“Sustainable industrial development of Western Kazakhstan’s regions”

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SUSTAINABLE INDUSTRIAL DEVELOPMENT OF WESTERN KAZAKHSTAN'S REGIONS

Abstract

The Lima Declaration established the basis for inclusive and sustainable industrial development, emphasizing industry as a driver of progress. This study aims to analyze the sustainable industrial development of the regions of Western Kazakhstan. Using a comparative approach and Sustainable Development Goal framework, an economic-static analysis was performed on data from the Bureau of National Statistics and the National Bank of the Republic of Kazakhstan for 2010, 2015, and 2019–2022 to evaluate the state and trends of structural shifts in the sectors forming the gross regional product, as well as the development dynamics of the manufacturing industry. The study revealed that the technological structure of industry in Western Kazakhstan is dominated by the IV technological paradigm (76–82%). The manufacturing industry accounts for 11.79% of gross domestic product and is characterized by a low share of gross value added of medium- and high-tech industries in the gross regional product (0.24–1.45%). Despite the steady growth of manufacturing development indicators, only the Aktobe region demonstrates high potential for sustainable industrial development, while the West Kazakhstan and Mangystau regions have medium potential, and the Atyrau region has low potential. In these regions, sectors such as mechanical engineering, pharmaceutical and chemical production, electrical equipment, computers, and electronic and optical products have significant development potential. An important direction in sustainable industrial development in these regions could be establishing strict environmental standards, the digital transformation of mining enterprises, the transition to low-carbon sources, increasing intellectual potential, and human capital development.

Keywords Sustainable Development Goals, sustainability, industrialization, manufacturing industry, technological paradigm, oil-based economy

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INTRODUCTION

Today, oil-exporting countries face the risk of an accelerating energy transition. These countries must diversify their exports and transform the prevailing growth model to achieve sustainable economic growth and development. One successful and effective strategy is industrialization with support for exports of complex sectors in both manufacturing and services (Cherif et al., 2024). In December 2013, Member States of the United Nations Industrial Development Organization (UNIDO) adopted the Lima Declaration, establishing a new global vision of inclusive and sustainable industrial development (ISID) and emphasizing industrialization's importance as a catalyst. Since the Sustainable Development Goals (SDGs) are the primary framework for development policies promoting sustainable development in all aspects (economic, social, and environmental) until 2030, the previous ISID was acknowledged within the framework of SDG 9, which advocates for developing resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation (Kynčlová et

al., 2020). Promoting inclusive and sustainable industrialization is one of the sustainable development goals within SDG 9, in particular, Target 9.2: "Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and of gross domestic product (GDP), in line with national circumstances, and double its share in the least developed countries" (UNDP, n.d.).

Kazakhstan's industrial policy aims to "ensure sustainable development of the manufacturing industry by increasing the production of competitive, high-tech, export-oriented products and moving away from a raw material-based development model." The objectives of Kazakhstan's industrial policy (improving the population's well-being, creating and developing modern infrastructure, introducing innovations and developing new high-tech industries, diversifying the economy and increasing the competitiveness of industrial production, etc. (Law of RK, 2021) are consistent with the principles of sustainable industrial development. Significantly, the development of industrial potential and regional specialization is envisaged through centers of high-tech and knowledge-intensive industries in the northeastern regions of the republic, advanced technologies in the development of the agro-industrial complex in the northern regions, the development of new energy sources and related industries in the southern regions, and "new processing stages" in the western regions (Government Decree of RK, 2018).

According to the 2022 data, the combined share of the Western Kazakhstan regions (Aktobe, Atyrau, West Kazakhstan, and Mangystau) in the republic's GDP was 26.04%. These western regions account for the major share of the country's mining and quarrying output, at 75.83% (BNS, n.d.a). Moreover, the oil and gas and mining industries are predominant in the economies of Western Kazakhstan. Consequently, analyzing the current state or the potential for sustainable industrial development in these regions is imperative.

1. LITERATURE REVIEW

Industrialization has led to economic progress and societal prosperity. However, industrial development has also contributed to environmental degradation and exacerbated climate change (Barragán-Ocaña et al., 2024). Although industry is crucial for meeting the demand for minerals and supporting economic and social progress, significant concerns remain about specific areas of its performance. In some instances, mining, processing, and utilizing minerals, as well as their subsequent disposal, have notably adverse effects on the local environment and society. Companies from emerging market countries frequently face allegations of possessing inadequate or nonexistent environmental and social credentials (Buxton, 2012).

Industrialization is fundamental to economic development (Zodape et al., 2015). Its expansion inevitably increases the exploitation of natural resources. While prioritizing industrial activity and output to achieve self-sufficiency, the environment often remains the least considered aspect in the growth strategies. At the same time, one of the critical factors of an economy that is susceptible to being impacted by industrialization is the environment and the country's overall carbon footprint. As industrialization intensifies, natural resources are depleted more rapidly, which significantly impacts the overall welfare of the broader community (Dubey & Narayanan, 2010; Cherniwchan, 2012; Mahmood et al., 2020). Hence, environmental repercussions associated with industrial progress threaten sustainable development (Bonilla et al., 2018; Le Tellier et al., 2019; Babatunde & Afolabi, 2024). Although the environmental component has traditionally been central to sustainable development, recent research has emphasized the importance of the social component, which includes human resources and social responsibility (Lund-Thomsen et al., 2014; Jabbour & de Sousa Jabbour, 2016).

Various regional research case studies and programs have examined sustainable industrial development (Staniskis & Arbaciauskas, 2004; Wang, 2012; Qing et al., 2016; Tsai, 2018; Ulbrych, 2020; Bilovodska et al., 2023). These studies focus on three dimensions of industrial

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sustainability: environmental, social, and economic. Nevertheless, the social and economic dimensions are rarely considered compared to the environmental consequences of industrial sustainable development (Heravi et al., 2015). According to Ferraz et al. (2021), research on economic complexity employs innovative empirical methodologies and considers both social and environmental sustainability. However, it often neglects the critical examination of theory and policy.

Modern global changes, including those in the organization and structure of industrial production, necessitate the search for new solutions oriented toward a symbiosis of technological and economic advancement with social and environmental progress. Sustainable industrial development is one of the pillars of the green economy. This concept assumes that well-designed structural change policies can consider both productivity and environmental concerns (Ulbrych, 2020). Sustainable industrial development aims to initiate a comprehensive approach to sustainable development, encourage the growing interconnectedness between environmental and industrial policies, and promote business and industry as a crucial factor in achieving sustainable development (Oral et al., 2021). It can be defined by three parameters: enhancing endogenous productive capacities, especially innovation opportunities; improving the industry's environmental performance; and raising living standards and reducing inequality, mainly by increasing the employment quantity and quality in the manufacturing sector (Zodape et al., 2015; Yuan et al., 2020).

