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Construction Management in Jordan during COVID-19: from Shock to Boom and the Strain on Urban Infrastructure

إدارة البناء في الأردن خلال جائحة كوفيد-19: التحديات والضغوطات وتأثيرها على البنية التحتيه

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الملخّص

جائحة كوفيد-19، التي بدأت في أوائل عام 2020، استدعت اتخاذ تدابير صحية عامة صارمة على مستوى العالم، مما أدى إلى اضطرابات كبيرة في القطاعات الاقتصادية. في الأردن، شهد قطاع البناء، وهو ركيزة حيوية تساهم بحوالي 20% من الناتج المحلي الإجمالي وتوفر فرص عمل كبيرة، تحولات عميقة. تدرس هذه الدراسة تأثير الجائحة على قطاع البناء في الأردن من خلال تحليل البيانات الكمية من نقابة المهندسين الأردنيين، الهيئة الرسمية المشرفة على تصاريح البناء. يقارن البحث اتجاهات البناء عبر ثلاث مراحل: قبل (2019-2015)، أثناء (2020)، وبعد (2022-2021) الجائحة. تكشف النتائج عن انخفاض حاد في مساحات المباني المشيدة بنسبة 20% في عام 2020، تلاه ارتفاع سريع بنسبة 24% فوق المتوسط قبل الجائحة في عامي 2022-2021. تميز هذا الازدهار بعد الجائحة بظهور نوع جديد من البناء وحدات سكنية صغيرة ومعزولة تُعرف محلياً باسم "شاليهات" وتركيز جغرافي ملحوظ للبناء في العاصمة، عمان، التي ارتفعت فيها نسبة النشاط البنائي من 55% إلى 69% من النشاط البنائي الوطني. هذا النمو غير المخطط له قد زاد من الضغوط على البنية التحتية الحضرية، بما في ذلك شبكات المياه والكهرباء والصرف الصحي، وزاد من ازدحام المرور. تؤكد هذه الدراسة على الحاجة الملحة إلى إدارة هندسية وتخطيط حضري تكيفي قائم على البيانات للتخفيف من آثار مثل هذه الأزمات وضمان مرونة قطاعية مستدامة.

ABSTRACT

The COVID-19 pandemic triggered widespread economic disruptions, and the construction sector—a critical pillar of Jordan's economy, contributing approximately 20% to GDP and providing substantial employment—was no exception. This study quantifies the pandemic's impact on building construction in Jordan using official, governorate-level data from the Jordanian Engineers Association (2015–2022). Comparing three phases—pre-pandemic (2015–2019), during (2020), and post-pandemic (2021–2022)—the analysis reveals three key findings. First, total constructed building area declined sharply by 20% in 2020, then surged by 24% above the pre-pandemic average in 2021–2022. Second, the post-pandemic boom was characterised by a new building typology: small, isolated residential units known locally as "chalets," reflecting shifting housing preferences toward privacy and reduced health risks. Third, construction became heavily concentrated in the capital, Amman, whose share of national building activity rose from 55% to 69%, exacerbating urban pressures on water, electricity, sanitation networks, and traffic systems. These findings highlight the vulnerability of rigid planning systems to sudden shifts in demand. The study underscores the urgent need for adaptive, data-driven engineering management and proactive infrastructure investment to ensure sustainable resilience in the face of future crises.

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Construction Management in Jordan during COVID-19: From Shock to Boom and the Strain on Urban Infrastructure

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Abstract

The COVID-19 pandemic caused severe monetary disruptions, and the construction sector - an important pillar of Jordan's economy, contributing almost 20% of GDP and providing huge jobs - was no exception to this experiment. Using reliable phase data from the Jordanian Association of Governors of Engineers, the 2021 impact of the pandemic on production output pre-pandemic (2015-2019), during (2020), and post-pandemic (2021-2022) reveals 3 key findings. First, the overall construction industry declined sharply by 20% in 2020, then climbed to 24% from the pre-pandemic average in 2021–2022. Second, post-pandemic growth was characterized by the use of a new building type: small, remote residential facilities regionally accepted as "mountain cabins," reflecting the shift of housing options towards privacy and health risks. It reflects scarcity. Third, production has been heavily concentrated in the capital, Amman, whose share of national production has increased from fifty percent to sixty-nine%, increasing urban pressure on water, electricity, and sanitation networks as well as site visitor systems. The study underscores the urgent lack of adaptive, statistics-driven engineering controls and proactive infrastructure funding to ensure sustainable resilience in the face of a debilitating crisis.

