

Assessing the Impacts of Changes in the Currency Exchange Rate on Air Pollution in Tehran: A Sectoral Review

Hamed Goharipour and Seyyed Soroosh Firoozabadi

ABSTRACT

The 2022 winter was the most polluted season of Tehran in the past five years. Tehran is rated as one of the world's most polluted cities in World Air Quality Index (AQI) Ranking. Air pollution in Iran's big cities is the consequence of several economic, technological, management, and socio-cultural factors. But how important is the currency exchange rate? Since the Iranian revolution in 1979, the country has been subjected to sanctions imposed by a varied of international entities, namely the United States. The economic and political consequences of the exchange rate have so far been the central topics of interest to researchers, journalists, and officials. Although multiple factors affect the level of air pollution in cities, this study narrows down its focus on the 2018-2020 period, during which changing in Dollar to Rial have burdened environmental strategies in Iran. National and public entities do not officially reveal the trade volume between Iran and the international community, importing and exporting transactions, and foreign and domestic investments. Therefore, this descriptive-analytical paper examines the experts' and official debate over the topic in the major national and international newspapers, news agencies, and interviews. Findings reveal political debate and economic consequences, namely a decrease in the Iranian Rial exchange rate against the U.S. dollar, have had undeniable impacts on the national and local actions related to five key areas of public transit, motorcycles, automobiles, petrol, and refineries and power plants, which are five significant pollution factors in Tehran.

Keywords: Air pollution, Currency Exchange Rate, Tehran.

Submitted: April 21, 2022

Published: May 24, 2022

ISSN: 2507-1076

DOI: 10.24018/ejbmr.2022.7.3.1411

H. Goharipour

Department of Urban Studies, The College of Wooster, USA.

(e-mail: hgoharipour@wooster.edu)

S. S. Firoozabadi*

Financial Engineering Group, Industrial and Systems Engineering Faculty, Tarbiat Modares University, Iran.

(e-mail: Soroosh_f@live.com)

**Corresponding Author*

I. INTRODUCTION

Economic sanctions are commercial and financial penalties applied by one or more countries against a targeted state (Lin, 2016). They are not necessarily imposed because of economic circumstances; they may also be imposed for a variety of political, military, and social issues (Lee, 2018). Sanctions are indeed political tools aimed at isolating and hurting the target country's economy, forcing it to change policy (Soroush & Madani, 2014). Since the Iranian revolution in 1979, the government has been subjected to sanctions imposed by many international entities, namely the United States. The stakes rose after 2006 when the U.S. unilaterally imposed sanctions replaced by multilateral sanctions imposed by the U.N. Security Council and European countries. After 2010, the E.U. first demoted business with Iran, then expanded it to invest in Iran's energy sector.

One of the critical consequences of sanctions is changes in the currency exchange rate, and it has been the central topic of interest to researchers, journalists, and officials. Although the economic and political effects of U.S. sanctions have been widely discussed, little has been said about the myriad challenges they pose to the already deteriorating environment in Iranian cities. Although the rate of sustainability could be studied in different districts (Khademi *et al.*, 2019) air quality plays an essential role in residents' health and satisfaction

(Goharipour *et al.*, 2011) the change in the exchange rate has proved that both the international parties and the target country have failed to consider the environmental implications.

Researchers at the Center for Environmental Policy at Imperial College London acknowledge that sanctions do not independently cause environmental degradation in a targeted nation. Still, the secondary impacts of sanctions can inadvertently act as "catalysts" that lead to environmental issues (Mehdi, 2019). Rocky Ansari, an economist at Cyrus Omron International, a firm that advises international companies on investing in Iran, claims that "Changing exchange rate comes from sanctions significantly contributed to pollution, and particularly the kinds of pollution that are damaging to health" (Time, 2014) and health status can predict like the ordered-logistic regression model (Anaman, 2019; Amirdadi *et al.*, 2021). According to the World Health Organization (WHO), more than three million people die each year due to breathing in urban spaces (Etemad, 2017), and Tehran is one of the world's most polluted cities. Focusing on the available data, including the number of polluted days before and after the sanctions, the changing value of the Iranian rial against the U.S. dollar, and the impacts of these changes on the most significant polluting sectors of the economy and transportation, this study does a review of the overlooked relationship between Dollar to Rial

exchange rate and air quality in Tehran in order to open up conversations about non-political consequences on ordinary residents and their future generations.

II. METHODOLOGY

Assuming the persistence of cultural, social, and administrative factors in Tehran before and after the U.S. withdrawal from JCPOA, this paper aims at reviewing the impact of changes in the currency exchange rate on Tehran's air quality. In other words, while we acknowledge that multiple factors affect the level of air pollution in cities, this study narrows down its focus on the Rial depreciation, during which sanctions put a heavy burden on environmental strategies in Iran. Although numbers and statistical trends provide an analytical basis for reviewing the impacts of this change, the qualitative approach better represents this paper's methodology. The research method is descriptive. We explore and describe the relationship between different dimensions of a fall in the ratio of Rial to Dollar and various polluting sectors. First, we explain the negative impact of the exchange rate on Tehran's air quality as a hypothetical consequence of sanctions after 2017. Then, using the City of Tehran's Proposed Plan for Reducing Tehran's Air Pollution (2017), we focus on five significant sources of air pollution in Tehran to develop the above hypothesis and explore how the falling Rial value, restriction of exports and imports, and other sanctions-related limitations have contributed to the increasing air pollution rate in Tehran. Since some direct and indirect impacts of sanctions, including the trade volume between Iran and the international community after the U.S. withdrawal from JCPOA, is not officially revealed due to political and security reasons, we use the arguments made by environmental experts and officials to interpret how this change have made obstacles to various ecological strategies and policies on different levels.

