply the economy as it created the material foundations of the socialist society. It defined and controlled the linkages between various economic sectors, in order to provide the flow of goods and services necessary for the functioning of an advanced industrial economy, and it did so on a nationwide scale. In theory, such an administrative structure would produce conditions of maximum efficiency within which economic activity could provide the greatest possible returns -- thus increasing to the greatest possible extent the material standard of living for the socialist population.

The command-administrative system failed to achieve its theoretical potential for environmental protection, however. There are several reasons for this. One was the imbalance created in the Soviet economic system by the adherence to a Stalinist model that emphasized the expansion of heavy industry at the expense of all other economic and social activity.[6] The policy of forced industrialization introduced economic imbalances into the Soviet economy that were never adequately resolved by the Soviet leadership that followed Stalin. In terms of environmental policy, the most important imbalance as a consequence of industrialization was the Stalinist insistence that the natural environment itself required reshaping to increase its efficiency as a repository of raw materials to be exploited to the maximum extent possible in the construction of communism.

All the tools of the state were brought to bear on this task, which resonated in the oft-repeated insistence that socialist humanity demonstrated its superiority through the mastery of its environment. Reshaping the environment, integrating it ever more closely into the

---

[6]Geoffrey Hoskins, *The Awakening of the Soviet Union* (Cambridge, MA: Harvard University Press, 1991).

economic system, was also seen as a tool to maximize production, another, even more important indicator of socialist superiority, and it is certainly true that the industrialization of the Soviet Union occurred at a breathtaking pace, matching that of the mightiest capitalist economy, the United States, in several key economic production indicators. The great strength of the Stalinist economic model was its ability to concentrate resources rapidly to solve economic tasks of national urgency, an ability that, to a great extent, allowed the state to industrialize as rapidly as it did.[7]

But this occurred at tremendous ecological cost. The belief that the environment was both malleable and essentially inexhaustible long persisted in the Soviet experience and it encouraged the state's ecologically rapacious behaviour. The Marxist-Leninist ideological tenet that only human labour possessed intrinsic worth impeded the valuation of natural resources and therefore encouraged their wasteful use. Familiarity with the practice of free resources bred contempt among the industrial elite toward those who suggested that resource evaluation was required, once it became clear that the Soviet Union neither possessed inexhaustible resources nor exhibited solicitous consumption of the resources that did exist.

More perniciously, while the Soviet state was founded on the premise of socialized property, no single state agency was ever established to protect that property. In a manner similar to the trampling of human rights that were guaranteed in the various Soviet constitutional documents, the environment was guaranteed the highest levels of protection by a plethora of Soviet resolutions, decrees, statutes, legislation and constitutional articles; yet it too was systematically torn apart in the quest for socialist progress. No effective environmental command and control network was ever instituted in the USSR, one that maintained the rational use of the environment as its *primary*

[7]Mirovitskaya and Soros, "Socialism and the Tragedy of the Commons," 84-85. As the authors point out, the severest test endured by the economic and political structure under Stalin was the Great Patriotic War, but they also suggest that the command-economic system was also successful -- though brutally so -- in dealing with the Chernobyl accident: "It is...hard to imagine how any other systemic arrangement could have coped with a catastrophe on the scale of Chernobyl with its tragic consequences. It is frightening to contemplate what would happen if an accident of such a magnitude occurred in Russia under the current state of disarray." *Ibid.*, 106 n. 24. This last point is a chilling one.

responsibility, nor were agencies ever empowered with the ability to halt practices that were ecologically harmful. By the time efforts were undertaken to create such agencies the command-administrative structure had ossified to such an extent that it was impossible to breach the edifice.

In any case, the bureaucratic oligarchies that comprised the administrative structure of the Soviet Union after the death of Stalin had weapons besides the already-powerful one of simple political power: the Marxist-Leninist faith in the immense forces unleashed by science in general, and by the scientific-technological revolution in particular, was repeatedly emphasized by the industrial and political elite as a positive force for change. The scientific-technological revolution was proclaimed as holding the means to solve all environmental problems created by the construction of communism. It was rarely admitted that the tremendously *positive* forces inherent in the revolution would only be released at some unspecified point in the future, whilst the immensely *negative* forces already released by the same revolution were causing environmental harm in the present. Thus, in general terms, the publicly-expressed faith in Soviet science reinforced environmentally destructive behaviour because it sublimated ecological distress beneath technological progress: in the short term, it was irrelevant that ecological damage occurred, because in the long term the power of science would not merely ameliorate those problems but would in fact refashion the environment into a "better than pristine" state.

The final contributing factor to the environmental dislocation of the Soviet state lay in the oft-repeated argument that such problems could not occur in a socialist system, by dint of ownership of the means of production and the tenet of communally-owned property. As it became increasingly clear that the capitalist system was progressively damaging the global environment, the self-satisfaction of Soviet pronouncements to that end were often couched in appeals for international cooperative efforts to solve environmental problems under the umbrella of *détente*. The leadership of the Soviet Union must have realized, however, that such international efforts were utterly meaningless while the reckless despoliation of the Soviet environment continued unabated; it is clear that at least a significant proportion of the Soviet scientific community

realized as much. Although they were motivated to a certain extent by selfish calculations, nevertheless it must be accepted that many Soviet scientists -- the very group essential to the forward, technologically advanced march of socialism -- began to doubt the wisdom of the policies and even the ideology that underpinned that journey.

Are there lessons to be learned from the Soviet experience of the environment? This study has described processes, policies, attitudes -- even ideologies -- that were not extinguished when the Soviet Union collapsed under its own weight in 1991. Not only did those things not disappear; on the contrary, it is suggested here that they flourish today, and not only in the fractured territories of the former Soviet empire but on a scale that is global in scope. Consider:

In the Soviet period, as this study has outlined, there existed an overweening sense of (at least publicly expressed) confidence that environmental dislocation was a characteristic of the political and economic system that was *other*, that was different and doomed to failure because of its internal contradictions. In our post-communist sense of self satisfaction, the capitalist world that emerged victorious from the Cold War has convinced itself of almost exactly the same thing: that the Chernobyls, Novaya Zemlyas, and Kyshtyms happened in the Soviet Union because *and only because* of its chosen economic and political system. It is certainly true that the chosen economic and political structure of the USSR contributed enormously to those environmental disasters, but it is likewise dangerous to assume that it was the sole cause. Nothing in the Soviet system directly explains why a test of a nuclear reactor was scheduled for a Friday, the last day of a work week, why delays cropped up that postponed the test until the engineers were sleep-deprived and careless, and why they committed errors in the small hours of April 26, 1986 that concatenated into catastrophe. It is far easier to explain this chain of events in terms of deadlines, commitments, schedules and administrative exigencies, all facts that were neither unique to the socialist system nor died with its collapse.

But, surely, the environmental rapacity of the Soviet economic and political system must be considered unique. After all, there are no extra-Soviet analogues for this behaviour: the unwillingness to value natural resources, for example, must be considered a peculiarity of the Marxist-

Leninist ideological underpinning of Soviet development. This unwillingness to fix a price on water in particular led to the destruction of some of the largest fresh water reserves on the planet, and some of the mightiest Siberian rivers have been converted into little more than toxic cocktails laden with the fruits of progress. This form of lunacy must have been peculiarly Soviet.

