



# ECOLOGICAL COMPETENCE OF SHIP OPERATORS IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Tetiana Gerliand

Doctor of Pedagogical Sciences, Senior Research Associate, Head of the Laboratory of Professional Training Technologies, Institute of Vocational Education of the National Academy of Educational Sciences of Ukraine, Kyiv, Ukraine, <https://orcid.org/0000-0002-7991-0431>, e-mail: [Alfina\\_G@ukr.net](mailto:Alfina_G@ukr.net)

## Abstract

*Relevance:* Under current conditions, the problem of ship navigation gains particular relevance – the formation of ecological competence of ship operators in the context of sustainable development, the study of important aspects of the interaction of vessels and the surrounding environment, particularly their impact on water resources, water pollution, emissions of harmful substances, and other ecological aspects.

*Objective:* To determine the role of ecological competence of ship operators in the context of sustainable development.

*Methods:* Theoretical methods: analysis, synthesis, generalization of scientific works on the issue of ecological competence of future professionals in the field of ship navigation and official documents – to define the theoretical and methodological bases of the phenomenon; study and generalization of the existing problem status with the aim of choosing pedagogical tools – for the development of ecological competence of ship operators; comparison – to identify various approaches to solving the researched problem; modeling – to justify the structural elements of the model for the development of ecological competence of ship operators.

*Results:* Key characteristics of ecological competence and its components have been identified; ecological competence of ship operators is considered as a complex integrative characteristic of the personality, reflecting motives of ecological activity, possession of ecological knowledge and natural science bases, practical skills and abilities regarding environmental protection; the necessity of forming ecological competence in ship operators during their professional training has been substantiated, as it directly affects the conservation of the marine water state, protecting them from pollution. It is noted that under current conditions, when sustainable development has become one of the priority directions of global policy, the ecological competence of ship operators is a key factor in ensuring safe navigation, and ecological education in the maritime sector is an important tool for forming this competence in ship operators.

*Conclusions:* Education acts as a catalyst for the development of sustainable thinking and practices in the maritime sector, promoting ecological safety and sustainable development in this strategically important industry; as the maritime sector continues to develop, the results of the conducted research emphasize the important role of education in preparing future ship operators to navigate the ecological complexities of the global maritime industry and to contribute to sustainable development and effective communication.

**Keywords:** *sustainable development, ecological competence, ship operators, future professionals, educational institutions, ecology.*

**Introduction.** Ecological competence of ship navigators is a critical component of modern maritime management, particularly in the context of sustainable development. Key aspects of this competence include understanding the ecological

impacts of shipping, compliance with natural resource conservation requirements, and efficient energy use, as well as participation in ecological safety measures. One of the crucial qualities of future navigators is the development of ecological

competence, which enables professionals to solve production-related problems associated with ecological and occupational safety without harming the environment.

Since the mid-1980s, ecological education has become part of the educational curriculum, yet studies indicate no positive effect (Safranov et al., 2017). The main reason is that while learners accumulate ecological information and knowledge, ecological culture does not develop. The educational process in Ukraine at the time required significant improvement to enhance effectiveness and integration. Such improvement is only possible through a deep philosophical and psycho-pedagogical understanding of the issue, considering the socio-cultural functions of ecology in society, the comprehensive structure of ecological knowledge, the current level of ecological science, traditions, customs, and history, the experience of the Ukrainian people in this field, and the specifics of the ecological-economic situation in the country. Therefore, the formation of ecological competence in future navigators under current conditions in Ukraine is an important quality, especially in the context of modern challenges related to environmental conservation and sustainable development, focusing on acquiring sustainable development skills and preparing for effective communication and ecological competence development.

**Sources.** The issue of developing ecological competence in future professionals of various specializations has been the subject of research by G. Galiyev, A. Glazachov, O. Gurenkova, L. Lukyanova, O. Litvinov, N. Oliynyk, L. Popenko, N. Pustovit, M. Tytarenko, T. Marchenko, and others. As T. Kharchenko notes, "a holistic solution to the problem of forming the ecological competence of a future navigator requires a comprehensive approach. Additionally, for effective formation of navigators' ecological competence, it is essential to consider factors such as the use of modern teaching and upbringing methods that foster the development of ecological awareness and motivation for environmentally safe activities and ensuring the accessibility of educational programs for all navigators, regardless of their age, experience, and education level" (Kharchenko et al., 2020).

