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THE PRESTIGE OF MODERN TECHNOLOGIES

HOPE IN MODERN WOOD PROCESSING RISES AND FALLS

In the technological dreamscapes of late Soviet specialists, modernization as the means for increasing the industrial productivity played a prominent role. By modernizing industry, they meant, on the one hand, the upgrading of machinery and equipment, and on the other, the more efficient use of raw materials and natural resources. Modernization was frequently used as a synonym for *technical improvement*. Specialists strongly believed in the power of modernization as a long-run technological process that required stimulation and investment, and widely employed the terms *modernization* and *modernize* when discussing machinery, facilities, and technological operations.[1] In particular, in the forestry industry, nature and economy were to be connected through sophisticated technology. Improved technologies were to be put in the service of the mastery of nature, helping to make its exploitation less wasteful through more productive wood-harvesting and wood-processing techniques.

Equipping the industry with new technology and developing new methods of production (such as assembly lines

and the continuous cooking of cellulose, among many others) had been discussed from the first decades of Soviet power and derived from a drive for rapid industrialization. After the Second World War, technological modernization received a new impulse from chemistry, became both a powerful industrial branch in itself and source of useful knowledge to change the approach to wood processing in industry. From the mid-1950s on, chemistry grew to become a crucial component in Soviet plans for building an industrialized and rationalized society, and contributed to the making of modern foods, clothes, furniture, construction materials, and other consumer products. Many specialists believed that chemistry could change patterns of consumption, bringing society up to international standards of material consumerism. Wood played a particularly important role in this transition: it was a material that through chemical additives, promised widened applicability to transform the material world that surrounded people.

By the mid-1950s, chemistry had become part and parcel of professionals' visions of the future development of forestry. Engineers emphasized the use of chemical methods for improving the processing of wood, once again connected to the discourse of rationality in resource use.[2] Chemistry was one of the key clusters of innovation in developed countries in the postwar period, and became one of the main spheres of progress given its potential to change the range of products along with the ways people, industries, and agriculture consumed.[3] Soviet ideologists placed chemicalization into traditional socialist incentives in the struggle for progress and the goal of building a modern society characterized by consumer choice. This type of society would no longer be

dependent on harvests or incapacitated by supply shortages, but instead would consume modern products such as paper and plastic packages and synthetic cloths produced from cheap, highly processed materials that would be easily available. Politicians often explained these improvements as laying the material basis of Communism, a stage of development they sought to reach in the nearest future.

Beyond ideology, the material basis implied an effective way for developing industrial enterprises to improve material life and increase the consumption levels of people. It resonated with the growing emphasis on consumer society as a modern way of life—a model that took root in the United States, and a little bit later, Western Europe. Behind the Soviet rhetoric about reaching Communism, industry positioned consumption as the central driver of the goal to improve living standards, which compared to the prewar and immediate postwar periods, had already expanded significantly. Chemicalization was to increase the productivity of wood as an industrial raw material with a wide applicability in consumer industry and formed part of the modernization solution for the wood crisis. Specialists explained that chemistry provided the tools for achieving the rational and cheaper use of "natural riches" and various industrial wastes because synthetic products, such as silk, were much less expensive than natural ones. A revolutionary method introduced to forestry chemistry, for instance, entailed the manufacture of wood plastic from wood and sawmill waste—a material that could be used in both industry and homes. This signaled part of the "synthetic polymers revolution" in which wood plastic came to be used in consumer industry more widely to manufacture various products. Adding chemicals into wood

processing also helped transform wood into bright white paper and firm viscose cloths, among other products. As the 1970 book *What Chemistry Makes from Wood* explained, the combination of chemicals and wood promised to produce a vast range of goods to furnish the whole apartment and create the material infrastructures to facilitate everyday practices. The book especially provided an interesting example of children's toys made from wood-based semisynthetic plastic, captioning a published picture as "the first meeting with celluloid," describing how a child first encountered a plastic toy manufactured by the chemical forestry industry.[4] In this sense, the toy made from wood plastic was a product of modernity and a desired material object, symbolizing the interaction between humans and technological progress. The chemical industry itself became a large consumer of wood, while chemicalization became an inherent instrument in technological progress and people's comfort.

