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REED BECOMES WOOD VALUE

INDUSTRIALIZING "HOMELESS" PLANTS

It was not only waste products that specialists saw as offering alternatives for industrial wood supply. The industrial potential of straw and annual plants, they argued, had also not been fully utilized. Reeds or phragmites (*kamysh*, quite frequently also called *trostnik* in Soviet sources) are perennial grasses that spread in warm parts of the world and grow in river deltas. In the Soviet Union, they covered large tracts across Ukraine, the south of Russia, and Kazakhstan. Local dwellers traditionally used this plant for constructing houses and making forage for cattle. In the framework of the search for more rational resources for industrial production, annual plants showed great promise, with a chemical structure similar to wood, and could be used for cooking and manufacturing paper. Annual plants formed one component of the experimental model that specialists proposed as a solution to the wood crisis, and many suggested that they could provide a sustainable industrial supply of raw materials. In the context of late Soviet industrial development, new materials could, on the one hand, serve as a remedy for depleting industrial forests, and on the other, offer a more modern and

economically efficient attributes. Reed was plentiful, seemed to be easily harvested, and was applicable for a wide range of industrially manufactured consumer products, such as low-quality paper and cardboard. It promised another avenue to acquire cheaper industrial material because its processing reduced time for industrial operations. Indeed, from an economic perspective, reed was cheaper than wood; in 1955, the input costs for making one ton of cardboard from reed were about 8 percent less than what was required to make the same amount of cardboard from wood.¹ And compared to wood, it was much more sustainable: while trees took at least fifty years before they reached a suitable size for industrial use, reed regrew every year.

The first attempts to use annual plants in manufacturing various consumer goods were made well before state socialism in the nineteenth century. In particular, some Russian manufactures used straw, old cloths, and fishery nets for making paper as early as in the nineteenth century, as was also practiced in other countries (especially Germany). In the early 1870s, industrialist M. A. Putikov established a paper manufacturing site in Astrakhan' in the south of Russia to recycle old ropes and fishery nets. The production remained quite limited, however—there were only nineteen workers and two steam-making machines—and the facility shut down in just a few years.² Such a small production was designed for manufacturing low-quality paper to supply unforested regions where industrial wood was in short supply. Initiatives similar to Putikov's had reduced production cycles because of the size of manufacture and did not operate for long. In the 1930s, some Soviet specialists spoke in favor of using similar materials in industrial production, but

this project did not develop either, owing to weak technological infrastructures at Soviet cellulose and papermaking enterprises. The deficit of paper was obvious at that time, but the government tried to solve it by increasing the existing capacities of wood consumption along with annexing several cellulose, papermaking, and wood-processing enterprises after the Second World War from Finland, the Baltic states, and Japan.

In the 1950s, specialists suggested that experiments with alternative resources were a more progressive solution than the extensive enlargement of wood-based enterprises. Reed in particular was seen as a promising material in terms of industrial value and became the center of interest when many specialists spoke confidently about how modern industry had the appropriate technologies to process the material. Unlike earlier initiatives that had remained local in scope, these new enterprises were large-scale and state led. Postwar industry had a strong economic interest in industrializing annual plants as an alternative to industrial wood, most immediately to supply the southern regions of the country. Revived as a nation-scale idea, late Soviet enforced industrialization saw alternative resources as modern materials.

The prospect of having a rapidly replenishing raw material was not only a matter of technological experiments made by specialists but also attractive for high-level officials who were interested in achieving more voluminous production at lower costs. In the context of the Cold War and East-West competition in consumer production beginning in the 1950s, reed and other alternative raw materials particularly mattered: they were seen as the key to making an efficient system of the industrial consumption of natural

resources, decreasing deforestation due to the enhancement of industrial production, and fostering a more sustainable use of forests. At that time, the search for more economical raw materials and alternative sources of energy became pivotal too.

Specialists spoke about the huge economic potential of reed as a source of numerous manufactured products. Engineer V. Mudrik, for example, calculated that one ton of reed could yield two hundred kilograms of feeding yeast, more than three hundred cubic meters of fiberboards, up to four hundred kilograms of cellulose, four hundred kilograms of paper, or up to six hundred kilograms of cardboard. This list measured the value of natural resources with a consumerist lens and presented modern materials in demand, especially cardboard, a crucial consumer material used for packaging food, shoes, and other consumer goods. As Mudrik proudly concluded after evaluating the stocks of this prospective plant, "This is what reed can really give us. It is thus a very valuable plant that simply grows in many our regions."³ In his work, three ideas are particularly important in revealing the new meanings attributed to reed as a natural resource for industry. First, he mentioned an economic *value*, the term that defined a resource of nature as a participant in the economic process. Reed, not yet involved in the Soviet production, carried a *potential* benefit and yet remained excluded from the industrial cycle, thereby waiting to be involved in the action. Second, he noted that reed grew abundantly in many regions, mainly in the south of the Russian Republic, Kazakhstan, and Ukraine. As in the case of forests, reed availability was connected to notions of natural riches and economic abundance. Unlike wood, however, it was seen as