If industrialization aims to provide affordable products with minimal environmental damage, then sustainable industrialization implies transforming the industrial economy to contribute to wealth creation, social development, and environmental sustainability; that is, industrialization by minimizing environmental impact and enhancing social integration (Yuan et al., 2020; Omankhanlen et al., 2021). The characteristics of sustainable development guide industrialization toward high-tech manufacturing, cleaner production, low resource consumption, green energy transitions, reduced environmental pollution, and the full realization of human resources benefits (Nguyen & Ye, 2015; Atchike et al., 2024). In this context, manufacturing sectors should be prioritized to shift the national and regional development trajectory away from a raw material-based concept toward an innovation-driven model. It should be noted that regions with oil-based economies and regions with low industrial eco-efficiency can pursue sustainable, high-quality, green development (Harris & Khare, 2002; Matsumoto & Chen, 2021).

Regions experiencing significant structural changes often demonstrate notable improvements in economic indicators (Vertakova et al., 2019). Optimizing, rationalization and upgrading the industrial structure impact on economic growth (Wu et al., 2022; Han et al., 2024) and largely hinges on accurately forecasting optimal sectoral proportions within the gross regional product (GRP) structure. So, the mechanism for modernizing the sectoral structure of the regional economy under conditions of sustainable development should include modules for assessing the state and trends of structural shifts in the GRP's constituent sectors, forecasting the optimal sectoral structure, selecting and testing priority instruments for implementing promising structural shifts.

Thus, sustainable industrial development represents a multifaceted concept that balances economic growth (industrial development), environmental protection, social equity, and well-being (Krajewska, 2024). Progress in technology, finance, and the economy has significantly contributed to the advancement of sustainable industrial development (Atchike et al., 2024). Science, technology, and innovation (STI) are important factors and conditions for achieving sustainable industrial development, boosting economic growth, social inclusion, and environmental protection. The benefits derived from STI should be shared among all, especially the poorest segments of the population, while protecting the natural environment for future generations (Colombage, 2019). So, the establishment of an eco-innovation ecosystem and the advancement of eco-innovations, including green innovations, play a crucial role in attain-

ing sustainable industrial development by enhancing industries' ecological performance and fostering a sustainability-oriented culture within the socio-economic landscape (Shkarupeta & Babkin, 2024; Suki et al., 2022). One pathway to meet these objectives, particularly for developing countries, is the transfer of advanced technologies (Bennett & Vaidya, 2002). The readiness of the economy to integrate these ISID solutions hinges on appropriate technological infrastructure and a supportive policy environment, while "technology push" and "demand pull" remain the two main promoters of technological innovation that ultimately shape the technological paradigm (Xu & Liu, 2020).

In summary, traditional industrialization paths have increased prosperity but also led to resource depletion and social polarization. A crucial task becomes the creation of economic strategies that simultaneously promote technological upgrading, sectoral diversification, and reduced dependence on resource-intensive industries. Such an approach allows for developing more comprehensive solutions that mitigate environmental risks and ensure a fair distribution of benefits. For sustainable industrial development of regions, it is primarily necessary to assess the state and trends of structural shifts in the GRP-forming sectors, paying particular attention to the dynamics of industrial development, especially in manufacturing. In oil-dependent economies, including those in Western Kazakhstan, this assessment is pivotal for reducing overdependence on volatile resource markets and addressing pressing ecological challenges. A comprehensive strategy emphasizing technological innovation and sectoral diversification can foster greater resilience and sustainability in industrial development.

Therefore, this study aims to analyze the sustainable industrial development of the regions of Western Kazakhstan.

2. METHOD

A descriptive, desk-based study was conducted using a comparative approach. The theoretical foundation of the study was grounded in concepts of sustainable industrial development and the framework of SDG 9. The primary research method employed was an economic-statistical analysis. The analysis of the sustainable development of the manufacturing industry and the fulfillment of SDG Target 9.2, was carried out based on statistical data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan and the National Bank of the Republic of Kazakhstan for the years 2010, 2015, and 2019–2022 (Table 1).

It should be noted that the monitoring of SDG Target 9.2 in Kazakhstan is conducted using the following indicators (BNS, n.d.b):

1. Value added generated in manufacturing, as a percentage of GDP and per capita (share of manufacturing value added (MVA) in GDP, percentage, in 2010 prices; MVA per capita, US dollars, in 2010 prices).

2. Labor productivity in manufacturing (growth rate of labor productivity in manufacturing, percentage change from the previous year).

3. The volume of exports of manufactured goods (growth rate of the volume of exports of manufactured goods, percentage change from the previous year).

4. Employment in manufacturing as a percentage of total employment (the number of new jobs created in manufacturing in thousands of people).

When classifying types of economic activity within manufacturing industries by their technological development, the methodology proposed by Lola and Bakeev (2020) was applied to identify both medium- and high-technology manufacturing sectors. According to this methodology, the following are classified as medium- and high-technology sectors: the manufacture of chemicals and food products; the manufacture of pharmaceuticals and materials used in medicine; the manufacture of computers, electronic and optical products; the manufacture of equipment; the manufacture of machinery and equipment not elsewhere classified; and the manufacture of motor vehicles, trailers, and semi-trailers.

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Table 1. Indicators used in the study

No.	Indicator / Statistical bulletin	Data source
1	Key socio-economic indicators for Aktobe region	BNS (2024a)
2	Key socio-economic indicators for Atyrau region	BNS (2024b)
3	Key socio-economic indicators for West Kazakhstan region	BNS (2024c)
4	Key socio-economic indicators for Mangystau region	BNS (2025a)
5	GRP	BNS (2024d)
6	GRP per capita	BNS (2024e)
7	Gross value added (GVA) by industrial sector, disaggregated by region	BNS (2024f)
8	GRP and GVA chain-type indices by economic activity	BNS (2024g)
9	Daily official (market) currency courses	NB (2025)
10	Volumes of industrial production by economic activity in Aktobe region	BNS (2023a)
11	Volume of industrial production by economic activity in Atyrau region	BNS (2023b)
12	Volume of industrial production by economic activity in West Kazakhstan region	BNS (2023c)
13	Industrial production in Mangystau region	BNS (2023d)
14	Employed population by economic activity and region	BNS (2025b)
15	Labor productivity by economic activity, disaggregated by region	BNS (2024h)
16	Value added generated in manufacturing, as a percentage of GDP and per capita	BNS (n.d.b)
17	Growth in labor productivity in manufacturing	BNS (n.d.b)
18	Employment in manufacturing as a percentage of total employment	BNS (n.d.b)

3. RESULTS

A multi-structural technological framework of the economy has taken shape in West Kazakhstan. The regional economies of West Kazakhstan are dominated by oil and metal production, which fall under the fourth technological paradigm (or the fourth Kondratiev wave) (Appendix A). According to the 2022 data, the fourth technological paradigm dominates the technological structure of West Kazakhstan's industry, particularly in Atyrau region (82.14%), Mangystau region (76.14%), and West Kazakhstan region (76.0%). Rudimentary elements of the fifth technological paradigm are also observed, especially in the Mangystau region (12.02%). Technologies of the third technological paradigm are also present at a similar level, except in the Aktobe region, where they account for one-third (Figure 1).

