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SUSTAINABLE ENVIRONMENTAL DEVELOPMENT STRATEGIES IN CONSTRUCTION AND MANUFACTURING

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ABSTRACT

Having a healthy and clean environment is of crucial importance to everyone. The industrial sectors are concerned with improving the social, economic and environmental indicators of sustainability. One of the most important problems today is the concerns resulting from the effects of contamination of natural resources and its transference to the human and environment. The objective of this study is to introduce solutions to combat environmental issues and develop a healthy and sustainable environment. The method was documentary research as a literature review. Among the important findings of this research is application of improving technologies, enhancing the awareness and level of knowledge among farmers, and use of novel and suitable irrigation systems in agriculture in the sustainability and development.

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INTRODUCTION

Today, not only is environmental contamination depriving humans of peace and security, it is also threatening the human entity. For this reason, environmental discussions are among the most serious issues across scientific and political circles. Previously, there were studies conducted on the lack of control strategies for soil salinity and the subsurface water level at Shadegan international (Akram *et al.,* 2013; Nahvi *et al.,* 2018; Arabzadeh et al. 2017, Sassani et al. 2018). "The results show the necessity of the application of management practices and drainage system development to protect the Shadegan International Wetland. Development of the project [sugar production] in its current condition is not recommended" (Nahvi *et al.,* 2018). The result of application the previous study in policy making in Khuzestan (Nahvi *et al.,* 2018) has been outweigh its shortcomings, and local authorities started applying wastewater management policies. This project has a direct impact on 400,000 people life quality by reducing environmental issues associated with draining the polluted water (Ceylan *et al.,* 2016) to Shadegan international wetland.

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Therefore, conducting similar studies with the aforementioned paper is necessary to reach a sustainable development. Unfortunately, since industrial revolution, the rate of environmental demolition has increased and now the risk is that humans demolish the earth by their own hands. In Iran, the environment is also being damaged very fast. In the past decade, consumption of chemical fertilizers has brought about adverse environmental consequences including air, water, soil, and landscape pollution as well as problems related to human and other creatures' health (Murtaugh *et al.,* 2017). Although it has been a long time that humans have realized the importance of environment in their life, the late decades of the twentieth century are the peak periods of propounding environmental issues. Some countries use natural and environmental resources unfavorably in the production process to enhance their share in international markets (Johanson and Mattsson, 2015; Daghighi *et al.,* 2018; Demirbas *et al.,* 2016). This eventually causes environmental degradation and propagation of contamination. The different types of contamination and flow of wastes resulting from human activities, which enter the environment, cause damage to plants, animals, and environmental systems. These types of activities have expanded in different industrial sectors from the very beginning steps of cultivation, which is fertilizing the soil,