**The aim** of this article: to identify the role of ecological competence of ship navigators in the context of sustainable development.

**Methods:** theoretical: analysis, synthesis, generalization of scientific works on the problem of ecological competence of future professionals in the maritime field and official documents - to define the theoretical and methodological foundations of the phenomenon; study and generalization of the existing state of the problem for the selection of pedagogical tools - for the development of navigators' ecological competence; comparison - to identify various approaches to solving the studied problem; modeling - to substantiate the structural elements of the model for the development of navigators' ecological competence.

**Results and Discussion.** In contemporary conditions, where sustainable development has become a prioritized direction of global policy, the ecological competence of mariners is a key factor in ensuring environmentally safe navigation, and ecological education in the maritime industry is an important tool for developing the ecological competence of mariners. It contributes to the development of their ecological awareness, understanding of ecological issues related to maritime transport, and knowledge about the principles of rational use of natural resources and environmentally safe operation of vessels. Training citizens with a high level of ecological knowledge, awareness, and culture based on new criteria for evaluating the relationship between society and nature should become one of the main levers in solving the extremely acute ecological and socio-economic problems of modern Ukraine (Tolochko et al., 2017).

According to the Concept of Ecological Education in Ukraine, all its achievements are aimed at acquiring fundamental ecological knowledge and methodology, as well as professional ecological training, greening of specialized disciplines, and ecological upbringing. This will ensure the formation of integrated ecological knowledge and thinking necessary for making substantiated management decisions at the level of enterprises, industries, regions, and the country as a whole (Concept, 2001).

Analyzing the state educational programs in ecology, an orientation towards the formation of rational use of natural resources among cadets of maritime institutions was identified, the quantity and

quality of which are diminishing each year. In July 2019, the Cabinet of Ministers of Ukraine adopted a new Regulation on the interaction between the Administration of Marine Ports of Ukraine (AMPU) and the State Environmental Inspection of Ukraine (SEIU) in case of pollution of the marine waters of Ukraine from vessels within marine ports. This will facilitate the fight against large-scale corrupt schemes in the system of ecological control in Ukrainian marine ports, which lead to significant expenses for ship owners and damage the international reputation of Ukraine as a maritime state.

Our study found that safe and high-quality maritime transportation has always been a priority of the European Union, alongside environmental protection and fair competition in the market (Tunysia et al., 2015). The list of legislative initiatives in this area is quite long and frequently updated. Specifically, the ISM Code is considered as one of the three "pillars" of the infrastructure created to eradicate substandard shipping. The other two are the activities of the flag states and the control by the port states (Padgett, 2016). The International Convention for the Prevention of Pollution from Ships (MARPOL) is the principal one covering the prevention of pollution of the marine environment from ships due to operation or accidents.

It should be noted that the impact of the maritime sector on the environment has prompted international and regional organizations to introduce strict rules and guidelines aimed at mitigating this impact. For example, the MARPOL Convention was adopted on November 2, 1973. The 1978 Protocol was adopted in response to a wave of tanker accidents in 1976-1977. The convention addresses pollution by oil from ships, harmful liquid substances carried in bulk, packaged form, sewage, garbage, and air pollution prevention from ships. The European Union supports all voluntary initiatives of its members, especially shipping companies, aimed at improving safety and quality. Many companies within the Community have also implemented ISO 9002 quality standards. Specifically, Occupational Safety and Environmental Certification (SEP) has been offered to the maritime sector since 1990. To date, more than fifty companies have voluntarily implemented SEP (Absalyamova et al., 2017).

Maritime instructors must demonstrate their readiness for effective interdisciplinary cooperation with instructors and lecturers of relevant disciplines. Additionally, they can involve maritime experts

(graduates of MET institutions, maritime officers) in the educational process itself.