The manufacturing industry in Western Kazakhstan is developing rapidly. However, from 2010 to 2022, the manufacturing industry's share in the studied regions' GDP decreased from 13.9% to 11.79% (Appendix B). According to the 2022 data, high manufacturing output volumes are observed

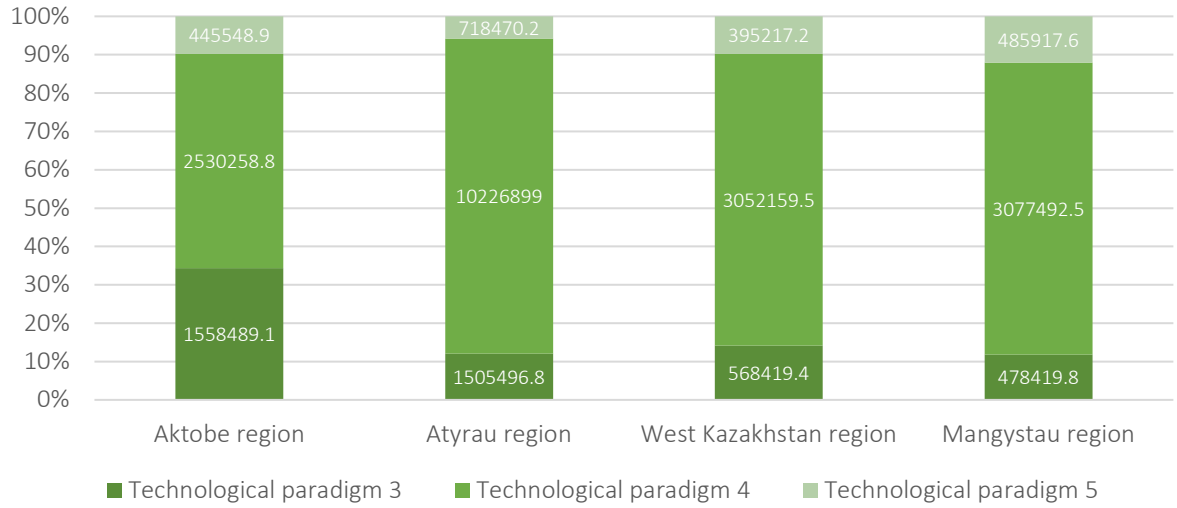

Figure 1. Technological paradigms in the structure of industrial production in the regions of West Kazakhstan, mln. tenge, %, 2022

in the Aktobe and Atyrau regions – 840,257,615 and 703,679,382 thousand tenge, respectively. The share of the manufacturing industry in the GVA structure of industrial production in the Mangystau region increased from 3.7% to 6.8%. Meanwhile, in other regions, the percentage of the GVA structure remained virtually unchanged.

In the Mangystau region, GVA growth rates are relatively low compared to other regions. This region is also characterized by negative growth rates in a larger number of industries than other regions, specifically in the production of beverages, paper and paper products, electrical equipment, and other finished goods. In this region, the prominent increase in GVA comes from mechanical engineering, the production of coke and refined petroleum products, and fabricated metal products, except for machinery and equipment. In the Aktobe region, high GVA is observed in the metallurgical industry in producing coke, refined petroleum, and food and beverage products. From 2013 to 2022, in the Aktobe region, the GVA of motor vehicle, trailer, and semi-trailer manufacturing increased significantly, from 0.5 to 741.5 million tenge, representing a 1,483-fold increase. More than tenfold growth was observed in industries such as the manufacture of other finished goods (49.92 times), textile manufacturing (38.91 times), basic pharmaceutical product manufacturing (18.63 times), and the metallurgical industry (12.85 times).

In the Atyrau region, the highest GVA is also in producing coke and refined petroleum products. Over the period under review, the largest GVA growth was in textile manufacturing (63.45 times), printing and reproduction of recorded media (40.62 times), paper and paper product manufacturing (31 times), clothing manufacturing (20.32 times), the manufacture of wood and cork products (except furniture), (13.13 times), chemical product manufacturing (12.47 times), repair and installation of machinery and equipment (12.41 times), the metallurgical industry (11.04 times), and mechanical engineering (10 times). Meanwhile, GVA declined in two manufacturing industries: motor vehicle, trailer, and semi-trailer manufacturing and other finished goods manufacturing. In the West Kazakhstan region, the highest GVA growth over the period under review is observed in food manufacturing and mechanical engineering. During the period studied, significant GVA growth was recorded in the manufacture of electrical equipment (431.69 times) and the manufacture of computers, electronic, and optical products (272.47 times), as well as in the manufacture of wood and cork products (except furniture), and articles of straw and plaiting materials (29.44 times). More than a tenfold increase in GVA is observed in manufacturing chemical products (14.22 times) and other finished goods (14.59 times). At the same time, GVA decreased in industries such as paper and paper product manufacturing (Appendix C).

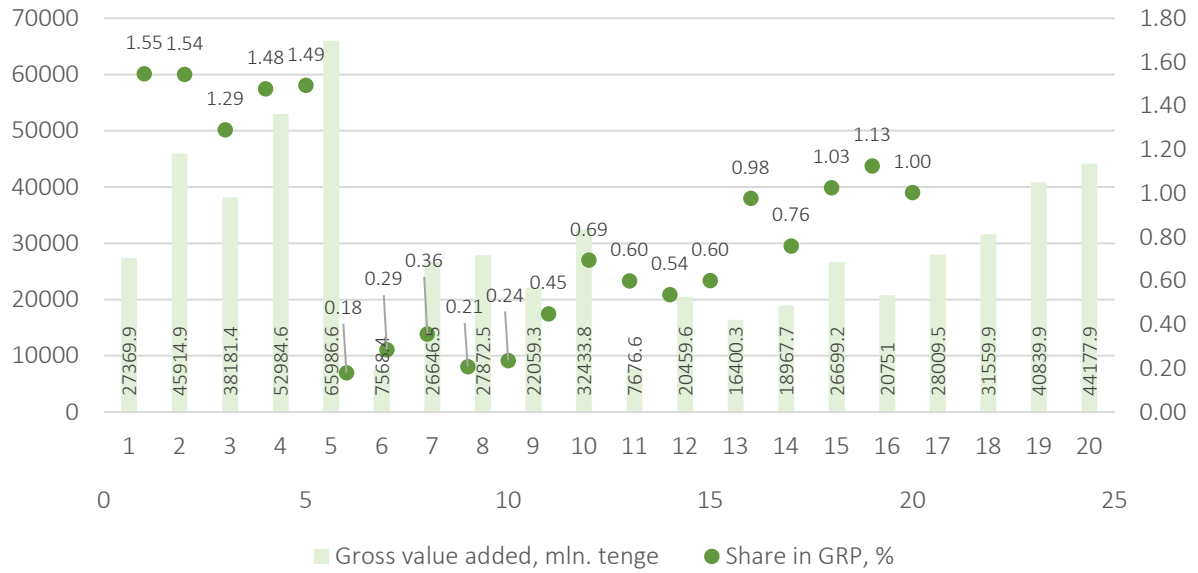

Figure 2. Medium- and high-technology industries: GVA and share in GRP (Western Kazakhstan's regions, 2010–2022)

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Western regions of Kazakhstan are characterized by a very low share of GVA of medium- and high-technology industries in GRP, despite the steady growth of GVA in these industries, except 2020, primarily due to the negative impact of the COVID-19 pandemic (Figure 2).

