


**THE STATUS OF THE ENVIRONMENTAL MANAGEMENT SYSTEM, ITS IMPROVEMENT ASPECTS UNDER COVID-19 CRISIS, AND ITS IMPACT ON SUSTAINABLE ENVIRONMENTAL DEVELOPMENT IN JORDAN (AN APPLIED STUDY ON MINING INDUSTRIES SECTOR)**

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ARTICLE INFO	ABSTRACT
<p><b>Article history:</b></p> <p><b>Received</b> November, 01<sup>st</sup> 2023</p> <p><b>Accepted</b> January, 30<sup>th</sup> 2024</p>	<p><b>Objective:</b> Identify the impact of the new conditions created by Covid-19 crisis on achieving sustainable environmental development by studying the environmental management system and the impact of improving energy use, improving water use, and improving the impact of emissions in Jordanian mining industrial companies in achieving sustainable environmental development as a useful framework in the post-pandemic recovery period.</p>
<p><b>Keywords:</b></p> <p>Environmental Management System; Sustainable Environmental Development; COVID-19 Crisis; Mining Industries Sector.</p>	<p><b>Research Design &amp; Methods:</b> The descriptive correlational method was used where a questionnaire. The research population consisted of specialists in of safety, environment, and occupational health in the Jordanian extractive industries and mining companies. A total of (8) companies were identified, of which the two largest companies were chosen as a cluster sample for this study: Arab Potash Company with 33 employees in safety and environment, and Jordan Phosphate Mines Company with 45 employees.</p>
	<p><b>Findings:</b> The results showed from the point of view of the workers in the Jordan Phosphate Mines Company and the Arab Potash Mines that there is a positive and statistically significant impact of improving aspects of the environmental management system in light of the Covid-19 crisis in general on sustainable environmental development by (77%).</p>
	<p><b>Conclusion:</b> The results showed from the point of view of the workers in the Jordan Phosphate Mines Company and the Arab Potash Mines that the level of improvement of the environmental management system in the field of energy use, in the field of water use, and in the field of the impact of gas emissions, ranges between medium and high level, and the results showed that there is a positive and statistically significant impact of improving aspects of the environmental management system (improving energy use, improving water use, improving the impact of gas emissions) in light of the Covid-19 crisis in general on sustainable environmental development by (77%).</p>
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**O STATUS DO SISTEMA DE GESTÃO AMBIENTAL, SEUS ASPECTOS DE MELHORIA SOB A CRISE DA COVID-19 E SEU IMPACTO NO DESENVOLVIMENTO AMBIENTAL SUSTENTÁVEL NA JORDÂNIA (UM ESTUDO APLICADO SOBRE O SETOR DAS INDÚSTRIAS DE MINERAÇÃO)**

**RESUMO**

**Objetivo:** Identificar o impacto das novas condições criadas pela crise da COVID-19 na consecução de um desenvolvimento ambiental sustentável, estudando o sistema de gestão ambiental e o impacto da melhoria da utilização de energia, da melhoria da utilização da água e da melhoria do impacto das emissões nas empresas

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industriais mineiras jordanas na consecução de um desenvolvimento ambiental sustentável, enquanto quadro útil no período de recuperação pós-pandemia.

**Design e Métodos de Pesquisa:** O método correlacional descritivo foi usado onde um questionário A população de pesquisa consistiu de especialistas em segurança, meio ambiente e saúde ocupacional nas indústrias extrativas jordanianas e empresas de mineração. Um total de (8) empresas foram identificadas, das quais as duas maiores empresas foram escolhidas como uma amostra de cluster para este estudo: Arab Potash Company, com 33 funcionários em segurança e meio ambiente, e Jordan Phosphate Mines Company, com 45 funcionários.

**Constatações:** Os resultados mostraram, do ponto de vista dos trabalhadores da Jordan Phosphate Mines Company e da Arab Potash Mines, que há um impacto positivo e estatisticamente significativo na melhoria dos aspectos do sistema de gestão ambiental, à luz da crise da Covid-19 em geral, no desenvolvimento ambiental sustentável (77 %).

**Conclusão:** Os resultados demonstraram, do ponto de vista dos trabalhadores da Jordan Phosphate Mines Company e da Arab Potash Mines, que o nível de melhoria do sistema de gestão ambiental no domínio do uso da energia, no domínio do uso da água e no domínio do impacto das emissões de gases varia entre o nível médio e o alto, e os resultados demonstraram que há um impacto positivo e estatisticamente significativo na melhoria dos aspectos do sistema de gestão ambiental (melhoria do uso da energia, melhoria do uso da água, melhoria do impacto das emissões de gases) à luz da crise da Covid-19 em geral sobre o desenvolvimento sustentável do ambiente (77 %).

**Palavras-chave:** Sistema de Gestão Ambiental, Desenvolvimento Ambiental Sustentável, Crise da COVID-19, Setor das Indústrias Mineradoras.

## EL ESTADO DEL SISTEMA DE GESTIÓN MEDIOAMBIENTAL, SUS ASPECTOS DE MEJORA EN EL CONTEXTO DE LA CRISIS DE LA COVID-19 Y SU IMPACTO EN EL DESARROLLO MEDIOAMBIENTAL SOSTENIBLE EN JORDANIA (ESTUDIO APLICADO SOBRE EL SECTOR DE LAS INDUSTRIAS MINERAS)

### RESUMEN

**Objetivo:** Identificar el impacto de las nuevas condiciones creadas por la crisis de la Covid-19 en el logro de un desarrollo ambiental sostenible mediante el estudio del sistema de gestión ambiental y el impacto de la mejora del uso de la energía, la mejora del uso del agua y la mejora del impacto de las emisiones en las empresas mineras industriales jordanas en el logro de un desarrollo ambiental sostenible como marco útil en el período de recuperación posterior a la pandemia.

**Diseño y Métodos de Investigación:** Se utilizó el método descriptivo correlacional donde se aplicó un cuestionario. La población investigada estuvo conformada por especialistas en seguridad, medio ambiente y salud ocupacional en las industrias extractivas y empresas mineras jordanas. Se identificaron un total de 8 empresas, de las cuales se seleccionaron como muestra de conglomerados para este estudio las dos empresas más grandes: Arab Potash Company, con 33 empleados en seguridad y medio ambiente, y Jordan Phosphate Mines Company, con 45 empleados.

