

Depression Contributes to the Global Warming

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Abstract

The globe faces a serious threat coming from the increase in greenhouse gases (GHG) and the damage caused by it. As emissions depend on the performance and efficiency of manufacturing companies as well as on individual lifestyles, the performance of each individual should be taken into consideration. Herein, the susceptibility to the global emission rate can be linked to a mental state of the population. Therefore, an increasing trend in depressive disorders among individuals was shown. It was described the mental state of individuals can affect their decision-making and performance in resource management, including material handling, inventory control, finance, and losses in time and energy. Secondly, major industrial accidents caused by human error, fatigue, and losses of concentration coming from the mental state were shown. Additionally, the way depression affects individuals in terms of consumption of certain products, indifference to an economy of utilities, and how it might lead to compulsive buying was also described. The results of this study can help to highlight growing problem worldwide, so that better studies supported by private sector as well as a government could be done. Consequently, the risk of unanticipated growth in emissions and environmental damage can be prevented.

Keywords: Depression • GHG • Environment • Human error • industry • Mental health • Emission

Introduction

The Depressive disorder has become one of the most prevalent issues globally in the workplace. According to World Health Organization, over 300 million people are suffering from depression in the globe. Meanwhile, at least 800 thousand people commit suicide annually [1]. Since individuals play a role in the economy and global changes, it is worth analyzing the scope and depth of depression. According to the report of Abuse and Mental Health Services Administration, 7 percent of employees experienced major depressive period (Major Depressive Disorder (MDD)) in 2006 [2]. Therefore, depression has an influence on socioeconomic burdens at organizational as well as individual levels. Since the chronic course of depressive disorders and an early age of onset, it is found to have a huge impact on productivity in the workplace [3]. Even if there are myriad studies that document the reasons and consequences of MDD in the workplace, there are still issues related to screening and tackling them as well as in the community. This is particularly imperative since the workforce exhibits limitations in their performance, absences, job loss, and early retirement [4]. According to data in the last decade, clinical depression in 55 industries had a range of 6.9%-16.2%, with the highest indications witnessed in national public services [5]. This can also be bound to the fact of an increasingly sedentary lifestyle and low physical activity. Several international organizations started to recognize it as a global condition that can cause severe suffering in the workplace as well. Sequentially, a person is less likely to treat it or control their performance at work.

Case Study

The main aim of this study is to highlight the main reasons for global warming coming from low efficiency in workplaces found in all sectors.

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Since the efficiency rate in the workplace can be altered not only by stress level and psychological states of employees but also by decision-making practices, it should be considered as one of the priorities. That is to say, low efficiency leads to slower processes, inadequate resource management, energy utilization, emission savings, and downtime that can be described in detail. These factors contribute to higher emission rates, carbon footprint, unsustainable operation, and therefore boost global warming [6-9] (Figure 1).

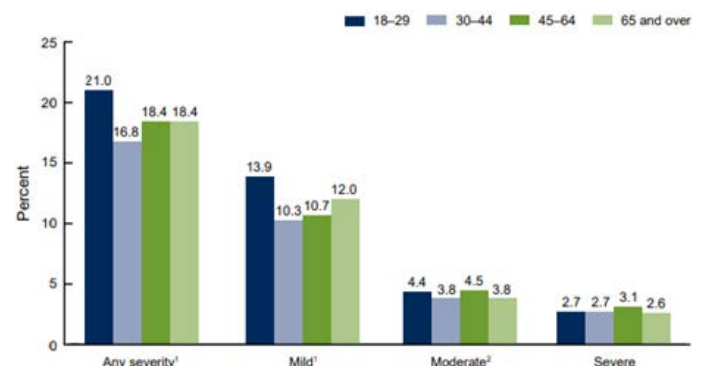


Figure 1. Percentage of individuals aged 18 and over with depression symptoms in 2019, United States

Apart from efficiency, industrial accidents brought about by human errors are caused mainly by improper design or fatigue [10]. Incidents may happen in all parts of the globe where production is carried out with further development. These processes involve the utilization of hazardous raw materials, products, as well as dangerous gases. Historically, many industrial incidents are followed by air, soil, water contamination, or human loss [11]. As many industrial accidents are caused by inadequate plant design, poor training, fatigue, lack of coordination, and reaction time, it is useful to find the root causes of these root causes [12]. Also, it is found that most of the incidents are more likely to happen at the beginning of the week [12]. This is underpinned by the fact of higher depression levels, compared to weekends [13]. To tackle the issue, certain concepts for optimality, irreversibility, and safe limits are going to be described, by highlighting and mitigating root causes as well as impacts.

