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Monitoring of Atmospheric Air Quality in Bishkek city

8th Almaty-Bishkek Economic Corridor Subcommittee Meeting
28- 29 May 2024

Monitoring of atmospheric air pollution

- ❖ The monitoring network for the pollutants concentration in the atmosphere was formed in the territory of Kyrgyzstan from 1968 to 1992.
- ❖ **Kyrgyzhydromet monitors the atmospheric air pollution in cities of:**
 - ❖ Bishkek
 - ❖ Kara-Balta
 - ❖ Osh
 - ❖ Tokmok
 - ❖ Cholpon-Ata





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The following pollutants concentrations are determined:

Bishkek

Kara-Balta

Tokmok

Osh

Cholpon-Ata

14 posts, 1 automatic station and 50 sensors

Sulphur dioxide (SO₂)
Nitrogen oxides (NO, NO₂, NO_x)
Formaldehyde (HCOH)
Total dust (TSP)
Particulate matters (PM₁₀, PM_{2,5}, PM₁)

Sulphur dioxide
(SO₂)
Nitrogen oxide and
dioxide (NO,NO₂)

Sulphur dioxide (SO₂)
Nitrogen dioxide
(NO₂)

Daily business process of sampling and analysis of atmospheric air

Sampling

Sample preparation

Performing tests





Three indicators SI, HR and API are used to assess the level of atmospheric air pollution

To assess the level of atmospheric air pollution, in accordance with RD 52.04.186-89, Kyrgyzhydromet calculates the **Atmospheric Pollution Index (API)** based on the past year results. Mean concentrations of impurities and API characterize the level of chronic, long-term air pollution.

- **SI** - standard index, i.e. the highest one time concentration of any pollutant measured in the city divided by $MPC_{o.t.}$, SI characterizes the degree of short-term atmospheric air pollution.
- **HR** - highest recurrence of exceedance of maximum one-time $MPC_{o.t.}$ according to observations for one impurity at all posts of the territory for a month or a year, in %.



The degree of air pollution is assessed by 4 categories of SI and HR values:

Degree		Atmospheric pollution indicators	Evaluations for		
Gradations	Atmospheric pollution		days	month	year
I	low	SI	0-1	0-1	0-1
		HR	-	0	0
		API	-	-	0-4
II	Increased	SI	2-4	2-4	2-4
		HR	-	1-19	1-19
		API	-	-	5-6
III	High	SI	5-10	5-10	5-10
		HR	-	20-49	20-49
		API	-	-	7-13
IV	Very high	SI	>10	>10	>10
		HR	-	>50	>50
		API	-	-	>=14



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Providing information to government agencies and the public

“Newsletter on the state of air pollution in Bishkek for the season” is published



Media interviews

The year ends with publication of the Yearbook on the state of atmospheric air pollution in the Kyrgyz Republic cities with analysis of the pollution trends for 5 years.





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Consumers of information:

- ✓ Ministry of Emergency Situations;
- ✓ Ministry of Natural Resources, Environment and Technical Supervision;
- ✓ Ministry of Health
- ✓ National Statistics Committee;
- ✓ National Academy of Sciences;
- ✓ Mayor's Offices of Bishkek and Osh cities;
- ✓ International organizations interested in environmental issues;
- ✓ Media;
- ✓ Population, etc.