**Hallazgos:** Los resultados mostraron desde el punto de vista de los trabajadores de la Compañía de Minas de Fosfato de Jordania y de las minas árabes de potasa que existe un impacto positivo y estadísticamente significativo de la mejora de aspectos del sistema de gestión ambiental a la luz de la crisis de la Covid-19 en general sobre el desarrollo ambiental sostenible en un 77 %.

**Conclusión:** Los resultados mostraron, desde el punto de vista de los trabajadores de la empresa Jordan Phosphate Mines y la Arab Potash Mines, que el nivel de mejora del sistema de gestión medioambiental en el ámbito del uso de la energía, en el ámbito del uso del agua y en el ámbito del impacto de las emisiones de gases, oscila entre el nivel medio y alto, y los resultados mostraron que existe un impacto positivo y estadísticamente significativo de la mejora de aspectos del sistema de gestión medioambiental (mejora del uso de la energía, mejora del uso del agua, mejora del impacto de las emisiones de gases) a la luz de la crisis de la Covid-19 en general sobre el desarrollo medioambiental sostenible en un 77 %.

**Palabras clave:** Sistema de Gestión Ambiental, Desarrollo Ambiental Sostenible, Crisis de COVID-19, Sector de Industrias Mineras.

## INTRODUCTION

The world is exposed to many crises, and if we look at the global financial crisis in 2008, we find reports that global carbon dioxide emissions resulting from combustion, such as oil, gas, and coal, decreased by 1.4% to rise in 2010 by 5.9%, as this shift hindered global efforts to address climate change, and on the other hand, United Nations Secretary-General António Guterres said in a press briefing on the annual United Nations Climate Summit, which was to be held in Glasgow in November 2020 "Covid-19 crisis may have a longer-term impact on the environment, at a greater cost to human health and security, as 2020 was supposed to be crucial in efforts to confront environmental changes". And in the same direction, 196 countries were expected to present their plans for emission reduction targets under the Paris Agreement of 2015 ahead of the summit, but the United Nations announced on April 1, in the face of the coronavirus outbreak, postponing the summit until a later date as COVID-19 crisis will threaten local efforts to meet climate commitments already made (Wilkinson, Chávez, 2020).

The MENA region has the highest air pollution levels after South Asia. Most of the populations in MENA's cities live with air pollution that surpasses the World Health Organization (WHO) thresholds for what is considered healthy air by 4-5 times. (The World Bank, 2022)

On the other hand, in a World Bank blog entitled Middle East and North Africa: Two Opportunities to Rebuild After the Corona Pandemic in a Comprehensive Manner, Considering Environmental Conditions, the question of what the best and most environmentally friendly path is to building after the COVID-19 pandemic was asked. David Malpass, President of the World Bank Group, noted "Many natural systems have been neglected over the years, resulting in water and air pollution and frequent climate events; the current pandemic has highlighted the need to focus on such issues to achieve a better recovery after its recedes and there are now opportunities for the region to improve urban air quality. (Acerbi, et al.,2021)

As the crisis develops around the world, it is the duty of MENA governments, including Jordan, to ensure that stimulus measures and policy responses are in line with anticipated climate change and broader environmental protection goals. They must also systematically assess the negative potential unintended environmental impacts of new short-term recovery measures (OECD, 2020)

## RESEARCH PROBLEM

In talks about the impact of the Corona virus on the environment and climate, the report published in Amadeus (2020) touched on the fact that in light of the dual effects of the Corona pandemic, experts and those interested in environmental affairs confirm that the issue of preserving the environmental gains resulting from the pandemic is a very complex issue, given the stakes and challenges posed at the economic and social levels, and they stressed that giant capitalist companies will press for the return of the consumption train to its proper track, in order to raise the pace of productivity and ensure the recovery of economic institutions, and that governments will find themselves in front of complex social dilemmas (Al-Wardi, 2020), therefore, the research problem will answer the following questions

1. What is the status of the environmental management systems in Jordan Phosphate Mines Company and Arab Potash Company, from the employees' perspective?
2. What is the status of improving the aspects of the environmental management systems (improving energy usage, improving water usage, improving the effect of gas emissions) under the COVID-19 crisis in Jordan Phosphate Mines Company and Arab Potash Company from the employees' perspective?
3. What is the status of sustainable environmental development in Jordan from the perspective of employees of Jordan Phosphate Mines Company and the Arab Potash Company?
4. What is the effect of improving the aspects of the environmental management system (improving energy use, improving water use, improving the effect of gas emissions) under COVID-19 crisis, on sustainable environmental development in Jordan Phosphate Mines Company and the Arab Potash Company, from the employees' perspective?

## RESEARCH OBJECTIVES

The study aims to identify the extent of implementing an environmental management system in the extractive industries and mining companies and the aspects of improving the environmental management system (improving energy use, improving water use, improving the effect of gas emissions) under COVID-19 crisis from the sector perspective. It aims to discover the status of sustainable environmental development in Jordan from the perspectives of employees in Jordan Phosphate Mines Company and Arab Potash Company. The study seeks

to understand the effect of improving the environmental management system under COVID-19 crisis in achieving sustainable environmental development in Jordan Phosphate Mines Company and Arab Potash Company.

## **RESEARCH IMPORTANCE**

The importance of the study appears in shedding light on the COVID-19 pandemic, sustainability, and environmental systems, as the Organization for Economic Co-operation and Development (OECD,2020) report indicated the urgent need to consider not only the financial system but also consider the role of capital and investors in making economic, social and environmental systems more dynamic and resilient to external shocks after the pandemic. The report indicated that green recovery measures could also include new financing and programs to create jobs and stimulate economic activity through ecosystem restoration and implementation of environmental indicators.

