

8

The Environment and Economic Transition

In the face of hunger and cold . . . one can forget all other problems.
—Vitalii Chelyshev, USSR Supreme Soviet environment committee

Your dirt is our dirt and our dirt is your dirt.
—Mariya Cherkasova, chair, Social-Ecological Union

As the states of the former Soviet Union have grappled with the most wrenching social and economic upheaval since the Bolshevik revolution and civil war, political leaders and environmentalists have been attempting to change radically how their societies affect their natural surroundings. The restructuring of environment and resources management outlined in the previous two chapters illustrates the most visible changes taking place. Regardless of the accomplishments of glasnost, democratization, and legal reform, the fate of the environment in the post-Soviet era depends to the greatest extent on the results of the third component of reforms: economic restructuring.

As Mikhail Gorbachev and his successors have discovered, government bureaucracy, entrenched political and economic interests, the pain of cruel choices, and the fear of social upheaval all work as a powerful brake on the reform impulse. Thus, the traditional emphasis on industrial development and the exploitation of natural resources continues to threaten nature, while state-controlled prices promote neither efficiency nor conservation and hamper efforts to regulate pollution through market mechanisms. Meanwhile, funds for environmental protection remain scarce, poor technology and an overworked infrastructure slow the

cleanup process, and structural characteristics remaining from the former Soviet economy slow the transition to market-oriented principles. Finally, with the Union broken up and the economy broken down, policymakers and legislators are forced to overlook the environment while the disruption upsets any well-intentioned environmental plan.

As the post-Soviet societies choose their development paths and decide the fate of their natural environments, they will encounter complex issues, such as pegging the cost of remediation, establishing the social value for a clean environment (often conceived of as a tradeoff between jobs and the environment), choosing development options, determining the appropriate role of technology, and clarifying the implications of foreign investment.

ESTIMATING THE SCALE OF A LONG-TERM CLEANUP

The uncertainty of the process of economic reforms under way makes estimating the cost of a future cleanup impossible. Though hampered by the distorted prices of the Soviet economy, predictions made in the late Soviet era give an estimate of the scale of the financial burden left for the successor states. What is clear is that vastly more resources will be required in the future to make a noticeable improvement in conditions.

According to the 1990 long-range environmental program presented to the Soviet government by USSR Goskompriroda, environmental spending, if continued at the heightened levels of the late 1980s (about 1.3 percent of GNP), was sufficient only to maintain the status quo, or the same rate of degradation experienced before—a condition the agency labeled its “pessimistic forecast.” In contrast, decisively reversing environmental problems would require spending on the order of 7 to 9 percent of GNP—the “optimistic but unreasonable” scenario.¹ Nikolai Vorontsov personally advocated spending on the order of 5 percent of GNP.² Government planners settled on boosting spending substantially to bring it in the range of 3–4 percent of GNP—Goskompriroda’s “moderately optimistic” forecast—and targeted government-backed capital investment for the program at 132–146 billion (pre-price reform) rubles between 1991 and 2005. This worked out to about 9 billion rubles a year (presumably in constant rubles), or about 2.5 times higher than investment levels in 1990. Aleksandr Tsygankov, deputy chairman of the Commission on Emergency Situations that oversaw the program’s development, said that planners aimed at stabilizing environmental conditions by 1995 and bringing pollution down to a “tolerable level” by the

end of the century. From then on, the planners envisioned a general improvement in conditions.³

Although never implemented, the aforementioned program would have claimed over 10 percent of the government's dwindling capital investment budget. In the summer of 1990, however, the team of economists under Stanislav Shatalin (commissioned jointly by Mikhail Gorbachev and Boris Yeltsin) issued their blueprint for rapid economic reform, concluding that the government's environmental remediation program would have required the added conversion of defense industries to producing pollution control equipment amounting to 2 billion rubles a year—a doubtful prospect given the poor performance of the conversion program. Moreover, the financial requirements for retooling Soviet industry to bring it in line with environmental standards would have exceeded all of the government's other social programs, and required "the public's recognition of the expediency of substantially faster progress in the ecological sphere than in other priority areas of socioeconomic development," such as education, health care, and social security.⁴

As the Shatalin team suggested, the pressure to limit spending on the environment to fund these other needs will be fierce. In the years before its demise, the Soviet government assumed new commitments to upgrade the pension system, to increase benefits to handicapped persons and war veterans, and to provide job retraining to displaced workers. These responsibilities have fallen to the republics. Need remains to upgrade the region's neglected healthcare and education systems. The Soviet successor governments also must provide relief to citizens living in poverty; at least one-quarter of the Soviet population lived at or below the poverty line in 1991, even before the imposition of radical economic reforms.⁵ These pressing needs come at a time when the region's new states are facing the rigors of the market and global competition, and politicians are under pressure to maintain subsidies to uncompetitive industries to prevent massive unemployment. Finally, economic recovery eventually will demand massive resources to rebuild the region's dilapidated infrastructure—roads, telephones, and viable water systems. With the breakup of the Union, each individual republic now is responsible for funding its own environmental and social programs. As everywhere in the world, political leaders will have to make some difficult decisions about the allocation of resources and the fate of environmental quality—decisions made even more pressing by the rigors of economic restructuring.

ECONOMIC CHALLENGES IN THE POST-SOVIET ERA

During the Cold War, the Soviet Union ranked as a superpower in international politics, but domestic conditions in many parts of the USSR resembled those of less-developed nations. Environmental problems outlined in Chapters 2 through 5 reflect this dual image: The region must confront problems common in advanced industrialized nations as well as those of Third World countries. As officials contemplate ways to dispose of toxic wastes from high-technology industries and to manage fallout from nuclear disasters at Chernobyl and Kyshtym, they also must find the tremendous resources necessary to extend more basic but essential communal services such as garbage collection and sewage treatment. A tragic aspect of environmental policy decisions in the former Soviet Union is that the debate is not simply one of aesthetics—for many communities, the environmental crisis has reached the scale of a health crisis. In 1990, 4 million people in Belarus, Ukraine, and the Russian Federation lived in areas contaminated by Chernobyl; 5 million inhabitants of rural Uzbekistan did not have running water.⁶

The response to environmental degradation in the post-Soviet world will vary, determined largely by the ability of each successor state to foot its own bill. For most republics, the collapse of the central government resulted in an immediate loss of financial resources, as they were net recipients of investment and subsidized raw materials. Although the polluter-pays systems adopted as part of the overall transition to market economies have helped fund some environmental protection efforts, the high costs of the task combined with the political imperative to cut government spending as part of structural adjustment have hurt overall environmental protection efforts in the post-Soviet era. As a consequence, many republics have been forced to slash even the meager environmental programs they had under the Soviet regime.

Before the demise of the Soviet government, for example, the government of Kyrgyzstan expected to fund three-quarters of its 1992 budget with money from Moscow; by May of that year, it was asking an already strapped Kremlin for a handout.⁷ As his republic lost funds coming from Moscow in December 1991, Tajik President Rakhman Nabiev called for “a large-scale effort” to cut government employment by up to 40 percent across the board.⁸ Despite severe environmental problems in Ukraine and the great personal prestige of the republic’s environment minister, Yurii Shcherbak, the Kiev government sharply curtailed funding for environmental protection in Ukraine in 1992 as a result of budget cutting. The Russian government under Prime Minister Yegor Gaidar also threatened to cut its funding for the environmental protection bureau-

cracy by one-half, and none was allotted to environmental protection agencies below the federal level.⁹

The total cost of the Chernobyl cleanup for Belarus was pegged at 16 billion rubles in early 1992, more than half the republic's annual national income produced.¹⁰ Ukraine also will be hard-pressed to tackle the fallout from Chernobyl as well as the devastation in the Donets Basin in the east and pollution in its rivers and along its coast. The Central Asian republics, because of their large, unskilled labor forces, underdeveloped infrastructure, and poor social services, will struggle to achieve rates of growth that exceed their birthrates. In such a situation, they will have little to spare for environmental protection; collectively, they will look abroad for help. In the Russian Federation, moneys for the already-impooverished system of nature preserves were slashed by 80 percent in 1992, leading officials to approach the World Bank and the U.S. government for emergency funding.¹¹