Keywords: Corona pandemic, construction management, Jordanian construction sector, infrastructure strain, urban planning, Jordanian Engineers Association, GDP.

إدارة البناء في الأردن خلال جائحة كوفيد-19: التحديات والضغوطات وتأثيرها على البنية التحتيه

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الملخص

جائحة كوفيد-19، التي بدأت في أوائل عام 2020، استدعت اتخاذ تدابير صحية عامة صارمة على مستوى العالم، مما أدى إلى اضطرابات كبيرة في القطاعات الاقتصادية. في الأردن، شهد قطاع البناء، وهو ركيزة حيوية تساهم بحوالي 20% من الناتج المحلي الإجمالي وتوفر فرص عمل كبيرة، تحولات عميقة. تدرس هذه الدراسة تأثير الجائحة على قطاع البناء في الأردن من خلال تحليل البيانات الكمية من نقابة المهندسين الأردنيين، الهيئة الرسمية المشرفة على تصاريح البناء. يقارن البحث اتجاهات البناء عبر ثلاث مراحل: قبل (2015-2019)، أثناء (2020)، وبعد (2021-2022) الجائحة. تكشف النتائج عن انخفاض حاد في مساحات المباني المشيدة بنسبة 20% في عام 2020، تلاه ارتفاع سريع بنسبة 24% فوق المتوسط قبل الجائحة في عامي 2021-2022. تميز هذا الازدهار بعد الجائحة بظهور نوع جديد من البناء—وحدات سكنية صغيرة ومعزولة تُعرف محلياً باسم "شاليهات"—وتركيز جغرافي ملحوظ للبناء في العاصمة، عمان، التي ارتفعت فيها نسبة النشاط البنائي من 55% إلى 69% من النشاط البنائي الوطني. هذا النمو غير المخطط له قد زاد من الضغوط على البنية التحتية الحضرية، بما في ذلك شبكات المياه والكهرباء والصرف الصحي، وزاد من ازدحام المرور. تؤكد هذه الدراسة على الحاجة الملحة إلى إدارة هندسية وتخطيط حضري تكيفي قائم على البيانات للتخفيف من آثار مثل هذه الأزمات وضمان مرونة قطاعية مستدامة..

الكلمات المفتاحية: جائحة كورونا، إدارة الإنشاءات، قطاع الإنشاءات الأردني، الضغط على البنية التحتية، التخطيط الحضري، نقابة المهندسين الأردنيين، الناتج المحلي الإجمالي.

Introduction

In the structure of the national economy, there are related sectors of industry, agriculture, tourism, construction, supply, and production. Their relative importance varies throughout the United States. The building and construction sector in Jordan is much more important, contributing to the national Gross Domestic Product (GDP) by at least 20% (Central Bank of Jordan, 2012–2022) is available] It also boosts and supports other important industries such as the production of iron and metals, production of cement and production of electrical and sanitary furniture (Jordan Union of Engineers 2012-2022). Due to the importance of the Jordanian economy, the growth pipeline is relatively exposed to external shocks, internal disturbances, and natural shocks. Any disruption in this zone must be transmitted through the rest of the financial system, impacting growth prospects and business opportunities [1,2]. Under stable conditions, planning and forecasting with the help of the concerned government can provide some predictability. However, unpredictable events—whether exogenous (e.g., earthquakes, hurricanes, epidemics) or maturity-created (e.g., wars, financial crises)—result in significant instability [3,4,5]. This research focuses on engineering construction management during the unprecedented global disaster of the COVID-19 pandemic. The impact of the pandemic began in Jordan in the early 2020s, initiating a good-sized lockdown, disrupting supply chains, and altering social behavior, accordingly creating a unique stress test for development enterprises [6]. This has a look at quantifies the impact of the pandemic on construction time activities in Jordan through documented information from the Jordanian Society of Civil Engineers, the professional body responsible for auditing and approving construction permits [7].

By comparing completed construction zones to their geographic distribution before, during, and after the pandemic, have a look at delineates the exact implications of the crisis. This paper is organised as follows. Section 2 provides an opinion on the existing literature on the worldwide impact of the COVID-19 pandemic on the construction industry, describing significant demand scenarios and responses. III. Section 4 Discussion and Evaluation of the Findings: General scope of creation, geographical focus, and changes in type of building. Section 5 concludes the paper with a summary of the main findings and their implications for engineering management and practical construction planning, and implications for sustainability research and coverage development**.**