Not so. In 1998 the United Nations in association with the Stockholm Environment Institute released a report describing the global water supply situation of the planet. The report concluded that fresh water would become the primary focus of resource conflicts in the twenty-first century,[8] as easily accessible supplies are overtaxed and poorly managed. It is not because of rising population pressures that the global water supply problem threatens to worsen, however, although that is a contributing factor. According to most water experts, the danger lies in profligate use of water today: the source of that profligacy lies in the fact that in the 1970s and 1980s United Nations development programmes made water cheap, perhaps too cheap: as one source put it,

> Indian farmers, for instance, install about one million electric or diesel pumpsets a year, and face no regulation on how much water they can withdraw from the ground, often with free electricity. More than 80 percent of India's and Asia's freshwater supply goes to irrigation....
>
> As the irrigated water flows freely, almost wildly, over fields and down Asia's drainage ditches, large parts of the continent's water tables are sinking. Areas of India and China have seen their water tables drop by more than 100 metres in the past few decades, and the villages on the surface are running dry. In the farming fields around Madras, the groundwater has been sucked so voraciously that large parts of it are saline. In neighbouring Pakistan, the mighty Indus River struggles to meet the sea.
>
> The profligacy has spread to cities and industries, too. The typical Indian steel mill uses about ten times as much water per tonne of steel as a European mill does. And New Delhi consumes more than double the amount of water (300 litres per capita per day) as Copenhagen (140 litres per capita per day), a much wealthier city.[9]

---

[8]John Stackhouse, "The Fray Over Freshwater," *Globe and Mail* (14 February 1998), sec. D, 5.
[9]*Ibid.*

If this strikes the reader as familiar, it is because precisely the same problems were endemic in the Soviet Union as a consequence of the state's treatment of water as a free commodity. Since there was no cost associated with excess use, then there was no incentive to conserve.

In India, water problems are not restricted to overuse: pollution now threatens to damage the Ganges River irreversibly as millions of litres of untreated human and industrial sewage are dumped into it daily. Recognizing the problem, in 1985 the Indian government launched the Ganges Action Plan (GAP) a project meant to clean up India's most important river. However, "after 12 years of work and $300 million in funding, the GAP has achieved few of its objectives. A recent study found that the amount of sewage flowing into the Ganges has doubled since 1985, while a government audit found evidence of widespread corruption in siphoning off funds earmarked for the project."[10] The GAP finds historical precedent in Soviet efforts to clean up the Volga and Ural rivers in the 1960s and 1970s. When those projects failed, the Soviet government announced new ones. In March 1998 the Indian government announced a $500 million project to clean up the country's worst polluted rivers.[11]

Elsewhere, similar environmental dislocations are being created by the refusal to value natural resources properly. "The year of the fire" is how environmentalists and governmental agencies described 1997, as forest fires ravaged southeast Asia. While it is certainly true those fires were exacerbated by global climatic phenomena, it is also generally recognized that many of the fires in Indonesia and Malaysia in particular were started intentionally by logging companies seeking an easy way to clear stumpage from logged land. They did not own the land, but leased it from the governments of those states in return for a percentage of corporate profits. Thus, the incentive in this case is to log, clear, and move on to the next parcel of land as rapidly as possible in order to maximize profits, a policy that struck welcome chords with the governments of those states until they found themselves enveloped in the

---

[10]John Zubrzycki, "Pollution of Rivers in India Reaches a Crisis," *Christian Science Monitor*, News Service Report, 14:00 PST 28 October 1997.

[11]"India's 960 Million People Face Serious Pollution Hazards," *Agence France-Press* 6:05 PST, 2 April 1998.

worst atmospheric conditions this century.[12] In 1998 alone, the worst forest fires yet to strike the Brazilian Amazon basin have consumed rainforest with an area the size of Belgium, as peasants clear land allocated free to them by the government.

To return to the Soviet Union: it is ultimately paradoxical that, for all the harm inflicted on the Soviet environment as a consequence of that state's economic activity, the situation could nevertheless have been worse. The very economic structure that damaged so much, also, by its very nature, prevented a great deal of damage too: the economy was so inefficient that it failed to utilize its natural resources as fully as might have been the case. Thus, in logging the vast Siberian taiga, enormous quantities of larch were usually left standing, for a very simple reason: the larch does not float, and floatation was the only means available to the Soviet logging industry to transport lumber. With the collapse of the Soviet Union, however, this situation is now changing as western, South Korean, and Japanese logging companies are granted logging rights in exchange for the cash so desperately needed by the governments of the successor states of the Soviet Union. As a recent report put it,

> the result has been destruction on a breathtaking scale. In 1996 at least 10,000 square kilometres of Russian trees were cut down, and experts say the figure would be much higher if the overall economy were more vigorous. Entire ecosystems are being destroyed as logging turns forests into deserts and peat bogs, melts permafrost, clogs rivers with silt and debris and ruins habitats for wildlife.[13]

Ten thousand square kilometres is a million hectares of land. It was envisioned in Soviet times that the Sibaral Project would irrigate twice, perhaps four times this amount, and Sibaral was considered to be a "project of the century." The project, had it gone ahead, would have required the combined efforts of thousands of scientists, tens of thousands of engineers and labourers, and, according to Abel

---

[12]"Indonesian Fires a Global Catastrophe, Says UN Official," *Agence France-Press* 8:38 PST, 3 April 1998.

[13]Michael S. Serrill, "Ghosts of the Forests," *Time Special Issue: Our Precious Planet* (November 1997), 52.

Aganbegyan, "the entire [sum] allocated for the growth of the construction and road industries of the whole of the USSR."[14]

If the aim of the project, as stated by its boosters, was "to make the desert bloom," then it is fair to say that in the Soviet period what would have required years to construct, and enormous investments of treasure and, assuredly, blood, can now be achieved in reverse in a single year with the cunning employment of western technology and planning. It is a frankly horrific thought. The tragedy of the Soviet Union was not that the Soviet system created a society of environmental barbarians; it is that we were, and are, so like them. In some ways, we may be worse: they set out on the road of natural domination and ultimately ruin with a faulty compass and no foreknowledge of what was to come. We have their example -- and yet we forge ahead.

[14]Abel Aganbegyan, *Inside Perestroika: The Future of the Soviet Economy* (New York: Harper and Row, 1989), 96.

BIBLIOGRAPHY

Newspapers and Magazines Consulted

Current Digest of the Soviet Press (CDSP)

The Economist

Ekonomicheskaya gazeta

Izvestiya

Komsomolskaya pravda

Krasnaya zvezda

Nauka i zhizn

Pravda

Sovetskaya rossiya

Time

Trud

Vedomosti Verkhovnogo Soveta RSFSR

Vedomosti Verkhovnogo Soveta SSSR

News and Research Services

Agence France-Press

Christian Science Monitor News Service

OMRI Daily Digest

Radio Free Europe/Radio Liberty Report

Reuter's

Official Government Sources: Soviet and Western

Central Intelligence Agency. *Soviet Acquisition of Western Technology.* Langley, VA: Central Intelligence Agency, 1984.

Central Intelligence Agency, National Foreign Assessment Center. *Evolution of the Central Administrative Structure of the USSR, 1917-1979; A Reference Aid.* CR-79-10123. August 1979.

Central Intelligence Group. Office of Research and Evaluations. "Soviet Capabilities for the Development and Production of Certain Types of Weapons and Equipment." ORE 3/1 (31 October 1946).

The Constitution of the USSR. Moscow: Novosti Publishing House, 1977.

"Draft Principles of Land Legislation of the USSR and Union Republics." *Izvestiya,* 26 July 1968, 3-4. Reprinted and translated in *CDSP* XX, no. 30 (14 August 1967): 11-15.

Foreign Broadcast Information Service. FBIS Daily Report. Soviet Union.

Joint Publications Research Service. Translations on USSR Resources.

Joint Publications Research Service. USSR Report. Political and Sociological Affairs.

Kommunisticheskaya Partiya Sovetskogo Soyuza v resoliutsiyakh i resheniyakh s"ezdov, konferentsii i plenumov TsK, 9th ed., XI, 1966-1970. Moscow: Politizdat, 1986.

Materialy XXV s"ezda KPSS. Moscow: Politizdat, 1976.

North Atlantic Treaty Organization, Committee on the Challenges of Modern Society. *Cross-Border Environmental Problems Emanating from Defense-Related Installations and Activities, Final Report, Volume I: Radioactive Contamination, Phase I: 1993-1995.* Kjeller, Norway: NATO, 1995.

Nuclear Wastes in the Arctic: An Analysis of Arctic and Other Regional Impacts from Soviet Nuclear Contamination, OTA-ENV-623. Washington, DC: U.S. Government Printing Office, September 1995.

U. S. Department of Defense. *Soviet Military Power, 1987.* Washington, DC: U.S. Government Printing Office, 1987.

U. S. Department of Defense. *Soviet Military Power, 1989.* Washington, DC: U.S. Government Printing Office, 1989.

USSR Goskompriroda. *Sostoyanie prirodnoi sredy v SSSR v 1988 godu* [State of the Soviet Natural Environment in 1988]. Moscow: Lesnaya Promyshlennost, 1990.

