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**ENVIRONMENTAL MONITORING IN CENTRAL ASIA**

**Submitted by the Regional Environmental Centre for Central Asia<sup>1</sup>**

**Introduction**

1. Environmental monitoring in the Central Asian countries has a long tradition. Initially, an extensive monitoring network was established in the Republics of the former Soviet Union as a part of two separate organizations - the Meteorological Service (Gidromet) and the Hygiene and Epidemiology Service (SES). When ministries of environmental protection (branches of the USSR State Committee for Nature (Goskompriroda)) were set up in the Union Republics, the monitoring network of these two systems was not integrated into the environmental protection system, which had to make its own monitoring arrangements from scratch: this led to duplication. At the moment, Gidromet stations monitor air, water and soil quality; SES takes care of contamination in premises and protected areas affecting public health.

2. Environmental monitoring in Central Asia is concerned with four areas: water, air and soil analysis and radiological monitoring. Its major objectives are:

(a) To track levels of atmospheric, surface-water and soil contamination using physical and chemical indicators to assess the adverse impact of man-made pollution on people and their habitat;

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<sup>1</sup> This document was submitted without formal editing.

(b) To keep stakeholder organizations supplied with regular and ad hoc reports on changes in levels of environmental pollution, and with forecasts and warnings of potential changes in those levels.

## I. STATUS OF ENVIRONMENTAL MONITORING

3. Air pollution monitoring includes regular tracking of atmospheric pollution in cities and industrial centres in Central Asia.

4. Regular fixed-station tracking of atmospheric pollution levels is performed in 19 cities in Kazakhstan (at between 24 and 45 stations, depending on the year) and 4 in Kyrgyzstan (17-13 stations); the number of tracking stations has declined from 21 to 3 in Tajikistan, Turkmenistan has about 20, and Uzbekistan has 69 fixed stations in 25 cities. In recent years important monitoring stations have been closed for lack of funding. Tursunzad, in Turkmenistan, for example, has lost three stations that used to track atmospheric emissions from the Tajik Aluminum Plant. The fixed stations have fully-equipped laboratories to take regular measurements of air pollution and the meteorological parameters that determine contaminant dispersion in the atmosphere. In accordance with approved practice, air pollution monitoring stations are situated in populated areas close to major sources of contamination and in city centres.

5. The following pollutants are measured in city air: dust, sulphur dioxide (SO<sub>2</sub>), nitrogen oxide (NO) and dioxide (NO<sub>2</sub>), carbon monoxide (CO), formaldehyde (HCOH), ammonia (NH<sub>3</sub>), 3,4-benzopyrene. The monitoring schedule for each station is drawn up individually, based on its location, proximity to emission sources and the composition of the emissions. All the Central Asian countries have monitoring as part of their State inspection systems: for instance, the Uzbekistan State Nature Conservation Committee performs instrumental checks on industrial emission sources in 136 population centres within the country, and on mobile sources. Samples are taken and analysed by 18 specialist inspectorates, monitoring between 4 and 39 emission constituents.

6. Atmospheric pollution levels in all Central Asian countries are measured by a compound atmospheric pollution index (API) calculated for the five substances found in the highest concentrations in relation to their degree of hazardousness. Air pollution is deemed to be very high, if the aggregate API exceeds 14; high, if  $14 > \text{API} > 7$ ; relatively high, if  $7 > \text{API} > 5$ ; low, if  $\text{API} < 5$ .

### Atmospheric pollution in Central Asia

In 1998, APIs in the range 5-8 were reported in five Uzbek cities - Navoi, Almalyk, Tashkent, Bukhara and Fergana. In 1999 there was a slight downturn in air pollution: APIs above 5 were reported in only three cities - Navoi, Tashkent and Fergana. The most polluted city in the Republic is Navoi with its large metal, energy, chemical and building-material plants.

According to 2000 data, 10 cities in Kazakhstan rank as having high pollution levels (API > 7), and Ust-Kamenogorsk as having very high air pollution (API > 14). The cities of Aktau, Petropavlovsk, Temirtau, Zhezkazgan, Taraz, Almaty, Leninogorsk, Aktobe and

Shymkent have APIs between 5.1 and 10. Compared to 1991, air pollution has risen in Aktobe, Zhezkazgan, Leninogorsk and Taraz. There has been a slight decrease in Ust-Kamenogorsk, Shymkent, Almaty, Temirtau, Aktau, Karaganda, Semipalatinsk, Ekibastuz and Uralsk; in other cities, APIs remain practically unchanged. Most cities have experienced some increase in atmospheric pollution since 1997.