The consumption of industrially manufactured modern products implied increased demands for raw materials, such as water, meat, stone, sand, and wood. These were conceived as materials of modernity extracted from nature and processed by science and technology to satisfy the standards of modern life. Importantly, wood plastics and other goods could be made not from wood as such but rather alternative resources such as wood waste, thereby demonstrating that chemistry could offer solutions for the wasteful forestry industry. Specialists promoting the modernization model believed that by minimizing waste and increasing the volumes of produced goods, chemical forestry could help solve the problem of wood scarcity. At the same time, the proponents of this solution did not deny the need for the

Figure 5.1 "The first meeting with celluloid." *Source:* Anatoliy Averbukh and Kseniya Bogushevskaya, *Chto delaet khimiya iz drevesiny* (Moscow: Lesnaya promyshlennost', 1970).

colonization and experimental options to solve the wood crisis—the approaches explained in the previous chapters. Many of those who insisted on technological modernization, for example, explained that a chemicalized, mechanized, and automated industry would waste less resources, instead processing more waste and low-quality materials. They thus supported the idea of a no-waste economy, while those who saw the eastern lands as the drivers of economic advancement also hoped to do it efficiently with the use of modern technology. In their professional dreamscapes, chemistry was to serve nature positively, preventing its devastation while allowing for its effective exploitation at the same time.[5] Overall, modernization was to result in more

efficient manufacturing along with the rationalized use of raw materials, and in this way help shield nature from total depletion.

In 1953 and 1960, respectively, the Soviet government issued two decrees that stated the need to close the gap that saw the USSR "lagging behind in the forestry industry," and emphasized the importance of the "struggle for making the industry an advanced branch of the national economy."[6] Following these decrees, the first factory for manufacturing modern papermaking machines was constructed in the USSR in 1964. Such machines had previously only been purchased from abroad. At the same time, while stressing the crucial need to produce world-class paper products, specialists typically referred to Western samples as the standard to reach. Many wrote that in other countries, capitalist and socialist, furniture making and other branches of the forestry industry used numerous chemical products, such as synthetic rubber—materials still in short supply in Soviet industry. For this reason, specialists evaluated the industry as backward, comparing the development of socialist forestry with that of developed economies. They typically attributed this lagging behind to low technical levels along with the absence of cheap, productive, and reliable machinery.

Comparisons between the "advanced West" and "backward Soviets" featured frequently in Soviet industrial language, and in the case of forestry, the problem of more efficient manufacturing met that of resource exploitation and the imperative to save on raw materials. Raw material shortages always presented significant costs to the planned economy due to irregular supplies caused by the poor logistics typical of state socialism. Specialists therefore believed that chemistry could

enable the industry to efficiently manufacture goods to provide the kind of material modernity to state socialism that was evident in capitalist consumer societies.

While chemistry offered numerous possibilities for making consumer products, and specialists underscored the need to invest in forestry chemistry, the manufacturing of some key goods was a source of constant problems. The production of paper and paperlike materials—one of the basic products of forestry chemistry—remained a pivotal issue for Soviet industry during its whole history. Since the Bolsheviks had seized power in Russia, they had tried to solve the problem of shortages of paper, the material required for numerous social and cultural projects such as the literacy campaigns launched in the 1920s. While Soviet leaders proclaimed that the Soviet Union was "the top reading country in the world," and promoted the publication of a large number of books and journals, the industry suffered from a lack of consumer paper. The gap between the political campaigns and technological possibilities was captured by an employee of the Institute of the Paper- and Cellulose-Making Industry: "In order to publish a brochure, we will find the author but will not find paper."[7] Admitting this fact, they stressed the gap between the intellectual capabilities of socialist society and its material infrastructures, and concluded that the way that scarce paper was being used was irrational. In 1955, the average consumption of paper per person was ten times lower than in developed capitalist economies: according to some calculations, while the average in the United States was 162.3 kilograms per person annually, in the USSR it was a meager 12 kilograms per person. Interestingly, some Soviet commentators attributed this gap to the fact that people in

the United States needed more paper for printing advertisements, while "the socialist system of economy and Soviet trade do not require advertisements that the Americans do."[8] Behind this, however, the gap in paper and cardboard consumption was held as a testament to the differing living standards that marked the two societies, and the shortage of paper proved a serious problem in the Soviet economy.