Indeed, with costs mounting and funds drying up, officials in all of the new republics are in search of outside aid. Admitting that millions of their citizens were condemned to live in contaminated regions with no hope of evacuation or adequate medical care, officials from Ukraine and Belarus were forced to turn to the United Nations and the international community at large for assistance. "There never has been in the history of mankind a technological disaster so destructive and so unprecedented in its consequences for the health and lives of present and future generations and for the state of the environment," read a 1990 appeal from the Ukrainian government to the United Nations.¹² The same year, Belarus asked the UN for assistance in relocating 2 million of its citizens still living in 27 cities and almost 2,700 villages contaminated by the Chernobyl accident: "[W]e have no energy, no transportation, no communications" in the affected regions, said Belarusian ambassador Viktor Borovikov.¹³ In a special address to the UN General Assembly, the head of the Belarusian government requested that the republic be reclassified from a donor country to a recipient of technical assistance.¹⁴

THE DILEMMA OF ECONOMIC PRODUCTION VERSUS ENVIRONMENTAL PROTECTION

Regardless of the volume of foreign aid or domestic spending on the environment, a significant improvement in environmental quality in the Soviet successor states only can be obtained by closing down the thousands of inefficient, dated, and dirty industrial enterprises that are the legacy of Soviet economic development. Given their economic predicaments, however, many republics will be pressured to fall back on the

factors of production with which they were endowed by the past regime, regardless of the environmental consequences. For Turkmenistan and Uzbekistan, this may mean continuing to produce huge quantities of cotton; for Kazakhstan uranium and fertilizers; for Estonia shale oil-generated electricity.

One reason Soviet enterprises are unlikely to be abandoned quickly is the “monopoly problem”: Many goods produced in the former Soviet economy are supplied by only one factory.¹⁵ Unlike Western economies, the ex-Soviet region’s economy lacks surplus production capacity in most sectors and therefore is unable to compensate for plant shutdowns by shifting production to less controversial facilities. Severe shortages of hard currency compounded by an underdeveloped transportation system and large distances to Western markets prevent the rapid replacement of domestic production with imports. The concentration of production also means that the closure of a single enterprise can have a devastating impact on the economy of localities. Large population centers have sprung up around single industries often in isolated and remote locations. Migration in search of jobs is an option for few in the near term because most of the former Soviet Union suffers from an acute housing shortage and an undeveloped housing market and enterprises threaten to shed millions of workers to cut costs.

In September 1990, an explosion at the Ulba Metallurgical Plant in eastern Kazakhstan sent a poisonous cloud of beryllium and beryllium oxide gas over the neighboring town of Ust-Kamenogorsk. In response to public anger, the oblast soviet declared the region an “ecological disaster zone” and voted to close the plant. Yet Ulba reportedly was responsible for 80 percent of Soviet production of rare metals such as beryllium and tantalum, as well as fuel for nuclear power plants.¹⁶ “This is unrealistic,” said the plant’s chief engineer about the decision to shut down the facility. “We have obligations to thousands of enterprises in the Union, not to mention consumers abroad. They cannot get by without beryllium. From an economic point of view, it will be cheaper to build the city in a new location.”¹⁷ After the explosion at Ulba, *Izvestiya* noted: “From a town of 30,000 inhabitants in the 1940s, Ust-Kamenogorsk became an oblast center of 300,000, thanks to its factories. Today the enterprises that gave rise to the city are killing it. The situation is deadlocked and typical of many of the country’s cities.”¹⁸ The massive Bratsk aluminum processing complex exports 40 percent of its output, produced with cheap hydropower generated from the Angara River. “Bratsk has been declared an ecological disaster zone,” noted Vyacheslav Vashanov, a Russian en-



The Nadezhda plant at the Norilsk Mining-Metallurgical Combine is one of Russia's largest and most modern light metal smelters and a major hard-currency-earner for the Federation. For the foreseeable future, Nadezhda (which means "Hope" in Russian) will continue to play a major role in the economic development and environmental degradation of the Russian north. Photo: DJ Peterson.

vironment official, of the city of a quarter million residents. "The local population pays with their health."¹⁹

The breakup of the USSR also radically changed the external economic relations of the region; with the notable exception of the Russian Federation, most of the republics will find themselves in a less advantageous trading position in world markets than they enjoyed in the Soviet system.²⁰ One potential source of hard-currency income for many republics is the development and sale of natural resources. Governments will be under great pressure to increase the exploitation of nature rather than to promote conservation. Several scientists writing in *Izvestiya* in 1990 warned that economic autonomy without sufficient provisions for environmental protection threatened "a clearance sale on nature." The scientists noted that in Central Asia, valuable plants, animals, and minerals already were being sold abroad through official as well as illegal channels. "In the race for hard currency," officials had issued licenses for the export of tons of antelope antlers obtained illegally outside of their territory.²¹ Many local governments in Siberia and the Russian Far East have circumvented Russian environmental codes to negotiate deals directly with Asian companies. Speaking of one deal permitting clear-cutting north of Vladivostok, Aleksei Yablokov claimed that the Kremlin was "virtually powerless to prevent the Koreans from cutting every last tree in Siberia."²² Although many point to the vast mineral wealth of Russia as a sustaining factor, efforts to boost rapidly exports of gas, oil, timber, and metals have depressed global markets for many of these commodities, diminishing returns. During the last years of its existence, the Soviet Union held a virtual clearance sale on its mineral reserves, depressing world prices for zinc, aluminum, gold, platinum, mercury, and other metals.²³ "Our society is in the middle of a revolution," says Yablokov, "and our natural resources are caught in the middle."²⁴

HARD CHOICES: THE CASES OF LITHUANIA, UKRAINE, AND ARMENIA

For aspiring politicians, campaigning on behalf of the environment in the late 1980s was a no-lose strategy; environmentally troublesome enterprises in many of the Soviet republics were censured as evidence of "ecological colonialism" by Moscow. Asserting they were autonomous from the center, local governments responded to public pressures and shut down polluting enterprises in record numbers. The collapse of the USSR foisted new economic and political responsibilities on the successor states, however, changing the priorities of political elites and environmentalists alike. In many cases, nature looks to be the loser. A new

attitude is apparent in republican and regional politics that frequently paints nature as a fungible good to be exploited when the economy or national interest is at stake.

In the 1980s, Lithuanian environmentalists, backed by the Lithuanian national movement Sajudis, challenged the operation of the Ignalina Atomic Energy Station, pointing out that the two operating reactors at the station were of the same design as the one that exploded at Chernobyl in 1986, only 50 percent larger. Antinuclear forces also pointed out that Ignalina lacked automated safety systems found on reactors in the West, that it was subject to frequent fires, and that it was built on unstable soil, causing the foundation of one reactor to subside. In addition, thermal pollution from water used to cool Ignalina's reactors had destroyed wildlife in adjacent Lake Druksiai.²⁵ With support from local authorities, the antinuclear movement forced Moscow to agree to halt construction of reactor No. 3 at Ignalina in 1988, and the movement pressed on with its demands that the plant's two operating reactors be decommissioned.

