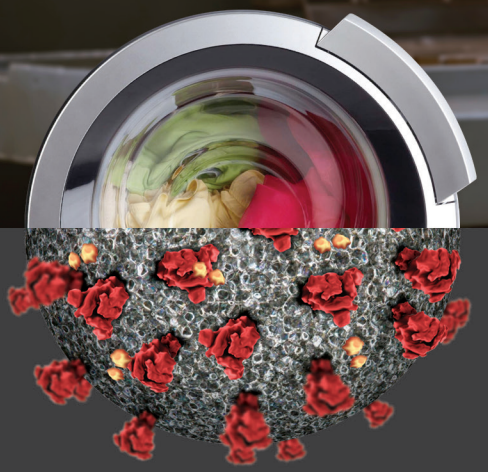

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REPUBLIC OF TURKEY
MINISTRY OF INDUSTRY
AND TECHNOLOGY

UNDP

COVID-19 Crisis Response
and Resilience Project

MACHINERY SECTOR ANALYSIS REPORT and GUIDELINES

TRC1 REGION

(Gaziantep, Kilis, Adıyaman)

MACHINERY SECTOR ANALYSIS REPORT AND GUIDE

TRC1 Region (Gaziantep, Kilis, Adıyaman)

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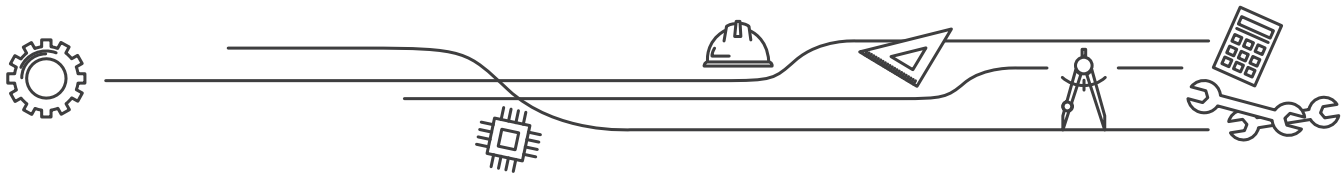

COVID-19 Crisis Response
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TRC1 REGION

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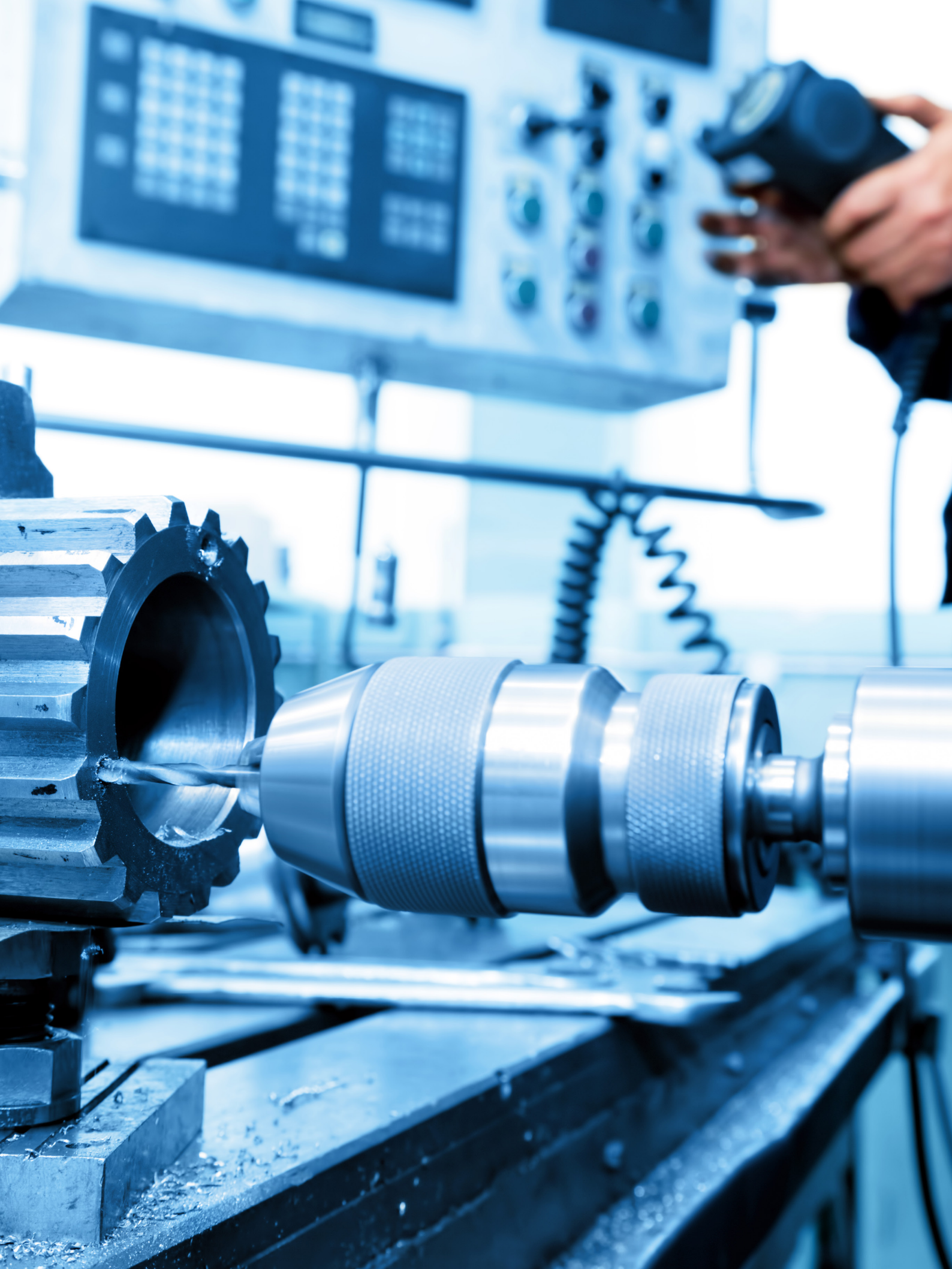

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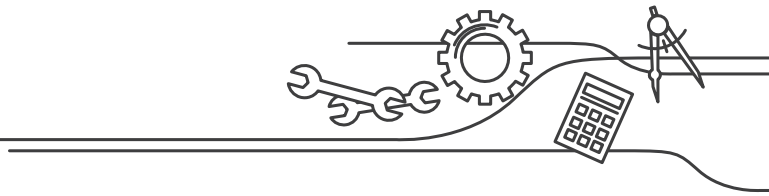

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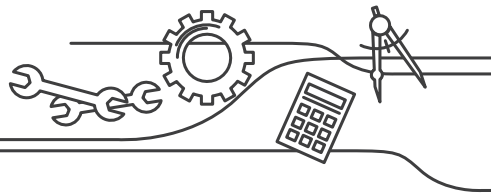
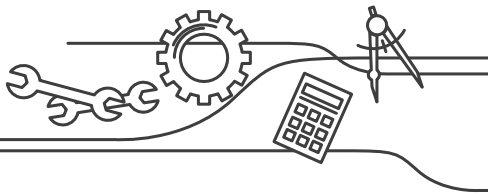


ABBREVIATIONS

EU	European Union
USA	United States of America
ABİGEM	European Union Turkey Business Development Centers
AR/VR	Augmented Reality / Virtual Reality
R&D	Research & Development
BDDK	Banking Regulation and Supervision Agency
UN	United Nations
CAGR	Compound Annual Growth Rate
CE	Compliance with Europe
CRM	Customer Relations Management
SSO	State Supply Office
ERP	Enterprise Resource Planning
EEC	Energy Efficiency Consultancy
EURO	European Union Member States Common Currency
FSR	Fragile Sectors
SWOT	Strengths, Weaknesses, Opportunities and Threats
HS84	Harmonized System Machinery Sector Code
IE	Electric Motor Energy Efficiency Class
IoT	Internet of Things
IPA	Instrument for Pre-Accession Assistance
ISO	International Standards Organization
IT	Information Technologies
ITC	International Trade Center
HR	Human Resources
CCM	Cluster of Construction Machinery
DA	Development Agency
VAT	Value Added Tax
CGF	Credit Guarantee Fund
SME	Small and Medium Enterprises
KOSGEB	Small and Medium Enterprises Development Organization
GSC	Global Supply Chain
NACE	Statistical Classification of Economic Activities in the European Community
OECD	Organization for Economic Co-operation and Development
OKA	Central Black Sea Development Agency
OIZ	Organized Industrial Zone
PESTLE	Political, Economic, Social, Technological, Legal and Environmental
PwC	PricewaterhouseCoopers
RCEP	Regional Comprehensive Economic Partnership
SSI	Social Security Institution
U.S.S.R.	Soviet Union
MoIT	Ministry of Industry and Technology
NGO	Non-Governmental Organization
SICDP	Supporting International Competitiveness Development Program
SSO	State Supply Office
TAYSAD	Vehicle Sub-Industrialists Association
TCMB	Central Bank of the Republic of Turkey



TİM	Turkish Exporters Assembly
TOBB	Union of Chambers and Commodity Exchanges of Turkey
CCI	Chamber of Commerce and Industry
TTO	Technology Transfer Office
TÜBİTAK	Scientific and Technological Research Council of Turkey
TURKSTAT	Turkish Statistical Institute
TÜRSAB	Turkish Travel Agencies Association
TÜSİAD	Turkish Industrialists and Business People Association
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UR-GE	Supporting the Enhancement of International Competitiveness
WEF	World Economic Forum
World Bank	World Bank
WTO	World Trade Organization
3D	3 Dimensional

FOREWORD

The COVID-19 pandemic has gone beyond a health crisis and turned into a global problem, due to its impacts felt in all areas of life and all over the world. It is obvious that the problems caused by the pandemic, which has turned into a serious threat to all humanity, can be solved with a sustainable and fair understanding that requires international solidarity, cooperation, and common solution ideas.

The restrictions applied as a necessity of the pandemic led to slowdown in production, decrease in labor supply, delay in the supply of intermediate goods and raw materials, and increased logistics costs in our country as well as all over the world. Therefore, it is essential for sustainable development that policies should focus on the fragile sectors most affected by the pandemic in order to ensure the continuity of economic activities and accelerate the recovery.

By closely following the changes observed in the global system, Turkey carries out a comprehensive transformation in every field from education to health, from manufacturing industry to tourism, from industrial zones to research infrastructures.

Our development agencies, which perform their activities under the coordination of the Ministry of Industry and Technology, carry out studies at the regional level in order to reduce the negative impacts of COVID-19 on the national and regional economies and to identify the sectors most affected by the pandemic. One of our works in this field is the Government of Japan funded COVID-19 Resilience and Response Project, which we have implemented together with the United Nations Development Program (UNDP), the General Directorate of Development Agencies, and our development agencies.

Within the scope of the project, 25 region-based “fragile sector analysis reports” were prepared in the textile, logistics, food, machinery, and automotive sectors, which are of key importance for the Turkish economy. These reports, taking into account global developments and trends, offer new policy recommendations that will increase the resilience of the relevant sectors against crises. In addition, the “New Market Analysis” and “Product Space Analysis” reports, which cover studies to increase the export potential of enterprises operating in fragile sectors, were also completed within the project. These reports aimed to create road maps to support the business continuity of fragile sectors and to prevent supply chain disruptions.

We believe that the policy recommendations in these reports, which are in line with the targets within the framework of our national technology move, will support inclusive and sustainable development; it will carry Turkey to a more strategic point in the international trade and investment decisions that will be reshaped in the post-COVID-19 period and will contribute to our country's 2023 goals.

I would like to thank the Government of Japan for their generous contribution to mitigating the economic impact of the COVID-19 crisis, ensuring economic recovery, strengthening sectors, and transforming SMEs in this process.

I congratulate all our stakeholders, particularly UNDP Turkey management and project team, and the employees of the Development Agencies General Directorate and development agencies, who have made these studies realised and turn them into concrete outputs, and I hope that the reports will contribute to the future of our country.

Mustafa Varank

Republic of Turkey Minister of Industry and Technology

FOREWORD

The global context for development has fundamentally changed with the COVID-19 pandemic. The pandemic created many new obstacles to overcome as well as new problems to be solved. Although COVID-19 started as a health crisis, it has turned into both a humanitarian crisis and a development crisis.

This unprecedented crisis is pushing millions of people into extreme poverty, changing and widening existing inequalities, and disrupting progress towards the Sustainable Development Goals (SDGs). Therefore, the SDGs are now more important than ever. The 2030 Agenda remains the only option for a more prosperous future for people and planet.

The COVID-19 pandemic has also shaken the global trade and development landscape. The global health emergency turned into a global economic shock with its impacts on growth, international trade, investments, global production, value chains, employment and eventually livelihoods of people.

UNDP is responding to a growing volume of requests from countries to help them prepare for, respond to, and recover from the COVID-19 pandemic with a particular focus on the most vulnerable. As of now our focus is to help decision-makers look beyond COVID-19 recovery, towards 2030, making choices and managing complexity and uncertainty in four key areas: governance, social protection, green economy, and digital disruption.

UNDP's COVID-19 Resilience and Response Project, which is funded by the Government of Japan is a part of our rapidly developed integrated response to the COVID-19 health, humanitarian, and development crisis. Being complementary with the efforts of the Government of Turkey and other development partners and fully aligned with the country-specific needs, UNDP aims to tackle the impacts of the pandemic under three priority areas: Health system support; Inclusive and integrated crisis management and response; Social and economic impact needs assessment and response.

I am pleased to present these 25 region-based sectoral analysis reports that provide policy recommendations and action plans for key economic sectors in Turkey that are most impacted by COVID-19 pandemic. These reports, which were developed within the COVID-19 Resilience and Response Project in cooperation with Ministry of Industry and Technology and Development Agencies, formulated in the light of recent global context and trends as well as UNDP's response to COVID-19 crisis. Through this work, our aim is to support national capacities for an integrated and inclusive crisis management, ensure business continuity and prevent supply chain disruptions and speed up the development of the key economic sectors -automotive, textile, food, machinery, and logistics in different regions of Turkey and to increase competitiveness on a regional basis.

Our recovery efforts focus on rebuilding more inclusive economies and societies, moving towards a low-carbon and climate-resilient world where no one is left behind.

We believe that these reports will provide a pathway for economic recovery of sectors and development of regional competitiveness. In the reports the review of the pandemic crisis impact is accompanied by a set of policy recommendations targeting both the interventions in response to the negative effects of the pandemic and the post-COVID-19 social and economic recovery support measures. Overcoming the challenges faced by the sectors and society and ensuring better recovery can only be possible with joint efforts of the entire private sector, authorities, and the society as a whole.

In this regard, we appreciate the cooperation of Ministry of Industry and Technology, Development Agencies, and all experts for the preparation of these reports. We believe that these reports will also enable better cooperation in key economic sectors and help to accelerate the implementation of the Sustainable Development Goals in Turkey.

Louisa Vinton

UNDP Turkey Resident Representative

EXECUTIVE SUMMARY

JWith this report prepared specifically for TRC1 Region, for the machinery sector, which is one of the 5 fragile sectors defined within the scope of "COVID-19 Resilience and Response Project" funded by the Government of Japan and conducted by the United Nations Development Program (UNDP) in cooperation with the Ministry of Industry and Technology of the Republic of Turkey; the overall assessment of the sector during the COVID-19 pandemic has been made and policy recommendations and action plans have been put forward to accelerate the development of the sector and to increase the level of regional competition in the light of global trends.

The commercial protectionism trend inherited from 2018, the trade wars between the USA and China, and the Brexit process had a serious impact on 2019. For these reasons, there was a significant slowdown in the world economy in 2019. Global growth decreased from 3.1% in 2018 to 2.4% in 2019. In 2019, world trade in goods decreased 3.0% and fell to US $ 18.25 trillion. This slowdown and the contraction of trade, combined with the decrease in demand, decreased capacity utilization rates in industries and public investment also slowed down. Accordingly, the growth in global machinery and equipment investments in 2019 was narrowed down and realized as 2.5%.

The Machinery Sector in Turkey maintains its leadership in the manufacturing industry with the input it provides to other sectors, its contribution to the development of these sectors, the employment it creates for the trained workforce, the added value it provides and its wide industrial network. When it comes to the use of technology, the importance of the machinery sector for the manufacturing industry is increasing day by day with the exemplary production models it has developed and the synergy it creates. The qualified production structure of the Machinery Sector in Turkey, generally in the middle-high technology class, is of vital importance for the future of our country. The machinery sector is a strategic sector for Turkey with its positive contribution in productivity and economic growth. For these reasons, it has become one of the 7 sectors supported by the Technology Oriented Industrial Action Program of the Ministry of Industry and Technology for the reduction of foreign dependency in medium-high and high technology products and for the rapid implementation of localization in selected machine groups.

In 2019, due to the increasing protectionism in global trade abroad, machinery and equipment investments in our country decreased by 5.5%. Although the increase in exports only compensated the contraction in domestic demand to a limited extent, the machinery sector production in 2019 decreased by 6.2% compared to 2015. Thus, the rapid growth in machinery sector production since 2010 started to shrink in 2019 for the first time.

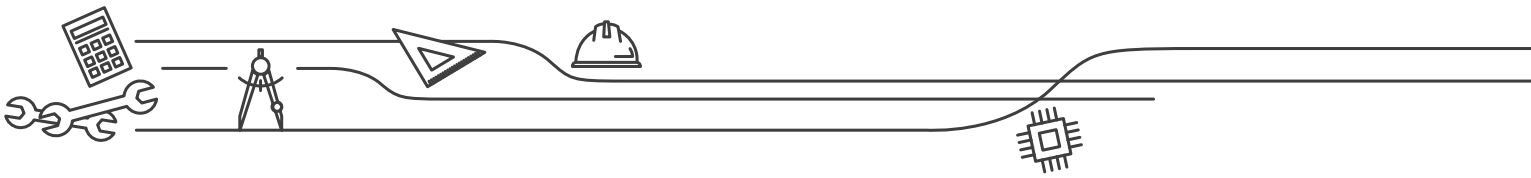
The machinery sector turnover increased by 8.2% in 2019 with the slowdown of domestic and foreign sales and reached 117.71 billion TL and showed the lowest increase in recent years. While its share in total manufacturing industry turnover rose up to 5% in 2017, it became 4.93% in 2018. Despite the 12.7% increase in the manufacturing industry turnover in 2019, the machinery sector could not follow the same increasing trend and grew by 8.2% and its share in the manufacturing industry decreased to 4.74%. This relative shrinkage is considered to be due to a decrease or pause in the global investment appetite and decreasing exports.

However, despite the shrinkage in its share in the manufacturing industry in 2019, the Compound Annual Growth Rate (CAGR) of the Machinery Sector, calculated over its turnover between 2010-2019, is 19%. This ratio clearly reveals the annual growth performance of the sector.

According to SSI data for 2019 it is seen that there are 259 machinery manufacturing companies in TRC1 Region, 14 of which employ 55 people in Adıyaman, 5 of which employ 34 people in Kilis and 240 of which employ 1.623 people in Gaziantep which makes a total of 1.712 employees.

In the region, the highest export figure of the Machinery Manufacturing Sector in 2020 was realized in Gaziantep with 130.7 million USD. The sector is the 10th most exporting sector of the province. The sector is low in Kilis and Adıyaman both in terms of size and ranking.

Along with the Covid-19 Crisis that emerged during the aforementioned global, national and regional conditions, the approach to crisis in the Machinery Sector, crisis management and the effects of the crisis and sectoral trend changes in the world, in our country and in the TRC1 region were examined.



Primary and secondary data sources were used for the analysis. The survey conducted for sector representatives, the Working Group and Focus Group Meetings were used as the primary data source. As the secondary data source, the reports and statistics prepared by NGOs and global research companies representing the sector were used. In the light of these data, the national and regional results of the survey were compared and Value Chain, SWOT, PESTEL, Five Forces and Gap analyzes were conducted.

Companies quickly overcame the concerns of workers and workplace health, lack of personnel, order cancellations and not being able to receive new orders with the first shock experienced with the Covid-19 Crisis. The fact that Human Resources is a critical factor for competition has stepped up to a higher level of importance with the Covid-19 Crisis, as expressed in Focus Group meetings. It has been understood that HR, especially the strategic personnel, is the most important basis of companies to get out of crises. In order to protect this valuable resource, flexible working hours and working from home for employees with low workplace requirements have been urgently implemented throughout the sector. With the contribution of the short-time working allowance in order to prevent lay offs, there was no significant personnel reduction in the sector.

As can be understood from the information obtained during the study, in addition to the current problems of the sector, the most troublesome issues with the Covid-19 Crisis are as follows:

1. **Cash Flow Problems**
   - Difficulty in accessing Credit Guarantee Funds,
   - Lack of limit in banks,
   - Density, late response, high interest demands in Banks
   - Delays in VAT refund payments.
2. **Disruptions in the supply and logistics chain**
   - Pricing difficulty due to fluctuating exchange rates,
   - Increase in intermediate product prices,
   - Disruption of payment balance to suppliers,
   - Slowdowns in customs,
   - Cash demand from suppliers instead of maturity,
   - International logistics disruptions,
   - Increases in freight costs.
3. **Operational difficulties due to travel restrictions**
   - Inability to perform customer controls during the delivery of finished products,
   - Failure to assemble the delivered products, failure to receive payment for finished products, and delaying of subsequent orders.

Problems caused by the disruptions in the supply and logistics chain and travel restrictions, as a consequence, negatively affected the cash flow and caused the financial crisis to deepen for the companies.

There have also been opportunities in the industry with the Covid-19 Crisis. Thanks to the flexibility, rapid response and customer-oriented aspects of the sector, these opportunities have enabled companies to reach the milestones they will attain in product development and innovation in 4-5 year time within months and to increase the strategic awareness of localizing imported goods in their supply chains.

Progress in product development and innovation has enabled companies to receive new orders and even gain new customers in times of crisis. Besides, thanks to the rising motivation of localization in the supply chain, the imports of intermediate goods will decrease with the production of substitution domestic products in the short and medium term and therefore, the domestic supplier industry will gain strength. Also, the increase in the need for protective equipment and disinfection due to the pandemic was reflected in the sector as an additional machine order, enabling small SMEs to breathe during the crisis.

In order to get rid of the troubles experienced during the Covid-19 Crisis, there have been companies that switched to Crisis Management and were in search of new customers, except for producing the orders of their existing customers. These companies saw the necessity to increase their competitiveness in order to be able to sell in markets that they did not or could not reach until the crisis period. In addition to reducing costs in order to enter these new markets, the awareness of companies about the need to make progress in the areas of Innovative Product Development, Resource Efficiency and Energy Efficiency for being more respectful to the environment and to increase competitiveness has also increased considerably.

In TRC1 Region, the Covid-19 Crisis, which manifested itself in the form of exchange rate fluctuations, travel restrictions and problems in raw material production, consequently caused companies to experience cash flow shortages. The problems have been alleviated by using loans to overcome cash shortages and government subsidies such as short-time work allowance and thus the companies took a deep breath and stepped out of the crisis. However, as the travel restriction could not be exceeded for the delivery of the orders, the control process was carried out by inspectors, but still they were left with the finished product stock due to the high number of customer orders. Although this situation delayed the exit from the crisis, there was an increase in demand for food and textile machinery after the crisis. With this increase in demand, the opportunity to reach a safer point from the crisis has been created by conditioning the new orders in accordance with the crisis period. Briefly mentioned, this management style and flexibility in production have been the formula of providing both sufficient and fast response to customer demands in the TRC1 Region.

The most important experiences that turned the crisis into an opportunity for the companies in the sector were the Knowledge Economy and Innovation infrastructures, which enable them to respond quickly to different customer demands. Investments to be made and the developments to be achieved in these two issues will bring along important opportunities in terms of private sector performance and economic growth, as well as being the key to long-term competitiveness for SMEs. It has been noticed also by them that a great opportunity stands near SMEs for achieving digital transformation with the Knowledge Economy and Innovation infrastructure, closing the shortcomings in terms of market and product diversity with smart machines faster than expected, and thus catching the 4th Industrial Revolution. With this opportunity, it has been clearly noticed that the export of the region, which is predominantly based on medium-high technology products, has the opportunity to switch to high technology products.