Another important aspect to consider is the need for adequate educational resources to incorporate "green" skills into maritime education, which includes ecological competence. These could be cases for analysis, professionally-oriented projects for cadets, and authentic documentation. The primary task is the selection and adaptation of educational resources and the use of the opportunity to study disciplines. The accompanying tasks must be carefully developed; they serve as an effective tool for awakening interest and motivating future ship operators to participate in discussions. Future ship operators recognize the potential danger that shipping poses to the marine environment, hence the crew requires "green" skills, which are actually used on a daily basis to ensure proper ship operation.

Recognizing the need to implement "green" skills content in the educational process, researchers in environmental issues focus attention on various aspects of ecological issues that concern the role of instructors in this process (Kudryavtseva, etc., 2022). "Green" skills are understood as skills related to reducing the impact on the environment and supporting economic restructuring to achieve a cleaner, climate-resilient, and efficient economy that maintains ecological stability and provides decent working conditions. It is believed that their structure consists of three dimensions: knowledge, skills, and attitudes. "Green" skills support sustainable development of the economy, society, and the environment through activities in education and the economy.

Given the information provided, it is clear that the formation of ecological competence is important for the development of modern professionals, as it contributes to the creation of a sustainable and environmentally responsible society. By conducting an analytical review and summarizing the essential characteristics of the above definitions, it can be concluded that ecological competence is defined by the following key characteristics:

- knowledge about environmental problems: future marine professionals should understand the basic principles of ecosystem functioning, the processes of human impact on the natural environment, and the causes of environmental problems;

- ability to use environmentally friendly technologies: mariners must be able to apply modern technologies and methods aimed at reducing the

negative impact of human activity on the environment;

- conscious consumption. It is important to educate future marine professionals in a conscious attitude towards natural resources, understanding the principles of sustainable consumption, and responsible use of resources;

- ability to make decisions in ecological situations. Future marine professionals should be able to consider ecological aspects in professional problem solving and make decisions aimed at preserving nature;

- cooperation in a global context. In a world where environmental problems have a global character, it is important for professionals to be able to cooperate internationally, adhering to ecological standards and agreements;

- active participation in ecological initiatives. Future mariners should be prepared to participate in projects and initiatives aimed at improving the environmental condition and preserving biodiversity.

- As noted, under current conditions, where sustainable development has become one of the priority directions of global policy, and the ecological competence of mariners is a key factor in ensuring environmentally safe navigation.

- Let's define what the concept of "ecological competence" includes. It is a complex of knowledge, skills, and abilities necessary for the performance of professional duties with consideration for environmental protection requirements. Analyzing numerous scientific studies on this issue, it can be stated that it includes the following components:

- ecological knowledge, defined as understanding the ecological problems associated with maritime transport, as well as knowledge of the principles of rational use of natural resources and environmentally safe operation of ships;

- ecological skills, which can be defined as the ability to apply ecological knowledge in practice, particularly in areas such as: ship management considering environmental protection requirements; prevention of environmental pollution during ship operation; response to ecological emergencies;

- ecological skills: the ability to make ecologically reasoned decisions in various situations.

Thus, it can be concluded that the formation of ecological competence in mariners is a task facing all participants in the maritime industry. It is carried out within the framework of training mariners in educational institutions, as well as through the

enhancement of qualifications and retraining in courses and seminars.

Maritime education traditionally focuses on providing cadets with the technical and operational skills necessary for navigation and ship management. These skills include navigation, ship management, cargo handling, and emergency response. Although this traditional approach remains crucial, there is an increasing realization of the need to integrate environmental education into maritime training programs. Researchers advocate for a comprehensive educational approach in maritime education, which includes aspects of sustainable development, because maritime education is of great importance for the formation of ecological competence, awareness, and management among future mariners, in particular:

- Future mariners encounter various environmental problems, such as marine pollution, emissions of harmful substances, and the impact of climate change on the marine environment. Training on these issues helps prepare cadets for effective management of such challenges;

- Understanding environmental aspects is crucial for the safety of navigation. For example, training about the impact of weather conditions on marine events and knowledge of ecological systems allows future mariners to be prepared for various situations at sea;

- International standards and duties require maritime professionals to comply with environmental norms and procedures. Environmental awareness is important for fulfilling these duties and adhering to standards;

- Given the growing attention to sustainable development, future mariners must understand the principles and practices that contribute to the conservation of marine resources and the reduction of human impact on the marine environment;

- Cadets should learn to effectively respond to environmental disasters and take necessary measures to prevent further pollution and restore the natural environment (Hurenkova, 2009).

