Smokestack Diplomacy

Cooperation and Conflict in East-West Environmental Politics

Robert G. Darst

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The MIT Press
Cambridge, Massachusetts
London, England

This book was set in Sabon by Best-set Typesetter Ltd., Hong Kong.

Printed and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

Darst, Robert G.
Smokestack diplomacy : cooperation and conflict in East-West environmental politics / Robert G. Darst.
p. cm.
Includes bibliographical references and index.
ISBN 0-262-04183-9 (hc. : alk. paper)—ISBN 0-262-54111-4 (pbk. : alk. paper)
1. Environmental protection—International cooperation—Case studies. 2. Environmental policy—International cooperation—Case studies. 3. Marine pollution—Baltic Sea—Case studies. 4. Air—Pollution—Case studies. 5. Transboundary pollution—Case studies. 6. Nuclear power plants—Safety measures—Case studies. I. Title.

TD170 .D37 2001
363.7′0526—dc21

00-056240

For Jane

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Figures

Acknowledgments

This book would not have been possible without the support of many individuals and institutions. First, I am deeply indebted to the friends and colleagues who pitched in with advice and encouragement along the way. Special thanks go out to Deborah Baumgold, Andy Bennett, Thomas Bernauer, George Breslauer, Bill Clark, Barbara Connolly, Elizabeth Economy, Lynn Eden, Matthew Evangelista, Jim Goldgeier, David Guston, Ernst Haas, John Holdren, David Holloway, Gail Lapidus, Ron Mitchell, Miranda Schreurs, Lars Skalnes, Kelly Smith, Olga Tsepilova, David Victor, Veljko Vujačić, and Paul Wapner. The final product owes much to their contributions and moral support. All shortcomings are, of course, my responsibility alone.

My field research would never have been successful without the help of the following people: Olga Tsepilova, Valeriy Dankevich, Andrey Nedre, Sergey Shelestyuk, and Valeriy Karpov in St. Petersburg; Yuriy Koryakin, Elena Nikitina, and Rafael Vartanov in Moscow; Ain Lääne in Tallinn; and Tapani Vaahtoranta and Lasse Mattila in Helsinki. I sincerely hope that the finished product merits the energy that they expended on my behalf.

Financial support for this project was provided by several generous sources. My field research was supported by an SSRC-MacArthur Foundation Fellowship in International Peace and Security, as well as grants from the Social Science Research Council, the Institute on Global Conflict and Cooperation, the Institute for the Study of World Politics, and the National Council for Soviet and East European Research. Time for writing was made possible by financial support from the Center for

Science and International Affairs at the John F. Kennedy School of Government, the Harvard Academy for International and Area Studies, and the University of Oregon.

Last but far from least, I owe the debt of deepest gratitude to my wife, Jane Dawson: my strongest supporter, most relentless critic, and surely the only person more relieved than I that this project is finally complete.

1

Introduction

The ruling circles of the USA and its more zealous allies . . . saw in this event merely yet another opportunity to place additional obstacles in the path of development and deepening of the already troubled dialog between East and West, and to justify the arms race. . . . We view this tragedy quite differently. We understand: This is one more toll of the bell, one more terrible warning that the nuclear era demands new political thinking and new policies.

—Mikhail Gorbachev, speaking on Soviet television in the aftermath of the Chernobyl nuclear accident, 14 May 1986

Ukraine has no problem with Chernobyl. The problem exists in the West. If they want the plant shut down, this may be done in a very simple way—simply divide Ukraine's losses among the participants in the process. These include the fifteen countries of the European Union, the three G7 countries that are not members of the European Union, and Ukraine. These states need only pay $200 million each, and this price is not very high for an advanced country that would like to solve an enormous task and rid its own people of worries.

—Serhiy Parashyn, director of the Chernobyl Nuclear Power Plant, 19 April 1995

This book examines cooperation and conflict in East-West environmental politics from the late 1960s, when the first modest cooperative efforts emerged during the heyday of the Cold War, to the much more energetic—and often more contentious—post–Cold War environmental diplomacy of the 1990s. Through a comparative study of three key international environmental issues—nuclear power safety, transboundary air pollution, and the protection of the marine environment of the Baltic Sea—this study seeks to explain the changing strategies and levels of success associated with transnational efforts to promote environmental protection and the reduction of transboundary emissions in the USSR and, subsequently, in five of the USSR's successor states: Russia, Ukraine, and the Baltic republics of Estonia, Latvia, and Lithuania.

This study is driven by a profound paradox. At first glance, we might have expected Russia and the other newly independent states to have been much more eager to address transnational environmental concerns than the USSR had been. During the Cold War period, international environmental cooperation was hampered by the hostility and secrecy that accompanied the bipolar division of the European continent, while internal efforts to address environmental degradation within the USSR were sharply constrained by the closed character of the Soviet political system and the Soviet leadership's determination to pursue military and industrial development at any cost. By contrast, in the wake of the dramatic events of 1990–1991, domestic political power increasingly devolved to the people most likely to benefit from improved environmental quality: the ordinary citizens of Russia and the other newly independent states. This transition was also accompanied by the dismantling of the notoriously inefficient and environmentally unfriendly command economy, the marked relaxation of state controls on transnational political and scientific contacts, and growing economic interdependence between East and West—all of which might reasonably be expected to be conducive to more aggressive environmental policies at home and more enthusiastic environmental cooperation abroad.

In fact, the end of the Cold War and the collapse of the Soviet Union did not prove to be an unalloyed boon for transnational efforts to promote environmental protection and nuclear power safety in the newly independent states. The period of greatest enthusiasm for East-West environmental cooperation occurred not in the 1990s, but in the second half of the 1980s—well before the unraveling of the Soviet political system or the end of the Cold War. In the wake of the 1986 Chernobyl nuclear power plant accident and the simultaneous unveiling of Mikhail Gorbachev's campaign to fundamentally reform the Soviet Union's domestic and foreign policies, Soviet diplomats enthusiastically embraced East-West environmental cooperation, undertaking a number of unprecedented commitments in areas such as transboundary air pollution, nuclear safety, and pollution in the Baltic Sea. Moreover, Soviet interest in East-West environmental cooperation did not begin with Gorbachev.

The USSR responded positively to Western calls for environmental cooperation as early as the late 1960s, and in one case—transboundary air pollution—an initiative put forward by Leonid Brezhnev paved the way for the conclusion of an international agreement embracing all of Europe and North America, an agreement that otherwise might not have come to pass.

By contrast, the 1990s were characterized by a much more confrontational form of "smokestack diplomacy." The newly independent states were uniformly less willing to take deliberate, independent, effective action to address the sources of transboundary pollution than had been the USSR under Gorbachev, despite the fact that most of these sources generated even more severe *internal* damage as well. The newly independent states' emissions of air and water pollutants declined sharply in the early 1990s, but this decline was almost entirely the inadvertent consequence of the sharp economic recession that accompanied the collapse of the command economy. To the extent that the newly independent states undertook deliberate efforts to reduce transboundary pollution or to improve nuclear power safety, they did so only when Western governments and international lending institutions agreed to foot a considerable part of the bill. Furthermore, Russia and Ukraine threatened to expose their more affluent neighbors to greater transboundary dangers in order to exact larger payments from them—a form of "environmental blackmail" never employed by the USSR, even during the darkest days of the Cold War.

The key to this paradox is a phenomenon that has generally been overlooked in the study of international environmental politics: the *instrumental manipulation of external environmental concerns*. Unlike the affluent capitalist states—whose policies have provided most of the grist for the mill in the study of international environmental cooperation—the USSR and the newly independent states were rarely motivated to participate in international environmental cooperation by genuine concern about the domestic impact of externally generated pollution. The most severe environmental problems in these states were uniformly self-inflicted; consequently, international policy coordination was not a necessary condition for the amelioration of them. Instead, the motive that brought both the USSR and the newly independent states to the international bargaining table was the desire to manipulate *Western* concerns about transboundary environmental problems in order to advance other goals: the mitigation of East-West hostility, economic development, and the amelioration of their own self-inflicted environmental problems.

The motives that lay behind this pattern of instrumental manipulation changed dramatically along with transition from the Cold War to the post–Cold War period. Until the collapse of the Soviet Union in 1990–1991, successive Soviet leaders used East-West environmental cooperation as a way to project an image of "cooperativeness," and thus elicit Western cooperation in nonenvironmental areas of greater interest to the USSR—a tactic that reached its apex with the astonishing but short-lived "greening" of Soviet foreign policy under Mikhail Gorbachev in the late 1980s. After the collapse of the USSR, Russia and the other newly independent states manipulated the environmental concerns of the affluent Western states for quite different reasons: to secure external financing for economic development, energy production, and the resolution of their own *internally generated* environmental problems—that is, problems that could, in principle, have been addressed through strictly domestic measures. The history of East-West environmental cooperation therefore presents an unprecedented opportunity to examine the instrumental manipulation of transboundary environmental degradation, a critical aspect of international environmental politics that has, until now, remained largely unexplored.

Just as the motives underlying instrumental manipulation changed along with the end of the Cold War and the dissolution of the USSR, so too did its form. During the Cold War, the USSR sought to advance its broader political goals by participating in formal international environmental agreements and conventions, such as the 1973 Helsinki Convention on the Protection of the Baltic Marine Environment and the 1979 Convention on Long-Range Transboundary Air Pollution (LRTAP) and its subsequent protocols. Prior to 1990, the question of external financing for Soviet environmental protection measures was never raised in these negotiations; instead, both the Soviet government and its Western counterparts assumed that the USSR was fully capable of financing and implementing its obligations under these agreements. Since the underlying goal of Soviet participation in these agreements was to project an image of "cooperativeness" and thus offset Cold War tensions, the extent of the obligations undertaken by the USSR prior to its demise depended upon the reigning Soviet General Secretary's interest in the moderation of East-West hostility. Long-time Soviet leader Leonid Brezhnev desired only a limited moderation of Cold War tensions, and so kept the Soviet Union's obligations within very narrow bounds: The Soviet government agreed only to those obligations that it expected to fulfill at little or no additional cost, and it was careful to keep transnational information sharing under extremely tight control. Mikhail Gorbachev, by contrast, desired to end the Cold War altogether, and thus sought to project a far more impressive image of cooperativeness. Consequently, the USSR shared environmental information much more freely and undertook a number of extremely ambitious and potentially costly obligations to reduce its own emissions.

With the end of the Cold War and the concurrent disintegration of the USSR, the basic form of East-West environmental cooperation was fundamentally transformed. The Western countries, which had earlier assumed that the Soviet government was capable of carrying out far-reaching environmental reforms if only it could be convinced of the desirability of doing so, realized by the end of 1990 that this was no longer the case: The disintegrating Soviet government could no longer marshal the economic or political resources necessary for expensive independent action, nor, after 1991, could the badly fragmented Russian Federation or the other newly independent states. The innovative Western response to this new situation was *transnational subsidization*: offers to contribute significantly to the financing of concrete environmental protection measures in the newly independent states, particularly those that promised a reduction in the transboundary environmental threats of greatest concern to the West. By the end of the 1990s, the Western states had disbursed billions of dollars toward this end in the form of direct grants and low-interest loans. The newly independent states, for their part, were happy to accept this assistance when it suited their own economic and environmental interests to do so. However, the recipients' interests were rarely identical with those of the donors, and quite often the two worked at cross-purposes.

From the Western perspective, therefore, outcomes in the post–Cold War period were often as frustrating and unexpected as had been the collapse of the "greening" of Soviet foreign policy in 1990–1991. In some cases—particularly in the international effort to clean up the Baltic Sea—the results of transnational subsidization were quite impressive. At the same time, this new formula carried the seeds of conflict as well as cooperation. The prospect of subsidization encouraged policymakers in the newly independent states to shift the costs of environmental protection onto their more affluent neighbors wherever possible, and along with it the costs of other goals, such as industrial modernization and more reliable energy production. Transnational subsidization also encouraged greater environmental risk taking—a phenomenon known as "moral hazard"—and the extension of the service lives of industrial enterprises and nuclear power plants. In two cases, successor states exploited the environmental sensitivity of other states by threatening to expose the latter to even greater environmental hazards: Ukraine's threat to prolong the operation of the Chernobyl nuclear power plant unless the West paid for the closure and replacement of it, and Russia's threat to resume radioactive waste dumping at sea if its more affluent neighbors did not agree to finance alternative methods of disposal.

Outcomes were not uniform in either the Cold War or post–Cold War period. Prior to 1986, the most impressive manifestation of Soviet interest in East-West environmental cooperation was the USSR's participation in international efforts to control LRTAP. Brezhnev himself launched the initiative that ultimately led to the conclusion of the LRTAP Convention, and subsequently agreed to reduce the USSR's transboundary emissions of sulfur dioxide by 30 percent. In retrospect, however, this was a textbook lesson in "how to succeed in 'greenness' without really trying": The Soviet government had no real interest in the problem of long-range sulfur deposition and expected to meet the 30 percent reduction through previously planned shifts in its energy strategy. The outward effects of Soviet participation in East-West discussions of nuclear power safety and pollution in the Baltic Sea were less impressive, although in all three cases increased expert interaction led to the diffusion of new ideas and understandings from West to East.

After 1986, the USSR increased its participation and undertook bold new obligations in all three cases. Outcomes sharply diverged, however, with the democratization and decentralization of the Soviet political system in 1989–1990. Soviet specialists concerned with the degradation of the Baltic Sea were able to make common cause with municipal, regional, and republican officials concerned with local environmental degradation, but the specialists associated with the LRTAP regime met with little receptiveness at the local or regional level. In the nuclear power case, the effects of the expansion of political participation in the USSR ran *directly counter* to the goals of the internationally connected experts; as a result, the Soviet government and nuclear industry engaged in a new form of instrumental manipulation, making common cause with the International Atomic Energy Agency to combat antinuclear activism at home.

In the post–Cold War period, the speed, scope, and success of transnational subsidization varied both across issues and from one newly independent state to the next. Post–Cold War cooperation to address the pollution of the Baltic Sea was rapid and comprehensive, thanks to the convergent environmental interests of the donors and recipients. By contrast, external efforts to address sources of long-range air pollution within the former Soviet Union typically foundered, due to the poor fit between donor and recipient environmental interests and the economic vicissitudes of the transition period. The issue of nuclear power proved the most contentious of all: The former socialist states encouraged the West to pay for safety upgrades at the Soviet-designed reactors on their territories but refused to shut down their older and more dangerous reactors (which, they argued, could be made less dangerous with Western assistance) any earlier than absolutely necessary. The nuclear case was also marked by two cases of apparently successful "environmental blackmail": Ukraine's threat to modernize the Chernobyl nuclear power plant, and Russia's threat to resume radioactive waste dumping at sea.

Case Selection and Methodology

Over the past three decades, the USSR and its successor states have participated in international efforts to address a broad range of environmental and natural resource issues, ranging from the conservation of polar bears to global climate change. Of course, not all of these issues are equally significant (although polar bears might disagree), and a work of this scope could not hope to do justice to all of them in any case. Consequently, this study is based upon detailed case studies of three of the issues that have figured most prominently in East-West environmental politics to date: pollution in the Baltic Sea, transboundary air pollution, and nuclear power safety. These cases were selected for three reasons: (1) in each case, East-West interaction stretches back to the late 1960s or early 1970s; (2) in each case, one or more Western states developed an interest in the reduction of transboundary environmental threats generated within the former USSR; and (3) in none of these cases were the USSR or the newly independent states able to avoid internal environmental damage by exporting their pollution or "free riding" on emissions reductions undertaken by other states.

First, in each case, East-West interaction extends from the late 1960s or early 1970s to the end of the 1990s. This chronological span allows for the comparison of the Cold War and post–Cold War periods, as well as the comparison of the pre-1986 and post-1986 policies pursued by the USSR. Second, each of these cases is one in which one or more Western countries developed a direct interest in the solution of an environmental problem generated from within the territory of the former Soviet Union. The reason for this criterion is simple: If there were no such interest, there would have been no significant external involvement (particularly in the post–Cold War period) and hence no grounds for examining the effect of Western interest on Soviet and post-Soviet environmental diplomacy.

The third criterion for case selection—the fact that, in each case, the USSR and the newly independent states could not avoid internal environmental degradation by exporting their pollution or free-riding on the efforts of others—allows us to control for differences in the contractual structure of international environmental problems. There are two situations in which we should expect any state, regardless of its internal characteristics, to be averse to international environmental cooperation. The first is the "tragedy of the commons." If several states share the use of a common resource—the atmosphere, or a common waterway—and none of them can insulate itself against the actions of its fellows, then each has an incentive to exploit that resource to the fullest profitable extent, regardless of what the others do. Even if others decide to limit their exploitation of the resource, a clever, self-interested state may prefer to "free ride" on the sacrifices of its fellows rather than contribute to the common good (Hardin 1968). A situation even less conducive to co-operation is the one in which "upstream" or "upwind" states find themselves relative to their "downstream" or "downwind" neighbors. If a state in such a position has the ability to export all or most of its pollution to its unfortunate neighbors while receiving little or none in return, it will have little environmental interest in contributing to international cooperation to address the problem. Were the USSR or any of the newly independent states to find itself in either of these positions, we should expect the result to be a reluctant attitude toward far-reaching international environmental cooperation, regardless of the domestic political characteristics of the state involved.

However, in each of these three cases, the activities that generated transboundary environmental degradation (or the risk of it) have generated even more severe environmental hazards *within* the USSR and the newly independent states. The Chernobyl disaster caused great alarm in Western Europe, but its external effects were trivial compared to the devastation wreaked upon the population of Ukraine, western Russia, and Belarus. The pollutants emitted in the city of Leningrad/St. Petersburg contribute significantly to the degradation of the Baltic Sea, but the effects in the immediate vicinity of the city have been considerably greater. The airborne effluents of the nickel smelters on the Kola Peninsula may well be detrimental to the health of the forests of northern Scandinavia, but the trees on the Russian side of the border are already dead. In each of these cases, internal environmental damage has been caused above all by the *direct* impact of internally generated pollution, rather than by pollutants imported from abroad. This situation was not substantially altered by the disintegration of the USSR, as self-inflicted damage remained the most pressing cause of environmental degradation in even the smallest of the newly independent states. For the most part, therefore, Soviet and post-Soviet reluctance to cooperate in the resolution of these three transboundary environmental problems cannot be attributed to "upstream" disinterest or an attempt to "free ride," since in each case the USSR and the newly independent states were the primary victims of their own environmentally harmful activities. Indeed, all else being equal, the USSR and the newly independent states should have been not only eager to cooperate in the resolution of these problems, but also willing to take unilateral action to deal with them. (The partial exception to this rule was the post-Soviet politics of transboundary air pollution. This case will be discussed in greater detail in chapter 4.)

This study is the fruit of extensive field research, including more than 150 interviews with activists, specialists, businessmen, and officials in Western Europe, Russia, Ukraine, and the Baltic states. Most of these interviews were conducted between 1990 and 1995, and a number of respondents were interviewed more than once over the course of this period. I was particularly fortunate to have lived in the (former) USSR for an extended period in 1990–1992, when the bases for the policy tool that would subsequently come to dominate East-West environmental politics in the 1990s—transnational subsidization—was only just beginning to take shape. I have also drawn extensively upon press reports, governmental reports, and documentation made available by the Helsinki Commission, the International Atomic Energy Agency, the UN Economic Commission for Europe, the European Bank for Reconstruction and Development, the World Bank, the European Union, and other international organizations involved in East-West environmental politics.

This methodology does, of course, have its limitations. It was not always possible to reconstruct important developments entirely, particularly where the pre-perestroika period was concerned; personal memories have grown hazy and selective with the passage of time, and reliable corroborative documentation remains scant. Even in the post-Soviet period, old habits of secrecy are alive and well, particularly in the nuclear power field. I was often unable to gain access to participants at the highest levels of environmental and political decision making, and even when I was able to do so, respondents "in the know" refused to discuss sensitive issues such as environmental blackmail for the record. Consequently, I have avoided relying exclusively upon any one participant's version of events, seeking instead to confirm it with information garnered from other interviews and from official documents and press reports. In the interests of protecting my respondents from any possible harm—a very real possibility even a decade after the disintegration of the Soviet state—I cite documents or other print sources in the text wherever possible, and I rarely refer to specific individuals in my citations. However, an illustrative list of the interviews conducted is appended to the text.

An unavoidable limitation of this type of research is that it is not possible for me to definitively determine or document the *intentions* of the leaders of the governments involved. When the Ukrainian government decided in October 1993 to reverse its earlier decision to shut down the Chernobyl nuclear power plant ahead of schedule, was this a deliberate threat designed to increase the flow of Western economic assistance? Was the Russian government's decision in October 1993 to resume the dumping of low-level radioactive waste in the Sea of Japan a deliberate shot across Japan's bow, a warning that Russia was in a position to threaten Japan's perceived environmental well-being if Japan did not fund the construction of alternative disposal facilities? Based upon the documents and "for the record" interviews available to me, I cannot definitively answer these questions. Consequently, wherever possible I define and analyze phenomena such as "environmental threats" and "environmental blackmail" in terms of the observable behavior of the actors involved (including their public pronouncements) rather than the unobservable intentions of individual decisionmakers.

The Structure of the Book

Chapter 2 presents the theoretical perspective adopted in this book in greater detail. I begin with a brief overview of existing approaches to the analysis of international environmental cooperation and then turn to my analysis of instrumental manipulation before and after the Cold War. Just as the motives, form, and consequences of instrumental manipulation were very different in the Cold War and post–Cold War periods, so too are the theoretical tools that I bring to bear in order to explain them. In my analysis of the Cold War period, I emphasize the effects of the domestic political structure of the USSR, the foreign policy strategies adopted by the two key General Secretaries during the period under consideration, Leonid Brezhnev and Mikhail Gorbachev, and the unanticipated effects of the domestic structural changes unleashed by Gorbachev in the late 1980s. In my analysis of the post–Cold War period, I expand my framework to encompass a more generalizable model of transnational environmental subsidization, based upon the work of the economist Ronald Coase. Chapters 3, 4, and 5 form the heart of the book: they contain detailed case studies of the East-West politics of pollution in the Baltic Sea, transboundary air pollution, and nuclear power safety, respectively. Finally, I conclude in chapter 6 with an analysis of the successes and failures of transnational subsidization in the post–Cold War period, and I provide recommendations for minimizing the perverse incentives and outcomes that too often attend programs of this sort and that will continue to do so in the future.

2

Instrumental Manipulation in International Environmental Politics

In both the Cold War and post–Cold War periods, the participation of the USSR and the newly independent states in East-West environmental cooperation was predominantly characterized by the instrumental manipulation of the transboundary environmental concerns of the advanced capitalist states. Since the most pressing environmental problems in the USSR and its successor states were almost entirely self-inflicted, rather than the result of pollution produced elsewhere, international policy coordination was not a necessary prerequisite for the solution of them; in principle, internal environmental degradation in the USSR and the newly independent states could have been resolved through strictly domestic measures. Instead, the USSR and the newly independent states sought to take political advantage of the environmental concerns of the capitalist states to advance goals other than the amelioration of transboundary environmental degradation.

The goals, form, and consequences of this manipulation differed markedly in the Cold War and post–Cold War periods. During the Cold War, East-West hostility—itself largely the byproduct of the competitive policies pursued by the USSR—presented successive Soviet leaders with obstacles to the realization of other goals. This in turn generated an incentive to moderate Western hostility in order to enhance the prospect of Western cooperation in *nonenvironmental* issue areas of greater interest to the Soviet leadership. Participation in East-West environmental cooperation was one way, among others, of expressing the "cooperativeness" necessary for this strategy to succeed. The quality of the USSR's participation in international environmental cooperation depended upon the extent of East-West cooperation sought by the reigning Soviet leader. Brezhnev and his immediate successors desired only limited cooperation with the West and therefore placed crippling restraints upon Soviet participation in East-West environmental regimes. Gorbachev, by contrast, desired to end the Cold War altogether, and so was willing to take on much more ambitious international environmental commitments, with far fewer restraints. Throughout the Soviet period, it was assumed that the USSR, as an advanced industrialized state on a par with its capitalist peers, would be responsible for the financing and implementation of its own environmental protection policies.

In 1990–1991, Gorbachev's reforms led not only to the end of the Cold War, as he had intended, but also to the unintended disintegration of the Soviet state itself. This simultaneous revolution in domestic and international politics fundamentally changed the basic form of East-West environmental cooperation, and with it the incentives that brought the newly independent states to the bargaining table. The newly independent states sprang from the rubble of the USSR not as fully clad capitalist democracies, but as impoverished, politically unstable states with few resources to spare for environmental protection. The affluent capitalist states responded by offering to subsidize specific environmental protection measures in the former Soviet bloc, particularly those that promised a diminution of transboundary environmental degradation. The prospect of external subsidization did indeed bring the newly independent states to the bargaining table, but not because of a shared interest in the amelioration of transboundary environmental problems. Instead, the newly independent states manipulated the Western states' transboundary environmental concerns to advance other goals: the modernization or replacement of aging firms and power plants, and the amelioration of their own internally generated environmental problems. Furthermore, the introduction of transnational subsidization generated incentives for "recipient" behavior not desired by the "donors": greater environmental risk taking ("moral hazard"), insistence upon the life extension of polluting firms and aging nuclear power plants, and the temptation to threaten the donors with even greater transboundary hazards in order to extract larger payments from them.

The goal of this chapter is to elaborate the analytical framework that I use to explain the goals, forms, and consequences of instrumental manipulation in the Cold War and post–Cold War periods. My analysis of instrumental manipulation during the Cold War period focuses primarily upon domestic political structure and leadership strategy within the USSR. For the post–Cold War period, this framework must be expanded to incorporate the new incentives for instrumental manipulation generated by the introduction of transnational subsidization. This component of my analytical framework takes as its starting point the work of the economist Ronald Coase, but expands Coase's approach to encompass additional factors germane to the "real world" of transnational subsidization. Before turning to my argument in more detail, however, I will first briefly review three alternative approaches to the explanation of national participation in international environmental cooperation and demonstrate why these fail to adequately account for the outcomes observed in either the Cold War or post–Cold War periods.

Alternative Explanations: Domestic Politics, Transnational Learning, and the International Distribution of Power

What motivates a state to participate in international environmental cooperation? A widely shared finding in the burgeoning study of international environmental politics is that a state's willingness to participate in international environmental cooperation is ultimately driven by domestic politics, particularly the strength of popular and elite concern about environmental degradation.[1] Those countries that are home to a robust and politically influential domestic environmental lobby tend to take the most active interest in the resolution of transboundary environmental problems. In turn, the political salience of domestic environmental concerns depends in large part upon the domestic political structure of the state.[2] A state characterized by an open, democratic political system is more apt to be responsive to the environmental concerns of its citizenry, and to new information about the causes and effects of transnational environmental degradation, than a closed, authoritarian regime. Consequently, all else being equal, democratic states will be more likely than authoritarian regimes to take an active interest in international environmental cooperation.[3]

A second factor that bears upon national willingness to participate in international environmental cooperation is the diffusion of scientific knowledge and environmental values from one state to another. Environmental activists work across national borders as well as within them; consequently, a growing number of studies have focused upon the transnational consciousness-raising efforts of environmental nongovernmental organizations (NGOs) (e.g., Princen and Finger 1994; Taylor 1995; Wapner 1996; Raustiala 1997; Keck and Sikkink 1998). Another important cross-national "transmission belt" is scientific learning: the development and diffusion of an expert consensus on the nature of and solution to a given transboundary environmental problem. This process is embodied in the activities of transnational "epistemic communities": informal networks of specialists and officials united by shared understandings about a transboundary problem and a common program for translating these understandings into domestic and international political action.[4]

Third, the international distribution of power cannot be left out of the equation. During the Cold War, the international system was rigidly bipolar in character. Although hegemonic power could be exerted on either side of the Cold War divide, it was much more difficult for the rival superpowers to elicit compliance across it. However, the end of the Cold War and the concomitant dissolution of the USSR fundamentally altered this state of affairs. After the Eastern European revolutions of 1989, the economic and military enclave formed by the Soviet Union and its Eastern European satellites collapsed, and the USSR itself broke apart shortly thereafter. The USSR's successor states found themselves impoverished and desperately in need of foreign investment, trade, and financial assistance, much of which they sought from their former Cold War enemies. Under these conditions, the realist perspective would lead us to expect that the newly independent states, now almost prostrate in their dependence upon the West, would be compelled to respond positively to Western environmental concerns, lest the broader network of emerging economic ties be disrupted.

How well do these expectations hold up when applied to East-West environmental politics? First, let us consider domestic political structure. It is certainly true that the Soviet government, prior to 1986, was far less interested in environmental protection than were its Western neighbors. Nevertheless, the Soviet government *did* participate in international environmental cooperation before 1986, in some cases with greater enthusiasm than was manifest in the post-1990 period. Moreover, the most remarkable changes in Soviet receptivity to environmental cooperation with the West—the emergence of the "new political thinking" and the accompanying "greening" of Soviet foreign policy—began to appear in 1986–1987, well before the fundamental domestic structural changes of 1989–1991. Finally, popular and official support for the environmental policies advocated by the West actually declined after 1990, in some cases quite precipitously. These anomalies do not mean that domestic structural change is unimportant; on the contrary, the shift from Soviet-style socialism to electoral democracy (whatever its imperfections) does indeed constitute the central dividing line in the history of environmental politics in the former Soviet Union.[5] However, as these peculiar outcomes indicate, the effects of domestic politics on both sides of this divide were rather more complex than a simple distinction between democracy and authoritarianism would lead us to expect.

To what extent can Soviet and post-Soviet interest in international environmental cooperation be attributed to transnational learning? To attribute changes in policy solely to the transnational diffusion of new ideas, we would have to demonstrate that the shifts in Soviet and post-Soviet policies toward these issues occurred independently of broader changes in domestic political structure and the regime's coalitional base. During the longest period of domestic political stability in the former Soviet Union—the period from the late 1960s until 1985—new ideas that suggested the need for international environmental cooperation did enter the Soviet policymaking process from abroad and, to varying degrees, they were embodied in new policy programs. In practical terms, however, these new programs were not fulfilled and had relatively little effect upon Soviet behavior. In other words, this response was not learning, but *adaptation*: the addition of new goals to preexisting programs without any reexamination of the underlying reasoning upon which these programs were based (E. Haas 1990, 1991).

At the same time, fundamental reevaluation did occur at the level of the lower-level specialists and officials engaged in interaction with the West, even if these lessons could not immediately be put into practice—a phenomenon that Breslauer (1990: 270–271) has evocatively described as “subterranean learning.” Were it not for this inclusion of Soviet specialists and officials into broader international epistemic communities, there would have been no basis for the more fundamental policy shifts that accompanied the emergence of perestroika. However, these more fundamental changes in Soviet environmental policies came only with broader changes in the underlying domestic political environment—indicating that transnational scientific learning, although perhaps a necessary condition for the fundamental policy changes of the perestroika period, was not in itself sufficient. Moreover, most of these policy shifts proved short-lived—again, because of changes in domestic political structure—despite the fact that the scientific understandings underlying them had not changed in the meantime.

To what extent can the responsiveness of the USSR and the successor states be explained in terms of the international distribution of power? Contrary to what might be expected, during the Cold War the Soviet government was actually *more* willing to devote attention and resources to international environmental issues of interest to the West than it was to purely domestic environmental problems—even though the latter caused far more harm to the Soviet economy and population. Moreover, the most striking period of Soviet receptivity to Western environmental concerns occurred in 1986–1989, *before* the collapse of the Soviet economy or the disintegration of the USSR’s Eastern European empire. Even in the post-Soviet period, policy outcomes can only partially be understood in terms of the international distribution of power. Although the economies of the newly independent states were far more dependent upon Western assistance, trade, and investment than the USSR had ever been, there is no evidence that any of the successor states devoted significant amounts of their own resources to the amelioration of environmental problems solely in response to Western pressure.

The problem is not that these perspectives are wrong. Rather, they are incomplete: They fail to capture some of the most important dynamics generated by the interaction of international and domestic politics in both the Cold War and post–Cold War periods. In the remainder of this chapter, I will advance a model of instrumental manipulation that accounts for the paradoxical nature of East-West environmental politics in both the Cold War and post–Cold War periods, while also distinguishing between the dynamics of instrumental manipulation in the two periods. My analysis of the Cold War period focuses on the paradoxical incentive for "cooperativeness" generated by the domestic political structure of the USSR and the closely related political and military tensions of the Cold War. I will then take the model one step further to incorporate the new patterns of instrumental manipulation that have characterized the post–Cold War period.

The Importance of Projecting "Cooperativeness": Instrumental Manipulation during the Cold War

Prior to the late 1980s, the USSR was a unitary, centralized, hierarchical, and extremely authoritarian state. All key decisions were made by a small group of individuals at the apex of the Communist Party elite; elections were a sham, as were the various legislative bodies and the federal structure of the USSR itself. The state exercised tight control over the press, the arts, and all other forms of expression. The permissible scope of autonomous social activity was extremely limited, as all organized societal activity, however politically innocuous, had to be channeled through state organizations: the Communist Party, official youth organizations, state-controlled trade unions, and so on. All economic enterprises were owned or effectively administered by the state, and most decisions concerning production, distribution, and prices were made by state planners rather than by producers and consumers. This system was kept in place by the powerful secret police (the KGB), a vast network of informers, and an extensive prison system—although by the 1980s, the Soviet system had become so familiar, and its mobilizational goals so modest, that a relatively low level of outright violence and intimidation was required to sustain it.[6]

As a result of this hierarchical and centralized domestic political structure, Soviet domestic and foreign policies were decisively shaped by the leadership strategy pursued by the reigning General Secretary. Although no aspiring Soviet politician could hope to become or remain General Secretary without cultivating his own base of personal power and appealing to powerful interests within the ruling elite, political outcomes at the apex of the Soviet hierarchy were not simply the mechanical result of clashing vectors of political power or group interests. Instead, rival candidates for the position of General Secretary also sought to demonstrate that they offered innovative and distinctive solutions to the USSR's most pressing problems (Breslauer 1982, 1990, 1991; Gelman 1984; Snyder 1987/1988, 1991). This leadership strategy in turn defined the context within which subordinate political issues, such as environmental protection, were resolved. Given the extraordinary amount of power available at the apex of the Soviet political hierarchy, the appearance of a new General Secretary with a new leadership strategy could have a dramatic impact upon the overall course of Soviet domestic and foreign policy.

Each General Secretary's leadership strategy had a twofold effect upon Soviet receptivity to East-West environmental cooperation. First, each leader's strategy defined the *domestic* context of environmental politics by determining the priority of environmental protection relative to other goals and by molding the institutional framework within which environmental regulation took place. Second, and more significantly, each General Secretary's leadership strategy determined the scope available for *international* environmental cooperation by determining the desirable mix of conflict and cooperation in East-West relations.

Throughout most of the Soviet period, the USSR's relationship with the West was characterized by political rivalry and military hostility. This tense international environment was in large part the product of the underlying domestic political characteristics of the Soviet regime and the competitive foreign and military policies pursued by every Soviet leader from Stalin to Konstantin Chernenko. At the same time, however, this competition also constrained the Soviet leadership's ability to pursue other, equally desirable goals, such as economic development. Consequently, to different degrees, successive Soviet leaders sought to mollify Western hostility in order to ease the constraints that the Cold War imposed upon their preferred domestic policies.

One arena in which every Soviet leader from Brezhnev to Gorbachev sought to project "cooperativeness" was international environmental cooperation. Since the Soviet Union's most pressing environmental problems were almost entirely self-inflicted, the USSR did not need to engage in international policy coordination to secure gains in its own environmental quality. Instead, the Soviet leadership's interest in East-West environmental cooperation was driven by broader political goals, above all the desire to mitigate the tensions generated by the Cold War. Successive Soviet leaders viewed international environmental cooperation, subject to appropriate limitations and constraints, as a useful way to soothe the Western hostility and anxiety generated by less cooperative policies pursued in other realms, or (in Gorbachev's case) by previous leaders. That the USSR had little or no intrinsic interest in international environmental policy coordination was irrelevant; environmental cooperation was an excellent vehicle for projecting cooperativeness precisely because it was of greater interest to the Western states—an interest that Soviet leaders could, and did, manipulate to their advantage.

That being said, the Soviet leadership's tactical interest in international environmental cooperation did have an important trickle-down effect: Soviet participation opened windows of opportunity for Soviet and Western actors interested in the promotion of environmental protection inside the USSR.[7] The width of this window was determined by the reigning General Secretary's leadership strategy: above all, the extent to which that strategy hinged upon the moderation of East-West hostility and the promotion of East-West cooperation in nonenvironmental areas. Since Brezhnev and his immediate successors desired a fairly modest reduction in East-West hostility, the window opened by East-West environmental cooperation remained narrow prior to 1986. Since Gorbachev sought a much more fundamental reduction in East-West hostility, the window opened by his leadership strategy proved to be much, much wider indeed.

East-West Environmental Cooperation before Gorbachev

The leadership strategy devised by Leonid Brezhnev (General Secretary from 1964 to 1982) did little to advance the cause of domestic environmental protection. Brezhnev's strategy catered primarily to the interests of the most powerful segments of the Soviet elite: the military, the party *apparat*, and politically important economic sectors such as heavy industry and agriculture. The key to Brezhnev's strategy was the circumvention of far-reaching political or economic reforms through massive programs of capital investment in key sectors such as defense procurement, agriculture, and energy. Brezhnev attempted to append environmental protection to his program, particularly in those areas (such as agriculture) where environmental degradation interfered with his economic strategy (Gustafson 1981; Breslauer 1982).[8] However, the policy windows opened to environmental advocates by this strategy proved woefully narrow. The advocates of environmental protection could not direct their efforts outside of the channels controlled by the state, and when trade-offs between environmental protection and economic growth could not be avoided, the Soviet leadership almost invariably sacrificed environmental quality: After all, the groups most hostile to aggressive environmental protection were well represented in the ruling coalition, whereas its supporters were not.[9] The result, by the mid-1980s, was a nationwide environmental crisis of staggering proportions.[10]

Yet the very same leadership strategy that frustrated environmental protection at home also created opportunities for environmental cooperation abroad. By the early 1970s, it was increasingly apparent that Brezhnev's economic strategy would be unworkable without budgetary redistribution among his major constituents. To avoid this politically painful task, Brezhnev looked to the West for the additional technology and investment capital necessary to support his programs. Toward that end, he sought to counterbalance continued East-West competition with the selective relaxation of hostility and increased interbloc trade—a policy that Snyder (1987/1988, 1991) has characterized as "offensive détente."[11] Since Brezhnev risked alienating his key constituencies if he made far-reaching concessions on any of the central issues of the Cold War—the arms race, competition in the third world, human rights practices in the USSR—he looked for other ways in which the USSR could express its cooperativeness and thus mitigate the hostility of the West.

As chance would have it, a wholly new issue appeared on the international agenda in the late 1960s and early 1970s: the danger of transboundary environmental degradation. Brezhnev and his more progressive foreign policy advisers soon grasped that the USSR could project an image of cooperativeness by engaging in international environmental cooperation—a concession that posed a relatively small threat to the internal or external security of the Soviet state, yet one of considerable interest to the West. Since the important point was to appear cooperative and progressive, the actual substance of the discussions was less important. Consequently, the Soviet government seldom raised novel international environmental issues in its dealings with the West, instead responding to the issues raised by the Western countries—provided that the Soviet Union was careful to avoid entangling itself in any commitments that might interfere with its economic policies or provide ammunition for its internal or external critics.

Nevertheless, Brezhnev and his immediate successors *were* willing to undertake impressive international environmental commitments, provided that the Soviet Union's geographical position and economic policies permitted them to do so at a very modest cost, and provided that these commitments did not present an opening for Western espionage or otherwise threaten the core interests of the Soviet military and industrial elite. Thus, despite the fact that the Soviet leadership had no interest in the issue of acid rain, the USSR was instrumental in the negotiation of the 1979 LRTAP Convention and subsequently agreed to reduce its transboundary emissions of sulfur by 30 percent—a policy that required very little behavioral change thanks to plans to expand the use of natural gas in the western USSR and the fact that the prevailing winds in Europe blow from west to east. At the same time, the Soviet leadership took great care to ensure that East-West environmental cooperation did not threaten any of the core values of the Soviet elite. Thus, for example, the Soviet government excluded much of its territory from the conventions on LRTAP and pollution in the Baltic Sea, permitted no foreign inspections of its civilian or military nuclear power facilities, and refused to release any raw data on the locations or size of sources of pollution in the Soviet Union.

Despite these restrictions, the willingness of the Soviet leadership to engage in even limited environmental cooperation with the West did have palpable internal effects. East-West environmental cooperation was greeted positively by a number of groups within the Soviet political and scientific elite. In addition to environmental specialists, these enthusiasts included diplomats from the Ministry of Foreign Affairs, computer analysts and technocrats interested in global modeling, specialists in international affairs, and ideologists determined to adapt Marxism-Leninism to the demands of the late twentieth century.[12] The advocates of East-West environmental cooperation thus included individuals primarily interested in using these issues to promote the overall rationalization and opening up of the Soviet system, as well as specialists concerned about specific international environmental problems. Within the narrow boundaries open to them, these specialists were quick to take advantage of the external policy windows opened up by East-West environmental cooperation for the advancement of their own scientific and policy programs. The resulting policy reforms uniformly fell short of intentions, but a growing number of Soviet environmental specialists and officials were nevertheless able to participate in regular transnational contacts. In the process, many came to share the scientific understandings and policy prescriptions favored by their Western counterparts. Although this knowledge could not immediately be put into effect, it did constitute an important reservoir of "subterranean learning" that could quickly be brought to bear once domestic political circumstances changed (Breslauer 1990: 270–271).

East-West Environmental Cooperation under Gorbachev

When domestic political circumstances finally did change, they changed with a vengeance. Like his predecessors, Mikhail Gorbachev—elevated to the post of General Secretary in March 1985—viewed East-West environmental cooperation as one way among others to moderate the hostility of the Cold War, to project a more favorable image of the USSR abroad, and to secure Western cooperation in areas of greater interest to the USSR. The main difference between Gorbachev and his predecessors was the degree of moderation that he sought. Brezhnev desired only a limited moderation of East-West competition, and only a limited amount of interbloc economic cooperation; consequently, he was willing to engage in only limited environmental cooperation with the West.

Gorbachev, by contrast, was committed to ending the Cold War altogether and to the integration of the USSR into the world capitalist economy. He was therefore willing to sanction a massive redirection of Soviet resources toward the environmental issues of greatest interest to the West—an orientation that generated the unprecedented "greening" of Soviet foreign policy in the second half of the 1980s.

Environmental protection was one of the earliest issues around which Gorbachev sought to mobilize elite and popular support for domestic reforms, even prior to the Chernobyl disaster.[13] This emphasis was due in part to genuine concern: By 1985, environmental degradation in many areas of the USSR had reached critical levels, with deleterious consequences for both the economy and public health. Equally important from the point of view of Gorbachev and his advisers, however, were the domestic political gains to be made by calling attention to the Soviet Union's environmental woes. These potential gains grew exponentially in the wake of the Chernobyl accident. Criticism of the Soviet Union's past environmental record implied criticism of the Brezhnev regime, and, by extension, criticism of the conservative opponents of Gorbachev's reform program. The new emphasis on environmental protection also served to help rally elite and popular opinion around the emerging reform package. At the popular level, environmentalism was seen as a politically safe way to encourage pressure from below upon a recalcitrant bureaucracy; accordingly, environmentalism was one of the first popular movements permitted to flourish openly as political controls were progressively relaxed in the second half of the 1980s.

Environmental protection also figured prominently in the "new political thinking," the radically revisionist view of international relations embraced by Gorbachev.[14] From a political standpoint, this "greening" of Soviet foreign policy served a dual purpose. First, it helped to discredit the foreign policy platform of Gorbachev's opponents within the Communist Party, who, in order to maintain their privileged political positions, continued to argue that class conflict must remain the dominant consideration in international politics. To undermine this claim, and therefore the political grip of the conservatives, Gorbachev and his allies had to find convincing arguments in support of their contention that the common interests of humanity superseded class divisions and differences in social systems. What more convincing evidence could there be of this counterclaim—especially in the wake of the Chernobyl disaster—than a looming global ecological catastrophe that threatened capitalists and socialists alike?

The second target of the new emphasis upon international environmental cooperation was Gorbachev's audience abroad. He and his allies believed that a necessary condition for the success of perestroika was a major reduction in the Soviet Union's military spending and its commitments abroad, as well as the further integration of the USSR into the world capitalist economy. Since the reformers would be politically vulnerable at home if they were seen to be deliberately and unilaterally weakening the USSR's international position, they preferred to convince Western leaders to join the USSR in the disarmament process. The new regime's emphasis on the need to cooperate to save the global environment served these goals by promoting the image of a reformed, activist, humanitarian Soviet leadership and by raising the specter of a common problem that could only be averted by jointly reassigning military expenditures to environmental protection.

Although many abroad interpreted Gorbachev's enthusiasm for international environmental cooperation as further evidence of "learning" in Soviet foreign policy, in fact it was not.[15] Neither Gorbachev nor the country's leading environmental specialists had come to believe that the solution of the USSR's environmental woes depended upon the reduction of transboundary pollutants produced outside its borders. Instead, the greening of Soviet foreign policy was a continuation and intensification of the basic pattern that had prevailed before Gorbachev came to power. Like Brezhnev, Gorbachev enlisted "environmental cooperativeness" in the service of his broader foreign and domestic policy goals. The key difference was the extraordinary and unprecedented degree of cooperativeness that Gorbachev sought to project.

The primacy of these broader political aims in the new emphasis on international ecological interdependence was reflected in the vague character of the references to international environmental problems made by the Soviet leadership in the late 1980s. Gorbachev, Shevardnadze, and other prominent "new thinkers" seldom referred to specific environmental problems when referring to global ecological interdependence, and even the Chernobyl disaster itself was usually invoked only in the same breath as nuclear disarmament. The Soviet government's chief international environmental initiative—the creation of an international environmental "rapid deployment force" under the aegis of the United Nations—was a rather modest and generic proposal, unconnected to any particular environmental concern.[16] This is hardly surprising, since the key proponents of the "new political thinking" were not environmental specialists, but high-ranking ideologists and experts in international affairs.[17] These individuals moved in entirely different circles from the specialists and diplomats involved in concrete questions of international environmental cooperation, and the various groups were only vaguely aware of one another's activities.[18]

Just as in the pre-Gorbachev period, however, the Soviet leadership's instrumental manipulation of Western environmental concerns had a trickle-down effect, providing otherwise unavailable resources to the lower-ranking specialists and diplomats concerned with specific environmental issues. But now, because of the fundamentally more radical character of the leadership strategy pursued by Gorbachev, that trickle turned into a flood. Gorbachev's reform campaign opened up vast new windows of opportunity for Soviet advocates of environmental protection, both at home and abroad. Within the USSR, the regulatory structure of environmental protection was reformed, and new opportunities were provided for autonomous public action. Internationally, Soviet diplomats and environmental officials were encouraged to adopt the boldest and most conciliatory positions possible in negotiations over specific environmental issues, a shift that resulted in far-reaching commitments to stem the transboundary flow of pollutants from the USSR and a dramatic increase in the ability of Soviet officials to share environmental information freely with their Western counterparts.

As a result, the specialists and diplomats concerned with specific transboundary environmental issues increasingly dominated the formulation of the details of Soviet environmental diplomacy from 1986 onward. In each of the three cases under consideration, Soviet policies shifted dramatically as these officials—many of whom had participated in the increased East-West interaction fostered by Brezhnev's earlier, more limited interest in détente—sought to bring their country's practices in line with those advocated by their respective "epistemic communities." In the wake of the Chernobyl accident, the Soviet government released a flood of information relating to the disaster and Soviet nuclear power in general, and the USSR began to participate much more actively in the safety programs of the International Atomic Energy Agency. Even bolder positions were taken with regard to pollution in the Baltic Sea and transboundary air pollution. In both cases, the barriers to the free exchange of information were gradually eliminated, and the Soviet government agreed to ambitious targets for reductions in its emissions of transboundary pollutants. Unlike the sulfur protocol, to which the USSR had agreed in 1984, these new commitments would have involved enormous capital investments and the fundamental restructuring of the entire industrial base of the northwestern USSR.

Great Expectations, Dashed

The greening of Soviet foreign policy was destined to be short-lived, because of the destruction of the twin pillars upon which it rested: the centralized, hierarchical structure of the Soviet political system, and the incentives for cooperativeness generated by the Cold War. First, as Gorbachev met with growing opposition to his reform campaign within the economic and political elite, he responded by redefining his strategy in an increasingly radical direction, encouraging ever-greater popular political participation in order to exert ever-greater pressure upon his opponents from below. From 1989 onward, increasingly competitive elections were held to legislative bodies at the federal, republican, regional, and local levels: as a result, these bodies were filled by a growing number of noncommunist, anticommunist, and even anti-Soviet politicians. The newly elected politicians in the peripheries used these rejuvenated structures to challenge not only recalcitrant local and regional Communist Party officials, but also the primacy of the federal government in Moscow, and ultimately the continued existence of the Soviet Union itself. Rising nationalism in the non-Russian republics and the unexpectedly rapid collapse of the Soviet command economy fueled this centrifugal process.

As the structure of politics within the Soviet Union changed, so too did the constellation of forces that could be brought to bear in environmental politics and the motivations of the actors involved. The lifting of state controls over the press and independent political organization led to an unprecedented explosion of environmental activism; more importantly, the subsequent introduction of competitive elections led to the creation of autonomous legislative and executive bodies—including new bodies tasked with environmental protection—at the republic, regional, and local levels. In the process, the central policymaking elite—including the specialists and officials concerned with international environmental cooperation—increasingly lost control over the formulation of environmental policy in the USSR. Moreover, as the USSR dissolved, so too did the Cold War, and along with it the incentives that had driven the greening of Soviet foreign policy in the first place. The new actors at the subnational level were not interested in international cooperation for cooperation's sake, or in defining their environmental priorities in accordance with the interests of the West. Instead, they were interested in international cooperation only to the extent that it would increase the resources available for the solution of their own *internal* environmental and economic problems.

To make matters worse, the final collapse of the Soviet system was not accompanied by an increase in popular support for environmental protection, but the reverse: Faced with economic shortages, political instability, and in some instances open warfare, ordinary citizens and politicians alike lost interest in the immediate solution of the USSR's environmental problems. By December 1991, when Ukraine's vote for independence delivered the coup de grâce to the still shuddering corpse of the USSR, interest in environmental protection at both the official and popular levels had already plummeted to a record low. In the process, most of the promising political gains made by Soviet environmentalists—whether with the help of international cooperation, or despite it—came to naught. As a result, the environmental promise set forth during the heady summer days of perestroika—the vision of a rejuvenated and reformed USSR, willing and able to independently implement ambitious domestic and international environmental commitments—remained unfulfilled.

However, the demise of perestroika and the collapse of the USSR did not spell the end of East-West environmental cooperation. On the contrary, with the end of the Cold War and the disintegration of the USSR, East-West environmental cooperation actually intensified—and took on a wholly new form.

Transnational Subsidization and Its Consequences: Instrumental Manipulation after the Cold War

Even before the formal dissolution of the USSR in December 1991, the chaos that attended its disintegration made it clear that the old model of East-West environmental cooperation—one in which a unified, centralized USSR would be responsible for the financing and implementation of its own environmental commitments—was no longer realistic. Environmental protection proved to be a relatively low priority for the newly independent states that succeeded the Soviet Union in the fall and winter of 1991. Confronted with a deepening economic recession, administrative chaos, and political violence, most citizens and politicians in the new states were more concerned with basic survival than with improved environmental quality.[19] At the same time, in response to the ever-greater flow of information about the poor state of environmental protection and nuclear power safety in the former Soviet Union, the affluent capitalist states grew ever more anxious to reduce the magnitude of the transboundary environmental dangers emanating from the newly independent states.

Consequently, in 1990–1991 the Western states adopted a new set of strategies designed to overcome the persistent obstacles to environmental protection and nuclear safety in the newly independent states. The most revolutionary of these new strategies was transnational subsidization: offers to contribute to the cost of specific environmental protection measures designed to reduce the transboundary environmental threats posed by the newly independent states. The newly independent states in turn responded to the prospect of transnational subsidization with new forms of instrumental manipulation, setting the trend that would dominate East-West environmental politics in the 1990s. After a brief overview of the Western strategies employed in order to promote environmental protection and nuclear safety in the newly independent states, the remainder of this chapter will be devoted to the logic, politics, and consequences of transnational subsidization—a strategy that has provided the most propitiously situated successor states with a whole new range of opportunities to manipulate the transboundary environmental concerns of their more affluent and environmentally sensitive Western neighbors.

The New Shape of Post–Cold War Environmental Cooperation

As the highly centralized domestic structure of the USSR gave way to much more decentralized political and economic decision making in the newly independent states, external environmental advocates found it increasingly easy to gain access to the various actors with real or putative responsibility for nuclear safety and pollution control. Indeed, as the number of actors involved multiplied, so too did the possible points of access. Where once everything had been channeled through Moscow, political decision-making power was now dispersed among fifteen independent states and among the regional and local governments within them. In addition, the directors of individual plants, industrial conglomerates, and public utilities gained much greater leeway to negotiate directly with the representatives of foreign organizations. All of these actors could, and did, seek to participate in international environmental cooperation.

At the same time, this dispersion of authority, together with persistent political and economic instability, made it increasingly difficult to identify actors in the newly independent states that were willing and able to undertake effective environmental protection measures at their own expense. The environmental regulators in the newly independent states were politically weak, understaffed, and underfunded; the directors of factories and power plants had the power to control their own emissions but little interest in doing so; and elected officials either viewed environmental problems as a low priority, or lacked the funds necessary to cope with them. In any case, responsibility for environmental protection and industrial safety within the newly independent states was often unclear and constantly shifting. As a result, Western governments, NGOs, and international organizations found that increased access did not necessarily translate into increased influence over the policies pursued by the newly independent states.[20]

In the face of these persistent obstacles to effective environmental protection in the former socialist bloc, external actors adopted four main strategies designed to improve environmental policymaking and reduce the danger of transboundary pollution: (1) technical assistance and other forms of capacity building; (2) the promotion of indigenous nongovernmental environmentalism; (3) the promotion of market reforms designed to bring about the more efficient use of energy and other inputs; and (4) the direct subsidization of specific measures designed to reduce transboundary environmental threats emanating from the former socialist bloc. These strategies were viewed as mutually reinforcing, so that any given assistance program typically displayed a mix of several or all of them.[21]

Programs geared toward *technical assistance and capacity building* were designed to increase the ability of actors within the newly independent states to monitor, assess, and resolve their own environmental problems. The donors and foreign institutions conducting these programs were quite diverse, as were the program targets. The donors included foreign governments, the European Union, international lending institutions, public utilities, national environmental protection and nuclear regulatory agencies, NGOs, and private foundations such as the Soros and MacArthur Foundations. The targets included virtually all types of actors involved in environmental protection and nuclear safety in the newly independent states: natural scientists, environmental officials, nuclear regulators and plant operators, foresters and game wardens, military officers, and managers and engineers at power plants, factories, and municipal wastewater treatment plants. These efforts led to extensive foreign penetration of virtually all government agencies, public utilities, and scientific institutes involved in environmental protection and nuclear safety, through joint projects, training programs, technical support, and the insertion of on-site foreign advisers. They were also characterized by attempts to transplant Western technology, legislation, standards, and operating procedures to the newly independent states.

The second strategy was the *promotion of nongovernmental environmentalism* in the newly independent states. After the unprecedented wave of nongovernmental environmentalism that arose in the perestroika period peaked in 1989–1990, it even more quickly subsided. Many of the most prominent organizers of the environmental movement of the late 1980s left to pursue careers in business or politics, and those groups that remained tended to be politically weak and fragmented, often consisting of no more than a few individuals. External actors, startled by the unexpected evaporation of organized public opposition to pollution and nuclear power in the newly independent states, moved in to fill the gap with money and organizational assistance. By the mid-1990s, a large number of Western governments and NGOs had become directly involved in the creation, organization, financing, coordination, and programmatic direction of hundreds of environmental NGOs throughout Eastern Europe and the former Soviet Union. Indeed, it would have been difficult to find any indigenous environmental NGO of any size that was not the recipient of some form of external financial support.

The third strategy was the *promotion of economic reforms* designed to bring about more efficient energy and natural resource use and the closure of older, inefficient enterprises and power plants. The newly independent states were encouraged to privatize state-owned enterprises and end state subsidies to them, in the hope that these firms would either learn to operate more efficiently, find more experienced foreign business partners, or shut down altogether. The newly independent states were also pressured to increase prices for fossil fuels, electricity, natural resource use, and municipal water and sewer services above the costs of providing them, and to collect payment for these inputs and services more effectively. These efforts were not restricted to "environmental" aid programs. Instead, they were part and parcel of the broader Western goal of promoting the development of capitalism in the former socialist states, and measures such as the deregulation of energy prices were often attached as conditions to loans made by the International Monetary Fund and other international lending institutions.[22]

The fourth strategy—and the one that consumed the largest share of Western financial resources—was *transnational subsidization*: direct external financing for the implementation of specific environmental protection measures in the newly independent states. Prior to the disintegration of the Soviet Union, most environmental specialists and officials (both in the USSR and abroad) had assumed that the Soviet government was capable of autonomously implementing more aggressive environmental protection measures, provided that it could be convinced of the desirability of doing so. In other words, the problem was the will, not the way. By the close of 1990, however, this was manifestly no longer the case: Newly elected politicians at all levels of the crumbling Soviet hierarchy recognized that more needed to be done to arrest the ecological disaster generated by decades of official neglect, but they also pled—with considerable justification—that they lacked the administrative and economic wherewithal to take the necessary actions. Faced with these rapidly changing circumstances, foreign governments and international lending institutions adopted a new strategy: They sought to elicit specific behavioral changes in the newly independent states by offering to pay part or all of the cost associated with them. In most cases, these offers of transnational subsidization were designed to reduce or eliminate *transboundary* environmental threats emanating from the newly independent states: municipal and industrial pollution in the Baltic Sea basin, transboundary air pollution in border regions, the danger of further nuclear power plant accidents, the dumping of radioactive wastes at sea, and so on. In other words, where persuasion failed—as it usually did—those threatened by pollution from the former USSR resorted to bribery.

Of these four strategies, transnational subsidization represented the most revolutionary innovation in international environmental politics. To begin with, transnational subsidization led to the involvement of foreign officials and consultants in the most minute details of environmental policymaking in the newly independent states: the identification and prioritization of the sources of environmental degradation, the selection of the most appropriate technical and regulatory solutions, the cross-national distribution of the costs, and the creation of the mechanisms by which the recipient states would generate the funds necessary to pay back loans and any remaining costs. The result was an unprecedented internationalization of environmental policymaking in the newly independent states: By the early 1990s, key decisions about whether and how to deal with particular sources of pollution in the newly independent states were as likely to be made in London, Brussels, or Helsinki as in Kiev, Moscow, or Tallinn. However, it would be wrong to conclude that the affluent capitalist states were now able to easily impose their preferences upon the newly independent states, or that subsidization provided a panacea for the environmental concerns of either the Western donors or the newly independent states. On the contrary, East-West environmental politics grew more contentious in the 1990s than at any previous time.

To a considerable extent, this conflict stemmed from the new incentives for instrumental manipulation generated by the introduction of transnational subsidization as the centerpiece of Western environmental diplomacy. Instrumental manipulation now took on a much more aggressive and confrontational form than it had during the Cold War period. During the Cold War, the whole point of the instrumental manipulation of the Western states' transboundary environmental concerns had been to express the Soviet Union's willingness to cooperate, and thus to ease the barriers to East-West cooperation in other areas of greater interest to the Soviet government. With the Cold War over, that incentive no longer came into play. Instead, the newly independent states now sought to manipulate the Western states' environmental concerns in order to extract money from them: money for environmental protection *and* for economic development. Moreover, when the interests of the newly independent states and the Western states diverged, the newly independent states proved more than willing to engage in hard bargaining, recalcitrance, and even extortion to manipulate the interests of the Western states to their advantage.

This leads us to the following questions: What were the motives that underlay the introduction of transnational subsidization, and why, from the donors' perspective, did subsidization have unintended and undesirable consequences in addition to those its architects desired? What were these consequences? How were the potential recipients—in this case, the newly independent states—able to manipulate the environmental concerns of the more affluent states to secure financing for projects of interest to the recipients? We now turn to these questions.