As a result, firms' cash flows were disrupted as the first shock with the Covid-19 Crisis, however, policies and practices that were quickly implemented enabled companies to survive financially. The crisis has shown that companies that can react to the crisis and change operationally, have found new customers and increased their sales during the crisis period, beyond surviving. These companies are the ones that respond quickly to customers, provide solutions to customer demands with innovation, and easily adapt these innovations to their production and meet customer expectations with the new product they produce, that is, companies that are resistant to crisis.

In order for all companies in the sector to gain these characteristics, certain strategies were developed and policy recommendations were made within the scope of the study. Moreover, although these strategy and policy suggestions were methods foreseen before the Covid-19 Crisis, this crisis clearly revealed the necessity of these methods in order to catch the new industrial revolution.

In this sense, the strategies developed should not only be innovative, but also should enable the regional industry to switch from low to high value added and efficient production. As with all Turkey's Machinery industry stakeholders, the machinery sector companies in TRC1 Region, have a common consciousness that supports innovative and continuous development regarding the need for change and the necessary sectoral transformation. While this awareness is the most important force for the development of the Machinery Sector, which is a strategic sector for our country, it is also the most important reason to look at the future with hope. Sectoral Development, which must be completed and constantly renewed, should be supported by professional management and qualified employees. It is clear that development will be achieved through export-oriented production and in order to start or advance this cycle, it is necessary to manage digital transformation and to ensure the transition to high value-added, technology-based production across the industry.

The proposed policies, short, medium and long term strategies, sub-strategies and actions under sub-strategies to achieve these goals are shared in the relevant sections.

1. INTRODUCTION

The Covid-19 pandemic that emerged on December 1, 2019 in Wuhan, the capital of the Hubei region of China has started to spread around the world in 2-3 months. Most countries of the world have halted their economies to slow the spread of Covid-19 and have taken many measures to mitigate the short-term impact of the Pandemic Crisis. The main measure implemented has been social distancing and this resulted in a sudden stop in the services sector, a decrease in companies' cash flow and income, and a serious decline in economies with an increase in unemployment.

Turkey reported the first positive case of Covid-19 on March 11, 2020. Similar to other countries responding to the pandemic, the number of positive cases in Turkey has increased every day with the increase in the number of tests performed across the country. The fight against Covid-19 is still continuing today, however, the temporary closure of businesses has caused lower wages, unemployment, loss of income, and continues to affect all segments of the society.

Thus, the Covid-19 pandemic continues its effects on social and economic lives, public health systems, livelihoods and economy, with casualties, quarantines and job losses. In response to the medium-term impacts of Covid-19 and priority needs identified with stakeholders at national and local level; it is aimed to accelerate companies in making investments in supportive, inclusive, sustainable and climate-friendly businesses for technological transformation.

Within the scope of the report, region-based sectoral analysis and guidance were provided to increase the resilience and adaptation capacity of companies in TRC1 Region Machinery sector and to support them against crises. Strategies and policy recommendations for reducing the effects of Covid-19 in the short / medium and long term for the machinery sector in the relevant region have been made into a detailed report as a result of analysis obtained from focus group meetings attended by sector representatives and surveys conducted with sector representative companies.

In order to slow the spread of the Covid-19 Pandemic, the closure and / or restriction measures taken in our country, as in the whole world, started to affect all economic activities, especially the service sector, foreign trade, industrial production and tourism, as of mid-March 2020 and the effects deepened as of April and spread to the entire economy.

In this context, the "Fragile Sectors Analysis" project is thought to contribute to the technological transformation of SMEs and to develop more inclusive, sustainable and climate / environment friendly business models as a medium and long-term response to the negative effects of Covid-19 on the economy. Within the scope of the project, while region-based sectoral analyzes and guidelines were prepared for 5 fragile sectors (Machinery, Food, Textile, Automotive and Logistics), the most important output of the studies are short, medium and long-term strategy and policy recommendations on a sectoral / regional basis.

Machinery Sector analysis and guidelines were determined according to the Code 28, which is the dual group of the NACE classification used in the European Union. The NACE Codes of the sub-sectors are as follows:

C.281: Engines, turbines, compressors, pumps, faucets, valves, bearings, gears, etc.

C.282: Ovens, furnaces, lifting machines, baling machines, office machines, cooling and ventilation equipment, general purpose machines, etc.

C.283: Agricultural and forestry machinery such as tractors, planters, trailers and semi-trailers, combine harvesters and harvesters, seed graders, animal feed preparation machinery, etc.

C.284: Metalworking machines such as lathes, milling machines, hydraulic presses, forged iron machines.

C.289: Construction Machinery, other workbenches for working with other materials such as wood, stone, glass or rubber. Special machines for other purposes such as food industry, textile, garment and leather industries, paper and card industry, rubber and plastics industry, Construction Machinery, etc.

Food and Textile Machinery Sub-Sectors included in the C.283 and C.289 NACE Codes have been predominantly structured in the TRC1 Region. 1.7% of the total exports of the Turkish Machinery

Sector is from the TRC1 Region [Table 10].

This report has been prepared specifically for the machinery sector in the region. Meetings with industry representatives aim to explain the conditions that developed before and after Covid-19 and the current challenges faced by companies, using the results of studies and surveys conducted. The report also aims to provide an interpretation of the sector with strategic and operational points of view, to create regional recommendations, strategies and action plans by sharing global, national and regional assessments of sectoral trends and changes.

In the report, in Section 3, where the sector profile was drawn, the data up to 2019 were used; then, the data for the year 2020, which includes the effects of Covid-19, are given in Chapter 4, where the effects of crisis are examined and again in the same section, sector performance predictions for the end of 2020 are shared in the Tab 4.2. This ordering was made in order to see the impact of Covid-19 more effectively.

2. METHODOLOGY

Interviews were held with all project stakeholders to determine the methodology. A consensus has been reached on the work flow chart detailed below to be used as the methodology as a result of the desk-based work of the project expert team of 7 from 5 sectors and one-on-one interviews.

Assumptions, Risks and Risk Reduction Methods were studied with the support of key experts and associated risks have been identified and rated; and comments have been made on the analysis, mitigation and monitoring of these risks. The time schedule of development activities is determined in the project report and sectoral meeting dates were specified within the scope of this plan and activities were started.

As seen in the Work Flow Chart shown in Figure 1, the working methodology consists of Data Collection, Analysis, Verification and Result stages.

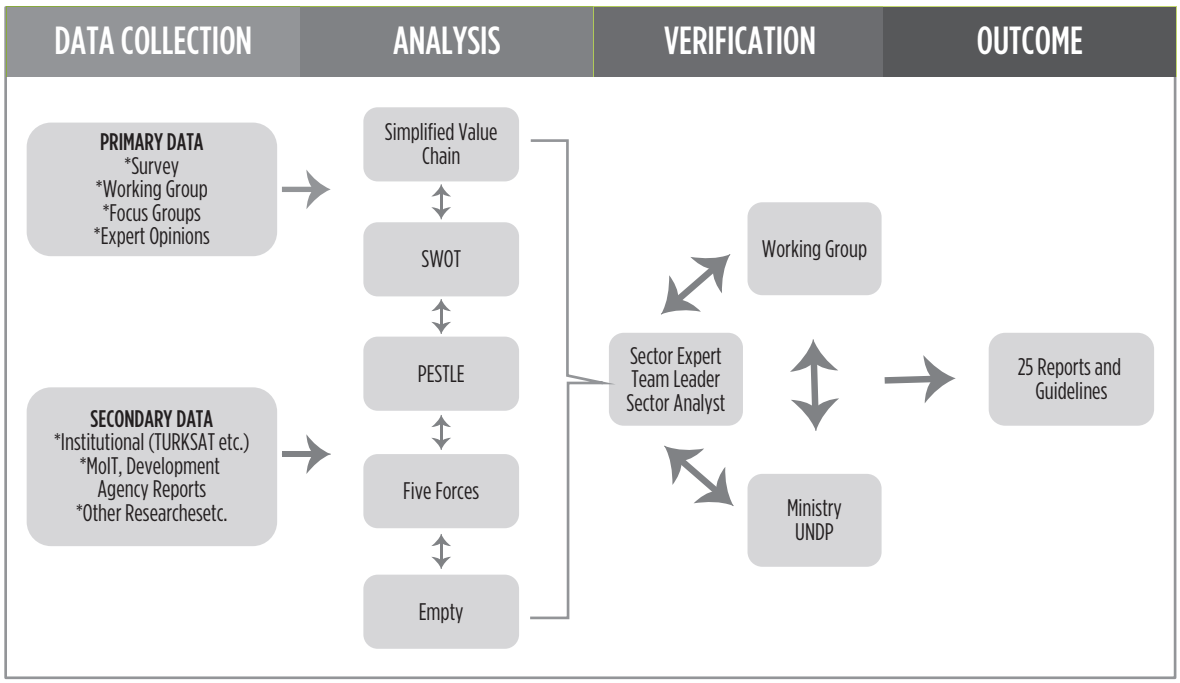


Figure 1: *Work Flow Chart*

In Data Collection, Survey Studies, Sectoral Studies, Focus Groups and Expert Opinions were considered as Primary Data. While the summary of the Focus Group meetings was given in the relevant section of the report, reference was made to the data obtained from the Focus Group meeting where necessary. The Focus Group Participant List is given in Annex 1. Working Group meetings were held in order to support the works of the Machinery Sector Experts, to provide guidance and to share information. Institutional Data Sources, Reports Prepared by the Ministry of Industry and Technology and Development Agencies, Reports prepared by Sectoral Organizations, Other Researches, Publications and Reports were discussed as the secondary data.

Data collected from institutions such as World Bank, UNDP, ITC, UNCTAD, WTO, WEF, TURKSTAT, SSI, TOBB, CBRT, BRSA, TIM, Ministry of Trade, Ministry of Industry and Technology were used as institutional data sources. Many reports have been prepared by the Ministry of Industry and Technology and Development Agencies in order to examine the effects of Covid-19. Relevant reports were used as a reference during the preparation process. In addition to these, reports prepared by professional and umbrella organizations, etc. were also examined.

The Spatial Value Chain Analysis prepared by the General Directorate of Development Agencies

was taken into consideration for the analysis of the data. The current situation of companies operating in the sector that is the subject of the reports and in the specified regions has been analyzed. For this purpose, Simplified Value Chain Analysis, SWOT, PESTEL, Porter's Five Forces Analysis and Gap Analysis, which are among the most effective analysis methods decided at the beginning of the project, were used. In addition to collecting region-specific data; the Working Group and Focus Group Studies contributed to both the analysis of the data and the verification of the analyzes.

One of the most important sources of information for the report is the Machinery Sector Working Group established by the Ministry of Industry and Technology. 9 experts were assigned within the Working Group. During the 14-week study period following the preparation of the inception report, the working group met 5 times in total every 2 weeks. The Working Group has examined the work done by the Sector Expert and made comments and served for validating analyzes, assumptions and policy / strategy proposals. Working Group meeting participant list is given in Annex.2 and meeting dates are given in Annex.3

One of the important sources of qualitative information has been the Machinery Sector Focus Group. Focus Group members selected on the basis of the sector and the region consist of Ministry of Industry and Trade, Development Agencies, Chambers of Industry and Commerce, Organized Industrial Zones, Umbrella Organizations (TAYSAD, TÜRSAB, Exporters' Unions etc.), Clustering Organizations, Universities, SMEs, Large-Scale Enterprises, UNDP, Sector Specialist, Sector Analyst and Team leader. The Focus Group contributed to the determination and prioritization of policy / strategy recommendations. In addition to the issues expressed by the participants at the meetings, the opinions of experts from different institutions and organizations, who know the relevant sector / region well, were also evaluated.

The sectoral sizes included in the report were calculated based on the Trade map data of Harmonic System 84 in order to make comparison with other countries. For this reason, the difference between the data expressed in the report and the data used by sectoral organizations such as MAKFED and prepared by TURKSTAT has been ignored since only proportional evaluation and trend analysis will be made in the report.

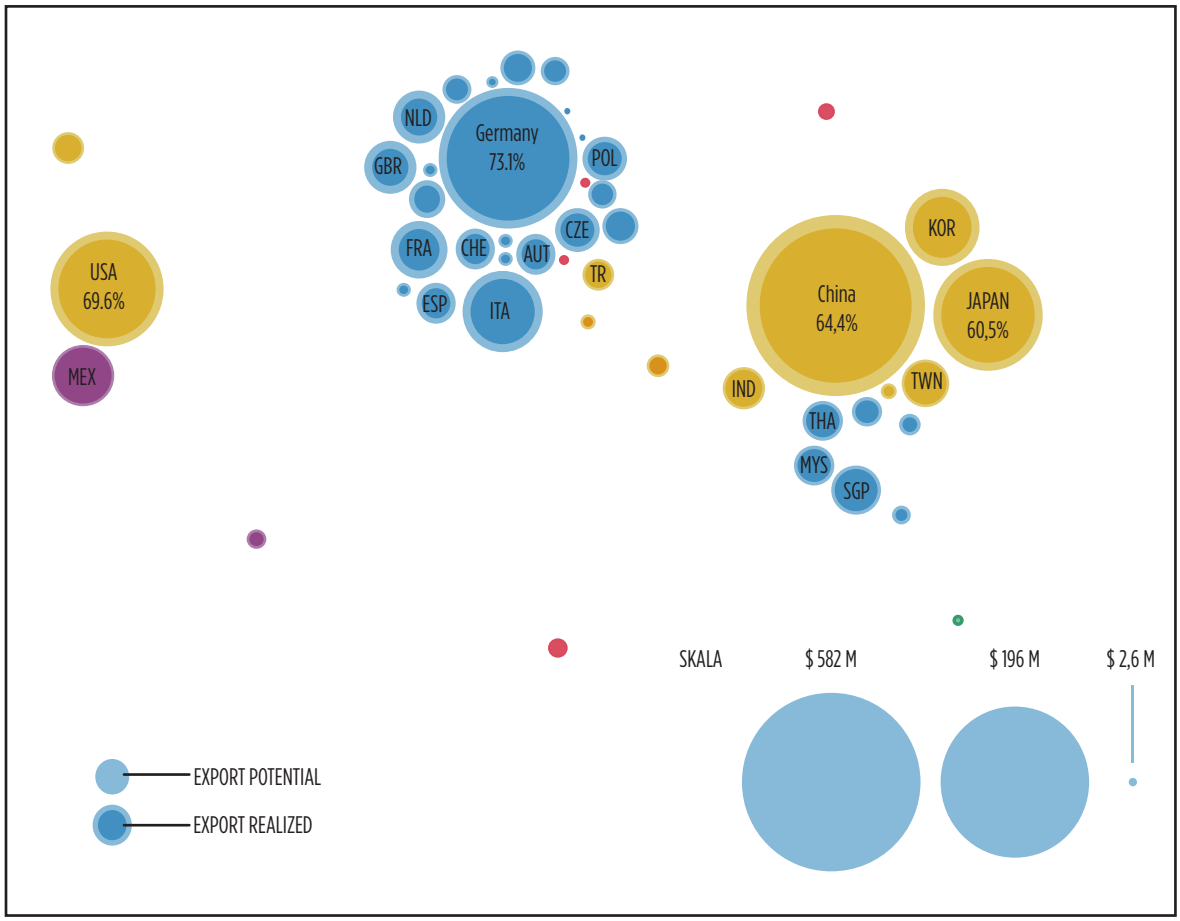
As a result of the study, a Machinery Sector Report and Guideline was created specific to TRC1 Region

3. Profile of the Machinery Sectory

3.1. General Outlook of the Machinery Sector in the World

In 2018 and 2019, a transition period was experienced in the investment environment due to the effect of trade wars and investor behaviors suppressed by this effect. During this transition period, international investors sought alternative investment locations outside of China to avoid the restrictions and sanctions they may encounter. The delay in the implementation of investment decisions during this searching period firstly manifested itself as a decrease in demand in the machinery sector. As a result, the growth in world machinery and equipment investments in 2019 slowed down and realized as 2.5%.

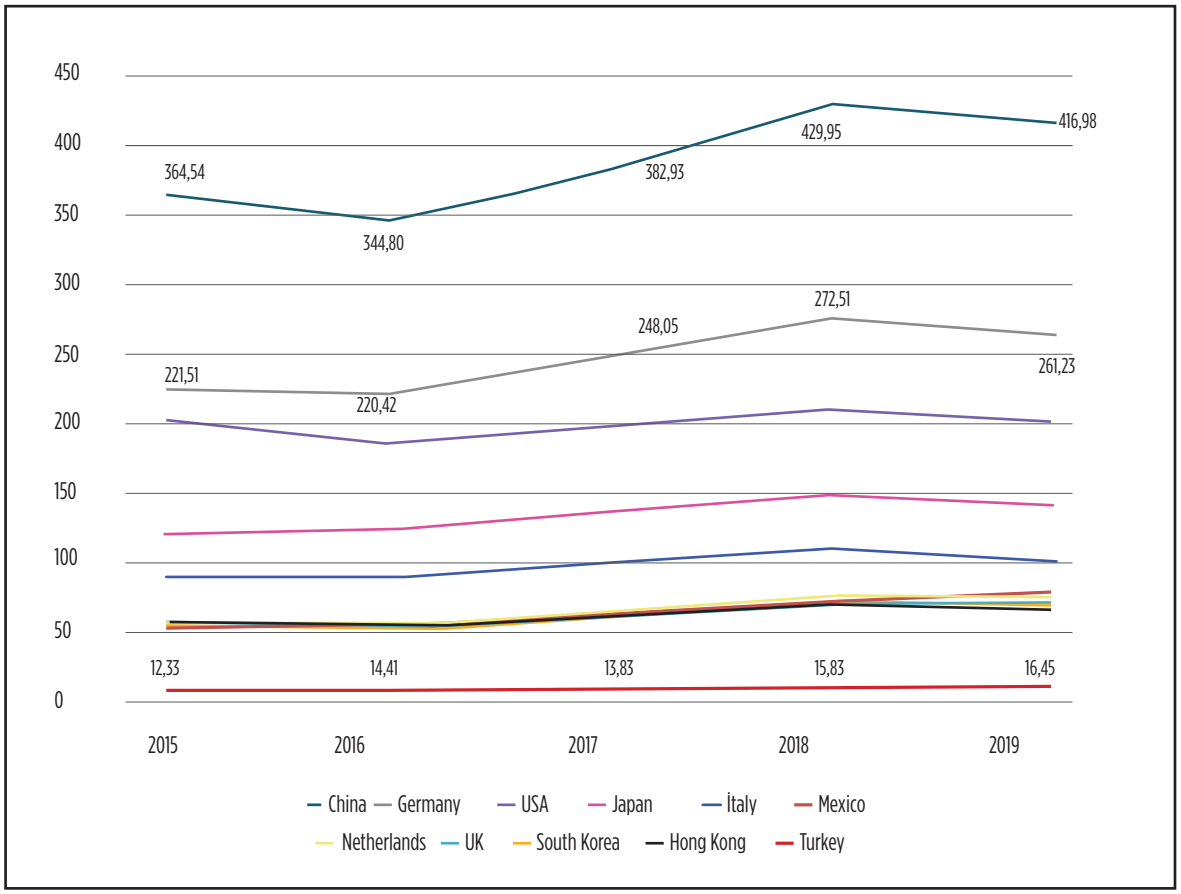
In the development process of countries, the importance of the machinery in the manufacturing industry is gradually increasing. The Machinery Sector directly affects the production, quality and competitiveness of the manufacturing industry sectors where it provides machinery and equipment. The export sizes and additional export potentials of the top 50 exporting countries in the Machinery Sector can be seen in Figure 2 below. The top countries mainly have medium and large-scale companies on the basis of turnover, which positively affects the competitiveness and market power of the countries.



[ITC_Trademap, 2021]

Figure 2: *Top 50 Countries in Machinery Sector in 2019, Their Exports and Export Potentials (HS84)*

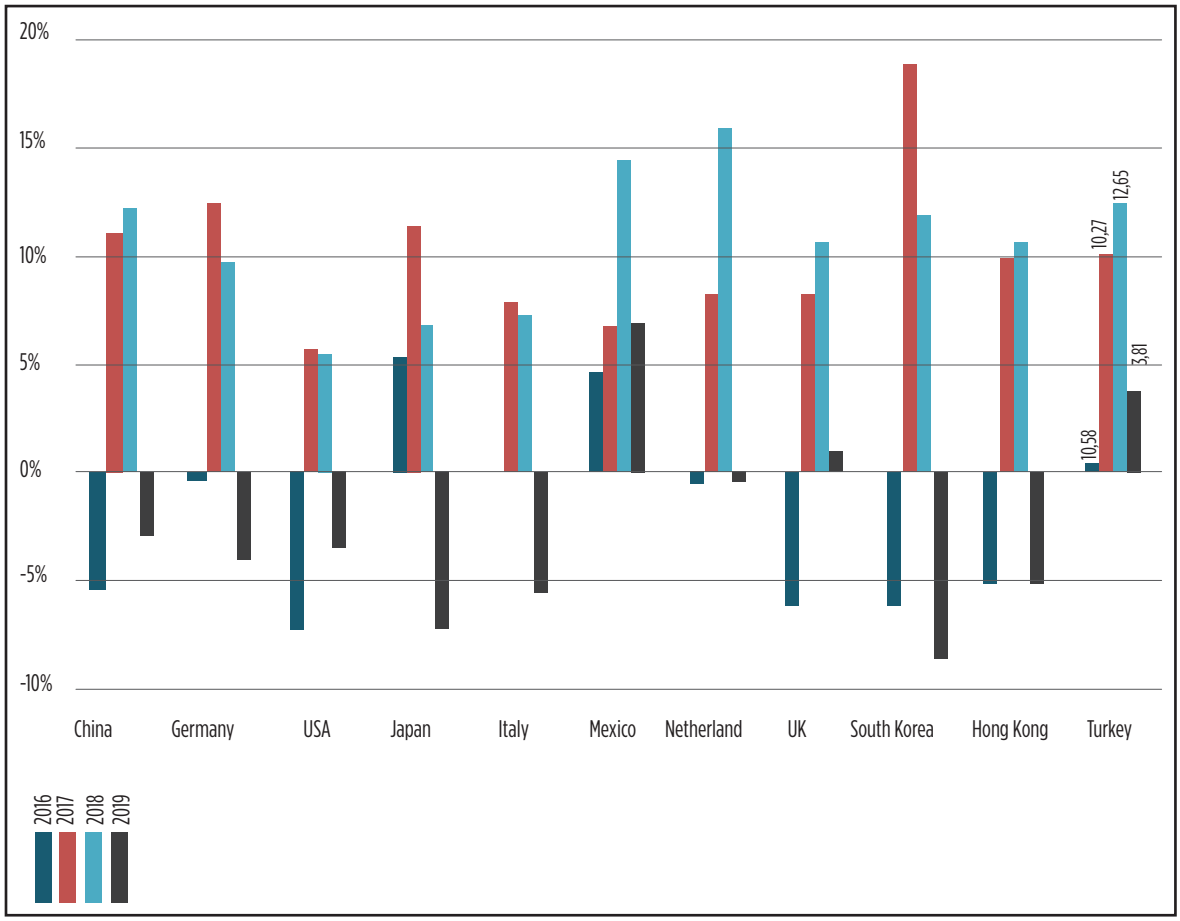
We can compare the exports of the top 10 countries and Turkey which ranked 17 between 2015-2019 in Figure 3. China, Germany, United States of America, Japan, Italy are the top exporting countries of the world in the sector.