III. RESULTS

The first wave of recent international multilateral sanctions in response to the Islamic Republic's nuclear program was imposed on the country after 2010, when the EU joined the United States and, first, demoted business with Iran, then expanded it to the investment in Iran's energy sector. Fig. 1 depicts how air pollution in Tehran increased dramatically after 2010 when the Rial-Dollar ratio fell over time.

Iran and the UN Security Council's five permanent members; namely China, France, Russia, the United Kingdom, and the United States, plus Germany (The P5+1), started negotiations over both sides' concerns in 2011 which led to a relatively calmer psychological climate in the Iranian society and the foreign exchange market. This optimistic step resulted in a somewhat better, or at least more stable, life condition in Tehran, represented in the increasing number of clean days in Tehran. Again, we acknowledge that multiple factors affect the environmental quality of Iranian cities. However, our explanations and interpretations in the next section of the paper show how the market climate plays a crucial role in affecting economic and governance players' capabilities to improve the environmental quality of life. The

hopeful and positive trend flourished in 2013 when Iranians gave power to a new government whose economic plans were based solely on negotiation and agreement with international actors.

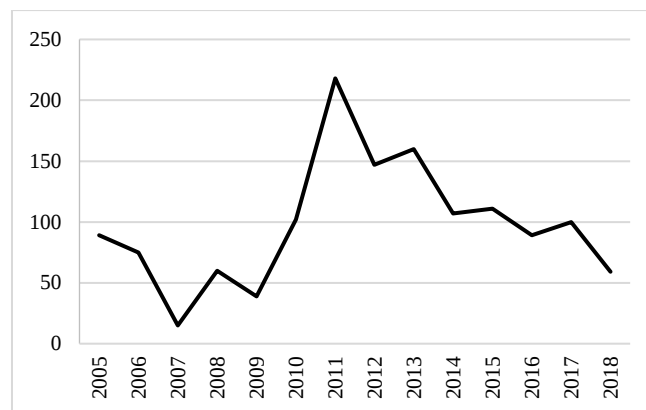


Fig. 1. Number of days with AQI greater than 100 in Tehran, from 2005 to 2018 (Tehran Air Quality Control Company, 2018; Malekloo, 2018; IRNA, 2019a).

After the Joint Comprehensive Plan of Action (JCPOA) agreement in 2015, known commonly as the Iran nuclear deal or Iran deal, the international community pledged to improve trade relations and unfreeze \$100 billion in frozen assets and ease financial obstacles with Iran (Hakim, 2019). Therefore, many experts and officials hoped that lifting sanctions would significantly impact the decreasing trend of air pollution levels (IRNA, 2016) that had begun after the election of the new government in 2013. Hassan Rouhani, President of the Islamic Republic of Iran, explicitly claimed in 2015 that "sanctions must be lifted in order to raise capital and solve the issues related to the environment, employment, industry, etc." Emphasizing air pollution, Former Iranian Vice President and Head of the Department of Environment Masoumeh Ebtekar argued that Iran had experienced a difficult time due to sanctions and deprivation of access to new technologies in the fields of environment and green technology (Aftab News Agency, 2015). "More than 60 percent of the air quality crisis will be solved if the government invests in it in the post-sanctions era" (Shafaqna, 2016), said Esmail Kahrom, the advisor of the Iranian Department of Environment. Increasing the production of high-quality cars under Euro 4 fuel standards, expanding the production and use of electric-motorcycles, forcing factories to install air pollution filters, developing green spaces, and improving public transit modes such as subways were examples of environmental investments that Kahrom argued.

All these changed On May 8, 2018. President Trump signed a Presidential Memorandum requiring the reinstatement of the tougher sanctions after the US formally withdrew from the deal. Although the culture of consumption, urban form, environmental policies, urban development patterns, temperature, etc., are all influential factors affecting the quality of air in cities, a comparison of air pollution levels between 2018 and 2019 clearly shows the significant impact of sanctions. The dean of the modeling department of Tehran Air Quality Control Company (AQCC) claims that 2019 was more polluted than 2018 (Tasnim News Agency, 2019). Eighty-five days of unhealthy

($151 < \text{AQI} < 200$) and unhealthy for sensitive groups ($101 < \text{AQI} < 150$) in 2019 compared to 0 days of unhealthy and 59 days of unhealthy for sensitive groups in 2018 (Mashregh, 2020) confirms that, in 2019, Tehran experienced fewer days of clean and healthy air than in 2018 (PANA, 2019). In 2018, schools were shut down for only one day due to air pollution. They even don't utilize the student insurance and their satisfaction model to assess students' willingness (Anaman, 2018). They were closed 12 days in 2019 (YJC, 2019). Similarly, Isfahan, Iran's other metropolitan area, had 101 days of hazardous, unhealthy, and unhealthy for sensitive groups in 2019, compared to 46 days in 2018. Fig. 2 clearly shows an increase in the number of days with AQI greater than 100 in Tehran, Isfahan, and Mashhad in 2019.

