

Full Length Research Paper

The role of an environmental engineer in preventing and reducing environmental stress

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Environmental engineer is concerned with the protection and prevention of the environment and develops the solution to environmental problem. Environmental engineer ensures work place hazards and environmental health and safety related policies and procedure are communicated to employer and employees, ensures the availability of medical surveillance programme in assisting employer and employees in the course of potentially hazards, that can pose immediate danger to health and safety, encouraging conducive environment for stress free conditions in the environment. Consequently, restriction of stress to condition where an environmental demand exceeds the national regulatory capacity of an organism, in particular situations that include unpredictability and uncontrollability also ensuring employees are properly trained for their jobs and environmental health and safety obligation are carried out by everyone involved.

Key words: Environment, stress, engineer, health and safety.

INTRODUCTION

The role of an environmental engineer in an establishment is preventing and reducing environmental stress (health), hence he lays more emphasis on these components, stress (health), environment, safety and engineer. Stress is defined as non-specific response of the body to any demand for change. It could be a negative, physical, emotional or nervous system response. Stress is also a state of mental or emotional strain, tension resulting from adverse and demanding circumstances; example emotional stress from job or work and family, (Segal, 2017). Stress could be a situation, variable or circumstance that interrupts the normal functioning of an

individual and most of the time carries a threat. It causes both mental and physical ill health. Stress is also a physiological response of an individual to environmental stress that affects their performance and well being.

Environment is defined as the total planetary inheritance and the biotic and abiotic factors that influence each other, (Winpenny, 1996). Environment involves the inter-relationship between these biotic and abiotic components of the environment. It is also all the natural materials and living things.

Moreover, environment is something we are very familiar with and affects our ability to live on the earth, the

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air we breathe, the water that covers most of the earth's surface, the plants and animals around us, and much more (Thissen and Agusdianata, 2008). Environment is everything around living beings, especially the circumstance of life of people and society in their life conditions. It comprises the set of natural, social and cultural values existing in a place and at a particular time, that influence in the life of human beings and in the generation to come (Cambridge English Dictionary).

Environmental stress is the response to things around us that cause stress, such as noise coming from quarry industry or fabrication industry, pressure from work or exhausting work schedules resulting from over-use of employees. Stress that is left unchecked can contribute to many health problems such as high blood pressure, heart disease, obesity, diabetes and depression. Environmental stress is a price shaping adaptation and evolution in a changing environment. It changes the conditions and causes the reduction in performance or fitness. Environmental stress is a significant impact on evolutionary and ecological processes that affects and shapes the genetic, as extensively discussed by Tourigny et al. (2010) in their work, stress episode in aviation, the case of China. It is considered to be primarily a response to physical features of the environment, also a condition of impaired fitness of the environment or an organism (Baba et al., 2009).

Aim and objectives

The aim of this study is to restrict stress to condition where an environmental demand exceeds the natural regulatory capacity of an organism, in particular situations that include unpredictability and uncontrollability, meanwhile the objectives are to:

- (i) Control stressors that cause environmental conditions that impairs fitness.
- (ii) Cultural environmental factors causing changes in human systems which are potentially injurious.
- (iii) Ensure that environmental, health and safety obligation are carried out by everyone involved.
- (iv) Ensure employees are properly trained for their jobs.
- (v) Reduce environmental allergens caused by exposures to early life, of over crowded households.

METHODOLOGY

Source of stress

There are three main sources of environmental stress. They are physical, chemical and biological sources. Physical stress is an environmental factor or stress that forces the body to compensate for conditions outside the norm. The following are the causes under physical source:

- (i) Time pressure, occurs when there is a limit on a task or

operation. A longer hour on tighter schedules, which causes time pressure and makes human error more likely, that is increases the possibility of human error.

(ii) Work load and overload occurs when the amount of work exceeds maximum working capacity. This causes a lot of environmental stress.

(iii) Fatigue at work occurs when staying at work longer than average period of time. It causes accident, reduces human performance and error.

(iv) Noise can cause physical stress and long term health risks, such as hearing impairment, annoyance and sleep disorders which would decrease performance.

(v) Temperature when higher than ambient level can degrade both mental and physical performances. Thermal stress also caused by cold temperature, affects both health and performance quality.

(vi) Air pollution (both indoor and outdoor).