Inability to go “green” under depression study design

Considering tremendous changes in industry and the level of pollution, going “green” has become vital for certain sectors. As not only the ecosystem

but also the population is affected by growing damage to the environment, several studies for reducing damage and costs have been carried out. A study by Abu-Elsamen and AL Dmour (2011) identified environmental, social responsibilities, and managerial attitudes towards green marketing as the main antecedents [14]. Other studies show that the main driver comes from moral obligation or governmental regulation with pressure, motivated by the rise in GHG [15]. At the same time, it is known that Environmental Management System (EMS) is affected by the same factors and other factors, such as competitive advantage as well as consumer pressure [16,17]. Therefore, it is concluded that there is an interconnection between sustainable development goals 7, 12, 13, 14, and 15 and the mental health of people [18]. This is due to the fact that the progress is hardly achievable, provided no improvements in mental health are present. For this reason, there are suggestions to integrate mental health into a part of SDG or ensure that there are programs that promote SDG with enough prevention of mental illnesses as well as their impact on socioeconomic indexes [19].

Meanwhile, as fatigue affects human performance, it also contributes to mental illness which is found to exist comorbidly [20]. EMS being affected by this fails to give expected results as well as solutions. It was found that the enterprises implementing EMS present higher efficiency and better performance [21]. Yet, affected EMS and workplace performance lead to failures in eco-efficiency.

Review of demographic data

Throughout the years, the number of individuals suffering from depression increases rapidly. This leads to the need for analysis of its causes depending on various factors, including age, nationality, geographical location, and sex. The most flexible for companies is an age since it is more flexible to assign professionals from different age groups rather than hiring individuals from other nationalities. Thereby, by taking a look at the distribution of depression at different levels according to age groups, it is possible to make conclusions. According to the National Center for Health Statistics of the U.S. (2019), people between the ages of 45-64 and over 65 suffer from moderate and severe depression more than people under 44 ($p < 0.05$) [22]. Also, it was found that women are less prone to MDD. Yet, what stands out from Figure 1 is that the percentages for all severity indications represent the high level of observed symptoms in total. Moving on to European countries, similar data given in the Table 1 shows that individuals aged over 44 experience MDD more than the other group of people in 27 European countries (Figure 2).

Table 1. Severty of depressive symptoms by age groups in 27 European states (Source of data: Eurostat, 2019)

Level Age	Moderate	Mild	Severe	Moderately Severe
25-34	4.2	14.2	0.5	1.2
35-44	3.2	12.8	0.5	1.3
45-54	4.2	13.6	0.7	1.6
45-64	4.1	14.3	0.7	1.7

Moreover, there are thousands of individuals hiding or being unaware of their mental health condition and do not get treatment [23,24]. Thus, the data given in Table 1, cannot be precise to describe the whole population. However, it is possible to use this data to link it with the fact that middle-aged people occupy most of the managerial positions in enterprises (Figure 3). Hence, the main decision-making processes are executed by the people who are the most susceptible to MDD and therefore have a higher risk to make changes that would lead damage. Similarly, what stands out from Table 2, is that middle-aged people with higher education who are more likely to hold managerial positions are prone to depressive symptoms, which should be considered.

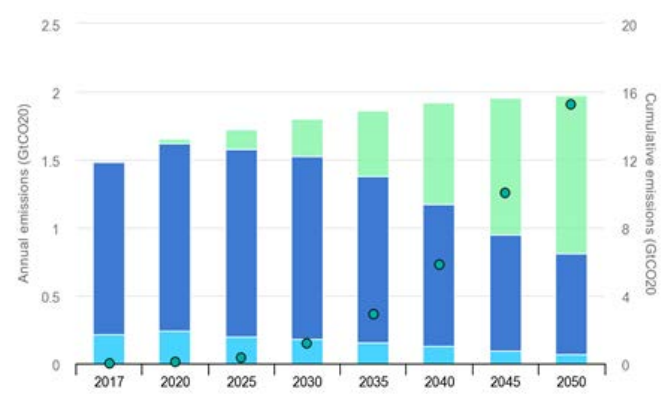


Figure 2. Annual emissions from Process (Turquoise bar), Energy (Blue bar), and Additional Emissions



Figure 3. Distribution of the number of people in managerial positions according to their ages