growing more quickly and so was more economically profitable. As in case of forests, many stressed the imperial character of this natural resource when speaking about quantities: "The USSR has the largest squares of reed, which is the most valuable raw material that had significance for people's economy. It is the time now to reconsider our attitude toward the reedbeds."⁴ Third, this view was similar to the professional outlook of waste: through the discovery of technical possibilities and recognition of the wood crisis, previously unutilized material gained a specific economic value and came to be tied to hopes for more rationalized industrial processes in the future. This sense of gained value exemplified a shifting model of industry-nature relations and involved "new" resources in the industrial chain to increase manufacturing where traditional wood was insufficient. At the same time, many stressed the enormous role of reed in industrial production: they saw it as an alternative remedy for easier harvesting and a way to foster a stable base for supplying numerous enterprises with raw materials. Saving forests from depletion therefore emerged alongside productivity aims as a by-product of the industrialist vision of nature.

Reed was just one example that emerged in the multiple searches for alternative materials. In the mid-1950s, many specialists sought technologies to efficiently transform alternative resources into new industrial raw materials. The publication of books and brochures that claimed to have "discovered" new types of materials boomed. In general at that time, engineers and scientists working at different institutions discovered new characteristics of raw materials. For instance, a few engineers at the Leningrad technological institute for the pulp and papermaking industry reported

on experiments with new types of pulp at the Kherson pulp plant in Ukraine, explaining that new sources, including aspen wood, were progressive.⁵ Aspen was not widely used in industry, but it offered appropriate qualities for increasing everyday consumer modernity; toilet and other sanitary papers made from that wood species were milder and cheaper, and so more readily available to consumers.⁶ Specialists used the word *recycling* (*perepabotka*) when speaking about both recycling wastepaper and processing the annual plants used in industry. They saw plants as having definitively changed their meaning from waste—in terms of their potential value and something previously not demanded by the industry—to an industrial material. Technology was to industrialize plants never before used in production at a large scale. Reed was thus elevated from domestic to industrial use.

EXPERIMENTING WITH NATURAL MATERIALS

In June 1955, the minister of the paper and wood-processing industry, Feodor Varaksin, and his vice deputy, Nikolay Chistyakov (a multiply awarded Soviet official and forestry specialist), decreed that the industry would conduct scientific research on reed, which grew abundantly in the delta of the Volga. There were some immediate investigations of the region conducted by local scientists and engineers in Ukraine on the decree from the political center. In particular, in 1955 the Ukrainian branch of Giprobum, the key planning institution of the paper industry, undertook research on reed in the region. Its main revelation was that phragmites formed one of the most widespread plants “stretching

from the tropics to the polar circle” and were an industrially appropriate raw material. This was a positive conclusion that once more replicated the image of the Soviet Union as a country abundant in natural resources; “reed,” the Ukrainian branch wrote, “grows almost in every republic of the Soviet Union and covers huge squares [swathes]. In the Asian republics [of the Soviet Union] alone, mainly in the Kazakh SSR, the square of clumps is about two million hectares.”⁷ In other words, the Soviet Union was not only full of wood, oil, gas, coal, and other well-known natural resources but also reed, a long-neglected source of industrial value.

In Russia, reed grew in the deltas of the Volga, Kuban', and Don, in the lower course of the west Siberian plain on the bank of the Irtysh, Ob', and Yenisey, in the Novosibirsk and Omsk regions, in the Far East, and in Ukraine in the lower course of the rivers Dnieper, Dniester, Danube, and others. Specialists often reported on these geographies as holding national riches underfoot that could be extracted more easily than cutting wood, and could provide quicker manufacturing and cheaper products of the equal quality. Hence resources that offered alternatives to wood were given priority as the levels of their consumption remained miserably low. Using other natural resources instead of cut wood was to become a matter of urgency. As the ministerial report on the investigation of Volga natural resources in 1955 claimed, the “annual harvest of reed in the Soviet Union makes up, according to the most *humble* calculations, more than thirty billion tons, from which the economy currently consumes just a miserable portion.” The report also referred to Khrushchev's speech in which reed was heralded as “a wonderful material.”⁸

