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Poisoning the Proletariat: Urban Water Supply and River Pollution in Russia's Industrial Regions during Late Stalinism, 1945–1953[1]

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Introduction: Water Supply, Urban Sanitation, and Everyday Life

Water supply is part of a tightly-knit sanitary nexus formed by housing conditions, sewerage, waste removal, and access to clean water. The interconnections here are more or less obvious and well discussed in the historical literature, especially of Victorian Britain and Wilhelmine Germany. Most hinterland Russian cities had very limited sewerage systems. Only in Moscow did a majority of residents live in buildings with sewerage; everywhere else, including very large cities such as Gor'kii, Sverdlovsk, Cheliabinsk, and Molotov (Perm'), most people had to use outhouses which emptied into cesspits or crudely dug ditches. This created enormous problems of waste removal, and for most of the year human and animal excrement was left to wash away during the rain or the spring thaws into local rivers. Even sewerage did not always help, because most cities discharged their raw sewage into rivers and lakes with at best inadequate treatment, and in most cases with no treatment at all. These discharges, together with the sewage and industrial wastes discharged by factories, made rivers unsafe to use as drinking water or to bathe in, both locally and in all communities downstream.[2] To this extent the Soviet Union shared a common history with other societies that underwent industrialization and urbanization. Cities tended to expand water supply faster

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The article is part of a larger study of urban sanitation, living conditions, food and diet, and infant mortality across a range of industrial regions in the RSFSR during late Stalinism. The study focusses specifically on what I call the "hinterland" regions, that is, those areas of the RSFSR which did not suffer combat damage during World War II. The reason for this is methodological. The aim is to identify and analyze those aspects of the urban environment that were systemic features of Stalinism, undistorted by the large-scale destruction of housing and infrastructure in the occupied regions or by the task of postwar rebuilding.

2 I have discussed these issues in Donald Filtzer, "Standard of Living versus Quality of Life: Struggling with the Urban Environment in Russia during the Early Years of Postwar Reconstruction," in Juliane Fürst, ed., *Late Stalinist Russia: Society Between Reconstruction and Reinvention* (London, 2006), pp. 81–102.

than they installed sewerage. They tended to expand sewerage systems faster than they built sewage plants to disinfect the sewage and neutralize hazardous chemicals, or water treatment works to purify the water taken from local water sources before putting it back into the water supply.[3] All of this had enormous repercussions on public health, perhaps most graphically dramatized in the cholera epidemics that affected France, Britain, and Germany throughout the second half of the nineteenth century. In terms of sanitation, the Soviet Union lagged some 30 to 50 years behind its Western European counterparts, but their respective relationships between sanitary reform and general improvements in public health sharply diverged. During the postwar period the USSR attenuated the impact of sanitation-dependent diseases (tuberculosis, pneumonia, gastro-enteric infections) on general and infant mortality, but it did this not via housing and sanitary reform (the route followed in Western Europe and the United States), but by compensating for the *absence* of sanitary reform through the application of stringent public health measures and modern medical advances, such as immunization and antibiotics.

In terms of water supply, the issue has two equally important dimensions to it. The first involves people's access to water and what this meant for their health, hygiene, and domestic labour. Apart from the obvious risk of disease, the absence of clean running water greatly increased the burdens of domestic toil. Most urban residents in the postwar RSFSR did not have indoor running water, but had to haul water up from street pumps or wells. Basic domestic tasks, such as laundering clothes and bed linen, maintaining minimal levels of hygiene for adults and children, cooking, washing utensils after meals, not to mention fetching and carrying the water itself, required significant expenditures of time and energy. When added to other claims on energy – long hours of heavy physical labour; working in under-heated factories; living in under-heated buildings; walking long distances to work because public transport was inadequate – the lack of indoor piped water contributed to a situation where individual daily calorie requirements substantially exceeded what the typical daily diet could provide.[4] The second dimension, of course, is pollution, and it is this that forms the theme of this article. We shall focus on three key issues: efforts to curb industrial pollution prior to World War II; postwar anti-pollution legislation and obstacles to its enforcement; and the different patterns of water pollution in large cities versus small industrial towns. The source base is mainly from the files of the State Sanitary Inspectorate (*Gosudarstvennaia Sani-*

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3 On Britain, see Anthony S. Wohl, *Endangered Lives: Public Health in Victorian Britain* (London, 1983). For Germany, see Jörg Vögele, *Urban Mortality Change in England and Germany, 1870–1913* (Liverpool, 1998), in particular pp. 173–178.

4 On the diets of postwar workers' families, see Donald Filtzer, "The 1947 Food Crisis and its Aftermath: Worker and Peasant Consumption in Non-Famine Regions of the RSFSR," in Donald Filtzer, Wendy Z. Goldman, Gijs Kessler, and Simon Pirani, eds., *A Dream Deferred: New Studies in Russian and Soviet Labour History* (New York and Berlin, 2008), pp. 343–383.

tarnaia Inspektsiia, or GSI), which had responsibility for overseeing all aspects of public health, including urban sanitation, water supply, adherence to anti-pollution legislation, food safety, housing, public bathhouses, and epidemic control.[5]

Prewar Attempts to Control River Pollution

Stalinist industrialization placed tremendous pressure on the urban infrastructure. There was a mass influx of new workers into cities, towns, and new workers' settlements, but the regime channelled almost all new investment into building and equipping factories, and almost nothing into making urban environments safe and comfortable for their inhabitants. This was most obvious in terms of housing, as workers crowded into corners of communal flats, bunked down in factory premises, or in hastily constructed barracks and dormitories, often with little or no heating and very little sanitation. Those older cities that had a limited sanitary infrastructure soon found it overwhelmed. We need to remember, however, that in cities like Ivanovo the nature of the housing (a mass of private, single-storey, wooden buildings) meant that there was almost no sanitation at all. In the new towns and cities created by industrialization, such as Magnitogorsk in Cheliabinsk oblast', the situation was, not surprisingly, even worse.[6] By the end of the 1930s the impact that industrialization was having on the country's rivers and lakes was beginning to attract attention, not, one suspects, because of the hazards this posed to human health, but because of the economic damage it was causing, both to the fishing industry and to industry proper. In May 1937 the regime issued a decree which in theory, at least, placed severe restrictions on industrial discharges of pollutants. It forbade all enterprises from discharging harmful substances within the sanitary protection zones surrounding water supplies or within the boundaries of populated areas. Enterprises either had to discharge their wastes into urban sewerage

5 The GSI came under the USSR and Republican Ministries of Health, but the USSR GSI has its own collection (*fond* 9226) in the State Archive of the Russian Federation – Gosudarstvennyi Arkhiv Rossiisskoi Federatsii, hereafter referred to as GARF. This *fond* contains *inter alia* a number of oblast' and city reports for the RSFSR, plus a few Republic-wide (but no local) reports for Ukraine. The most consistent run of Russian city and oblast' reports is in GARF's Reading Room 2, which holds documentation for the RSFSR. These all bear the letter "A" before the *fond* number. From 1951 the detailed local reports became the responsibility of the Sanitary-Epidemic Centres [*Sanitarno-epidemicheskie stantsii*, or SES] after the latter were made organizationally independent of the GSI. With few exceptions, the oblast' GSI reports then concern themselves mainly with internal organizational matters. Although analogous to the Medical Officers of Health (MOH) in Britain, the GSI/SES material is not as rich in detail and analysis, although this varied from one locality to another.