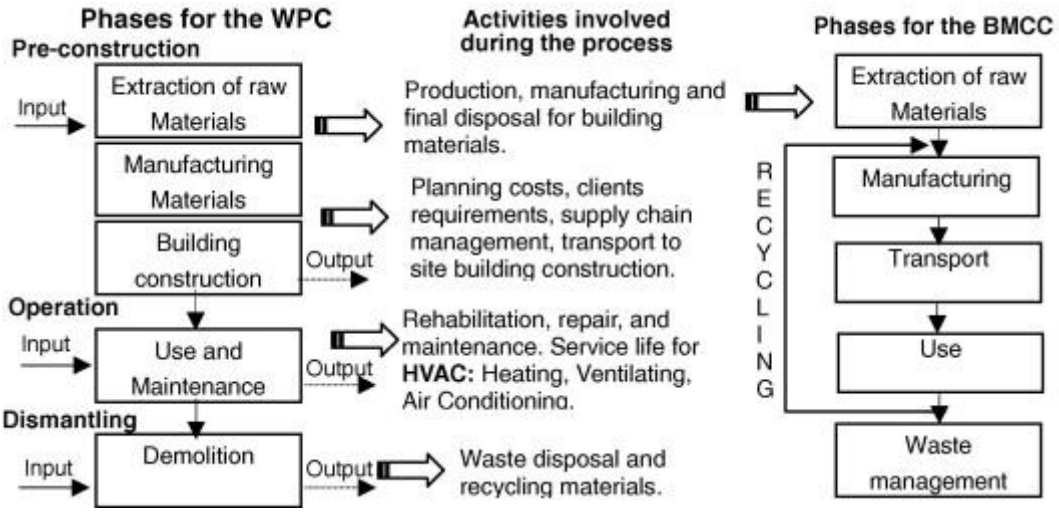

Figure 1. Schematic representation of the building life cycle

to the end part of distributing the productions which is transportation of the products. These days in each sectors, the focus is on reducing the produced pollutants and increasing the efficiency of that part (Haghighat *et al.,* 2018). Emission of contaminants into the air, their discharge into rivers or their absorption by soil incur irrecoverable damages (e.g. increased disease or mortality, diminished reactions and entertainment, etc.) to human welfare. Overuse of natural resources such as raw materials and energy generation using fossil fuels and industrial development have caused increased air and water pollution, production of toxic compounds, as well as industrial wastes and environmental degradation(Notani and Mokhtarnejad, 2018). Nevertheless, throughout the process of development, it cannot be expected that industrial and economic growth occur without changes in the environment.

However, it has also been evident that the contaminations generated by human societies exert excessive pressure on ecosystems or biodiversity (Cantalupo *et al.,* 2015; Fang *et al.,* 2015). Physical development of human societies is associated with construction, while, only the cement production –as a necessary part of construction sector- is responsible for 7% of the total anthropogenic CO_2 emission in the atmosphere (Sassani, 2014). On the other hand, energy inefficiency of built environments, and the environmental impacts of construction in the level of material extraction and processing cause concerns of damage to the environment and collective human health (Sassani *et al.,* 2014). Without adopting immediate measures of this irrecoverable trend, without following the principles of sustainable development and environmental protection, one cannot conceive a desirable future for the present generation and the subsequent ones (Haghiri *et al.,* 2018). Also, we will bequeath a biologically poor world for the future generations. Environmental degradation and contamination especially in the second half of the 20th century caused scholars to believe that if economic growth and environmental protection does not match each other, then the possibility of a suitable life cannot be conceived for humans on the Earth. Thus, it seems that to achieve sustainable development in the environment and realize the goals and policies projected for achieving a healthy environment, an appropriate solution is essential for meeting the plants' food needs through soil-dwelling creatures (Garnett, 2014). Now, we should ask ourselves whether we are able to save the climatic and environmental status of our surroundings or we let our world become progressively warmer and polluted over time and change into barren desert, which is full of contamination. The aim of this research is providing environmental protection for sustainable development. It is an indisputable principle which is widely approved by the public. This necessity has gained more importance in parallel with the growth of industries, technology and in turn incidence of contaminations.

MATERIALS AND METHODS

The environment and contamination of resources

From the distant past so far, different conceptions have existed about the environment as well as its condition and effect on human resources. For instance, the environment has been described as a dangerous creature, irregular or as regular phenomena, something independent of humans, vehicles, and as a good at the service of humans, etc. (Maqbool *et al.,* 2016; Daghighi, 2017). Generally, the environment is the area that has encompassed the life process or interacts with it and consists of the nature, human societies, as well as thinking spaces and human-made, engulfing the entire earth's biosphere (Flemming *et al.,* 2016). The environment contains a small part of the atmosphere, hydrosphere, and lithosphere. In other words, the environment is a thin layer of the air, earth, and water encompassing the whole life (Lindgren *et al.,* 2016). Brown believes that the term 'environment' can refer to a limited region or the entire planet and even the external space, which has engulfed it (Brown *et al.,* 1987). The environment refers to an area on which humans are dependent directly and indirectly, and their activities are associated with it.

The negative effects of the environment include waterlogging, soil erosion, extracting soil nutrients, soil salting, water pollution, soil saltiness, water saltiness, desertification, deforestation, diminished level of natural potential lands, negative effects of toxic chemicals used in agriculture on the health of humans and living creatures in the ecosystem (Geiger *et al.,* 2010). Contamination of resources refers to dispersing or adding external materials to the water, air, or earth to such an extent that its physical, chemical, or biological quality is affected in a damaging way to the humans and other living creatures and plants or works and buildings (Falconer, 1998).