Based on the 2022 data, the highest GVA in medium- and high-technology industries is observed in the Aktobe region, while the lowest is in the West Kazakhstan region. However, the West Kazakhstan region shows a significant increase in its share of GRP, whereas the Aktobe region has experienced a decrease in its relative weight. Among the regions of West Kazakhstan, the largest share of GVA from medium- and high-technology industries within the GRP is found in the Aktobe and Mangystau regions.

Between 2010 and 2022, the number of employed individuals in the manufacturing industry of West Kazakhstan's regions increased by 77,400, with the most substantial increases occurring in the Aktobe and Mangystau regions. In the West Kazakhstan region, the number of employed individuals in the manufacturing industry surpasses the number employed in other industrial sectors. Over the review period, the Aktobe region also showed growth in manufacturing employment, with an increase of 8,500 people, reaching 30,100 in 2022; however, its share in the industrial employment structure decreased by 3.61 percentage points (p.p.). In 2022, the Atyrau region's manufacturing employment showed a slight absolute increase of 1,200 people, but its relative weight decreased by 3.6 p.p. The West Kazakhstan region demonstrates notable growth in manufacturing employment both in absolute numbers and relative weight, from 10,500 to 19,900 people (rising from 47.16% to 55.38%). The Mangystau region is characterized by a significant increase in industrial employment, particularly manufacturing. Specifically, the number of employed individuals in manufacturing increased from 9,400 to 20,500 people.

The Atyrau and West Kazakhstan regions demonstrate high labor productivity in industry, particularly in the mining sector, which exhibits the most substantial growth in labor productivity. It can likely be attributed to significant investments and modernization in oil and gas and metallurgical industries. In the manufacturing sector, high productivity is observed in the Atyrau and Aktobe regions, specifically 53,626.0 and 23,342.8 thousand tenge per employee, respectively. All regions display significant growth in labor productivity within the manufacturing sector, which may indicate modernization, technological improvements, and increased investment in the industrial sector. The Mangystau region also experiences productivity growth, though at a more modest rate than the other regions.

According to the SDG-9 Industry Index, in 2020 Kazakhstan ranks 86th out of 135 countries, having risen 19 positions in comparison to 2000. This index comprises the following dimensions: value added in manufacturing, manufacturing employment, technological complexity of manufacturing production, and environmental performance (UNIDO, n.d.). By contrast, in the SDG-9 index developed by Kynčlová et al. (2020), Kazakhstan ranked 82nd out of 128 countries in 2016.

It should be noted that the regions of West Kazakhstan experienced positive dynamics across many indicators of SDG 9.2 from 2010 to 2022 (Table 2).

Thus, according to the 2022 data, the largest share of MVA relative to GDP was observed in the Aktobe region at 10.2%, while in other regions, it ranged from 4.3% to 5.6%. A significant increase in this indicator was recorded in Aktobe and Mangystau regions. Conversely, the Atyrau region decreased from 5.5% to 4.6%, against the backdrop of a high MVA per capita compared to other regions. A significant increase in this per capita indicator was observed in the Aktobe region. However, labor productivity in manufacturing decreased in all regions of Western Kazakhstan in 2022, except the Atyrau region. The share of manufacturing employment increased to within the 6–7% range of total regional employment, except for the Atyrau region, which decreased from 3.9% in 2010 to 3.4% in 2022. Concurrently, the number of new jobs created in manufacturing steadily declined during the period under review in all western regions of the republic. In total, 18,700 new jobs were created in manufacturing in Western Kazakhstan, of which 41.34% were in the Aktobe

Table 2. Dynamics of SDG 9.2 indicators in the regions of West Kazakhstan, 2010–2022

SDG	Indicator	2010	2015	2019	2020	2021	2022
Aktobe region							
9.2.1	Share of MVA as a percentage of GDP	7.9	7.8	9.1	9.4	10.1	10.2
	MVA per capita, USD, at 2010 prices	821.5	902.8	1178	1196.1	1301.2	1292.2
	Growth rates of labor productivity in the manufacturing industry, as a percentage compared to the previous year	–	99.7	98.5	108.3	109.1	95.6
9.2.2	The share of employment in the manufacturing industry as a percentage of total employment	5.7	6.2	7.1	6.7	6.8	7.1
	The number of new jobs created in the manufacturing industry (in thousands of people)	3.033	2.092	0.08	1.2	0.42	0.9
Atyrau region							
9.2.1	Share of MVA as a percentage of GDP	5.5	5.1	4.4	4.7	4.7	4.6
	MVA per capita, USD, at 2010 prices	2014.1	1828.8	2151	2104.7	2207.4	2098.7
	Growth rates of labor productivity in the manufacturing industry, as a percentage compared to the previous year	–	70.8	107.3	100.1	104.8	108.7
9.2.2	The share of employment in the manufacturing industry as a percentage of total employment	3.9	5.1	3.8	3.8	3.8	3.4
	The number of new jobs created in the manufacturing industry (in thousands of people)	1.5	1.0	0.1	0.6	0.1	0.6
West Kazakhstan region							
9.2.1	Share of MVA as a percentage of GDP	4.7	3.9	4.9	5	4,2	5.3
	MVA per capita, USD, at 2010 prices	549.8	507.4	647.1	653.7	526.1	646.5
	Growth rates of labor productivity in the manufacturing industry, as a percentage compared to the previous year	–	76.4	107.5	97.1	81.3	93.7
9.2.2	The share of employment in the manufacturing industry as a percentage of total employment	3.3	4.5	5.2	5.5	5.4	6
	The number of new jobs created in the manufacturing industry (in thousands of people)	1.034	0.873	–	0.3	0.22	0.6
Mangystau region							
9.2.1	Share of MVA as a percentage of GDP	3	3.5	4.4	4.7	4.6	4.6
	MVA per capita, USD, at 2010 prices	588.3	631.9	728.4	715.4	685.4	662.5
	Growth rates of labor productivity in the manufacturing industry, as a percentage compared to the previous year	–	69.3	87.5	114.2	100.8	87.9
9.2.2	The share of employment in the manufacturing industry as a percentage of total employment	4.6	6.6	6.8	5.9	5.4	6.2
	The number of new jobs created in the manufacturing industry (in thousands of people)	1.633	0.983	0.04	0.3	0.61	0.4

region. The overall trend of increasing indicators suggests a growing importance of manufacturing in Western Kazakhstan.