The Politics of Transnational Subsidization

In principle, international environmental diplomacy is governed by the maxim that we were all supposed to learn in kindergarten: Clean up your own mess (Fulghum 1988). The principle that each state is responsible for controlling the transboundary effects of pollution generated within its borders—the international equivalent of the "polluter-pays principle"—is enshrined in the 1972 Stockholm Declaration and in virtually every subsequent international legal document pertaining to environmental protection. In practice, of course, things are not quite so simple. The average kindergartner is perfectly happy to leave his or her mess for someone else to clean up; similarly, in the adult world, most polluters will resist assuming the costs of pollution abatement in the absence of government intervention. In international environmental politics, the absence of any supranational authority capable of enforcing the polluter-pays principle reinforces this reluctance to engage in self-regulation. Consequently, in most cases in which polluters and the victims of pollution find themselves separated by international boundaries, the victims must rely on their own resources to persuade polluters to reduce transboundary environmental threats to an acceptable level. One possible response is a direct financial incentive to reduce emissions or to improve industrial safety—in other words, a bribe.

Although international "environmental bribery"—that is, transnational subsidization—emerged on a large scale only in the 1990s, the idea that victims might pay polluters to reduce emissions is not new. In a seminal 1960 article entitled "The Problem of Social Cost," economist Ronald Coase argued that domestic disputes over "negative externalities" (i.e., pollution and other undesirable side effects of economic activity) could be resolved without direct governmental regulation. In the absence of transaction costs, Coase argued, market transactions would cause externalities to be reduced to the same, socially optimal level, regardless of the prior distribution of property rights—that is, regardless of whether the polluter had the right to pollute or the victim had the right to a clean environment. If the victim had the legal right to a clean environment, then the polluter would pay the victim to accept that level of pollution at which the marginal benefit to the polluter of an additional increment of production would equal the marginal cost to the victim of an additional increment of pollution. By the same token, if the polluter held the right to pollute, then the victim would pay the polluter to reduce emissions—again, to the identical point at which the marginal benefit of another increment of cleanliness would equal the marginal cost of the foregone production (Coase 1960:2–8). Subsequent commentators dubbed this the "Coase theorem."[23]

Naturally, Coase recognized that transaction costs in the real world were not equal to zero: In fact, he was primarily interested in those real-world cases in which transaction costs were greater than zero and in which the assignment of property rights was itself in dispute. In such cases, Coase argued, judges should act to maximize the social value of production by assigning property rights—for example, the right to pollute, or the right to a clean environment—to the party with the higher transaction costs (Coase 1960:15–19). Although Coase did not fully spell out the implications of this maxim, in practice it would tend to favor victims. Polluters tend to have more concentrated interests and be fewer in number than victims, whose interests are more diffuse and who may number in the hundreds, thousands, or even millions; the latter therefore face much higher barriers to collective action (i.e., transaction costs) than do the former.[24]

At first glance, the world described by Coase might not seem particularly relevant to international environmental politics. Although the government does not intervene directly as a regulator in Coase's model, government nevertheless figured prominently in his account. Coase presumed the existence of judges able to assign and reassign property rights, which in turn presumes a common, authoritative legal system with powers of enforcement. Even where property rights themselves were not in dispute, Coase assumed that the costs of contracting would be fairly low—which again presumes an authoritative legal system to which the parties could turn in the event of a breach of contract. By contrast, in international environmental politics there is no overarching government or authoritative legal framework. Transaction costs are not only greater than zero, they are considerably higher than in domestic bargaining. The costs of monitoring and enforcing agreements are also much higher, and there is a much greater danger that partners will prove unable or unwilling to implement bargains as intended. Finally, property rights in the international system cannot be easily reassigned, particularly if land borders are involved—at least not by any means short of war.[25]

Nevertheless, the increasing popularity of transnational environmental subsidization indicates that the dynamic described by Coase is indeed at work in international relations.[26] For all of the lip service paid to the polluter-pays principle, international environmental politics remains a "victim pays" world. Victims can of course use means of persuasion other than direct financial incentives—sanctions, linkage to other issues, or even the threat of force—but all of these impose costs upon the victim as well. Consequently, in a growing number of cases, the victims of transboundary pollution have decided that the most effective way to improve their own environmental quality is to subsidize environmental protection in other countries—even if the results are far from optimal. However, the parsimonious model Coase presented fails to capture all of the interests that feed into the politics of transnational subsidization, whether on the part of the "victims" (the donors) or the "polluters" (the recipients). Specification of these broader interests is critical, because they play a crucial role in shaping the conditions under which transnational subsidization is likely to be attempted, and the form that it is likely to take. Before turning to the unintended consequences of transnational subsidization, then, we need to examine the underlying interests of both donors and recipients in more detail.

Donor Interests As the Coasian model suggests, donor states—that is, victims interested in offering a transnational bribe—are interested first of all in minimizing ongoing or potential transboundary environmental contamination. Generally speaking, there are two circumstances under which this problem may arise. First, effluents generated in one state may directly contaminate the territory of another. This is the position in which "downstream" or "downwind" states find themselves relative to their "upstream" or "upwind" neighbors, and it is the class of transboundary environmental issues most similar to the domestic cases Coase analyzed. Although the victims in such cases can take unilateral measures to minimize the impact of these emissions—a compensatory reduction of their own emissions, or defensive measures such as the liming of lakes vulnerable to acidification—such measures are often ineffective or prohibitively expensive. By 1990, for example, many Nordic scientists and environmental activists believed the Russian nickel smelting industry to be responsible for extensive forest damage in the adjacent areas of Norway, Finland, and Sweden. Yet even if the Nordic countries stopped producing air pollution altogether, this would not have brought the levels of sulfur and heavy metal deposition in Lapland down to an acceptable level. Likewise, no amount of safety improvement at one's own nuclear power plants can have any effect on the risk of an accident in a neighboring country. As a result, in these and other cases, Western countries found it in their interest to pay for environmental protection in the former socialist bloc.

Alternatively, transnational subsidization may be a response to the degradation of a common resource shared by a number of states, such as an international waterway, the sea, or the global atmosphere. If none of the states involved can be excluded from use of the resource, then each will have an incentive to exploit that resource to a significantly greater extent than if the resource fell within the sovereign jurisdiction of one state alone. This will ultimately lead to the overexploitation and permanent degradation of the resource: the so-called tragedy of the commons (Hardin 1968). However, although the degradation of a common resource is the product of the sum of the activities of all of the states that make use of it, damages, responsibility, and the marginal cost of emissions reductions are rarely distributed equally among them. Some states will suffer more than others, perhaps as a result of their geographical position, or of cultural, economic, or political attributes that lead them to place a higher value on environmental quality. By the same token, others may bear more responsibility for the problem or suffer less as a result of it. Moreover, some states may have already invested considerable resources in environmental protection or energy efficiency, making further increments of "cleanliness" quite expensive, whereas others may have invested relatively little. Under these conditions, some or all of the "leaders" may be willing to pay some or all of the "laggards" to reduce their contribution to the degradation of the commons—provided that this promises to be significantly more cost-effective than further investments in domestic pollution control.[27] The broader point here is that Coasian bargaining can emerge in response to transboundary environmental degradation even if the amelioration of that degradation has the characteristic of a public good: that is, even if there are multiple "victims" involved, none of whom can be excluded from enjoying the benefits of transnational subsidization for failing to contribute to the collective "bribe."[28] In East-West environmental politics, the foremost example of this type was the international effort to clean up the Baltic Sea.

In the case of nuclear power safety, fears of *political* contamination also came into play. Almost all of the major Western donors depended upon nuclear power for a considerable portion of their own electricity generation, so the risk of further accidents in the former Soviet bloc placed them in a double bind. First, there was the danger of transboundary environmental contamination: The toxic "plume" generated by the Chernobyl disaster drifted across much of Europe before dissipating, in the process exposing the citizens of a number of other countries to sharply elevated levels of radiation. But beyond that, Chernobyl very nearly destroyed public acceptance of nuclear power in the West, and another accident might finish it off altogether. Consequently, the strongest proponents of nuclear safety assistance to the former socialist states tended to be those national agencies, utilities, firms, and international organizations committed to the use of nuclear power in other countries.

This observation with respect to nuclear power can be stated in a more general form: Transnational environmental subsidization is to a considerable extent driven by the *economic* interests of the donors. In the Coasian model, the victim who pays a polluter to reduce production receives no benefit beyond the anticipated reduction in the environmental degradation generated by the polluter. But in the real world of international environmental politics, the distribution of the economic benefits of a transnational bribe is at least as important as the reduction in transboundary pollution or risk that such a payment is ostensibly intended to bring about. Donor economic interests have a threefold effect upon transnational subsidization programs: They shape who does the work and what sort of work gets done; they shape the distribution of contributions among the donors; and they may lead a state to engage in transnational subsidization even in the absence of any transboundary environmental damage from the source in question.

First, unlike the victims in Coase's model, importers of transboundary environmental degradation are not willing to simply pay polluters in other states to reduce production, because this would not allow the "victims" to recoup any of the economic benefits involved. Instead, the donors prefer technical solutions that provide work for their own firms: the modernization of existing facilities, or the construction of new ones. Consequently, offers of transnational subsidization are typically tied to the purchase of services and technology from the donor countries, or the inclusion of the donor countries' firms in joint projects. In effect, then, transnational environmental subsidization serves a dual purpose: It reduces transboundary environmental degradation, and it subsidizes the foreign operations of the donor states' own firms. These economic considerations affect not only who does the work, but also what sort of work gets done. For example, Nordic metallurgical engineering firms led the campaign to link the modernization of Russia's antiquated nickel smelting industry on the Kola Peninsula to forest damage in Lapland, in anticipation that they would secure highly profitable contracts to carry out the work. Likewise, the economic interests of the Western nuclear industry played a key role in shaping the international response to nuclear safety problems in the former socialist states—namely, to modernize them with Western nuclear technology, rather than to replace them with some alternative form of energy production.

Second, donor governments pay close attention to the *interdonor* distribution of the economic benefits of transnational subsidization. Where more than one donor is involved in a given project, the amount of financing each contributes tends to reflect the size of the contracts awarded to its firms, rather than its relative sensitivity to the transboundary environmental problem in question. When, for example, a Norwegian engineering firm beat out its Finnish rival in the competition for the tender to renovate the Russian nickel smelting industry on the Kola Peninsula, Finland sharply reduced its proposed contribution to the cost of the project, despite the fact that the relative sensitivity of the two countries to the Russian emissions had not changed. Where environmental assistance is channeled through multilateral institutions such as the World

Bank or the European Bank for Reconstruction and Development (EBRD), this link is less rigid, but still relevant: If donors do not, on balance, expect to receive economic benefits commensurate with their contributions, they may simply channel more of their environmental aid through bilateral or ad hoc channels—a response that may undercut efforts to pool donor resources and thus diminish the bargaining power of the donors vis-à-vis prospective recipients (Connolly 1996:351–354).

Finally, economic interests may motivate states to engage in transnational environmental subsidization solely as a tool of industrial policy, in the absence of any environmental threat whatsoever. In the Baltic Sea case, for example, the interests of domestic engineering firms motivated such "offstream" states as France, Switzerland, and the United Kingdom to finance municipal wastewater infrastructure development in Poland and the former USSR, even though this could bring them no palpable ecological benefit.[29]

Beyond environmental and economic considerations, donors may have other motivations for offering to subsidize the implementation of environmental protection measures in other states. For example, offers of transnational subsidization may be driven by broader political and economic considerations analogous to those that guide other types of foreign aid. Environmental aid may be used to express support for a friendly but shaky foreign government, or as a side payment to elicit cooperation on some other issue of interest to the donors. For example, Ukraine, Belarus, and Kazakhstan were compensated for the removal of Soviet-era nuclear warheads from their territory with large sums of environmental and other types of assistance—a bargain that had the unintentional effect of impressing upon the newly independent Ukrainian government the benefits of demanding a high price for the reduction of negative transboundary externalities generated within its territory. External environmental assistance may also be motivated by altruism: by genuine sympathy for the difficult situation in which the citizens of impoverished and environmentally degraded states find themselves. The problems tackled do not always have significant transboundary effects, and the solutions chosen do not always advance the economic interests of foreign firms. But it must be said that those programs that do not appeal directly to the economic and environmental interests of the major donors tend to be much more modest in scope—and much less closely monitored for effectiveness—than those that do.

Recipient Interests Donor willingness to invest in environmental protection in other states is only half of the story. If transnational subsidization is to be successful, then the intended recipient must be willing and able to pay the remaining costs, assume the responsibility for paying back loans, and ensure that the subsidized facilities are maintained and operated as intended. What interests might lead potential recipients to agree to such an arrangement?

To begin with, potential recipients may have *environmental interests* of their own. The sharp distinction Coase draws between polluters and victims is misleading when applied to international environmental politics, because states can rarely externalize all of the environmental costs of urbanization and domestic production. The sources of transboundary pollution often (though not always) cause direct local damage as well, and polluting states may suffer adverse indirect effects due to the degradation of international commons. To the extent that the measures desired by external victims will also reduce internal environmental damage, governments in polluting states—whether at the national, regional, or municipal level—may be willing to assume part of the cost for environmental protection projects. This is especially true when environmental protection is a "lumpy" good—that is, when one cannot simply purchase whatever increment one desires, but must instead invest in large, expensive chunks like municipal wastewater treatment plants. Such a convergence of interests makes possible a *partial Coasian payment*: The victim state may seek to reduce the cost of environmental protection measures just to the point at which domestic environmental interests will motivate the polluting state to pick up the rest of the tab.

That being said, two important caveats are in order. First, recipient environmental interests are not a straightforward function of the "objective" severity of the environmental problem in question. These interests also depend on political and economic factors: the strength of the indigenous environmental lobby, available economic resources, overall political stability, and the distribution of political power among national, regional, and local authorities. In many cases, even where an internal environmental problem is quite serious, national, regional, or local governments may be unwilling or unable to devote significant resources to the amelioration of it. Second, the existence of *internal* environmental interests—even politically salient ones—does not necessarily imply the existence of corresponding *external* environmental interests. For a source of local environmental damage to be a truly promising candidate for external subsidization, it must also pose a transboundary threat—and it must pose a transboundary threat not just to any state, but to one (or more) with the will and means to engage in the expensive business of transboundary subsidization. If either of these caveats is not met, then transnational subsidization cannot be based upon convergent environmental interests.

However, the existence of convergent environmental interests is not the only hook upon which to hang transnational environmental subsidization—nor is it, in and of itself, a sufficient basis for successful joint implementation. Would-be donors must also appeal to the *economic interests* of governments and polluters in the recipient states. The reasons for this are twofold. First, environmental regulators in potential recipient states tend to be weak relative to other domestic actors, and so they are rarely in a position to impose solutions that are not to the liking of the more powerful and autonomous firms and public utilities. In other words, transnational subsidization often cannot succeed without the voluntary cooperation of the organizations directly responsible for the generation of the negative externality in question. If proposed joint projects do not serve the interests of these organizations, then they have no incentive to cooperate. Second, governmental authorities in the recipient states often lack sufficient financial resources to contribute large sums of money to the implementation of joint environmental projects. If the donors are not willing to shoulder the entire cost of joint projects—as they usually are not, particularly if the projects are large and expensive—then joint projects must be at least partially self-financing: That is, the investments involved must generate an income stream that can be used to repay credits and cover the costs of maintenance and operation over time. Such an income stream will quickly dry up unless it is in the polluting organization's interest to participate in externally subsidized projects as intended.

What are the recipients' economic interests? The directors of nuclear power plants, factories, and public utilities have some interest in improving operational safety and reducing pollution, but these are not their main concerns. Their main concerns are staying in business, maximizing their profits, and increasing or safeguarding their organizational autonomy. The directors of polluting enterprises, power plants, and public utilities in recipient states can therefore be expected to press for technical solutions that enhance their prospects for organizational survival and prosperity: solutions that extend the life of existing facilities, or that replace obsolete facilities with new ones that remain under their control. These preferences resonate with local, regional, and national government officials, all of whom have a convergent interest in minimizing the social costs of economic restructuring and insuring greater stability and self-reliance in energy, industrial, and agricultural production.

This raises the possibility of a critical overlap in the economic interests of the donors and recipients. As noted above, donors are not willing to simply pay polluters to reduce production, as this will not allow the donors to recoup any of the economic benefits of transnational subsidization. The donors therefore *also* prefer technical solutions that involve the modernization of existing facilities or the construction of new ones—provided that their own firms conduct the work. However, the need to appeal to the economic interests of the recipients limits the extent to which the donors can dictate the terms of an agreement. First, firms, utilities, and governments in recipient states may resist solutions that threaten to "crowd out" indigenous producers. Thus, the powerful nuclear industry in Russia and Ukraine successfully opposed the wholesale replacement of indigenous technology with components or turnkey plants imported from the West. Secondly, powerful firms (or their still more powerful parent companies and ministries) will resist any transnational solution that involves the replacement of older facilities by newer ones under the control of a different firm or organization—such as the proposal that elderly Soviet-built nuclear power plants be shut down early and replaced with thermal power plants. Since the modernization of existing facilities tends in any case to be considerably less expensive than the construction of entirely new ones, this was typically the solution around which donor and recipient economic interests coalesced in the post–Cold War period.

Unintended Consequences: Moral Hazard, Polluter Life Extension, and Blackmail

The introduction of transnational subsidization as a tool of Western foreign environmental policy fundamentally altered the dynamics of East-West environmental cooperation. There can be no doubt that most of the progress in environmental protection in the post–Cold War period—at least to the extent that this progress depended upon positive action, rather than the windfall reductions in emissions that accompanied economic recession—would not have occurred in the absence of joint financing and implementation. However, the introduction of transnational subsidization also shaped post–Cold War environmental politics in ways that neither donor governments nor environmental activists intended or desired. The three most notable unintended consequences were moral hazard, polluter life extension, and donor vulnerability to extortion or environmental blackmail on the part of would-be recipients.

Moral Hazard From the perspective of the donors, one unintended and undesired consequence of transnational environmental subsidization is "moral hazard." This term originated in the insurance industry, where a "hazard" is any condition that increases the probability of loss. Physical hazards are those that arise from the relatively immutable nature of the insured property or person (e.g., the value of an automobile, or a person's age). Moral hazards, on the other hand, are those that arise due to the deliberate actions of the insured person. It has long been recognized that the purchase of insurance tends to make the insured party more risk-acceptant: For example, a person with good medical insurance may be more likely to engage in risky activities such as rock climbing or jet boating than he otherwise would have been, and persons with comprehensive property insurance tend to invest less in security precautions than those with no such insurance (Heimer 1985). Generally speaking, moral hazard may be defined as "a disposition on the part of individuals or organizations to engage in riskier behavior than they otherwise would, because of a tacit assumption that someone else will bear part or all of the costs and consequences if the incurred risk turns out badly" (Wolf 1999:60).[30]

Thus conceived, moral hazard is by no means restricted to the insurance business. Governmental guarantees of bank deposits reduce the incentives for depositors to monitor the behavior of the banks in which they keep their money and may encourage banks to incur greater risks in their loan-making and investment activity then they otherwise would—as, for example, in the U.S. savings and loan crisis of the 1980s (Prescott 1999).[31] Moral hazard may also come into play *in advance* of any formal contract or rule change, if an actor *anticipates* that others will subsequently step in to share the costs if that actor's risky behavior turns out badly, or that others will step in to pay for measures that will diminish the potential risks. For example, many critics of emergency "bailout" loans to states threatened by rapid currency devaluation and capital flight argue that this practice has the effect of encouraging greater risk taking on the part of host governments and foreign investors. Even if prospective "lenders of last resort" are careful to offer no firm assurances that further bailouts will be forthcoming, the result is nevertheless greater risk taking and an increase in the likelihood that even larger bailouts will be needed in the future.[32] We may label behavior of this type *anticipatory* moral hazard.

Once transnational subsidization emerges as a prospective vehicle for international environmental cooperation, it immediately generates anticipatory moral hazard. The mere *prospect* of transnational subsidization—well in advance of the conclusion of formal international negotiations—will encourage potential recipients to accept higher levels of ecological risk than they might otherwise have been willing to live with, in the expectation that their more affluent and environmentally sensitive neighbors will furnish the resources necessary to reduce that risk to an acceptable level. Very often, as noted above, the facilities or practices that generate transboundary environmental threats pose far more severe local hazards, and pollution-exporting states may also suffer from the degradation of common resources such as the Baltic Sea and the Earth's ozone layer. However, if the *transboundary* effects of these activities will induce other states to pay all or part of the cost of measures that will also mitigate *internal* environmental damage, then the potential recipients have no incentive to take unilateral action to address the problem. On the contrary, the government of a pollution-exporting state in such a position has a positive *disincentive* to undertake unilateral environmental investments, since this would only diminish the probability of transnational subsidization. Likewise, the prospect of transnational subsidization may encourage potential recipients to pursue economically profitable but environmentally risky activities, such as the continued operation of aging, unsafe nuclear power plants, safe in the knowledge that their more affluent and environmentally sensitive neighbors will step in with the money and technology necessary to minimize the risks involved. In other words, the prospect of transnational subsidization provides pollution-exporting states with a form of insurance against the negative environmental consequences of their own actions.

Polluter Life Extension Polluter life extension is a second consequence of transnational subsidization that may be undesirable from the perspective of donor governments and/or environmentalists. Like moral hazard, polluter life extension may occur either before or after the conclusion of a formal agreement or contract.

Let us begin with "postcontractual" polluter life extension. Once an agreement has been reached and implemented, transnational subsidization almost invariably extends the service lives of environmentally threatening facilities. As noted above, the economic interests of both donor and recipient tend to push transnational subsidization toward the modernization of existing factories and power plants, rather than the closure or replacement of them. Although this may be in the *economic* interests of the firms and utilities involved, it is not necessarily in the *environmental* interests of either the donor or the recipient. The reason for this is simple: Although a modernized factory or nuclear power plant may be cleaner or safer than it was before (assuming that the modernized facility continues to be operated as planned, which can by no means be taken for granted), the renovated facility is unlikely to be as clean or safe as it would be if it were shut down altogether. This is particularly true when existing facilities are technologically antiquated, as is the case throughout much of the former Soviet bloc. For example, most Western safety experts agreed that Soviet-designed nuclear power plants could never be brought up to contemporary Western standards, no matter how much money was poured into them. Yet if these facilities were modernized with Western assistance, they were likely to remain in operation significantly longer than they otherwise would have, even if—one hoped—at a lower level of pollution or risk.

Transnational subsidization may encourage polluter life extension *in advance* of an actual agreement. This occurs when the prospect of subsidization encourages governments and parent companies to prolong the operation of environmentally threatening but economically threatened facilities, in the hope that environmental assistance will lead to externally financed modernization, and thus reinvigorated profitability. Why close an antiquated, environmentally threatening facility—or take any steps to clean up its emissions—if there is a reasonable chance that its very "dirtiness" will lead to a transnational bailout? For a power plant or factory in the former socialist bloc, few assets were more valuable than the ability to pose a serious transboundary environmental threat to one or more of the affluent capitalist states, for this threat brought with it the prospect of externally financed modernization. Externally financed modernization would, in turn, improve the economic prospects of the enterprise in question and perhaps allow its managers and workforce to escape bankruptcy and closure—the unpleasant fate of so many other enterprises in the early post–Cold War period. The catch, of course, was that the directors of the enterprise had to avoid giving the public impression that they needed external subsidization in order to escape imminent economic failure, as this impression might diminish the urgency experienced by the potential donors and, accordingly, the likelihood of transnational subsidization. Would-be recipients therefore endeavored to assure their nervous neighbors that the sources in question *would* stay in operation, despite local environmental degradation, the uncertainties generated by the privatization of state-owned enterprises, and the bumpy transition to a market economy.

Environmental Blackmail Finally, the prospect of transnational subsidization raises the specter of environmental blackmail: the possibility that potential recipients might be tempted to threaten potential donors with even *greater* transboundary environmental hazards to extract an external payment for forbearance. Coase raised this possibility in his original discussion of property rights. Imagine a cattle ranch located next to a farm, he wrote, and further suppose that the cattle routinely trample crops planted along the border between the two properties. If the rancher is not liable for his cattle's trespassing, then the farmer may be willing to pay the rancher to reduce the size of the herd and thus the damage to the crops. But once the rancher anticipates such an agreement, he may choose to increase the size of his herd above the level he would otherwise have found profitable, in order to induce the farmer to make a larger total payment (Coase 1960:7–8). In a later essay, Coase added that it would not even be necessary to actually introduce the additional cattle before agreeing not to do so: "All that need be done would be to threaten to take such actions—and for most people payment for not carrying out a *threat* is the essence of blackmail" (Coase 1988:3). Subsequent commentators drew similar conclusions. Shoup (1971) predicted that once polluters realized that they could extract payments from victims for pollution reduction, the result would be the emergence of "environmental protection rackets" in which "pollution entrepreneurs" would seek to sell the nonoccurrence of as yet nonexistent environmental degradation. These entrepreneurs might even invest resources to generate pollution solely to make their threats credible, provided that the cost of doing so was less than the value of the bribes they expected to receive from the intended victims.

How can we distinguish "extortion" or "blackmail"—pejorative terms, to say the least—from other byproducts of transnational subsidization, such as moral hazard and polluter life extension? Analysts working in the Coasian tradition have tended to define "blackmail" or "extortion" as a threat to carry out some action that, if actually implemented, would not advance the self-interest of the threatening party. In other words, an action or threat constitutes blackmail if the *only* reason for undertaking or threatening to undertake it is to extract a payment from another actor. Daly and Giertz (1975:998) put it this way: "The term extortion refers in a general way to the act of obtaining payments from some entity in return for *not* imposing upon that entity some harmful effect, where the generator of the external effect receives no direct net internal benefit from the act."[33] In other words, actually carrying out this threat is not the "first best use" of the blackmailer's resources, as defined by the blackmailer. This definition is consistent with Coase's (1988) description of "blackmail."

I believe that this definition sets an excessively high hurdle for categorizing an action or threatened action as "blackmail."[34] If a threatened action appears not to be in the economic interests of a would-be blackmailer, then the threat will not be sufficiently credible: The intended targets will either dismiss the threat entirely or wait to see if the blackmailer is actually willing to expend the resources necessary to carry out the activity in question. In my opinion, the key distinguishing feature of extortion is not the extent to which the threatened action is in the interests of the threatener, but the *goal* of the threat. A threat constitutes "blackmail" or "extortion" if its goal is external compensation for the *abandonment* of a threatening activity that has yet to fully materialize: or, as McChesney (1997) has succinctly put it, "money for nothing." Environmental blackmail, then, refers to any threat to initiate a *new* activity with threatening transboundary consequences, or to significantly expand such an activity, in the hope that one will receive an external payment for forbearance.

This definition leaves open the question of the extent to which the threatened action is in the threatener's self-interest. The threatened action may be one that the threatener would carry out in the absence of the prospect of an external payment, or it may not. In either case, if the threat is to be sufficiently credible, the blackmailer must be willing to direct resources toward the initiation of the activity in question, provided that the cost of these investments (and any attendant internal environmental damage) is less than the expected value of the external payoff. Such "credibility enhancing" investments are much more likely to be undertaken if the blackmailer views the actual undertaking of the threatened action as the "second-best" outcome, but this is not a necessary condition. In either case, the defining characteristic of environmental blackmail is that the threatener's *first most favored preference* be external payment for halting or abstaining from an environmentally threatening activity.

This definition will become clearer if we compare environmental blackmail with moral hazard and anticipatory polluter life extension. Moral hazard is generated by the expectation that external actors will shoulder all or part of the cost of reducing the environmental risks of a given activity, thereby making it more attractive to undertake that activity and less attractive to take costly unilateral measures to reduce the associated risks. Anticipatory polluter life extension involves the deliberate perpetuation of an *ongoing* activity in hopes of attracting externally financed modernization, which in turn will allow that activity to continue. In both cases, the goal is external financing for the *continuation* of the activity in question, albeit at a higher level of economic profitability and a lower level of environmental risk. Environmental blackmail, by contrast, involves (1) the threat of a *new or significantly expanded transboundary danger* (i.e., a break with the *status quo*) and (2) threatening or initiating such an activity in the hope that external actors will pay one to *refrain from continuing*.

In the short history of post–Cold War East-West environmental politics, there have been two cases that appear to fit this revised definition of environmental blackmail: Ukraine's threat to resuscitate and modernize the Chernobyl nuclear power plant unless paid not to do so, and Russia's threat to resume the Soviet-era practice of dumping radioactive wastes into the Arctic and Pacific Oceans unless its more affluent neighbors agreed to finance an alternative solution to its waste disposal problem. These two cases will be analyzed in chapter 5.

3

Pollution in the Baltic Sea

When widespread international concern over the health of the Baltic Sea first emerged in the late 1960s, the sea was ringed by seven states, with the dividing line of the Cold War running right down the middle: NATO members West Germany and Denmark were on one side; Poland, East Germany, and the USSR were on the other; and neutral Sweden and Finland occupied an uncertain middle ground between them. By the close of the 1990s, that number had increased to nine: West Germany absorbed its eastern neighbor in 1990, and in 1991 the USSR bequeathed its coastline to the newly independent states of Russia, Estonia, Latvia, and Lithuania. In the meantime, international efforts to protect the marine environment of the Baltic Sea progressed from very humble beginnings to become the most successful case of transnationally subsidized environmental protection on record.

During the Cold War, Soviet water protection policies steadily lagged behind those of the Western littoral states. At the same time, Western interest in East-West cooperation created a window of opportunity for those within the USSR who genuinely desired to improve environmental protection in the Baltic region. The size of this window was determined primarily by the extent of the reigning Soviet leader's interest in defusing East-West hostility. Since Brezhnev and his immediate successors desired only a limited moderation of Cold War tensions, this window remained narrow in the 1970s and early 1980s, but it was nevertheless wide enough to permit increased East-West specialist interaction under the aegis of the Helsinki Commission (HELCOM), the international organization established in 1973 to oversee the international effort to clean up the Baltic Sea. The result was the creation of a transnational "epistemic community" of specialists and environmental officials armed with ever-greater knowledge about the causes and consequences of Baltic marine pollution, even if this knowledge could not yet be translated into effective policy reforms in the USSR.

In the second half of the 1980s, high-level political support for both East-West cooperation and domestic environmental protection skyrocketed under Gorbachev. The Soviet members of the epistemic community affiliated with HELCOM used this much wider window to commit the USSR to ambitious new commitments to reduce its emissions into the Baltic Sea. Within the space of a few short years, however, the very trends that promised to facilitate environmental protection in the USSR—democratization, political decentralization, and economic reform—gave way to a maelstrom of economic and political chaos. Many of the old obstacles to domestic environmental protection were gone, but new and no less crippling ones quickly took their place. Under these conditions, East-West environmental cooperation in the Baltic Sea region entered a fundamentally new phase, one predicated upon direct Western involvement in the identification, planning, and financing of specific environmental protection measures in the successor states. This new phase of East-West environmental diplomacy was embodied in the Joint Comprehensive Environmental Action Programme (JCP), unveiled by HELCOM in April 1992.

Implementation of the JCP made significant progress in the 1990s, primarily in the critical area of municipal wastewater treatment. Transnational subsidization did not proceed with equal speed everywhere—independent Estonia, Latvia, and Lithuania were able to move more swiftly than the Russian regions of Kaliningrad and Leningrad/St. Petersburg—but there was little variation in the basic outcomes: By the end of 1999, transnational investments in municipal wastewater treatment were planned or underway in all of the former socialist territories along the Baltic seaboard. A number of factors combined to make this success possible. First, the sources of pollution of concern to the Western donors were also the sources of the domestic pollution of greatest concern to decision makers in the post-Soviet Baltic region—and with the breakup of the USSR and the decentralization of the Russian Federation, regional decision makers now had more control over their own fate than had been the case during the Soviet period. Secondly, the three newly independent Baltic states (and, to a lesser extent, the Russian city of St. Petersburg) were characterized by relatively rapid political and economic stabilization, and by relatively strong environmental lobbies at the popular and specialist levels—all of which helped to increase the political salience of environmental protection. Third, municipal wastewater treatment provided a propitious focal point for transnational subsidization. Finally, the sources of transboundary pollution were "substitutable" and distributed fairly evenly throughout the newly independent states, which meant that none of the recipients was able to engage in extortion or obstruct progress by holding out for a better deal.

Potemkin Purification and Subterranean Learning: The USSR and the Protection of the Baltic Sea, 1968–1985

The USSR and the Helsinki Convention, 1968–1973

By the late 1960s, the Baltic Sea was one of the most intensively studied bodies of water in the world. The most important advances in the scientific understanding of the sea were made by Western marine specialists, who benefited from an open flow of information, sophisticated research equipment, and generous government funding.[1] However, there were also a growing number of specialists in the USSR who were concerned about Baltic marine degradation.[2] Some of these specialists had been able to participate in intermittent conferences and meetings with their Western counterparts through scientific organizations such as the Conference of Baltic Oceanographers, the Baltic Marine Biologists, and the International Council for the Exploration of the Sea (ICES). These fora provided invaluable opportunities for Soviet scientists to meet and exchange ideas with their Western counterparts, but they did not offer Soviet specialists the chance to cooperate directly with their Western colleagues in joint research efforts.[3] The first concerted effort to organize regular, systematic scientific cooperation between Soviet and Western Baltic experts began in 1968, when a Working Group on the Protection of the Gulf of Finland was established under the aegis of the Finnish-Soviet Committee for Scientific and Technical Cooperation. On the

Soviet side, the initiative for the establishment of the joint Working Group came from Dr. Harald Velner, director of the Laboratory of Water Problems at the Tallinn Polytechnical Institute. When the bilateral Working Group was created, Velner became the cochairman for the Soviet side (Finnish-Soviet Commission for Scientific-Technical Cooperation 1981). From that point forward, Velner and his colleagues would continue to dominate Soviet participation in international efforts to protect the Baltic Sea.

The emerging international scientific consensus of the late 1960s was embodied in a 1970 report produced by the ICES. Although this consensus did not extend to all aspects of the hydrological and ecological systems of the Baltic Sea, there was agreement among most experts that human activities were seriously disrupting the Baltic ecosystem. Of particular concern were the increasing deoxygenation of the sea's deep basins, the expansion of areas poisoned by hydrogen sulfide (a product of the decomposition of organic material by anaerobic bacteria), high concentrations of polychlorinated biphenyls (PCBs) and dichlorodiphenyltrichloroethane (DDT) in ecologically and economically significant animal species, and the steadily increasing anthropogenic loads of phosphorus and nitrogen generated by land-based sources. The large inputs of these nutrients might increase fish catches in the short run, but the ICES warned that in the longer term the consequence would be eutrophication, the further deoxygenation of the sea's deep waters, and a greater frequency of toxic algal blooms (ICES 1970). The ICES report proved to be remarkably prescient: Over the next quarter-century, the production of phytoplankton doubled, toxic algal blooms grew larger and more prolonged, and by 1992 one-third of the Baltic sea floor was declared effectively "dead" due to deoxygenation.[4]

Against this backdrop of growing scientific concern, the governments of the littoral states moved to take political action. Since pollution generated within each littoral state was felt most directly in that state's own rivers and coastal waters, each state had an incentive to reduce its effluents regardless of what its neighbors did. However, unilateral measures could bring only partial results. The Baltic Sea is sufficiently narrow, and its outlet to the North Sea sufficiently constricted, to ensure that pollution emanating from one country will ultimately be felt by others. Consequently, to the extent that the Baltic states were concerned about their own environmental quality, each had an interest in the reduction of pollution in the other states. Moreover, just as individual states could not resolve their own problems, neither could any plausible subgroup of them. Most important, the Western states (including Finland and Sweden) could not address the problem without the cooperation of Poland, East Germany, and the USSR, since the shoreline, territorial waters, and catchment basin of the Baltic Sea were divided roughly equally between the two groups.

By 1970, the major obstacle to an international convention was not endemic to the issue area itself, but an extraneous political concern: the problem of the joint participation of the two Germanys. The Federal Republic of Germany (FRG), or West Germany, refused to sign any agreement together with the German Democratic Republic (GDR), not wishing to take any steps that might imply recognition of East Germany prior to the conclusion of the Basic Treaty then under negotiation between the two states. After the Basic Treaty was concluded in December 1972, international cooperation in the Baltic region quickly gathered steam. The resulting Convention on the Protection of the Marine Environment of the Baltic Sea Area was signed by the representatives of all seven littoral states in Helsinki on March 22, 1973 (Boczek 1978; Füllenbach 1981; Fitzmaurice 1992; Nekrasova 1984). The Helsinki Convention, as the agreement is better known, was the first international agreement to protect the marine environment from all sources of pollution, including land-based sources, pollution from ships, oil and chemical spills, airborne pollutants, offshore dumping, and exploitation of the seabed. The Convention also provided for the creation of a Baltic Marine Environment Protection Commission—better known as HELCOM—that would oversee the implementation of the convention, define pollution control criteria and objectives, and promote scientific and technological research.[5]

Despite the broad scope of the pollution sources gathered within the purview of the commission, its powers and jurisdiction were severely restricted. To begin with, the commission faced the same problems that bedevil most other international organizations: Its recommendations were not binding on the member states, and its staff and budget were very limited. Further limitations stemmed from the fact that while the *substantive* scope of the commission's purview was exceptionally broad, its *geographical* scope was quite narrow. First, the internal waters of the member states were left wholly outside of the convention, despite the fact that riverborne pollutants accounted for well over half of the land-based pollution load to the Baltic Sea. Second, while the Helsinki Convention nominally applied to both the international and coastal waters of the Baltic Sea, the commission was not accorded the right to oversee implementation of its recommendations in the territorial waters of the member states. Instead, it was agreed that "each Contracting Party shall implement the provisions of the present convention within its territorial sea through its national authorities" (HELCOM 1989a:3). The constraints imposed by this provision grew over time. When the convention was first concluded, most of the member states claimed a territorial sea of only three or four miles; the USSR was the only exception, claiming territorial waters up to twelve miles from its coast. By the end of the 1970s, however, the remaining Baltic states had followed the Soviet lead. Since the Baltic Sea is scarcely more than 200 miles wide at its widest point, this provision sharply limited the area of the sea subject to the scrutiny of the commission, and some of its most ecologically critical areas, such as the Gulf of Finland, were effectively excluded altogether (Fitzmaurice 1992:51–53, 85–93, 103–123).

Why did the Soviet government agree to such an ambitious convention, and yet subject it to such crippling restrictions? The answer is that the Soviet leadership's primary interests in the Baltic region in the early 1970s were political, not ecological. Prior to the signing of the Basic Treaty between the two Germanys in 1972, the interest of the Western countries in the protection of the Baltic marine environment provided additional leverage with which to press for Western recognition of the German Democratic Republic. Moreover, the early 1970s were the heyday of détente, and the Soviet government wished to demonstrate its willingness to create a more positive political atmosphere in Europe. In other words, the Brezhnev leadership manipulated Baltic environmental cooperation in order to express its "cooperativeness." At the same time, however, the Soviet government was extremely reluctant to permit any external interference in its internal economic and political affairs, or to release any information that might cast the USSR in a negative light or somehow provide useful military and industrial intelligence to the West. Hence the USSR's insistence that the geographic scope of the Helsinki Convention be restricted to the open seas—a proviso that severely limited the convention's practical impact.[6]

Despite these handicaps, the commission managed to achieve some notable results prior to 1986. First of all, HELCOM's activities considerably increased the available knowledge about the state of the marine environment and the processes underway within it. In 1978, the Interim Commission established a comprehensive Baltic Monitoring Programme that greatly added to the available knowledge concerning the state of the sea.[7] Second, since HELCOM could not directly monitor pollution levels in coastal or inland waters, inspect individual sources of pollution, or issue binding targets and timetables, the commission focused its efforts on educating its members about the best way to reduce land-based discharges, the actual implementation of which would be left to the contracting parties. This campaign took two main forms: a series of international symposia and workshops to discuss concrete technological alternatives for pollution abatement, and the promulgation of an increasing number of recommendations concerning the best means for reducing pollution from land-based sources, often including concrete targets and suggested deadlines for fulfilling them.[8]

Domestic Implementation in the USSR, 1973–1985

Despite the Soviet government's relative indifference toward the protection of the Baltic Sea, the USSR's participation in the negotiation of the Helsinki Convention and the subsequent work of the commission did have a palpable impact upon Soviet scientific and environmental policies. The two most important consequences were the formulation of an ambitious strategy for pollution abatement in the Soviet Baltic region and a considerable expansion of the resources available to Soviet specialists interested in Baltic marine pollution.

First, the USSR's participation in Baltic Sea cooperation spurred the development of ambitious plans for pollution abatement in the Baltic region. In July 1976, the USSR Council of Ministers issued a decree that specifically targeted pollution in the catchment basin of the Baltic Sea.

This decree enumerated a comprehensive set of measures designed to completely curtail the emission of untreated industrial, agricultural, and household wastes into the Baltic Sea and the rivers and lakes leading into it by 1985. The state planning agency, Gosplan, and the Councils of Ministers of the relevant republics were ordered to draw up a detailed plan of capital investment aimed at controlling the effluents of economic enterprises and municipalities, and the economic ministries with interests in the region were ordered to draft measures to end air and water pollution in the Baltic Sea basin. The main thrust of the water quality program in the Baltic region was the construction of municipal and industrial wastewater treatment facilities. During 1976–1982, according to Soviet figures, more than 2,500 treatment plants and other water purification facilities were constructed in the Soviet Baltic region, including some 1,800 biological treatment plants. The flagships of this effort were the new municipal wastewater treatment plants to be constructed in Leningrad and Tallinn.[9] Specific instructions were also issued for the introduction of emissions controls at pulp and paper mills throughout the Baltic catchment basin.[10]

Unfortunately, the fruits of this program failed to live up to the expressed intentions of its designers. In fact, the environmental situation in the Soviet Baltic region grew worse, not better, over the course of the 1970s and 1980s. By the end of the 1980s, for example, only one of the three wastewater treatment plants planned for the city of Leningrad had been completed, and untreated wastes were still being emptied into the Neva from almost 500 separate discharging points. As a result, one-third of the city's municipal effluents, and almost 90 percent of its industrial discharges, were released without treatment in 1989. By the end of the 1980s, the city of Leningrad alone was contributing 40 percent of the load of biological oxygen demand (BOD_5 a measure of oxygen-consuming organic wastes), 50 percent of the total nitrogen, and more than half of the total phosphorus discharged into the Gulf of Finland from all sources, including those in Finland. Leningrad also remained by far the largest source of heavy metal discharges into the Gulf, either through direct discharge or through leakage from the burial of the city's highly contaminated sewage sludge. And Leningrad was no exception: The situation remained equally bad or worse in the rest of the Soviet

Baltic region (Nordic Project Fund 1989, 1990, 1991; Voropaeva 1990; Estonia 1991a, 1991b; Finland 1991b; Lithuania 1991; Andrikis 1992; HELCOM 1992b).

How can we explain the failure of the Soviet Union's water protection program in the 1970s and early 1980s? If the Soviet government's strategy was to attempt to free ride on emissions reductions in the West—and there is no evidence to suggest that it was—then this strategy was a dismal failure, since the consequences of Soviet pollution were felt most intensely in its own inland and coastal waters. For example, specialists from the Water Protection Laboratory at Tallinn Technical University estimated in 1991 that the concentration of heavy metals in the coastal waters of the Gulf of Finland were two to three times higher than in the open Gulf, and three to four times higher in Tallinn Bay, where the bottom vegetation had been completely destroyed (HELCOM 1991c:76–78). Eutrophication was also most pronounced in coastal and inland waters, and noxious algal blooms appeared in Lake Ladoga and in Soviet coastal waters with increasing frequency from the early 1970s onwards. This had a very immediate impact: High bacterial counts and algal blooms steadily ruined many of the most popular beaches along the Baltic coast, a traditional Mecca for vacationers from across the USSR, and the rising levels of pollution steadily undermined the quality of the region's drinking water (HELCOM 1991c:69–92; Voropaeva 1990:16–33; Estonia 1991b:41–49).

Rather than an effort to "free ride," the failure of the Soviet Union's Baltic environmental program was a product of the shortcomings of the Soviet system in general. To begin with, the program fell prey to all of the problems that plagued Soviet environmental protection in general: the construction delays, operational difficulties, and economic inefficiency engendered by the command economy; the organizational weakness and fragmentation of the environmental regulatory agencies; the superior political resources wielded by polluters; the exclusion of the general public from the policymaking process; and the relatively low priority that the Soviet leadership attached to environmental protection. In addition, the closed and compartmentalized structure of the Soviet system inhibited the diffusion of knowledge about the latest developments in wastewater purification technology and practice abroad. Very few water protection experts were able to participate in HELCOM's activities, and those that did could exert only limited influence at home. Far longer than in the West, Soviet water protection authorities adhered to a "release and dilute" strategy, trusting in the natural assimilative capacities of recipient bodies of water to break down large quantities of organic wastes. Furthermore, the wastes of industrial enterprises were routinely routed directly into the municipal treatment systems, usually with little or no preliminary on-site treatment. This practice, long since abandoned in the West, burdened municipal systems with a whole set of chemical pollution problems that they were not designed or equipped to handle and increased the toxicity of both the treated effluent and the remaining sludge.[11] This problem was exacerbated by the fact that Soviet water quality standards were defined in terms of the *concentrations* of harmful substances, which led industrial managers to circumvent the standards by diluting their discharges prior to release. The resulting increase in wastewater flow placed an additional burden on the already overloaded municipal treatment systems.

Brezhnev and his colleagues genuinely wanted to have clean water in addition to increased industrial, agricultural, and military production, but these goals inevitably came into conflict, and only rarely were the resulting conflicts resolved in favor of effective environmental protection. On one important occasion, Moscow did intervene directly on behalf of wastewater treatment in the Baltic region, but this was the exception that proved the rule: Moscow's intervention was motivated not by environmental or health considerations, but by concern for the Soviet Union's international prestige. When the USSR hosted the summer Olympics in 1980, the sailing events were scheduled to be held in Tallinn Bay. An impressive new yachting and tourist facility was constructed in Pirita, across the bay from Tallinn itself, and Moscow placed considerable pressure upon the Estonian authorities to complete the construction of Tallinn's new municipal wastewater treatment facilities before the Olympics began. The first stage of the treatment plant was duly brought on line well in advance of the Olympics, but, as the big day drew near, it became clear that several of the city's largest industrial enterprises—all of which emptied their effluents directly into the bay—could not be connected to the sewage system in time. Consequently, several months in advance of the Olympics, the Soviet authorities simply ordered the worst offenders to shut down their operations until the games were over—a crude but effective exercise in "Potemkin purification."[12]

Despite the failure of the Baltic water protection program, Soviet participation in the work of the Helsinki Commission did have an important and lasting *cognitive* effect: It was an invaluable spur to the development of Baltic marine science in the USSR. The most visible result was the "Baltic Project," an ambitious long-term program of research that brought together specialists from a number of research institutions in the Baltic region and in Moscow (Davidan and Aitsam 1989). Moreover, Soviet marine scientists were now able to take advantage of yet another conduit to the West thanks to the work of the Helsinki Commission. Since findings and recommendations under the Helsinki Convention had to be unanimously accepted, Western specialists now had a much greater incentive to ensure that their Soviet colleagues actually concurred with them on a wide variety of scientific and technical issues. This was not an easy or an apolitical process; debates dragged on for years over the terms of reference of the convention, such as the definition of "pollution" and the "best available technical means" to combat it. Nonetheless, the result was the formation of an increasingly cohesive epistemic community that spanned the East-West political divide. Throughout this period, Soviet specialists were prevented from putting most of this community's program into effect, and they could only watch in frustration as the USSR fell further and further behind the Western states in the effort to improve water quality in the region. However, the Soviet specialists associated with HELCOM did provide an important reservoir of "subterranean learning"—a reservoir that would subsequently be put to use once domestic political circumstances changed.

Great Expectations: Perestroika and the Protection of the Baltic Sea, 1986–1990

The USSR and HELCOM, 1986–1990

With the advent of Gorbachev's reform campaign, Soviet participation in HELCOM became increasingly open and active. The most immediate manifestations of these changes were diminished censorship and expanded transnational contacts. As in all other areas of environmental protection, the Chernobyl disaster was a major spur to this process. Joint monitoring of radionuclides in the open sea had begun in 1985 as a continuation of work previously carried out by the International Atomic Energy Agency (IAEA), but closer international cooperation had hitherto been resisted by the Soviet government due to the sensitivity of the Soviet military and its allies in the powerful nuclear energy complex. Immediately after the accident, Harald Velner—Executive Secretary of HELCOM from July 1984 to July 1988—formally requested that the Baltic Sea states compile a report on radioactive substances in the Baltic region. The resulting report, remarkable for its frankness and attention to detail, was made publicly available in 1988 (HELCOM 1989d). Soviet Baltic specialists were also able to ease the internal barriers to environmental monitoring in Soviet inland and coastal waters. Due to the military sensitivity of the region, this was no small feat; in fact, it would be late 1990 before the first international research vessel would ply the Gulf of Finland on the Soviet side of the border.[13]

The most important achievement of the perestroika period was the Ministerial Declaration on the Protection of the Marine Environment of the Baltic Sea Area. This document was signed in February 1988 at the ninth meeting of HELCOM, which was attended by the ministers responsible for environmental protection in each of the littoral states. The Ministerial Declaration represented a clear victory for the transnational epistemic community of Baltic marine scientists and officials, of whom Velner was the foremost Soviet representative. To begin with, it declared that the parties to the Helsinki Convention "must adopt a precautionary approach and not wait for the full and undisputed scientific proof of harmful effects before taking action to prevent and abate pollution." Furthermore, the ministers pledged to cut their countries' discharges of heavy metals, nutrients, and persistent organic substances into the Baltic Sea by 50 percent, a reduction to be achieved as soon as possible, and no later than 1995. They also pledged to use the best available technology to minimize pollution from all of the nuclear industries in the region (HELCOM 1988:32–33).

The heightened activity within the Helsinki Commission during the perestroika period did not end with the Ministerial Declaration.

Throughout 1987–1990, HELCOM approved a series of increasingly specific and demanding recommendations for the reduction of pollution from a variety of land-based sources (cf. HELCOM 1988, 1989b, 1990a, 1991a). All of these measures, if implemented, would also have greatly improved the local ecological situation within the Soviet Baltic region. Moreover, at its eleventh meeting in February 1990, the commission established an ad hoc working group to draft a revised convention to supersede the one signed in 1974. This group was instructed to consider the introduction of more legally binding recommendations on land-based sources, the implementation of "best available technology," the introduction of a commitment to the precautionary principle, the development of instruments to reduce pollution from diffuse sources (e.g., agriculture), and the extension of the geographical scope of the Convention to cover all coastal and inland waters in the Baltic's catchment basin (HELCOM 1990a:14–15).

Throughout this period, Harald Velner remained the most prominent participant on the Soviet side. Prior to the February 1988 meeting at which the Ministerial Declaration was signed, Velner traveled to the capital of every Baltic Sea state in order to make preparations, lobbying for the adoption of the precautionary principle at every step of the way.[14] He also served as Secretary General of the meeting when it opened. Velner's colleagues from Estonia also occupied increasingly visible places in HELCOM's activities.[15] Even the rising tensions between Moscow and the governments of the mutinous Baltic republics did not undermine Velner's position. When the USSR's turn to appoint the chairman of the commission came in 1990, Velner was chosen for the post—a position from which he would subsequently oversee the expansion of HELCOM to include an independent Estonia.

Domestic Implementation in the USSR, 1986–1990

Alongside the dramatic changes taking place in HELCOM during the perestroika period were equally striking reforms in domestic environmental regulation. Almost immediately after perestroika got underway, environmental protection officials in the Soviet Baltic region began to enjoy greater political support, both at the local level and in Moscow. In 1986–1987, after years of struggle, health and environmental protection officials in the Leningrad region succeeded in shutting down the antiquated pulp and paper mill at Priozersk on the western shore of Lake Ladoga, pending its reconstruction.[16] A much more sweeping change came in January 1988, when the Soviet government concentrated the country's far-flung environmental regulatory agencies into a single body, the State Committee for Environmental Protection (Goskompriroda).[17] One of the main priorities of the new agency was the introduction of economic regulatory mechanisms, including real charges for the use of natural resources such as water, the sale of licenses to polluters, and fines for discharges above permitted levels. In 1990, this system was carried out on a trial basis in several areas, including the Leningrad region, and it was introduced on a nationwide basis at the beginning of 1991.[18]

A second internal development that promised to improve the ecological situation in the Soviet Baltic region was the growing voice of ordinary citizens in the country's political affairs. With the gradual relaxation of political controls, thousands of grassroots organizations sprang up in the USSR, many of them devoted to environmental protection.[19] The rise of grassroots environmentalism was particularly noticeable in the Baltic region. In Leningrad, several groups were formed to protest a variety of environmental ills, especially the construction of the "dam," a gargantuan flood control dike under construction across the eastern tip of the Gulf of Finland. In Latvia, a plan to build a dam across the Daugava River was canceled in 1987 after sustained public protest, and in Estonia, a large popular movement emerged to block the expansion of phosphate mining in the republic.[20]

The rise of popular environmentalism took place within the context of the progressive democratization of the Soviet political system. For the first time in Soviet history, many voters were given a choice among candidates in the elections to the Congress of People's Deputies in March 1989. Although these elections were not truly competitive, many nonparty candidates ran openly against party officials and won. The upstart winners included several candidates from the city of Leningrad and the Baltic republics, all four of which were hotbeds of political protest compared to most of the rest of the USSR at this time. In March 1990, genuinely competitive elections to local, regional, and republican legislatures (soviets) were held throughout most of the USSR. The result in the city of Leningrad and the Baltic republics was the overwhelming defeat of traditional party candidates, although conservatives retained their hold on Leningrad Oblast and Kaliningrad.[21] As in the 1989 elections, many of the victors ran on "green" platforms. Immediately afterward, independent legislative oversight committees responsible for environmental policy were set up at the republican, regional, and municipal levels, and they were filled by legislators with a genuine interest in ecological problems. The members of these committees not only worked to draw up new legislation but also pushed for the resolution of specific environmental issues. The Leningrad city council, or Lensoviet, was particularly active in this regard. Lensoviet's most visible environmental action came in October 1990, when it voted overwhelmingly to halt further construction of the "dam" across the Gulf of Finland.[22]

Great Expectations, Dashed

Despite the auspicious developments of the late 1980s—increasingly active Soviet participation in HELCOM, domestic regulatory reform, and accelerating democratization—the environmental situation in the Soviet Baltic region did not noticeably improve by the end of 1990. In fact, by the end of the 1980s the prospects for the independent resolution of the region's environmental woes appeared worse than ever. In part, this was due to persistent shortcomings in the regulatory process and a mismatch in the environmental priorities of the specialists associated with HELCOM and those of the newly empowered local legislatures. In the end, however, environmental perestroika fell victim to the administrative chaos and economic collapse generated as conflict between rival centers of political power pulled the USSR apart.

Goskompriroda was fated to enjoy only a very short life between its birth in early 1988 and its territorial dismemberment in 1990–1991; it is consequently difficult to judge how well the agency might have performed had Gorbachev been able to realize his dream of a reformed, unified socialist state. In the event, Goskompriroda's efforts to curb water pollution in the Baltic region were hampered by most of the shortcomings that had plagued water policy prior to the perestroika period. Just as in the Brezhnev era, the environmental inspectorates suffered from low pay, inadequate manpower and equipment, and insufficient resources to bring major polluters to heel. Fines could not be levied above an officially established ceiling, and in any case enterprise managers simply passed these costs along to their ministries, who could in turn hold them up indefinitely in state arbitration. The large defense industries in Leningrad were among the worst violators of this type.[23]

In the city of Leningrad, the single largest source of land-based pollution in the Baltic Sea region, a second obstacle to the implementation of more effective water protection policies was the mismatch between the immediate environmental priorities of the specialists affiliated with HELCOM and those of local environmental activists and the newly elected "greens" in Lensoviet. While the scientists and engineers affiliated with HELCOM pressed for capital improvements in the city's municipal and industrial wastewater infrastructure, local environmental activists and the city council focused their energies instead upon halting the "dam" in the Gulf of Finland. In the minds of the project's opponents, the dam had come to symbolize all of the city's ecological woes, as well as the aloofness and gigantomania of the Soviet regime. Yet by the time the issue came to a vote on the floor of the city council, the dam was a fait accompli: The dike itself had been completed, and work remained only on the shipping passages through the dam and the ring road along its upper surface. In other words, the real damage had been done, and very little could be gained by discontinuing work on the project, which in its present, unfinished state posed a danger to shipping. To the deputies in Lensoviet, however, the vote against the dam was a highly public way to demonstrate their concern for the environment. The revolt against the Leningrad dam was, in other words, first and foremost an exercise in symbolic politics (Edelman 1964). Having voted against the project, most of the deputies felt that they had discharged their duty towards the environment for the time being, and environmental protection subsequently dropped from the top of the city council's agenda.[24]

The difficulties experienced by environmental specialists in Leningrad and the Baltic republics were exacerbated by the territorial fragmentation and administrative and economic chaos that accompanied the dissolution of the Soviet Union. This bedlam worked against protection of the Baltic environment in several ways. First, interest in environmental protection waned among both politicians and ordinary citizens, as both groups now had much more pressing concerns: whether achieving national independence from the Soviet empire, or finding something to eat. (By the fall of 1990, the economic situation in Leningrad had grown so dire that the city and oblast introduced ration coupons for basic foodstuffs.) Second, effective action was blocked by bitter conflict over administrative jurisdiction among competing levels of territorial organization (i.e., federal, republican, oblast, municipal, and rayon) and between the executive and legislative authorities at each level. Efforts to curb industrial effluents in the Baltic republics, for example, were hampered by the fact that many of the largest industries continued to report to Moscow rather than to Riga, Vilnius, or Tallinn. This problem was exacerbated by the fact that noncooperation on the part of all-Union enterprises (that is, those subordinate to nationwide ministries headquartered in Moscow) was used as yet another weapon in Moscow's fight to retain control over the rebellious Baltic republics.

In retrospect, 1986–1988 was the high-water mark for transnational efforts to persuade the Soviet government to undertake more effective water protection policies in the Baltic Sea region. By taking advantage of the dual window opened by the Soviet leadership's ambitious foreign policy goals and rising Western concerns over pollution and deoxygenation in the open sea, Harald Velner and his colleagues were able to secure powerful allies in their struggle to improve environmental protection within the Soviet Baltic region. Before Gorbachev launched his reform campaign, the commitments outlined in the Ministerial Declaration would have been immediately vetoed by any of the dozens of ministries (including the Ministry of Defense) whose operations would have been affected. Yet when the epistemic community led by Velner found a sympathetic ear at the top of the Soviet hierarchy, the opposition of even the most powerful parochial interests could be overruled. Thus, the victory of the Baltic Sea specialists in 1988 was not the result of structural change, which was still in its infancy, but the appearance of a radically different leadership strategy at the apex of the Soviet system.

By the fall of 1990, it had become clear that international cooperation to protect the Baltic Sea could not proceed much further along the wellworn tracks laid down in the Soviet period. First, the political and economic chaos that accompanied the collapse of communism made it increasingly unlikely that either Poland or the USSR would be able to fulfill the ambitious goals set forth in the 1988 Ministerial Declaration. (The GDR had by this time been absorbed by the Federal Republic, which took on both its international obligations and the task of cleaning up its environmental problems.) Second, the accelerating disintegration of the USSR generated a discordant babble of multiple claimants to the right to negotiate with Western actors: the Soviet government, the governments of the three Baltic republics and the Russian Soviet Federated Socialist Republic (RSFSR), and municipal and regional authorities within the RSFSR itself. The main task of HELCOM in the early 1990s was therefore to manage the transition from the old pattern of international cooperation—one in which the central government of a cohesive USSR was responsible for the fulfillment of its own international obligations—to an altogether new pattern, in which responsibility for international cooperation would shift to the regions and republics along the former Soviet coast, and in which Western governments and international lending organizations would increasingly participate in the selection, financing, and implementation of environmental protection measures in the East.

Harmonious Balkanization: Protection of the Baltic Sea in the Post–Cold War Period

Subsidization Makes the Agenda: The Road to the JCP

The failure of water protection in the USSR, Poland, and the GDR in the 1970s and 1980s contrasted sharply with the progress made by the Western littoral states. By the end of the 1980s, the vast majority of the population in the Western countries was served by some form of biological or chemical wastewater treatment, usually both in combination.[25] Sweden and Finland also undertook dramatic reductions in the emissions of the pulp and paper industry, the single greatest source of industrial water pollution in the Western states (OECD 1988:89–93; HELCOM 1984a:33–34). By the end of the 1980s, the disparity between the environmental protection achievements of the Western countries and their socialist neighbors had created a situation in which increasingly expensive investments in environmental quality in Denmark, Sweden, Finland, and West Germany were required to offset the transboundary effect of the pollution emanating from East Germany, Poland, and the USSR. Moreover, since each effort to wring additional reductions from domestic sources brought progressively diminishing marginal returns, each increment of improvement in environmental quality (measured in terms of the quality of the Western countries' coastal waters, as well as the state of the Baltic Sea as a whole) cost more than the last. At the same time, due to the primitive state of environmental regulation and wastewater treatment in the socialist bloc, the *same* reductions could be achieved by investing in the East, and at considerably less cost. The Western states thus became increasingly self-interested in bringing about reduced discharges in the Eastern states, quite irrespective of any benefit that this might provide to the local inhabitants.

