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Unilateral interaction of human with nature in desert biome- a dilemma

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ABSTRACT

From way back, it has been mentioned several times that behavior of industrial age human with environment cannot be considered ably. Failure of human relationships with nature as a result of development of technology in many cases knowingly or unknowingly leads to environmental imbalances, destruction of various aspects of life and disruption of positive functions in ecosystems on Earth. The degradation process in the second half of the twentieth century and the early years of the new millennium was more than all of the past. In the meanwhile, the reflection of such damages in desert biome has been evident much more than others due to sensitivity and fragility of this kind of ecosystems. The current study is a review on a unilateral interaction of human with desert biome. The authors do their best to examine different challenges faced with decision makers derived from self-interaction of human beings with desert nature. At the end, it is tried to review applied managerial approaches to deal with the challenges, occurred. It is hoped that awareness of the consequences of irresponsible activities is a way to change human nature for future generations.

Key words: desert biome, desertification, combating desertification, dust storm, drought, desiccation

Introduction

Deserts are regions in which evaporation amount is more than precipitation (Stringer, 2008; Verón et al., 2006). The average annual precipitation of deserts is around 400mm. such areas are characterized by quit poor land cover, so little rain falls, great temperature fluctuation and so on. By allocating one fifth (20%) of the Earth's land surface can be claimed that deserts are the greatest biome in the world (Barrow, 2009; Kassas, 1995). Whenever the word ‘desert’ is raised most of people think of hot areas while it is completely false whereas, there some deserts situated near the North and South Poles wherein all moisture is frozen (Wright, 2001). Generally, there are four major types of deserts including hot and dry deserts in which warm season lasts throughout the year and summer is extremely hot, semiarid deserts wherein summer is fairly long and dry and winter brings low precipitation. It is noteworthy that summer temperatures usually average between 21-27° C. Coastal deserts are commonly characterized with cool winters in which temperature is 5° C or below and moderately long, warm summers with an average temperature of 13-24° C (Cereceda et al., 2008; Mamtimin et al., 2011; Friedmann, 1986; Lee and Bland, 2004). Cold deserts are known with features like cold winters in which snowfall and high overall rainfall occurs throughout the winter and rarely in the summer (Lee and Bland, 2004). Desert biome in its harshness environment is a concealed host of a plenty of life forms (Klimes, 20003). Lots of reptiles such as small lizards and spiders, many insects, birds or burrowing creatures are living there (MacMahon, 2001). Although, due to the severe environmental conditions most of them are not often visible to the untrained eye, but they are so vital for maintaining the functions of the ecosystem (Holzapfel, 2008). Due to the natural vileness of the environment, these kinds of ecosystems are quit fragile in a way that any disruptions caused by human beings leads to imbalance of the wildlife chain and make the survival situation impossible for fauna and flora (Le Houérou, 1997; Kheirallah and Mikhail, 1995). Unfortunately, nowadays, it is witnessed that human activities can damage the fragile balance of the desert ecosystem. Excessive withdrawals from underground aquifers (Minhas, 1996; Dayton, 2008), farming on poor semiarid lands (Baudron et al., 2011), bush digging by endogenous people for fuel supply (Nyssen et al., 2004), unplanned desert tourism (Priskin, 2003) and mining (Letnic and Fox, 1997) all are considered only a small fraction of human destructive activities imposed on the sensitive desert biome. The problem is exacerbated when reckless measures are supposed and done to rehabilitate the destruction. Such measures not only won’t help to repair the dysfunctional situation but also makes it to get worse. In the followings, first of all, the

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challenges ahead of desert biomes are described briefly afterwards, the successfulness of the applied mitigation measures is discussed. At the end, by introducing environmental friendly utilizations of deserts, the concept of BILATERAL instead of UNILATERAL interaction of human and desert will achieve in a sustainable manner.