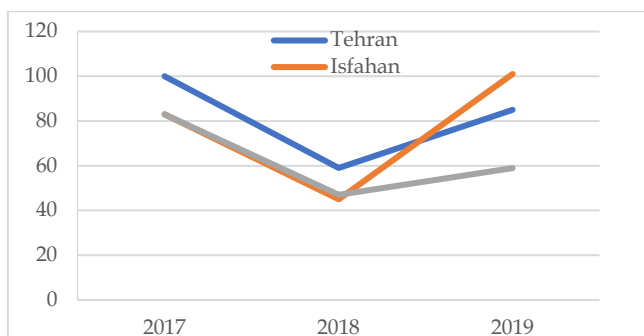


Fig. 2. Number of days with AQI greater than 100 in Tehran, Isfahan, and Mashhad, from 2017 to 2019 (IRNA, 2019a; IRNA, 2019b; IMNA, 2020; IRNA, 2020).

According to the World Bank, most of the pollution in Tehran is caused by heavy-duty vehicles, motorbikes, refineries, and power plants (Press TV, 2019). The Clean Air Law, constituting 35 articles, has been drawn up by the Department of Environment as an integrated approach to curb air pollution was passed by the parliament on July 16, 2017. The law singles out inefficient vehicles, substandard fuels, industrial activities, and dust storms as the significant sources of air pollution in the country and tasks various organizations with specific actions in line with the objective (Tehran Times, 2019). Here we conduct a review of the impacts that changes in currency exchange rate have had on the government and local actions within each of the mentioned categories.

IV. DISCUSSION

Even though there are one-sided and two-sided relationships between the five significant pollution generators discussed in this paper, there are some useful numerical functions optimization which interact with each other based on the complex mathematical model (Noroozi *et al.*, 2022; Maghami *et al.*, 2019; Maghami *et al.*, 2018). There is an analysis of the morphological recognition of Takaya as a vital continuum through architectural and urban aspects. It also considers the necessity of its revival along cultural lines (Zoghi 2020). We review and interpret direct and indirect impacts of change in exchange rate on each category as a separate subsection.

A. Public Transit

Among numerous reasons behind air pollution, the transport sector, mainly buses operating on fossil fuels, is the

guiltiest party. According to news pieces quoted from various health or environmental officials, over 70 percent of pollutants in Iran's capital, Tehran, is produced by clunker buses (Qarehgozlou, 2018). There are about 25000 buses in Tehran (Eghtesad Online, 2019a). In a Press conference held on January 13, 2018, deputy environment chief Masoud Tajrishi said that some 97 percent of Tehran's buses are old. The only way to address this problem is to increase fuel quality to meet international standards and to renovate public transport (Qarehgozlou, 2018). We discuss the issue of fuel quality under a separate title. Here, we focus on renovating/replacing the buses, which needs a large budget allocation.

There is a need for a cycle of economic activities within automobile companies and car part manufacturing factories and a high rate of imports to replace this large number of buses (Eghtesad Online, 2019a). All of these require allocating financial sources that are not available to the Iran Government and municipalities due to the change in the currency exchange rate. While the value of Iran's currency (Rial) was almost stable (35,000 to 42,500 to U.S. Dollar) from 2013 to 2018, it hit the new record of 54,150 in May 2018, concurrently with the U.S. withdrawal from JCPOA. The Iranian rial had lost nearly half of its value since April of the same year in July of 2018. Because of financial difficulties at local banks and high demand for Dollars among Iranians fearful of the consequences of sanctions, 1 U.S. Dollar became equivalent to 112,000 rials. After September 2018, when the Central Bank of Iran released more dollars into the market and authorities cracked down on currency traders, the rial has recovered some of its value. However, it again lost its value, reaching a record low of 182,500 at the time of this writing (Mizan, May 2020), which is more than two years following the United States' withdrawal from a 2015 agreement. Fig. 3 illustrates the loss of the value of the rial against the dollar.

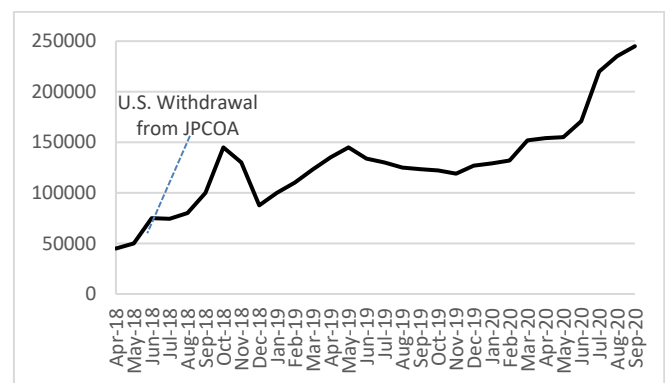


Fig. 3. The value of the Rial to the U.S. Dollar from 2018 to 2020 ((Mizan, 2019; Eghtesad Online, 2020).

Underground public transportation also plays a central role in reducing the level of air pollution in big cities. According to Nobakht, CEO of Tehran Urban & Suburban Metro Operation Company, using the Tehran subway system in the last nine months of 2018 prevented some 810,000 tons of CO₂ and 113,000 tons of PM₁₀, SO₂, NO_x, CO, and HC (ISNA, 2018). Tehran, however, is also building a more integrated subway system. The current operating lines are frequently overcrowded, making subway travel difficult, especially during rush hours. There are currently five operational

subways lines in the City of Tehran, which deliver some 2.5 million rides daily (ANA, 2019; Izadi, 2019). To minimize air pollution in Tehran, the municipality expected to increase subway ridership to 5 million per day by completing lines 6 and 7 by March 20, 2019, the end of the Iranian calendar year (Qarehgozlu, 2018), which was not implemented. While there are many criticisms of the City's approach to allocating transportation budget during the last two decades, the negative role of Rial depreciation is irrefutable. According to a city councilor, the purchase of 360 subway wagons was under negotiation before the U.S. withdrawal from JCPOA cannot be imported now due to the sanctions (Eskan, 2019). A lower number of wagons will result in a lower number of trains and longer train intervals. For instance, while during rush hour, the New York City subway schedule provides trains with every 3 to 5 minutes on the busiest sections, and 4 to 12 minutes during other traffic periods, the train interval time in Tehran is approximately 45 minutes on some routes. It means that the Tehran subway system is over-crowded and undesirable on some routes, and inefficient on others.

