DOI 10.31489/2023BMG1/184-194

UDC 581.6 (574.20)

G.A. Sadyrova[1, 4*], G.A. Sadyrov[2], G.A. Sadyr[3], G.A. Sadyrova[4]

[1]*Kazakh National University named after al-Farabi, Almaty, Kazakhstan;*
[2]*University of International Business, Almaty, Kazakhstan;*
[3]*Almaty Management University, Almaty, Kazakhstan;*
[4]*International engineering technological University, Almaty, Kazakhstan*
**Corresponding author: gulbanu-s@mail.ru*

# The impact of the green economy on the urban ecosystem of Almaty city

The article presents the impact of the green economy on the urbanized ecosystem of the city of Almaty. The concept of green economy is considered as sustainable development with minimal risks to the environment and the reduction of the negative impact of human economic activity on the environment, as well as the development of this direction in the country and, in particular, in the city of Almaty. A phased process of transition to a green economy is shown, the implementation of the "Zhasyl Almaty" project, where, according to the concept of transition to a green economy, according to the concept of "smart cities", one of the main goals of the development of Almaty is to preserve natural resources, comfortable living conditions for the population and improve the quality of life in all areas of Almaty, which is the main requirement of a green economy. In recent years, the growth of new buildings in the city of Almaty has intensified the processes of anthropogenic impact on the urban flora. The existing experience of green building in the city of Almaty does not fully take into account the specific environmental conditions of various districts of the city and the level of their technogenic pollution, and the issues of the state of plantations in residential and industrial areas, the resistance of vegetation to the impact of the urban environment are ignored. Due to the increasing density of urban development with multi-storey buildings (more than 20 floors), it is becoming increasingly difficult to realize the concept of a green city of Almaty.

*Keywords:* Almaty city, green economy, green spaces, city urbanization, ecosystem.



## *Introduction*

Recently, environmental factors have become increasingly important to mankind in modern conditions, which have become increasingly important since the beginning of the scientific and technological revolution, where mankind did not pay due attention to them, which in turn caused great environmental problems. To overcome the growing global crisis in all spheres of human activity, including the climate crisis, the biodiversity crisis, the fuel, food, water, financial crisis, it was necessary to create a special new development model that would not upset the balance of environmental, social and economic interests. The green economy has become such a model, which emphasizes the need to reduce the negative impact of human activities on the environment and which puts at the forefront the sustainability of development with minimal risks to the environment. Many economically developed countries have already taken concrete steps in this direction. The Republic of Kazakhstan in the National Strategy for Sustainable Development also expressed its intention to move towards the transition to a green economy. Currently, many scientists from different countries are engaged in the development of the green economy [1–5].

The term "green" economy was first introduced into the scientific literature by British economists David Pearce, Anil Markandya and Edward Barbier in a report to the UK Government in 1989 called "Blueprint for a green economy" [6]. In the Kazakh language, this term is entirely borrowed from the English language, that is, by translating the words of the original phrase. Another frequently used term is the green city associated with the protection and improvement of the ecological state of the city. The term green technology is also widely used for various solutions that help to competently manage resources and reduce the negative burden on nature. The term green jobs is considered as the activity of people aimed at reducing pollution, conserving natural resources, and improving the environment. However, it should be noted that this problem has not been sufficiently studied and, in particular, the theme of the green economy in the cities of the republic has been worked out. In general, the principles of the green economy have not been sufficiently implemented yet, due to the fact that the transition to a green economy requires, to a certain extent, the rejection of the traditional economy. The main goal of the green economy is to ensure economic growth and investment growth, to improve the quality of the environment and social inclusion [7]. The objectives of the green econ-

omy are: strengthening environmental protection, increasing the efficiency of resource use, improving social integration, and improving sustainable economic development (Fig. 1).

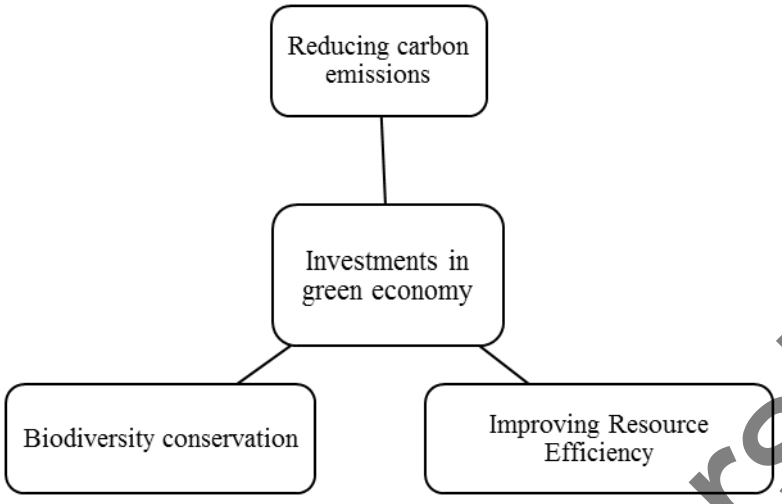


Figure 1. Investments in green economy

The purpose of the study is to assess the role of the green economy of Almaty as the main component of green infrastructure in ensuring the sustainable development of the urban ecosystem.

Integrating environmental, social and economic concerns requires an integrated approach to designing and ensuring the effective implementation of green economy policies, which require new business thinking, a new level of skilled workforce and specialists. Investing in green economy research, technology development and innovation are key points to the transition to a green economy (Fig. 2).

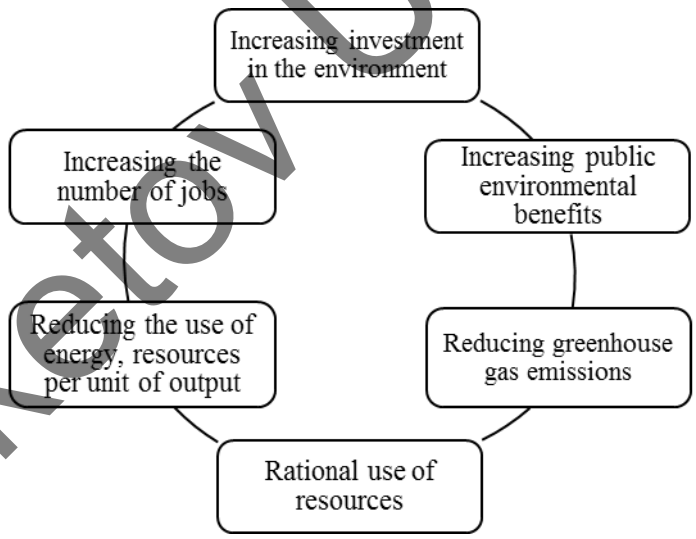


Figure 2. Conditions for the transition to a green economy

Thus, the green economy is aimed at obtaining environmental, social and economic benefits in the areas of using clean energy technologies, increasing the efficiency of resource use through investments in cleaner production, and improving food security, use of sustainable agricultural practices and access to new markets for green goods and services.