Indoor air quality is maintained by avoiding smokes, and air infection which can occur through personal contact. Outdoor air pollution is made up of carbon dioxide, sulphur dioxide and others. Carbon dioxide produced by industrial enterprises, vehicles, reacts with hemoglobin in the blood, causing suffocation and allergies. Sulphur dioxide in contact with moist air transforms into sulphuric acid which has a negative impact on the lungs. Also harmful dust can cause havoc when it penetrates the lungs.

(i) Ecological situations are unfavorable in industrial zones, where fairly large deposits are discharged in high populated density area.

(ii) Crowd can cause stress, when establishments over populated with employees cause rowdiness and unhealthy cross breathing.

(iii) Excessive vibration at the work place can cause environmental stress and the human body can be affected.

(iv) Deforestation and destruction of green cover of urban landscape can cause environmental stress.

Chemical sources can cause environmental stress which affects the body. Chemical sources includes the following; flammable gases or liquids stored or disposed at the premises causing stress, which can lead to loss of lives. A good ventilation system must be installed to avoid ignition of flame.

(i) Explosive materials can cause a high level of environmental stress, which may lead to death. They must be securely stored in safe and suitable places, away from people.

(ii) Corrosive substances can destroy or severely damage any material or substance, that is of importance to the establishment and thereby cause an environmental stress.

Biological source of stress. This is an environmental stress that affects the body and makes it tough to perform on day to day basis. It makes employees ill and tired. The following constitute biological sources of stress:

(i) Viruses affect workers. It can spread through the air, via sneezing, cough or by physical contact.

(ii) Bacteria can be ingested, spread by flies and rodents which cause diseases.

(iii) Parasites can be spread through physical contact.

Unsafe environment contributes to chronic stress, non-compliance to safety measures, and unhealthy maintenances are generally associated with distress, prevalence of mental health problems, and with health-impairing behaviors that are also related to stress (NSF, 2013).

In the other hand, an engineer is a professional that is competent by virtue of his/her fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problem (Wikipedia, 2017). He takes personal

responsibility for the development and application of engineering science and knowledge, notably in research, design, construction, manufacturing, superintending, and managing in the scientific innovation. Moreover, (Anyata et al., 2001) in their Engineer and society stated that an engineer develops new technological solutions and takes the responsibilities of defining problems, conducting, narrowing research, analyzing solutions, and making decision.

Importance of the environmental engineer

In the past decades, there have been growing developments which have been unsustainable due to inaccessibility of the environmental impacts, now the issue is being considered through Millennium Development Goals (Nnodu, 2005). Also, the current generation, in the process of satisfying their basic needs and enjoying a better quality of life, in terms of project development without considering environmental impacts assessment, is going to deprive the future generation of quality life, (Muntemba et al., 1999).

Currently, the loss of biodiversity with the depletion of rainforest and negative effect in the environment and climate, results in the extinction of wild life. Therefore, our way of life is placing an increasing stress we put on resources and environmental systems such as water, land and air, cannot go on forever, (Tenney et al., 2000).

In view of the above issues of environmental impacts in the society and the role of an engineer in saving, protecting and reducing all these environmental stresses that are affecting the sustainable development which is very important considering the negative effects, these stresses can be taken care of by an environmental engineer.

Davis and Cornwell (1998), in Introduction to Environmental Engineering gave importance of an environmental engineer being concerned with the application of scientific and engineering principles for protecting of human population from, the effects of adverse environmental factors, protection of environments from potentially deleterious effects of natural and human activities, and improvement of environmental quality. An environmental engineer also applies science and technology that addresses the issues of energy-preservation, production, asset and control of waste from human and animal activities, (Tchobanoglous et al., 1993). Furthermore, he is concerned with finding plausible solution in the field of Public Health, such as water borne diseases, implementation of law which promotes adequate sanitation in urban, rural and recreational areas. Environmental engineer also involves in waste water management, air pollution control, recycling, waste disposal radiation protection, industrial hygiene, animal agriculture, environmental sustainability, public health and environmental engineering laws (Peavy et al., 1985).

Environmental engineer studies the effect of technological advances on the environment, by conducting studies on hazardous waste management to evaluate the significance of such hazards, advice on treatment and containment and develop regulations to prevent mishaps. Most often, he addresses local and worldwide environmental issues such as the effects of acid rain, global warming, ozone depletion, water pollution and air pollution from automobile exhaust and industrial sources. Obviously he is concerned with economy and sustainability of an environment (PNNL, 2015).