B. Motorcycles

Motorcycles account for 11.6 million of the country's 32.9 million motor vehicles, accounting for 35 percent of all vehicles on the road. 56 percent of motorcycles are plying the roads in only five provinces of Tehran, Khorasan Razavi, Isfahan, Fars, and Khuzestan (Tehran Times, 2020). One of Tehran's air pollution's main reasons is carburetor motorcycles which, in many Iranian cities, is a convenient choice for point-to-point trips. Each carburetor motorcycles adds 15 grams per kilometer to Tehran's air pollution, which is seven times more than a car operating on Euro 2 standards. There are about 8 million carburetor motorcycles in Tehran. Most families in Tehran use motorcycles as a livelihood. They are moving around the central business district. These vehicles are responsible for roughly 20% of Tehran's air pollution which, according to a World Bank report (Tehran Times, 2020), are the second-largest source of particulate matter (PM) in Tehran, after private cars, which outnumber them by a wide margin.

The carburetor motorcycles cannot adjust the air-fuel ratio as quickly as a fuel-injection system due to a lack of an injector; therefore, they have lower efficiency and higher emission rate. Hassani and Hosseini's (2016) survey indicates that approximately 40 percent of the fuel consumed by a 125cc motorcycle operating on a carburetor-equipped engine burns incompletely in Tehran. High emission rates could be caused by the use of a carburetor fuel supply system, a low engine compression ratio, aging, and the lack of a catalyst. About three years ago, the national working group for air pollution control, which is affiliated with the Department of Environment (DoE), suggested putting a stop to polluting carbureted-engine motorcycles. The government's cabinet approved the proposal, which went into effect as of September 2016 (Tehran Times, 2019). Although there are still around 1 million motorcycles in the capital, the legislation was intended to promote the use of fuel injection technology rather than polluting models. Still, change the value of Rial respect to U.S. Dollar has been the first obstacle (Eghtesad online, 2019a). Because of this exchange rate and sanctions on importing non-medical products, the country

imports this type of motorcycles from China, which, according to ISNA (2017), is equipped with low-quality engines. Accordingly, the high repairing costs of this type of motorcycles and the high foreign currency exchanging rate (Fig. 3) increases these motorcycles' prices and, consequently, removes them from the list of affordable vehicles.

Electric motorcycles may also be a viable alternative to gasoline-powered motorcycles in many urban areas. Switching from gas-powered to electric motorcycles will increase local air quality and reduce one of the motorcycles' most dangerous effects. While the same proposal, approved three years ago, had emphasized the manufacture of electric motorcycles, it was not widely implemented until 2020 when, finally, in collaboration with the Ministry of Industry, Mining, and Trade, Iran's Energy Minister announced that electric motorcycles will be marketed in major cities. The plan is also to transform existing motorcycles to use electricity sources. This three-year delay in implementing the proposal has many reasons, the most significant of which is the change in the currency exchange rate.

C. Automobiles

Cars, trucks, and buses powered by fossil fuels are significant contributors to air pollution. Besides other contributors, they have played a significant role in increasing the air pollution rate in Iranian cities during the past decades so that "having clean air has become an impossible dream for Iranians," Kalantari said a few months ago. He mentioned that "87% of the minibusses, 81% of the motorbikes, 73% of buses, and 61% of the trucks in Iran are dilapidated. We are living in the country of broken-down vehicles, and still expect to have clean air" (Radio Farda, 2020). While there are various reasons why and how automobiles increase air pollution, catalytic converters used in their manufacture have contributed significantly to improving air quality in cities worldwide. Although catalytic converters' installation, compared to their environmental profits, is efficient and effective, many people in low-income countries cannot afford it. Rial depreciation made it even more costly, and sometimes impossible, for the Iranian companies and automobile users, so they continue to drive cars that emit unfiltered emissions.

Carbon monoxide and nitrogen oxides emitted into the air are major pollution contributors produced by motor vehicles. The catalyst oxidizes the pollutants formed by incomplete combustion to carbon dioxide and water. Consequently, car exhaust makes up a large percent of air pollution in large cities like Tehran. Catalytic converters use a catalyst, typically an expensive metal such as platinum or palladium, to speed up chemical reactions between oxygen and contaminants in the air, converting them into less toxic by-products like water vapor, carbon dioxide, and nitrogen gas. Directing exhaust fumes through a metal housing coated with the catalyst can remove up to 98% of pollutants from them. Regulations requiring the installation of catalytic converters on cars and smokestacks have dramatically improved air quality in cities worldwide since the 1970s (Brownell, 2020). However, Iran's ability to equip new vehicles with pollution-controlling catalytic converters has been hampered by various sanctions phases. Today, the catalyst manufacturers and auto companies in Iran struggle with accessing financial and

material requirements needed to install catalytic converters on cars.