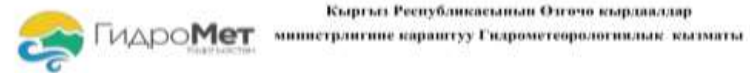
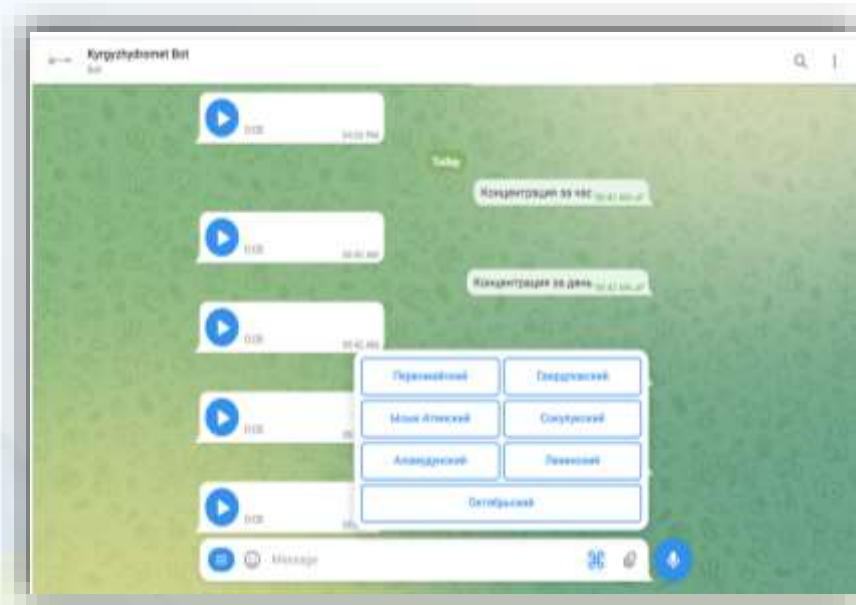


Access to information

Information on atmospheric air pollution is published weekly in the Open Data Portal through the Crisis Management Center of the KR MES.

Daily posting in instagram stories @Kyrgyzhydromet

Developed Chat-bot in Telegram channel KyrgyzhydrometBot



Дүйнөлүк IQAir сайтында атмосфералык абанын булгануусу боюнча шаарлардын рейтингти (ангирейтинг*) 25-январынан саат 10:00до төмөнкүдөй болду: Бишкек шаары 28 орунда.

ИКВ	Качество воздуха	Рекомендации
0-50	Хорошее	Отличный день, чтобы быть активным на улице!
51-100	Умеренное	Необычно чувствительные люди: рассмотрите возможность уменьшения длительных или тяжелых физических нагрузок.
101-150	Нездоровое для чувствительных групп	Чувствительные группы: уменьшите длительную или тяжелую нагрузку. Можно быть активным на улице, но сделать больше перерывов и заниматься менее интенсивно. Следите за такими симптомами, как кашель или озноб. Люди с астмой: следуйте своим планам действий при астме и иметь под рукой быстродействующее лекарство.
151-200	Нездоровое	Чувствительные группы: Избегайте длительных или тяжелых физических нагрузок. Все остальные: Уменьшите длительные или тяжелые нагрузки. Делайте больше перерывов во время любых мероприятий на свежем воздухе.
201-300	Очень нездоровое	Чувствительные группы: Избегайте любой физической активности на открытом воздухе. Все остальные: Избегайте длительных или тяжелых физических нагрузок.
301-500	Опасное	Всем: Избегайте любой физической активности на открытом воздухе. Чувствительные группы: оставьте в помещении и поддерживайте низкий уровень активности.



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- In 2020, to implement the Plan of complex measures to improve air quality in Bishkek city, Alamudun and Sokuluk districts of Chui oblast in 2020-2023, as part of support to Almaty-Bishkek Economic Corridor (Grant Technical Assistance of the Asian Development Bank to Bishkek and Almaty cities in their efforts to ensure healthy and clean urban environment), a Memorandum of Cooperation was signed with the Asian Development Bank for procurement of 50 Clarity NODE S air pollution measurement sensors.



ГидроМет
Кыргызстан



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Clarity NODE S sensors

In fact, we're so confident in the Node-S's ability to amaze, our solution comes with free hardware replacements.



Clarity Node-S Solar-powered model

The Clarity Node-S measures PM_{2.5} and NO₂. Additionally, PM₁, PM₁₀, and TVOC measurements are available dependent on the project.