6 On Magnitogorsk see, Stephen Kotkin, *Magnetic Mountain: Stalinism as a Civilization* (Berkeley, 1995), pp. 136–141.

systems (where such existed), or build waste treatment plants to neutralize the effluent prior to discharge into a water course. They were given six years, from 1937 to 1942, to implement these measures.[7] We need to point out here a basic flaw in the decree's logic. Since most Russian cities either had no sewage treatment plants, or plants that could only cope with small volumes of waste, the discharge of factory wastes into urban sewers would not have eased the problems of pollution. A classic example would be Kazan', where a number of tanning and felting factories, hospitals, public buildings, and workers' settlements discharged untreated or primitively treated wastes into the city's sewerage system. Insofar as this system then transported these wastes out of the city to discharge points along the Kazanka and Volga rivers and downstream from the intake for the city's water supply, it brought some measurable, although limited relief to the local population. What it did not do, however, was protect the rivers themselves. From the point of view of river pollution, a factory connected to the Kazan' sewerage system was little different from the large number of other Kazan' factories which simply released their wastes directly into the Volga, the Kazanka (a Volga tributary), or Lake Kaban. In fact, so many enterprises were dumping their wastes into the Kazanka (in some cases *upstream* from the city water supply) that it had become impossible to measure the total quantity of the pollution.[8]

I have chosen Kazan' as an example, but in fact there was nothing special about that city. In the year or so prior to the German invasion health officials in the RSFSR had become alarmed at the state of Russia's rivers. One river of special concern, naturally enough, was the Volga, which ran from Yaroslavl' down to Gor'kii, then eastwards to Kazan', then down to Kuibyshev, and eventually, of course, down to the Black Sea. Heavy pollution was already noticeable at Yaroslavl', not far from the river's source. Around Gor'kii, pollution from the large paper combine in Balakhna (Gor'kii oblast') rendered the Volga unusable as a source of clean water by the population living in settlements along its banks. The pollution was so strong that the rather limited treatment works in Gor'kii and other nearby Volga towns could not cope with it. Moreover, the scale of the pollution caused by the Balakhna combine was daunting. It left a layer of minute fibre particles several centimetres thick on the river bed, and extended over a distance of 100 to 200 kilometres downstream. This, we should bear in mind, was just one polluting factory among literally hundreds

7 Decree of the Central Executive Committee of the Council of People's Commissars of the USSR, 17 May 1937, "O sanitarnoi okhrane vodoprovodov i istochnikov vodosnabzheniia [On the sanitary protection of water supplies and sources of water supply]" (No. 96/834), discussed in E. I. Smirnov, *Meditsina i organizatsiia zdravookhraneniia (1947–1953)* (Moscow, 1989), p. 171. Smirnov does not, however, outline the decree's specific provisions. These are from a draft of a report prepared sometime in early 1941 on the failure to implement it within the RSFSR, in GARF, f. A-482, op. 47, d. 157, l. 96.

8 GARF, f. A-482, op. 47, d. 157, l. 50–50ob., 52

which discharged untreated industrial wastes into the Volga. The major impact was on fish, since fish are especially vulnerable to cellulose fibres. Every year there were mass fish kills along the Volga and its tributaries, and the GSI warned that the fishing industry which depended on these rivers was on the brink of ruin. Nor was this a problem just for the Volga river network. Chemical pollution was depleting oxygen levels to such an extent that in winter fish were dying of oxygen starvation in the Oka, Kliaz'ma, Northern Donets, Dno, Viatka, "and other" rivers.[9]

The Urals presented a somewhat different set of problems. Many of its large industrial centres (Sverdlovsk, Cheliabinsk, Nizhnii Tagil, Zlatoust, and Serov, among others) were badly located from the point of view of the efficient organization of water supplies. Many of them were sited along the upper reaches of Urals rivers, so that the organization of adequate water supplies required special hydrological planning and investment. This flew in the face of the entire logic of Stalinist industrialization, which had placed exclusive emphasis on the development of large-scale industry at the expense of the water infrastructure. The situation was compounded by the slow flow rate of many rivers, which made dilution and dissipation of untreated discharges more difficult. The more or less unbridled release of faecal and industrial wastes into the region's rivers – almost all of it without any prior treatment – posed obvious health risks to populations. It also made the Urals a classic illustration of a problem already observed during Britain's industrial revolution: the pollution of rivers by factories lying upstream rendered them unusable even for industrial purposes by factories lying downstream. Urals factories were finding it harder and harder to acquire water of sufficient quality to carry on production, and were going to find it harder still in the future, given the region's rapid industrial development and population growth. So, too, were enterprises in the Kuzbass, a bit further to the east in Western Siberia. The coke-oven products factory in Kemerovo had so polluted the River Tom' that factories located even hundreds of kilometres downstream from Kemerovo could not use its water.[10]

Irrespective of public health issues, it was now obvious that the uncontrolled pollution of Russia's rivers was jeopardizing industrialization, in particular the surge in military investment during the years leading up to June 1941. Yet a review of implementation of the 1937 decree shows two things. First, much of the construction that enterprises were to undertake in order

9 GARF, f. A-482, op. 47, d. 157, l. 94–95.

10 GARF, f. A-482, op. 47, d. 157, l. 45 (Urals); op. 47, d. 154, l. 92 (Kemerovo). Regarding Britain, Wohl cites this passage from the Royal Commission on River Pollution, in 1867: "Manufacturers pollute the water for each other until the streams have to be abandoned for all but the coursest purposes of trade, and clean water has to be purchased from waterworks companies, or must be sought at great cost in well-sinking and boring, to which must be added the charges for extra steam-power. In some cases the manufacture and dyeing of finer sorts of goods has been necessarily abandoned." Wohl, *Endangered Lives*, p. 237.

to implement the decree was due for completion only in 1941; another, even larger proportion was scheduled to be finished only in 1942. Thus, even if everything had proceeded trouble-free, the war would have stopped the work dead in its tracks. Secondly, in reality, the work did not proceed trouble-free. There was a whole raft of commissariats and enterprises that had made little or no progress. An analysis of the reasons *why* progress was so slow is very revealing. It shows, among other things, that we need to analyze water pollution within the larger context of the political economy of the Stalinist system as a whole.

I can illustrate this point by producing a small table, itself adapted from a much larger table and accompanying documentation in one of the GSI archive files. The table charts the progress made by seven major industrial centres (six of the regions in my comparative case study, plus the city of Leningrad) in fulfilling their 1940 targets for constructing sewerage systems and waste treatment installations. It also lists the reasons why these plans went unfulfilled.[11]

Anyone familiar with the system of Stalinist "planning" will recognize the difficulties most of these projects encountered. One was the lack of funds. Because industrial commissariats considered these projects to be of low priority, they would approve them in the plan, and even authorize the design work, but would not allocate funds for the actual construction. A second obstacle was the shortage of building materials, and in one case, also of labour power. A third was the lack of coordination in the "planning" process – the essential planlessness (*besplanovost'*) of the Stalinist economic system.[12] This operated

11 GARF, f. A-482, op. 47, d. 154, l. 1–5, 15–18ob., 64–64ob., 92.

12 The argument that the Stalinist economy was planless, rather than planned, dates back to the very beginning of the five-year plans in the late 1920s. The Menshevik exile journal, *Sotsialisticheskii vestnik* [Socialist Herald] (until 1933 based in Berlin) noted that the Stalinist plans lacked any internal coordination between the essential components of the production process; targets were imposed from the top, without any attempt to calculate whether the resources needed to fulfil these targets actually existed. The emphasis on high tempos and target-maximization within each production unit made coordination and integration of the different links within production impossible. Constant bottlenecks and shortages were the inevitable result. The Trotskyist Oppositionist, Khristian Rakovskii, writing from internal exile, advanced a similar argument, but attributed the breakdown of the plans to two further factors: the intense pressure on the working class through speedup and a catastrophic fall in living standards; and the huge amount of defective production that such high tempos produced – defective production which circulated through the entire economic system, reproducing the defects at each stage in the production process. For a fuller discussion of these early critiques see Donald Filtzer, *Soviet Workers and Stalinist Industrialization: The Formation of Modern Soviet Production Relations, 1928–1941* (London, 1986), pp. 35–44. Some mainstream Western economists arrived at a similar view after World War II. Eugene Zaleski showed that the five-year plans never functioned as operational documents (most were approved only after they were already allegedly underway), and even the operational plans had little connection to actual economic policy. Eugene Zaleski, *Stalinist Planning for Economic Growth, 1933–1952* (London, 1980). More recently Paul

Sewage and Waste Treatment Construction at Major Industrial Enterprises, RSFSR, 1937–1940, as of March 1941