Thus, the economies of the western regions of Kazakhstan exhibit a dependence on traditional industries against the backdrop of nascent technological modernization. Over the last decade, the manufacturing sector in these regions has witnessed significant growth, particularly in producing food products, chemicals, and machinery. This growth reflects broader economic trends of industrial expansion and diversification in these regions, especially in Aktobe region. Aktobe region demonstrates a more diversified technological structure, including a significant presence of third technological paradigm technologies and high MVA in medium- and high-technology industries, indicating a more advanced level of technological development than other regions of Western Kazakhstan. Mangystau region demonstrates potential, possessing the largest number of nascent fifth technological paradigm technologies. The regions of Western Kazakhstan hold potential for the development of machinery manufacturing, the pharmaceutical and chemical industries, as well as the production of electrical equipment, computers, and electronic and optical products.

4. DISCUSSION

In Kazakhstan, there are practically no studies devoted to sustainable industrial development. For the most part, studies reveal individual aspects of

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it, or individual regions of the country. Thus, several studies have analyzed industrial development in specific regions. For instance, Kilybayev et al. (2023) identified socio-economic challenges facing single-industry towns within the Zhambyl region. Among those challenges were employment issues and environmental degradation due to industrial activities. Whereas a vast portion of industries lie in the western part of Kazakhstan, the environmental issue is a challenge even in such a small industrial region, unwillingly leaving much to be reconsidered in these industries. Kilybayev et al. (2023) indicated the need to reassess sustainable policy solutions to address the region's pressing employment and infrastructure concerns, even if many growth plans are already in place. Maimurunova et al. (2022) examined the sustainability issues encountered by mono-industrial cities, specifically in the Karaganda region. The article proposes that augmenting investments can improve economic performance and sustainability.

Kazakhstani regional scholars have highlighted the ecological difficulties that the regions of Kazakhstan are currently facing, especially western regions of the country (Alimbaev et al., 2020; Iskakov et al., 2024). At the same moment, Western Kazakhstan plays a crucial role in the republic's development, accounting for over a quarter of the country's GDP. Between 2010 and 2022, almost all sectors of Western Kazakhstan's economy showed a significant increase in GVA. In recent years, the share of the tertiary sector has increased. However, the mining industry, which has a detrimental impact on the environment, remains dominant. These findings confirm results of previous studies, and highlight the need to modernize the sectoral structure of the economy to ensure sustainable industrial development in the regions of Western Kazakhstan. For example, Aktobe region is characterized by a medium-diversified manufacturing industry, while Atyrau, West Kazakhstan, and Mangystau regions exhibit a critically low level of manufacturing industry development without stable specializations (Alibekova et al., 2023). Focusing on stabilizing unstable sectors and supporting growing industries could further accelerate industrial development. Indeed, economies with a more significant proportion of manufacturing activities are likely to experience higher economic growth rates, thereby emphasizing the significant role of manufacturing as a driving force in the economy (Gryshova et al., 2020). Thus, according to the findings the Aktobe region possesses a high potential for sustainable manufacturing development due to the stable growth in GVA and employment. There is potential for growth in West Kazakhstan and Mangystau regions if labor productivity in manufacturing, which can be assessed as average, is increased. Taskarayeva (2025a, 2025b) confirms the high potential of Mangistau region in diversifying its economy and achieving sustainable industrial development. However, industrial development in the Atyrau region requires particular attention, as the decline in most indicators over the studied period suggests a steadily declining dynamic in manufacturing development, indicating low potential for sustainable industrial development.

It should be recognized that various industries face unique challenges and opportunities when implementing sustainable development. Moreover, enterprises are not always prepared to implement this concept (Nguyen & Ye, 2015). For instance, the mining industry encounters distinct challenges in achieving sustainability. A key global trend in sustainable development for mining enterprises, contributing to improved performance indicators at all production levels and overall growth of industry indicators, is digital transformation. It encompasses scientific and innovative technologies, including automation, digitalization, and intelligent technologies across all production processes. The aim is to maximize product cost-effectiveness, increase productivity and economic efficiency, and enhance safety at all sites of mining enterprises (Mottaeva & Gordeyeva, 2024). Indeed, innovations have a positive impact on the sustainable economic development of regions. However, the Aktobe and Mangystau regions have consistently exhibited a low level of innovative resource development in recent years, while the West Kazakhstan region has demonstrated an unsatisfactory level of innovative resource development (Nurlanova et al., 2020). Therefore, the issue of sustainable industrial development in the western regions of Kazakhstan remains pressing, despite the fact that in July 2014 there was approved a country program for Kazakhstan on sustainable industrial development with an estimated total budget

of €15.6 million, including one aimed at competitiveness, modernization and energy efficiency of industry (UNIDO, 2015).

Sustainable industrial development, understood as both environmentally and socially sustainable, requires the transformation of industry and markets – specifically, demand for new products and processes. In fact, sustainable industrial development cannot occur without demand for environmentally friendly products. Ensuring future industrial transformations will necessitate a transition of enterprises to low- and zero-carbon energy sources to mitigate the effects of climate change (Bianchi et al., 2023). Therefore, there is a positive relationship between environmental actions (alternative measures of energy efficiency) and enterprise performance (firm-level productivity) across all industries and regions, although the degree of this effect varies (Montalbano et al., 2022). Governmental policy strategies play a critical role in a nation's prosperity; concurrently, the capacity of the scientific workforce becomes increasingly important for making sound public decisions that guide a nation's sustainable development (Li et al., 2019; Yussupov et al., 2023). For instance, the Chinese government aims to improve the economic structure of its industries by implementing stricter environmental laws. Yu and Wang (2021) demonstrated that implementing various environmental control policies can expedite the transformation of the industrial structure in a specific area. The economic impact of environmental regulations varies significantly among regions (Zhang & Wen, 2008). Furthermore, Yuan and Zhang (2020) observed that environmental regulatory enforcement positively moderates the role of flexible environmental policy in promoting technological innovation. Likewise, Makazhe and Maramura (2024) indicated that Fourth Industrial Revolution technologies could substantially influence and contribute to achieving the UN SDGs. Intellectual potential and human capital are crucial drivers of both sustainable economic and sustainable technological development (Kireyeva et al., 2022). In order to strengthen the potential for sustainable industrial development in Western Kazakhstan's regions, these factors and measures must be considered when formulating national and regional industrial development strategies.

Thus, diversifying the sectoral structure, strengthening the role of manufacturing, and implementing innovations can ensure more dynamic and balanced economic growth in the regions of Western Kazakhstan. It is also necessary to consider social and environmental aspects, including the problems of energy poverty and the negative impact of extractive industries on the environment. China's experience reveals that applying stringent environmental regulations stimulates sustainable industrial development. The digital transformation of mining enterprises and the transition to low-carbon energy sources are key factors in enhancing their efficiency and competitiveness. Clear strategies and well-designed state support measures are necessary to realize the potential of sustainable industrial development of oil-based economies in Western Kazakhstan regions. Achieving this requires an in-depth analysis of state policy in promoting the application of modern technologies in the manufacturing sector of Western Kazakhstan regions, followed by the development of recommendations for the sustainable development of machinery manufacturing, pharmaceutical and chemical industries, as well as the production of electrical equipment, computers, electronic and optical products.