- Particulate Matter (PM)
- Nitrogen Dioxide (NO₂)

[Download Spec Sheet](#)

Service Features:

- Self-powered by solar panel and battery;
- Weatherproof UV-resistant;
- Internal global SIM card allows for flexible deployment sites;
- Complimentary replacements under warranty
- Service life of 2 years

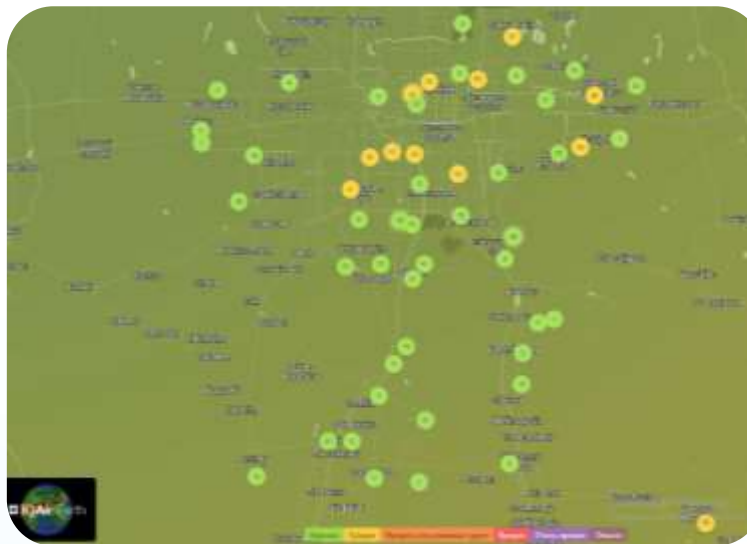


Location of Clarity NODE S sensors

To install these sensors, much work has been performed to map Bishkek city and its surroundings. Based on the report prepared by Ricardo Energy & Environment and guided by the State Standards and Guidelines, 50 sites for the Clarity NODE S sensors have been selected.

According to this Memorandum of Cooperation with the Asian Development Bank, 50 Clarity NODE S sensors have been installed in and around Bishkek city from December 2020 to February 2021.

In November 2023, due to the need to study the spread of polluted air to the southern part of Bishkek city, especially during days of temperature inversions, the sensors were re-installed and moved from the northeastern part of the city to other locations, i.e. along the perimeter of the Alamedin and Ala-Archa gorges, and also covered the previously unstudied residential areas and neighborhoods of the capital.



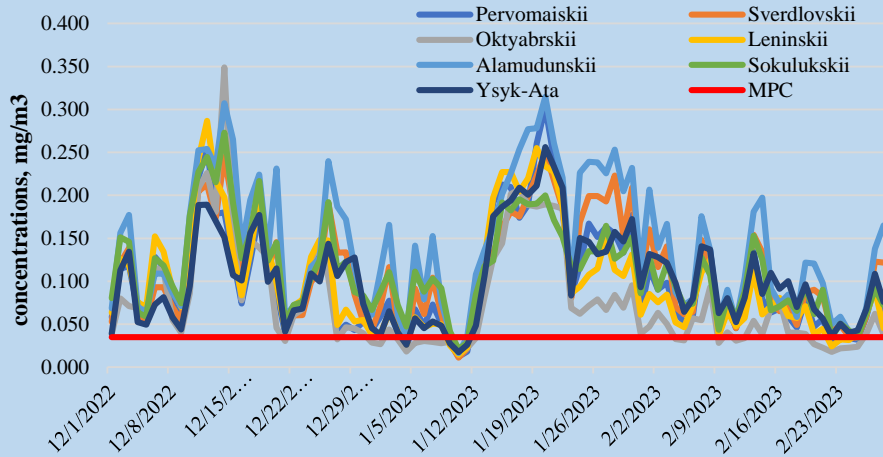
Currently, the Clarity Node-S sensors are being installed at former locations.