The importance of the study increases in the nature of the sector it addresses, which is the mining industries sector, as this accounted for 20.1% of the total Jordanian industrial exports, thus ranking second in export volume, as the volume of its exports reached about 1234.7 million Jordanian Dinars by the end of 2019, where the phosphate and potash companies are the most important Jordanian natural resources and many investment companies have started with this sector, which is considered the third largest industrial sector (JCI, 2022)

## **LITERATURE REVIEW**

### **Environmental Management System**

The creation of a framework for the implementation of the Environmental Management System lies in compliance with the international standards ISO 14001, which are defined as "documented specifications that require the contributing organization to maintain the use of raw materials, the production, the treatment, and the disposal of hazardous waste which describe potential environmental and social risks and impacts that require special attention, (Krajewski & Ritzman, 2007:25), The environmental management system is based on the amount of responsibility and respect for the environment (Dascalu et al.2011:92).The Flejszman (2009) study surveyed the effectiveness and efficiency of environmental management systems, where the study proved that organizations that committed to implementing the environmental management system by 76% for several years reaped positive long-term effects.

United Nations Environmental Programme Report sees that the idea of enterprise-level environmental management is focused primarily on the implementation of environmental strategies and policies aimed at tracking and evaluating the environmental impacts of an industrial enterprise, covering all production stages, starting from access to raw materials, and ending with the finished product and its related environmental aspects (UN,1996). Environmental management is also based on the implementation of the most efficient control procedures, considering the costs and environmental impact of these procedures, and how resources are used, emphasizing the importance of clarifying the tools and methods used to prevent pollution and to use resources rationally. (Rumman,2017)

The environmental management system is also defined as part of the organization's overall management system, which aims to improve actions that will reduce the waste of raw materials and energy, prevent air and water pollution, and recycle solid waste. The environmental management system depends on the amount of responsibility, culture, and respect for the environment (Dascalu et al. 2011: 92), and in return, a study (Rumman, 2019) touched on how to activate environmental management in institutions by seeking to improve energy use and improve water use.

### **Environmental Management System & COVID-19 Crisis**

COVID-19 pandemic crisis prompted specialized organizations to launch campaigns labeled "Ecosystems" in attempts to adapt and recover as a response to the crisis and in preparation for post-crisis reconstruction phase.

The study (Brears, 2020) dealt with the green economy and ecosystems in the post-COVID-19 world driven by new technologies that reduce the pressures of the relationship between water, energy, food, environmental sustainability, and a sustainable future. The study concluded that the post-COVID-19 reconstruction phase revolves around the green economy and ecosystems, and an international report specialized in the field of water published by the magazine "Smart Water Magazine", (Brears, 2020) (to rely on the axes of environmental systems during the post-Corona phase, stressing its key role in reducing the pressures associated with the relationship between water, energy and food, the extent to which the concept of environmental management system is formulated for a stage during the crisis and beyond by leading new technologies that ensure reducing pressures on resources (water, energy and waste), and to use those resources more efficiently while seeking policy consistency across sectors to support the concept of an environmental management system that allows promoting

economic growth and investment, with environmental quality increase and social inclusion, while significantly reducing environmental risks and environmental scarcity.

### **Sustainable Environmental Development**

Sustainable development is based on three pillars: economic efficiency, social efficiency, and environmental efficiency, and sustainable environmental development will be addressed as one of the pillars of sustainable development for any country, where success depends on a balanced combination between those pillars and on the rationalization of the use of non-renewable natural resources in order to extend their lifespans (Jehan et al., 2020, Wen et al., 2022).

Atiyat (2020) touched on a UN report entitled Natural Assets Management is the Key to Sustainable Development that showed that "there is a need to measure and track comprehensive wealth, and identify climate change and biodiversity loss, as the two most important threats facing business and economy in Jordan and the world, and after the end of the Corona crisis. According to the report, issued in English, "The concept of comprehensive wealth takes into account the social value of industrial, human and natural capital, which in turn is the source of GDP for Jordan and the world.

Many recent previous studies (Cesário et al., 2022., Khatoon et al.,2022., fang,2022) recommended the need to pay attention to environmental protection and introduce concepts related to sustainability to guide workers in organizations towards positive behaviors in preserving the environment to achieve the environmental dimension of sustainable development. Developments, environmental changes, and crises require humanity to accelerate its paths toward Sustainable Development Goals by reviewing the production and consumption behaviors of societies and increasing the resilience of global systems (Scherera et al., 2018., Rashid,2018)).

### **Sustainable Environmental Development & COVID-19 Crisis**

Arab countries should assess their responses to the COVID-19 pandemic based on a comprehensive framework that balances the dimensions of sustainable development and avoids reversing the environmental gains achieved so far (OECD,2021). and in a study (Martins-Loução, 2020) stated that the "COVID-19 storm" must never forget pollution, biodiversity, climate change, and public health and that the three corners of the triangle must serve to determine future economic strategies. This complete storm of social, economic, and health

disasters caused by the COVID-19 pandemic, directly threatens the world's livelihoods and well-being, and the achievement of the United Nations Sustainable Development Goals (Berchin et al.,2020). A study in 2020 by the Institute for Global Environmental Strategies (IGES) touched on the fact that COVID-19 pandemic is closely linked to many environmental issues. The study participants at the eleventh Petersburg Climate Dialogue hosted by the governments of Germany and the United Kingdom on April 28, 2020, which nearly 30 ministerial-level officials from developed and developing countries, the UN Secretary-General, and the President of the UN Convention on Climate Change attended, emphasized the importance of a "green recovery" which integrates economic recovery from COVID-19, climate action, and the SDGs and therefore economic stimulus directed at COVID-19 recovery that should also contribute to the transition towards resilient and carbon-neutral societies (IGES,2020)

In his message for International Earth Security Day, Secretary-General António Guterres (UN,2020) said: "The current COVID-19 crisis is an unprecedented wake-up call, and we need to turn recovery into a real opportunity to do things right for the future." Mr. Guterres proposed several climate-related actions to shape the recovery from which the huge sums to be spent on recovery from the coronavirus should include new jobs and businesses through a clean and environmentally friendly transformation.