Attitudes in the republic changed, however. In March 1990, the Lithuanian parliament declared the republic's independence from Moscow. In retribution for this act, Mikhail Gorbachev, newly empowered as president of the Soviet Union, cut off the republic's supply of oil and gas flowing in from Russia. Transport quickly ground to a halt and factories shut down, but the lights kept burning. Suddenly, Ignalina became a pillar and symbol of Lithuania's independence. The plant was not so bad after all: Ignalina produced the equivalent of 30 percent of all electricity consumed in Lithuania. In addition, a share of the energy produced by the plant was exported.²⁶ "The Ignalina problem is still here," an environmentalist told the *Los Angeles Times* in October 1991, one month after Moscow formally handed over control of the nuclear plant to the newly independent Lithuanian government. Said Janos Tamulis, a leader of the Lithuanian Greens and a member of parliament: "It's impossible to shut down [Ignalina] now because the electricity it produces serves Latvia, Belarus, and Kaliningrad. In 1988, that would have been Moscow's problem. Now it's a problem between Lithuania and other countries." Vytautas Statulevicius, founder of the Lithuanian Green movement, put it another way to the same newspaper: "When Lithuania was in the Soviet Union, it was one thing. But now it belongs to us."²⁷

A similar shift of attitude appeared in Ukraine. In the 1970s, Moscow laid out ambitious plans to develop nuclear power in Ukraine to help meet the voracious demands for electricity created by the heavy industries of the republic as well as the Soviet Union's Warsaw Pact allies to the west. As illustrated in Chapter 7, public opposition in the aftermath

of the Chernobyl disaster effectively thwarted the Kremlin's nuclear power development plans in the republic. In August 1990, the popularly elected Ukrainian Supreme Soviet bowed to public pressure and passed a five-year moratorium on all nuclear development projects in the republic. After a turbine fire in the No. 2 power unit at Chernobyl in October 1991, the Ukrainian parliament voted to decommission immediately the disabled unit and called for the two reactors still operating at Chernobyl to be shut down by 1993. Yet despite the republic's tribulations with harnessing the atom, many in Ukraine continue to see nuclear power as an essential energy supply option.

On the eve of Ukraine's independence, nuclear power accounted for over one-quarter of electricity generated in the republic. Ukraine could meet just 30 percent of its electricity needs with domestic fossil fuel resources, the most important of these being high-sulfur coal.²⁸ To fill the large gap in domestic supplies, the republic relied on imported energy—namely, oil from Russia and natural gas from both Russia and Turkmenistan. When Ukraine was a member of the Union, the wholesale price it paid for a ton of oil purchased from Russia averaged 70 rubles in 1991, about the market price of a pack of imported cigarettes.²⁹ In the wake of the collapse of the USSR, Ukraine has had to pay world market prices for its energy imports coming from its unreliable and rather hostile neighbors. As a result of a trade dispute that cut supplies of natural gas coming in from Turkmenistan, Ukraine was forced to turn to domestic supplies of low-quality fuel in the winter of 1991–1992.³⁰

To help meet domestic needs, the Ukrainian government decided to halt electricity exports to Eastern Europe by 1994, sacrificing a valuable source of hard currency pegged at \$1.5 billion annually.³¹ Another option for the republic is to build more coal-fired power plants. But obtaining Ukrainian coal is difficult, dangerous, and expensive—many of the republic's mines are over 100 years old—and the product is dirty. Burning vast new increments of high-sulfur coal, not to mention the disruption caused by increased coal extraction, would devastate an already stressed environment. The republic faces bleak options: "In terms of ecological damage and human casualties, the current cost of the Donbass coal fields outstrips that of the nuclear industry, even taking into account the effects of the accident at Chernobyl," argues David Marples, a Canadian specialist on Ukrainian environmental affairs.³² In 1991, the Ukrainian first deputy prime minister and energy minister both began to say that new nuclear power plants might be needed.³³

Like Lithuania and Ukraine, Armenia faces hard development choices having significant environmental repercussions. After four years of efforts to reduce emissions from Yerevan's Nairit Scientific Production

Association, the Armenian Supreme Soviet ordered the plant to cease operations at the end of 1989. The production of chloroprene-based rubber and latex at Nairit (the only such site in the Soviet Union) had resulted in the yearly release of 3,500 tons of noxious gases into the air over the Armenian capital (1990 population of 1.2 million). Similar topographically to Mexico City, Yerevan is surrounded by tall mountains and is subject to thermal inversions resulting in some of the highest levels of dust, sulfur dioxide, carbon monoxide, nitrogen dioxide, low-level ozone, chloroprene, and lead officially reported in the former Soviet Union.³⁴ Nairit had been the target of protesters who cited official data indicating drastic increases in the rates of cancer, cardiac and respiratory diseases, birth defects, and leukemia. Invoking images of genocide, many opponents of Nairit linked the fate of the plant to the fate of the Armenian nation.³⁵

The closure of Nairit in early 1990 resulted in the lost production of thousands of tons of chloroprene, ammonia, fertilizer, and caustic soda. Moreover, Nairit was a monopoly producer of inputs for various lines of heart medicines, painkillers, and vitamins, many of which disappeared from store shelves across the Soviet Union. Soon after the plant shut down, however, critics began to charge that the closure was responsible for a sharp deterioration in the Armenian economy, including the worsening of food shortages: Armenia had lost an important source of export revenue, and other republics had begun retaliating with trade sanctions for the breaking of supply contracts. Given the difficulty of quickly renovating the plant (its technology dates back to 1941) or raising capital to build a new factory, Armenians have found themselves in a terrible dilemma: Do they threaten their health in order to earn money providing others with essential life-enhancing drugs?

As members of the anti-Communist opposition, many parliamentarians had voted in 1989 to shut down the plant because of its poor environmental record. After the opposition came into power in democratic elections the following year, however, opinions about Nairit changed rapidly.³⁶ During the debates to reconsider its decision, Levon Ter-Petrosyan, chair of the Supreme Soviet, noted that when the parliament had decided to close the plant, "Nairit wasn't ours, we received nothing from it but hell and insignificant compensation; all else went to the Union." Ter-Petrosyan noted that the decision to halt production was made in an effort to coerce the Soviet government into taking a more favorable position on Armenia's dispute with Azerbaijan over Nagorno-Karabakh. This tactic failed—and in the process, the republic sacrificed one of its major exporting industries. The decision had turned Armenia into a "beggar" to the Union with nothing to offer in return, said Premier

Vazgen Manukian. "If we are going to be a nation, we must think about morality and national dignity."³⁷

As protesters chanted "Traitors! Traitors!" in the streets outside, the Armenian Supreme Soviet voted in April 1991 to overturn its decision and to reopen Nairit. In the decision to restart Nairit, the Armenian parliament indicated its intention to take over control of the plant from the all-Union government, implying that it would be better managed under local control.³⁸ Despite assurances that strict measures would be implemented to minimize pollution when the plant was restarted, environmentalists contended that Nairit's performance only had deteriorated as a result of the plant standing idle for over one year.³⁹

Another Armenian plant once closed may also be reopened. In January 1989, the two reactors at the Armenian nuclear power station at Medzamor were decommissioned; the plant had been built in a seismic zone, and the Spitak earthquake one month before had convinced officials in Moscow of the possibility of another nuclear disaster. Plans were under way to convert Medzamor to burning natural gas. In 1990, Armenia began suffering severe energy shortages as neighboring Azerbaijan cut off its fuel supplies in an economic boycott; the two republics virtually were at war over the fate of Nagorno-Karabakh. Frequent brownouts forced the closure of schools and factories in Armenia, and electricity had to be diverted from Georgia and southern Russia, regions experiencing their own energy shortages.⁴⁰

Not only is the Medzamor plant located in a seismic zone, but international experts have declared its two VVER-440 reactors the most dangerous Soviet commercial type because they lack basic safety equipment. Nevertheless, calls for Medzamor to be recommissioned soon could be heard: "The decision of the Armenian and Soviet Union governments to halt the Armenian nuclear power station was hasty, not thought out, and, to say directly, not correct," wrote A. Petrosyants, an Armenian academician. Before Medzamor was closed, the plant's output equaled 40 percent of the republic's electricity needs, and power was exported to Georgia and Azerbaijan. Petrosyants called not only for the two existing reactors to be restarted but for more to be built in the republic: "A sovereign Armenia cannot exist without its own supply of energy."⁴¹

As with the opposition to Nairit, images of genocide have been conjured up by many in Armenia when they speak of the potential threat from a nuclear accident. In response to such a heated debate, the Armenian Supreme Soviet passed a resolution declaring that Medzamor would not be started or any new plants be built in the small republic without a national referendum.⁴² But in an interview published in June 1991, an official at the Soviet Union Ministry of Atomic Power indicated

that Armenia already had requested Moscow to restart the plant on “a temporary basis.” “Their proposal . . . seems strange to me,” said N. Yermakov. “It’s unrealistic and not serious. A nuclear power station is not a samovar [in which] you boil water, drink a little tea, and shut it off.”⁴³ When power outages the following December forced all enterprises in Armenia to grind to a halt, an official announced that the government was going ahead with its plans to recommission Medzamor by the end of 1992, adding that the original decision to close the plant was “mistaken and not thought out . . . made under the influence of emotions.”⁴⁴

THE POTENTIAL BENEFITS OF ECONOMIC REFORM

Despite the hardship presented by the upheavals of political and economic change, the news is not all bad. A transition away from the Soviet model of economic development, if executed, could result in a radical restructuring of the region’s emerging economies. In meliorating the ills of the Soviet economic legacy, reform also presents the potential for improvement of many types of environmental problems. It is impossible to predict the pace of change and the nature of the region’s economy in the future, but one can outline broad trends that are likely to ensue.

