NP JSC **"South Kazakhstan University named after M. Auezov"**

"Sustainable cities and communities"

Shymkent 2024

Introduction

Modern cities and towns are centers of economic growth, social activism and technological innovation. However, they also face challenges related to rapid population growth, overpopulation, high levels of pollution and depletion of natural resources. Understanding and implementing the concept of sustainable development are becoming vital to create conditions in which cities can grow and develop without compromising the environment and human well-being. The introduction to the topic allows you to understand the main challenges and directions of sustainable urban development.

Urban planning and ecology

Effective planning of the urban area contributes to the creation of a healthier and more comfortable living environment:

- **Integration of green areas and natural landscapes.** Parks, squares, alleys and garden areas perform important functions not only from an aesthetic point of view, but also from an environmental point of view: they contribute to improving air quality, reduce the temperature in the city during the hot period, and create habitats for wildlife.
- **Creation of ecologically clean areas.** Limiting the construction of large industrial facilities near residential areas contributes to improving the quality of life.

- **Protection of reservoirs and forests from development.** The conservation of natural areas around cities helps to maintain biodiversity and reduces the risk of natural disasters.

Energy efficiency and use of renewable energy sources

Switching to more sustainable energy sources and improving energy efficiency are important aspects for cities:

- **The use of energy-efficient materials in construction.** For example, the use of thermal insulation materials, energy-saving windows and solar panels helps to significantly reduce energy consumption.
- **The development of renewable energy sources in the urban environment.** The installation of solar panels on the roofs of buildings, the development of small wind farms and the use of geothermal energy can reduce the dependence of cities on traditional energy sources.
- **Managing energy consumption in cities using smart technologies.** Intelligent lighting, heating and ventilation control systems allow you to optimize the use of resources**.**

Transport and mobility

Efficient transport infrastructure is the key to sustainable urban development:

- **The development of high-quality and affordable public transport.** The introduction of low-emission or electric buses, the construction of subways and light rail systems helps to reduce carbon dioxide emissions and reduce the number of cars on the roads.
- **Encouraging the use of alternative modes of transport.** Bike paths, infrastructure for electric scooters and bike rentals help reduce the load on urban roads.
- **Stimulation of carpooling and car-sharing.** Car sharing services and shared trips can reduce the number of cars on the roads**.**

Waste management

Comprehensive measures for waste recycling and disposal contribute to reducing the environmental impact:

- **The introduction of separate waste collection systems.** Creation of a convenient infrastructure for the separate collection and processing of paper, glass, plastic and organic waste**.**

- **Composting of organic waste.** The use of organic waste for the production of fertilizers and biogas.
- **The development of technologies for the processing and recycling of materials.** Modern recycling methods make it possible to reuse materials and minimize the amount of waste that ends up in landfills**.**

Water resources management

Sustainable water management plays an important role in the life of the city:

- **Reducing water losses in urban water supply systems.** Monitoring and automatic control technologies help to quickly detect leaks and eliminate them.
- **Wastewater treatment and reuse.** Recycling and reuse of water for technical needs, such as watering green areas and washing roads.
- **Implementation of rainwater collection systems.** The use of rainwater for domestic and industrial needs reduces the load on urban water pipelines.

Sustainable housing

Creating affordable and environmentally friendly housing is an important element of sustainable development:

- **Designing energy-efficient buildings.** Wall insulation, installation of energy-saving windows and the use of solar collectors for water heating.
- **Creation of housing for socially vulnerable segments of the population.** Implementation of government programs to provide affordable housing, especially in regions with high levels of poverty.
- **The development of eco-settlements and "smart" residential complexes.** Integration of modern technologies and energy saving solutions into housing construction**.**

Smart urban technologies

Innovative technologies help to optimize the management of urban processes:

- **Smart lighting and traffic management systems.** Adjusting the intensity of street lighting and controlling traffic using sensors allows you to save resources and reduce congestion.
- **The use of Internet of Things (IoT) technologies.** Monitoring and management of energy consumption, the condition of water supply systems and the level of air pollution.
- **Digitalization of services for the public.** The development of electronic services and applications for obtaining public services, paying for utilities and making an appointment with a doctor.

Social well-being and security

Cities must ensure a high quality of life for all categories of the population:

- **Access to health care and education.** Investments in medical and educational infrastructure.
- **Social integration programs.** Support for people with disabilities, the elderly and low-income citizens**.**
- **Ensuring safety in public places.** Creating a comfortable and safe urban environment, installing video surveillance and improving street lighting.

The role of universities and scientific institutions

Universities can make a significant contribution to the development of sustainable cities:

- **Conducting scientific research and developing new technologies.** Research in the field of urban planning, energy conservation and ecology.
- **Educational programs and courses on sustainable development.** Training of specialists and improving the level of environmental literacy**.**
- **Practical participation of students in projects to improve the urban environment.** Conducting campaigns, research and volunteer programs aimed at solving environmental and social problems.

International experience and successful examples

Studying the experience of other countries helps to implement best practices:

Sweden and the Netherlands. Examples of the creation of eco-cities and the use of renewable energy sources.

Singapore. Water resources management and urban greening policy.

Tokyo, Japan. Innovative solutions for recycling waste and reducing air pollution.

The Massachusetts Institute of Technology (MIT) Senseable City Lab develops smart urban technologies, including traffic and waste management.

Arizona State University (USA): Development of an environmentally friendly campus using solar energy, water-saving technologies and sustainable architecture.

University of Zurich (Switzerland): sustainable urbanism projects with a focus on energy efficient buildings and urban mobility.

University of Melbourne (Australia): programmes of interaction with local authorities to develop sustainable transport solutions.

Lund University (Sweden): Master's degree program in Sustainable Urban Management.

University of Toronto (Canada): Interdisciplinary courses in urbanism, ecology and sustainable development.

Proposed measures of the South Kazakhstan University named after M. Auezov

“City of the Future" - The University has created a miniature model of a sustainable city using 3D printing technologies, renewable energy sources and smart solutions for water and waste management. It can become a training and research ground for students.

Urban gardens and farms - The University, based on the Faculty of Agriculture, has allocated two greenhouses - a space for urban gardening, where students, staff and local residents grow organic products. This will improve environmental awareness and support for the local community.

Contests for the best sustainable city project. Organizing annual competitions among students to develop ideas for improving urban infrastructure and the environment.

Open Data Laboratory for Cities. A platform is being created on the basis of the university to collect and analyze data, for example, on air quality, traffic, energy use on campus and the surrounding area. This will help you make more informed decisions...

The Green City Festival is the organization of a university festival dedicated to the sustainable development of cities, with workshops, exhibitions and presentations of innovations.

Sustainable urban development requires an integrated approach and the active participation of all sectors of society, including government, business and citizens. It is important to introduce advanced technologies, develop eco-education and improve the quality of the urban environment

in order to ensure the well-being of current and future generations.