*Experimental*

To conduct the study, various methods were used to determine the prospects for the development of the city of Almaty in the transition to a green economy. The method of studying primary and secondary statistical data was applied. For this, documents were studied and the following materials were considered: Development Strategy “Almaty–2050”; “The results of the socio-economic development of Almaty for January –

March 2021"; Development of the national project "Green Kazakhstan" for 2021–2025; Law of the Republic of Kazakhstan "On the special status of the city of Almaty"; Decrees of the Government of the Republic of Kazakhstan "On approval of the State Program for the Development of Regions until 2020"; "On Approval of the State Program for the Development of Regions for 2020–2025" and others [8–13]. To conduct a comprehensive analysis, a comparison method was used, where changes in the structure and volume of GRP, indices of the physical volume of industrial production, investments in fixed assets and other basic indicators were compared.

*Results and Discussion*

As foreign experience and world practices of transition to a green economy show, the scale of the green sector of the world economy is still relatively small. Today, the volume of employment in the field of green economy around the world is within 10 million people. However, the contribution and investments in the development of the economic complex of individual states are quite high (Fig. 3).

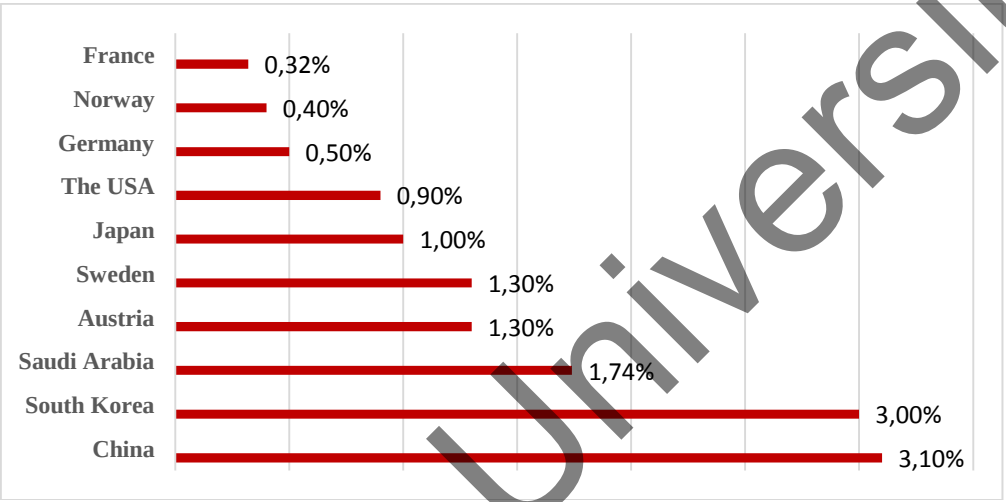


Figure 3. The share of the green economy in the gross domestic product of the countries of the world

As can be seen from Figure 3, in the United States, the green economy provides more than 600 billion dollars of products and services, employment there is estimated at 3 million people, in Japan 3.4 % of GDP and about 1.5 million people, respectively, in the EU countries 2.5 % of the total GDP and more than 3.4 million people, in Germany these figures are even higher at about 4.8 %, and in the UK this figure is more than 5.0 % [14]. In the Republic of Kazakhstan, the beginning of the official process of transition of Kazakhstan to a green economy is considered to be 2013, when the Concept of the transition of the Republic of Kazakhstan to a green economy was signed. In 2014, a plan for the transition to a green economy was adopted and active work began on the development and reform of legislation. In 2016, the law on the transition of Kazakhstan to a green economy comes into force, where the process of reforming the legislation was accompanied by the development of strategic plans for various sectors of the economy for their transition to a green economy [15]. In the Republic of Kazakhstan, a phased transition to a green economy is planned (Table 1).

Table 1

**Stages of transition of the Republic of Kazakhstan to a "green" economy**

| | |
|---|---|
| 2013–2020 | Optimizing the use of resources and increasing the efficiency of environmental protection activities creating a "green" infrastructure |
| 2020–2030 | On the basis of the existing "green" infrastructure, the reconstruction of the national economy will begin, focused on careful water use, the construction of facilities based on high standards of energy efficiency |
| 2020–2050 | The transition of the national economy to the principles of the so-called "Third Industrial Revolution", requiring the use of natural resources in the conditions of their renewal and sustainability |

The total investment required to implement Kazakhstan's transition program to a green economy is estimated at an average of $3–4 billion per year during 2017–2050. It is planned that most of the funding will come from private investors. Since the adoption by the Republic of Kazakhstan of the concept for the transition to a green economy, the following results have been obtained: given the geographical location and climatic conditions of Kazakhstan, small hydropower plants, solar and wind energy are the most promising renewable energy sources. According to experts, the total potential of renewable energy sources is 1885 billion kilowatt-hours per year. To date, 142 renewable energy facilities operate in Kazakhstan. Thus, the share of electricity generation by renewable energy sources in the Republic of Kazakhstan is 3.7 %, hydroelectric power plants (HPP) — 21 %, solar power plants (SPP) — 37 %, wind power plants (WPP) — 42 %, biogas plants (BGU) — 0.2 % [16].