CONCLUSION

This study aims to analyze the sustainable industrial development in the regions of Western Kazakhstan. The economies of Western Kazakhstan regions are largely dominated by the fourth technological paradigm, while the share of GVA from medium - and high-tech industries in GRP is very low. Consequently, the primary task is diversifying the economies of Western Kazakhstan regions. Western Kazakhstan currently demonstrates stable industrial development: industrial output, gross value added, the number of employed, and productivity are all increasing. A noticeable increase in labor productivity and eco-

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nomic diversification contributes to improved resource efficiency, reduced costs, and enhanced regional competitiveness. Such a dynamic is important for sustainable industrial development, as highly productive industries attract more investment and contribute to economic growth.

The Aktobe region exhibits high potential for sustainable industrial development, with its economy characterized by an increasing role in the manufacturing sector. There is potential for growth of manufacturing sector and its sustainability in West Kazakhstan and Mangystau regions. Industrial development in the Atyrau region requires particular attention, as it remains heavily dependent on the oil and gas sector and exhibits a steadily declining trajectory in manufacturing development. Sectors with development potential in Western Kazakhstan include manufacturing machinery, pharmaceutical and chemical products, and the production of electrical equipment, computers, and electronic and optical products.

For the regions of Western Kazakhstan with oil-based economies, industrialization supported by exports from complex manufacturing sectors represents an effective strategy for transforming the prevailing growth model. However, the share of manufacturing in the gross regional product and the level of development of manufacturing in these regions indicate a low potential for sustainable industrial development that balances economic growth, environmental protection, and social well-being. Establishing stringent environmental regulations, digital transformation of mining enterprises, transitioning to low-carbon energy sources, increasing intellectual potential, and developing human capital could become important directions in this area. These measures help to increase the potential for sustainable industrial development in West Kazakhstan's regions. Further research could focus on designing a methodology for assessing sustainable industrial development, considering manufacturing development's social and environmental sustainability, and creating a corresponding system of indicators for which statistical data will be collected at the national and regional levels.

AUTHOR CONTRIBUTIONS

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APPENDIX A

Table A1. Technological paradigms in the structure of industrial production in the regions of Western Kazakhstan, mln. tenge, %, 2022

Type of Economic Activity	Aktobe Region		Atyrau Region		West Kazakhstan Region		Mangystau Region	
	mln. tenge	%	mln. tenge	%	mln. tenge	%	mln. tenge	%
Technological Paradigm 3	1558489.1	34.37	1505496.8	12.09	568419.4	14.15	478419.8	11.84
Agriculture, forestry, and fishing	262124.9	5.78	103769.2	0.83	171954.7	4.28	30478.1	0.75
Mining of coal and lignite	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mining of metal ores	359013.6	7.92	0.0	0.0	0.0	0.0	0.0	0.0
Other mining and quarrying	15603.7	0.34	138575.9	1.11	822.7	0.02	2571.5	0.06
Manufacture of food products	60136.7	1.33	13021.2	0.10	72222.2	1.80	6759.0	0.17
Manufacture of beverages	43056.9	0.95	968.9	0.01	1218.3	0.03	336.6	0.01
Manufacture of tobacco products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of textiles	1895.1	0.04	3908.8	0.03	172.0	0.0	25.5	0.0
Manufacture of apparel	1330.4	0.03	3138.1	0.03	674.0	0.02	1451.5	0.04
Manufacture of leather and related products	0.0	0.0	26.8	0.0	58.0	0.00	451.3	0.01
Manufacture of wood products	516.0	0.01	677.7	0.01	2255.4	0.06	11.3	0.0
Manufacture of paper and paper products	849.6	0.02	105.4	0.0	278.2	0.01	10.3	0.0
Ferrous metallurgy	427612.4	9.43	9360.0	0.08	19634.4	0,49	23400.4	0.58
Manufacture of finished metal products	14335.6	0.32	8381.8	0.07	11138.8	0,28	21398.6	0.53
Manufacture of other finished products	64.9	0.0	322.9	0.0	493.0	0.01	0.4	0.0
Repair and installation of machinery and equipment	21740.1	0.48	41647.8	0.33	14610.1	0.36	14156.9	0.35
Electricity, gas, steam and air conditioning supply	91753.0	2.02	59340.8	0.48	44822.1	1.12	122452.4	3.03
Water supply; sewerage system, waste collection, and distribution management	20933.0	0.46	25389.2	0.20	6808.0	0.17	12345.5	0.31
Construction	200417.2	4.42	979809.5	7.87	191153.1	4.76	184541.9	4.57
Accommodation and food service activities	37106.0	0.82	117052.8	0.94	30104.4	0.75	58028.6	1.44
Technological paradigm 4	2530258.8	55.80	10226899.0	82.14	3052159.5	76.00	3077492.5	76.14
Extraction of crude petroleum and natural gas*	416330.9	9.18	6456036.0	51.85	2045067.3	50.93	1649690.9	40.82
Technical services in the field of mining industry	68482.5	1.51	125029.8	1.00	52489.3	1.31	195694.9	4.84
Manufacture of furniture	1628.6	0.04	661.8	0.01	2975.1	0.07	374.4	0.01
Coke production and petroleum refining	33344.9	0.74	462305.5	3.71	17178.0	0.43	40040.0	0.99
Manufacture of chemical industry products	53022.0	1.17	30393.6	0.24	6373.9	0.16	31002.3	0.77
Manufacture of rubber and plastics products	5152.4	0.11	6485.3	0.05	5704.2	0.14	2735.7	0.07
Manufacture of other non-metallic mineral products	38521.8	0.85	18808.6	0.15	12339.0	0.31	25886.6	0.64
Manufacture of precious and non-ferrous metals	413276.8	9.11	978.2	0.01	8495.6	0.21	2001.8	0.05
Manufacture of electrical equipment	103.7	0.00	604.5	0.0	6561.7	0.16	5.8	0.00
Manufacture of machinery and equipment not elsewhere classified	6272.7	0.14	1352.8	0.01	8037.8	0.20	12816.4	0.32
Manufacture of motor vehicles, trailers, and semi-trailers	741.5	0.02	1.1	0.0	3030.9	0.08	0.0	0.00
Manufacture of other transport equipment	429.5	0.01	0.0	0.0	2231.7	0.06	0.0	0.00
Wholesale and retail trade; repair of motor vehicles and motorcycles	623180.4	13.74	1577134.7	12.67	326159.2	8.12	218004.0	5.39
Transport and storage	385564.2	8.50	643109.8	5.17	194786.0	4.85	302629.1	7.49
Real estate activities	309117.3	6.82	244837.0	1.97	166278.4	4.14	329055.3	8.14
Administrative and support service activities	45150.2	1.00	473348.0	3.80	63104.4	1.57	100221.5	2.48
Arts, entertainment, and recreation	16091.8	0.35	11803.4	0.09	10647.5	0.27	17912.8	0.44

