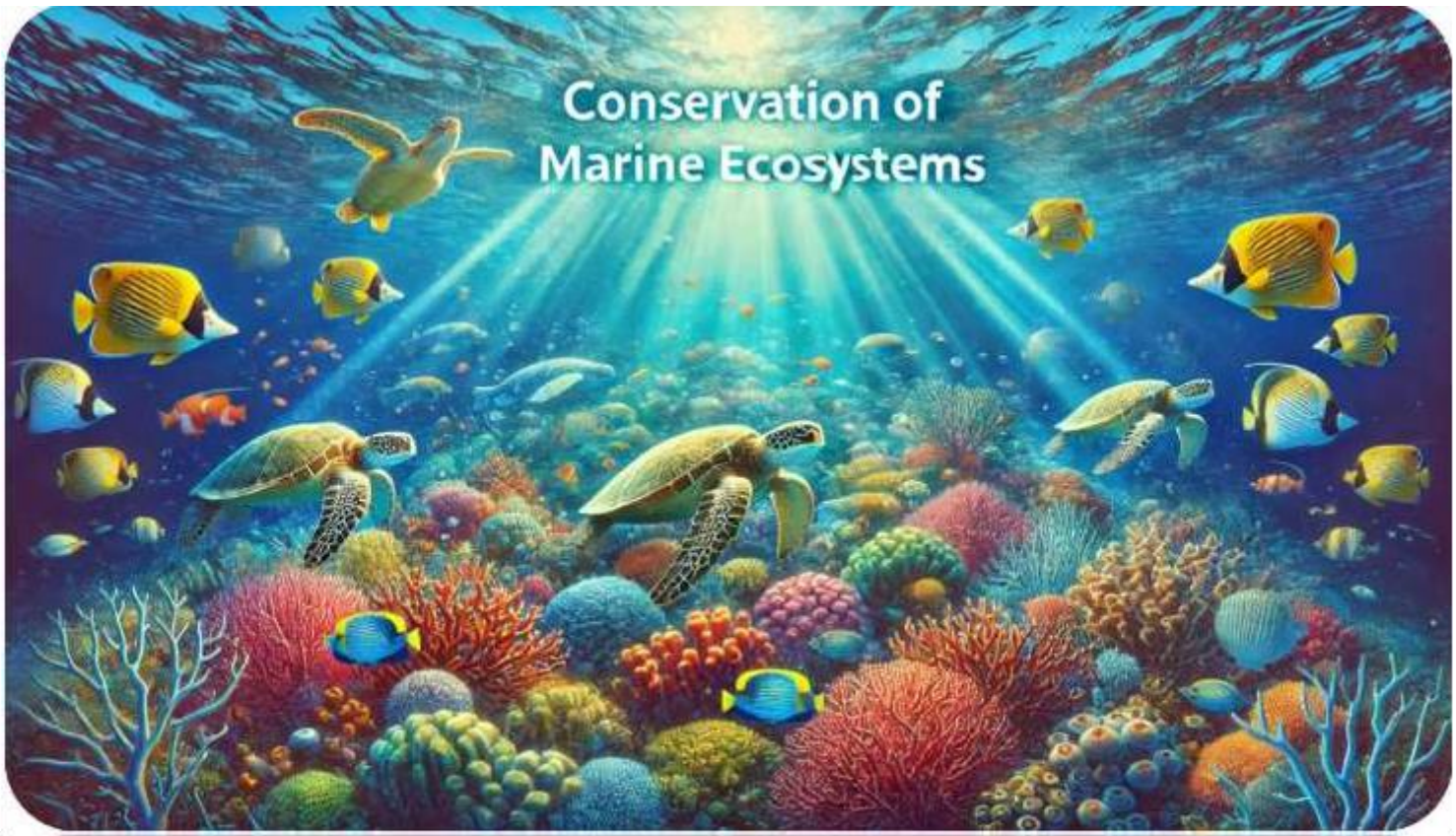
NP JSC **"South Kazakhstan University named after M. Auezov"**

"Life below water"