According to the Concept for the transition to a green economy, by 2030 the share of waste processing in the Republic of Kazakhstan should be increased to 40 %, by 2050 — up to 50 %. Every year, Kazakhstan generates 4.5–5 million tons of municipal solid waste (MSW). The share of recycled and disposed production waste in 2020 was 36 %, solid waste — 18 %, 81 % of the country's population are provided with waste collection and disposal services. In 2021, the government began to develop a Low-Carbon Development Concept for the implementation of the second phase of the Concept for the transition to a green economy. According to this concept, for the implementation of the national project "Zhasyl Kazakhstan", the country's forest fund will be increased by 2 billion trees within 5 years, and 15 million of new seedlings will be planted in settlements. In 2021, trees were planted on an area of 66 thousand hectares (in the amount of 138 million trees). In the current 2022, it was planned to plant about 244 million trees (at the beginning of this year, 280 million trees were planted), in 2023 — 411 million, in 2024 — 573 million and in 2025 — 643 million trees. Currently, 138 million tree seedlings have already been planted, and since the beginning of this year, 280 million trees. For these purposes, in 2022, the state planned to spend 161 billion tenge [16]. It should be noted that the state program "Digital Kazakhstan" has been developed, the purpose of which is the digitalization of the main sectors of the economy, which provides support for the creation of an unified state information system for monitoring the environment and natural resources, automated monitoring of fish resources, biodiversity, specially protected natural areas, water resources and water facilities [17].

*Prospects for the development of the city of Almaty in the context of the transition to a green economy. The main ways of developing a green economy in Almaty*

Almaty is the largest metropolis of our country, an intensively developing city, which is the center of business, economic, cultural life and occupies a special place in the development of Kazakhstan and Central Asia. Almaty is distinguished by a favorable geographical location, connection with large transport arteries, and a developed economy. According to the concept of transition to a green economy, according to the concept of "smart cities", one of the main goals of the development of Almaty is to preserve natural resources for a clean environment, comfortable living for the population and improve the quality of life in all districts of Almaty, which is the main requirement of a green economy. This program covered all the main areas of development of the city, including the economy, social sphere, public safety and law and order, infrastructure, ecology and land resources, public services and is formed taking into account 7 priorities (Fig. 4). Starting from 2017, after the law on the transition of Kazakhstan to a green economy came into force, the city administration and experts of the city of Almaty developed a program for the development of the city of Almaty – 2020. In 2022, a new program for the development of the city of Almaty until 2025 and medium-term prospects until 2030 were developed. According to the concept for the transition of the city of Almaty to a green economy, first of all, it is necessary to develop sustainable development and use of water resources, increase energy efficiency in industry, housing and communal services; transport industry, development of renewable energy sources, electric power industry, reduction of air pollution, conservation and effective management of ecosystems.

The green fund of the city for 2022 amounted to more than 2.3 million green spaces. Of these, 134,129 are coniferous trees, 1,932,807 are deciduous trees, and 164,199 are shrubs. For 2017–2019 more than 274 thousand green spaces were planted in Almaty. New rules for the maintenance and protection of green spaces have been approved [18]. Thanks to this measure, compensation planting increased by 25 % or 10,000 trees. Thus, according to the "comfortable city" concept, up to 1 million green spaces are planned to be planted in Almaty by 2025, where the green area of the city will grow to 5,000 square meters. Today, the area of green spaces for general use in the city of Almaty is only 894 hectares — 4.8 square meters per person; whereas in the 80s this figure reached 10 square meters. The decrease is explained both by the growth of the territory of the city and by the increase in the population [18].

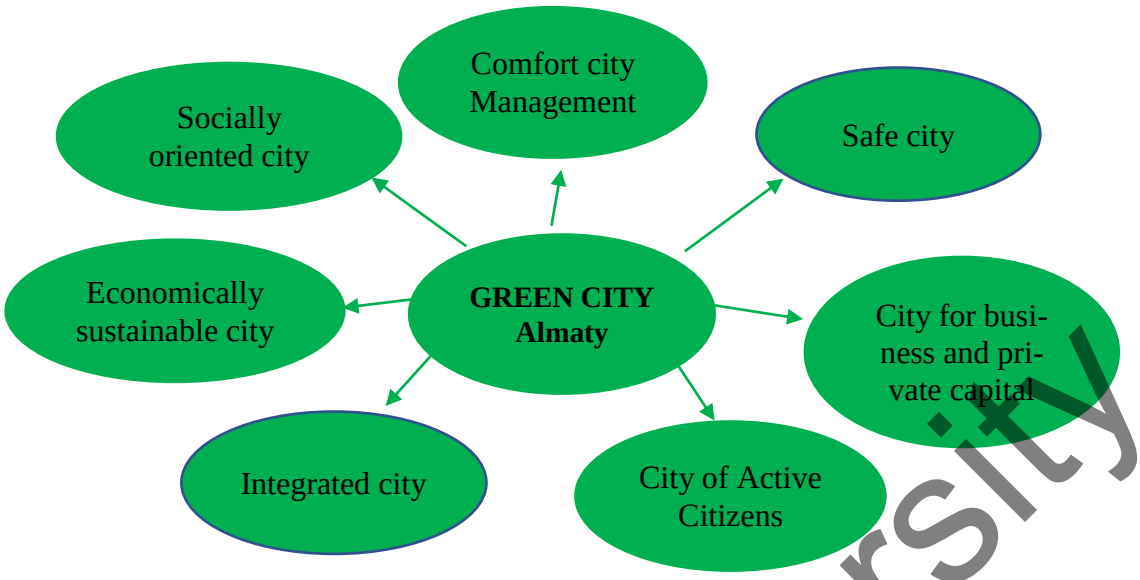


Figure 4. Key Dimensions of Green City for Sustainable Urban Development

In addition, the area of park and pedestrian zones is increasing annually in Almaty. In addition to the existing Almaty Arbat, Terrenkur, new pedestrian zones were formed along Panfilov Street. The length of this pedestrian part is 1400 m [19]. Another priority area of the green economy is the development of renewable, "clean" energy. The existing power supply system of the city of Almaty is characterized by a high level of wear and tear and needs to be modernized. Coal remains the main source of heat production in the city. Thus, the share of coal in the Combined Heat and Power Plant-2 and Combined Heat and Power Plant-3 is 99.4 %. Since 2017, Thermal Power Plant-1 has been completely switched to burning natural gas and fuel oil. In general, according to 2017 data, heat production using solid and liquid fuels is 70 %. The administration of the city of Almaty is working on the transfer of Thermal Power Plant-2 to natural gas. According to the chosen option of switching to natural gas, emissions will be reduced from 38 thousand tons to 6 thousand tons [20]. This will have a great impact on reducing air pollution in the city of Almaty. According to the concept of the city's transition to a green economy, work is also underway in Almaty on the construction of renewable energy sources. Thus, by analogy with the project of the Finnish company Wello "electricity generators from waves and water", a project is being implemented to build a small hydroelectric power station on the Malaya river, where each of the installations will produce up to 4.5 MW per year. In addition, the implementation of a project for the construction of biogas plants at sewage treatment facilities of the State utility company on the right of economic management "Almaty Su" has begun [21].