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Table A1 (cont.). Technological paradigms in the structure of industrial production in the regions of Western Kazakhstan, mln. tenge, %, 2022

Type of Economic Activity	Aktobe Region		Atyrau Region		West Kazakhstan Region		Mangystau Region	
	mln. tenge	%	mln. tenge	%	mln. tenge	%	mln. tenge	%
Public administration and defense; compulsory social security	74985.9	1.65	64144.6	0.52	74578.3	1.86	66448.7	1.64
Other service activities	38861.7	0.86	109864.3	0.88	46121.2	1.15	82972.3	2.05
Technological paradigm 5	445548.9	9.83	718470.2	5.77	395217.2	9.84	485917.6	12.02
Extraction of natural gas	N/A		N/A		N/A		N/A	
Manufacture of pharmaceutical products	2933.6	0.06	0.0	0.00	0.0	0.0	353.4	0.01
Manufacture of computer, electronic and optical products	2483.6	0.05	81.8	0.0	463.2	0.01	0.0	0.0
Information and communication	28109.7	0.62	20571.9	0.17	15280.5	0.38	18959.9	0.47
Financial and insurance activities	56904.4	1.25	59213.4	0.48	42593.1	1.06	51141.6	1.27
Professional, scientific and technical activities	60127.2	1.33	371637.8	2.98	74174.6	1.85	134521.2	3.33
Education	196514.1	4.33	176784.2	1.42	180578.2	4.50	135721.1	3.36
Health care and social services	98476.3	2.17	90181.1	0.72	82127.6	2.05	145220.4	3.59
Total	4534296.8	100.00	12450866.0	100.00	4015796.1	100.0	4041829.9	100.00

Note: Calculated based on GVA; *means that specific data on oil and natural gas extraction are unavailable; N/A – Data not available.

APPENDIX B

Table B1. Manufacturing industry development indicators in Western Kazakhstan's regions, 2010–2022

Region	Absolute value of indicator						Share in the region's industry structure, %					
	2010/2013*	2015	2019	2020	2021	2022	2010	2015	2019	2020	2021	2022
Production volume, mln. tenge												
Aktobe	168698.0	264391.4	605300.2	569692.2	840257.6	N/A	17.54	26.06	32.60	35.71	37.39	N/A
Atyrau	254306.9	335679.1	525596.3	526416.5	703679.4	N/A	8.15	9.75	6.66	10.17	8.22	N/A
Western Kazakhstan	83015.2	107057.7	215384.2	210678.8	231733.6	291243	8.38	8.22	9.00	11.56	8.15	7.42
Mangystau	60943.9	116154.2	175628.2	177466.2	187592.4	216417	3.70	7.40	6.04	8.23	6.88	6.80
GVA, mln. tenge												
Aktobe	134405	161897.8	334656	324550.6	456737	702922.1	19.79	26.22	31.95	33.85	34.06	41.96
Atyrau	169218.5	184664.2	374907.7	403147.4	564147.3	594766.3	8.13	8.45	8.43	11.40	10.62	8.04
Western Kazakhstan	76770.1	63024.7	134400.8	132961.3	139774.7	177109.3	8.04	7.14	9.60	10.78	7.74	7.61
Mangystau	57392.4	77097.2	118886.6	129555.1	134532.4	160362	5.61	7.64	6.00	8.64	7.38	7.48
The number of employees, thousand people												
Aktobe	25.4	42.4	41.5	41.6	41.8	43.5	45.77	54.16	49.81	50.80	50.99	50.96
Atyrau	9.9	15.2	11.9	11.9	12.1	11.1	33.20	38.46	31.01	30.82	31.10	29.60
Western Kazakhstan	10.5	14.1	16.8	17.6	17.5	19.9	47.16	49.55	53.64	54.96	55.45	55.38
Mangystau	9.4	18.3	20.6	18.3	17.9	20.5	18.00	20.21	27.39	23.61	22.73	26.04
Labor productivity, thousand tenge												
Aktobe	4 322.7	6 428.3	11 329.3	11 567.1	16 108.4	23 342.8	–	–	–	–	–	–
Atyrau	15 765.8	12 117.1	31 407.2	33 926.4	46 600.6	53 626.0	–	–	–	–	–	–
Western Kazakhstan	4 689.0	4 483.2	8 010.5	7 568.8	7 976.2	8 914.7	–	–	–	–	–	–
Mangystau	4 717.6	4 215.5	5 761.4	7 087.3	7 519.1	7 832.5	–	–	–	–	–	–

Note: 1) N/A – Data not available; 2) * Data on GVA are for 2013; 3) GVA per employed person is used to measure labor productivity.

APPENDIX C

Table C1. GVA in the manufacturing industries of the regions of Western Kazakhstan, mln. tenge, 2013–2022: Aktobe and Atyrau regions