Resource and waste management

A range of environmental damages is being observed throughout the life cycle of materials used, including their extraction, preprocessing, transportation, treatment, use, and disposal. Contemporaneous emissions of GHGs into the atmosphere are also being observed in all main stages of the life cycle of materials. With a growing demand in petrochemical, cement, iron, copper, and other material products, projected impacts linked to their utilization will rise dramatically. To tackle this issue, G20 countries have commenced to develop new strategies for the application of circular economy practices, resource productivity, as well as their sustainable use [25]. According to the report given by IEA, it is clear that better resource management practices are going to be implemented, and it is anticipated that production processes are also believed to be more sustainable. Yet, the total impact will rise and meanwhile, the environmental impact caused by the use of materials in all stages will increase substantially not only due to the increase in the volume of materials but also due to the changes already occurring from the use of single unit [26]. This means that the overall process of tackling the impact will become susceptible to the application of new strategies or procedures. Considering minor mistakes and unwillingness to fulfill procedures on time can put the company, its reputation, materials, and the safety of personnel at risk. In addition, periodic anxiety and chronic depression lead to the release of adrenalin during decision-making, and the body initiates dealing with “threat”, thereby leading to consequences in the workplace [27]. Herein, the relationship between mental health, resources, and environmental impact becomes clear. Therefore, specialists in supply chain and process optimization fail to address Just-In-Time inventory management and overall material flow, leading to higher energy consumption and use of transportation [28,29].

Table 2. Depressive symptoms of people according to the education level

Depressive symptoms-2019																									
Upper-secondary and Post-secondary education																									
Age groups	EU (22)	DE	DK	FR	ES	IE	SI	GR	HR	IT	HU	CZ	BE	BG	NL	AT	PL	PT	RO	SK	FI	SE	IS	NO	TR
25-34	6.5	12.5	14.1	11.5	2.4	6.3	6.8	2	1.5	2.4	3.6	1.5	6	1.3	8.3	3.7	2.3	3	0.6	2.3	11.2	16.7	10.3	5.9	4.5
35-44	5.3	3.5	9	4.5	2.5	9.8	2.8	7.4	1.4	8.5	5.3	3.1	3.8	7.2	5	2.1	6.3	2.1	6.2	2.6	8.8	9.8	11.6	10	6.5
45-54	7.1	7	3	2.3	3.7	9	12	5.8	5.5	12.1	4.5	4	13.6	8.3	5.9	4	7.3	2.2	9.4	3.2	8.8	12.6	8.2	5.5	8.1
55-64	6.4	4.8	5	2.8	6	8.1	7.1	3.9	5.1	7.5	7.1	7.2	7.3	7.5	4.9	5.5	4.5	4.2	5.7	3.4	3.9	7.9	7	6.1	5.4
65+	7.2	4.7	8.8	3.3	6.8	11.8	6	3	6.3	8.1	9.2	6	8.7	7	6.9	9.6	3.5	8.3	10.2	4.9	2.3	6	6.9	4.9	5.2
Tertiary education																									
25-34	4.4	5.3	6.6	7.5	2.3	5	5.3	0.8	0.6	2.1	5	2.4	5.7	1.6	6.4	3.6	2	3.1	0	0	5.2	11.2	5.8	3.1	4
35-44	3.9	4.1	6	6.9	2.4	2.5	4.3	0.4	3.6	1.2	2.2	1.8	7.9	0.3	7.2	2.9	2.2	3.8	0.3	0.5	3.7	10.9	3.2	2.6	3.4
45-54	4.6	4.6	4.3	7.8	2.9	1.6	4.8	1.1	4.2	3.4	2.1	0	6.6	2.4	4.1	5.4	5.9	4.5	0.8	2	5.2	5.3	3.1	3.6	3.5
55-64	5.9	2.1	6.5	7.3	4.3	5.8	4.1	2.7	4.2	8	5.3	5.7	1.6	3.8	2.5	3.4	6.2	3.3	1.1	7.8	6.3	3	1.3	3.2	5
65+	5.7	5.6	3	8.4	3.8	3.6	6.9	2.3	13.5	3.7	3.6	3.6	3.9	8.2	5	2.8	8.1	6.1	9.8	4.6	1.2	4.5	4.3	2.5	4.4

Moreover, depression has been correlated with financial losses in companies. So that the estimations in the United States were made between \$ 36.6 and \$ 51.5 billion each year [30]. This is due to the loss of performance of employees brought about by the emerging depression which presents much more frequent absences. Financial losses can be helpful to estimate the damage to the environment, thus GHG emissions can be withdrawn as well.

