

WASTES & AIR POLLUTION

How the war has changed Russia

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WASTES & AIR POLLUTION

Assessment of Changes during 2022 — early 2024

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Notes on Authorship and Accessibility

Since the start of the full-scale invasion of Ukraine by the Russian army, many Russian environmental experts have been publishing under pseudonyms to hide their identities. For those working in Russia, this helps to reduce the risk of repressions by Russian security services and harassment by government-controlled media and public associations while allowing them to continue participating in important discussions and sharing expert opinions. You can contact them via our email address peresborka@proton.me.

In this analytical review, the authors refer to government data sources. Many of these sources are not accessible to users with Internet providers outside Russia. To access these sources, you may need to use a VPN service that connects through Russia. Please ensure that the use of VPNs complies with the legal requirements in your country.

Contents

Summary	4
Introduction	5
Assessment methods	6
Air Pollution	8
Air quality control system in Russia	8
Pollution data presented by enterprises	10
Estimates of vehicle exhaust emissions	13
Estimates of pollution dynamics according to ROSGIDROMET reports	14
Waste	19
Total amount of generated waste	19
Difficulty accessing data	21
“Leaps” in waste generation volumes	22
Legal issues	23
Some Conclusions	24
Air Pollution	24
Waste	25
Addendum	26

Summary

The events that took place in Russia after February 2022 have had a serious impact on how humans interact with nature. Effects of such interaction accumulate gradually, hence today we can hardly notice any changes except as regards a limited set of parameters. These include processes most probably related to import limitations, lower environmental protection standards and sloppy handling of production technologies.

Monitoring of the condition of the environment and the negative impacts that it experiences remains at an extremely low level in Russia. Air pollution is controlled in only 20% of cities. But even Rosstat data indicates that in the period 2020-22, emissions from stationary sources increased. Statistics on pollution from vehicles cannot be used due to questionable reliability of the methodology; when it was changed in 2019, their emissions data dropped by a factor of three. In addition, the requirements for permissible vehicle emission levels were lowered in 2022.

There are divergent trends in the amounts of pollutants emitted and changes in average concentrations. Negative indicators are the steady increase in formaldehyde concentrations and emissions.

The 2022-2023 changes are due to a decrease in the number of stations and an increase in the number of high pollution cases (discrete measurements with comparable data across years).

A drastic leap in emissions of benzopyrene and lead was recorded, as well as an increase in cases of high pollution with benzopyrene in 2022, compared to the previous year.

It is impossible to draw unambiguous conclusions about the dynamics of air pollution in all of Russia based on the available data. While emissions and concentrations of some substances or groups of agents are decreasing, others are rising, and their toxicity has not been assessed not in all cases. Yet we can say with confidence that there has been no noticeable improvement in air quality in the country. Instead, a series of data for the years 2022-23 are indicative of significant negative trends.

The problem of growing waste amounts continues to be an issue for several decades now. The rate of such growth exceeds 10% per year, which significantly exceeds the GDP growth rate. The volume of waste generated in the Russian Federation is more than double that of China, which is impressive even considering the different monitoring methods used in these countries.

Introduction

At the end of February 2022, Russia had embarked on an era of serious transformations that affected both legislation and the economy. As far as environmental protection was concerned, difficulties arose with the supply and maintenance of imported equipment, financing of ecological activities, affected were the systems of management and control (in current Russian terminology — *nadzor* -inspection), and the consumption patterns have changed. But the most important thing is that environmental protection has actually ceased to be a priority for the authorities, giving way to other concerns.

Let us consider two examples: waste generation and urban air pollution. It is not accidental that we refer to them: waste is difficult to hide, and of all environmental problems it is air pollution that causes the greatest concern among Russian residents.¹

It should be noted that the statistics provided by government agencies look increasingly less reliable. For example, in the “State reports on the status and protection of the environment in the Russian Federation” for 2021-22, one has to deal with confusing terminology: officials confuse inter- and in-facility oil pipelines with the main ones. The corresponding 2022 Report² states that the discharge of sulfate anions (sulfates) amounted to 5 million tons in 2021 (in 2020 — 1.7 million tons), whereas in the Report³ published in 2023, the data for 2021 “unexpectedly” dropped to 1.6 million tons without any explanation. The information from these reports may be used not so much as a source of reliable measurement data as for assessing overall dynamics. It is remarkable that the data by ROSGIDROMET (Federal Service for Hydrometeorology and Environmental Monitoring) are more accurate — the reason might be that the funding of this Federal Service does not depend on the results of measurements.

1 According to Levada-Center’s most recent results, air pollution has been listed by the residents of RF as the MOST serious problem (26%), followed by “disposal of household waste” (17%) - <https://www.levada.ru/2020/01/23/problemy-okruzhayushhej-sredy/>

2 The Federal Report on the status and protection of the Environment in the Russian Federation, 2021


3 The Federal Report on the status and protection of the Environment in the Russian Federation, 2022

As noted above, industrial processes — the main source of environmental pollution — are typically very inertial⁴. Measuring changes such as those due to a deficit of equipment and resources or weakening of control, can take a long period of time. However, certain signs of the processes associated, for example, with equipment maintenance, adherence to production cycles, and replacement of parts, may be detected sooner. We will consider this using the example of ruptures in oil and other pipelines. In the period from 2017 to 2022, largely thanks to the activities of social groups, the number of such breaches decreased by an average of 8-10% annually⁵. Whereas in 2022 alone, this number decreased 2.2 - 2.6 times. Data for 2023 have not yet been made public, so we cannot yet identify a stable trend.

Assessment methods

We are not able to conduct a comprehensive analysis and will need to limit ourselves to a recap of the specimens of available data relating to the current trends or noticeable changes in the situation with the environment in Russia in the period 2022-23⁶.

For each of the two “objects” (atmosphere and waste), we will consider the following elements:

	Individual standard assessments	Certain general characteristics showing the presence, vector and magnitude of the changes as well as the gravity of associated effects.
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4 Bosi S, Desmarchelier D, Ragot L. Pollution effects on preferences: A unified approach. *J Public Econ Theory*. 2019; 21: 371–399. <https://doi.org/10.1111/jpet.12348>

5 According to Federal reports on the status and protection of the Environment in the Russian Federation

6 Comparable data typically does not become available before the end of the first quarter of the following year, so for 2023 it won't be available until summer 2024


Rapid or substantial changes

Unpredictable, sudden or significant changes in statistical and hydrometeorological indices (mainly based on data from 2022). For example, a noticeable “leap” in an indicator that had been changing gradually or slightly in previous years, is a manifestation of some significant change that could have been a result of some major event. Data for 2022 (and where possible, 2023) were compared with data from the preceding 3-5 year periods. It should be borne in mind that significant annual fluctuations can also be caused by natural phenomena — such as specific weather conditions.


Quality and accessibility of ecological information

We speak about restricted access to data that had never been limited before.