Literature Review

The impact of the COVID-19 pandemic on the construction industry globally has been well documented, with common challenges and many immediate responses being highlighted. [8]. Studied the impact of the pandemic, identifying significant disruptions in workflow and delivery chains. Their study highlighted the emergence of opportunities, including the need for virtual drive and modern procurement and construction plans, underlined the need for contingency planning, and new work technologies for situations with minimal human contact [9]. examined the impact on construction contracts. They looked at questionnaires and found that the pandemic negatively affected the project outcome, especially regarding the final timeline. There were additional costs, a lack of human and useful resource capacity, and specialized equipment. In the United States, [10]. analyzed the early impact of the pandemic on the US creative enterprise. Their findings provided important insights into early disruption for stakeholders and laid the groundwork for the development of good practices to ensure continued safe and productive

operations [investigated the responses of challenged managers, contractors, and engineers, targeting the UK construction industry. Based on 30 participant interviews, the study concluded that residential and commercial developers are significantly affected by lockdowns and social distancing measures.

Prioritize maintaining strong vendor relationships in key technologies and protect manufacturing teams. Examined the long-term consequences of epidemics on residential architecture, arguing that future design should incorporate features such as containment spaces and spatially isolated self-isolation zones to accommodate the new fact that epidemics may also prove to be more prevalent [11].

Their observations were intended to provide policymakers and business leaders with resources for increasingly robust responses. This study builds on this global framework of work by providing a selected, record-breaking assessment of the Jordanian context. Unlike many studies that rely on surveys or assumptions, this study uses exhaustive data from the Jordan Engineers Association to examine the actual creative output (construction area) in all governorates . It quantifies the immediate decline, subsequent increase, and the geographical variation present.

Relate Work

The impact of the COVID-19 pandemic on the global creative enterprise has been widely documented. Under normal demand conditions, the distribution includes chain disruptions, labor shortages, and contract disputes, to which local reactions vary, highlighting the need for adaptive management.

Ogunwusi et al. Identified key disruptions to international workflows in the early stages of the pandemic and delivery chains. Their research also mentioned accelerating the adoption of digital driving and sophisticated procurement planning. They emphasized the importance of desirable contingency plans for situations with minimal human interaction. Pandey (2020) conducted a comprehensive international assessment identifying viable paths for the development of industry throughout the pandemic and emphasizing the costs of resilience and effective publications. [11]. Examined the impact of Kuwait on the manufacturing sector, reporting delays, price overruns, and contractual problems [12]. Examined the factors affecting creative enterprise control in Riyadh and found that textile allocation, labor, and task funding became major constraints. The Saudi Labor Authority (2020) worked hard to improve worker flexibility and (2020) conducted an initial qualitative assessment of the consequences of the pandemic in the field of civil engineering development. This vision talked about immediate problems, closure, rules of movement, etc., but has not yet caught up with long-term consequences.

Studies explored the effects of the pandemic on overall performance and engagement [13]. Recorded similar results in jobs and overall performance in manufacturing firms in the UAE, emphasizing the necessity of powerful conversation and virtual technology [14]. Noted that the pandemic hit India hard, leading to labour shortages, supply chain disruptions, lower productivity, higher mission finance rejection quotas, and lower foreign investment. It challenged policymakers and managers to have complete information about the crisis at a glance. In the Western context, [15]. studied early impacts in the U.S. manufacturing industry, presented stakeholder perceptions of early disruptions, and set the stage for quality practices to maintain safe, continuous operations; in the UK, observed and confirmed, through interviews, that residential and commercial development was critically reduced with closures. Strategies for

coping included having meaningful conversations with providers and focusing on group protection. [16]. also took into account the long-term effects of the housing structure, in addition to the short-term challenges. In future designs, there should be operations with detention centres and spatially separated self-isolation zones to accommodate a new reality in which outbreaks may also become more common, he said. This further line of enquiry is consistent with structural work undertaken in other international contexts [17]. While existing research lays a good foundation for predicting the impact of the pandemic, most studies have been based on surveys, interviews, or self-review. It is still lacking in full, record-driven studies that use long-term valid statistics to measure the level of actual research in manufacturing production, building typology, and geographic distribution. The Gift Study bridges this gap by using detailed annual data from the Jordan Association of Engineers (2012–2022). It can offer a quantitative vision of the measures that have modified the volume of the epidemic-epidemic product, concentrated activities in the capital, and stimulated the development of new building types in Jordan.