Industrial accidents

Manufacturing industries require human machine interactions, although most of the processes are automatized. For this reason, prevalent machine failures come from human errors. Previous industrial accidents leading to huge human losses, environmental damage (including the massive release of GHG), near misses, financial loss, and damage to reputation are considered as experiences to mitigate other possible consequences. As it is known that the highest rate of industrial accidents occurs during the shift time of workers, it can be concluded that the main reason is human error [31,32]. According to Niles (1998), depression, anxiety, fatigue, and challenges in personal life are the main reason for human errors [33]. For instance, industrial accidents in BP Texas City, where fatigue and incompetence led to an explosion, Three Mile Island (TMI), where the main cause was human error, Johor, Malaysia, where millions of dollars were lost due to operator failure, Bhopal, with the root cause of an unsatisfied employee, and Piper Alpha, with 12 hour shift as well as inappropriate shift change time, and lack of experience can be presented [34-36]. Nowadays, there is a demand to uncover the extent of the relationship between fatigue and human error in manufacturing. Human error as well as its awareness and knowledge are significant to mitigate or eliminate possible accidents. This will improve the workplace, ergonomics, and resources in return, thereby increasing productivity [37]. Workplace and ergonomics play a significant role as there are several studies such as the study by Parimalam et al. (2006), S. Kvarnström (1997), and J. Knisley (2005), where workers complained of low safety margins and headaches coming from noises, lack of light, and equipment, as they lead to poor performance and therefore human errors [35-37].

Moreover, manufacturing enterprises hold one of the most prevalent positions among industries with depressed employees (14.5%, 95% CL) [38]. This comes from studies in the aircraft industry, medical, mining, and nuclear power industries, where the manufacturing industry showed the highest total costs for accidents [39]. The reason for this may lie in shifts, planning management, stress, repetition, overtime performance, and mental strain [40]. According to CCOHS Performance Report (2005), half of 5000 employees in manufacturing enterprises face stress a few times every

week. Meanwhile, as an addition to the review of demographic data, men, who remain the dominant sex in the manufacturing industry experience more pressure from society for a need to be more masculine, to control emotions, and to stay strong. As a result, this leads to a large number of remaining undiagnosed cases amongst them. This leads to more examinations for females than males, and therefore to scarcity in data [41].

Growing consumerism alongside depressive disorders

Over the century breakthroughs in science and technology led to the improvement in life quality of people. Throughout the years, life satisfaction was found in mainly in traveling, investments in textile, automotive industries, real estate, and food consumption. Since carbon footprint of individuals has risen dramatically, it is suggested to alter consumption patterns. These new routes have been defined as anti-consumption, downshifting and voluntary simplicity [42-44]. The latter one is considered the optimal one owing to the voluntary basis of restriction for purchasing a product. However, emerging limitations in consumption can and will drive people to return back over time, since motivational factors and habits play a significant role [45]. Meanwhile, people suffering from depressive disorders tend to buy new products, eat, travel more, and consume more energy inefficient devices to get satisfaction, due to Compulsive Buying. This was found when a group of individuals with and without depression was tested, where the primary group showed less consumption of fruits and vegetables, but a higher amount of processed food [46]. Regarding other products, compulsive buying has been found more linked with people suffering from depression [47]. Other studies also found that there is a direct link between high consumption rates and depression [48,49]. According to Eurostat, household consumption has increased significantly within the last three years, comprising 15.5% of higher expenditures in the tourism sector in 2021 compared to 2020, which is similar to previous years [50]. Similarly, people tend to neglect the economic use of utilities while being depressed, which also leads to high emission rates.

Discussion

The main objective of this study was to clarify how the impact of mental disorders, particularly depression can lead to various problems. Amongst listed, environmental damage and increasing greenhouse gases were highlighted. Direct as well as indirect causes of depression were shown in companies, particularly manufacturing enterprises, in the management of resources, finance, and waste which have a very high relation with emissions, and individual lifestyle. Considering studies carried out for the relationship of depression with financial loss, performance, and human errors which used various demographic data and surveys it is possible to

derive an equation showing the relation. Yet, it is hard to conduct a survey of the mental state of employees and relate it with performance as well as emission rates of an individual company for conflicts of interest.

Conclusion

Therefore, in the future, it is suggested to consider the emerging problem on a higher level to include more data and study better. Factors, such as conflicts at workplaces and households should be taken into account, to get more precise results. These factors of potential impact or sub-variables should be added to increase the sample size. Similarly, it was shown that people with higher education are more prone to depressive disorders, being in higher managerial positions and responsible for decisive processes. This will be helpful for further predictions which will prevent possible accidents and losses for the companies. Meanwhile, it is important to evaluate the mental state of every individual working in the companies to reduce risks. Elimination or reduction of potential damage can be done via a better work-life balance setting, reduction of work time, psychological support, and obligatory extracurricular activities.

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