Prior to the late 1980s, Western environmental officials believed that the primary obstacles to improved environmental regulation in the East were political rather than economic. That is, they assumed that the socialist states could do something about the sorry state of their environmental policies, if only they would make the political decision to do so. Accordingly, Western environmental specialists and officials concentrated their efforts on attempting to convince their counterparts in the recalcitrant socialist states that the degradation of the Baltic Sea was a serious problem, and that they ought to do something about it. By 1989, however, political reforms in Poland and the USSR had generated much stronger official support for environmental protection. The problem now appeared to be not the will, but the way: As hopes for painless economic and political reform dwindled, there were increasingly few resources to spare for environmental protection in the former Soviet bloc. Consequently, specialists and officials in the Western Baltic states began to seriously consider a radically new tactic: the direct subsidization of environmental protection measures in the East.

Once the idea of subsidization surfaced, it quickly attracted support from across the political spectrum. Environmentalists, alarmed at the growing threat to their hard-won achievements at home and sympathetic to the plight of their counterparts in the East, came out as strong proponents of subsidization. The factories and municipal treatment plants facing tougher emission controls as a consequence of the Western countries' one-sided attempt to clean up the Baltic also enthusiastically endorsed the idea. Transnational subsidization likewise received strong support from Western firms that stood to benefit from the sale of the necessary purification technology to aid recipients, and from government economic officials who viewed state-subsidized exports of environmental technology as a way to boost their recession-wracked national economies.[26] Needless to say, the idea also found a ready audience among frustrated environmental protection officials in the East.[27]

The first concrete step toward the introduction of large-scale subsidization was taken in the wake of the Eastern European revolutions of late 1989, when the prime ministers of Sweden and Poland invited their counterparts from all of the littoral states to a special conference to be held in Ronneby, Sweden, in September 1990. All of the Baltic Sea states, as well as Norway and Czechoslovakia, sent high-ranking delegations to the Ronneby Conference, in most cases headed by the reigning prime minister.[28] The conference was also attended by representatives of the European Bank for Reconstruction and Development, the European Investment Bank, the Nordic Investment Bank, the World Bank, and the European Commission. The most important result of the conference was the decision to create an ad hoc high-level task force within HELCOM, charged with drawing up a comprehensive program of investments to reduce the degradation of the Baltic marine environment. This program would in turn serve as the basis for financing by international lending institutions and Western governments. The conference participants agreed that the program should be presented to a subsequent diplomatic conference on the protection of the Baltic Sea, to be held at the level of environment minister in April 1992 (HELCOM 1991d).

By the time of the September 1990 Ronneby Conference, it was clear to all concerned that the Soviet government in Moscow was no longer able to coordinate environmental policy along its Baltic coast. Environmental policymaking in the three Baltic republics was already in the hands of effectively independent republican bodies, even if these did not yet exercise actual control over the activities of all of the enterprises within their borders. The Western states therefore began to press, however gingerly, for greater autonomy for the Baltic republics within HELCOM. The Baltic republics also asserted their right to independent representation, but they chose not to make satisfaction of their political demands a precondition for their continued participation in HELCOM activities—a conciliatory posture facilitated by the importance of the issues at stake, and by the fact that the current chairman of the commission, Harald Velner, was himself an Estonian. Finland and Sweden therefore proposed that the Baltic republics and the RSFSR—which, under Yeltsin's leadership, had declared its sovereignty in June 1990—be invited as independent delegations to the first meeting of the HELCOM Task Force, scheduled for October–November 1990. The Soviet government demurred but agreed that the Baltic republics would submit independent national reports to HELCOM along with the one compiled by the USSR. After the conclusion of the first task force meeting, the prime ministers of the Baltic republics sent a letter to HELCOM asking for independent representation. The Soviet government finally relented, and the Baltic states were allowed to send independent (but nonvoting) delegations to the second meeting of the task force in May 1991.

The administrative confusion and diplomatic discomfort generated by the fragmentation of the USSR eased considerably in the wake of the failed coup of August 1991. Within a few days, Moscow recognized the independence of the Baltic states, and the remainder of the USSR was dismembered along republican lines soon thereafter. Since the Baltic republics had already been assigned responsibility for the preparation of their own national reports to HELCOM, the formal breakup of the USSR did not seriously disrupt the preparations for the planned conference. Thus, when the Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area opened in April 1992, it was attended by four independent delegations from the former USSR.

The April 1992 conference formally acknowledged the new era of cooperation with the adoption of a new convention. The revised Helsinki Convention brought the internal waters of the contracting parties within the jurisdiction of HELCOM, and the signatories committed themselves to observance of the precautionary principle, the polluter-pays principle, and the use of the best available technology and practices to control emissions. Specific technological and regulatory measures to be taken by national authorities to combat land-based pollution were spelled out in a special annex. The new convention also required that the contracting parties make a wide range of information—including the issuance and requirements of discharge permits, the results of water and effluent monitoring, and the degree of compliance with water quality and permit requirements—freely available to the public, both in their own countries and abroad (HELCOM 1992a). The revised convention thus represented a formal repudiation of the exclusionary and secretive posture adopted by the USSR and its allies in the pre-Gorbachev period.

The second product of the April 1992 conference was a detailed and ambitious JCP for the Baltic Sea region. The JCP was based on detailed assessments of the problems posed by specific municipalities, industrial plants, and agricultural enterprises. Where possible, each project was accompanied by estimates of the cost of implementation and the anticipated reductions in harmful emissions. On the basis of these assessments, the task force conducted a cross-national cost-benefit analysis of various investment options and drew up a short list of the highest-priority projects, many of them in the former USSR. The plan also identified shortcomings in environmental regulation as practiced in the former socialist states and made recommendations as to how these might be improved.[29] The JCP was notable not only for its contents, but also for the process through which it had been compiled and the uses to which it was expected to be put. Although the compilers of the plan had relied upon the national plans submitted by the USSR and the Baltic republics, they relied even more heavily upon independent analyses carried out by Western consultants, such as those working for the Nordic Project Fund and the World Bank. Implementation of the plan, too, was conceived as a joint enterprise. The cost estimates for the various projects were broken down into local and foreign costs, that is, the amounts expected to be contributed by internal and external sources, respectively. Some of the external funding would be available in the form of grants, the rest as long-term credits. The supply of the necessary expertise and equipment would also be joint, since the involvement of the Western states had as much to do with their industrial and employment policies as with their environmental concerns.

Implementation of the JCP, 1993–1999

Despite the tremendous difficulties that accompanied the transition from socialism in the Eastern bloc, the progress achieved in the implementation of the JCP during its first seven years (1993–1999) was remarkable. By early 1995, one-quarter of the total investments envisaged by the JCP had been allocated or committed, including ECU 820 million earmarked for the priority hot spots in the former socialist states.[30] The main focus of implementation was municipal wastewater treatment. By the end of 1999, internationally financed projects to modernize municipal wastewater treatment were planned or underway in all of the major ex-socialist cities on or near the Baltic seaboard, and in many of the smaller cities as well. (See figure 3.1.) Although these projects were not financed through a common pool of donor funds, the costs were shared by Western governments (including some that were not members of HELCOM), the European Union, international lending institutions such as the EBRD, the World Bank, the Nordic Investment Bank, and the recipient states themselves.

Although the emissions reductions stimulated by the JCP in its first five years fell short of the 50 percent reduction envisaged by the 1988 Ministerial Declaration, the results were nevertheless impressive. By the end of the first five years of the JCP, HELCOM reported significant decreases in the total pollution load originating from the hot spots. Between 1991 and 1995, reduced emissions from the hot spots resulted in a decrease in BOD_5 of approximately 240,000 tonnes; a decrease in chemical oxygen demand (COD) of approximately 300,000 tonnes; a decline in phosphorus of 160,000 tonnes; and a drop of approximately 100,000 tonnes in emissions of nitrogen. Much of this reduction was a product of the sharp reduction in industrial and agricultural production that accompanied the collapse of the Polish and Soviet command economies, but HELCOM also attributed a significant portion of it to transnationally financed improvements in environmental infrastructure.[31] This reduction in emissions resulted in marked improvement in water quality in a number of coastal areas, most notably in Estonia and in the Gulf of Riga (HELCOM 1996a:6–7).

The rapid progress of international cooperation to protect the Baltic Sea in the post–Cold War period was the result of the fortuitous intersection of four factors: (1) the *convergent environmental interests*

Figure 3.1
The Baltic Sea catchment basin

of the donors and the recipients; (2) the existence of propitious *economic and political conditions* in the recipient states; (3) the availability of municipal wastewater treatment as an *economic and organizational focal point* for joint implementation; and (4) the *substitutability* of the sources involved from the perspective of the donors.

First, international cost sharing was facilitated by convergent environmental interests. Since the major sources of transboundary pollution were also the primary sources of internal and coastal pollution in the former socialist states, all of the littoral states shared an interest in addressing them. This convergence was further facilitated by the breakup of the Soviet Union and political decentralization within the Russian Federation, which transferred decision making power from Moscow—for whom pollution in the Baltic Sea was a low priority, particularly now that it was shorn of its connection to détente—to the Baltic states and the Russian enclaves of Kaliningrad and Leningrad/St. Petersburg, the areas most adversely affected by local pollution. The environmental interests of the donors and the recipients were not identical: The donors were primarily concerned about the state of the open Baltic and that of their own coastal waters, whereas the recipients were primarily interested in the environmental quality of their own inland and coastal waters and in the reliable provision of safe drinking water. This was not an insurmountable hurdle, however: Since none of these goals worked at cross-purposes, they could simply be added together into mutually acceptable package deals.

Second, Poland and the Baltic republics—and, to a somewhat lesser degree, St. Petersburg—were blessed by relatively propitious economic and political conditions for translating these underlying ecological interests into politically salient policy goals. In comparison to most of the rest of the former socialist bloc—and certainly in comparison to most of the rest of the former Soviet Union—these territories were characterized by relatively rapid economic development, relatively stable and effective political institutions, and comparatively strong environmental lobbies at both the popular and official levels. This happy state of affairs was, in part, the consequence of policies pursued during the Soviet period: Because the USSR's scientific infrastructure for Baltic Sea cooperation had been concentrated in Leningrad and the Baltic republics, these territories inherited most of the ex-Soviet members of the epistemic community for the Baltic Sea. This specialist legacy greatly eased the headaches associated with post-Soviet environmental capacity-building, minimized the disruption in international cooperation, and ensured that a well-respected and well-connected specialist lobby was already in place to press for aggressive action to combat water pollution in the Baltic region.

Third, municipal wastewater treatment provided a particularly provident economic and organizational focal point around which donor and recipient interests could converge. Since cities and towns do not easily go out of business, would-be donors had no incentive to delay subsidization in the hope that economic reform would automatically solve the transboundary pollution problem generated by untreated or inadequately treated municipal sewage. Municipal charges for water and sewer services also promised to provide a steady and reliable resource stream that could be used to pay back credits. The directors of the municipal utilities themselves also desired to maximize their financial and institutional autonomy, a goal shared by the donors, who saw this as a necessary precondition for ensuring that credits were repaid (HELCOM 1993). Again, the interests of these municipal utilities and those of the external donors were not identical; to embrace all of the interests involved, multilaterally financed municipal water utility projects typically combined the modernization of municipal wastewater collection and treatment with the modernization of facilities for the collection, storage, purification, and delivery of drinking water. These packages also combined sewage treatment measures designed to remove phosphorus and organic wastes, the main source of eutrophication and poor sanitation in inland and coastal waters, with the removal of nitrogen, the limiting nutrient in most areas of the open sea.[32]

Finally, international cooperation was facilitated by the substitutability of the sources of pollution involved. Since the degradation of the open sea resulted from the mixing of a large number of sources, the donors did not need to tackle any specific, individual source in order to advance the overall environmental goal of improving the condition of the open sea and their own coastal waters. Instead, the sources were substitutable: Failure to achieve timely and significant reductions in emissions from one source could be offset by reductions at another source or an equivalent combination of sources. This placed the recipients in potential competition with one another. Since the national authorities in Poland and the Baltic states and the regional and municipal authorities in the Russian Federation were self-interested in the reduction of *local* water pollution and improvements in the supply and purification of *local* drinking water, each had an interest in reaching agreement with the donors quickly, before the available external assistance was diverted elsewhere. This incentive was amplified by the Balkanization of the ex-Soviet Baltic seaboard: Now that the sources of pollution in the former USSR were divided fairly evenly across the national territories of Russia, Estonia, Latvia, and Lithuania, none of the recipients was in a position to engage in extortion or to stall in hopes of a better deal.

These achievements notwithstanding, implementation of the JCP did not move ahead with uniform speed everywhere. To begin with, conspicuous success in the area of municipal wastewater treatment was somewhat offset by much slower progress in other areas. Nonpoint sources of pollution such as agricultural runoff and automobile emissions proved to be much less amenable to the primary tool at the disposal of the donor states—large-scale, technology-intensive, and easily monitored modernization programs—than was municipal wastewater treatment. Progress was also noticeably slower in efforts to deal with industrial point sources. Although industrial sources could certainly be addressed through subsidized modernization programs, they made less attractive targets than did municipal wastewater treatment, because the future of industrial enterprises was far less assured than that of cities and towns—an additional element of uncertainty that called into question both the rationale for subsidization and the probability that credits would be repaid. Potential investors were also discouraged by legal uncertainties, above all the possibility that they might be held liable for past environmental damage (HELCOM 1998a).

Second, even in the area of municipal wastewater treatment, there was *geographical* variation in the speed with which implementation of the JCP progressed in the newly independent states. The transnational subsidization of municipal wastewater treatment and other measures designed to reduce water pollution proceeded more swiftly in the Baltic republics, especially Estonia, than in the Russian Federation; and within the Russian Federation, implementation proceeded more rapidly in St. Petersburg than in Kaliningrad. This geographical variation was the product of two main factors: the political salience of local environmental degradation, and the recipients' capacity to marshal the indigenous resources necessary for joint implementation. In Estonia, Latvia, and Lithuania, the political salience of Baltic environmental degradation was not only high, it was a national political priority: Consequently, the powers of the central government were brought to bear in support of joint implementation. In St. Petersburg, environmental degradation was also a high political priority, but the city authorities found it much more difficult to exercise effective control over all of the policymaking levers necessary to make joint implementation work. This was a result of the fact that St. Petersburg was not an independent state, but part of the economically troubled and politically fragmented Russian Federation—and the federal authorities in distant Moscow did *not* view Baltic Sea pollution as a high priority. The consequences of these differences can be illustrated by a brief comparison of implementation in Estonia and St. Petersburg.

Implementation in Estonia

Estonia was the first territory in the former Soviet Union to benefit from transnational subsidization and the newly independent state in which implementation of the JCP advanced most rapidly. The reasons for Estonia's rapid progress were geopolitical, cognitive, and economic. First, like Latvia and Lithuania, Estonia emerged from the rubble of the USSR as an independent state, able to engage in environmental diplomacy without the need to secure the cooperation of the Russian government in distant Moscow. Moreover, Estonia was blessed by its geographical and cultural proximity to neighboring Finland, which moved more swiftly than did the other Western littoral states to undertake the transnational subsidization of environmental protection in the former Soviet Union. Since the barriers to progress were lowest in Estonia, this is where Finland's pioneering efforts produced the most rapid results. Second, Estonia inherited many of the most influential members of the specialist community that emerged in the 1970s and 1980s as a result of Soviet participation in HELCOM, including Harald Velner, who served as the chairman of HELCOM until 1996. The presence of these authoritative figures further increased the political salience of water pollution at the national level and greatly eased the disruption associated with the transition from Soviet rule. Finally, Estonia moved more quickly than any of the other newly independent states to undertake the economic reforms demanded by Western donors, including the stabilization of its currency—a circumstance that considerably helped Estonia in the ensuing competition for Western loans and grants.

The transnational subsidization of municipal wastewater treatment in Estonia began while Estonia was still (in Moscow's eyes) an integral part of the Soviet Union. In early 1991, an "East Europe Project" was created within the Finnish Ministry of the Environment in order to finance transnational investments in environmental protection in Poland and the neighboring regions of the USSR. Most of the projects financed through the East Europe Project were relatively modest—the Finnish contribution toward any particular project rarely exceeded one million Finnish marks (FIM)—but the total size of the effort was quite impressive. In 1991–1993 alone, the Finnish Ministry of the Environment provided FIM 185 million (approximately $36 million) for concrete environmental protection measures in the former socialist states, and an additional FIM 40 million ($8 million) for technical assistance. Water protection was the main target of the Finnish program, accounting in 1991–1994 for 56 percent of the investments in Poland and 75 percent of the investments in Estonia and Russia.[33] Estonia was the largest single recipient of Finnish assistance, and, along with Poland, the former socialist state in which the Finnish subsidization of environmental protection proceeded most swiftly.

Initial Finnish assistance for water protection in Estonia took a variety of forms, some quite imaginative. Purely by chance, the disintegration of the USSR coincided with the construction of a new centralized wastewater treatment facility in Helsinki to replace the five smaller plants that had previously served the metropolitan area. Although these older plants had been superceded by a newer and more advanced facility, the equipment in use in them remained quite serviceable—and, most importantly, would constitute a tremendous improvement over that currently in use in Estonia. Beginning in 1991, this equipment was dismantled and shipped to Tallinn, where it was reassembled with Finnish assistance.[34] Next, in 1992, the Tallinn Waterworks and the Finnish firm Kemira launched a joint venture with funding from the East Europe Project and the Nordic Environment Finance Corporation (NEFCO), the goal being to launch local production of some of the chemicals used in the existing chemical treatment plant. These chemicals had previously been imported from Russia, but post-Soviet customs barriers now made that practice prohibitively expensive; in any case, the Russian chemicals had the undesirable side effect of corroding the plant's equipment.[35]

In early 1993, work began on the first phase of a larger program for the modernization of the Tallinn Waterworks: the construction of a biological wastewater treatment plant in addition to the chemical treatment plant already in use. This project began as a Finnish-Estonian venture, but soon (as the Finns and Estonians had hoped) it attracted additional donors and considerably more money. In July 1994, the EBRD announced that Estonia would be the recipient of the bank's first major investment in environmental infrastructure in the former Soviet bloc: a loan of ECU 23 million (then about $28 million) to the Tallinn Waterworks for the further renovation of its intake, pumping, storage, distribution, metering, and treatment facilities. The EBRD loan constituted nearly half of the total cost of the modernization program, estimated at ECU 48 million; this was supplemented by an additional ECU 6 million in grants from Finland and the EU's PHARE program.[36] The Tallinn Waterworks undertook the responsibility of paying the remaining costs (just over 30 percent of the total) and the repayment of the EBRD loan. Toward this end, the Tallinn Waterworks would transform itself into an independent, self-financing enterprise with the help of an ongoing twinning arrangement with the Helsinki Waterworks. The EBRD projected that the resulting reduction in pollution would reduce the total load of phosphorus and nitrogen discharged into the Gulf of Finland by one percent, in addition to the local benefits that it would provide.[37] For its part, HELCOM hailed the Tallinn project as a model of joint implementation.[38]

Although the Tallinn project was the flagship of the international effort to reduce the water pollution generated in Estonia, it was by no means alone. By early 1992, Finland had already begun to invest in wastewater treatment improvements at municipal and industrial sources elsewhere in Estonia, such as the heavily polluted region of Kohtla-Järve (Finland 1994). Subsequently, as had been the case in Tallinn, the effort to promote water protection throughout Estonia expanded to include additional donors and lenders. In May 1995, the EBRD announced a new "Small Municipalities Project" in Estonia. This project envisaged the modernization of the water and sewer services of ten Estonian cities, all of which empty their wastes directly or indirectly into the Baltic Sea. The adjective "small" was somewhat misleading, for the group included all of the sizable cities in Estonia, including Kohtla-Järve and Tartu—both of which were generating more organic wastes than Tallinn by 1995.[39] Of the total expected cost of ECU 46 million, the EBRD provided a loan of slightly more than ECU 10 million; this was matched by roughly ECU 12 million in grants from individual governments, all in support of the contracts awarded to their firms—a group that included "offstream" Switzerland as well as the Nordic states. As in the case of the Tallinn project, the Small Municipalities Project was based upon the expectation that credits would be repaid primarily through the earnings of the municipal water and sewer utilities, which would be revamped so as to operate on a self-financing basis.[40] Thus, by the time the JCP celebrated its fifth anniversary in 1997, the modernization of municipal wastewater treatment in Estonia was in full swing—both in Tallinn and in many other smaller cities and towns throughout the country.[41]

Implementation in St. Petersburg

Implementation of the JCP moved forward more slowly in the Russian Federation than in Estonia or its sister Baltic states, Latvia and Lithuania. Large-scale multilateral efforts to modernize municipal wastewater treatment in Estonia, Latvia, and Lithuania began almost immediately after the collapse of the USSR and were well underway by the summer of 1996, when the announcement of the multilateral financing package for the Latvian capital Riga put the last major piece of the Baltic puzzle into place.[42] A comparable multilateral package for the city of St. Petersburg—the single largest source of municipal pollution in the ex-Soviet Baltic region—was announced in the summer of 1997, and agreement on an equivalent package for municipal wastewater treatment in Kaliningrad was reached only in April 1999.

Why did transnational subsidization proceed more slowly in the Russian Federation than in the Baltic states? In Kaliningrad, the slow pace of subsidization was due in large part to the weak representation of environmental concerns at the local level. During the Soviet period, Kaliningrad served primarily as a closed military outpost rather than as a center for education or scientific research; as a result, in comparison with St. Petersburg and the Baltic republics, Kaliningrad inherited little of the Baltic marine science community that emerged in the USSR during the 1970s and 1980s. This low level of specialist representation was matched by a relatively low level of nongovernmental environmentalist activity: In the late 1980s and early 1990s, the popular expression of environmental concerns was far less visible in Kaliningrad than in Leningrad/St. Petersburg or the Baltic states. Consequently, despite the near-total absence of municipal wastewater treatment in Kaliningrad, there was no immediate internal "push" for environmental protection to match the external "pull" exerted by the Western littoral states.

However, the strength of local environmental concern is not sufficient to explain the slower pace of implementation in the Russian Federation, for, in contrast to Kaliningrad, local environmental concerns were extremely well represented in the city of Leningrad/St. Petersburg. Leningrad was one of the chief beneficiaries of the scientific capacity-building program that accompanied Soviet participation in HELCOM, and many of the marine specialists based in Leningrad were, in turn, active in efforts to promote municipal water protection, both before and after the city was rechristened St. Petersburg. Moreover, popular concerns about environmental degradation and public health risks were also relatively well represented in the city and its environs. Environmentalist organizations flourished in Leningrad during the perestroika period, and in 1990 many representatives were elected to the city soviet on environmentalist platforms. Much of this energy dissipated in the chaos that accompanied the collapse of the USSR, but not all. Even in the darkest days of the mid-1990s, environmental problems continued to absorb more political attention in St. Petersburg than in most other Russian cities.

Instead, the slow pace of implementation was due primarily to the fact that St. Petersburg was not the "fourth Baltic republic"—a popular slogan that accompanied the city's assertion of its "sovereignty" in 1990–1991—but one of the eighty-nine constituent subjects of the Russian Federation. (This was also true of the surrounding Leningrad Oblast, from which the city of St. Petersburg was effectively independent.) This difference in political status worked to the disadvantage of rapid joint implementation in two main ways.

First, economic and political stabilization in St. Petersburg, a precondition for effective participation in the JCP, was dependent upon overall political and economic stabilization in the Russian Federation—a process which proceeded slowly and was subject to major reversals, such as the shelling of the Russian parliament in October 1993 and the economic crisis of 1998. Despite the generous decentralization of political and economic power in the reconstructed Russian Federation, the authorities in St. Petersburg had far less control over the rate and direction of economic reform than did their counterparts in the Baltic states, as many of the key decisions affecting their fate (such as monetary policy) continued to be made in Moscow. Local revenue collection, including the levying of fines and charges for pollution and natural resource use, was extremely difficult given the nationwide problem of tax evasion and nonpayment of fines, charges, and wages of all sorts. Even the very existence of political structures at the regional level could not be insulated from the broader political instability that wracked the Russian Federation in the 1990s. In late 1993, for example, Russian President Boris Yeltsin, flush from his violent victory over his opponents in the national legislature, ordered the dissolution, reconstruction, and fresh election of legislative assemblies at the municipal and regional levels as well. In St. Petersburg, where the municipal assembly had been extremely active in the campaign to improve the city's environmental situation, this process consumed more than a year, during which there was no legislative assembly whatsoever.[43]

Second, the Russian regional authorities in the Baltic region did not exercise control over all of the policymaking levers needed to make joint implementation work. In the Baltic states, the "regional" governments were now *national* governments: They were both intensely interested in environmental protection in the Baltic region *and* able to exercise control over all of the policymaking levers necessary to make joint implementation work. In the Russian Federation, by contrast, the regional authorities involved in joint implementation were dependent upon the cooperation of the central government in Moscow, which was much further removed from the problems and priorities of the Baltic region. The primary responsibility for the negotiation of the technological and organizational details of transnational environmental projects lay at the local level; this was also the level at which recipient interest in the problems of drinking water supply and pollution control was greatest. Yet, at the same time, the regional authorities and their Western negotiating partners expected the central government in Moscow—which, after all, bore primary responsibility for Russian participation in HELCOM—to share in the financing and to provide sovereign guarantees for international loans. For its part, however, Moscow viewed pollution in the distant (and, by Russian standards, comparatively clean) Baltic Sea as a very low priority, even among environmental problems—all of which were a relatively low priority to begin with.

Transnational financing for the modernization of St. Petersburg's water and sewer system began on a small scale even before the final collapse of the USSR, while the city was still named Leningrad, and continued to grow thereafter. The problem was that these early projects could not progress beyond the scale at which they could be supported primarily through foreign grants. The central government in Moscow refused either to contribute large sums from the national budget for water protection in St. Petersburg or to provide a sovereign guarantee for the large loans that would be required for the modernization of the city's water and waste treatment infrastructure. On the other hand, the city of St. Petersburg and the municipal water and sewer utility, Vodokanal St. Petersburg, could not finance the local share of large joint projects from their regular budgets—and without a sovereign guarantee from Moscow, the major international lending institutions would not make large loans to either the city or Vodokanal. This logjam was finally broken in 1997, when the EBRD and the Nordic Investment Bank agreed to extend a loan package of ECU 81 million (approximately $90 million) to Vodokanal St. Petersburg. These loans were formally guaranteed by the city of St. Petersburg, rather than the government of the Russian Federation, a step that was hailed as a major institutional innovation by the EBRD.[44]

Conclusion

The first seven years of HELCOM's JCP were not an unmitigated victory. The Baltic Sea states did not succeed in meeting the ambitious target set forth in the 1988 Ministerial Declaration, a 50 percent reduction in all harmful emissions by 1995. Indeed, when environment ministers from HELCOM's member states met in early 1998 to mark the tenth anniversary of the 1988 declaration, they announced that the target date for fulfilling it would be pushed back by ten years, to 2005 (HELCOM 1998b). Implementation of the JCP was also uneven: It advanced much more rapidly in the area of municipal wastewater treatment than in the areas of industrial and nonpoint source pollution, and it proceeded more swiftly in Poland and the newly independent Baltic republics than in the Russian Federation.

Nevertheless, the overall picture that emerges from East-West cooperation in the Baltic Sea region is one of impressive accomplishment, particularly given the difficulties of the transition period. By investing in environmental protection in the former socialist states as well as in further emissions reductions within their own borders, the Western littoral states were able to reduce the overall pollution load to the Baltic at a far lower cost. The recipient states, in turn, were able to hitch the solution of their own environmental and water supply problems to the multilateral effort to clean up the Baltic Sea as a whole and therefore received a much larger return on their own investments in environmental infrastructure. Although the environmental and economic interests of the donors and recipients were not identical, their goals did not work at cross-purposes. Instead, these goals could simply be added together in mutually satisfactory package deals: Both sides obtained reductions in organic wastes, a wide range of chemical pollutants, and phosphorus; the recipients obtained improvements in the supply and purification of drinking water; and the donors obtained reductions in nitrogen, the limiting nutrient in the open sea.

The Baltic Sea case also demonstrates that the proliferation of actors does not necessarily make international environmental cooperation more difficult. One of the main findings of the literature on collective action is that the barriers to cooperation tend to rise along with the number of actors involved: As the number of actors grows, each individual actor's ability to contribute to the solution of the problem declines, while the temptation to free ride increases (Olson 1965; Hardin 1982). However, territorial dismemberment and decentralization did not have this effect in the Baltic case: On the contrary, the proliferation of actors was actually favorable for East-West cooperation. This occurred because the breakup of the USSR and the territorial devolution of political power within the Russian Federation transferred far greater policymaking power from Moscow, for whom pollution in the Baltic Sea was a low priority in the post–Cold War period, to the political authorities in the Baltic region: precisely those most interested in solving the problem of local water pollution. In other words, under the right conditions, the proliferation of actors may actually be *more* conducive to collective environmental action—provided that there is a significant overlap in the measures required to solve *local* environmental problems and those required to solve *transboundary* ones.

Finally, the experience of the JCP indicates that a common, centrally administered pool of donor money—such as the Global Environment Facility or the EBRD's Nuclear Safety Account—is not a necessary condition for a comprehensive, well-coordinated program of transnational subsidization. HELCOM and the JCP provided not a central repository for donor funds, but an integrated plan that translated the goal of improving the marine environment of the Baltic Sea into a list of specific targets for transnational subsidization, together with rough estimates of the local and transboundary environmental benefits and the cost effectiveness of investments in each case. The actual financing of this plan was left to the donor states, the recipient states, and international lending institutions to work out on a case-by-case basis. Duplication was minimized (although certainly not avoided altogether) by means of information sharing within HELCOM and the emergence of an informal division of labor among the leading donor states and international lending institutions. HELCOM, in turn, monitored the progress of the implementation of the "plan" as a whole and provided a forum within which the donors and recipients could share and learn from their previous and ongoing experiences. HELCOM's approach—which might be characterized as "centralized plan, decentralized implementation"—proved to be flexible, expeditious, and effective, and it seems unlikely that the creation of a centralized funding mechanism would have made it significantly more so.

4

Transboundary Air Pollution

The history of the involvement of the USSR and the newly independent states in international efforts to combat transboundary air pollution presents a particularly sharp paradox. On the one hand, Soviet participation in international efforts to reduce transboundary air pollution was, on the surface at least, enthusiastic and far-reaching. In no other environmental issue area, prior to the perestroika period, did the Soviet government agree to concrete targets for reductions in its internal emissions, and in no other area did the participation of the Soviet Union in international environmental cooperation represent so great a shift in its internal environmental priorities. Indeed, it is possible that a broad international convention to limit transboundary air pollution would not have been achieved at all were it not for the diplomatic efforts of the Brezhnev regime, which paved the way for the conclusion of the LRTAP Convention in 1979. Soviet willingness to cooperate in this area accelerated still further under Gorbachev in the second half of the 1980s, when the USSR took on still more ambitious and potentially costly international commitments. Then, in the wake of the disintegration of the USSR, the newly independent states almost entirely lost interest in the issue. In fact, of the three international environmental issues under consideration, it is precisely in the area of transboundary air pollution that the fit between the interests of the Western European countries and those of the newly independent states was least conducive to effective international collaboration in the 1990s.

This paradox resolves itself upon closer inspection. When LRTAP first emerged as a major international issue in the 1970s, the USSR was a net importer of air pollution, due to the prevailing west-to-east wind pattern in Europe. This alone would not have been enough to interest the Soviet leadership, because acidification—the main consequence of the long-range transport of sulfur and nitrogen, the first transboundary air pollutants to generate widespread international concern—was not yet considered a serious problem by Soviet environmental specialists. While the Western countries bickered over the need to reduce gaseous emissions such as sulfur dioxide (SO_2) and nitrous oxides (NO_x), environmental regulators in the Soviet Union were still working to trap particulate emissions such as dust, ash, and heavy metals: tasks that had, for the most part, already been accomplished in the West. However—and largely by default—progress in international efforts to control transboundary air pollution became linked to the advancement of détente, a goal which *did* engage the interests of the Soviet leadership. This linkage motivated Brezhnev and his immediate successors to manipulate Western interest in the issue as a way to advance their interest in détente. The result was the skewing of Soviet air pollution policies toward the substances of greatest interest to the West, a phenomenon that continued with even greater force under Gorbachev, despite the rising projected costs of complying with additional international commitments.

The collapse of the Soviet Union and the concomitant decentralization of environmental decision making in the Russian Federation fundamentally changed this equation. The newly independent states and the Russian regions were less concerned about projecting an image of cooperativeness than they were about economic survival and the amelioration of their most pressing internal environmental problems. This led to a general drop in interest in the long-range deposition of sulfur and nitrogen. At the same time, the prevailing west-to-east wind pattern meant that Western European states had relatively little interest in the comprehensive reduction of sulfur and nitrogen emissions in the newly independent states. The exceptions were those sources sited sufficiently near the Nordic states to generate transboundary air pollution. Even here, the interests of would-be donors and recipients usually failed to coincide. Because the newly independent states' environmental interest in controlling SO_2 and NO_x emissions was so weak, would-be donors were compelled to appeal to the economic interests of polluting firms in the newly independent states. However, due to the uncertainty, instability, and lure of quick profits that accompanied privatization and the transition to the market in the former Soviet Union, these interests proved to be a weak and unstable foundation upon which to base the joint implementation of environmental protection measures. Consequently, joint projects designed to reduce transboundary air pollution from the newly independent states—including those to which the donors attached the highest priority—tended to stall or collapse in the post–Cold War period.

How to Succeed in "Greenness" without Really Trying: The USSR and Transboundary Air Pollution, 1968–1985

The Road to the LRTAP Convention

From the very outset, the international politics of transboundary air pollution differed from those of Baltic Sea pollution. First, unilateral measures taken to reduce domestic air pollution damage did not necessarily lead to reductions in transboundary emissions. Some national measures, such as the use of cleaner fuels and coal washing, did lead to reductions in the long-range transport of SO_2 and other gaseous pollutants. However, other popular measures undertaken to reduce local environmental degradation, such as the construction of tall chimney stacks and the introduction of particle collection, either had no effect on transboundary emissions or actually caused them to increase. Second, due to the prevailing west-to-east wind pattern and the wide variations in the sensitivity of regional ecosystems, emissions and damage were distributed much more unevenly than in the Baltic Sea case. Many "downwind" countries (including the USSR) were net importers of sulfur pollution, while "upwind" polluters such as the United Kingdom were able to export much of their own sulfur emissions while receiving little in return. In most countries, including the USSR and the United Kingdom, domestic emissions were responsible for most of the sulfur deposited within national territories. However, by the late 1970s several downwind states—including Austria, Switzerland, and all of the Nordic countries except Iceland—imported significantly more sulfur from abroad than they inflicted upon themselves (Wetstone and Rosencranz

1983:20–21). To make matters worse, the largest polluters tended to be located in areas more resistant to acidification, while many of the net importers were located in much more sensitive northern or alpine areas (Kämäri et al. 1992).

The international politics of LRTAP began in 1968, when Swedish soil scientist Svante Odén published a study ascribing the acidification of Swedish lakes to the long-range transport of sulfur emitted in Britain and Central Europe (Odén 1968). Swedish concern soon spread to neighboring Norway. Outside of Norway, Sweden's campaign to place the issue of transboundary air pollution on the international agenda initially met with skepticism. Nevertheless, in 1972 the Organization for Economic Cooperation and Development (OECD) launched a Cooperative Program to Measure the Long-Range Transport of Air Pollutants, coordinated by the Norwegian Institute for Air Research. Eleven Western European countries participated in the program, which in 1978 was given independent status as the Cooperative Program for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (EMEP). The results, published in 1977–1979, for the first time provided independent confirmation that sulfur compounds could in fact be transported over long distances and that these were primarily to blame for the worsening acidification of lakes in southern Scandinavia.[1] Despite these findings, most Western European countries remained reluctant to agree to far-reaching cuts in SO_2 emissions. As it turned out, the impetus for further action came from a most unexpected quarter: Soviet General Secretary Leonid Brezhnev.

Speaking at the Seventh Congress of the Polish Communist Party in December 1975, Brezhnev called for intensified East-West cooperation along the lines suggested by the Final Act of the Conference on Security and Cooperation in Europe (CSCE), which had been signed a few months earlier in Helsinki. Specifically, Brezhnev proposed that pan-European conferences be held on three of the issues mentioned in the Final Act: energy, transportation, and environmental protection.[2] At first, Brezhnev's initiative was received with little enthusiasm by most Western governments, but the Soviet government continued to press the matter. Finally, at the annual meeting of the UN Economic Commission for

Europe (UN/ECE) in April 1977, the representatives of the Warsaw Pact countries insisted that the organization's yearly report contain positive references to the operationalization of the Brezhnev proposals. After hasty negotiations between the Eastern and Western blocs, it was agreed that the UN/ECE would give further consideration to the desirability of holding a ministerial conference on environmental protection (Jackson 1990; Füllenbach 1981:168–171).

The topic of environmental protection was chosen by default. Few Western governments felt any burning need to discuss environmental protection in such a large forum; instead, the environment was chosen because it was the most innocuous of the three issues proposed by Brezhnev. Energy was of too much strategic importance for serious interbloc discussion, and the West German government feared that the Soviet bloc would use a pan-European conference on transportation to press for the internationalization of the Rhine-Main-Danube waterway, which ran through the territory of the FRG (Füllenbach 1981:185–186). Over the course of 1977–1978, the UN/ECE studied a number of possible candidates for an East-West environmental conference, and ultimately decided to proceed with the issue of LRTAP—the fruit of hard lobbying by the Scandinavian delegations.

The resulting LRTAP Convention was signed at a ministerial meeting of thirty-three states in Geneva in November 1979. Although the LRTAP Convention did not immediately establish concrete targets or deadlines for emission reductions, it did establish an organizational mechanism within which subsequent bargaining could take place. In addition, the EMEP network was expanded to include the national monitoring efforts of the non-OECD states, which in many cases required the expansion of their preexisting capabilities. Two centers using competing methodologies were set up to synthesize the EMEP data, one in Oslo and one in Moscow. (The political rationale for this duplication will be explained below.) LRTAP activities also stimulated the participating states to develop national research programs to determine the environmental effects of transboundary air pollution, although these national efforts were not integrated to the degree found in HELCOM's Baltic Monitoring Programme (Wetstone and Rosencranz 1983:141–146; Levy 1993a:81–87).

The next step in the evolution of the international politics of transboundary air pollution was the negotiation of a protocol limiting sulfur emissions. Progress on this front was greatly facilitated by a sudden and unexpected shift in the position of the West German government, a reversal brought about by the rapid acceleration of forest damage in the country, particularly in the highly valued Black Forest. At the first session of the executive body in June 1983, Sweden, Norway, and Finland presented a draft protocol calling for a 30 percent rollback in SO_2 emissions. This proposal was strongly supported by other importers and the newly converted FRG. Meeting in Ottawa in March 1984, the ten most fervent supporters of the proposed rollback announced the formation of a "30 Percent Club," each member of which agreed, at a minimum, to reduce its SO_2 emissions by 30 percent by 1993, taking 1980 levels as the baseline. The next breakthrough came at a ministerial conference on acidification held in Munich in June 1984, when the USSR and several other states announced their membership in the club. This campaign culminated in a formal protocol to the LRTAP Convention, committing the signatories to reduce their emissions or transboundary fluxes of SO_2 by 30 percent by 1993. Nineteen states, including the USSR, signed the sulfur protocol in Helsinki in July 1985. The United States and Great Britain abstained (Wetstone and Rosencranz 1983; Wetstone 1987; Björkbom 1988; Levy 1993a; McCormick 1989a).

The USSR and the LRTAP Convention

Considering the environmental and economic interests of the states involved, the conclusion of an international treaty to combat LRTAP in Europe and North America verges on the miraculous. Prior to the negotiation of the LRTAP Convention, only two countries, Sweden and Norway, were seriously concerned about the problem. The remaining thirty-odd participants either showed little interest in the issue or expressed a positive disinterest in the prospect of taking expensive measures to address a problem with little domestic relevance. How, then, did the LRTAP Convention come about? The answer lies in the extraordinary degree to which interest in the LRTAP issue was stimulated by the broader context of international politics, particularly by the widely shared desire to preserve the fragile East-West détente that had emerged in the early 1970s.[3] This was nowhere more true than in Moscow.

In retrospect, the Brezhnev proposals of December 1975 and the subsequent Soviet support for the LRTAP Convention may be seen as the culmination of a twenty-year effort by the Soviet leadership to formally cement the postwar segregation of Europe. Since the mid-1950s, the socialist states had periodically pressed for the convocation of a European security conference. In 1969, the leaders of the Warsaw Pact suggested for the first time that other issues, such as energy, transport, health, and environmental protection, might also be discussed at a pan-European conference, and in the following year they formally accepted the participation of the United States and Canada. After several years of negotiation, these efforts culminated in the summit meeting of the CSCE, which met in Helsinki in 1975. As was usual during the détente period, the Soviet Union and the West entered into the CSCE negotiations with conflicting goals and emerged with quite different understandings of the resulting agreement. This contradiction was reflected in the very structure of the CSCE Final Act. The Final Act was divided into three so-called baskets of issues: security in Europe (Basket 1); trade, scientific and technical cooperation, and environmental protection (Basket 2); and human rights (Basket 3). The USSR and its Eastern European allies were primarily interested in the principles laid out in Basket 1, which (they hoped) would finally establish the permanence of the postwar division of Europe and the absolute impermissibility of Western interference in the domestic affairs of the socialist states. They were also interested in expanded East-West trade, particularly the lifting of Western export restrictions. The Western countries, on the other hand, were less interested in finalizing the partition of Europe, and more interested in pressing for the relaxation of internal political controls within the socialist states. Hence the great amount of emphasis which Western leaders placed upon the principles outlined in Basket 3, a set of topics which the socialist bloc would have preferred not to discuss at all.

Although Soviet spokesmen heaped fulsome praise upon the CSCE Final Act as the centerpiece of East-West détente, by late 1975 the Soviet leadership was increasingly irritated by Western efforts to use the CSCE process to keep the spotlight on human rights abuses within the socialist bloc. Brezhnev made his irritation abundantly clear in his speech to the Polish Party Congress that December. Turning at the end of his speech to the CSCE, Brezhnev denounced those who, for their own tactical convenience, tore bits and pieces from the Final Act rather than viewing it as a whole; and he noted with alarm the accelerating campaigns of disinformation and slander designed to poison the positive atmosphere created by the CSCE. To give a decisive rebuff to the enemies of international cooperation, Brezhnev concluded, the socialist states must demonstrate their readiness to take concrete actions in order to deepen the positive process outlined by the Final Act. To do so as quickly as possible, pan-European congresses or intergovernmental meetings should be held in the areas of energy, transportation, and environmental protection.[4] Brezhnev's initiative of December 1975 was thus an effort to get détente back on track by diverting attention from the knotty problems generated by Basket 3 to the happier vision of East-West cooperation outlined in Basket 2.

The selection of LRTAP as the focus of the resulting conference was the result of the skill and alacrity with which Sweden and Norway seized upon the window of opportunity opened by Brezhnev's initiative, rather than any particular Soviet interest in the problem. In fact, the long-range deposition of sulfur and nitrogen was a low priority for Soviet environmental regulators. In contrast to the major sulfur emitters in the West, the USSR had yet to effectively address its most basic, self-inflicted air pollution problems: the deposition of particulate matter, heavy metals, and noxious hydrocarbons in the immediate vicinity of its power plants and industrial facilities, many of which were located in densely populated urban areas. By the time the long-range deposition of gaseous pollutants emerged as a major issue in the West, most Soviet factories and power plants still lacked effective particle collection systems, much less gas purification technology. By any yardstick—public health, economic losses, soil pollution, even damage to lakes and forests—the consequences of internally generated, short-range emissions were by far the most serious air pollution problems facing the USSR in the late 1970s.[5]

Nevertheless, participation in LRTAP opened a valuable window of opportunity for the leading Soviet air protection agency, the USSR State Hydrometeorological Service (Gidromet), which rose over the course of the 1970s from a lowly meteorological service to become the most prominent environmental protection agency in the USSR. (In 1978, Gidromet was renamed the USSR State Committee for Hydrometeorology and Environmental Control, or Goskomgidromet.)[6] Soviet integration into the EMEP monitoring network necessarily entailed the expansion of Gidromet's monitoring network and opportunities for Gidromet officials to interact with their foreign counterparts. Moreover, the theoretical issues raised by LRTAP resonated with the scientific interests of prominent Soviet researchers. The study of large-scale climatic and atmospheric processes was extremely popular among prominent Soviet mathematicians and atmospheric scientists, work in which the chairman of Gidromet, Yuriy Izrael', was closely involved.[7] The weak link in these efforts was computer modeling, an activity hampered by the primitive level of Soviet computing facilities. Consequently, Izrael' and his colleagues fairly leapt at the chance to advance their modeling activities through association with EMEP.

Just as in the case of the Baltic Sea, however, the leadership's wish to appear cooperative in its dealings with the West did not translate into a blank check for Soviet environmental officials. From Gidromet's perspective, Soviet participation in the LRTAP Convention would make little sense if the USSR did not also take part in EMEP, the international monitoring system originally established under the auspices of the OECD. In the OECD/EMEP system, national data on the emission and deposition of sulfur were organized according to a grid imposed upon the map of Europe, each quadrant measuring approximately 150 km on a side (Ottar 1976, 1978; Eliassen 1978; Izrael' et al. 1989). With the conclusion of the LRTAP Convention, this grid would be extended to encompass the European part of the USSR. However, the Soviet military and KGB immediately objected to the release of any data on emissions within the area covered by the grid, on the grounds that Western intelligence agencies would be able to use this information to calculate the exact location, composition, and potential of the Soviet industrial complex. Efforts by Gidromet officials to convince the representatives of the military and the KGB (the Committee for State Security) that this would be impossible met with a brick wall, and the whole prospect of Soviet participation was cast in doubt.

Realizing that permission to release emissions data would not be forthcoming, the top specialists at Gidromet frantically searched for an alternative formula that would allow the USSR to participate in EMEP without giving out information on the "quadrants" within its territory. After consultations with their Norwegian counterparts, Gidromet officials came up with the following solution: The USSR would only release its own calculations of the "transboundary fluxes" of pollutants crossing its western border. Since this was "cooked" rather than "raw" data, a separate synthesizing center would be set up in Moscow in order to perform the necessary calculations. This was the origin of the EMEP Meteorological Synthesizing Center (MSC)–East, whose task was to calculate the trajectory and deposition of air pollutants based upon the emissions data submitted by the members of EMEP. The difference, of course, was that the data on Western emissions were publicly available, while Gidromet's data on Soviet emissions remained secret. The main EMEP synthesizing center in Oslo, now dubbed MSC-West, had to recalculate Soviet emissions from the Soviet calculations of transboundary fluxes.[8]

The USSR and the First Sulfur Protocol

Immediately after the conclusion of the LRTAP treaty, the Western sulfur importers resumed the campaign for mandatory reductions in SO_2 emissions. Initially, together with the United States, Britain, and France, the Soviet bloc rejected the 30 percent reduction in SO_2 emissions proposed by the Nordic states at the first meeting of the LRTAP Convention's executive body in June 1983 (McCormick 1989a:78–80). This aloofness was partly the consequence of scientific uncertainty, but it owed even more to the overall deterioration of East-West relations in the early 1980s. Whatever contribution the conclusion of the LRTAP treaty might have made to East-West détente, it was forgotten in the furor surrounding the Soviet invasion of Afghanistan the following month. Relations between the USSR and the West soured still further with the acrimonious dispute over the deployment of a new generation of American long-range tactical nuclear weapons in Western Europe (Garthoff 1985:966–1067; Sodaro 1990:265–316).

In 1984, however, the Soviet position toward the sulfur protocol changed dramatically: At an environmental conference of UN/ECE members hosted by the FRG in Munich in June 1984, the USSR and the GDR triumphantly announced their membership in the 30 Percent Club. Again, this shift had little to do with environmental considerations, and much to do with broader political concerns. By mid-1984, many members of the Soviet elite, including heir apparent Mikhail Gorbachev, recognized that the heavy-handed tactics applied in 1983—such as walking out of the Geneva arms talks and attempting to intimidate West German voters and parliamentarians—had proved counterproductive (Sodaro 1990:283–312). When the advocates of a more conciliatory approach began searching for ways to improve the USSR's image in Western Europe, they quickly seized upon the proposed sulfur protocol. The diplomatic gains of this move were all the more valuable given that the United States refused either to join the club or to sign the sulfur protocol.

At first glance, a 30 percent cut in sulfur emissions would seem a tremendously high price to pay in order to score a relatively minor diplomatic coup. Soviet environmental officials were themselves divided over the relative priority of sulfur reductions. Izrael' and other leading Goskomgidromet officials were in favor of the protocol, but others argued that the main threat to the nation's forests was the short-range deposition of heavy metals: If the Soviet government was genuinely concerned about forest damage, then it should concentrate its efforts on the reduction of the emission of these substances—all of which came from readily identifiable point sources within the USSR—rather than long-range sulfur deposition. However, the Soviet diplomats involved in the negotiations were not interested in the nation's environmental priorities; they simply wanted to know whether it would be possible to upstage the United States at a reasonable cost. Goskomgidromet's specialists agreed that it would, provided that the USSR agreed to a 30 percent cut in the *transboundary flux* of sulfur emitted within the USSR, rather than a 30 percent reduction in emissions across the board. Since only a tiny fraction of all sulfur emitted in the European part of the Soviet Union crossed the USSR's western border, Soviet specialists projected that the USSR could meet these targets through a well-focused program of pollution control in its westernmost regions, which promised to be much less expensive than an across-the-board reduction in total emissions.

This approach was possible because the Soviet leadership had just launched a massive campaign to expand the use of natural gas and nuclear power throughout the European USSR, a shift driven by economic rather than environmental considerations. In the mid-1970s, the quantity and quality of the coal and oil produced in the European USSR began to decline precipitously. Worse still, the output of the Siberian oil fields fell behind planned targets. By 1980, it was clear that the share of oil in the national fuel balance could not be maintained at its current level, since to do so would consume more capital investment in 1981–1985 than all of the rest of Soviet industry combined (Gustafson 1989:27–29). The Soviet leadership consequently found itself on the horns of an unenviable dilemma: If oil exports were to be maintained without a reduction in domestic energy consumption, then some other source of energy had to be found for the densely populated and heavily industrialized European USSR. Brezhnev opted to respond by expanding the use of nuclear power and natural gas. Although the nuclear power program was plagued by construction delays, the gas campaign was a spectacular success: All of the planned pipelines linking the western USSR to the gas fields in Siberia were finished ahead of schedule, despite a U.S. embargo on the necessary compressor technology (Gustafson 1989).

Since natural gas and nuclear power emitted negligible amounts of SO_2, this new energy policy promised to permit the USSR to achieve the 30 percent reduction with a minimum of additional investment. Soviet diplomats and environmental officials occasionally presented this shift in energy policy as a response to the USSR's international environmental commitments, rather than the reverse.[9] However, the environmental impact of this shift, while significant, was largely incidental. The gas campaign was extraordinarily expensive and required constant political attention at the very highest level; it strains credulity to imagine that such a Herculean undertaking could have been motivated by environmental concerns, given the low priority that Brezhnev attached to environmental protection.

Domestic Implementation in the USSR, 1980–1985

Soviet participation in the LRTAP Convention had a fairly limited domestic impact in the first half of the 1980s. Participation in the convention stimulated the development of Soviet science, particularly in the area of atmospheric modeling; however, its effect on Soviet studies of the consequences associated with long-range deposition, such as forest decline, was much less marked. Although most major European countries undertook comprehensive studies aimed at determining the effects of long-range acid pollution, the USSR did not. This was because most Soviet forestry specialists were primarily concerned with other problems: forest fires, short-range industrial pollution, and, above all, grossly wasteful harvesting practices.[10] Participation in the LRTAP Convention also led to the development of a comprehensive plan for the reduction of SO_2 emissions along the USSR's western border, above and beyond those expected from the shift to natural gas. The strategy that emerged called for the installation of gas purification devices at thermal power plants and a reduction of the emissions of the two largest sulfur emitters in the western USSR—the Severonikel and Pechenganikel nickel smelting combines on the Kola Peninsula—by 56 and 47 percent by 1993, compared with 1980 levels (USSR State Committee for the Protection of Nature 1989:116).

How effective were these efforts? Certainly, Soviet SO_2 emissions fell noticeably in the 1980s, both along the USSR's western border and throughout the country as a whole. Emissions of SO_2 in the European USSR fell from about 12.8 million tonnes in 1980 to 10.3 million in 1988, a decrease of nearly 20 percent (UN/ECE 1989:14). However, it is difficult to attribute much of this reduction to deliberate regulation. First, most of the gas purification technology intended for sources along the USSR's western border failed to materialize. Of the more than 7 million tonnes of SO_2 emitted by Minenergo's power plants in 1989, filters removed only 117,000 tonnes, or less than 2 percent (Berlyand 1990:220, 262, 277). Likewise, there was no significant decrease in the sulfur emissions from the nickel smelters on the Kola Peninsula. Equipment to improve the recovery of sulfur (which had some economic value) was introduced at both plants in the early 1980s. Even so, emissions remained high. By 1989, the Pechenganikel and Severonikel combines recovered only 35 and 51 percent of their sulfur emissions, respectively (Berlyand 1990:279). Since these figures were based on self-reporting, they almost certainly exaggerated the actual operating efficiency of the equipment. In any case, the potential reduction in emissions was offset by a simultaneous expansion of production: Between 1980 and 1987, annual SO_2 emissions at Pechenganikel decreased from 384,000 to 337,000 tonnes—a reduction of only 12 percent—while emissions at Severonikel actually rose from 200,000 to 224,000 tonnes per year over the same period (Kulmala 1989).

Why did implementation of these plans prove so difficult? First, even when environmental officials made a sustained effort to fulfill the plans drawn up in accordance with the USSR's international obligations, they immediately encountered all of the familiar obstacles to effective environmental protection in the USSR: the obstruction and secrecy of the economic ministries, the poor quality of environmental control technology, the fragmentation and political weakness of the regulatory agencies, and the lack of strong political support from party and government officials. Moreover, responsibility for the development of new waste gas purification systems was assigned to the Ministry of Chemical and Petroleum Machine-Building (Minkhimmash)—the same organization that simultaneously led the high-priority crash program to develop the compressor technology needed to overcome the U.S. embargo (Jancar 1987:157; Gustafson 1989:202–208). Given these competing tasks—one of intense concern to the top leadership, the other of interest only to a small circle of diplomats and environmental protection officials—it is not surprising that Minkhimmash chose to concentrate on the former.

There was a subtler factor at work as well: The measures required for the fulfillment of the sulfur protocol often did not square with the priorities of local and regional environmental protection officials. Local and regional environmental protection officials faced a bewildering mix of air pollution problems, of which the deposition of SO_2 was but one. Each small reduction in emissions cost these officials a tremendous amount of time and trouble—as one past participant observed, "It was not a job, but a kind of battle"—and so they had to choose their battles carefully. Moreover, regional Goskomgidromet officials could only act in concert with their counterparts from the Ministry of Health, who naturally preferred to concentrate on substances that posed an immediate danger to the surrounding population. From this perspective, the reduction of SO_2 emissions was a fairly low priority compared to the control of emissions of ash, soot, and other particulates. That being the case, it is hardly surprising that local authorities often chose to concentrate their energies elsewhere.

In summary, Soviet policies toward transboundary air pollution in the 1970s and early 1980s was a function of neither external pressure nor transnational learning. Prior to the late 1980s, Western countries placed little pressure on the USSR to reduce its transboundary atmospheric emissions: The USSR was located at the extreme downwind end of Europe, and the Nordic countries did not yet appreciate the full scale of the damage inflicted by the smelters on the Kola Peninsula. To the extent that the Western proponents of a treaty desired Soviet participation, it was largely for broader political reasons: the USSR's ability to bring the much more problematic polluters of Eastern Europe to the table, and the possibility of attracting the interest of the more recalcitrant *Western* states by defining the issue in terms of détente. Transnational learning likewise played little role in the USSR's attitude toward LRTAP. Certainly, international interaction led Soviet environmental specialists and officials to focus upon a problem of which they had previously been unaware, and the most active Soviet participants, such as Yuriy Izrael' and others associated with MSC-East, were drawn into the international epistemic community of LRTAP enthusiasts. Nevertheless, long-range air pollution continued to be a low priority for most environmental protection officials: Even after they understood the problem, most would have preferred to address the hellish state of urban air quality before turning to more subtle issues such as acidification. In the end, the main contribution of the USSR's air pollution specialists was the determination that the costs of compliance would be relatively low.

Instead, Soviet support for the LRTAP Convention and the subsequent sulfur protocol was dictated by the leadership's broader diplomatic interests. When Brezhnev spoke to the Polish Party Congress in December 1975, he had no burning desire to conclude a treaty on transboundary air pollution per se. Instead, thanks to the skillful diplomacy of Sweden and Norway, the Soviet leadership found itself in a situation in which the attainment of its broader political goals (i.e., the strengthening of détente) depended upon its participation in the international efforts to reduce transboundary air pollution, a problem that it otherwise would have continued to ignore. Soviet participation in the LRTAP process was viewed as a relatively harmless way to express the Soviet leadership's interest in détente, to score a diplomatic victory over the United States, and to divert attention from less cooperative Soviet policies in other areas, such as human rights and Afghanistan—even though Soviet participation in LRTAP had the effect of diverting attention and resources away from the USSR's more pressing domestic air pollution problems. This was possible because the Soviet leadership was free to set the nation's environmental priorities as it saw fit—and in the LRTAP case, the leadership's external political concerns overrode the relative impact of pollutants inside the USSR.

Great Expectations Redux: Perestroika and Transboundary Air Pollution, 1986–1990

Moscow Takes on Ambitious New Obligations

Great expectations accompanied Soviet policy towards transboundary air pollution in the perestroika period. First, in January 1988, the USSR signed the LRTAP Protocol on nitrogen oxide emissions. This protocol committed the USSR to freeze its NO_x emissions at 1987 levels by 1994, subject to the familiar "transboundary flux" proviso. Second, in 1989, the raw data on Soviet atmospheric emissions gathered by Goskomgidromet (which remained an independent monitoring agency after the creation of Goskompriroda) were made directly available to the EMEP synthesizing center in Oslo. This shift was the result of a successful campaign by Goskomgidromet officials to make their data openly available both at home and abroad—a step strongly opposed by the KGB and the economic ministries, but nonetheless approved by the political leadership in Moscow. Finally, the Soviet government concluded a separate bilateral agreement with neighboring Finland in which it agreed to reduce sulfur emissions in the northwestern USSR by 50 percent by the end of 1995—a commitment that went well beyond the 30 percent reduction in "transboundary fluxes" mandated by the 1984 sulfur protocol.

Although the nitrogen protocol called only for a freeze in emissions rather than an outright reduction in them, the Soviet decision to sign it was a significantly more daring step than the signing of the sulfur protocol had been. The sulfur protocol virtually fulfilled itself thanks to Brezhnev's gas campaign, which continued under Gorbachev: From 1985 to 1988, Soviet natural gas output rose by nearly 20 percent, accompanied by a further 10 percent drop in sulfur emissions in the European USSR during the same period (Gustafson 1989: 138; UN/ECE 1990: 17). Freezing NO_x emissions, however, promised to be considerably more difficult. Soviet NO_x emissions had grown steadily throughout the 1980s, from about 3.1 million tonnes in 1980 to 4.5 million tonnes in 1989 (UN/ECE 1990: 18; Berlyand 1990: 221). Action to reverse this trend would be difficult and costly. First, Soviet automobile emission standards remained extremely primitive, and the implementation of them even more so (USSR State Committee for the Protection of Nature 1990: 44–45). Second, unlike SO_2, the increased use of natural gas brought no corresponding windfall in NO_x reductions. Without additional investments to lower combustion temperatures and increase waste gas purification at the nation's factories and power plants, increased use of natural gas would only lead to further increases in nitrogen emissions.