On the other hand, when the European Green Deal (EGD) was announced by the EU in December 2019, the EGD included a target to achieve net zero greenhouse gas emissions by 2050 (becoming the world's first "climate-neutral" region). And in the wake of the Covid-19 crisis, the EU spokesperson firmly said: "While our immediate focus is on the fight against the coronavirus, our work continues to deliver the European Green Deal (EGD). The climate crisis remains a reality and requires our continued attention and effort." (European Commission, 2020) Meanwhile in Asia, the Government of the Republic of Korea announced its version of the Green New Deal and also aims to neutralize carbon despite the repercussions of the crisis (KBS, 2020). Furthermore, a study (Cheval, et al., 2020) addressed the various environmental factors in the outbreak and spread of the pandemic, which in turn may cause reactions to the environment. This study provides an early overview of the observed and potential impacts of COVID-19 on the environment. Also, the study (Jian et al., 2020) investigated the impacts of COVID-19 on the hotel sector, where the interaction between consumers' fear, COVID-19

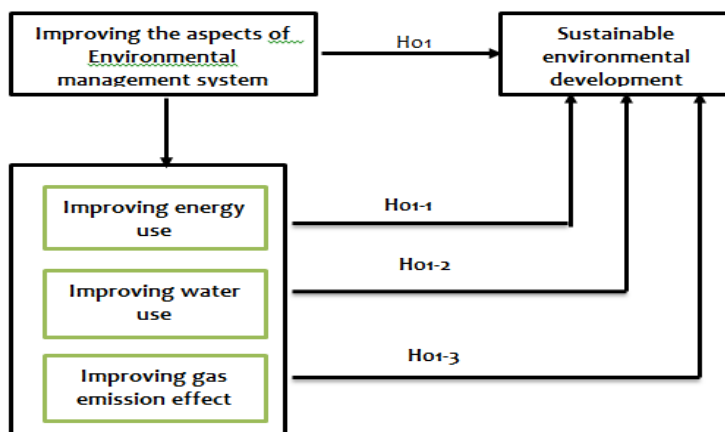


uncertainty, and trust in eco-friendly hotel brands has been studied. The paper contributes to the research on green consumption behavior in the hotel sector during the Covid-19 pandemic.

Certainly, building a post-Corona world will not be an easy task, as the competition between the green movement and the industrialists will intensify, as the first will defend its firm convictions of the need to protect the environment, while the second calls for postponing the application of all strict environmental regulatory laws to fix the defects of the economy, and therefore the obstacles to climate action in the post-pandemic era will be even more severe than they were before, current systems must be re-evaluated to enhance the resilience of countries, regions, and the whole world. (Al-Wardi,2020).

**Model and Research Hypotheses:**

Figure 1: the theoretical framework of the study. We, therefore, hypothesized the following:



Source: Prepared by Authors (2024)

H01: "There is no statistically significant effect at a significance level  $(0.05 \geq \alpha)$  of improving the aspects of environmental management system during COVID19 crisis on sustainable environmental development in the Jordan Phosphate Mines and Arab Potash Mines companies.

Also, the following sub-hypotheses stem from this primary hypothesis:

H01-1: The first sub-hypothesis: There is no statistically significant effect, at a significance level  $(0.05 \geq \alpha)$ , of improving energy use under COVID-19 on sustainable environmental development in Jordan Phosphate Mines Company and Arab Potash Company, from employees' perspective.

H01-2: The Second sub-hypothesis: There is no statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) of improving water use under COVID-19 crisis on sustainable environmental development in Jordan Phosphate Mines Company and Arab Potash Company, from employees' perspective.

H01-3: The third sub-hypothesis: There is no statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) to the extent of improving the effect of gas emissions under COVID-19 crisis on sustainable environmental development in Jordan Phosphate Mines Company and Arab Potash Company, from employees' perspective.

## **METHOD AND PROCEDURES**

### **Research Methodology**

The descriptive correlational method was used where a questionnaire was distributed to employees in the safety, environment, and occupational health divisions in the Jordanian extractive industries and mining companies.

### **Research Population and Sample**

The research population consisted of specialists in the fields of safety, environment, and occupational health in the Jordanian extractive industries and mining companies. A total of (8) companies were identified, of which the two largest companies were chosen as a cluster sample for this study: Arab Potash Company with 33 employees in safety and environment, and Jordan Phosphate Mines Company with 45 employees. The questionnaire was electronically distributed to them on the following links:

The link for Phosphate Mines Company: [https://docs.google.com/forms/d/e/1FAIpQLSc9OR0goxT8PbmQQ0XKy5nMtyPasxxpNb1hPMLT4qfHgBru2g/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSc9OR0goxT8PbmQQ0XKy5nMtyPasxxpNb1hPMLT4qfHgBru2g/viewform?usp=sf_link)

The link for Arab Potash Company: [https://docs.google.com/forms/d/e/1FAIpQLSd-hwV2n3bZPsj6u296dblbXmR1TKzNjKkXXkRe1IglkSmIOg/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSd-hwV2n3bZPsj6u296dblbXmR1TKzNjKkXXkRe1IglkSmIOg/viewform?usp=sf_link)

(59) employees responded to the study tool, about (76%) of the target sample. Table (1) shows the distribution of the sample units working in extractive industries and mining companies, according to their personal and employment characteristics.

Table (1) Distribution of sample units according to their characteristics

Variable	Category	Frequency	Percentage
Company	Arab Potash Company link	23	39%
	Phosphate mines company	36	61%
	Total	59	100%
Gender	Male	50	84.70%
	Female	9	15.30%
	Total	59	100%
Age	30 to less than 40	11	18.60%
	40 to less than 50	29	49.20%
	50+	19	32.20%
	Total	59	100%
Educational level	Diploma	11	18.60%
	Bachelor's degree	30	50.90%
	Master's degree	13	22%
	PhD	5	8.50%
	Total	59	100%
Career level	Higher Management	4	6.80%
	Middle management	36	61%
	Operational management	19	32.20%
	Total	59	100%
Years of Experience	5 to less than 10	7	11.90%
	10 to less than 15	18	30.50%
	16+	34	57.60%
	Total	59	100%

Source: Prepared by Authors (2024)

### Study Instruments

A questionnaire was designed consisting of two parts; the first part included primary data of the study sample, and the second part included the statements and subjects of the questionnaire, and it consisted of (3) subjects. The first subject measures: the status of the environmental management system in the Jordanian extractive industries and mining companies. The second subject measures: aspects of improving the environmental management system in those companies (the independent variable), and it includes (21) statements, distributed in (3) areas (improving energy use = 7 phrases), (improving water use = 5 phrases), (improving the effect of gas emissions = 9 phrases). The third subject measures: sustainable environmental development (the dependent variable) which includes (10) statements. The responses to the statements of the questionnaire are according to the five-point scale (strongly Agree = 5 points, Agree = 4 points, Neutral = 3 points, Disagree = 2 points, strongly Disagree = 1 point).