The highest levels of dust, carbon monoxide, formaldehyde and 3.4-benzopyrene pollution in Kyrgyzstan are found in the capital, Bishkek, Benzopyrene levels in the atmosphere can reach 48 times the maximum permissible concentration (MPC) during the winter.

The parts of Tajikistan most severely affected by air pollution are the densely populated districts of the Vakhsh and Gissar valleys in Sogd oblast, along with the major cities of Dushanbe, Khodzhent and Kurgan-Tyube.

The major air pollutant in Turkmenistan is dust. Dust storms occur throughout the year and depend on local features. The longest average annual dust storm period - over 50 days a year - is found in the Central Karakum and the west of the country. The dust concentration in the air of Ashgabad can reach 3,5 MPC, sulphur dioxide - 1,5 MPC, and carbon monoxide - 3,3 to 6,2 MPC during the summer season.

7. Fuel and energy plants and the oil and gas industry cause most of the atmospheric pollution with sulphur dioxide and untreated hydrocarbons in the region. The fuel and energy complex is also a major source of greenhouse gases (GHG): carbon dioxide and methane. Mining and metalworking are major sources of air pollution with gaseous admixtures and heavy metals. The chemical industry discharges specific pollutants into the air - ammonium nitrate dust, nitrogen oxides, ammonia, phenol and organic solvents. The building industry and cement works are the major sources of dust.

**Table 1: Composition of pollutant emissions from stationary sources in the region (thousands of tonnes) (1999)**

Constituents	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Solid matter	641.1	13.6	6.5	14.3	102.6
Sulphur dioxide	945.5	8.7	2.5	9.0	371.3
Nitrogen oxides	151.4	2.4	0.9	11.4	72.4
Carbon monoxide	379.7	3.7	24.9	62.6	69.3
Hydrocarbons, including VOCs	173.4	2.3	0.9	1 306.5	155.8
Others	8.5	0.45	0.2	0.5	5.6

8. As Table 1 shows, the largest single pollutant in Kazakhstan is sulphur dioxide; in Kyrgyzstan it is solids, in Tajikistan, carbon monoxide, in Turkmenistan, hydrocarbons, and in Uzbekistan, sulphur dioxide.

9. In most of the major Central Asian cities, emissions from mobile sources make up between 60 and 90 per cent of total emissions. Motor transport is responsible for 90 per cent of the nitrogen oxides, 70 per cent of the carbon monoxide and almost 100 per cent of the volatile hydrocarbons in the air.

10. The results of atmospheric pollution monitoring are analysed and interpreted at different levels - local, oblast and national. Based on the figures obtained, information on atmospheric pollution is published in the form of bulletins and yearbooks on air pollution in cities (see attachment). If pollution levels are high, warning notices are sent to industries and organizations.

11. State monitoring of water use has been carried out in Central Asia, like everywhere else in the former Soviet Union, since 1977, in accordance with government resolutions. The current monitoring system, which supplies information for use in water resources management, operates at two principal levels: State and local (departmental). Each level has its own tactical objectives. The local level monitors pollution sources and water quality at the point of consumption (water supply points, recreational areas etc.) to inform managerial action and decisions to improve the situation; the State level monitors water resources in general and allows the appropriateness of local-level managerial decisions and practical action to be assessed.

12. Surface water pollution monitoring covers regular monitoring of surface water pollution at a network of hydrological and hydrochemical stations; the investigation of the chemical content of water in rivers, lakes and reservoirs, with due regard for contamination by industrial and other waste water; and the analysis and assessment of surface water contamination in the Central Asian countries.

13. Water quality is monitored under several programmes, which determine physical and chemical properties, gas content, main ions, organic matter including pollutants (chemical oxygen demand (COD), BOD<sub>5</sub>, petroleum products, phenols, synthetic surfactants, pesticides and herbicides), biogenic components and inorganic pollutants (ammonia nitrogen (NH<sub>3</sub>), nitrite nitrogen (NO<sub>2</sub>), nitrate nitrogen (NO<sub>3</sub>), phosphorus (P), iron (Fe), silicon (Si), copper (Cu), zinc (Zn) and chromium (Cr)). The findings are used to produce monthly and annual reports on surface water quality in the Central Asian countries.