Why did the Soviet government agree to sign the nitrogen protocol? Certainly, by 1988 Soviet environmental officials recognized nitrogen oxides as a problem that they would like to ameliorate. At the same time, the USSR suffered from a wide variety of air pollution problems, of which NO_x was but one, and generally not among the most pressing.[11] Left to their own devices, it is unlikely that Soviet environmental officials would have chosen to concentrate their scarce resources on the reduction of NO_x emissions. (The protocol called only for a freeze, but meeting it at a time of steadily growing NO_x emissions would require substantial emissions reductions.) Instead, the Soviet decision to sign the nitrogen protocol was driven by the broader foreign policy interests of Gorbachev and his allies, who were by this point engaged in an across-the-board campaign to improve the USSR's international image—a campaign in which environmental cooperativeness played a major role. This conclusion is borne out by the compressed nature of the internal decision-making process. In contrast to the lengthy deliberations over the sulfur protocol, in which the costs of compliance were explored in great detail, the decision to sign the nitrogen protocol was taken relatively quickly, and despite warnings from prominent technical experts that it could not be fulfilled given the Soviet Union's current energy program.

Although the USSR was, on the whole, a net importer of transboundary air pollution, emissions from the power plants and factories located along its western borders regularly crossed over into the territories of neighboring states. This was particularly true in the northwestern corner of the USSR, the area comprising Estonia, Leningrad, Karelia, and the Kola Peninsula (Murmansk Oblast). Here the prevailing winds blow more often to the north than to the west, so that airborne pollutants emanating from this area were regularly deposited in Finland and northern Scandinavia. Moreover, many of the region's worst polluters—above all, the shale-fired power plants in the Narva area of northeastern Estonia and the nickel smelters on the Kola Peninsula—were situated sufficiently near to the Finnish and Norwegian borders to ensure that the *short-range* effects of the plants' emissions were felt in those states as well. The effect of these transboundary emissions was considerable. In 1980, 19 percent of the sulfur deposited in Finland originated in the USSR, as compared to 36 percent from Finnish sources. By 1988, those figures had very nearly been reversed, reaching 32 and 23 percent, respectively. Transboundary heavy metal deposition was also a serious problem: By 1990, the concentration of copper in moss and lichens along Finland's border with the Kola Peninsula exceeded that found in Finland's heavily industrialized south (Finland 1991a: 12–14). These trends were all the more alarming given the high sensitivity of the Arctic environment (Henriksen et al. 1988; Kämäri et al. 1991).

Before 1987, Nordic concern over transboundary air pollution emanating from the USSR was relatively muted. This was not a reflection of trends in the emissions themselves; we now know that SO_2 emissions in the northwestern USSR were higher in the late 1970s than they were ten years later (Kulmala 1989). Instead, concern was kept low by a lack of information about the magnitude and effects of Soviet emissions. Data on the magnitude of Soviet emissions were a state secret, and Western researchers could only guess as to their true extent. Moreover, relatively little monitoring had been carried out in Lapland prior to the second half of the 1980s. The initial focus of acidification research in Norway, Sweden, and Finland was in the southern part of these countries, where the effect of Soviet emissions was clouded by the simultaneous input of atmospheric pollutants from a variety of other foreign and domestic sources.

From 1987 onward, there was a sharp rise in Nordic concern about transboundary air pollution from the Soviet Union. This increase in concern was primarily a response to the flood of new information made available as a result of "glasnost" in the USSR, much of it leaked by Soviet environmental officials frustrated by the persistent obstacles to the reduction of *short-range* air pollution in the northwestern USSR. The first major diplomatic breakthrough on this front came in October 1988, when Finnish Environment Minister Kaj Bärlund visited the Kola Peninsula at the invitation of Fedor Morgun, the head of the newly created Goskompriroda. During and immediately following the ministerial visit, Soviet environmental officials provided their Finnish counterparts with detailed information about the smelters' emissions and technological processes (Kulmala 1989; Tuovinen 1989). Over the course of the next several months, Finnish and Soviet officials negotiated an agreement to cut SO_2 emissions in Finland and the adjacent regions of the USSR (Estonia, Leningrad Oblast, Karelia, and the Kola Peninsula) by 50 percent by the end of 1995. This agreement was signed by Bärlund and new Goskompriroda chairman Nikolay Vorontsov in September 1989, one month in advance of Mikhail Gorbachev's state visit to Finland.[12] The Soviet commitment to a 50 percent reduction dovetailed fairly well with Goskompriroda's existing goals for emissions reductions in the northwestern region; its main impact, if implemented, would have been to marshal greater political support behind Goskompriroda's efforts to put those plans into effect.

The Center and Periphery Part Company

The progressive diminution of the power of the central government after 1989 was far more debilitating for international cooperation to control

LRTAP than it was in the Baltic Sea case. Acidification and long-range deposition were of great interest to a small coterie of environmental specialists in Moscow, but these issues were not a high priority for environmental officials, activists, or politicians at the regional and municipal level. In the absence of extensive financial support from the center, these actors were not willing to reorder their environmental priorities in order to satisfy scientists and diplomats in Moscow. Consequently, as the central government increasingly lost control over economic and environmental policy throughout the USSR, the scientists and officials affiliated with the LRTAP epistemic community discovered that their newfound influence in Moscow did not translate into corresponding policy changes in the periphery. Ultimately, the Soviet government's ability to implement its new commitments was undercut by the political and economic chaos of 1990–1991 and its own subsequent demise.

The one locale in which we might have expected pronounced local support for the USSR's international air pollution commitments was Murmansk Oblast, where the atmospheric emissions of concern to the USSR's western neighbors also generated profoundly negative local consequences. In fact, however, there was very little grassroots environmentalism in the Kola region in the late 1980s and little support for more aggressive environmental protection on the part of the oblast's regional and municipal authorities. This was in part because the mining and smelting industry employed many of those living in the area, but it was also a reflection of the generally low level of political activism in Murmansk Oblast, which remained firmly under the control of regional party and KGB officials until well after the August 1991 coup. (This low level of environmental activism and concern would continue to characterize Murmansk Oblast in the post-Soviet period as well.) Consequently, by 1991, the prospects for deliberate action to reduce the long-range air pollution generated within the former USSR appeared scarcely more promising than they had in 1986. Ultimately, the European successor states would come into compliance with the Soviet Union's LRTAP commitments, but only by dint of economic recession—hardly the method of implementation that the Soviet government envisaged when it accepted these obligations.

Windfall Reductions and Selective Subsidization: The Post–Cold War Politics of Transboundary Air Pollution

International Commitments and Domestic Compliance in the Post–Cold War Era

With respect to nitrogen and sulfur reduction, the most significant development in the post–Cold War evolution of the LRTAP regime was the conclusion of the 1994 Oslo Protocol on Further Reduction of Sulfur Emissions, or "second sulfur protocol."[13] In comparison to the earlier sulfur and nitrogen protocols, in which the signatories agreed to "flat rate" reductions in their emissions or "transboundary fluxes," the second sulfur protocol incorporated a more comprehensive and integrated approach: Each signatory agreed to reduce its emissions to whatever level was necessary to ensure that depositions did not exceed "critical loads" in any part of the LRTAP grid. The "ceiling" for the sulfur emissions of each party to the protocol was therefore a function of the estimated critical load for each cell in the LRTAP grid as well as the calculation of the links between emissions and deposition. Although the calculation of these ceilings was a much more complex undertaking than the selection of the "flat rate" reductions used in previous protocols, this approach promised to bring about the greatest and most even improvement in environmental quality at the lowest collective cost.[14] The result was wide variation in the reductions required of each party to the protocol. Taking 1980 as the baseline, for example, the targets set for the year 2000 represented reductions ranging from 80 percent or more for Germany and the Nordic countries to an actual increase in emissions for Portugal and Greece.[15] According to the protocol, the final ceilings for most of the Western European states would come into effect in 2000, while the former socialist states and some of the larger Western European polluters were given more time to reach their respective ceilings, through one to two additional five-year stages. For example, the ceilings for emissions within the European part of the Russian Federation were set at 4.44 million tonnes in 2000 and 4.297 million tonnes in 2005.[16]

The newly independent states (and the former socialist states more generally) did not rush to embrace all of the ambitious new commitments undertaken by the Western members of the LRTAP Convention in the 1990s. Three of the newly independent states—Russia, Ukraine, and Belarus—automatically acceded to the international commitments undertaken by the USSR, the original LRTAP Convention and the first sulfur and nitrogen protocols. (Russia inherited the international commitments undertaken by the USSR, while Ukraine and Belarus, as founding members of the United Nations, were also "independent" members of the UN/ECE and therefore original signatories to the LRTAP Convention.) Ukraine and Russia also signed the 1994 Sulfur Protocol, although neither had ratified it as of late 1999. Latvia, Lithuania, Moldova, and Armenia acceded to the LRTAP Convention but did not sign the sulfur or nitrogen protocols, while Estonia elected to remain outside of the LRTAP regime altogether.

In terms of actual emissions, the newly independent states appeared quite scrupulous in their observance of the LRTAP targets, including those that they did not formally undertake. SO_2 emissions in the European part of the Russian Federation fell from 7.16 million tonnes in 1980 to 3.46 million in 1993, a reduction of 52 percent—well beyond the 30 percent reduction called for in the first sulfur protocol. In 1994, SO_2 emissions in European Russia fell further to 2.98 million tonnes, a 58 percent decrease relative to 1980 and well within the limits set for European Russia by the 1994 sulfur protocol. Emissions of NO_x in European Russia fell from 2.653 million tonnes in 1987 to just under 2 million in 1994, a reduction of 25 percent that went well beyond the freeze envisaged by the 1988 nitrogen protocol. Similarly, Ukrainian emissions of SO_2 declined by 55 percent from 3.849 million tonnes in 1980 to 1.715 million in 1994, well below the year 2000 target of 2.31 million tonnes established by the second sulfur protocol. Likewise, Ukrainian NO_x emissions declined from 1.094 million tonnes in 1987 to 568,000 in 1994, a 48 percent decrease (UN/ECE 1997). The available evidence indicates analogous figures for the smaller newly independent states as well. In Estonia, for example, emissions declined from 239,000 tonnes of SO_2 and 93,000 tonnes of NO_x in 1990 to 141,000 tonnes of SO_2 and 50,000 tonnes of NO_x in 1994—a decline of 41 and 46 percent, respectively.[17]

These impressive reductions were not the result of deliberate efforts to reduce transboundary air pollution. On the contrary, the control of long-range air pollutants proved to be a low priority for the newly independent states—even among environmental problems, which tended to be low priorities to begin with. Instead, these were "windfall reductions," both figuratively and literally: an unintended side effect of the steep decline in industrial production and energy use that accompanied the transition from socialism (see also Kotov and Nikitina 1988a). All of the newly independent states posted steep declines in real GNP and industrial production in the first half of the 1990s, and even when positive economic growth resumed, as it did in the Baltic states in 1995–1996, industrial production and energy consumption did not return to the high levels of the late 1980s (EBRD 1996a).

However, these windfall reductions did not eliminate external concern about transboundary air pollutants generated within the newly independent states. First, several large stationary sources of particular concern to neighboring countries, such as the nickel smelters on the Kola Peninsula, continued to operate despite the overall economic downturn. Secondly, an increase in the emission of air pollutants could be anticipated along with the resumption of positive economic growth. Thus, as Estonia moved from negative to positive economic growth in 1995, its emissions of air pollutants also increased: Estonian emissions of SO_2 grew by 6,900 tonnes, or 6.3 percent, while emissions of NO_x grew by 1,500 tonnes, or 10 percent—increases well in excess of the 4.8 percent growth in real output reported by the World Bank for 1995.[18] Even where industrial and energy production did not rebound so quickly, private automobile ownership (and consequently mobile-source NO_x emissions) rose sharply throughout the newly independent states in the 1990s.

Selective Subsidization and Shifting Economic Interests

Even though the LRTAP Convention's adoption of the critical loads approach suggested a collective determination to invest environmental protection dollars where they would do the most good for the pan-European environment, the post–Cold War evolution of the LRTAP regime did not extend to the pooling of donor funds, as in the case of the EBRD's Nuclear Safety Account, or to the development of a comprehensive program for joint implementation along the lines of

HELCOM's JCP. The reason for this was quite simple: Since the primary flow of long-range air pollutants in Europe is from west to east, the affluent Western European states had no real stake in the comprehensive reduction of sulfur and nitrogen emissions throughout the whole of the former Soviet bloc. Instead, the donors chose to concentrate their resources on those sources located sufficiently near to Western Europe to cause transboundary deposition despite the prevailing west-to-east wind patterns. This ad hoc, selective approach to subsidization stood in marked contrast to the much more comprehensive approach taken by HELCOM and (to a lesser extent) in Western efforts to coordinate nuclear safety assistance to the former Soviet bloc.

Most of the sources of concern to the affluent Western European states were located in Poland and the Czech Republic; consequently, the most aggressive programs of transnational subsidization were undertaken in these states. By contrast, most of the newly independent states of the former Soviet Union were not geographically or meteorologically well positioned to take advantage of Western interest in sulfur and nitrogen reductions. Due to the prevailing west-to-east winds, the vast majority of the pollutants emitted within the former Soviet Union wound up somewhere else within the former Soviet Union: either within the state that emitted them, or in one of the other newly independent states. Even when these pollutants did escape the confines of the former USSR, they most often wound up in the territory of another relatively poor state. In 1996, for example, EMEP estimated that 46 percent of Ukraine's sulfur emissions were deposited in Ukraine itself, 28 percent in the other European successor states, and 18 percent in Eastern Europe, Turkey, or the Black Sea, while only 2 percent were deposited in Western Europe.[19]

The main exceptions to this general rule were those sources located far enough to the north and west of the former USSR to threaten the air quality of one or more of the Nordic countries. Foremost among these were three main culprits: the Kostamuksha iron mining and smelting complex in the internal Russian Republic of Karelia; a pair of aging oil shale-powered thermal power plants near the city of Narva in northeastern Estonia; and, above all, the nickel smelters on the Kola Peninsula—particularly the Pechenganikel combine, located a scant few kilometers from the Russian-Norwegian border. These three sources were the targets of the most sustained efforts to subsidize air pollution abatement in the newly independent states, although donors also undertook subsidization at other sites as well.

In contrast to the Baltic Sea case, however, transnational efforts to reduce transboundary atmospheric emissions generated within the newly independent states could not be built upon convergent environmental interests. The local and national authorities in northwestern Russia and Estonia did not attach a very high priority to the control of the long-range pollutants of interest to their Western neighbors, as these were not, in most cases, among the most serious causes of local environmental damage. To the extent that local and national authorities were concerned about air pollution, their concerns focused on emissions of ash, dust, and other substances that posed serious health risks in the immediate vicinity of the source—emissions that could be reduced or dispersed without the installation of expensive equipment to control sulfur and nitrogen emissions. This disinterest was exacerbated by the breakup of the USSR and the decentralization of environmental decision making in the Russian Federation: Most of the sulfur and nitrogen emitted by large stationary sources now wound up in another country or region, and was therefore someone else's problem. Ironically, the one area in which sulfur emissions *did* cause significant local damage—the ecologically sensitive Kola Peninsula—was also the region in which environmental interests were most weakly represented in regional decision making.

Given this poor fit between internal and external environmental priorities, would-be donors were compelled to appeal to the economic interests of firms and officials in the recipient states. The directors of factories and power plants, and the directors of their parent companies and utilities, had no real interest in combating transboundary air pollution, but they did have in interest in maintaining and modernizing their production facilities, increasing their exports, and attracting foreign capital. Regional and national authorities, for their part, were interested in maintaining local industrial production, avoiding plant closures, and maintaining a steady and dependable supply of energy. Moreover, to the extent that the regional or national authorities in the newly independent states were oriented toward accelerated East-West economic integration, they had an additional interest in addressing the environmental concerns of their more affluent neighbors—particularly if the latter agreed to bear a large part of the cost.

These efforts were sometimes successful. Transnational subsidization contributed, for example, to the construction of a cleaner gas-fired thermal power plant in St. Petersburg and the modernization of the Kunda Cement plant in Estonia.[20] In practice, however, apparently convergent economic interests often diverged before the projects could be consummated. With the decentralization and marketization of the post-Soviet economies in the early 1990s, firms, power plants, and their parent organizations acquired ever-greater autonomy from the wishes of national and local political authorities. At the same time, these organizations were increasingly hard-hit by the economic instability of the transition period. Domestic consumers of electricity and manufactured goods failed to pay their bills, making it increasingly difficult for power plants, public utilities, and other firms to actively participate in joint projects. Privatization was another source of instability: ownership changed hands or grew uncertain as enterprises and utilities were privatized or slated for privatization. Moreover, firms and parent companies in the newly independent states decreasingly viewed participation in subsidized environmental protection projects as the most profitable use of their resources—particularly in a business environment in which the order of the day was quick and massive profits rather than long-term corporate development.

As a result of the changes wrought by economic transition, large-scale transnational subsidization failed to materialize in each of the three cases of greatest concern to the Nordic states. In two cases—that of the Pechenganikel smelter and the Kostamuksha iron combine—shifting ownership and economic strategies caused the target firms to lose interest in externally subsidized pollution control projects. In the case of the power plants in Estonia, however, economic transition had the opposite effect: The organizational restructuring and partial privatization of the Estonian energy sector, together with the process of accession to membership in the European Union, led to the provision of a "market" solution to the problem, obviating the need for large-scale transnational subsidization altogether.

Subsidization Frustrated, Part 1: The Kostamuksha Combine

As in the Baltic Sea case, Finland was the first Western state to launch a broad effort to subsidize the abatement of transboundary air pollution generated within the USSR. In 1990–1991, Finland launched a major study of possible subsidization opportunities in the neighboring areas of what was then still the Soviet Union (Finland 1991b). Among the sources of transboundary air pollution identified in the study, three stood out in particular: the Kostamuksha iron mining and smelting complex in western Karelia; the nickel smelters on the Kola Peninsula; and a pair of oil shale-fired power plants near the city of Narva in northeastern Estonia. (See figure 4.1.)

Finnish concern over the Kostamuksha iron complex was largely proactive, an outgrowth of the rising concern about forest damage that had been fueled by the furor over emissions from the Kola Peninsula. Although the Kostamuksha combine had been in operation since the early 1980s, when it had been constructed for the Soviet government by Finnish firms, serious forest damage in the neighboring areas of Finland had yet to materialize by 1991. Nevertheless, the combine's annual sulfur emissions were considerable—on the order of 70,000 tonnes per year, over 40 percent of Karelia's total sulfur emissions—and much of this was deposited within Finnish territory (Finland 1991b: 41–44). However, this external concern was not matched by internal environmental interest in the problem. The Kostamuksha plant was located in a sparsely populated area of the Karelian Republic, far from the shores of Lakes Onega and Ladoga, home to both the vast majority of the republic's population and the environmental problems of greatest internal concern. In any case, compared to most other factories and power plants in Karelia, the Kostamuksha plant was a model of cleanliness, since its emissions of dust and other substances threatening to the health of nearby inhabitants were quite low (Berlyand 1990: 151; Bezuglaya 1990: 71, 80, 123; Finland 1991b: 41–44, 140–153).

Finland therefore appealed to the economic interests of the plant's directors and the Karelian government. At the time, the plant's most important customer was the Finnish iron mill in Raahe, so its directors were interested in maintaining a cooperative relationship with the Finnish authorities. The Karelian authorities were intensely interested in

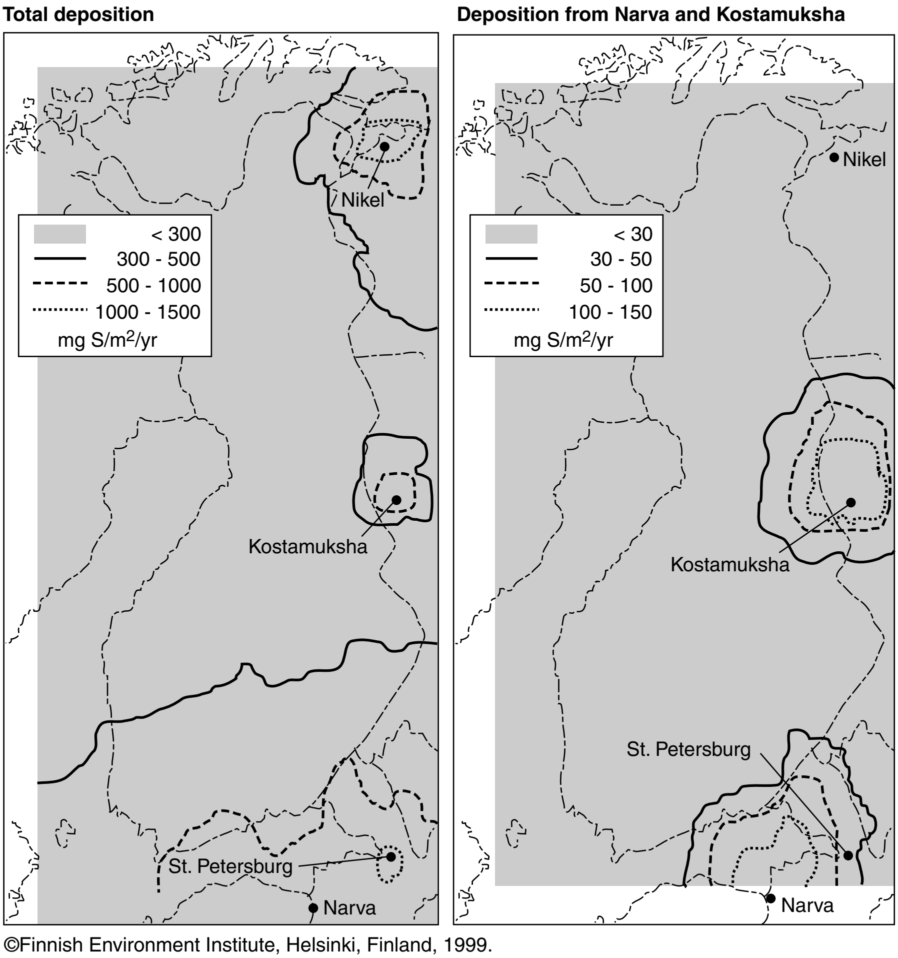

Figure 4.1
Sulfur deposition from the Narva and Kostamuksha Plants to Finland, 1995

cooperation with neighboring Finland in a wide variety of areas, including trade, logging, infrastructure development, foreign investment, and environmental protection. To refuse to address an environmental issue of such obvious interest to Finland—particularly when Finland was willing to bear much of the cost—would be to place the prospects for broader cooperation in jeopardy. Consequently, Finland and Karelia promptly agreed on a project to reduce emissions at the Kostamuksha combine by refitting the first of its three production lines with a Finnish-supplied flue gas desulfurization system. The hard currency portion of the project—about $10 million—was to be financed through a combination of grants and loans, the latter to be repaid through the combine's export earnings.

Due to the changes wrought by economic transition, however, the Kostamuksha project stalled in the mid-1990s. Although Finland invested FIM 19 million (about $3.7 million) in flue gas desulfurization at the Kostamuksha combine in 1992–1995, the project was never completed. By 1996, the Kostamuksha combine—now privatized and renamed Karelian Pellet (*Karel'skiy okatysh*)—was operating at a loss. The firm refused to pay for its share of the project, and the regional and federal authorities—to whom the firm was deeply indebted for unpaid taxes and pension fund contributions—were not willing to pressure it to do so. Finland's leverage decreased still further when the Russian steel giant Severstal, based in Vologda Oblast, acquired the controlling stake in the firm and took Finland's place as Karelian Pellet's chief customer. By the end of 1998, Karelian Pellet was once again operating in the black; but despite continued Finnish pressure, no one on the Russian side was willing to pay for the completion of the desulfurization project.[21]

Subsidization Frustrated, Part 2: The Pechenganikel Smelter

The clash between economic development and environmental protection on the Kola Peninsula is almost as old as the Soviet Union itself. Jutting precariously into the last vestiges of the Gulf Stream, the Kola Peninsula is home to one of Russia's most unique ecosystems, a place where the harsh severity of the Arctic North is softened by the distant breath of the tropics. In 1930, the Lapland Nature Preserve was established in the center of the peninsula in order to preserve and study the region's ecology. At the same time, the peninsula's thin soil also covered an abundance of mineral deposits, including large quantities of nickel, copper, and apatite (a mineral used in the production of fertilizers). As a result, eight years after the establishment of the Lapland Nature Preserve, a huge nickel smelting combine, "Severonikel," went into operation in the nearby town of Monchegorsk. Various other mining and mineral processing activities soon sprang up throughout the region. In 1944, the Soviet Union acquired a second nickel smelting combine, "Pechenganikel," as a result of the territorial concessions won in its armistice with Finland (Berlin 1991; Bond and Levine 1989; Kryuchkov et al. 1988).

By the 1960s, the atmospheric emissions of the two nickel smelting combines had already begun to seriously disrupt the region's fragile ecosystem. The plants emitted a wide variety of substances harmful to the environment and human health, including large amounts of SO_2 and heavy metals. By 1965, the airborne deposition of heavy metals in the vicinity of the plants was so great that a team of geologists prospecting in the Monchegorsk area thought that they had stumbled upon a hitherto undiscovered deposit of nickel, cobalt, and copper. The problem intensified in the early 1970s, when the smelter combines began importing ore from Norilsk in response to the exhaustion of the local nickel deposits. Although the Norilsk ore contained about as much nickel as the local ore, its sulfur content was much higher. The result was a sharp increase in the amount of sulfur emitted by the smelting combines. At Severonikel alone, SO_2 emissions tripled in the early 1970s, rising from approximately 100,000 tonnes in 1970 to nearly 300,000 tonnes in 1975 (Berlin 1991:40–42). Yearly SO_2 emissions at Pechenganikel underwent a similar surge, reaching 384,000 tonnes in 1980 (Kulmala 1989).

Thanks to the vantage point provided by the Lapland Nature Preserve, Soviet scientists were able to carefully document the environmental effects of the Severonikel combine's emissions from the 1960s onward. Even before Severonikel began to use imported ore, plant life within a radius of 20 kilometers showed signs of serious deterioration (Berlin 1991; Doncheva and Kalutskov 1977). In the late 1970s, the situation grew still worse. The pH of the snowfall in the nearby nature preserve fell as low as 3.9, and the snow also contained high levels of heavy metals. Fish populations sharply declined—a trend exacerbated by the wastewater emissions of the region's industries—and the surviving fish had very high concentrations of heavy metals in their internal organs. The deposition of sulfur and heavy metal pollution was especially catastrophic for the region's trees, which suffered in direct proportion to their proximity to the plant. By the late 1980s, most plant life in the immediate vicinity of the plants had been entirely destroyed (Kryuchkov et al. 1988; Alexeyev 1989; Berlin 1991; Tømmervik, Johansen, and Pedersen 1995). (See figure 4.2.)

Widespread *external* concern over the possible transboundary effects of the smelters' emissions emerged only in the late 1980s, in response to the sudden avalanche of information about the smelters' emissions

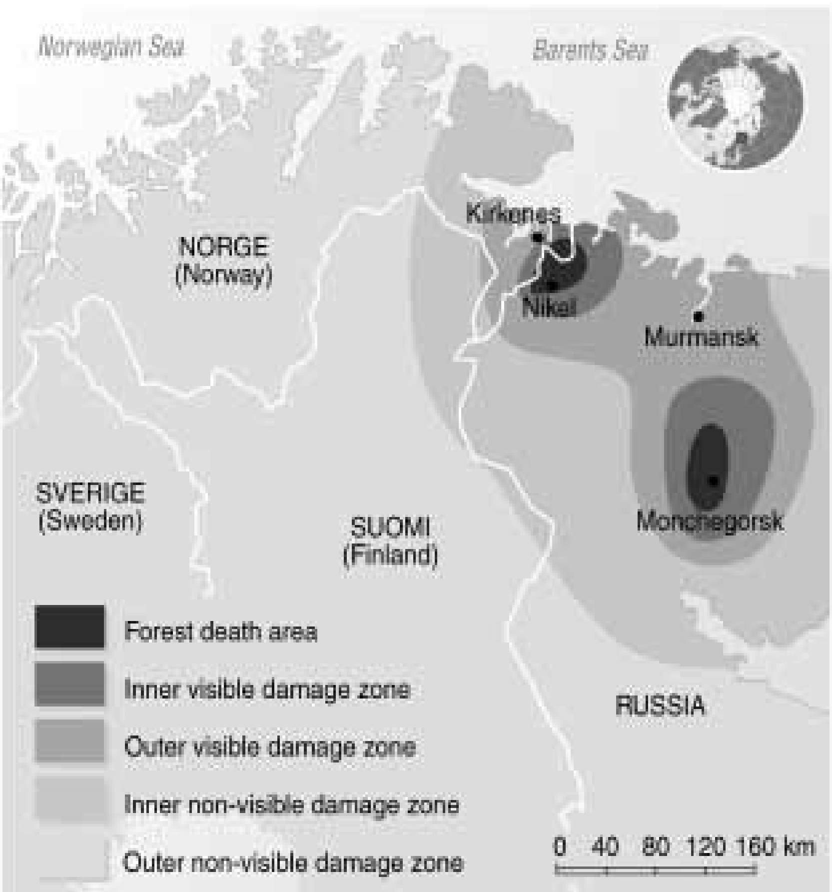

Figure 4.2
Forest damage due to air pollution on the Kola Peninsula, 1997

generated by glasnost in the USSR and the preliminary findings of a national acidification survey in Finland. This combination led Finnish scientists to hypothesize that the emissions of the Russian smelters were to blame for premature needle shedding in the forests of Lapland (Finland 1991a). By the end of 1989, these concerns had spread to neighboring Norway.[22] Popular fears in both countries reached near-panic levels in June 1990, when Norwegian meteorologists spotted a mysterious cloud over the Kola Peninsula, drifting westward. Norwegian news reports initially claimed that the cloud was the result of an explosion in the vicinity of the Severonikel plant, and contained dangerous chlorine gases.[23] The celebrated "death cloud" turned out to contain nothing more than ordinary water vapor, but the incident greatly increased popular pressure for swift action to reduce emissions at the Kola plants—including the aerial bombardment of them, if need be.[24]

In 1989, this rising tide of environmental concern merged with a second, previously unrelated policy stream, one that emerged out of the highly institutionalized *economic* cooperation between Finland and the Soviet Union. In accordance with a string of agreements stretching back to 1947, Soviet-Finnish economic relations were conducted on a clearing trade basis. While no hard currency exchanged hands, the monetary value of the exchange of goods had to be balanced over the long run: As a general rule, Finland imported oil and raw materials from the USSR and paid for them by exporting finished products to the USSR and by participating in the construction of hotels, factories, and other projects in the socialist countries. One of the areas in which Finnish-Soviet economic cooperation was particularly robust was metallurgy: Finnish firms built the Kostamuksha iron mining and ore processing complex in Karelia, and played a large role in the development of the Siberian nickel and copper smelting industry at Norilsk in the 1970s (Möttölä, Bykov, and Korolev 1983:311–320).

The shipping of ore from Norilsk to the Kola Peninsula for smelting was a response not only to the exhaustion of the local ore, but also to the relatively greater attractiveness of the location. In comparison to remote Norilsk, the Kola Peninsula was located closer to Soviet and foreign consumers, suffered fewer transportation bottlenecks, and, thanks to the construction of the Kola nuclear power plant, offered access to cheap energy. It was also easier to recruit workers to the Kola plants: As bad as the climate, air quality, and isolation might be on the Kola Peninsula, they were vastly worse in Norilsk (Bond and Levine 1989). The drawback to this strategy was the smelters' age: Both had been built in the 1930s, and both suffered from low efficiency in recovering metals and sulfur from the ore (Poluektov and Zharov 1983). Consequently, in 1985, the Soviet delegation to the Finnish-Soviet Economic Commission raised the possibility of Finnish participation in the modernization of the smelters. This led to a proposal by the Finnish engineering firm Outokumpu to completely refit the Pechenganikel smelter.[25] Outokumpu promised that this project would greatly increase the rate of metal extraction, improve operating reliability, and permit the recovery of over 95 percent of the sulfur contained in the ore—a considerable improvement over the current rate of 35 percent or less.[26]

Although the original rationale for the joint project was purely economic, the mounting international concern over the smelters' transboundary emissions provided it with a substantial boost. The Finnish government made the modernization of the Pechenganikel smelter one of the central issues in its relations with the USSR, and Soviet President Gorbachev—who was eager to attract foreign investment in support of his own domestic reform program—held the project up as a model joint venture during a state visit to Finland in October 1989.[27] The main obstacle was financing: Outokumpu estimated the cost of the Pechenganikel project at over $600 million. In early 1990, however, the proposed project was lifted on the rising tide of the Nordic states' growing interest in transnational subsidization as a tool of environmental and industrial policy. Meeting separately, the Nordic countries agreed to provide $100 million of the total in the form of grants; the rest of the project would be financed by long-term loans to be repaid with Pechenganikel's export earnings. The donors agreed to share the financing of the agreement according to the degree of their economic and environmental interest in the project: Finland would provide 50 percent, Norway 25 percent, and Sweden 10 percent. (Norway's "intermediate" contribution reflected not only its geographical proximity to the problem, but also the anticipated participation of the Norwegian firm Elkem as Outokumpu's junior partner.) The remaining portion would be sought from other Western sources. With the problem of financing apparently resolved, preliminary agreements between the Finnish and Soviet governments and between Outokumpu and its Soviet counterpart, the recently created Norilsk Nickel state enterprise, were concluded in September 1990.[28]

At this point, however, the proposed joint venture collided headlong into the collapse of the Soviet command economy. The forty-year-old system of barter trade between Finland and the USSR broke down, which meant that the deal would now have to be consummated on a cash basis. At the same time, the Soviet government was hard-pressed for hard currency and so refused to grant Norilsk Nickel the necessary exemption to the requirement that all enterprises engaged in foreign trade hand over their hard currency receipts to the central government. Even if the Soviet government had been willing to subsidize the project, it would have made little difference. By early 1991, the federal government in Moscow was locked in a high-stakes struggle with the Russian republic over control of natural resources and state-owned enterprises on Russian territory. In the wake of the August 1991 coup, this struggle was decided in favor of the Russian republic, and the USSR itself ceased to exist shortly thereafter. In September 1992, the Russian government formally rejected Outokumpu's proposal, citing the high costs involved.[29]

Despite this rejection, the Nordic countries continued to press the Russian government to approve the Pechenganikel project. In the spring of 1993, Moscow announced that it would hold an international competition for tenders for the modernization of the Pechenganikel plant, but only after making it clear that the winning bid would have to come in well under the $640 million price tag proposed by Outokumpu.[30] The tender was ultimately awarded to a Norwegian-led consortium that proposed to modernize the smelter at a cost of approximately $257 million—considerably less than half of the previous estimate (Norway 1995). One consequence of this outcome was that Norway, rather than Finland, now took the lead in financing the project. Norway renewed its offer of a grant of 300 million kroner (about $50 million); this sum now assumed much greater importance in the context of the newer, smaller project. Finland and Sweden also agreed to contribute, although at much lower levels (approximately $1 million each). The last major hurdles appeared to have been overcome in March 1996, when Russian President Boris Yeltsin formally agreed to finance the Russian portion of the project through a combination of direct budgetary support and exemptions from export tariffs.[31]

The Russian government's support for the modernization of the Pechenganikel smelter was not driven by environmental interests. First, despite the enormous ecological destruction in the immediate vicinity of the plant, there was little pressure for action within the surrounding region, which remained heavily dependent upon the mining-industrial complex; on the contrary, the governor of Murmansk Oblast accused the Nordic countries of engaging in a "witch hunt" against his province, arguing that Russia suffered more from Norwegian industrial emissions than Norway did from Russia's.[32] There was also strikingly little support for the project among environmental officials in Moscow, most of whom argued that the best way to solve the problem was to allow market forces to run their course. If nothing were done, the smelters' obsolescence, the exhaustion of the local ore, and the cost of shipping ore across the Arctic Ocean—a cost that must now be internalized by Norilsk Nickel—would cause production, and therefore emissions, to decline sooner rather than later. From an environmental perspective, the money that Russia was being asked to contribute to the project could be better spent elsewhere.[33] And, indeed, production at the two smelters dropped sharply from 1993 onward, as a result of which SO_2 emissions declined from 460,000 tonnes in 1991 to no more than 300,000 tonnes in 1995.[34]

Instead, the Pechenganikel project moved forward as a result of the economic interests and political influence of Norilsk Nickel and its Nordic partners, all of whom were well placed to lobby their respective governments, and the Norwegian government's determination to actively "do something" about an environmental issue that aroused strong public concerns at home. Once this juggernaut was in motion, the Norwegian government remained committed to it. Norwegian officials occasionally threatened to withdraw from the project, but only in response to footdragging on the part of the Russian government.[35] And while opposition politicians and nongovernmental activists in Norway occasionally called upon the government to threaten to abandon the project, these calls were motivated primarily by efforts to link the project to Russian human rights and military policies, rather than the questionable economic logic of the project itself.[36]

Then, just as in 1990, the Pechenganikel project foundered at the very moment that it appeared destined to proceed. This was due not to any change of heart on the Norwegian side, but to a change in the ownership of Norilsk Nickel itself. In November 1995, the Russian Unexim Bank acquired the controlling interest in Norilsk Nickel as a result of a so-called loan-for-shares auction. Unexim Bank (whose director, Vladimir Potanin, was the original author of the loan-for-shares idea) agreed to loan the financially strapped Russian government $170 million in exchange for temporary control of the Russian government's controlling interest in Norilsk Nickel. A few months later, Unexim ousted the previous leadership of Norilsk Nickel and installed its own management team. Finally, in August 1997—just after the term of Unexim's temporary control of the Russian government's share in Norilsk Nickel had expired—Unexim obtained full ownership of the government's shares with a winning bid of ECU 236 million (about $250 million at the time).[37]

This sequence of events was sharply criticized, both within and outside of Russia, as crony capitalism at its worst. Critics charged that Unexim was able to use its political and financial connections to acquire control of the management of one of the most valuable enterprises in Russia for a paltry $170 million *loan*—which, moreover, was not even the highest bid submitted in the loan-for-shares auction—and was then able to draw upon the firm's assets and financial flows to ensure that it would submit the winning bid in the final auction for ownership of the controlling stake in the firm.[38] Indeed, $170 million seemed a small price to pay to obtain control of a sprawling industrial empire that, in 1995, produced over 60 percent of Russia's copper, 80 percent of its cobalt, 90 percent of its nickel, and nearly all of its platinum, and possessed total assets valued at over $9 billion.[39]

Whatever the shortcomings of the process, the result of the Unexim takeover was much greater sensitivity to the costs and benefits of various investment options—and much less interest in the subsidized modernization of the Pechenganikel smelter. The new team at Norilsk Nickel announced that it would concentrate its attention on the three smelters at the firm's main plant in Norilsk, which alone accounted for some four-fifths of the company's production, and the development of its mining operations in the Norilsk region.[40] Pechenganikel, by contrast, performed poorly relative to both Severonikel and the Norilsk plant, and its near-term viability was in serious doubt due to the exhaustion of the local ore and the growing cost of shipping ore from Norilsk.[41] Norilsk Nickel concluded that Pechenganikel would have to close if new deep mine shafts could not be dug to remaining local deposits. The new owners therefore chose to concentrate not on the modernization of the plant's nickel smelting facilities, but on the development of the plant's resource base. Consequently, in December 1997, Norilsk Nickel and Outokumpu announced the establishment of a joint venture to explore the possibilities for the further development of mining operations in the Pechenga area. Many observers doubted that further extensive mining in the Pechenga area would prove to be cost-effective, but at least Unexim had opted to put the horse before the cart: to explore the feasibility of further mining in the Pechenga region before investing in the modernization of the accompanying smelter.[42]

Although the Norwegian offer to subsidize the modernization of the Pechenganikel smelter remained on the table as 1999 drew to a close, the prospects for its realization had grown exceedingly dim. The Nordic and Russian governments, the Nordic engineering firms, and the pre-1996 leadership of Norilsk Nickel were all willing to overlook the doubtful prospects for the further development of the nickel smelting industry on the Kola Peninsula, although the Russian government's enthusiasm for the project was never very high. However, the more profit-minded management installed after the Unexim Bank takeover of Norilsk Nickel was not. Thus, once again, economic interests on the recipient side proved to be an undependable reed upon which to base an expensive transnational subsidization project in the post-Soviet period—especially when the economic logic underlying that project was not particularly sound.[43]

Subsidization Transcended: The Narva Power Plants

The third major source of transboundary air pollution targeted for transnational subsidization was a pair of oil shale-fired power plants near the city of Narva in northeastern Estonia. These were the 1,400-MW Baltic plant, built in the early 1960s, and the 1,600-MW Estonian plant, built in the early 1970s. Both of these plants were designed to burn oil shale, Estonia's principle native energy resource. By 1991, oil shale provided more than half of Estonia's total fossil fuel consumption, almost all of it burned at the Baltic and Estonian plants. Neither was equipped with gas purification equipment; by 1990 the combined SO_2 emissions of the two plants were estimated to be at least 125,000 tonnes per year (Estonia 1991b:61). As in the case of the smelters on the Kola Peninsula, Finnish concerns grew markedly along with the increased flow of information that accompanied the opening up of the Soviet Union: A Finnish delegation visiting Narva in late 1990 was reportedly shocked by the primitive technology in use at the Baltic plant.[44] From the Estonian perspective, however, the two plants were considered a low environmental priority. The most pressing local environmental problems generated by the two plants—the emission of ash and other particulates—had been addressed by the late 1980s through the installation of particle collection systems and the construction of tall chimney stacks. Most of the plant's sulfur emissions were carried out of the republic by the prevailing winds, and the acidifying effect of the sulfur deposited in the Narva region was neutralized by the deposition of the plants' emissions of alkaline dust (Estonia 1991b:61; Finland 1991b:154; UN/ECE 1995:17).

Consequently, as in the case of the Kostamuksha and Pechenganikel combines, Finland was compelled to appeal to the economic interests of the Estonian government and the utility that operated the plants. From the very outset of the post-Soviet period, Estonia was highly dependent upon economic cooperation and integration with Finland; consequently, the Estonian government could not afford to ignore its northern neighbor's environmental concerns. Moreover, both the Estonian government and the utility that operated the Baltic and Estonian plants (Eesti Energia, or Estonian Energy) were committed to the further exploitation of oil shale, which provided some 98 percent of Estonia's internally generated electricity supply. Since oil shale was mined as well as burned in Estonia, the intensified exploitation of it promised to free Estonia from the dependence on imported Russian energy that hobbled most of the other newly independent states—a source of leverage that the Russian government proved more than willing to exploit in order to extract foreign and domestic policy concessions in the so-called "near abroad." This meant that both the Estonian government and Eesti Energia were interested in the modernization of the two shale-fired power plants near Narva, which together provided 95 percent of the country's domestic electricity production.

As a result, the Estonian government and Eesti Energia agreed in 1991–1993 to cooperate with Finland in a pair of pilot projects for the reduction of sulfur emissions from the Narva plants, provided that Finland financed them: the installation of a pilot desulfurization plant at the Baltic power plant, and a joint study of the feasibility of reducing sulfur emissions through the introduction of circulating fluidized bed (CFB) boiler technology (Finland 1994). Moreover, in 1993, the Estonian and Finnish governments signed a bilateral agreement to reduce national sulfur emissions by 50 percent by 1997 and 80 percent by 2005, taking 1980 as the reference year. Both also agreed to hold national NO_x emissions at 1987 levels from 1995 onward. This agreement did not obligate Finland to any emission reductions beyond those already required by its LRTAP convention commitments, but for Estonia it was the functional equivalent of accession to the LRTAP convention's sulfur and nitrogen protocols.[45]

The proposed pilot projects were carried out as planned, but the transnational subsidization of desulfurization at the Narva power plants went no further. This was not due to a loss of Finnish interest on either the environmental or economic fronts: Even at lower levels of production, the Baltic and Estonian plants continued to be a major source of sulfur deposition in southern Finland, and Finnish firms remained eager to supply the necessary technology, especially if they were subsidized by the Finnish government in the process. Instead, large-scale subsidization fell by the wayside because the Estonian government chose to address the problem through the restructuring and partial privatization of its energy sector. Drawing upon the advice of Western experts, the Estonian government decided to detach the Baltic and Estonian plants from Eesti Energia and merge them into a separate firm (Narva Elektrijaamad, or Narva Power Plants). In keeping with the republic's national Energy Act, which went into effect in early 1998, the Estonian government was to hold no less than 51 percent of the ownership of the new firm. The remaining 49 percent stake in Narva Elektrijaamad was to be sold to a foreign firm in exchange for the modernization of the plants' production facilities.[46]

In 1997–1999, protracted negotiations were held with the American firm NRG Energy over the terms of such an agreement. NRG Energy's interest was purely economic: Energy production in Estonia promised to be highly profitable, particularly if completion of the proposed "Baltic Ring" power transmission network would eventually allow power plants in Estonia to export electric power to the European Union.[47] Indeed, as part of the deal, NRG insisted that the Estonian government lower the charges for air and water emissions levied on the two power plants, a concession opposed by Estonian and foreign environmentalists but strongly supported by the Estonian Ministry of the Economy.[48] A final agreement was reached in late November 1999, whereby NRG Energy would acquire the 49 percent stake in Narva Elektrijaamad in exchange for an initial payment of $67 million and the investment of several hundred million dollars thereafter. The centerpiece of the investment program was to be the installation in 2000–2004 of new power blocks at each plant, equipped with modern combustion technology, at a cost of approximately $440 million. This, together with additional investments in environmental control, was expected to extend the life of the plants by twenty-five to thirty years and to reduce the plants' emissions of sulfur and other pollutants to the levels necessary to meet EU standards and Estonia's bilateral commitments with Finland.[49]

This promising outcome—one in which transnational public subsidization was effectively superseded by transnational private investment—was not an automatic consequence of marketization and privatization per se. Marketization and privatization proceeded apace in the Russian Federation as well, but with much less favorable consequences for the abatement of transboundary air pollution. What made the Estonian case different? First, through protracted negotiations and retention of the controlling share in the new company, the Estonian government maximized the likelihood that the desired level of pollution abatement would accompany the partial privatization of the Narva plants. This careful process stood in stark contrast to the rapid "insider" privatization of Norilsk Nickel and the Kostamuksha combine, a process in which environmental concerns played no important role. Underlying this difference, however, was a second and more important factor: Estonia's drive to join the European Union as quickly as possible. Estonia's negotiations with the European Commission over the terms of its accession to the EU decisively shaped both the restructuring of the Estonian energy sector and its plans for air pollution abatement, as in both cases Estonia came under strong pressure to emulate EU models and approximate EU standards.[50]

Conclusion: The Perils of Privatization

In the wake of the collapse of the command economies in Eastern Europe and the former Soviet Union, many observers anticipated that the privatization of state-owned enterprises and the transition to a market-based economy would in and of itself lead to a significant reduction of the amount of pollutants generated within the former Soviet bloc, and hence to the transboundary effects of them. The oldest and least efficient enterprises—those that tended to be the "dirtiest" to begin with—would shut down altogether. Those firms that survived would be forced to learn to use inputs more efficiently and to make profitable use of industrial byproducts (such as sulfur) previously discarded as worthless waste. As efficiency rose and production fell, so too would the demand for energy, and along with it the levels of pollution generated by fossil fuel–fired thermal power plants. To a considerable extent, these forecasts proved correct. The transition from the command economy in the 1990s was accompanied by a sharp decrease in industrial production and energy demand throughout the former Soviet bloc, a decrease accompanied by a remarkable drop in the levels of sulfur, nitrogen, and other pollutants emitted within the former socialist states. Upon closer inspection, however, the relationship between economic transition and the reduction of transboundary emissions was considerably more complex. In each of the three cases examined here—the Kostamuksha iron complex, the Pechenganikel smelter, and the Narva power plants—external efforts to secure additional emissions reductions were decisively shaped by the effects of privatization, and in each case the outcome was quite different.

In the Kostamuksha case, the outcome was the suspension of transnational subsidization, with no "market solution" in sight. The privatization of the firm and Severstal's subsequent acquisition of it frustrated the Finnish effort to subsidize the installation of flue gas desulfurization at the iron smelting complex, even after much of the necessary equipment had already been put into place. At the same time, production at the plant (now rechristened Karelian Pellet) recovered in the late 1990s, thanks to the relative modernity of its equipment and the acquisition of new customers unconcerned about the plant's sulfur emissions. The plant's sulfur emissions therefore remained unpurified and increased along with the plant's recovery. Despite continued diplomatic efforts, the Finnish government was unable to locate allies within the Russian Federation interested in the reduction of the plant's industrial emissions. Local environmentalists—who were politically weak to begin with—were more concerned about the effects of logging (much of it conducted by Finnish firms) and about pollution in the republic's more populated and industrialized areas. The Karelian authorities were much more concerned about recovering the back taxes owed by the plant than they were about reducing its sulfur emissions, a preference ordering shared by the Russian federal government. As a result, transnational subsidization was frustrated, and the environmental transboundary problem remained unsolved.

The outcome in the Estonian case was a "private" solution that effectively superseded large-scale transnational subsidization. The Narva power plants and the oil shale mining industry that supported them were separated from Eesti Energia and partially privatized in order to attract foreign private investment—but only if the potential investor presented an acceptable plan for the long-term development of the oil shale industry and the reduction of the plants' transboundary atmospheric emissions. This outcome was possible for several reasons. First, for political as well as economic reasons, the Estonian government made the modernization of the oil shale industry the top priority in its domestic energy policy. Second, outside investors like NRG viewed the modernization of the oil shale industry as economically feasible and potentially lucrative. Third, both the restructuring of the Estonian energy sector and the Estonian government's commitment to reduce the plants' transboundary emissions were decisively shaped by Estonia's desire to join the European Union as quickly as possible. In other words, the external pressure that Finland and the European Union were able to bring to bear upon Estonia in the Narva case was a consequence of the Estonian government's own foreign political and economic strategy. Had the Estonian leadership been less interested in joining the EU, or had the prospect of doing so been considerably more remote, Estonia would not have been as forthcoming where the emissions of the Narva plants were concerned. (Even with the lure of EU membership, the languor with which Estonia moved to address the problem of the Narva plants' atmospheric emissions stood in marked contrast to the alacrity with which it embraced efforts to clean up the Baltic Sea.) By contrast, a similar degree of external pressure could not be brought to bear upon the authorities in Moscow, Murmansk, or the Republic of Karelia, for whom membership in the EU was not even a remote prospect.

The Pechenganikel case presents a more complex picture. The failure of the campaign to subsidize the modernization of the Pechenganikel smelter was not simply a consequence of the chaos that attended economic transition; it was also a consequence of the flawed economic assumptions that underlay the project. These flawed assumptions stemmed from the fact that the proposed project was based primarily on the short-run economic interests of the Nordic engineering firms involved, rather than a careful estimate of the long-run impact that the modernization of the smelter might have upon environmental quality, compared to other possible uses of the money. The initial decision in the 1930s to build the smelters on the Kola Peninsula made good economic sense in light of the location and quality of the local ore, and the subsequent decision to supplement the dwindling local ore with ice breaker–enabled imports from Norilsk made sense so long as the Soviet government was willing to internalize the transportation costs involved. With the collapse of the command economy, however, the further development of the nickel smelting industry on the Kola Peninsula became much more problematic. A number of observers, both inside and outside of Russia, concluded that the most cost-effective response to the air pollution problem would be to let the nickel smelting industry on the Kola Peninsula die a natural death—a death that might be eased with external assistance—rather than an expensive campaign to modernize the smelters. Ultimately, it was left to the upstart "robber barons" at Unexim Bank to recognize what the more experienced Nordic capitalists had chosen to overlook: that the modernization of the Pechenganikel smelter at a cost of hundreds of millions of dollars would be money wasted —money wasted for environmental protection, as well as economic development—if the refitted smelter could not obtain ore of a sufficiently high quality at a sufficiently low price.

5

Nuclear Power Safety

Of the three cases analyzed in this study, that of nuclear power safety is the most tragic, paradoxical, and instructive. It is, first, a Greek tragedy in which the isolation and hubris of the Soviet nuclear power community led almost inexorably to one of the greatest peacetime environmental disasters on record, the explosion of the Chernobyl nuclear power plant in April 1986. It is the story of a grassroots antinuclear movement that arose almost overnight and without external assistance, triumphed in the face of a powerful transnational coalition determined to contain it, and then vanished without a trace. It is the story of the subsequent resurrection of nuclear power in the newly independent states, an about-face aided and abetted—intentionally and unintentionally—by the response of the affluent Western states. It is, finally, a cautionary tale for the proponents of environmental aid: a tale in which the very measures taken to reduce the transboundary threat posed by Soviet-built nuclear power plants had the unintended effect of perpetuating that danger, and one in which the heirs of the Soviet Union's nuclear power complex were able to exploit its dangers in order to extract greater amounts of assistance from their more affluent neighbors.

Prior to the Chernobyl accident, there was little overt concern about the safety of Soviet nuclear power, either inside or outside of the USSR; consequently, this issue did not provide as attractive an opportunity for instrumental manipulation as had pollution in the Baltic Sea and transboundary air pollution. In the absence of external concern about the transboundary risks posed by nuclear power production in the USSR, the Soviet nuclear power community plied its trade largely in isolation from its Western counterparts. One of the results of this insulation was the development of a uniquely Soviet commercial reactor design known as the RBMK, the type that would later explode at Chernobyl.

The conjuncture of perestroika and the disaster at Chernobyl effectively ended the isolation of the Soviet nuclear power community and provided the Soviet government with new incentives to manipulate external environmental concerns to its own advantage. Gorbachev used the devastation caused by the accident to press for an end to the arms race and cooperated with the IAEA in a successful effort to contain the damage to the USSR's external image. The subsequent relaxation of internal political controls in the USSR also unleashed a torrent of popular opposition to the further development of nuclear power, but this burst of internal antinuclear activism was not accompanied by a comparable campaign abroad: on the contrary, the Soviet government was able to manipulate its contacts with the IAEA in order to combat the spread of antinuclear sentiment at home. In the end, this attempt at "transnational containment" was unsuccessful: By the summer of 1990, antinuclear activists succeeded in putting a halt to virtually every reactor planned or under construction in the USSR.

In the post–Cold War period, this relationship was reversed. As the Soviet Union collapsed, internal opposition to nuclear power evaporated. The governments of the newly independent states that had inherited the USSR's nuclear power plants—Russia, Ukraine, Lithuania, Armenia, and Kazakhstan—uniformly decided that they could not afford to do without nuclear energy, despite the fact that they were even less capable of guaranteeing nuclear safety than the Soviet government had been. At the same time, nuclear experts, environmentalists, and politicians in the West grew increasingly anxious about the safety of nuclear power in the former socialist bloc. But just as the domestic opponents of nuclear power in the USSR had previously been unable to enlist significant external support for their cause, concerned external actors now found themselves unable to secure internal support for the curtailment of nuclear power within the newly independent states.

The solution to this mismatch was a massive transnational campaign to subsidize the modernization of Soviet-designed reactors throughout the former Soviet bloc—a solution strongly supported by the Western nuclear power industry, which had been hard-hit by declining orders in the 1980s. The newly independent states, in turn, were able to manipulate this campaign to their own advantage, often with results that ran counter to the interests of the donors. The introduction of transnational subsidization made nuclear power even more attractive to the newly independent states, as they were now able to shift the costs of enhancing safety and (more importantly) extending the service lives of their nuclear power reactors onto their more affluent Western neighbors—including those that the donors insisted be closed ahead of schedule. Furthermore, two of the successor states engaged in environmental blackmail, successfully threatening to expose their more affluent neighbors to elevated levels of nuclear risk to extract larger and more timely amounts of external assistance. These were Ukraine's threat to extend the service lives of the remaining reactors at the Chernobyl plant and Russia's threat to resume the dumping of radioactive wastes in the Arctic and Pacific Oceans.

Hubris: Nuclear Power and Nuclear Safety in the USSR, 1946–1985

The Development of Nuclear Power in the USSR

When the Soviet nuclear program first began, there was no obvious economic justification for the commercial development of nuclear power in the Soviet Union. In fact, Soviet economic planners were generally skeptical about the cost effectiveness of nuclear energy, especially in comparison to coal and hydroelectric power (Medvedev 1990:227–232). Consequently, the initial drive to develop commercial nuclear power was essentially a "bottom-up" campaign, propelled by the enthusiasm and political influence of the nuclear community itself. The key development during this period was the coalescence of the Soviet nuclear engineering community around two competing reactor designs, a graphite-moderated, water-cooled, pressure-tube model (the RBMK) and a pressurized-water reactor (the VVER).[1] In the early 1970s, however, the Politburo undertook a major expansion of nuclear power in response to rising world prices for oil (of which the USSR was a major producer) and the increasing mismatch between energy consumption and production in the European region of the Soviet Union. The result was the simultaneous development of both the RBMK and the VVER and a booming expansion of nuclear power that continued until the late 1980s.

From its very inception, the development of "commercial" nuclear power in the USSR (that is, the use of nuclear fission for the production of electricity and heating) was intimately intertwined with the exploitation of nuclear energy for military purposes—a circumstance that decisively shaped the direction subsequently taken by the Soviet nuclear power industry. In fact, the "father of the Soviet atomic bomb," the nuclear physicist Igor Kurchatov, was also the father of the Soviet nuclear power program. Kurchatov and his colleagues first achieved controlled nuclear fission at a secret laboratory near Moscow, later renamed the Kurchatov Institute of Atomic Energy, in December 1946. Eighteen months later, the first Soviet reactor of sufficient size to produce plutonium for the construction of nuclear weapons went into operation near the Siberian city of Chelyabinsk. In 1949, Kurchatov proposed the construction of an experimental power reactor. Design and construction took place at another secret laboratory established in Obninsk, subsequently dubbed the Institute of Physics and Power Engineering. After the death of Stalin in 1953, the various components of the nuclear complex, including the Kurchatov and Obninsk Institutes, were combined into a single ministry under the deliberately innocuous and misleading title of the "Ministry of Medium Machine-Building," or "Minsredmash" for short. This close organizational relationship between the commercial and military wings of the Soviet nuclear program would prove to be an enduring feature of the nuclear power complex in the USSR and post-Soviet Russia.

The experimental reactor at Obninsk—the first in the world designed expressly for the production of electricity—went online on June 27, 1954. It was a graphite-moderated, water-cooled, pressure-tube reactor, similar to the plutonium production reactors constructed near Chelyabinsk. Other reactor designs had been considered, but the earlier success of the graphite-moderated, pressure-tube design prompted Kurchatov, who exercised close personal supervision over the project, to favor it over the other alternatives. The Obninsk atomic energy station (AES), or nuclear power plant, was only an experimental plant, and even at its full power of 5 megawatts (MW) it probably consumed more electrical power than it generated. Nevertheless, it was a fateful first step, for it set the stage for the commercial exploitation of graphite-moderated, pressure-tube reactors in the USSR—the only country in the world to follow such a path. The Obninsk design team included Anatoliy Aleksandrov and Nikolai Dollezhal', both of whom would be lasting and influential proponents of the graphite-moderated, pressure-tube design (Medvedev 1988:14–15, 1990:227–229; Dollezhal' 1989:153–167; Holloway 1994:346–347). Aleksandrov would subsequently rise to become president of the USSR Academy of Sciences, a position of vast power in the centralized and hierarchical world of Soviet science.

The Soviet nuclear community's enthusiasm for nuclear power was permeated by a keenly felt spirit of technological competition with the West. Although opportunities for direct contacts with Western nuclear engineers were extremely limited in the 1950s and early 1960s—in his memoirs, former Soviet leader Nikita Khrushchev vividly recounts the anxiety suffered by the Politburo at the prospect of allowing Kurchatov to take part in a state visit to Great Britain in 1956 (Khrushchev 1974:59–60)—the Soviet nuclear community was not entirely isolated, and developments abroad, particularly in the United States, set the standards for Soviet achievement. By the mid-1960s, commercial nuclear engineering efforts in the West were concentrating primarily on two types of reactors—boiling-water and pressurized-water—and the dominant trend was in the direction of increasingly large reactors of 1,000 MW or greater. This trend reinforced the conclusions of Soviet nuclear specialists that cost-effective nuclear power could only be achieved by increasing the power of individual reactors. However, Soviet nuclear engineers had already rejected the boiling-water approach, and the Soviet industrial base was not yet capable of producing the enormous pressure vessels needed for the construction of large pressurized-water reactors.