### Validity and Reliability of Research Instruments

Research instruments have been verified in their preliminary form by presenting them to a board of referees formed from University professors. Referees’ opinions were taken into consideration and necessary adjustments were made. The validity coefficients of the questionnaire's internal consistency were extracted using the Pearson correlation coefficient between each of the statements with the field contained therein. Table (2) shows the values of correlation coefficients.

Table (2) the values of the correlation coefficients for the questionnaire statements with the total score for the field contained therein

The first subject: The status of the environmental management system		The second subject: aspects of improving the environmental management system (independent variable)						The third subject: sustainable environmental development (dependent variable)	
		Improving energy use		Improving water use		Improving the effect of gas emissions			
Statement Number	Correlation coefficient	Statement Number	Correlation coefficient	Statement Number	Correlation coefficient	Statement Number	Correlation coefficient	Statement Number	Correlation coefficient
1	0.696**	11	0.748**	18	0.835**	23	0.809**	32	0.827**
2	0.696**	12	0.760**	19	0.702**	24	0.779**	33	0.821**
3	0.867**	13	0.837**	20	0.862**	25	0.895**	34	0.694**
4	0.810**	14	0.644**	21	0.789**	26	0.868**	35	0.622**
5	0.785**	15	0.611**	22	0.765**	27	0.834**	36	0.547**
6	0.890**	16	0.746**	-----	-----	28	0.802**	37	0.707**
7	0.796**	17	0.778**	-----	-----	29	0.724**	38	0.815**
8	0.777**	-----	-----	-----	-----	30	0.619**	39	0.867**
9	0.746**	-----	-----	-----	-----	31	0.785**	40	0.834**
10	0.830**	-----	-----	-----	-----	-----	-----	41	0.862**

\*\* The correlation coefficient is statistically significant at the level of significance ( $\alpha = 0.01$ ).

Source: Prepared by Authors (2024)

The results in Table (2) indicate the existence of a positive correlation, statistically significant at the level of significance ( $\alpha = 0.01$ ), for statements with the field or subject contained in it, which indicates the suitability of each of the terms to measure the field or subject contained in it. After verifying the internal consistency validity, the questionnaire’s reliability coefficients were extracted, using Cronbach's alpha equation "Cronbach's alpha," as in Table 3.

Table (3) reliability coefficients for the research questionnaire

Subjects	Fields	Statement Numbers	Cronbach alpha coefficient
The first subject: the status of the environmental management system		10	0.93
The second subject: aspects of improving the environmental management system (independent variable)	Improving energy use	7	0.851
	Improving water use	5	0.841
	Improving the effect of gas emissions	9	0.926
	Total statements for the second subject	21	0.945
The third subject: sustainable environmental development (dependent variable)		10	0.921

Source: Prepared by Authors (2024)

The data in Table (3) indicate that the reliability coefficients for the three research subjects were high and suitable for the current research; as the value of the reliability coefficient for the entire first subject was (0.930), the entire second subject (0.945), and for the entire third subject (0.921).

**Statistical processing**

1. To answer the first three questions, arithmetic averages and standard deviations were used. The standard in Table (3) was extracted from the range equation to explain the arithmetic average of employees' responses in extractive industries and mining companies.

Table (4) Criterion for interpreting the arithmetic mean of the study sample responses to the study questionnaire

Arithmetic average	Agreement Level
3.68-5.00	High
2.34-3.67	Medium
1.00-2.33	Low

Source: Prepared by Authors (2024)

2. To answer the fourth question and test the hypotheses resulting from it regarding the effect of improving the environmental management system under COVID-19 crisis (independent variable) on sustainable environmental growth (dependent variable), a simple linear regression was used to test the primary hypothesis, while multiple regression analysis was used to test the three sub hypotheses.

**RESULTS AND DISCUSSION**

**The first question results:** What is the status of the environmental management systems in Jordan Phosphate Mines Company and Arab Potash Company, from employees' perspective?

The arithmetic averages, standard deviations, and statements' rankings were extracted for the study sample responses on the second subject of the study questionnaire, which measures the environmental management system's status in those companies. Table (5) illustrates the results.

Table (5) Averages, standards deviations, and statement rankings for questionnaire responses on the status of environmental management system

Rank	Statement Number	Statements	Arithmetic average	Standard Deviation	Agreement Level
1	1	The company adopts its own ecosystem	4.05	0.51	High
2	2	The company's strategy focuses on environmental variables	3.95	0.60	High
3	6	The services provided by the company are in line with environmental requirements	3.75	1.03	High
4	4	The company provides a center to monitor the consumption of resources such as electricity, water, fuel, and paper	3.73	1.05	High
5	3	The company conducts studies on the direct and indirect environmental impact of its activities	3.68	0.90	High
6	8	Management recognizes the aspirations of employees through special surveys in the areas of environment and working conditions (health, occupational safety)	3.66	0.99	Medium
7	7	The company discloses its reports on environmental challenges	3.64	0.96	Medium
8	10	The company relies on a policy based on innovation that aims to develop new technology or products to reduce the harmful effects of emissions caused by its production activity.	3.63	0.98	Medium
9	9	The company's ecosystem is resilient	3.53	0.88	Medium
10	5	Recycling materials benefits the company	3.49	0.97	Medium
Overall average of the status of Environmental Management System			3.71	0.71	High

Source: Prepared by Authors (2024)

The results in Table (5) show that the environmental management system in Jordan Phosphate Mines Company and Arab Potash Company came at a high level, with an arithmetic average of (3.71) and a standard deviation of (0.71).

As for the statements, the results showed that the status of the environmental management system in the two companies ranges between medium and high levels, where (5) statements came at a medium level and (5) statements were of a high level. Statement (1) came first "The Company adopts its own ecosystem," with an average of (4.05), and a standard

deviation of (0.51), at a high level. While statement (5) came last "Recycling materials benefits the company," with an average of (3.49), and a standard deviation of (0.97), at a medium level.

**The second question results:** What is the status of improving the aspects of the environmental management systems (improving energy usage, improving water usage, improving the effect of gas emissions) under the COVID-19 crisis in Jordan Phosphate Mines Company and Arab Potash Company from the employees' perspective?