3. Research Methodology

It is based on a quantitative analysis of secondary information from the annual report of the Jordanian Engineers Association, the professional authority that audits and issues licenses in Jordan. The period of the study is 8 years (2015-2023) and is divided into several phases:
- Pre-pandemic: 2015-19
- Epidemic phase: 2020 (the year when Jordan felt the full impact of the pandemic)
- Post-pandemic: 2021/2022.
- The assessment is based on three major criteria:
    - Total constructed area: Total area of houses constructed per year in Jordan (million square metres).
    - Geographical Distribution of Construction: The percentage of the total built construction space attributed to each of Jordan's 12 governorates.
    - Building Typology Distribution: % of total built-up area tagged with type: residential, industrial and commercial

JEA review information was collected and summarised into tables and figures, which visually displayed characteristics that considered trends, percentage adjustments, and full-scale changes to building models between described phases to provide a clear picture of the impact of the pandemic.

Table 1. Total Area of Buildings Constructed in Jordan (2015-2022)

Year	Total Building Area (Million m²)
2015	17.34
2016	16.99
2017	17.373
2018	16.70
2019	16.135
2020	13.65
2021	22.20
2022	19.60

Source: Jordanian Engineers Association Annual Reports.

Table 2. Geographical Distribution of Building Construction by Governorate (2018-2022) as a Percentage of the Total National Area

Governorate	2018 (%)	2019 (%)	2020 (%)	2021 (%)	2022 (%)
Capital (Amman)	58.60	53.00	63.90	68.70	68.60
Alzarqa	10.78	9.78	7.12	5.80	5.60
Almafraq	3.54	4.10	3.82	3.10	3.60
Ajloun	0.60	0.89	0.82	0.90	0.70
Albalqaa	6.63	7.26	4.99	4.40	4.70
Madaba	2.17	2.64	1.98	1.60	1.40
Jerash	1.31	1.90	1.62	1.30	1.30
Alaqabq (Aqaba)	2.65	3.34	2.51	2.20	1.90
Alkarak	3.30	2.55	2.12	2.00	1.90
Maan	0.80	1.60	0.89	0.70	0.60
Altafelah	0.80	1.06	0.84	0.50	0.50
Irbid	8.80	11.71	9.40	8.80	9.00

Source: Jordanian Engineers Association Annual Reports.

Table 3. Distribution of Building Construction by Type (2018-2022)

Year	Residential (%)	Commercial (%)	Industrial (%)
2018	67.20	20.63	12.17
2019	67.50	21.10	11.40
2020	78.20	14.15	7.65
2021	76.80	14.80	8.40
2022	72.00	19.50	8.50

Source: Jordanian Engineers Association Annual Reports.

4. Analysis and Discussion

A review of official statistics reveals a remarkable 3-block pattern of Jordan's manufacturing sector without the lag of the pandemic calendar: a phase of relative stability, a steep slump and a huge, transformative boom.

4.1. Overall Impact on Construction Volume

As Figure 1 shows, Jordan's total built-up neighborhood remained relatively strong between 2015 and 2019, averaging around 17 million square meters per year in 2020 with a sharp decline to 13.65 million square meters since the start of the pandemic. This 20% decrease directly

reflects the impact of the lockdown, movement rules, monetary uncertainty, supply chains, and disruptions in the delivery of available labour.

The length of the sub-pandemic period (2021-2022) increased unprecedentedly. The total built-up area returned to an average of 20.9 million square meters, a 24% increase from the pre-pandemic norm. This increase can be attributed to several factors: the 2020 recession calls, the migration to social ownership, and privatization of the original space.

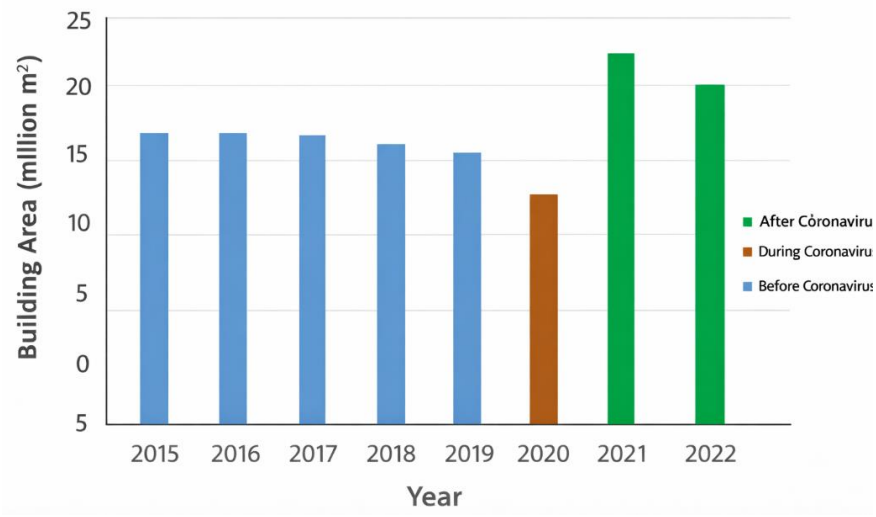

Figure 1. A: Total area of buildings constructed in Jordan 2015–2022 in million square metres (A bar or line chart would be inserted here, clearly showing the drop in 2020 and the sharp increase in 2021-2022, using the data from Table 1