The Soviet nuclear power community finally hit upon a solution to this problem in the mid-1960s, when it was decided to combine the overall plant parameters of General Electric's 1,000 MW boiling-water reactor with the tried-and-true graphite-moderated, pressure-tube approach (Dollezhal' 1989:189–196). This technological shortcut was designated the RBMK. The RBMK's supporters included not only

Dollezhal' and Aleksandrov—by this time director of the Kurchatov Institute and, after 1975, President of the USSR Academy of Sciences—but also Andranik Petros'yants, who would subsequently become head of the State Committee for the Utilization of Atomic Energy (SCUAE), the organization charged with the supervision of commercial design efforts and international cooperation. (Despite its independent-sounding title, the SCUAE was an integral component of Minsredmash.) The first RBMK went into operation near Leningrad in 1973, followed by similar units at Kursk and Chernobyl.

The RBMK's influential proponents could point to several advantages of the design, in addition to its immediate practical feasibility. First, because of the modular nature of the reactor core, the reactor could be assembled on-site. By contrast, pressurized-water reactors had to be built into their pressure vessels at the factory, a step that was itself fraught with problems, and then shipped to the construction site by rail or barge. Second, since the RBMK was graphite-moderated, it used less-enriched uranium than that used by the VVER. Third, the individual fuel elements of an RBMK reactor could be removed for refueling or repair during operation, obviating the need for a total shutdown as in the case of the VVER. Moreover, the absence of the need to enclose the reactor core inside a single pressure vessel meant that the size of an individual RBMK could be expanded indefinitely—no small selling point in a state that prided itself on the unrivalled grandiosity of its technological achievements. (By the time of the Chernobyl disaster, a 1,500 MW RBMK was in operation at the Ignalina AES in Lithuania, and plans had been developed for even larger 2,000 MW and 2,400 MW versions.) The RBMK's proponents even marshaled national pride on behalf of the design: Since graphite-moderated, pressure-tube reactors were in commercial production nowhere else in the world, the RBMK was hailed as the USSR's only truly "national" (*otechestvennyy*) reactor (Medvedev 1990:230–240; Katsman 1986:35–42; Petros'yants 1984:135–140).

The first commercial model of the RBMK'S chief competitor—the VVER—began operation in 1964.[2] Although the RBMK's proponents were vastly more influential than were the designers and promoters of the pressurized-water reactor, the VVER ultimately became an equal partner in the Soviet nuclear energy program. The serial production of the VVER was initially stimulated by the Soviet government's desire to substitute some other form of energy for the subsidized oil exported to the USSR's dependent satellites in Eastern Europe (Marples 1986; Reisinger 1992). The construction of nuclear power plants in Eastern Europe was an obvious alternative, but the RBMK was not suitable for export since it could be used for the simultaneous production of weapons-grade plutonium. Once serial production of the VVER began, this type of reactor was also incorporated into the USSR's domestic nuclear power program alongside the RBMK.

The serial production of the VVER came in three waves. Until the late 1970s, the manufacture of pressure vessels large enough to accommodate a 1,000 MW pressurized-water reactor was beyond the capabilities of Soviet industry. Consequently, the VVER program began with the production of a more modest 440 MW model. The first version, the VVER-440/230, was fairly primitive: It had no containment, only the most rudimentary emergency core cooling and fire protection systems, poor instrumentation and control, and was constructed using metal alloys that, when exposed to prolonged radiation, became brittle much more quickly than expected (Halverson 1993; Regnell 1990). Many of these design flaws were addressed in the second-generation 440 MW design, the VVER-440/213. Although a few VVER-440s were built in the USSR, this model was primarily intended for export.[3] The mainstay of the pressurized-water program inside the Soviet Union was instead to be a new and more powerful 1,000 MW version, the VVER-1000.

At the close of the 1960s, the total generating capacity of the USSR's operating nuclear power plants was well under 1,000 MW. By the end of 1970, construction had begun on the first reactors intended for serial production: a pair of RBMK-1000s at the Leningrad AES, and first-generation VVER-440s at the Novovoronezh and Kola plants. This modest expansion in the face of the skepticism of the central planners was a victory for the nuclear power lobby, but in terms of the Soviet Union's overall energy picture, the role of nuclear power remained minuscule. However, the fortunes of nuclear power improved dramatically after 1970, when the Politburo decided to expand the use of natural gas and nuclear power in the European USSR in order to free up oil for hard-currency exports. The expansion program of the 1970s proceeded along two tracks, reflecting the dual technology of the Soviet nuclear power industry. The early emphasis was on the serial production of the RBMK, which formed the basis of the Leningrad, Kursk, Chernobyl, Smolensk, and Ignalina plants; subsequently, the VVER program was to be dramatically expanded through the serial production of the VVER-1000. By 1980, nine nuclear plants with a total of twenty-four reactors were in operation in the USSR. These plants provided 5.6 percent of all of the electricity produced in the Soviet Union; in the European part of the country, nuclear energy's share reached 9.3 percent. This expansion continued in the 1980s: Total nuclear production capacity rose from 12,500 MW in 1980 to more than 28,000 MW by the end of 1985. (See figure 5.1.) In March 1986, on the eve of the Chernobyl disaster, Gorbachev announced plans to expand nuclear power production to 69,000 MW by the end of 1990 (Marples 1986:71–74; Thornton 1986: 139–140).

The Soviet Approach to Nuclear Safety

In the United States and Western Europe, nuclear power became the target of a rising tide of public protest in the 1970s. Since the ability to suppress public opposition and withhold information about safety incidents was fairly limited in the West, the proponents of nuclear power in these countries were compelled to respond to public concerns—even when they believed these to be grossly exaggerated—by paying close attention to safety considerations in the design, siting, and operation of nuclear power plants. By contrast, all decisions regarding the design, siting, and operation of nuclear power plants in the USSR were the exclusive province of a narrow elite committed to the rapid expansion of nuclear power. Public criticism of the nuclear power program could only take place with the consent of party authorities, and even then only within tightly restricted bounds. As a result, the public expression of concern over the safety of nuclear power was limited to occasional press criticism of inadequate conscientiousness in the implementation of official policy, such as shortcomings in plant construction and quality control.[4]

This insulation from public criticism led Soviet nuclear specialists to adopt a very different attitude toward nuclear safety from that which

Figure 5.1
Nuclear power plants in the newly independent states, 1999

prevailed in the West. The leaders of the Soviet nuclear power community scoffed at the installation of expensive systems to prevent highly unlikely accidents, or to contain accidents after the fact, arguing instead that disciplined operation was sufficient to prevent serious accidents from occurring in the first place.[5] Soviet nuclear engineers did make allowances for certain types of accidents and equipment failures, but this planning fell far short of the preparation for improbable but plausible accidents that characterized nuclear power engineering in the West. This minimalist approach was reinforced by the pressures of internal competition with other sources of electrical power, a competition that generated an incentive to minimize the construction and operational costs of nuclear power plants wherever possible.

This relaxed attitude toward safety was particularly evident in the development of the RBMK. In the earliest Soviet pressure-tube reactor, the steam that drove the turbines was generated in a closed circuit separate from the boiling water that cooled the reactor core. The disadvantage of this arrangement was that the ratio between the thermal power produced in the reactor core and electric output of the turbines was very high (approximately six to one). Under pressure to demonstrate the economic viability of nuclear power, the RBMK's architects dispensed with the secondary steam circuit in subsequent designs. Instead, the steam produced by the coolant water passing through the reactor core was channeled directly to the turbines. This alteration reduced the loss of energy entailed by the transfer of heat from one circuit to another, but it greatly increased the risk of an escape of radioactivity. The production of superheated steam inside the reactor core also had another, more ominous consequence: the so-called positive void coefficient. Coolant water turns to steam unless it is kept under pressure; steam is a poor coolant, so any pockets or "voids" of steam in the coolant circuit will cause the temperature of the core to increase still further. In a water-moderated reactor, this phenomenon is not inherently dangerous; steam is as poor a moderator as it is a coolant, so when temperatures rise in a boiling-water reactor, nuclear fission in the core slows and eventually stops. But in an RBMK, graphite, not water, serves as the moderator, and so rising temperatures generate increased reactivity. Unchecked, this spiral can end only with the destruction of the reactor core—as it did at the Chernobyl nuclear power plant in April 1986 (Medvedev 1990; Snell 1988).

Furthermore, the tremendous size of the RBMK made the provision of a comprehensive containment structure prohibitively difficult. Not only was the reactor core itself large in comparison to VVERs of similar power, but the tall fuel handling machine that sat atop the reactor lid would have to be included within any comprehensive containment structure. Since a containment structure of this magnitude would greatly increase the cost of each RBMK unit, the proponents of the RBMK dispensed with the concept. Instead, they argued that the reactor housing itself could contain the "maximum design accident" that Soviet nuclear specialists were prepared to imagine: the rupture of one or two pressure tubes. The possibility that all of the pressure tubes might rupture simultaneously as the result of an uncontrolled surge of power was apparently never considered.[6] The earliest RBMKs, such as the Leningrad AES and the first two reactor blocs at Chernobyl, were built without any containment whatsoever. Later models were equipped with partial containment underneath the reactor, but an ordinary industrial building was used above the reactor cover (Snell 1988:8–11).

The 1979 accident at the Three Mile Island (TMI) plant in the United States prompted a high-level review of nuclear power safety in the USSR. In the ensuing discussions, Aleksandrov and the other leaders of the Soviet nuclear community—most of whom were personally tied to the development of the RBMK—engineered an interpretation of the accident that was consistent with their previously held positions on safety: The accident was the result of careless operation and inadequate attention to the man-machine interface, precisely those areas stressed by the Soviet approach to nuclear safety. Such an accident was therefore impossible in the USSR. In fact, the TMI accident actually reinforced the orthodox view that the RBMK, even without full containment, was actually safer than the VVER: An accident in an RBMK could never involve more than one or two pressure tubes, while an accident in a pressurized-water reactor, though less likely, would necessarily affect the entire core.[7]

East-West Nuclear Safety Cooperation before Chernobyl

In principle, there were a number of international organizations and other fora within which Soviet nuclear specialists and officials could interact with their Western counterparts prior to 1986. These included the World Health Organization (WHO), the International Labor Organization (ILO), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the International Commission on Radiological Protection (ICRP), the IAEA, and numerous conferences on the peaceful uses of atomic energy and nuclear disarmament.[8]

In practice, however, these channels provided Soviet nuclear power specialists with relatively little direct contact with their Western counterparts. Most of the Soviet representatives who participated in these interactions were scientists and diplomats concerned with arms control and disarmament issues rather than commercial nuclear power.[9] A second and much smaller group of Soviet participants consisted of medical experts, typically from the USSR Ministry of Health, working on questions of radiation protection. One result of this cooperation (associated most closely with WHO, UNSCEAR, the ILO, and the ICRP) was the convergence of Soviet and Western standards for radiation exposure. However, this work tended to be purely theoretical, since officials from the Ministry of Health had little influence over (or even knowledge about) the practical day-to-day operations of the USSR's nuclear installations. The Soviet government took little interest in the IAEA's nuclear safety programs, viewing these as relevant only for developing countries just undertaking nuclear power programs.[10] Consequently, in most instances in which Soviet nuclear power engineers and operators were able to interact directly with their Western counterparts, this interaction was brief, episodic, and inconsequential. As one past participant put it, "At best, all of these reports on foreign trips resulted in a lot of sighs and 'Ahs!' and 'How come we can't do that?' "

However, there was one external window of opportunity in the years before Chernobyl that did open a channel for a much more extensive East-West discussion of nuclear power safety: the export of two VVER-440s to Finland in the 1970s. In 1965, the Finnish electric utility Imatran Voima Oy (IVO) announced an international competition for the construction of a nuclear power plant at Loviisa on Finland's southern coast.

In addition to bids submitted by the leading Western nuclear engineering firms, IVO also received a proposal from the USSR. After protracted negotiations, IVO decided to accept the Soviet offer. The formal contract between IVO and the Soviet organization Technopromexport (later renamed Atomenergoexport) was signed in 1970, and construction began in May 1971. In August 1971, the two organizations signed a contract for the delivery of a second reactor, and construction of the second unit began the following year. The two units were completed and connected to the grid in 1977 and 1980, respectively.

Unlike the Baltic Sea and LRTAP cases, this external window of opportunity was a product not of the Politburo's broader foreign policy interests, but of the unique economic relations that existed between Finland and the USSR at the time. Finnish-Soviet trade was conducted on a "clearing" or barter basis; as a general rule, the USSR imported finished products from Finland, and exported oil and other raw materials in return (Möttölä, Bykov, and Korolev 1983). The drawback of this arrangement was that the USSR tended to import goods of higher value than it exported, so that the Soviet demand for Finnish imports was generally greater than the Finnish demand for Soviet exports. The Soviet planning authorities were therefore attracted by the prospect of exporting high-value nuclear technology to Finland, since this would help balance the trade between the two countries and demonstrate the global competitiveness of Soviet technology. In the course of the negotiations, the Soviet side made a number of concessions that made the project attractive to Finland: The USSR offered to finance the project on extremely favorable terms; the Soviets held out the prospect of close Finnish participation in each stage of the project, whereas the Western offers were essentially turnkey projects; and the Soviets promised to allow Finland to return the plant's spent fuel to the USSR for final disposal, thus absolving Finland of the need to process and store the plant's radioactive waste on its own territory.

At the same time, however, Finnish officials were concerned that the reactors proposed by the Soviets—first-generation VVER-440/230s designed for export to Eastern Europe—would not meet Finland's rigorous safety demands. Finland therefore insisted that the plant be built with full containment and a proper emergency core cooling system—

features lacking in the 230 model. Finland also refused to accept Soviet instrumentation or computer technology. The USSR therefore supplied the reactor, the turbines, and the auxiliary equipment, while IVO was responsible for the general plans for the plant, the construction work, and the instrumentation and electrical systems. Westinghouse provided the containment system, Siemens supplied the instrumentation and control systems, and Finnish engineers and other Western consultants worked together with the Soviets to develop an improved core cooling system. The result was a truly multinational undertaking in which Soviet engineers were involved at every step.[11]

From the perspective of nuclear power safety in the USSR, the most important aspect of the Loviisa experience was the learning experience that it provided for Soviet nuclear specialists tasked with the design of pressurized-water reactors. The Soviet engineers involved in the project became convinced that their existing safety provisions were inadequate, and so many of the modifications demanded by the Finns at Loviisa—above all, the provision of containment and improvement of the emergency core cooling system—were introduced in subsequent VVERs: somewhat tentatively in the modified VVER-440/213, and then more vigorously in the VVER-1000. Soviet engineers also paid attention to the lessons learned by Finland in the subsequent operation of the Loviisa plant. In 1980, IVO discovered that the reactor's steel pressure vessel was becoming embrittled much more rapidly than expected; in order to guarantee the reactors' design life, the IVO engineers reduced the irradiation rate at the vessel wall by replacing the outermost fuel assemblies with stainless steel dummies. Soviet engineers took note of the embrittlement problem and drew upon the Finnish solution to retrofit their own VVERs and to avoid the problem in later designs.[12]

Unfortunately, the bifurcation of the Soviet nuclear engineering community meant that the lessons learned by one wing were not easily transmitted to the other. It was one thing for the Soviet engineers involved in the Loviisa project to bring home new ideas for improved pressurized-water reactors; it was quite another to foist these lessons upon the engineers involved with the RBMK, an entirely different design that enjoyed the backing of the top leadership of the Soviet nuclear power complex.

To some extent, the enhanced awareness of safety issues that emerged in the USSR in the early 1980s did filter into the design and operation of the RBMK: Later models (including the fourth unit at the Chernobyl plant) were outfitted with more robust safety features, such as the provision of partial containment underneath the reactor core. By then, however, it was too late to question the underlying wisdom of the design altogether. In any case, senior officials within the nuclear power complex continued to insist that full containment was wasteful and unnecessary, since a major nuclear accident was impossible.[13] Thus, despite the experience gained in the construction and operation of the Loviisa plant, the Soviet nuclear power industry continued to barrel headlong toward disaster.

Transnational Containment: Chernobyl, the International Atomic Energy Agency, and Nuclear Power in the USSR, 1986–1991

Transnational Containment, Part 1: Post-Chernobyl Spin Control

In the early morning hours of April 26, 1986, the No. 4 reactor at the Chernobyl nuclear power station erupted. The force of the blast flung the roof off of the reactor housing—there was no outer containment shell—and hurled the contents of the reactor core into the atmosphere. The damaged reactor continued to burn for ten days, while Soviet firefighting teams and military personnel fought to bury it under thousands of tons of sand, lead, and concrete. As daring and self-sacrificing as these efforts were, they were less than fully successful: Subsequent studies indicated that most of the material dumped onto the damaged fourth unit missed the intended target, the reactor core. At least 120 million curies of radioactive material were released as a result of the accident, a considerable portion of which coalesced into an enormous plume that drifted over much of Europe before it finally settled. By the time the reactor fire was extinguished, dozens were dead or dying as a result of radiation poisoning, and millions more throughout Europe had been exposed to elevated levels of radiation. In the months and years that followed, hundreds of thousands of people were evacuated from the contaminated zone (Snell 1988; Marples 1988; Medvedev 1990; Medvedev 1991; Sich 1994).

In the immediate aftermath of the Chernobyl disaster, the initial response of the Soviet leadership—itself confused about the cause and scope of the accident—was to deny that anything was seriously amiss. Unlike earlier Soviet nuclear disasters, however, the Chernobyl accident could not easily be covered up. The accident took place quite near the Soviet Union's external borders, and it was not long before northerly winds dragged the resulting radioactive plume across the territory of the Belorussian SSR into Scandinavia, where it was detected by Swedish radiation monitors on the morning of April 28. This discovery set off a storm of international speculation, protest, and demands for additional information—a storm that grew more fierce as radiation continued to pour across the USSR's western borders. Within a few days, the Gorbachev leadership—which had already launched its campaign to improve the USSR's image in the West—realized that it had an international public relations disaster as well as an environmental catastrophe on its hands. In its search for a means of damage control, the Soviet government turned to an international organization with which it enjoyed longstanding contacts: the IAEA.

Although the primary organizational mission of the IAEA is to prevent the proliferation of nuclear weapons technology, it is also charged with the promotion of the peaceful uses of atomic energy. On May 4, the Soviet government issued a formal invitation to the agency's director general, Hans Blix, to visit Chernobyl and examine the situation at first hand. Blix inspected the damaged reactor by helicopter on May 8 and held a news conference in Moscow the following day.[14] Blix's visit marked the beginning of a marked turnaround in the Soviet government's management of the international repercussions of the Chernobyl disaster. On May 14, with the immediate emergency over, Gorbachev went on national television to speak about the accident. Like other Soviet spokesmen in the preceding two weeks, Gorbachev was rather vague about the causes of the accident, and he criticized the Western response to the disaster, calling it "an unrestrained anti-Soviet campaign with mountains of lies." Nevertheless, Gorbachev also used his televised address to launch an international public relations counteroffensive. Gorbachev called for the enhancement of the international authority of the IAEA and announced that a full report on the accident would soon be presented at a special IAEA conference. Gorbachev also struck a note that would soon become a familiar refrain of the "new political thinking": He held up the Chernobyl accident as proof of the dangers of the nuclear arms race and went on to announce an extension of the USSR's unilateral moratorium on nuclear testing.[15]

The promised official report on the causes of the accident, presented to a special IAEA conference held in Vienna at the end of August, was the first of a series of highly successful efforts by the Soviet government to reverse the damage that Chernobyl had done to its international reputation. Although the Soviet report was later criticized for putting too much stress on operator error and too little on the basic design flaws of the RBMK, it was widely praised at the time for its frank and comprehensive treatment of the accident.[16] Shortly thereafter, the USSR joined in the conclusion of two international nuclear safety conventions under the aegis of the IAEA. The first mandated early notification in the event of a transboundary nuclear accident, while the second established provisions for multinational emergency assistance in the event of such an accident. The Soviet government astounded its Western counterparts by immediately agreeing to include military as well as civilian nuclear installations within the terms of the conventions.[17]

At the same time, despite the horror of the Chernobyl disaster, the Soviet leadership's enthusiasm for the expansion of nuclear power remained undiminished. Soviet spokesmen repeatedly reaffirmed the government's commitment to build more nuclear power plants and to add additional reactor units at those plants already in operation. The Chernobyl accident itself was portrayed as an isolated incident, the product of human error and criminal negligence, rather than fundamental flaws in reactor design or governmental regulation. Throughout the remainder of 1986 and 1987, at the same time that the Soviet government was laboring to project an unprecedented image of openness abroad, official support for the expansion of nuclear power continued to be backed by the suppression of internal dissent: Although numerous articles appeared in the press recounting the desperate and heroic struggle to contain the disaster at the Chernobyl plant, public criticism of the underlying safety of nuclear power was effectively discouraged (Marples 1986; Dawson 1993, 1995, 1996).

This is not to say that Soviet nuclear policies remained unaffected by the Chernobyl disaster and the intensification of its involvement with the IAEA. The Soviet government introduced a number of policy changes in 1986–1987, the most important being the decision to curtail further development of the RBMK. Initially, Soviet officials maintained that the RBMK program would go ahead as planned, despite the accident at Chernobyl. In keeping with this stance, a second RBMK-1500 went on line at the Ignalina AES in August 1987. However, during Blix's second visit to Moscow in January 1987, the Soviet government announced that no more RBMKs would be built following the completion of those currently under construction. Later in the year, the Soviet government announced that the construction of the fifth and sixth units at Chernobyl would not continue, and that the RBMK-1500s planned for the Kostromo AES would be replaced by VVER-1000s (Marples 1988:100–102). In addition, a number of highly publicized modifications were introduced in order to lower the probability of further accidents at those RBMKs already in operation.[18] The Soviet government also undertook a major organizational restructuring of the nuclear power industry, introducing greater separation between its military and civilian components.[19] These reforms were promoted by both the IAEA and the more safety-conscious members of the Soviet nuclear power establishment.

Transnational Containment, Part 2: Fending Off Domestic Opposition

The decision to curtail the further development of the RBMK and to retrofit those already in operation did much to satisfy international concerns in the wake of the Chernobyl accident but little to mollify the growing fear of nuclear power inside the Soviet Union. As soon as state controls over the press and public political activity were liberalized, popular opposition to nuclear power exploded. In January 1988, the government lifted the requirement that all articles concerning nuclear power be cleared by the military censor, and the result was an immediate proliferation of articles critical of the Soviet nuclear power program. This campaign was fueled by some of the most prominent figures of the perestroika period, including longtime dissident Andrey Sakharov (Dawson 1993). In May, *Pravda* published the posthumous memoirs of

Valeriy Legasov, deputy director of the Kurchatov Institute and one of the leading figures in the Soviet nuclear power community. The disillusioned Legasov, who had committed suicide the previous month, argued that the slipshod management of the Soviet economy and the pressures for conformity within the nuclear power community made nuclear power inherently unsafe in the USSR (Legasov 1989).

Public opposition to the Soviet nuclear power program was expressed still more vociferously at the grassroots level. In 1988–1990, anti–nuclear power movements sprang up around almost every nuclear power plant then in operation or under construction in the USSR. Since local officials had no responsibility for the provision of electrical energy—after all, that was the responsibility of the central ministries in Moscow—they often took a benign attitude toward these movements, especially once their tenure in office became dependent upon the satisfaction of constituent demands. The anti–nuclear power movements also drew strength from underlying nationalist and regional hostility towards Moscow—sentiments which, in the early perestroika period, could not be openly expressed with impunity. The power of the local anti–nuclear power activists grew still further in early 1990, when many of them were elected to local, regional, and republican legislative assemblies.

In its struggle to fend off this onslaught of popular opposition—an entirely indigenous movement, in which Western antinuclear activists played no role—Moscow turned once again to the IAEA. This was once again a case of instrumental manipulation: The Soviet government's decision to involve the IAEA was not motivated by genuine concerns about nuclear safety, but was instead an effort to use international cooperation in order to advance an entirely different goal: namely, to deflect the growing grassroots opposition to nuclear power in the USSR. The intervention of the IAEA was intended to shore up the central government's position by demonstrating that it had the support of objective, Western experts. This intervention took two forms: a series of IAEA inspections of besieged nuclear power plants, and a special IAEA investigation of the Soviet government's efforts to deal with the radiation consequences of the Chernobyl disaster.

The first visit by an IAEA safety team was the inspection of the third unit of the Rovno AES in Ukraine in December 1988. The plant and reactor were chosen by the Soviet nuclear power authorities, not the IAEA: Rovno-3 was a newly built VVER-1000, and thus Soviet nuclear power officials considered it to be one at which safety problems were least likely to be encountered. The invitation to inspect Rovno-3 was therefore part of a broader effort to demonstrate to the Soviet public that the VVER-1000 (upon which the further expansion of the nuclear program vitally depended) was safe and in conformity with "Western" standards. As the Soviet authorities had hoped, the IAEA team returned a largely favorable review of the Rovno plant. The mission concluded that the management at the Rovno AES demonstrated a high degree of concern for safety, that the plant's radiation protection standards conformed to international norms, and that the plant had no adverse impact upon the surrounding population or environment.[20] These conclusions were highly publicized in both Ukraine and Moscow, where the IAEA team held a press conference before returning to Vienna.[21]

As it turned out, however, the IAEA visit to Rovno failed to have the intended effect, either in Ukraine or in the country as a whole. The Rovno inspection coincided with a massive earthquake in Armenia, which generated considerable public anxiety about the safety of the two first-generation VVER-440s operating at the republic's Medzamor AES—already the target of widespread public opposition before the earthquake. Minister of Atomic Energy Nikolay Lukonin, who had just returned from Armenia, attended the press conference held in Moscow to celebrate the conclusion of the IAEA mission. Consequently, the meeting was dominated by questions about the safety of the Armenian station and of Soviet nuclear power in general, and the reassuring conclusions of the IAEA team were lost in the background.[22] The Rovno mission also failed to reassure the local population. Ukrainian antinuclear activists, who initially welcomed the visit, pointed out afterward that the IAEA had been allowed to visit only one of the station's four units, and they accused the IAEA of undue favoritism toward nuclear power and of being "in the pocket" of the Soviet government.[23] Charges of this sort would subsequently become a familiar refrain in the debate over nuclear power in the USSR. Although the Rovno AES was not closed, further construction of the fourth unit (along with the construction of all other unfinished nuclear power plant units within Ukraine) was halted by a decree of the Ukrainian Supreme Soviet in August 1990. Subsequent IAEA safety inspections met a similar fate. Once antinuclear activists learned that the IAEA could not be counted upon to deliver a verdict hostile to Moscow, opposition to the participation of the IAEA rose. In the end, the remaining IAEA inspections were postponed indefinitely after the agency ran into opposition from local politicians intent upon canceling the projects.[24]

At the same time, the Soviet government also enlisted the IAEA in its effort to deflect domestic criticism of its handling of the aftermath of the Chernobyl disaster. More than 100,000 persons were permanently evacuated from their homes after the accident, and millions more continued to live in areas that had been contaminated by radioactive fallout. This led to widespread local anxiety about the safety of continued residency and food production in these areas—especially after it was publicly revealed that the initial evacuations had been badly mismanaged and that the Soviet government had covered up the full extent of the environmental contamination.[25] The affected population also distrusted Moscow's reassuring reports on the medical consequences of the accident. Although Soviet officials maintained that the health consequences of the accident would be minimal, a wide variety of alleged health problems, ranging from mutant calves to thousands of premature deaths, were popularly attributed to the Chernobyl disaster. As in the case of environmental contamination, the secrecy and disorganization displayed by the Soviet government only exacerbated popular fears about the health effects of the accident—fears that dismissive references to "radiophobia," a neologism perpetually on the lips of Soviet officials, did little to dispel.[26]

This continuing controversy was troubling to Moscow for two reasons. First, as in the case of the anti–nuclear power movement, the uproar helped to fuel the growing regional and republican opposition to rule from Moscow, especially in Ukraine. Secondly, the assertions that the radioactive contamination and medical consequences were greater than Moscow was willing to admit were, in effect, claims for greater compensation to the stricken areas—compensation in the form of direct payments to the victims of the disaster as well as the construction of new villages and apartment blocks for the families that had been or might be evacuated from the contaminated zones.[27] These were claims that the financially strapped central government was increasingly reluctant to satisfy. Consequently, in October 1989 the Soviet government asked the IAEA to conduct an expert analysis of the steps that it had taken to protect the population after the accident. The agency agreed, and a preparatory mission arrived in the USSR in March 1990. This assessment subsequently became known as the International Chernobyl Project (ICP). Although the ICP was administered by the IAEA secretariat, it was a vast multilateral undertaking, involving some 200 outside experts from seven international organizations and a variety of national institutions.[28] Between March 1990 and January 1991, these experts completed more than fifty missions to the USSR. The Soviet government bore the on-site costs of the project, which was coordinated within the USSR by the Ministry of Nuclear Power and Industry.[29]

The final report of the ICP was publicly released at an international conference in Vienna in May 1991. The project's findings were generally reassuring and supportive of the measures taken by the Soviet government in the aftermath of the disaster. In fact, to the extent that the report criticized the Soviet authorities at all, it was for intervening *too extensively* after the accident. The ICP report concluded that the levels of contamination in food products were well below international standards, and that no health disorders within the contaminated zones could be attributed directly to radiation exposure. The ICP report also supported the contention that the most significant medical effects of the accident were psychological. The levels of intervention established by the Soviet government for relocation and the restriction of food products were found to be much more conservative than could be justified on radiological protection grounds, and the report strongly recommended that they not be made any more restrictive (IAEA 1991a, 1991c).

The findings of the ICP immediately unleashed a storm of protest in increasingly wayward Ukraine and Belorussia, both of which were by this time using their fledgling diplomatic resources as members of the UN to press for greater foreign financial assistance to cope with the accident's aftermath.[30] Georgiy Gotovchits, head of the Ukrainian Ministry for the Protection of the Population from the Consequences of the Chernobyl Accident, accused the IAEA of "deliberately undermining international efforts to eliminate the consequences of the Chernobyl disaster," and the Ukrainian Supreme Soviet instructed its commission for the consequences of Chernobyl to draft an official protest to be sent to the IAEA.[31] The Belorussian Supreme Soviet also criticized the findings of the ICP and announced that it would file an official rebuttal of the report with the IAEA secretariat.[32] The critics of the ICP report also charged that the IAEA was the spearhead of a powerful "international nuclear mafia" determined to downplay the seriousness of the Chernobyl accident to preserve its reputation and save the day for the further growth of nuclear power.[33] Consequently, the ICP had no more effect upon Moscow's critics than had the IAEA's safety inspections.

The Logic of Transnational Containment

From May 1986 until early 1988, Soviet participation in international nuclear safety cooperation was similar in many ways to its participation in the Baltic Sea and transboundary air pollution cases. Gorbachev responded to the Chernobyl accident with greater openness and accelerated East-West cooperation; as his remarks from May 14 onward made clear, his aim in doing so was not only to minimize the damage that the accident had caused to the Soviet Union's international reputation, but also to press forward his campaign to sharply reduce the East-West tensions of the Cold War. As in the other two cases, this opened a window of opportunity for those specialists who favored the wider introduction of Western-style policies. These specialists were able to make common cause with like-minded foreign experts to push for the curtailment of the RBMK program and other reforms in the Soviet nuclear power industry.

As in the other two cases, the subsequent expansion of political participation within the USSR empowered nonspecialists and nongovernmental actors at the expense of the influence of the specialist elite that had hitherto monopolized East-West cooperation. From this point on, however, the nuclear safety case was unique: It was the only case in which Soviet governmental and industrial officials—including those specialists who sought to reform the Soviet nuclear power industry—manipulated international cooperation in order to combat domestic environmentalist opposition. In other words, it was the Soviet nuclear industry, not its critics, that benefited most from the transnational (as opposed to internal) expansion of the scope of environmental politics in the USSR.[34] How was this possible?

The answer lies in the nature of the international nuclear safety community itself. Both the Baltic Sea and transboundary air pollution cases were characterized by strong international epistemic communities of environmental scientists, specialists with no ties to any particular industrial or economic sector. In turn, the members of these communities dominated the activities of the international bodies established to coordinate national research and emissions reductions: HELCOM and the LRTAP Convention. In the nuclear safety case, by contrast, the international specialist community was composed overwhelmingly of nuclear engineers and other specialists whose raison d'être was tied to the continued exploitation of nuclear power. Not surprisingly, most of these specialists supported nuclear power, subject to effective safety controls. This was particularly true of the IAEA: Since part of its organizational mission had always been the promotion of the peaceful uses of nuclear power, it shared the Soviet government's interest in containing the damage that the Chernobyl accident had inflicted upon nuclear power in general. This constellation of forces was favorable to the Soviet nuclear power industry, since the Western nuclear experts engaged in international cooperation—many of whom worked for national utilities and nuclear regulatory agencies—tended to be more sympathetic to their counterparts in the USSR than they were to the demands of the antinuclear opposition. The opponents of nuclear power, on the other hand, did not have access to an intergovernmental organizational base of comparable authority. This disadvantage was compounded by the fact that the officials in charge of the Soviet nuclear program were also responsible for the management of all international cooperation in the nuclear power area. This power allowed Soviet nuclear officials to control not only the issuance of invitations to foreign experts, but also what those experts saw and what they did not.

This interpretation of the Soviet government's motivations for cooperating with the IAEA is borne out by the timing of the Soviet government's requests for assistance. Although the IAEA's mechanisms for conducting confidential safety inspections of its member states' nuclear power plants were well established before 1986, the Chernobyl accident did not prompt any such request on the part of the USSR. Moreover, there were no international inspections in 1986–1987, although other types of contacts between Soviet and Western nuclear experts accelerated rapidly during this period. When, in 1988, the Soviet government finally did begin to issue invitations for IAEA teams to conduct inspections inside the USSR, the impetus was not Western pressure—that would come only later, after the fall of the Berlin Wall and the further deterioration of the situation inside the Soviet Union—but the rising tide of public criticism of nuclear power inside the USSR.

In the end, the Soviet government's effort to enlist the IAEA in its battle with its domestic critics failed—not because the IAEA was unwilling to play the part scripted for it, but because the opponents of nuclear power were not swayed by the IAEA's findings. Instead, they simply lost confidence in the IAEA's objectivity. As the Soviet state disintegrated, anti–nuclear power activists were able to make common cause with those who opposed Soviet rule on broader political grounds, and with local, regional, and republican officials who now faced elections and therefore the need to satisfy the political concerns of their constituents. By the end of 1990, the opponents of nuclear power in the USSR succeeded in halting the construction of more than forty reactors—including those inspected by the IAEA. In retrospect, however, this was the high-water mark of antinuclear activism in the USSR, because the former Soviet republics soon found that nuclear power looked rather different in the cold light of national independence.

A New Lease on Life: The Post–Cold War Politics of Nuclear Power Safety

The Newly Independent States Rethink Nuclear Power

During the late perestroika period, domestic opposition to the Soviet Union's nuclear power program greatly outstripped the much milder expressions of concern emanating from the West. As a result, the opponents of nuclear power within the USSR were unable to enlist significant external support for their efforts to curtail the Soviet nuclear power program; in fact, to the extent that external actors were drawn into the domestic debate over nuclear power in 1988–1991, they were allied with the Soviet nuclear power industry against its opponents. With the dissolution of the USSR, however, this relationship was reversed. The governments of the newly independent states that have inherited Soviet-built nuclear power plants—Russia, Ukraine, Lithuania, Armenia, and Kazakhstan—uniformly decided to continue and expand their reliance on nuclear power, while their increasingly alarmed Western neighbors began to demand that the existing plants be closed. But just as the domestic opponents of nuclear power had previously been isolated internationally, Western critics of post-Soviet nuclear power now discovered that they were virtually bereft of internal support within the newly independent states. Like ships passing in the night, the newly independent states and their Western neighbors turned, reversed course, and once again found themselves heading in opposite directions.

The first manifestation of the remarkable about-face in the former Soviet Union occurred even before the USSR formally ceased to exist. In March 1990, shortly after the IAEA inspection of the Ignalina AES in late 1989, the newly elected Lithuanian parliament unilaterally declared the republic to be an independent state. The Soviet government responded by authorizing the seizure of key buildings in Vilnius—a measure that failed to dislodge the independence-minded government—and by subjecting the entire republic to an energy blockade. The Ignalina AES, which supplied more than half of the republic's electricity, now became Lithuania's sole dependable source of energy. Under these conditions, Lithuania's leading nationalists—including the former leaders of the anti–nuclear power movement, who now held government positions—reversed their stance toward nuclear power and enthusiastically embraced the continued operation of the Ignalina AES. Indeed, the government even began considering plans to expand the station.[35]

Shortly after the final collapse of the USSR in late 1991, analogous developments took place in the other nuclear-powered successor states. Armenia, like Lithuania before it, found itself the target of an energy blockade because of its war with Azerbaijan over the disputed territory of Nagorno-Karabakh. With its only remaining supply lines continually interrupted by civil war in neighboring Georgia, the Armenian government decided in early 1993 to restart the Medzamor AES, shut down after the devastating earthquake of December 1988. The plant's two VVER-440/230 reactors were duly restarted in 1995. Ukraine decided in late 1993 to lift the moratorium on the construction of new reactor units within the republic, and one of the three units under construction in Ukraine when the moratorium was imposed in 1990, the sixth unit at the Zaporozhye AES, was completed and connected to the grid in 1995. Ukraine also annulled its earlier decision to close the Chernobyl AES, and decided instead to modernize and prolong the service life of the troubled facility. Kazakhstan inherited one small nuclear plant, a fast breeder reactor on the shore of the Caspian Sea; this plant remained in operation. Moreover, like Lithuania, these three states expressed their determination to expand their nuclear power generating capacities in the near future.[36]

Russia followed a similar course. In early 1992, the Russian government announced an ambitious new plan for the expansion of nuclear power. This program envisaged the resumption of the construction of many of the reactors previously halted by popular protest (including an unfinished RBMK-1000 at the Kursk plant in western Russia), the replacement of a number of existing units with next-generation Russian-made reactors, and the eventual construction of several new nuclear plants throughout the country.[37] In the event, the Russian plan proved to be overly ambitious, since the government's financial problems and the problem of nonpayment for electrical power usage sharply constrained the resources available for the construction of new nuclear power reactors. Of the three reactors projected to come online by 1995, Russia managed to complete only one, a VVER-1000 at the Balakovo plant. However, the Russian nuclear industry's ambitions were merely delayed, not permanently thwarted, by the economic crisis of the 1990s: In July 1998, the Russian government reaffirmed its commitment to the development of nuclear power. The Russian government's new plan called for the immediate completion of three partially constructed units (VVER-1000s at the Kalinin and Rostov plants and the RBMK-1000 at Kursk) at an estimated total cost of $900 million, as well as the introduction of six additional reactors by 2005, as many more by 2010, and still others thereafter. This program included the commissioning of the world's first floating nuclear power plant, construction of which began in 1997. If the program were implemented in full, the percentage of Russian electricity produced by nuclear power could rise from the 13 percent recorded in 1997 to 20–30 percent by 2030.[38]

Why did such a fundamental reevaluation of nuclear energy take place in the newly independent states? First, the strength of the popular opposition to nuclear power in 1988–1990 was artificially inflated by the peculiar political opportunity structure characteristic of the perestroika period. As Jane Dawson has compellingly argued in her study of the anti–nuclear power movement in the former Soviet Union, antinuclear activism initially served as a surrogate for more radical political demands that could not yet be voiced openly or safely, especially ethnic nationalism. As soon as anti-Soviet platforms could be aired freely, organizers and supporters alike began to shift their attention away from anti–nuclear power protest.[39] The exact timing of this shift varied from one republic or region to another, but in all cases the anti–nuclear power movements had peaked by the fall of 1990, after which the deepening economic and political troubles that accompanied the collapse of the USSR diverted public attention away from the potential dangers of nuclear power. By the early 1990s, the few remaining opponents of nuclear power in the newly independent states were weak and dependant upon support from Western governments, foundations, and environmental organizations such as Bellona (based in Norway) and Greenpeace International. Ironically, the most visible “antinuclear” protests of the 1990s were organized and carried out by *nuclear power plant operators*, who protested not nuclear power itself, but chronically unpaid wages, consumer nonpayment for electricity, and inadequate state funding for routine maintenance and safety improvements.[40]

Second, while the Soviet Union was still intact, it was possible to ignore the economic trade-offs involved in halting the development of nuclear power. The provision of electricity was the responsibility of the central government, not of local or republican leaders; if the construction of nuclear power plants were blocked, Moscow would come up with an alternative, and the price of energy would remain the same. With the disintegration of the Soviet economy along territorial lines in 1990–1991, however, ordinary citizens and regional and republican officials alike began to face the prospect of real energy crises for the first time, and they realized that nuclear power could not be discarded quite so painlessly. This lesson was driven home with still greater force after the collapse of the USSR, as Russia began to charge its former Soviet neighbors much higher prices for energy. Russia also exploited the energy dependence of the other ex-Soviet republics in the pursuit of its other foreign policy goals in the "near abroad," as the remainder of the former Soviet Union was known in Russian parlance after 1991. Consequently, those successor states that had inherited Soviet-built nuclear power plants now viewed them not as hated symbols of Russian imperialism, but as valuable bulwarks of national independence in a world where Russia controlled most other sources of energy.

Third, the nuclear industry in the newly independent states remained organizationally coherent and politically powerful relative to its potential opponents. The political power of the nuclear industry was most pronounced in the Russian Federation, which had inherited the bulk of the Soviet nuclear complex. The Russian Ministry of Atomic Energy (Minatom) was established in January 1992 on the basis of the Soviet Ministry of Nuclear Power and Industry; like its Soviet-era predecessor, Minatom combined the commercial and military wings of the nuclear complex within a single organization, providing the nuclear industry with a strong and unified voice in domestic decision making. Thus, in its decision to expand its nuclear power program, the Russian government experienced not only a powerful "pull"—the desire to free up the country's oil and gas supplies for export—but also a "push" from the economically depressed but politically influential nuclear industry. The revitalization of Russia's nuclear complex was also supported by conservative Russian politicians suspicious of the West.[41] The Russian government also promoted the nuclear industry's efforts to reinvigorate its foreign commercial activity. By the late 1990s, the Russian nuclear power industry had concluded contracts valued at over $6 billion for participation in the construction of nuclear power reactors in China, India, Cuba, Iran, and Slovakia: accomplishments made possible with the help of financing arranged by the Russian government.[42] The Russian government's willingness to back these projects was all the more remarkable given the friction that the Iranian and Cuban projects generated in Russia's relationship with the United States.

Finally, to the extent that the governments of the newly independent states remained worried about the risks of a nuclear accident—and they could hardly fail to be aware of the danger, given the recent experience of the Chernobyl accident—these fears were increasingly offset by the knowledge that their more affluent Western neighbors were willing to subsidize safety improvements at the nuclear plants located within their territories, provided that those plants remained in operation. Moreover, this assistance would also extend the service lives of the existing reactors, making the continued operation of them more economically attractive as well. To understand why the Western countries chose to respond in this way, let us direct our attention to the other ship in the night, heading in the opposite direction.

Transnational Subsidization, Moral Hazard, and Nuclear Life Extension

By the time the USSR disintegrated in late 1991, the affluent states of Western Europe and North America had grown increasingly concerned about the safety of Soviet-built nuclear facilities. The stimulus for this shift was not the Chernobyl accident—as noted above, the West remained remarkably complacent about nuclear power safety in the USSR throughout the perestroika period—but the fall of the Berlin Wall in late 1989 and the subsequent reunification of Germany. Now, for the first time, Western nuclear experts were free to inspect Soviet-designed nuclear power plants at their leisure, and their findings were alarming. By the end of 1990, the German government had shut down all of the nuclear reactors on the territory of the former GDR, Austria was loudly protesting the continued operation and planned expansion of nuclear power in Czechoslovakia, and there were growing fears about the safety of nuclear facilities in the other Eastern European states, especially Bulgaria (Kramer 1992). In response, in late 1990 the IAEA launched a broad program to study the safety of the older VVER-440/230s that dotted the Eastern European landscape.

This expanding wave of international anxiety soon spread to the former USSR. External fears were fueled not only by increased familiarity with the Soviet-designed plants in Eastern Europe, but also by a string of alarming incidents within the former Soviet Union itself. In July 1991, an operating mishap at the Ignalina AES caused several workers to be exposed to excessive levels of radiation.[43] This incident was followed in early 1992 by the disclosure that one of the plant's workers had sabotaged the station's computer system, allegedly in hopes of securing a bonus for correcting the problem.[44] Coming on the heels of a number of previous incidents at the plant, these disclosures did little to inspire confidence abroad; in March 1992, the Swedish environment minister declared the improvement of safety at Ignalina to be his country's top environmental priority in the former USSR.[45] In October 1991, a major fire broke out at the second unit of the Chernobyl AES. Although the reactor itself was not damaged, the fire destroyed the roof of the adjacent turbine building, and the reactor was shut down.[46] Another disturbing incident took place in March 1992, when the rupture of a pressure tube in unit 3 of the Leningrad AES led to the release of radioactive gases into the outside atmosphere: a development which, according to the proponents of the RBMK, was supposedly impossible. The wind was blowing directly toward neighboring Finland at the time, and the resulting transboundary radioactive contamination, though small, greatly aggravated Western concerns about the safety of the remaining RBMKs—particularly since the Leningrad accident began in very much the same way as the catastrophe at Chernobyl.[47] The most serious incident of all took place at the Kola AES in February 1993, when a storm-induced loss of electrical power caused prolonged coolant failure in the plant's oldest reactor.[48] As external concern mounted, the IAEA's VVER-440/230 program was expanded to include safety problems at VVER-440/213s, VVER-1000s, and RBMKs.

In addition to incidents at individual plants, Western experts were alarmed by the general deterioration of the state of the nuclear power complex in the former Soviet Union. Routine maintenance, operator morale, and the delivery of spare parts were disrupted by the widespread problem of consumer nonpayment for electricity generation. Moreover, each of the newly independent states now had to establish its own nuclear regulatory agency, a task complicated by the fact that the low wages offered to safety inspectors drove many of the most qualified to opt for higher-paying positions in the nuclear industry itself. In any case, the new regulatory agencies remained weak relative to the nuclear industries that they were supposed to supervise. The disintegration of the USSR was also accompanied by the disruption of the nuclear fuel cycle. The former USSR's main facility for processing spent fuel and disposing of radioactive wastes, the Mayak plant near Chelyabinsk, was full to overflowing, and the local authorities were loath to accept any further shipments. As a result, spent fuel rods and other contaminated wastes began to pile up around the former Soviet Union's nuclear power plants, overloading the stations' temporary storage facilities.[49]

As with respect to other environmental problems of transboundary concern, external actors pursued four main strategies in response to the newly independent states' positive reappraisal of nuclear power. The first component of the international response was capacity building: a broad effort to improve the regulatory and operational environment in the successor states. This effort was aimed at both plant operators and the new regulatory agencies that had been formed on the basis of the regional branches of the Soviet safety agency. Plant operators and safety inspectors were encouraged to take advantage of a wide range of contacts with their Western counterparts: programs arranged by international bodies such as the IAEA and the utility-based World Association of Nuclear Operators (WANO); bilateral cooperation with other national agencies, such as the U.S. Nuclear Regulatory Commission and Finland's STUK; and twinning arrangements with specific nuclear power plants in the Western states. Officials in the newly independent states participated eagerly in these activities, and they relied heavily upon foreign examples in the elaboration of new regulatory guidelines and operational codes.[50] At the same time, Western governments and NGOs also sought to reinvigorate indigenous nuclear activism and to convince the governments of the newly independent states that greater energy efficiency and reliance upon alternative sources of electrical power would be more cost-effective than further dependence upon nuclear power.[51] These latter two strategies were signal failures: As the 1990s drew to a close, indigenous antinuclear activism remained weak, ineffective, and dependent upon Western aid, and none of the newly independent states had abandoned its commitment to the further exploitation of nuclear power.

The fourth and most resource-intensive component of the external response was the subsidized modernization of the existing reactors in the former Soviet bloc. This strategy was enthusiastically promoted by the Western nuclear power industry, which viewed the troubled state of nuclear power in the former Soviet bloc as both a threat and an opportunity. The Western nuclear industry could not hope to shield itself from the political backlash that would inevitably follow another major accident in the former Soviet bloc; Chernobyl had very nearly destroyed public acceptance of nuclear power in the West, and another accident could finish it off altogether. At the same time, however, the Western nuclear industry was equally quick to recognize the economic opportunity presented by the reappraisal of nuclear power in the East. At a time when new orders were declining in the West, expansion into Eastern Europe and the former Soviet Union could provide a welcome source of new business—particularly if it were subsidized by the Western firms' home governments. Western nuclear engineering firms and their governmental supporters therefore worked hard to ensure that the main thrust of the Western response to the former socialist states' renewed interest in nuclear power would be the modernization and expansion of the post-socialist nuclear power industry, rather than pressure for reduced dependence upon nuclear power through greater energy conservation or the replacement of nuclear power with other forms of energy.

This lobbying effort was remarkably successful, prompting a massive multilateral campaign to subsidize the modernization of existing Soviet-built nuclear power plants and to assist in completion of some of the unfinished reactors interrupted by the antinuclear surge of 1988–1990. Although Western nuclear safety assistance was never as tightly orchestrated as the concurrent effort to clean up the Baltic Sea, it did become somewhat more coordinated over time as the donors sought to minimize duplication and to present a united front to potential recipients. Toward this end, in February 1993 the G7 announced the creation of a Nuclear Safety Account (NSA) within the EBRD, through which a sizable portion of the Western effort would henceforth be channeled. As of mid-1999, total contributions to the NSA (excluding the Chernobyl Shelter Fund, of which more below) were £260.6 million (approximately $260 million). However, the greater part of Western aid continued to be directed through bilateral programs and other "non-NSA" channels: As of October 1999, overall assistance in the area of nuclear plant safety alone totaled more than £1.856 billion—more than seven times the amount channeled through the NSA.[52]

The response in the newly independent states to this campaign was largely positive, but not unreservedly so. By the end of 1992, very few environmental officials continued to oppose Western assistance on the grounds that it would prolong the use of nuclear energy in the former USSR; indeed, at a press conference in January 1993, Russian Environment Minister Danilov-Danilyan expressed his agreement with the government's plans for the expansion of nuclear power, arguing that the alternatives were worse.[53] Ironically, the loudest concerns were voiced by the Russian nuclear industry. In a letter to the government in early 1993, for example, representatives of Minatom, Minenergo (the Ministry of Electric Power), and Gosatomnadzor (the Federal Inspectorate for Nuclear and Radiation Safety) argued that the wholesale import of Western nuclear technology would result in the destruction of Russia's indigenous nuclear industry and "complete economic and technological dependence."[54] Top Minatom officials and leading political conservatives endorsed this sentiment.[55] Since the designers and manufacturers of the RBMK had the least to gain from cooperation with the West, the leaders of the RBMK lobby—who continued to occupy powerful positions within the nuclear industry—came out as the most strident opponents of excessive Western penetration of the Russian nuclear industry.[56] Nevertheless, most officials within the former Soviet nuclear industry were eager to cooperate with the West, provided that their own interests were furthered in the process. This was particularly true of the nuclear power plant directors, who were eager to accept any assistance that might improve the operational reliability of the units under their care.

The chief obstacle to externally subsidized modernization was the thorny question of liability. Western nuclear engineering firms did not wish to be held financially accountable in the event of an accident, especially since modernization would have to proceed on the basis of Soviet-era technology and designs. The donor governments therefore insisted that the recipients adhere to the principles of the Vienna and Paris Conventions, which assign exclusive and absolute liability for any transboundary damage to the operator of the nuclear installation concerned.[57] The financially strapped former socialist states were understandably reluctant to assume such enormous financial obligations, but after considerable foot-dragging most of them made the necessary commitments. By the end of 1994, Lithuania, Armenia, and the Eastern European states had ratified or acceded to the Vienna Convention, and Ukraine did so in 1996. Russia signed the Vienna Convention in 1996, but still had not ratified it as of mid-1999—a problem partially circumvented through bilateral agreements that limited the liability of Western equipment suppliers.[58] Western efforts to subsidize nuclear safety in Russia were also hampered by the high import taxes that Russian customs officials sought to impose upon Western equipment, a practice that caused shipments of valuable equipment to be held up for many months at a time. Ultimately, as in the case of liability, this problem could only be resolved through bilateral agreements concluded at the highest level.

How effective was the international campaign to improve nuclear safety in the newly independent states? Nuclear safety is more difficult to measure than air or water pollution, as it involves estimates of the risk of incidents that *might* occur as well as measurements of actual pollution. However, we can get some idea of the safety picture by looking at the number of incidents reported at the newly independent states' nuclear power plants, as measured by the IAEA's International Nuclear Event Scale (INES). The INES rates incidents on a scale from zero (no safety significance) to seven (a major accident with widespread health and environmental effects). The 1986 Chernobyl accident was a 7, while the 1979 TMI accident was a 5: an accident involving severe damage to the reactor core together with a significant external release of radioactivity. The September 1999 accident at the Tokaimura Processing Facility in Japan was rated a 4: an incident involving severe damage to the facility and/or the exposure of plant workers (in this case, two) to potentially fatal doses of radioactivity, but without significant off-site contamination (IAEA 1999). Such high-level accidents are, fortunately, quite rare; most incidents fall into the zero-to-three range. A "level 1" incident indicates an "anomaly" in which normal operating limits and procedures are exceeded. A "level 2" incident involves a more serious failure of safety provisions, one leading to the overexposure of workers within the plant to radiation and/or to the radioactive contamination of other parts of the plant. A "level 3" incident is more serious still, involving the exposure of workers to doses high enough to cause acute health effects, the severe contamination of the interior of the plant, a small external release of radioactivity, and/or a situation in which there are no remaining safety barriers to a much more severe accident.[59]

Judging from the incidents reported by the newly independent states in accordance with the INES, it appears that the international campaign to improve nuclear power safety in the former Soviet Union was associated with a significant, if uneven, improvement in nuclear safety in the 1990s. In Russia, safety generally improved in the 1990s, despite the persistent problem of consumer nonpayment and protracted obstacles to the timely delivery, installation, and maintenance of externally subsidized safety technology. The number of level 1 and 2 incidents at Russian nuclear power plants dropped from twenty-seven in 1993 to an annual level of four or less in 1995–1998, and there were no level 3 incidents after 1993. (Two level 3 incidents were reported in 1993, one being the near-catastrophe at the Kola AES.)[60] In Lithuania, the number of recorded incidents at the Ignalina AES also declined in the 1990s: The number of level 1 incidents declined from five in 1996 to three in 1997, two in 1998, and none in the first ten months of 1999.[61] In Ukraine, the trend in the 1990s was more uneven. There was a fairly serious level 3 incident at the Chernobyl plant in November 1995, when a fuel element broke open during the defueling of the first unit. This accident was publicly disclosed only four months later.[62] The number of level 1 and 2 incidents in Ukraine declined from eleven in 1996 to four in 1997, but rose again to eight in 1998—an increase that Ukraine's chief nuclear regulator blamed on the lack of financing and the consequent "systematic disinclination" of plant directors to observe the proper safety standards.[63]

Whatever effect the international campaign had on safety, it unquestionably had additional effects that were less desirable from the donors' perspective. First, external financing for safety improvements meant that the newly independent states need not internalize the costs of reducing the associated environmental and health risks to an acceptable level. Instead, those costs could now be spread over a large number of countries, a fact that encouraged potential recipients to adopt a more risk-acceptant attitude toward nuclear power: a classic example of moral hazard. Second, the newly independent states and their Eastern European counterparts were able to draw upon Western financial and technical assistance in their efforts to extend the service lives of their existing nuclear reactors, including the RBMKs and older VVERs, and to complete some of those under construction. Western aid contributed to nuclear life extension both directly, through the subsidized installation of improved fire control systems, equipment backfits, instrumentation and automation, and so on, and indirectly, by freeing up scarce resources that the newly independent states could direct towards additional measures to extend their reactors' service lives. The prospect of Western assistance had an anticipatory "life extending" effect as well: The former socialist states realized that if they demonstrated their resolve to keep the older VVER and RBMK units in operation over the opposition of the Western countries, then the latter would respond either by subsidizing measures to improve safety at those plants—thus extending their service lives as well—or by subsidizing the construction of new reactors to replace them. In other words, transnational subsidization actually prolonged the transboundary threat posed by nuclear power in the former Soviet bloc—albeit, one hopes, at a lower level of risk.

The donors also contributed to the newly independent states' enthusiasm for nuclear power by encouraging the export of electricity from the newly independent states to the West. Nuclear power plants generated much of this electricity; in fact, electricity exports were encouraged as a way to repay credits for the modernization of the newly independent states' nuclear power plants. By 1998, both the Leningrad and Kola nuclear power plants were exporting electricity to Finland (one of the largest contributors to subsidized improvements at these two plants), and plans were underway to export power from the Ignalina plant to the Nordic countries as well.[64] The export of electricity was especially crucial to the financial survival of the Kola plant, which by mid-1998 faced falling demand from its two main customers, the economically distressed Severonikel and Pechenganikel plants. Ironically, Nordic demand for Lithuanian and Russian electric power was expected to increase due to the Swedish and Finnish governments' decisions not to proceed with the further exploitation of nuclear power in their own countries.[65] This led a number of observers, both in the Nordic countries and in the newly independent states, to accuse Sweden and Finland of exporting the environmental and health risks of nuclear power to the East. Be that as it may, the prospect of lucrative energy exports further encouraged the newly independent states to modernize and extend the service lives of those nuclear power plants, since doing so would allow for profitable operation even if domestic demand should continue to fall.

Initially, the subsidized modernization of late-model nuclear power plants in the newly independent states (and in Eastern Europe more broadly) was to be tied to the early closure of those Soviet-built reactors that Western officials and nuclear experts deemed most unsafe. With regard to the former Soviet Union, Western concerns focused primarily on those RBMK reactors located in closest proximity to Western Europe—the Chernobyl, Ignalina, and Leningrad plants—and the two VVER-440/230s at the Kola AES. Those in favor of the early decommissioning of the RBMKs and older VVERs argued that the West should not subsidize any far-reaching safety improvements at these units, since this would only encourage the governments of the successor states to continue to operate them for the remainder of their design life, if not longer.[66] This argument was echoed by Russian Environment Minister Viktor Danilov-Danilyan and Aleksey Yablokov, Yeltsin's chief adviser on environmental issues, both of whom spoke out against Western assistance for the reconstruction of Russia's oldest and most dangerous nuclear power plants.[67]

Nevertheless, the nuclear-powered successor states successfully resisted external pressure for the early decommissioning of these plants. The governments of the former socialist states preferred instead to modernize their older reactors, and they gambled—correctly—that their more affluent neighbors would step in to remedy those reactors' most egregious shortcomings once it became clear that early decommissioning was not in the offing. In the West, too, support for aggressive efforts to secure the early closure of the older VVERs and RBMKs waned, particularly after the EBRD's attempt to link a loan for the completion of two VVER-440/213s at the Mochovce nuclear power plant in Slovakia to the closure of two VVER-440/230s at Jaslovské Bohunice led the Slovak government to reject the package. The Slovak government went ahead with the Mochovce project anyway, awarding much of the work to Russian and

Czech firms instead—a sharp blow to the economic interests of the French and German firms that had expected to secure the leading role in the project, as well as to their respective governments.[68] Consequently, in most cases, the Western donors went ahead with the subsidized modernization of a number of plants that they would have preferred to see closed ahead of schedule, including the first-generation VVER-440s at the Kola AES, the RBMK-1000s at the Leningrad AES, and the RBMK-1500s at Ignalina. This, in turn, provided the recipients with the ability to continue to operate the upgraded reactors for considerably longer than would otherwise have been possible.