Law, Funds and Media

Changes in legislation or public opinion are such that need to be observed over protracted periods of time (longer than one year). These kinds of latent elements may be subtle but often lead to dramatic changes.

Air Pollution

In many Russian cities air is heavily polluted with emissions from industrial enterprises and vehicles. Such pollution can be both short-term (occurs from time to time) and long-term; also, it may differ across the same locality. To describe air pollution “in general,” especially on the country scale, different approaches are applied that provide many discrete measurements of a small number of comparable (for different years) indices, rather than a general overview. Such indices include, for example, the number of cities with different levels of pollution or the proportion of samples that fail to meet standards.

Air quality control system in Russia

Air quality is not probed except in a small proportion of cities.

IN 2022 32% OF THE URBAN POPULATION INHABITED AREAS WHERE THE LEVEL OF POLLUTION WAS NOT ASSESSED BECAUSE MEASUREMENTS WERE FEW OR NONE AT ALL.⁷

Ten years earlier, in 2012, pollution levels were not measured for 35% of the population⁸. At this rate (+ 3% over 10 years), the measurements of pollution levels for all urban residents of Russia can hardly be expected to be completed within about a hundred years, but now even this prospect is vague. Figure 1 shows the 5-year dynamics of the number of Russian stations that monitor air pollution.

7 Annual Report: Air pollution status for 2022, -2023 see addendum

8 Annual Report: Air pollution status for 2012, -2013 see addendum

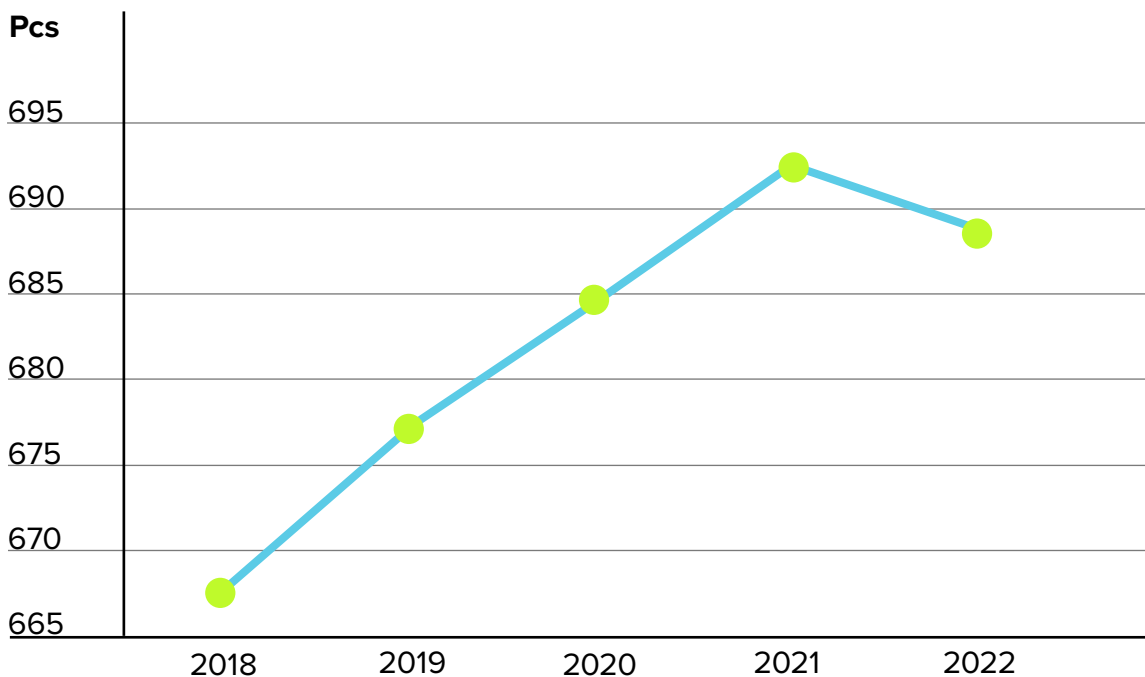


Fig. 1. Total number of stations in RF rigged with ambient air pollution monitoring equipment

In 2022, the number of such stations decreased, overturning the tendency of the previous period. It could be due to import restrictions.

In the year 2022 air pollution was being monitored in only 20% of cities in the country, but in as few as 10% of those with less than 100.000 population. Only cities with million or over inhabitants have been monitored comprehensively. Of course, regular monitoring may not be necessary in many smaller towns, but as far as towns hosting potentially noxious industries are concerned it is necessary. Taking Chelyabinsk Region as an example, three cities stand out as featuring high pollution levels: Karabash, Satka and Verkhniy Ufaley , where no state-run monitoring networks are available⁹. Apparently, such limitations are due to short funding of hydrometeorology in general.

9 The state-sponsored Program “Environmental Protection in the Chelyabinsk Region for the 2018-2025 period” [cks174.ru/storage/app/media/Документы/Государственная программа охраны.pdf](https://cks174.ru/storage/app/media/Документы/Государственная_программа_охраны.pdf) or data of the Chelyabinsk Hydrometeorology Center and Environmental Monitoring Center www.chelpogoda.ru/pages/228

LACK OF FEDERAL SURVEILLANCE NETWORK STATIONS IN **KARABASH, A CITY THAT ALREADY 10 YEARS BACK WAS RATED AS ONE OF WORLD'S **DIRTIEST CITIES**¹⁰, DOES DEMONSTRATE A **LACK OF RESPECT** FOR CITIZENS AND WRONG PRIORITIES IN THE COUNTRY.**

This year, Federal bodies of the RF have repeatedly published on their official sites reports of adverse meteorological conditions and calls for cutting down noxious emissions — both in the Region (Oblast')¹¹ and the country in general.¹²

Pollution data presented by enterprises

Industrial enterprises are required to submit information to government agencies about how much pollutants these enterprises emitted into the air. Based on their data, a tax is calculated as a sort of compensation for the negative impact on the environment. Of course, these enterprise reports must be treated with caution: their financial interest cannot but influence the reliability and completeness of the information provided. However, even from the emitting companies' data we conclude that the air quality situation has not improved in recent years – the observed trends have been multidirectional. Figure 2 illustrates the dynamics of emissions of the most common pollutants according to producers' own data¹³. As can be seen from the graphs, there has been no noticeable downward trend in emissions; in 2022, emissions of sulfur dioxide increased and, over the past five years, emissions of nitrogen oxides have been growing (by more than 10%).