Besides paper, a range of other materials were in constant shortage; in 1970, Soviet industry produced eight times less plywood and two times less fiber desks than did the United States.[9] The same problem applied to the making of packaging, in particular that intended for the food industry. In the West, new forms of packaging were seen as characteristic of modern life, reflective of hygienic and civilized practices. Soviet specialists recognized that the economy would significantly benefit from the availability of cheap and firm packages, and often identified food and other types of packaging as progressive materials. In the 1960s, sanitary towels and other everyday paper products were also seen as modern materials to ease female labor and the life of young mothers. But even by the end of the Soviet epoch, industry could not satisfy consumer demands for these goods. Progressivism in experimentation and professional visions ran up against a scarcity of technological infrastructure, constituting a complicated picture of socialist industrial development and the partiality of Soviet technological modernity. Even at the end of the Soviet regime, few paper boxes were used. A lot of cargo was packaged in wooden bins, which were heavier and more complicated for loading and transporting, requiring more wood in the process. Bread, meanwhile, was usually sold without packaging.[10]

The low level of manufacturing wood-based products nonetheless did not undermine the growth of production and the fact that specialists cared about wood as a rapidly shrinking resource. First, the production of new materials indeed increased compared with the pre-1945 levels, provoking alarmism over shrinking wood supplies. For example, the production of paper before and after the Second World War increased several times, but was nevertheless still not high; in 1940, 2,300 tons of paper was produced per day; 6,400 in 1960; 11,500 in 1970; 14,400 in 1980; and in 1986, 17,600 tons. Yet the volumes of round timber exported abroad were always high. In 1950, the Soviet industry exported 4.4 million tons of round wood; in 1960, it rose more than fourfold; and by 1985, 18.1 million tons were being exported.[11]

Many specialists argued that a higher level of mechanization and automation of industrial operations in forests and the manufacturing of wood-derived goods served as an important prerequisite for making the industry more efficient. Such modernization could help produce more consumer goods while leaving behind less waste from processing wood, thereby reaching the key goal of Soviet industry to produce more goods at lower costs. Industry would cope with the wood crisis by launching better mechanized and automated operations to minimize the loss of natural resources.

A LEAP TO THE FUTURE

In his memoir, *A Russian Journal*, US writer John Steinbeck wrote of his travels to the USSR in 1947. "They [Russians] love automatic machinery," he commented, "and it is their dream to be completely mechanized in practically all of their

techniques."[12] In actuality, the total percentage of mechanization and automation in Soviet industry at the time was pretty low; for example, in traditional industries such as forestry, the level of mechanization of wood harvesting in 1948 was 12 percent, while the loading of wood was almost entirely done manually.[13] In 1962, of fourteen operations in forests, eleven required enormous muscle effort from workers. This not only displayed backward technology but also resulted in higher risks to the health of workers in forests undertaking this dangerous work.[14]