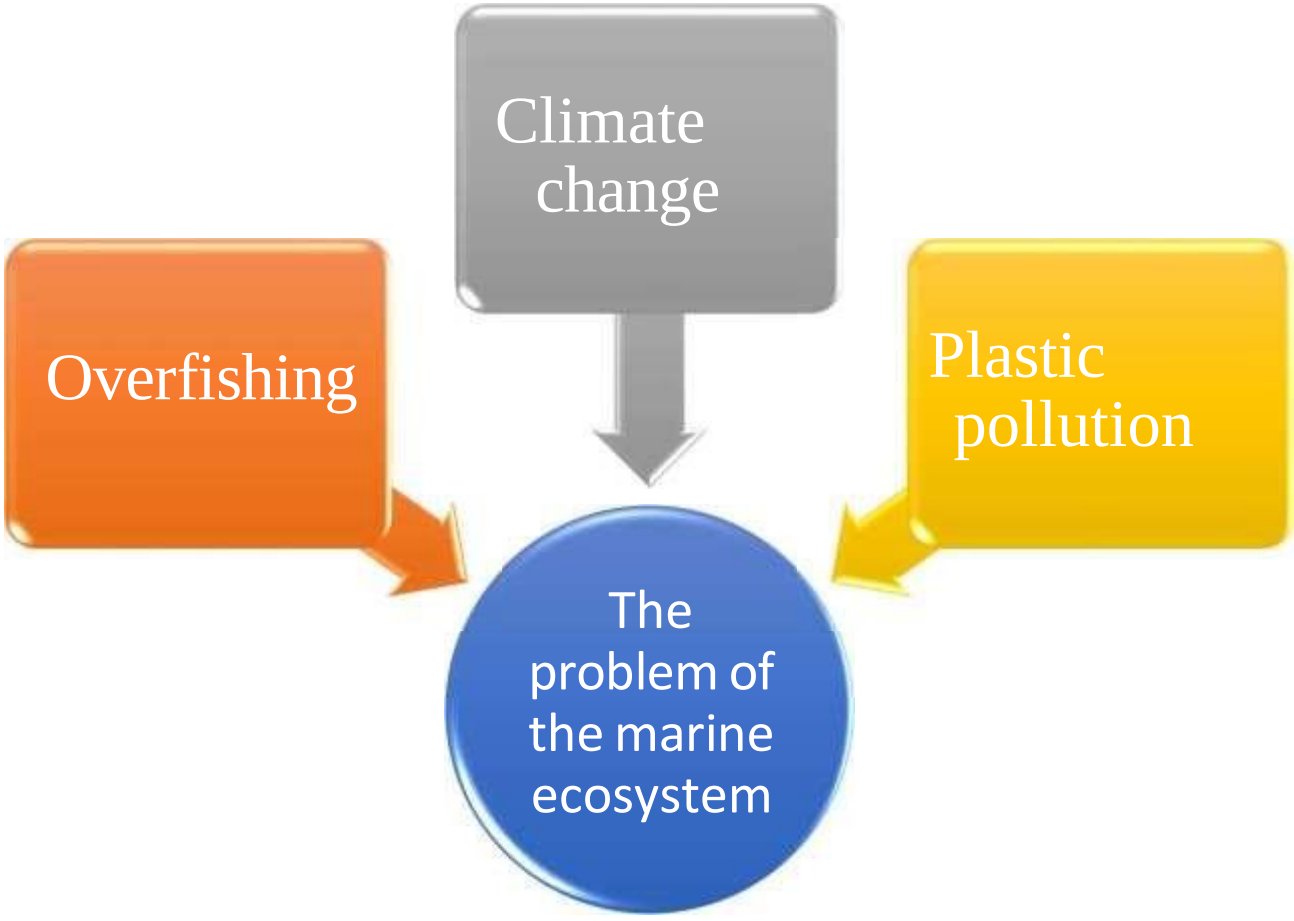


Shymkent 2024

Introduction

Marine ecosystems are complex systems that include oceans, seas, coral reefs, coastal zones, mangroves and salt marshes. They occupy about 70% of the Earth's surface and play a key role in maintaining life on the planet: the oceans absorb about 30% of carbon dioxide, produce more than half of oxygen and serve as an important source of food and resources for millions of people. However, despite their importance, marine ecosystems face serious threats due to human activity and climate change. Conservation of marine ecosystems — this is a global task that requires efforts at all levels.