4.2. Geographic Concentration of Construction

Figure 2 and Table 2 show a considerable change in the geographic pattern of construction activity. Before the pandemic (2018-2019), the capital, Amman, accounted for around 55% of the total built-up building area. This concentration was large but distributed over a broader range of governorates.

Construction activity was highly concentrated in Amman during the pandemic (2020) and particularly the post-pandemic years (2021-2022), accounting for nearly 69% of the national total (see Table 4). Jordan Department of Statistics (Population Estimates 2023): Published: Amman, Jordan: Department of Statistics.URL: https://dosweb.dos.gov.jo/product/jordan-statistical-yearbook-2023/ Table 4. Population and area of Jordanian governorates (estimates, 2023-2024)

Governorate	Population (millions)	Area (km²)	Population density (per km²)
Amman	4.8345	7,579	537
Irbid	2.135	1,572	1,304
Zarqa	1.616	4,761	286
Balqa	0.593	1,120	500
Mafraq	0.666	26,551	14
Karak	0.381	3,495	92
Madaba	0.228	940	223
Jerash	0.286	410	512
Ajloun	0.212	420	452
Aqaba	0.227	6,905	28
Ma'an	0.191	32,832	5
Tafilah	0.116	2,209	41
Jordan	11.516	89,318	124

Amman alone is home to 37% of Jordan's population (4.07 million out of 11.05 million). The second largest governor has the easiest half of so many people in Irbid.

The population of Amman is more than the combined total of 11 different provinces (which is about 6.98 million).
Geographically, Amman is neither the smallest nor the largest, yet the relevant area, infrastructure, and business market make it a magnet for immigration and an engine for the nationwide economy.

This results in an increase of 14% in the capital's share. The governorates of Irbid, Alzarca, and Albalka saw their relative shares decline, and Amman's dominance increased.

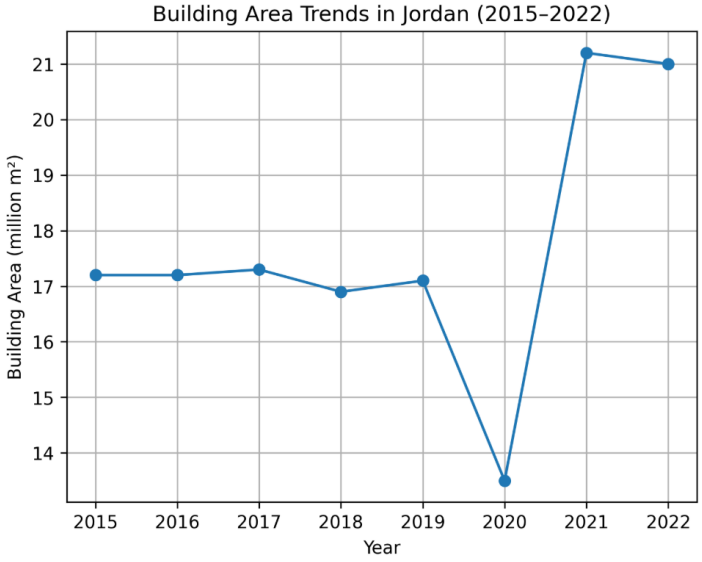

Figure 1. B: The area of buildings constructed in Jordan from 2015 to 2022 in million square meters

Figure 2 shows the share of construction zones built in Jordan through the government from 2018 to 2022, which now includes the years before the COVID-19 pandemic, during the pandemic, and after recovery. The capital, Amman, possessed the largest share of built output – fifty% of the national total before the pandemic- and this share increased to around sixty-nine% after the pandemic, representing an upward jump of a factor of 14 percentage points on average compared to the pre-pandemic global average.

Following the pandemic, the proportion of building areas constructed in Amman reached 69% of Jordan's total constructed area. This post-pandemic concentration of construction activity in a single governorate has placed very high pressure on infrastructure and public services. Furthermore, the significant increase in population density within a small geographical area has led to severe traffic congestion and strain on public transportation. These outcomes reflect poor management and irresponsible planning in the execution of building projects in Jordan.

