

# Dust storms and environmental health impacts

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**Abstract**— One of the arid and semi -arid climatic phenomena and areas adjacent to these areas, phenomena are dust and to dust storms, which have affected large areas of the atmosphere, causing atmospheric blur reduction horizontal and vertical viewing many effects on other environmental, social, economic and health. One of the most devastating effects of Hurricane dust phenomenon that happens it can cause environmental damage and the onset or exacerbation respiratory diseases, heart disease, air and ground traffic, tourism, agriculture. This study investigates the phenomenon of dust and its impact on the environment and health are identified.

**Keywords**— Dust storm, Environmental, Impact

## I. INTRODUCTION

Research scientists on the ocean floor sediments indicate that the incidence of dust storms to 70 million years ago (before the Cretaceous geological period) is on the earth [1]. But the phenomenon of dense fog with visibility less than 500 meters in the West and North West of Iran is emerging phenomenon. This phenomenon in warm seasons (spring and summer) was not due to low rainfall and higher humidity occurs [2]. Desert when the wind speed exceeds a certain limit (8 meters safely) depending on the level of roughness, soil moisture, grain size, vegetation, soil, energy bands (indicating the adhesion of soil particles) and topography of ground particles into the atmosphere are producing atmospheric dust [3]. Lack of vegetation in areas prone to dust over these regions to global warming and air upward move and when the high speed winds to deal troposphere, and towards the result of a circulating current cause is low. The high intensity winds hitting the earth's surface caused by dust storms are primarily in the areas of precipitation less than 50 mm per year [4]. According to the agreement, the World Meteorological Organization, the station whenever the wind speed exceeds 15 meters per second, and horizontal visibility due to dust, less than a kilometer to reach the dust storms reports. sand storm,

the wind, which can be defined as particles with a diameter 15/0 to 30/0 mm displacement meters to 15 meters in height to fit in, in this case, is a sand storm, but the storm soil the particles, finer, and the flow is upward these particles are suspended in the air can hold[5, 6]. The occurrence of dust due mainly caused by currents in the area is a foreign origin [7]. Synoptic analysis of dust waves in the West that Iran was determined with the Azores high pressure system immigrant westerly winds most important factors influencing the synoptic systems are turn to dust and landing area of cyclone when settlers came to the area a tropical that the pressure near the Azores is absent or weakened [8]. When the warm weather than a piece of land adjacent areas, the volume will increase by. In the vertical direction to move and expand. The heated area, on land, air molecules of thermal energy to heat and light and climb so low air pressure on Earth more than adjacent areas and thus the hot zone, low pressure centers images created on the cold, high-pressure center will emerge [9-10]. In desert and arid regions of rapid change in temperature causes the pressure gradient at different points and is composed of strong winds and permanent [11]. Many of these particles have a diameter less than 10 microns, and quickly fell under the influence of gravity on the size of the not measured and therefore remain suspended in the atmosphere, such as, because desertification areas may air for a long time dust state remain [12]. The area of high pressure to an area of low pressure air flows and pressure gradient wind is a major factor in air movement [13]. Before creating dust storms, air pressure very low and very high temperatures and sunny and the wind speed is low, when the dust storms occur falls , strong winds start blowing dust and sand to rise and immediate increase in air temperature and air pressure suddenly decreases to is (around 5 ° C ) and relative humidity of 10% be increases [14]. Dust storm led to the closure of schools, an increase in road accidents canceled air flight [6, 4], disrupting the function power plants, reduced water resources (water loss), disruption of the signal TV, increasing the number of visits to clinics due to respiratory problems, etc. is. In Australia, the cost of asthma due to dust between 10 to 50 million dollars per year is estimated. The share of home cleaning after a storm of dust residents would be more than \$ 3 million. Dust and sand storms imposed against China in 2003 was \$ 6 billion into the economy. Rural areas than in urban areas are more at risk due to dust are. Soil erosion and damage to crops, livestock and agriculture imposed could be destroyed the economy of rural