At that time, Soviet specialists clearly recognized that the routine mechanization of works in forests and at factories had significantly increased in developed countries over the last decades. The reference to mechanization as a superpower that could help improve economic developments appeared more and more frequently in Soviet professional and official sources. The Soviet leadership aimed to be part of global trends in automated processes and resolved to follow the world's most advanced countries, primarily the United States, filtering internal development through the lens of technological competition with the West. US technological success in automating industrial operations, particularly introducing automated assembly lines for mass production at Ford automobile factories in the early twentieth century, played a crucial role in inspiring Soviet industrialization. As early as the first decades following the revolution, the Bolsheviks transferred practices of mechanized operations and automated production inspired by Fordism and Taylorism, trying to adapt techniques like the scientific management of labor to the socialist system. Automated assembly lines, as with many other technological achievements of the US economy,

were to produce capitalist fruits on socialist ground and contribute to the building of the material basis of Communism to bring the socialist society into the future. In 1948, Swiss historian Siegfried Giedion published *Mechanization Takes Command* in which he discussed the effects of mechanization on human life, confirming that mechanization had become part and parcel of US and other Western societies. Resonating with Giedion's thesis, one Soviet commentator held that in the United States, mechanization was woven into "the pattern of thought and customs," and significantly transformed the society.[15] In the USSR, full mechanization of the forestry industry was not yet a matter of reality but instead inhabited the professional imagination about future economic and societal development. In this, socialist society was to be part of the global industrialized and technologically equipped society.

While the mechanization levels of industrial operations were still low after the Second World War, specialists increasingly spoke of automation as a leap forward, bounding over the persistent realities of incomplete mechanization. The Soviet type of modernization, as imagined by specialists, was a nonlinear process, in some ways in opposition to the Marxian vision of progress; while mechanization was not yet completed, specialists already saw automation as the means of catching up with the West. As one specialist said, "If we look at US [professional] literature, we will see that all the chemical journals publish research on the use of calculation machines and automation." He insisted that specialists could really be helped not only by mechanisms for heavy forestry operations but also by calculating machines in managing the technological process in the industry and forests.[16] Many

specialists connected automation and technological progress in seeking to increase the amounts of manufactured products and provide a sustainable economic production—while at the same time producing less waste. The central level went in accordance with this expert opinion: the party program of 1961, for example, spoke of the automation of industrial processes as a necessary condition for the transition to the Communist mode of labor. The regime hoped that automation as a step above mechanization would help not just to substitute human muscle with machine power, resulting in higher outputs of cut wood, less wasteful cutting, and more efficient wood processing; it would move the worker away from direct involvement in the production process and to a position of control over automated systems that would take care of production instead.

Automation in the forestry sector, including wood harvesting in forests and wood processing at enterprises, formed part of a much broader history of Soviet computers called electronic calculating machines. In the 1950s, Soviet scientists held impressive positions in cybernetics and developed several research centers that formulated promising solutions about ways to employ computers in economic activities. In the 1950s and 1960s, there were several large-scale projects to create an automated calculation system for the Soviet planned economy. Among them were Anatolyi Kitov's Economic Automatic Management System, Aleksandr Kharkevich's Unified Communication System, and N. I. Kovalev's rational system of economic control. From 1962 until 1970, Viktor Glushkov was the primary architect for the most well-known Soviet project, the National Automated System for Computation and Information Processing (OGAS).

The network was to be built with one main computing center in Moscow that regulated up to thirty local computing centers in city sites of "information flow concentrations," and an unspecified number of regional calculating centers and points of information gathering. OGAS was expected to build "electronic socialism" and network the command economy. Calculating machines were to accumulate and analyze numbers as opposed to people. In this way, automation was expected to offer a path to a technologically progressive future in which the effectiveness of economic production was vastly increased.

Automated technology fostered the techno-optimistic side of socialism and to a large extent was the foundation for the reforms of industrial management launched in the 1960s. The so-called Kosygin economic reform aimed to increase the productivity of industrial enterprises and quality of manufactured products.[17] Starting in the 1960s, many called for the introduction of calculating machines to wood-processing and other industrial operations. The meeting held in 1966 by the Central Management of the Scientific-Technical Society of the Forestry Industry was the first to state the importance of mathematical methods in pulp, paper, and wood-processing industries. They argued in favor of using computers for planning new enterprises and advised on their locations in the country based on scientific methods.[18]