10 <https://ria.ru/20101102/291393195.html> and according to estimates by Green Cross Switzerland <http://www.worstpolluted.org/projects/pollutants/ap>

11 www.chelpogoda.ru/pages/975.php

12 <http://prognoznmu.ru/>

13 <https://rosstat.gov.ru/folder/11194>

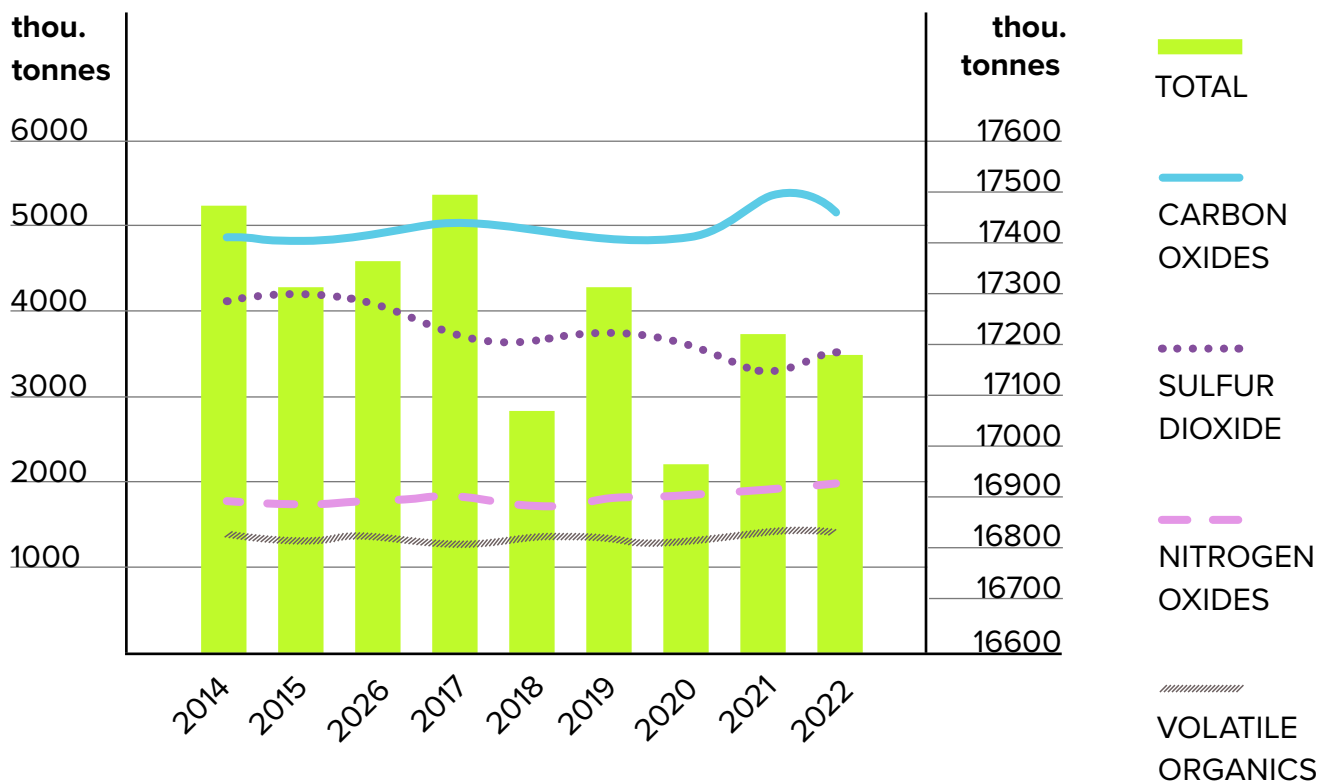


Fig. 2. Emissions from stationary sources

The summary statistical data (so-called "2TP-Air" forms) were posted on ROSPRIRODNADZOR's official site, covering the four year period between 2019 and 2022¹⁴. These data have varying degrees of comprehensiveness (depending on the year, they incorporate from 100 to more than 300 indices), but comparison allows us to notice sharp changes that significantly exceed the fluctuations observed in 2019-21. These changes are shown in Table 1.

¹⁴ <https://rosstat.gov.ru/folder/11194>

SHORT NAME OF POLLUTING AGENT	2019	2020 ¹	2021	2022	INCREASE IN 2022 COMPARED TO 2021, %
1,2,3,4- tetrahydronaphthalene		2.04	2.01	2.67	33
benzopyrene	206	324	243	439	81
dimethylamine	240	259	252	286	13
methylmercaptan	176	120	167	197	18
polyethene	232	286	277	419	51
prop-1-ene-2-al	91	107	110	126	15
propane-2-one	6621	7998	8876	11011	24
lead and derivatives	75	81	84	95	13
formaldehyde	4881	5093	5465	5740	5
chlorine	582	665	633	718	13

Table 1. Dynamics of emission of certain agents derived from the 2TP-Air forms

Of these, two groups of substances deserve special attention. The first is prop-2-ene-1-al, propane-2-one, lead and its compounds, formaldehyde and chlorine. They are emitted in ever growing amounts annually. ROSGIDROMET systematically monitors only formaldehyde — and the indications of the constant increase of its emissions correspond with the data on increasing concentrations of this agent in the atmosphere. The second group, which includes benzopyrene and polyethylene, soared sharply in 2022 — by more than 80% and more than 50%, respectively.

THE INCREASE IN BENZOPYRENE EMISSIONS IS LIKELY DUE TO TECHNOLOGICAL LIMITATIONS IMPOSED IN 2022.

Over the last 30 years (more precisely, since 1992)¹⁵, the level of cleaning reported by companies has remained virtually unchanged. If this trend continues, based on comparison of 2002 and 2022, it will take 250 years to completely clean up these pollutant emissions.

¹⁵ https://rosstat.gov.ru/storage/mediabank/Oxr_vibr1.xls

Estimates of vehicle exhaust emissions

The assessment of emissions from transport vehicles¹⁶, primarily cars, for the period after 2019 is based¹⁷ on the data concerning the cars' ecological classes and average mileage. Taking into account the problems of cars not meeting the declared ecological class requirements, disabled Ad Blue injection systems, the inadequacy of dividing mileage into "urban" and "off-road" modes only, violations of the requirements for the physical and chemical characteristics of motor fuels, likely additional adjustments on regional level, - the available data on vehicle emissions can hardly be recognized as complete and adequate¹⁸. Even using the much more advanced methodology introduced in the Netherlands¹⁹ (which includes up-to-date data on mileages and volumes of fuel sold) implies an error of from 20 to 200%.

The changes in measurement methods introduced in 2019 led to a threefold decrease²⁰ in the total volume of transport emissions accounted for in reports, i.e. by 10 million tons, which undermined the validity of the final data.