Yablokov, Alexei. "Zayavlenie dlya pressy" [Announcement for the Press], *Tsentr Obshchestvennoi Informatsii po Atomnoi Energii Informatsionnyi Byulleten'* No. 3 (1992): 5.

Soviet Scientific Reports

Administratsiya Prezidenta Rossiiskoi Federatsii. *Fakty i problemy, svyazannye s zakhoroneniyem radioaktivnykh otkhodov v moryakh, otmyvayushikh territoryu Rossiiskoi Federatsii.* Moscow: 1993.

Antonnikov, A. "Interbasin River Reversal." *Vodnyy Transport*, 27 December 1977, 3. Translated in JPRS - 70720. Translations on USSR Resources, No. 781 (2 March 1978): 157-158.

Apollov, B. A., K. K. Gyul', and V. G. Zavriyev, eds. *Materialy Vsesoyuznogo soveshchaniya po probleme Kaspiyskogo morya* [Materials of the All-Union Conference on the Caspian Sea Problem]. Baku: Akademiya Nauk Azerbaidzhan SSR, 1963.

Arakelian, A. "The Scientific-Technological Revolution and the Biosphere" [Nauchno-tekhnicheskaia revoliutsiia i biosfera]. *Voprosy ekonomiki*, No. 5 (1976): 15-24. Reprinted and translated in *Problems of Economics* XIX, no. 11 (March 1977): 68-85.

Armand, D. L. and I. P. Gerasimov. "Economic Significance and Basic Principles of Natural Resource Use." In *Natural Resources of the Soviet Union: Their Use and Renewal* [*Prirodnyye resursy Sovetskogo Soyuza, ikh ispolzovaniye i vosproizvodstvo*], ed. I. P. Gerasimov, D. L. Armand, and K. M. Yefron. Moscow: Nauka, 1963. Translated and reprinted as W. A. Jackson, ed., *Natural Resources of the Soviet Union: Their Use and Renewal.* San Francisco: W. H. Freeman, 1971: 3-8.

Belen'kii, N. P., and V. S. Maslennikov. "The Baikal-Amur Mainline Railroad: Its Area of Influence and Its Projected Freight Flows." *Zheleznodorozhnyy Transport* No. 10 (1974): 39-46. Reprinted and translated in *Soviet Geography: Review and Translation* XVI, no. 8 (October 1975): 503-513.

Biryukov, V. "The Baikal-Amur Mainline: A Major National Construction Project." *Planovoe khoziaistvo* No. 10 (1974): 6-11.

Bogdanov, B. "Conservation and Economics." *Ekonomika sel'skogo khoziaistva* No. 2 (February 1970): 7-11.

Bol'shakov, V. N. and O. F. Sadykov. "Kontseptsiya formirovaniya regional'noi systemy ekologicheskoi bezopasnosti (na primere Urala)" [Conceptual formation of a regional system of ecological

security (in the Ural example)], *Vestnik Akademii Nauk SSSR*, No. 11 (1988): 97-100.

Budyko, M. I. "On the Threshold of a New Science-- Global Ecology." *Voprosy filosofii*, No. 1 (1973). Reprinted and translated in *Soviet Studies in Philosophy* XIII, No. 2-3 (Fall-Winter 1974-75): 17-20.

Davydov, M. M. "The Ob' Will Enter the Caspian: The Yenisey-Ob'-Aral-Caspian Water Connection and the Energy Problem." *Sibirskiye ogni* No. 2 (1949): 102-110. Reprinted and translated in *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972): 603-617.

_____. "The Water Resources of the Ob' River Basin." In *Kompleksnoye osvoyeniye vodnykh resursov Obskogo basseyna* [Multipurpose Development of the Water Resources of the Ob' Basin]. Novosibirsk, 1970: 237-240. Reprinted and translated in *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972): 618-621.

Denisova, T. B. "The Environmental Impact of Mineral Industries." *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya* No. 6 (November-December 1976): 55-66. Reprinted and translated in *Soviet Geography: Review and Translation* XVIII, no. 9 (November 1977): 646-659.

Doncheva, A. V. and V. N. Kalutsov. "Prediction of the Environmental Impact of Mining and Metallurgical Production in the Taiga Zone." *Vestnik Moskovskogo Universiteta, geografiya* No. 5 (1975): 65-72. Reprinted and translated in *Soviet Geography: Review and Translation* XVIII, no. 4 (April 1977): 223-229.

Fedorov, E. K., and I. B. Novik. "Man and His Natural Environment." *Voprosy filosofii*, No. 12 (1972). Reprinted in *Soviet Studies in Philosophy*, XII, No. 2 (Fall 1973): 3-25.

Frolov, I. T. "The Global and Interdisciplinary Character of Ecological Problems." *Voprosy filosofii*, No. 1 (1973). Reprinted and translated in *Soviet Studies in Philosophy* XIII, No. 2-3 (Fall-Winter 1974-75): 7.

Gangardt, G. G. "On the Question of Diverting Part of the Unused Runoff of Northern and Siberian Rivers into Regions Suffering from a Shortage of Water Resources." *Gidrotekhnicheskoye stroitel'stvo* No. 8 (1970): 10-13. Reprinted and translated in *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972): 622-628.

Gerasimov, I. P. *et al.* "Large-Scale Research and Engineering Programs for the Transformation of Nature in the Soviet Union and the Role of Geographers in their Implementation." *Materialy VI s"ezda Geograficheskogo obshchestva SSSR* [Proceedings of the Sixth Congress of the Geographical Society USSR]: Papers of Plenary Sessions (Leningrad: Nauka, 1975): 3-18. Reprinted and translated in *Soviet Geography: Review and Translation* XVII, no. 4 (April 1976): 235-245.

Gorodestkaya, M. Ye. "Forecast of possible changes in the natural environment along the proposed transfer canal for West Siberian streamflow." *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya* No. 1 (1982): 53-59. Reprinted and translated in *Soviet Geography: Review and Translation* XXII, no. 6 (June 1982): 406-413.

Gvozdetskiy, N. A. *et al.* "Physical-Geographical Fundamentals of Nature Management."*Materialy VI s"ezda Geograficheskogo Obshchestva SSSR* [Materials of the Sixth Congress of the Geographical Society USSR]: Papers at plenary sessions. (Leningrad, 1975): 19-36. Reprinted and translated in *Soviet Geography: Review and Translation* XVII, no. 5 (May 1976): 291-303.

Kapitsa, P. L. "Three Aspects of the Global Problem of the Relation Between Man and Nature."*Voprosy filosofii*, No. 2 (1973). Reprinted and translated in *Soviet Studies in Philosophy* XIII, No. 2-3 (Fall-Winter 1974-75): 44-53.

Khachaturov, T. "Economic Problems of Ecology." *Voprosy ekonomiki* No. 6 (1978): 3-14. Reprinted and translated in *Problems of Economics* XXII, no. 1 (May 1979): 3-22.

_____. "Natural Resources and National Economic Planning." *Voprosy ekonomiki*, No. 8 (1973). Reprinted and translated in *Problems of Economics* XVI, no. 11 (March 1974): 3-28.

_____. "The Role of Natural Resources in the Economy." *Voprosy ekonomiki* No. 8 (1973): 16-29. Translated in *CDSP* XXV no. 49 (2 January 1974): 5-6.

Komi Filial, Akademiya Nauk SSSR. *O vliyanii perebroski stoka severnykh rek v basseyn Kaspiya na narodnoye khozyaystvo Komi ASSR* [Concerning the Influence of the Diversion of the Flow of Northern Rivers into the Caspian Basin on the Economy of the Komi ASSR]. Leningrad: Nauka, 1967.

Kudelin, V. I., V. N. Kunin, M. I. L'vovich and A. A. Sokolov. "Freshwater-Supply Problems of Mankind." *Soviet Geography: Review and Translation* XII, no. 6 (June 1971): 329-346.