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areas [15]. Bennett, the father of soil conservation movement in the United States of America, also known as the Big spores on dust storms Great Plains of America writes the result lot of fertile soil to a level of conscious provider being demolished and the loss of conscious and the same percentage also represents the threat of sand are leaving [16]. This has the highest frequency of dust storms in the world of North Africa, the Middle East and Asia and has been introduced. He also studies the impact of agriculture on the type and density of vegetation and dust storms, the dry bed of the best places for dust as [17]. Faraj and Fdhyal (2001), and the negative effects of desertification in Iraq sand and dust storms in Iraq and studies have concluded that soil and sand storms on water resources, regional economies and livelihoods people have a deleterious effect time [18]. The same relative intensity of the crisis, developing countries than in developed countries, with a greater reduction in the production encountered [19]. Coral (1372), in examining the synoptic winds exceeding 15 meters per second (storm) in Khorasan, get a dust storm on the atmospheric electricity can affect radio communication. Layer of dusty air, often very hot in the day time and greatly reduces the potential for relative humidity [20]. Democracy (1375), in a study showed that the action of wind on the surface of separation of materials from demolition sites started and continues to hundreds of kilometers away. Make the most of the colloidal particles of dust (clay and silt) formed under the barrier function of the currents and the wind power depends on [21]. Majd et al (1380) Effects of air pollution on the development of anther, pollen and allergenic development Marigold They were examined and showed that air pollutants can directly affect the development of anthers and pollen grains while pollen dispersal and establishment of the oocyte abnormalities or indirectly through stress on plant growth (change in PH, the effect on chlorophyll, peroxides enzymes, sugars, proteins, amino acids, etc.), the amount of plant products are affected [22]. Impact of drought in some rural areas has been so profound that led to severe unemployment and rural exodus and thus haunted by a number of villages. However, it is clear that several factors influence the occurrence of dehydration and drought alter and intervene in order to prevent its occurrence, is beyond the ability of human beings [23]. Air pollution can cause heart disease, lung disease, shortness of breath, increased respiratory illness in children, increased chronic bronchitis, exacerbation of heart disease, muscle cramps, intestinal diseases, neurological, renal, brain, increased cough, discomfort breast tenderness eye, nose, throat, blood oxygen depletion, loss of consciousness, headache, weakness and lack of control of asthma and irreversible damage Jbarn duty mind, brain, and other human organs, and increasing the polluting effects gas leads. Air pollution damages in addition to the above, the reduction in efficiency due to the risk of these diseases can lead to the loss of productive capacity, decreased life span and ultimately will

reduce GDP. In addition to adverse effects on human Vdgy, air pollution can affect the beauty of the environment, sunlight, temperatures, etc. affect the value of their homes [24].

The occurrence of some heavy metals such as lead dust concentrations and concentrations of toxic metals mercury and arsenic are three times the amount of increase [25]. Dust can carry 107 types of bacteria and fungi to 106. In a survey by researchers on the microbial load of dust in the occupied Palestinian territories was conducted dominant fungal populations were: Alternate, Aspergillums fumigates, A. Niger, A. Tommy, Clostridium and Penicillium. Most fungi are known allergens [26]. Dusts storms are natural events in arid, semi-arid and desert world frequently occur. But these storms do not occur only in regions of origin, but also are carried much farther distances. In recent years, much attention has been dust storms [27]. Sand and dust storms not only in Iran but also in other countries in Asia, Africa and the U.S. has caused great financial losses and casualties [28].

The effects of dust at distances up to 4000 km from the main source of continuity and cause extensive damage to biological adverse effects of agriculture, industry, transportation, and telecommunication systems dates [29-30]. Dust in the atmosphere as a pollutant, has various negative effects and consequences. Dust difficult nectar flowers and honey production and reduces more than 50% decrease in honey production is 130 tons and 10 million dollars compensation to beekeepers has arrived. Air contaminated with dust, drastically reduced honey production. However, another problem we face is that the beekeepers irregular migration [31]. Dust can cause climate changes on a global and local scale, changes in the biological cycle, ground geological, chemical and biological environment may cause. Mineral aerosols from dust can affect cloud formation, cloud properties and precipitation rates [25-15]. Dust can prevent the penetration of sunlight and this can lead to aggravated damages resulting from the occurrence of pests and plant diseases and reduce the amount of 5 to 30 percent of agricultural production [6, 15]. Clay particles suspended in the air sits on leaves and causes stomata are closed. This will prevent photosynthesis and plant respiration [32]. In addition, it will reduce the absorption of light by leaves, after some time, due to disruption of the normal mechanisms of life, trees, and leaves that fall from the tree canopy plant resistance is reduced and pests attack [32]. High concentration of dust particles in the storm causing sinusitis, bronchitis, asthma and allergies, and damage to the immune function of macrophages, which leads to an increase in nosocomial infections, Also breathing high concentrations of calcite (calcium carbonate) resulted in dust particles will sneezing and coughing. Long-term exposure of calcite and into the body by ingestion may cause Alkalosis, among the other compounds in dust particles are calcium, iron, aluminum, magnesium and etc. Short-term inhalation of particles containing aluminum may cause coughing and irritation of the