Ensuring a high level of ecological awareness and management in maritime education helps form responsible and competent professionals capable of working effectively in the conditions of the contemporary marine environment.

**Conclusions.** It has been established that the maritime sector in the modern world faces various challenges related to environmental aspects and the need for sustainable development. One of the key strategies for addressing these problems is the

integration of environmental education into the training of future mariners, aimed at highlighting the importance of the role of education in promoting sustainable practices in the maritime sector. It has been determined that the integration of environmental education into the training of future mariners is important for forming ecologically competent and sustainability-oriented professionals. Education thus serves as a catalyst for the

development of sustainable thinking and practices in the maritime sector, contributing to ensuring ecological safety and sustainable development in this strategically important industry. The integration of environmental education becomes a key element in preparing future generations of mariners for effective resolution of environmental challenges in the maritime sector.

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## ЕКОЛОГІЧНА КОМПЕТЕНТНІСТЬ СУДНОВОДІВ В УМОВАХ СТАЛОГО РОЗВИТКУ

Тетяна Герлянд

доктор педагогічних наук, старший науковий співробітник, завідувач лабораторії технологій професійного навчання, Інститут професійної освіти НАПН України, м. Київ, Україна, <https://orcid.org/0000-0002-7991-0431>, e-mail: [Alfina\\_G@ukr.net](mailto:Alfina_G@ukr.net)

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### Реферат:

*Актуальність:* за сучасних умов особливої актуальності набуває проблема в сфері судноплавства – сформованості екологічної компетентності судноводіїв у контексті сталого розвитку, дослідження важливих аспектів взаємодії суден та навколишнього середовища, зокрема їх вплив на водні ресурси, забруднення водойм, викиди шкідливих речовин та інші екологічні аспекти.

*Мета:* визначити роль екологічної компетентності судноводіїв в умовах сталого розвитку.

*Методи:* *теоретичні:* аналіз, синтез, узагальнення наукових праць з проблеми екологічної компетентності майбутніх фахівців у сфері судноплавства й офіційних документів – для визначення теоретико-методологічних основ феномену; *вивчення та узагальнення* існуючого стану проблеми з метою вибору педагогічного інструментарію – для розвитку екологічної компетентності судноводіїв; *порівняння* – з метою визначення різноманітних підходів до розв'язання досліджуваної проблеми; *моделювання* – з метою обґрунтування структурних елементів моделі розвитку екологічної компетентності судноводіїв.

*Результати:* визначено ключові характеристики екологічної компетентності та її складові; розглянуто екологічну компетентність судноводіїв як складну інтегративну характеристику особистості, яка відображає мотиви екологічної діяльності, володіння екологічними знаннями і природно-науковими основами, практичні вміння та навички щодо охорони навколишнього середовища; обґрунтовано необхідність формування екологічної компетентності судноводіїв у процесі їхньої професійної підготовки, оскільки від цього безпосередньо залежить збереження стану морських вод, захист їх від забруднення. Зазначено, що у сучасних умовах, коли сталий розвиток став одним з пріоритетних напрямів світової політики, екологічна компетентність

судноводіїв є ключовим фактором забезпечення безпечного мореплавання, а екологічна освіта в морській галузі є важливим інструментом для формування цієї компетентності судноводіїв.

*Висновки:* освіта виступає каталізатором для розвитку сталого мислення та практик у морському секторі, сприяючи забезпеченню екологічної безпеки та сталого розвитку в цій стратегічно важливій галузі; оскільки морський сектор продовжує розвиватися, результати проведеного дослідження підкреслюють важливу роль освіти у підготовці майбутніх судноводіїв, щоб вони могли орієнтуватися в екологічних складнощах глобальної морської індустрії, а також сприяти сталому розвитку та ефективній комунікації.

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**Ключові слова:** *сталий розвиток, екологічна компетентність, судноводії, майбутні фахівці, заклади освіти, екологія.*

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