Electronic calculating machines were recommended for planning and intended for the purposes of economic management. As forestry specialist D. I. Teterin wrote, "Calculating machines and mathematics provide excellent opportunities that make automation a new miracle of scientific-technical revolution. . . . [I]n ten to fifteen years the automated systems

will become an essential part of each enterprise like the mechanization of manual labor."[19] From his point of view, this was a crucial step in building a future shorn of muscle labor. It had two other implications for forestry. First, automation promised an important means for technological control over the use of natural resources in forests. Second, automation offered the potential of both technological autonomy and speed: it could quickly transmit data from an enterprise to the central institution, thereby making forest management more effective. In fact, in this sense computers and automated systems corresponded to the will of the Soviet regime to foster technological progress, where technology was seen as a trigger, the subject of admiration, and a sign of progress. It was part and parcel of Soviet optimistic views of the future where positive human-machine relations would form the bedrock of the new society. The project of the aforementioned program of the Soviet Communist Party that began in 1961 specifically declared that the future would herald the merging of mental and physical labor in the production process. As specialist A. Mnushkin wrote in 1961, "On their cultural and technical level, workers of physical labor would reach the level of people working in the intellectual sphere." Automation would transform the worker from a cog within the production machine into an agent who controlled the technological process and thus could better control the use of nature. It would erase the difference between the worker, engineer, and scientific researchers, thereby merging creativity and physical work.[20]

In the Soviet narrative, automation—both in terms of mechanisms and the computer-led management of technological processes—appealed to Karl Marx's idea of freeing the worker from heavy and unhappy labor while offering the

possibility to enjoy the results of creative work. In Marxism, the routine of industrial operations at capitalist enterprises was considered in negative terms: conveyors made workers constantly fulfill the same operations and did not allow them to think creatively. Specialists conceived of capitalist forms of automation in negative terms as well: machines in the service of capitalist purposes produced surplus, but did not free the worker to enjoy the process. Mechanized machines that excluded human force became an independent entity and liberated the person from routine labor due to the self-controlling nature of technological processes. Sophisticated automation, as specialists interpreted it, would make the human the observer and regulator—someone who "stands nearby the industrial process instead of being its major agent." It contradicted conveyor work with its scientific management of labor in which humans became "levers in the machines."[21] Now, the operations were made by machines, and the human was a manager of automated processes, giving machines the right to properly deal with nature and harvest wood.

Forestry specialists translated this idea into their industry. One example can be found in a book stating that due to automation, "the [forestry industry] personnel will be liberated from exhausting routine work and pay more attention to creative work."[22] They saw automated machines as liberators in forestry, one of the physically hardest industries. Due to more complicated professional structures than existed before, specialists proposed to use technologies to free up the labor of not only workers but also managers. In addition, some projects proposed that computers could decrease bureaucracy and increase the efficiency of management in

the forestry industry. Economist N. A. Medvedev wrote in 1973 that each industrial enterprise issued about a hundred reports on annual activities and submitted numerous routine documents to the central ministry, while research and project institutions issued eighty reports per year to the ministry.[23] It required a lot of negotiations, involving personal contacts and corruption deals as well as the involvement of personal networks. Emphasizing automation and the electronic circulation of reports, he concluded that "it is not possible to survive without automation today" because "information is the nervous system of high level"; automation could make reporting and calculation independent of humans as well as their personal interests and mistakes.[24] In forestry, sixteen to eighteen new types of forestry machines were tested annually, and it was believed that three hundred employees who processed data manually could be released from calculation through automation. Specialist D. I. Teterin predicted that calculating machines in forestry would be twenty times more efficient in creating various databases recording the kinds of timber cut along with its size and other qualities, thus avoiding the mistakes, illegal operations, and irrationalities in wood harvesting.[25] Computers could project, create, and test forestry machines in different conditions using the database of natural conditions in industrial forests. Technician V. Z. Gabriel argued in 1986 that the automated system must supplement the traditional procedure of making engineering decisions. He insisted that in these new times, the potential between the engineer and machine had to be realized to make critical decisions much quicker.[26] In forestry, managers wanted to merge the economic calculation and nature to use information technology for calculating and controlling

various stages of exploiting nature, or more specifically, control and manage the exploitation of forest resources.

