

**13****ENVIRONMENTAL GEOTECHNICS: INTRODUCTION TO YOUNG MINDS FOR SUSTAINABLE ENVIRONMENT AND DEVELOPMENT**

*Dr. Masirin M.I.M<sup>1</sup>, Ir. Aziz A.A<sup>1</sup>, Adon R<sup>2</sup>*

1- Associate Professor, 2- Researcher  
[idrusmas@yahoo.co.uk](mailto:idrusmas@yahoo.co.uk); [azizanaz@uthm.edu.my](mailto:azizanaz@uthm.edu.my);  
[rashidaa@uthm.edu.my](mailto:rashidaa@uthm.edu.my)

Universiti Tun Hussein Onn Malaysia  
86400 Parit Raja, Batu Pahat  
Johor Darul Takzim, Malaysia

**ABSTRACT**

*In order to create environmental awareness among the community, many programs are being conducted by the governments of the world including Malaysia. These programs and activities include the awareness and sensitivity to the depleting greens, flora and fauna, the climatic change due to human activities and the pollution to soil and ground water. Humans, animals and other living things rely greatly on soil, water air and the sun. Without them, all living things will perish and disappear from the surface of the earth. Thus, it is critical to inculcate better understanding and creating a more caring society to ensure the sustainability of the earth for future existence of mankind.*

*In this paper, a discussion on the needs of introducing environmental geotechnics to young generations as early as in the pre-school education is deemed necessary as being conducted by most developed countries. Developing countries such as Malaysia, must starts now to ensure that existing resources such as its soils and ground water quality are preserved as the country continue to strive in becoming a developed and modern country by year 2020. Proposed course content for each group age is outlined from early age of a child to the university education system. However, these course contents are a recommendation which indicate the importance of continuity to ensure that the young generations will subsequently not only aware of preserving the environment and its surroundings but, will also work hard to improve the existing situation of the world for quality environment and a better place to live.*

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Keyword: *Environmental Geotechnics, Awareness, Young Generations, Year 2020, Malaysia, Flora, Fauna, Course Content*



## 1.0 INTRODUCTION

Preservation of the environment has been the role of the each and everyone of us being a member of the community. It is without doubt that polluting is easier than cleaning up the environment as when we discuss about the environment it encompasses the scope of preserving the water that we drink, the air that we breathe, the land that we stand-on and grow our plants. Thus, it is evermore important to understand the profession that will be able to spearhead or lead the preservation of all these aspects especially when soil and water is concerned.

In many countries, especially in developed countries, the roles of geoenvironmental engineers or environmental geotechnical engineers are important to assist the government and relevant authorities in issues pertaining to environmental monitoring. Some of the roles of environmental geotechnical engineers among others are as follows:

- (a) To assess land condition in relation with site investigation, geological analyses, groundwater flow simulations and quantitative risk assessment
- (b) To advise on remediation schemes
- (c) To engage on site redevelopment – Excavation, piling, drain runs may create new pathways for contained contaminant and new threat to people and/or the environment
- (d) To assist risk restructuring – May be liable for the design, many new legislation imposes a new and far-reaching liability regime on owners of land and others for cleaning up land

## 2.0 SUSTAINABLE ENVIRONMENT AND DEVELOPMENT

Sustainable development has been an ecovative concept, first mooted by the World Commission on Environment and Development (WCED) in the Our Common Future Report (1987). Sustainable development may be translated as a kind of development that meets the needs of the present without compromising the ability of the future generations to meet their own needs (WCED, 1987). The concept is much centered around the appropriate mix of the man-made and natural capital that needs to be preserved for future generations, and whether these two kinds of capital are substitutable. Debates between two views such as environmentalists versus economists are something to be discussed and taken into considerations when embarking on any construction or development works.

Environmentalists insisted that the disappearance of dinosaurs and ancient civilizations are due to the man-made development. The ozone is being destroyed due to man's activities. Whereas economists defended that we can ensure the destruction to the environment reduced while continuing with development and enhancing existing technologies. These will later benefited the next generation as inheritor to new technologies and wealth. The human health and survival will be better while new technologies will reduce effect to the environment. Thus the role of environmental engineers especially environmental geotechnical engineers are of great importance to preserve the environment, soil and water quality.



### **3.0 CHILDREN AND EDUCATION**

Childhood is the best period where any exposure will be easily absorbed by children. With proper programs and planning, children can be the catalyst for a better environment. The present generation is only borrowing the world and its environment from the younger generations as they are the inheritor to what we do today. Thus, it is necessary for us to educate them about the world and the environment from pre-school level straight to the university level. A strong understanding of the fundamentals relating to the environment will ensure that the next generation will observe measures to preserve the environment. In many developed countries, environmental education has been introduced as early as children in the kindergarten. The method is more subtle and easy to understand.