The 1955 report explained that local people in the regions covered with reed had been the main consumers of this plant, which they had used for construction, fuel, and heating their homes, utilized as a natural alternative to wood, coal, and peat, which were all lacking in supply. The document demonstrated that the ministry was particularly concerned with the sustainable growth of reed to facilitate continuous industrial production. As the report said, “The question about the regrowing of reed is important, especially because we have knowledge about the Korean and Chinese experience of destroying reed after harvesting” (the report provided no detail about that experience, however). It warned, for instance, that the construction of new hydro-power stations in the delta of the Volga could damage reedbeds. What it proposed, in fact, was translating local values of reed into industrial scales, converting limited uses into voluminous manufacturing. The ministry sent a request to industrial institutions in the south of Russia asking them to examine the existing practices of harvesting and growing reed. One replied that according to their observations and talks with local users, the “annual harvesting of reed not only does not hinder but instead favors the sustainable growth of reed.”⁹ The report concluded that the sustainable growth of reed could provide a resource base for industrial development.

In 1955, the Institute of the Paper- and Cellulose-Making Industry requested that the ministry send its specialists into a few countries that had some experience using alternative resources instead of wood. It requested a visit to East Germany to study the technology of cooking straw used in the city of Wittenberg, inquiring about sending “the whole

brigade” there as the USSR had no experience of developing such technologies. The institute also proposed sending specialists to China—to examine how the Chinese cooked pulp from annual plants, such as reed and rice straw—and Italy, the Netherlands, and Sweden to study *if* there were similar experiences and “collect the maximum of materials for choosing the most advanced technology for processing annual plants.”¹⁰ Documents show that Soviet institutions did not have a clear vision of foreign enterprises that used alternative nonwood materials but rather *implied* that industrially advanced economies potentially could develop these projects. Archives do not reveal if these travels really took place, but Soviet specialists saw foreign industries as effectively using natural resources, which for them meant extracting the maximum benefit that these resources could give. Importantly, specialists had theoretical rather than practical knowledge about using reed and sought out any experience abroad. They did not mention the prerevolutionary experience, despite some czarist scientists having previously examined and described reed. As early as 1840, for instance, G. Kuzmishchev described the huge reedbeds of the Volga and their economic application in heating brickmaking factories in Astrakhan’.¹¹ Yet Soviet specialists were particularly interested in the large-scale industrial use of reed, evidencing a break with the pre-Soviet past.

In 1956, a group of Soviet specialists from several institutions of the Russian Republic and Ukraine traveled to Romania. In the report they wrote on their return, they noted that they had established contact with all the administrative employees and institutions that worked on the use of reed in industry. Soviet specialists visited reedbeds in the delta

of the Danube, a cardboard-making factory that was under construction to process reed, and a factory that produced harvest and transport machinery. What the Soviet delegates found in Romania was similar to what had existed in the Soviet Union at that time: there was no ready reliable reed-harvesting machinery in use; Soviet visitors, they evaluated, had better expertise and had more thoroughly investigated the qualities of reed as compared to their Romanian specialists. As they wrote in their report, "Our group, to the extent our knowledge allowed, tried to help Romanian comrades to see weak points in projecting and constructive use of machinery and mechanisms."¹² Comparing Romanian and Soviet research, they also admitted that Romanian construction was slow, the technology for using reed they chose was not "progressive," and investments became a heavy burden as they significantly increased because of the low productivity of the project. Contrary to this experience, many volumes published in the 1950s and 1960s about reed and its industrial potential enthusiastically talked about the Romanian experience and perspectives.¹³ Interestingly, Soviet institutions tried to include the industrial use of reed and other annual plants as a topic for investigation within joint research initiatives of the socialist bloc.

Despite strong enthusiasm about the potential of reed, ministerial producers admitted that harvesting the material was complicated primarily by technical factors: reed grew in water, which required new equipment. In the 1950s, the industry in fact harvested less than 20 percent of all growing reed because of, as reports explained, a lack of machinery. Some wrote that "it evokes hesitation about the sustainability of raw material base [from reed]." They also questioned