WHO (1999) was of the view that environmental engineer provides advice to the public on the adverse impacts of environmental stress on human and ecological health, which are evident from declining quality of air, water and land at locations in the different countries of the world. Environmental engineer equally advises people on the environmental challenges and promoting a healthy economy, as he predicts earth's climate and ecosystem to environmental stress and prevention in human and ecosystem

health. Moreover, human health and ecosystem health are intertwined, each dependent on the other for sustainability and survival. Over the last century, human activities associated with population growth and industrialization have had the greatest negative impact on the health and quality of environment as observed by (NSF, 2013) in funding environmental engineering. Therefore, it is the duty of an environmental engineer to encourage and advise the stakeholders involved, on how to prevent and reduce the stress attached to environmental impact on human health. The ecosystem is always subjected to environmental stressor on a daily basis such as water and air pollution, global warming, degradation and loss of habitat from economic development. As part of the ecosystem, humans are subjected to the same stressors with significant health consequences, which the environmental engineer must be knowledgeable enough to prevent and reduce its effect on the environment.

Responsibility for prevention and reduction of environmental stress

An environmental engineer is mostly concerned with protecting the environment by developing solution to environmental problems created by company operations or activities. He assesses the impact of projects in the environment and ensures systems and facilities are compliant with environmental regulations, prevent and reduce the incidence of environmental stresses that can lead to sickness and death (WHO, 1999).

Consequently, every environmental engineer must:

- (i) Ensure that environment, health and safety obligations are carried out by everyone working under his operation;
- (ii) Ensure work place hazards and environmental health, and safety related policies and procedure are communicated to employees and visitors;
- (iii) Ensure that self assessment inspection of environment, health and safety are performed regularly, that records are retained and that deficiencies identified in any inspection are addressed;
- (iv) Ensure individuals working in their operation have the proper safety equipment and personal protective equipment to perform their work safely;
- (v) Encourage prompt reporting of health and safety concerned without fear of reprisal;
- (vi) Curtail work being carried out under his authority if he reasonably believes that continuation of the work poses an immediate danger to health or safety;
- (vii) Inform employees of the availability of medical surveillance programme to assist them in the course of potentially hazards exposures or injuries.

RESULTS

Analysis shows the stress is characterized as a force shaping adaptation and evolution in changing environments and, and a property of both the stressor and stressed observation gives the evidence of environmental stress as a significant impact on evolutionary and ecological processes that affect and shape the genetic structure and evolution of population Ezeigwe (2015). Moreover, stress is an attribute of both stressor (environment) and stressed (biology). It also experience by organisms or population and couldbecome consequence of changes of either the stressor or

the stressed considering evolutionary perspective of environmental pressure and biological response as integrative, (Johnstone et al., 2012).

Evidence shows that stress has many difference ways, conspiring physiological context, physiological responses of individuals to environmental stresses that affect their performance and wellbeing Tchobanoglous (2003). Avoiding of environmental stressors in the work place which can create an unpleasant atmosphere, poor work performance, absenteeism and possibly even physical injuries must be paramount in any industry finally the emphases land on stress by reduction in fitness of organism or population caused by the environmental factor must be overcome to avoid detrimental impacts, by responding phenotypically or genetically and evolve adaptive mechanisms, Aubin-Horth et al. (2012).

Conclusion

In conclusion, (AEO, 2013) noted that the existence of stress caused by unhealthy and unsafely environment can induce a rise in certain hormones secreted by the adrenal gland which triggers and increase the heart rate and blood pressure on the employees of the establishment. PNNL (2015) is of the opinion that uncondusive and unsafe environment are the factors that mostly cause environmental stress, which can cause ill-health to the employees. Therefore, unhealthy employees are always unproductive and thus a socio-economic problem that could lead to moribund of any establishment (company)

Consequently, an environmental engineer is more qualified to curb the problems of stress. Moreover, his responsibilities as an environmentalist are complying, implementing, communicating and ensuring, adherence to environmental, health and safety, regulations, principles and practice which will be beneficial to the employer, employees and entire establishment (Renald, 2010).

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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