Threatening factors in deserts:

There are lots of human origin factors threatening desert biomes which are briefly described in the followings:

Mining:

Deserts can include major sources of minerals like lead, cupper, salt, nitrate and so on. The accumulation process of the mineral materials in desert is a direct consequence of climate condition. On other word can be raised that evaporation enriches minerals over the lake beds, also called playa. Gypsum, salts (including sodium nitrate and sodium chloride), and borates are some of the minerals deposited by water evaporation. Geologic processes are another case of the minerals in desert biomes. Ore minerals are leacheted and deposited by water in areas adjacent to the water table. The areas are mined later as the mining sources. Great Basin Desert of the United States and The Atacama Desert of Chile contain two main and valuable mines in the world. In spit of evident economic values of mines in deserts, there are lots of hidden, adverse impacts imposed irreversible losses on desert biomes. Nowadays, by raising the environmental economics such destruction can be economically valuated as well. The output of these studies is clearly determined that considering the great losses on deserts obtained from mining activities, they cannot be that much cost effective. The quotable point is that along side the negative impacts of mining operations which in turn disturb the desert habitat, plants and animals, the construction of the infrastructures like access road also destroy the desert. Currently, uranium mining considers a main source of radioactive hazards.

Ranching and bush digging:

Overgrazing is regarded an inevitable dilemma mainly in deserts situated in third word countries. Livestock grazing in arid and semi-arid areas contained poor land covers, in addition to the gradual disappearance of vegetation will brings irreversible consequences such as dust storm (Nash et al., 2004). Alongside, bushes digged up by indigenous people empty the empty desert and semi desert areas of sparse land cover. Accordingly, the bare ground of emptied deserts would be a good origin for dust storm and sand dunes.

Drilling operations:

Drilling operations on oil fields located in deserts are considered another destructive measure affected the ecology of the desert over an extent of area. Construction and operation of oil fields is the main factor threaten the fragile balance of deserts. It is clear that most of the oil fields are located in arid and semi arid land. South Pars Gas Field situated at south of Iran can a good example.

Farming:

Ever-increasing world population (around 7 billion people) is an alarming sign for food supply which causes a sharp raise in demand for more agricultural products. Consequently, by applying the modern agricultural technologies, a wide range land use changes have been occurred in order to converting semi-arid lands into farmland. As regards, the productivity as well as fertility of such areas is low for farming, in near future, these lands are converted to the barren lands. A part from lack of enough fertility of soil for agricultural functions, the saline irrigated water in these areas renders the soil useless for agriculture whereas it evaporates and makes hard salty crusts on the soil. Furthermore, the drainage farming water increases the salinity of desert streams. Consequently, the salinity rate exceed the tolerable threshold of the species lived there.

Challenges ahead of deserts:

Unfortunately, within the last decades, measure such as oil drilling operations, tourism, farming, ranching, mining etc. have deteriorated deserts critically. Such unique wilderness areas are used as nuclear waste landfills. Lots of military weapons and bombs are tested in deserts. Due to the unique features of desert animals such as lizards, some people interested in capturing them and pet them. For example Mansoori in 2006 declared that Houbara Bustard *Chlamydotis undulate* once lived in large groups in deserts of Iran are now endangered. He raised the main causes of the severe decline of Houbara Bustard in recent years as a result of habitat loss by grazing, habitat changes to agriculturallands, and trapping (and shooting adults) to export live birds illegally to Arab countries. Lots of aquatic desert species are endangered by construction of lots of dams and reservoirs to reserve and capture water. For example Hamoon Wetland in south east of Iran (regarding Koppen and De Martounne methods is dry type, Ivanove method is saharan type and Amberge is mild desert) is dried and a plenty of aquatic species have been died. Najafi and Vatanfada in 2011 declared occurrence of droughts, decreased discharge of the Hirmand River due to increased water use in Afghanistan, over-exploitation of natural resources by the growing local population and the introduction of exotic herbivorous fish as main causes of such a condition. Generally, two main challenges ahead of desert biomes can be classified as follows:

Desertification:

Desertification is a kind of land degradation considered one of the most significant environmental challenges at global and local scales caused by unilateral human beings interaction with deserts. As it has been already mentioned, desert ecosystems are already so fragile, so that cannot stand pressures derived from population growth. The pressures are reflected by over cultivation which depletes the nutrients in the soil, soil salinity and dropt in aquifers. Alongside, the land cover is over grazed by livestock or dig up for burnings as a fuel. Accordingly, due to uprooting the land cover the rate of runoff is raised and finally led a sever erosion and loss of topsoil. Desertification has lots of social and economic consequences as well. It often limits the capacity of rural lands to support the same sized populations previously lived. Therewith, a large number of people migrate to large cities which resulted in being the cities overcrowded as well as high rate of unemployed people and of course sharp increase in social crimes.

Dust storm:

At first glance, dust storm seems to be a nature origin phenomenon. In the meanwhile, the impact of human activities on its severity and frequency wouldn't be ignored. Soil is moved from one place to another by suspension of the particles in arid and semiarid lands. There are two main causes for such a condition; climatic reasons and land degradation as a result of human activities. Uprooting the land cover, salinization of the surface water and farming in poor lands, all make the top soil susceptible to erosion. Dust storm has lots of economic, social and environmental consequences.

Managerial strategies:

Regarding the factors threatening desert biomes as well as current challenges, sustainable management of these areas is rather difficult. Considering the fragile environment of the deserts, any mistakes in this field will lead to serious consequences that cannot be easily compensated. Currently, lots of strategies are offered by scientists each in turn has its own advantages and disadvantages and suited for particular situations (Zaredar and Kheirkhah Zarkesh, 2011, Jafari and Zaredar, 2011, Jozi et al, 2010a;b; 2011; Rezakhani and Zaredar, 2011, Zaredar et al., 2010). Installation of windwards in the direction of wind flow at windy places, mulch spreading in lands suffer from poor a land cover, application of modern farming methods to improve the productivity at the unit of land all are appropriate strategies to combat land degradation in deserts. The most important point is that the successfulness of all managerial approaches and techniques deepens on an important concept "bilateral interaction' of human and nature in deserts. To achieve the concept, focusing on public participation is so essential. Holding training workshops for indigenous inhabitants as well as desert tours at universities in make the students aware of the importance of desert biomes play an important role toward the sustainable interaction between human beings and the nature in desert biome.