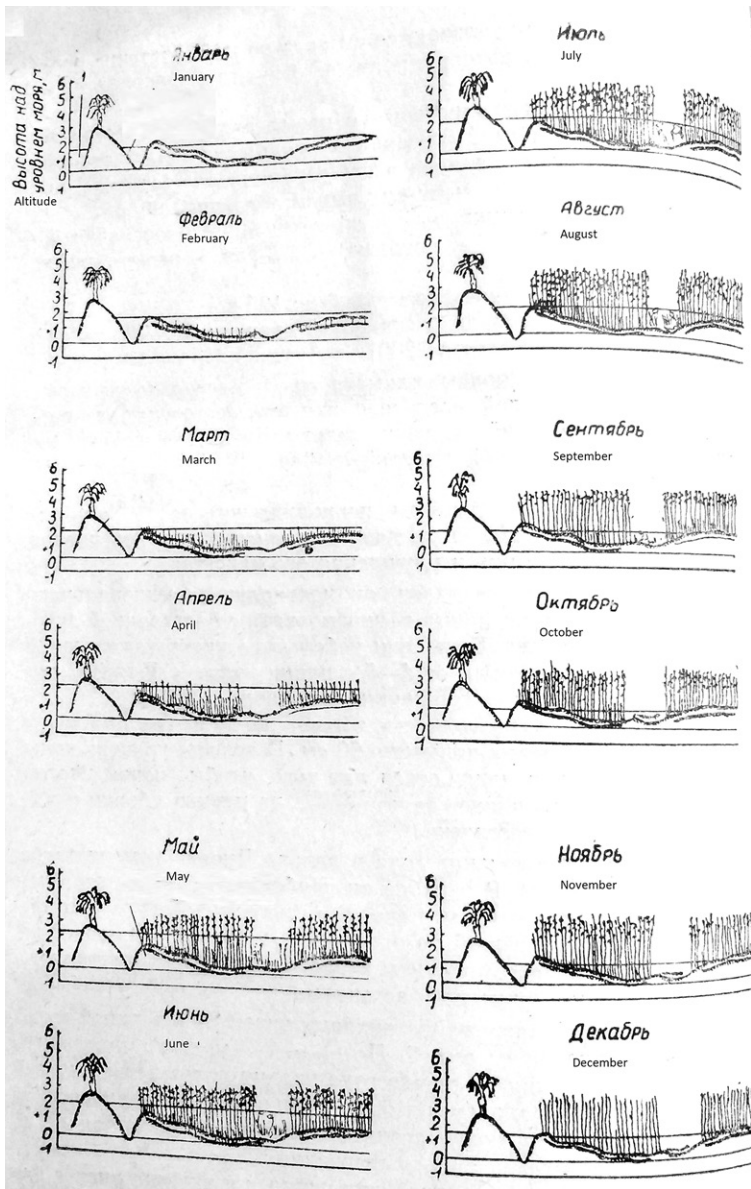


Figure 4.1 Soviet scheme depicting the growth of reed from January to December. Source: F. F. Derbentsev and A. F. Grishankov, *Zagotovka i khranenie trostnika v Rumynskoi narodnoi respublike* (Moscow: B.i., 1959).

the reed's capability to regrow every year if it was industrially harvested. The expert warned that the situation was even worse in the areas of the future Ismail and Kherson pulp plants, which were projected for construction to manufacture paper from reed. Soviet-constructed harvester machinery was instead a danger for reed, they believed, because of its poor quality and heavy weight.¹⁴ In addition, there arose typical problems around storage: harvested reed, stored in the open air, was often drenched by rain, thereby preventing its use for industrial cooking.¹⁵ Ministerial specialists complained that the authorities issued decrees but did not investigate anything in detail before making a decision.¹⁶ As Feodor Kuteinikov, a senior researcher at Institute of the Paper- and Cellulose-Making Industry, said in 1960, "Until now we did not have any reliable experience of intensive exploitation of reed and did not have scientific data on how reed could grow again after planting, so this complicates the construction of machinery and mechanisms for planting it." When looking for solutions, the ministry proposed the idea of attracting local dwellers to harvest reed—mainly fishers living in the region. If the local population used reed for its own purposes in decades past, now the ministry defined its reedbeds as "zones of industrial exploitation." At first, industrial harvesting implied that manual labor still would be practiced. It was calculated, however, that the average worker could harvest five hundred kilograms of reed manually during an eight-hour working day. Consequently, the ministry estimated that to harvest all the reed of the region to fulfill the plan, the incredible amount of twenty-five to thirty thousand seasonal workers would be required.¹⁷ In 1962, the state-led harvesting of reed constituted twice the

amount that locals achieved altogether during the year. To organize the large-scale harvesting, the ministry employed more than seventeen hundred permanent workers and more than five thousand seasonal ones. Thus while large numbers of people were involved, this was still less than was required to substitute mechanical operations with manual labor.¹⁸

Until that point, the ministerial harvesters had never had any experience of growing reed, while local workers did not have any experience of the industrial growing of reed. The main differences between the industrial and domestic use of reed lay in scale as well as types of storage for the harvest. The domestic harvest of reed was on a much smaller scale and undertaken with more care, as dwellers harvested it manually and did not use heavy machinery, which could destroy the shoots. Soviet-made tractors used for agriculture were heavy and not appropriate for working in water. The purposes of industrial harvesters were ambitious, though: the ministry proposed to grow what it considered more 'progressive' types of reed (e.g., Mediterranean reed), which it believed had a higher productivity and could produce more voluminous harvests. Yet this proposal was left unrealized.