For the short term, the impact of radical economic reforms and the ensuing structural adjustment of the region’s economy will have some positive effects on the environment. As mentioned in Chapter 2, economic downturn was responsible for a sharp improvement in atmospheric emissions from stationary sources beginning in 1990. Idle factories also will ease the pressure on the region’s overworked, outdated, and under-maintained power plants—thermal, nuclear, and hydroelectric. Thus, the environment benefits from an immediate depression dividend. Eventually, the region’s economy will rebound, but many former Soviet enterprises are likely to be closed permanently, and this will have long-term implications for the environment. There are several reasons why.

First, the introduction of scarcity-based prices for goods and the end of state subsidies to industries will reduce enterprises’ insatiable appetite for inputs like steel and energy. As illustrated in Chapter 5, the inefficiency of the Soviet economy was manifest in the massive generation of waste; accordingly, the value of a conservation dividend in the former Soviet economy cannot be underestimated. An example of the potential gains to be made from increasing efficiency is demonstrated by the case of energy consumption. Although accurate figures are elusive, the gist of the argument is undeniable: In 1987, the CIA estimated that the Soviet economy produced \$253 of GNP for every barrel of crude-oil equivalent

consumed; the corresponding figures for the United States, West Germany, and Japan were \$341, \$420, and \$604, respectively.⁴⁵ Thus, the Soviet Union used one-third more energy to produce the same amount of GNP as the United States, another country with a reputation for inefficient use of energy.⁴⁶ Other estimates put the energy intensity of the Soviet economy at 50–70 percent above the rate of the United States, or twice that of Western Europe.⁴⁷ Therefore, the less energy consumed, the less pollution goes up the stack. In addition, lower rates of energy consumption translate into less environmental disruption, because less coal, for example, must be extracted, transported, and processed to meet the needs of the economy.

Second, market mechanisms and exposure to international competition will force local producers to improve the quality of their output, thereby ending the propensity in the former Soviet economy to produce high volumes of shoddy output. The shoe industry is an example. In 1989, Soviet factories produced 827 million pairs of shoes, enough to provide every Soviet citizen with three pairs.⁴⁸ Nevertheless, Soviet footwear sat on store shelves, while citizens queued up for days just for the opportunity to purchase one of the 150 million pairs imported that year.⁴⁹ Given the notoriously sad state of Soviet footwear design and quality, one wonders: Who needed so many bad shoes? The higher the shoe quality, the fewer shoes discarded prematurely. The same was true for the 160,000 tons of steel, 143,000 metal-cutting machines, and 532,000 tractors poorly produced in 1989.

Third, the future may see entire economic sectors bankrupted because of their inability to compete on the world market without access to state subsidies and artificially cheap raw materials. As already mentioned, the technology employed in many Soviet enterprises dates back to World War II and before; many firms simply will be unable to compete in the world marketplace. Moreover, research in the West has pointed out that the largest heavy industrial enterprises had become the most reliant on state subsidies under the Soviet regime, and, thus, grew the least efficient.⁵⁰ Just as the U.S. rustbelt saw its aged steel mills put out of business in the 1970s, many of the open-hearth steel mills of the Donets and Kuznetsk basins will be rendered unprofitable when confronted with cheap imports of steel (from the Pacific Rim, for instance).

Fourth, the output of many enterprises will be rendered superfluous for a lack of consumers. The end of the Communist-inspired forced-pace industrialization and the end of the arms race mean that the region's economy no longer will require vast quantities of domestically produced steel, aluminum, petroleum, plutonium, and practically everything else produced by the Soviet economy. Examples of the peace dividend are

numerous: In 1990, the Soviet government shut down the last of five reactors producing fissile material for nuclear weapons at the notorious Mayak plant in Chelyabinsk-40. Military reactors at Tomsk-7 and Krasnoyarsk-26 also have been decommissioned. Nuclear weapons testing was halted at Semipalatinsk in 1991. Cuts in the military's procurement budget resulted in a 66 percent reduction in the output of tanks in 1991, with tank factories in Kharkov and Nizhnii Tagil being shut down.⁵¹ In 1992, the military's High Command revealed that it was planning an "urgent program" to decommission up to 100 obsolete nuclear submarines.⁵² Thus, the environmental impact of the peace dividend will be tremendous; Western estimates pegged the share of total economic output accounted for by the defense sector at up to 25 percent in the 1980s. Moreover, as illustrated by the case of Chelyabinsk-40, defense-related activities proved to be some of the most destructive to the environment. As the ex-Soviet economy deindustrializes and demilitarizes, one can expect to see the development of lower-polluting service and high-technology industries.

Finally, structural adjustment should produce a resurgence of the agricultural sector as higher food prices and the privatization of land create incentives for increased production and investment in the countryside. Price reform will erase distortions in the economy central planning caused, such as incentives to farmers to bury fertilizer as well as the massive waste that claimed up to 40 percent of agricultural output. As pointed out in Chapter 4, farmers began to decrease their use of agricultural chemicals in the late 1980s as a result of reforms designed to increase economic accountability. With time, Russia and Ukraine once again could become major food exporters, using less land and fewer inputs per hectare.⁵³

NEW THREATS OF POST-SOVIET DEVELOPMENT

Although the heavy industrialization drive of the Soviet period proved disastrous for the environment, the postponement of the mass consumerism and living style of the West minimized the damage in many ways. As mentioned in Chapter 5, Soviet-style development, for better or for worse, produced few consumer goods and, therefore, little domestic waste. As a result, the region largely has been spared the burgeoning landfills of the advanced industrialized nations and the littered landscapes of many Third World countries. On a per capita basis, U.S. citizens generated three times as much trash as their Soviet counterparts in the 1980s.

The concentration of industrial development in a relatively small number of large complexes created hot spots of intense environmental degradation, but such development also left vast corridors of territory relatively unscathed to serve as refuges for wildlife. Strict security measures also have left broad swaths of undeveloped land along international boundaries and sensitive coastlines.⁵⁴ Despite the encroachment of poorly managed development, cities remain ringed by greenbelts, and bioindicators like bears, moose, and storks remain common sights, even near urban centers. Many cities obtain their heat and electricity from the same facility (the principle of cogeneration). Urban planners were able to site these plants where needed (often near residential neighborhoods) because there was little “not-in-my-backyard” opposition during the Soviet era. With the application of the latest Western technology, such as combined-cycle turbogenerators, the thermal efficiency of these cogeneration facilities could be raised well above the world average.

