

# Environmental Ethics Challenges Engineers and Countermeasures

Jiale Li \*

College of Economics and Management, Southwest Petroleum University, Chengdu 610500, China

\* Corresponding author Email: 18200550756@163.com

---

**Abstract:** With the process of modernization, the relationship between engineering technology and environmental issues is more and more close, the theory and practice of environmental ethics has been more and more attention, the challenge to engineers is more and more obvious. The purpose of this paper is to discuss the negative effects of engineering activities on the environment and the challenges of environmental ethics to engineers.

**Keywords:** Environmental Ethics; Engineer; Challenges; Measures.

---

## 1. Introduction

Environmental ethics is an interdisciplinary subject, involving ethics, philosophy, sociology, politics, economics and other fields[1]. It is concerned with the relationship between human beings and the natural environment and the impact of human beings on the natural environment. Engineers are professionals who design, build, and improve engineering systems in society. Therefore, environmental ethics is closely related to engineers. In the field of engineering, there are many projects involving the environment, such as urban planning, environmental engineering, energy engineering, traffic engineering. The implementation of these projects will directly or indirectly affect the natural environment, such as water pollution, air pollution, land damage, etc. Therefore, engineers need to consider environmental factors and understand the characteristics of the natural environment, develop appropriate engineering solutions to protect the environment[2]. In engineering practice, engineers' decision-making is often influenced by many factors, including economic interests, political factors, technical feasibility, social influence and so on. However, environmental ethics should also be an important factor for engineers to consider in practice. Engineers need to recognize that their decisions affect not only the fate of humanity, but the health of the entire Earth's ecosystem. Therefore, in engineering practice, engineers need to follow some environmental ethical principles, these principles are discussed in detail below.

## 2. Negative Environmental Impacts of Engineering Activities

Science and technology create comfortable modern life for us to enjoy, but also produce its by-product-pollution! Such as air pollution, water pollution, solid waste pollution and noise pollution. All of these have unimaginable negative effects on human life now and in the future. If we do not fully realize its seriousness and control it in a timely manner, it is entirely possible to bring harm and disaster to mankind in the future, and even threaten the living conditions of mankind and all species on the earth. Especially when some engineers lack the sense of social responsibility to the natural world as their own laboratory, technology as their own means of

profiteering, human beings will be more times nature's retaliation and damage[3].

### 2.1. Air Pollution

Engineering activities will inevitably produce a large number of air pollutants, such as carbon dioxide, nitrogen oxides, volatile organic compounds, particles and so on. These pollutants will cause great harm to air quality and human health. First, engineering is one of the causes of global climate change. The use of large amounts of fossil fuels in engineering activities results in the release of large amounts of carbon dioxide and other greenhouse gases into the atmosphere. These greenhouse gases will prevent the heat radiated by the Earth from escaping into space, causing the Earth's temperature to rise, causing global climate change. Second, engineering-induced atmospheric pollution poses a threat to human health. Sulfur dioxide, nitrogen oxides, particulate matter and other pollutants in the atmosphere will cause respiratory disease, cardiovascular disease and other health problems. Especially for those who live in heavily polluted cities, the harm of these pollutants on the body is more significant. In addition, engineering activities can lead to acid rain. Sulfur dioxide and nitrogen oxides are the main components of acid rain[4]. These compounds are emitted from engineering activities and enter the atmosphere, where they react with water vapor and oxygen to form acids that cause acid rain. Acid rain can cause soil acidification, damage plant growth, and affect the quality of water and groundwater. Finally, the air pollution caused by engineering activities will also affect the environmental ecosystem. Atmospheric pollutants can be deposited in the form of precipitation, polluting land and water. These pollutants will destroy the natural ecosystem, leading to the decline of biodiversity, and then affect the balance of the whole ecosystem. To sum up, the air pollution caused by engineering activities not only does harm to the air quality and human health, but also damages the environmental ecosystem. Therefore, we need to take effective measures to reduce air pollutants in engineering activities, to protect our environment and health.

### 2.2. Water Pollution

Engineering activities can lead to two types of water pollution: surface water pollution and groundwater pollution. Surface water pollution caused by engineering activities is

mainly manifested in construction sites, sewage treatment facilities and industrial facilities may directly or indirectly release harmful substances into nearby rivers, lakes or oceans. These may include chemicals, heavy metals, petroleum products and other harmful chemicals. This has implications for aquatic life and human health.

Groundwater contamination is manifested in the fact that groundwater can be contaminated by chemicals in construction, industrial and agricultural activities. These chemicals may leach into groundwater through the soil or enter groundwater directly through groundwater contamination sources. This can have an impact on drinking water resources and environmental health.