Almaty belongs to the cities of Kazakhstan with a high level of air pollution throughout the year. The high level of pollution is due to both the natural and climatic features of the region and the anthropogenic impact on the environment. According to the concept of green economy, it is planned to reduce air pollution in the metropolis, where the main sources of pollution are vehicles and thermal power plants. To date, the population of Almaty as of August 2022 is 2,135,365 thousand people. In this regard, about 530 thousand cars are registered in the city; about 250 thousand more are entering from other regions, which create an enormous burden on the city's ecology. In this regard, a large-scale transport reform is being carried out in the city. According to the experience of developed countries, the key direction is public transport and reducing the use of private cars. The expenses of business entities aimed at protecting the environment in 2019 amounted to 4444.3 million dollars in 2020 in the amount of 4984.6 million tenge [22]. A significant part of environmental expenditures (95.4 %) is carried out by industrial enterprises, mainly at the expense of enterprises of the Alatau and Zhetysu districts of Almaty. Since the official announcement of the course for green growth in Almaty, a rapid rise in green business has begun. According to the Committee on Statistics, Almaty ranks the 1st in the country in terms of gross output and are a center for the development of small and medium-sized businesses (Fig. 5).

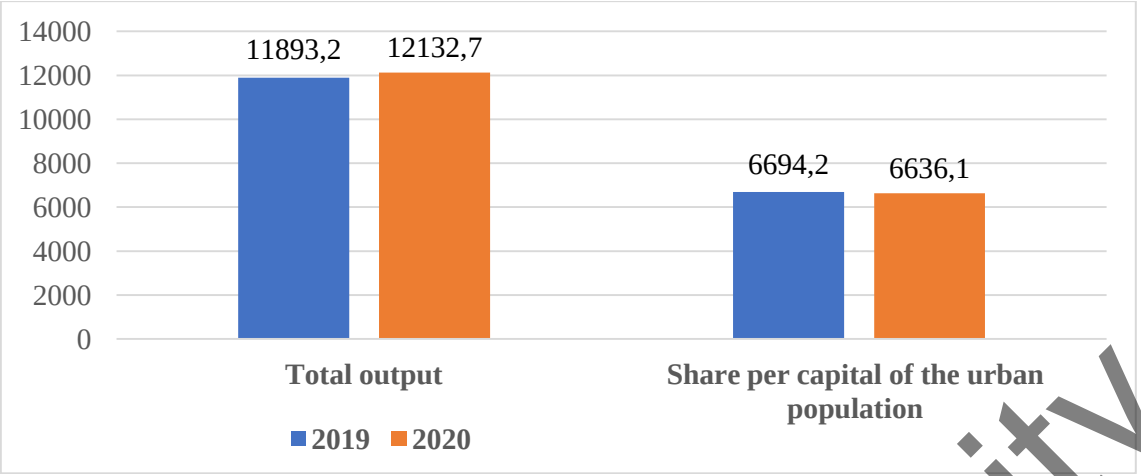


Figure 5. The share of gross output and output per capita of the city of Almaty (million tenge)

As noted above, improving the ecological state of the city of Almaty is one of the priorities in the development plan of the city of Almaty for 2025–2030. Currently, the city has a difficult environmental situation, the growth of the economy, prosperity and consumption have increased the negative human impact on the environment. In conditions of weak natural ventilation and a large number of mobile and stationary sources, atmospheric air pollution is the most urgent environmental problem of the city of Almaty. At the same time, there has been an increase in the rate of fleet renewal, the decommissioning of pollutants, and an improvement in the resilience of the city's natural ecosystems. Every year there is an increase in the number of electric vehicles, the activation of the use of small vehicles (electric bicycles, electric mopeds, electric scooters). To reduce air pollution and the overall anthropogenic impact on the environment of the city of Almaty, one of the most effective ways is to increase the area of green spaces, which is the most affordable, simple and effective way to combat air pollution. The development of green infrastructure is primarily aimed at preserving biodiversity, restoring urban natural landscapes, improving and greening areas near places of residence, enhancing environmental education and educating the urban population. The improvement of the ecological situation in cities is associated with the improvement of the landscaping system, which refers to the scientifically based spatial placement of all components of urban landscaping in accordance with urban zones, soil, climatic and other factors in order to achieve optimal environmental, sanitary, hygienic and aesthetic effects. As you know, the city of Almaty is the greenest city in our country, it belongs to a region with a high level of urbanization, where the urban population, as noted above, is 2,147.1 thousand people as of August 2022 [23]. The main elements of the landscaping system of the city of Almaty include parks, squares, groves, boulevards, gardens, nurseries, an arboretum, green spaces along the streets, landscaping within micro districts, and lawns (Table 2).

Table 2

**The total area of green spaces in the city of Almaty**

| City | Total area of green spaces (ha) | City area, km$^2$ | Share of green areas in the city (%) | Area for 1 person, m$^2$/person | City population, thousand people, 08.05.2022 |
|---|---|---|---|---|---|
| Almaty | 1 050,97 | 682 | 15,4 | 7,0 | 2 147,1 |

Today, there are about 2.3 million green spaces in Almaty. Of the 70.1 thousand hectares of the territory of Almaty, 25.38 thousand hectares are covered with greenery. The coefficient of greenery in Almaty is 36 % on average. The area of green spaces is 1,050.97 ha. At the same time, the provision of public green spaces in the districts of Almaty is unevenly distributed, ranging from 5–7 m$^2$/person in the western and northwestern regions up to 17 m$^2$/person in the Medeu region. As you know, to provide oxygen to one person, 1.54 trees are needed, where one tree absorbs the emissions of one car and neutralizes 80 kg of harmful substances and 20 kg of dust. The area of plantations of common use in Almaty has increased for 1988–2020. 1.5 times and amounted to 7.4 m$^2$/person due to the inclusion of the lands of the Talgar, Ili, Karasai regions and plantations growing along highways, driveways, roads and streets. In recent years, the growth of

construction in the city of Almaty has intensified the processes of anthropogenic impact on the urban flora. The existing experience of green building in the city of Almaty does not fully take into account the specific environmental conditions of various districts of the city and the level of their technogenic pollution, and the issues of the state of plantations in residential and industrial areas, the resistance of vegetation to the impact of the urban environment are ignored. Due to the growing density of urban development with high-rise buildings (more than 20 floors), it is becoming increasingly difficult to realize the concept of a green city-metropolis of Almaty. Monitoring the state of plantings in the city of Almaty (2010–2022) indicates positive trends in the development of green infrastructure [24]. A system of gardening has been created and is being developed in the city, funding has been increased, new green objects (parks, squares) have appeared, the area of the nursery of ornamental crops has been expanded, and in the future it is planned to increase it by 1.4 times (Table 3).