lungs. And prolonged inhalation may cause damage to the lungs [33]. Dust storms have direct effects on humans too. For example, you can allergies and disease causing agents to communicate and can disrupt communications. Piper and Hvizar (1989), a study of the regional effects of wind erosion in New Mexico America carried out. Their findings are summarized below:

1. Damage outside the area of wind erosion in New Mexico is 50 times the intra-regional loss.
2. 90 to 95 percent of the estimated losses is cleaning house
3. Most damage is estimated to areas with the highest frequency of dust storms and air pollution has the greatest.

Many studies in developed countries to affect air quality in the value of assets (property) is done so that Smith and Hung, 1995, a summary of a study of fifty cities in the United States during the years 1967 to 1988 was made. The results show that the willingness to pay per unit reduction in particulate matter varies between zero and \$ 98 [34].

Williams and Young (1999), in a study of wind erosion damage to the people of South Australia were examined. Most damage Most damage to health And minimal damage was related to the cancellation of airline flights [35].

Miri and colleagues (2008), the research intensity of wind erosion and destruction of agricultural land, and the continuing drought that reduced pasture plant vitality, loss of vegetation and land degradation in the region[36].

Negative effects of dust storms in human disease is different In a study on the environmental effects of the storm were conducted in Nigeria revealed that dust causes acute respiratory diseases, asthma and allergies, asthma, syndrome[37]. Dell career (2010), in his study of the phenomenon of dust and Health, writes that Dust pollution causes 500 premature deaths per year and the mortality rate increases to 6 percent and Horizontal visibility to less than 1 km from the storm arrives [38]. Textile Zavareh (1380), in their study as the study of economic, social and environmental sustainability drought showed that the most important economic and environmental impact of the drought on the environment, including reduced income for farmers and workers in agriculture, increases in input prices , rising unemployment and immigration, the decline agricultural land prices, rising food prices, reduction of variation and waste vegetation, soil degradation, loss of plant genetic resources during the short period of vegetative growth [39].

Ebrahimi, H. (1380), in studying the effects of environmental, social and economic solutions to deal with the drought and the nomadic population of Iran, some of the most important effects of drought puts it this way: the reduction of surface and ground water resources in the winter and countryside, dry wells, springs and canals, reducing the diversity of vegetation in winter pastures, soil erosion and desertification, rising Khshby plants in pastures, reduced water quality (environmental impact), lower income from livestock and dairy increased

costs of production and consumption, rising input prices, rising debt-to-government organizations(40).

H. King (1381), in research as an estimate of the economic costs of air pollution in the city, due to the devaluation of residential air pollution is studied. In this study, the total damage to homes in the city in exchange for a percentage increase in aerosols is estimated that annually about 221 billion dollars [41].

Dedicated and colleagues ( 1383 ), the study of wind erosion, fancies and damage in the area Yazd - ardakan achieved these results in some loss of vision in the stormy days of the plain, less than 6 m Apparently, a vehicle accident on the road to Yazd - duck has to be some Halts flying aircraft . Various estimates of wind erosion and storm damage, Ghbarza in Yazd , show that year totaled 6/54 million dollars to environmental and economic resources Yazd be damages . If the correct management of this process is not applied, the damage has grown exponentially in the coming years we will face (42). President of the Poor (1387), the statistical analysis and synoptic phenomena dust in the province, says the cause of the phenomenon is dust: reduction of annual rainfall, global warming due to increasing greenhouse gases and drying wetlands [43].