[Trademap HS84, 2021]

Figure 3: *Export Values of Top 10 Countries and Turkey (billion USD)*

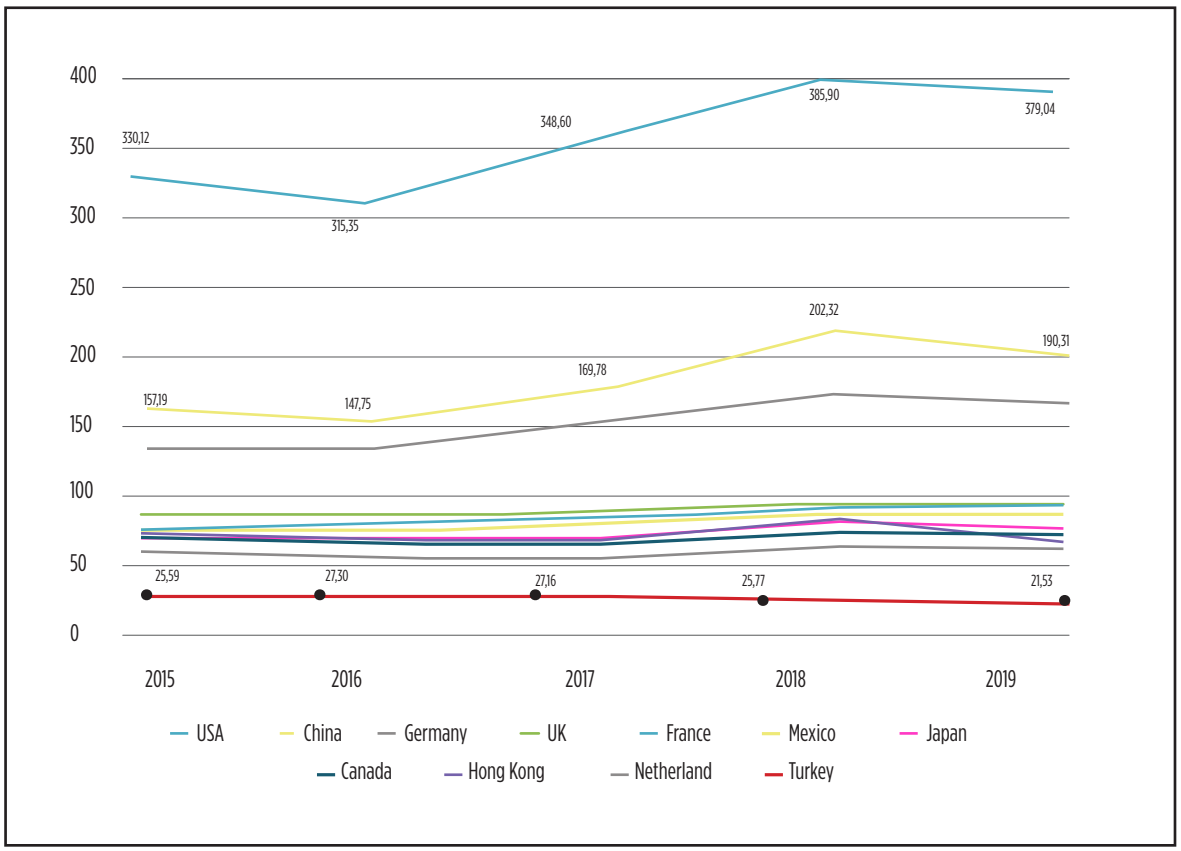
While the annual exports of machinery and equipment of major economies in the world pointed to a general decrease in 2016, there was a recovery in exports in 2017 and 2018. However, it can be seen in Figure 4 that there has been a decrease in the export figures of all countries with the decreasing investment appetite in 2019 due to the aforementioned reasons.



[ITC_Trademap, 2021]

Figure 4: *Export Increase Rates of Top 10 Countries and Turkey between 2016-2019 in World Exports*

In terms of world machinery imports, the size of the machinery imports of the country is directly proportional to the size of the investment made by the industry of that country in production. Therefore, attention should be paid to a strategy that pays attention to the balance of foreign trade in the machinery sector and to increasing sectoral production and scale. The import ranking also shows the production capacity of the countries in other sectors. Investments made by the manufacturing sectors in machinery and equipment are among the most important components in increasing production capacity and capabilities. Top 10 Countries with the Highest Import in the Machinery Sector in 2016-2019 and the import values (billion USD) of Turkey, which ranked 27th in the machinery import list, are shown in Figure 5. Of course, meeting the relevant machinery imports from domestic manufacturers directly affects both the development of the machinery sector and the ratio of country's exports to its imports and eventually its current account deficit.



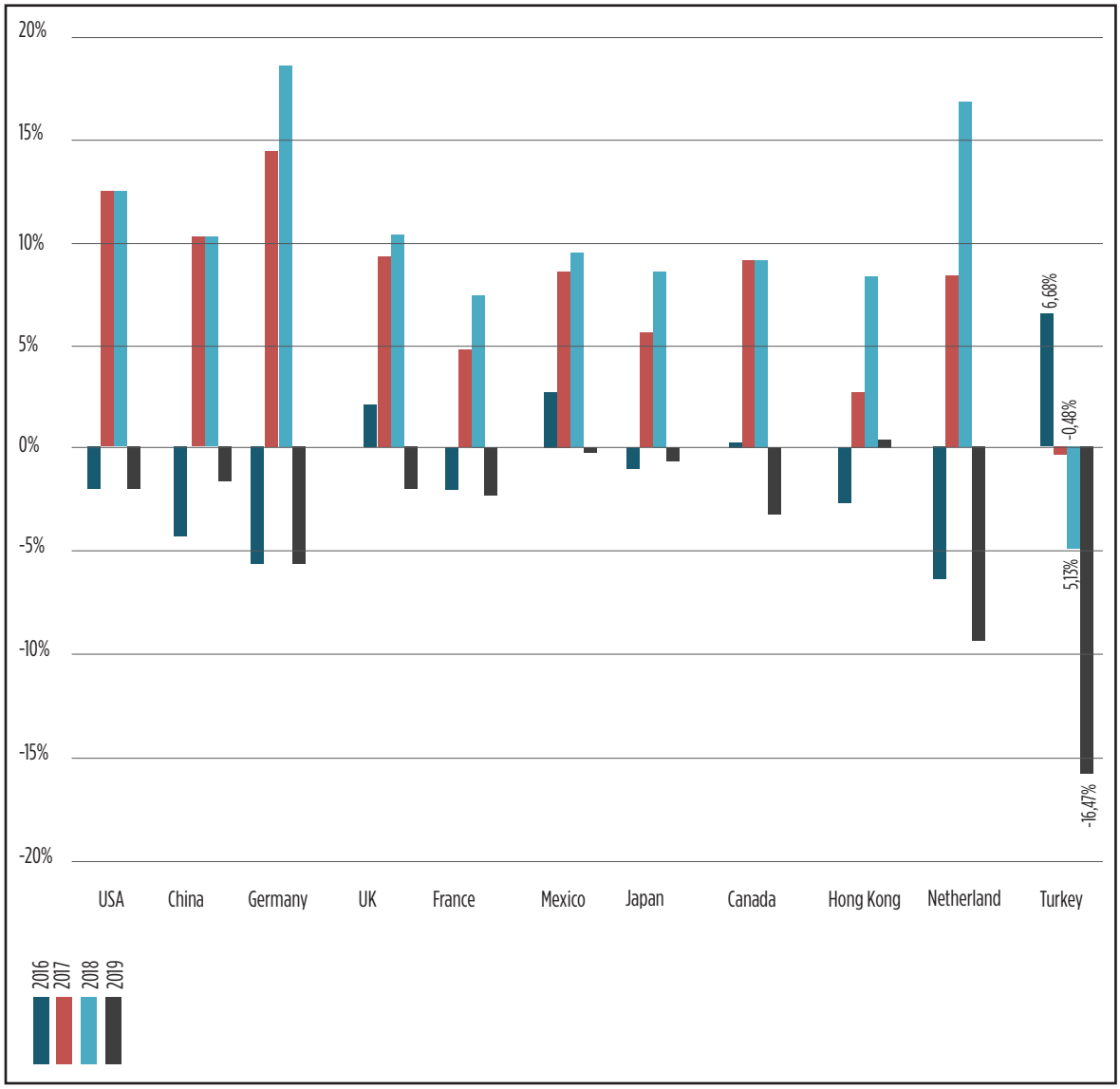
[Trademap HS84, 2021]

Figure 5: *Import Values of Top 10 Countries and Turkey (billion USD)*

According to the data of 2015-2019, the United States, China, Germany, England and France are the world's largest machinery importers. As seen in Figure 5, increasing machinery imports in these countries indicate that investment is being made in manufacturing sectors.

While the annual increase in machinery and equipment imports of major economies in the world indicates a general decrease in 2016, it is recovering in 2017 and 2018 as in exports. However, it is seen in Figure 6 that in 2019, with the decreasing investment appetite due to the reasons we mentioned earlier, there was a greater decrease in all countries compared to exports.

What is important for a developing country is not that imports are less, but the higher ratio of export to import. However, the overall sharp decline in machinery imports indicate that investors are avoiding risks or that the investment climate does not attract investors.



[ITC_Trademap, 2021]

Figure 6: *Import Increase Rates of Top 10 Countries and Turkey between 2016-2019*

As seen in Figure 6, while machinery import of Turkey is decreasing, there is no significant decrease in imports of Asian, Eastern European and African countries for the same period [ITC_Trademap, 2021].

3.2. General Outlook of the Machinery Sector in Turkey

The Machinery Sector is one of the key growth factors of Turkey's economy and the driving force of industrialization. Turkey is the 6th largest machinery manufacturer in Europe and around 80% of the sector consists of SMEs with less than 20 employees. Turkey's Machinery Sector has increased the ratio of exports to imports from 61.4% in 2018 to 76.5% in 2019 and increased its production value 3.5 times in 10 years (2010, 22.5 million TL; 2019, 99.5 million TL) and is a pioneering sector of development, exporting to more than 200 countries, including free zones.

Table 1: Turkey's Machinery Sector Export-Import Balance Between 2015-2019

	2015	2016	2017	2018	2019
Export [Billion Dollars]	12,33	12,41	13,83	15,83	16,45
Export Increase Rate [%]	-	0,58	11,45	14,48	3,96
Import [milyar dolar]	25,59	27,30	27,16	25,77	21,53
Import Increase Rate [%]	-	6,68	-0,48	-5,13	-16,47
Balance (Deficit)	-13,25	-14,89	-13,34	-9,94	-5,07
Coverage Ratio [%]	**48,20**	**45,45**	**50,90**	**61,42**	**76,44**

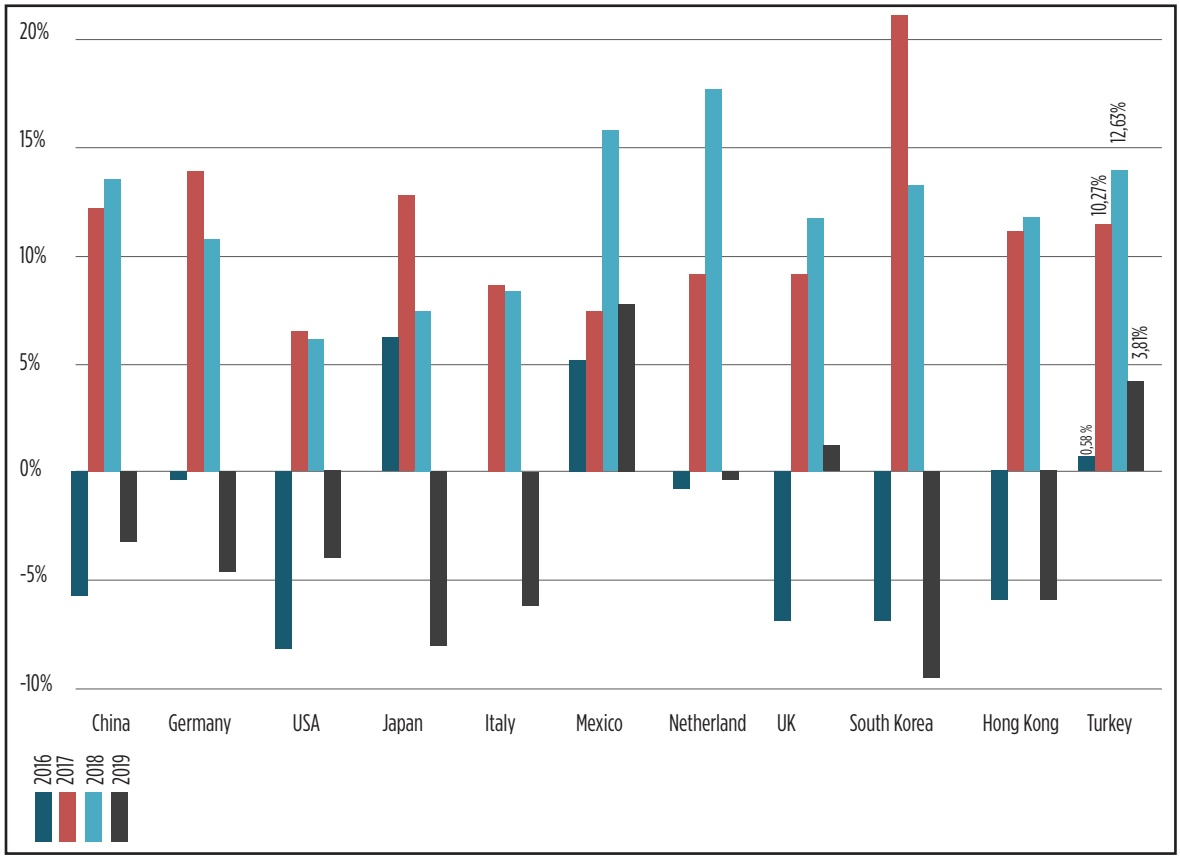
[ITC, Trademap, 2021]

As seen in Table 1, Turkey's machinery exports increased by 14.48% in 2018 to USD 15.83 billion, and in 2019 it increased by 3.96% to USD 16.45 billion. Despite the declining investment appetite in 2019, the sector was able to increase its exports and its coverage ratio between exports and imports from 61.4% in 2018, to 76.4%. However, it should not be ignored that the shrinkage in machinery imports, as seen in Figure 6, is due to the consecutive decline in demand after the exchange rate fluctuations in our country's economy in 2018 and 2019.

In the upcoming period, imports can be expected to increase faster than exports with the investment appetite, provided that the deferred investments are realized and economic confidence is ensured. In this case, even if the lowest trade deficit of the last five years (Balance, $ 5.1 billion in Open Position, Table 1) occurred in 2019, the deficit may increase drastically despite the mitigating effect of the increase in exports. In the following parts of the report, an evaluation will be made within the scope of the data obtained for the year 2020.

The future of the sector and the maximum benefit of our country can be achieved by finding new markets and increasing sales in existing markets thanks to structural developments that will be achieved through innovative and technological developments, and by permanent raise in the export-Import balance.

As can be seen in Figure 7, Turkey, which ranked 17th within machine export figures in 2019, is one of the countries with the highest rate of export growth and has the potential to force higher ranks in the list. Among the top 10 most exporting countries in the machinery sector, the countries that showed growth success in 2019 were Mexico with 7.1% and the United Kingdom with 1.0%. In 2019, when the world export average decreased by 2.8%, Turkey's 3.8% growth performance is an indication that our country has a high potential to rise to a higher position in the following years in the export ranking.



[ITC_Trademap, 2021]

Figure 7: *Figure 7. Export Increase Rates of Top 10 Countries and Turkey between 2016-2019*

The Machinery Sector provides 4.3% of our country's industrial production, 10% of its exports, 6% of employment and 5.7% of its added value. As in all over the world, it is mainly composed of SMEs and has representatives from all scales; large, medium and small enterprises, in line with general and special purpose machinery branches. As seen in Table 2; the machinery sector consists of about 17,400 manufacturers classified within the Harmonized System HS84, of which 17,200 are in the class "Machinery Not Otherwise Classified" (NACE 28) and it employs approximately 243,000 people.

Table 2. Number of Machinery Sector Enterprises

Years	Machinery Industry	Manufacturing Industry	Share of Machinery Sector (%)
2010	12.895	326.925	3,94
2011	13.317	335.571	3,97
2012	13.591	354.256	3,84
2013	13.921	365.723	3,81
2014	14.528	371.911	3,91
2015	15.347	375.480	4,09
2016	16.101	379.894	4,24
2017	16.707	391.024	4,27
2018	17.189	395.816	4,34
2019	17.210	396.410	4,34

[TURKSTAT, 2021]

The sector has made a great leap forward in the last 20 years and by achieving an average growth rate of 12.2% in exports, 59% of which were made by small and medium-sized enterprises, it grew 10 times by catching the second largest acceleration after China in the period when the world grew only twice. The figure for 2019 exports is US $ 16.45 billion [Trademap HS84, 2021], and this figure rises to US $ 19 billion when free zones are included.

Turkey's economy faced a significant financial shock in 2018, and the economy and real sector were adversely affected. In the first two quarters of 2019, the economy contracted, a recovery was experienced in the last quarter, and the year was closed with a 0.9% cumulative growth [TURKSTAT, 2021]. In 2019 increasing protectionism in global trade and decreasing domestic investments have created restrictive effects in the machinery sector. Depending on these developments in the economy, machinery and equipment investments decreased by 5.5% in 2019, while machinery sector production decreased by 6.2% in 2019 compared to base year 2015. Growth in export could only compensate for the contraction in domestic demand to a limited extent and the rapid growth in machinery sector production since 2010 paused for the first time in 2019 (Table 3).

Table 3. Machinery Sector Production Value (million TL

Years	Machinery Industry	Manufacturing Industry	Share of Machinery Sector (%)
2010	22.458	538.842	4,17
2011	32.144	712.234	4,51
2012	36.072	771.754	4,67
2013	40.163	866.169	4,64
2014	47.967	996.977	4,81
2015	54.503	1.116.847	4,88
2016	60.395	1.220.497	4,95
2017	78.297	1.574.831	4,97
2018	102.133	2.089.572	4,89
2019	99.537	2.217.955	4,48

[Makfed, 2021]

As can be seen in Table 4; while the share of the machinery sector in the total manufacturing industry turnover rose to 5% in 2017, it decreased to 4.93% in 2018. Despite the 12.7% increase in manufacturing industry turnover in 2019, the machinery sector could not follow the same increase and grew only by 8.2% and its share in the manufacturing industry decreased to 4.74%. It

is evaluated that this relative contraction is due to the decrease or pause in the global investment appetite and the falling growth rate of Turkey's machinery exports, as seen in Table 1.

However, despite the contraction in its share in the manufacturing industry in 2019, the Compound Annual Growth Rate (CAGR) calculated over the turnover of the Machinery Sector between 2010-2019 has become 19%. This ratio clearly reveals the annual growth performance of the sector.

Table 4: Turnover of Machinery Sector (million TL) and its Share in Manufacturing Industry

Years	Machinery Industry	Manufacturing Industry	Share of Machinery Sector (%)
2010	24.432	577.275	4,23
2011	35.694	761.945	4,68
2012	39.754	833.932	4,77
2013	45.721	930.896	4,91
2014	52.134	1.076.277	4,84
2015	59.281	1.203.634	4,93
2016	65.424	1.314.067	4,98
2017	84.834	1.695.855	5,00
2018	108.803	2.205.284	4,93
2019	117.710	2.485.514	4,74

[Makfed, 2021]

Although the non-performing loans in the machinery sector were relatively low, there was an increase in 2019 due to the cash flow difficulties. As can be seen in Table 5; the ratio of loans used in the machinery sector in 2018 and 2019 to loans used in the manufacturing industry is 4.04%. Despite this, in 2019, the share of the machinery sector in the manufacturing industry increased from 3.58% to 3.95% with regard to non-performing loans.

Table 5: *Domestic Loan Usage in Machinery Sector (million TL)*

Years	Total Loans			Non-Performing Loans		
	Machinery	Manufacturing	Share of Machinery (%)	Machinery	Manufacturing	Share of Machinery (%)
2014	9.246	250.486	3,69	159	7.086	2,24
2015	1.184	280.609	0,42	341	8.093	4,21
2016	12.962	315.557	4,11	502	11.339	4,43
2017	16.514	387.586	4,26	503	13.035	3,86
2018	19.471	481.363	4,04	693	19.334	3,58
2019	22.469	556.466	4,04	1.133	28.719	3,95

[Makfed, 2021

Considering the distribution of exports in the machinery sector among company groups, approximately 60% of exports are made by companies with less than 250 employees (Table 6); and this gives information about the magnitude of the added value that SMEs in the sector will create if they make progress in innovation and productivity.

Table 6: Export Shares According to Scales in the Machinery Sector

Years	Small and Medium Enterprises					
	1-9 Employees	10-49 Employees	50-249 Employees	1-249 Employees Total Share (%)	250+ Employees Total Share (%)	Total (Million Dollars)
2015	19,1	22,4	19,7	61,2	38,8	8.658
2016	19,0	22,5	19,9	61,4	38,6	8.582
2017	18,6	22,0	20,6	60,9	39,1	9.719
2018	17,9	21,1	20,3	59,3	40,7	11.489
2019	17,3	21,0	20,4	58,7	41,3	12.364

[TÜİK, 2021]

3.3. General Outlook of the Machinery Sector in TRC1 Region

Gaziantep has an area of 6.803 km2 and as of 2019, it is the 9th most populous city with a population of 2.101.157 people, of which approximately 63.2% are at working age and 13.5% have university or higher education. [TURKSTAT, 2021]. The center of Gaziantep, which has 10 districts, is an area where universities, technology development centers, organized industrial zones, strong clusters of sectors and non-governmental organizations are concentrated.

Adıyaman has an area of 1.814 km2 and as of 2019, it is the 35th most populous city with a population of 632.459 people, of which approximately 64.1% are at working age and 14.3% have university or higher education [TURKSTAT, 2021]. There is 1 university in the center of Adıyaman, which has 9 districts.

Kilis has an area of 1.522 km2 and as of 2019, it is the 75th most populous city with a population of 142.792 people, of which approximately 63.9% are at working age and 16.9% have university or higher education [TURKSTAT, 2021]. There is 1 university in the center of Kilis, which has 4 districts.

Gaziantep has a gross domestic product of approximately 77 billion 109 million TL and a share of 1.8% according to 2019 data [TURKSTAT, 2021]. In foreign trade, Gaziantep has a share of 5.08% in the country with an export of 7 billion 936 million USD and is the 5th most exporting province [TİM, 2021].

Adıyaman has a gross domestic product of approximately 14 billion 045 million TL and a share of 0.1% according to 2019 data [TURKSTAT, 2021]. In foreign trade, Adıyaman has a share of 0.07% in the country with an export of 106 million USD and is the 50th most exporting province [TİM, 2021].

Kilis has a gross domestic product of approximately 4 billion 148 million TL and a share of 0.4% according to 2019 data [TURKSTAT, 2021]. In foreign trade, Kilis has a share of 0.03% in the country with an export of 44 million USD and is the 62nd most exporting province [TİM, 2021].

When the sectoral components of the economy of the TRC1 Region are examined, it is seen that Gaziantep stands out in the machinery sector.

When looking at the number of enterprises on the basis of the machinery sector, according to the data of 2019 in Table 7 [SSI, 2021] it is seen that there are 259 machinery manufacturing companies in TRC1 Region, 14 of which employ 55 people in Adıyaman, 5 of which employ 34 people in Kilis and 240 of which employ 1.623 people in Gaziantep which makes a total of 1.712 employees.

Table 7: Number of Machinery Companies and Employees in TRC1 Region (2019)				
Number of Companies and Employees in Class NACE 28 in TRC1 Region	Adıyaman	Kilis	Gaziantep	Toplam
Number of Companies	14	5	240	259
Number of Insured Employees	55	34	1.623	1.712

As seen in Table 8, in 2018, there was a concentration in the Food and Textile Machinery sub-sectors with 67 and 60 companies in TRC1 Region.

Table 8: Number of Machinery Manufacturing Companies by City (2018)

Sınıf	Machinery Groups	İstanbul	Ankara	Kocaeli	Bursa	İzmir	Eskişehir	Konya	Manisa	G.Antep	Mersin	Adana	Sakarya
2811	Engines Turbines	30	22	16	16	24	2	48	1	1	1	6	2
2812	Fluid Power Eq.	110	80	19	24	58	2	103	1	4	1	9	3
2813	Pump & Comp.	215	78	25	23	85	5	74	4	6	2	9	10
2814	Taps & Valves	239	25	26	10	28	4	37	10	1	1	7	1
2815	Bearings & Gears	142	25	11	15	41	4	77	13	1	1	7	7
2821	Ovens & Furnaces	173	54	27	15	32	1	28	8	6	4	4	
2822	Lifting Handling	544	236	86	74	146	26	179	24	30	28	32	17
2823	Office Machinery	14	3			1	1	1					1
2824	Power Hand Tools	12	1	1	1	4		4	1		1	1	1
2825	Cooling Mach.	345	116	57	41	118	17	44	29	19	3	19	12
2829	Other Gen. Mach.	617	158	83	41	163	14	84	16	19	11	22	25
2830	Agr. & Forestry	46	44	16	31	77	17	203	40	12	13	32	17
2841	Metal Forming	314	71	41	119	61	10	81	6	6	5	12	10
2849	Machine Tools	168	69	34	161	42	11	34	6	2	3	4	11
2891	Metallurgy	49	10	24		19	4	14			1	7	
2892	Construction	105	355	33	15	71	7	50	12	12	11	17	7
2893	Food Mach.	200	67	11	40	121	21	165	14	60	16	14	31
2894	Textile Mach.	252	15	5	34	40		20	2	67	4	10	4
2895	Paper Mach.	54	6	9	3	15		8	2	8		6	
2896	Plas. & Rub. Mach.	221	13	27	24	31	4	15	3	21	3	7	11
2899	Other Spec. Mach.	309	112	41	69	86	13	54	27	9	2	7	4
Toplam		4.159	1.560	592	756	1.263	163	1.323	219	284	111	232	174

[Makfed, 2021]

When the Machinery Manufacturing sector investment incentive documents between the years 2015-2020 in TRC1 Region are examined in Table 9, It is seen that 6 foreign investors received investment incentive certificate in Gaziantep province in the region, domestic investors prefer Gaziantep province for investment in the machinery sector, and again Gaziantep province is far ahead in terms of the size of the investments.