City	Task	Reasons Not Fulfilled
Moscow	Hook up a number of railway stations, food processing plants, and some heavy industry enterprises to the city's main sewage collector.	Completed – in fact, completed installation and connection of 16 units, against a plan of 9.
	Ongoing work on the construction of treatment works at two textile mills feeding into the Rublevskii and Cherepovets water supplies serving Moscow city.	Work due for completion only in 1941, but was behind schedule. Cause not given.
	Ongoing work on treatment facilities at three factories in Mytishchi, in Moscow oblast', but which had a pumping station serving Moscow city.	Work due for completion in 1941 and 1942, but behind schedule. Funds were allocated but had not been fully utilized.
Moscow oblast'	Karbolit factory, Orekhovo-Zuevo, Moscow oblast': Construct phenol-neutralization plant; construct sewage collector; connect collector to factory sewerage system.	Work on both installations could not be finished because the factory could not obtain essential equipment or building materials and because of changes imposed on the factory's construction plan.
Leningrad	Most scheduled work involved renewing or reconstructing the already-existing sewerage system.	Progress unknown.
	Construction at several factories not yet joined to the city system.	Still in the design stage – no construction scheduled to begin during 1941.
Sverdlovsk	Verkhne-Isetskii Iron and Steel Works: draw up technical designs for sewerage and treatment plant.	No funds allocated.
	Sverdlovsk linen-spinning factory. Connect the factory to the city sewerage system.	Work completed.
	Polevskii cryolite factory (non-ferrous metallurgy): Construct treatment plant.	Work halted due to labour shortage.
	Degtyarka copper mine. Construct treatment plant.	Designs approved, but work not yet started, despite being scheduled for completion in 1940.
	Pervoural'sk Novotrubnyi iron and steel works: Construct phenol-removal installation, to be completed in 1940.	Design approved and allocated building materials for the work, but could not begin work because the construction area still had barracks on it, which could not be removed.
	Zyuzel'skie copper mines. Complete waste treatment plant by 1940.	Completed and started up a neutralization unit, but had not started work on construction of treatment plant to remove copper from waste water.
	Uralmash zavod: Complete design work on phenol-removal unit and start construction by 1940.	Design work finished and building materials acquired, but start of construction delayed until 1941.

Kemerovo	Coke-oven products factory to build a city-wide sewerage system. In conjunction with two other factories, also to build factory sewerage systems and treatment (phenol-removal) plants, to neutralize factory wastes before they enter the city system.	Funds allocated for the city system, but no funds allocated for the factory systems or the special treatment plant.
Gor'kii city and Gor'kii oblast'	Gor'kii motor vehicle factory: Build a sewage collector and treatment plant by 1940.	No funds allocated.
	Krasnoe Sormovo heavy engineering factory: Connect the factory to the city sewerage system during 1939-1941.	Had used all funds allocated and completed "preparatory" work.
	Balakhna paper combine: Construct treatment works to treat both faecal wastes and industrial wastes by 1940.	No funds allocated.
	Balakhna cardboard factory: Construct treatment works by 1940.	No funds allocated.
Yaroslavl'	Yaroslavl' motor vehicle works: Rebuild sewage collector during 1940.	Work completed.
	Krasnyi Perekop textile factory: Connect the factory to the city sewerage system during 1937-1940.	Work completed.
Kazan'	Linen combine: Connect the factory to the city sewerage system during 1937-1940.	Could not complete the work because it depended on the prior completion of a sewage collector. Work on the collector had not yet started.

at both macro- and micro-level. Typical of macro-level planlessness was the Urals. The region had no general plan for the utilization of water resources. Each individual commissariat determined the needs of its own enterprises, and these in turn carried out any work, for example, on waste treatment facilities, to meet only their own local needs. There was no attempt to coordinate the work done by one factory with that being done by any other. Where the quest for clean water was concerned, enterprises were in competition with one another, and the success of one district in locating and collecting adequate supplies could leave others with water shortages. As for the discharge of industrial wastes, as we have already seen, there was no coordination of discharge points or waste treatment. One factory's discharges posed a hazard to factories downstream.[13]

If we turn to the micro-level, we see a graphic illustration in the Karbolit factory in Orekhovo-Zuevo, in Moscow oblast'. A look back at our table shows that the factory had two projects to complete: construction of a phenol-neutral-

Gregory, using documents uncovered in the former Soviet archives, has demonstrated that not even the Soviet leadership believed that they had created planning. Paul R. Gregory, *The Political Economy of Stalinism: Evidence from the Soviet Secret Archives* (Cambridge, 2004), in particular pp. 209–212.

13 GARF, f. A-482, op. 47, d. 157, l. 46.

ization unit, to detoxify its high volume of phenol discharges into the Kliaz'ma River; and construction of a factory sewerage system. Work on the phenol-removal unit began in 1939, and by 1940 they had finished the construction work and installed much of the equipment. The plant could not actually go into operation, however, because it still lacked some essential equipment: a boiler; a refrigerator; two pumps; and four motors. The Glavk responsible for supplying this equipment claimed it had no planning authorization to produce or deliver it. As of May 1941 – just a month before the German invasion – the factory had effectively abandoned work on the unit, even though it needed just this small number of items to begin functioning. All the investment in its construction and outfitting had effectively been wasted.[14]

Similar difficulties beset the sewerage system. Construction of the system, and of the pumping station needed to move the sewage from the collector to the sewerage network, had gone relatively smoothly, but then came to a halt because the factory could not obtain the last bits of pipe, a pump, 900 metres of high-voltage cable, lubricants, and 150 cubic metres of gravel. However, the factory eventually solved these problems, and with both the materials and the labour power needed to finish the project now on hand, it came up against a new obstacle. It could not extend the sewerage system to include the factory's workers' settlement or essential communal buildings (bathhouse, creche, and kindergarten) because this required construction of a separate pumping station, which had not been included in the 1941 plan. If this was not bad enough, the Orekhovo-Zuevo City Soviet then stepped in and raised the stakes. They would not allow the factory to begin using its new sewerage system until it had built a new pumping station for the city itself. There may have been a valid logic to this move, insofar as the added sewage coming from the factory may have overtaxed the undoubtedly limited capacity of the city's sewerage system. Whether a justified demand or not, the factory could not carry out this work: it could not lay hold of the cement, the gravel, the timber, the metal, the ruberoid, or a host of other materials needed to build the station, and had no chance of doing so at any time during 1941.[15]

What we see, therefore, is that river pollution in the prewar period had several inter-locking causes. One was the weakness of sanitary infrastructure. Few cities had comprehensive sewerage systems, and those that did merely collected the sewage and discharged it downstream, below the point where the town or city took its water supply. There was little or no attempt to treat it prior to discharge. A second was the impact of forced industrialization. The regime devoted all its resources to rapid industrial growth (with a commensurate growth in population centres), but made little or no investment in sanitary infrastructure. The latter simply could not cope with the vast amounts of pollution factories and urban populations were now generating. Here the

14 GARF, f. A-482, op. 47, d. 154, l. 16.

15 GARF, f. A-482, op. 47, d. 154, l. 17, 18, 18ob., 64.

Soviet Union presented a picture typical of Britain or Germany in the mid- to late nineteenth century. Factories discharged their waste into open waterways without prior treatment, and in so doing created major risks for public health and for industrial production itself. Thirdly, once the regime became alarmed at the problems its own policies had created, it attempted to compel enterprises and their commissariats to instal anti-pollution equipment – but these attempts largely failed. And this is the most interesting aspect of the problem. The 1937 law had so little effect because it fell victim to the entire logic of Stalinist planlessness. Industrial commissariats and enterprises applied the same calculus to waste treatment as they did to investments in labour safety. These were of minor importance compared to the need to boost production, and so had little or no priority when it came to allocating funds, building materials, equipment, or labour power. Even where a commissariat or enterprise might actually commit resources, as in the case of Karbolit, the whole effort could still turn out to be wasted because they could not acquire the last bits of material or machinery needed to finish the job and allow these installations to go into operation. This was a problem endemic to the Stalinist system, and it affected all areas of production. The Soviets had a special word for it: "incompleteness" (*nekomplektnost'*).[16]