This device's role in reducing air pollution is so critical that Ehteram attributes the failure in improving air quality to the inefficiency of catalyst converters in vehicles. The device is susceptible to poor-quality fuel and might break down or lose efficiency with a single substandard fuel injection. "Euro-4 fuel is only supplied in eight metropolises, and if the driver gets the car filled up in a town along a journey, the catalyst will most likely be spoilt" (Ahmadi, 2017). Behzad Ashjaei, an official with Iran's Department of Environment, also believes that "the financial damage can be significantly curbed if people become more aware and careful about the technical conditions of their vehicles, regularly change their catalytic converters" (Financial Tribune, 2019). But the catalyst manufacturers in Iran have not received the currency they need to import their raw material. Not allocating money to this issue can have irreparable consequences. Even those automobile companies that install catalyst converters on some vehicles have significantly increased their products' price so that many people cannot afford a catalyst converter-equipped car. There are currently 3 to 4 catalyst production manufacturers in the country, which have just been established and have not been able to meet the auto companies' needs. If the production of catalysts in the country increases, there is a need to increase the demand for this product so that its production is economically viable; otherwise, catalyst manufacturers cannot expand their production level because it is not financially viable (Saipa News, 2020). Increasing the demand is not at this moment due to the change in currency exchange rate that has affected the government's financial power and weakened the financial ability of ordinary people.

It is a solution for this part that is formulated as an optimization problem that incorporates the overall costs of the electric distribution system, including reliability costs and operation costs (Kavousi-Fard *et al.*, 2021).

D. Petrol

Gasoline is a highly flammable and harmful liquid. As fuel evaporates, vapors are released. When gasoline is burned, it produces carbon monoxide, nitrogen oxides, particulate matter, and unburned hydrocarbons, all of which contribute to air pollution. Experts state that a significant part of air pollution is pollutants and incomplete combustion of fuel in cars. More than 80% of air pollution is due to the low quality of gasoline and low-quality vehicles whose engines are not regulated (Sarkheil, 2019). In addition to the role of cars discussed above, there is a need to address petrol quality and its relationship with sanctions and also changes in the currency exchange rate.

In 2010, Iran imported 40% of its consumed fuel. When President Obama introduced penalties for selling petrol to Iran and imports fell by 75%, Iran responded by developing its refining and producing the primary cause of its deadly air pollution. Reports suggest that Iran's petrol contains ten times the contaminants of imported petrol and its diesel 800 times the international standard for Sulphur (Soroush & Madani, 2014). While the JCPOA was a watershed moment in Iran's import power, the US withdrawal has exacerbated the situation. That is why opponents of the sanctions believed that

Iran's lack of refining capacity to meet domestic demand for gasoline and other important petroleum products is a major strategic threat to the nation's environmental resiliency.

Iran may have the world's fourth-largest proven petroleum reserve. The country may be brimming with crude oil. Still, it is unable to refine sufficiently raw material into refined fuels such as diesel, kerosene, or gasoline, and imports fuel from Europe. Sanctions cut off those products, drastically decreasing gasoline supplies. Government officials were forced to turn petrochemical factories into ad hoc refineries in order to keep millions of cars, trucks, and motorcycles on the road. The price of gas has been changed from 1000 Rial to 3000 Rial recently due to the exchange rate. This expensive and inefficient process produces a low-grade fuel choked with pollutants (Baker, 2014). Petrochemical plants, which normally produce plastics, have been used to make gasoline at a high health cost. The resulting fuel incorporated health-hazardous chemicals is restricted in most Western countries. Paul Sampson, an analyst at Energy Intelligence, argues that the sanctions have forced Iran to be innovative, although at the expense of air quality. "They have been putting petrochemical components like benzenes and Methyl Tertiary-Butyl Ether into the gasoline, which has increased overall supplies but reduced the quality" (Merat, 2015). As a result, Iran experienced a significant rise in air pollution, which directly contributed to poor health. According to a Bloomberg report, Iran needs about \$14 billion to upgrade five existing refineries to produce gasoline that burns more cleanly. Sanctions and changing in the currency exchange rate have highly limited the government's power to finance this mega-project (Balikhani, 2017).

According to Iran's Clean Air law, the car's pollution rate should have been improved to Euro 5 by March 2019. This is postponed to March 2020 due to the unprepared infrastructure, the lack of the production and distribution of Euro 5 gasoline, and, more importantly, Rial depreciation. This standard has not been improved yet, as of the writing of this article in Fall 2020.

E. Refineries and Power Plants

Studies carried out in 2003-2004 have indicated that mobile sources of pollution accounted for 90 percent of Tehran's air pollution, while stationary sources were responsible for 7-8 percent of air pollution (Petro Energy Information Network, 2004). The use of nonstandard mazut at Tehran Oil Refineries within an industrial complex located in the nearby town of Shahr-e Rey is a significant source of air pollution in this metropolitan area, the Tehran municipality and a member of City Council revealed 16 years later. Mazut is a low-quality fuel oil used in power plants and contains high-density sulfur. Today, there are nine refineries in Iran, one of which is located in the south of Tehran called Tehran Oil Refineries, that extract crude oil and make other oil by-products.

Mazut is a by-product of the distillation of crude oil. The heavier refuse – mazut – is used as fuel while the refined oil is exported as kerosene or petroleum. Iranian refineries have produced more than 60 million liters (approximately 15.8 million U.S. liquid gallons) of mazut per day on average, of which 35.5 million liters (roughly 9.3 million gallons) have been exported, 4.3 million liters (1.1 million gallons) used for

bunkering (vessel fuel), and the rest domestically consumed (Radio Farda, 2020). The use of mazut is strictly prohibited in urban areas around the world, especially in metropolitan areas such as Tehran, where people are suffering from air pollution. It is why the DoE head, Isa Kalantari, believes power plants and refineries are the primary sources of air pollution in the country (Radio Farda, 2020). The level of sulfur density in mazut produced in Iran is nearly 3.5 percent, seven times more than the international standard for ships, which use mazut (Jalilov, 2019). The emission factors for CO₂, NO_x, and SO₂ are 3.5, 4.2, and 119 times higher than British refineries, respectively (Karbassi *et al.*, 2008).