Manufacturing industry	Aktobe region						Atyrau region					
	2013	2015	2019	2020	2021	2022	2013	2015	2019	2020	2021	2022
Manufacture of food products	22416.4	25266.8	43649.4	50211.9	45273.9	60136.7	2771.6	3756.7	8249.2	10340.1	10981.2	13021.2
Manufacture of beverages	9548.1	11735.1	17746.9	45610.7	13129.2	43056.9	66.4	14.8	473	327.4	277.3	968.9
Light industry	189.6	288.6	1433.4	1941.9	2026.9	3225.5	216	650.4	2247.9	3766.2	3472.2	7073.7
Manufacture of textiles	48.7	80.5	447.3	551.9	608.9	1895.1	61.6	376.4	1353.8	2246	1940.1	3908.8
Clothing manufacturing	140.9	208.1	984.7	1390	1335.4	1330.4	154.4	274	838.2	1520.2	1492.1	3138.1
Manufacture of leather and related products	0	0	1.4	0	82.6	0	0	0	55.9	0	40	26.8
Manufacture of wood and cork products, except furniture, and articles of straw and plaiting materials	284.5	187.2	319.5	386.1	544.5	516	51.6	51.3	1.4	0	7.4	677.7
Manufacture of paper and paper products	458.3	433.7	776.5	684.1	863	849.6	3.4	69.6	311.4	245.6	141.1	105.4
Printing and reproduction of recorded media	294.9	539	343.2	276.6	871.4	1085.7	22	197.6	676.1	777.5	271.4	893.7
Coke production and petroleum refining	11664.2	11992.6	44181.7	30362	43415.3	33344.9	150648.1	152814.3	280564.6	322686.9	483804.2	462305.5
Chemical product manufacturing	23610.4	22367.6	37458	28928.8	43341.7	53022	2436.6	3291.8	23988.5	26886.5	20834.6	30393.6
Basic pharmaceutical product manufacturing	157.5	280.9	2158.1	2408.1	2338.5	2933.6	0	0	0	0	0.6	0
Manufacture of rubber and plastic products	1735.1	1623.1	3285.3	3223.8	4901.2	5152.4	1393.2	1911.5	3122	3217.8	7484.8	6485.3
Manufacture of other non –metal mineral products	15952.3	13826.8	22598.9	27447.2	32337.6	38521.8	3868.9	6846.3	17498.9	12601.1	13804.9	18808.6
Ferrous metallurgy	37453.2	60608.3	144225.2	118538.3	243734.1	427612.4	2270.6	2210.3	14344.6	7492.5	7641.1	9360
Metallurgical industry	32172.1	54337.3	137378.5	113460.5	233156	413276.8	88.6	144.7	148	286.3	246.5	978.2
Manufacture of finished metal products, except for machines and equipment	5281.1	6271	6846.7	5077.8	10578.1	14335.6	2182	2065.6	14196.6	7206.2	7394.6	8381.8
Mechanical engineering	10265.4	11684.9	15605.5	13738.7	22474.2	31771.1	4324.2	12421.1	22675.1	13873.1	14679	43688
Manufacture of computers, electronic, and optical products	536.7	281.9	646.4	1890.8	2163.7	2483.6	0	0	7.3	64.8	68.7	81.8
Manufacture of electrical equipment	32.7	46.2	104	287.9	83.4	103.7	103.5	462.6	1449.2	649.2	453.7	604.5
Manufacture of machines and equipment not included in other categories	4418.1	4011.7	5021.3	4412.9	4814.1	6272.7	858.7	3813.4	1201.5	272	700.7	1352.8
Manufacture of motor vehicle, trailer, and semi–trailer	0.5	57.4	176.9	54.5	69.9	741.5	6.2	0	0	0	1	1.1
Manufacture of other vehicles	150.6	324.2	350.2	198.4	173.3	429.5	0	0.6	0	0	0	0
Manufacture of furniture	373.8	1061.3	868.7	771.4	1388.7	1628.6	172.9	193.1	290.4	487.1	711	661.8
Manufacture of other finished goods	1.3	1.9	5.7	21	96.8	64.9	973	235.4	464.6	445.6	36.5	322.9
Repair and installation of machinery and equipment	5126.8	6963.5	9306.7	6894.2	15169.8	21740.1	3355.8	8144.5	20017.1	12887.1	13454.9	41647.8

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Table C2. GVA in the manufacturing industries of the regions of Western Kazakhstan, mln. tenge, 2013–2022: Western Kazakhstan and Mangystau regions

Manufacturing industry	Western Kazakhstan region						Mangystau region					
	2013	2015	2019	2020	2021	2022	2013	2015	2019	2020	2021	2022
Manufacture of food products	17727.8	22777.2	47794.6	49326.3	48003.8	72222.2	3432.9	4518.9	5906.2	8348.9	6266.1	6759
Manufacture of beverages	1188.9	1517.8	2621.5	2167.8	2692	1218.3	586	641.6	467.4	308.6	288	336.6
Light industry	256.7	502.4	598.7	711.7	1057.4	904	1270.3	1087.5	1690.1	1692.9	1015	1928.3
Manufacture of textiles	115	146.2	84.7	120.6	296.5	172	13.5	30.5	21.6	53.9	26.7	25.5
Clothing manufacturing	141.7	356.2	486.1	547.6	687.9	674	793.5	608.2	1107.7	899.7	530.2	1451.5
Manufacture of leather and related products	0	0	27.9	43.5	73	58	463.3	448.8	560.8	739.3	458.1	451.3
Manufacture of wood and cork products, except furniture, and articles of straw and plaiting materials	76.6	323	461.7	347	569.5	2255.4	5.3	23.5	11.3	16.1	11.3	11.3
Manufacture of paper and paper products	336.5	344.6	85.7	97.4	159.3	278.2	18.6	21	5.4	10.3	11.8	10.3
Printing and reproduction of recorded media	196.2	274.5	683.1	372.2	410.9	598.2	240.6	249.3	546.9	331.2	353.4	544.2
Coke production and petroleum refining	27883.2	6813.3	17748.6	14056.8	7213.9	17178	5766.7	8442.5	23576.4	25217.1	25116	40040
Chemical product manufacturing	448.1	815.9	2708.9	1738.1	5245.2	6373.9	13967.7	17705.7	21936.3	22047.4	32789.7	31002.3
Basic pharmaceutical product manufacturing	0	0	0	0	0	0	293.1	246.7	356.9	124.8	203.1	353.4
Manufacture of rubber and plastic products	2713.3	1702.2	3103.3	4517.9	11118.4	5704.2	1354.4	4013.2	2913.7	4688.6	3957.4	2735.7
Manufacture of other non –metal mineral products	6763.5	7661.4	11042.3	13442	12018.6	12339	7033.7	21401.6	16770.6	21043.6	23975.6	25886.6
Ferrous metallurgy	7567.2	7456.2	17894	16688.7	14345.3	19634.4	13958.8	9561.5	26067.3	20408.1	24092.1	23400.4
Metallurgical industry	3974.7	2576.5	7497.4	5117.9	3375.9	8495.6	2829.3	2724.9	1850.7	873.1	1779.5	2001.8
Manufacture of finished metal products, except for machines and equipment	3592.5	4879.7	10396.6	11570.8	10969.4	11138.8	11129.5	6836.6	24216.6	19535	22312.6	21398.6
Mechanical engineering	9734	11723.6	28914.1	26462.5	32902.7	34935.4	9337.8	9084.3	18162.9	24965.8	16178	26979.1
Manufacture of computers, electronic, and optical products	1.7	272	1448	181.3	475.8	463.2	3.2	0	0	0	0	0
Manufacture of electrical equipment	15.2	343.2	4785.9	4882.7	6030.5	6561.7	58.9	0	0	64.9	7.7	5.8
Manufacture of machines and equipment not included in other categories	2093.3	2577	9475.3	7889.7	2562.5	8037.8	5481.5	2798.6	5716.3	9322.8	7839.4	12816.4
Motor vehicle, trailer, and semi–trailer manufacturing	1020.1	1377.1	87.6	300.6	2100	3030.9	0	0	0	0	0	0
Manufacture of other vehicles	4136.5	2291.4	1953.9	1407.9	2553.7	2231.7	0	0	0	0	0	0
Manufacture of furniture	1844.3	1089	675.7	2603.4	3580.7	2975.1	124.4	99.5	474.8	350.6	274.5	374.4
Manufacture of other finished goods	33.8	23.6	68.6	429.5	457	493	2.1	0.4	0.4	1.1	0.4	0.4
Repair and installation of machinery and equipment	2467.2	4862.9	11163.4	11800.3	19180.2	14610.1	3794.2	6285.7	12446.6	15578.1	8330.9	14156.9