Postwar Legislation: The Political Economy of Evasion

Understandably, the war took a terrible toll on all sanitary infrastructure, including water supplies. In the occupied territories there was massive damage to pipe, pumping stations, and sewage and water treatment plants. What was not physically destroyed in the fighting decayed due to neglect. In the hinterland regions infrastructure also suffered through neglect and lack of investment, and from the fact that in cities like Gor'kii, Sverdlovsk, and Cheliabinsk, this now-weakened infrastructure had to sustain much larger populations. Even if the depreciation of plant and equipment had been less than it was, water quality would still have deteriorated because industry no longer produced essential chemicals, instruments, or parts, including: water gauges, chlorinators, cylinders for liquid chlorine, taps, valves and stopcocks, water pumps, spare parts for water treatment equipment, and coagulants for decontaminating chemical pollutants.[17] Nor were the shortages simply material. Water supplies, waste treatment, and water purification plants required skilled engineers, technicians, and maintenance staff. Their numbers had fall-

16 For a general analysis of "incompleteness" see Donald Filtzer, *Soviet Workers and de-Stalinization: The Consolidation of the Modern System of Soviet Production Relations, 1953–1964* (Cambridge, 1992), pp. 162–163.

17 GARF, f. 9226, op. 1, d. 636, l. 50–52.

en during the war, but at least in the early postwar years there was no effort to train their replacements.[18]

The postwar situation was therefore the product of the interaction between structural and conjunctural factors, factors compounded, or rather reproduced on a larger scale, by the renewed emphasis on the rapid restoration and expansion of industrial output at the expense of investment in infrastructure. A draft report compiled in early1947 by A. Lavrov, a Deputy Chief Sanitary Inspector in the All-Union GSI and their expert on water resources, gave this summary of the state of the rivers in the Moscow, Central Industrial, and Urals regions:[19]

Moscow and Moscow Oblast' – The Moscow River and the Kliaz'ma: The Moscow River, from Moscow down to where it emptied into the Oka, had become just a gutter, and dangerous to both people and livestock. The Kliaz'ma was polluted from Shchelkovo down to where it left Moscow oblast', to such an extent that as far away as Vladimir oblast' it was unsuitable for human use, a situation unchanged since at least 1937.

Gor'kii and Gor'kii Oblast' – The Oka River and the Volga: The Oka and Volga rivers converged at the city of Gor'kii, which depended on both rivers for its water supplies. Pollution of the Oka in the region of Dzerzhinsk in Gor'kii oblast' posed a threat to one of the Gor'kii water supplies. (We discuss this in more detail in the next section.) The Volga around Balakhna and Sormovo posed "serious obstacles" to Gor'kii's other water supply, which fed its Zarechnaia districts. Lavrov claimed that "an analogous situation" existed on the Volga upstream from Gor'kii at Yaroslavl', and downstream around Saratov, Kuibyshev, and Stalingrad.

Sverdlovsk and Sverdlovsk Oblast' – The Neiva, Tagil, Chusovaia, and Iset' Rivers: The Neiva, from the Neivorudnianskii Pond to the Neiva Pond, could not be used as a source of drinking water or for domestic use in workers' settlements or population centres, due to excessive pollution by salts of copper, zinc, and iron – all washed into the river by mine runoffs. Waste waters from mining had also "colossally" polluted the Tagil, whose toxicity was now so great that along a large stretch it had become a dead river, in which all forms of life had disappeared. Concentrations of copper and zinc salts vastly exceeded all permissible standards and had "totally wiped out the river's macro- and micro-fauna and flora." Needless to say, the river was unfit for domestic or drinking water supply. The Chusovaia, from its upper waters to Bilimbai, was badly polluted by industrial wastes coming from the North-Polevskii industrial area. Pollutants included "colossal quantities" of fluorine, sulphuric acid,

18 GARF, f. 9226, op. 1, d. 1010, l. 100–101.

19 GARF, f. 9226, op. 1, d. 1010, l. 93–94. I provide a more complete discussion of these and other rivers in these regions in an unpublished conference paper, "Environmental Health in the Regions During Late Stalinism: The Example of Water Supply," (University of Wales, May 2005), available as PERSA Working Paper No. 45 [at www.warwick.ac.uk/go/persa].

copper salts, iron salts, and chromium. The concentration of fluorine was four times permitted levels. The river was unfit not only as a source of drinking water, but also as a source of water for industrial or technical use. For example, in the winter of 1943, in the area around Revda, a "massive" number of steamship boilers went out of service because of the "impermissibly high content" of sulphuric acid in the water. The Iset', starting at the city of Sverdlovsk and for over 100 kilometres downstream, could not be used as a water supply for drinking or domestic washing. It was, in Lavrov's words, no more than a "receptacle for the waste waters of industrial enterprises."

Perhaps prompted by this situation, as well as an equally serious crisis with water supplies in Ukraine,[20] in May 1947, almost exactly 10 years after the major prewar decree, the regime passed new legislation in an effort to compel industry to curb toxic discharges. Note that the emphasis here was on industrial pollution. The pressing problem of how to stop cities and towns from discharging untreated human waste into open waterways received less attention, at least until the early 1950s.[21] Factories were encouraged to reduce the volume of harmful products (including sewage) in their discharges in three main ways. First, improved technology might reduce the number and volume of harmful by-products of production processes. Secondly, factories might capture more of these by-products for recycling, primarily through traps and filters. Thirdly, whatever they could not capture they were expected to neutralize in treatment plants before releasing their waste waters. The new decree, together with follow-up orders and decrees in 1948, 1949, and 1950, compelled industrial ministries to instal treatment equipment in their enterprises and to halt the discharge of untreated wastes into open bodies of water by no later than 1950. The worst-polluting ministries were given the tightest time frame. The iron and steel, non-ferrous metallurgy, chemical, agricultural machinery, cellulose and paper, textile, armaments, and light industries, were in theory required to erect water treatment installations in each and every one of their factories by the end of 1947. Factories in areas with exceptionally bad pollution, most notably Kemerovo oblast', were given until the end of 1948 – no doubt in

20 For Ukraine see GARF, f. 9226, op. 1, d. 779, l. 23–35ob., 72–75; d. 838, l. 67–83; and d. 924, l. 57–80.

21 Sewage and water treatment were mainly the job of the local soviets, and although local GSI inspectors grasped its importance, the reality was that local soviets had inordinate difficulties acquiring funding for actual construction. For examples see, GARF, f. 9226: op. 1, d. 798, l. 34ob. (Gor'kii); op. 1, d. 693, l. 62 (Sverdlovsk oblast'). GARF, f. A-482: op. 47, d. 4937, l. 36–37 (Moscow oblast'); op. 49, d. 1628, l. 68 (Magnitogorsk); op. 47, d. 4925, l. 183, and op. 49, d. 1610, l. 11 (Ivanovo oblast'); op. 47, d. 7685, l. 94 (Yaroslavl' oblast'). Industrial enterprises were accountable for "local" sewage generated by the factories themselves and the workers' settlements attached to them; in some towns where one enterprise or industrial ministry dominated the town's activities, the enterprise might have responsibility for the entire system. One good example was the iron and steel combine in Magnitogorsk.

recognition of the daunting scale of the task.[22] Given what we know about the fate of the 1937 decree and about the Stalinist system in general, it should come as no surprise that these timetables proved more or less fictitious. So, too, did the timetables specified in later decrees. According to data cited by Lavrov in December 1948, that is, 18 months after the May 1947 decree, of 181 factories that were due to build treatment works, only 20 per cent had actually done so. Around a quarter were in various stages of construction – although as he later noted, this did not necessarily mean that the units were anywhere near completion. Just under a quarter (22 per cent) were still in the design stage. Another 25 per cent had designs in hand, but construction had either not started or was only just getting under way. Finally, 12 factories had done absolutely nothing.[23] Just under three years later, in August 1951 (that is, 18 months after the decree of February 1950), Boldyrev, the head of the USSR GSI, reported that of 356 enterprises ordered to construct treatment works (15 on the original list of 371 were later exempted), one third (114) had done so on time, work was still going on at just over one third (123), but the remaining one third had not even started, including 88 which were to have finished the plants and put them into operation before the end of 1950. Significantly, some of the worst polluting industries were the also the worst offenders: half of all chemical factories affected by the 1950 decree, and two-thirds of factories in the paper and woodworking industry had taken no steps whatsoever even to initiate design work much less do any construction.[24]

The question is, what factors and forces worked to create such massive non-compliance?