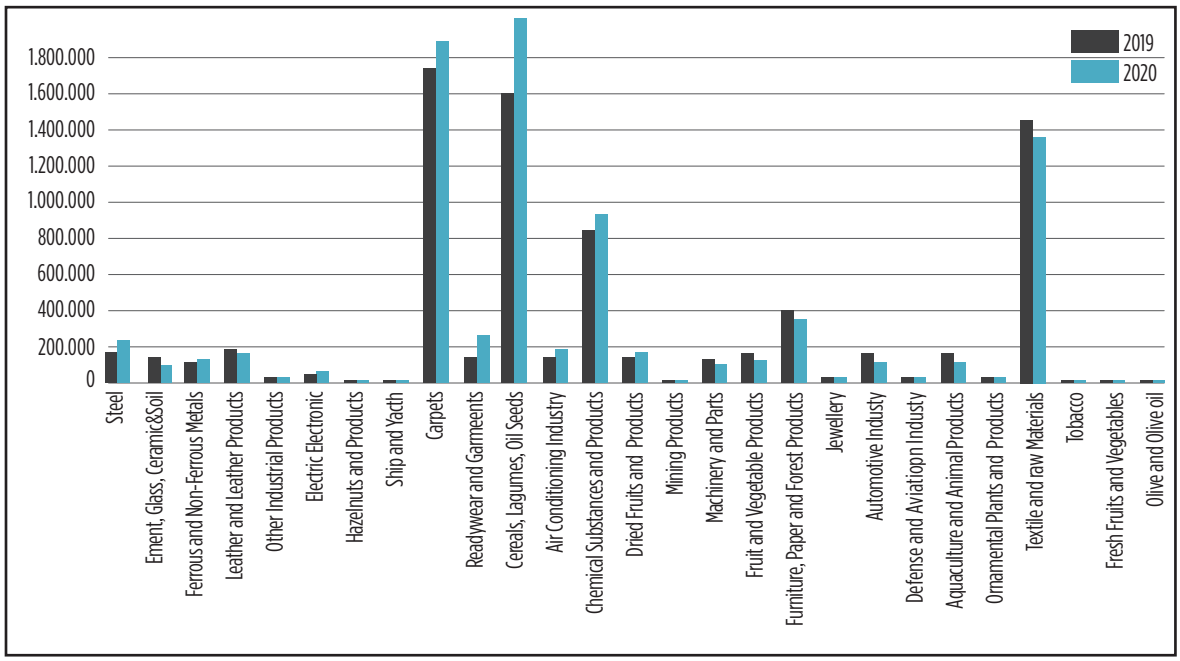
Table 9: Investment Incentives Received Between 2015-2020 In TRC1 Region under NACE 28						
INVESTMENT INCENTIVES BETWEEN 2015-2020 IN TRC1 REGİON NACE 28	DOMESTIC INVESTOR			FOREIGN INVESTOR		
	Number of Incentives	Amount of Investment [Million TL]	Employ-ment Provided	Number of Incentives	Amount of Investment [Million TL]	Employ-ment Provided
Adıyaman	1	1	5	0	0	0
Kilis	0	0	0	0	0	0
Gaziantep	22	115	277	6	6	32

As can be seen in Table 10, although the TRC1 Region Machinery Sector decreased by 10% compared to the same period of the previous year with an export amount of approximately 113 million USD in 2020, their share in Turkish machinery industry exports, which decreased by 3.71% in the same period, decreased from 1.9% to 1.77%.

Table 10: Top 20 Cities in Machinery Exports in 2020 and Export Shares (Thousand USD)						
MACHINERY EXPORT RANKS	1 January-31 December					
	CITY	2019	Share	2020	Share	Difference
1	İSTANBUL	2.852.388	36,4%	2.628.887	34,9%	-7,8%
2	ANKARA	1.207.172	15,4%	1.140.353	15,1%	-5,5%
3	BURSA	806.518	10,3%	686.714	9,1%	-14,9%
4	İZMIR	574.502	7,3%	533.762	7,1%	-7,1%
5	KONYA	460.402	5,9%	508.934	6,7%	10,5%
6	KOCAELI	471.293	6,0%	469.943	6,2%	-0,3%
7	MANISA	107.752	1,4%	137.851	1,8%	27,9%
8	MARDİN	21.290	0,3%	135.500	1,8%	536,4%
9	**GAZİANTEP**	**146.239**	**1,9%**	**130.715**	**1,7%**	**-10,6%**
10	ESKIŞEHIR	104.015	1,3%	101.954	1,4%	-2,0%
15	ÇORUM	75.017	1,0%	63.269	0,8%	-15,7%
18	SAMSUN	47.984	0,6%	53.533	0,7%	11,6%
30	KARAMAN	11.665	0,1%	14.857	0,2%	27,4%
62	**KİLİS**	**861**	**0,0%**	**1.331**	**0,0%**	**54,5%**
66	**ADIYAMAN**	**1.664**	**0,0%**	**1.001**	**0,0%**	**-39,8%**
70	AMASYA	468	0,0%	482	0,0%	3,0%
71	TOKAT	541	0,0%	356	0,0%	-34,3%
	Türkiye Toplam	**7.832.002**	100,0%	**7.542.293**	100,0%	

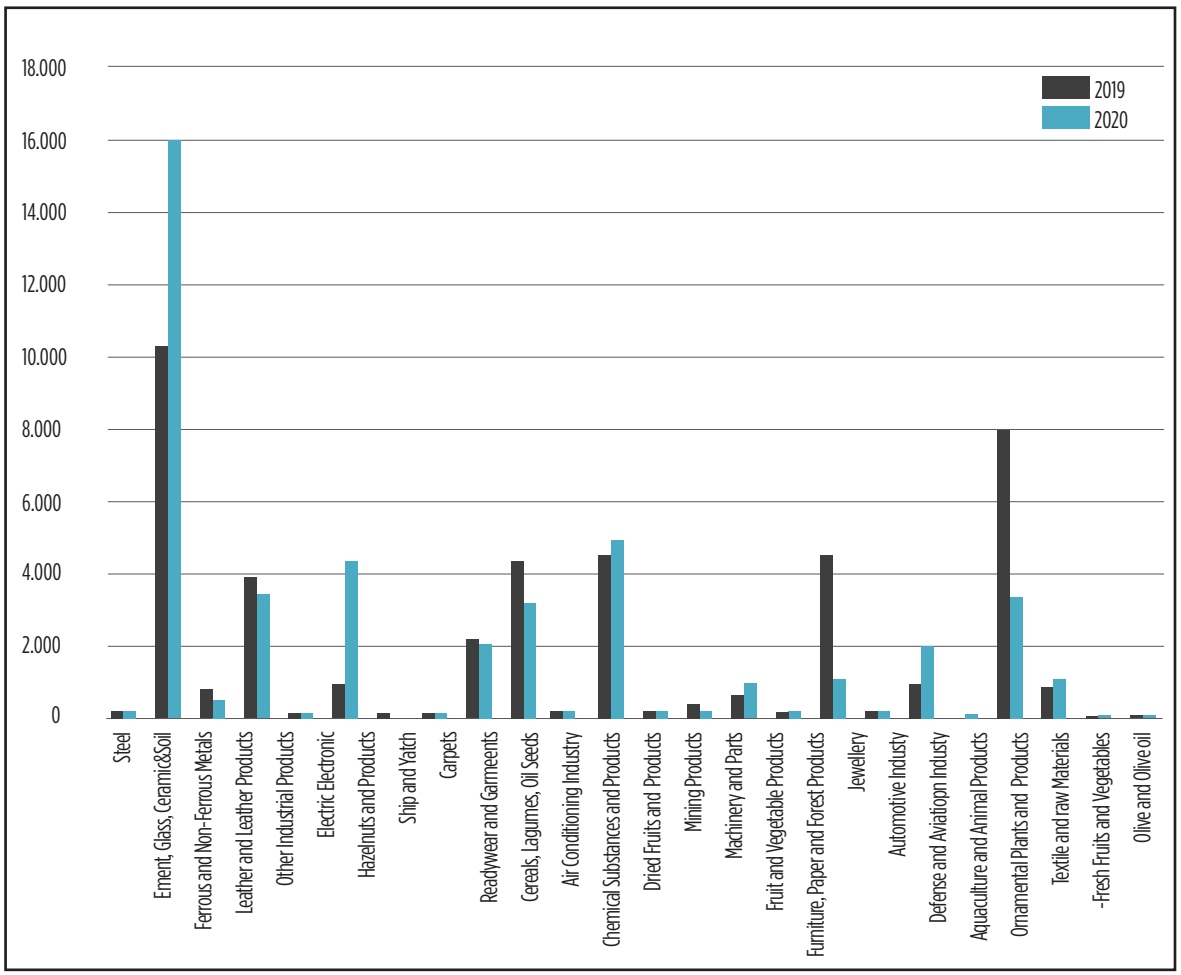
[TİM, 2021]

While the most exported countries from TRC1 Region are Iraq, Saudi Arabia, Syria, Libya and the USA, the highest import is from Saudi Arabia, Russia, Germany, China and Ukraine. (TRC1 Regional Plan 2014-2023, İKA, 2015) The distribution of exports from Gaziantep can be seen in Figure 8, Kilis in Figure 9, and Adıyaman in Figure 10. the highest export figure of the Machinery Manufacturing Sector in 2020 was realized in Gaziantep with 63.3 million USD. The sector is low in Adıyman and Kilis both in terms of size and ranking.



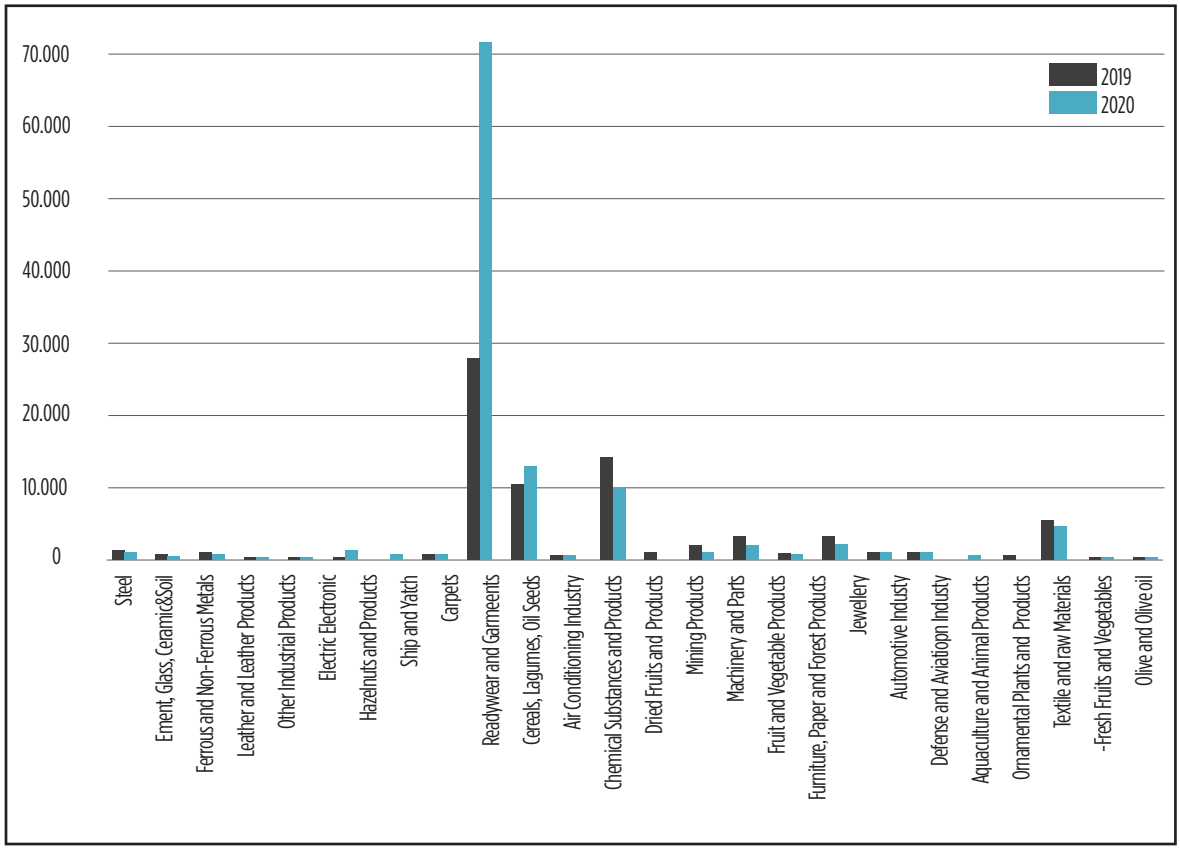
[TÜİK, 2021]

Figure 8: *Gaziantep İli İmalat Sanayi Sektörleri 2019-2020 Yılı İhracatları (bin ABD doları)*



[TURKSTAT, 2021]

***Figure 9**. Exports of Manufacturing Industry Sectors in Kilis in 2019-2020 (Thousand USD)*



[TURKSTAT, 2021]

Figure 10. *Exports of Manufacturing Industry Sectors in Adıyaman in 2019-2020 (Thousand USD)*

Gaziantep has a total of 10 R&D centers in the fields of food, textile, energy, chemistry, packaging and health, one of which is in the field of machinery and equipment. While Adıyaman has 1 R&D center in the field of energy, there is no R&D center in Kilis province [MoIT, 2021].

When the Gaziantep Machinery Manufacturing sector is examined, the biggest sub-sectors encountered are the Textile, Food and Packaging Machinery Sector. Developed in order to modernize the intensive carpet and food production in the province, the production of Textile, Food Machinery has grown in parallel with the increasing production and has been able to go beyond national growth with exports. Food processing, biscuit chocolate machines and weaving, knitwear, carpet machines and equipment belonging to the Food and Textile Machinery sub-sectors are exported to many countries.

Gaziantep Machinery Metal Cluster in the sector was established in 2015 and consists of 20 companies.

Food and Textile Machinery manufacturer companies producing in Gaziantep have achieved many successes in national and international rankings. Özmaksan Machinery, Özpolat Machinery, Hemaks Machinery are among the leading players of the sector in the province.

4. The Effects of the Covid-19 Pandemic on the Machinery Sectori

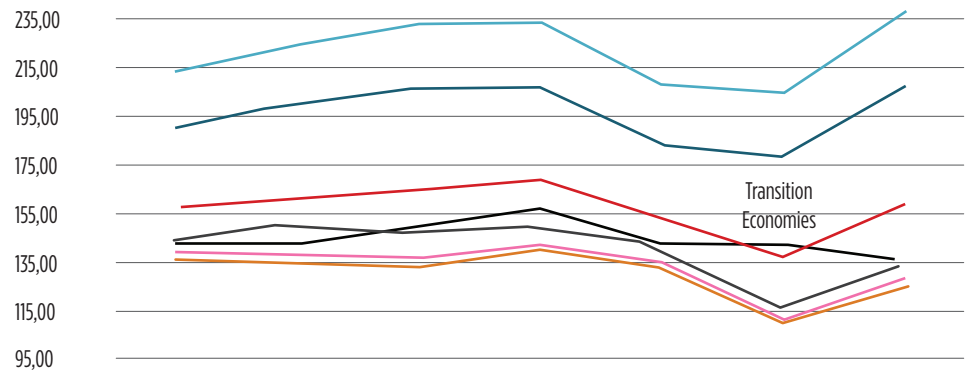
Most countries of the world have taken many measures to mitigate the short-term impact of the Pandemic Crisis. The main measure implemented has been social distance and this resulted in a sudden stop in the services sector, a decrease in companies' cash flow and income, and a serious decline in economies with an increase in unemployment.

The Covid-19 pandemic caused a significant contraction in the world economy and trade in 2020. The assumptions that the pandemic will take place in a single wave, that it will be taken under global control at the end of the summer months and the vaccine will be found and implemented in 2021 are the basis of optimism in predictions regarding the world economy and trade.

4.1. Comparison Before and After the Pandemic

As a general opinion in the world economy, a contraction of 5-6% is projected in 2020 and a growth of about 4% in 2021. As for World Trade, a recovery is expected from the third quarter of 2020, first in the form of shrinking and then in the form of growth. A total contraction of about 20% is forecast for 2020 and a recovery of up to 15% in 2021 [the World Bank, 2021].

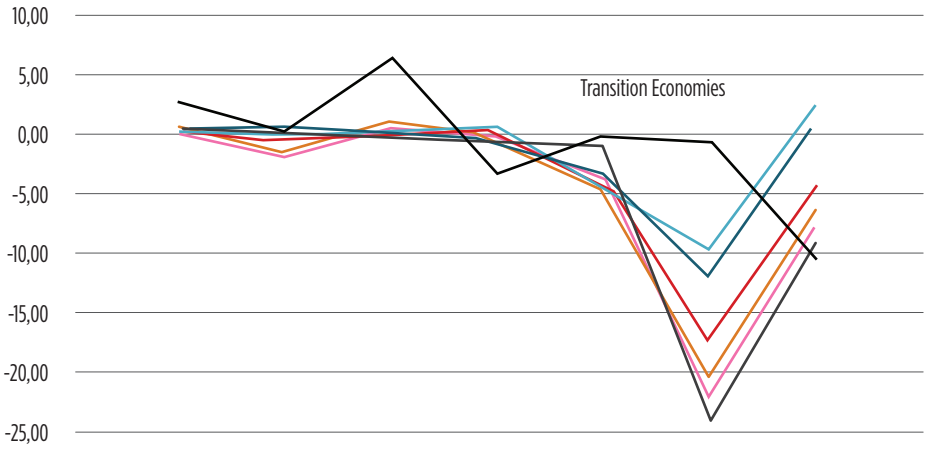
By using the data finalized as of January 2021, the world total and export volume and export growth rates in various economic regions can be examined in Figure 10 and Figure 11. As can be seen in Figure 10, it is seen that the decline in export volumes of both the world and economic regions with the onset of the pandemic in the first quarter of 2020 reached the bottom point at the end of the 2nd quarter and returned from this point, approaching the 1st quarter figures at the end of the 3rd quarter. However, in Transition Economies of the Former USSR (Russia, Ukraine, Belarus, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan and Tajikistan) there is an almost stable progress in the second and third quarters with a relatively low retreat at the end of the 1st quarter. This might be due to the fact that countries of transition economies have implemented quarantine and travel ban practices taken against the pandemic later and more flexibly.



	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020
World	156,80	160,76	161,41	165,17	152,19	134,40	155,55
America	143,63	150,64	148,65	150,44	142,82	116,30	136,76
Asia	211,61	222,80	231,49	233,04	205,11	203,03	238,01
Europe	136,67	135,60	133,10	139,18	131,36	109,42	125,60
Developing Economies	188,45	199,15	205,30	206,37	183,15	176,54	207,28
Transition Economies	143,06	142,80	150,73	157,73	143,54	142,57	136,03
Developed Economies	140,20	140,71	137,94	142,92	135,74	111,26	128,58

[UNCTAD, 2021]

Figure 11: *Dünya ve Çeşitli Ekonomik Bölgeler İhracat Hacimleri [2005=100]*



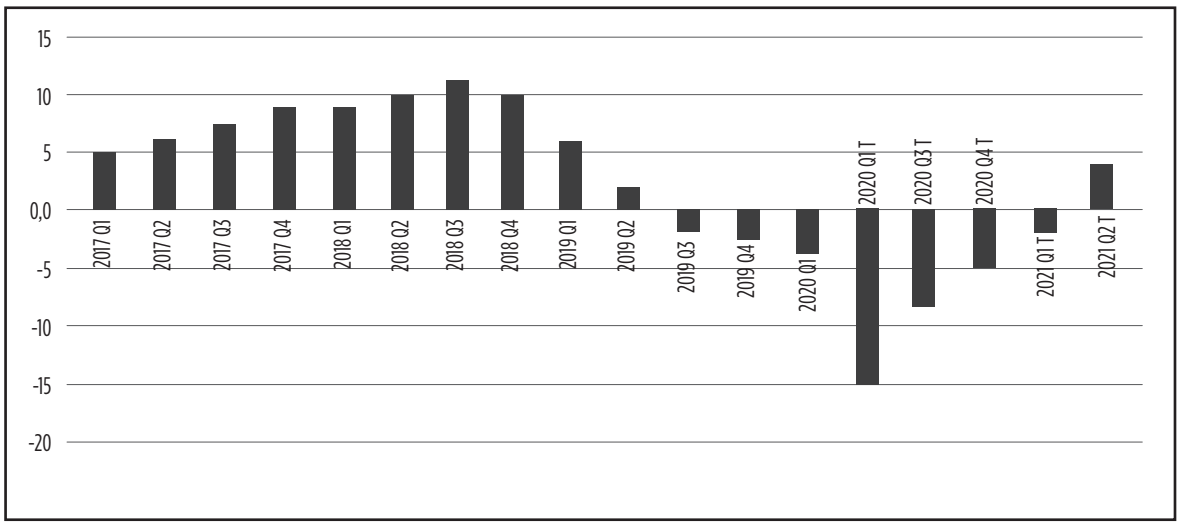
	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020
World	0,62	-0,20	0,84	0,22	-2,94	-16,40	-3,66
America	0,94	0,29	0,49	-0,37	-0,57	-22,80	-8,00
Asia	0,84	0,66	0,31	0,97	-3,07	-8,87	2,81
Europe	1,05	-1,10	1,42	0,39	-3,88	-19,31	-5,63
Developing Economies	0,59	1,14	0,43	0,55	-2,81	-11,35	0,96
Transition Economies	3,00	0,67	6,53	-2,53	0,33	-0,16	-9,75
Developed Economies	0,53	-1,24	0,92	0,25	-3,18	-20,93	-6,79

[UNCTAD, 2021]

Figure 12. *Export Growth Rates of the World and Various Economic Regions Compared to the Previous Period*

The same is true for export growth rates, as can be seen in Figure 12. It is highly probable that in the 4th quarter the export growth rates of the transition economies will follow the rest of the economies and will make a comeback as other economies have performed in the 4th quarter.

While the current information and expectations of the world economy are like this, UNCTAD's predictions regarding world machinery and equipment investments are as follows: As can be seen in Figure 13; world machinery and equipment investments will likely recess in parallel with the world economy; however, its recovery will take a longer time. World machinery and equipment investments shrank by 4.0 percent in the first quarter of 2020. It is estimated that there was a 15.0% shrinkage in the second quarter. In the third and fourth quarters of the year, contractions are expected as 8.0% and 5.0%. After a limited contraction in the first quarter of 2021, the first growth figure in world machinery and equipment investments is expected to be 4.0% in the second quarter of 2021.