Although the Soviet government boosted car production in the 1970s, the private automobile remains rare in the post-Soviet era: In 1987, there was only 1 car for every 22 Soviet citizens compared with 1 car for every 1.8 persons in the United States. As a result, urban landscapes remain uncluttered by ribbons of freeways and acres of paved parking lots. In place of the automobile, city dwellers have benefited from the most extensive public transportation systems available in the world. In 1989, Moscow’s aging subway system carried over 2.7 billion passengers, and Muscovites relied on passenger cars for less than 5 percent of their trips.⁵⁵

A successful economic reform, however, if not mediated by effective environmental protection controls, could spell a second onslaught against nature. Like developing nations in Latin America and Africa, the Soviet successor states are poised to see an explosion in their generation of solid waste, an issue they have not adequately managed in the past. A proliferation of cars would not only choke the existing system of roads and highways but boost levels of urban smog. Economic development is associated with increased energy consumption and, hence, higher emissions of greenhouse gases. Referring to the pent-up demand for consumer goods like large refrigerators, washers, and dryers, the National Resources Defense Council (NRDC) has warned:

If . . . perestroika increases these products’ availability, energy consumption in the residential and commercial sectors could explode. For example, from the end of World War II to 1973, US electricity consumption for residences grew at an average annual rate of 9 percent. The challenge will be to establish a large-scale conservation effort that can reduce or hold energy use constant in this repressed sector in the face of growing wealth.⁵⁶

As the newly industrializing nations of Asia are discovering, an economy growing rapidly at the expense of environmental quality does not guarantee a higher standard of living or ensure long-term prosperity. Reducing environmental degradation is essential to improving public health, reducing the burden on the region's overtaxed healthcare system, and increasing worker productivity. And, as many in the West now argue, the "get rich fast, first" development argument does not hold in the long run, as the cost of remediation of environmental damage often proves more expensive and problematic than does pollution prevention.⁵⁷

The temptation to borrow wholesale the development experience of the West is great—if indeed it is made available. Yet this approach could prove to be as misguided as the Soviet government's wholesale purchases of car plants, oil refineries, chemical plants, and cattle farms in the past. Many commentators in the former Soviet Union consider the West to have solved its pollution problems—despite decades of being told that capitalism spelled the devastation of nature. Indeed, the Soviet media often have painted images of conditions in the West as far more favorable than reality would dictate. Officials express familiarity with the concept of *ustoichivoe razvitie* (sustainable development), but few demonstrate a commitment to its principles. The chair of the Moldovan environmental protection agency represents one of the few policymakers to demonstrate that they are looking beyond the Western experience:

The entire world, the United States, and France, and the FRG, and Japan, and other countries included, are making a fatal mistake today: they are spending intellectual efforts and material resources for purification structures rather than for no-waste technologies, and from the standpoint of preventive measures, that is altogether unpromising. We are trying not to repeat that mistake.⁵⁸

THE ROLE OF THE INTERNATIONAL COMMUNITY

The former USSR, on the one hand, accounts for over one-sixth of the earth's landmass and almost one-quarter of its forest resources, most of which remain virgin, old-growth stands. A vast wilderness of wetlands, tundra, and Arctic coastline supports summer populations of migratory birds from Europe, Africa, and Asia and provides a year-round home to indigenous rare and endangered species like the Siberian tiger, sable, and the snow leopard. The territory includes treasures such as Lake Baikal, the world's deepest fresh-water lake, and the Ob, Asia's longest river. It is in everyone's interest that these resources be sustained. On the other hand, in the mid-1980s, the Soviet economy accounted for 10 percent of

the world's production of chlorofluorocarbons and produced almost 1 billion tons of carbon annually, 18 percent of global anthropogenic emissions. It is in everyone's interest that these emissions not be sustained.

Businesspeople, government officials, and environmentalists traveling and working in the former Soviet area are struck by the great interest expressed in acquiring Western environmental technology as well as know-how in environmental economics and public policy. Indeed, government officials and the public alike see a leading, if not commanding, role for the West in cleaning up the destruction wrought by Soviet rule. This mind-set is characteristic of an attitude that dates back to the time of Peter the Great and represents a lack of faith in the ability of the domestic economy, the technical establishment, and the political system to remedy the situation. Belief in the correctness of things foreign, says Sheryl Belcher of Greenpeace's "Children of Chernobyl" project, is powerful, a view maintained by the notion that "transplanted technology and skills will solve everything." Indeed, when the international organization opened an office in Kiev, many Ukrainians expected Greenpeace to create a new environmental protection agency for the republic.⁵⁹ Ominously, the mood often dips into a paralyzing resignation to the environmental status quo or the desire simply to escape the predicament. As implied by Aleksei Yablokov (see Chapter 1), the notion of an environmental refugee has gained currency.⁶⁰

The lack of confidence in the domestic scientific and engineering establishment—a sector held in the highest esteem in the Soviet period—stems, in part, from such misguided and poorly applied adventures as the Chernobyl-type RBMK nuclear reactor, methods to produce cattle feed supplements from petrochemicals, and the St. Petersburg flood-control dam. Blatant untruths told by scientific officials such as Yurii Izrael' of the Soviet meteorological service only served to further erode the level of citizens' trust. The general public has not, however, lost faith in science and technology and consequently has frequently demanded that foreign expertise be brought in to assess environmental problems in an earnest desire to get at the "objective" truth. In autumn 1988, for example, over 100 children in the western Ukrainian city of Chernovtsy began suffering from sudden hair loss as well as other disorders. The Soviet and Ukrainian governments commissioned several investigations of the matter, but their findings were inconclusive and disputed.⁶¹ Protesting what they said was officials' lack of concern, troubled mothers went on a hunger strike.⁶² As the problem persisted, the public demanded outside help: "The inability of medical personnel and Soviet officials to definitely identify the source of the problem . . . has the local

population in a near panic," noted one doctor visiting from the United States.⁶³ Two doctors from the World Health Organization were brought in, but again their findings were inconclusive.⁶⁴

Similarly, officials have turned abroad in search of expertise to back their agendas. To help cool the fever of radiophobia after Chernobyl, officials have sponsored and publicized international inspections of many nuclear plants. Studies of Lithuania's Ignalina plant and the Nizhnii Novgorod (formerly Gorkii) nuclear-powered city heating station, for example, both returned favorable results.⁶⁵ Eugene Yeremy, a member of the team visiting the Nizhnii Novgorod plant, pointed out that the Soviet government had invited this international commission in an attempt to calm the "severe negative public reaction" of local residents to the project.⁶⁶ The effort was not very successful; the Nizhnii Novgorod city and oblast soviets subsequently voted to scrap construction. Although international expertise is welcomed, local critics have pointed out that such a tactic is often used by the government to find "obliging consultants" when projects are opposed by the domestic technical community.⁶⁷

The potential impact of international organizations is illustrated by the case of Chernobyl. In October 1989, the Soviet government asked the International Atomic Energy Agency (IAEA) to conduct the first independent analysis of public health in those regions contaminated by the Chernobyl accident. The IAEA agreed, noting that its goal was to corroborate data already collected by Soviet experts and to restore the trust of people still living in the affected areas.⁶⁸ When the report was released in May 1991, it was not surprising that the agency, a strong advocate of nuclear power, downplayed the impact of the accident. To the dismay of Ukrainians, Belarusians, and Russians affected by the disaster, the IAEA stated that the Soviet government had overestimated radiation exposures and contended that the accident had not caused widespread illness as assumed.⁶⁹ Criticizing the IAEA for not examining all populations at risk and accusing the organization of a "cover-up," Ukraine's Zelenyi Svit environmental group complained that the study had "compromised the efforts of Ukrainian governmental and nongovernmental organizations to effectively bring international aid to the victims of the Chernobyl disaster."⁷⁰ Ukrainian officials also protested, calling the report "too optimistic"⁷¹ and accusing the IAEA of "deliberately undermining international efforts to eliminate the consequences of the Chernobyl disaster."⁷²

For some functions, such as the disposal of weapons of mass destruction and the cleanup of the defense complex, Western assistance is crucial. This is the intent of the U.S. pledge of \$400 million in 1992, \$25 million of which was dedicated to a new nuclear technology center in

Russia: "We want to help you find new projects . . . applying your skills to the cause of science and peace, rather than forging the weapons of war," proclaimed U.S. Secretary of State James Baker to a group of scientists assembled in the secret city of Chelyabinsk-70.⁷³ The West will have to contribute much more money and technology to the cleanup. As Viktor Mikhailev, director of the Soviet military's nuclear weapons program, commented, without the financing and skills needed to erase the legacies of the cold war, Russia could become "one big Chernobyl."⁷⁴ "They have a hell of a mess on their hands and don't have any good way to clean it up," concluded Thomas Cochran of the NRDC.⁷⁵

Through foreign investment, Western firms can provide many of the technologies and skills essential to modernizing the region's antiquated and inefficient economies, just as U.S. investment in Germany and Japan after World War II helped these countries undertake the rebuilding process. U.S. drilling technology, for example, could yield access to oil reserves hitherto inaccessible with local technology that dates back to the early twentieth century. Western turbine technology could increase the efficiency and throughput of oil and gas pipelines and decrease transmission costs, and imported monitoring and repair equipment could reduce the rate of leakage and accidents. In the end, not only would the environment be better safeguarded, but the oil and gas conserved could be exported to earn much-needed hard currency. Finally, Western entrepreneurs familiar with ex-Soviet design bureaus speak highly of innovative technologies with potential application for pollution abatement and environmental cleanup, which have never been developed because of the obstacles of the Soviet economy. The application of Western capital, production methods, and business know-how could bring many of these technologies to fruition for the benefit of all.