Water pollution restricts economic development and directly endangers the health and safety of human beings and other living things. According to statistics in recent years, nearly half of the seven major water systems in our country have been seriously polluted, with 36 billion tons of waste water discharged nationwide, and 80 to 90 percent of urban domestic sewage entering rivers without treatment, 85.9% of the rivers do not meet the drinking water standard, and the lakes such as Danchi Lake and Taiho Lake are seriously eutrophic, and the red tides are frequent in the coastal areas.

### 2.3. Solid Waste Pollution

Engineering activities may bring a variety of solid waste pollution, mainly including the following kinds of garbage.

Construction waste: construction activities generated by waste including concrete, brick, wood, stone, sand and other wastes.

Electronic waste: solid waste caused by electrical equipment, electronic components, wires and cables, etc. discarded in engineering activities[5].

Chemical Waste: for example, construction site waste materials such as paint barrels, solvents, contaminated soil, pesticides and so on. Metal waste: for example, construction equipment, machinery, steel, etc. Domestic waste: such as food packaging, paper, bottles and cans eaten by engineers on the construction site.

The levels of environmental pollution caused by these types of wastes vary, for example, the accumulation and disposal of construction waste may have an impact on the surrounding environment, the chemicals in electrical and electronic waste may pollute groundwater or soil, while chemical waste may do harm to human health. Therefore, in the process of engineering design and construction, the generation and treatment of solid waste should be given full consideration, and effective measures should be taken for garbage classification, reduction, recovery and safe treatment, to minimize environmental pollution.

### 2.4. Noise Pollution

Two out of three urban residents in our country live in environments where noise levels exceed the legal limit. The noise pollution caused by engineering activities mainly includes the following aspects:

Construction Noise on construction site. Construction site of machinery and equipment and workers will produce noise, to the surrounding resident's interference and discomfort. Road construction noise. Road construction, mechanical equipment and traffic noise will affect the lives of surrounding residents and rest.

Urban rail transit noise. During the operation of urban rail transit, the train running, opening doors, changing lanes and

other actions will produce noise, affecting the lives of the surrounding residents.

Building Reconstruction Noise: when the adjacent building reconstruction, demolition, wall, decoration and other activities will produce noise, to the surrounding resident's interference.

Noise from power plants, factories and other industries. Large power plants, factories and other industrial facilities in operation, there will be mechanical noise, exhaust noise, and so on, affecting the lives of surrounding residents.

The noise pollution caused by these engineering problems may have a negative impact on the health of the surrounding residents, such as hearing loss, decreased sleep quality, increased psychological stress and so on. Therefore, in the process of engineering design and construction, we should fully consider the problem of noise pollution, take effective measures to control noise, reduce the impact on the surrounding environment and residents.

## 3. Environmental Ethics Challenges Engineers

### 3.1. The Need for Sustainability

Sustainable development is an international concern and the core of environmental ethics. Sustainable development requires meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. However, it is not easy to apply the principles of sustainable development to various engineering projects[6]. Challenges for engineers include:

First, engineers need to consider how to minimize the environmental impact of construction. This means reducing the pollution of land, water and air by buildings and infrastructure, reducing damage to wildlife and plants and avoiding the impact of damage on established communities. Therefore, engineers need to adopt a sustainable approach in the design and implementation of projects, such as using renewable energy, reducing energy consumption and waste generation.

Second, engineers need to consider how to maintain sustainability throughout the life cycle of a project. This means that, after design and construction, a range of sustainability plans and measures need to be put in place to ensure that buildings and infrastructure do not have a negative impact on the environment during their use and operation. Such measures could include the use of renewable materials, the implementation of energy efficiency and water resources management and the implementation of sustainable waste management plans.

Finally, engineers need to consider how to maintain sustainability in the social aspects of the project. This means that in the design and implementation of projects, engineers need to consider how to best meet the needs and interests of local communities and how to minimize negative impacts. This may require working with local governments and civil society organizations to ensure that projects comply with local regulations and standards and to communicate and consult with the local population.

In short, the requirements of sustainable development pose a major challenge to engineers. However, we can create a sustainable future that is environmentally, socially and economically sound only if engineers actively adopt sustainable approaches and measures.

## 3.2. Environmental Requirements

With the increasing awareness of environmental protection, people have higher and higher demands on environmental protection. This means that engineers need to design more environmentally friendly engineering solutions, reducing the negative impact on the environment.

In new energy technologies, for example, engineers face the problem of choosing the greenest option. In solar technology, engineers need to consider the efficiency and cost of solar power generation balance, to ensure that the full use of solar energy without a negative impact on the environment. In wind energy technology, engineers need to consider how to avoid large wind turbines to the environment and excessive consumption of natural resources[7].