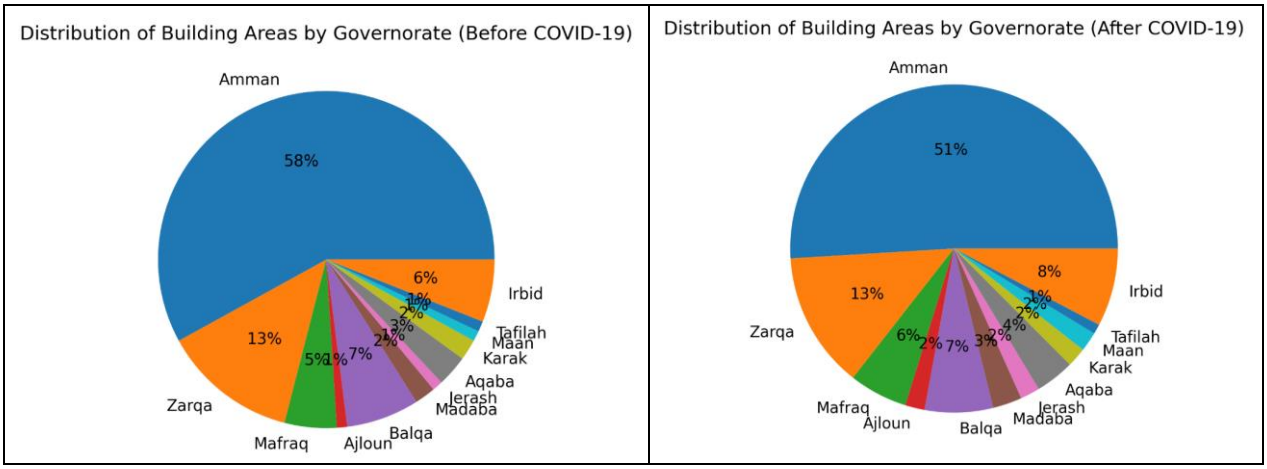

Figure 2. A: The percentage of building constructions in Jordan distributed before the coronavirus in the governorates (regions) in 2018-2019

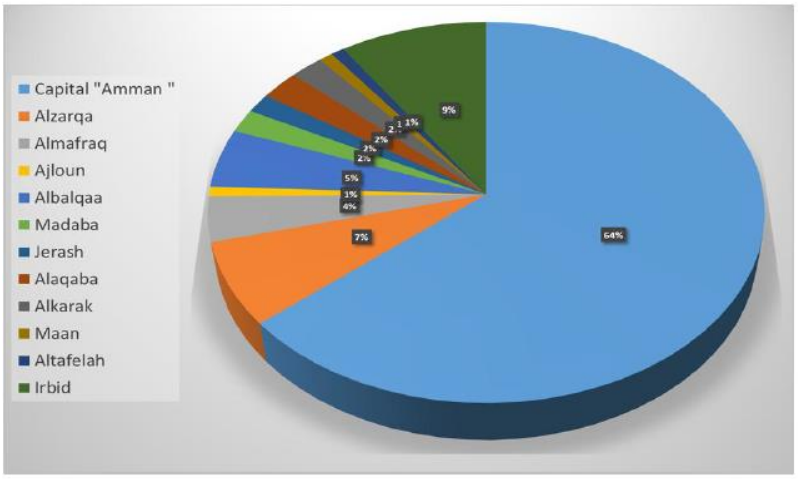

Figure 2. B: The percentage of building constructions in Jordan distributed during the Coronavirus pandemic in the governorates (regions) in 2020

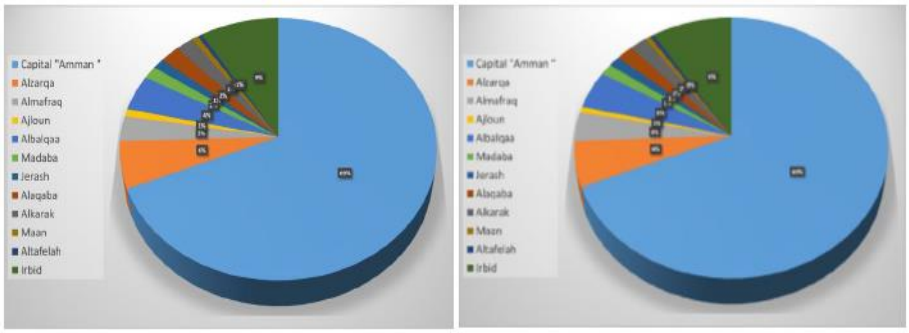

Figure 2. C: The percentage of building constructions in Jordan distributed after the coronavirus pandemic in the governorates (regions) in 2021- 2022