Rendering direct financial and technological assistance to the states of the former Soviet Union is as economically sound as it is ecologically beneficial. Russia has already taken significant steps to reduce domestic sulfur emissions; paying the country to reduce emissions at its metallurgical plants on the Kola Peninsula presents the least-cost means of controlling air pollution in Finland. Helping St. Petersburg and the Baltic states treat their sewage helps Sweden clean up its beaches at home. Western aid to seal methane leaks in gas pipelines and coal mines could reduce the potential for global warming with less expense and disruption than curtailing carbon emissions elsewhere in the world.

Nevertheless, international investment and aid must be rendered in an ecologically sound manner and with extra care taken not to worsen an already tenuous situation. Environmentalism in the former Soviet Union has been strongly associated with national and ethnic awareness, and

environmental degradation proved an effective vehicle for promoting pronationalist sentiments, be it in Lithuania or Russia. A perception that the West has contributed to the devastation only has reinforced the environmentalist-nationalist nexus. To many, like Russian social commentator Valentin Katasonov, Western cooperation often has abetted environmental destruction and threatens to turn the region into "an ecological colony."⁷⁶ The reputation is not entirely unfounded. Environmentalists point out that logging enterprises level entire expanses of Siberian taiga to feed raw wood stock to Japan and Korea.⁷⁷ Pipelines, often built with imported material, carry Siberian oil and gas to customers in Western Europe but spill or leak up to 20 percent of their throughput in the process. Writing in *Pravda*, an economist accused an Odessa ammonia plant built with the assistance of a U.S. firm of turning the northwestern region of the Black Sea into "an ecological disaster area."⁷⁸

The experience of the infamous Astrakhan natural gas condensate processing complex is exemplary. The plant was built with the assistance of foreign firms and was supposed to be equipped with French-made pollution control equipment: "[T]here is no more modern technology in the world today," proclaimed General Director V. Shchugorev. But the construction of the 15-billion-ruble plant was rushed, and by the time its first capacity came on line in 1987, only 14 of 42 pollution control features were installed. Moreover, a belated environmental impact study conducted by the Russian environmental agency found in the plant's construction almost 1,000 defects, the majority of which involved pollution abatement. The results were tragic: On March 1, 1987, four people died and others fell ill as a result of a gas leak. In 1988, the first full year of operation, the plant belched forth 400,000 tons of highly toxic pollutants; that year ambient levels of highly poisonous hydrogen sulfide exceeded air quality standards 243 times. Children in nearby towns were issued gas masks to use when walking to school, and villages inside a 25-kilometer "exclusion zone" had to be permanently evacuated. Production eventually had to be scaled back by up to two-thirds until the proper repairs could be effected, making the plant a chronic money loser.⁷⁹ Although fault for the plant's poor management rests with the Russian side, opposition to the enterprise nevertheless has focused on the facts that imported technology was used and that the enterprise's output is sold on international markets.

Astrakhan is but one example of how the environmental impact of Western businesses will only increase as the Soviet successor states seek to integrate into the world economy and to attract foreign investment. In 1989, a group of academics wrote to *Izvestiya* protesting a Western-backed plan to build five mammoth petrochemical plants to process nat-

ural gas coming out of western Siberia. Government assurances that the 31-billion-ruble joint venture was “absolutely ecology-safe,” they warned, were “intentional lies.”⁸⁰ Lambasting a deal with Chevron Corporation to develop the Tengiz oil field in western Kazakhstan, the usually pro-Western newspaper *Moscow News* asserted, “The contract has been drawn up in such a manner that the corporation can get more than \$100 billion. This country does not get anything like this. Chevron does not take on any serious ecological obligations.”⁸¹ “We are being plainly tricked. We are being robbed through joint ventures,” decried Aleksei Yablokov to Western reporters in 1989. “We have to set up legal barriers. We are not ready for cooperation.”⁸²

In the wake of the collapse of the Soviet regime came announcement of a flurry of new raw materials extraction and processing projects, leading many to believe that a new “Klondike” was about to ensue. “For a long time [Siberian] forests have been locked up because of the political system,” warned Russell Mittermeier, president of Conservation International. “What’s happening is that you’re going to see the Americans, the Japanese—everyone else who needs timber—moving in there like crazy.”⁸³ “The terrifying efficiency of the Japanese and Koreans will devastate our forests and watersheds far more effectively than we Russians are capable of,” asserted Yablokov.⁸⁴ For many regions of the former Soviet Union, the only hindrance to rapid development remains a lack of transport.⁸⁵ A sense that the West is profiteering from the exploitation of the region’s wealth of natural resources while causing irreparable environmental damage could turn public sentiment away from cooperation with and integration into the global community, especially in Russia where attitudes toward the West are particularly fickle. The implications for international politics and security, in turn, could be enormous.

Popular attitudes toward the West and multinational firms often belie a poor understanding of the nature of foreign investment and reveal expectations of international ventures that are patently unrealistic. In 1991, the Russian government passed a law requiring environmental impact studies of development projects involving foreign investment, yet the legislation failed to specify with which regulations investors must comply.⁸⁶ In deference to the evolving ethic of international accountability, many multinational firms, particularly those from the United States, earnestly would like to adhere to local environmental regulations, but these are rarely standardized or transparent. As a result, agreements specifying international firms’ environmental responsibilities must be hammered out in lengthy and arduous negotiations for every project.⁸⁷ As stated in Chapter 5, up to 80 percent of hazardous wastes produced

during the Soviet era were disposed of on the premises of the enterprises that produced them, leading to the potential need for large-scale and expensive cleanups. In such cases, foreign investors simply will shy away from the region unless they are granted indemnity for environmental damage caused by prior management.⁸⁸

Despite these caveats, the West bears responsibility, when possible, not to violate the good faith and hopes of the emerging societies in the region. Pressure must be exerted in the West, therefore, to ensure that all Western firms doing business in the former Soviet Union follow a basic code of environmental ethics. In Europe, this is already beginning to happen: At the June 1990 European Community (EC) environment meeting in Dublin, the EC signed a joint communiqué with the USSR and six East European countries calling for the creation of an EC environmental agency that would be open to non-EC members in order to facilitate cleanup efforts.⁸⁹

Nongovernmental organizations also can play a vital role in monitoring economic development. In 1990, Occidental Petroleum Corporation agreed to postpone plans for a \$200-million polyvinyl chloride plant in Ukraine because of local concerns over the environment. Occidental had planned to use feedstock from an existing Soviet-built plant in the western Ukrainian city of Kalush, but the NRDC in conjunction with Moscow's Social-Ecological Union and Ukraine's Zelenyi Svit conducted an environmental study of the region and found that air pollution emissions from the existing plant exceeded Soviet norms by up to 9 times, while the volume of petrochemicals in a river downstream from the facility exceeded the norm by 6 times. "We're not opposed to the Occidental plant," said Kristen Suokko, the NRDC's program coordinator for the former Soviet Union. "We just think it's a perfect opportunity for [Occidental] to set a model for corporate behavior abroad by helping to solve the environmental problems caused by the existing plant."⁹⁰

For Soviet society, the state of the environment, in physical terms, epitomized the state of the Union. Environmental destruction, added to social, economic, and political stresses, compounded the people's anger and ultimately undermined the Soviet regime. The Soviet Union can be relegated to history, but its *dostizheniya* (achievements), manifest in the legacy of widespread environmental destruction, cannot be easily erased. Will the emerging post-Soviet societies cope with the challenge?