Kuznetsov, N. T. "Geographical Aspects of the Future of the Aral Sea." *Problemy Osvoyeniya Pustyn'* No. 1 (1976): 3-11. Reprinted and translated in *Soviet Geography: Review and Translation* XVIII, no. 3 (March 1977): 163-171.

Lesnikova, N. P. "Pravovye problemy okhrany prirody v SSSR" [Legal Protection of Nature in the USSR], *Priroda*, No. 1 (January 1970): 119.

Lopatina, Ye. B., A. A. Mints, L. I. Mukhina, O. R. Nasarevskiy, and V. S. Preobrazhenskiy. "The Present State and Future Tasks in the Theory and Method of an Evaluation of the Natural Environment and Resources." *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya* No. 4 (1970): 45-54. Reprinted and translated in *Soviet Geography: Review and Translation* XII, no. 3 (March 1971): 142-151.

L'vovich, M. I. "Geographical Aspects of a Territorial Redistribution of Water Resources in the USSR." *Izvestiya Akademii Nauk, seriya geograficheskaya* No. 2 (1977): 22-37. Reprinted in *Soviet Geography: Review and Translation* XVIII, no. 8 (October 1977): 557-574.

_____. "Introductory Remarks to Conference on Likely Environmental Changes Associated with the Territorial Redistribution of Water Resources, Moscow, June 1977." *Izvestiya Akademii Nauk, seriya geograficheskaya* No. 5 (1977): 23-48. Reprinted in *Soviet Geography: Review and Translation* XIX, no. 10 (December 1978): 698-701.

Melnikov, N. "Before Reversing the Rivers." *Literaturnaya gazeta*, No. 28, 12 July 1967, 11.

Mikhaylov, N. I., V. A. Nikolayev, and I. Ye. Timashev. "Environmental Protection Issues and the Southward Diversion of Siberian Rivers." *Vestnik Moskovskogo Universiteta, Seriya Geografiya* No. 5 (1977): 50-56.

Neyshtadt, M. I. "The Contemporary Swampiness of West Siberia and the Problems Likely to Arise in Connection with the Withdrawal of Part of the Streamflow and the Amelioration of Swampy Land." Paper presented at Conference on Likely Environmental Changes Associated with the Territorial Redistribution of Water Resources, Moscow, June 1977. *Izvestiya Akademii Nauk, seriya geograficheskaya* No. 5 (1977): 23-48. Reprinted and translated in *Soviet Geography: Review and Translation* XIX, no. 10 (December 1978): 706-707.

Oreshkin, D. B. "Aral'skaya Katastrofa." [The Aral Catastrophe], *Nauka o Zemle* No. 2 (1990): 41.

Perevedentsev, V. "The Idea is Intriguing But...." *Literaturnaya gazeta*, No. 10, 10 March 1982, 11.

Shebalin, Yuri. "The Ob' Will Flow to the South." *Vodnyy Transport*, 11 September 1973, 4. Translated in *CDSP* XXVI, no. 10 (3 April 1974): 17.

Shelest, L. "Utilization of the USSR's Natural Resources." *Voprosy ekonomiki* No. 9 (1973): 148-49. Translated in *CDSP* XXV no. 49 (2 January 1974): 5-6.

Shishkin, N. I. "On the Diversion of the Vychegda and Pechora Rivers to the Basin of the Volga." *Soviet Geography: Review and Translation* III, no. 5 (May 1962): 46-57.

Shkatov, V. "Prices for Natural Riches and the Perfecting of a Planned Price Formation." *Voprosy ekonomiki*, No. 9 (September 1968): 67-77.

Shul'ts, V. L. "The Aral Sea Problem." *Trudy Sredneaziatskogo nauch. - issled. gidrometeorol. inst.* [Transactions of the Central Asian Hydrometeorological Scientific Research Institute]. No. 32: 47 (1968): 3-7. Reprinted and translated in *Soviet Hydrology: Selected Papers* No. 5 (1968): 489-493.

Sokolov, Aleksey A. "The World Water Balance." *Materialy VI s"ezda Geograficheskogo obshchestva SSSR* [Proceedings of the Sixth Congress of the Geographical Society USSR]: Papers of Plenary Sessions. Leningrad: Nauka, 1975, 91-105. Reprinted and translated in *Soviet Geography: Review and Translation* XVII, no. 8 (October 1976): 513-514.

Sukhotin, Yu. "Evaluation of Natural Resources." *Voprosy ekonomiki*, No. 12 (December 1967): 87-98.

Vendrov, S. L. "A Forecast of Changes in Natural Conditions in the northern Ob' basin in case of construction of the lower Ob' hydro project." *Soviet Geography: Review and Translation* VI, no. 10 (December 1965): 3-10.

Vitt, M. "Ob ekonomicheskikh stimulakh ratsional'nogo ispol'zovaniya prirodnykh resursov" [Concerning the economic stimulus for the rational use of natural resources]. *Planovoe khoziaistvo*, July 1970: 73-81.

Voropayev, G. V. "The problem of water supply for the country and the territorial redistribution of water resources." *Vodnyye resursy* No. 6 (1982): 18.

Voropayev, G. V., I. P. Gerasimov, O. A. Kibal'chich and N. I. Koronkevich. "The Problem of Redistribution of Water Resources in the Midlands Region of the USSR." *Izvestiya Akademii Nauk SSSR, seriya geograficheskaya* No. 6 (1982): 24-32. Reprinted and translated in *Soviet Geography: Review and Translation* XXIV, no. 10 (December 1983): 713-723.

Voznesenskiy A. N. *et al.* "Principal Trends and Prospects in the Use of Water Resources in the USSR." *Vodnyye resursy* No. 3 (1974): 3-14. Reprinted and translated in *Soviet Geography: Review and Translation* XVI, no. 5 (May 1975): 291-302.

Vorob'yev, V. V., and A. T. Naprasnikov. "Prediction of Environmental Change Under the Impact of Construction and Operation of the Baikal-Amur Mainline." *Geografiya i Prirodnyye Resursy*, No. 1 (1980): 7-17. Reprinted and translated in *Soviet Geography: Review and Translation* XXII, no. 5 (May 1981): 312-324.

"The Yanka Kupala Expedition on the Volga." *Vodnyy transport*, 20 July 1972, 3. Reprinted in *CDSP* XXIV, no. 32 (6 September 1972): 7-8.

Other Soviet and Russian Sources

(Note: Soviet newspaper articles are generally not included in the bibliography unless they were cited repeatedly in the text.)

Aganbegyan, Abel. *The Economic Challenge of Perestroika.* Bloomington, IN: Indiana University Press, 1988.

_____. *Inside Perestroika: The Future of the Soviet Economy.* New York: Harper and Row, 1989.

Aganbegyan, A., G. Golitsyn, V. Tikhonov, T. Eneyev, and A. Yanshin. "Land is the Chief Resource." *Pravda*, 12 February 1986. Translated in *CDSP* XXXVIII, no. 7 (19 March 1986): 1-3.

Agayev, Emil, and R. Bakhtamov. "Distortions of 'natural selection'." *Literaturnaya gazeta*, No. 42, 18 October 1972, 11.

Antonov, A. M. "The Birth of Red November." *United States Naval Institute Proceedings* 121, no. 12 (December 1995): 79-81.

Anuchin, V. A. *On the Problems of Geography and the Tasks of Popularizing Geographical Knowledge* [*O problemakh geografii i zadachakh*

propagandy geograficheskikh znanii]. Moscow: Znaniye RSFSR, 1968.

Armand, D. L. *Nam i vnukam* [For Us and Our Grandchildren]. Moscow: Mysl', 1966.

Babayev, A. "Science and Technology: Vistas of the Twenty-First Century." *Krasnaya Zvezda*, (26 March 1983). Translated in FBIS-SOV-83-069. FBIS Daily Report. Soviet Union (8 April 1983), U1.

Bannikov, A. G. "Ot zapovednika do prirodnogo parka" [From preserve to natural park]. *Priroda* No. 4, (April 1968): 89-96.

Biasalov, S. "A Sensible Balance." *Izvestiya*, 12 September 1968, 3.