Najim et al (1388) study on the physical and chemical composition of the dust input to the western provinces of the country show that adverse effects on the respiratory tract and lung dust and human health are generally [44].

Darvish (1391), in research as the dust of geographical reality to man-made disaster, Suggest that the effects of dust contamination, increased consumption of water, electricity and other energy reduction performance of crops, horticulture , livestock, poultry and fish, increasing plant and animal diseases caused by pests such as flooding. ticks, increased losses of livestock, poultry and fish, increased production costs, increase administrative closure of schools, threatening the health of farmers, agriculture professionals, immigration, manpower, lack of foreign investment, reduced storage life of products, increased fruit falling to 12 percent, reducing the quality and shelf life of machinery, climate change, 35% and 5% damage products apiary losses to the aquaculture production of 120 metric tons [45].

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## REFERENCES

- [1] K, Nadafi. *Air Pollution (its Origin and Control)*. Nas Scientific Institute. Inc, Tehran, Iran, 2010, [Persian], 2010.
- [2] H, Savari. *Liability theory and practice of support letters*. Journal of Law and Politics, 1390. Year 13 (No. 32).
- [3] S. T, Englestadter. R, Washington. *North African Dust Emissions and Transport*. Earth-Science Reviews, 2006. 79 (1-2).
- [4] J. S, Xuan. J, Hao. F, Mao. G, Yang. *Identification and Characterization of Sources of Atmospheric Mineral Dust in East Asia*. Atmospheric Environment, 2004. 38(36).
- [5] E, Dehghanpor. *Statistic and synoptic dust storms in the central plateau of Iran, between the years 1990-2000*. Resale climatology, Tarbiat Moallem University, 1374.
- [6] H, Bahiraie. *Synoptic analysis of dust phenomena in Ilam province*. Journal-New research approaches in human geography, 1390. Year 4 (No.1).
- [7] GH, Abdinejad. *Description of the occurrence of the phenomenon of harmful effects of dust and how to control it*. Monthly news, analysis, research, Chlorophyll, 1389. Year 5 (No. 43).
- [8] H, Zolfaghari. *Synoptic analysis of dust systems in West Iran*. Journal of Geography and Development, 1384. (No. 6).
- [9] F, Riahi. *Regional flood analysis within the Karun, Dez, Maroon (surgery) and Venus (Hendijan)*. Tehran: MS Thesis, 1375.
- [10] A, Jafarpor. *Climatology*. Tehran: Payam Noor University Press, 1385.
- [11] D, Mehrshahi. *Changes in natural conditions at the end of Yazd Desert ARDEKAN quarter*. Journal of Geographical Research, Mashhad, 1382. No. 68.
- [12] N, Hemmati. *Frequency of occurrence of dust storms in Central and South-West regions of the country*. MA thesis, Department of Geography, Department of Geophysics, Tehran University, 1374.
- [13] T, Tavosi. *Synoptic analysis system Dust in Khuzestan province*. Journal of Geography and Development, 1389. No. 20.
- [14] F.K, You. D, Rong. *The Causative Factors and Forecasting of the Black Storm in Hexi Corridor*. Journal of Meteorology, 1994. 20(12).
- [15] E, Shahsavani. *Dust storms effects on health and the environment*. North Khorasan University of Medical Sciences, 1389. Volume 2 (Number 4).
- [16] , G.A.P, McTainsh. *Dust and Related Phenomena Measured from Meteorological Records in Australia*. Earth Surf Process Landforms, 1987. 12: p. 415-424.
- [17] S , Englestadler. *Dust Storm Frequencies and their Relationship to Land Surface Conditions*. Fridrich-Schiller University, Jena, 2001.
- [18] A.F.a, Fadahi. *Ating Desertification in Iraq. Desestification Control Bulletin*. 2001.
- [19] I, Noy. *The Macroeconomic Costs of Natural Disaster*. Preliminary Text, Department of Economic, University of Hawaii, 2006.