The project of using annual plants revealed a tension between, on the one hand, the imagined picture of the progressive use of reed as an alternative to wood supply for unforested regions, and on the other, practical implementation, which suffered from a lack of skills, knowledge, and technological infrastructure to use the material industrially. The initiative to industrialize annual plants was a reflection of modern industrial processes when greener production mattered as a rationalized practice. Despite obvious problems with reed harvesting and the lack of relevant knowledge

about it, the Soviet leadership launched the construction of a network of enterprises to process this new and, as many still believed, promising material.

INDUSTRIAL BUILDING IN THE SOUTH

In 1963, G. Asteryakov, the head of the factory committee of the newly built pulp and paper plant in Astrakhan' in the south of Russia, wrote that the enterprise was "new in all senses. . . . A big life came to the shores of the delta of the Volga [River]."¹⁹ Historical sources attribute the decision to create a network of industrial enterprises to process annual plants to political will at the highest level, which supported professional proposals for the use of reed. In the early 1960s, one political memoir explains, Khrushchev and the former minister of the forestry industry and vice president of Gosplan, Georgiy Orlov, were flying over the delta of the Volga. Orlov asked Khrushchev to look out through the airplane window at the vast areas covered by reed, noting that it might be a good place to construct a large pulp and paper plant. Inspired, Khrushchev immediately gave an order to Alexey Kosygin, the head of Gosplan, to build such a plant near Astrakhan'. Kosygin expressed his hesitation, stating that Gosplan had already approved the list of new plants to construct. He also said that he never heard about manufacturing pulp and paper from reed. But Khrushchev insisted on immediate construction. After a short squabble, Kosygin conceded and the plant was built.²⁰ The Soviet leadership came to include reed as a raw material in the five-year plan. As Khrushchev said in one of his official speeches in 1963, "Reed is *profitable*: today you cut it and then the next year it

will grow again."²¹ He stressed that the industrial potential of reed had been underestimated and this was the reason for primitive methods of harvesting. Through the political lens, reed was thus an industrial miracle to supplement wood that was costly for the south. In the course of rapid industrialization in the 1960s, three enterprises were constructed in the Russian, Ukrainian, and Kazakhstan republics. Among the projected enterprises were several more in the southern part of the country: the Astrakhan', Kzyl-Ordynsk, Ismail, and Kherson plants.

Soviet planners aimed to build a network of reed-based enterprises to launch the cheap and sustainable production of pulp, cardboard, and low-quality paper from annual plants in unforested regions in the south. The harbinger was the aforementioned cardboard-making factory (later enlarged into the pulp and cardboard-making plant) in Astrakhan'; its construction was launched in the early 1960s. It was completely equipped with Finnish machinery, such as special cookers for reed.²² The construction of the Ismail pulp factory near Danube in Ukraine began in 1963. In addition, the Kherson pulp plant was built in Tsyurupinsk in Ukraine by the mid-1960s. The construction of the Kzyl-Ordynsk pulp and cardboard-making plant also started in Kazakhstan in 1964. In addition, a few more similar enterprises were projected for the coming decade. All of these projects were part of industrial exploration of the southern regions of the country, echoing the unspoiled lands campaigns where exploring was held as more crucial than long-term planting on new lands. The plan was grandiose: to launch at least four enterprises fully supplied with reed to satisfy the needs for paper and other products in the unforested south. Specialists

believed that the cost of the construction would be returned in just one year due to the fact that products made from reed would be much cheaper than those made from wood and the production itself would be more sustainable.

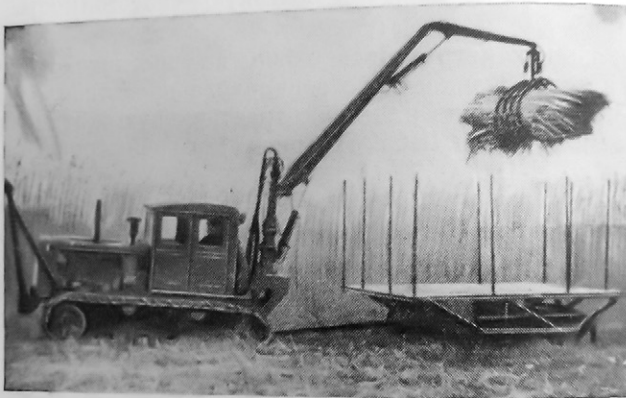
Yet the question of reed availability in the future was among the most pivotal since the initial days of the construction. Many reports drafted by ministerial and research experts concluded that the real availability of reed at industrial scales was a bigger problem than the promising perspective anticipated. Paradoxically, these pessimistic prognoses were advanced simultaneous to the construction and the enthusiastic praise espoused for the potential of reed by political leaders. Thus the 1962 expert conclusion on the general harvesting scheme in the Astrakhan' region insisted that the amounts of reed were not sufficient to satisfy all industrial needs.²³ Specialist Zaitsev wrote that the change of the raw material base had been caused by intensive building on the banks of the Volga, which became a fully regulated river controlled by a cascade of hydropower stations, leading to a change in the hydrologic regime of the river. This decreased the quantities of reed available for making cardboard and meant its further degrading. As Zaitsev concluded, artificial interference in the river would lead to the loss of the industrial potential of reed and the enterprises built nearby. The industrial potential of reed was most crucial for him, and he measured the environmental destruction from the perspective of the capacity for industrial production. For example, the Kakhovsk and Kremenchugsk water reserves, opened as exemplars of Soviet industrialization, flooded the reedbeds: "The experience of harvesting reed with machinery in flooded areas showed that the damage increased by