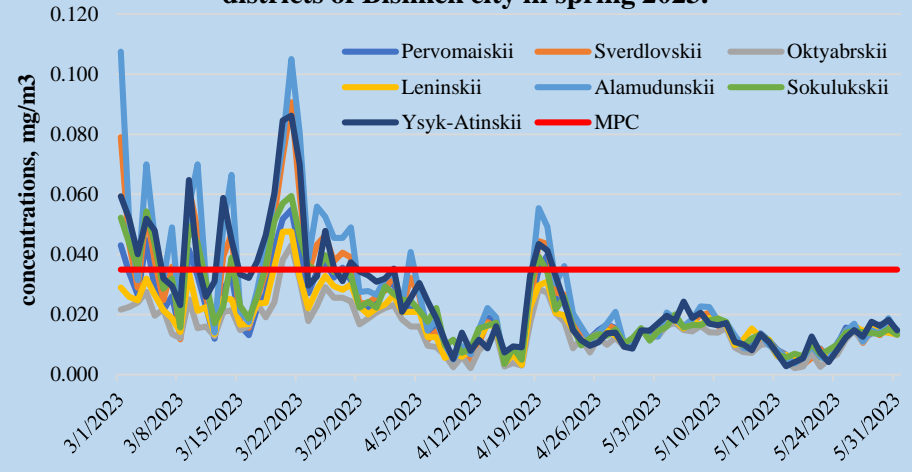
Charts of exceedances of the average daily standard by season in 2023

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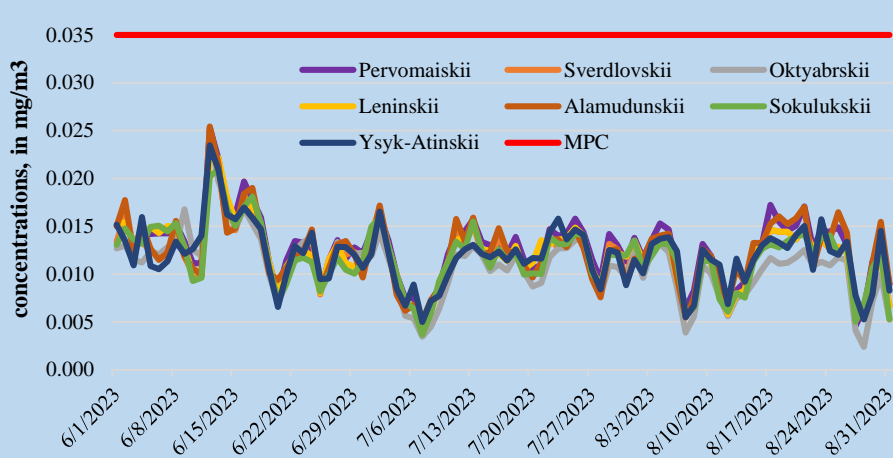
Change in mean daily concentrations of PM2.5 by districts of Bishkek city in winter 2022-2023.



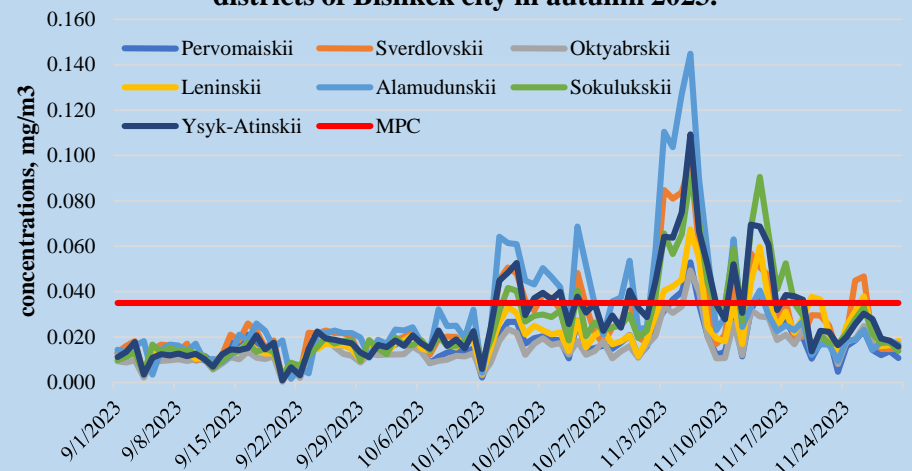
Change in mean daily concentrations of PM2.5 by districts of Bishkek city in spring 2023.



Change in mean daily concentrations of PM2.5 by districts of Bishkek city in summer 2023.