The possibility of a praetorian, reactionary swing driven by hypernationalism is real, given that the nascent post-Soviet states remain highly polarized and volatile and democratic political institutions have yet to be consolidated. Ongoing environmental crises like Chernobyl, Chelyabinsk, Astrakhan, and Aral would only fuel the anger. Jack Snyder, a

specialist in international relations and Soviet politics, argues that the best way to prevent the rise of mass praetorianism and the threat to peace is for the West to create strong political, institutional, and economic ties with the Soviet successor states in order to promote stability and security.⁹¹ The scale of the post-Soviet environmental challenge, in terms of global interdependence, mandates cooperation to support the democratic alternative.

Notes

1. "Gosudarstvennaya programma okhrany okruzhayushchei sredy . . . ," *Ekonomika i zhizn'*, No. 41, 1990, insert page 6; V. V. Prokhorov, "Ekologicheskaya programma—vozmozhny varianty," *Energiya: Ekonomika, tekhnika, ekologiya*, No. 3, 1990, p. 2.
2. N. V. Uspenskaya, "Nuzhna polnaya ekologicheskaya glasnost'," *Priroda*, No. 11, 1989, p. 5.
3. Radio Moscow, May 3, 1990.
4. Stanislav Shatalin et al., *Perekhod k rynku: Kontseptsiya i programma* (Moscow: Arkhangel'skoe, 1990), p. 182.
5. According to USSR Deputy Minister for Labor and Social Affairs Nikolai Cheshenko, nearly 80 million people in the USSR "live close to or below the poverty line." TASS, April 2, 1991. Cheshenko's comments were made at the time of the government's first across-the-board price hikes, and it was not clear if he was referring to conditions before or after the increase. His comments nevertheless reveal the scale of poverty. By 1992, many observers claimed that up to one half of the Russian population lived in poverty.
6. Radio Moscow, July 30, 1990.
7. *Economist*, October 19, 1991, p. 57. In early May, the Kyrgyzstan government asked Russia for 1.5 billion rubles to meet its budget for the second quarter of 1992 alone. Interfax, May 11, 1992, as reported by Radio Free Europe/Radio Liberty (RFE/RL) Daily Report, May 12, 1992.
8. TadjikTA-TASS, December 18, 1991.
9. *Kuranty*, March 12, 1992, p. 4.
10. Belarus Radio, January 17, 1992, cited in RFE/RL Daily Report, January 21, 1992.
11. Steve Raymer, "Cash Needs Precede Forests in Poverty-Stricken Russia," *National Geographic News Feature*, April 1992, pp. 2-3.
12. Associated Press (AP), May 2, 1990; Reuter, May 2, 1990; RFE/RL Special Report, May 12, 1990.
13. AP, June 18, 1990.
14. *Izvestiya*, October 15, 1990, p. 2.
15. Philip Hanson, "The Dimensions of the Monopoly Problem," *Report on the USSR*, No. 17, 1991, p. 6.
16. *Kazakhstanskaya pravda*, September 22, 1990, p. 3; *Pravda*, August 28, 1990, p. 2.

17. *Izvestiya*, November 4, 1990, p. 2.
18. *Ibid.*
19. Personal communication with Vyacheslav Vashanov, Moscow, August 1991.
20. If they were to have traded with each other at world prices in 1988, all of the Soviet republics with the exception of the Russian Federation and Turkmenistan would have had a trade deficit. *Economist*, October 20, 1990, p. 9. See also *Ekonomika i zhizn'*, No. 10, 1990.
21. *Izvestiya*, July 18, 1990, p. 2.
22. Raymer, "Cash Needs," p. 2.
23. *Economist*, October 5, 1991, p. 74.
24. Raymer, "Cash Needs," p. 1.
25. Kaunas Economics Institute, "Urgent Ecological Problems in Lithuania," briefing submitted to the Lithuanian Council of Ministers, November 1988, pp. 16-20.
26. *Moscow News*, No. 13, 1991, p. 5.
27. *Los Angeles Times*, October 2, 1991, p. A1.
28. Ukrainian Prime Minister Vitold Fokin, cited by TASS, February 13, 1991, translated in JPRS-TEN-91-005, p. 33. In 1989, coal accounted for over 76 percent of primary energy production in terms of energy equivalents. Natural gas and crude oil accounted for 19 and 4 percent of energy production, respectively. Ukrainian SSR State Committee for Statistics, *Narodnoe khozyaistvo Ukrainskoi SSR v 1989 godu* (Kiev: Tekhnika, 1990), p. 295.
29. *Pravda*, December 3, 1991, p. 2.
30. R. Caron Cooper, University of California, Berkeley, Energy and Resources Group, personal communication, Los Angeles, May 1992.
31. Radio Kiev, February 18, 1991. In 1991, Ukraine exported 16 billion kilowatt-hours of electricity to Eastern Europe. *Times* (London), March 25, 1992.
32. David Marples, "Future of Donbass Coal Field Reviewed," *Report on the USSR*, No. 18, 1990, p. 18.
33. *Pravda Ukrainy*, April 26, 1991, p. 2; *Financial Times*, October 18, 1991, p. 2. In many ways, the situation in Ukraine is similar to that in neighboring Czechoslovakia. In 1990-1991, Czechoslovakia faced a steep drop in oil imports from the USSR as the result of a decrease in Soviet production. Czechoslovakia's supply problems were compounded by the fact that prices shot up when a new trade agreement forced Czechoslovakia to buy Soviet oil and gas at world market prices using hard currency. As a result, Czechoslovak power plants increased their burning of low-quality brown coal obtained domestically. Meanwhile, the Czechoslovak government has pressed on with its ambitious nuclear power program (based on Soviet technology) despite the misgivings of neighboring countries. Unlike Ukraine on the eve of its independence, the Czechs, and environmentalists in particular, have supported nuclear power as the only viable solution to the widespread environmental devastation in their country caused by a heavy reliance on dirty coal.
34. USSR Goskomstat, *Okhrana okruzhayushchei sredy i ratsional'noe ispol'zovanie prirodnnykh resursov v SSSR* (Moscow: Finansy i statistika, 1989), p. 28; USSR

Goskompriroda, *Sostoyanie prirodnoi sredy v SSSR v 1988 g.* (Moscow: VINITI, 1989), p. 15.

35. Elizabeth Fuller, "Mass Demonstration in Armenia Against Environmental Pollution," Radio Liberty Research (RL) 421/87, October 18, 1987, p. 2; Agence France Presse, October 17, 1987, translated in FBIS-SOV-87-203, p. 63.

36. Valerii Papanian, consultant to Union of Greens of Armenia, personal communication, Kiev, July 1991. See also *Izvestiya*, February 7, 1991, p. 2.

37. *Golos Armenii*, April 23, 1991, p. 1.

38. *Golos Armenii*, April 27, 1991, p. 1.

39. Papanian, personal communication, July 1991.

40. See, for example, *Izvestiya*, February 5, 1991, p. 1, and October 7, 1991, p. 2.

41. *Golos Armenii*, July 11, 1991, p. 3.

42. *Golos Armenii*, April 23, 1991, p. 1.

43. *Pravitel'stvennyi vestnik*, No. 24, 1991, p. 6.

44. TASS, December 31, 1991.

45. The figures are 1987 estimates converted at U.S. purchasing-power equivalents by the Central Intelligence Agency, *Handbook of Economic Statistics, 1989* (Washington, DC: Government Printing Office, 1989).

46. The low overall energy efficiency was in part the result of the relatively large share of the Soviet economy devoted to heavy industry. Nevertheless, as illustrated with a few sectors in Chapter 5, the sectors' efficiency, in terms of various inputs, remained substantially below that of other countries.