Table 1. The complication resulting from carbon monoxide across different concentrations (Grossman *et al.*, 1995)

Carbon monoxide concentration ppm	Time	Effects
5	20 min	Central nervous reactions
30	8 h	Diminished vigilance and sharpness
100	2-4 h	Mild headache
200	2-4 h	Sense of pressure in the forehead or mild headache
500	2-4 h	Severe headache, weakness, and nausea
1000	2-3 h	Face blurriness, possibility of coma and seizure
2000	1-2 h	death

Table 2. Evolution of the issue of environment in development plans

development plan	strong points	weak points
First plan 1989-1993	Incorporation of only one note in the entire plan to control environmental degradation for the first time	Implementation of only three systematic plans; the qualitative environmental objectives of the development plan (lacking quantitative objectives); lack of provincial environmental objectives
Second plan 1995-1999	Development of environmental articles of the plan under the effect of Rio conference (1992); incorporation of quantitative environmental objectives in the plan; extensive attention to international understandings, provincial environmental plans, development of the national committee for sustainable development in the plan	Low absorption of the approved budget predicted for environmental plans (more extreme degradation of environmental dimensions in the country compared to the beginning of the period)
Third plan 2000-2004	Developing the multi-sectoral committee for implementing environmental plans, extensive attention to the role of public participation in public education in the plan (elevating 156 nongovernmental organizations to about 600), adopting preventive policies instead of passive policies in the plan, allocating a separate chapter in the plan to the issue of the environment	Lack of suitable executive mechanisms and guarantees to accomplish the plans
Fourth plan 2005-2008	Alignment of the plan with the provisions and documents supporting the twenty-year perspective (horizon 1404), developing the multi-sectoral document for the environment, allocating a separate chapter to the environment	
Fifth plan 2009-2014	Relative preservation of the strong points of the fourth development plan	Diminished attention to the environment (in terms of the number of quantitative articles and provisions), generalizations, and lack of measurability in some of the environmental provisions in the plan

There are many natural resources exposed to pollution, which include air, water, and soil, each of which is examined further. Every person breathes about 22000 times/day and needs around 15 kg of air per day. Typically, humans can survive for five weeks without food and five days without water. However, they cannot survive without air even for five minutes. Thus, air is one of the vital elements for humans. Healthy and natural air usually consists of 78% nitrogen, 21% oxygen, 0.93% Argon, 0.3% carbonic gas, and trace amounts of neon, helium, krypton, xenon, radon, ozone, hydrogen, etc. Natural sources of air pollution include dust storms, forest fires, eruption of volcanoes, scattering of plants' pollens, and leakage of natural gas. Their resultant pollution is a permanent phenomenon; whose value is almost constant across the earth due to circulation of natural processes. Artificial sources of pollutions have a far larger contribution to air pollution, compared to natural resources (Nahvi *et al.,* 2017). They are human made and a result of their activities. Among the major sources of production of artificial contaminations are industries, vehicles, refineries, power plants, commercial and cultural sources, agricultural drainages, laboratories, and hospitals. The major problems resulting from artificial contamination include development of gases such as greenhouse gases, which have established the global climate change, global warming, inversion, acid rains, ozone layer degradation, and their devastating effects to demolish the ecosystem and life of living creatures (Feng *et al.,* 2015). Table 1 shows carbon monoxide, which develops from breakdown of carbon dioxide, brings about harmful effects for the human.

Nitrous oxide (N_2O) is responsible for about 6% of the greenhouse effect (radiative forcing), and its ability in absorbing infrared radiation is 300 times as large as that of carbon dioxide (Seinfeld, and Pandis, 2016). In other words, one molecule of N_2O equal to one molecule of CO_2 decreases the potential of passage of light reflected off the earth. This gas usually enters the atmosphere through the nitrification process in the nitrogen cycle. Oceans, soil, combustion of fossil fuels, biomass burning, use of nitrogen containing chemical fertilizers in the agriculture, and different industrial processes are among the most important natural and human-borne sources of production and liberation of nitrous oxide in the atmosphere. After photolysis (photochemical processes), N_2O gradually enters the stratosphere from biosphere, and survives about 150 years in the atmosphere. The concentration of this gas grows by about 0.2% each year (Crutzen and Ehhalt, 1977).