Table 3

**Area of urban green spaces in Almaty, ha**

| Object category | Area, ha (2022) | Project until 2025–2030 area, ha |
|---|---|---|
| *Public landscaping* | | |
| Parks | 149,5 | 205,6 |
| Squares | 142,52 | 5,6 |
| Groves | 2,6 | – |
| Boulevards | 30,0 | – |
| Green areas | 270,986 | 153,0 |
| Street plantings | 143,72 | 150,0 |
| Total: | 739,326 | 514,2 |
| *Special purpose landscaping* | | |
| Arboretum | – | 57,0 |
| City nurseries | – | 30,0 |
| Total: | – | 87,0 |
| *Specially protected natural areas* | | |
| State Regional Natural Park “Medeu” | 708,2 | – |
| Ile-Alatau State National Natural Park | 12219 | – |
| Botanical Garden | 103,6 | – |
| Baum Grove | 137,8 | – |
| Total: | 131686 | – |
| Total: | 132 428356 | 601,2 |

To remove the problem of disproportion in the provision of green spaces for general use, for the medium term, the volume of planting of new seedlings is calculated: until 2025 1,158,380 trees, until 2030 — about 1,300,000 trees (including felling and planting). An analysis of parks, boulevards, squares, alleys and green areas in eight districts of Almaty showed their uneven distribution by district (Fig. 6).

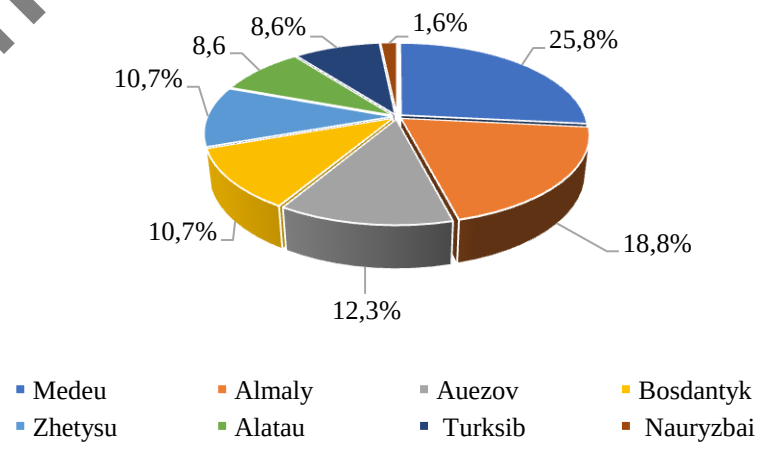


Figure 6. Percentage of parks, boulevards, squares, alleys and green areas in eight districts of Almaty

As can be seen from Figure 6, the first place in terms of the number of parks, boulevards, squares, alleys and green areas is led by the Medeu district, the total number of which is 48, which is 25.8 %. The second place in terms of the number of parks, boulevards, squares and green areas is occupied by the Almaly district, only 35, which is 18.8 %. In third place in terms of the number of parks, boulevards, squares and green areas is the Auezov district — only 23 or 12.3 %. The fourth place in terms of the total number of parks, boulevards, squares and green areas is occupied by the Bostandyk and Zhetysu districts, 20 each (10.7 %). Fifth place is Turksib and Alatau districts, 16 each (8.6 %). And the smallest number of squares (1) and green areas (2), only 3, is located in the Nauryzbai district and is 1.6 %. The state of the green fund of the city of Almaty is greatly affected by the lack of regular watering. Irrigation schemes are based on existing reserves of water sources. These are small rivers and reservoirs of the city of Almaty, groundwater reserves, rational use of rain and melt water. For irrigation of green spaces growing in citywide areas, the state of ditches plays an important role. There are 1,525 km of ditch networks in Almaty, of which only 11 % — 168 km — are used for irrigation. Work is underway to organize a comprehensive irrigation scheme, including the repair and construction of new sections of the canal network, which will increase the level of irrigated areas through the canal network up to 40 %. New wells were built to irrigate green spaces in Almaty, an inventory of the irrigation ditches was carried out, and work on irrigation was intensified. As is known, in an urban environment, trees age much faster than in a natural environment, under the influence of many factors (emissions from cars, engineering networks, reagents entering the soil during street cleaning, damage during construction work, etc.).

As part of the Green Almaty program, planted trees and shrubs are cared for, the green fund is treated, and biodiversity is maintained. The influence of urban conditions on the plant can be seen in various indicators of life processes, appearance, structural features of its organs, and the longevity of the plant under these conditions. The most common result of the influence of urban conditions on the vital activity of plants is a decrease in their life expectancy. So, if in the mountain forests of the Trans-Ili Alatau, spruce lives up to 300–600 years, then in Almaty parks — up to 125–150 years, and on the streets — only up to 60–70 years. The processes of photosynthesis are disturbed in urban trees, so they have a rarer crown, small leaves, and shorter shoots. In heavily polluted conditions, the leaves dry out at the edges, brown spots appear on them — areas of dead tissue, they curl. Lawn grasses are undersized. The crowns of coniferous trees are becoming bald, their annual growth is lower than in unpolluted areas; phytomass productivity decreases. Active visits by city residents to parks, gardens, and other green spaces lead to direct and indirect impacts on plant communities. Direct impacts include damage to trees and shrubs, excessive gathering of flowering herbs, littering, and fires. Everywhere there is a strong compaction of the upper layer of the soil, and hence the violation of its water-air regime. Plant roots suffer, growth processes are disturbed, dwarf forms are formed with irregular branching and a decrease in leaves. In this case, the following should be taken into account: the urban environment is alien to woody plants, they are not evolutionarily adapted to it; therefore, their survival depends not only on the intensity of anthropogenic impact, but also on their ability to adapt to conditions that are often extreme for all living things. To date, the usual for the green attire of the cities of our country are such species as — *Morus alba* L., *Ailanthus altissima* (Mill.) Swingle, *Gleditsia triacanthos* L. and others are introducers; at one time they arrived and successfully acclimatized in Almaty. In Almaty, more than 70 species of trees and shrubs were introduced into production recommended by the botanical garden. From the trees: *Phellodendron amurense* Rupr., *Faidherbia albida* (Delile) A. Chev., *Crataegus maximowiczii* C.K. Schneid., *Ulmus laevis* Pall., *Ulmus parvifolia* Jacq., *Ulmus glabra* Huds., *Quercus robur* L., *Catalpa bignonioides* Walter., *Aesculus hippocastanum* L., *Acer ginnala* Maxim. ex Rupr., *Juniperus virginiana* L. and others, from the bushes — *Amorpha fruticosa* L., *Swida alba* (L.) Opiz, *Syringa vulgaris* L., *Spiraea vanhouttei* (Briot) Carrière and others.