[UNCTAD, 2021], (Compared to the same period of the previous year)

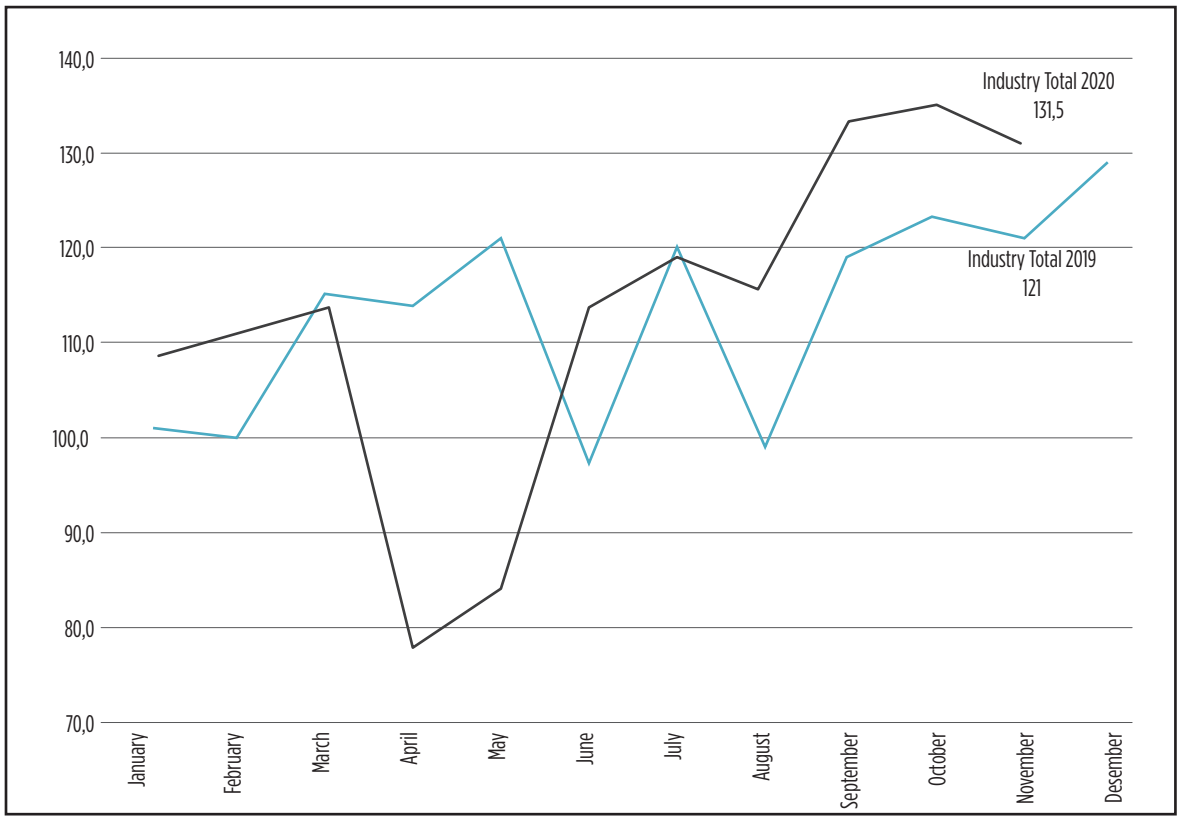
Figure 13. *World Machinery Investments Growth Rates (%)*

These expectations and the export growth rates shown in Figure 12 do not match. Along with the recovery in world export volume and growth rate, a recovery in the machinery sector should be expected in parallel with the export growth rate. As a matter of fact, TURKSTAT data for 2020, which will be shared below, and monthly improvement comparisons of the manufacturing and machinery sectors also indicate a faster recovery.

In response to the Covid-19 Crisis, the Manufacturing Industry and Machinery Sector has taken hygiene and social distance measures in the workshop and business services in general to minimize the impact of the virus on production and employees with chronic illnesses and / or those over 55 years old were given the opportunity to take leave. A home-based working system has been introduced for white-collar personnel who are not obliged to actually work in the workplace. As a result, it has become evident that most white-collar workers can do their jobs remotely.

In this period when the fight against the virus is at a high level; efforts were made to produce with additional working hours in order not to interrupt the infrastructure services such as energy, water, sewage, cleaning and hygiene, infrastructure services such as elevators, air conditioning, cold chains, and to maintain agricultural production for food security of our country with the aim of protecting public health and eliminating the risks that may hinder social life. In this critical period, the machinery sector was able to take quick actions in areas such as respirators and mask manufacturing machines, and put the necessary work into practice very quickly.

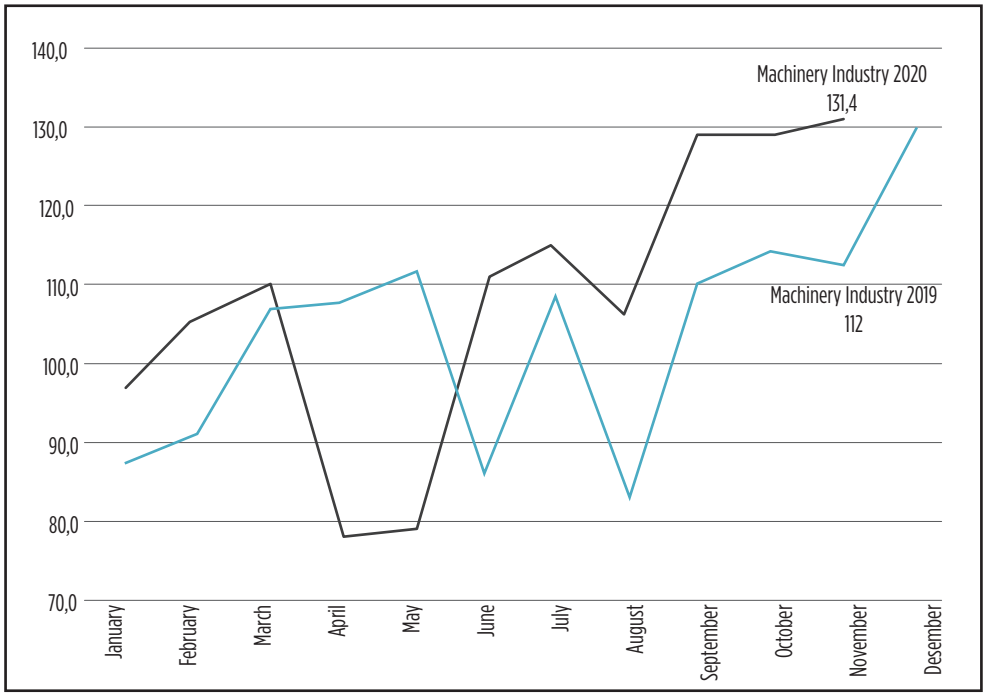
As can be seen in Figure 14, Manufacturing industry and Machinery Industry generally followed the same trend with the onset of the pandemic. However, in November 2020, the Machinery Industry showed a better performance than the Manufacturing Industry, signaling that it will perform even better in December and later.



[TURKSTAT, 2021]

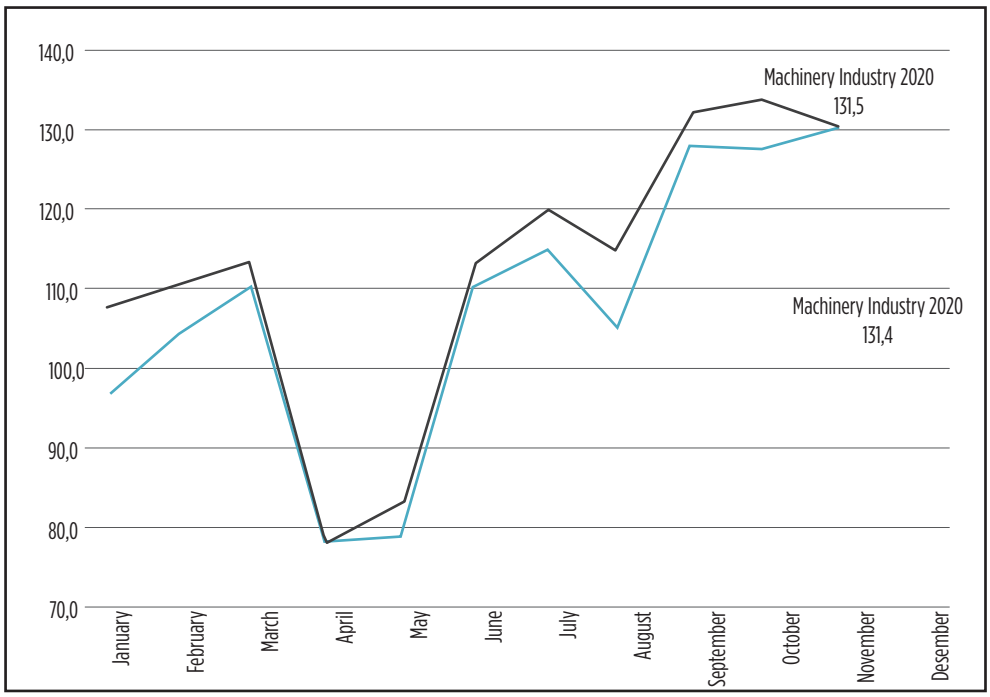
Figure 14: *Manufacturing Industry Production Index 2019-2020 Monthly Comparison [2015=100]*

As can be seen in Figure 15, Manufacturing and Machinery Sector generally followed the same trend with the beginning of the pandemic. However, in November 2020, the Machinery Sector performed better than the Manufacturing Industry and signals that it will perform even better in the period after December.



[TURKSTAT, 2021]

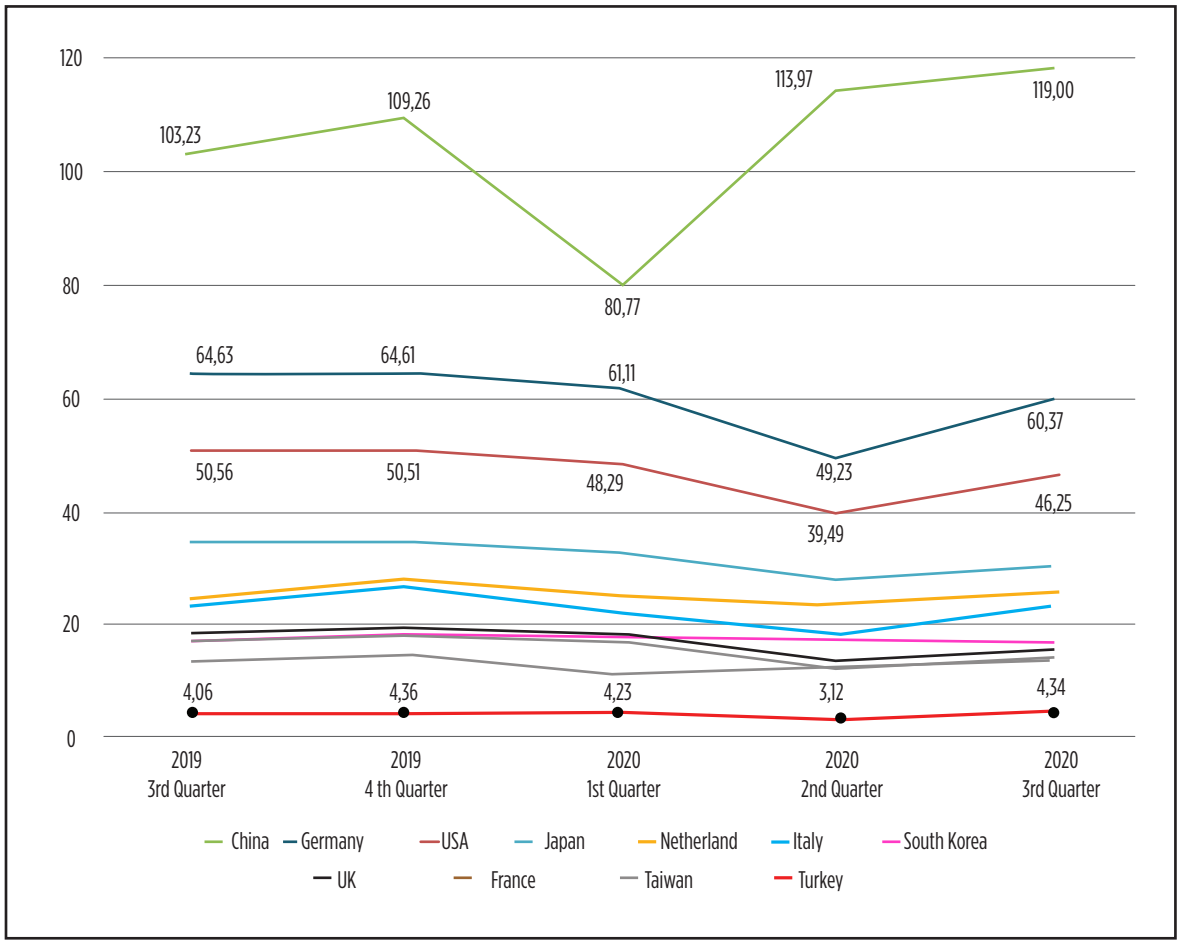
Figure 15: *Machinery Sector Production Index 2019-2020 Monthly Comparison [2015=100]*



[TURKSTAT, 2021]

Figure 16: *2020 Comparison of Manufacturing and Machinery Sector Production Index for 2020 [2015=100]*

As can be seen in Figure 16, Manufacturing and Machinery Sector generally followed the same trend with the beginning of the pandemic. However, in November 2020, the Machinery Sector performed better than the Manufacturing Industry and signals that it will perform even better in the period after December.



[ITC_Trademap, 2021]

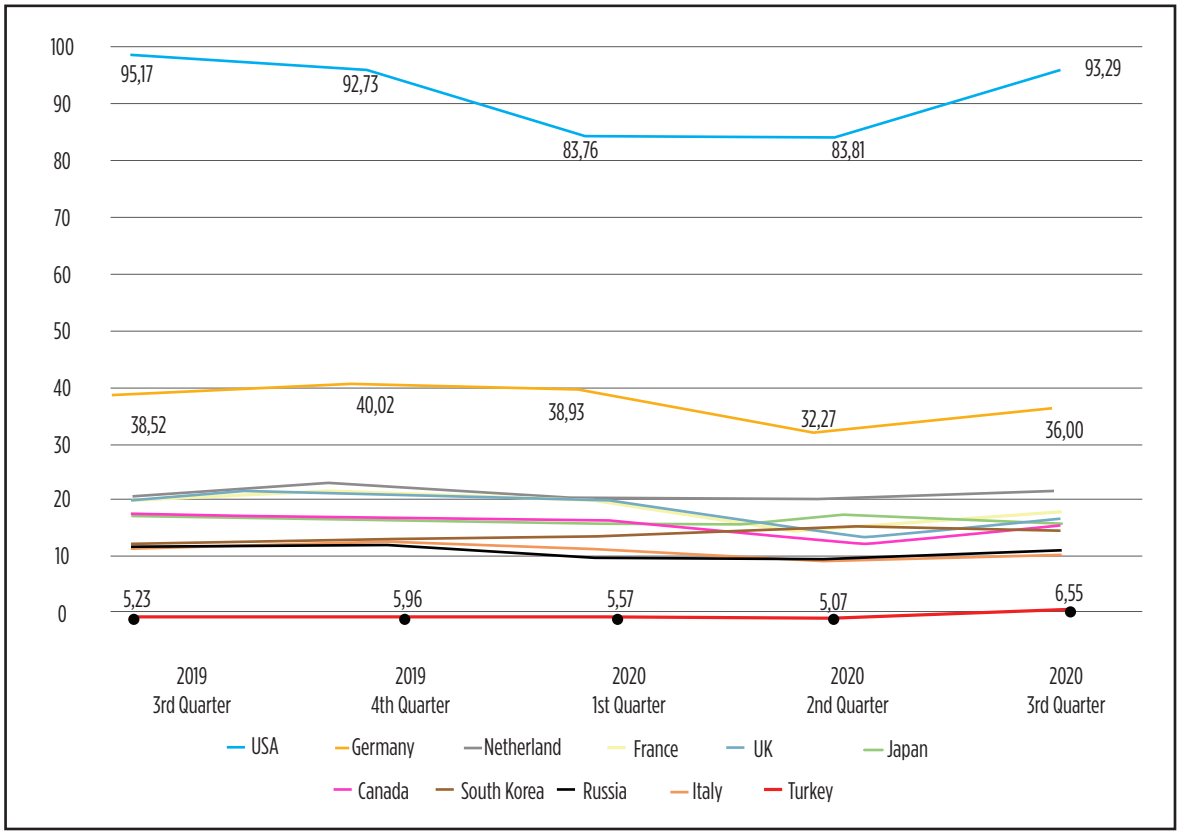
Figure 17: *Impact of Covid-19 Crisis on Top 10 Countries and Turkey in Machinery Export (billion USD)*

As seen in Figure 17, in China, the country that experienced the crisis first in the world, the impact of the crisis on machinery exports manifested itself in the 1st quarter of 2020 and completed the recovery process in the 2nd quarter (For China, which has not yet shared the results of the 3rd quarter of 2020, the export value of the machinery sector for the 3rd quarter has been estimated.)

In all countries except China; the decrease that started in the export figures of the 1st quarter when the crisis started, reached the lowest level in the 2nd quarter and returned to the level of the end of the 1st quarter in the 3rd quarter. With the realization of the accumulated investment demands in the 4th quarter, export values can be expected to rise above the 1st quarter levels.

The machinery sector in Turkey is one of the few countries that have stepped out of this export trend and exceeded the 1st quarter level in the 3rd quarter of 2020, reaching the 3rd quarter level in 2019, when the decline started. As it can be understood from here, it is obvious that the Turkish machinery sector would have been capable of displaying a much different export and growth performance in 2020, if it were not for the crisis. Although the sector's performance in the first half of 2020 was not at the desired level, it closed the year approximately 15% above 2019 with its 3rd quarter and 4th quarter performances and it is expected to reach an export level of US $ 4.45 billion.

This rapid recovery is due to the Turkish Machinery Sector's ability to achieve flexibility, rapid response to change, customer focus and innovation potential. After the crisis, these characteristics of the sector representatives immediately manifested themselves and accelerated the actions taken following the first shock.

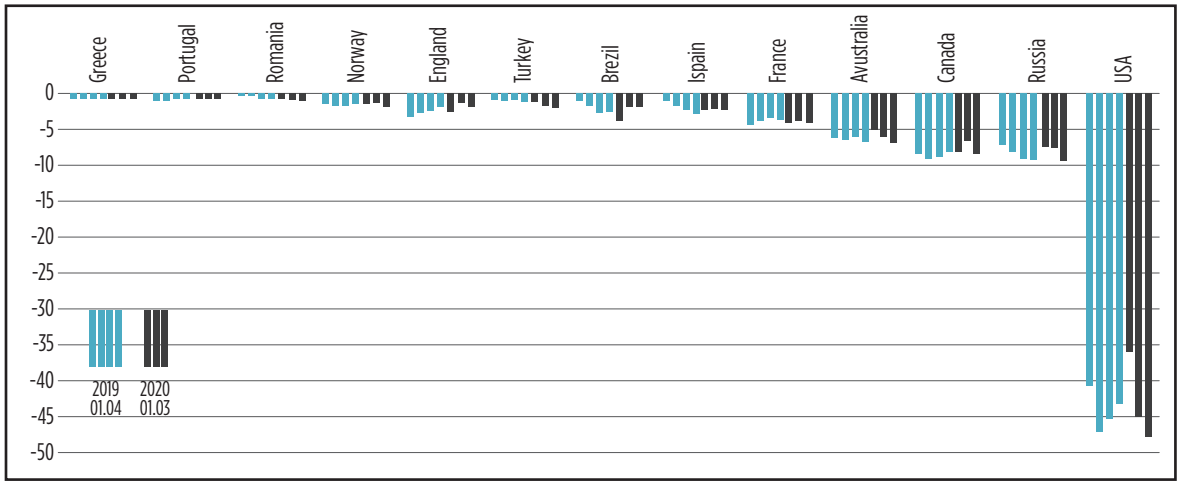


[ITC_Trademap, 2021]

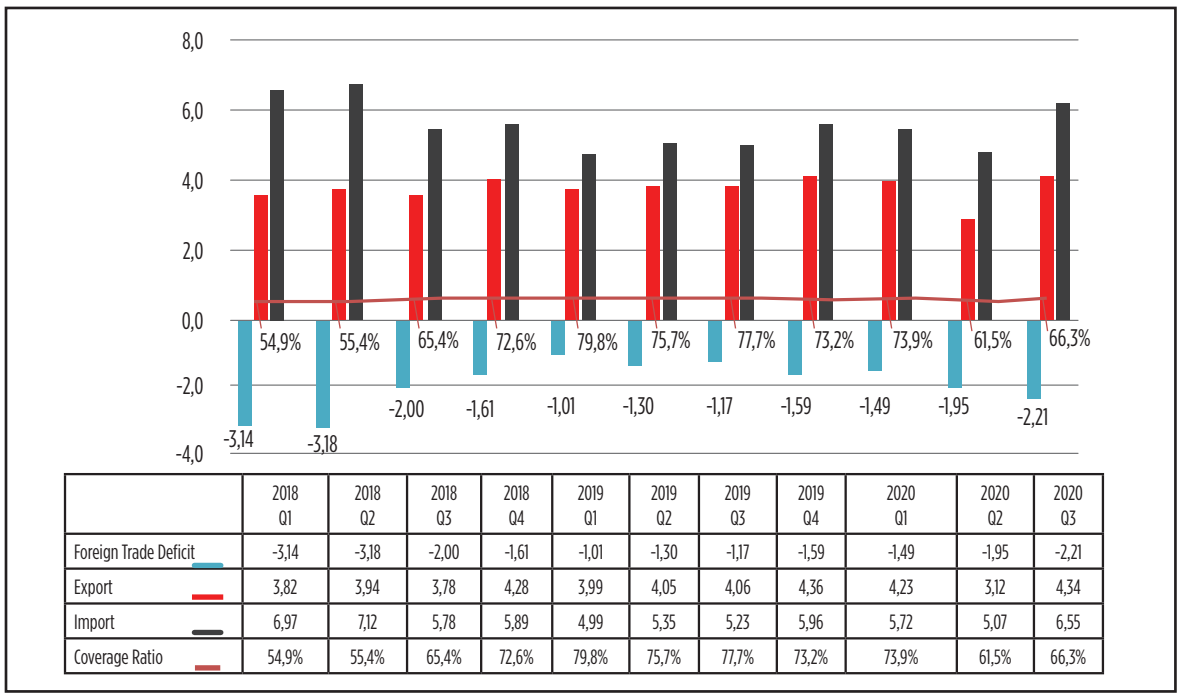
Figure 18: *Impact of Covid-19 Crisis on Top 10 Countries and Turkey in Machinery Imports (billion USD*

However, in the machinery sector, import is a topic that should be handled as carefully as export. The sector has a foreign trade deficit. As seen in Figure 18, it is seen that the decreased appetite for investment due to Covid-19, generally caused a decrease in imports in the 1st and 2nd quarters of 2020 although there are a few exceptional countries. The declining import in Turkey, unfortunately, did not decrease as fast as exports and completed its return faster than exports. Although the third quarter is 7% higher in exports compared to the same period of the previous year, this rate is unfortunately 25% in imports.

In Figure 19, there is a comparison of the countries with the highest foreign trade deficit in the machinery sector in 2019 and 2020 (countries with missing information are not included) on a quarterly basis. While the foreign trade deficit decreased in almost all countries in at least one of the first and second quarters of 2020, when the restrictions started and economies slowed down due to the pandemic, it is seen that Turkey was negatively different from them. Although Turkey's machinery sector foreign trade deficit improved in Q1 2020 compared to Q4 2019, it continues to rise in the second quarter of 2020 from where it left off.



[ITC_Trademap, 2021]
Figure 19: *Countries with Highest Foreign Trade Deficit in Machinery Sector (billion USD)*



	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3
Foreign Trade Deficit	-3,14	-3,18	-2,00	-1,61	-1,01	-1,30	-1,17	-1,59	-1,49	-1,95	-2,21
Export	3,82	3,94	3,78	4,28	3,99	4,05	4,06	4,36	4,23	3,12	4,34
Import	6,97	7,12	5,78	5,89	4,99	5,35	5,23	5,96	5,72	5,07	6,55
Coverage Ratio	54,9%	55,4%	65,4%	72,6%	79,8%	75,7%	77,7%	73,2%	73,9%	61,5%	66,3%

[ITC_Trademap, 2021]
Figure 21: *Machinery Foreign Trade on the Basis of Quarters between 2018-2019-2020 (billion US*

Figure 19, where Turkey's deficit in foreign trade of machinery is examined in detail, shows the development of the foreign trade deficit, export, import and coverage ratio in 2018, 2019 and 2020 on a quarterly basis.