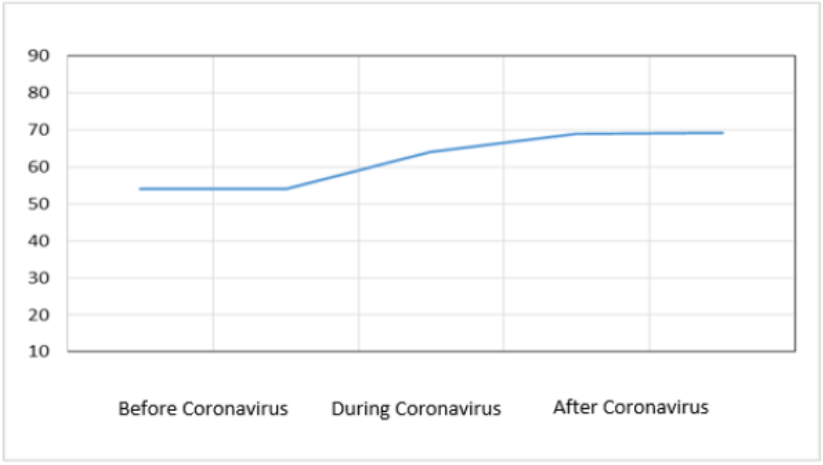

Figure 2.D: The percentage of building constructions in Amman distributed among governorates (regions) in 2018-2022

Figure No. (3) shows the areas of the buildings that were constructed in Jordan during the period (2018-2022) and according to the type of building (commercial, residential, and industrial) ، where it was found that the areas of residential buildings accounted for the highest percentage, at about 67% of the areas of buildings that were established before the COVID-19 pandemic. Then, the residential building areas increased to 78% in the year 2022, which is the year in which the impact of the COVID-19 pandemic began in Jordan, i.e., an increase of 11% compared to the areas of residential buildings before the COVID-19 pandemic.

The increase in the number of residential buildings in the year 2022, resulting from the impact of the COVID-19 pandemic, has resulted in a new type of residential building that is isolated and inside a farm and is called locally a chalet, to get away from mixing with people.

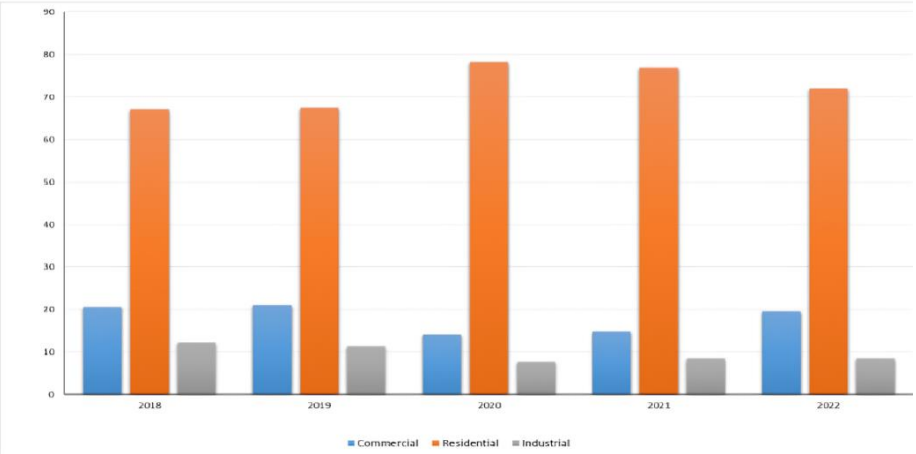

Figure 3.1: The percentage of building constructions by building type in Jordan from 2018 to 2022

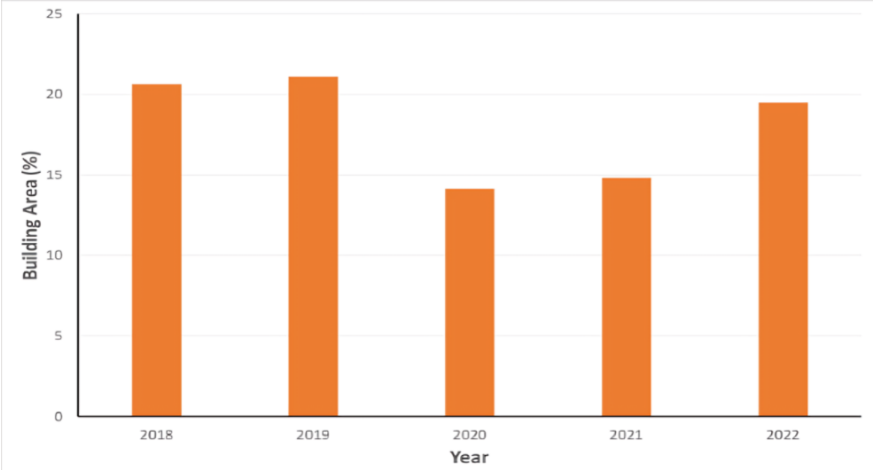

Figure 3.2: The percentage of building construction in Jordan from 2018 to 2022)