The arithmetic averages, standard deviations, and statements' rankings were extracted for the study sample responses on the second subject of the study questionnaire, which measures the status of improving the environmental management system aspects under the COVID-19 crisis in Jordan Phosphate Mines Company and Arab Potash Company (independent variable). Table (6) illustrates the Results.

Table (6) the arithmetic averages, standard deviations, and statement rankings for the study sample responses about the status of improving the environmental management system aspects under the COVID-19 crisis

Field	Rank	Statement Number	Statements	Arithmetic average	Standard Deviation	Agreement Level
Improving energy use	1	11	Management worked on periodic maintenance of the electrical network, buildings, and equipment	3.68	0.92	High
	2	17	Management is focusing more on installing electric motors that have large capacity and lower consumption rates	3.61	1.07	medium
	3	16	Management took into account that its air conditioners are energy-saving brands	3.59	1.04	medium
	4	13	The company provided advice on improving energy management and operating the voluntary shutdown system for electrical devices during the peak period of the pandemic	3.54	0.95	medium
	5	12	Management monitored the electricity consumption index, especially after the outbreak of the pandemic	3.46	1.02	medium
	6	14	Management focused on using renewable solar energy instead of entirely relying on electricity	3	0.95	medium
	7	15	The company's electricity needs are generated from natural gas.	2.92	1.19	medium
Overall average for improving energy use				3.4	0.74	Medium
Improving water use	1	19	Management works on improving the periodic maintenance of the water network to fix any malfunction or leakage	3.83	0.77	High

	2	20	Management monitors more effectively the water consumption index and provides advice to improve water management	3.73	0.78	High
	3	18	Management utilizes gray water to the maximum extent (water in sinks, drains, and bathtubs) after its treatment	3.24	1.19	Medium
	4	22	Management is paying more attention to building Artesian wells to collect rainwater	3.2	1.01	Medium
	5	21	Management is committed to further activating the installation of automatic control taps	3.15	1.01	Medium
Overall average for improving water use				3.43	0.76	Medium
Improve the effect of gas emissions	1	27	Management worked on implementing periodic environmental measurements in factories to improve process control and visual inspection of specific emission sources	3.69	0.84	High
	2	28	Management sought to enter projects to monitor and treat dust and gases emissions from factories and keep them at acceptable levels	3.63	0.89	Medium
	3	23	Management has adopted more scientific methods to reduce the percentage of carbon dioxide emissions	3.53	0.97	Medium
	4	24	Management is working to improve the fuel efficiency index to reduce emissions	3.53	0.88	Medium
	5	30	Management worked on improving the ambient air monitoring stations project and its direct link with the Ministry of Environment to ensure the ambient air quality complies with legal standards	3.47	0.8	Medium
	6	26	Management worked to improve the application of periodic inspection and monitoring tools to detect cases of leakage and fugitive emissions into the atmosphere (leak detection and repair programs)	3.42	0.97	Medium
	7	31	Management worked to improve work by replacing burning fuel in factories with natural gas, which will provide the company with savings and reduce pollutants coming out of the chimneys to a high degree	3.42	0.99	Medium
	8	29	Management worked to improve its ignition avoidance at start-up as much as possible (start without ignition)	3.39	0.79	Medium
	9	25	Management improved permanent gas monitoring devices, video surveillance cameras, and equipment monitoring devices (such as real-time monitoring of vibrations) for early detection and warning of abnormal conditions	3.34	0.99	Medium



Overall average of improving the effect of gas emissions	3.49	0.72	Medium
Overall average of improving the environmental management system aspects	3.45	0.66	Medium

Source: Prepared by Authors (2024)

The results in Table (6) show that the status of improving the environmental management system aspects under COVID-19 crisis in Jordan Phosphate Mines Company and Arab Potash Company was average from the employees' perspective, where the arithmetic average of their responses was (3.45) and standard deviation was (0.66). As for the fields, the field of improving the effect of gas emissions came first with a mean (3.49) and a standard deviation (0.72) at a medium level, followed by the field of improving water use with a mean (3.43) and a standard deviation (0.76) at a medium level. The field of improving energy use came last with a mean (3.40), and a standard deviation (0.74), at a medium level.

As for the statements in the three areas, the results indicated the following:

- The level of improving the environmental management system in the field of energy use ranges from medium to high level, where one statement came at a high level, and (6) statements were at a medium level. Statement (11) came in the first order "Management worked on periodic maintenance of the electrical network, buildings, and equipment" with a mean of (3.68) and a standard deviation of (0.92), at a high level. Statement (15) came last "The company's electricity needs are generated from natural gas," with a mean of (2.92), and a standard deviation (1.19), at a medium level
- The level of improving the environmental management system in water use ranges between medium and high levels, as two statements came at a high level, and (3) statements were of a medium level. Statement (19) ranked first "Management works on improving the periodic maintenance of the water network to fix any malfunction or leakage" with a mean (3.83) and a standard deviation (0.77), at a high level. In the last order came statement (21), "Management is committed to further activating the installation of automatic control taps" with an arithmetic average (3.15), and a standard deviation (1.01), at a medium level.
- The level of improving the environmental management system in the field of gas emissions ranges between the medium and high levels, where (1) statement came at a high level, and (8) statements were of a medium level. Statement (27) ranked first "Management worked on implementing periodic environmental measurements in factories to improve process control and visual inspection of specific emission sources" with a mean (3.69) and a standard deviation (0.84) at a high level. Statement (25) ranked

last "Management improved permanent gas monitoring devices, video surveillance cameras, and equipment monitoring devices (such as real-time monitoring of vibrations) for early detection and warning of abnormal conditions", with a mean of (3.34), and a standard deviation (0.99) at a Medium Level.

**The third question results:** What is the status of sustainable environmental development in Jordan from the perspective of employees of Jordan Phosphate Mines Company and the Arab Potash Company?

The arithmetic averages, standard deviations, and statement rankings were extracted for the study sample's responses on the third subject of the study questionnaire, which measures the status of sustainable environmental development. Table (6) illustrates the Results.