References

Barrow, C.J., 2009. Desertification. International Encyclopedia of Human Geography, pp: 96-101.
Baudron, F., P. Tittonell, M. Corbeels, Letourmy Ph., K.E. Giller, (in press). Comparative performance of conservation agriculture and current smallholder farming practices in semi-arid Zimbabwe. Field Crops Research.
Cereceda, P., H. Larrain, P. Osses, M. Farías, I. Egaña, 2008. The climate of the coast and fog zone in the Tarapacá Region, Atacama Desert, Chile. Atmospheric Research, 87(3-4): 301-311.
Dayton, G.H., 2008. Water Availability. Encyclopedia of Ecology, pp: 3718-3723.
Friedmann, E.I., 1986. The antarctic cold desert and the search for traces of life on Mars. Advances in Space Research, 6(12): 265-268.
Holzapfel, C., 2008. Deserts. Encyclopedia of Ecology, pp: 879-898.
Jafari, S. and N. Zaredar, 2011. Land Suitability Analysis using Multi Attribute Decision Making Approach. International Journal of Environmental Science and Development, 1(5): 441-445.
Kassas, M., 1995. Desertification: a general review. Journal of Arid Environments, 30(2): 115-128.
Kheirallah, A.M., W.Z.A. Mikhail, 1995. Distributional analysis of soil fauna data in the Ethiopian highlands and Arabian Peninsula. Journal of Arid Environments, 31(4): 453-458.
Klimes, L., 2003. Life-forms and clonality of vascular plants along an altitudinal gradient in E Ladakh (NW Himalayas). Basic and Applied Ecology, 4(4): 317-328.
Le Houérou, H.N., 1997. Climate, flora and fauna changes in the Sahara over the past 500 million years. Journal of Arid Environments, 37(4): 619-647.
Lee, M.R., Ph. A. Bland, 2004. Mechanisms of weathering of meteorites recovered from hot and cold deserts and the formation of phyllosilicates. Geochimica et Cosmochimica Acta, 68(4): 893-916.
Letnic, M., B.J. Fox, 1997. The impact of industrial fluoride fallout on faunal succession following sand-mining of dry sclerophyll forest at Tomago, NSW, II. Myobatrachid frog recolonization. Biological Conservation, 82(2): 137-146.
MacMahon, J.A., 2001. Desert Ecosystems. Encyclopedia of Biodiversity, pp: 37-59.
Mamtimin, B., A.M.M. Et-Tantawi, D. Schaefer, F.X. Meixner, M. Domroes, 2011. Recent trends of temperature change under hot and cold desert climates: Comparing the Sahara (Libya) and Central Asia (Xinjiang, China). Journal of Arid Environments, 75(11): 1105-1113.
Minhas, P.S., 1996. Saline water management for irrigation in India. Agricultural Water Management, 30(1): 1-24.
Nash, M.S., D.F. Bradford, S.E. Franson, A.C. Neale, W.G. Whitford, D.T. Heggem, 2004. Livestock grazing effects on ant communities in the eastern Mojave Desert, USA. Ecological Indicators, 4(3): 199-213.
Nyssen, J., J. Poesen, J. Moeyersons, J. Deckers, M. Haile, A. Lang, 2004. Human impact on the environment in the Ethiopian and Eritrean highlands-a state of the art. Earth-Science Reviews, 64(3-4): 273-320.
Priskin, J., 2003. Physical impacts of four-wheel drive related tourism and recreation in a semi-arid, natural coastal environment. Ocean & Coastal Management, 46(1-2): 127-155.
Rezakhani, P. and N. Zaredar, 2011. Indoor winter recreational site selection in arid and semi arid mountainous regions. International Conference on Environmental Science and Development – ICESD, pp: 220-223.
Seyed Ali Jozi, Narges Zaredar, Sahar Rezaeian, 2010b. Evaluation of ecological capability using spatial multi criteria evaluation method (SMCE) (Case study: Implementation of Indoor Recreation in Varjin Protected Area-Iran). International Journal of Environmental Science and Development (IJESD), 1(3): 273-277.
Seyed, A. Jozi, Narges Zaredar, Sahar Rezaeian, 2011. Maryam khalilzadeh Poshtegal. Land evaluation for Extensive Recreation using spatial multi criteria evaluation method. International Conference on Environmental Science and Development – ICESD, pp: 133-136.
Stringer, L.C., 2008. Reviewing the International Year of Deserts and Desertification 2006: What contribution towards combating global desertification and implementing the United Nations Convention to Combat Desertification? Journal of Arid Environments, 72(11): 2065-2074.
Verón, S.R., J.M. Paruelo, M. Oesterheld, 2006. Assessing desertification. Journal of Arid Environments, 66(4): 751-763.

Verstraete, M.M., A.B. Brink, R.J. Scholes, M. Beniston, M.S. Stafford, 2008. Climate change and desertification: Where do we stand, where should we go? Global and Planetary Change, 64(3-4): 105-110.

Wright, J.S., 2001. "Desert" loess versus "glacial" loess: quartz silt formation, source areas and sediment pathways in the formation of loess deposits. Geomorphology, 36(3-4): 231-256.

Zaredar, N. and M.M. Kheirkhah Zarkesh, 2011. Examination of compensatory model application in site selection. Environmental Monitoring and Assessment, DOI: 10.1007/s10661-011-1976-z.

Zaredar, N., M.M. Kheikhah Zarkesh, A. Ghadirpour, S.A. Jozi, S. Jafari, 2010. International Conference on Chemistry and Chemical Engineering (ICCCE), Kyoto, Japan, 1-3.