## 3.3. The Balance between Man and Nature

In engineering practice, engineers must find a balance point, which can not only meet the needs of human beings, but also protect the natural environment. The concept of balanced development between human and nature requires us to pay attention to the protection of natural environment and the sustainable use of resources while technological innovation and economic development. This poses many challenges for engineers. They need to develop new technologies and innovative designs to reduce environmental damage while improving resource use and sustainability. In addition, they need to consider environmental and social factors in their design and construction, as well as how to deal with possible future risks. Engineers need to work hard to find solutions to promote environmental protection and the protection of natural resources, such as air, water and land, in order to achieve a balanced development between man and nature and achieve the goal of sustainable development.

For example, in the construction of large-scale hydropower stations, engineers need to take into account that the construction of water conservancy projects may have a negative impact on the ecological environment. They need to reconcile interests and find a balance between providing clean energy for humanity and protecting the natural environment from adverse impacts on ecosystems.

## 4. Meeting the Challenges of Environmental Ethics

### 4.1. Actively Learning about Environmental Ethics

For engineers, learning about environmental ethics is the first step in meeting the challenges of environmental ethics. Engineers need to understand the concepts and principles of environmental ethics and how to apply these principles in engineering design and implementation. In order to learn environmental theory well, engineers should first take courses and training related to environmental engineers, which can let engineers understand the latest theory and practice in environmental engineering, and environmental ethics laws and policies. Second, read environmental engineering books and papers, through reading the relevant books and papers, you can understand the causes of environmental problems, diagnosis and solutions, and other aspects of knowledge, this helps to develop a scientific thinking style. And then participate in environmental research activities, environmental research activities can increase the practical experience of engineers, grasp the correct experimental skills

and data analysis methods. Finally, join relevant groups and organizations, join Environmental Protection and sustainable development organizations, can exchange views and experience with other environmental science professionals, access to the latest information on environmental issues. Active participation in environmental protection projects: active participation in environmental protection projects allows engineers to practice environmental theory and contribute to improving environmental quality, to gain a deeper understanding of environmental ethical challenges and solutions.

### 4.2. Create Awareness of Environmental Ethics

Engineers should strengthen their understanding of environmental ethics and build awareness of environmental ethics. They need to be aware that environmental considerations should be given priority in engineering practice, with emphasis on sustainable development and the reduction of negative environmental impacts.

The establishment of environmental theory consciousness is the premise and foundation for engineers to study environmental theory knowledge actively. Here are some ways to build awareness: understand environmental issues. Engineers need to understand the history and background of environmental problems, environmental causes and factors affecting them. Learn about laws, regulations, policies and industry standards related to environmental protection and sustainable development.

Learn the basic theories of environmental science. Engineers need to learn the basic theories of environmental science, including environmental pollution and control, environmental ecology, climate change and so on, in order to deepen the understanding of environmental issues. Study environmental ethics. Engineers need to learn the basic theories of environmental ethics, including environmental values, environmental ethics, environmental rights and so on, in order to deepen the understanding of environmental ethics.

In-depth understanding of environmental science and technology. Engineers need to understand the development and application of environmental science and Technology, master the knowledge and skills of environmental science and technology to solve environmental problems and improve the ability of environmental protection.

Practice environmental protection. Engineers need to actively participate in the practice of environmental protection, experience the importance and necessity of environmental protection, and constantly improve their environmental theoretical awareness.

### 4.3. Develop Green Initiatives

Engineers should develop sound environmental practices in the design and implementation of projects. Engineers should consider the following aspects when formulating environmental protection measures:

Collecting and analyzing environmental data. Understanding current environmental conditions and future trends, and collecting and analyzing environmental data are the basis for formulating environmental protection measures. Based on the principles of environmental ethics, it is necessary to consider the principles of environmental ethics when making environmental protection measures, such as the "Polluter pays" principle, carbon emissions trading principle.

Identify environmental goals. Environmental Ethics, environmental regulations and government regulations

should be taken into account in the formulation of environmental protection objectives.

Choosing appropriate technical solutions. Engineers need to select appropriate technical solutions according to environmental characteristics, investment and operation costs, technical feasibility and other factors. At the same time, the sustainability and environmental costs of the technical solution need to be considered.

Implement an environmental management plan. Engineers need to develop an environmental management plan, including the design, construction and operation of environmental facilities, environmental monitoring, assessment and improvement. At the same time, environmental management systems and standards need to be established and implemented in accordance with the Environmental Management Plan.