14. At present, surface water quality is monitored at 15 sites in Kazakhstan, 9 rivers in Kyrgyzstan and 1 reservoir in Chu oblast. Uzbekistan monitors surface water pollution at 134 points on 94 bodies of water. As a rule, the following items are tracked: mineral components, biogenic substances, petroleum products, phenols, chlorine- and phosphorus-based organic pesticides, synthetic surfactants, heavy metals, fluorine and substances in suspension. Gidromet and SES perform hydrobiological monitoring at 77 points and 100 hydrographic sections on 50 bodies of water in Uzbekistan. Monitoring has been an order of magnitude less extensive in other countries in recent years.

15. The problems of subregional water use being of particular importance for the Central Asian countries, activity within the basins of transborder rivers (Syr-Darya, Amu-Darya, Ili etc.), including data sharing and monitoring-system harmonization is regulated by multilateral and bilateral agreements. There are plans to continue to integrate efforts in this area during current work to formulate a subregional strategy for sustainable development and environmental protection.

16. There has been practically no systematic soil contamination monitoring in Central Asian countries in recent years. There is individual research within the framework of some projects and specialized programmes, for example at the nuclear test site in Semipalatinsk, Kazakhstan. Environmental protection agencies monitor land and vegetation use and conservation.

17. Radiation monitoring includes regular measurements of radioactive contamination in the air at population centres in the region. A lack of consumables has been causing a fall-off in background radiation measurements.

18. Stations throughout the region take daily measurements of aggregate exposure to gamma radiation (radiation background). In major cities, radioactive contamination is monitored by sampling atmospheric fall-out in and aerosols from the surface atmospheric stratum.

19. Beta activity in aerosol and fall-out samples is measured twice: the day after sampling and four days later. This is done in order to identify the nature of contamination: natural or artificial. Samples with 10 or more times the average daily concentration of radioactivity in the surface stratum for the previous month are analysed for radionuclide composition. The radiological monitoring data are included in monthly reports on environmental pollution; in some cities this information is displayed on special screens installed in public areas.

20. The results of the monitoring in recent years indicate that radiation concentrations in the Central Asian countries have remained stable and not exceeded natural fluctuations.

21. If one looks at the ecological monitoring systems in Central Asian countries one finds that they are severely dilapidated in virtually all of them. Insufficient budgetary funding, dwindling year by year, adversely affects monitoring programmes. Work at pollution monitoring stations in some cities is put on hold. There is less monitoring of matter in suspension, carbon monoxide, heavy metals and other pollutants. Monitoring of water quality in the tributaries of big rivers has been significantly reduced. Pollution data are often processed manually on paper.

## **II. INSTITUTIONAL FOUNDATION AND LEGAL FRAMEWORK**

22. The Central Asian countries do have the necessary legal framework for environmental monitoring. The following basic issues are regulated by laws and codes:

- Authority of State agencies to manage, use and conserve the environment, apportionment of functions in the area of monitoring and oversight between the Government, ministries, oblast and local authorities;

- Rights to use natural resources and the manner in which natural resources are to be monitored;
- Legal liability for violations of the law;
- International cooperation.

23. Environmental and natural-resources monitoring issues in Kazakhstan are addressed in accordance with land, forest and water-ecosystem monitoring regulations adopted by the Government. A 1996 Presidential order endorsed an environmental safety master plan defining the strategic focus of State environmental policy and laying down a system of organizational, legislative, economic and social moves to preserve the environment. Pursuant to a new version of the Environmental Protection Act passed in 1997, an Environmental Monitoring Office was established as part of the Ministry of Natural Resources and Environmental Protection. Control of the Gidromet system was handed over to the Ministry.

24. Environmental monitoring used to be performed by Kazgidromet, specialist units at the Ministries of Agriculture and Health, industrial enterprises and research institutes, using a variety of methods and various, often extremely outdated, pieces of equipment. The results were essentially incomparable, they were accumulated and used by different governmental authorities, and only some of them reached the statistical and environment authorities.