Table (7) the arithmetic averages, standard deviations, and statement rankings for the study sample responses about the status of sustainable environmental development

Rank	Statement Number	Statements	Arithmetic average	Standard Deviation	Agreement Level
1	33	Management works to follow up on developments in the economic, social, and environmental fields that may come from government authorities and affect the company	3.95	0.73	High
2	34	Management voluntarily pursues a clear policy in the field of improving work conditions, especially occupational health and safety, away from those imposed by labor laws and legislation	3.9	0.82	High
3	32	Management works to respect the laws and legislation in producing products, especially those related to environmental fields, and reviews them periodically	3.86	0.82	High
4	36	Management takes precautionary measures away from the obligations imposed by laws that allow reducing energy consumption	3.73	0.61	High
5	37	Management is working to integrate environmental indicators into measuring the overall performance of the company	3.68	0.71	High
6	35	Management takes precautionary measures away from the obligations imposed by laws that allow controlling emissions from the production process	3.66	0.71	Medium
7	40	Management monitors developments in economic, social, and environmental fields that may come from political circles and affect the company	3.58	0.89	Medium
8	39	Management reflects the needs of the local community for environmental services	3.53	0.88	Medium

9	41	Management links communication channels with the competent authorities to integrate sustainable development bets to achieve compatibility between the three levels of corporate social responsibility	3.47	0.99	Medium
10	38	Management pursues initiatives with suppliers to design and develop products that take into account the environmental and social dimension aimed at reducing emissions resulting from the company's production activity	3.42	0.77	Medium
Overall average of the status of Sustainable Environmental Development			3.68	0.61	High

Source: Prepared by Authors (2024)

Table (7) shows that the status of sustainable environmental development in Jordan was high from the perspective of employees in Jordan Phosphate Mines Company and Arab Potash Company. Their responses averaged (3.68) with a standard deviation (0.61). It is noted that this average falls within the lower range of the high level adopted in the study.

As for the statements, the results showed that the status of sustainable environmental development ranges between medium and high level, where (5) statements came at a medium level, and (5) statements were of a high level. Statement (33) ranked first "Management works to follow up on developments in the economic, social, and environmental fields that may come from government authorities and affect the company", with a mean of (3.95) and a standard deviation (0.73), at a high level. Statement (38) ranked last "Management pursues initiatives with suppliers to design and develop products that take into account the environmental and social dimension aimed at reducing emissions resulting from the company's production activity", with an average of (3.42) and a standard deviation (0.77) at a medium level.

**The fourth question results:** What is the effect of improving the aspects of the environmental management system (improving energy use, improving water use, improving the effect of gas emissions) under COVID-19 crisis, on sustainable environmental development in Jordan Phosphate Mines Company and the Arab Potash Company, from the employees' perspective?

The fourth question was answered by testing the hypotheses derived from it, as follows:

**Primary hypothesis:** H01: "There is no statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) of improving the aspects of environmental management system during COVID19 crisis on sustainable environmental development in the Jordan Phosphate Mines and Arab Potash Mines companies from employees' perspectives."

A simple regression analysis was used to test this hypothesis, measuring the effect of independent variables (improving aspects of environmental management system under COVID-19 “as a whole”) on the dependent variable (sustainable environmental development). The validity of the model for this hypothesis was verified by extracting the results of the ANOVA for regression, as in Table (8).

Table (8) Results of Analysis Of Variance to verify the validity of the model for testing the primary hypothesis

Source	Sum of Squares	df	Mean Square	F	Sig.	R <sup>2</sup>
Regression	15.017	1	15.017	128.833	0.000*	0.693
Residual	6.644	57	0.117			
Total	21.661	58	-----			

\*Statistically significant at the 0.05 level.

Source: Prepared by Authors (2024)

Table (8) shows the validity of the primary hypothesis testing in the model, where the value of calculated (F) for the model reached (128.833), which is a statistically significant value at the level of ( $0.05 \geq \alpha$ ). The value of the coefficient of determination (R<sup>2</sup>) reached ((0.693), which means that the independent variables (improving aspects of environmental management system under COVID-19 “as a whole”) in the model explain (69.3%) of the variance in the dependent variable (the sustainable environmental development). The results are as in Table (9).

Table (9) Results of Simple Linear Regression analysis to test the effect of improving environmental management system aspects under COVID-19 crisis on sustainable environmental development

Independent variable	Un-standardized Coefficient	Standardized Coefficient	t	Sig.
	B	B		
(Constant)	1.026		4.312	0.000
Aspects of improving environmental management system (overall)	0.770	0.833	11.350	0.000*

\*Statistically significant at the 0.05 level. Dependent Variable: sustainable environmental development

Source: Prepared by Authors (2024)

Table (9) shows that there is a positive and statistically significant effect of improving the aspects of the environmental management system under COVID-19 crisis, on sustainable environmental development, as the values of ( $\beta = 0.833$ ) and ( $t = 11.350$ ) are values of a statistical significance at the level ( $\alpha \leq 0.05$ ). The value of (B) “Unstandardized Coefficient” (0.770) indicates the increase in the dependent variable (sustainable environmental development) as a result of the increase in (improving aspects of the environmental management system as a whole). The increase in enhancing the environmental management

system aspects under COVID-19 crisis as a whole, at the value of one unit, leads to an increase in sustainable environmental development by (77%) of this unit.

In light of the previous results, the primary hypothesis is not accepted, as follows: there is a statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) of improving aspects of the environmental management system under COVID-19 crisis on sustainable environmental development from the Jordan Phosphate Mines Company and Arab Potash Company employees' perspective.

### Results of the Three Sub-Hypotheses

Multiple Regression analysis was used to test the three sub-hypotheses related to measuring the effect of the independent variables (improving energy use, improving water use, and improving the effect of gas emissions) on the dependent variable (sustainable environmental development). The validity of the model for this hypothesis was verified by extracting the results of the ANOVA for regression, as in Table (10).

Table (10): Results of Analysis of Variance to verify the validity of the model for testing the sub-hypotheses

Source	Sum of Squares	df	Mean Square	F	Sig.	R <sup>2</sup>
Regression	15.324	3	5.108	44.332	0.000*	0.707
Residual	6.337	55	0.115			
Total	21.661	58	-----			

\* Statistically significant at the 0.05 level.