The Ignalina case is particularly instructive, since here the temptation to exploit the externally financed modernization of the plant clashed with the lure of eventual membership in the European Union (EU). In February 1994, the EBRD offered Lithuania a loan of ECU 35 million (then about $37 million) to support safety upgrades at the Ignalina plant, on the condition that Lithuania agree to close the two units when the time came to replace the pressure tubes inside the reactor core (EBRD 1996b). The Lithuanian government accepted this condition, and the work went ahead as planned. Once the bulk of the money had been paid out, however, members of the Lithuanian government and nuclear industry began to argue that Lithuania should renege on its commitment not to refuel the reactors. After all, they argued, the plant provided well over 80 percent of the republic's energy, a contribution that could not easily or cheaply be replaced, and Lithuania lacked the funds necessary for the early decommissioning of the plant, the costs of which were estimated to be in the range of $3.5 to 5.5 billion. In any case, the safety improvements conducted in the meantime had removed all cause for concern about the prolonged operation of the plant.[69]

In December 1998, the Lithuanian government approved a national energy strategy that provided for either of two scenarios: the "forced early closure" of the Ignalina plant in 2005–2010, as required by the 1994 agreement with the EBRD, or the replacement of the reactors' fuel channels, which would prolong the operation of the plant until at least 2030.[70] In response, the European Commission linked the early closure of the plants to the start of talks about Lithuanian accession to the EU (a source of leverage that was not available in the donors' dealings with

Russia and Ukraine). The Lithuanian government, in turn, accused the European Commission of "politicizing" the issue and of being more interested in setting an example for other states (i.e., Slovakia and Bulgaria, both of whom were engaged in similar disputes with the EU) rather than the actual safety of the Ignalina plant or Lithuania's national economic interests. If the European Commission demanded that the Ignalina plant be closed earlier than technically necessary, the argument went, then it should be willing to pay the cost of doing so.[71] Public opinion polls indicated that this sentiment was widely shared in Lithuania and that public support for Lithuanian membership in the EU had dropped sharply in the wake of the European Commission's threat to tie Lithuanian accession to the premature closure of the Ignalina plant.[72]

The ensuing bargaining converged around the amount of external compensation that the EU was prepared to offer in exchange for a firm commitment by Lithuania to adopt the "forced early closure" scenario. In August 1999, the European Commission declared itself ready to provide Lithuania with "exceptional" financial support—on the order of ECU 100 million per year—provided that Lithuania agreed to set an exact date for the decommissioning of the Ignalina plant.[73] In turn, the Lithuanian government—despite criticism from both the nuclear industry and the parliamentary opposition that it was selling out the country's national interests—agreed to adopt the "forced early closure" track of the dual-track energy strategy adopted in December 1998.[74] According to the revised national energy strategy adopted in October 1999, Lithuania committed itself to close the older reactor at the Ignalina plant by 2005; a decision regarding the future of the newer reactor would be taken no later than 2004.[75] The European Commission approvingly noted this concession in its annual report on Lithuania's progress towards accession and announced the creation of a special fund to help finance the decommissioning of the Ignalina plant.[76]

Despite this outcome, the Ignalina case was the exception that proved the rule. In the Ignalina case, the modernization of the plant's two RBMK reactors had a dual effect: It increased public and official acceptance of the risks associated with nuclear power, and it presented the Lithuanian government with a strong temptation to renege on its earlier agreement with the EBRD to forego the refueling of the reactors. The European

Commission sought to induce Lithuania to comply by linking the early decommissioning of the reactors to Lithuania's pursuit of membership in the EU, but this tactic alone was insufficient to bring about the desired result. Instead, the Lithuanian government agreed to abide by the 1994 agreement only after the European Commission agreed to defray a significant part of the costs of decommissioning the plant—a commitment not envisaged by the original agreement with the EBRD. Moreover, Lithuania's ability to secure this additional funding was considerably enhanced by the earlier modernization programs financed by the EBRD and other Western donors. *Within* Lithuania, these modernization programs made the refueling and prolonged operation of the Ignalina plant more technically feasible, economically profitable, and politically acceptable than it otherwise would have been; this in turn increased the *external* credibility of the Lithuanian government's apparent determination to prolong the plant's service life. In other words, the very success of the donors' earlier subsidization programs enhanced Lithuania's ability to extract additional—and much larger—payments from them later on.

The Politics of Nuclear Blackmail

From the donors' perspective, Lithuania's threat to renege on its 1994 agreement with the NSA verged on extortion: a threat to prolong the risk to which the more affluent states were exposed, unless Lithuania received an additional payment not to do so. In the Ignalina case, the "threat" was a relatively mild one: the prospect of the prolongation of an already ongoing activity, at a significantly reduced level of risk. But it is also theoretically possible that a "polluting" state might engage in extortion of a wholly different magnitude: that a potential recipient of external funding might present more affluent and environmentally sensitive states with the prospect of a substantially increased level of risk, or the introduction of a wholly new threat, in order to be paid not to introduce or expand the activity in question. As noted in chapter 2, Coase raised the possibility that a polluter, anticipating the prospect of a payment from a victim, might choose to deliberately step up the production of unpleasant side-effects, and thus inflict greater harm upon the victim, in order to extract a larger payment in exchange for ending or reducing the activity in question (Coase 1960:7–8). Coase added that actually undertaking this increase would be unnecessary, as the threat alone would suffice: a tactic he labeled "blackmail" (Coase 1988:3).

Could this happen in reality? In the East-West environmental politics of the 1990s, there were two cases in which potential recipients successfully used the threat of higher levels of nuclear risk to extract larger payments from the affluent capitalist states: Ukraine's threat to modernize the Chernobyl nuclear power plant, and Russia's threat to resume radioactive waste dumping at sea. Not surprisingly, these two cases of ostensible "nuclear blackmail" were two of the most contentious disputes in post–Cold War environmental politics.

The Resuscitation of the Chernobyl Nuclear Power Plant

In the summer of 1990, the Ukrainian parliament imposed a five-year moratorium on the introduction of any new nuclear units and decreed that the remaining three reactors at the Chernobyl plant should be shut down within five years. Following a major fire in the turbine hall of the second unit in October 1991, the Ukrainian parliament accelerated the schedule for the plant's closure, mandating that unit 2 be closed immediately and that units 1 and 3 be closed by the end of 1993.[77] This proved to be a Pyrrhic victory, however: In Ukraine, as in the other newly independent states, the attainment of full national independence was accompanied by a fundamental reappraisal of nuclear power. In October 1993, the Ukrainian parliament rescinded the nuclear moratorium and approved the government's plan to modernize and extend the service lives of the two units (1 and 3) that remained in operation at the Chernobyl plant. A few months later, the government approved the nuclear industry's plan to begin preparation for the restart of unit 2 as well.[78]

The domestic reaction to the Ukrainian government's decision to grant the Chernobyl plant a new lease on life was surprisingly muted, but the external reaction was one of loud dismay. Although the Western states had acquiesced in the continued operation of most other Soviet-built nuclear power plants (including others of the RBMK type), they drew the line at Chernobyl—a plant allegedly crippled by the effects of the 1986 disaster, and a powerful international symbol of the dangers associated with the exploitation of nuclear power. The leaders of the Western states therefore insisted that units 1 and 3 be shut down as soon as possible, and that unit 2 remain closed. There then ensued a year and a half of diplomatic wrangling, in the course of which the EU grew so incensed that it temporarily froze an ECU 85 million package of macroeconomic assistance to Ukraine.

Finally, in April 1995, the Ukrainian government agreed in principle to close Chernobyl by the year 2000—but only on the condition that the West contribute $4.5 billion toward the cost of decommissioning the plant. The bill presented by Ukraine included not only the cost of shutting down the Chernobyl plant itself, but also financing for the reconstruction of the ailing shelter (or "sarcophagus") surrounding the destroyed fourth unit, the resettlement and retraining of the plant's workforce, cleanup of the surrounding contaminated zone, and—most important—the construction of new generating facilities to replace the electricity produced at Chernobyl, approximately six percent of the Ukrainian total.[79] The director of the Chernobyl plant at the time, Serhiy Parashyn, helpfully suggested that the member states of the EU and G7 could raise most of the necessary money by contributing a mere $200 million each, noting that "this price is not very high for an advanced country that would like to solve an enormous task and rid its own people of worries."[80] In December 1995, Ukraine, the G7, and the European Commission signed a Memorandum of Understanding (MOU) in which the West agreed to provide $2.3 billion in assistance in exchange for the closure of Chernobyl by 2000. The MOU envisaged approximately $500 million in grants for short-term safety improvements and decommissioning, and $1.8 billion in credits for the completion of the Khmelnitsky-2 and Rovno-4 reactors—both of which had been halted by popular protest in 1990—and the modernization of existing hydroelectric and thermal power plants.[81]

Despite this apparent resolution of the conflict, implementation of the MOU subsequently stalled. Although the Western offer gradually crept upward to $3.1 billion, Ukraine continued to press for larger sums of aid. Minister of Environmental Protection and Nuclear Safety Yuriy Kostenko (the head of the Ukrainian negotiating team) and other Ukrainian spokesmen complained that the grant portion of the Western offer was too small, that the timetable for the delivery of the aid was too slow, and that the amount Ukraine itself was expected to contribute (approximately $1 billion) was too large. Kostenko and other Ukrainian officials also pointed out that the G7 package did not constitute genuinely "new" money, since it included a number of projects that were already underway when the Chernobyl negotiations began.[82] Ukrainian officials furthermore complained that the Western governments were paying insufficient attention to the need to repair and replace the shaky "shelter" covering the destroyed fourth unit—a problem which posed a clear and immediate threat to Ukraine, but a much lower danger to the distant "upwind" donors. At a press conference in Kiev in September 1996, Kostenko revealed that an unexplained increase in neutron activity had been observed inside the sarcophagus. He argued that this was evidence of a chain reaction inside the ruined reactor, and that an explosion could occur at any moment. Ukrainian President Leonid Kuchma reprimanded Kostenko for attempting to "intimidate people," but stressed that the donors should pay greater attention to the shelter issue.[83]

Frustrated by the inadequate size and slow pace of Western assistance, Ukraine undertook further reactor rattling in the fall of 1996. Kuchma had previously announced that the plant's first unit—an aging "first generation" RBMK—would be removed from operation by the end of the year and that its fuel channels would not be replaced as originally planned.[84] However, in the wake of yet another round of inconclusive negotiations with the donors in October, Kostenko announced that the government was considering the possibility of keeping the first unit in operation for at least one more year.[85] Shortly thereafter, Ukraine and the EBRD signed an agreement granting Ukraine ECU 118 million toward the closure of the Chernobyl plant, and the first unit was duly closed at the end of November 1996. The EBRD argued that this grant—intended to pay for interim spent fuel storage, liquid radioactive waste treatment, and short-term safety improvements at unit 3—represented a "very concrete step" toward the closure of the plant on schedule.[86] Nevertheless, Ukrainian officials continued to stress that the closure of the third unit by 2000 would not be possible unless the new units planned for the Rovno and Khmelnitsky nuclear power plants were brought online by the same date. The Ukrainian government also announced that it would begin preparations to restart unit 2 to replace the power currently generated by unit 1—unless Western assistance arrived more swiftly.[87]

From late 1996 onward, negotiations over the Chernobyl plant proceeded along two parallel tracks: the reconstruction of the shelter over the destroyed fourth unit and the proposed completion of the unfinished reactors at the Rovno and Khmelnitsky plants. In June 1997, the G7 and EU pledged $300 million toward the estimated $760 million cost of reconstructing the shelter, and a subsequent pledging conference was held in November with the aim of producing an additional $300 million. That goal proved to be overly optimistic: By the end of 1998, additional pledges to the EBRD's "Chernobyl Shelter Fund" amounted to only $93 million. This sum was nevertheless sufficient for the project to go ahead: In 1998 the EBRD approved the release of the first grants for work at the site, most of which was to be carried out by firms from the donor states. The donors also funded several projects designed to resolve the problem of processing and storing the Chernobyl plant's radioactive wastes, with most of the work, again, carried out by Western firms.[88]

This steady progress on the shelter front stood in marked contrast to the continued haggling over the proposed completion of the Khmelnitsky-2 and Rovno-4 reactors, known collectively as "K2R4." In February 1997, an independent economic panel commissioned by the EBRD reported that the plan to complete the Khmelnitsky and Rovno reactors would not be the most cost-effective use of the EBRD's funds at this time. The panel argued that Ukraine currently faced a large *surplus* in its power generating capacity, due to the country's depressed economic situation, and predicted that this surplus would last until 2010 at the earliest. The panel also argued that safety upgrades at Ukraine's existing VVER reactors were not only more pressing than the completion of the two additional reactors at Khmelnitsky and Rovno, but would also increase the operational reliability of the existing reactors, thus further diminishing the need for additional generating capacity. In any case, the least-cost approach to Ukraine's energy problems would be to increase the efficiency of the country's existing power plants and transmission and distribution grid and to reduce excess demand by improving the efficiency of residential and industrial energy use. Indeed, the panel concluded, the installation of additional generating capacity would be worse than unnecessary, it would be counterproductive—for this would make it easier for the Ukrainian government to avoid the market-based reforms being urged upon Ukraine by the EBRD and other Western representatives in the name of greater energy efficiency (Surrey et al. 1997; see also IEA 1996).

The panel's conclusions were warmly embraced by foreign environmental NGOs opposed to the further development of nuclear power in Ukraine and elsewhere in the former Soviet bloc.[89] Suspicion of the K2R4 project was also bolstered by a growing perception that the Chernobyl plant would soon close regardless of what the donors did or failed to do. In June 1997, the only reactor remaining in operation at the Chernobyl plant, unit 3, was closed for maintenance, at which point numerous cracks were discovered in the reactor's piping.[90] As the weeks planned for the repair of the unit stretched into months—a delay exacerbated by financial difficulties—many outside observers increasingly doubted that the reactor would ever reopen. However, three forces kept the K2R4 project alive throughout the remainder of the 1990s: an intensified campaign of Ukrainian reactor rattling in late 1997 and early 1998; continued support from the Western nuclear industry and its governmental backers; and parallel negotiations between Ukraine and Russia.

First, lest Ukraine's more affluent neighbors think that the Chernobyl problem might go away on its own, Ukraine went ahead with the repair and preparations for the restart of the third unit. Chernobyl-3 was accordingly reconnected to the grid in June 1998, shortly after the adjournment of the annual meeting of the EBRD's Board of Governors, held in Kiev in May 1998. (The Ukrainian government had initially announced that Chernobyl-3 would be reconnected to the grid on May 5—three days before the EBRD meeting was to begin—but agreed to delay the startup of the unit at the EBRD's insistence.)[91] Moreover, in the period before, during, and immediately after the May EBRD meeting, Ukraine's leading spokesmen—including Kostenko, President Kuchma, and Nur Nigmatullin, chairman of the newly privatized nuclear utility Enerhoatom—continued to insist that Ukraine would not shut down the

Chernobyl plant until the Khmelnitsky-2 and Rovno-4 reactors went online. Chernobyl plant director Serhiy Parashyn, who opposed closing the plant any earlier than absolutely necessary, helpfully added that unit 3 could easily remain in operation until 2010, while unit 2 could also be restarted at a very modest cost to Ukraine.[92]

At the same time, leading Western nuclear engineering firms and the governments that represented them continued to support the K2R4 project. These proponents prevailed upon the EBRD to commission a *second* external review of the project's cost effectiveness. This second analysis, carried out by the American consulting firm Stone & Webster, was presented to the EBRD in May 1998. The new study nimbly concluded that there was a 50 percent probability that the completion of the K2 and R4 reactors would be part of an overall least-cost solution to the problem of meeting the long-term demand for electric power in Ukraine (Stone and Webster Management Consultants 1998). This was not a particularly resounding endorsement, perhaps, but it was enough—along with continuing pressure from the United States, France, and the home governments of other eager nuclear engineering firms—to get the K2R4 project back on track. In June, the K2R4 project passed initial review at the EBRD, albeit at a lower level of bank funding than the project's authors had originally envisaged.[93]

Shortly after the K2R4 project passed initial review at the EBRD, the Ukrainian Cabinet of Ministers issued a statement in which it formally linked the timing of the closure of the Chernobyl plant to the launching of the new reactors at the Rovno and Khmelnitsky stations. The Ukrainian Cabinet declared that since the G7 and EU had not lived up to the bargain outlined in the MOU—namely, the commitment to finance the timely introduction of new reactor units to compensate for the production capacity that would be lost at Chernobyl—Ukraine no longer felt bound by its agreement to close the Chernobyl plant by the year 2000. The Cabinet of Ministers placed the blame for this "difficult situation" squarely on the shoulders of the EBRD, which, owing to its complicated and time-consuming procedures, had made the launching of the two new units by 2000 "practically impossible," unless the major donors "introduce appropriate extraordinary measures aimed at the allocation of the necessary financial resources" for the K2R4 project. "Otherwise," the

Cabinet concluded, "it will be surely necessary to change the deadline for the closure of the Chernobyl nuclear power plant." The Cabinet of Ministers frankly admitted that its goal in linking the timetables of the two projects was to place greater pressure upon the West. As the Cabinet statement dryly observed, "This kind of well-balanced decision will facilitate the enhancement of the implementation of the projects on constructing compensating capacities and the strengthening of responsibility on the part of the parties to the Memorandum for the implementation of their obligations."[94]

Finally, Ukraine simultaneously turned to Russia as an alternative supplier and source of financing for the completion of the K2R4 project—thus threatening the recalcitrant West with both the loss of contracts and the adoption of safety standards much less strict than those desired by the EBRD. Ukrainian officials objected not only to recalcitrance and delay on the part of the EBRD, but also to the high cost of the Western-backed project. While Ukrainian officials estimated the basic cost of the completion of the two reactors at approximately $800 million, the price tag for the project being considered by the EBRD had risen to well over $1 billion—largely because of the EBRD's insistence that the plant meet safety standards much higher than those for which the VVER-1000s were originally designed, or than most Ukrainian officials thought necessary.[95] Consequently, Ukraine and Russia began to discuss the possibility that Russian firms might take the lead in the project instead, provided that the Russian government could arrange the necessary financing. In early 1998, Russia agreed to loan Ukraine $180 million to support Russian participation in the completion of the two reactors. That agreement proved to be overly optimistic, however; in September 1999, a Ukrainian spokesman announced that Russia's promised assistance—which would be used to pay for Russian nuclear fuel—had decreased to $60–70 million.[96]

As 1999 drew to a close, the dispute over the K2R4 project and the fate of the Chernobyl nuclear power plant remained unresolved. In March 1999, the Ukrainian Cabinet of Ministers announced that it had decided to abandon plans to repair and restart the Chernobyl plant's second unit (closed since the fire of October 1991), a decision that was presented as a conciliatory gesture toward the West.[97] However, the prospects for Western financing of the K2R4 project were clouded in 1999 by a widening fissure among the major donors. The French and Finnish governments—looking out for the interests of Electricité de France and IVO, both of which expected to assume a leading role in the project—continued to express their support for K2R4. However, the new German government under Gerhard Schröder, whose Social Democratic Party was able to form a government only in alliance with the German Greens, opposed the project. In June 1999, the Bundestag voted against German participation in the funding of the K2R4 project and instructed the German government to urge the EBRD to finance nonnuclear alternatives instead. Schröder visited Kiev the following month in an effort to convince the Ukrainian government to replace the Chernobyl plant with a gas-fired station, but to no apparent avail.[98] Instead, the Ukrainian government continued to insist that the K2R4 reactors be completed in accordance with the December 1995 MOU and warned that the Chernobyl plant would not be closed until these reactors were in operation. In the event that the EBRD and EU should renege on their commitment to finance the project, Ukraine expressed its determination to complete the reactors with Russian assistance.[99] Meanwhile, after having been shut down for five months for additional repairs, the third unit at the Chernobyl plant was restarted in late November—only to be closed again a few days later when leaks were discovered in its core cooling system.[100]

Although the final disposition of the Chernobyl plant and the K2R4 project remained unsettled as 1999 drew to a close, the Ukrainian threat to keep the Chernobyl plant operating indefinitely had already generated more external assistance for the modernization of the Ukrainian nuclear industry and energy sector, and for Ukraine's efforts to cope with the consequences of the 1986 Chernobyl accident, than had appeared likely in mid-1993. The reasons for the issuance of this threat, and its success, will be analyzed in greater detail below. First, however, let us turn to the second apparent case of post–Cold War nuclear blackmail: Russia's threat to resume the Soviet-era practice of dumping radioactive wastes at sea.

Radioactive Waste Disposal in Russia

One of the most alarming environmental revelations to emerge from the former Soviet Union in the early 1990s was the disclosure that the USSR had for many years dumped large quantities of radioactive waste and discarded naval nuclear reactors into the Arctic and Pacific Oceans. Allegations to this effect surfaced with increasing frequency in 1989–1990, but the full story began to emerge only in September 1991, when Andrey Zolotkov, a legislator from Murmansk, publicly revealed that the Murmansk Shipping Line (which operated the Soviet Union's nuclear icebreaker fleet) had dumped large amounts of solid and liquid nuclear waste into the Barents and Kara Seas from 1964 to 1986 (Zolotkov 1991). Zolotkov's exposé was followed by revelations about similar operations carried out by the USSR's Northern and Pacific Fleets. At the urging of the international community, the Russian government commissioned an official report on the problem, the final text of which was released in April 1993. This report—dubbed the "Yablokov Report" after its chief author, presidential adviser Aleksey Yablokov—revealed that the Northern Fleet and the Murmansk Shipping Company had dumped some 2.5 million curies of liquid and solid radioactive waste—including sixteen discarded nuclear reactors, six with spent nuclear fuel still on board—into the Arctic Ocean between 1959 and 1991. The Pacific Fleet had also discharged a smaller amount of waste into the Pacific Ocean over a somewhat shorter period. Moreover, this practice had not ended with the breakup of the USSR: The report revealed that the Russian Navy had released 55 curies of liquid and solid radioactive wastes into the Arctic and Pacific Oceans in 1992 before the Russian government imposed a moratorium on the practice (Russian Federation 1993). (See Figure 5.2.) Ironically, much of this waste was dumped in the late 1980s, precisely at the time when Mikhail Gorbachev was loudly proclaiming the Soviet government's newfound respect for environmental security in the Arctic region.

Unfortunately, Russia's radioactive waste disposal problem did not end with the collapse of the USSR. Although the Northern and Pacific Fleets and the Murmansk Shipping Company had disposed of a significant portion of their radioactive waste at sea during the preceding three decades, a great deal of it remained on hand at naval bases and ship-

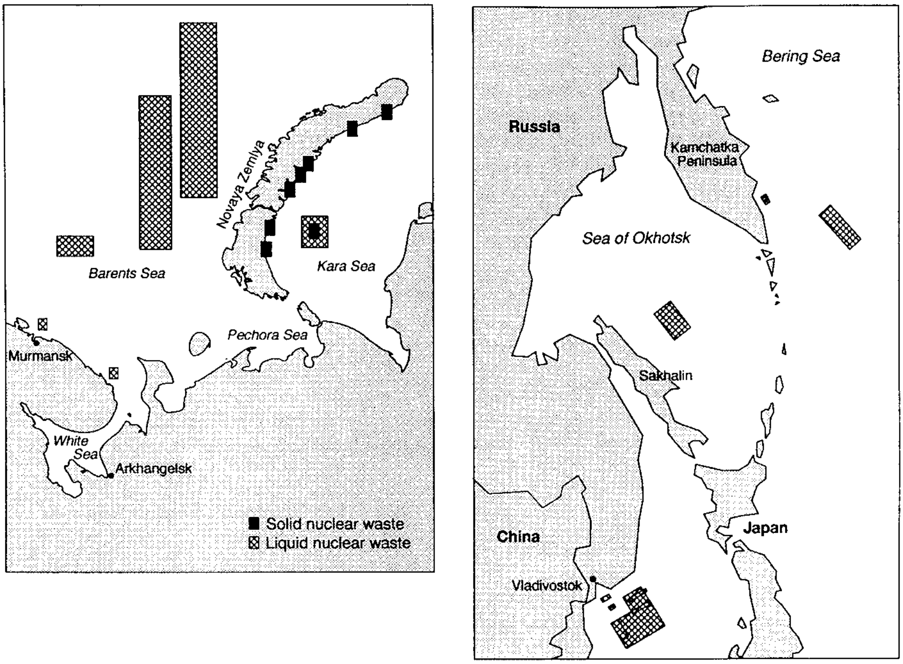

Figure 5.2
Radioactive waste dumping in the Arctic and Pacific Oceans, 1959–1992

yards in the Arctic and in the Far East. This waste was stored under extremely undesirable conditions: in leaky "temporary" storage tanks close to the sea and populated areas, or on board rusty tankers that were no longer seaworthy.[101] For example, some 640 spent fuel elements were stored aboard the aging refueling vessel *Lepse*, which served the Soviet icebreaker fleet from 1962 to 1981 and thereafter remained docked in Murmansk. The total level of the long-lived isotopes contained in the fuel assemblies on board the *Lepse*—most of them damaged and difficult to remove—was estimated to be as high as 750,000 curies, an amount equivalent to 30 percent of the long-lived isotopes released during the Chernobyl accident.[102] Russian and foreign environmentalists feared that these storage facilities could begin to leak at any time, if indeed they had not already. This fear was confirmed in early 1998, when Russian researchers discovered that the level of cesium-137 in the sediments of Andreeva Bay outside the Northern Fleet's main spent storage facility—located 200 meters from the water—was 12 times the background rate and rising.[103]

To make matters still worse, the radioactive waste problem in the Arctic and the Far East was steadily *growing* due to the rapid reduction in the size of the Russian nuclear fleet mandated by Russia's economic crisis and the START nuclear arms reduction agreements with the United States. Russia's Navy, shipyards, and nuclear industry lacked the capacity to cope with such a large influx of decommissioned submarines over such a short period of time. By July 1998, 157 nuclear-powered submarines had been taken out of service: 95 from the Northern Fleet, and 62 from the Pacific Fleet. Defueling and dismantling proceeded very slowly due to financial and technical difficulties, so most of these decommissioned submarines remained moored at naval bases on the Kola Peninsula and in the Far East, most with their nuclear fuel still on board.[104] Moreover, even after the submarines were defueled and dismantled, the problem of transporting and storing the resulting radioactive waste still remained. Russia possessed only one set of rail cars capable of transporting the spent fuel to its central storage and processing center, the Mayak complex near Chelyabinsk, which itself stood in need of substantial modernization and decontamination. The Russian Navy estimated that ten shipments per year were needed to cope with the deluge of decommissioned submarines, but the actual number was much lower due to high costs, equipment failures, and interruptions of the rail connections.[105] In any case, removing, transporting, and reprocessing the spent fuel was but one component of the radioactive waste disposal problem. The decommissioning and dismantling process also generated thousands of cubic meters of other solid and liquid radioactive wastes that had to be reprocessed and stored, either locally or in Chelyabinsk.

When the Yablokov Report was unveiled in April 1993, the Russian government admitted that the dumping of radioactive waste at sea violated both Russia's international commitments and its newly enacted law on environmental protection. At the same time, however, Russian diplomats and environmental officials warned that Russia would have no choice but to resume the practice unless its neighbors agreed to subsidize the construction of alternative processing and storage facilities. By 1993, Norwegian and U.S. interest in the problem of Russian radioactive waste in the Arctic was already intense: Norway's concern was motivated primarily by environmental considerations, whereas the United States was more concerned about smoothing the obstacles to the prompt and effective implementation of the START agreement. Consequently, external assistance programs to cope with Russian radioactive waste disposal in the Arctic were launched as soon as the Russian government publicly admitted that it had a problem, and there were no major instances of dumping after 1992. Although these programs did not move ahead as speedily as their architects had hoped, the main obstacle was not U.S. or Norwegian indifference, but administrative confusion, seemingly interminable customs delays, and military secretiveness on the Russian side (U.S. Congress 1995; Stokke 1998).

By contrast, progress in the Far East was stymied by Japanese recalcitrance: specifically, Japan's determination to withhold any substantial assistance to the Russian Federation pending a satisfactory solution to the bilateral dispute over the Kurile Islands: a tiny archipelago that the USSR had annexed at the close of the Second World War, and which both Japan and the Russian Federation claimed as their territory. After the release of the Yablokov Report in April 1993, Japan agreed to contribute \$100 million toward denuclearization in the former Soviet Union—a commitment that the United States had been pressing it to make for some time—and suggested that some of this money might be used for radioactive waste disposal in Russia. However, Japan did not yet attach any real urgency to this issue and took no practical steps with respect to it.

This aloof posture changed very quickly in October 1993, when the Russian Pacific Fleet, having received the proper authorization from the Ministry of Environmental Protection and Natural Resources, pointedly and publicly dumped some 900 cubic meters of low-level radioactive wastes into the Sea of Japan. (A Greenpeace ship was nearby to record and report on the entire episode.) This episode occurred less than one month before the contracting parties to the London Dumping Convention met to approve a global prohibition on the ocean dumping of low-level radioactive wastes, a measure from which the Russian Federation abstained. Speaking at the meeting, Russian Environment Minister Danilov-Danilyan described the incident as an emergency measure needed to avoid an accident; Russia was prepared to halt this practice, but could not do so without external financial help.[106] After the October action provoked a predictably sharp protest from the Japanese government, Russia agreed to suspend further dumping—provided that Japan agreed to subsidize alternative arrangements. In early 1996, the two countries announced that Japan had agreed to finance the construction of a $21 million floating reprocessing facility in the Far East.[107] Shortly thereafter, Russian President Yeltsin announced that Russia would accede to the December 1993 amendment to the London Dumping Convention, banning the discharge of radioactive waste at sea.[108]

The Japanese, Norwegian, and U.S. commitments to subsidize radioactive waste disposal in the Arctic and the Far East forestalled any further waste dumping at sea but did not immediately translate into successful implementation on the ground. As in the case of civilian nuclear power, the progress of international efforts to address the radioactive waste problem in 1993–1999 was hampered by a variety of obstacles: the thorny question of liability, the high customs duties imposed upon equipment imported from the West, and persistent organizational confusion and lack of financial resources on the Russian side. Progress in the radioactive waste disposal issue was further complicated by the secretiveness of the Russian military, which barred Western experts from many of the most contaminated sites. The Russian military and Federal Security Service (the successor to the KGB) also insisted upon the arrest, detention, and prosecution of a former Russian naval officer, Aleksandr Nikitin, who had contributed to a report on the Northern Fleet's radioactive waste problems put together by the Norwegian environmental NGO Bellona. The Nikitin case became a cause célèbre in Norway and a major irritant in Russian-Norwegian relations, placing yet another brake upon international efforts to deal with the radioactive waste issue.[109] A similar incident followed in the Far East in November 1997, when Russian Navy journalist Grigoriy Pasko was arrested and charged with treason for providing a Japanese television company with video footage of the October 1993 dumping incident and other information about the environmentally harmful operations of the Pacific Fleet.[110]

As a result of these obstacles, international efforts to address Russia's radioactive waste disposal problems made slow and often halting progress in the late 1990s. In October 1996, U.S. Defense Secretary William Perry traveled to the Kola Peninsula to witness the ceremonial dismantling of a Russian strategic nuclear submarine, made possible by funding allocated under the multibillion-dollar Cooperative Threat Reduction (CTR) assistance program. By early 2000, the United States had agreed to fund the decommissioning of thirty-one nuclear submarines through the year 2002—a noteworthy accomplishment, but one somewhat offset by the fact that the total number of submarines awaiting decommissioning was roughly 130.[111] Another key project, launched in 1994, was a trilateral U.S.-Norwegian-Russian program to upgrade the liquid waste processing facility in Murmansk at a cost of $3.5 million. This modernized facility should be capable of processing all of the liquid radioactive waste generated by the Northern Fleet and Russia's nuclear-powered icebreakers. By the end of 1999, the new facility was reportedly complete, but not yet in operation.[112] In the Far East, Japanese-Russian cooperation made equally slow progress. In May 1999, the Japanese government announced that the heavily subsidized "Suzuran" liquid waste processing facility, initially planned for completion in 1996, would go into operation "in the near future."[113] One year later, however, the facility was still incomplete. Nonetheless, at a meeting with G7 environment ministers in April 2000, Russia's chief environmental official, Viktor Danilov-Danilyan, promised that both the Murmansk and Suzuran facilities would begin operation by the end of 2000.[114]

As in the Chernobyl case, most of the progress made in dealing with the radioactive aftermath of the Soviet Union's nuclear program was directly attributable to transnational subsidization. At a press conference in Moscow in July 1998, Russia's deputy atomic energy minister reported that foreign funding for radioactive waste disposal in Russia exceeded $200 million, in contrast to domestic funding of $35 million.[115] How much of this was due to the Russian threat to resume radioactive waste dumping at sea? The Russian threat played relatively little role in stimulating Norwegian and American interest in the problem of radioactive waste disposal; by 1993, the United States was already interested in helping Russia to fulfill its START obligations as rapidly as possible, while the Norwegian government was eager to help Russia find an alternate solution to the disposal of the large amounts of radioactive wastes stored on the nearby Kola Peninsula. In the Far East, on the other hand, the effect of the Russian threat to resume that USSR's practice of ocean dumping—a threat made highly credible by the demonstrative dumping cruise of October 1993—had quite a significant impact on Japan's willingness to pay for alternative forms of waste disposal. Once again, then, a threat to expose one's more affluent neighbors to greater environmental risks proved to be a profitable and effective tactic in post–Cold War environmental politics.

Conclusion: Environmental Blackmail Reconsidered

Although the final outcome of the Chernobyl dispute remains uncertain, the Russian and Ukrainian threats to expose their neighbors to greater transboundary nuclear risks appear to have worked in both cases. Even if Ukraine and Russia did not receive all of the assistance that they demanded, they received more external compensation, and received it more swiftly, than appeared likely in September 1993—in the Ukrainian case, far more. But this begs the following question: If environmental blackmail is so profitable, why is it not more common? Why, out of all of the attempts at environmental extortion that might have been launched by the successor states in the post–Cold War period, were only two such efforts made?

The answer is that successful environmental blackmail is considerably more difficult than it might appear at first glance. First of all, the threat must be credible: The targets of the blackmail attempt must be convinced that the blackmailer will actually spend the money needed to initiate the activity in question and that it is willing to bear whatever *internal* environmental consequences might accompany implementation of the threat. If the potential costs to the blackmailer clearly exceed any gains it could hope to achieve, then the threat will simply be dismissed.[116] Second, the blackmailer must also be willing to face international condemnation and the threat of sanctions. Those countries that are rich enough to be attractive targets for blackmail also make dangerous enemies: In the Chernobyl case, for example, the EU froze an ECU 85 million emergency loan to

Ukraine for six months, relenting only when Ukraine agreed (at least in principle) to close the plant by the year 2000.[117]

Finally, it is not enough to be destitute, desperate, and dirty; some of one's dirt must land on someone who is clean, stable, and rich. Many of the most severe environmental problems in the former socialist bloc pose no real transboundary threat. For example, the Black Sea is in significantly worse shape than the Baltic Sea, but since the exchange of water between the Black and Mediterranean Seas is quite limited, this problem has relatively little impact on Western Europe. Indeed, since the Black Sea is the final destination of the once-blue Danube, the "sewer of Europe," the states that surround it are in the unenviable position of being both destitute and downstream. Further to the east, the Aral Sea is drying up, generating toxic sandstorms and severe regional climatic change—but this tragedy is so far removed from the developed West that it might as well be taking place on another planet. If those who suffer from these problems could extort greater assistance from the international community, they surely would—but they do not have the necessary leverage. As a result, the amount of foreign assistance devoted to these problems, while not insignificant, pales in comparison to the need.

These observations invite a reconsideration of the Chernobyl and waste dumping cases. Why were Russia and Ukraine willing to risk sanctions and condemnation in these two cases? Why did the threats succeed? The answers to these two questions are closely linked. In part, the Russian and Ukrainian threats succeeded because the sources involved were not substitutable: The affluent states that feared the transboundary consequences of the resuscitation of the Chernobyl plant and the resumption of Russian radioactive waste dumping at sea could not offset these dangers through further investments in nuclear power safety or radioactive waste disposal elsewhere. This alone was not sufficient, however, because the threats also had to be credible—and they *were* credible, *because all of the other options open to Russia and Ukraine were bad*. In fact, the alternatives were sufficiently bad to generate broad domestic support for undertaking the threatening activities, and they were sufficiently bad to convince potential donors that Russia and Ukraine probably would carry out their threats unless paid not to do so.

First, the Chernobyl nuclear power plant and radioactive waste in Russia were not problems that had been concocted de novo for the purpose of extorting the West. Instead, these problems had been inherited from the USSR, and they came with severe internal as well as transboundary consequences attached. Both Russia and Ukraine indicated their desire to unilaterally suspend these activities—and Russia actually did so, at least temporarily—but doing so entailed severe economic, environmental, and social costs. The Chernobyl plant provided roughly 6 percent of Ukraine's electricity; this was a considerable amount of energy to lose, especially at a time when Ukraine was already heavily in debt to Russia for its natural gas imports—a source of vulnerability which Russia eagerly exploited in negotiations over other bilateral issues, such as the disposition of the Black Sea fleet. Even if this shortfall could somehow be offset (e.g., through higher energy efficiency), the closure of the plant would still leave Ukraine with a host of extremely difficult and expensive problems: the safe decommissioning of the reactors, the reconstruction of the sarcophagus, the resettlement of the plant's workforce, and the decontamination of the surrounding zone. Moreover, the premature closure of the plant would deprive the Ukrainian nuclear industry of a significant source of income—the sale of the electricity generated by the remaining reactors—that could be used to finance the tasks associated with its final decommissioning.

For Russia, the alternative to dumping at sea was either indefinite "temporary" storage in leaky tankers and other inadequate facilities—many of them located near the large cities of Murmansk and Vladivostok—or the construction of expensive new processing and storage facilities. Although Minister Danilov-Danilyan and his colleagues could hardly have failed to consider the stimulating effect that the October 1993 dumping incident would have upon the recalcitrant Japanese government when the Environment Ministry approved the Pacific Fleet's waste dumping permit, his assertion that the dumping was motivated by fears of a local environmental disaster was entirely credible: The thirty-year-old tanker aboard which much of the waste had been (and thereafter continued to be) stored was so decrepit that Russian officials feared even to move it to a safer location, lest it sink along the way.[118] Moreover, this problem would only grow worse as Russia dismantled most of its nuclear submarine fleet in keeping with the START treaty. By January 1993, the Russian navy had already decommissioned some eighty nuclear submarines, most of which remained tied up at the dock with their nuclear fuel still on board.[119]

Second, by the fall of 1993 many Ukrainian and Russian policymakers had become convinced that large-scale Western assistance would not materialize as long as Russia and Ukraine appeared committed to the unilateral suspension of the activities in question. The closure of the Chernobyl plant and the suspension of radioactive waste dumping at sea would not solve the domestic problems associated with these problems, but unilateral restraint *would* drastically reduce the *transboundary* dangers that alarmed the Western countries—implying that there was no longer any urgent need for the latter to contribute large sums of money to amelioration of these problems. In both cases, the decisions to abandon unilateral restraint were taken only after Ukrainian and Russian policymakers became convinced that the relevant Western countries were not going to provide large-scale assistance for problems that appeared to have gone away on their own. This perception was underscored by the experience gained in the 1992–1993 negotiations over the future of the nuclear weapons stationed on Ukrainian territory: The more reluctant the Ukrainian government appeared to be to part with these weapons, the greater the price the United States was willing to pay to induce Ukraine to part with them (Miller 1992; Lepingwell 1994a, 1994b). This intense interest in "denuclearization" stood in sharp contrast to the indifference with which the Western states appeared to regard the problems associated with the decommissioning of the Chernobyl plant, and with which Japan viewed the problem of radioactive waste disposal in the Russian Far East.

These considerations fostered a widespread perception within Russia and Ukraine that they, not the West, were being treated unfairly. Newly independent Russia and Ukraine had inherited these problems from the USSR, through no fault of their own; they too were victims, not culprits. By acting with unilateral restraint, they provided public goods to the international community. But rather than hurrying to assist the newly independent states, the affluent Western countries selfishly took advantage of these initiatives and left Russia and Ukraine to bear most of the cost. From this perspective, the Russian and Ukrainian threats were not blackmail or extortion, but justifiable efforts to make wealthy free riders pay their fair share—just as if local PBS stations could selectively shut off *Mystery!* and *Masterpiece Theatre* to all nonmember households with incomes over $100,000.

The result was a virtually united front in both Russia and Ukraine. First, the threats were supported by powerful internal interests that wanted to resume these activities in any case: the Ukrainian nuclear industry and the Russian Navy. The threats were also backed by those who preferred an alternative multilateral solution, but viewed the resumption of the suspended activities as the least "bad" of the remaining unilateral alternatives. In the Russian case, this was the stance taken by the Russian Ministry of Environmental Protection and the regional authorities in Murmansk Oblast, Arkhangelsk Oblast, and Maritime Kray—the areas compelled to retain the Navy's radioactive waste for safekeeping. In the Ukrainian case, of course, the internal environmental consequences of continuing to operate the Chernobyl plant were potentially much more serious than were the environmental consequences to Russia of dumping radioactive wastes at sea. Nevertheless, even in this case, most of those who initially opposed the decision to resuscitate the plant eventually supported the threat to do precisely that—calculating that the result would be multilateral financing for the closure of the plant, an outcome preferable to either the unilateral decommissioning or continued operation of it. The most prominent of these converts was Ukrainian Environment Minister Yuriy Kostenko, who subsequently added nuclear safety to his portfolio and headed negotiations with the G7. This internal consensus greatly enhanced the credibility of the threats.

A final factor that enhanced the effectiveness of the Ukrainian and Russian threats was the fact that both appeared to be *new* problems, although neither was. This was an entirely *unintended* consequence of Ukraine's earlier pledge to shut down the Chernobyl plant ahead of schedule and Russia's short-lived, self-imposed moratorium on radioactive waste dumping at sea. In the case of Chernobyl, Ukraine's 1990 announcement that the plant would be shut down ahead of schedule meant that the decision *not* to do so was greeted with shock—despite the fact that Chernobyl had been in operation all along, and the fact that similar reactors were in operation at several other stations in the former Soviet Union, including the Ignalina plant in Lithuania. If the Ukrainian parliament had never voted to shut down the plant ahead of schedule, it is unlikely that the Western states would have responded with such outrage to its continued operation, or that they would have insisted so adamantly that it be closed by 2000. Likewise, Russia's demonstrative dumping of radioactive waste into the Sea of Japan gained greater force because most external observers assumed, in the wake of the publication of the Yablokov Report, that this method of disposal had been permanently discontinued. In other words, because of the earlier promises of unilateral restraint, the resumption of "business as usual" was perceived as something shockingly new, an unacceptable departure from the status quo. As a result, politicians in the donor states were quick to publicly commit themselves to decisive action—a posture that further strengthened the hands of their Russian and Ukrainian counterparts in the ensuing negotiations.

These considerations invite a fundamental question: Did the Russian and Ukrainian actions genuinely constitute "environmental blackmail"? The answer depends upon the height of the definitional hurdle attached to that term. Certainly, neither case conformed perfectly to the model of "pure" blackmail outlined by Coase. It is not at all clear that the threatened actions, if fully carried out, would not have provided a net benefit to Russia and Ukraine; on the contrary, both countries would have faced high costs—perhaps even higher costs—if they did *not* carry out their threats. For Ukraine, the result of continued unilateral restraint would have been lost energy production, social dislocation, and residual environmental problems that exceeded all available resources, while Russia would have faced a choice between expensive investments in new facilities or a great increase in local environmental risk. Many of the relevant actors who supported the decisions to resuscitate the Chernobyl nuclear power plant and to resume radioactive waste dumping at sea hoped that the result would be the external financing of an alternative solution to the difficult situations in which Ukraine and Russia found themselves, but many also viewed these responses as better than the remaining unilateral alternatives. Therefore, neither Russia nor Ukraine fit Coase's description of the Machiavellian rancher who threatened an action that he would not have contemplated in the absence of the prospect of an external payment, and who stood to lose nothing if he did not carry out his threat.

An alternative case can be made that the behavior and statements of the Ukrainian and Russian governments were not blackmail or extortion, but instead what Oye (1992) labels "explanation" or "bracketing": communicating to another party the fact that one's choices are dependent upon the actions taken by that party. Thus, for example, Ukraine's "threat" could be interpreted as a forthright explanation of the way in which Ukraine's choices depended upon the choices of its more affluent neighbors: If the Western states agreed to finance the decommissioning and replacement of the Chernobyl plant, then Ukraine would be able to take it out of operation; if the Western countries chose not to do so, then Ukraine's best alternative would be to keep the plant in operation. However, such an interpretation fails to capture the degree of instrumental manipulation that lay at the heart of both the Ukrainian and Russian actions. In both cases, the threateners' most preferred outcome was an externally financed solution, one that would bring about the greatest internal environmental and economic benefits at the lowest internal cost. This outcome, in turn, appeared feasible because of the introduction of transnational subsidization as the centerpiece of post–Cold War environmental politics. Furthermore, in order to achieve this outcome the Ukrainian and Russian governments deliberately manipulated the potential donors' threat perceptions. In the Russian case, this was accomplished fairly quickly, and at very little cost, by the demonstrative dumping of a small amount of low-level radioactive waste into the Sea of Japan. In the Chernobyl case, the task was somewhat more difficult and expensive, since the Ukrainian government had to offset the growing perception that the Chernobyl plant would soon be unfit for further exploitation, regardless of whether the Western donors agreed to fund the K2R4 alterative. Hence, while negotiations dragged on, the Ukrainian government made every effort to keep Chernobyl-3 in operation, despite the reactor's apparent determination to remain under perpetual repair.

In the final analysis, the Russian and Ukrainian threats were neither forthright "explanation" nor the purely Machiavellian blackmail described by Coase. Russia and Ukraine found themselves in unenviable positions in which they were compelled to choose from a menu of unappealing alternatives. The actions that they threatened to carry out were not obviously self-destructive; had Russia and Ukraine existed in a vacuum, these might well have been the chosen solutions (almost certainly, in the Russian case). But the menu of options facing Russia and Ukraine was decisively altered by the prospect of an externally financed alternative—a prospect that would have seemed remote a decade earlier, but which was now highly salient due to the widespread introduction of transnational subsidization in the early 1990s. In pursuit of this superior outcome, the Ukrainian and Russian governments not only deliberately threatened to expose their more affluent neighbors to higher levels of transboundary environmental danger in order to extract larger and more timely payments from them, but also undertook deliberate measures—relatively expensive ones, in the Ukrainian case—to enhance the credibility of those threats. In the real world of international environmental politics, as opposed to the abstract world imagined by Coase, this is the essence of environmental blackmail.

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Conclusions

With the benefit of ten years of hindsight, it is painfully clear that the three most prominent developments that were initially expected to be overwhelmingly beneficial for East-West environmental cooperation—the collapse of the Soviet regime, the end of the Cold War, and the introduction of transnational subsidization—all had negative as well as positive effects. The collapse of the USSR removed many of the obstacles that had frustrated environmental protection during the Soviet period, but it also left in its wake a fragmented and chaotic economic and political environment that was no more conducive to independent and effective environmental policies than the Soviet system had been. The end of the Cold War was accompanied by the evaporation of most political barriers to closer East-West environmental cooperation, but it also removed the paramount incentive that had brought the USSR to the table in the first place: the desire to moderate East-West hostility by demonstrating the Soviet Union's willingness to cooperate in the solution of international problems of interest primarily to the West. The introduction of transnational subsidization as the centerpiece of Western environmental diplomacy made progress possible in areas in which the donors and recipients had convergent interests, but it also led to outcomes that were not in the environmental interests of the West: moral hazard, polluter life extension, and donor vulnerability to environmental blackmail.

At the same time, it does not necessarily follow that East-West environmental cooperation would have proceeded more effectively in the absence of these developments. The conjunction of the Cold War and the centralized, authoritarian domestic structure of the Soviet system opened a window of opportunity for those interested in environmental problems, but for most of the period under consideration this window was narrow, and the USSR's environmental policies steadily fell behind those of the West. When the window opened wide under Gorbachev, much more rapid progress became possible, but this opening also contained the seeds of its own demise. Gorbachev's environmental initiatives were part and parcel of a campaign to undermine both the Cold War and the closed, hierarchical nature of the Soviet political system, the two factors that had combined to produce the elite-driven "greening" of Soviet diplomacy in the first place. Consequently, even had perestroika succeeded, it is unlikely that the USSR's unbridled enthusiasm for international environmental cooperation would have continued indefinitely. As East-West relations improved, the need to demonstrate the USSR's cooperativeness would have declined, while domestic pressure to concentrate on the environmental problems of greatest *internal* concern would have increased.

Finally, although transnational subsidization had effects that its architects had neither anticipated nor desired, this does not necessarily imply that it is not, under the right conditions, an effective tool for the solution of transboundary environmental problems. This issue is of considerable importance, since project-based transnational subsidization and other forms of transnational financial transfers have become an increasingly popular tool in international environmental politics (Keohane and Levy 1996). These transnational payments have taken a wide variety of institutional and economic forms. In some cases, affluent creditor states and indebted developing countries have concluded "debt-for-nature" swaps, in which the developing countries agree to pursue more aggressive conservation policies in exchange for partial debt forgiveness (Jakobeit 1996). Loans from multilateral development banks have increasingly been made conditional on progress in environmental protection and natural resource conservation, although not to the extent desired by nongovernmental environmental advocates (Rich 1990; Piddington 1992; Ross 1996; Conca 1996). On the organizational front, several new institutions have been established to facilitate the transnational transfer of financial resources for specific environmental purposes. The flagship is the Global Environment Facility (GEF), an international institution created in the early 1990s as a vehicle for the transnational subsidization of developing countries' efforts to address the global issues of climate change, biodiversity conservation, ozone depletion, and the pollution of international waters (Fairman 1996). Analogous institutions have been created within specific environmental regimes: For example, an independent mechanism to promote transnational subsidization was established within the context of the Montreal Protocol on ozone depletion, and the December 1997 Kyoto Protocol on global climate change provided for the creation of a freestanding "Clean Development Mechanism" to subsidize the reduction of greenhouse gas emissions in developing countries (DeSombre and Kauffman 1996; Victor 1998). The Kyoto Protocol also introduced an even more bold innovation: the prospect of "emissions trading" among those countries that accept emission caps, including the former socialist states. Under this system, a country (such as the United States) that found it prohibitively expensive to meet its emission targets through purely domestic measures could purchase a portion of another country's emissions allotment, provided that the latter's own emissions did not exceed the allotment remaining after the sale. The rationale is that emissions trading will cause actual measures to reduce emissions to be undertaken where the marginal costs are lowest (Swift 1998).

Given this growing interest in the use of transnational financial transfers, the significance of post–Cold War East-West environmental politics looms even larger—for it was here, more than in any other geographical region, that the greatest efforts were made in the 1990s to employ transnational subsidization in environmental diplomacy. This chapter is therefore devoted to drawing out the lessons of the East-West experience. Under what conditions did transnational subsidization work most effectively in post–Cold War East-West environmental politics, and what conditions were associated with failure? What strategies can potential donors use to maximize the effectiveness of transnational subsidization and other types of financial transfers in international environmental politics?

Interests, Substitutability, and Capacity: The Sources of Divergent Outcomes in the Post–Cold War Period

It was not an easy task to piece together successful international environmental projects in the 1990s. Joint implementation could proceed only when there was a propitious fit between the environmental and/or economic interests of the former socialist states and those of their more affluent neighbors—and, even then, only when interested actors in the target states were able to assemble the political, financial, and scientific resources necessary for participation in joint projects. Consequently, the scope and speed of the joint implementation of environmental protection measures in the newly independent states varied dramatically, both across issues and from one successor state or Russian region to another. So too did the tenor of the East-West bargaining involved, which ranged from highly cooperative to extremely contentious. While many factors can be adduced to explain this divergence, five were most important: (1) the convergence of the environmental interests of the donors and recipients; (2) the convergence and stability of the economic interests of the donors and recipients; (3) the "substitutability" of the sources of transboundary environmental threat to the donors; (4) the recipients' capacity to marshal the political and economic prerequisites for joint implementation; and (5) the recipients' broader external economic and political orientation. These factors were highly interdependent, and variation in one typically was accompanied by variation in one or more of the others.

The first factor involved was the extent of the *overlap of the environmental interests* of the donors and recipients. Where the environmental interests of donors and recipients were convergent, cooperation tended to move forward swiftly and amiably; where this convergence was partial or absent altogether, negotiations tended to stall or grow acrimonious. The degree of convergence was not simply a consequence of interests on the potential recipients' side; the environmental interests of potential donors, too, had to be engaged if major programs of subsidization were to proceed. Many of the newly independent states' most severe environmental problems—such as the devastation caused by the evaporation of the Aral Sea—posed little threat to wealthy Western countries and received correspondingly inadequate financial and political attention. On the recipient side, the extent of environmental convergence was not a simple function of the distribution of the sources and effects of environmental degradation; the underlying environmental problems also had to be *politically salient*. This in turn was a function of the broader political and economic environment in the newly independent states. The political salience attached to various environmental problems was dependent upon a large number of factors, but the most important were (1) the overall level of political and economic stability in the recipient state; (2) the political influence of the environmentalist lobby within the executive branch, the legislature, and the population as a whole; (3) the degree to which local residents and political authorities were economically dependent upon large polluters; and (4) the effects of the disintegration of the USSR and the decentralization of environmental decision making in the Russian Federation.

This last ingredient deserves further comment. The effect of the disintegration of the USSR and the decentralization of policymaking in the Russian Federation was a dramatic multiplication of the number of actors involved in the solution of transboundary environmental problems. At first glance, this might seem to be an unadulterated bane for East-West environmental cooperation: After all, the logic of collective action suggests that as the number of actors proliferate, so too will the obstacles to effective collective problem solving, such as the temptation to "free ride" on the contributions of others (e.g., Olson 1965; Hardin 1968; Hardin 1982). If, however, the emissions generated within a particular political territory (whether a state or substate administrative unit) cause substantial damage *within that same territory*, in addition to whatever transboundary damage those emissions may cause as well, then a politically salient interest in international cooperation may exist. This condition may appear highly restrictive, but in fact it was the case more often than not. For example, the environmental problem of greatest concern to the successor states and Russian regions in the Baltic Sea basin—the degradation of their own inland and coastal waters—was caused primarily by sources located within those same territories, and no amount of reduction in emissions *outside* those territories could offset failure to reduce emissions *within* them. This situation was even more pronounced for those successor states and regions that had inherited Soviet-built nuclear power plants: Although these territories were certainly vulnerable to the effects of accidents elsewhere, an accident within their own territory would probably be more devastating—and no amount of safety improvements at plants in other territories would have any effect upon the likelihood of a local accident. In the case of transboundary sulfur and nitrogen deposition, on the other hand, the multiplication of actors was less conducive to effective international cooperation. The one instance in which the sources of transboundary deposition also caused significant damage in the immediate vicinity was the case of the nickel smelters on the Kola Peninsula; but there, local environmental concerns were politically weak due to the economic dependence of the oblast's residents and political authorities upon the continued operation of the smelters.

The second factor that determined the scope and success of transnational subsidization was the *convergence and stability of the economic interests* of the donors and recipients. These economic interests affected not only the success or failure of proposed projects, but also the very nature of the work that was done. The donors were interested primarily in environmental protection projects that would provide work for their own firms, a consideration that allowed enterprising Western firms to define the solution to transboundary environmental problems in ways that suited their own interests. Thus the Western nuclear industry lobbied successfully to ensure that the primary response to the problem of nuclear power safety in the former Soviet bloc would be the modernization of nuclear power production in those states, rather than the replacement of nuclear power by some other form of energy. Likewise, Nordic engineering firms successfully convinced their own governments (if not that of the Russian Federation) that modernization of the Pechenganikel smelter was the ideal solution to the problem of transboundary air pollution in Lapland, despite the questionable economic assumptions underlying that conclusion.

Of course, it was not enough for the economic interests of the donors to be engaged; the donors also had to engage the economic interests of the governments of recipient states and those of the organizations actually responsible for the production of transboundary environmental threats. In most cases, given the administrative and political confusion that accompanied the disintegration of the USSR, the donors had to appeal directly to the interests of the "polluting" organizations—the post-Soviet nuclear industry, polluting enterprises and their parent companies, municipal water and sewer utilities, and so forth—without whose cooperation successful joint implementation was impossible. These interests, too, limited the set of possible solutions. Even if an agreement were reached, subsidized solutions could go forward successfully only if the economic interests of the polluters remained reasonably stable. Given the vicissitudes of the economic transition and the uncertainty and instability generated by privatization, however, this was often not the case. Firms changed hands, money grew short, business strategies changed, and other investment opportunities presented themselves. Any of these developments could—and did—torpedo joint projects into which donor firms and governments had already invested millions of dollars and years of work.

The third factor was the *substitutability* of the sources involved. Where the donors were able to achieve their goals by choosing among a variety of sources, they were able to circumvent recalcitrant governments or firms in favor of those that were more eager to cooperate. Substitutability was characteristic of the Baltic Sea case, where the sources of the degradation of the open sea were distributed fairly evenly among the ex-socialist littoral states—a propitious distribution facilitated by the breakup of the USSR and the consequent multiplication of states along the Baltic seaboard. Since the "pot" of external financing was limited, and since each of the states and territories along the Baltic coast had convergent interests in the uses to which that money was to be put, the potential recipients were effectively placed in competition with one another for a desirable resource—a factor that greatly contributed to the speed and success of transnational subsidization. On the other hand, where donors were forced to deal with particular sources, the recipients were in a much better position to drive hard bargains, renege on earlier agreements, or threaten to increase the danger to which their more affluent neighbors were exposed to extract larger payments from them. This was nowhere more evident than in the case of nuclear power safety, where failure to increase safety at one plant could not be offset by successful safety improvements elsewhere.

The fourth factor that contributed to the variation in outcomes was variation in the recipients' *economic, political, and administrative capacity*: that is, the recipients' ability to marshal the political and economic prerequisites for cooperation. Overlapping environmental and economic interests alone were insufficient. The recipients also had to be able to contribute to the cost of joint projects, offer credible guarantees that loans would be repaid, exempt imported equipment from exorbitant customs duties, adopt any necessary legal prerequisites (such as legislation exempting foreign suppliers from liability in the event of a nuclear accident), and otherwise smooth the way for joint implementation.

The recipients' capacity to marshal these resources in an effective and timely manner was a function of overall political and economic stabilization *and* the extent to which control over the necessary policy levers were concentrated in the hands of the actors most interested in cooperating with the West. The dissolution of the USSR led to a tremendous proliferation in the number and variety of actors taking part in international environmental cooperation. Where environmental diplomacy had once been confined to a small handful of experts and diplomats, the floodgates now opened to let in enterprise managers, the directors of public utilities, and representatives of the legislative and executive branches of governments at the local, regional, and national levels of fifteen newly independent states. However, this diffusion of responsibility did not mean that any of these actors were automatically capable of concluding and implementing international environmental agreements independent of the others. On the contrary, successful implementation generally required cooperation among the various ministries, branches, and territorial levels of the newly independent states, as well as cooperation between governments and private or highly autonomous public firms. Consequently, the speed and effectiveness of post–Cold War environmental cooperation depended upon support from *all* of the actors with control over the policy levers necessary for joint implementation—and the more diffuse the responsibility for implementation, the greater the difficulties involved.

Recipient capacity varied from case to case, and from one newly independent state to the next. The problems of coordination were most intense in the vast, highly fragmented, and economically troubled Russian Federation. Russia's regions claimed "sovereignty" over their own affairs, including the power to conduct their own international environmental negotiations, but this was not accompanied by control over all of the prerequisites for effective implementation. Effective authority over large industrial enterprises and utilities, national legislation, the cooperation of border and military authorities, and the ability to provide sovereign guarantees for loans lay elsewhere: in the hands of the federal government in Moscow or the politically powerful financial conglomerates that reaped the benefits of privatization. (Conversely, the central authorities in Moscow depended upon the cooperation of local and regional officials for the implementation of any environmental agreements concluded at the national level.) Even in the area of nuclear power, which remained highly centralized in Russia after the breakup of the USSR, international projects were hindered by the lack of cooperation among the various ministries and branches of government at the federal level. For example, Western equipment destined for the Russian nuclear power plants was held up by the federal economic authorities' reluctance to exempt that equipment from taxes and import duties and the State Duma's failure to enact the national legislation necessary to exempt Western equipment suppliers from liability in the event of an accident.

At the other end of the spectrum lay the territorially compact and politically centralized Baltic states. Here, political and economic stabilization proceeded relatively swiftly, and responsibility for international environmental cooperation was fairly concentrated. The Baltic states were sufficiently compact so that most environmental problems of local concern, such as coastal and inland water pollution, were effectively "national" in scope, and all final decisions about environmental protection, energy policy, and public financing could now be taken in Tallinn, Riga, or Vilnius, without any need to defer to Moscow. Moreover, the Baltic states were masters of their own fiscal and monetary policies as well, and so were much less vulnerable to political and economic instability in the neighboring Russian Federation than was, say, the municipal government of the city of St. Petersburg.