25. Regulations specifying the structure, scope and arrangements for State environment and natural resource monitoring and the procedure for the submission of information and the management of environmental statistics are now being readied for governmental approval. While subordinate legislation is being drafted there are also plans to set up a single State environmental monitoring system. A consolidated semi-annual departmental reporting system 1-4EM, “Ecological Monitoring of Environment Status (Pollution)”, has been introduced. State Inventories of all pollution sources have been developed. The development of the single State environment and natural resources monitoring system is being delayed by insufficient regulatory support and funding.

26. Efforts are under way to set up an industrial environment monitoring system as required by the Environmental Protection Act, which makes it mandatory for all enterprises that use natural resources to track and report on the impact of their economic activity upon the environment.

27. Environmental pollution monitoring in the Kyrgyz Republic is part of the Kyrgyzgidromet system and has been in operation since 1968. Under current Kyrgyz law, the functions of managing and monitoring water resources on behalf of the State are assigned to:

- The State Committee on Hydrometeorology (Kyrgyzgidromet) under the Ministry of Environmental Protection, which monitors the quality of surface water;
- The Ministry of Health (Health and Epidemiology Inspection Unit), which monitors the quality of drinking water and is responsible for the public health aspects of the water supply;

- The Agency for Geology and Mineral Resources, which monitors the quantity and quality of underground water.

28. The status of the atmosphere is monitored by the Ministry of Environmental Protection and Emergencies/Gidromet and the Ministry of Health (Health and Epidemiology Inspection Unit). Forestry management is performed by the Principal Forestry Office at the Ministry of Environmental Protection and Emergencies and its branches. Administrative oversight of protected areas is a function of the protected areas department at the Ministry of Environmental Protection and Emergencies. The management and supervision of mineral resources for the State is handled by a large number of ministries and agencies.

29. The environmental monitoring system and agencies of Tajikistan are defined in article 65 of the Republic's Environmental Protection Act: a national service to track changes in the physical, chemical and biological processes occurring in the environment, monitor levels of air, soil and water pollution and the impact of pollution upon flora and fauna, and provide current and urgent information, warnings and forecasts about changes in the environment to interested organizations and to the general public.

30. Monitoring is primarily performed by the Main Hydrometeorology Office at the Ministry of Environmental Protection. Hydrometeorological information is used by disaster-preparedness and relief units, the railways, the road transport industry, agriculture, the fuel and energy industry, the building industry, the natural resources complex, public utilities and other public, private and mixed-ownership entities.

31. In Uzbekistan, under the Atmospheric Air Protection Act, data measurement, collection, interpretation and analysis and forecasts of air quality are carried out under a unified State environmental monitoring system. Air quality management is the responsibility of two specially authorized governmental agencies, the State Committee on Nature Protection (Goskompriroda) and the Principal Weather Office (Glavgidromet). Following an analysis of the current state of air-pollution and emissions-sources monitoring, a Programme to develop and modernize monitoring arrangements over the period until 2005 has been put in place.

32. Water quantity and quality in Uzbekistan are managed by eight major agencies and an extensive network of subordinate departments representing their interests at the local (oblast, district, city) level. Surface-water monitoring is performed by Glavgidromet, subsurface-water monitoring by the State Committee on Geology (Goskomgeologia) and the State Mining Inspectorate (Gosgortekhnadzor). Quantitative management of irrigation and drainage water is the responsibility of the Ministry of Water Resources. Concentrated (single-point) industrial pollution sources are monitored by a division of Goskompriroda. The water at drinking-water supply points and in the water-supply network in cities and villages is monitored by divisions of the Ministries of Public Utilities and Agriculture, supervised on behalf of the State by the Ministry of Health, which also monitors municipal sewage disposal facilities, duplicating the monitoring functions of Goskompriroda in this area. Goskomgeologia is responsible for national subsurface-water monitoring and inventorying.

33. The quality of the environment in people's homes and workplaces, in particular air quality on industrial premises, drinking water, food, etc., is monitored by the health and epidemiology services of the Central Asian countries.

### III. INFORMATION FOR DECISION-MAKING

34. Decisions are, of course, based on information. Environmental assessments and decisions in Central Asian countries are based on the following key information:

- Public statistics;
- Environmental monitoring data;
- Departmental accounts;
- Scientific research;
- Reports, publications, bulletins.