Blagosklonov, K. N., A. A. Inozemtsev, and V. K. Tikhomirov. *Okhrana Prirody* [*Nature Protection*]. Moscow: Vyshaya Shkola, 1967.

Bronshtein, M. "Economic Responsibility." *Izvestiya*, 5 September 1968, 3.

Bykhovsky, B. and N. Gladkov. "The Rights of Nature." *Izvestiya*, 5 July 1967, 5.

Bystrov, S. "A Reactor for Submarines." *Krasnaya Zvezda*, 21 October 1989.

"The Calculations are Convincing: Interview with I. A. Gerardi." *Literaturnaya gazeta* No. 10, 10 March 1982, 11.

Cheshegorov, V. "We Live on the River." *Oktyabr'* No. 12 (December 1984): 173-185. Translated in JPRS-85023. USSR Report. Political and Sociological Affairs. (15 March 1985).

Chilivikhin, Vladimir. "How is Your Breathing, City Dwellers?" *Literaturnaya gazeta* No. 32, 9 August 1967, 10.

Chokin, Sh., and N. Kalachev. "Pay Us a Visit, Rivers of Siberia." *Kazakhstanskaya Pravda*, 20 June 1972. Reprinted and translated in *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972): 642-647.

Demchenko, Ia. G. *O navodnenii Aralo-Kaspiiskoi nizmennosti* [Concerning the Flooding of the Aral-Caspian Lowlands]. n.p.: Privately printed, 1900.

"Discussion of the Volume *Priroda i Obshchestvo*." *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva*, No. 4 (1969): 383-390. Reprinted

and translated in *Soviet Geography: Review and Translation* XI, no. 2 (February 1970): 127-138.

Dudenkov, I. "Burning Problems of Volgo-Caspia." *Ekonomicheskaya gazeta*, No. 9, 27 February 1968, 19.

Galazii, Grigori. "Lake Baikal Reprieved." *Endeavour* 15, no. 1 (1991): 13-17.

Gerasimov, I. P., ed. *Priroda i Obshchestvo* [Nature and Society], Moscow, 1970.

Gerasimov, I. P., D. L. Armand, and K. M. Yefron, eds. *Natural Resources of the Soviet Union: Their Use and Renewal* [*Prirodnyye resursy Sovetskogo Soyuza, ikh ispolzovaniye i vosproizvodstvo*]. Moscow: Nauka, 1963. Translated and reprinted as W. A. Jackson, ed., *Natural Resources of the Soviet Union: Their Use and Renewal*. San Francisco: W. H. Freeman, 1971.

Gorbachev, Mikhail. "What Made Me a Crusader." *Time Special Issue: Our Precious Planet*, November 1997, 74.

Gorshkov, S. G. *The Sea Power of the State*. Oxford: Pergamon Press, 1979. This edition is a translation of *Morskaya moshch gosudarstva*, 2nd revised ed. Moscow: Voenizdat, 1976.

Granov, V. "The Ideological Struggle and Ecological Problems." *International Affairs* No. 12 (1980): 87-95.

Gromov, F., Admiral. "The Navy Last Year." *Morskoi Sbornik* No. 12 (December 1994).

Imamaliyev, A. "Programming the Harvest." *Pravda*, 6 January 1975, 2.

Ivanov, E. "Problema prioritetov v sotsialisticheskom planirovanii." [Problems of priority in socialist planning] *Planovoe khoziaistvo* No. 11 (1987).

Kazantsev, N. D. *Pravovaia okhrana prirody v SSSR* [The Legal Protection of Nature in the USSR]. Moscow: Znanie, Series 17, 1967.

Khrushchev, N. S. *Khrushchev Remembers: The Last Testament*. Translated and edited by Strobe Talbott. Boston: Little, Brown, 1974.

Klimov, B. "We go after poachers." *Izvestiya*, 22 August 1971, 6.

Knystautas, Algirdas. *The Natural History of the USSR*. New York: McGraw-Hill, 1987.

Kolbasov, Oleg S. *Zakonodatel'stvo o vodpol'zovanii v SSSR* [Legislation on Water Use in the USSR]. Moscow: Iurizdat, 1965. Reprinted in *Water Resources Law and Policy in the Soviet Union*, ed. Irving K. Fox. Madison, WI: University of Wisconsin Press, 1971: 93-218

Komarov, Boris. [Ze'ev Wolfson]. *The Destruction of Nature in the Soviet Union*. White Plains, NY: M.E. Sharpe, 1980.

Korsunsky, Lev. "Novaya Zemlya -- An Arctic Chernobyl." *Chas Pik*, 10 November 1992, 3.

Kovalev V., and N. Gladkov. "Why the Aral Sea is Drying Up." *Pravda*, 4 February 1975, 2.

Loiko, P. "Give the Field Economic Protection." *Izvestiya*, 29 September 1968, 2.

Madenov, Mazhit. "Twelve Months of the Year." *Qazaqstan Ayyelderi*, No. 10 (October 1982): 22-23. Translated in JPRS - 83117. USSR Report. Political and Sociological Affairs, No. 1387. (23 March 1983): 5.

Meissak, Nikolai. *This Warm Siberia!* Moscow: Novosti Publishing House, 1973.

Nekrasov, N. N. "Scientific Principles of the General Outline for the Location of Productive Forces of the USSR for the Period up to 1980." *Materialy V s"ezda Geograficheskogo obshchestva SSSR.* (Leningrad, 1970). Reprinted and translated in *Soviet Geography: Review and Translation* XII, no. 4 (April 1971): 219-226.

Petrov, B. "After the Sea Was Created." *Izvestiya*, 21 January 1975, 5.

Piterskii, N. A. *et al. Boevoi put' Sovetskogo Voenno-Morskogo Flota* [*Battle Method of the Soviet Navy*]. Moscow: Izdatel'stvo, 1967.

Prokhanov, Aleksandr. "At the Approaches to the Floodlands." *Pravda*, 2 November 1973, 2.

Shcherbak, Yuri. "Foreword." In *The Geography of Survival: Ecology in the Post-Soviet Era*, Ze'ev Wolfson. Armonk, NY: M. E. Sharpe, 1994: ix-xi.

Shokin, Shapyq Shokiuly. "Questions to Look Into." *Qazaq Adebiyeti*, 28 January 1983, 3. Translated in JPRS - 83928. USSR Report. Political and Sociological Affairs, No. 1430. (19 July 1983).

Shvarts, S. S. *Tekhnicheskii progress i okhrana prirody: Lektsiia* [Technical Progress and the Protection of Nature: a Lecture]. Sverdlovsk, 1974.

Svetlichny, B. "The City Awaits a Reply." *Oktyabr'* No. 10 (1966): 157-169. Reprinted and translated in *CDSP* XVIII, no. 48 (21 December 1966): 11-17.

Travinsky, V. "Terrestrial Landscape." *Literaturnaya gazeta* No. 22, 31 May 1972, 10.

Turetsky, Mikhail. *The Introduction of Missile Systems into the Soviet Navy, 1945-1962.* Falls Church, VA: Delphic Associates, 1983.

Wolfson, Ze'ev. *The Geography of Survival: Ecology in the Post-Soviet Era.* Armonk, NY: M.E. Sharpe, 1994.

Yamolovich, O. "Ideinaya zakala nauchno-tekhnicheskoi intelligentsii" [The ideological tempering of the scientific-technical intelligentsia]. *Partiinaya zhizn'* No. 7 (1974): 48.

Yudin, Yu. "A River Will Flow From Siberia." *Sovetskaya Rossiya*, 29 August 1984, 3.

Zakharko, V. "Northern Water for the South; Interview with P. Polad-Zade." *Izvestiya*, 22 June 1984, 2.

Zalygin, S. "Lessons from a Discussion." *Novyi mir* No. 1 (January 1987): 3-18.

Zhuk, S., and G. Russo. "Now This is Within Our Capabilities." *Ekonomicheskaya gazeta* No. 44, 21 February 1961, 3.

Ziyadullayev, S. "Speed up Work to Solve the Problem of Diverting Parts of the Flow of Siberian Rivers Into Central Asia and Kazakhstan." *Ekonomicheskaya gazeta* No. 5 (January 1977): 7. Translated in *CDSP* XXXIII, no. 7 (18 March 1981): 6-7.