Water and soil pollution

Pollution can enter water from different sources and ways. Regardless of the cause of development of pollution, we consider water as polluted when the level of external substances present in water is so large that its usage causes incidence of harmful effects in different ways. Any material and object that prevents natural use of water is considered water pollutant (Holt, 2000; Mikkelsen *et al.,* 1994; Haghiri *et al.,* 2018; Ketabchy, 2018). Soil pollution is a ground on which the survival of millions of humans is dependent. Globally, after climate, soil is considered the third major component of

the environment. Soils are a big saver of carbon: four times the atmosphere and three times the trees around the world. However, the world soils have lost 100 billion tons of carbon over the past 10,000 years in response to cultivation and deforestation (Mulligan, Yong and Gibbs, 2001). When the soil is plowed, roots and other carbon containing plants become exposed to air and oxidation by carbon dioxide. It is suitable for eliminating weeds, but it is at the expense of liberation of carbon. Soil pollution is typically a result of unhealthy habits, different agricultural activities, and wrong methods of discharging solid and liquid wastes (Fishman and Seiler, 1983). In addition, fall of air polluting factors in response to precipitations can also be involved in development of soil pollution. Soil becomes polluted in response to imprudence by chemicals including heavy metals and oil industry products, whereby it enters the food cycle, surface or groundwater, and eventually the human body. Among the different soil pollutants, the most important ones include biological and chemical contaminations (Mulligan, Yong and Gibbs, 2001). As we know, discharging wastes results in soil pollution. On the other hand, production of wastes is a byproduct of industrialization. In the industry, given the extent of activity, type of technology used, the employed raw materials, and existence of recycling systems, significant amounts of wastes are produced, whose management is vital environmentally. In recent years, soil pollution resulting from usage of mineral compounds including Mercury, cadmium, lead, arsenic, copper, zinc, nickel, manganese, etc. has attracted a great deal of attention. Lead enters the atmosphere through gasoline combustion and motor vehicles and burning coal along with other human activities, and precipitates on soil during rainfall and snowfall. Heavy metals are present in the composition of organic fungicides, herbicides, and insecticides, causing soil pollution (Leighton, 2007). Super phosphates and limestone typically have some cadmium, copper, manganese, nickel, and zinc, whose application may lead to soil pollution (Sukkariyah *et al.,* 2005). Waste refers to solid, liquid (apart from wastewater) and gas materials which are directly or indirectly a result of human activity, and is considered waste by the producer. In addition, deicing agent used for snow removal operations can cause soil pollutions. Chemical toxins enter the soil through their direct application in soil can increase contaminating rates of mineral compounds, thereby polluting the soil (Shen *et al.,* 2017).

Sustainable environmental development strategies

The socioeconomic development should be realized such that at any time when a cost is incurred to the future generations, it minimizes the effects of economic activities (Nahvi et.al, 2017). When the current crucial and essential activities incur costs to the future generation, this incurred damages should be compensated for completely (Sri 2017). In other words, sustainable development should have a special emphasis on the welfare of the poor and provides the possibility of improving the public life level. At the same time, it should prevent incurrence of irrecoverable damage to the future generations (Woolcock and Narayan, 2000). Table 2 presents the history of sustainable development as well as the strong and weak points of each definition.

Conclusion

In this study, some of the most important environmental contaminations were introduced. Contemplating on what has been said, the following suggestions can be presented as conclusion for combating environmental contaminations. Enhancing the technology of vehicles to improve the status of emission of pollutants. Using suitable public transportation to reduce usage of personal vehicle. Retiring old vehicles. Suitable management of traffic of cities. Notifying and enhancing the awareness of people. Impugning vegetation. Insulating buildings. Employing double glazed windows and medium lattice walls and developing the green space as important solutions for preventing entrance of harsh noises into houses. Isolating and separating normal or industrial wastes from hazardous waste. Collecting garbage and waste in a way that hazardous chemicals are not mixed with industrial waste. Employing suitable waste collection techniques such that it becomes as dense and low-volume as possible. All production industrial units should collect and label wastes inside suitable initial containers separately considering the volume and properties of the wastes to recycle or keep them in temporary warehouses. The stores containers should be designed such that they can be collected in a mechanized way. The landfill site should have a collection system for surface water. Including suitable methods for water treatment.

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