Source: Prepared by Authors (2024)

Table (10) shows the validity of the sub-hypotheses testing in the model, where the value of (F) calculated for the model reached (44.332), which is a statistically significant value at (0.05 ( $\alpha$ )), and the value of the coefficient of determination (R<sup>2</sup>) reached (0.707), which means that the independent variables (improving energy use, improving water use, improving the effect of gas emissions) in the model explain (70.7%) of the variance in the dependent variable (sustainable environmental development), and accordingly multiple regression analysis was used as in Table (11).

Table (11) Results of Simple Linear Regression analysis to test the effect of improving energy use, improving water use, improving the effect of gas emissions, on the sustainable environmental development

Independent variable	Un-standardized Coefficient	Standardized Coefficient	t	Sig.
	B	B		
(Constant)	1.043		4.402	0.000*
Improving energy use	0.410	0.498	4.232	0.000*
improving water use	0.087	0.108	0.921	0.361
improving the effect of gas emissions	0.270	0.317	2.904	0.005*

\*. Statistically significant at the 0.05 level Dependent Variable: Environmentally Sustainable Development  
Source: Prepared by Authors (2024)

Table (11) illustrates:

**The first sub-hypothesis results:** Ho1-1: There is no statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) for improving energy use under COVID-19 crisis on sustainable environmental development from the perspective of employees in the Jordan Phosphate Mines Company and Arab Potash Company.

Table (11) shows that there is a positive and statistically significant effect of improving energy use under COVID-19 crisis on sustainable environmental development, as the values of ( $\beta = 0.498$ ) and ( $t = 4.232$ ), which are values of a statistical significance at the level of ( $\alpha \leq 0.05$ ). The value of (B) “Unstandardized Coefficient” (0.410) indicates that the increase in the dependent variable (sustainable environmental development) is a result of the increase in (improving energy use), meaning that an increase in improving energy use under COVID-19 crisis, with a value of one unit, leads to an increase in sustainable environmental development by (41%) of this unit.

In light of the previous results, the first sub-hypothesis is not accepted, as follows: There is a statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) of improving energy use under COVID-19 crisis on sustainable environmental development from the Jordan Phosphate Mines Company and Arab Potash Company employees’ perspective.

**The second sub-hypothesis results:** Ho1-2: There is no statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) for improving water use under COVID-19 crisis on sustainable environmental development from the perspective of employees in the Jordan Phosphate Mines Company and Arab Potash Company.

Table (11) shows that there is no effect of improving water use under COVID-19 crisis on sustainable environmental development, with values of ( $b = 0.108$ ) and ( $t = 0.921$ ), which are statistically insignificant values at ( $\alpha \leq 0.05$ ).

In light of this result, the second sub-hypothesis is accepted, as follows: There is no statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) of improving water use under

COVID-19 crisis on sustainable environmental development from the perspective of Jordan Phosphate Mines Company and Arab Potash Company employees.

**Results of the third sub-hypothesis:** Ho1-3: There is no statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) of improving the effect of gas emissions under COVID-19 crisis on sustainable environmental development from the perspective of employees in the Jordan Phosphate Mines Company and Arab Potash Company.

Table (11) shows that there is a positive and statistically significant effect of improving the effects of gas emissions under COVID-19 crisis on sustainable environmental development, as the values of ( $B = 0.317$ ) and ( $t = 2.904$ ), which are values of a statistical significance at the level of  $\alpha \leq 0.05$ ). The value of (B) "Unstandardized Coefficient" (0.270) indicates that the increase in the dependent variable (sustainable environmental development) is a result of the increase in (improving the effect of gas emissions). An increase in the effect of gas emissions under COVID-19 crisis by one unit leads to an increase in sustainable environmental development by (27%) of this unit.

In light of the previous results, the third sub-hypothesis is not accepted, as follows: There is a statistically significant effect at a significance level ( $0.05 \geq \alpha$ ) of improving the effect of gas emissions under COVID-19 crisis on sustainable environmental development from the perspective of the two companies' employees.

## CONCLUSION

The results showed from the point of view of the workers in the Jordan Phosphate Mines Company and the Arab Potash Mines that the level of improvement of the environmental management system in the field of energy use, in the field of water use, and in the field of the impact of gas emissions, ranges between medium and high level, and the results showed that there is a positive and statistically significant impact of improving aspects of the environmental management system (improving energy use, improving water use, improving the impact of gas emissions) in light of the Covid-19 crisis in general on sustainable environmental development by (77%). The findings highlight that investing in ecosystems is the ideal and most effective way to escape the economic repercussions of Corona, and by directing industries to reduce environmental risks while ensuring the continuation of natural assets on which well-being depends. These results are consistent with the proposal of the French anthropologist and philosopher Bruno Latour (2020) that we look at the new activities or habits that we would like

to develop in the wake of the Covid-19 pandemic; and how workers or entrepreneurs can be helped to transition to roles or other activities that are more sustainable or more resilient.

At the level of the results of the study related to testing the sub-hypotheses that showed that there is no impact of improving water use considering the (Covid-19) crisis on sustainable environmental development in the study sample companies. These results emphasize the need to increase the environmental awareness of workers in those companies, specifically in promoting activities that in turn improve water use, and this is what the researchers stressed that COVID-19 will result in positive and indirect negative effects on the environment, but the latter will be greater, and they indicated whether the increased awareness resulting from COVID-19 can be harnessed to increase environmental awareness and how to reformulate economic models for the post-pandemic recovery phase (Beattie & McGuire, 2020., Barlow et al.,2020., The Economist,2020).

This is confirmed by an international report specialized in the water sector where the need to improve water management to ensure a more productive use of limited water resources in various countries of the world, including Jordan, saying that calls for improved water management are parallel to protecting water-related ecosystem services and ensuring equitable access for all (Fares, 2020).

## RECOMMENDATIONS

### T

The study recommends that management in Jordan Potash and Phosphate Companies should require and encourage its specialists to comply with the responsibilities of environmental compliance and sustainability, facilitate the application of good practices, and provide basic assistance to deliver the environmental priorities of those companies.

The study also recommends that all companies should be encouraged to replace polluting infrastructure with clean solutions, and industries guided to reduce environmental risks as measures to recover from the Covid-19 pandemic with the goal to invest in a new economy that emerges from the crisis in a better image than it was; a future-suitable, sustainable, and competitive economy.



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