The refineries in Iran are aged. Most of them were built during Mohammad Reza Pahlavi's reign as Iran's last king. Exchange rate prevents them from acquiring new technology. 24 percent of their crude oil has turned into mazut, which compared with gasoline and diesel, has a very low value (Jalilov, 2019). There is a new methodology which is predict the future transportation energy (Lashgari *et al.*, 2022) could be apply for this part. The oil cannot export mazut due to US sanctions, and Iranian refineries are overflowing with heavy fuel oil. As a result, the government has been forced to use mazut for its power plants once again. Therefore, despite all the structural and managerial reasons for the power plants' unsustainable operation, one cannot ignore the destructive role of sanctions in polluting Tehran with mazut. Iran must invest 95 billion dollars in new oil refineries by 2045. Due to the sanctions, the country is now struggling with the lack of budget for overcoming various air pollution sources in big cities. The U.S. has also managed to limit, if not outright block, environmental financial assistance from major international organizations such as the United Nations Development Program and the Global Environment Facility, which can, in principle, help developing countries create a better life with no constraints. That is why the Western countries' attitude toward Iran's policies does not represent a promising outlook for the global vision of sustainable urban development. It has not even solved the problems of the Iran nuclear program, though.

V. CONCLUSION

Ahwaz, Sanandaj, Kermanshah, and Yasouj are examples of middle-size cities in Iran that, along with Tehran, Isfahan, Mashhad, and other metropolitan regions, suffer from the lack of clean air and blue sky. While it is not fair to claim that changes in the currency exchange rate is the main factor affecting Iranian cities' environmental quality, this study demonstrates that they have escalated the issue and have a negative impact on the quality of life, health, and wellbeing of current and future generations of Iranians who have had no role in the political decisions and conflicts and may not even have been born. Urban environmental planning does not have a long history in Iran. Although several cities have had a comprehensive plan for many years, ecological considerations and strategies have not been successful in finding their way into city planning in Iran. The centralized nature of the Iranian government has also linked national and international decisions and events to cities' destiny. The lack of integrated urban governance, existence of local and

national organizations with parallel responsibilities, financial restrictions, technological challenges, poor education, weaknesses of transportation planning, rapid urbanization, the concentration of a considerable percentage of the country's population in a small portion of its area due to the lack of regional planning, the geographical climate of cities and its impact on the level of air pollution during the cold seasons are some reasons of and contributors to the high level of air pollution in Iranian cities.

A few years ago, after many anti-planning years, the Iran government and urban authorities prepared strategic plans and policies to overcome the long-standing air pollution in cities. Exactly when cities were seeking to implement their environmental programs by seizing the opportunity provided by the nuclear agreement, imposed re-sanctions by the U.S. government, followed by international companies, destroyed the ways to save cities. This study's findings show how all five critical areas of public transit, motorcycles, automobiles, petrol, and refineries and power plants have been negatively affected by economic and political debates. Although a detailed evaluation of each of these sectors needs updated data, which is not available due to institutional and political reasons, we can predict the air pollution of the next year by using the models used by (Charandabi 2021) and (Pour *et al.*, 2022) due to high volatility.

All in all, the review of information that is available reveals the role that the depreciation of Rial has played in reducing the quality of air in Iran and threatening the life of Iranians as well as anyone who live in Iran.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

- Aftab News Agency. (2015). *The impact of lifting sanctions on Iran's environment*. Available at <https://aftabnews.ir/fa/news/313139/>.
- Ahmadi, D. (2017, December 23). Tehran's Dirtiest Autumn in 4 Years. *Financial Tribune*. Available at <https://financialtribune.com/articles/auto/78458/>.
- Amirdadi, M., Dehghanian, F., & Nahofti Kohnh, J. (2021). Design and development of a fuzzy credibility-based reverse logistics network with buyback offers: A case study. *Waste Management & Research*, 0734242X2111045210.
- ANA. (2019, June 15). "Tehran subway delivers 2.5 million rides on a daily basis". *Islamic Azad University News Agency*. Available at <http://ana.ir/i/398232>.
- Anaman, G. (2018). Willingness to Pay Student Insurance as a Primary Plan Among Eastern Illinois University Students at https://thekeep.eiu.edu/cgi/viewcontent.cgi?article=1000&context=lib_awards_2018_docs.
- Anaman, G. (2019). Heath status of US immigrants and the process of becoming a legal permanent resident alien. *Journal of Applied Business and Economics*, 21(1), 49.
- Baker, A. (2014, July 15). A Side Effect of Iranian Sanctions: Tehran's Bad Air. *Time*. Available at <https://time.com/2986299/iranian-sanctions-create-tehran-air-pollution/>.
- Balikhani, V. (2017, February 16). Poor Quality Gasoline Deadly for Iranians. *Atlantic Council*. Available at <https://www.atlanticcouncil.org/blogs/iransource/poor-quality-gasoline-deadly-for-iranians/>.
- Brownell, L. (2020, April 23). *Cooler catalytic converters: Cleaner air for all*. Available at <https://phys.org/news/2020-04-cooler-catalytic-cleaner-air.html>.