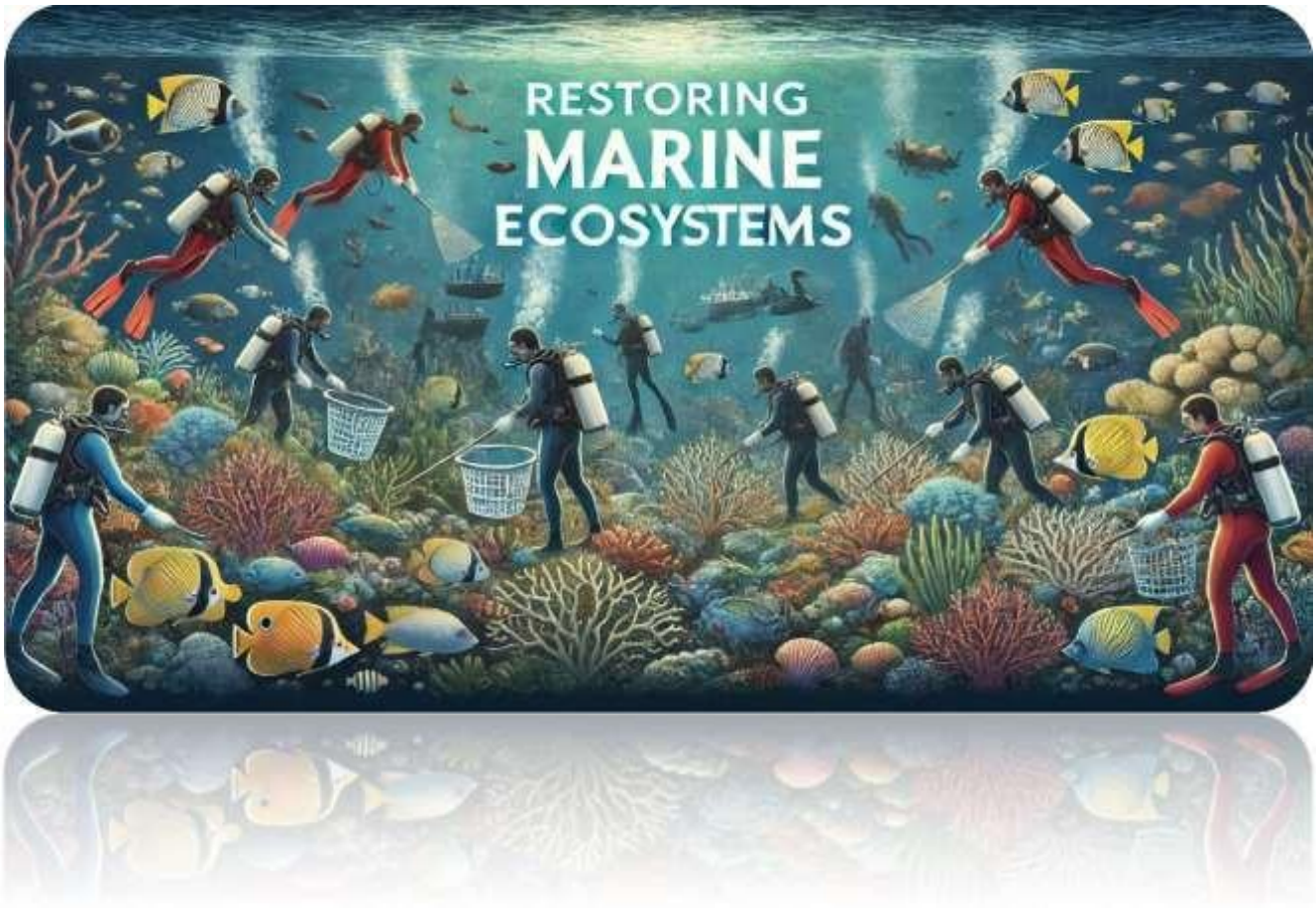
Problems of marine ecosystems



Marine ecosystems suffer from a variety of environmental problems that can lead to serious consequences not only for nature, but also for humanity.

- **Plastic pollution.** One of the most pressing challenges is plastic pollution of the oceans. About 8 million tons of plastic waste enter the world's oceans every year. These wastes cause serious harm to marine animals: turtles and birds can swallow plastic objects, mistaking them for food, which leads to death.
- **Climate change.** Warming oceans are causing the death of coral reefs, which play an important role in ecosystems, providing habitat for many species of fish. Corals undergo what is called "bleaching" when they lose their algae and die. This destroys the ecosystems on which many marine organisms depend.
- **Overfishing.** An irrational approach to fishing leads to a reduction in the populations of many fish species, which threatens not only ecosystems, but also the food security of millions of people. For example, more than 90% of the world's fish resources are depleted or on the verge of it

Measures for the conservation of marine ecosystems



- **Reduction of pollution.** The most important measure for the conservation of marine ecosystems is the reduction of plastic and chemical pollution. The introduction of bans on the use of single-use plastic and the development of waste recycling technologies are important steps along this path.
- **Protection of fish stocks.** The introduction of fishing quotas and the promotion of sustainable fishing are helping to restore fish populations. This includes the creation of marine reserves where fishing is restricted or prohibited, which allows the restoration of marine ecosystems and gives species the opportunity to reproduce.

- **Protection of coral reefs.** Coral reefs are one of the richest and most diverse ecosystems on the planet. To protect them, it is necessary to limit activities that destroy them, for example, to prohibit destructive fishing and limit the tourist load on the reefs.
- **Marine reserves.** The creation of Marine Protected Areas (MPA) contributes to the conservation of ecosystems and species. In these zones, any kind of economic activity is either prohibited or strictly controlled, which allows ecosystems to recover**.**

Factors affecting marine ecosystems

Anthropogenic impacts. Human activities have a significant impact on marine ecosystems. Industrial fishing, marine transport, oil and gas production lead to pollution of the oceans, as well as to the destruction of marine ecosystems. For example, oil spills can kill thousands of marine animals and cause long-term damage to ecosystems.