IN ADDITION, THE GOVERNMENT OF THE RUSSIAN FEDERATION HAVE LEGALIZED THE EURO 0 ECOLOGICAL CLASS FOR MOST TYPES OF CARS PRODUCED IN THE RUSSIAN FEDERATION SINCE MAY 2022.²¹

16 <https://docs.cntd.ru/document/499073959?marker=7DK0KB>

17 <https://docs.cntd.ru/document/564470082?marker=6500IL>

18 The problem received a more detailed treatment in <http://www.eecca-water.net/content/view/15993/12/lang,russian/>

19 <https://www.emissieregistratie.nl/sites/default/files/2022-05/2022%20%28Geilenkirchen%20et%20al.%29%20Methods%20for%20calculating%20the%20emissions%20of%20transport%20in%20NL.pdf>

20 https://rosstat.gov.ru/storage/mediabank/Oxr_vibr.xls

21 <https://base.garant.ru/404603783/#friends>

Estimates of pollution dynamics according to ROSGIDROMET reports

VERY HIGH-POLLUTION RATINGS

Over the past 10 years the number of Russian cities featuring high pollution indices (both short- and long-term) has not changed significantly²². There has been noted some increase in the number of cities with chronic pollution levels, but considering the changes and introduction of the updated year-average MAC²³, we cannot come up with reliable estimates of these results for several years on Fig. 3 gives results for the cities from the priority list²⁴ — where the API exceeds 14 — and cities with SI (one-time pollution index) higher than 10.

MEDIUM-HIGH POLLUTION LEVELS

Pollution level is considered medium-high if the year-average concentration of one or several substances exceeds the day-average MAC or maximum allowed year-average concentrations. The growth dynamics of the number of cities with such pollution levels is shown in Fig. 4. Similarly to the number of highly polluted cities, the number of medium-high polluted cities has not decreased either. The number of people living there has not diminished as well.

22 This group includes cities in which the SI (one-time pollution index) exceeds 10 or the API (air quality index) is more than 14. SI — shows the highest ratio of the measured real-time concentration of a pollutant to its real-time MAC (maximum allowed concentration). API — the total air pollution index - an indicator of long-term, chronic pollution. This is the sum total for the five largest values calculated separately for each substance. API for any one substance is the ratio of the average annual concentration to the average daily or average annual MAC adjusted to take into account the degree of its harmfulness.

23 <https://docs.cntd.ru/document/573500115>

24 When we needed to compare pollutant concentrations in the air, we used results obtained for the old MAC values for formaldehyde. We however could not make assessments according to the “new” MAC indices due to the lack of data obtained prior to the year 2024.

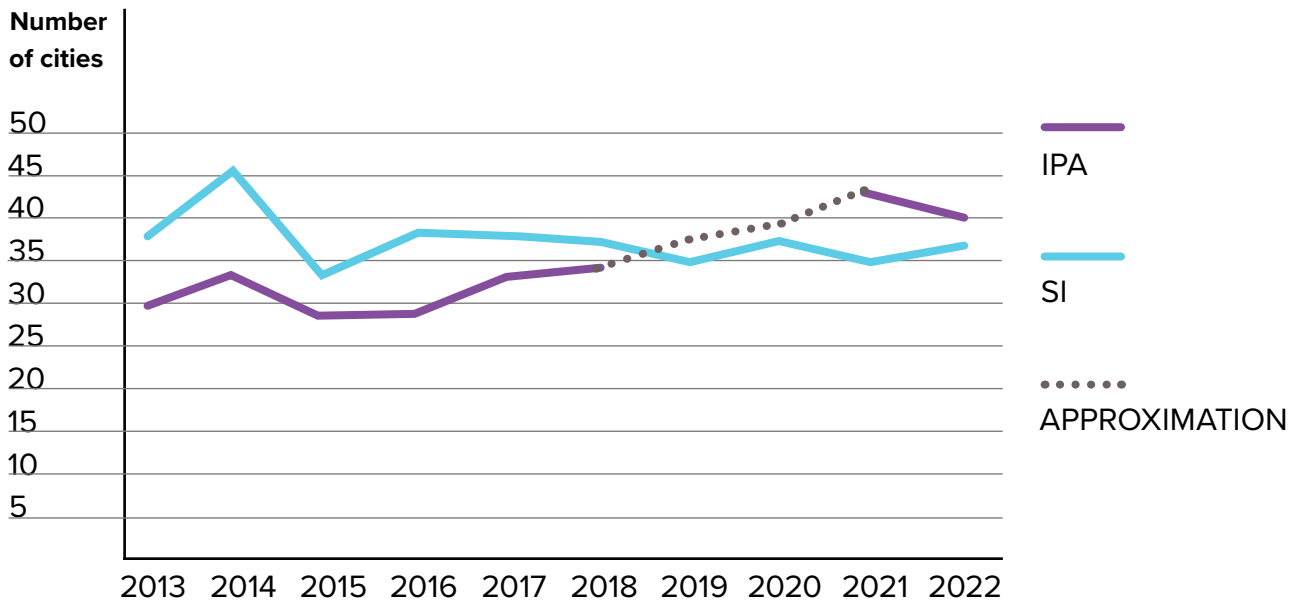


Fig. 3. Number of most polluted cities (average data for the years 2019 and 2020)