*Conclusions*

Thus, in order to solve the problem of forming a green infrastructure in the city of Almaty, it is necessary to implement the Green Almaty activities under the Almaty City Development Program until 2025 and medium-term prospects until 2030, and now concrete steps have already been taken in this direction for its implementation by the city administration. The transition to a "green" economy is a necessary process to maintain a viable state and improve the quality of urban plantings that perform important environmental, sanitary and aesthetic functions. Urbanized territories, as part of the ecological system, affect not only the landscape of the city, but also human health and the environment. Green spaces are indicators of the sustainable development of urbanization. In the landscaping of the city of Almaty, only 25 % of the species

diversity of local trees and shrubs is used. The natural and climatic conditions of the city of Almaty make it possible to significantly expand the assortment for landscaping the city, both at the expense of local and introduced trees and shrubs. In the landscaping of the city of Almaty, it is necessary to increase the number of coniferous and valuable hardwood species, both local and introduced, which have proven themselves well and feel great in urban conditions. The expansion of the range of local tree and shrub plant species in the landscaping of the city of Almaty contributes to the promotion and conservation of the biodiversity of the natural flora of the Republic of Kazakhstan.

## References

1 Khoshnava S.M. Aligning the Criteria of Green Economy (GE) and Sustainable Development Goals (SDGs) to Implement Sustainable Development / S.M. Khoshnava, R. Rostami, R.M. Zin, W. Strielkowski, A. Mardani // Sustainability. — 2019. — Vol. 11(17). — P. 4615. https://doi.org/10.3390/su11174615

2 Li J. Green Economy Performance and Green Productivity Growth in China's Cities: Measures and Policy Implication / J. Li, B. Lin // Sustainability. — 2016. — Vol. 8(9). — P. 947. https://doi.org/10.3390/su8090947

3 Parker J. Green Infrastructure in the Urban Environment: A Systematic Quantitative Review / J. Parker, M.E. Zingoni de Baro // Sustainability. — 2019. — Vol. 11(11). https://doi.org/:10.3390/su11113182

4 Ying J. Green infrastructure: systematic literature review / J. Ying, X. Zhang, Y. Zhang // Economic Research. — 2021. — Vol. 35(1). — P. 343–366. https://doi.org/10.1080/1331677X.2021.1893202

5 Hansen R. Using green infrastructure to stimulate discourse with and for planning practice: experiences with fuzzy concepts from a pan-European, a national and a local perspective / R. Hansen, M. van Lierop, W. Rolf, D. Gantar // Socio-Ecological Practice Research. — 2021. — Vol. 3(5). — P. 257–280. https://doi.org/10.1007/s42532-021-00087-2/

6 Pearce D. Blueprint for a Green Economy / D. Pearce, A. Markandya, E.B. Barbier. — Earthscan, 1989. — 192 p.

7 Зеленая экономика: реалии и перспективы в Казахстане. [Электронный ресурс]. Режим доступа: https://sk.kz/upload/iblock/3f5/3f5f8e2087688517bcc667eeebc82630.pdf

8 О Стратегии развития Алматы–2050. — [Электронный ресурс]. — Режим доступа: https://open-almaty.kz/ru/content/o-strategii-razvitiya-almaty-2050

9 Итоги социально-экономического развития г. Алматы за январь–март 2021 года. [Электронный ресурс]. Режим доступа: https://primeminister.kz/ru/news/itogi-socialno-ekonomicheskogo-razvitiya-kazahstana-za-7-mesyacev-etogo-goda-rassmotreli-v-pravitelstve-1674423

10 Разработка национального проекта «Зеленый Казахстан на 2021–2025 годы». — [Электронный ресурс]. — Режим доступа: https://adilet.zan.kz/rus/docs/P2100000731

11 Закон РК «Об особом статусе города Алматы». [Электронный ресурс]. Режим доступа: https://adilet.zan.kz/rus/docs/Z980000258

12 Постановление Правительства Республики Казахстан «Об утверждении Государственной программы развития регионов до 2020 года». — [Электронный ресурс]. — Режим доступа: https://adilet.zan.kz/rus/docs/P1800000767

13 Об утверждении Государственной программы развития регионов на 2020–2025 годы. — [Электронный ресурс]. — Режим доступа: https://adilet.zan.kz/rus/docs/P1900000990

14 Коданева С.И. От коричневой экономики — к «зеленой». Российский и зарубежный опыт. Россия и современный мир / С.М. Коданева. — 2019. — [Электронный ресурс]. — Режим доступа: https://doi.org/:10.24833/2071-8160-2019-5-68-134-155

15 О внесении изменений и дополнений в некоторые законодательные акты Республики Казахстан по вопросам перехода Республики Казахстан к «зеленой» экономике. — [Электронный ресурс]. — Режим доступа: https://adilet.zan.kz/rus/docs/Z1600000506/history

16 «Зеленая» экономика — парадигма инновационного и устойчивого развития Казахстана. — [Электронный ресурс]. — Режим доступа: https://dknews.kz/ru/ekonomika/184782-zelenaya-ekonomika-paradigma-innovacionnogo-i