In the 1980s, the state's faith in the power of cybernetics fizzled, and the government froze the funding and support of some initiatives. There was a concern over whether computers, with their power to transmit and collect information, would break many interactions and steady connections between institutions and individual actors. Even though ideologically the OGAS echoed the Marxist idea about making labor free and creative, it challenged the whole principle of the Soviet planned system, which was heavily based on personal connections and trust. At that time, Soviet computing obviously lagged behind the West. In the 1980s, the OGAS did not have the level of state support it had once enjoyed and became increasingly relegated to the past rather than celebrated as the future. Yet the idea of automation was still firmly connected to notions of progress. In the 1980s, the Soviet Union again planned an all-state program to develop the effective use of calculating machines and automated systems, setting a target for the full automation of all processes by the year 2000. During the whole period, sources replicated this idea: automation was something progressive and extremely important for productive development, but it was still ahead. This technical future seemed as elusive in the 1980s as it did in the 1960s.

Overall, forestry industry authorities and specialists who worked in the sector tried to justify the incorporation of mathematical approaches to production and management in forestry. They aimed to transfer automated systems to the forestry sector believing that it would offer huge boosts in controlling enterprises and the whole sector, increasing

the effectiveness of resource use. The automated system was seen as having the potential to break institutional barriers by making the planned economy more workable, optimizing timber harvesting and use, and collecting data from the testing of new techniques. Being a product of rationality, a concept so beloved by Soviet specialists, the automated system was, however, a failed leap for rationalization in wood harvesting and industrial production.

BETWEEN THE MODERNIZATION AND DEMODERNIZATION OF FORESTS

Different Soviet sources evaluated the practical success of mechanization and automation in the forestry industry differently. In 1953, forestry officials wrote that the "mechanization and automation of production became widely used. The Soviet Union is the best-equipped state in the world."[27] While some individual enterprises were indeed well mechanized, other sources insisted that these claims were clearly exaggerated with respect to the whole industry; in some forestry operations, automation was not at all well developed even in later decades. The differing levels of automation broke the homogeneity of the planned economy; despite inclusion in the centralized system, each enterprise and logging company advanced separate attempts to mechanize and automate with different degrees of success. Because of interenterprise barriers, the experiments in automation undertaken by different enterprises were sometimes developed as if there was no other experience in the country. The central economy that distributed resources to the enterprises did not manage to induce the hospitable conditions required

for each to choose the most promising path for automation and introduction of the most advanced technologies. The industry was characterized by enterprises that both lead and lagged behind—an unevenness that stemmed from the decisions of the center, which were based on how strategic and promising particular enterprises seemed in the eyes of state officials. At the same time, in general, the late 1950s represented a turning point for the forestry industry because both the political center and specialists admitted that in the Soviet Union, the country of "endless" forests, the forestry industry lagged behind the capitalist world. This was the time when two truths met: first, that many new technologies were in operation in other countries, demonstrating the point on the progress timeline where the Soviet forestry industry fell; and second, that introducing them was much too complicated for the planned economy, despite the constant state struggle for global technological leadership.

This also manifested in a conflict between professional visions and infrastructural realities: a desire to leap into an automated future faced practical obstacles caused by the existing infrastructures of the planned economy. Real technological possibilities and limits constrained the dream of automation. In practice, automation at factory operations and wood-harvesting sites did not represent a smooth digital move to Communism. Technological deficiency complicated industrial development, which was one of the central stakes of the Soviet regime. In the 1940s and even 1950s, the lack of mechanization at heavy operations presented a critical problem: the human remained the main lever, the primary cog. Primitive techniques based on human muscle remained pivotal. At some forestry enterprises, for instance,