35. The availability of this information generally allows decisions to be taken on environmental problems but there are some problems:

- The system of statistics in use in the region, which was basically set up for the command economy of the former Soviet system, encompasses a large number of indices on environmental condition, impact and action at the enterprise and establishment level. These indices do not, however, always correspond to national priorities or international requirements. What is more, statistics are generated by various governmental departments and ministries and are not always readily accessible to all interested parties.

Kyrgyzstan: Statistics are produced by a number of different monitoring organizations (oblast-level environmental protection authorities and environmental monitoring divisions of the Ministry of Emergency Situations and Environmental Protection, Ministry of Health health-inspection services, the geological services of the State Geology Agency, Ministry of Agriculture, Fisheries and Processing Industry services) but there is no sufficiently reliable information on current and accumulating waste.

- The monitoring system is a quite extensive network underpinned by a raft of regulations and institutional and physical infrastructure. However, as a result of recent cuts in public financing and reorganizations, the monitoring it does falls short of present-day requirements and must be upgraded. Besides, monitoring is performed by a variety of different services and obtaining and amassing all the data in one place can be difficult.

Kazakhstan: At present, samples of environmental components are taken at what remains of the Kazgidromet network, which has suffered sharp cut-backs over the last five years: the findings are not sufficient to support a full assessment of the state of the environment in Kazakhstan. Therefore, Kazgidromet serves only one third of the public monitoring network.

- Departmental reports are one of the prime sources of information for ministries and governmental departments on what is going on at the local authority and enterprise level. They are regularly updated and amended in accordance with programme and project priorities.

Uzbekistan has a department-internal (Goskomripoda) decision-making and reporting system. A quarterly analysis of operations in Goskomripoda bodies is conducted. Goskomripoda Uzbekistan collects data from the environmental inspection divisions of Goskomripoda Karakalpakstan, the city of Tashkent and 12 oblasts. The information is submitted in no particular format. Information sheets list site designations, value of the operations carried out, site risk categories, the decisions reached, and sites re-inspected once the inspectors' comments have been taken into account.

36. Traditional shortcomings of departmental reports are the large quantities of information requested, the duplication and insufficient coordination of inquiries from different departments and divisions even within a single ministry, the dispersal of information among a variety of ministries and organizations and the difficulty other parties concerned have in obtaining and using it.

37. Inspection data and reports afford a basis for daily, practical decisions on environment protection. The inspections are backed up by laboratory and in situ measurements of environmental quality and pollution from different sources and checks that legislatively required tasks and stipulations have been fulfilled. In the event of breaches or divergences from prescribed requirements, those responsible face administrative or economic sanctions.

38. Scientific research provides a basis for setting priorities and determining the scale of ecological problems at different levels. It serves to establish permissible limits for environmental pollution and natural resource use, and programmes and projects must take it into account. The region has accumulated significant experience of scientific research in a variety of environmental domains, which can be used to help determine the methods and means to use in tackling environmental problems.

39. At the present time, however, such research is poorly supported by the State and rarely used in decision-making. Besides insufficient financing, the reasons include poor coordination between those that commission research and those that take practical decisions on environmental protection, unclear task setting and poor performance checks. As a result, research often yields material with little practical application in the work of environmental services.

- Reports, publications, bulletins have become commonplace recently. The ministries responsible for protecting the environment publish annual reports on its state and the action that has been taken.

40. Voluntary environmental organizations also devote a lot of effort to this. In Central Asia, bulletins and newspapers are published regularly with support from donor institutions. At the same time, all experts in the region comment on the inadequacy of the information that is put out.

One goal of most environmental NGOs in Kyrgyzstan (about 200) is to promote environmental literacy and education and make the general public more aware of environmental protection issues. They issue sporadic bulletins when funding permits, but these do not appear at all regularly.

41. The reasons for this include limited access to the Internet, particularly at the local level, and the narrow range of official reports and bulletins distributed. The public authorities have insufficient budgets to print large runs, and the practice of selling bulletin and reports in some countries means that scientific, public and other concerned organizations cannot have free access to such information.