50–60 percent.”²⁴ The main problem lay in the fact that the constructors could not build lighter machines and the weight of the mechanisms they had available destroyed reedbeds. The paradox was in the fact that lighter machines were not usable in the delta of the Danube because their low-capacity motors and other weaknesses led to frequent breakdowns. The percentage of decimated reed roots in some cases exceeded 80 percent after chain tracks flattened and treaded the plants. The reedbeds ruined by the tractors could only be revived after several years.²⁵ Because the harvesting proved so damaging to nature, specialists suggested ridging and irrigating—forms of technical construction to prevent the flooding of reedbeds and increase productivity. They hoped that it would increase the harvest, doubling the yield of each hectare, but the project itself was costly.²⁶ Attempts to launch cheaper production chains of traditional wood-based products from alternative raw materials thus devolved into an expensive quagmire since the harvesting and cooking of reed required expensive machinery, infrastructures, and technologies.

In 1961, the ministry built special agricultural and biological stations in Tsyurupinsk on the Dnieper and Ismail on the Danube to investigate reed, particularly its harvesting and regrowth. In the early 1960s, several reed-harvesting stations (*kamyshezagotovitel'nye stantsii*) were also established on the Volga. In 1964, the authorities established special reed-harvesting stations in the deltas of the Dnieper and Danube called *kamyshpromkhozy*, similar to traditional *lespromkhozy*.²⁷ As early as 1964, however, several reed-harvesting stations were closed in the eastern part of the delta of the Volga because they stopped producing output;



Reed harvester ZhBT-1.8



Reed loader with a car

Figure 4.2 Soviet experimental machinery for reed harvesting. *Source:* Lazar' Kanevskiy, *Zapasy trostnika v SSSR* (Moscow: B.i., 1965).

reedbeds there had been all but destroyed by mechanical harvesting. The authorities sadly became prisoners of their own decisions: exploring new areas of reed cultivation and establishing new harvest bases, they had to construct housing and social infrastructure for workers, which proved a costly enterprise. The Volga hydropower station had a negative impact on reed too: it periodically flooded the plants. Harvesting nonetheless remained the primary challenge, as the “losses from production are not big, but the losses from the reed-harvesting practice are enormous.”²⁸

Immediately after the first stage of construction was completed, the lack of reed became a real danger—not only for nature, but in terms of fulfilling the industrial plans that as in the whole Soviet economy, were seen as a matter of paramount importance. The cost of harvested reed and manufactured cardboard was three times higher than had been projected, while the quality of production did not correspond to the requirements. The enterprises received less than half of the reed required and satisfied less than 50 percent of the need for raw materials.²⁹ Initial expectations to develop an alternative base for industrial manufacturing were in this way dashed, revealing that the reed project could not offer an alternative path for the development of products traditionally made from wood in the existing Soviet infrastructure.

RICH AND POOR NATURE

As early as the mid-1960s, simultaneous to the construction of reed-based enterprises, some specialists and politicians of the highest level expressed serious concern about the lack of raw materials for new production. They were concerned

about the destruction of reedbeds not because it entailed the annihilation of ecosystems but rather because it held industrial consequences. In 1964, some claimed that despite it being the midseason of harvesting, only 22 percent of the harvest had been completed for the Astrakhan' plant and slightly less than 30 percent of reed had been harvested for the Kherson pulp factory located in Ukraine.³⁰ The situation in Kherson was most difficult: the harvest of reed there was almost zero, and the managers of the factory had to purchase raw *wood* from forested regions that was transported over a distance of a thousand kilometers. By the mid-1960s, only one-third of raw materials was constituted by reed, while the rest was supplied by wood from the north of the country. This led to disappointment among many specialists about the prospect of building new reed-consuming enterprises, as had initially been planned.³¹ Moscow, however, was more enthusiastic about the current and future situation around the construction, and insisted that planned enterprises could not be canceled. The reason for that lay in positive expectations: moved by industrialist expectations, the planners believed that reed could be artificially flooded and its regrowth productivity thereby increased.³² They expected flooding to make the biotopes more homogeneous and allow for reed to grow faster. Some scientists supported the idea of flooding reed, particularly those from the Institute of Botany at the Kazakhstan Academy of Sciences who worked out a plan for flooding reed. These initiatives happened despite protest from other foresters and harvesters, who said that the planned flooding of half of all reedbeds did not correspond to the water regime and historical conditions of the riverbeds.³³