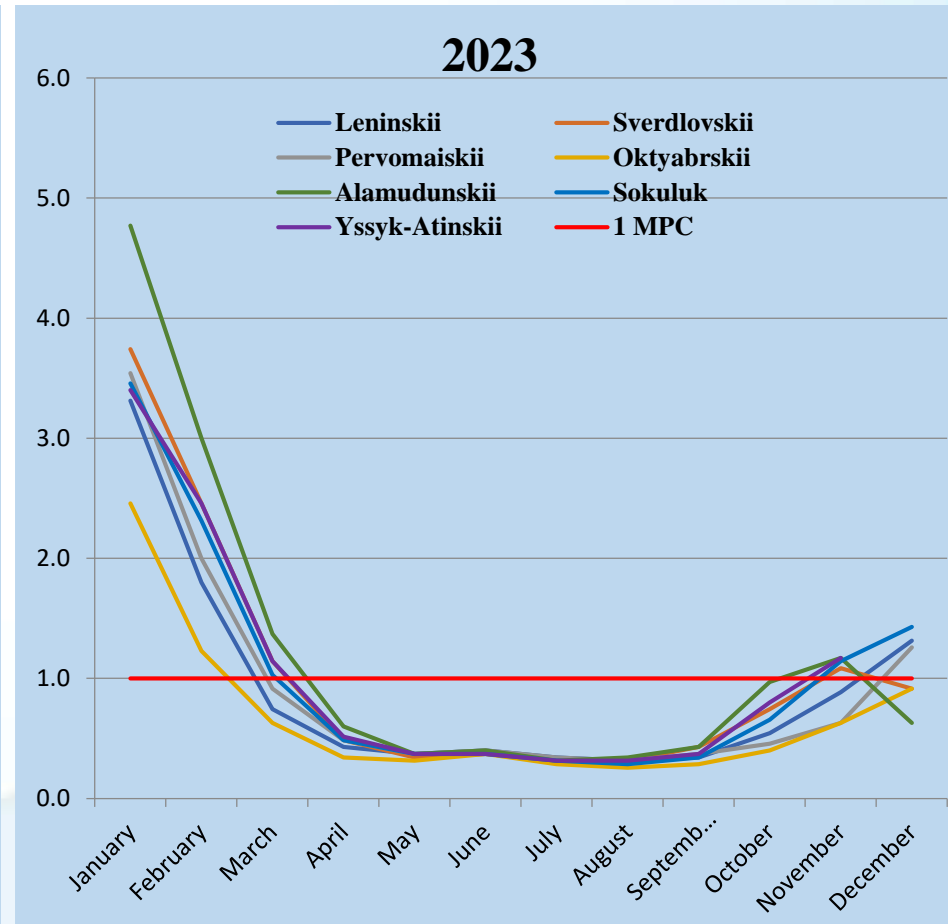
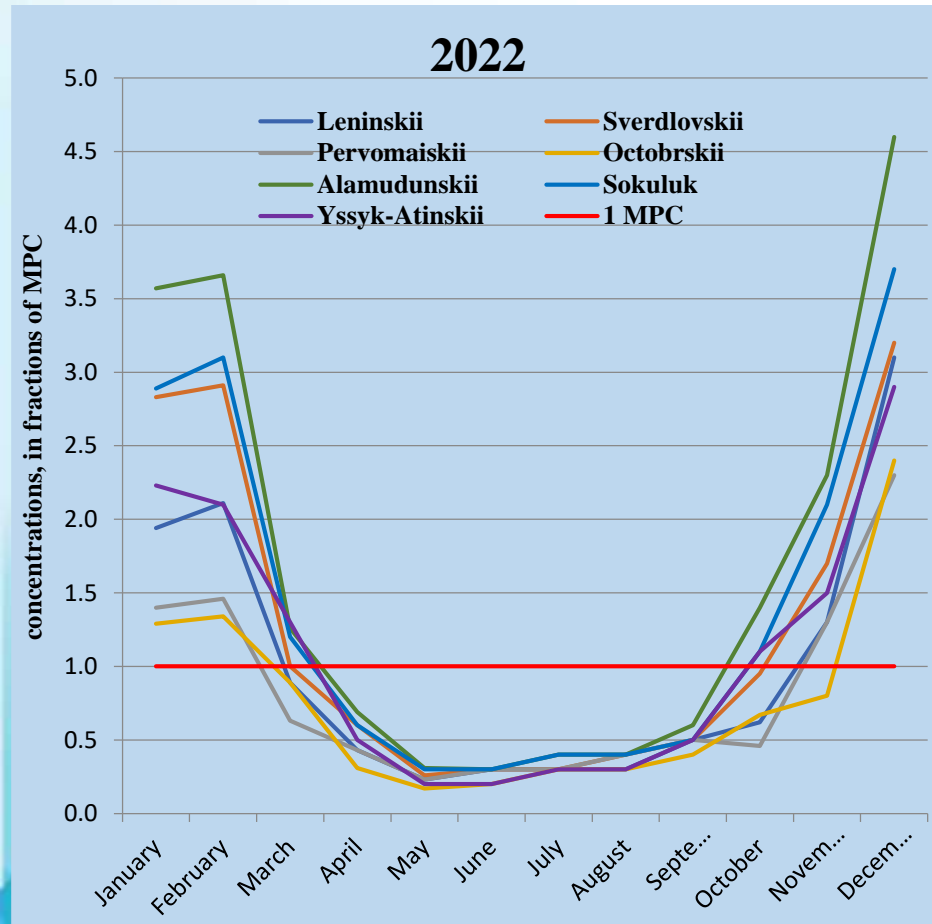