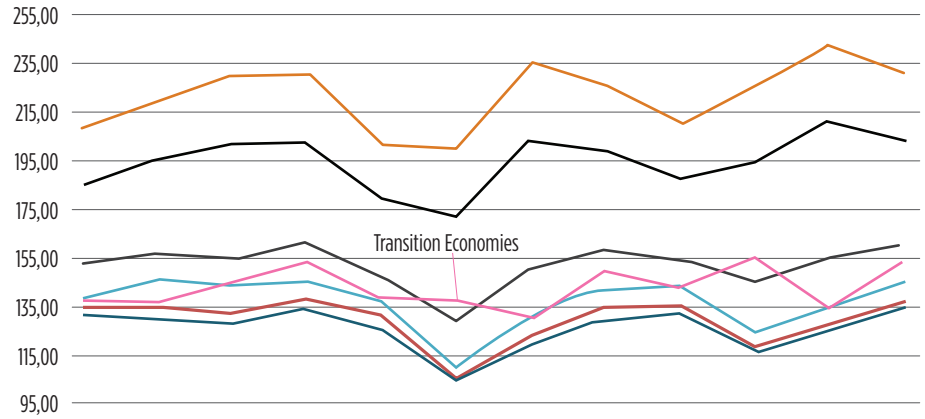
The positive trend that continued from the 1st quarter of 2018 to the 1st quarter of 2019 started to reverse in the 2nd quarter of 2019 and although there was a pause with the Covid-19 pandemic, the foreign trade deficit continued to grow despite the increasing exports. As it can be understood from here, the foreign trade deficit of the machinery sector has been continuing its growth trend for the last seven quarters, regardless of the pandemic effects. The necessary sectoral strategy and policy recommendations for reversing this trend will be shared in the relevant sections.

4.2. Possible Changes in the Sector After the Pandemic

Although various growth estimates are made by various authorities for the world economy [T.R. Presidency, 2020 / 1-2], it can be predicted that the World Economy will grow by 5% with a reactive return from shrinking in 2021.

It can be estimated that the machinery sector, which shows a growth performance above the world economy, will show a growth performance of 9% worldwide. It is a fact that the Machinery Sector of Turkey shows higher performance than the World Machinery sector, and the sector may achieve a growth performance of over 9% in 2021.

In the light of these forecasts, the graphics shared above were projected into December 2020 and 2021, and global export volume estimates on the basis of the World and Economic Regions can be seen in Figure 21 (Machinery Sector Expert Forecasts, 2021 through UNCTAD data). Accordingly, the figures of the last quarter of 2019 were obtained in the last quarter of 2021, however since the total export volumes within the year will spread more homogeneously, the export performance is expected to be 5.0% above 2020 in total.

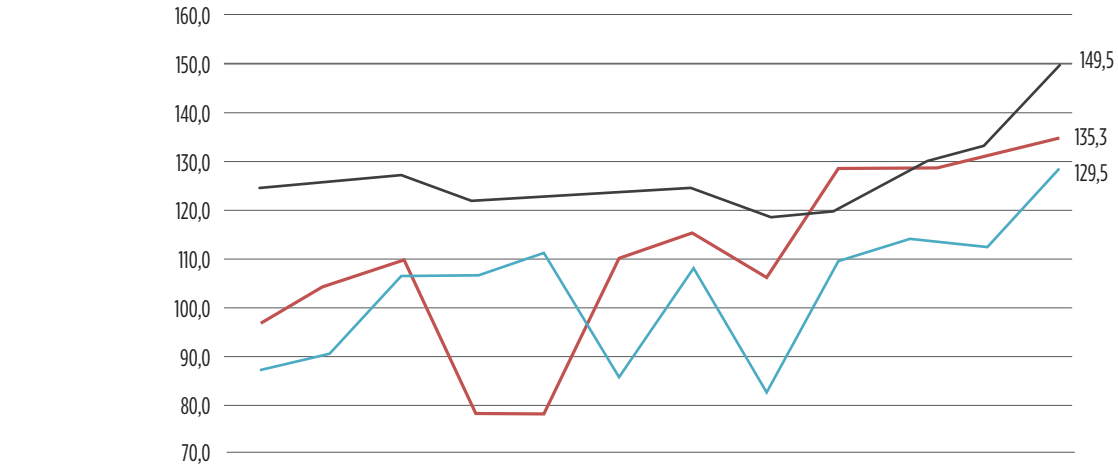


	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q3 2020 T	Q1 2021 T	Q2 2021 T	Q3 2021 T	Q4 2021 T
World	156,80	160,76	161,41	165,17	152,19	134,40	155,55	161,86	158,27	150,53	160,21	165,10
America	143,63	150,64	148,65	150,44	142,82	116,30	136,76	147,43	148,53	130,25	140,87	136,76
Asia	211,61	222,80	231,49	233,04	205,11	203,03	238,01	228,38	213,32	227,40	245,15	232,95
Europe	136,67	135,60	133,10	139,18	131,36	109,42	125,60	136,40	136,62	122,55	129,37	139,13
Developing Economies	188,45	199,15	205,30	206,37	183,15	176,54	207,28	202,24	190,48	197,73	213,50	206,28
Transition Economies	143,06	142,80	150,73	157,73	143,54	142,57	136,03	154,58	149,28	159,68	140,11	157,67
Developed Economies	140,20	140,71	137,94	142,92	135,74	111,26	128,58	140,06	141,17	124,61	132,44	142,86

[UNCTAD, 2021]

Figure 21: *Export Volumes of the World and Economic Regions for 2021 [2005=100*

Based on the same estimates; when Turkey's Machinery Sector manufacturing index is projected to December 2020 and to 2021, it can be expected to perform well in 2021 compared to 2020 and as a result, as can be seen in Figure 22, it may achieve at least 15% growth in the total year compared to 2020.



	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık
Machinery Ind. 2020	96,6	105,3	110,1	77,8	78,8	110,9	115,6	105,7	129,3	128,8	131,4	135,3
Machinery Ind. 2019	86,9	90,7	106,6	107,3	111,3	85,0	108,6	82,5	109,8	114,1	112,1	129,5
Machinery Ind. 2021 (T)	124,5	125,8	127,0	121,9	123,1	124,4	125,0	118,8	119,9	128,3	133,5	149,5

[TURKSTAT, 2021]

Figure 22: *Turkish Machinery Sector's Production Index in 2019-2020-20212 (Estimated) [2015 = 100]*

Apart from its effects on economic data, the Covid-19 pandemic had serious effects on the real economy. A restructuring is expected in global supply chains after the crisis caused by the pandemic.

Awareness about high dependence on China and other Asian countries in production and imports has increased. Especially developed countries had to face the difficulties of being dependent on a small number of suppliers in many industries, intermediate inputs and final products. This process will pave the way for restructuring of supply chains in the short and medium term in the upcoming period. Main elements of the new structuring will be reducing dependency on a small number of suppliers, using more suppliers and procuring inputs from domestic suppliers.

As in almost all sectors in supply chains, there is an expectation for restructuring in the supply chain of the machinery and equipment sector. Europe is the center of high technology in the machinery and equipment industry and has an important supply chain. For the machinery and equipment industry of Turkey, the most important expectation for restructuring the supply chains will be to increase the supply share in the new restructuring in Europe. However, considering the location of Turkey and the suitability of the technological competence level, it is highly likely that the sector will catch a larger potential business volume in Africa, which is although a smaller market compared to Europe, and Asia, the world's largest machinery market.

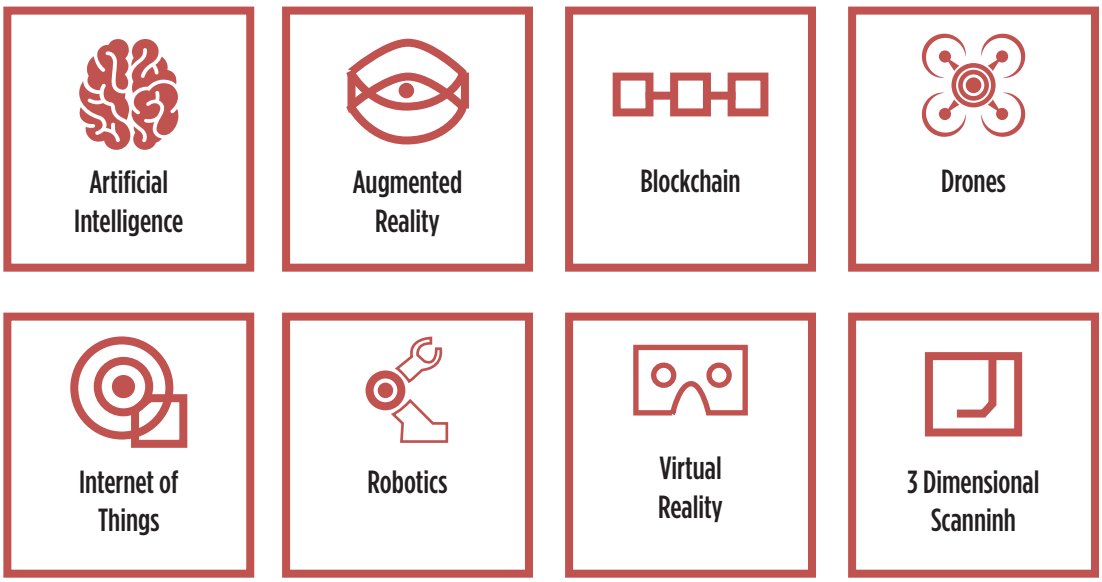
Before the Covid-19 crisis, rapid advances in technology were expected to encourage innovation in industrial machinery manufacturing and thus drive the market in the next 5 years. With the crisis, high-tech machinery exports, which is one of the most important competitive advantages in attracting new customers and overcoming the crisis, paved the way for sector representatives to rapidly renew their products without waiting for 5 years. In this way, with the effect of the crisis; the R&D, innovation and product development efforts, which are planned to be carried out in the future, were brought forward and the added value of the sector was increased. Moreover, digital technologies such as 3D printing, artificial intelligence, IoT and big data analytics started to be used more in production and this significantly helped protect the sector representatives from the effects of the crisis by enabling them to achieve higher productivity, lower operating costs and higher profit margins.

5. Special Trends in the Machinery Sector

5.1. Sectoral Trends in the Machinery Sector in the World

Robotic Automation, Enhanced Digitalization in the Supply Chain and Additive Manufacturing were identified as the 3 most important trends among the Latest Trends in World Industrial Policies [UNCTAD, World Investment Report, 2020].

PwC, on the other hand, states that the technologies it defines as "Essential Eight" (Figure 22) will be the main driving factors in the progress of companies after Covid-19 as before.



[PwC, 2021]

Figure 23: "Essential Eight" Technology

Additive Manufacturing, including 3D printing, is rapidly transforming business models in the industrial world. This less wasteful and more efficient new approach to production is changing the rules of production and industry regarding minimum intermediate stock levels, minimum operating stock and storage, facility location and design, spare parts and maintenance.

Global sectoral trends can be grouped under the following headings;

1. Increasingly Rising International Competition

In recent years, there has been an increase in international competition in the sector, especially with the effect of developing countries. For example, fastening products (screws, fasteners, clamps, etc.) and products such as valves have been affected by increased international competition. In particular, there is an increase in competition from Eastern Europe, North Africa and China. China has developed the "Made in China 2025" strategy, which aims to increase innovation and added value in the sector. This strategy has caused countries with low production costs to produce less value-added products.

2. Implementation of Strategic Actions to Increase Competitiveness

Increasing international competition has enabled countries to implement plans to increase their competitiveness. The ability to compete with standard machine production is decreasing day by day. For this reason, countries develop new strategies to increase the added value of their product groups by providing technology and quality improvements in products and services. On-Time Delivery, Modular Design and High Quality Assembly are those with the highest added value.

Rather than the production of standard machines or low-tech and easy-to-produce machines, the production trend of medium-high and high technology machines is increasing. This situation has become necessary both to stay away from competition and to increase profit margin.

Cooperation with Start-ups has become a strategic trend applied by companies that cannot develop partnerships and cooperation to achieve high technology. Start-ups offer unique opportunities for the development and renewal of the machinery sector, especially in terms of R & D and innovation of small and medium-sized companies, as well as to renew their product line and increase their engineering competencies.

Awareness of the demand for remote access and automation in the sector has increased, and although it has not yet spread to the general public, there is a significant increase in the number of companies adding these features to their products through investments and developments. The Covid-19 crisis has had a compelling effect on companies taking quick steps to switch machines to remote access with a simple adaptation and increase the level of automation.

Maintenance of machines stands out as an important area that every manufacturing company should address. Manufacturing companies are trying to perform planned maintenance with different strategies based on working hours, the number of products processed, or a certain period of time. To avoid failures and adapt to the company-specific operating systematics, a large amount of data is produced with sensors adapted to the machines, and the establishment of a remote monitoring system in which the machine's operating status is monitored provides a significant competitive advantage, ensuring that it can perform predictive maintenance.

3. Industry 4.0 and Technological Developments

Another trend in Modern industrial policies is digital development, improvement of internet connection infrastructure and wider adoption of information and communication technologies in companies. Information technology has provided opportunities to increase productivity and create new sectors across all sectors. This allowed industrial policies to expand its scope to include neighboring service industries rather than the condition that manufacturing was the sole focus.

Information technology has long been integrated into various departments of companies (Management, Production, Marketing, etc.). Digitalization, computer-based controls and full automation in production systems are also increasing day by day, and there is a rapid upward trend towards Industry 4.0. Recently, the technological development of modern industrial policies has been on the shoulders of the areas of digital transformation and operational technology.

By combining technologies such as mechanical, micro-electronic, computer, optical, sensor, which are recently easy to reach in machinery manufacturing has enabled even small companies to catch the high technological level of certain large companies. Digital solutions and technologies that companies use to adapt to industry 4.0 include:

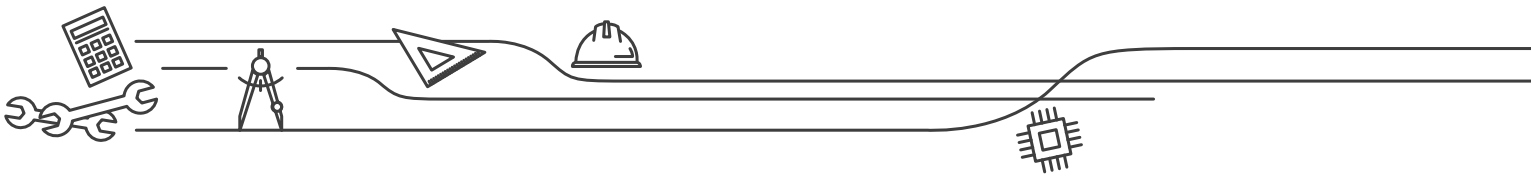
- Industrial Internet of Things
- Big Data
- Cloud Computing
- Additive Manufacturing
- Robotic Machines
- Augmented and Virtual Reality

4. Increasing Trend in Outsourcing

There is an increasing tendency to redirect some of the production activities to suppliers in order to increase flexibility. In the machinery sector, it is very common to outsource works like casting and machining.

5. Tendency of Customers to Procure Service Instead of Machinery

In recent years, machinery sector customers have entered a trend of demand shifting to service procurement instead of plants and systems. This means that machinery manufacturers start to provide services not only for machines, but also for software, management and above all.



6. Internationalization and Branding

In recent years, the number of companies focused on foreign markets in the sector has increased either by exporting or by establishing production or sales branches abroad. The measure of good internationalization of companies has begun to be measured by how less they are affected by the negative effects of crises in the countries where they are located. In machinery manufacturing, exports are the most important factor of internationalization and have been a safe zone for companies, especially in times of national and regional crisis. Internationalization, which had a limited effect at first during the Covid-19 crisis, has again shown itself as a way out of the crisis with the rapid transformation of alternative solutions offered to customers to exports.

The need for companies to be more international has increased the demand for international sales professionals and especially trade professionals who speak English and other languages well, and the growing demands have also led to changes in the desired professional profiles. The production of final products has forced companies to internationalize intensively in recent years, leading to the establishment or development of export departments.

Branding, which is one of the most important steps of internationalization, has become a factor that has been accumulated with the services provided over the years and has become a factor that gives the company after a certain level, a power that cannot be purchased with money and still continues its existence as an active trend. Companies not only exporting but also supporting their products and services and so, progressing their brand image, achieve growth and success beyond expectations in the medium and long term. In today's world, the first condition of being an international company is to make maximum use of e-commerce, especially in the machinery sector, and this trend is growing very strongly and rapidly.

7. Customer Oriented Production

Currently, buyers can easily access prices and information for comparison of technical characteristics. Therefore, sellers or manufacturers have to listen to customer feedback and quickly implement solutions for customers' needs in order to be competitive in the market. As a result, the boutique manufacturing trend based on customer expectations has developed with the aim of differentiation.

Customer-oriented innovation has been the first condition of customer-oriented production. Innovation increases the loyalty of customers to the brand and opens the way for new orders. Customer-oriented innovation is one of the most important elements in the sector that increases the resilience of companies against crises.

8. Reducing New Product Launch Time

With increasing technology and high levels of communication through social media, attracting customers has become more difficult for large companies, while small companies have the opportunity to capture customers through social media and introduce new products they have just designed and produced. Even though this rapid and effective promotion through social media affects the textile industry, where the buyer and user are the same, it has also significantly affected the machinery and equipment industry, because customers have started to know much more about all the products in the market, especially through Youtube, than in the past.

This brings the market to a higher competitive environment, allowing it to attract more customer interest with better features than competitors. Thus, the trend of companies to invest in high technologies which are more preferred by customers is increasing. Companies focus on producing new products by applying digital transformation to their existing machines or products. In fact, the added value that will be offered to the customer by digital transformation of machines will be marginal or zero, except for the added value that remote control structures bring.

On the other hand, companies will have the advantage of updating a digitally transformed product in the form of versions, such as versions of a software, and will be able to launch a new product with a feature that can be added with every software update. In recent years, it is an increasing trend to launch new products to the market at short intervals with software releases and minor structural changes, especially in European machinery manufacturers.

9. Customer Financing

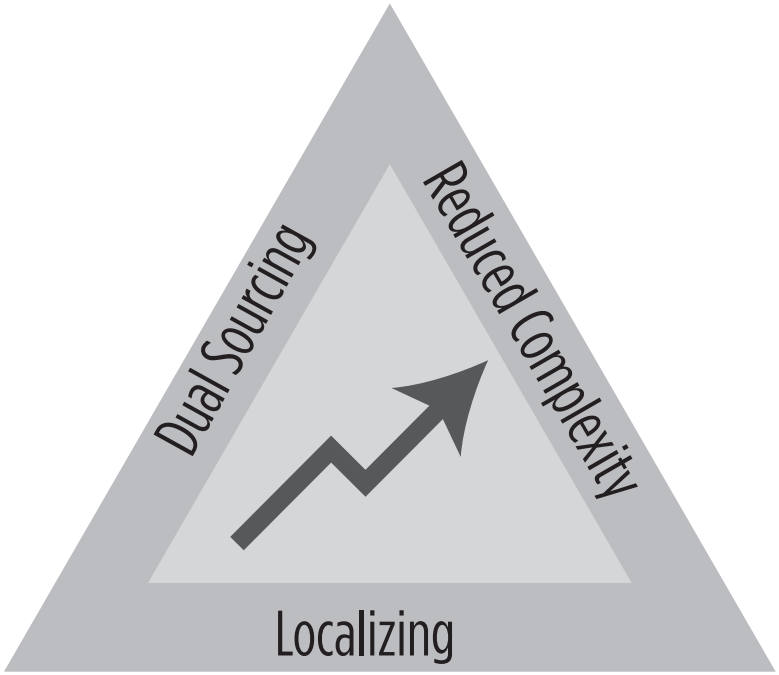
It is seen that especially European and Chinese machinery manufacturers in the world sell their products very comfortably with customer financing options such as 2-year grace period, low-interest 3-year maturity, 2 + 3 model. In fact, these sales can be realized at higher prices than the machines with higher added value. This shows how important customer financing is to create an export market and to retain customers.

10. Change in Environmental Regulations

Especially in countries such as Canada, USA and Mexico, it is predicted that the machines that comply with the 5th phase emission criteria by 2025 will have a large market. The EU, on the other hand, has started to implement the 4th phase within the framework of its own regulations and decreased its emission levels within the scope of the Paris Agreement signed in 2015.

11. Restructuring the Supply Chain

Among the three ideas proposed to increase resilience to the crisis, Localization, Dual Sourcing and Reduced Complexity are the ones that are recommended to be implemented with priority, and it is an increasing trend in Europe, which tends to give up supply from China (Figure 23). In this way, it is aimed to prevent the interruption of strategic product supply in case of any logistic setback, embargo, commercial restriction.

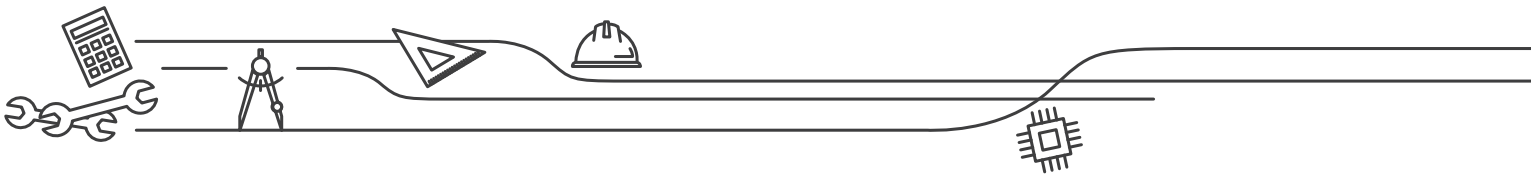


[AT Kearney, Building Resilience..., 2021]

Figure 23: *New Supply Chain Structuring*

5.2. Sectoral Trends in the Machinery Sector in Turkey

In addition to global trends, trade wars between America and China, trade restrictions imposed on North Korea, Iran, Syria, Libya, and Venezuela have been effective in almost all regions of the world. Economic and political sanctions imposed on countries have restricted the economic activities of both the country under sanctions and the countries which are trade partners of that country. In addition, geopolitical risks in Turkey directly affect the machinery sector as well as every sector of the manufacturing industry in our country.



The above-mentioned negative developments have led to a loss of momentum in the world economy, while investments in machinery and equipment and the machinery sector have also been negatively affected by this loss of momentum. But companies that evaluate sectoral trends well, especially in our country, continue to experience improvement in their business, rather than being affected by these risks.

1. Increasingly Rising International Competition

In addition to having the most qualified human resources, the machinery and equipment sector in our country is the sector consisting of the most innovative, fast-reacting and flexible companies. These are the most important elements in international competition that moves the sector forward compared to its competitors. The sector representatives of our country consist of companies that are export-oriented as well as the national market, attach importance to international marketing activities, and are managed with an export vision.

2. Implementation of Strategic Actions to Increase Competitiveness

In our country's machinery sector, new strategies are developed to increase the added value of product groups by providing technology and quality improvements in products and services. On-time Delivery, Modular Design, High Quality Assembly and After Sales Services in Standard Quality are effective values in the machinery sector of our country and are becoming noticeably widespread among sector representatives.

Especially with the Covid-19 crisis, high competition in standard machine production and difficulties in finding new customers have prompted industry representatives to seek new markets in the medium-high and high-tech machinery segments. The number of customers that sector representatives sold for the first time in 2020 with technology-enhanced products has gone far beyond 2018 and 2019.

The importance given to high-tech start-ups that are the driving force and dynamos of technology in the machinery sector is unfortunately low, as in other sectors. Almost all industry branches in our country are inadequate and weak in terms of supporting, purchasing and establishing partnerships with start-ups.

While the awareness of the demand for remote access and automation in the sector is increasing, there is a significant increase in the number of companies that add these features to their products. The Covid-19 crisis has had a compelling effect on companies to take quick steps to switch machines to remote access with a simple adaptation and to increase the level of automation.

There are industry representatives who create a significant competitive advantage by ensuring predictable maintenance. Increasing the share of after-sales revenues in total revenues, which are tried to be guaranteed by preventive maintenance, increases financial resilience by significantly contributing to cash flow during periods when the firm's sales decline or crises occur.

3. Industry 4.0 and Technological Developments

Information technology has also been integrated into various parts of companies (management, production, marketing, etc.) for a long time. Although this point is thought to be solved by making an ERP investment in our country's industry, this is a great illusion. A good evaluation of the value that ERP software adds to the product or the customer and the most accurate measurement of its effect will prevent companies from making unnecessary investments.