Ziyadullayev, S., A. Bostanzhoglo, and A. Pugachev. "The 'Project of the Century' Will Not Brook Dilettantism." *Pravda Vostoka*, (3 April 1982). Translated in JPRS - 80842. USSR Report. Political and Sociological Affairs. No. 1253 (18 May 1982): 61-65.

Zlaman, Nikolai. "Seventy Nuclear 'Bombs' Near Murmansk: Submarine Decommissioning Cannot be Postponed." *Krasnaya Zvezda*, 17 December 1994.

Western Sources: Articles

Alexander, Arthur J. "Decision-Making in Soviet Weapons Procurement." *Adelphi Papers* Nos. 147 and 148 (Winter 1978-79).

Amann, Ronald. "Industrial Innovation in the Soviet Union: Methodological Perspectives and Conclusions." In *Industrial Innovation in the Soviet Union*, ed. Ronald Amann and Julian Cooper. New Haven, CT: Yale University Press, 1982: 1-38.

_____. "Technical Progress and Soviet Economic Development: Setting the Scene." In *Technical Progress and Soviet Economic Development*, ed. Ronald Amann and Julian Cooper. Oxford: Basil Blackwell, 1986: 5-30.

Åslund, Anders. "Gorbachev's Economic Advisors." *Soviet Economy* 3, no. 3 (July-September 1987): 246-269.

Aspaturian, Vernon V. "The Soviet Military-Industrial Complex -- Does it Exist?" *Journal of International Affairs* 26, no. 1 (1972): 1-28.

Berman, Harold J. "The Educational Role of the Soviet Court." in *Man, State, and Society in the Soviet Union*, ed, Joseph L. Nogee. New York: Praeger, 1972: 279-287.

Bowers, Stephen R. "Soviet and Post-Soviet Environmental Problems." *Journal of Social, Political, and Economic Studies* 18, no. 2 (Summer 1993): 131-158.

Bradley, Don J., Clyde W. Frank, and Yevgeny Mikerin. "Nuclear Contamination from Weapons Complexes in the Former Soviet Union and the United States." *Physics Today* (April 1996): 40-45.

Brown, Bess. "Criticism of Siberian River Diversion Scheme Gets Hot Retort from Uzbekistan." *Radio Liberty Research Bulletin*, RL 167/82, 20 April 1982.

_____. "Discussion of Siberian Rivers Diversion Continues." *Radio Liberty Research Bulletin*, RL 478/81, 1 December 1981.

_____. "Scheme to Divert Siberian Rivers Seems to Have Been Deferred." *Radio Liberty Research Bulletin*, RL 119/86, 6 March 1986.

_____. "Setback for the Central Asian Lobby over the Siberian Rivers Diversion Scheme." *Radio Liberty Research Bulletin*, RL 103/81, 6 March 1981.

_____. "Turkmen Aviators Express Concern About Siberian Rivers Diversion Project." *Radio Liberty Research Bulletin*, RL 4/81, 2 January 1981.

_____. "The USSR is Going Ahead With 'Sibaral'." *Radio Liberty Research Bulletin*, RL 194/85, 7 June 1985.

_____. "Whatever Happened to 'Sibaral?'." *Radio Liberty Research Bulletin*, RL 420/85, 13 December 1985.

_____. "What Will Cancellation of the Siberian River Diversion Project Mean to Central Asia?" *Radio Liberty Research Report*, RL 334/86, 26 August 1986.

Buchan, D. "Western Security and Economic Strategy Towards the East." *Adelphi Papers* No. 192 (1984).

Bukharin, O. "Nuclear Fuel Management in the Russian Navy." Staff Paper Prepared for the U.S. Government, Office of Technology Assessment, November 1994.

Bukharin, Oleg, and Joshua Handler. "Russian Nuclear-Powered Submarine Decommissioning." *Science and Global Security* 5 (1995): 245-271.

Bush, Keith. "Environmental Problems in the USSR." *Problems of Communism* 21, no. 4 (July-August 1972): 21-31.

_____. "The Soviet Response to Environmental Disruption." In *Environmental Deterioration in the Soviet Union and Eastern Europe*, ed. Ivan Volgyes. New York: Praeger, 1974: 8-36.

Chappell, John E. "The Ecological Dimension: Russian and American Views." *Annals of the Association of American Geographers* 65, no. 2 (June 1975): 144-162.

Clarke, Doug. "Government Bans Shut Down Of Power To Military." *Open Media Research Institute Daily Digest* No. 186, Part I, 25 September 1995.

_____. "Power Cut-Off Nearly Causes Nuclear Submarine Disaster." *Open Media Research Institute Daily Digest* No. 185, Part I, 22 September 1995.

Clarke, Douglas L. "The Soviet Navy's First Aircraft Carrier." *Radio Liberty Report on the USSR* RL 284/91, 16 August 1991.

Conolly, Violet. "Turning the Rivers of Siberia in their Courses." *Radio Liberty Research Bulletin*. RL 189/78, 29 August 1978.

Darst, Robert G. "Environmentalism in the USSR: The Opposition to the River Diversion Projects." *Soviet Economy* 4, no. 3 (1988): 223-252.

Davis, Christopher M. "The High-Priority Military Sector in a Shortage Economy." In *The Impoverished Superpower: Perestroika and the Soviet Military Burden*, ed. Henry S. Rowen and Charles Wolf, Jr. San Francisco: Institute for Contemporary Studies Press, 1990: 155-184.

DeBardeleben, Joan. "Marxism-Leninism and Economic Policy: Natural Resources Pricing in the USSR and GDR." *Soviet Studies* 35 (1983): 36-52.

Elliot, Iain. "The Consolidation of Gorbachev's Political Power -- a Springboard for Reform?" In *The Soviet Union Under Gorbachev: Prospects for Reform*, ed. David A. Dyker. London: Croom Helm, 1987: 21-57.

Glantz Michael H., and Igor Zonn. "A Quiet Chernobyl." *The World and I* 6, no. 9 (September 1991): 324-330.

Goldman, Marshall. "The Convergence of Environmental Disruption." *Science* 170 (2 October 1970): 37-42.

_____. "Our Far-Flung Correspondents: The Pollution of Lake Baikal." *The New Yorker*, 19 June 1971: 58-66.

Graham, Loren R. "The Impact of Science and Technology on Soviet Politics and Society." In *Science and the Soviet Social Order*. ed. Loren R. Graham. Cambridge, MA: Harvard University Press, 1990: 1-16.

Handler, Joshua. "Send Help, Not Charity." *Bulletin of the Atomic Scientists* 48, no. 4 (May 1992).

Hardin, Garrett. "The Tragedy of the Commons." *Science* 168, no. 3859, (12 December 1968): 1243-1248.

Hollis, G. E. "The Falling Levels of the Caspian and Aral Seas." *The Geographical Journal* 144, part 1 (March 1978): 62-80.

Holloway, David. "The Soviet Style of Military R&D." In *The Genesis of New Weapons: Decision Making for Military R&D*, ed. Franklin A. Long and Judith Reppy. New York: Pergamon, 1980: 137-157.

_____. "The Soviet Union." In *The Structure of the Defence Industry: An International Survey*, ed. N. Ball and M. Leitenburg. London: Croom Helm, 1983: 50-80.

Kelly, P. M., D. A. Campbell, P. P. Micklin, and J. R. Tarrant. "Large-Scale Water Transfers in the USSR." *GeoJournal* 7, no. 3 (1983): 201-214.

Kramer, John M. "Prices and the Conservation of Nature in the Soviet Union." *Soviet Studies* 24 (1973): 364-373.

Krisch, Henry. "Diverting Soviet Rivers: Controversies and Prospects." *Radio Liberty Research Bulletin*, RL 251/76, 10 May 1976.

Leshkov, Sergei. "Lies and Incompetence." *Bulletin of the Atomic Scientists* 49, no. 5 (June 1993): 13, 55.