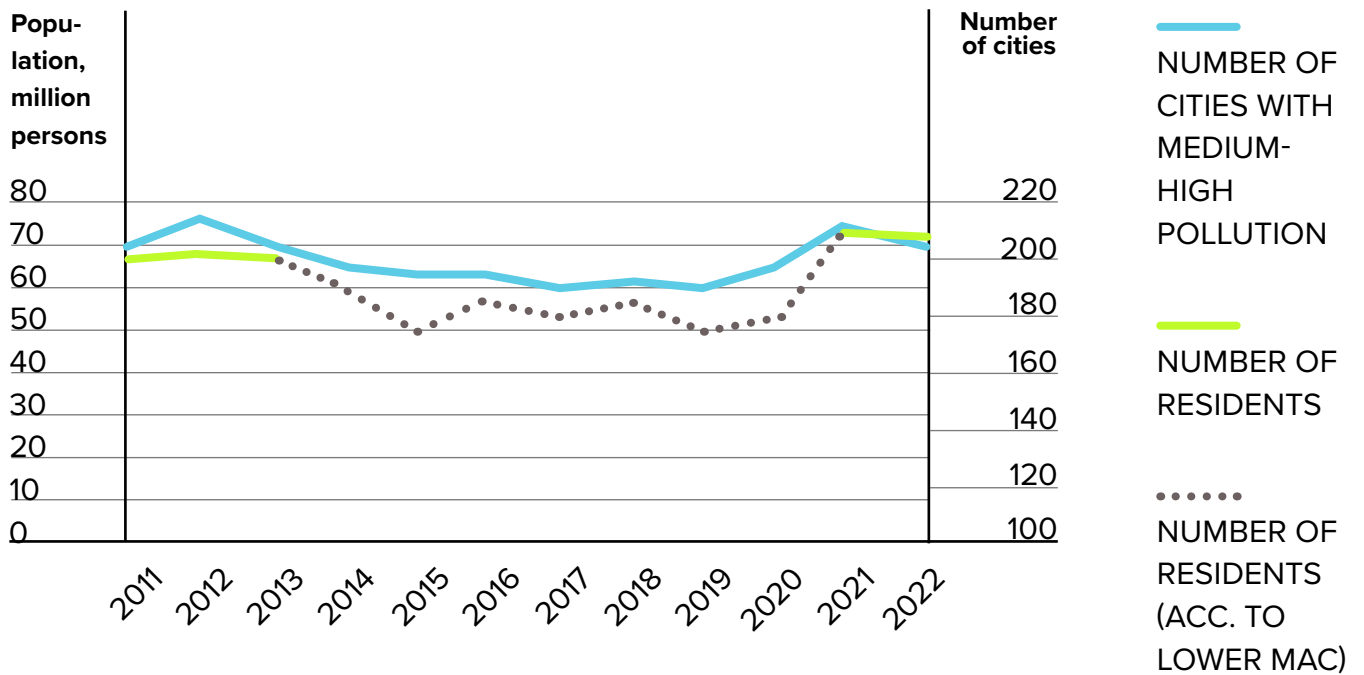


Fig. 4. Cities where the concentration of at least one toxic compound exceeded MAC, and number of residents in such cities

During the last decade, ROSPOTREBNADZOR did twice modify the MAC values for formaldehyde and some other agents: first they raised it, and later decreed the year-average values. Besides, over this period the observed country-average sulfur dioxide and formaldehyde concentrations have grown somewhat in Russia, whereas the calculated statistical concentrations of the other pollutants have gone down to some degree.

NUMBER OF HIGH-POLLUTION CASES

One of the most efficient techniques to estimate real-time variations is measuring the high or very high concentrations of polluting agents. Results for high and very-high concentration levels²⁵ are available for the year 2023 as an example. These data²⁶ are illustrated in Fig. 5.

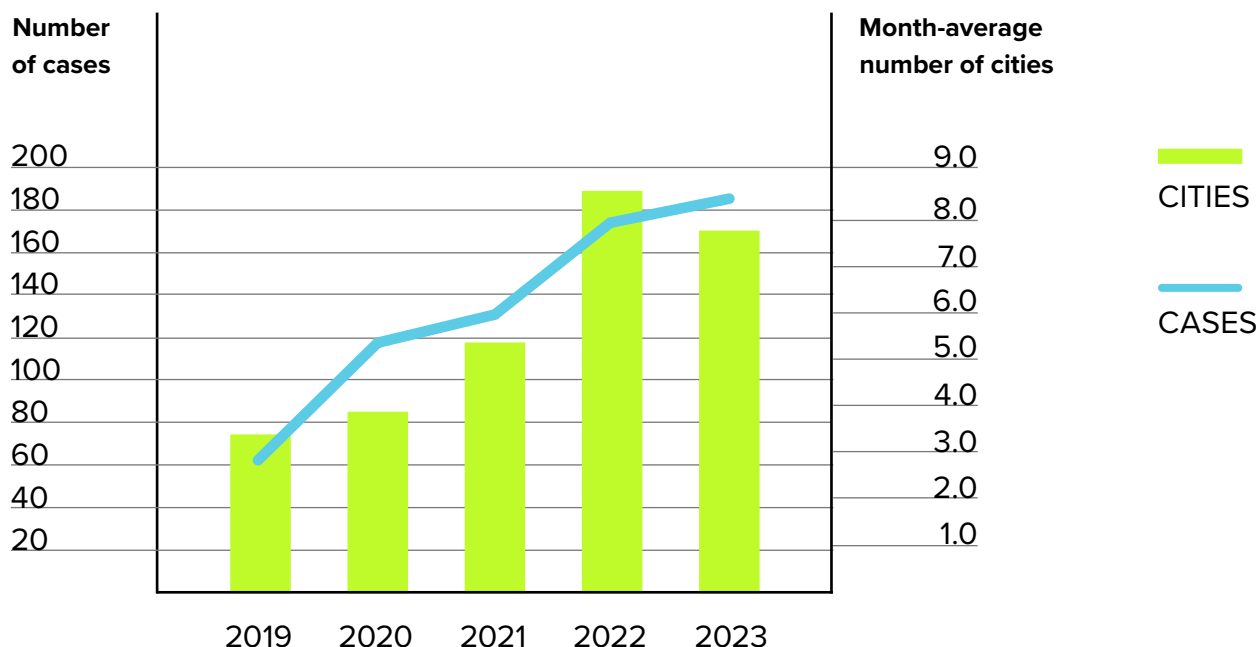


Fig. 5. Number of high pollution levels according to all monitoring data available

²⁵ <https://www.meteorf.gov.ru/product/infomaterials/99/?year=2024&ID=99>

²⁶ This leaves out of consideration the cases of high pollution that were observed to occur more than 10 times per year in the same locality – in order to neutralize the potential effect of the emitter locality.

One notices a sharp change in the number of occurrences of high pollution in 2020-2022, or even a growth of this index in 2023 — against the fact of decreased number of cities subject to monitoring.

THIS CANNOT BUT BE ATTRIBUTED TO THE RADICAL CHANGES ASSOCIATED, APPARENTLY, WITH DEFICIT OF SPARE PARTS DUE TO IMPORT RESTRICTIONS.

The data relating to benzopyrene pollutant is in the same category — you will find these data in Fig. 6