- Charandabi, S. E., & Kamyar, K. (2021). Prediction of Cryptocurrency Price Index Using Artificial Neural Networks: A Survey of the Literature. *European Journal of Business and Management Research*, 6(6), 17–20. <https://doi.org/10.24018/ejbmr.2021.6.6.1138>.
- City of Tehran (2017). *Proposed Plan for Reducing Tehran's Air Pollution*. Tehran, Iran.
- Eghtesad Online. (2019a, December 23). *How do economic factors affect air pollution?* Available at <https://www.eghtesadonline.com/n/245b>.
- Eghtesad Online. (2019b, December 21). *CO2 Recycling Plant Helps Tehran Oil Refinery Gets a Touch of Green*. Available at <https://www.en.eghtesadonline.com/Section-economy-4/31283-co-recycling-plant-helps-tehran-oil-refinery-gets-touch-of-green>.
- Eghtesad Online. (2020, March 27). *A look into currency market in 98*. Available at <https://www.eghtesadonline.com/n/11aP>.
- Eskan. (2019, May 13). What effect did the sanctions have on the subway? *Eskan News*. Available at <http://www.eskannews.com/report/19626/>.
- Etemad Newspaper. (2017, September 16). *Living with smoke until death*. Available at <https://www.etemadnewspaper.ir/fa/main/detail/86415>.
- Financial Tribune. (2019, September 23). *Air Pollution Annually Costs Tehran Residents \$2.6 Billion*. Available at <https://financialtribune.com/articles/environment/100006/>.
- Goharipour, H., Karimi, M., & Barakpour, N. (2011). Evaluation of urban management performance based on citizen satisfaction with municipal services in city of Tehran. *International conference of social science and humanity*, Singapore.
- Guilbert T.W., Morgan W.J., Zeiger R.S., Mauger D.T., Boehmer S.J., Szefer S.J., et al. Long-term inhaled corticosteroids in preschool children at high risk for asthma. *N Engl J Med*. 2006 May 11;354(19):1985–1997.
- Hakim, S. (2019). *The impact of economic sanctions on the environment: The Iranian example*. Ph.D. Dissertation. Imperial College London.
- Hassani, A., & Hosseini, V. (2016). An Assessment of Gasoline Motorcycle Emissions Performance and Understanding their Contribution to Tehran Air Pollution. *Transportation Research Part D, Transportation Science*, 47, pp. 1–12. <https://ssrn.com/abstract=2765010>. <https://tn.ai/2137483>. <https://www.eghtesadonline.com/n/2B0b>. <https://www.magiran.com/article/3628721>. <https://www.researchgate.net/publication/334494491>. <https://www.theguardian.com/world/iran-blog/2014/nov/21/iran-environmental-consequences-of-sanctions>.
- IMNA. (2020). How many days Isfahanians breathed in the polluted air? *Iran Metropolis News Agency*. Available at www.imna.ir/news/415642/.
- IRNA. (2016). Lifting sanctions are very effective in reducing air pollution., *The Islamic Republic News Agency*. Available at www.ima.ir/news/81925669/.
- IRNA. (2019a). A look at Tehran's AQI from 2005 to 2018. *The Islamic Republic News Agency*. Available at www.ima.ir/photo/83596801/.
- IRNA. (2019b). "The number of days with clean air increased in Mashhad", *The Islamic Republic News Agency*. Available at www.ima.ir/news/83258056/.
- IRNA. (2020). The air quality last year in Mashhad was lower than 97. *The Islamic Republic News Agency*. Available at www.ima.ir/news/83732784/.
- ISNA. (2017, August 30). *New facts about the quality of injector motorcycles*. Available at <https://www.isna.ir/news/96060804665>.
- ISNA. (2018). The role of Tehran subway system in reducing air pollution. *Iranian Students' News Agency*. Available at <https://www.isna.ir/news/97102915793/>.
- Izadi, M. (2019, December 18). Public Transport Problems and Tehran's All-Pervasive Smog. *Financial Tribune*. Available at <https://financialtribune.com/articles/people/101288>.
- Jalilov, O. (2019, December 25). Severe air pollution in Iran turns into major public health crisis. *Caspian News*. Available at <https://caspiannews.com/news-detail/severe-air-pollution-in-iran-turns-into-major-public-health-crisis-2019-12-25-59/>.
- Karbassi, A.R., Abbasspour, M., Sekhvatjou, M.S., Ziviya, F., & Saeedi, M. (2008). Potential for reducing air pollution from oil refineries. *Environmental Monitoring and Assessment*, 145(1–3), pp. 159–166.
- Kavousi-Fard, A., Mohammadi, M., & Al-Sumaiti, A. S. (2021). Effective Strategies of Flexibility in Modern Distribution Systems: Reconfiguration, Renewable Sources and Plug-in Electric Vehicles. In *Flexibility in Electric Power Distribution Networks* (pp. 95–119). CRC Press.
- Khademi, S., Norouzi, M., & Hashemi, M. (2019). Sustainable Land Use Evaluation Based on Preservative Approach. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, 42, 653–660.
- Lashgari, A., Hosseinzade, H., Khalilzadeh, M., Milani, B., Ahmadisharaf, A., & Rashidi, S. (2022). Transportation Energy Demand Forecasting in Taiwan based on Metaheuristic Algorithms. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 44(2), 2782–2800.
- Lee, Y.S. (2018). International isolation and regional inequality: Evidence from sanctions on North Korea. *Journal of Urban Economics*, 103(C), pp. 34–51.