Christopher Burton has argued in great detail that one of the main obstacles to effective control over water pollution was the scientific community's ideological adherence to two faulty scientific theories, namely the idea that rivers were self-cleaning, and the concept of maximum allowable concentrations of toxins (*predel'no dopustimye kontsentratsii*).[25] The first – which was by

22 Decree of the USSR Council of Ministers, 31 May 1947, "O merakh po likvidatsii zagriazneniia i sanitarnoi ochistke vodnykh istochnikov [On measures to liquidate pollution and the sanitary cleaning of water sources]." It is discussed in Smirnov, *Meditsina i organizatsiia*, pp. 171–173, and in a number of archive documents, including GARF, f. 9226, op. 1, d. 950. The latter contains the transcript of the Second Inter-Departmental Conference on Questions of Coordinating Scientific Research Work in the Field of Cleaning Industrial Waste Waters, held in December 1948. The follow-up orders were dated 1 March 1948 and 29 May 1949, and are discussed in Smirnov, *Meditsina i organizatsiia*, pp. 172–173. The 1950 decree, passed on 9 February of that year, specified a further 371 industrial enterprises that were to instal treatment plants. We discuss the outcome of this below. It is discussed in GARF, f. 9226, op. 1, d. 1142, l. 24–25.

23 GARF, f. 9226, op. 1, d. 950, l. 173–174.

24 GARF, f. 9226, op. 1, d. 1142, l. 24, 108–110. The data for the chemical and paper industries appear to be from April 1951, which was still 14 months since the decree's issue.

25 Christopher Burton, "Destalinization as Detoxification: The Expert Debate on Permissible

no means an idiosyncrasy of Soviet environmental science[26] – mistakenly held that powerful rivers could dilute even massive quantities of toxins and thereby render them harmless. The second ignored the facts (a) that even small amounts of toxins build up over time in aquatic flora and fauna, as well as in humans, and (b) that toxins often interact with one another to produce greater and/or longer-lasting hazards. The fallibility of both of these theories was manifestly obvious to local GSI inspectors, who cited countless cases where levels of pollution had grown so great as to overwhelm the "natural" processes of self-cleaning. Whether they actually believed in the theory and saw these as genuine exceptions, or whether they thought it was bogus and were using their counter-examples in a more subversive way, I do not know. It must certainly have been difficult to believe in self-cleaning when the discharges from a single factory like the Nizhnii Tagil coke-oven products factory could kill off fish and other fauna in the River Tagil over a distance of 200 to 300 kilometres.[27]

Burton makes a very strong case, but what I want to emphasize here are the behavioural and structural reasons for these laws' failure. At one level, there is plenty of evidence that ministries and enterprises deliberately avoided implementing the decree. One large defence factory in Kemerovo oblast', which each day discharged 100,000 cubic metres of contaminated waste water into its local river, including 4.5 tons of nitrocellulose, brazenly claimed there was no need to neutralize the latter, and therefore also no need to build a treatment facility.[28] This was a more or less general phenomenon. During 1948 a host of major ministries (light industry, timber, paper and cellulose, and textiles industries, and the Southern Region oil industry) petitioned the USSR Council of Ministers with requests to have at least some of their enterprises exempted. One Glavk (the hydrolytic industry) sought an exemption until 1952, on

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Concentrations of Toxins (PDK) Under Khrushchev," unpublished conference paper, University of Wales, 2005.

26 The idea of "self-cleaning" had dominated thinking in Victorian Britain, not the least because it provided industrialists with a perfect justification for indiscriminately discharging their hazardous wastes into the country's rivers. Wohl, *Endangered Lives*, p. 238.

27 GARF, f. 9226, op. 1, d. 693, l. 71–72. The example is from 1945. Even during the war, the GSI in the city of Kazan' could remark about the Kazanka River, "In its lower reaches the Kazanka River has, for all practical purposes, been turned into an open sewer, and any talk about the natural self-cleaning process is simply impossible." GARF, f. A-482, op. 47, d. 2328, l. 117.

28 GARF, f. 9226, op. 1, d. 951, l. 69–70, 78–80. Nitrocellulose is an explosive used in ammunitions manufacture, but there remains no clear consensus on its hazard as a water pollutant. The only clearly established danger is that in high enough concentrations it kills fish – a major concern of the GSI. In this sense it is similar to the role that phenol played in the postwar Soviet discussions of industrial discharges. There was widespread concern, if not alarm, about it, but the main immediate hazard is to fish, to which it is *highly* toxic. Phenol in low doses is used today in cough medicines. For nitrocellulose, see [www.pesticideinfo.org/Detail_Chemical.jsp?Rec_Id=PC37277].

the grounds that the problem of pollution "had been insufficiently studied" (a plaint with an interesting modern-day echo in debates over global warming).[29] Other ruses were much cruder. A ministry might fail to authorize the work (thus letting the factory off the hook), or might authorize it and then not issue any funds, thus fulfilling the law on paper but ensuring that nothing would be done in practice.[30] All this was aided and abetted – at least in the eyes of the All-Union GSI – by the weakness of local GSI inspectors. Either they were easily intimidated by local enterprises and too afraid to press for enforcement, or hampered by their own lack of information. Thus, in the case of the defence plant in Kemerovo oblast', cited above, the GSI actually had no knowledge of what pollutants the factory generated – it had to ask the parent ministry to provide this information,[31] something akin to asking the tobacco industry to volunteer all the evidence that cigarette smoking causes lung cancer.

Behind such wilful circumvention lay a much more complex range of structural factors that made these decrees unworkable. One was built into the very nature of Soviet anti-pollution legislation: enterprises paid a special tax for releasing toxic discharges into waterways; in effect, this provided an inbuilt incentive to ignore the law, since for many enterprises it was cheaper and easier to pay the fine every year than to divert scarce investment resources to the construction of waste treatment plants.[32] This conformed to the general

29 GARF, f. 9226, op. 1, d. 950, l. 177–178. A similar example in the Ministry of the Metallurgy Industry is in GARF, f. 9226, op. 1, d. 951, l. 54. For years the iron and steel combine in Magnitogorsk, which had responsibility for the city's sewerage system, was in dispute with the GSI over whether or not it had to build a modern treatment plant. The combine had been given a deadline to complete the plant by July 1952. It claimed that not only was a treatment plant unnecessary, its design and construction would take at least three years. Significantly, the combine appealed not to the GSI, but directly to I. F. Tevosian, Deputy Chair of the USSR Council of Ministers, who passed the matter to Boldyrev, head of the All-Union GSI. Boldyrev dismissed the combine's protest as groundless and insisted that it finish the work more or less on schedule, not the least because the existing methods of sewage treatment (filter beds and absorption) in Magnitogorsk left the town extremely vulnerable to high disease rates. GARF, f. 9226, op. 1, d. 1142, l. 45–47. We do not know how this dispute ended, but it is worth pointing out that Magnitogorsk had had one of the highest rates of infant mortality in the RSFSR: 16.5 per cent of all live births in 1950, and 9.7 per cent in 1951. Rossiiskii gosudarstvennyi arkhiv ekonimiki [RGAE], f. 1562, op. 329, d. d. 4703, l. 188 (1950); GARF, f. A-374, op. 14, d. 1702, l. 16 (1951).