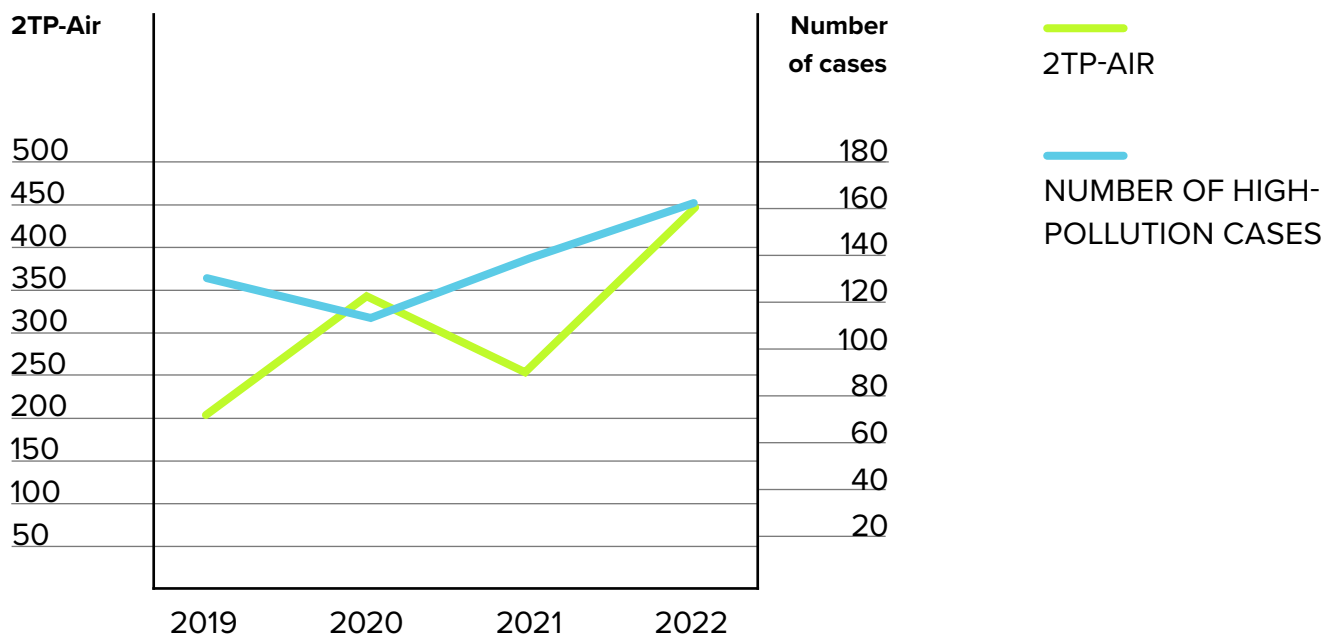


Fig. 6. Benzopyrene pollution data

Drawing an unambiguous conclusion about the dynamics of atmospheric pollution on the basis of the results of measuring pollutant concentrations or data on changes in the amounts of substances emitted by stationary sources, — cannot be considered a correct practice. A number of parameters show signs of deterioration while others indicate improvement. At the same time toxicity of emissions is not always assessed. All we can say with confidence is that there has been no noticeable improvement in air quality in Russia, and that some data for 2022-23 manifest an onset of significant changes related to lack of compliance with production regulations and technological discipline.

Waste

Data on waste generation is one of the most objective and verifiable indicators when assessing the effectiveness of both industry and the environmental protection systems. But as in many other areas, the availability and reliability of Russian data on waste generation is limited. However, it is not easy to “hide” waste; it must be transported, stored, buried - and this is recorded in documents and involves financial and other expenditures. It is much more difficult to falsify data on the volume of waste than data on the extent of pollutant emissions.

Most frequently it is the toxicity class of the waste that is falsified in order to reduce the costs paid by the production involved. This also reduces the costs that the industry is liable to pay for ensuring safety (often at the expense of ruining the environment or deteriorating human health). There are no trustworthy statistical data available on how the classes of the waste are being understated, but the recent publications²⁷ do testify to the considerable amount of data twisting by the Laboratory Analysis and Technical Monitoring Centers — the institutions that are within the jurisdiction of ROSPRIRODNADZOR. Some time back the director of the LATMC in the Belgorod Region was arrested precisely for such dealings²⁸.

Total amount of generated waste

Fig. 7 contains data on the total amount of waste generated in Russian Federation and the amount of accumulated waste. One cannot but notice the constant growth not only of the amounts of waste, but also of the “waste generation potential” of industry in Russia. The graph is a clear indicator of how the authorities “care” for the people.

27 <https://fishkamchatka.ru/articles/exclusive/51126/>, <https://www.svoboda.org/a/31225529.html>; <https://bloknot-volgograd.ru/news/kto-stoit-za-krupnym-ekologicheskim-prestupleniem--1616534>

28 <https://bel.ru/news/2023-12-11/glavu-tslati-zaderzhali-a-belgorodtsy-zhaluyutsya-na-vyvoz-musora-3125264>

COMPARISON WITH CHINA IS STUNNING: WHILE THE SCALE OF INDUSTRIAL PRODUCTION IN THE TWO COUNTRIES IS INCOMPARABLE, **CHINA PRODUCES MUCH LESS WASTE THAN RF** — CA. 4 BILLION TONS PER YEAR²⁹ — (THE 2021 DATA), AND THE GENERATION IS ON THE DOWN TREND EVERY YEAR. WHILE MEASUREMENT METHODS DIFFER, THESE **DATA SPEAK VOLUMES.**

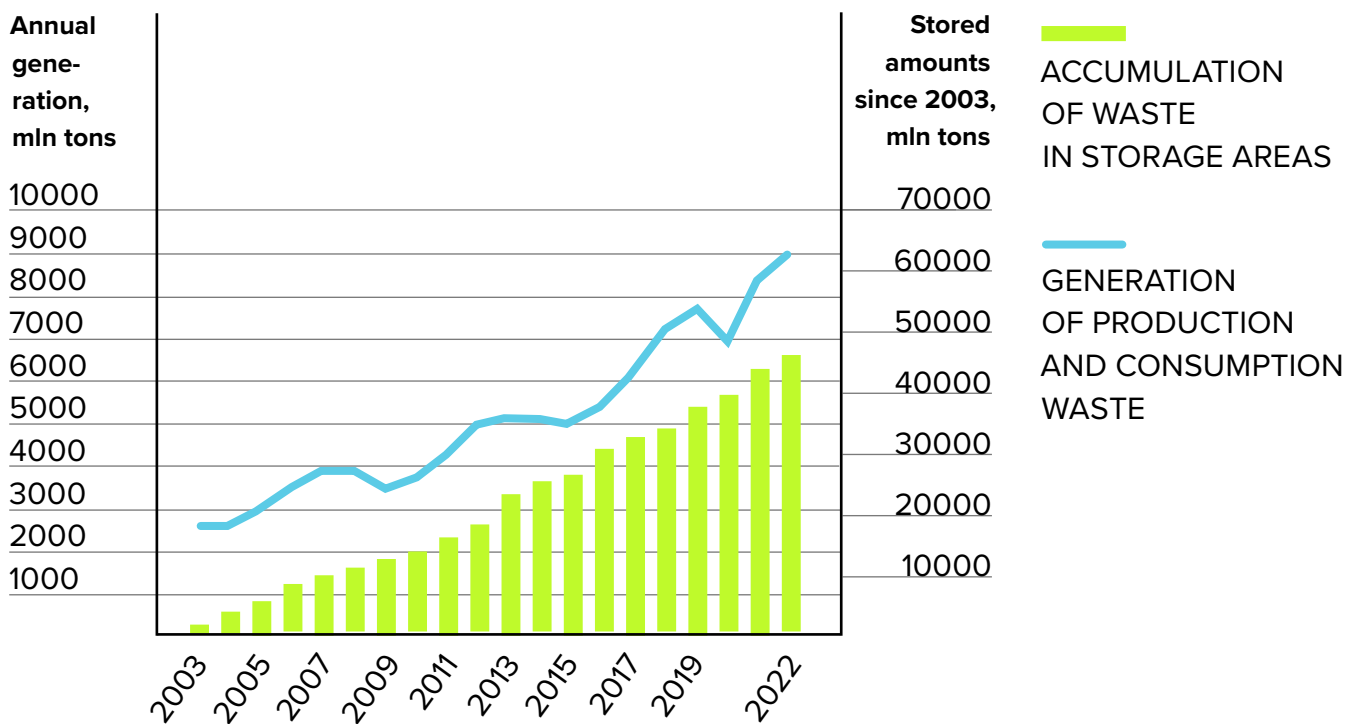


Fig. 7. Production dynamics of all classes of waste in RF

In 2022, the total amount of waste generated in Russia increased by 7%. At the same time, the annual amount of waste generated by coal mines increased by 14% and reached to as much as 5.6 billion tons, i.e. approximately 40 tons per each resident of the country. Interestingly, during the previous 3 years — from 2018 to 2021 — the annual volume of waste produced in this industry decreased by 4%.