42. The Central Asian countries have no unified databases where information about the state of the environment and environmental protection measures can be readily accessed. The databases that do exist are scattered among different ministries and organizations, including international ones; they are not always open to the public and quite often contain contradictory data.

Uzbekistan has no database for decision-making as the term has come to be understood. Sundry information can be said to exist at various ministries and departments, however, and there are libraries, collections of information stored on physical media, and archives.

43. Recommendations to the Central Asian countries as regards information include:

(a) Establish integrated national and subregional information systems on environmental protection and sustainable development based on a single conceptual approach;

(b) Investigate the status of existing environmental protection information systems and databases and their suitability for decision-makers. Begin by inventorying the environmental information on hand. Systematic publication of a register of the information available will facilitate access to environmental information;

(c) Devise strategies for cooperation and information exchange between State, local and non-governmental organizations, business and science;

(d) Study possible means of distributing information taking into account existing communications and technologies and the level of information consumers;

(e) Promote the growth of a library network with free access to environmental information.

44. Subregional databases for information sharing and joint decision-making on collective water use, transborder flows, climate change and the transport of waste are sorely needed. Last year, the governmental agencies of five countries commissioned the Regional Environmental Centre for Central Asia to create such a database for the collection, storage and unrestricted provision of information on environment and sustainable development issues.

45. The five countries are in the process of setting up a management system for their State inventories of natural resources, pollution sources and polluted areas, industrial and household wastes. This process has begun in Kazakhstan with the creation of State inventories of polluted sites and natural resources. Subordinate legislation governing state inventories of underground disposal of toxic substances, radioactive waste and sewage has been passed. Data are being analysed and a list of polluting enterprises is being put together. Plans for all the inventories have been developed and a scheme classifying industrial wastes by branch of industry has been laid down. This experience with the development of environmental inventories could be extended to other Central Asian countries.

46. Work on environmental and sustainable development indicators is continuing. Experts from the countries have tested United Nations sustainable development indicators for the Aral Sea basin. The Regional Environmental Centre, in conjunction with the European Commission, has begun implementing a project consisting in collecting statistics in Central Asia and analysing environmental and sustainable development indicators. The Kazakh Ministry of the Environment is funding the development and implementation of a system of national environmental indicators and monitoring, and the establishment of a normalized basis for ecological zoning.

47. The Environmental Monitoring Division at the Kazakh Ministry of the Environment is responsible for providing any environmental information requested by parliamentary and government agencies or required for publication in quarterly and annual newsletters targeted at a wide range of academic institutions, producer organizations and citizens.

48. The results of national and industrial monitoring efforts are not sufficiently well publicized. In fact, it is only the environmental information from government agencies which appears regularly in the form of Yearbooks and monthly bulletins that is generally available and widely used by all the government departments concerned. Access to information from individual governmental departments is very limited.

49. The regional community is hopeful that the situation will change with the ratification by the States of the region of the Orhus Convention. This will certainly make it easier to involve the local populace in the process of establishing a public monitoring system.

#### **IV. CONCLUSION**

50. It has been seen above that the old system of environmental protection monitoring, oversight and assessment in the Central Asian countries needs modernizing and strengthening.

51. The network of environmental monitoring stations is too thinly spread and does not have sufficient analytical resources. The system of standards in use is obsolete and needs revising. Data on pollution and resource use are often obtained by calculation; there are no direct measurements of actual impact or regular reports on the state of the environment, so the indicators calculated are not always reliable. The effect is to diminish the efficacy of nature conservation programmes.

52. What is needed is strict compliance with the law calling for polluters themselves to monitor their adverse impact on the environment. The enforcement of this requirement may be phased in, starting with the biggest industrial enterprises, because of the difficult financial situation.

53. Further improvements to the monitoring system should come through the creation of general, integrated, regional and global monitoring systems focusing upon common priorities with a single conceptual approach and logistical support. There is also a need to strengthen the existing monitoring structure and environmental data gathering, storage and analysis systems, in order to develop national, subregional and regional industrial and environmental policies.

54. Especial attention should be paid to the further development and improvement of national and regional inventories of natural sites, reserved territories and maps.

55. These measures should be applied in parallel with the introduction of international standards, norms and rules on environmental monitoring using modern techniques, including space technology; staff training; and appropriate support from specialized foundations, international funding organizations and donor countries.

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