Children are allowed to play with water, sand, soil and grow plants. They are taught to appreciate animals and plants. Children are always encouraged to observe and analyse the surroundings especially the place they live and the activities that may contribute towards conserving the environment. Many activities were participated by parents as well as the children. The success of inculcating environmental studies depended on the cooperation between institutions of learning at all levels and parents.

### **4.0 ENVIRONMENTAL GEOTECHNICS (EG) AND ITS IMPORTANCE**

Environmental geotechnics (EG) is important feature in civil engineering field as it is an area where civil engineers will be able to appreciate the needs of preserving the environment and ensuring geotechnical and related problems concerning disposal of waste in landfills and contamination of liquid and other environmental hazard materials. Matters pertaining to contamination or pollution to soil, surface and ground water are the main aspects focused in environmental geotechnics. Some prevention and protection methods especially when design and construction of waste disposal structures are considered as alternatives to rehabilitation of landfills when leachate leakages occurred. Thus, it is also utmost important for engineers to understand and calculate the risk of contamination in certain aspects of a landfill construction.

Understanding and critically taking great care in leachate control and observing the existence of new waste disposal technologies may later on contribute towards better environmental preservation. Soils and ground water are always open to contamination and pollution and with engineers acquiring knowledge and skills in waste management and containment, it is without doubt that better and quality waste disposal in Malaysia will be achieved as desired by the Malaysian government. The emphasis on Clean Development Mechanism (CDM) may be able to ensure that better waste management and disposal will be adopted by the relevant authorities. The new generation of civil engineers with the knowledge of EG will thus assist in the target of making Malaysia free from soil and ground water contamination.



## **5.0 EMBEDDING EG IN MALAYSIAN EDUCATION AND REVIEW OF SOME IMPLEMENTATION OF EG IN UNIVERSITIES**

In order to embed EG in Malaysian education, lots of effort has been started. Some universities in Malaysia has introduced EG as a subject in the post-graduate level such as Universiti Teknologi Malaysia (UTM). The introduction of this subject by UTM is to develop awareness on the importance of environment control in geotechnical processes (UTM, 2008). Among the emphasis are site investigation for contaminated soils, site selection for waste disposal and treatment of contaminated soils. These focus area are important to conserving and preventing the environment.

In developed countries, such as United Kingdom, Australia, Germany, France and United States, the introduction of EG as a subject has been done at Bachelors degree level. Some even started the awareness programs at the school level where the students started to learn about the effect of contamination and pollution to humans and the environment.

University of Sydney, Australia introduced EG as a unit in order to provide an introduction to geo-environmental engineering. It is envisaged to introduce geotechnical and related issues pertaining to waste disposal and its effect to soil and ground water. University of Cambridge, United Kingdom introduces EG in its third year Bachelors degree program. Similarly, the content will focus on waste disposal and management, landfill design and management and contaminated land treatments. However, materials for these aspects will mainly touch on soil and ground water contamination prevention and protection. Thus, materials for construction of landfill structures will be of main discussion.

In Cardiff University, the introduction of EG is at the third year studies of Civil Engineering programs. Introduction of legislation, regulations and codes of practice for environmental and soil preservation are emphasized with environmental impact assessment (EIA) being related in its project discussion sessions. Among the issues focused are EIA for waste disposal and dam construction. Cardiff University also introduce other aspects of EG such as waste disposal and contaminated land, soil behaviour and chemistry pertaining to contamination transfer.

With these areas being considered by the above universities, it is hoped that basic and better understanding on EG will be passed down to new generations of engineers as the world seems to be more populated and the growing needs of better environmental management has been very demanding since the age of industrial with most countries are actively exploring the fields of science and technology.

## **6.0 CONCLUSION AND RECOMMENDATIONS FOR IMPLEMENTATION**

As discussed earlier, EG has been introduced actively in many foreign universities. Local universities includes UTM and UKM have started the inclusion of EG in their educational programs. It is always desired that other levels of education in Malaysia such as in secondary schools, polytechnics, colleges and universities nation-wide, should start considering the introduction of EG as a subject in their respective curriculum. Preserving the environment is not only on issues when things happens but, we must be pro-active in tackling matters such as contamination of soils and ground water.





In order to ensure that Environmental Geotechnics is accepted as a component of compulsory area to explore and understood by students and the community at large, the followings are some considerations to be taken in account especially when designing an EG syllabus:

- Current and national needs and issues
- Current legislation and regulation in Malaysia
- The needs to perform life cycle assessment of geotechnical structures/construction
- The component which requires risk assessment and cost/benefit analysis (social, environmental, economic)
- Long-term prediction and monitoring
- How can we incorporate this into design?
- Do we have enough technical knowledge on predicting (uncertain) long-term future events?
- Teaching needs? Do we need to teach risk assessment in a more formal way?
- Focus on geotechnical design for long-term performance (maintenance and monitoring)?

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