29 <https://www.stats.gov.cn/sj/ndsj/2022/indexeh.htm>

**TODAY, WASTE FROM COAL MINING ACCOUNTS FOR ALMOST
TWO THIRDS OF THE TOTAL VOLUME OF WASTE GENERATED
IN THE RUSSIAN FEDERATION.**

Unless the dynamics of waste production are changed, Russia cannot ever expect to attain to the “zero waste” goal. As thing go, in less than 30 years there will be more than 100 tons of waste generated per each citizen.

Difficulty accessing data

Another important issue is the reduction in waste data reporting. Starting from 2019, data on the generation of waste of different toxicity classes by the Subjects of the Russian Federation are no longer published in government reports. The only information pertaining to the Subjects of the Russian Federation that appears in print is that on the generation of MSW (municipal solid waste), which constitutes less than 1% of the total volume of waste.

Data on the classes of waste generated can only be obtained for some regions from publications by regional governments; the author was unable to retrieve a generalized list of such data on a national scale. This data was also not included in the PM2.0-waste form posted³⁰ online in the period 2019-22. It is therefore difficult to identify “inconsistencies” in waste class definitions in regional data reports, similar to the 9000% increase in class 2 waste generation in the Ivanovo region in 2018.

30 <https://rpn.gov.ru/open-service/analytic-data/statistic-reports/production-consumption-waste/>

“Leaps” in waste generation volumes

The data that enterprises indicate in their PM2.0 — form reports, permits us to identify regions where abrupt changes in the total mass of waste generated occurred in 2022. These data (for the regions where changes exceeded 50%) are shown in Table 2. Among these regions, the Kamchatka Territory stands out where in 2022 there was detected an increase in the volume of waste by more than 1000% (to more than 7 million tons), whereas in 2021³¹ there was a drop by a similar factor. According to regional authorities the causes include the big share of the mining industry and a large number of reports published in 2022. At the same time, according to GRORO³², the total capacity of landfills on the Kamchatka Krai for the disposal of industrial waste does not exceed 12 million tons (in contrast to past years, the GRORO website no longer contains information on the real time volumes of waste disposal).

The data of Table 2 testify to a disbalance in the federal statistics service and grave waste reporting problems.

	WASTE GENERATION IN 2021, T	WASTE GENERATION IN 2022, T	VARIATION IN 2022 FROM 2021, %
Kamchatka Krai	587,555	7,149,250	1,117
Sakhalin Region	120,709,754	225,607,198	87
Republic of Mariy El	748,235	309,710	-59
Republic of Tatarstan	3,857,870	16,583,064	330
Republic of Dagestan	55,097	165,610	201
Chechen Republic	89,765	360,856	302
Vladimir Region	1,561,082	6,092,609	290
Ivanovo Region	487,274	2,608,744	435
Volgograd Region	4,470,592	11,610,990	160
Republic of Adygea	314,655	838,459	166
Rostov-on-Don Region	15,054,905	6,157,123	-59

Table 2. Irregular changes in waste volume by region in 2022 compared to 2021

31 <https://minprir.kamgov.ru/files/64f55ac61dac00.85925865.pdf>

32 <https://rpn.gov.ru/activity/regulation/kadastr/groro/>

Legal issues

The progress in law-making associated with waste has been very different from the dynamics of the development of laws pertaining to the conservation of nature in general. The number of amendments introduced in the field of waste management during the recent years is presented in Fig. 8.

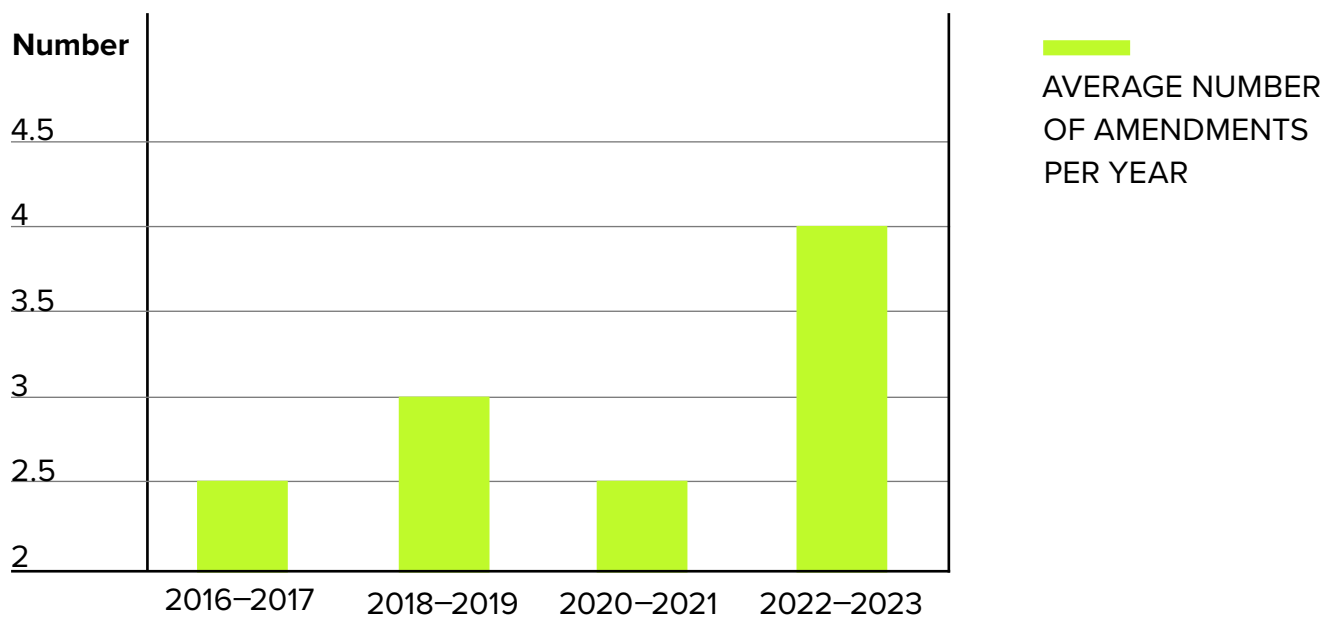


Fig. 8. Numbers of amendments made to legislation concerning production and consumption wastes in 2016-23

The law on industrial and consumer waste has been modified an average of four times a year over the past two years, while other “core” laws in the field of environmental protection have been changed ca. two and a half times a year. Over the previous five years, environmental laws have been updated at about the same rate. It is unlikely that any reasonable adjustments to the plans of government agencies or businesses or their making long-term decisions are possible against the backdrop of such rapid changes in legislation.