Environmental measures need to be regularly reviewed and updated. Engineers need to regularly evaluate the effectiveness of environmental measures, review and update environmental measures to ensure the sustainability and effectiveness of environmental measures.

#### **4.4. Strengthening Environmental Monitoring and Assessment**

Engineers should strengthen environmental monitoring and assessment, and develop a sound environmental monitoring and assessment system. This can help identify environmental problems and take timely measures to reduce damage to the environment. Engineers can strengthen environmental monitoring and assessment by:

Understand the relevant policies and regulations. Engineers should be aware of relevant policies and regulations, including Environmental Protection Law, environmental impact assessment law, etc. to ensure that their projects comply with the law, and it is necessary to refer to the EIA report and the Environmental Impact Report, to understand the environmental impact of the project.

Identify environmental impact factors. The engineer shall determine the environmental impact factors of the project, such as land, water, air, noise, vibration, etc.

Select appropriate monitoring methods. According to the different environmental factors, choose the appropriate monitoring methods, such as the use of sensors to monitor air quality, water quality, etc. Ensure monitoring accuracy. The engineer shall ensure the accuracy of the monitoring data and, if necessary, perform calibration and validation to obtain true and reliable data. Analysis of monitoring data.

Monitoring data are analyzed to identify potential environmental risks and sources of pollution. Prepare an environmental management plan. Based on the results of monitoring and assessment, the development of environmental management plans, the introduction of environmental protection and pollution prevention measures to reduce environmental risks and impacts.

Regular assessment. Engineers should regularly evaluate and feedback the results of environmental monitoring and assessment in order to continuously improve environmental management measures to ensure that the environmental objectives of the project are achieved.

#### **4.5. Strengthen Communication with Relevant Departments and the Public**

Engineers should communicate with relevant departments and the public to understand the interests of all parties and

develop reasonable solutions. At the same time, engineers need to enhance people's awareness and sense of responsibility for environmental protection through public education. Engineers can take the following measures to enhance communication with relevant departments and the public:

Social responsibility activities. Engineers can carry out socially responsible activities such as volunteering, environmental education and public welfare activities to enhance public recognition of projects.

Establish a good corporate image. Engineers should focus on managing a company's image, including putting out clear, intuitive, accessible information on social media and websites to build a healthy, tangible, and trusting image.

Establish communication and coordination mechanisms. The engineer shall establish a communication and coordination mechanism to maintain good communication with relevant departments, stakeholders and the public through regular meetings, communications and meetings.

Open and transparent information. Engineers should establish open and transparent mechanisms to ensure that the public is kept abreast of the progress of the project and that public trust and recognition is enhanced through open data and analysis.

Active listening and feedback. Engineers should actively listen to public opinions and suggestions and give timely feedback. This can take the form of social media, feedback boxes, surveys, etc.

Establishing a mechanism for sustainable development. Engineers should establish the mechanism of sustainable development, integrate social resources, communicate and coordinate with society to promote their own sustainable development. This can be done by setting up sustainable development committees and issuing corporate social responsibility reports.

### **5. Conclusion**

Environmental ethics challenges engineers in many aspects, including sustainable development, environmental protection, the balance between human and nature. Engineers should actively learn environmental ethics knowledge, establish environmental ethics awareness, formulate environmental protection measures, strengthen environmental monitoring and assessment, and strengthen communication with relevant departments and the public to address these challenges. Only in this way can we achieve sustainable development in engineering practice, protect the environment and create better conditions for the future development of mankind.

### **References**

- [1] Li Life. Study on the environmental ethical responsibilities of Engineers [J]. Mass standardization, 2022(09):107-109.
- [2] Shi Huan Cong, Fen Lei, Wang Zi meng, Wang Li, Tang Jing. Ideological and political construction of environmental ethics course under the background of new engineering [J]. Education and Teaching Forum, 2021(34):1-5.
- [3] Du Ranke. Study on the ethical responsibility of engineers in our country [J]. Technology and industry, 2020,20(12): 214-218.
- [4] Li Lian, Yin Zwei. An analysis of the ethical responsibility of contemporary engineers [J]. China Today Forum, 2013(17): 411 + 413.

- [5] Li Juan. Study on the environmental ethical responsibilities of Engineers. Hefei University of Technology, 2012.
- [6] Lung Cheung. On the environmental ethical responsibility of engineers from the natural attribute of engineering [J]. The Dialectics of Nature Study, 2008(02):66-70. DOI: 10.19484/J.CNKI.1000-8934.2008.02.016.
- [7] Zhang Di, Xiao Ning, Yang Mei-li. The challenges and countermeasures faced by the construction of enterprise environmental ethics in our country [J]. Contemporary Economics, 2014(15): 51-53.