- [20] S, Marjani. *Synoptic Survey of the strong winds of more than 15 meters per second (storm) in Khorasan*. MA thesis. Department of Geography, Department of Geophysics, Tehran University, 1372.
- [21] M, Salari. *Plan review and identification of air contaminants*. Environmental Protection Agency, 1375.
- [22] W. D. Doyle, "Magnetization reversal in films with biaxial anisotropy," in 1987 Proc. INTERMAG Conf., pp. 2.2-1-2.2-6.
- [23] P. Kardovani. *Iran Drought and ways to deal with it*. Tehran: Tehran University Press, 1380. Printing.
- [24] M, Hasanjani. *The estimated economic damage of air in the city*. Ph.D. Dissertation, University of Isfahan, 1381.
- [25] K, Nadafi. *Air pollution and health effects and environmental emphasizing Dust it*. Twelfth National Conference on Environmental Health martyrs Beheshti University of Medical Sciences, School of Public Health, 1388.
- [26] P.M, Schlesinger. I, Grishkan. *Transport of Microorganisms to Israel during Saharan Dust Events*. Aerobiologia, 2006. 22(4).
- [27] M, Jamali. *Dust storms forecast method of Artificial Neural Networks (Case Study: City of Zabol)*. Journal - Range and Desert Research, Iran, 1389. Volume 17 (No. 2).
- [28] G, Lin. *Dust Bowl in the 1930 and Sand Storm in 1999 in the USA, Global Alarm: Dust and Sand Storms from the Word Drylands*. United Nations, 2002.
- [29] V, Ebadat. *Dust Explosion Hazard Assessment*. J. Loss Prevent, 2010. Proc. 23(6).
- [30] R, Sabori. *Determine the effectiveness of river basin water quality parameters in conditions of dust occurrence in the prediction model (Case study: Ahvaz urban schools)*. Journal of wetlands - Islamic Azad University, Iran, 1390. Year 2 (No. 7).
- [31] M, Haidari. *Everything is provided for the overflow of dust*. Available on the website: <http://hamshahrionline.ir/details/132671>, 1390.
- [32] S, Hasani. *Iran's Arabic Dusts shadow of death over the trees*. Livestock, agro-industry, 1390.
- [33] A.E, Al-Hurban. *Textural Characteristics of Dust Fallout and Potential Effect on Public Health in Kuwait City and Suburbs*. Environmental geology, 2010. 60(1).
- [34] V.K, Smith. *Can Markets Value Air Ouality? A Meta-analysis of Hedonic Property Value Models*. Journal of Political Econimy, 1995. 103(1).
- [35] P.a, Williams. *How Much Dose Wind Erosion Cost the People of South Australia*. Policy and Economic Reserch Unit CSIRO Land and Water, 1999.
- [36] A.e, Miri. *Agricultural Land Degradation and Intensity Wind Erosion (Case Study in Sistan Region, Iran)*. International Conferece on Land Degradation, Valenzano, Bari, Italy, 2008.
- [37] A.C, Achudume. *Effects of Dust Storm on Health in the Nigerian*. Environment Biology and Medicine, 2009. Vol. 1(4).
- [38] A, Delpisheh. *Dust Phenomenon and Health*. Clinical Epidemiology, Ilam University of Medical Sciences, 2010.
- [39] M, Nasaji. *Effects of economic, environmental and social drought. Proceedings of the First National Conference on Water Crisis, Zabol University, 1380*. Volume I: p. 44-53.
- [40] A, Ebrahimi. *Effects of environmental, social and economic strategies to cope with drought and the Iranian tribes. Proceedings of the First National Conference on Water Crisis, Zabol University, 1380*. Volume I: p. 24-39.
- [41] M, Hasanjani. *The estimated economic damage of air in the city*. Ph.D. Dissertation, University of Isfahan, 1381.
- [42] M, Ekhtesasi. *Check morphometry and wind erosion faces Yazd - Ardakan and determine parameters for use in model evaluation process of desertification*. Resale climatology, Tarbiat Moallem University, 1383.
- [43] K, Raespor. *Synoptic analysis of dust phenomena in Khuzestan province*. MA thesis, Department of Geography, University of Sistan and Baluchistan, 1387.
- [44] E, Najimi. *Qom drowns in the dust*. DOE Office of Qom, 1389.
- [45] M, Darvishi. *Qom drowns in the dust*. DOE Office of Qom, 1389.