there remained in service a host of loader people. Engineer Sokrat Punegov described how even at a new Kamennogorsk papermaking factory built in 1949, there was no mechanization of papermaking operations in later decades. Many enterprises, and especially those that functioned in factory-based settlements, organized training for specialists on automation and control in local colleges. For enterprises, this was the only way to acquire qualified specialists as the labor turnover at Soviet enterprises was high. Sometimes up to half of the workers changed workplaces at an enterprise during the year, partly because of poor working and living conditions, and partly because forest labor remained largely seasonal. Punegov was disparaging of the level of those he called "homemade" specialists in factory-based monoindustrial towns, yet also criticized those who graduated from industrial training and industrial schools in larger cities; while they were better trained, they did not want to move to work and live in small monoindustrial settlements.[28] In forests, workloads were heavy and remained largely based on manual labor, even though new techniques were introduced such as tractors, saws, and logging trucks. At the same time, sources are replete with stories that indicate it was typical for Soviet enterprises to be equipped with outdated machines, and many struggled to acquire new techniques. Additionally, new automated and semiautomated lines frequently did not have repair details; in 1963, for example, a line in the Ural'sk logging company did not work for two months because of a broken pump and the absence of a spare.[29]

There was another contradiction in the Soviet type of modernization that lay between the new techniques and lack of skilled labor. There were different opinions about

what was to be the central force of progress: machines or humans. On the local level, enterprises suffering from shortages of resources were often more interested in employing excessive numbers of workers than investing in technological reequipment. At the Chepetsk logging company in the 1950s, for instance, an enterprise characterized by low levels of mechanization, thirty-seven workers continued to load timber even as mechanization could reduce that number to twelve workers. Frequently during winter, the company stopped production and used all workers to clean snow and repair mechanisms in place of their direct production responsibilities.[30] While equipping enterprises with new techniques was a problem of the shortage economy, the enterprises were in many senses addicted to using larger numbers of workers than needed so as to always have sufficient quantities of labor. For many producers, human labor was more reliable than techniques: it was possible to use the utmost economic potential of human labor.

Modernization was in fact slow in Soviet industry and often described not as a matter of the present but instead a prospect of the future: it was through the modernization of techniques and technologies that the modern future was to be arrived at faster.[31] When one commentator wrote, "We have so much to do in the future," he meant that specialists should invest more in technologies that were weak in Soviet industry.[32] Supporting the modernization solution for creating a sustainable system of wood consumption, many specialists nevertheless still believed that humans should be assisted, and accused engineers and workers of indifference toward new techniques. The aforementioned Punegov emotionally portrayed new Soviet paper machineries as "virgin

creatures" and Soviet workers as rude abusers. He complained of the rudeness of workers when they were dealing with new techniques: "Each machine can be *abused* by unskilled and unprepared cadres, and then it will not compensate the costs even though having significant economic potential."[33] Even as it appeared brash, similar criticism could be found in other publications. A lack of labor was not, as such, the most determinant problem for the Soviet economy but rather the lack of qualified and stable labor. Engineer V. Zelenin spoke in 1963 about the Bisert' logging company of the Sverdlovsk region where the first Soviet semiautomated line for cutting, sorting, and loading timber was set up. He described these lines as sophisticated machines that should be treated carefully by well-qualified and specially trained specialists. But these lines were too slowly used for full capacity, he said, because they are serviced by "sporadic people" who had only received cursory training.[34]

Technology was a means to transform raw materials into ready-made products, and Soviet producers wanted to derive as much benefit as they could from it. The principle contained in the phrase "we have to acquire total efficiency from the new techniques" (*Ot novoi tekhniki—polnuyu otdachu*) was widely disseminated in the Soviet Union. Workers often overexploited the techniques, meaning that they used machines at the highest-possible speed and capacity to produce the required amounts of products. The other side of the coin, however, was the underexploitation of techniques. For example, specialists complained that automobiles and tractors, the main productive force in logging companies, were used for only 50 to 60 percent of their total capacity because they were outdated.[35] Techniques were expected to offer everything they could to most effectively use the forest, and