Climate change. An increase in water temperature leads to a change in the ecological balance. The melting of polar glaciers increases sea levels, which negatively affects coastal ecosystems. In addition, the oceans absorb about 25% of all anthropogenic CO_2 emissions, which makes the water more acidic. The increased acidity of the oceans affects marine organisms such as shellfish and corals, weakening their shells and structures.

International and national initiatives

International programs. The United Nations Marine Environment Programme (UNEP) is actively working to reduce pollution and improve the state of marine ecosystems. There are also international agreements, such as the London Convention and the Convention on Biological Diversity, which aim to protect marine resources.

National measures. Many countries have adopted laws and programs aimed at protecting their coastal waters and marine ecosystems. For example, EU countries are actively working on the implementation of the Marine Strategy Directive, which establishes a framework for the protection of marine ecosystems and water resources. Universities can play an important role in solving problems related to the conservation of marine ecosystems through education, research and practical initiatives. Here are a few ways universities can help deal with this problem**:**

1. Education and awareness

- **Courses and programs.** The inclusion of topics related to the protection of marine ecosystems in the curricula for students of various specialties, such as ecology, biology, oceanography and sustainable development.
- **Seminars and lectures**. Conducting events with the participation of experts in the field of environmental protection to raise awareness among students and staff about the problems of marine ecosystems and ways to preserve them.

- **Educational campaigns.** Organizing events to raise awareness among students and the local community about the importance of marine ecosystems and the necessary measures to protect them.

2. Scientific research

- **Research projects.** Conducting research aimed at studying the state of marine ecosystems, identifying threats and developing methods for their conservation and restoration**.**

- **Cooperation with public and private organizations.** Participation in joint research and projects to protect the marine environment, which allows you to combine the efforts of various parties and achieve great results.
- **Development of innovative technologies.** The creation of new methods of ocean purification, fisheries management and ecosystem restoration based on scientific research.

3. Practical initiatives

- **Volunteer programs.** Organizing volunteer activities such as coastal cleanup, marine plant planting, or coral reef restoration where students can participate and contribute.

- **Creation of laboratories and centers.** The opening of specialized laboratories and research centers dedicated to the study and protection of marine ecosystems, where students can conduct research and experiments.

- **Marine reserves.** Participation in the creation and management of marine reserves or marine protected areas to protect vulnerable ecosystems.

4. Collaboration with local communities

- **Interaction with local residents.** Work with coastal communities to develop sustainable fishing and natural resource management practices that take into account the interests and traditions of local residents.
- **Training and consulting.** Providing information and recommendations on how local communities can reduce their impact on marine ecosystems and participate in their conservation.

5. Political and public impact

- **Lobbying for environmental policy.** Support and development of policies aimed at protecting marine ecosystems through interaction with government agencies and NGOs.
- **Publications and dissemination of information.** Preparation of research-based reports and publications that can be used to inform the public and make decisions at the policy level.

6. Technological innovations

- **Application and technology development.** Creating mobile applications and technologies that help monitor and analyze the state of marine ecosystems, as well as inform users about how they can help.

Marine Ecosystem Conservation Research Programs - University of Southampton (UK): developed coral reef monitoring systems to assess their condition and develop recovery measures.

•Sorbonne (France): conducts research on the protection of biodiversity in the Atlantic Ocean, including the study of rare species..

Projects to reduce ocean pollution. University of Tokyo (Japan): He has developed technologies for cleaning the ocean of plastic waste, including autonomous robotic devices. University of California at San Diego (USA): implements the initiative “A microplastic control project” by conducting research and offering solutions to reduce its entry into the ocean.

Educational Initiatives - University of Southern Denmark: launched courses for students on sustainable fisheries and aqua culture. University of Cape Town (South Africa): He has developed programs to train local communities in sustainable use of marine resources.

Partnerships with government and international organizations. Harvard University (USA): cooperates with the Government and environmental foundations to develop programs for the restoration of marine ecosystems. University of Bali (Indonesia): participates in global initiatives to conserve coral reefs and reduce marine pollution.

The conservation of marine ecosystems is a global task that requires efforts both at the international level and at the level of each individual. Marine ecosystems play a critical role in maintaining life on the planet, and their loss can have catastrophic consequences for all mankind. We can all do our part to protect them, from reducing the use of plastic to participating in volunteer projects to clean up coastal areas. The preservation of the oceans is the preservation of the future of the planet.