Change in mean daily concentrations of PM2.5 by districts of Bishkek city in autumn 2023.





Charts of exceedances of average daily norm for PM2.5 in Bishkek for 2022 and 2023 (by district)





Vision for further cooperation

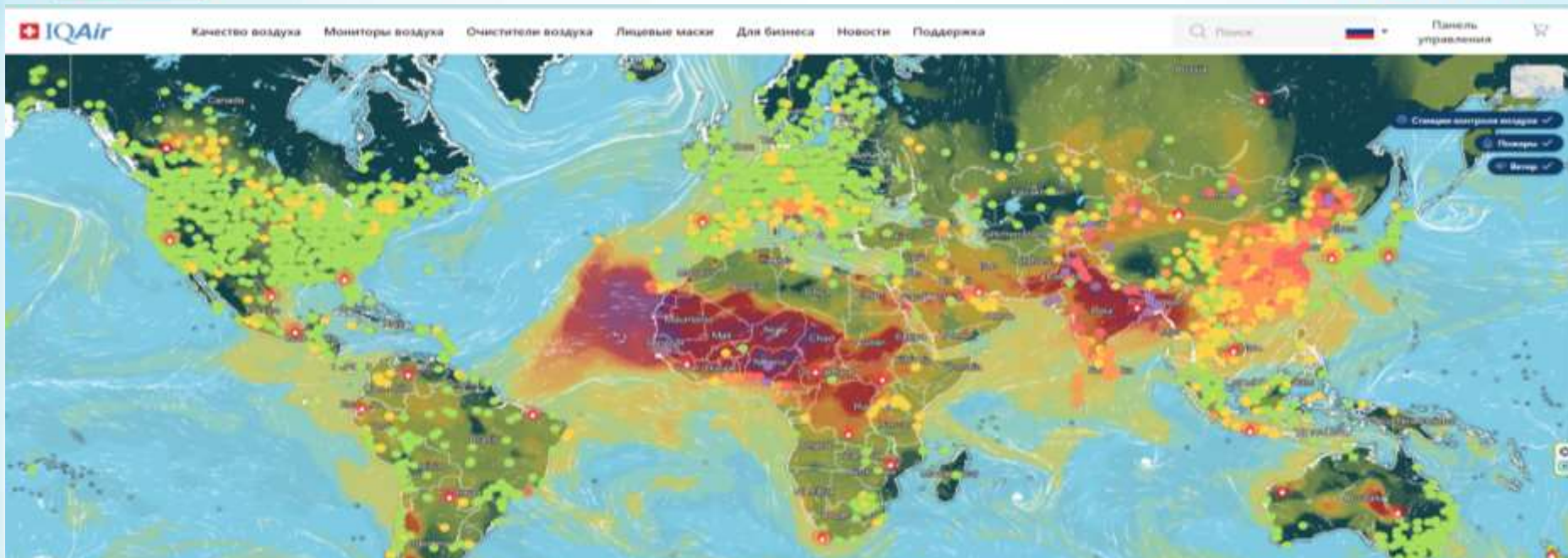
1. It is necessary to store data from Clarity Node-S sensors on the Kyrgyzhydromet server;
2. Capacity building of the staff in data processing and visualization;
3. Use of a large-scale network of low-cost sensors made it possible to understand the need for reference instruments and stations.