Simultaneously, the factories already built were constrained by the plans and ended up asking for supplies of wood instead of reed—an unstable material, as they put it, which was experienced primarily as a problem rather than a promise.³⁴ In 1966, workers of the Kzyl-Ordynsk explained that the enterprises did not work well because of the lack of raw materials: the factory produced just under 80 percent of planned cardboard, but only about 24 percent of packages.³⁵ This is why some planners spoke about the need to purchase Western equipment to produce materials from wood as opposed to reed—ironically at the enterprises precisely geared toward reed processing. The situation was complicated by the rapidity of construction; three factories were built without serious estimates of risks. The planning system managed to count the quantities of production, but did not assess the risks and pitfalls in the haste to compete with the West. This story also reveals that Soviet planners had an obscure vision of how closely raw materials, environment, technology, and industrial production were connected. And archival documents show that industrial and research institutions did not know how many natural resources were in fact available.

In the mid-1960s, the local authorities of reed-consuming enterprises planned to combine supplies of raw materials, mixing both reed and wood as a form of compromise in the face of reed shortages. From their perspective, supplying the enterprises with raw resources and making appropriate machines would take between five and seven years, prompting the necessity to supply the reed-based enterprises with wood and avert delays in production.³⁶ In 1964, the initial project of supplying the Astrakhan' plant was changed in

order to supply it with wood like other forestry-based enterprises. Interestingly, plans for new enterprises on the same lines were not scrapped, and construction continued even when it became clear that future supplies of reed would not be possible. Supplying wood for factories in unforested areas was costly, requiring lengthy transportation from the northwest of Russia and Siberia, and involving the hiring of a range of specialists. The planners noted the advice of scientists and engineers—experts who explored the availability of reed—but they regarded negative prognoses as temporary, and insisted that the situation would be improved through rational mechanisms for growing reed and appropriate harvesting machines. The ministerial lobby for the industrialization of the south was strong and held fast to the belief that the expansion of the resource base would be possible after the completion of the factory construction. Meanwhile, as they believed, partially supplying the plants with wood would help launch production without having to wait for technological achievements to increase the reed harvests. The Soviet system admitted no mistakes or uncertainty, and this is why the planners did not predict the multiple problems on the horizon with accuracy.³⁷ The change that the planners undertook in 1964 concerned the profile of the enterprise in Astrakhan', shifting from cardboard to print papermaking as the demand for the latter was larger. This shift was necessitated by the change of raw material supplies. In 1964, the Moscow Giprobum, the organization responsible for the construction in Astrakhan', suggested that the enterprise would make only 65 percent of the products from reed and 35 percent from wood and sawmilling wastes. This combination enabled the factory to make consumer paper.³⁸

For the Ismail plant in Ukraine, in accordance with its plan, before the availability of advanced harvesters, reed was to be harvested manually only in order to supply new production. This in fact contradicted Soviet plans of the 1960s for launching fully automated enterprises, in line with the proclamation that mechanization and automation should become the key elements of the socialist project.³⁹ In fact, what was witnessed was the reverse process: humans came to substitute for the machine at modern enterprises, proving what Jenny Smith called “involution” in Soviet agriculture.⁴⁰ The Kzyl-Ordynsk pulp and cardboard-making plant faced the same problems. As the chief engineer of the Kzyl-Ordynsk reed-harvesting enterprise, V. Karymsakov, wrote, “Because of the worse situation with flooding reeds, their squares and productivity of bed rushes significantly decreased, and it creates additional problems for supplying the plant with raw materials.”⁴¹ The lack of reed obstructed Soviet modernization along with the hopes of moving to material prosperity and satisfying consumer production.

The problem of supplying enterprises with raw materials was so pivotal that scientists at various research institutions undertook intensive experiments to improve the productivity of reed. In Astrakhan', the main institution that examined reed was the Central Research Institute of Reed, established in the early 1960s. It proposed growing reed together with fish and to “assign” workers of industrial fisheries with the responsibility of reed growing. In other words, scientists looked for options to make harvesting cheaper and sourcing labor resources that were in short supply in the reed-harvesting sector.