McDonnell, John. "The Soviet Defence Industry as a Pressure Group." In *Soviet Naval Policy: Objectives and Constraints*, ed. Michael MccGwire, Ken Booth, and John McDonnell. Praeger Special Studies in International Politics and Government. New York: Praeger, 1975: 87-122.

MccGwire, Michael. "Gorshkov's Navy, Part I." *United States Naval Institute Proceedings* (August 1989): 44-51.

Meyer, Stephen M. "Economic Constraints in Soviet Military Decision-Making." In *The Impoverished Superpower: Perestroika and the Soviet Military Burden*, ed. Henry S. Rowen and Charles Wolf, Jr. San Francisco: Institute for Contemporary Studies Press, 1990: 201-220.

Michaud, Norbert D. "The Paradox of Current Soviet Military Spending." In *The Impoverished Superpower: Perestroika and the Soviet Military Burden*, ed. Henry S. Rowen and Charles Wolf, Jr. San Francisco: Institute for Contemporary Studies Press, 1990: 111-126.

Micklin, Philip P. "The Baykal Controversy: A Resource Use Conflict in the U.S.S.R." *Natural Resources Journal* 7 (October 1967): 485-98.

_____. "The Dimensions of the Caspian Sea Problem." *Soviet Geography: Review and Translation* XIII, no. 9 (November 1972): 589-603.

_____. "Large-Scale Interbasin River Diversions in the USSR: Implications for the Future." In *Soviet Resource Management and the Environment*, ed. W. A. Douglas Jackson. Columbus, OH: American Association for the Advancement of Slavic Studies, 1978: 63-82.

_____. "Recent Developments in Large-Scale Water Transfers in the USSR." *Soviet Geography: Review and Translation* XXV, no. 4 (April 1984): 261-263.

_____. "Soviet Plans to Reverse the Flow of Rivers: The Kama-Vychegda-Pechora Project." *The Canadian Geographer* 13 (1969): 199-215.

_____. "The Status of the Soviet Union's North-South Water Transfer Projects Before Their Abandonment in 1985-86." *Soviet Geography: Review and Translation* XXVII, no. 5 (May 1986): 287-329.

_____. "The Vast Diversion of Soviet Rivers." *Environment* 27, no. 2 (March 1985): 12-20, 40-45.

_____. "Water Diversion Proposals for the European USSR: Status and Trends." *Soviet Geography: Review and Translation* XXIV, no. 7 (September 1983): 479-502.

Miller, David. "Navy Mourns End of Sea Power Dream." *Jane's Defence Weekly*, 4 November 1995, 42, 47.

Miller, John H. "Putting Clients in Place: the Role of Patronage in Cooption into the Soviet Leadership." In *Political Leadership in the Soviet Union*, ed. Archie Brown. Bloomington, IN: Indiana University Press, 1989: 54-95.

Mirovitskaya, Natalia, and Marvin S. Soros. "Socialism and the Tragedy of the Commons: Reflections on Environmental Practice in the Soviet Union and Russia." *Journal of Environment and Development* 4, no. 1 (Winter 1995): 77-110.

Mote, Victor L. "BAM, Boom, Bust: Analysis of a Railway's Past, Present, and Future." *Soviet Geography: Review and Translation* XXXI, no. 5 (May 1990): 321-331.

Nilsen, Thomas, Igor Kudrik, and Aleksandr Nikitin. *Sources to Radioactive Contamination -- Submarine Bases on the Kola Peninsula, Zapadnaya Litsa.* Bellona Working Paper No. 5, 1995.

Nove, Alec. "The Investment Process in the USSR." *Bericht des Bundesinstituts fur ostwissenshafliche und internationale studien*, No. 53 (1989).

Pallot, Judith. Review of *Environmental Management in the Soviet Union and Yugoslavia*, by Barbara Jancar, in *International Affairs* 64, no. 4 (Autumn 1988): 714-715.

Petersen, Charles C. "Aircraft Carrier Development in Soviet Naval Theory." *Naval War College Review* 37, no. 1 (January/February 1984): 4-13

Petro, Nicolai N. "The Project of the Century': A Case Study of Russian National Dissent." *Studies in Comparative Communism* XX, nos. 3/4 (Autumn/Winter 1987): 235-252.

Polmar, Norman. "The Quest for the Quiet Submarine." *United States Naval Institute Proceedings*, 121, no. 10 (October 1995): 119-121.

Pryde, Philip R. Review of *The Destruction of Nature in the Soviet Union*, by Boris Komarov [Ze'ev Wolfson]. In *The Annals of the American Academy of Political and Social Science* 460 (March 1982): 167-168.

Report of the Bellagio Conference on U.S.-U.S.S.R. Environmental Protection Institutions, 1991. "Environmentalism and Ethnic Awakening." *Boston College Environmental Affairs Law Review* 19 (Spring 1992).

Rostankowski, Peter. "Transformation of Nature in the Soviet Union: Proposals, Plans and Reality." *Soviet Geography: Review and Translation* XXII, no. 6 (June 1982): 381-90.

_____. "Will there be a Siberian Sea?" *Geographische Rundschau* No.12 (1977): 402-408.

"Russia's Deep Secrets." Text of British Broadcasting Corporation television programme *Horizon*, originally transmitted 16 January 1995.

Sadri, Roostam. "Possible Environmental and Demographic Problems from Diversion of Siberian Rivers." *Radio Liberty Research Bulletin*, RL 196/83, 17 May 1983.

Serrill, Michael S. "Ghosts of the Forests." *Time Special Issue: Our Precious Planet*, November 1997, 50-55.

Shabad, Theodore. "Soviet Moves to Halt the Pollution of Lake Baikal." *New York Times*, 8 February 1969, sec. 1, p. 8.

Simis, Konstantin. "The Machinery of Corruption in the Soviet Union." *Survey* 23, no. 4 (1977-78): 35-55.

Stackhouse, John. "The Fray Over Freshwater." *Globe and Mail*, 14 February 1998, sec. D5.

Taga, Lenore Shever. "Externalities in a Command Economy." In *Environmental Misuse in the Soviet Union*. ed. Fred Singleton. New York: Praeger, 1976: 75-100.

Vego, Milan. "The Role of the Attack Submarine in Soviet Naval Theory." *Naval War College Review* 36, no. 2 (March-April 1983): 2-16.

Volgyes, Ivan. "Introduction." In *Environmental Deterioration in the Soviet Union and Eastern Europe*. ed. Ivan Volgyes. New York: Praeger, 1974: 1-7.

Voronitsyn, Sergei. "Go-Ahead About to be Given for Siberian River Diversion Project?" *Radio Liberty Research Bulletin*, RL 184/83, 4 May, 1983.

_____. "The Plan to Divert Siberian Rivers and Pressure from the Central Asian Lobby." *Radio Liberty Research Bulletin*, RL 400/80, 27 October 1980.

_____. "The River Diversion Scheme: Is the Public Debate Only Obscuring the Real Problems?" *Radio Liberty Research Bulletin*, RL 310/86, 28 July 1986.

_____. "Will the Efforts of the Uzbek 'Lobby' Speed Up the Diversion of Siberia's Rivers?" *Radio Liberty Research Bulletin*, RL 76/81, 20 February 1981.

Weiner, Douglas R. "Prometheus Rechained: Ecology and Conservation." In *Science and the Soviet Social Order*, ed. Loren R. Graham. Cambridge, MA: Harvard University Press, 1990: 71-93.

Winiecki, Jan. "Large Industrial Enterprises in Soviet-Type Economies: The Ruling Stratum's Main Rent-Seeking Area." *Communist Economies* 1, no. 4 (1989).

"Work Has Started on the Diversion of Water from the Northern Rivers to the South." *Radio Liberty Research Bulletin*, RL 394/73, 12 December 1973.

Zaharchenko, Tatiana. "The Environmental Movement and Ecological Law in the Soviet Union: the Process of Transformation." *Ecology Law Quarterly* 17, no. 3 (1990): 455-475.

Zubrzycki, John. "Pollution of Rivers in India Reaches a Crisis." *Christian Science Monitor* News Service Report, 14:00 PST 28 October 1997.