30 GARF, f. 9226, op. 1, d. 951, l. 54; d. 1142, l. 25.

31 GARF, f. 9226, op. 1, d. 951, l. 44–52, 69. One of the interesting things about the first of these documents (on l. 44–52), is that it casts the work of the local Sanitary Inspectors in a rather different light from their own local reports. In the latter the inspectors portray themselves as diligent, dedicated, and highly conscientious sanitary physicians, whose enforcement powers may have been limited, but who used them as best they could. This was not always the perception of their superiors in Moscow, who here accuse them of being too cozy with factory managers.

32 This issue comes up constantly in the documentation. For an indicative reference, see GARF, f. 9226, op. 1, d. 950, l. 179. I discuss it in more detail at the end of this section.

calculus that informed ministerial and enterprise decisions: enterprises would only build and instal treatment plants if it brought them direct economic benefit – as when the oil industry installed traps to recapture oil for reprocessing. What damage their discharges did to other factories (or to people) was of no concern to them.[33]

Yet even if ministries acted in good faith and tried to abide by the decree, they found themselves blocked by other obstacles. The Soviet Union still did not have any standard designs or protocols for constructing waste treatment plants, nor any lists of standard parts and equipment. Most ministries would not know what equipment they would need, and much of it (specialized pumps, pipe work of the correct size) the economy did not manufacture. The same applied to the preliminary design work, which tended to be done with inordinate delays and then, when design organizations delivered their plans to the construction organizations, the latter found the plans to be incomplete. If, after all these difficulties, a factory nevertheless managed to build a treatment plant, it could then discover it had no one competent to operate it. Lavrov claimed that local GSI inspections in Ukraine found that many treatment plants were being operated so incompetently that they were doing more harm to the environment than if they had not existed in the first place.

It might be tempting to think that this complex of problems were all inheritances of the war, and thus confined to the early postwar years. By late 1951 it was clear that this was now a permanent state of affairs, and moreover, one institutionally sustained by Gosplan itself. The country still did not manufacture sufficient quantities of pipe or crucial parts, such as Raschig rings, without which treatment plants could not operate. If work passed beyond the design stage, construction work fell hopelessly behind schedule, not the least because industrial construction projects took priority. Ministries still did not issue funds to their factories to allow them to build treatment plants. More insidiously, enterprises paid out millions of roubles a year in tax for releasing untreated waste water. The iron and steel combine in Magnitogorsk paid out 12 million roubles in tax during 1950, and had already paid out another 4 million during the first three months of 1951 (an annual rate of 16 million roubles and a 33 per cent increase over 1950). Yet its parent ministry, the Ministry of the Iron and Steel Industry, refused to sanction the money for it to build a waste treatment plant. The same was true of the giant Kuznetsk Iron and Steel Combine in Kemerovo oblast' and the Kemerovo coke-oven products factory. They even included the cost of the tax in their annual budgets. The iron and steel combine set aside 3.5 million roubles a year as a specific budget item for this. It is worth reflecting on this fact, because it means that Gosplan must have included this

33 This was well articulated by Lavrov in his address to the Second Inter-Departmental Conference on Questions of Coordinating Scientific Research Work in the Field of Cleaning Industrial Waste Waters, held on 6-7 December 1948. The discussion in the following paragraphs is taken from his survey, found in GARF, f. 9226, op. 1, d. 950, l. 173–182.

cost in the factory's annual plan – at the same time as elsewhere Gosplan was deliberately refusing to include in local plans the funds for treatment works. The point was that no matter how high the tax (which was in effect a fine), in reality this cost the enterprises nothing, since the money was now part of their centrally-approved budget. If there were any need of evidence of just how seriously the Stalinist system took the problem of water pollution, we have it here.[34]

Large Cities vs. Small Towns

In his path-breaking book, *The Destruction of Nature in the Soviet Union*, Ze'ev Wolfson notes that one of the most serious causes of river pollution was Soviet agriculture, primarily through its careless use of mineral fertilizers, followed closely by its misuse of agricultural pesticides, gasoline, diesel fuel, and lubricants.[35] In the period I am dealing with in this paper, a period which predates the massive expansion of the chemical industry under Khrushchev, the main focus of concern was industry. The damage caused by the large industrial cities was obvious, and I have detailed some of this in the paper cited above, in footnote 19. This was true even in Moscow. During the postwar years Moscow had invested heavily in building sewage and water treatment plants in the north of the city, to capture the already polluted waters of the Moscow River where it fed the reservoirs from which Moscow took its water supply. At this point the SES claimed that the Moscow River was a "conditionally clean" river. After flowing through Moscow, however, the river had picked up enough industrial and faecal pollution to render it unfit for bathing.[36]

Moscow was in many ways exceptional, insofar as it was generally able to protect the water supply of its own population, while generating enormous hazards for the towns of Moscow oblast' and beyond. Other large industrial cities displayed a somewhat different pattern. If we look, for example, at the

34 GARF, f. 9226, op. 1, d. 1142, l. 24–26. In 1951, the USSR Ministry of the Food Industry issued funds for finishing the design work for treatment plants at Lithuania's sugar refineries. Gosplan of the Lithuanian SSR, however, did not include these funds in the plan of the Republic's Sugar Trust. Thus no design work was done in 1951.

35 Boris Komarov [Ze'ev Wolfson], *The Destruction of Nature in the Soviet Union* (White Plains, New York, 1980), pp. 35–36.

36 GARF, f. A-482, op. 49, d. 7373, l. 139. The bacterial pollution was by far the more serious hazard. Levels of industrial pollutants were high, but still far below those found prior to treatment. The general bacteria count, however, was virtually indistinguishable from raw sewage. The coliform titre, a measure of the number of intestinal bacteria per millilitre of water was 25,000 per ml. This was 90 per cent better than raw sewage, but still very, very high. By way of comparison, the permitted number of e-coli per millilitre of water in the United States is zero. Irina Mikhailovna Belova, "Eksperimental'nye issledovaniia effektivnosti biologicheskoi ochistki bytovykh stochnykh vod ot vozbuditelei kishechnykh infektsii," Candidate Dissertation (Moscow, 1953), pp. 79–87, 114.

three Urals industrial metropolises included in my comparative case studies – Sverdlovsk, Cheliabinsk, and Molotov – for a considerable period they, too, managed to maintain adequate quality drinking water for their own populations, while contributing substantially to the poor and often unsafe drinking water in the towns of their surrounding oblasti. Unlike Moscow, however, they had difficulty sustaining this situation over time, because as industrial recovery proceeded during the postwar years water quality substantially worsened. The classic illustration of this would be Molotov.

Molotov's water problems had a long history. Even before the war, average daily consumption was only 39.5 litres per person, and in the immediate postwar period only around 40 per cent of its population had access to water supply. As with some other Soviet cities, Yaroslavl' being one of the more graphic examples, Molotov's water supply was compromised by the fact that its main pumping station was situated just *below* the discharge points of massive amounts of pollution into the Kama River by a whole range of large industrial enterprises (the Molotov engineering works, a chemical plant, an iron and steel works, a handful of coke-oven products factories, and a petroleum depot). The local GSI characterized the Kama River inside of Molotov as "very like a complex chemical solution which, as they say, 'contains the entire Mendeleev system'." Yet for all this the city water supply met basic standards because Molotov, unlike the vast majority of industrial towns and cities, was able to put its water through the full cycle of treatment: chlorination, sedimentation, filter beds, and coagulation. Coagulation was one of the great Achilles heals of Soviet water systems. It was an essential step in removing chemical, as opposed to biological, wastes from water sources, yet the coagulants themselves were in very short supply. Molotov, however, had the good fortune that one of its chemical plants produced ferrous hydroxide – a coagulant – as a byproduct of the manufacture of sulphuric acid.[37]

By 1954 the situation had changed dramatically for the worse. There were a number of reasons for this. Up to this time the city had relied on treating the water at the intake point for its main supply – there was little effort to curb the original sources of the pollution by reducing and/or decontaminating the discharges from the city's factories. Thus the Kama River supply – the most important in the city – was having to deal with untreated discharges from no less than 28 different large-scale enterprises, 16 of which released their waste water directly into the Kama, and 12 of which discharged into tributaries of the Kama. The pollutants included dyes, phenols, chlorides, nitrates, petroleum residues, chromium, tin, lead, and cyanide compounds. It was only in *1953* that the City Executive Committee approved plans to build treatment works at 12 of the city's industrial enterprises (that is, at less than half of the main sources of pollution), but as of 1954 only two of these had actually started any construction work. The city now faced a major water crisis. Since the early 1950s it had