17 Около Т161 млрд планируют потратить в 2022 году на нацпроект «Жасыл Қазақстан». — [Электронный ресурс]. — Режим доступа: https://kaztag.kz/ru/news/okolo-t161-mlrd-planiruyut-potratit-v-2022-godu-na-natsproekt-zhasyl-aza-stan

18 Об утверждении Государственной программы «Цифровой Казахстан». [Электронный ресурс]. Режим доступа: https://kaztag.kz/ru/news/okolo-t161-mlrd-planiruyut-potratit-v-2022-godu-na-natsproekt-zhasyl-aza-stan

19 Типовые правила содержания и защиты зеленых насаждений изложены в новой редакции. — [Электронный ресурс]. — Режим доступа: https://online.zakon.kz/Document/?doc_id=37868284

20 В 7,5 раз увеличится количество высаженных деревьев в Алматы. — [Электронный ресурс]. — Режим доступа: https://camonitor.kz/33839-v-75-raz-uvelichitsya-kolichestvo-vysazhennyh-derevev-v-almaty.html

21 Пять крупнейших электростанций Казахстана в 2020 году увеличили выработку на 2,5 %. — [Электронный ресурс]. — Режим доступа: https://kz.kursiv.media/2021–03–15/pyat-krupneyshikh-elektrostanciy-kazakhstana-v-2020-godu-uvelichili/

22 В Алматы показали очистные сооружения после частичного капремонта. — [Электронный ресурс]. — Режим доступа: https://informburo.kz/novosti/v-almaty-su-pokazali-ochistnye-sooruzheniya-posle-chastichnogo-kapremonta.html

23 Численность населения Казахстана достигла 19,7 млн человек. — [Электронный ресурс]. — Режим доступа: https://www.aa.com.tr/ru/мир/численность-населения-казахстана-достигла-19-7-млн-человек

24 Садырова Г.А. Урбанизированная флора города Алматы / Г.А. Садырова. — Алматы, 2017. — 279 с.

Г.А. Садырова, Г.А. Садыров, Г.Ә. Садыр, Г.А. Садырова

## «Жасыл» экономиканың Алматы қаласының урбанизацияланған экожүйесіне әсері

Мақалада «жасыл» экономиканың Алматы қаласының урбанизацияланған экожүйесіне әсері келтірілген. «Жасыл» экономика ұғымы қоршаған орта үшін ең аз тәуекелдермен орнықты даму және адамның экономикалық қызметінің оның тіршілік ету ортасына теріс әсерін қысқарту, сондай-ақ елде, атап айтқанда Алматы қаласында осы бағытты дамыту ретінде қарастырылған. «Жасыл» экономикаға көшудің кезеңдік процесі, «Жасыл Алматы» жобасын іске асыру туралы көрсетілген, онда «жасыл» экономикаға көшу тұжырымдамасына сәйкес «ақылды қалалар» тұжырымдамасы бойынша Алматының дамуының негізгі мақсаттарының бірі — табиғи ресурстарды сақтау, халықтың жайлы тұруы және қаланың барлық аудандарында өмір сүру сапасын арттыру, яғни бұл «жасыл» экономиканың басты талабы болып табылады. Соңғы жылдары Алматы қаласының жаңа құрылыстарының өсуі урбанофлораға антропогендік әсер ету процестерін күшейтті. Алматы қаласының жасыл құрылысының қазіргі тәжірибесі қаланың әртүрлі аудандарының экологиялық жағдайларының ерекшелігін және олардың техногендік ластану деңгейін толық көлемде ескермейді, ал тұрғын және өнеркәсіптік аудандардың екпелерінің жай-күйі, өсімдік жамылғысының қалалық ортаның әсеріне тұрақтылығы мәселелері назардан тыс қалады. Қала құрылысының көп қабатты ғимараттармен (20 қабаттан астам) тығыздалуының артуына байланысты Алматыда жасыл қала тұжырымдамасын іске асыру қиындай түсуде.

*Кілт сөздер:* Алматы қаласы, «жасыл» экономика, жасыл желектер, урбанизация, экожүйе.

Г.А. Садырова, Г.А. Садыров, Г.Ә. Садыр, Г.А. Садырова

## Влияние «зеленой» экономики на урбанизированную экосистему города Алматы

В статье приведены факты влияния «зеленой» экономики на урбанизированную экосистему города Алматы. Рассмотрено понятие «зеленой» экономики как устойчивое развитие с минимальными рисками для окружающей среды и сокращения отрицательного воздействия экономической деятельности человека на среду его обитания, а также развитие этого направления в стране и, в частности, в городе Алматы. Показан поэтапный процесс перехода к зеленой экономике, реализация проекта «Жасыл Алматы», где согласно концепции перехода к «зеленой» экономике, по концепции «умных городов» одной из основных целей развития Алматы является сохранение природных ресурсов, комфортного проживания населения и повышение качества жизни во всех районах Алматы. В последние годы рост новостроек города Алматы усилил процессы антропогенного воздействия на урбанофлору. Существующий опыт «зеленого» строительства города Алматы не учитывает в полной мере специфичность экологических условий различных районов города и уровень их техногенного загрязнения, а вопросы состояния насаждений жилых и промышленных районов, устойчивости растительного покрова к воздействию городской среды остаются без внимания. Из-за растущего уплотнения городской застройки многоэтажными зданиями (более 20 этажей) становится все труднее реализовать концепцию «зеленого» города Алматы.

*Ключевые слова:* город Алматы, «зеленая» экономика, зеленые насаждения, городская урбанизация, экосистема.

## References

1 Khoshnava, S.M., Rostami, R., Zin, R.M., Strielkowski, W. & Mardani, A. (2019). Aligning the Criteria of Green Economy (GE) and Sustainable Development Goals (SDGs) to Implement Sustainable Development. *Sustainability, 11(17)*; 4615. https://doi.org/10.3390/su11174615

2 Li, J. & Lin. B. (2016). Green Economy Performance and Green Productivity Growth in China's Cities: Measures and Policy Implication. *Sustainability, 8(9)*; 947. https://doi.org/10.3390/su8090947

3 Parker, J. & Zingoni de Baro, M.E. (2019). Green Infrastructure in the Urban Environment: A Systematic Quantitative Review. *Sustainability, 11(11)*. https://doi.org/:10.3390/su11113182

4 Ying, J., Zhang, X. & Zhang, Y. (2021). Green infrastructure: systematic literature review. *Economic Research, 35(1)*; 343–366. https://doi.org/10.1080/1331677X.2021.1893202

5 Hansen, R., van Lierop, M., Rolf, W. & Gantar, D. (2021). Using green infrastructure to stimulate discourse with and for planning practice: experiences with fuzzy concepts from a pan-European, a national and a local perspective. *Socio-Ecological Practice Research, 3(5)*; 257–280. https://doi.org/10.1007/s42532–021–00087–2/

6 Pearce, D., Markandya, A. & Barbier, E.B. (1989). *Blueprint for a Green Economy*. Earthscan.

7 *Zelenaia ekonomika: realii i perspektivy v Kazakhstane [Green economics: current state and prospect in Kazakhstan]*. Retrieved from https://sk.kz/upload/iblock/3f5/3f5f8e2087688517bcc667eeebc82630.pdf [in Russian].