ZumBrunnen, Craig. "The Lake Baikal Controversy: A Serious Water Pollution Threat or a Turning Point in Soviet Environmental Consciousness." In *Environmental Deterioration in the Soviet Union and Eastern Europe*. ed. Ivan Volgyes. New York: Praeger, 1974: 80-122.

_____. "Water Pollution in the Black and Azov Seas." In *Environmental Misuse in the Soviet Union*, ed. Fred Singleton. New York: Praeger, 1976: 33-59.

Western Sources: Monographs

Åhlander, Ann-Mari. *Environmental Problems in the Shortage Economy: The Legacy of Soviet Environmental Policy.* Aldershot: Edward Elgar, 1994.

Alexander, Arthur J. *R&D in Soviet Aviation,* R-589-PR. Santa Monica, CA: RAND, 1970.

Åslund, Anders. *Gorbachev's Struggle for Economic Reform.* London: Pinter, 1991.

Baer, George W. *One Hundred Years of Sea Power: The U.S. Navy, 1890-1990.* Stanford: Stanford University Press, 1993.

Bonds, Ray., ed. *The Illustrated Directory of Modern Soviet Weapons.* New York: Prentice Hall, 1986.

Breemer, Jan. *Soviet Submarines: Design, Development and Tactics.* Coulsdon, Surrey: Jane's Information Group, 1989.

Brown, Archie. *The Gorbachev Factor.* Oxford: Oxford University Press, 1996.

Clarke, William A. *Crime and Punishment in Soviet Officialdom: Combating Corruption in the Political Elite, 1965-1990.* Armonk, NY: M. E. Sharpe, 1993.

Commoner, Barry. *The Closing Circle: Confronting the Environmental Crisis.* London: Jonathan Cape, 1972.

Dawson, Jane I. *Eco-Nationalism: Anti-Nuclear Activism and National Identity in Russia, Lithuania, and Ukraine.* Durham, NC: Duke University Press, 1996.

DeBardeleben, Joan. *The Environment and Marxism-Leninism: The Soviet and East German Experience,* Westview Special Studies on the Soviet Union and Eastern Europe. Boulder, CO: Westview Press, 1985.

Djilas, Milovan *Conversations With Stalin.* New York: Harcourt, Brace and World, 1962.

Douglas, Mary. *How Institutions Think.* Syracuse, NY: Syracuse University Press, 1986,

Feshbach, Murray, and Alfred Friendly, Jr. *Ecocide in the USSR: Health and Nature under Siege.* New York: Basic Books, 1992.

Forrester, J. W. *World Dynamics.* Cambridge, MA: Wright-Allen Press, 1971.

French, Hilary F. *Green Revolutions: Environmental Reconstruction in the Soviet Union and Eastern Europe,* Worldwatch Paper No. 99. Washington, DC: Worldwatch Institute, 1990.

Friedman, Norman. *U.S. Aircraft Carriers: An Illustrated Design History.* Annapolis, MD: Naval Institute Press, 1983.

Goldman, Marshall. *The Spoils of Progress: Environmental Pollution in the Soviet Union.* Cambridge, MA: M.I.T. Press, 1972.

Green, Eric. *Ecology and Perestroika.* Washington, DC: American Committee on U.S.-Soviet Relations, 1990.

Grundmann, Reiner. *Marxism and Ecology.* Oxford: Clarendon, 1991.

Gunston, Bill. *An Illustrated Guide to the Modern Soviet Air Force.* New York: Arco, 1982. Reprinted as Section III of *The Illustrated Directory of Modern Soviet Weapons,* ed. Ray Bonds. New York: Prentice Hall, 1986.

Gustafson, Thane. *The Soviet Gas Campaign: Politics and Policy in Soviet Decisionmaking.* Rand Publications Series R-3036-AF, June 1983.

Hall, Gus. *Ecology: Can We Survive Under Capitalism?* New York: n.p., 1972.

Hazan, Baruch A. *From Brezhnev to Gorbachev: Infighting in the Kremlin.* Boulder, CO: Westview Press, 1987.

Herrick, Robert W. *Soviet Naval Strategy: Fifty Years of Theory and Practice.* Annapolis, MD: United States Naval Institute Press, 1968.

Hewlett Richard G., and Francis Duncan. *Nuclear Navy, 1946-1962.* Chicago: University of Chicago Press, 1974.

Hoffmann Erik P., and Robbin F. Laird. *Technocratic Socialism: The Soviet Union in the Advanced Industrial Era.* Duke Press Policy Studies. Durham, NC: Duke University Press, 1985.

Holloway, David. *The Soviet Union and the Arms Race.* London: Yale University Press, 1984.

Hoskins, Geoffrey. *The Awakening of the Soviet Union.* Cambridge, MA: Harvard University Press, 1991.

Jackson, W. A. Douglas, ed. *Soviet Resource Management and the Environment.* Columbus, OH: American Association for the Advancement of Slavic Studies, 1978.

Jancar, Barbara. *Environmental Management in the Soviet Union and Yugoslavia: Structure and Regulation in Federal Communist States.* Durham, NC: Duke University Press, 1987.

Jordan, John. *An Illustrated Guide to the Modern Soviet Navy.* New York: Arco, 1982.

_____. *Soviet Submarines: 1945 to the Present.* London: Arms and Armour Press, 1989.

Kneen, Peter *Soviet Scientists and the State: An Examination of the Social and Political Aspects of Science in the USSR.* London: Macmillan, 1974.

Marples, David R. *Belarus: From Soviet Rule to Nuclear Catastrophe.* Edmonton, AB: University of Alberta Press, 1996.

_____. *Chernobyl and Nuclear Power in the USSR.* London: Macmillan, 1986.

_____. *The Social Impact of the Chernobyl Disaster.* London: Macmillan, 1988.

_____. *Ukraine Under Perestroika: Ecology, Economics and the Workers' Revolt.* Edmonton, AB: University of Alberta Press, 1991

Meadows D. H., *et al. The Limits to Growth: a Report for the Club of Rome's Project on the Predicament of Mankind.* NY: Universe Books, 1972.

Moore, John E. *The Soviet Navy Today.* London: Macdonald and Jane's, 1975.

Nilsen, Thomas, Igor Kudrik, and Aleksandr Nikitin. *The Russian Northern Fleet: Sources of Radioactive Contamination,* Bellona Report No. 2, 28 August 1996.

Nolting, L. *The Financing of Research, Development and Innovation in the USSR, by Type of Performer,* US Department of Commerce Foreign Economic Report No. 9. Washington DC: US Government Printing Office, 1976.

Oberg, James E. *Uncovering Soviet Disasters: Exploring the Limits of Glasnost.* New York: Random House, 1988.

Parrott, Bruce. *Politics and Technology in the Soviet Union.* Cambridge, MA: MIT Press, 1983.

Parsons, Howard L. *Marx and Engels on Ecology.* Westport, CT: Greenwood Press, 1977.

Peterson, D. J. *Troubled Lands: The Legacy of Soviet Environmental Destruction.* Boulder, CO: Westview Press, 1993.

Polmar, Norman, and Thomas B. Allen. *Rickover.* New York: Simon & Schuster, 1982.

Pryde, Philip R. *Conservation in the Soviet Union.* Cambridge: Cambridge University Press, 1972.

Rezun, Miron. *Science, Technology, and Ecopolitics in the USSR.* Westport, CT: Praeger, 1996.

Ruge, Friedrich. *The Soviets as Naval Opponents, 1941-1945.* Annapolis, MD: Naval Institute Press, 1979.

Schwab, Ernest Louis. *Undersea Warriors: Submarines of the World.* Lincolnwood, IL: Publications International, 1991.

Simmons, Ian G. *Environmental History: A Concise Introduction,* New Perspectives on the Past Series. Oxford: Blackwell, 1993.

Stokes, Kenneth M. *Man and the Biosphere: Toward a Coevolutionary Political Economy.* Armonk, NY: M. E. Sharpe, 1994.

Zaloga, Steven J. *Target America: The Soviet Union and the Strategic Arms Race, 1945-1964.* Novato, CA: Presidio Press, 1993.

Zeigler, C. E. *Environmental Policy in the USSR.* Amherst, NJ: University of Massachusetts Press, 1987.