47. Christopher Flavin, vice-president, WorldWatch Institute, telephone communication, January 1992. The higher estimates of Soviet energy intensity were based in part on downward revisions of estimates on the size of the Soviet economy.

48. USSR Goskomstat, *Narodnoe khozyaistvo SSSR v 1989 g.* (Moscow: Finansy i statistika, 1990), p. 690.

49. Ministerstvo Vneshnikh Ekonomicheskikh Svyazei SSSR, *Vneshnie ekonomicheskie svyazi SSSR v 1989 g.* (Moscow: Finansy i statistika, 1990), p. 47.

50. Jan Winiecki, "Large Industrial Enterprises in Soviet-type Economies: The Ruling Stratum's Main Rent-Seeking Area," *Communist Economies*, Vol. 1, No. 4, 1989.

51. Central Television, "TSN," November 22, 1991, cited by RFE/RL Daily Report, November 26, 1991; Radio Moscow, December 3, 1991, cited by RFE/RL Daily Report, December 4, 1991.

52. Postfactum, cited by RFE/RL Daily Report, May 13, 1992.

53. Lester Brown and John Young argue that the revival of agriculture in the ex-Soviet world is likely to be slow, given the demise of a family-based farming culture. "Feeding the World in the Nineties," in Lester R. Brown et al., *State of the World, 1990* (New York: W. W. Norton, 1990).

54. Dr. Hartmut Walter, Department of Geography, University of California, Los Angeles, personal communication, February 1991.

55. V. G. Glushkova, "Vazhnye napravleniya ekologicheskoi situatsii v Moskve," in E. M. Pospenov et al., eds., *Problemy uluchsheniya ekologicheskoi*

situatsii i ratsional'nogo prirodopol'zovaniya v Moskovskom regione (Moscow: Moskovskii filial Geograficheskogo Obshchestva SSSR, 1989), p. 72.

56. Robert K. Watson and David B. Goldstein, "The National Resources Defense Council/USSR Academy of Sciences Joint Program on Energy Conservation," *Soviet Geography*, November 1989, p. 731.

57. See, for example, Barry Commoner, "The Environment," *New Yorker*, June 15, 1987.

58. *Molodezh Moldavii*, August 2, 1990, translated in JPRS-UPA-90-056, p. 69.

59. Personal communication with Sheryl Belcher, Kiev, July 1991.

60. Of citizens polled in Russia in the summer of 1991, one-fifth said they would like to change their place of residence because of pollution problems. *Radio Rossii*, July 1, 1991, translated in JPRS-TEN-91-015, p. 63.

61. *Sovetskaya Rossiya*, November 10, 1988, p. 4; *Rabochaya gazeta*, December 5, 1988, p. 3.

62. Central Television, June 23, 1989.

63. Tom Lane, "Scientists Probe Puzzling Childhood Illness," *Healthpro*, Fall/Winter 1991, p. 11.

64. Foreign advice does not always help. Having rendered a judgment on the state of affairs, foreign visitors have reported that their Soviet hosts may disagree, demanding that they be "more frank" and deliver more critical assessments.

65. RFE/RL Special, February 1, 1990. According to Lithuanian environment minister Julius Sabaliuaskas, the study found "no deviations from global construction standards."

66. RFE/RL Special, June 23, 1989. Jeremy noted that the heating plant was of a "very forgiving" design and "basically sound" conceptually, but said that the group did not address the quality of construction, though they made some recommendations for improvement.

67. Comments made at a press conference chaired by Sergei Zalygin and featured in *Izvestiya*, February 9, 1991, p. 3.

68. Reuter, March 7 and May 10, 1990. For a report on the initiation of the project, see *Pravda*, August 3, 1990. As an advocate of nuclear power, the IAEA also had a compelling interest in assuaging the public's fear.

69. *Wall Street Journal*, May 21, 1991, p. A19.

70. Green World, "Ukrainian Greens Outraged over IAEA Report on Chernobyl," press release, Kiev, June 23, 1991. In the study, the IAEA did not examine an estimated 600,000 persons who participated in the cleanup operation or the more than 100,000 people permanently evacuated from contaminated villages.

71. V. Baryaktar, vice-president, Ukrainian Academy of Sciences, and chair, Ukrainian Chernobyl Commission, cited in RFE/RL Special, May 23, 1991.

72. Interfax, May 29, 1991, translated in JPRS-TEN-91-012, p. 60.

73. *New York Times*, February 15, 1992, pp. 1, 4; *Los Angeles Times*, February 18, 1992, p. A1.

74. *Financial Times*, February 18, 1992, p. 1.

75. Reuter, August 17, 1990.

76. Valentin Katasonov, *Velikaya derzhava ili ekologicheskaya koloniya?* (Moscow: Molodaya gvardiya, 1991).

77. The criticism has not been limited to Western capitalists. For a critique of North Korean logging practices in the Russian Far East, see *Komsomol'skaya pravda*, October 21, 1990, p. 3.

78. *Pravda*, March 20, 1990, p. 5. For a report about an Italian leather factory built in Minsk, see *Rabochaya tribuna*, February 1, 1990, p. 2.

79. For reporting on the Astrakhan complex, see *Pravda*, June 17, 1989, p. 1; *Kuranty*, March 12, 1992, p. 4; *Sovetskaya Rossiya*, May 24, 1989, p. 4, March 24, 1989, p. 3, and May 28, 1989, p. 3; *Sovetskaya kul'tura*, March 10, 1990, p. 5; William Freeman, "Environmental Opposition to Foreign Investment in the USSR," U.S. Information Agency Research Memorandum, November 22, 1989, p. 3; Fedor Morgun, "Ekologiya v sisteme planirovaniya," *Planovoe khozyaistvo*, No. 2, 1989, p. 54. See also Boris Yermolaev, "Gazovaya ataka," *Energiya: Ekonomika, tekhnika, ekologiya*, No. 7, 1990.

80. *Izvestiya*, April 3, 1989, p. 2. For more details of the projects and opposition to them, consult Matthew J. Sagers, "News Notes," *Soviet Geography*, No. 3, 1990, pp. 224-227.

81. *Moscow News*, No. 25, 1991, p. 10. A commission assembled by Kazakh President Nursultan Nazabayev to review the project subsequently gave a favorable review of the environmental impact. *Rabochaya tribuna*, July 6, 1991, p. 3. For more coverage of the debate, see *Nezavisimaya gazeta*, June 4, 1991, p. 4, and June 27, 1991, p. 1; *Rossiskaya gazeta*, August 14, 1991, p. 2; *Argumenty i fakty*, No. 25, 1991, p. 1.

82. Reuter, September 15, 1989. For more on the joint venture debate, see *Argumenty i fakty*, No. 32, 1989, p. 2; *Literaturnaya gazeta*, No. 27, 1989, p. 10; and Freeman, "Environmental Opposition."

83. AP, February 14, 1991.

84. Raymer, "Cash Needs," p. 1.

85. For example, in January 1992, Kazakhstan's deputy minister for foreign economic relations, Bolaton Taiyanov, told a group of visiting German industrialists that his government hoped to boost its export earnings quickly to pay off its share of the Soviet debt by exploiting its wealth of natural resources. A lack of transport was the main obstacle, however. *Handelsblatt*, January 24, 1992, cited in RFE/RL Daily Report, January 24, 1992.

86. See the RSFSR law "Ob inostrannykh investitsiyakh v RSFSR," *Ekonomika i zhizn'*, No. 34, 1991, insert p. 7.

87. Kristen Suokko, National Resources Defense Council, telephone communication, July 1991.

88. Writing on the situation in the Czech republic, the country's deputy environment minister noted that the value of an enterprise up for privatization often is established by its "ecological debt." Dr. Pavel Trpak, "Problems of the Ecological Policy of the Ministry of Environment of the Czech Republic," typescript, 1991.

89. Reuter, April 22, 1990.
90. Reuter, May 3, 1990; *Journal of Commerce*, May 4, 1990.
91. Jack Snyder, "Averting Anarchy in the New Europe," *International Security*, Spring 1990.