Although the industrial sector of our country is one step ahead in this regard, it is seen that Industry 4.0 is not fully understood in the machinery sector, and the added value that can be created with its use has not yet been fully recognized. Although there are companies that have a tendency towards Industry 4.0 and started the transition period with restricted applications, it is important to take the necessary steps together with a strategic management plan. The technologies that should be worked on with the New Information Revolution and that should be used to create added value by developing company-specific strategies are as follows:

- Industrial Internet of Things
- Big Data

- Cloud Computing
- Additive Manufacturing
- Robotic Machines
- Augmented and Virtual Reality

4. Increasing Trend in Outsourcing

In the machinery sector of our country, it is common for suppliers to be used as outsources depending on the work for orders that cannot be made ready on time, and on a continuous basis for parts produced outside. As branding comes to the forefront, outsourcing of industry representatives, except for critical processes and parts, can reach quite high levels.

5. Tendency of Customers to Procure Service Instead of Machinery

In line with the demands of customers abroad, the demand for purchasing systems and facilities instead of purchasing machines and, beyond that, the demand for supplying services instead of purchasing systems and facilities has been a rising trend today.

In order for companies whose competence is not sufficient to supply facilities and systems instead of machines, they must take part in clusters and work according to the understanding of solidarity competitiveness. Examples of such cooperation are still in progress in our country and are improving rapidly day by day. The awareness of benefiting from start-ups that will adapt high technology to the industry in software and system automation issues and establishing partnerships if necessary, is becoming widespread just recently. It is hoped that the number of successful examples of service supply instead of machinery, systems and facilities in our country will increase day by day.

6. Internationalization and Branding

Sector representatives have made intensive efforts to find new customers and promote themselves at fairs and abroad for many years on both branding and internationalization using the phrase “Made in Turkey”.

However, to provide authorized service abroad and spare parts availability, which is an important step of internationalization for the machinery sector, are elements that can be realized with planned growth and cooperation beyond travel and fair participation. For this reason, this growth must be supported by planned and controllable growth, both in sales and after sales. Despite the increased awareness in recent years, the sector has still not reached the desired level in providing after-sales service abroad.

The percentage of e-commerce usage of the machinery sector is increasing day by day. It is a realistic prediction that the sector's presence in e-commerce will increase faster with the supports.

7. Customer Oriented Production

Customer orientation, which is the point where the sector representatives of our country are strongest and gain high competitiveness, ensures that both production and customer complaints are evaluated and the necessary modifications are made in the product quickly and problems are solved with customer-oriented innovation. Timely response to the customer, flexible production and quickly solving problems of customers, have been among the most important factors that increase the resilience of our companies in the sector to crises. These competencies are behind the rapid recovery of the industry and even gaining new customers during the Covid-19 crisis.

8. Reducing New Product Launch Time

Unlike European competitors, unfortunately, it is a trend open to improvement in our country. Sector representatives of our country tend to sell cheaper and easily, rather than raising the price by introducing new products. However, the proposition that the introduction of machines combined with a software or even software updates in these machines are launched as a new product which increases the added value as a competitive advantage that works in the market. With the application of the same method by the sector representatives of our country, new product and added value increase can be achieved more easily; so that, while increasing sales and

profitability, customer loyalty can also be achieved.

Mergers and acquisitions in the Machinery and Equipment sector have increased in recent years, especially in the EU. One of the reasons for this development is that companies prefer to establish a structure that will gain an advantage by establishing production lines in the market instead of selling individual machines. Chinese companies in the sector tend to purchase branded and technologically advanced machinery manufacturers in the EU in order to gain competitive advantage.

Production in the world machinery sector is shifting towards large companies rather than SMEs. One of the main reasons for this is the requirement for an R&D budget, which is very important to be innovative and competitive in the market. Large companies with this competence have an important share in the machinery production market in countries such as Germany, USA, Japan and China.

9. Customer Financing

In addition to added value and competence; financing opportunities that attract customers have also become a major factor in increasing sales. So that machines with lower quality or higher maintenance costs are preferred to be imported by investors only because the provided financing solution is attractive.

10. Compliance with Environmental Regulations

In line with the European Union's directives 2012/46 / EU, 2011/88 / EU and 2010/26 / EU and 97/68 / EC directive; there are also practices in Turkey according to the procedures and principles determined within the framework of the regulation for the particle and gas pollutant emissions from the engine to be at certain limit values. In order to comply with the relevant regulations, technological development, certification and standardizing the respect shown to the environment also ensure that the companies have a rising brand image in the eyes of their customers.

11. Local Production

There has been a rising trend in National Production specifically in our country due to restrictions, sanctions and even embargoes on some special products that Turkey is subjected to, and it has been strengthened with the consequences of Covid-19 Crisis. This trend has the potential to positively affect the machinery sector, which is the first pillar of the investment. As can be seen in foreign sources (Figure 23 [AT Kearney, Building Resilience..., 2021]), among the ideas proposed to increase resilience against the crisis, Localization and Reduced Complexity are the efforts that should be implemented primarily in our country.

With the Technology-Based Industrial Action Program, there is a comprehensive and wide support for increasing localization in the machinery sector. The areas of support are wide if the sector plans to produce in the NACE codes included in the Program.

5.3. Sectoral Trends in the Machinery Sector in TRC1 Region

1. Increasingly Rising International Competition

Representatives of the machinery and equipment sector in RC1 Region find it difficult to attract or retain qualified human resources due to socio-political reasons in the region. Although this situation is much easier for Gaziantep than other provinces in the region, there is a problem of losing qualified personnel trained in Gaziantep. This situation may cause the region to remain short in human resources, which is the most important resource in terms of competitiveness [TRC1 Focus Group, 2020].

It is seen that innovative approach, rapid reaction and flexible production, which are the dynamics of the sector in the region, are mostly the fundamentals of the main development and high added value creation capacity of the industry's leading companies. These competencies have been realized to a certain extent in most of the Food and Textile Machinery sector representatives, which are the leaders of the regional machinery and equipment sector. This is the most important factor that

moves the region forward compared to its competitors in the Food and Textile Machinery industry. Regional sector representatives consist of export-oriented companies that attach importance to international marketing efforts and are managed with an export vision.

2. Implementation of Strategic Actions to Increase Competitiveness

The machinery sector representatives in the TRC1 region are very successful in providing On Time Delivery, Modular Design, High Quality Assembly and Standard Quality After Sales Service. In addition, there have been many sector representatives who have closed 2020 better than 2019 by adapting new technologies to their products even during the crisis period and increasing the localization rates in their products. Although public procurements have a share in this, there has been growth in exports especially in the Food Machinery sector, which is developed in TRC1 region.

As in all Turkey, the importance given to the adaptation of high technology start-ups, which are the dynamo of innovation and development, to industrial companies is low in TRC1 Region. The region is open to development in matters such as supporting and purchasing start-ups and establishing partnerships with them.

The awareness of the demand for remote access and automation has increased in the region, and there is a significant increase in the number of companies that add these features to their products. Although certain problems of the customer can be solved with this technology, sector representatives in the region should cooperate to establish foreign after-sales organizations. Otherwise, the export of high-tech Food Machinery that needs intensive maintenance is at risk of decreasing day by day.

3. Industry 4.0 and Technological Developments

There are technology-oriented structures such as universities, techno-parks, model factories, lifelong education centers, predominantly in Gaziantep within TRC1 Region. This density enables the companies in the region to reach Industry 4.0 and technological developments whenever they want, get support or find companies to cooperate easily. Although there are potential opportunities in the region, a needs analysis should be made on how Industry 4.0 can be adapted to the production environments of the sector representatives and the necessary steps to be followed by the company should be defined.

4. Increasing Trend in Outsourcing

TRC1 Region is a region where outsourcing is widely used and cooperation is intense, especially in the Food Machinery sector [TRC1 Focus Group, 2020]. In particular, the leading companies of the Food Machinery Sector, sharing their work from abroad or domestically with their suppliers, enables the sector to grow and develop a competition based on solidarity. TRC1 Food Machinery Sector representatives have developed a working order that will set an example for Turkey in this regard.

5. Tendency of Customers to Procure Service Instead of Machinery

As in all Turkey there are almost no examples of service procurement instead of machinery, systems and facilities in TRC1 Region. Instead of purchasing machinery and investing, there is a tendency to purchase the work to be done with the machine or the complete facility installation as a service. This situation allows the contractor companies to become stronger. Contractor companies are growing both as a buyer and a user for the sector. The sector should ensure and increase their loyalty in the medium term by elaborating and diversifying their relations and business practices with these companies.

6. Internationalization and Branding

In order to create a Product Conformity Brand for the machinery sector, the product conformity brand "TURQUM" has been implemented in order to meet the need to strengthen the image of "QUALITY TURKISH MACHINE" in international markets. Textile Machinery manufacturers within Gaziantep can also make progress towards increasing brand value by participating in this branding movement. [TRC1 Focus Group, 2020], [Turqum, 2021]. Sector representatives have documented

the standardization in the following details with the "TURQUM" brand:

- Company and production system competence
- Production in accordance with the Quality Management System
- Product Safety
- Product Quality
- Service and after sales services
- Constant surveillance

7. Customer Oriented Production

Customer orientation, which is the point where the sector representatives of our country are strongest and gain high competitiveness, ensures that both production and customer complaints are evaluated and the necessary modifications are made in the product quickly and problems are solved with customer-oriented innovation [TRC1 Focus Group, 2020]. Timely response to the customer, flexible production and fast solving have been among the most important factors that increase the resilience of our companies in the sector to crises. These competencies are behind the rapid recovery of the industry and even gaining new customers during the Covid-19 crisis. Apart from customer visits, fairs and sales relations, sector representatives of TRC1 Region have a solution-oriented approach especially towards customer complaints and demands they collect. They make maximum effort to use the feedback from the customers in production and new product development. This is an important factor in increasing the competitiveness of the sector in the region and improving itself.

8. Reducing New Product Launch Time

Although it is a common strategy to produce new products and try to increase market share in the region, there is no strategy to reduce the time to launch new products to the market. This strategy prevents business and income loss, with an increase in the loyalty of customers who make purchases over time.

9. Customer Financing

TRC1 Region Machinery Sector representatives are using Eximbank Buyer loan. However, extending the existing interest and maturity range of the Eximbank buyer loan to compete with foreign competitors will provide the opportunity to achieve a significant increase in exports [TRC1 Focus Group, 2020].

10. Compliance with Environmental Regulations

For the machinery sector, it is important to comply with the changes in the EU legislation and to produce vehicles / machines that comply with the USA phase 5 criteria for the coming years. The products that will be mostly affected by these regulation changes are farm tractors, diesel grass mowers and tree cutters.

11. Local Production

The difficulties experienced in the Food Machinery sub-sector, especially during the Covid-19 crisis, in the region, in the supply of raw materials, have once again clearly demonstrated how important domestic production is in terms of the continuity and durability of industrial production.

6. Current Status of the Machinery Sector

6.1. Primary Research Results

6.1.1. Surveys

The number of survey responses in the survey conducted within the project for the machinery sector in TRC1 Region including Konya and Karaman Provinces is shown in Table 11 below.

Table 11: *Number of Answers by Sub-Sectors in TRC1 Region*

Sub-Sector Fragmentation	Gaziantep	Adıyaman	Kilis
NACE 281 Engines and turbines, pumps and compressors, taps and valves, bearings, gears etc.			
NACE 282 Furnaces, burners, lifting, bailing, cooling and ventilation equipment, general purpose machinery etc.	1		
NACE 283 Agriculture and forestry machinery like tractors, planters, trailers, semi-trailers and combine harvesters, seed graders, animal feed preparation etc			
NACE 284 Machine tools, cutters, hydraulic presses, forged iron etc. metal processing machinery	2	1	
NACE 289 Construction Machinery, other tools for wood, stone and rubber. Special machinery for other purposes such as food, textile, apparel and leather production, paper and paperboard, plastic and rubber.	1		
Total	**4**	**1**	**0**

[FSR Machinery Sector Survey Results, 2021]

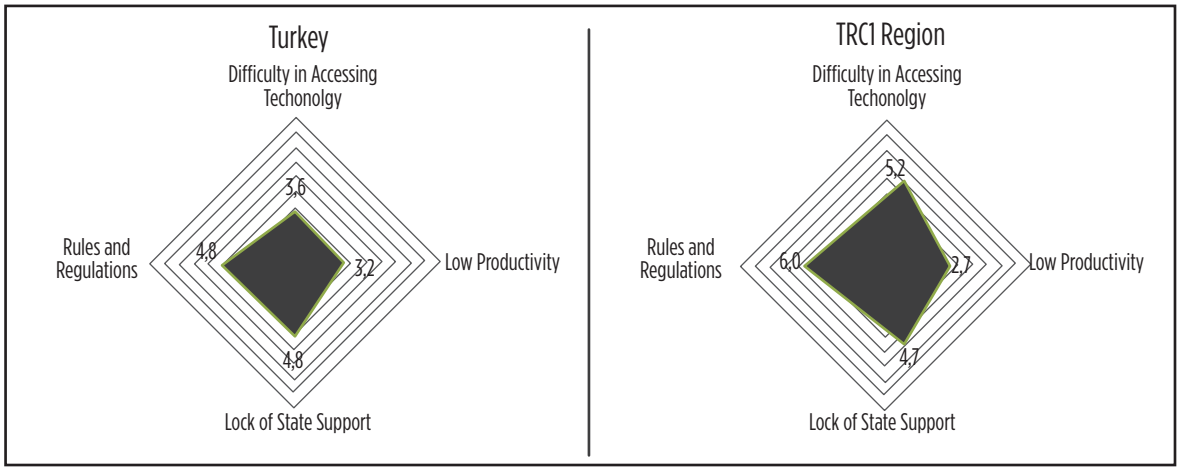
When looking at the number of survey responses, it is clear that the current number of answers is not sufficient to obtain regionally significant statistical results. The survey study aiming to obtain information about the Food Machinery sub-sector, which is especially important for the region, is far from the targeted sample numbers and therefore it is not sufficient to represent the Food Machinery subsector. However, it is also possible to make a comparison based on the responses of the 158 participants participating in the survey across the whole Turkey and the responses from TRC1 Region. The comparisons, whose details you can see below, are selected among the criteria that are thought to give an idea about the status of the region, with the risk of differences in perception [FSR Machinery Sector Survey Results, 2021].

The results obtained from the answers to the questions about the difficulties experienced by the companies in the field of Competitiveness are shared in Figure 25 for Turkey and TRC1 Region. Looking at the figures, the sector representatives of TRC1 Region stated that they perceive a higher rate of difficulty in Rules and Regulations and Difficulty in Accessing Technology under the title competitiveness. In terms of the region, while TRC1 Region has 1 R&D center in the Machinery Sector, there is no design center belonging to the sector in the region.

In terms of the region, TRC1 Region Machinery Sector has 1 R&D centers and 1 design center. In this case, sector representatives can develop technology through R&D by attracting qualified manpower and can access new technology through start-ups that are developed in the Incubation Centers existing within GETHAM or technology import channels. Since these alternatives cannot be implemented from today to tomorrow, they support the evaluation of the sector representatives participating in the survey.

In terms of productivity, the fact that the adaptation of Lean Manufacturing to operational processes within the company culture has not been completed yet, is an indication that the efforts in this area have not reached sufficient maturity in the Region in general and is consistent with the survey results. In addition to the works within the Gaziantep Model Factory established in the region, it is very important not only for the Machinery Sector, but also for the entire Regional Industry, to start alternative productivity-enhancing activities in the fastest way.

Although there is no discrepancy between Country and Region in the survey results, it should be kept in mind that the perception level of the problems may differ.



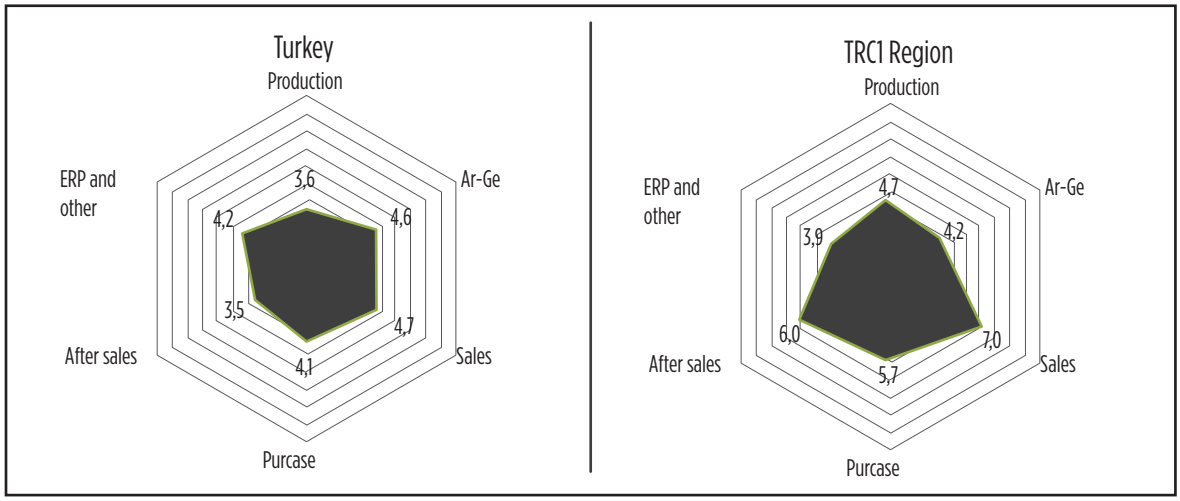
[FSR Machinery Sector Survey Results, 2021]

Figure 25. Comparison of Competitiveness Infrastructure from the Perspective of Entrepreneurs

The results obtained from the questions about Operational Areas where Digital Transformation is Applied are shared in Figure 26 for Turkey and TRC1 Region. Looking at the figures, TRC1 Region sector representatives see that there is an adaptation process above Turkey in Production, Purchasing and After Sales under Digital Transformation, but they foresee that there is less progress in process management applications such as R&D and ERP when compared to Turkey.

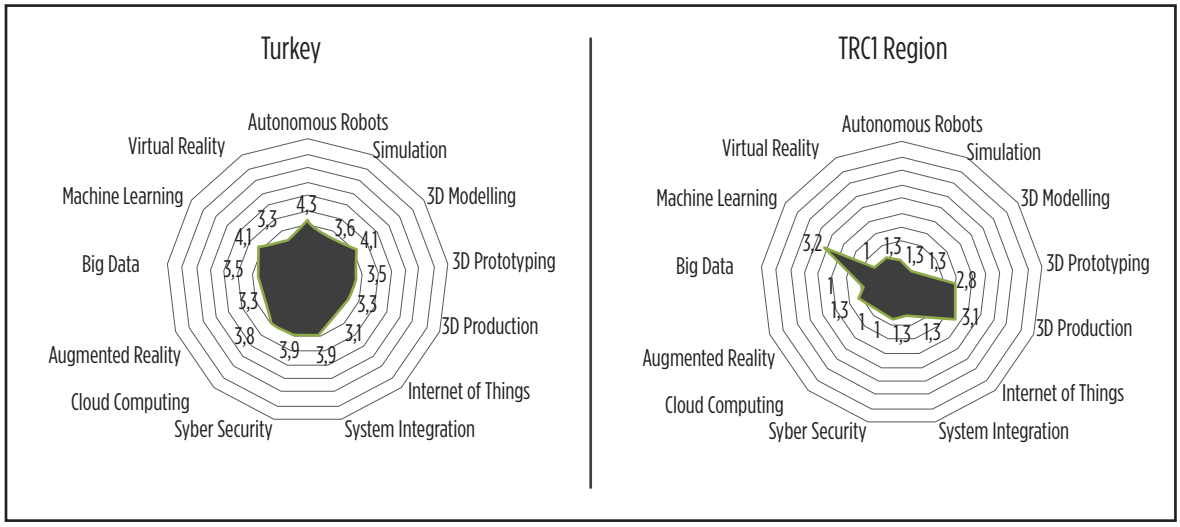
The results obtained are close to each other, and it seems compatible with the fact that the adaptation of Digital Transformation to the operational processes within the companies is open to development and the potential is high in TRC1 Region as in Turkey.

It is stated that the added value that can be achieved through digital transformation will amount to 100 trillion US dollars in the next 10 years in addition to those achieved by conventional production and management techniques [WEF, 2021].



[FSR Machinery Sector Survey Results, 2021]
Figure 26. Comparison of Operations where Digital Transformation is Implemented

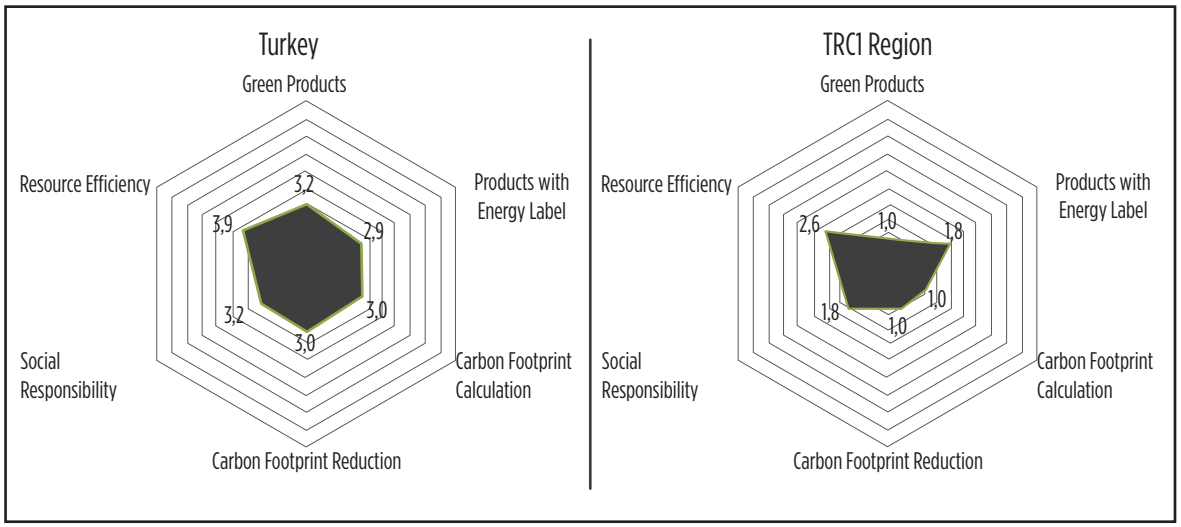
The results obtained from the answers about the Application of Industry 4.0 are shared in Figure 27 for Turkey and TRC1 Region. Looking at the figures; Sector representatives of TRC1 Region have expressed an application density that is close to Turkey average in every issue regarding the implementation of Industry 4.0 only for Machine Learning, 3D Production and 3D Prototyping. The sector representatives of TRC1 Region mostly consist of companies with a developing awareness in the fields of Industry 4.0 and which are at the beginning of the transformation process. For this reason, it is considered that the results of the survey are in harmony with the realities of the Region.



[FSR Machinery Sector Survey Results, 2021]

Figure 27. Comparison of Industry 4.0 Applications

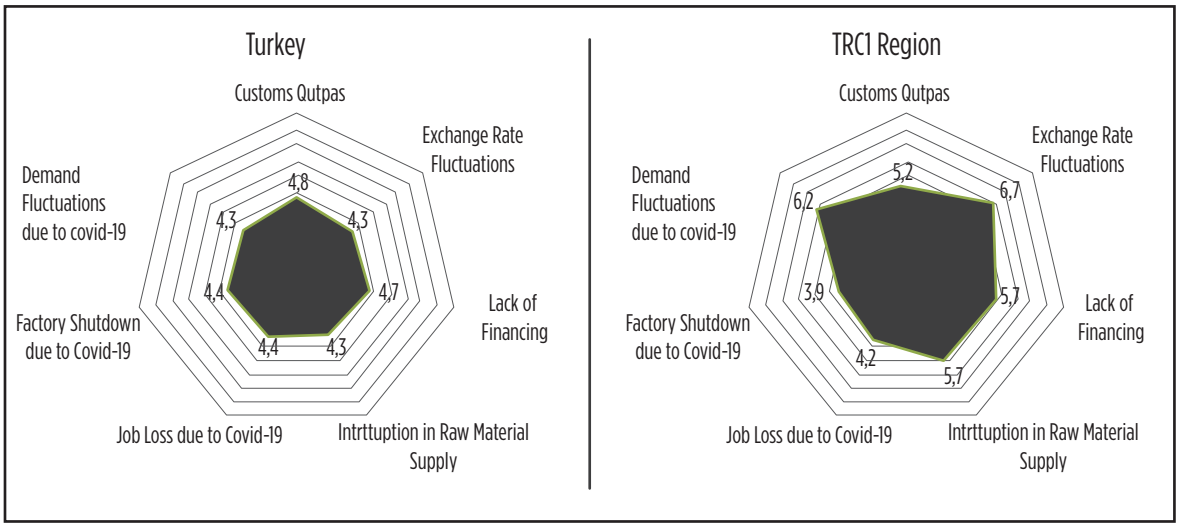
The results obtained from the answers about Environmental Awareness and Environment-Friendly Production Areas are shared in Figure 28 for Turkey and TRC1 Region. Looking at the figures; sector representatives of TRC1 Region are close to Turkey average only in resource efficiency. However, considering the effects of climate change that are felt even in our country today, it is obvious that this will be the most important issue of the next 10 years. For this reason, it is very important to comply with the decisions to be taken on Green Production in target markets in terms of both commercial growth and respect for the environment. Progress should be made with decisive actions on the development potential that exists in both Turkey and TRC1 Regions in terms of environmental production.