through this sacrifice, to realize Communism. Interestingly, the state tried to regulate this by giving prizes for a solicitous attitude to techniques. There was a tension between those specialists who thought that new techniques were required for future progress, and those who were suppressed by the plan and did not invest in learning how to work with new and more sophisticated techniques. These two poles of interaction with techniques showed how modernization and tradition merged in forestry, bringing together progressive thinking about technology, on the one hand, and old-fashioned practices, on the other. Factory newspapers often stressed that workers were unwilling to invest in self-education, but poor living and working conditions in many places of the forestry industry, high rates of labor turnover, and the suppression of the plan explained the reasons for this attitude. Progressivists complained that "introducing new techniques is slow because of egoistic love of old techniques. We must look progressively; if the old techniques are backward, we have to throw them away and introduce new techniques."[36] This simple logic, presented at the party meeting of the logging trust Sevzaples in 1955, was important: it was not unusual for Soviet production to run on old machines. An engineer of the Svetogorsk pulp and papermaking plant, I. Plakhov complained of the "firm opinion that we should not introduce new techniques [in the industry]." He specified that two production units of the same enterprise had polar attitudes toward the new techniques.[37] This seems to have been rather a personal choice, but it shows that the technological drive of the state did not always find unanimous support at the bottom level.

It is probable that some feared that the machine would come to substitute the human and therefore they continued

relying on human muscles in forests and at industrial enterprises. Even in the age of rapid technological changes and dreams, in which human-machine relations were a driving force for the management and development of the forestry industry, human factors remained the priority when looking at the level of enterprises. As some specialists said, "We fulfilled the plan, taking huge pains" (*prilozhiv mnogo usiliy, plan vypolnili*). Others stressed that "not banner resolutions and declarations but cadres, humans, define the developments of the techniques."[38] If cybernetics relied on equality in human-machine interactions and freeing labor from routine work, forestry workers and engineers (with the exception of those I identify as progressivists who proposed the modernization solution to the wood crisis) still saw the human factor as decisive. L. Ross, the head of the Technical Management of the Forestry Ministry, observed once that "our engineers and technicians are not worse than Canadian, Swedish, and French. And it is a pity that overall productivity in [the West] is two to three times higher."[39] In opposition, progressivists relied on new technologies; for them, the human factor was to enhance the operations of techniques, which in turn served the Soviet economy. Yet in the 1980s, up to half of all operations in the forestry industry were still done manually.[40] In 1984, the forestry industry remained an industrial branch where the level of mechanization of forestry works was only 40 percent. Specialists referred to this fact in explaining the slow reforestation and ineffective use of forest resources.[41]

By the end of the Soviet period, modernization did not transform into a full-fledged driving force for the efficient development of socialist forestry and remained a matter of

progressive dreamscapes. As in the imperial and experimental solutions, implementing mechanization and automation required not only professional approval but also state action, political will, and serious financial investments. The role of the state was ambiguous, though: while insisting on the importance of technological improvement, it did not fully complete mechanization and automation both because of a lack of funding and the resistance that emerged at some enterprises that emphasized the dominance of humans. The planned economy thus developed a complicated environment where successes in the mechanization of forest work and some industrial processes at particular enterprises coexisted with the continuation of manual labor. Both coevolved with the progressivist picture of the future. At the same time, attempts to improve technology for better exploiting forests were sparked by the desire among specialists to decrease the amount of forestry waste and wasteful cutting, and improve the inefficient production chain. Machines and automated equipment were expected to run forests with greater precision and accuracy than humans could, and sought to make workers and specialists supervisors of industrial processes. This contributed to industrially embedded ecology, showing how progressive technologies were to participate in saving forests due to a more careful and accurate approach to them. As a space of modernizing and demodernizing practices, the forestry industry gave room for thinking about progressive technologies as more efficient tools for keeping forests sustainable, even as many of these were not effectively implemented.

The Green Power of Socialism

Wood, Forest, and the Making of Soviet Industrially Embedded Ecology

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