The amounts of usable reed remained limited, though, and experimentation did not open any avenues for the

increase of the harvests. As such, reed-consuming enterprises began dividing available reed among themselves, while each received additional supplies of wood—even shortly after launching. Further compounding the problem was the fact that the equipment installed there could not be used for processing wood, so using additional supplies of wood to keep the production sustainable was not possible. As a result, in 1967 some shops stopped working at the Astrakhan' factory. One that produced fiberboards ceased production after it did not receive reed and could not manufacture fiberboards that met Soviet quality standards. Counting the real supply of reed, engineer V. Bogdanov inquired about limiting the amount of fiberboards required of the shop to six million square meters, but planners more than doubled that figure, demanding fourteen million square meters per year. The decision had been made at the highest level based only on economic interests and the abstract logic of intensive production rather than on grounded concern over the destiny of reed. The highest-level institutions—the Central Committee of the Party and the Council of Ministries of the USSR—made corrections for the production plan of the shop twice, increasing the quotas significantly.⁴² Construction was undertaken in accordance with that plan, but the real raw material base did not match the plan and was unable to facilitate the demanded production.

The problems associated with creating appropriate infrastructures lasted until the end of the regime. Thus usable harvesting machines were never actually built, despite many attempts. After the 1970s, the question of reed-based production fell into neglect, and wood almost completely substituted reed. Yet specialists working in forestry became

more critical toward the industrial methods that led to the destruction of reed, mainly because of disrupted industrial plans. The reed-based enterprises faced interruptions in cellulose making because of the lack of resources, along with the negative industrial practices typical of the Soviet system, such as the rapid turnover of labor and a lack of repair workers. Because the enterprises were completely equipped with Western machinery, as in many other enterprises across the country, "the repair parts were not produced by Soviet industry [even as] the limits on purchasing foreign equipment were small." This is why "this expensive equipment often broke down and did not work for a long time," resulting in dropped output.⁴³

Annual reports on the activities of reed-based enterprises show that in conditions of raw material shortages, they had to search for alternative sources and methods to fulfill the plan. By the late 1970s, the Astrakhan' enterprise was being supplied with 60 percent wood and 40 percent reed. Reed harvests dwindled even further; in 1979, the harvesters supplied half the amount of reed that was required, even though the planned amount was small. In February 1979, the situation at the Astrakhan' plant grew especially critical because of the shortage of raw material. To continue production in the main shops at the very least, the staff of the factory's wood storage unit went to the Volga to break the ice and lift logs that were lost while floated. As the director of the enterprise wrote, "Hard organizational and preparation work was conducted in winter to prepare the fleet for lifting lost logs," which they previously saw as rubbish. They continued lifting sunken logs during the whole year and beyond.⁴⁴ This practice had been used as an urgent measure since

Stalinist industrialization in the 1930s, when enterprises lifted sunken logs to use in industrial operations to make up for shortages.⁴⁵ As worker A. P. Borisova said in January 1980, the “plant has a fever because there is no raw materials.”⁴⁶ Fever was a word frequently used in archival documents and periodicals that spoke about a specific style of work in Soviet enterprises: long stoppages due to material shortages and frenzied searches for resources according to rapid tempos often took place at the end of the year to fulfill the plan. The history of the reed-based enterprises in the last decades shows a constant struggle for raw resources to supply the production suppressed by the plan. The enterprise reports often described the situation as “very difficult.”⁴⁷

The reed project exemplified the Soviet tendency to render natural resource wealth into degraded assets while still failing to fulfill the industrial plans. As the case of reed use demonstrates, despite possessing rich natural resources, the Soviet planned economy failed to build a viable industry that fostered the sustainable use of raw materials. While in practice the project resulted in the destruction of reedbeds, the very idea of using reed had been motivated—as with the consideration of other alternative resources in industrial production—by an attempt to achieve the sustainable use of natural resources and save wood from depletion. Specialists’ expectations around the regrowth potential of reed were high, and in their view, sophisticated technologies were to play a major role in exploiting newly discovered resources. The modernist vision of reed as a quick and cheap natural treasure that could facilitate modern consumption and sustainable economic growth was intended to save costs on transporting wood. Less wood and more annual plants

that could grow more quickly would be consumed. This was a strong and well-articulated discourse that nevertheless remained largely a feature of the dreamscape of specialists, once again exposing the gap between professional expectations and infrastructural disabilities. This gap intensified ecological criticism directed against Soviet industrialism, contributing to forms of industrially embedded ecology. By this time, specialists and journalists clearly connected the shortage of reed and the function of southern pulp, papermaking, and cardboard-making enterprises with environmental risks. In 1970, the newspaper *Forestry Industry* published an article titled “Reed Sings, or the Delta of the Volga Is in Danger,” warning that the Astrakhan’ plant had been built in a hurry and without proper water treatment facilities.⁴⁸ The southern projects thus constituted a failed rationality, contributing to critical visions of Soviet industrialization and the increased value of ecology.

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