Finally, outcomes in the post–Cold War period depended upon the *broader external orientation* adopted by the governments of the recipient states. The donors invariably sought to use the prospect of further economic cooperation—trade, investment, and assistance—to convince recipient governments at all levels of the territorial hierarchy to lend their support to externally subsidized environmental projects. The extent to which this lure was effective depended on the extent to which the recipient government was oriented toward significantly greater economic and political integration with the "West" (i.e., the European Union and/or NATO). In practice, this meant the three Baltic republics: Estonia, Latvia, and Lithuania. Where the economic and environmental interests of the Baltic states failed to coincide with those of the donors—as was the case in the disputes over the decommissioning of the Ignalina nuclear power plant in Lithuania and the transboundary atmospheric emissions of the Narva power plants in Estonia—the donors were able to use the Baltic states' interest in "westward" economic and political integration as a bargaining lever with which to bring about a mutually satisfactory solution. By contrast, such leverage could not be effectively brought to bear on the governments of Ukraine or Russia, neither of which was oriented toward rapid integration into Western economic and political structures. The same was true of most of Russia's regions; and even the most westward-oriented of them, such as the city of St. Petersburg, could not free themselves of the economic and political constraints imposed by membership in the Russian Federation.

Variation along these dimensions led to divergent outcomes in the post–Cold War period, both across environmental issues and from one newly independent state to the next. Post–Cold War environmental cooperation was most comprehensive, rapid, and successful in the case of the Baltic Sea. Here, the overlap of donor and recipient environmental interests was exceptionally good, since both sides shared an interest in the reduction of inland and coastal water pollution throughout the Baltic drainage basin. Second, municipal water and sewer utilities provided a stable and effective economic basis for joint implementation. Third, the donors were able to select projects to be subsidized from a fairly large list of potential candidates scattered throughout the former socialist states, a circumstance which further discouraged deliberate foot-dragging or attempted extortion on the part of the potential recipients. The speed with which the newly independent states moved forward was a function of the ease with which the "recipient" political authorities in the region were able to muster the resources necessary for joint implementation. Joint implementation proceeded most swiftly in newly independent Estonia, Latvia, and Lithuania; these three states were now masters of their own fate and did not need to turn to Moscow for political or economic support, and they were also blessed by relatively rapid political and economic stabilization. Joint implementation proceeded more slowly in the Russian regions of Kaliningrad and Leningrad/St. Petersburg because of the slower rate of economic and political stabilization in Russia and the fact that the regional governments involved could not, on their own, marshal all of the resources necessary to make joint implementation move forward.

Post–Cold War cooperation to combat transboundary air pollution was, by contrast, ad hoc, slow, and often unsuccessful. Because the prevailing winds in Europe blow from west to east, the donors (primarily the Nordic states) did not adopt a comprehensive approach to the reduction of air pollution throughout the territory of the former Soviet Union. Instead, they were interested primarily in a small subset of large sources located in Estonia and northwestern Russia. At the same time, the sources of greatest concern to the donors were of little interest to the recipients, either because the local environmental effects were slight, or because local environmental interests were weakly represented. This compelled the donors to appeal to the economic interests of the polluting firms, promising modernization and financing in exchange for emission reductions. Because of the vicissitudes of privatization and the economic transition, however, these recipient economic interests proved unstable and undependable. As a result, many of the most aggressively promoted projects designed to reduce transboundary air pollution stalled in the 1990s, including the proposed modernization of the Pechenganikel smelter on the Kola Peninsula. The exception was the pair of oil shale-fired power plants in northeastern Estonia; in this case, the need for transnational subsidization was effectively superseded by the effects of privatization and Estonia's drive for membership in the EU.

Post–Cold War cooperation in the area of nuclear power safety was both extensive and highly contentious. After the collapse of the USSR, all of the states that inherited the Soviet Union's nuclear power plants decided to continue and expand their reliance on nuclear power. The Western states responded by offering to subsidize the modernization of those plants—a response that served the economic interests of the nuclear industry in both the newly independent states and the West, as well as the shared interest in avoiding another Chernobyl. The newly independent states agreed to accept this assistance but rejected the accompanying demands that they close their Chernobyl-type RBMK reactors and older pressurized-water units ahead of schedule. Faced with this recalcitrance, the Western states agreed to subsidize the modernization of the older and more dangerous units as well—with the result that these units could now continue to operate even *longer* than originally planned. The newly independent states were able to successfully pursue this course because the sources involved were not substitutable: The Western goal could only be achieved by minimizing the risk of an accident at *any* of the newly independent states' nuclear power reactors, especially those that were older or more dangerous. The nuclear case was also characterized by two cases of environmental blackmail: Ukraine's threat to modernize the Chernobyl plant unless the West paid for its closure and replacement, and Russia's threat to resume radioactive waste dumping at sea unless its more affluent neighbors paid for alternative methods of disposal. Both of these threats were successful, in part because the donors could not circumvent the impending dangers through investment in compensatory "risk reduction" elsewhere.

Lessons for the Future

What lessons can potential donors draw from the East-West experience of the 1990s? Six stand out in particular:

1. Wherever possible, build upon recipient environmental interests.
2. Always try to ensure that the economic benefits of joint implementation reinforce the achievement of environmental goals, and avoid

situations where economic and environmental goals work at cross-purposes.

3. Place potential recipients in competition with one another wherever possible.

4. Coordinate donor efforts; toward this end, an integrated menu of investment options is more useful than the creation of a common pool of money.

5. Avoid investing large sums of money to reduce transboundary environmental threats that are likely to go away on their own.

6. Never pay for reductions that have already occurred and cannot easily be reversed.

1. *Wherever possible, build upon recipient environmental interests.* If recipients share an environmental interest in the reduction of the ongoing or potential pollution generated within their own borders, then transnational subsidization is much more likely to be successful. It is important to note that the recipients' environmental interests need not be identical to those motivating the donors. Recent experience suggests that most potential recipients tend to be much less interested than their more affluent neighbors in the amelioration of transboundary problems, such as the pollution of the open sea, long-range air pollution, or the degradation of the Earth's atmosphere; if a common interest in combating these transnational issues is the only environmental interest to which the donors are able to appeal, then recipients are likely to attach as high a price to their cooperation as the market will bear. However, if the sources that contribute to these transboundary problems may also cause *direct local damage* as well, *and* if the projects promoted by the donors will ameliorate these local consequences, then the recipients may have a much greater interest in contributing to the cost of joint projects and ensuring that the resulting environmental improvements are maintained even after all of the money has been paid out. In other words, convergent donor and recipient environmental interests may enable a partial Coasian payment: one in which the donors offer to reduce the cost of specific environmental protection measures to the point at which the *internal* environmental interests of the recipients will motivate the latter to pay the remaining costs.

In this context, it is important to keep in mind that recipient environmental interests are not fixed; they are not automatic projections of the underlying distribution of the sources and effects of environmental degradation. Recipient environmental interests are shaped by many other factors, such as the broader domestic political and economic context, economic dependence upon large polluters, and the strength and goals of the indigenous environmental lobby, both within the government and at the grassroots or NGO level. Although the broader political and economic context may not be particularly amenable to manipulation by donors interested in transnational environmental subsidization, donors *can* promote the development of the indigenous environmental lobby—scientific, regulatory, and nongovernmental—through organizational and technical support, joint monitoring and research projects, outright cash grants, and efforts to protect indigenous environmentalists from harassment and punishment at the hands of state or private actors hostile to environmental protection and natural resource conservation. External support for the indigenous environmental lobby will not *necessarily* translate into increased recipient interest in the solutions favored by the donors, but where the sources of transboundary concern also cause local damage, the prospects for successful joint implementation will be enhanced by the stronger representation of environmental interests within potential recipient states. Moreover, once the bulk of the donors' money has been paid out, a strong internal environmental lobby can help to ensure that joint projects will continue to be operated as intended. The existence of these internal "watchdogs" will be particularly important if governmental officials and firms within the recipient states have an economic incentive to renege on the original agreements reached with the donors (e.g., to cut down trees in nature preserves, or to neglect pollution control or nuclear safety equipment in the interests of lower operating costs).

2. *Ensure that the economic benefits of joint implementation reinforce the achievement of environmental goals, and avoid situations where the two work at cross-purposes.* Since environmental interests tend to be weak or weakly represented in many potential target states, transnational subsidization must also appeal to the economic interests of the organizations actually responsible for the undesirable behavior in question, as well as those of the governments of the states within which those organizations are located. Projects that do not appeal to recipient economic

interests are unlikely to be successful, a lesson driven home by the collapse of the Pechenganikel and Kostamuksha projects. Moreover, linking joint implementation to the economic interests of the organizations responsible for emissions or nuclear safety also helps to ensure that facilities constructed or modernized with external financing will be operated as intended over the long term. If a firm or utility receives an *economic* benefit when it operates these facilities as intended, quite apart from any accompanying decrease in emissions or nuclear risk, then it is more likely to do so—particularly in a political environment in which external regulation is extremely weak and ineffective. In order for the polluter's economic interests to have this salutary effect, joint projects should be designed so that the economic benefits to the polluter cannot easily be decoupled from the proper operation of the equipment intended to bring about a reduction in transboundary pollution or risk.

For example, fundamental modernization of an enterprise's basic production facilities—making it simultaneously cleaner *and* more profitable—is more likely to deliver sustained environmental benefits than are projects in which pollution control equipment is simply tacked on to preexisting production facilities. The contrast between the proposed modernization of the Pechenganikel smelter and the abandoned Kostamuksha project is instructive in this regard. The Pechenganikel proposal (in both its Finnish and Norwegian variants) involved the reconstruction of the plant's basic smelting technology, whereas the Kostamuksha project was essentially an emission-cleansing "add-on" that did not affect the combine's basic production processes. If the Pechenganikel project were implemented, the plant's emissions would automatically fall, since the new production process would be both inherently cleaner and more cost-effective. In the Kostamuksha case, flue-gas desulfurization was added on top of the preexisting production process, which meant that the combine's owners would have had little incentive to operate the new facilities as intended, even if the project were completed.

At the same time, donors must take care to ensure that the *economic* benefits provided to the recipients do not directly conflict with the *environmental* interests of the donors, as they did in the case of nuclear power safety. Here, the donors wished to enhance the near-term safety of older and less safe Soviet-designed reactors, without extending their service lives in the long run. Yet this goal ran counter to, and could not be decoupled from, the most attractive *economic* benefit to the recipients: the extension of the reactors' service lives. The recipients therefore refused to accept early shutdown as a condition for the external financing of the modernization of these reactors—or if they accepted this condition, as Lithuania ultimately did, they successfully pushed the anticipated closure date as far back as possible. If the donors genuinely wished to see the older Soviet-designed reactors shut down as soon as possible, then externally subsidized modernization of them was the wrong response to the problem—since this response simply reinforced the recipients' incentive to continue to operate these units for as long as possible. Of course, the donors' choice of this strategy was driven by economic as well as environmental considerations, namely, the economic interests of the Western nuclear engineering industry. This raises another important lesson: The environmental and economic goals of actors *within the donor states* may work at cross-purposes as well.

3. *Place potential recipients in competition with one another whenever possible.* If potential recipients interested in externally subsidized projects must compete for a limited pot of money, then none has an interest in dragging its heels. On the contrary, each has an incentive to come to an agreement quickly, while donor funds are still available. This type of competitive environment can be fostered in two ways: *internationally*, by placing states in competition with one another; and *within* states, provided that it is possible to bypass central governments and deal directly with local authorities and individual firms. Both of these strategies worked quite well in the Baltic Sea case and could certainly be applied to the problem of global greenhouse gas emissions. It is important to note, however, that this strategy will not work if a donor feels that it *must* deal with a particular source. For example, Ukraine's hand was strengthened in the Chernobyl dispute because the leaders of the largest donor states publicly and irrevocably committed themselves to the prompt closure of that particular plant. Moreover, nuclear power safety in general is a difficult area in which to foster competition among potential recipients, because the goal of the donors is not simply to reduce the cumulative frequency of accidents worldwide, but to reduce the chance of *any* major accident *anywhere*. The directors of "unsafe" nuclear

plants, and their governments, can therefore rest assured that offers of subsidization will eventually come their way, so long as no unilateral action is taken to close the reactors or to significantly improve the safety of them.

4. *Coordinate donor efforts*. Greater coordination can help donors to avoid duplication, reduce the transaction costs of joint implementation, and enhance their bargaining leverage vis-à-vis recalcitrant recipients. How can this be accomplished? If a single source of transboundary pollution or risk is sufficiently important, as in the Chernobyl and Pechenganikel cases, then the donors can meet to discuss the details, both among themselves and with the recipient. But coordination grows more difficult when there are many donors, multiple recipient states, and many possible investment targets—features that characterized both the Baltic Sea and nuclear power safety cases in the post-Soviet period.

In each of these two cases, the donors pursued a different strategy to achieve coordination. In the nuclear safety case, the donors created a *common pool* of financial resources—the NSA, administered by the EBRD. One of the main goals of concentrating resources in the NSA was to maximize the bargaining leverage that the donors could bring to bear on the recipients: above all, to impose the early shutdown of older or less safe reactors as a condition for short-term safety upgrades at those plants and the longer-term modernization of newer ones. This goal was ultimately unsuccessful: When the former socialist states refused to shut down their older reactors ahead of schedule, the donors went ahead and subsidized the modernization of their nuclear power plants anyway. There were several reasons for the failure of this strategy: The recipient governments were more concerned with uninterrupted energy production than with the observance of strict safety standards, and the donors were more interested in securing contracts for their own nuclear engineering firms than in securing the early closure of older Soviet-designed reactors (see also Connolly and List 1996). In the end, the NSA proved to be more of a hindrance than a help—particularly when repeated delays on the part of the EBRD threatened to scuttle the subsidized completion of the Khmelnitsky-2 and Rovno-4 reactors, the linchpin of the effort to secure the early closure of the Chernobyl plant.

In the Baltic Sea case, transnational subsidization proceeded on the basis of an *integrated menu of investment options*: HELCOM's JCP. The authors of the JCP—which included representatives from the recipient states as well as the donor states—listed all of the major sources of pollution in the Baltic Sea basin and made a rough determination of the costs and benefits of addressing them, and thus provided the donors with a guide to the most cost-effective use of their resources. The actual implementation of the plan was carried out in a decentralized, case-by-case basis, as bilateral aid agencies and multilateral development banks worked together with the recipients to piece together financing for the amelioration of the most pressing sources of pollution outlined in the JCP. Excessive duplication was avoided through an informal division of labor among the donors and constant exchange of information within HELCOM and other channels. Although on the surface this approach might seem haphazard and inefficient in comparison to the NSA, in practice it proved to be flexible and expeditious. Of course, the donors in the Baltic Sea case enjoyed a significant advantage that they did not enjoy in the nuclear safety case: The sources of the degradation of the open sea were substitutable, and so progress was less vulnerable to obstruction and hard bargaining on the part of potential recipients. Nevertheless, the approach pioneered by the JCP—an integrated, continually updated menu of investment options, coupled with decentralized funding and implementation—offers a promising model for other international environmental issues, such as global climate change, that are also characterized by multiple donors, multiple recipients, and substitutability of sources.

5. *Avoid investing large sums to reduce transboundary environmental threats that are likely to go away on their own.* Before undertaking expensive transnational subsidization projects, prospective donors concerned about a transboundary environmental threat should carefully assess the life expectancy of the source or sources of that threat. Is the source of the transboundary environmental threat—an aging nuclear power plant, say, or a nickel smelter—economically viable in the long term? If not, what will happen if the donors do nothing, and economic forces are allowed to take their course? If the prognosis bodes ill for the continued survival of the source in question, then it may be more cost-

effective to do nothing, or to do relatively little, than to undertake costly programs designed to substantially reduce the threat posed by that source—especially since modernization may further extend the service life of the facility in question. Of course, the disadvantage of this "do little or nothing" strategy is that the donors may have to accept continued or even elevated levels of transboundary environmental pollution or risk in the short run, a prospect that may be unpalatable for domestic political reasons.

An important caveat is in order here: Do not assume that domestic *environmental* considerations alone will motivate less affluent states to take unilateral measures to permanently halt or reduce polluting activities with transboundary environmental consequences—particularly if polluting activities are *economically* profitable and sustainable, and if unilateral measures to reduce the associated environmental risks would be costly. Domestic environmental interests tend to be weakly represented in most developing and post-socialist states, so policymakers in those states tend to be willing to accept higher levels of environmental degradation than would be acceptable in more affluent states. Moreover, unilateral action on environmental grounds is even *less* likely if the source of internal degradation also poses a transboundary threat to one or more affluent states, since unilateral action would also reduce the prospect for transnational subsidization. The most instructive case in this regard was Ukraine's reversal of its earlier decision to close the Chernobyl nuclear power plant ahead of schedule. Ukraine initially assumed, incorrectly, that this gesture of environmental consciousness and goodwill would lead to large amounts of external assistance to cope with the costs of closing the plant, while the affluent states assumed—also incorrectly—that Ukraine's environmental interests alone were sufficient to secure the early closure of the plant. When rapid and massive external help failed to materialize, the proponents of the resuscitation of the plant were able to prevail in the internal debate—and since the earlier decision to close the plant ahead of schedule had not been motivated by economic necessity, it was easily reversed.

6. This lesson has an important corollary: *Avoid paying for reductions that have already occurred, provided that they cannot easily be reversed.* This might seem an obvious point: Given the scarce resources available

for environmental protection, it makes little sense to make transnational payments that will have no effect on present or future levels of environmental degradation. Yet this is precisely the prospect that has emerged in the wake of the December 1997 Kyoto Protocol to the UN Framework Convention on Climate Change. The signatories to the Kyoto Protocol, which include the advanced capitalist states and most of the former Soviet bloc, committed themselves to various limits on their emissions of greenhouse gases in 2008–2012, measured as a percentage of their emissions in the baseline year, in most cases 1990. For example, the United States agreed to limit its emissions to 93 percent of the 1990 level, the European Union agreed to a limit of 92 percent, and Russia and Ukraine agreed to hold their emissions at the 1990 level. The signatories to the protocol can meet these commitments through domestic measures, through the financing of joint projects to reduce emissions in other countries, or through emissions trading: that is, the transnational buying and selling of emission allotments. The logic behind emissions trading is that the market will lead to overall reductions in emissions at the lowest possible cost, as governments, utilities, and firms in those countries where the marginal costs of reducing emissions are low will take additional measures to reduce their emissions below their agreed-upon limits, and then sell the excess "allotment" to utilities, firms, or governments in states where the marginal costs of reducing emissions are significantly higher.

However, in practice this logic is undermined by the chosen baseline year: 1990, the last year in which the Soviet command economy continued to function on anything resembling a "normal" basis.[1] Prior to 1990–1991, the USSR and its Eastern European allies consumed far greater amounts of fossil fuels in the production of electricity and manufactured goods than did their counterparts in the capitalist West, largely because there were few economic incentives to use energy inputs more efficiently. Fossil fuel use, and consequently carbon dioxide emissions, peaked in the late 1980s. In the early 1990s, however, industrial production and fossil fuel consumption in the former socialist states plummeted, and along with it the emission of greenhouse gases, especially carbon dioxide (CO_2). By 1996, CO_2 emissions in Russia and Ukraine, which together produced approximately 80 percent of the former Soviet

Union's CO_2 emissions in 1990, had dropped below three-fourths of the 1990 level, purely by dint of the collapse of the command economy.[2] These emissions could be expected to rise again along with economic growth, but most analyses predicted that Russian and Ukrainian CO_2 emissions would not return to their 1990 levels until well into the twenty-first century, perhaps as late as 2040.[3]

This unintended economic downturn left the former socialist states (and above all, Russia and Ukraine) with an enormous windfall surplus of "emission reductions" to sell—and it soon became clear that there were several interested buyers among the advanced capitalist states, above all the United States, which repeatedly stated its intention to achieve most of its Kyoto Protocol commitment through emissions trading, rather than domestic action to reduce emissions. The drawback of this scenario is that the sale of the former socialist states' windfall reductions would undermine the whole logic of emissions trading. Emissions trading is based on the premise that the possibility of selling unused emissions allotments will lead countries to undertake *additional domestic measures* to reduce their own emissions and then sell the unused portion of their allotment to states in which the marginal costs of emissions reductions are significantly higher. If this occurs, then the result will be the same net reduction in greenhouse gases worldwide, but at a lower net cost. However, the emissions allotments sold by Russia and Ukraine (the two largest potential sellers) would result not from any deliberate internal measures to reduce emissions, but would instead be artifacts of the 1990 baseline and the unintended and largely irreversible collapse of the Soviet command economy. The sale of these unused allotments would have no effect on emissions within Russia and Ukraine, but *would* result in *greater* emissions in the United States and other purchasing states. In other words, the effect of emissions trading will actually be an *increase* in worldwide greenhouse gas emissions, over the level that would obtain if the potential purchasers of the excess Russian and Ukrainian allotments were to invest the same amount of money in domestic emissions reductions.

The situation that has emerged in the wake of the Kyoto Protocol is reminiscent of nothing so much as nineteenth-century Russian novelist Nikolay Gogol's comic masterpiece, *Dead Souls*. Gogol tells the story of a savvy entrepreneur who hatches a plan to purchase "dead souls"—peasants that have died since the last census—in order to "relocate" them to a nonexistent estate, mortgage that estate to the national treasury, and then use the proceeds to buy a genuine estate worked by living peasants. Like Gogol's deceased peasants, the unused allotments that Russia and the other former socialist states propose to sell (and that the United States and others propose to buy) are not genuine, "living" commodities; they do not represent any deliberate reduction in greenhouse gas emissions. Instead, these unused allotments are "dead air," artificial commodities that have value simply by virtue of having accidentally ceased to exist since the last census—in this case, the 1990 baseline established by the Kyoto Protocol. However, unlike the sellers of the "dead souls" described by Gogol—most of whom were mystified as to why this commodity might have any value whatsoever—Russia and Ukraine are fully aware of the potential value of their "dead air," and plan to charge as high a price for it as the market will bear. While the value of this "dead air" (or "hot air," as it is often dubbed) will ultimately depend upon the market price for emissions permits and the rate of economic recovery in the former Soviet Union, the windfall profits to Russia and Ukraine could ultimately exceed $100 billion.[4]

From a short-run economic perspective, the purchase of this "dead air" will also be profitable for the United States and other major greenhouse gas emitters, as this will reduce the domestic cost of fulfilling their international legal commitments under the Kyoto Protocol.[5] However, transactions of this sort will do nothing to reduce the actual emission of greenhouse gases—on the contrary, these transactions would lead to an actual increase in emissions worldwide, because the buyers will be able to avoid domestic reductions by purchasing "nonreductions" from Russia and Ukraine. Such an outcome would be the reductio ad absurdum of the use of transnational payments in international environmental diplomacy and might well tarnish the legitimacy of the use of transnational financial transfers in general, as well as that of the emerging climate change regime in particular.

Under the right conditions, transnational subsidization can be an appropriate and highly effective response to transboundary environmental problems. The use of this tool has drawbacks, to be sure, but so do all other strategies designed to change the behavior of actors in other states. In lieu of financial incentives, the victims of transboundary degradation can respond with economic sanctions, tactical issue-linkage, or even the threat of force; but these tools also impose costs upon the country that employs them, costs that may well exceed those of project-based subsidization or other types of direct transnational financial transfers (Baldwin 1971; Mitchell 1997). Moreover, positive incentives of this sort may be (and have been) employed in other international issue areas as well, such as economic development, nuclear nonproliferation, conflict resolution, and human rights. An important task for current and future research is to analyze the experience gained in these various issue areas and the extent to which the lessons learned in one area can be transferred to the others.[6]

At the same time, however, international environmental politics cannot be reduced to Coasian bargaining among the exporters and importers of transboundary pollution. The transaction costs involved are high, as are the costs of monitoring and enforcement, and potential donor states have a limited amount of money to spend in this way. Moreover, the most concerned victims are often major polluters themselves, a circumstance that suggests the need for domestic action as well as the encouragement of action in other states. Even where direct transnational subsidization is a viable response to transboundary environmental degradation, it is not necessarily the *best* strategy; depending upon the circumstances, other responses—such as tactical issue-linkage, or the negotiation of reciprocal targets and timetables for national action—may be more politically acceptable and cost-effective.[7] In any case, transnational subsidization is never sufficient in and of itself. Actors interested in environmental protection in other states must also work to build national regulatory capacity, promote nongovernmental environmentalism, facilitate the emergence of a transnational scientific consensus, and encourage the negotiation of mutually binding targets and timetables for national action. These activities make up much of the "stuff" of international environmental politics and are essential to the creation of a sustainable and mutually acceptable framework within which transnational subsidization can proceed.

Notes

Chapter 2: Instrumental Manipulation in International Environmental Politics

1. Leading contributions to the analysis of international environmental politics include Caldwell (1990); Soroos (1986); Peter Haas (1989, 1990); McCormick (1989b); Young (1989, 1994, 1999); Inglehart (1990); Hurrell and Kingsbury (1992); Rowlands and Greene (1992); Thomas (1992); Haas, Keohane, and Levy (1993); Kamieniecki (1993); Lipschutz and Conca (1993); Choucri (1993); Sjöstedt (1993); Skolnikoff (1993); Young and Osherenko (1993); Litfin (1994); Mitchell (1994); Redclift and Benton (1994); Sprinz and Vaahtoranta (1994); Susskind (1994); Bernauer (1995a, 1995b); Keohane and Levy (1996); Vogler and Imber (1996); Dryzek (1997); Meyer et al. (1997); Schreurs and Economy (1997); Victor, Raustiala, and Skolnikoff (1998); and Weiss and Jacobson (1998). A closely related body of literature is the comparative study of national environmental policies. See, for example, Lundqvist (1974); Kelley, Stunkel, and Wescott (1976); Nelkin and Pollak (1981); Reich (1984); Brickman, Jasanoff, and Ilgen (1985); Kitschelt (1986); Vogel (1986); and Boehmer-Christiansen and Skea (1991).

2. "Domestic political structure" refers to the overarching political framework within which national political conflict takes place: the formal and informal rules that govern relations among executive, legislative, and judicial institutions; the rules that govern relations among agencies and ministries within the executive branch; the distribution of power and responsibility among national, regional, and local authorities; the extent and political content of autonomous societal organization; and the nature of the intermediate institutions or "policy networks" that link societal actors to the state. Leading examples of the development and use of the concept of domestic political structure in the study of international politics include Katzenstein (1976, 1977a, 1977b, 1984); Krasner (1978, 1984); Skocpol (1985); Gourevitch (1978, 1986); Ikenberry (1988); Ikenberry, Lake, and Mastanduno (1988); Evangelista (1988, 1995a, 1995b); Ikenberry and Kupchan (1990); Risse-Kappen (1991, 1994, 1995a, 1995b); Zürn (1993); and Solingen (1994).

3. This conclusion is strongly reminiscent of Immanuel Kant's 1795 argument that "perpetual peace" could only be achieved on the basis of a community of internally congruent liberal republics, a thesis that lies at the core of the liberal approach to understanding international relations (Kant 1986; Doyle 1983, 1986; Schmitter 1991).

4. For further definition of the epistemic community concept, see Peter Haas (1992b). Groups to which this label has been applied include arms control experts, cetologists, economists, and environmental specialists interested in such issues as ozone depletion and marine pollution (Adler 1992; P. Haas 1989, 1990, 1992a; Lavoy 1991; Weber 1991b). Their efforts to build and expand a transnational scientific and political consensus may take place through formal diplomatic political channels, international scientific and professional organizations, or informal networks of specialists with similar interests (Evan 1981; Crane 1972).

5. The "dividing line" between the Soviet/Cold War and post-Soviet/post–Cold War periods is sharp and clearly discernible only in retrospect. As will become clear in the ensuing case studies, 1990–1991 was a fluid and confusing period of transition during which Soviet and post-Soviet elements coexisted. Soviet rule came to an end more swiftly in some republics and regions than in others, and the same is true of different sectors of the economy. It is thus impossible to date precisely when one stage ended and the other began.

6. "Authoritarian" is rather a weak term to use to describe the pre-1986 Soviet political system, since it suggests a level of suppression of autonomous public activity comparable to that found in any run-of-the-mill dictatorship. In fact, the political control by the post-Stalinist Soviet state was vastly more pervasive, if often less crude, than that found in most other dictatorships. On the other hand, the label "totalitarian" has been so loaded with ideological baggage by both its proponents and its critics that its use invites needless aggravation. Of course, the Soviet political system, whatever one chooses to call it, changed substantially over time. By 1986, it had become so pervasive and familiar, and its mobilizational goals so modest, that a relatively low level of outright intimidation and violence was required to sustain it. The extreme degree of political terror, social atomization, and state-led mobilization practiced under Stalin, which many postwar theorists of "totalitarianism" and novelists such as Orwell and Zamyatin raised to the status of an ideal type, ultimately proved to be a transient, if crucial, stage in the development of the system. For an excellent overview of the development of the totalitarian model, see Breslauer (1992).

7. The concept of "policy windows" was originally developed by Kingdon (1984).

8. The domestic and foreign policies crafted by Brezhnev underwent no significant change during the brief Andropov-Chernenko interregnum of November 1982–March 1985. That being said, there is ample evidence to suggest that Yuriy Andropov (November 1982–February 1984) did plan to introduce more far-reaching domestic reforms (see, for example, Arbatov 1992). Even during

Andropov's brief tenure as General Secretary, some liberalization of state controls over transnational scientific contacts did filter down to the specialists engaged in East-West environmental cooperation. However, Andropov fell ill and died before undertaking any fundamental changes in either domestic or foreign policy.

9. For more on the politics of environmental protection in the USSR, see Goldman (1972); Pryde (1972, 1991); Kramer (1973); Kelley (1976); Medvedev (1979); Komarov (1980); Gustafson (1981); DeBardeleben (1985); Jancar (1987); Ziegler (1987); Weiner (1988, 1999); Green (1990), and Stewart (1992). The difficulties of environmental regulation were compounded by the political constraints imposed upon Soviet scientists. See Graham (1987, 1990, 1993a, 1993b), Joravsky (1970), Lubrano and Solomon (1980), Kneen (1984), Vucinich (1984), Fortescue (1987, 1990), and Holloway (1994).

10. For comprehensive surveys of the environmental crisis generated within the USSR, see Feshbach and Friendly (1992), Peterson (1993), Feshbach (1995), and Pryde (1995).

11. "Offensive détente"—a term coined by Snyder, not the Soviet leadership—combined a massive military buildup and vigorous competition in the developing world with sufficient East-West cooperation to codify Soviet gains, diminish the risks of uncontrolled escalation, and ensure access to the external goods and capital needed to bolster the faltering Soviet economy. In the long run, of course, these goals proved to be incompatible, just as environmental protection at home could not be squared with the need to pump further growth out of an unreformed command economy, but that conflict would not be officially recognized until the advent of Mikhail Gorbachev.

12. Soviet writings on international environmental problems are too voluminous to be recounted here. The best treatments of them in the Western literature are Hall (1987) and Clemens (1990).

13. Two of Gorbachev's closest personal advisers on ecological issues in the early days of perestroika were the Marxist-Leninist philosopher Ivan T. Frolov and the writer-environmentalist Sergey Zalygin (promoted by Gorbachev to be editors of the prestigious journals *Voprosy Filosofii* and *Novyy mir*, respectively). Both have said that Raisa Gorbachev was, in this early stage, the main conduit through which the concerns of the environmentalists reached the General Secretary (author interviews with Ivan Frolov and Sergey Zalygin, Moscow, June 1992). The earliest sign of this component of Gorbachev's strategy was the increased freedom granted in 1985 to the critics of the proposed diversion of Siberian rivers to Central Asia and the Caspian Sea. At the elite level, the environmentalist message attracted not only members of the liberal intelligentsia, but also influential public figures such as the Russian nationalist writers, who disliked the Soviet regime but otherwise did not share perestroika's Westernizing spirit. It is difficult to overestimate the importance that Gorbachev and his fellow reformers attached to the support of the most prominent Russian nationalists in the early stage of perestroika. Alone among the major elite groups critical of the

regime, they had been allowed to voice their concerns openly in the press during the Brezhnev era, and so they commanded tremendous moral authority. Environmental protection, the preservation of cultural monuments, and increased tolerance for the Russian Orthodox Church were all employed by the reformers to woo this important constituency, which included the prominent Academician Dmitriy Likhachev and the "village writers" Valentin Rasputin and Vasiliy Belov. Eventually, this commonality of interests would prove insufficient to keep the more anti-Western Russian nationalists, such as Rasputin, within the reformist camp, but by then the demise of the Soviet order was irreversible. For more on the river diversions, Russian nationalism, and early environmental reforms under Gorbachev, see Darst (1988).

14. For broad overviews of the development of the new political thinking in Soviet foreign policy, see Kubálková and Cruickshank (1989), Legvold (1988, 1991), Kull (1992), Checkel (1993, 1997), Mendelson (1993, 1998), and Evangelista (1999).

15. The most sophisticated proponents of the "learning" approach to the explanation of the "new political thinking" were Robert Legvold and George Breslauer. See Legvold (1988, 1991), Breslauer (1987, 1990) and Breslauer and Tetlock (1991).

16. See, for example, Gorbachev's famous speech to the UN General Assembly in December 1988 (reprinted in USSR, Ministerstvo inostrannykh del, 1990, 2:318–336). The decision to create a "Center for Urgent Ecological Assistance" was finally adopted by the United Nations Environment Programme (UNEP) at its 16th session in June 1991 (*Pravda,* June 17, 1991, p. 5).

17. Among the most influential academic proponents of the new emphasis on international environmental problems were Vasiliy Sokolov of the Institute of the USA and Canada; Rafael Vartanov and his section at the Institute of the World Economy and International Relations (IMEMO); Oleg Kolbasov of the Institute of State and Law; and Dzherman Gvishiani and others at the All-Union Research Institute for Systems Analysis. These individuals were only a tiny subset of the broader intellectual community that developed and promoted the "new thinking."

18. While the "new thinkers" attached significance to the activities of the environmental scientists, the reverse was not typically the case: Most Soviet environmental scientists interviewed at the time dismissed the new thinkers as irrelevant, meddling dilettantes. Nevertheless, the efforts of the "new thinkers" did open enormous policy windows for the scientific advocates of specific environmental policies, even if the latter were not fully aware or appreciative of that fact.

19. Analogous problems complicated environmental protection in the former socialist states of Central and Eastern Europe. For more on environmental protection in the former socialist states, see Jancar-Webster (1993); Kotov and Nikitina (1993); Manser (1993); Peterson (1993, 1995, 1997); Vari and Tamas (1993); Eckerberg (1994, 1997); DeBardeleben and Hannigan (1995); Feshbach

(1995); Pryde (1995); OECD (1995); Bridges and Bridges (1996); Hicks (1996); Klarer and Moldan (1997); Baker and Jehlička (1998); Cole (1998); and Glushenkova (1999).

20. This paradox between "access" and "influence" is an example of what Evangelista (1995a, 1995b) has described as "the paradox of state strength": Given a receptive political leader, a closed, authoritarian political system may be more conducive to the success of transnational lobbying than an open, democratic one. This proposition is borne out by recent studies of "transnational relations" (Risse-Kappen 1995a, 1995b) and Evangelista's study of the changing fortunes of the transnational scientific groups that attempted to moderate Soviet national security policies during the Cold War (Evangelista 1999).

21. Other studies of Western efforts to promote environmental protection in the former socialist states include Levy (1993b); Hiltunen (1994); Berg (1995); Connolly and List (1996); Connolly, Gutner, and Bedarff (1996); Löfstedt and Sjöstedt (1996); and Sawhill (1998).

22. For an in-depth analysis of Western economic advice and assistance to Eastern Europe and the newly independent states in the post–Cold War period, see Wedel (1998).

23. The first commentator to use the phrase "Coase Theorem" in print was Stigler (1966:113). For an excellent summary of the evolution of the concept, see Medema (1995).

24. Although Coase did not explicitly spell out this implication, subsequent commentators were quick to do so. See, for example, Mishan (1965) and Calabresi (1968). For more on diffuse interests, concentrated interests, transaction costs, and associated problems of collective action, see Olson (1965) and Hardin (1982).

25. The disjuncture between the international political system and the domestic environment analyzed by Coase has not precluded efforts to apply his insights prescriptively to problems of international cooperation. Outstanding efforts to do so include Conybeare (1980) and Gallarotti (1991). Oye (1992) takes a more skeptical view, arguing that Coasian bargaining will be efficient only with respect to certain kinds of externalities, namely, those that do not have the properties of public goods. For an extended analysis of public goods in international relations, see Snidal (1979).

26. Recent studies of this phenomenon include Hiltunen (1994), Bernauer (1995b), Keohane and Levy (1996), Löfstedt and Sjöstedt (1996), Darst (1997), Victor, Raustiala, and Skolnikoff (1998), and Sawhill (1998).

27. The terminology of "leaders" and "laggards" is drawn from Keohane, Haas, and Levy (1993:16–17).

28. Numbers matter, of course. The greater the number of victims, and the more evenly the costs of degradation are spread across them, the greater the barriers to effective collective action, and the greater the likelihood that any bribe offered will be "suboptimal," if indeed one materializes at all (Oye 1992:20–21). If,

however, the number of victims is fairly small (as in the case in the Baltic Sea), or if a subset of the victims is willing and able to provide a sufficient bribe regardless of what the others do (as in the case of post–Cold War nuclear power safety), then attractive offers of transnational subsidization may materialize despite the well-known barriers to collective action. For the theoretical underpinnings of this claim, see Schelling (1978:215–218), Hardin (1982), and Snidal (1985); for experimental confirmation of it, see Hoffman and Spitzer (1986).

29. I am indebted to Matthew Evangelista for the concept of "offstream" states.

30. Economists employ a broader and more technical definition of moral hazard: Moral hazard may arise when a principal cannot observe all of the actions of an agent after a contract has been concluded, thus creating the possibility that the agent may act in ways that run counter to the interests of the principal. For the purposes of this study, I will use the narrower and less technical definition cited in the text. For more on the treatment of moral hazard in the field of information economics, see Williamson (1985:80–85); Macho-Stadler and Pérez-Castrillo (1997); and Molho (1997).

31. Moral hazard has even been invoked to explain the increased incidence of "plunked" (or hit) batsmen in the American Baseball League after the introduction of the "designated hitter" rule in 1973: Now that pitchers no longer had to face opposing pitchers at bat, they grew more willing to deliberately "plunk" opposing players, since they no longer feared retaliation in kind (Goff, Shughart, and Tollison 1997). For further discussion of this argument, see Levitt (1998), Trandel, White, and Klein (1998), and Goff, Shughart, and Tollison (1998).

32. This argument has been advanced by Calomeris (1998) and Kapur (1998), among many others. Indeed, this argument became so widespread in the wake of the Asian economic crisis of the late 1990s that primers on the meaning of "moral hazard" began to appear in the pages of *New York Times* and other mass-circulation newspapers. (See, for example, William Safire, "Moral Hazard," *New York Times Magazine*, December 20, 1998, p. 30.) Hale (1998) offers a dissenting view. Similarly, financial institutions may be encouraged to engage in greater risk-taking if they (or the countries in which they are investing) are viewed as "too big to fail"—that is, too large or too central to the economy *to be allowed to fail* by their home governments or by international lenders (Moyer and Lamy 1992; Roth 1994). Recent examples of risky behavior arguably encouraged by the "too big to fail" assumption include the failed Long Term Capital Management hedge fund, bailed out by the U.S. Federal Reserve Board in late 1998 (Mayer 1999); the South Korean *chaebol*, whose risky behavior contributed to the South Korean economic crisis of the late 1990s (Jacobs 1999); and the massive foreign capital inflows into the East Asian "emerging markets" from the late 1980s until the economic crisis of 1997 (Sarno and Taylor 1999).

33. Oye (1992:35–50), Schlicht (1996:325), and McChesney (1997:20–42) advance similar formulations.

34. I will use the terms "extortion" and "blackmail" interchangeably. While blackmail today is most commonly associated with threats to expose compromising information unless some payment is made, our ordinary usage of the term is by no means restricted to that particular brand of extortion. In fact, the word "blackmail" dates back to the 1500s, when it was used to describe the tribute exacted by Scottish bandits in exchange for not pillaging villages and farms—in other words, a protection racket. The term "blackmail" has also been widely employed in security studies to refer to any threat of violent punishment, particularly one (such as a nuclear attack upon a nuclear power) that would impose a cost upon the threatener as well as the target (Schelling 1963; Ellsberg 1975; McMahan 1983; Betts 1987).

Chapter 3: Pollution in the Baltic Sea

1. Söderqvist (1986:259–264); Jamison et al. (1990:23–29); Dybern (1980). For a concise history of scientific research on the Baltic marine environment and an extensive international bibliography, see Laganovska and Kachalova (1990).

2. These specialists were scattered across a number of different institutions. These included, first of all, the relevant research institutes of the Academies of Sciences of the USSR and the Baltic Republics. Leading institutes of the Soviet Academy included the Institute of Oceanology, with branches in both Moscow and Leningrad, and the Institute of Limnology in Leningrad; these were complemented in the Baltic Republics by organizations such as the Institute of Zoology and Botany and the Institute of Thermodynamics and Electrophysics of the Estonian Academy of Sciences and the Latvian Academy of Sciences' Institute of Biology. Second, some prominent specialists were based at local universities, most notably the Tallinn Polytechnical Institute (later renamed Tallinn Technical University). Third, many marine specialists worked in research institutes subordinate to the state environmental monitoring agency, Gidromet; the most prominent of these were the Leningrad Branch of the State Oceanographic Institute and the Baltic Branch of the Institute of Applied Geophysics. Finally, there were a number of research institutes which specialized in narrower technical areas such as fishing and shipbuilding and which were attached to the relevant ministries. From the 1970s onward, the most active of these was the Baltic Fisheries Research Institute in Riga.

3. The ICES is a formal intergovernmental organization, regulated by treaties concluded in 1902 and 1964. The Conference of Baltic Oceanographers and the Baltic Marine Scientists are international nongovernmental scientific organizations. In all three cases, Soviet participation was regulated by the USSR Academy of Sciences, an integral part of the Soviet state—and, of course, by the ubiquitous KGB.

4. This situation improved in the wake of a large inflow of saltwater from the North Sea in January 1993, but oxygen concentrations in the Baltic's deep waters

afterwards returned to low levels (HELCOM 1996a:2–4). For more on the hydrology, ecology, and anthropogenic pollution of the Baltic Sea, see Cederwall and Elmgren (1990); Elmgren (1989); HELCOM (1990b, 1990c, 1991b, 1994, 1996a, 1996b, 1997); Nordic Council (1989); Rantajärvi et al. (1997); Rosenberg et al. (1990); and Underhal et al. (1989).

5. The Baltic Marine Environment Protection Commission formally came into existence once the convention entered force in 1980, two months after the last of the signatories deposited instruments of ratification; until then, an interim commission fulfilled its functions. The six-year delay in the ratification of the treaty was due not to recalcitrance on the part of the Soviet bloc, but to a conflict between the accession of Denmark and the FRG to the convention and their membership in the European Community (EC). The European Court of Justice ruled in 1971 that the EC member states lose the power to enter into international agreements in cases where the EC has adopted internal regulations governing the activities in question. When the EC adopted a directive regulating land-based pollution in 1976, Denmark and the FRG lost their competencies to enter into the Helsinki Convention. One way to solve this problem was for the EC to join the convention as a member, but this was opposed by the members from the Soviet bloc, who did not want to recognize the EC as a subject of international law. Finally, Denmark and the FRG went ahead and ratified the Helsinki Convention anyway (Boczek 1980:225–226). In the wake of the Cold War, this dilemma evaporated: Denmark, Germany, and the European Community were all signatories to the revised Baltic Sea Convention of 1992.

6. Former Soviet participants report that the Soviet government eased some of the restrictions on information sharing with the West after the death of Brezhnev and the ascension of Yuriy Andropov to the post of general secretary. If so, this case offers modest support for the proposition that Andropov did indeed plan to bring about significant changes in Soviet foreign policy, particularly by relying more heavily on Western-oriented intellectuals and by reducing the barriers to the exchange of information with the West. Whatever Andropov's plans might have been, however, they were soon cut short by his debilitating illness and subsequent death. After Andropov's demise, Velner and his colleagues managed to preserve their recent gains but could make no further breakthroughs until the advent of Gorbachev's reform program.

7. The first stage of the program was conducted in 1979–1983, and its conclusions, formally published in 1985, were alarming. Although levels of DDT and PCBs had decreased or remained stable in most parts of the sea, the report found rapidly rising nutrient levels, growing evidence of widespread eutrophication, and rapidly worsening oxygen conditions in the deep waters. Although both natural and anthropogenic factors were involved, the authors of the report concluded that the impact of the latter was growing. These findings were reinforced by the conclusions of the second stage of the monitoring project, which was carried out in 1984–1988 (HELCOM 1986a, 1987a, 1990b, 1990c). Throughout the 1970s and 1980s, data on the emissions of the socialist countries

remained spotty, and the information on the state of the coastal waters contained in these assessments was woefully incomplete.

8. By 1986, the commission had approved recommendations dealing with storm water run-off, pollution from oil refineries, the control of mercury and cadmium discharges from various land-based sources, municipal sewage treatment, and the application of fertilizers in agriculture (HELCOM 1981, 1982, 1983, 1984b, 1985b, 1986b).

9. The first (mechanical) stage of the Tallinn plant was put into operation in 1978, and the second (chemical) in 1983, two years ahead of schedule. Biological purification was scheduled to be added in 1988. The Leningrad project was more ambitious still, comprising three separate treatment plants which would, when completed, have a total capacity of 4.5 million cubic meters per day (HELCOM 1985a:184–191, 215–221; 1984a:134–139).

10. Sovet Ministrov SSSR, "O merakh po usileniyu okhrany ot zagryazneniya basseyna Baltiyskogo morya" (16 June 1976), in Galeeva and Kurok (1986:268–274).

11. At the Tallinn treatment plant, the effluents of the city's largest industrial enterprises were responsible for *three quarters* of the incoming BOD_5 load—a circumstance that explains how the *treated* wastes of a city with slightly less than 500,000 inhabitants could contain as much organic waste as the *untreated* wastes of the same number of people (Finland 1991b:71–72). The effect in Leningrad was far more debilitating, due to the much greater level of industrial activity within the metropolitan area. Of course, many of Leningrad's industrial enterprises bypassed the municipal sewage system altogether and simply dumped their wastes directly into the Neva.

12. Potemkin, a favorite of Russian Empress Catherine the Great, is said to have constructed fake villages along the routes that she traveled in order to give her a false impression of prosperity and political loyalty among the populace. These became known as "Potemkin villages."

13. Even then, this joint Soviet-Finnish expedition was delayed for several months after permission to enter Soviet waters was initially refused.

14. HELCOM (1988:32); for Velner's comments in 1987, see HELCOM (1989c:6–7).

15. The most prominent of these was Ain Lääne, Velner's successor as director of the Water Protection Laboratory. From an early date, Lääne was one of the most active members of HELCOM's Scientific-Technological Committee, the body responsible for working out practical solutions to the region's environmental problems. He subsequently became the commission's technological secretary.

16. Even after the Priozersk mill was closed, several other large polluters continued to operate in the vicinity, and it is doubtful that the overall condition of the lake was significantly improved as a result of the action (Voropaeva 1990).

17. The concentration of environmental regulatory responsibilities within Goskompriroda was not entirely complete. The Ministry of Health's Sanitary-Epidemiological Service remained an independent agency, as did the State Committee for Hydrometeorology and Environmental Control (Goskomgidromet), although the latter was stripped of all but its monitoring functions.

18. Although the fervor with which officials in all of the former Soviet republics embraced these economic mechanisms owed much to the infatuation with the "market" that swept the USSR in 1990–1991, they had in fact been under preparation for nearly twenty years, and environmental specialists, particularly those working in the area of water protection, had advocated their introduction for quite some time.

19. All of these groups were extremely small and tended to splinter still further, often into "groups" of only one or two members (Dawson and Tsepilova 1993, and author interviews with environmental activists).

20. Muiznieks (1987); Estonian Green Movement (1989); Raun (1991:223); Pryde (1992:16–18). This project was opposed not simply because of its environmental effects, but also because it would have brought in an additional influx of Russian settlers to Estonia. Indeed, the "phosphate war" is yet another case of the use of environmentalist protest as a surrogate for ethnic nationalism, a doctrine that could not be openly advocated in 1987.

21. As of mid-1998, Leningrad Oblast retained its Soviet-era name, despite the fact that the city of Leningrad was renamed St. Petersburg in 1991.

22. The dam's builders fought back by summoning an international commission of sympathetic hydrological experts to examine the project (*Izvestiya*, June 3, 1991, p. 3). As in the nuclear power debate, the reassuring conclusions of the foreign experts had no immediate effect on local opposition to the project.

23. For a comprehensive analysis of the problems of water protection in Leningrad in 1990, see *Ogonek*, 13–20 October 1990, pp. 9–11.

24. After the breakup of the USSR, the dam project was resurrected with the support of the St. Petersburg city administration. Unable to interest private investors in the project, the city administration turned to the EBRD with a request for a $400 million loan to finance the completion of the structure (*St. Petersburg Times*, 7–13 April 1997). As of late 1999, neither the EBRD nor any other donor had approved credits for this project.

25. By 1987, for example, approximately 90 percent of the Swedish population was connected to municipal treatment plants with both chemical and biological treatment, in which practically all phosphorus was removed. In the late 1980s, standards for nitrogen removal were tightened, and a 50 percent reduction was made the minimum for all major municipal plants in coastal areas (Sweden 1991:46–47). In relatively more rural Finland, about three-quarters of the population was connected to municipal plants by 1985; of those living in areas with sewage systems designed to accommodate more than 200 inhabitants, 84 percent were served by biological-chemical treatment, and only one percent of the total

amount of municipal wastewater was being discharged without centralized treatment. As in Sweden, steps were taken in the late 1980s to improve nitrogen removal in Finland's larger cities (HELCOM 1987b:91; OECD 1988:88–93). In Denmark and West Germany, too, approximately 90 percent of the population was served by biological and/or biological-chemical treatment by the late 1980s (OECD 1991:51). By 1992, expanded municipal treatment facilities were under construction or planned in Helsinki, Copenhagen, and Stockholm (HELCOM 1992b; *Hufvudstadsbladet*, December 29, 1991, p. 3).

26. This was particularly true in Finland, which suffered a ten percent drop in GNP in 1991–1992 as a result of the collapse of its traditional trade arrangements with the USSR (*Hufvudstadsbladet*, 29 December 1991, p. 3; *Helsingin Sanomat*, 6 February 1993, p. 2).

27. Participants from the former Soviet Union consistently report that the idea of external subsidization of environmental protection in the USSR came first from the West, most naming Sweden as the original source. While some progressive Soviet specialists became interested in new ideas such as debt-for-nature swaps in the period immediately prior to the emergence of perestroika, this was in the context of their desire to join the Western "club"; they consequently imagined that the USSR would be a donor, not a recipient of such aid. From 1990 onward, however, the idea swept the country, and before long every official or activist concerned with an environmental problem was desperately seeking external funding for his or her activity.

28. The only Prime Ministers who declined to attend the conference were Nikolay Ryzhkov and Helmut Kohl. Ryzhkov had, however, expressed the Soviet government's support for the conference when the invitation from Swedish Prime Minister Ingvar Carlsson was delivered to him in July (*Izvestiya*, 27 July 1990, p. 4).

29. HELCOM (1992b). Of the top-ten municipal "hot spots" identified by the task force, six were in the former USSR. St. Petersburg was number one, far in front of the next closest contender, Kaliningrad. The other four were Tallinn, Riga, Klaipėda (Lithuania), and Narva (Estonia). See HELCOM *Ad hoc* High Level Task Force, "Pollution Load and its Reduction Plans from Urban Areas of the Baltic Sea Region (Review and Prioritization of Investment Needs)," HELCOM TF 2/5/7 (3 May 1991).

30. *HELCOM News*, No. 1, 1995, p. 5.

31. HELCOM (1998a). In the course of the implementation of the JCP, several hot spots were removed from the list, either because the necessary improvements had been undertaken, or because the enterprises in question had closed for economic reasons. By March 1998, the total number of remaining hot spots had fallen to 117.

32. Phytoplankton does not require equal amounts of all nutrients in order to thrive. Although different species require different ratios of nitrogen and phosphorus, the consumption of nitrogen relative to phosphorus is generally quite

high. (The most frequently cited N:P consumption ratio, the "Redfield value," is 16:1.) The key to reducing eutrophication, then, is to reduce the nutrient that is in shortest supply, relative to the ratio in which it is consumed. In other words, assuming an N:P consumption ratio of 16:1, one should attempt to reduce phosphorus emissions if the overall level of nitrogen (natural and anthropogenic sources combined) is more than sixteen times higher than the level of phosphorus, since further reductions of nitrogen will have no effect on primary production. Conversely, if the level of phosphorus is greater than one-sixteenth that of nitrogen, one should attempt to reduce nitrogen, since it is now the nutrient whose availability limits plankton growth. Recent studies indicate that the limiting nutrient in most areas of the open Baltic is nitrogen.

33. Finland (1994, 1995). The value of the Finnish mark fell sharply from 1991 to 1994, so one must use caution when translating these figures into dollar amounts. On January 1, 1991, FIM 1 million was equivalent to approximately $275,000; by January 1, 1994, the value of FIM 1 million had fallen to approximately $172,500. The above estimates are based upon an exchange rate of 5.1 Finnish marks to the dollar, roughly the average value for 1992–1993.

34. The first of the five plants was shipped and reassembled in the second half of 1991; equipment from a second plant followed in early 1993, and that of the remaining three in 1994–1995 (*Helsingin Sanomat*, 4 February 1993, p. B1; Finland 1994, 1995).

35. *Helsingin Sanomat*, 25 September 1992, and 1 May 1993, p. 9; author interviews at the Tallinn Wastewater Treatment Plant, May 1992.

36. The acronym "PHARE" stands for "Poland and Hungary: Action for the Restructuring of the Economy," a program launched in 1989. The PHARE program was subsequently extended to most of the other former socialist states of central and Eastern Europe.

37. EBRD, *Environments in Transition*, Spring 1995, pp. 7–8.

38. *HELCOM News*, 1995, No. 1, p. 15.

39. Estonian Environmental Home Page, Ministry of Environment of Estonia (http://www.envir.ee/ehp/), accessed June 3, 1998.

40. EBRD, *Environments in Transition*, Autumn 1995, pp. 12–14. Also in 1995, the World Bank, Finland, Sweden, and Denmark launched a $8 million program aimed primarily at the modernization of wastewater treatment in the eastern coastal city of Haapsalu (World Bank, Project Identification Document, "Estonia-Haapsalu and Matsalu Bays Environment Project," April 10, 1995).

41. The transnational subsidization of environmental protection in Estonia was not limited to municipal sources. Finland, other Western countries, and the European Union also subsidized a variety of other activities that promised, inter alia, to reduce the degradation of the Baltic Sea. Examples include the acquisition of modern oil spill combating equipment, the modernization of port facilities, efforts to contain and clean up toxic wastes at the metallurgical works in

Sillamäe, and the dismantlement and decontamination of a pair of nuclear reactors at the former Soviet naval base at Paldiski.

42. Riga at that point was responsible for roughly 60 percent of Latvia's total municipal pollution load. The total cost of the project was an impressive $121 million. The EBRD agreed to provide a loan of $22.5 million to Riga Water, the municipal water and sewer utility, in addition to a second $19 million loan from the European Investment Bank and $12 million in bilateral grants from Finland, Sweden, and Switzerland. As in other cities, the goals of the program included the modernization of all aspects of Riga Water's activities, from the provision of drinking water to sewage treatment, as well as the organizational restructuring of the utility itself, which would be placed on a self-financing footing. The loan was guaranteed by the national government of Latvia, with most of the actual financing to come from Riga Water's own operations (EBRD press release, 6 August 1996; *Environments in Transition*, Spring 1997, pp. 3–4).

43. For a much more detailed examination of municipal politics in St. Petersburg during this period, see Orttung (1995).

44. The total price tag for this project—envisaged as the first phase of a long-term modernization program—was estimated at ECU 160 million, or approximately $177 million—the largest yet of the JCP-inspired subsidization projects in the post-Soviet Baltic region. Donor grants added another $11 million toward this total. The modernization program was similar to that already underway in the major cities of the Baltic states, combining improved purification and delivery of the city's drinking water, major improvements in wastewater treatment, the installation of water meters, and the organizational modernization of Vodokanal St. Petersburg itself (EBRD press release, 17 July 1997; Nordic Investment Bank press release, 24 June 1998; *Rossiyskaya gazeta*, 3 June 1998; EBRD, *Environments in Transition*, Autumn 1997, pp. 11–14). In the case of Kaliningrad, Moscow agreed to provide a sovereign guarantee for a loan from the EBRD, but the price tag was much lower: EBRD financing of $18 million out of a total project cost of $62.6 million (EBRD Project Summary: Kaliningrad Water and Environmental Services Project, Russian Federation, 14 July 1999).

Chapter 4: Transboundary Air Pollution

1. Ottar (1976, 1978); Eliassen (1978); Wetstone and Rosencranz (1983:134–136); Levy (1993a:80–81). The USSR and its Eastern European satellites were not members of the OECD and did not participate in these initial international monitoring efforts.

2. *Pravda*, 10 December 1975, p. 2. This proposal was reiterated in several public statements over the next year, including a joint communiqué released at the conclusion of a visit by Finnish Foreign Minister Kalevi Sorsa to Moscow in January 1976, and the declaration of the heads of state of the Warsaw Pact in November (*Pravda*, 9 January 1976, p. 4, and 27 November 1976, p. 2).

3. This point has also been made by Levy (1993a), Jackson (1990), Chossudovsky (n.d.), Björkbom (1988), and Wetstone (1987).

4. *Pravda*, 10 December 1975, p. 2.

5. This was still true in the late 1990s.

6. "O dopolnitel'nykh merakh po usileniyu okhrany prirody i uluchsheniyu ispol'zovaniya prirodnykh resursov" (1 December 1978), in Galeeva and Kurok (1986:196–210, 321–326).

7. See, for example, Budyko and Izrael' (1987). Other Soviet studies of climate change are cited throughout this text.

8. The only "uncooked" data released by the USSR came from a string of ten monitoring stations located immediately along its western border, ranging from the Kola Peninsula in the north to western Ukraine in the south. From 1981 on, the observations of ambient air and precipitation chemistry recorded at these stations were forwarded to EMEP (Izrael' et al. 1989:157–161).

9. See, for example, the statement by V. Sokolovskiy to the executive body of LRTAP, cited in Levy (1993a:123).

10. Braden (1988). In the detailed blueprint for Soviet forestry drawn up in 1988–1989 under the leadership of A. S. Isaev, a noted reformer and the newly appointed chairman of the State Committee for Forestry, no mention whatsoever was made of long-range deposition, and only the most cursory references were made to industrial pollution (USSR, Gosudarstvennyy komitet po lesu 1989).

11. For surveys of the urban air pollutants considered most alarming by Soviet environmental officials, see USSR State Committee for the Protection of Nature (1989:7–19, 1990:48–50) and USSR (1991:139–149). These sources indicate that Soviet concern over the long-range deposition of nitrogen was relatively low.

12. "Protokol III sessii Smeshannoy sovetsko-finlyandskoy kommissii po sotrudnichestvu v oblasti okhrany okruzhayushchey sredy," Moscow, 11–17 September 1989.

13. In addition to the 1994 (Second) Sulfur Protocol, three other substantive protocols were concluded within the LRTAP framework in the 1990s: the 1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds (VOCs) or their Transboundary Fluxes; the 1998 Aarhus Protocol on Heavy Metals; and the 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs).

14. The critical load refers to the level of the deposition of a given pollutant (in this case, sulfur) that any given area can sustain without damage to the area's aquatic and terrestrial ecosystems; since some soils and species are more vulnerable to the deposition of sulfur than are others, the critical load will vary from one area to another. For more on the critical loads approach, see Swedish NGO Secretariat on Acid Rain (1995), Grennfelt, Hov, and Derwent (1994), UN/ECE (1992), and Kämäri et al. (1992).

15. From the perspective of 1994, of course, the picture looked rather different: Norway, Sweden, and Finland needed only slight reductions in their already drastically reduced emissions to reach their targets, whereas Germany would have to cut its emissions by an additional 56 percent in order to reach its target for the year 2000.

16. UN Economic Commission for Europe, *The 1994 Oslo Protocol on Further Reduction of Sulfur Emissions*, Annex II (http://www.unece.org/env/protocol/94sulp_a/annex2.htm).

17. EMEP/MSC-W Report 1/97 (July 1997).

18. "Estonian Environmental Home Page," Estonian Environmental Information Centre, May 1998 (http://www.envir.ee/ehp/); World Bank, "Estonia," January 1998 (http://www.worldbank.org/html/extdr/offrep/eca/estb.htm).

