Measures to improve the environment (example of Krasnodar, Russia)

T V Konovalova¹, A Y Inozemtceva¹, E Y Balaev¹, A E Litvinov¹,², and M P Mironova¹
¹Kuban State Technological University, 2 Moskovskaya St., Krasnodar, 350072, Russia
E-mail: ²artstyleone@mail.ru

Abstract. The article discusses measures to improve the environment, presents the measures proposed by the mayor of Krasnodar, describes the advantages of building parks for residents. The project “SOS! Air”, an interactive map with foci of pollution. The problem of pollution of the center of Krasnodar is described. The project “General cleaning” is considered. Conclusions are drawn about the need to preserve a clean environment.

1. Introduction
Due to the growth of cities, the increase in the number of vehicles, the construction of new plants and factories, the ecology of many cities is deteriorating every day. The capital of the Krasnodar Territory, the city of Krasnodar, is no exception. The population of Krasnodar is growing every year. The population dynamics can be seen in Figure 1.

![Figure 1. Population of Krasnodar.](image)

New educational institutions appear, so students come to Krasnodar not only from all regions and districts of the Russian Federation, but even from other countries. Many people move to Krasnodar...
from small towns and villages in search of work with the most favorable wages.[1,2]

It is not surprising that as the population grows, so does the number of personal vehicles, which significantly pollute the air of the city, and many trees are being cut down due to the construction of new houses for this population. However, there are measures, the adoption of which will significantly help the restoration of the environment.

Various meetings are held to discuss environmental problems, as well as the protection of the entire environment. One of these meetings took place on February 13, 2018, which was chaired by the head of the city, Evgeny Pervyshov [1]. The mayor of the city has proposed a number of measures to create a favorable environment.

First of all, according to the mayor, it is necessary to continue adding green areas to the city's transport infrastructure. Two years after the conference, we can really observe the growth of parks, squares, as well as various green spaces. Figure 2 shows a map of the city of Krasnodar showing the location of some green areas and squares.

Figure 2 Boulevards and squares of Krasnodar.

2. Materials and methods
In addition to squares and boulevards, Krasnodar has many different parks. A striking example of this is the beautiful park named after. Galitsky. Now he continues to build and delight residents with more and more plants. People have the opportunity to take a break from the noise and gas-filled air without leaving the city. Parks with a large number of green spaces not only improve the environment, but also make it possible to get aesthetic pleasure at the sight of beautiful flowers or unusual trees. People feel better, which can not but have a positive effect on their health. In the parks of Krasnodar, you can often see children and the elderly. If adults who are busy at work simply have no time to walk, then children with grandparents simply need to spend a lot of time in the fresh air. It is the construction of parks and squares that can provide this opportunity.

Further Evgeny Pervyshov said that it is necessary to continue to carry out subbotniks and campaigns to collect hazardous household waste in the city [3]. These are really the right measures in relation to the environment, because, unlike the construction of parks, many city dwellers can take part in such events. This is not about toxic waste, which is collected by special services, but about garbage,
which, unfortunately, is now just lying around on the street. It is necessary to organize subbotniks as often as possible at schools, universities, and enterprises with a large territory. If people clean up even the area that surrounds them, the city will become much cleaner.

The mayor of the city also proposed the development of a system of separate waste collection and other modern technologies for sorting, processing and disposal of waste [3,4]. Separate waste collection will allow this waste to be reused, thereby reducing the amount of hazardous waste buried in the ground or taken to overfilled landfills.

An important part of environmental activities is continuous monitoring of the environment. It is the monitoring of the environment that will make it possible to identify the main foci of environmental pollution in order to further direct all the main forces to eliminate these particular foci and causes.

At the moment, the project “SOS! Air”. For this project, the international public environmental organization Greenpeace launched an interactive map of Russia [4]. All places with the highest air pollution can be tracked on this map.

It is quite possible to open this card not only with a computer, but also to use a phone or tablet for these purposes, which is a very convenient function. This project provides people with the opportunity to submit complaints about polluted air themselves, and if their words are confirmed by this card, various measures will be taken to improve the situation in the area from which the complaint was received.

According to the latest data, the map shows six places in Krasnodar [5], where the air is most polluted by exhaust from vehicles and various factories. These locations are shown in Figure 3.

![Figure 3. Pollution map.](image)

3. Analysis of Simulation Results and Experimental Data

The air in the city center is mostly polluted due to the large congestion of cars. In the morning and evening, during traffic congestion, the largest amount of harmful substances gets into the air. It is for this reason that it is necessary to stimulate residents to switch to public transport. However, this is not an easy task, because some people are forced to purchase a private car, because they cannot get to their place of work or study by public transport, or they have to make several transfers for this. To reduce the number of personal vehicles, it is necessary to take at least two measures: make public transport a priority mode of transportation and increase the sale of electric vehicles.

As for electric vehicles, this is a fairly promising mode of transport. It not only helps to keep the air cleaner, but also requires less money for its maintenance. The main problem in the introduction of electric vehicles into the modern vehicle market is the lack of places and devices for recharging.
electric vehicles. The lack of large-scale production of electric vehicles by domestic manufacturers also affects. It is necessary first of all to offer incentives to manufacturers of electric vehicles, and then stimulate the demand for them among consumers in the same way.

Air pollution from vehicles is also present on the streets of Krasny Partizan and Dushastaya (next to the Yeisk highway) [6] - the streets also marked on the Greenpeace map. On the streets of Rossiyskaya and Beregovoy, the main cause of air pollution is industrial emissions. Lenin’s farm near Krasnodar and the villages of Novy and Enem in Adygea were also marked on the map [6].