According to the Guidance on Atmospheric Pollution Control RD 52.04.186-89, the number of posts is determined depending on the population. For Bishkek city with more than 1 million population, 10-20 posts (automatic and manual) are needed.

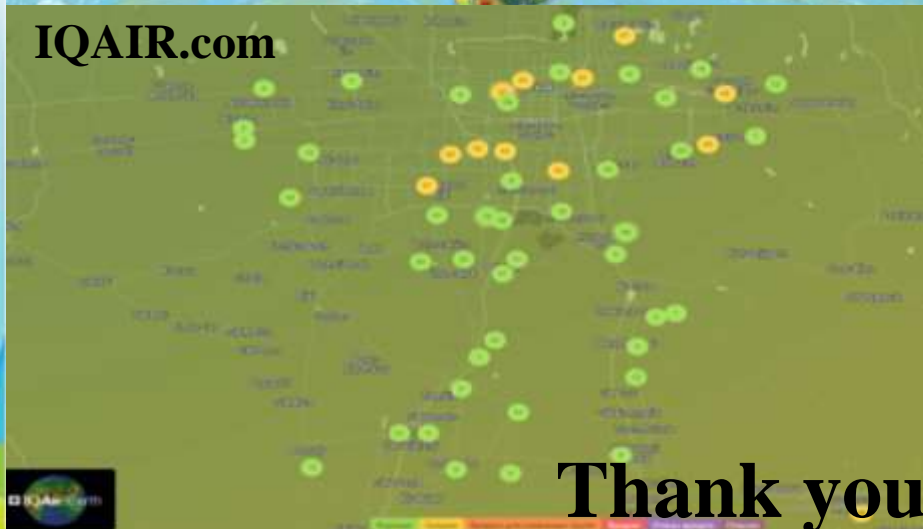


Current smog level in the world and Bishkek city

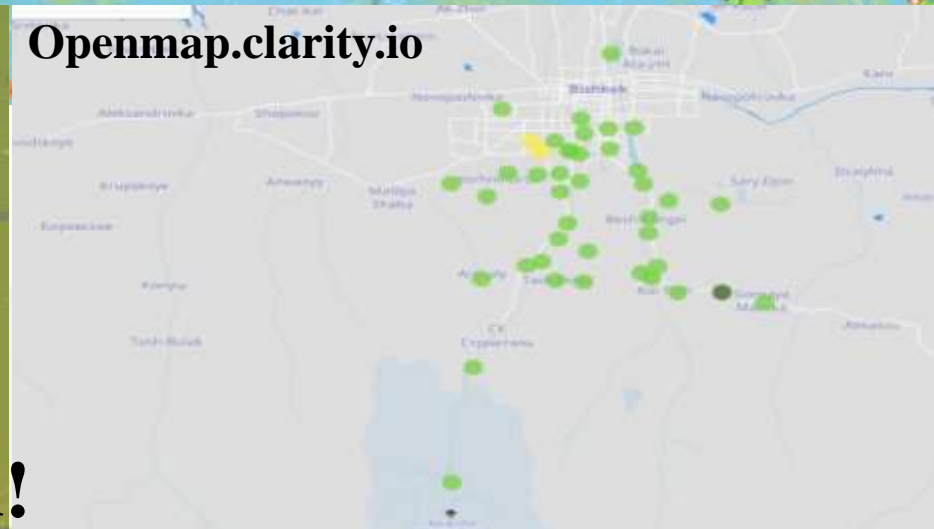
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Thank you!