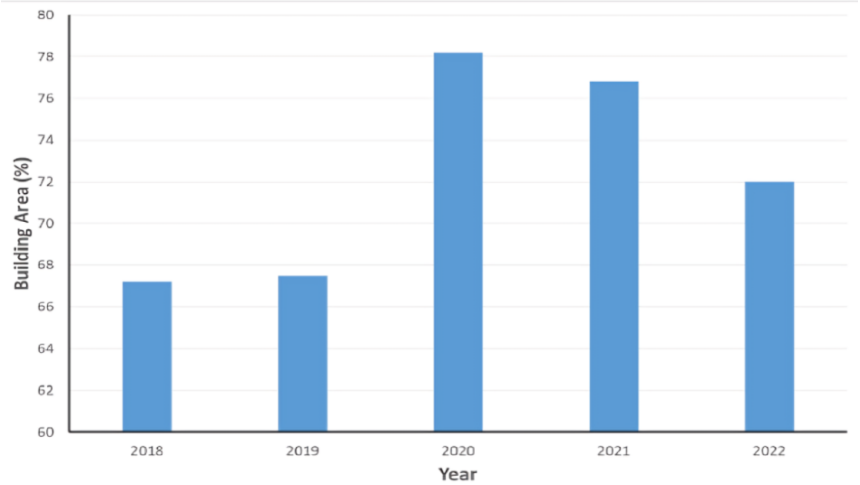

Figure 3.3: The percentage of residential building construction in Jordan from 2018 to 2022)

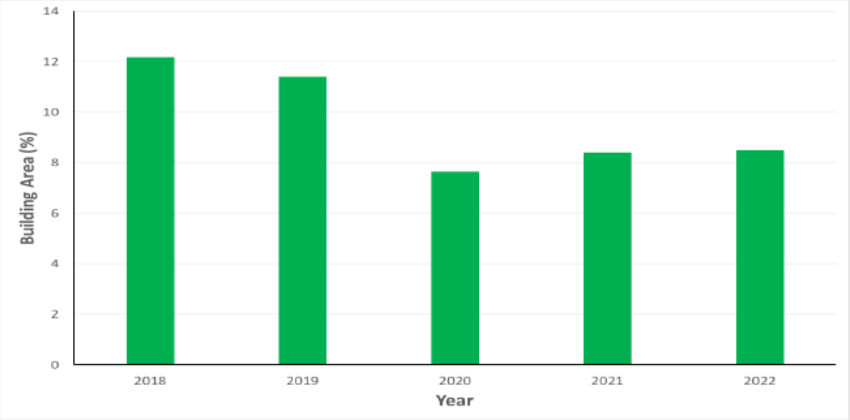

Figure 3.4: The percentage of building construction and industry in Jordan from 2018 to 2022)

5. Conclusions

Based on a radical examination of reliable documents published primarily using the Jordan Engineering Association, this assessment quantifies the primary impact of COVID-19 on the Jordanian manufacturing industry Impacts show that although the sector was not max available from the crisis, on the contrary, it has changed.

1. Changes in manufacturing expansion: As a result of the pandemic shutdown, total rural manufacturing space decreased by 20% in 2020. This was reflected in a rapid and surprising upward trend: in 2021, manufacturing expansion increased to 24% of pre-pandemic levels.

2. Growing geographical inequalities: The established epidemiological pattern was concentrated within the capital city of Amman in most cases, increasing the percentage of production tests nationwide from fifty% to sixty-nine%, this surplus interest added to problems of urban congestion and public transport possibilities of public transport problems. ministers.

3. New styles of creation emerge: The pandemic is changing consumer preferences in housing, with the percentage of housing trends increasing by a factor of 11 percentage points. A dramatic improvement is the emergence of a new style of building: faház (wooden living), living further outside cities.

This trend reflects social changes driven by a desire for additional privacy and fewer public health concerns. The rapid and large variations described in this review underscore the importance of flexibility and realistic strategies in engineering management and realistic creation and deployment.

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