19. EMEP, "Deposition Budget Matrix for Oxidized Sulphur in 1996," updated October 1998. Most of the remaining Ukrainian sulfur emissions were deposited in the Mediterranean Sea or outside the EMEP grid.

20. Unlike the Narva power plants, the Kunda factory produced large amounts of local, short-range air pollution, especially dust and other particulates; consequently, the Estonian government had a pronounced *environmental* interest in the modernization of the plant. In St. Petersburg, environmentalists were divided over the benefits of the new power plant: Some argued that it would contribute to the reduction of urban air pollution, while others opposed it on the grounds that it would destroy the wetlands upon which it was built.

21. *Interfax Mining Report*, 20 June 1997; *Hufvudstadsbladet*, 5 July 1998, p. 6; *Interfax Metals & Mining Report*, 4 December 1998; personal communications from Esko Seppälä, Senior Adviser, Finnish Ministry of Foreign Affairs, 18 August 1998 and 25 November 1999.

22. *Arbeiderbladet*, 3 March 1990, p. 8.

23. Radio Helsinki Domestic Service, 8 June 1990.

24. *International Environment Reporter*, 27 January 1993, pp. 38–39. Calls for more aggressive action (if not necessarily air strikes) came from a quite diverse set of sources, including newspaper editorials, the venerated social scientist Johan Galtung, the Technical Research Centre of Finland, and a Norwegian environmentalist coalition entitled "Stop the Death Cloud from the Soviet Union" (*Arbeiderbladet*, 13 June 1990, p. 6; *Helsingin Sanomat*, 28 June 1990, p. 10; *Hufvudstadsbladet*, 29 June 1990, p. 2; *Helsingin Sanomat*, 11 August 1990, p. 5).

25. Press interviews with Outokumpu general manager Pertti Voutilainen in *Helsingin Sanomat*, 3 April 1990, p. 6, and 26 May 1991, pp. C1–2.

26. Outokumpu Engineering (1991a, 1991b). According to the original Outokumpu plan, the Severonikel plant would eventually be closed and its operations transferred to the retooled Pechenganikel facility. In early 1991, Norilsk Nickel—the parent enterprise of the two smelters—rejected Outokumpu's plan

to close the Severonikel smelter, arguing that the railway line from Murmansk to the Pechenganikel plant could not bear the additional load envisaged by the Finnish proposal. Outokumpu conceded the point, and the question of the ultimate fate of Severonikel was set aside for the time being.

27. *Helsingin Sanomat*, 26 May 1991, pp. C1–2; *Visit of Mikhail Gorbachev to Finland, October 25–27, 1989: Documents and Materials* (Moscow: Novosti Press Agency, 1989), pp. 22–25.

28. *Izvestiya*, 11 October 1990, p. 4; *Helsingin Sanomat*, 26 May 1991, pp. C1–2.

29. *International Environment Reporter*, 23 September 1992, p. 608, and 21 October 1992, p. 690.

30. *Helsingin Sanomat*, 4 April 1993, p. 4.

31. *Mining Journal*, 29 March 1996, Vol. 326, No. 8371. Most of these arrangements had been ironed out almost a year earlier (*Rossiyskaya gazeta*, 13 July 1995, p. 4), but the final agreement was delayed until Russian President Boris Yeltsin could complete a long-awaited and repeatedly postponed state visit to Norway.

32. *Izvestiya*, 16 January 1993, p. 3. This was a selective use of the facts. According to EMEP, Norway was responsible in 1993–1994 for the annual average deposition of 4,800 tonnes of nitrogen in Russia, compared to the deposition of 800 tonnes of Russian nitrogen in Norway. In the case of sulfur, however, the situation was reversed: Russian sources were responsible for the average annual deposition of 5,300 tonnes of sulfur in Norway, while Norway contributed 800 tonnes per year to Russia (*Acid News*, December 1995, p. 13).

33. This was, for example, the position taken by Russian Environment Minister Danilov-Danilyan prior to the announcement of the new competition (*Nezavisimaya gazeta*, 6 May 1992; *International Environment Reporter*, 23 September 1992, p. 690).

34. Juha-Pekka Tuovinen, Finnish Meteorological Institute, personal communication, June 1996. Nickel production at Pechenganikel alone declined by nearly 50 percent between 1992 and 1993; the rate of decline slowed in 1994 and recovered slightly in 1995 before falling again in 1996 (*Aftenposten*, 4 December 1993, p. 3; *Polyarnaya zvezda*, 11 January 1995, p. 2; *Murmanskiy vestnik*, 2 August 1995, p. 2; *Interfax Mining Report*, 27 June 1997).

35. For example, Norwegian Environment Minister Thorbjorn Bernsten declared in March 1995, “I have told the Russians that unless they get moving during the month of March, I will withdraw my 300 million kroner” (*Dagens Industri*, 15 March 1995, p. 15).

36. Norwegian concerns about Russian human rights practices were most strongly aroused by the arrest and trial of Aleksandr Nikitin, a former Soviet military official charged with treason for contributing to a report on nuclear safety problems in the Russian Northern Fleet, compiled by Norwegian envi-

ronmental NGO Bellona. Bellona, the Norwegian government, Amnesty International, and others demanded his release, arguing that Nikitin had not disclosed any information that was not already publicly available. Another call for linkage came in October 1996 from former Norwegian Prime Minister Gro Harlem Brundtland, who called for the Norwegian parliament to withhold its support for the Pechenganikel project if Russia went ahead with the construction of a new nuclear submarine in nearby Severodvinsk (Interfax, 23 October 1996). The Norwegian government did not publicly link its support for the Pechenganikel project to either of these issues.

37. *OMRI Daily Digest*, 20–22 November 1995; *Obshchaya gazeta*, 6–12 March 1997, p. 3; *Delovoy mir*, 10 July 1996, p. 3; *Interfax Mining Report*, 27 June 1997, 8 August 1997. Unexim Bank is alternatively transliterated as UNEXIMBank, Oneksimbank, or Oneximbank.

38. Another firm, KONT, submitted a $355 million bid in the loan-for-shares auction, but this bid was rejected by the Russian State Property Committee on the grounds that KONT did not have sufficient assets to guarantee the loan (*OMRI Daily Digest*, 22 November 1995). The only other bid in the August 1997 auction, submitted by a consortium of foreign firms, came in a distant second at ECU 171 million (*Interfax Mining Report*, 8 August 1997). Despite calls from the State Duma and other firms that these auctions be postponed, cancelled, or nullified, both were held on schedule, and the Russian government approved the results of both.

39. Rye, Man and GOR Securities (1997); Bond (1996). Norilsk Nickel's share of the total Russian production of these metals subsequently grew still further (*Obshchaya gazeta*, 6–12 March 1997, p. 3).

40. Investments in the Norilsk facilities were badly needed: Almost all of the Norilsk Plant's fixed assets were reported to be heavily depreciated, one-half of the equipment having a depreciation factor of greater than 75 percent. The pipeline connecting the ore processing mills to the smelters was nearing the end of its service life, and the mills themselves were working at only 50–70 percent of their design capacity. Norilsk Nickel also announced that plans were underway to cooperate with Outokumpu in the overhaul of the nickel smelter in Norilsk (*Interfax Mining Report*, 25 July 1997, 9 January 1998, 10 April 1998).

41. *Rossiyskaya gazeta*, 5 August 1998.

42. Outokumpu press release, December 1997; *Mining Journal*, 2 January 1998; *Interfax Mining Report*, 27 February 1998; *Næring i Nord* 4:40 (1998). I am grateful to Steven Sawhill for his translation of the latter source.

43. For a much more favorable interpretation of the environmental and economic cost effectiveness of the proposed Pechenganikel modernization project, see Kotov and Nikitina (1998b).

44. *Sovetskaya Estoniya*, 1 December 1990, p. 3.

45. Juha-Pekka Tuovinen, Finnish Meteorological Institute, personal communication, August 1998.

46. Narva Elektrijaamad, in turn, received a 51 percent stake in the oil shale mining company Eesti Põlevkivi (Estonian Oil Shale), the Estonian government retaining the remaining 49 percent (*ETA News Release*, 2 June 1999).

47. For a detailed analysis of the proposed Baltic Ring, see Belenergo et al. (1998).

48. Personal communication from Andrus Meiner, Deputy Director, Estonian Environmental Information Centre; *CEE Bankwatch Network Mail*, no. 4, November 1999, p. 4; *ETA News Bulletin*, 24 November 1999.

49. *ETA News Release*, 30 June 1997; *Postimees*, 12 May 1998, p. 11; *Interfax Business Report*, 12–19 May and 21–28 July 1998; *Eesti Päevaleht*, 24 November 1999, p. 13.

50. European Commission, "1999 Regular Report from the Commission on Estonia's Progress towards Accession," pp. 40–47; personal communications from Andrus Meiner, Deputy Director, Estonian Environment Information Centre.

Chapter 5: Nuclear Power Safety

1. The former was disignated the RBMK (*reaktor bol'shoy moshchnosti, kanal'nyy*, or "high-power channel-type reactor"); the latter was dubbed the VVER (*vodo-vodyanoy energeticheskiy reactor*, or "water-water electric power reactor").

2. Medvedev (1990:240–241); Katsman (1986:9–10).

3. A total of six VVER-230s were constructed in the USSR—two each at the Kola, Novovoronezh, and Armenian (Medzamor) plants—and four VVER-213s: two at the Kola station, and two at the Rovno station in Ukraine.

4. This differentiation between the West and the USSR should not obscure the substantial differences in the experiences of the various Western countries: For example, the scope for public anti–nuclear power protest was much more restricted in France than in the United States (Nelkin and Pollak 1981; Okrent 1981). Even so, the virtual absence of outside scrutiny in the USSR was without parallel in the West. For a detailed discussion of the closed nature of Soviet nuclear decision making, see Marples (1986) and Dodd (1994).

5. The former deputy director of the Kurchatov Institute, Valeriy Legasov, who committed suicide two years after the Chernobyl accident, vividly recalled this mindset in his memoirs (Legasov 1989:14–15).

6. Medvedev (1990:235–236); Potter (1991); Dodd (1994:84); author interviews with Soviet participants. Even the assumption that the rupture of one or two pressure tubes could be contained within the reactor building proved to be mistaken, as the March 1992 accident at the Leningrad AES would subsequently demonstrate.

7. Medvedev (1990:239, 272–273) and author interviews with past Soviet participants.

8. The ICRP is an international scientific committee devoted to the elaboration of common standards for radiation exposure. It and the UN's other radiation safety programs are discussed by Caulfield (1989). For more on the IAEA and its relationship to the United Nations, see Scheinman (1987).

9. Although these contacts did little to improve Soviet nuclear power safety, there is considerable evidence that they facilitated the transmission of Western ideas about nuclear deterrence and arms control to scientists and officials in the USSR (Weber 1991a, 1991b; Lavoy 1991; Evangelista 1995a, 1995b, 1999; Nye 1987; Adler 1991, 1992).

10. The only practical result of Soviet participation in the IAEA's activities was the creation of the nominally independent State Committee for the Supervision of Nuclear Power Safety (Gosatomenergonadzor) in 1983. This move had been advocated for several years by those officials from the Ministry of Foreign Affairs and Minsredmash who were engaged in international negotiations on nuclear matters, and who wanted the government to adopt a regulatory structure more compatible with those found in the West. The creation of a separate nuclear safety inspectorate was finally approved after the Politburo became concerned by several troubling incidents in the nuclear power industry. Prior to the Chernobyl accident, however, the existence of Gosatomenergonadzor had no appreciable impact on nuclear safety in the USSR (Medvedev 1990:263–264, 271–274 and author interviews). This same group of officials also pushed for an overhaul of the entire Soviet nuclear legislative framework. A team of legal scholars was created in 1980 at the Institute of State and Law to study Western nuclear legislation and draft a comparable law on nuclear power. The resulting legislation was on the verge of passage when the USSR collapsed.

11. Finland, Ministry of Trade and Industry (1989:9–10); Imatran Voima Oy (1990); author interviews with Finnish and Soviet participants.

12. Regnell (1989) and author interviews with Finnish and Soviet participants.

13. Several Soviet participants reported in interviews that Aleksandrov and Petros'yants—both longtime supporters of the RBMK design—privately ridiculed the lengths to which the Finns were prepared to go to ensure safety at Loviisa. Both were especially scathing in their evaluation of the introduction of full containment, which they regarded as entirely redundant and a complete waste of money.

14. Medvedev (1990:65–69); *International Atomic Energy Agency Bulletin* 28:2 (Summer 1986), pp. 61–65; "Kommyunike o visite v SSSR General'nogo Direktora Mezhdunarodnogo agenstvo po atomnoy energii (MAGATE) Khansa Bliksa," 11 May 1986 (USSR, Ministerstvo inostrannykh del 1989, 1:344–345).

15. "Vystuplenie General'nogo Sekretarya TsK KPSS M. S. Gorbacheva po Sovetskomu televideniyu," 14 May 1986 (USSR, Ministerstvo inostrannykh del, 1989, 1:346–352).

16. For more on the conference, see IAEA (1986). The strengths and weaknesses of the Soviet report are extensively analyzed in Medvedev (1990, chap. 1).

17. Interviews with IAEA officials and Soviet participants. Draft versions of these conventions had been drawn up in the early 1980s, but only Chernobyl provided the political support necessary for their adoption (Scheinman 1987:105; Barkenbus 1987:485).

18. The number of control rods held permanently in the "down" position was increased from 15 to 30, and the raised position of the remaining rods (of which there were more than 200) was fixed at a depth of 1.2 meters into the core. The control rod drives were modernized to decrease insertion time still further. Finally, it was decided to use higher-enriched uranium in order to reduce the reactor's positive void coefficient. All of these refits increased the costs of the RBMK and reduced the power of each unit to about 800 MW (Medvedev 1990:303–304).

19. The Politburo created a new Ministry of Nuclear Power, which was given responsibility for the operation of all of the country's nuclear power plants, previously under the jurisdiction of Minenergo or Minsredmash. In 1989, this ministry was combined with Minsredmash to form the USSR Ministry of Nuclear Power and Industry; this reconstitution of the original organizational unity of the military and civilian wings of the nuclear power program would subsequently survive the transition to post-Soviet rule.

20. The main safety recommendations advanced by the IAEA team were uncontroversial: an increase in the decision-making flexibility of the plant's operating staff, more intensive quality control inspections, and the wider introduction of modern office equipment (IAEA 1989).

21. See, for example, the interview with the IAEA team leader in *Pravda Ukrainy*, 14 January 1989.

22. Author interviews with IAEA officials.

23. Author interviews with Zelenyi Svit (Green World) activists.

24. These were planned inspections of the Bashkir and Tatar nuclear power stations, both of which were still under construction. During this period, the IAEA offered two types of on-site safety inspections: OSARTs (Operational Safety Advisory Review Teams) and ASSETs (Assessment of Significant Safety Events Teams). OSARTs are international teams of experts assembled by the IAEA to conduct speedy, on-site reviews of safety at a given nuclear facility. OSARTs can be dispatched only at the request of the government of the member state in which that facility is located, and their findings are confidential. ASSETs are dispatched (only by invitation) to investigate the causes of specific safety incidents and to offer corrective prescriptions (Scheinman 1987; Rosen 1989). The Rovno visit was an OSART. In the summer of 1989, two additional OSARTs were invited to the nearly completed nuclear heat supply station (AST) in the city of Gorky (subsequently renamed Nizhny Novgorod); as at Rovno, their findings were quite favorable. The local population was not convinced, however, and in the wake of the elections of 1990, the city and oblast soviets voted to halt further construction, a decision subsequently confirmed by the government of the RSFSR. In

December 1989, an ASSET inspected the Ignalina AES in Lithuania. This team had been invited by the Soviet government in the wake of several disturbing safety incidents over the preceding two years, including a fire that threatened the integrity of the control room—incidents that had further inflamed popular opposition to the station. As before, the conclusions of the IAEA were generally positive; and as before, local environmentalists rejected the agency's findings (author interviews with IAEA officials).

25. A detailed map of the fallout from the accident—similar to that presented to the Politburo in July 1986—was not published in the USSR until March 1989, nearly three years after the accident (Medvedev 1990:80–89). Indeed, official restrictions on the release of information about the accident were lifted only in May 1989 (*Pravda*, 17 April 1990, p. 4). The Soviet maps of the contamination around Chernobyl were subsequently published abroad under the auspices of the IAEA's International Chernobyl Project (IAEA 1991b).

26. The notion of "radiophobia" appears to have been coined by Leonid Il'in, vice president of the USSR Academy of Medical Sciences and the leading government spokesman on the health impact of the Chernobyl disaster. Radiophobia refers to the general state of anxiety suffered by many individuals after real or imagined exposure to radiation; it is manifested in an unwillingness to believe any official information and a readiness to attribute any and all symptoms to radiation poisoning.

27. See Marples (1988, chap. 6) for a more detailed account of the problems of relocation and reconstruction after the disaster.

28. In an interview conducted in June 1990, a very defensive Hans Blix told Soviet journalists that other international organizations had been included in the project in order to dispel "the conventional thinking that the IAEA is made up of pronuclear people" (*Pravda*, 15 June 1990, p. 5). In addition to the IAEA, the international organizations involved were the United Nations Food and Agriculture Organization (FAO), the WHO, the UNSCEAR, the ILO, the World Meteorological Organization (WMO), and the Commission of the European Communities (CEC) (IAEA 1991a).

29. IAEA (1991a:1–7); *Pravda Ukrainy*, 29 March 1990, p. 3; *Pravda*, 15 May 1990, p. 1.

30. The Ukrainian and Belorussian SSRs were among the founding members of the United Nations—a concession to Stalin, who initially demanded that all 15 of the USSR's constituent republics be granted rights of full membership in the new organization.

31. *JPRS Report: Environmental Issues*, 26 June 1991, pp. 60–61.

32. Radio Minsk, 11 June 1991; reported in *JPRS Report: Environmental Issues*, 5 July 1991, p. 88.

33. For example, Gotovchits charged that the IAEA's scientists "did that which they were asked to do and for which they were paid over a million dollars by our government alone," and said, "We do not rule out [the possibility] that this

was done intentionally in order to downgrade the severity of the accident and calm world public opinion" (*Trud*, 3 July 1991, p. 2). A similar charge was made by Volodomir Yavorivskii, chairman of the Ukrainian Parliamentary Commission on Chernobyl: "[O]ver several decades there has developed a worldwide 'nuclear lobby' headed by the IAEA, which has vast funding and . . . tends to hamper the development of alternative directions in the search for energy sources" (*Narodna hazeta*, no. 15, April 1992, pp. 1–2). The most creative response came from the Ukrainian Green Party, which invited the IAEA to move to Pripyat (the center of the contaminated zone) since the agency must find Vienna so dirty and crowded by comparison (Radio Kiev, 18 July 1991). These sentiments were frequently encountered in interviews with Ukrainian officials and environmental activists.

34. The idea of the "politics of scope" was originally developed by Schattschneider (1960).

35. See Dawson (1996:58–61). At the close of 1999, the original two RBMK-1500s at Ignalina remained in operation, but no further expansion had taken place.

36. Lithuanian President Valdas Adamkus reiterated his government's determination to build a third reactor unit in early 1998 (Interfax, 7 March 1998). In late 1997, the Armenian government confirmed its intention to build a new nuclear power plant to replace the aging Medzamor AES, provided that external financing could be arranged (Interfax, 4 December 1997; Bellona, 15 January 1998). In March 1998, Kazakhstan announced that it had finalized plans for the construction of a second nuclear power plant on the southern shore of Lake Balkash, with construction to begin as early as 1999 (Bellona, 18 March 1998). The Ukrainian case is discussed in greater detail below.

37. *Komsomol'skaya pravda*, 2 June 1992, p. 2, and 26 January 1993, p. 3; *Rossiyskaya gazeta*, 16 January 1993, p. 3; *Rossiyskie vesti*, 23 January 1993, p. 5; *Izvestiya*, 6 February 1993, p. 15.

38. *Novye izvestiya*, 5 August 1998; ITAR-TASS, 13 February 1997; Interfax, 2 August 1998; Bellona, 8 April 1997, 7 July 1997, 19 August 1997, 15 January 1998; Thomas Nilsen, Bellona, personal communication, 31 August 1998.

39. Dawson (1995, 1996). The surrogate role of environmentalism was not restricted to non-Russian nationalism or anti–nuclear power protest. For other examples of nationalist mobilization around environmental problems in the perestroika period, see Darst (1988) and Muiznieks (1987).

40. One of the largest of these protests took place in July 1998, when operators from several nuclear power plants marched on Moscow to protest unpaid wages—which had reached 300 million rubles, or about $48 million—and consumer nonpayment for electric energy (ITAR-TASS, 13 and 15 July 1998). There were numerous other instances of operator protests in Russia in the 1990s (*Rabochaya tribuna*, 13 April 1994, p. 1; *Segodnya*, 24 May 1994, p. 2; *Novaya yezhednevnaya gazeta*, 8 June 1994, p. 1; Interfax, 4 and 9 August 1994; ITAR-TASS, 29 November 1995).

41. See, for example, the comments of Russian Communist leader Gennadiy Zyuganov on the eve of the April 1996 nuclear safety summit in Moscow (*Sovetskaya Rossiya*, 18 April 1996, p. 3).

42. Bellona, 15 January 1998; Interfax, 24 February 1998; *Interfax Business Report*, 12 May 1998.

43. *Izvestiya*, 29 July 1991, p. 2.

44. *Izvestiya*, 4 February 1992, p. 8. This version of events was subsequently challenged by reports that the technician in question had been framed as a result of his consistent opposition to the unsafe decisions of the head of computer operations at the plant (*Literaturnaya gazeta*, 3 June 1992, p. 12).

45. Stockholm Sveriges Radio, 30 March 1992; reported in *JPRS Report: Environmental Issues*, 22 May 1992, p. 102.

46. *Izvestiya*, 28 October 1991, p. 2.

47. *Komsomol'skaya pravda*, 4 April 1992, p. 2, and author interviews with Finnish nuclear safety experts, June 1992.

48. *Aftenposten*, 12 October 1993, p. 6; *Hufvudstadsbladet*, 15 October 1994, p. 13.

49. Press reports and author interviews with nuclear safety officials in Finland, Russia, Ukraine, and Lithuania, 1991–1995.

50. Author interviews with nuclear safety officials in Russia and Ukraine, 1992–1995.

51. For a recent example of these activities, see *Süddeutsche Zeitung*, 2 July 1999, p. 5.

52. EBRD Press Release, 17 April 1999; data from the G-24 NUSAC Database, October 1999 (http://europa.eu.int/comm/environment/g24/g24home.htm).

53. *International Environment Reporter*, 24 February 1993, pp. 136–137.

54. *Novaya yezhednevnaya gazeta*, 21–27 May 1993, p. 5.

55. See, for example, remarks made by Deputy Atomic Energy Minister Yevgeniy Reshetnikov (Düsseldorf *Handelsblatt*, 6 July 1993, p. 3), Deputy Atomic Energy Minister Viktor Sidorenko (*International Environment Reporter*, 24 February 1993, pp. 136–137), and Russian Communist leader Gennadiy Zyuganov (*Sovetskaya Rossiya*, 18 April 1996, p. 3).

56. The post-Chernobyl leaders of the RBMK lobby were Yevgeniy Adamov, director of the Scientific Research and Design Institute of Power Technology (NIKIET, formerly headed by Nikolay Dollezhal') and Armen Abagyan, director of the Scientific Research Institute for Nuclear Power Plant Operations (VNIIAES). Adamov and Abagyan stated repeatedly in 1991–1993 that the existing RBMKs in Russia would not be shut down, and they even pushed for the resumption of the development of improved graphite-moderated pressure-tube reactors (press reports and author interviews). The RBMK's supporters were not shy about playing the nationalist card against their opponents. Witness the following statement by Adamov, issued in June 1992 after a group of experts within

the Russian Academy of Sciences called for the early decommissioning of the older RBMKs and VVER-440s: "[T]he initiative for [this decision] does not lie with the Academy of Sciences, but with a number of foreign politicians who are playing a primitive kind of 'double game': There has already been a series of statements in the press about the dangerous state of our nuclear power stations, demands for their closure, and proposals that they be built by Western firms. The aims are clear: to not only remove a competitor, but first and foremost to 'capture' the former USSR's immense energy market" (*Izvestiya*, 26 June 1992, p. 2). Adamov succeeded Viktor Mikhaylov as Russia's Minister of Atomic Energy in March 1998.

57. For more on the international nuclear liability regime, see OECD (1995).

58. *NucNet*, 12 April 1996; *Rossiyskaya gazeta*, 13 May 1996, p. 9; *Nucleonics Week*, 1 January 1998.

59. For more detailed information on the INES scale, see IAEA, "The International Nuclear Event Scale: For Prompt Communication of Safety Significance," WorldAtom web site (http://www.iaea.org/worldatom/inforesource/factsheets/ines.html).

60. ITAR-TASS, 6 January 1993; *International Environment Reporter*, 9 March 1994; ITAR-TASS, 8 April 1996; Bellona, 28 April 1997; *Interfax Business Report*, 5–12 May 1998; *Interfax Business Report*, 14–21 July 1998; *Interfax Weekly Business Report*, 23 February 1999.

61. *INPP Newsletter*, December 1996, December 1997, December 1998, and October 1999.

62. ITAR-TASS, 19 March 1996.

63. *Demokratychna Ukrayina*, 13 April 1996, p. 1; NAEK Energoatom, *Obzor soobshchenii informatsionnykh agentsv po energeticheskoy tematike*, 1998, no. 1 (24 December–9 January) and 1999, no. 7 (10–16 February).

64. Bellona, 14 January 1997, 4 April 1997; Pohjolan Voima Oy press release, 3 November 1997; *Svenska Dagbladet*, 14 January 1998, p. 22; Belenergo et al. (1998).

65. Sweden decided after the Chernobyl accident to phase out the use of nuclear power by 2010. Finland decided to continue to operate its existing four reactors (including the two VVERs at Loviisa) until the end of their normal operating lives, but not to build any new reactors.

66. "Western Leaders Disagree on Soviet Reactor Safety Plan," *Science*, 17 July 1992, pp. 319–320.

67. Yablokov's statement appeared in *New Times*, April 1992; Danilov-Danilyan expressed his opposition to the reconstruction of the RBMKs in *Nezavisimaya gazeta*, 6 May 1992, p. 6.

68. The first pair of four planned reactors at Mochovce, both VVER-440/213s, were nearly complete when work halted due to a shortage of funds in 1991. The proposed EBRD loan for the completion of the first two units came under attack

from two sides: The Slovak government objected to the high cost and the bank's insistence that Slovakia raise energy prices and close Jaslovské Bohunice ahead of schedule, while the government of Austria and Western European environmentalists, who feared an accident at the plant, wanted the project scrapped altogether. Just like their Western counterparts, the Russian and Czech governments arranged for Russian and Czech banks to extend credits to Slovakia for the completion of the plant, provided that most of the money was used to pay for equipment and services supplied by their own firms. Russia put forward $150 million towards the cost of the $850 million project. The first reactor at the Mochovce plant was started up in June 1998.

69. ETA, 8 April 1997; Interfax, 7 March 1998; Baltic News Service, 22 October 1998; Interfax, 12 November 1998.

70. Baltic News Service, 24 December 1998, 17 March 1999, 22 June 1999.

71. Baltic News Service, 17 March 1999, 8 April 1999.

72. According to the European Commission's own polling data, popular support for EU membership in Lithuania dropped from 51 percent to 27 percent in the first six months of 1999. An earlier poll indicated that 80 percent of the Lithuanian population supported the continued operation of the Ignalina plant (Baltic News Service, 9 June 1999).

73. Baltic News Service, 9 August 1999.

74. Baltic News Service, 17, 22, and 27 September 1999.

75. "Postanovlenie Seyma Litovskoy Respubliki ob utverzhdenii Natsional'noy strategii energetiki," 5 October 1999, No. VIII-1348.

76. European Commission, 1999 Regular Report from the Commission on Lithuania's Progress towards Accession (13 October 1999); ETA Economic News Bulletin, 27 October 1999.

77. *Pravda Ukrainy*, 12 November 1991, p. 2.

78. ITAR-TASS, 21 October 1993; UNIAN, 21–23 March 1994.

79. Official pronouncements along these lines came from Nur Nigmatullin, then deputy chairman of the State Committee for Atomic Energy (Interfax, 21 April 1994); Ukrainian President Kravchuk (ITAR-TASS, 25 April 1994); Mykhaylo Pavlovskyy, chairman of the Parliamentary Committee for nuclear issues (Paris AFP, 13 February 1995); Mykhaylo Umanets, head of the State Committee for Atomic Energy (Intelnews, 30 March 1995); Foreign Minister Hennadiy Udovenko (ITAR-TASS, 20 April 1995); Ukrainian President Kuchma (ITAR-TASS, 24 April 1995); Yuriy Kostenko, Minister of Environmental Protection and Nuclear Safety (*Vseukrainskiye vedomosti*, 13 September 1995, p. 6); Prime Minister Yevheniy Marchuk (*Uryadovyy kuryer*, 25 November 1995).

80. *Holos Ukrayiny*, 19 April 1995, p. 4.

81. "Memorandum of Understanding between the Governments of the G7 Countries and the Commission of the European Communities and the Government of Ukraine on the Closure of the Chernobyl Nuclear Power Plant" (Ottawa,

20 December 1995). By this time, Ukraine had already brought the sixth unit at the Zaporozhye nuclear power plant on line, making Zaporozhye the largest nuclear power plant in Europe (*Nuclear News*, August 1995, p. 87).

82. Ukrainian officials voiced these complaints repeatedly throughout 1996. For representative statements, see the comments made by Viktor Tatarynov, head of the International Department of the Ukrainian Ministry of Environmental Protection and Nuclear Safety (Lvov Infobank, 5 June 1996), and by Environment Minister Kostenko (*Kyyivska pravda*, 6 June 1996, pp. 1–2).

83. Interfax, 26 September and 14 October 1996; *Trud*, 8 October 1996, pp. 1–2; *Ecodefense!inform*, No. 100, October 1996.

84. ITAR-TASS, 20 April 1996.

85. *OMRI Daily Digest*, 16 October 1996.

86. EBRD press release, 12 November 1996.

87. *NucNet*, 13 November 1996; *OMRI Daily Digest*, 15 November 1996; ITAR-TASS, 29 November 1996.

88. *Interfax Weekly Business Report*, 11 August 1998; EBRD, *Chernobyl Shelter Fund Newsletter*, No. 3, December 1998; ITAR-TASS, 22 June 1999; Interfax, 7 July and 20 July 1999; Intelnews, 8 July 1999.

89. A few environmentalist groups submitted supporting reports of their own. See Greenpeace, "The European Commission, the European Bank for Reconstruction and Development and the Completion of Khmelnitsky 2 and Rovno 4 Nuclear Reactors in Ukraine" (February 1997); CEE Bankwatch Network, "K2/R4 Completion Projects" (20 March 1997); Friends of the Earth International, "Safety Problems at Rovno and Khmelnitsky NPP: A Preliminary Survey" (n.d.).

90. Interfax, 19 September 1997; ITAR-TASS, 17 May 1998.

91. *Interfax Ukraine Business Panorama*, 15 May 1998; Interfax, 22 June 1998.

92. Intelnews, 18 February 1998; *Interfax Ukraine Business Review*, 20–26 April 1998; ITAR-TASS, 11 and 20 May 1998; *Holos Ukrayiny*, 30 May 1998, p. 6. Parashyn was subsequently dismissed as director of the Chernobyl plant as a consequence of his highly public opposition to the creation of the National Atomic Power Generating Company Enerhoatom. The creation of Enerhoatom united Ukraine's five nuclear power plants (including Chernobyl) into one company, thus depriving the directors of Ukraine's nuclear power plants of much of the organizational autonomy that they (especially Parashyn) had hitherto enjoyed. For Parashyn's and Nigmatullin's competing accounts of the circumstances that led to the former's departure, see *Vechirniy Kiev*, 22 May 1998, pp. 1–2, and *Holos Ukrayiny*, 30 May 1998, p. 6.

93. EBRD Project Summary Document, "Khmelnitsky 2 and Rovno 4 (K2R4) Completion Project, Ukraine," 6 August 1998. At the time of the MOU, the total cost of the K2R4 project was estimated at $1.2 billion. The EU promised a Euratom loan of ECU 400 million, at that time just over $500 million, or about

40 percent of the total anticipated cost. The project's authors envisaged that the EBRD would provide another 31 percent of the total (about $370 million), with the remainder of the financing coming from bilateral import-export banks and Ukraine. The EBRD now stated that it was willing to extend a loan of no more than $190 million in support of the project, now estimated at $1.725 billion, or approximately 11 percent of the total—a sharp decrease from the 31 percent EBRD contribution envisaged in the original proposal. However, a Enerhoatom spokesman expressed confidence that the EU would finance 50 percent of the project through Euratom, the maximum amount that Euratom's revised rules would allow it to contribute (Tobias Muenchmeyer, Greenpeace, personal communication, 20 August 1998).

94. *Khreshchatyk*, 18 July 1998, pp. 1–2.

95. *Nezavisimost*, 11 February 1998, p. 2; *Interfax Ukrainian Business Review*, 20–26 April 1998. By summer 1998, the EBRD's estimated cost for the K2R4 project had grown to $1.7 billion (EBRD Project Summary Document, "Khmelnitsky 2 and Rovno 4 (K2R4) Completion Project, Ukraine," 6 August 1998).

96. Bellona, February 1998, 15 February 1999; ITAR-TASS, 12 August 1998; *Nucleonics Week*, 1 October 1998; Intelnews, 9 September 1999.

97. Interfax, 16 March 1999.

98. Paris AFP, 23 April 1999; *Süddeutsche Zeitung*, 17 June, 2 July 1999; "G7 Statement," G8 Summit Press Release, 18 June 1999; ITAR-TASS, 21 June, 7 July, 8 July, 9 July, 14 July 1999; Interfax, 7 July, 23 July 1999.

99. Interfax, 11 March, 21 April, 29 April, 7 May, 17 June 1999; ITAR-TASS, 15 April, 29 June, 23 July 1999; Intelnews, 9 September 1999; Associated Press, 22 November 1999.

100. Paris AFP, 26 November, 2 December 1999; Interfax, 2 December 1999.

101. The most comprehensive study of the Northern Fleet's radioactive waste problem is Nilsen, Kudrik, and Nikitin (1996). That report, as well as a great deal of information about the state of radioactive waste disposal in Mayak and the Far East, is available at the Bellona web site (www.bellona.no). Russia's radioactive waste problems are also detailed in US Congress (1995).

102. Bellona, 2 July 1997. There is considerable debate about how much radioactivity was released during the Chernobyl accident, but a recent study conducted by the OECD's Nuclear Energy Agency estimated the release of the long-lived isotopes cesium-137 and strontium-90 to have been 85,000 terabecquerels (TBq) and 10,000 TBq, respectively (Nuclear Energy Agency 1995). 95,000 TBq is equivalent to roughly 2.6 million curies.

103. Bellona, 24 April 1998. The same study, which was conducted by highly reputable Russian scientific institutes, found that levels of cobalt-60 outside the Polyarnyy shipyard on the Kola Peninsula had risen 8 times between 1995 and 1997.

104. ITAR-TASS, 30 July 1998. According to Minatom, 65 of the 157 decommissioned submarines had been defueled.

105. Bellona, 8 December 1997.

106. *FBIS Daily Report: Central Eurasia*, 12 November 1993.

107. *OMRI Daily Digest*, 15 January and 8 February 1996.

108. ITAR-TASS, 10 April 1996.

109. The Nikitin case finally went to trial in November 1999, nearly four years after Nikitin's arrest in February 1996. For more details on the case, see the Bellona web site (www.bellona.no).

110. Pasko was convicted of "abuse of office" in July 1999, sentenced to three years in prison, and then immediately granted amnesty by the court (ITAR-TASS, 25 November 1997, 8 February 1999, 22 February 1999, 20 July 1999; Amnesty International Press Release, 20 July 1999).

111. ITAR-TASS, 6 April 2000; Bellona, 1 December 1998, 5 May 1999, 30 July 1999, 4 August 1999, 20 October 1999, 20 March 2000. Between 1991 and 1999, the U.S. Congress provided the CTR program with a budget of $2.3 billion; most of this money was spent on projects other than nuclear submarine decommissioning and local waste disposal.

112. Bellona, 29 September 1999; ITAR-TASS, 9 April 2000.

113. Ministry of Foreign Affairs of Japan, "Japan-Russian Federation Joint Efforts for Disarmament and Environmental Protection," 29 May 1999; Interfax, 30 May 1999. "Suzuran" is Japanese for "lily of the valley."

114. ITAR-TASS, 9 April 2000.

115. Interfax, 30 July 1998.

116. These considerations are not limited to environmental issues. There is also a rich literature in international security studies pertaining to the circumstances under which *military* "nuclear blackmail" may or may not be credible. See, for example, Betts (1987), Schelling (1963, 1966), and Ellsberg (1975).

117. *Nuclear News* 38:9 (July 1995), p. 31.

118. ITAR-TASS, 20 December 1993; Greenpeace, 7 July 1994.

119. ITAR-TASS, 21 January 1993.

Chapter 6: Conclusions

1. Several of the Eastern European states, having encountered economic meltdown somewhat in advance of the newly independent states of the former USSR, successfully pushed their Kyoto Protocol baseline back even further in order to capture the full windfall in emission reductions generated by the collapse of the command economy. Thus, Bulgaria and Romania adopted a baseline year of 1989, Poland a baseline year of 1988, and Hungary—the first of the Eastern European states to undertake serious economic reform—chose as its baseline the average of its emissions in 1985–1987 (UN Framework Convention on Climate Change, "Report of the Conference of the Parties on its Second Session: Addendum," Geneva, 8–19 July 1996).

2. *Moskovskie novosti*, 8–15 February 1998, pp. 6–7; David G. Victor, personal communication, 30 September 1998.

3. Victor, Nakicenovic, and Victor (1998). The Russian government's own official projections are based upon more optimistic economic projections, but still conclude that Russian CO_2 emissions in 2010 will remain well below the 1990 level, even in the scenario that assumes the most optimistic rate of economic growth (Russian Federation 1995).

4. Assuming a moderate rate of economic growth and relatively low permit prices of \$20–50 per tonne of carbon, Victor, Nakicenovic, and Victor (1998) estimate that the value of the Russian and Ukrainian "carbon bubble" could be \$25–50 billion in 2008–2012 (the Kyoto Protocol's first implementation period). Under this scenario, the "bubble" does not burst until 2040, so Russia and Ukraine would continue to reap windfall profits in subsequent implementation periods as well. Former Ukrainian Minister of Environmental Protection and Nuclear Safety Yuriy Kostenko estimated in early 1998 that Ukraine expected to hold "in reserve" approximately 100 million tonnes of its greenhouse gas quota in the Kyoto Protocol's first implementation period, and that prices discussed for the sale of this commodity ranged from \$20 to \$100 per tonne—suggesting a windfall profit to Ukraine of \$2–10 billion in the Kyoto Protocol's first five-year implementation period (*Moskovskie novosti*, 8–15 February 1998, pp. 6–7). The profits to Russia would be several times greater.

5. The Clinton administration suggested in early 1998 that the United States could meet at least 75 percent of its target for emissions reductions through joint implementation and emissions trading (U.S. Government 1998).

6. For recent contributions along these lines, see Boyce (1996); Fairman and Ross (1996); Cortright (1997); Mitchell (1997, 1998); Boyce and Pastor (1998); Bernauer and Ruloff (1999); and Darst (1999).

7. This is particularly likely to be true in bargaining among affluent states operating within a broader environment of close political and economic integration. See Bernauer (1995b, 1996).

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Interviews

I. Officials, Scientists, and Activists in the Former Soviet Union

A. USSR/Russian Federation

Igor' Artem'ev, Chairman, Ecology Commission of the Leningrad City Council. Leningrad, September 27, 1990, June 4, 1991, and July 25, 1994.

Prof. M. E. Berlyand, Director of the Department of Investigation of Atmospheric Diffusion and Air Pollution, Voeykov Main Geophysical Observatory, State Committee for Hydrometeorology. St. Petersburg, July 22, 1994.

Ivan Blokov, Co-Chairman, Partiya Zelenykh (Green Party). Leningrad, November 16, 1990.

Dr. Sergey N. Bobylev, Deputy Director, Faculty of Natural Resource Economics, Department of Economics, Moscow State University. Moscow, June 4, 1992.

Petr K. Bogdanov, Director of the Department for International Cooperation, Ministry of Environmental Protection and Natural Resources. Moscow, July 5, 1995.

Sergey A. Burtsev, Sector Chief, Department of Environmental Impact Assessment, Ministry of Ecology and Nature Resources of the Russian Federation. Moscow, June 10, 1992.

Aleksandr A. Bystrykov, Legal Department, State Committee for the Supervision of Nuclear and Radiation Safety (Gosatomnadzor) of Russia. Moscow, June 15, 1992.

Sergey S. Chicherin, Director of the Division of Air Pollution Monitoring, Voeykov Main Geophysical Observatory, State Committee for Hydrometeorology, July 22, 1994.

Dr. Izrail' N. Davidan, Laboratory Director, Leningrad Division of the State Oceanographic Institute. Leningrad, January 8, 1991.

Aleksey Yu. Davydov, Department of International Cooperation, State Committee for the Supervision of Nuclear and Radiation Safety (Gosatomnadzor) of Russia. Moscow, June 15, 1992.

A. A. Denisov, Deputy Director of the USSR Supreme Soviet Ecology Committee. Leningrad, December 15, 1990.

Sergey V. Dutchak, Deputy Director, Main Directorate of International Cooperation, USSR Ministry of Natural Resource Use and Environmental Protection. Moscow, May 6, 1991.

Prof. Ivan T. Frolov, President of the Philosophical Society of Russia and Director of the Institute of Man. Moscow, June 4, 1992.

Dr. Konstantin G. Gofman, Central Economics and Mathematics Institute. Moscow, June 5, 1992.

Leonid A. Gorokhov, Engineer, Atomenergoexport. Moscow, June 3, 1992.

Evgeniy V. Gorshkov, Leading Specialist, Main Directorate of International Cooperation, USSR Ministry of Natural Resource Use and Environmental Protection. Moscow, May 6, 1991.

Mark S. Goukhberg, Deputy Chief Engineer, Vodokanal St. Petersburg. St. Petersburg, July 20, 1994.

Vladimir A. Gushchin, Co-Chairman, Partiya Zelenykh (Green Party). Leningrad, October 10, 1990.

Dr. Valeriy V. Ikonnikov, Deputy Director, Leningrad Division of the Center for Ecotoxicometry. Leningrad, January 9, 1991.

Dr. Abram I. Iorysh, Sector for the Legal Problems of the Utilization of Nuclear Power, Institute of State and Law. Moscow, May 12, 1992.

Nataliya Ipatova, Journalist, *Smena*. Leningrad, November 27, 1990.

Yuriy G. Ivanov, Deputy Director, Atomenergoexport. Moscow, June 3, 1992.

Igor' S. Izvol'skiy, Ministry of Ecology and Natural Resources of the Russian Federation. Moscow, June 18, 1992.

Tat'yana G. Kazakova, Directorate for International Scientific and Technological Cooperation, USSR Ministry of Foreign Affairs. Moscow, May 7, 1991.

Mikhail Ye. Kokeev, Deputy Director, Directorate of International Scientific and Technological Cooperation, Ministry of Foreign Affairs of the Russian Federation. Moscow, May 15, 1992.

Dr. Evgeniy I. Komarov, Deputy Director, Central Radiological Research Institute of the USSR Ministry of Health. Leningrad, January 3, 1991.

Evgeniy A. Konygin, Director, Centre for Preparation and Implementation of International Projects on Technical Assistance. Moscow, June 28, 1995.

Dr. Yuriy I. Koryakin, Department Head, Research and Development Institute of Power Engineering. Moscow, March 21 and 23, 1991, and May 16, 1992.

Viktor N. Makharandin, Chief of Inspection Department, Committee for Environmental Protection of Leningrad and Leningrad Oblast (Lenkompriroda). Leningrad, January 9, 1991.

Dr. Igor' N. Malyvannyy, Chief Medical Officer, Leningrad Oblast Sanitary-Epidemiological Station. Leningrad, December 7, 1990.

Stanislav V. Markin, Coordinator of Russian Environment Management Program with the US Environmental Protection Agency, Ministry of Environmental Protection and Natural Resources. July 6, 1995.

Irina M. Markovets, Deputy Chairman, Committee for Environmental Protection of Leningrad and Leningrad Oblast (Lenkompriroda). Leningrad, November 29, 1990.

Aleksey V. Mikhailov, Vice Minister, RSFSR State Committee for Ecology and Natural Resources. Moscow, May 15, 1991.

Dr. Andre Yu. Nedre, Leningrad Oblast Committee for the Defense of Peace, Commission on Ecology for Peace. Leningrad, October 16, 1990. Subsequently Scientific Secretary, St. Petersburg Division of the Institute of Environmental Protection. St. Petersburg, May 23, 1992.

Sergey M. Nikiforov, Environmental Centre for Administration and Technology. St. Petersburg, July 26, 1994.

Boris M. Oreshkin, Deputy District Chief, Northern European District, Gosatomnadzor Russia. St. Petersburg, July 28, 1994.

Dr. Evgeniya V. Pastukhova, Department of the Conservation and Renovation of Aquatic Ecosystems, All-Union Research Institute of Nature Conservation and Reserves. Moscow, February 19, 1991.

Prof. Sergey A. Pegov, Chief of Department of System Ecology, Institute for System Studies of the Russian Academy of Sciences. June 28, 1995.

Artur G. Petrov, Chief of Inspection of the Leningrad AES, State Committee for the Supervision of Nuclear and Radiation Safety (Gosatomnadzor) of Russia. St. Petersburg, May 18, 1992.

Sergey Pomogaev, People's Deputy, Leningrad/St. Petersburg City Soviet and Cochairman, "Del'ta" Group. Leningrad, September 17, 1990 and St. Petersburg, May 22, 1992.

Dr. Aleksandr Ya. Pressman, Director, EMEP Meteorological Synthesizing Center-East, Institute of Applied Geophysics. Moscow, April 29, 1991.

Viktor S. Revyakin, Chairman, RSFSR Supreme Soviet Committee on Ecology and Natural Resources. Moscow, May 15, 1991.

Lyubov' Rubinchik, Social-Ecological Union. Moscow, June 10, 1992.

Valeriy M. Rumyantsev, Head of Marine Division, Main Control and Inspection Department, USSR Ministry of Natural Resource Use and Environmental Protection. Moscow, May 6, 1991.

Oleg P. Sadykov, Director, "Promekologiya." Moscow, March 18, 1991.

Nikolai A. Shabarov, Commercial Director, Lenvodokanal. St. Petersburg, May 21, 1992.

Sergey Shelestyuk, Press Assistant to the Director, Vodokanal St. Petersburg. St. Petersburg, May 20–21, 1992 and July 20, 1994.

Anatoliy V. Shevchuk, Chief of the Department of Natural Resource Economics, Ministry of Ecology and Natural Resources of the Russian Federation. Moscow, June 8, 1992.

Viktor Slipchenko, Directorate for Problems of Nonproliferation, Export Control, and Conversion, Russian Ministry of Foreign Affairs. Moscow, May 13, 1992.

Dr. Vasiliy I. Sokolov, Institute of the USA and Canada. Laxenburg, Austria, May 25, 1990; Moscow, February 19, 1991 and June 1, 1992.

Lyudmila I. Suslova, Lenkomekologiya. St. Petersburg, July 26, 1994.

Dr. Roland M. Timorbaev, former Soviet Ambassador to the IAEA. Monterey, CA, April 16, 1992.

Vasiliy N. Tselikov, Leading Expert, Main Directorate of Economics and the Organization of Natural Resource Use, USSR Ministry of Natural Resource Use and Environmental Protection. Moscow, May 6, 1991.

Ol'ga Tsepilova, Institute of Sociology, USSR/Russian Academy of Sciences. Leningrad/St. Petersburg, 1990–1995.

Vladimir V. Tsirkunov, Environmental Specialist, The World Bank. Moscow, July 30, 1995.

Evgeniy Usov, Partiya Zelenykh (Green Party). Leningrad, November 16, 1990.

Rafael' V. Vartanov, Head of Section, Ecology and Ocean Section, Institute of the World Economy and International Relations (IMEMO). Moscow, February 12, 1991.

Dr. Sergey V. Viktorov, Laboratory Director, Leningrad Division of the State Oceanographic Institute. Leningrad, December 23, 1990.

Prof. Nikolai N. Vorontsov, member of Russian Parliament, former USSR Minister of Environment. Moscow, June 19, 1992.

Dr. Galina M. Voropaeva, Laboratory Director, Institute of Limnology, USSR Academy of Sciences. Leningrad, January 9, 1991. Director of the Regional Environmental Problems Laboratory, Research Institute for Nature Conservation of the Arctic and North, Ministry of Environmental Protection and Natural Resources. St. Petersburg, July 7, 1994.

Dr. Svyatoslav Zabelin, Director of the Ecological Department, Office of the Russian Federation State Counsellor for Ecology and Public Health. Moscow, June 8, 1992.

Dr. Aleksandr S. Zaytsev, Deputy Director, Voeykov Main Geophysical Observatory, USSR State Committee for Hydrometeorology. Leningrad, December 4, 1990.

Sergey P. Zalygin. Author, former editor of *Novyy mir*. Moscow, June 18, 1992.

Dr. Ivan M. Zrazhevskiy, Director, Laboratory of the Scientific-Methodological Bases for the Analysis of Air Protection Measures, USSR Goskompriroda. Leningrad, October 24, 1990.

B. Estonia

Allan Gromov, Head of Environmental Protection Department, Ministry of the Environment. Tallinn, May 25, 1992.

Dr. Eva Kraav, Vice Minister, Ministry of the Environment. Tallinn, June 7, 1991 and May 27, 1992.

Dr. Ain Lääne, Director, Water Protection Laboratory, Tallinn Technical University. Tallinn, June 6, 1991 and May 26, 1992.

Dr. Robert Lääne, Manager, Production Technique Department, Eesti Energia. Tallinn, May 28, 1992.

Dr. Mari Lahtmets, Estonian Environmental Research Laboratory. Tallinn, May 25, 1992.

Vladimir Makarov, Chief Engineer, Tallinn Municipal Wastewater Treatment Plant. Tallinn, May 26, 1992.

Peeter Marksoo, Water Department, Ministry of the Environment. Tallinn, May 25, 1992.

Dr. Jüri Martin, Scientific Secretary, Tallinn Botanical Gardens. Tallinn, June 10, 1991.

Andrus Meiner, Estonian Nature Management Scientific Information Center. Tallinn, June 7, 1991.

Dr. Evald Ojaveer, Deputy Director, Institute of Ecology and Marine Research of the Estonian Academy of Sciences. Tallinn, June 7, 1991.

Dr. Avo Reinvald, Institute of Economics of the Estonian Academy of Sciences. Tallinn, May 28, 1992.

Rein Talumaa, Deputy Technical Director, Eesti Energia. Tallinn, May 28, 1992.

C. Lithuania

Dr. Rimvydas Andrikis, Head of the Economics Division, Environmental Protection Department. Vilnius, June 17, 1991.

Valdas Langas, Chief Engineer, Water Protection Board, Environmental Protection Department. Vilnius, June 17, 1991.

Rapolas Liuzinas, Deputy General Director, Environmental Protection Department. Vilnius, June 17, 1991.

Daiva Norkeviciene, Chief Consultant, Foreign Affairs Division, Environmental Protection Department. Vilnius, June 17, 1991.

D. Ukraine

Aleksandr V. Belov, Ukrainian SSR State Committee for the Protection of Nature. Kiev, May 22, 1991.

Sergey N. Bevz, Ministry of Environmental Protection, Department of International Project Implementation. Kiev, June 22, 1992.

Aleksandr S. Bogachev, Ukrainian SSR State Committee for the Protection of Nature. Kiev, May 22, 1991.

Andriy O. Demydenko, Member of Secretariat, Zelenyi Svit (Green World) Environmental Association. Kiev, May 20, 1991.

Andrey Glazovoy, environmental activist and director of ecological group "Unikorn." Kiev, June 6, 1995.

Dmitriy M. Grodzhinskiy, Chairman of the National Commission for the Protection of the Population from Radiation, Verkhovna Rada (Parliament). Kiev, June 7, 1995.

Arkadiy M. Yershov, Representative of Zelenyi Svit from city of Rovno. Kiev, May 20, 1991.

Viktor I. Karamushka, Deputy Director, Department of International Relations, Ministry of Environmental Protection and Nuclear Safety. Kiev, June 9, 1995.

Vasiliy A. Khitak, Ukrainian SSR State Committee for Hydrometeorology. Kiev, May 22, 1991.

Aleksandr Kordyuk, Gosatomnadzor Ukraine. Kiev, June 23, 1992.

Yuriy N. Krokhmal', Gosatomnadzor Ukraine, Legal Division. Kiev, June 23, 1992.

Dr. Valeriy P. Kukhar, Chairman of the Presidential Commission on Nuclear Policy and Environmental Security and Director of the Institute of Bioorganic Chemistry and Petrochemistry, Ukrainian National Academy of Sciences. Kiev, June 9, 1995.

Oleksandr I. Maidannik, Chief of Division of International Relations, Ministry of Environmental Protection. Kiev, June 25, 1992.

Nikolay Shteynberg, former head of Gosatomnadzor Ukraine. Kiev, June 8, 1995.

Aleksandr Smyshlyaev, Head of Nuclear Regulation, Ministry of Environmental Protection and Nuclear Safety. Kiev, June 6, 1995.

Viktor V. Tatarinov, Head of the Department of International Relations, Ministry of Environmental Protection and Nuclear Safety. Kiev, June 7, 1995.

Igor' M. Turyanskiy, Head of the Division of International Economic Relations, Ministry of International Affairs of the Ukrainian SSR. Kiev, May 21, 1991.

II. Western Officials, Scientists, Activists, Advisors, and Program Managers

A. Finland

Barbara Appel, Division of International Affairs, Ministry of the Environment. Helsinki, September 7, 1990 and August 3, 1994.

Pekka Haavisto, Member of Parliament, Green Party. Helsinki, September 6, 1990 and May 8, 1992.

Heidi Hiltunen, Research Fellow, Finnish Institute of International Affairs. Helsinki, August 1, 1994.

Pekka Hynynen, Project Director, Pechanganikel Smelter Project, Outokumpu Engineering Oy. Espoo, May 4, 1992.

Antero Inkari, Secretary General for the Finnish Side, Finnish-Soviet Commission for Scientific and Technical Cooperation, Ministry of Foreign Affairs. Helsinki, September 5, 1990.

Esko Joutsamo, Secretary General, Finnish Society for Nature Conservation. Helsinki, September 7, 1990.

Katarina Koivumaa, Counsellor, Ministry of Foreign Affairs. Helsinki, May 6, 1992.

Hannu Koponen, Deputy Director, Department of Nuclear Safety, Finnish Centre for Radiation and Nuclear Safety (STUK). Helsinki, May 7, 1992 and August 2, 1994.

Jorma Kotro, Project Manager, Nuclear Power Plant Design, IVO Engineering International. Vantaa, May 5, 1992 and August 3, 1994.

Timo Mäkelä, Project Director, East Europe Project, Ministry of the Environment. Helsinki, May 8, 1992.

Dr. Lasse Mattila, Director, Nuclear Engineering Laboratory, Technical Research Centre of Finland (VTT). Helsinki/Espoo, September 7, 1990; May 4, 1992; and August 4, 1994.

Satu Nurmi, Senior Ministerial Secretary, Environmental Protection Department, Ministry of the Environment. Helsinki, September 7, 1990.

Bjarne Regnell, Corporate Advisor on Nuclear Safety, Power Plant Division, IVO Engineering. Vantaa, September 4, 1990.

Pasi Riine, Project Secretary, "Our Common Environment—Forum." Helsinki, May 8, 1992.

Sauli Rouhinen, Secretary General, Environmental Protection Council, Ministry of the Environment. Helsinki, September 5, 1990.

Anneli Salo, Director, Surveillance Department, Finnish Centre for Radiation and Nuclear Safety (STUK). Helsinki, September 7, 1990.

Dr. Pekka Sutela, Special Advisor, Bank of Finland. Helsinki, September 6, 1990 and May 5, 1992.

Erkki Tirri, Project Manager, Nuclear Power Engineering, IVO Engineering International. Vantaa, May 5, 1992.

Ilmari Toumainen, Counsellor, Ministry of Foreign Affairs. Helsinki, May 6, 1992.

Dr. Tapani Vaahtoranta, Finnish Institute of International Affairs. Helsinki, September 3, 1990 and May 7, 1992.

B. Russian Federation

Olav Berstad, Counsellor for Energy and Environment Affairs, Embassy of Norway. Moscow, July 6, 1995.

Nila Bogdan, Mary Carpenter, and Amy McVie, Moscow Office, ISAR. Moscow, June 28, 1995.

Aleksandr Cherdanets, Ecotech International (US Department of Commerce CABNIS project). Moscow, June 26, 1995.

Robin Copeland, United States Department of Energy. Moscow, July 6, 1995.

Theodore E. Devlin, Vice-President, Ecotech International. Moscow, July 7, 1995.

Gene V. George, Chief, Regional Office of Energy and Technology, United States Agency for International Development. Moscow, July 3, 1995.

Jerry W. Knapp, Regional Director, Moscow Office, Environmental Policy and Technology Project, CH2M Hill/United States Agency for International Development. June 28, 1995.

Vladimir Korneev, EU/TACIS Programme. Moscow, July 3, 1995.

Anil Markandya, Senior Environmental Policy Advisor, Harvard Institute for International Development. Moscow, June 27, 1995.

Christine M. Nasser, Environment Advisor, Office of Environment and Health, United States Agency for International Development. Moscow, June 26, 1995.

Viktor V. Nikiforov, Programme Coordinator, Russian Programme Office, World Wide Fund for Nature. Moscow, June 27, 1995.

Stephen Richardson, Project Officer, Know-How Fund, British Embassy. Moscow, July 4, 1995.

Dr. Kevin A. Rushing, Deputy Director and Environmental Health Officer, Office of Environment and Health, United States Agency for International Development. Moscow, June 26, 1995.

Michael Wallace, Natural Resource Economist, Harvard Institute for International Development. Moscow, July 5, 1995.

Laura Williams, Projects Manager, Russian Programme Office, World Wide Fund for Nature. Moscow, June 27, 1995.

C. Ukraine

Jonathan Spaulding, ISAR WESTNIS Program Manager. Kiev, June 9, 1995.

Ties Van Kempen, Regional Director, Ukraine, Belarus & Moldova Regional Office, Environmental Policy and Technology Project, CH2M Hill/United States Agency for International Development. Kiev, June 8, 1995.

III. International Organizations

A. Baltic Marine Environment Protection Commission (HELCOM)

Ulf Ehlin, Executive Secretary. Helsinki, August 5, 1994.

Vasiliy Rodionov, Technological Secretary. Helsinki, September 6, 1990 and May 7, 1992.

Prof. Harald-Adam Velner, Chairman of the Commission. Tallinn, June 10, 1991.

B. European Bank for Reconstruction and Development

Gerry Muscat, Environmental Specialist. London, March 25, 1992.

C. International Atomic Energy Agency

Vladimir Boulanenkov, Legal Division. Vienna, May 21, 1990.

D. Calmet, Waste Management Section, Division of Nuclear Fuel Cycle. Vienna, May 22, 1990.

Mona Dreicer, Radiation Safety Section, Division of Nuclear Safety. Vienna, May 21, 1990.

Ferdinand L. Franzen, Head, Nuclear Power Plant Operational Safety Services Section, Division of Nuclear Safety. Vienna, May 24, 1990.

Morris Rosen, Director, Division of Nuclear Safety. Vienna, May 21, 1990.

Boris A. Semenov, Deputy Director General. Vienna, May 22, 1990.

Robert Skjoeldebrand, Special Assistant to the Director General, Office of the Director General. Vienna, May 21, 1990.

Bernard A. Thomas, Division of Nuclear Safety. Vienna, May 21, 1990.

M. Wilmshurst, Director, External Relations. Vienna, May 21, 1990.

Eugene M. Yaremy, Head, Safety Standards and Co-Ordination Section, Division of Nuclear Safety. May 22, 1990.

D. International Institute for Applied Systems Analysis

Joseph M. Alcamo, Research Scholar, Transboundary Air Pollution Project. Laxenburg, May 23, 1990.

Professor Sten Nilsson, Principal Investigator, Forestry Project. Laxenburg, May 25, 1990.

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