37 GARF, f. A-482, op. 47, d. 3431, l. 11–18; the quotation is from l. 12.

already had to cut back on the process of coagulation. If in the early postwar years it coagulated regularly, from 1951 onwards it coagulated only during the spring and summer, mainly because the ferrous hydroxide they used as the coagulant proved ineffective in hard water at very cold temperatures, especially when, as it turned out here, it was also of poor quality. The only way that the city could have brought the water back to acceptable standards would have been to halve the amount of water treated at the pumping station. The dilemma was rather clear cut: the city now supplied up to 60 per cent of its population with water from a central supply (an increase of 50 per cent since 1947), but the quality of the water was substandard; it could provide clean water only by dramatically reducing the amount of water available.[38]

The situation in the large cities differed fundamentally from that in small industrial towns. In terms of water quality they were in an infinitely worse situation, an issue I discuss in the article cited above in footnote 2. Perhaps less obvious was the fact that they were some of the worst polluters of waterways. Especially in the Urals, but not only there, the Soviet Union was littered with small and medium-sized towns, sometimes little more than villages, dominated by one or two large industrial enterprises, or even small factories (especially dangerous were food processing plants, especially those handling animals). These were capable to doing extraordinary amounts of damage. In some cases they could be more of a danger than the large cities, because these towns were least likely to have sewerage or treatment facilities, and their local soviets or sanitary inspectors were least likely to be able to pressurize the industrial ministries to make the required investments.

We can illustrate this by following the course of the Kama River, the main waterway in Molotov oblast'. Long before it reached Molotov oblast', the Kama would already have received substantial pollution from its larger tributaries. One of these was the Chusovaia, one of the major rivers in Sverdlovsk oblast' whose dismal state at the end of World War Two we have already described. The Chusovaia had its source just north of the city of Sverdlovsk, whence it flowed westwards for some 600 kilometres, and eventually fed into the Kama. In 1945 and 1946 the state of the Chusovaia was still catastrophic. Already at its source it was polluted by fluorine, sulphuric acid, oil, alkalis, and slag from copper mines, a cryolite factory, and an iron and steel works along two of its tributaries, the Zheleznianka and the Severushka. Then, as the Chusovaia flowed through the area around Revda, it acquired still more of these same pollutants, thanks to the copper mines around Degtyarka, the metallurgical works in Revda itself, and the copper smelting plant in Sredne-Ural'sk. As the Chusovaia made its way westwards through Pervoural'sk it picked up chromium salts, phenols, and an assortment of different resins from a dinas brick factory, a chemical plant, and the Novo-Trubnyi iron and steel works. The early postwar GSI reports cited a number of protective measures designed to

38 GARF, f. A-482, op. 49, d. 8862, l. 9–12, 14, 17, 23–24, 30–34, 36–38.

curb the discharges of phenol and fluorine – measures that had relatively little success because of shortages of lime, needed as a coagulant. The GSI also warned that along parts of the river the contamination had reached a point where neither industry nor people could use the water.[39] By 1953 it was clear that these measures had produced little effect – either that, or new sources of pollution had simply cancelled them out. Each day factories situated along the Chusovaia's shores pumped into it "tens of thousands of cubic metres" of copper compounds, iron, phenol, resins, various acids, and other organic compounds.[40]

As the Kama ran through Molotov oblast' and Molotov city itself, the sources of contamination multiplied. The main culprits were paper mills in Krasnokamsk and Krasnovishersk; chemical works and a paper mill in Solikamsk; more chemical plants and a power station in Berezniki; iron and steel works in Chusovoi, Chermoz, and Dobrianka; two large coal fields around Kizel and Gubakha; and last but not least the chemical and engineering works in Molotov city itself, which I have already described. The paper mills were especially hazardous, because in addition to chemicals they also discharged cellulose fibres which killed off fish by blocking up their gills. The effluent from the soda factory in Berezniki was said to be so toxic that even at dilutions of 500,000 to 1 it was still killing off fish and microorganisms. The fish kills were of some significance, as they jeopardized the oblast' fishing industry – not to mention the risk to anyone who ate those fish which managed to survive.[41]

Because we associate the Urals and Western Siberia with heavy industry, the above portrait may not be surprising. Yet the story varies only in degree from the less industrialized oblasti, of which Gor'kii oblast' is a good example. Gor'kii oblast' was primarily agricultural, but it nonetheless contained a number of industrial towns of roughly 20,000 to 30,000 inhabitants, and one city, Dzerzhinsk, of considerable size (139,000 residents) and economic significance.

The oblast' was home to a vast range of industries. Paper, chemicals, building materials, agricultural machinery, iron and steel, electric power, food, and light industries all had enterprises there, and most were located on, or very near to, open bodies of water, ranging from the Volga and the Oka, to smaller tributaries (the Riazanka, Arzinka, and Chugunka, being the most important). Irrespective of the diversity of what they produced or where they were located, they all had one thing in common: they dumped their waste waters either totally untreated, or treated only in rudimentary and unsatisfactory fashion.[42]

39 GARF, f. 9226, op. 1, d. 693, l. 63–69, and d. 736, l. 73–84.

40 GARF, f. 9226, op. 1, d. 1249, l. 27.

41 GARF, f. 9226, op. 1, d. 899, l. 56–60, 291–300. GARF, f. A-482, op. 47, d. 6345, l. 255–257. Significantly, the latter report (l. 257) commented only on the economic damage done by the fish kills, and not their potential implications for public health.

42 GARF, f. A-482, op. 47, d. 6335, l. 65.

Let us start with Dzerzhinsk. The city was located on the Oka, not far from Gor'kii. Its most important industry was chemicals. Its largest chemical works was the Kalinin Chernorechensk Chemical Combine, whose existence was so secret that the GSI reports could refer to it only obliquely. In 1946 it discharged an average of 85,000 cubic metres of waste waters a day into the Oka, including 34 tons of chloride salts and 42.5 tons of sulphates. The factory had no treatment facility whatsoever. By 1947 the volume of discharges had risen by nearly 50 per cent, to 115,000 cubic metres a day. The other chemical plants in Dzerzhinsk contributed smaller, but still considerable amounts to the overall pollution – in 1946 their combined discharges came to 60,000 cubic metres a day. The Oka was a powerful river, and according to the then prevalent theory of "self-cleaning," it should have been able to cope with this kind of pollution. The fact is, however, that it could not. If in 1946 sanitary experts raised the alarm that the number of fish in the Oka below Dzerzhinsk was sharply declining, by 1947 they claimed that fishing in the river had virtually ceased. In some ways this seemed more alarming than the fact that the pollution from Dzerzhinsk was also threatening the water supply of Gor'kii city.[43]

Dzerzhinsk, admittedly, was a proper city. The other sources of river pollution in Gor'kii oblast' were not. The industry that attracted the most attention here was paper. Balakhna had a population in 1948 of 18,800, but another 33,600 lived in surrounding workers' settlements attached to its various factories, the two most important of which were the paper combine and its cardboard factory. There was another cardboard factory in the town of Kalinin. The main pollutant from the Balakhna paper combine was wood fibre. The factory actually provided some treatment of its wastes, but their overall volume was so great that even after trapping some 70 per cent of the fibre, it still discharged around 30 tons of it, plus another 500 cubic metres of sulphite ash, into the Volga each and every day. In the area around the factory the Volga was unusable for drinking water. The pollution extended several tens of kilometres downstream. Thus one its first victims was the cardboard factory, located 7 km downstream from the paper combine, insofar as the remaining fibre in the water made it difficult to purify enough Volga water for the domestic use of the cardboard factory's own workers. Needless to say, it was no longer possible to fish along this part of the river, primarily because of massive growth of the fungus, *Leptomitus Lacteus*. The discharges from the cardboard factory into the Volga were on a much smaller scale, a "mere" 10,000 cubic metres of waste water per day – but it was all completely untreated. The cardboard factory in Kalinin was a relatively small enterprise, but it fed into a similarly small river, the Vol, which the GSI characterized as "a bedraggled tributary" of the River Vetluga. The weak flow of the Vol meant that it was impossible to dilute or wash away the pollution. On the contrary, it had become "putrid, with a dark