Some Conclusions

Air Pollution

1

Regular measurements are not conducted in all cities of Russia. In the year 2022 around 32% of population lived in areas where pollution levels were not being assessed due to lack of or inadequate monitoring. Considering the current dynamics, all citizens will not be living in areas covered by monitoring programs until a hundred years have passed.

2

Over the last two decades, the cleaning depth of industrial air emissions has remained almost unchanged at around 75 %. Considering the current progress in the scrubbing degree (less than 1 % between 2002 and 2022), the goal of 100 % scrubbing of industrial emissions will only be reached in 250 years.

3

In 2022 the indices related to high or medium-high (both long- and short-term) pollution have not dropped below those recorded in 2012. Neither did the cities with medium-high chronic pollution (year-average concentration of higher than 1 day-average MAC) or high short-term pollution levels decrease in number.

4

According to data from polluting enterprises, the air quality situation is not improving, and divergent trends are observed. Based on the available data, it is impossible to predict when air pollution in Russia will cease.

Waste

1

The validity of the Russian waste classification system is open to question, yet the reports concerning the overall amounts of waste generated can be used for assessing the dynamics. For the last several decades it is apparent that the overall amount of generated wastes is on the increasing trend. The rate of such growth exceeds 10% annually which is way faster than the growth of the GDP. The total amount of waste generated in RF is twice as great as that in China, if we take solid waste into account, which is impressive even if different measurement techniques are used.

2

Comprehensive data on the waste generation rates (with regard to toxicity levels) have not been available on the regional scale since 2019.

3

The annual abrupt changes in waste generation levels in some regions (according to the 2021-2022 records) testify to a disbalance in statistical data retrieval systems and grave problems in waste management reporting.

4

The dynamics of the rate at which Russian waste disposal legislation has been modified increased two-fold: such changes are introduced at a rate of once in three months on the average.

Addendum

SOURCES FOR ATMOSPHERIC AIR POLLUTION DATA

Data from ROSGIDROMET

Generalized state air monitoring data for populated areas (including information for extremely high air pollution) are published on the website of the Main Geophysical Observatory named after A.I. Voeikov (FGBU “GGO”) — “Yearbook. Air Pollution Conditions in the cities of Russia” for the years 2006-22 — <http://voeikovmgo.ru/index.php/deyatelnost/publikacii/40-perechen-materialov-izdannyykh-ggo>

Map of Russia containing data on air pollution in cities is to be found here — <http://voeikovmgo.ru/index.php/srednegodovye-kontsentratsii-dioksida-azota-v-gorodakh-na-territorii-rossii>

Annual summaries of information concerning environmental pollution are published on the site of the Institute of Global Climate and Ecology (“A Review of the status and pollution of environment in the Russian Federation...” for the 2005-2022 period) — <http://www.igce.ru/performance/publishing/reports/>

More detailed data (sometimes even with an overview of urban districts) are posted on the websites of the institutions subordinate to Rosgidromet; they also publish lists of settlements in which monitoring is carried out. There is also some special data for cities where there is no monitoring on everyday basis — <https://www.meteorf.gov.ru/about/structure/local/> (in the “Environmental Monitoring” section).

Data from ROSPOTREBNADZOR

The Federal Report “On the state of sanitary and epidemiological well-being of the population in the Russian Federation in 2021” is posted on <https://rospotrebnadzor.ru/bitrix/redirect.php?event1=file&event2=download&event3=Gosudarstvennyy-doklad.-O-sostoyanii-sanitarno-epidemiologicheskogo-blagopoluchiya-naseleniya-v-Rossiyskoy-Federatsii-v-2021-godu.pdf&goto=/upload/iblock/594/sqywwl4tg5arqff6xvl5dss017vvuank/Gosudarstvennyy-doklad.-O-sostoyanii-sanitarno-epidemiologicheskogo-blagopoluchiya-naseleniya-v-Rossiyskoy-Federatsii-v-2021-godu.pdf>.

Regional Reports from ROSPOTREBNADZOR are posted here https://rospotrebnadzor.ru/region/structure/str_uprav.php (in the Regions sections).

Some regional sources of information (including that from ROSGIDROMET)

Annual summaries on the state of the natural environment in the Subjects of the Russian Federation are posted on the Internet resources of the relevant Administrations or their specialized environmental protection units — departments or ministries. A number of administrations of the Subjects of the Russian Federation publish some monitoring results.

Below are links to the websites of some of them. The list is not intended to be complete and does not include data from monthly or annual surveys, but only sources of daily pollution data — in the form of maps or test protocols.

Moscow (MOSEKOMONITORING) — <https://mosecom.mos.ru/karta/>

Saint-Petersburg — <https://www.infoeco.ru/index.php?id=53>

Nizhniy Novgorod Region — <http://vvugms.meteorf.ru/monitoring-zagryazneniya-okruzhayushhej-sredyi/zagryaznenie-vozduxa/-n.novgorod.html>

Chelyabinsk Region — <https://emc.gov74.ru/uisem/portal/ad/chelyabinsk> (Cheyabinsk city), <http://chelpogoda.ru/pages/1076.php>

Krasnoyarsky Krai — <https://air.krasn.ru/map.html> (Krasnoyarsk city), <http://www.krasecology.ru/>

Sverdlovsk Region — http://svgimet.ru/?page_id=9079, https://mprso.midural.ru/news/show/id/23/news_category/main

Irkutsk region — <https://www.irmeteo.ru/index.php?id=5>

Kaluga Region — <https://air.giskaluga.ru/>, https://www.feerc.ru/monit_obninsk/environment/air/bulletin/ (Obninsk city), <http://www.obninsk.ru/obninsk/jkh/ecology/monitoring/?curPos=0&template=97> (Obninsk city)

Arkhangelsk Region — <http://www.sevmeteo.ru/monitoring/air/>

Krasnodarski Krai — http://eco-ozel-krd.ru/?page_id=1603 (Krasnodar city), <https://www.pogodasochi.ru/info/101/> (Sochi)

Some other sources

Some of the bodies that collect and summarize data on the environmental situation in Russia are not associated with the Federal system. In such cases information may be generated by devices that had not passed certification or other verification. Another important factor is the location of the sensors. The information from these systems cannot be considered except as an auxiliary indicator; it cannot be used in place of data from the Federal network, even though it is often more up-to-date than the latter. We did not take into account these non-Federal sources, but we provide links to some of them below:

<https://www.iqair.com/ru/russia>

<https://aqicn.org/city/all/ru/>

<https://nebo.live/ru/>

<https://www.accuweather.com/ru/>

<https://air.plumelabs.com/en/>