Apart from the SOS! Air ”was launched and the ONF project “General cleaning”. The aim of this project is to monitor environmental problems, as well as collect public opinion and complaints about the presence of unauthorized dumps [3]. Any resident of the city of Krasnodar has the right to file a complaint if the presence of landfills will interfere with the comfortable life of people or have a detrimental effect on the environment. Figure 4 shows all identified unauthorized dumpsites in the Krasnodar Territory. It should be noted that these dumps are also present in Krasnodar itself.[7-10]

Figure 4. Unauthorized tags of the Krasnodar Territory.

4. Conclusion
Environmental protection is one of the most important areas of human activity. New technologies bring many benefits to people, the economies of countries are growing, more and more new medicines, products, things appear. But now it is very important to reduce the share of the negative impact of progress, so as not to give up these modern benefits and at the same time preserve the ecology and a favorable environment.

The negative impact of progress is not just words. The most striking example is the explosions on oil platforms. An oil spill can destroy not only the soil, but also various bodies of water, while water is
the primary resource for the entire population of the planet. Oil, being a product of long-term decay, covers the entire surface of the reservoir at lightning speed. The oil film remains on the surface of the water and blocks access to air and sunlight. Such negative consequences significantly affect the life of all living organisms inhabiting the oil spill area.

Not only aquatic living organisms suffer. Birds living on the surface of water bodies spoil their plumage, because oil sticks to feathers, tangles them. Birds can no longer move freely and will eventually die.

Such a spill occurred quite recently in our Krasnodar Territory, though not on a huge scale. However, this does not diminish the magnitude of the negative impact on living organisms and the surrounding nature.

In June 2020, for a whole month in Anapa, Sochi and Novorossiysk, residents noted heavy pollution of beaches with oil products. Because of this pollution, dolphins began to die. People found the carcasses of dolphins completely covered with a film of oil. The worst thing is that no one can determine the real source of these emissions. Without a specific source of pollution, it will be very difficult to prevent further flow of oil products into the waters of the Krasnodar Territory.

Another negative consequence of the technical and technological development of the Krasnodar Territory is man-made fires. Despite the fact that the main problem of Krasnodar and the Krasnodar Territory itself is air pollution from automobile emissions, man-made fires also make their negative contribution to the ecology of the area. In addition to the all-consuming fire, fires create a lot of harmful gases formed during the combustion of various artificial materials and released into the atmosphere. Figure 5 clearly shows the scale of emissions of harmful substances into the atmosphere during a technogenic fire:
- thermal radiation;
- Complete or partial destruction of significant building structures and objects;
- Shock wave upon ignition of flammable substances.

Technological progress has also involved water resources. Reservoirs are of great importance for the Krasnodar Territory. They solve the problem of uneven distribution of water resources throughout the region and serve for their storage. However, such structures are capable of causing significant harm to the environment.

A striking example of a man-made disaster in the Krasnodar Territory associated with reservoirs is the disaster in the city of Krymsk.

In 2012, the dam of the Neberdzhaevsky reservoir failed, due to which the water was drained. A huge wave covered the city and resulted in the destruction of a huge number of houses and the death of many people. Figure 6 shows the scale of the disaster in Krymsk:

![Figure 6. Consequences of a man-made disaster in Krymsk.](image)

One of the main problems of Krasnodar and Krasnodar Territory is air pollution with harmful car emissions. However, you cannot focus on just one problem. Situations are possible when one man-made disaster can be closely related to other environmental problems. Therefore, along with the development of technology and various new technologies, it is necessary to simultaneously develop methods for preventing man-made disasters that may arise during the operation of this equipment and these technologies. Only an integrated approach to the situation will make it possible to develop without prejudice to the people themselves and the entire planet.

References
[1] McKinsey on Sustainability & Resource Productivity, 2012 The McKinsey Quarterly — № 27, 2013
[2] Sukharev O S 2015 National interests: priorities and security Vol 11 No. 1 (286).
[3] Pugachev I, Kulikov Y, Markelov G, Sheshera N 2016 12th International Conference “Organization and Traffic Safety Management in large cities”, SPbOTSIC-2016, 28-30
[4] Kravchenko P, Oleshchenko E 2016 12th International Conference "Organization and Traffic Safety Management in large cities", SPbOTSIC-2016, 28-30 pp 367-372
[5] Konovalova T, Zarovnaya L 2016 12th International Conference "Organization and Traffic Safety Management in large cities", SPbOTSIC-2016, 28-30 pp 311-315
[6] Kurakina E, Evtukov S 2017 Architecture and Engineering. 018. № 3 (1)
[7] George R, Jana I, Joseph K 2013 The world of transport and technological machines 4 (43).
[8] Muizemnek A, Kartashova E, Zemskov R 2012 Proceedings of higher educational institutions. Volga region. Technical science 3 (23)
[9] Agakhanov E K, Batmanov E Z, 2012 Bulletin of the Dagestan State Technical University. Technical science Vol 3 (26) 67-72.
[10] Zemskov R, Parkina U 2012 Models, systems, networks in economics, technology, nature and society 1 (2)
[11] Komarov U, Lemeshkin A, Silchenkov D 2014 Bulletin of the Volgograd State Technical University Series: Ground transportation systems Vol 19 (146)
[12] Razgovorov K 2016 New materials and technologies in mechanical engineering 23
[13] Orlov L, Tumasov A, Bagichev S 2014 Proceedings of NSTU Vol 105
[14] Konovalova T, Nadiryan S 2013 Science. Technics. Technologies (polytechnic bulletin) Vol 4
[15] Konovalova T, Kotenkova I 2013 Bulletin of the Saratov State Technical University Vol 2 (71)