43 GARF, f. A-482, op. 47, d. 4914, l. 107–108, and d. 6335, l. 71–72.

colour," totally devoid of fauna, and with fish able to survive only in its lower reaches.[44]

The Vetluga had other small tributaries that were equally in peril and perilous in turn. Again, the problem lay in relatively small factories which, however, produced highly toxic discharges. A tar factory along the Belen'kaia, for example, released only 1.5 cubic metres of waste water an hour, but these contained an array of organic compounds, including acetone, methylated spirit, phenols, and tar, which turned the bed and both banks of Belen'kaya totally black, while the water itself was completely brown and covered in a chemical film. All this ran into the Vetluga.[45]

The town of Bor (total population 24,000, including its workers' settlements) was home to the Maksim Gor'kii glass factory. The town of Vyksa (population 32,000) was the site of an iron and steel works. What linked them was the pollution from their gas generators, a source of contamination rarely discussed in other local GSI reports. The process of gas generation produced chemicals which, even in small quantities, were highly toxic: phenol compounds, tars and resins, and acetic acid. Both factories discharged their waste water not into the Volga (at least not directly), but into lakes or ponds with underground connections to the Volga. Both factories had converted their respective receptacles into "dead" bodies of water. The local pond at Vyksa had a number of population settlements on its banks, but the water was so poisoned that no one could use it. The pollution from the Bor glass works was said to have killed off fish along the Volga over a stretch of 20 kilometres.[46]

Finally, we should mention the damage done by branches of production we might not immediately associate with river pollution, notably food processing and hides. The oblast' had a number of starch factories, which operated only for three months of the year following the potato harvest, that is, from October to December. These months saw massive fish kills, and the water was so contaminated that no livestock could drink it. Even more damaging were the leather factories, which released lime, fleece, bristle, sodium chloride, soda ash, hydrochloric acid, and sulphuric acid. These went into the Riazanka river, and although they caused only "occasional" fish kills, they had destroyed all crustacean life.[47]

The above data are all from 1946 and 1947. By 1954 there appears to have been some improvement in both the Oka and the Volga, at least insofar as the SES now claimed that water samples only "sometimes" exceeded permitted limits – although these, as we know, could be far higher than what was actually safe. To the above noted range of toxins, however, they now detected lead and cyanide (although they could find no obvious source for the latter). The

44 GARF, f. A-482, op. 47, d. 4914, l. 105–106, and d. 6335, l. 66.
45 GARF, f. A-482, op. 47, d. d. 6335, l. 67.
46 GARF, f. A-482, op. 47, d. 4914, l. 111–112, and d. 6335, l. 70.
47 GARF, f. A-482, op. 47, d. 6335, l. 68–70.

main difficulty was the continued slow pace of construction of waste treatment plants. The Balakhna paper combine, the Bor glass works, and the chemical plants in Dzerzhinsk *still* had not gone past the design stage. Neither they, nor any of the other large enterprises in the oblast' still without treatment works had begun actual *construction* during 1954, a full seven and one-half years after the May 1947 decree. What of those factories that had done something in this interval? The main progress had been in the leather factories at Bogorodsk. They now had equipment that removed anywhere from half to 90 per cent of their waste products, yet they were still discharging effluent containing fats, chromium, sulphates, dies, and calcium.[48]

Despite its mainly agricultural economy, Gor'kii oblast' therefore made a major contribution to the destruction of two major rivers, the Oka and the Volga. The poisoning of Russia's rivers was not a Urals problem. It was part and parcel of the Stalinist industrial economy.

Conclusion

There are a number of conclusions we can draw from the material we have presented here. The most obvious, perhaps, is that the prehistory of what Murray Feshbach and Alfred Friendly called "ecocide"[49] really begins here, in the very essence of Stalinist industrialization, in particular its fetishization of industrial growth and "plan fulfilment" at the expense of the people who laboured to fulfil these plans. The economic damage of river pollution was enormous: it destroyed the ecosystems of these water sources; it did serious damage to the machinery of industrial enterprises and to the river boats that hauled goods and raw materials. The contamination of rivers caused inordinate misery and hardship to communities that relied on them for their water supply. As we have seen, already in the early postwar period, there were significant stretches of rivers where neither people nor livestock could use the water. However, when referring specifically to the late Stalin period we must be careful not to overstate the extent of the damage already done. The wholesale poisoning of the USSR's rivers that we were to witness in the 1970s and 1980s had not yet occurred – most sections of most rivers were still probably reasonably clean. What is crucial here is that the policies and behaviours that were to produce the later catastrophe were now already definable.

To a certain extent the Soviet Union was repeating the experience of nineteenth century Britain and Germany. The more rapidly industrialization proceeded, the worse the rivers became. Yet the Soviet Union was not Victorian Britain and it was not Wilhelmine Germany. Its planners and scientists knew perfectly well what damage they were causing and what technology they need-

48 GARF, f. A-482, op. 49, d. 8835, l. 7–8.

49 Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR: Health and Nature Under Siege* (London: Aurum Press, 1992).

ed in order to reduce the hazard, if not eliminate it altogether. Stalinist investment priorities made it impossible to act on this knowledge. Gosplan and the Council of Ministers would allocate funds for factories and production shops, but not for waste and water treatment plants – even when their own legislation required their construction.

The other great impact, much more difficult to assess, was on public health. What, if any, damage did these dirty rivers do to people, either immediately or over the long term? I am not qualified to deal with the question of the long-term health problems, but in the short term we can make some approximate assessments. As we have stressed in several places in this paper, water supply was part of a larger complex of sanitary issues that affected both the quality of people's lives and their health and life prospects. One of the better measures of this is infant mortality, which is generally accepted as an accurate indicator of a society's overall state of public health and well being. We know that infant mortality in Russian cities remained high after the war, although with the exception of the famine year of 1947, it was lower than prewar levels. One of the causes of high infant mortality was lack of access to clean water in cities where general sanitation was also poor. This proved especially dangerous during the food crisis of 1947, when many babies died because their mothers could not breastfeed, could not buy milk in state stores or on the kolkhoz market, and therefore had to resort to substitute foods made with unsafe water. A closer look at regional data shows that after the crisis of 1947 new patterns emerged. Overall, infant mortality in the cities of the RSFSR fell, but it fell unevenly. In Moscow, where the regime had concentrated its postwar efforts on sanitary reform and protecting the water supply, infant mortality dropped very fast and very far. Infant mortality in the other industrial regions did not show such dramatic improvement, and in the cities and towns of Cheliabinsk, Molotov, and Sverdlovsk oblasti it persisted at close to 1947 levels until the early 1950s. A large gap opened up between the survival chances of a baby born in Moscow and a baby born in nearby Moscow oblast', and especially a baby born in the Urals or Kemerovo oblast'. Even when infant mortality began to fall in these regions, it fell much more slowly than in Moscow: right up to the mid-1950s a baby born in the industrial towns of the Urals or Kemerovo oblast was roughly twice as likely to die during the first year of life as a baby born in Moscow city. What we see here is that infant mortality was highest in precisely those industrial regions where sanitary reform was slowest. Insofar as water supply formed a crucial part of this sanitary nexus, we can say that the poisoning of the rivers, and the failure to provide proper sanitation and water supply in general, took a heavy toll. This was indeed a poisoning of the proletariat. The long-term impact on adult proletarians may be difficult to measure; but its impact on their newborn children was not.[50]

50 Donald Filtzer, "Understanding Infant Mortality during Late Stalinism: War, Famine, & the Urban Environment," unpublished conference paper, American Association for the Advancement of Slavic Studies annual convention, Washington D. C. (November 2006).