8 *O Strategii razvitiia Almaty–2050 [About strategy of development of Almaty-2050]*. Retrieved from https://open-almaty.kz/ru/content/o-strategii-razvitiya-almaty-2050 [in Russian].

9 *Itogi sotsialno-ekonomicheskogo razvitiia g. Almaty za ianvar–mart 2021 goda [Results of socio-economic development of Almaty in January — March 2021*]. https://primeminister.kz/ru/news/itogi-socialno-ekonomicheskogo-razvitiya-kazahstana-za-7-mesyacev-etogo-goda-rassmotreli-v-pravitelstve-1674423 [in Russian].

10 *Razrabotka natsionalnogo proekta "Zelenyi Kazakhstan na 2021–2025 gody" [Development of the national project "Green Kazakhstan" for 2021–2025*]. Retrieved from https://adilet.zan.kz/rus/docs/P2100000731 [in Russian].

11 *Zakon RK "Ob osobom statuse goroda Almaty" [Law of the Republic of Kazakhstan "On the special status of the city of Almaty"*]. Retrieved from https://adilet.zan.kz/rus/docs/Z980000258 [in Russian].

12 *Postanovlenie Pravitelstva Respubliki Kazakhstan "Ob utverzhdenii Gosudarstvennoi programmy razvitiia regionov do 2020 goda" [Decree of the Government of the Republic of Kazakhstan "On the approval of the State Program for the Development of Regions until 2020"]*. Retrieved from https://adilet.zan.kz/rus/docs/P1800000767 [in Russian].

13 *Ob utverzhdenii Gosudarstvennoi programmy razvitiia regionov na 2020–2025 gody [On the approval of the State Program for the Development of Regions for 2020–2025]*. Retrieved from https://adilet.zan.kz/rus/docs/P1900000990 [in Russian].

14 Kodaneva, S.I. (2019). *Ot korichnevoi ekonomiki — k "zelenoi". Rossiiskii i zarubezhnyi opyt. Rossiia i sovremennyi mir [From the brown economy to the green one. Russian and foreign experience. Russia and the Modern World]*. Retrieved from https://doi.org/:10.24833/2071-8160-2019-5-68-134-155 [in Russian].

15 *O vnesenii izmenenii i dopolnenii v nekotorye zakonodatelnye akty Respubliki Kazakhstan po voprosam perekhoda Respubliki Kazakhstan k "zelenoi" ekonomike [On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on the Transition of the Republic of Kazakhstan to a "Green Economy"*]. Retrieved from https://adilet.zan.kz/rus/docs/Z1600000506/history [in Russian].

16 *"Zelenaia" ekonomika — paradigma innovatsionnogo i ustoichivogo razvitiia Kazakhstana ["Green" economy is the paradigm of innovative and sustainable development of Kazakhstan]*. Retrieved from https://dknews.kz/ru/ekonomika/184782-zelenaya-ekonomika-paradigma-innovacionnogo-i [in Russian].

17 *Okolo T161 milliarda planiruiut potratit v 2022 godu na natsproekt "Zhasyl Qazaqstan" [It is planned to spend about T161 billion in 2022 on the national project "Zhasyl Kazakhstan"*]. Retrieved from https://kaztag.kz/ru/news/okolo-t161-mlrd-planiruyut-potratit-v-2022-godu-na-natsproekt-zhasyl-aza-stan [in Russian].

18 *Ob utverzhdenii Gosudarstvennoi programmy "Tsifrovoi Kazakhstan" [On Approval of the State Program "Digital Kazakhstan"]*. Retrieved from https://kaztag.kz/ru/news/okolo-t161-mlrd-planiruyut-potratit-v-2022-godu-na-natsproekt-zhasyl-aza-stan [in Russian].

19 *Tipovye pravila soderzhaniia i zashchity zelenykh nasazhdenii izlozheny v novoi redaktsii [The standard rules for the maintenance and protection of green spaces are set out in a new version*]. Retrieved from https://online.zakon.kz/Document/?doc_id=37868284 [in Russian].

20 *V 7,5 raz uvelichitsia kolichestvo vysazhennykh derevev v Almaty [The number of planted trees in Almaty will increase 7.5 times]*. Retrieved from https://camonitor.kz/33839-v-75-raz-uvelichitsya-kolichestvo-vysazhennyh-derevev-v-almaty.html [in Russian].

21 *Piat krupneishikh elektrostantsii Kazakhstana v 2020 godu uvelichili vyrabotku na 2,5 % [Five largest power plants in Kazakhstan in 2020 increased production by 2.5 %]*. Retrieved from https://kz.kursiv.media/2021–03–15/pyat-krupneyshikh-elektrostanciy-kazakhstana-v-2020-godu-uvelichili/ [in Russian].

22 *V Almaty pokazali ochistnye sooruzheniia posle chastichnogo kapremonta [Treatment facilities showed in Almaty after partial overhaul]*. Retrieved from https://informburo.kz/novosti/v-almaty-su-pokazali-ochistnye-sooruzheniya-posle-chastichnogo-kapremonta.html [in Russian].

23 *Chislennost naseleniia Kazakhstana dostigla 19,7 mln chelovek [The population of Kazakhstan reached 19.7 mln people]*. Retrieved from https://www.aa.com.tr/ru/мир/численность-населения-казахстана-достигла-19-7-млн-человек [in Russian].

24 Sadyrova, G.A. (2017). *Urbanizirovannaia flora goroda Almaty [Urbanized flora of Almaty city]*. Almaty [in Russian].