- Lin, T.C.W. (2016, April 14). Financial weapons of war. *Minnesota Law Review*, 100, p. 1377, Temple University Legal Studies Research Paper No. 2016-25. Available at <https://heinonline.org/HOL/LandingPage?handle=hein.journals/mnlr100&div=36&id=&page=>.
- Maghami, A., Shahabian, F., & Hosseini, S. M. (2018). Path following techniques for geometrically nonlinear structures based on multi-point methods. *Computers & Structures*, 208, 130–142.
- Maghami, A., Shahabian, F., & Hosseini, S. M. (2019). Geometrically nonlinear analysis of structures using various higher order solution methods: A comparative analysis for large deformation. *Computer Modeling in Engineering & Sciences*, 121(3), 877–907.
- Malekloo, A. (2018). *The Effects of Economic Sanctions on Iran's Air Quality*. A paper submitted to Assoc. Prof. Dr. Julian Saurin (Political Economy and Law in Sustainability), Middle East Technical University. Available at https://www.researchgate.net/publication/334494491_The_Effects_of_Economic_Sanctions_on_Iran%27s_Air_Quality.
- Mashregh News. (2020, March 8). *The number of clean days in the capital in 2019*. Available at mshrg.h.ir/1049556.
- Mehdi, S.Z. (2019, December 20). US sanctions cause environmental crisis in Iran. *Andolu Agency*. Available at <https://www.aa.com.tr/en/middle-east/us-sanctions-cause-environmental-crisis-in-iran/1679080#>.
- Merat, A. (2019, January 12). US Sanctions Have Made Iran's Air Quality Much Worse. *Vice*. Available at https://www.vice.com/en_us/article/a38b38/us-sanctions-have-made-irans-air-quality-much-worse.
- Mizan. (2019, March 27). Dollar price changes in 97. *Mizan Online News agency*. Available at <https://www.mizanonline.com/fa/news/505751/>.
- Mizan. (2020, May 16). Currency value in May 16, 2020. *Mizan Online News agency*. Available at <https://www.mizanonline.com/fa/news/621118/>.
- Noroozi, Mohammad, Mohammadi, H., Efatinasab, E., Lashgari, A., Eslami, M., & Khan, B. (2022). Golden Search Optimization Algorithm. IEEE Access.
- PANA. (2019). Unhealthy condition of air quality in the capital. *Public Association News Agency*. Available at <http://pana.ir/news/972489>.
- Petro Energy Information Network. (2004, June 30). *Industries Account for 4% of Tehran Air Pollution*. Available at <https://en.shana.ir/news/25253/>.
- Pour, E. S., Jafari, H., Lashgari, A., Rabiee, E., & Ahmadi Sharaf, A. (2022). Cryptocurrency Price Prediction with Neural Networks of LSTM and Bayesian Optimization. *European Journal of Business and Management Research*, 7(2), 20–27.
- Press Tv. (2019, December 31). *Iran opens \$238 million express train service near Tehran*. Available at <http://french.presstv.com/Detail/2019/12/31/615023/Iran-Tehran-electric-train-metro-airport-pollution>.
- Qarehgozlou, M. (2018, February 11). Messy air pollution: transport sector largely at fault. *Tehran Times*. Available at <https://www.tehrantimes.com/news/421154>.
- Radio Farda. (2020, January 19). *Harmful oil bi-product used in Iranian cities, polluting the air*. Available at <https://en.radiofarda.com/a/harmful-oil-bi-product-used-in-iranian-cities-polluting-the-air/30385903.html>.
- Rayman, N. (2013, October 18). The 10 Most Polluted Cities in the World. *Time*. Available at <https://science.time.com/2013/10/18/the-10-most-polluted-cities-in-the-world/>.
- Saipa News. (2020, May 5). *Catalyst Production Is Not Economical in the Country*. Available at <http://www.saipanews.com/news/ID/19849/>.
- Sarkheil, H. (2019, December 24). Low quality of gasoline is the main cause of air pollution in Iran. *Islamic Azad University News Agency*. Available at <http://ana.ir/i/452326>.
- Shafaqna News Organization. (2016). *The possibility to remove more than 60% of air pollution in the post-sanctions*. Available at <https://fa.shafaqna.com/news/105823/>.
- Soroush, N., & Madani, K. (2014, November 21). Every breath you take: The environmental consequences of Iran sanctions. *The Guardian*. Available at <https://www.theguardian.com/world/iran-blog/2014/nov/21/iran-environmental-consequences-of-sanctions>.
- Tasnim Agency. (2019). *The year 2019 is more polluted than 2018*. Available at <https://tn.ai/1418390>.
- Tehran Air Quality Control Company. (2018). Available at <http://air.tehran.ir/>.

- Tehran Times. (2019, July 31). *DoE strongly rejects reproduction of carbureted motorcycles*. Available at <https://www.tehrantimes.com/news/438791/DOE-strongly-rejects-reproduction-of-carbureted-motorcycles>.
- Tehran Times. (2020, January 24). *E-motorbikes come to curb air pollution in metropolises*. Available at <https://www.tehrantimes.com/news/444502/E-motorbikes-come-to-curb-air-pollution-in-metropolises>.
- YJC. (2019, December 25). A comparison of school closing due to air pollution from 2014 to 2019. *The Young Journalists Club*. Available at <https://www.yjc.ir/00U9Gf>.
- Zoghi Hoseini, E., Tabasi, M., & Hashemi, M. (2020). Cultural-Communicative Phenomenology of Iranian Tekyeh from a Physical-Special Value perspective. *Creative City Agency Design*, 3(1), 95–101.