[FSR Machinery Sector Survey Results, 2021]

Figure 28. Comparison of Environmental Awareness and Environmentally-Friendly Production

The results obtained from the answers about Sustainability are shared in Figure 29 for Turkey and TRC1 Region. Looking at the figures; sector representatives of TRC1 Region stated that they experienced sensitivity far above Turkey average in every issue except for factory shutdowns under the topic of Sustainability predominantly in Demand Fluctuation and Raw Material Supply Constraints and Lack of Financing due to Covid-19. Especially exchange rate fluctuations, travel restrictions and interruptions in raw material supply have been the areas of trouble in the region especially for the SMEs [TRC1 Focus Group, 2020].

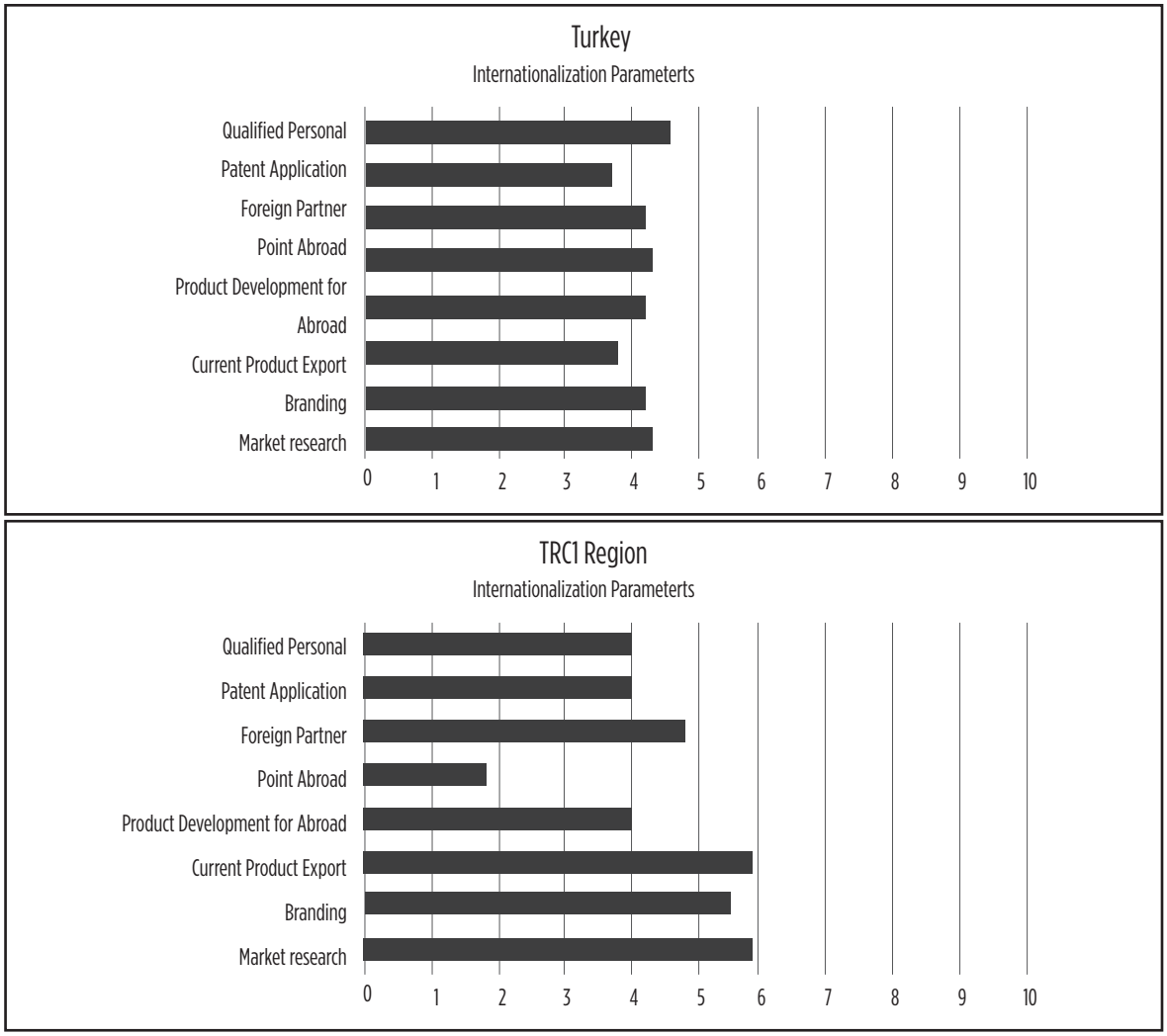


[FSR Machinery Sector Survey Results, 2021]

Figure 29. Comparison of Sustainability

The results obtained from the answers about "internationalization" are shared in Figure 29 for Turkey and TRC1 Region. Looking at the figures; while the sector representatives of TRC1 Region have a position below Turkey average in Abroad Structuring and Patent Application, it is seen that they are above Turkey average in Branding, Export of Existing Products, Market Research and Foreign Partnership. Although the machinery sector throughout Turkey is inadequate in Patent Applications and Abroad Structuring, the lack of organization especially in abroad aftersales is felt much more in TRC1 Region due to the fact that it has a sub-sector structure focused on Food and then Textile Machinery. However, TRC1 Region Food Machinery Manufacturers have started to adapt in the fields of Remote Management of Machines and active use of new technologies after sales, and they are developing rapidly. Sector representatives should move forward to minimize the need for abroad restructuring by cooperating in areas such as Remote Management, Modular Installation, etc.

It is understood that there is a development potential in internationalization both throughout the country and regionally, from the fact that the scores of the questioned criteria could only approach 5 points out of 10. Export is absolutely essential for sector representatives with capacities above the national market demand to develop, make profit, and invest in product development and innovative technologies with these profits. It is indispensable to meet the internationalization criteria for export.

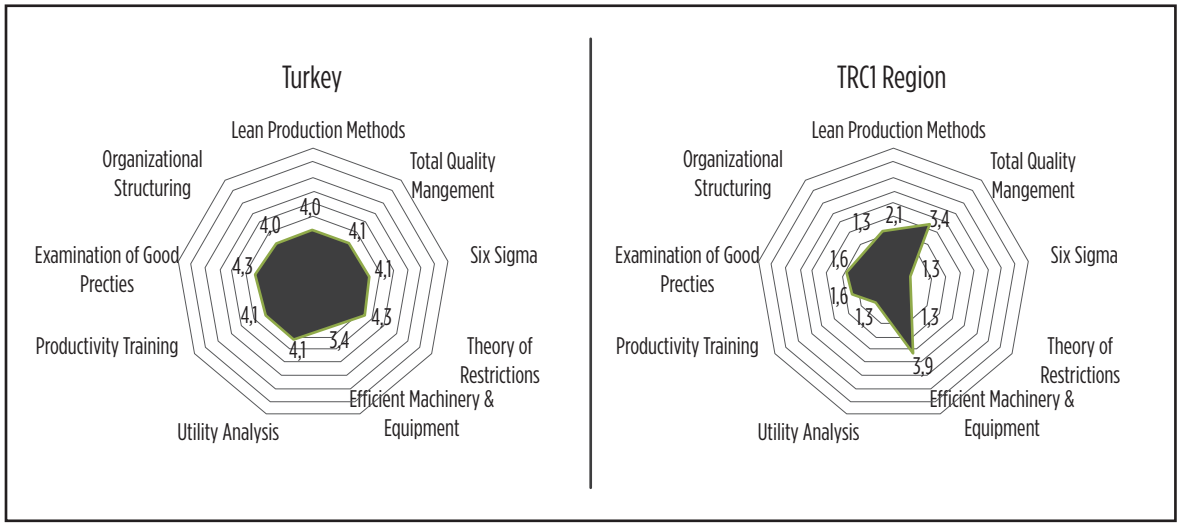


[FSR Machinery Sector Survey Results, 2021]

Figure 30. *Comparison of Internationalization Criteria*

The results obtained from the answers about Productivity Focus are shared in Figure 30 for Turkey and TRC1 Region. Looking at the figures; sector representatives of TRC1 Region have a position above the Turkey average in the titles of Productivity, Total Quality Management and Efficient Machinery & Equipment, while they are below the average of Turkey in Six Sigma, Theory of Constraints, Productivity Utility Analysis and Productivity Training. When this situation is evaluated, it is seen that the knowledge and application competence of TRC1 Region on Total Quality Management is already quite sufficient, while a development potential is seen in focusing on productivity-enhancing studies including different management and systematics.

Also across the country; the necessity of a more intensive implementation of productivity studies that will provide both increase in quality and added value and decrease in costs with productivity-oriented work, embedding productivity culture in production and continuous improvement clearly manifests itself in the region.



[[FSR Machinery Sector Survey Results, 2021]]

Figure 31. Comparison of Productivity Criteria

6.1.2. Focus Groups

Participants included the representatives of Chambers of Industry, Chambers of Commerce, University and Sector in TRC1 Region.

In the Machinery Sector Focus Group, the opinions and suggestions of the sector representatives and stakeholders were listened to in 4 groups in the Region and ideas on related issues were exchanged mutually. Within the report, the outputs of the Focus Group work were utilized to the maximum extent specific to the region.

The following questions were sent to the Focus Group participants in advance as the meeting agenda and they were expected to make preparations. During the meeting, each question group was asked one by one to the participants, and the answers, ideas and suggestions of the whole group were received. The question groups shared as the meeting agenda are as follows:

1st Group of Questions

What was the situation in the sector before Covid-19?

How is the current situation after Covid-19, are there new trends emerging?

What are the 2021 forecasts for the sector?

How will the sector be affected if the Covid-19 pandemic ends in the medium-long term (1-3+ years)? What are the scenarios they foresee?

2nd Group of Questions

What are the national trends in the sector and what are the regional repercussions of these trends?

What are the sectoral trends specific to the region?

Which province stands out in the region in which sub-sector, why?

What are the needs and demands of sector representatives in the region?

What are the strengths and weaknesses of the sector in the region?

What are the opportunities and threats faced by the sector in the region?

What are the aspects open to development in terms of competitiveness in the region?

3rd Group of Questions

What are their thoughts on the following horizontal issues specific to the sector?

(Managing the pandemic crisis, Energy Efficiency, Climate Change, Gender Equality)

4th Group of Questions

What are the national and regional short, medium and long-term strategy proposals?

What are the sectoral actions that can be taken in the region, how much can the estimated budgets of these actions be?

What are the governmental policy recommendations?

Below is a summary of the responses to the above questions during the Focus Group Meetings:

TRC1 Region Machinery Sector Focus Group Meeting Summary

Among the participants were representatives of Gaziantep University Technopark and GÜ and H. Kalyoncu University TTO, Gaziantep Exporters Union, Gaziantep OIZ, as well as Kilis Chamber of Industry and Commerce, which closely follows the sector.

It was stated that before Covid-19, rather than the effect of global fluctuations, the course of the sector in the region contracted with the effect of exchange rate fluctuations at the Turkish economy in 2018, the wounds began to heal as the exchange rate movements ceased in 2019, and a good introduction was welcomed for 2020.

It was stated that orders in the 2-3-month period before Covid-19 in 2020 indicated growth in the sector. With Covid-19, it was stated that the most troubled days in the sector were the first quarantine days, they did not know what to do in terms of both business, personnel management and relations with customers, but they adapted very quickly, but the impact was still clearly felt.

It was stated that this effect was mostly felt in the areas of logistics and travel restrictions, and that both customer visits and customer visits including control and approval stages during the delivery of goods were interrupted, resulting in incomplete sales.

It has been stated that the demand for food in the food sector, due to the pandemic, turned to stocking, caused orders to go far beyond the anticipated, and that positive effects were observed in the Textile Machinery sub-sector due to the increase in the demand for home decoration and household goods. In addition, due to the fact that public transportation is not preferred, the production of bicycles, electric individual vehicles and motorcycles has increased far beyond their capacity and neither national nor international demand has been met and still cannot be met. Due to the demand for protective equipment and especially mask machines, the machinery industry experienced a rapid sales graphic during the pandemic; however, it has been stated that due to most of the companies turning to this temporary demand, there are currently both idle mask production capacity and there are manufacturers with finished machine stock.

Providing credit support to companies, extending short-time working allowances, increasing the machinery purchase shares of KOSGEB supports, expanding the reporter bank pool to cover African countries and managing country risks, granting machine purchase credit to the customer or sales loan to the machine manufacturer stand out as the demands of the sector.

In addition, suggestions were made to carry out studies in the field of branding and image management both on the basis of SMEs and as a country, and to set standards and rank the representatives of the sector through accreditation.

TRC1 Region Focus Group Participant List is in ANNEX.1.

6.2. Sectoral Analysis

6.2.1. TRC1 Region Machinery Sector Value Chain Analysis

Value chain is essentially a systematic method to examine the development of competitive advantage. In this respect, the model is used as a useful analysis tool in identifying the main competence areas of an organization and determining the operations that are effective in gaining competitive advantage. It is not possible to understand the competitive advantage by looking at an organization in general. The competitive advantage arises from the different operations that the organization performs, such as design, production, marketing, delivery and product support services.

In order to better understand the operations that attracts competitive advantage, it is necessary to start from the value chain with its general scope and then to identify the appropriate operations specific to that organization or structure. The competitive advantage of an organization stems from its ability to outperform its competitors in key operations in the value chain.

Competitive advantage depends on whether the organization performs its value-creating functions at a cheaper cost than its competitors or offers its products to the market at a high price by differentiating their quality and functions. Therefore, differences from competitors provide competitive advantage to the organization.

In other words, value chain is a method of dividing the firm's operations into strategically important operations and understanding the effects of these operations on cost and value. Value chain is essentially a systematic method to examine the development of competitive advantage. In this respect, the model is used as an analysis tool to identify the main competence areas of a company or the whole sector and to determine the operations that are effective in gaining competitive advantage.

While preparing the simplified value chain belonging to the machinery sector in Figure 33, machinery sub-sectors in our country are listed according to the added value they create and the size of the added value they produce has been rated with box sizes. (The added value of Agriculture and Forestry Machinery is US $ 2.316 million according to 2019 data) [MAKFED, 2021]

The added value produced by sub-sectors increases from left to right and from top to bottom. After the sub-sectors, operations that create added value are listed considering the current structure of the machinery sector in our country. These operations are also the ones that create higher added value from left to right from top to bottom. The added value creation potential of these operations is also proportional to the box sizes.

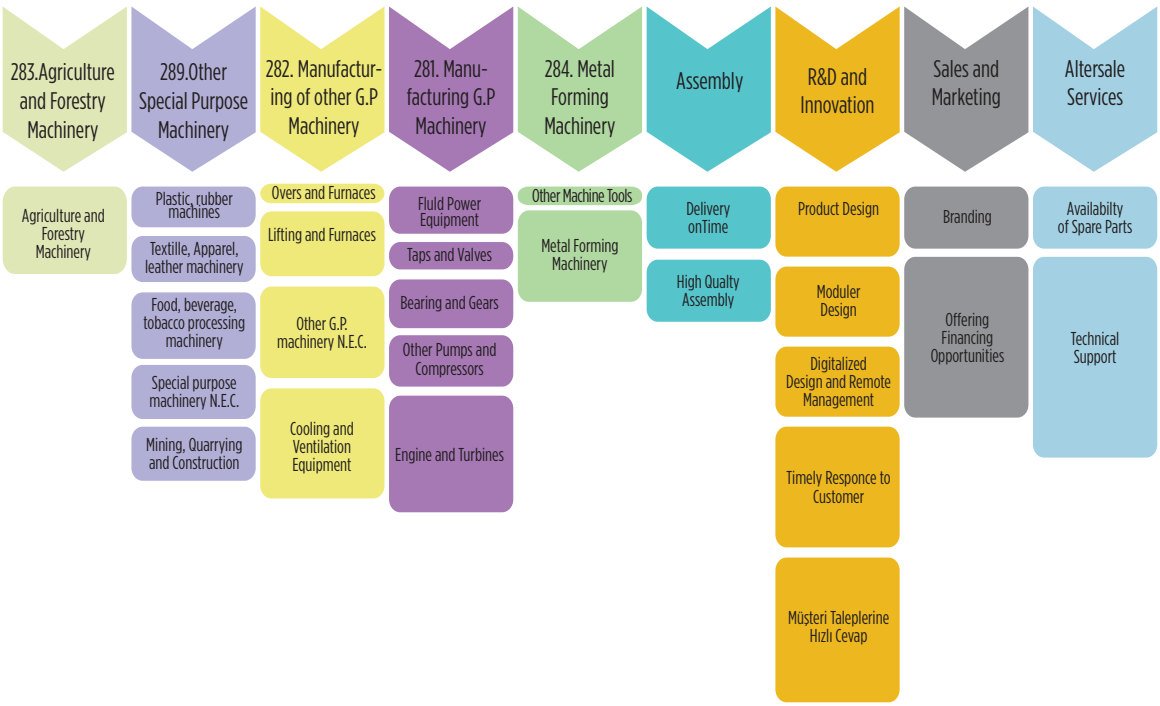


Figure 32: . Simplified Value Chain for the Machinery Sector

Figure 33 shows the simplified value chain of the Food Machinery Sector, the largest sub-sector of the Region. Analysis of the value chain will be covered in the Sector Gap Analysis.

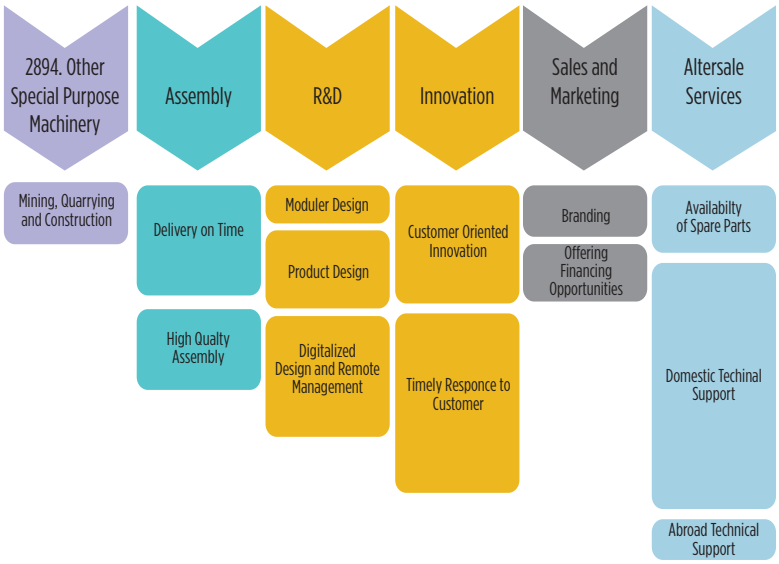


Figure 33: Simplified Value Chain Analysis for Food Machinery

6.2.2. TRC1 Region Machinery Sector PESTEL Analysis

PESTEL analysis, which is made to provide input in determining the opportunities and threats for short, medium and long-term strategies, by evaluating the effect of macro developments on political, economic, sociocultural, technological, legal and environmental scales in the distant environment of the enterprises of machinery sector in TRC1 Region is shared in the table below.

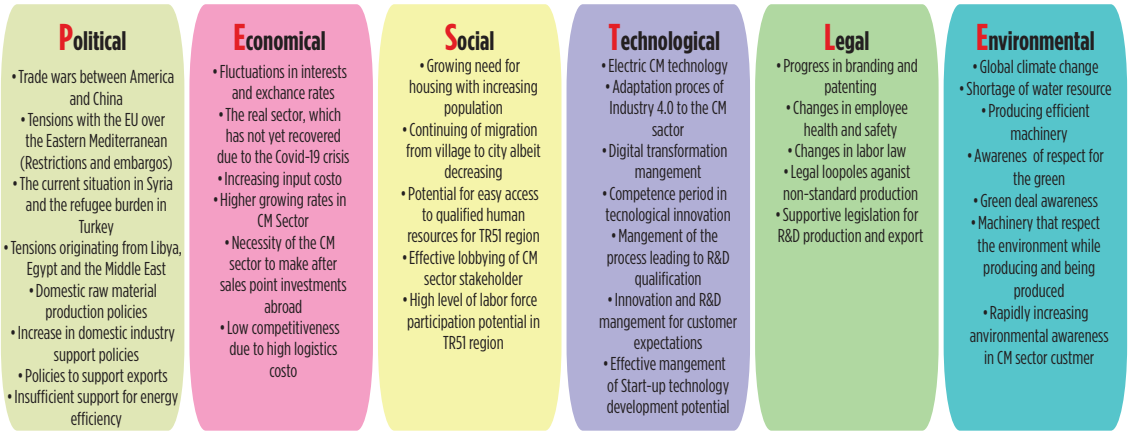


Figure 34:*PESTLE Analysis for the Machinery Sector in TRC1 Region*

6.2.3.TRC1 Region Machinery Sector SWOT Analysis

The strengths and weaknesses of TRC1 Region and the main issues creating Opportunities and Threats for the region in line with the data obtained from secondary sources and the information obtained from the focus group meetings are presented in the table below.

STRENGTHS	WEAKNESSES
• Flexible production ability • Quick response to customer requests • Quick adaptation • Strong position in Food Processing technology • Strong manufacturer position and industry awareness in the region • Experience, knowledge, quality awareness, expertise • Open to innovation • Positive / sincere relationships with customers • After-sales service • Entrepreneurial sector representatives • Awareness of the added value provided by digitalization	• Foreign dependency in spare parts, equipment and raw materials • Long-term and low-interest loan alternatives in textile machinery foreign competitors in buyer financing • Low HR attraction power due to limited social life in Gaziantep • Lack of strategic planning • Lack of marketing plan • Insufficient attention to design development and R&D, insufficient resources • Lack of market diversity and inability to reach markets with growth potential • Lack of qualified staff, especially difficulty in finding experienced engineers • Lack of high value-added and original strategic products • Lack of institutionalization • Lack of using digital opportunities in internationalization
OPPORTUNITIES	**THREATS**
• Export potential to Africa with the development of financial alternatives • The added value of combining artificial intelligence and automation in food machines • Presence of products with the potential to create a brand in the region • Qualified manpower potential • Young and dynamic population structure to work in the coming years • High production cost in developed countries • The existence of a significant number of companies in the market that will produce in accordance with international standards • The image of "European Turkey" in the Far East • Increasing construction demands in nearby geographies • Increasing national production trend with restrictions and sanctions	• Failure to allocate sufficient resources for R&D • "Made in China" strategy and tendency to sell cheap products in Far East countries • Covid-19 crisis repeating with attacks or pandemic process not ending within 2021 • Slow tendency in transition to Industry 4.0 • High input (energy, raw material) costs • Low prices applied by low tech companies

6.2.4. TRC1 Region Machinery Sector Five Forces Analysis

This analysis is based on the data obtained from the surveys and the information obtained from the remarks of the sector stakeholders in the Focus Group meetings.

Porter points out that competition in industry is influenced by five competitive power factors that shape the industry. According to Porter, the industry structure consists of the threat from new companies entering the sector, the threat from substitute products, the market dominance of the suppliers, the power of the buyers and the intensity of the current competition. These factors affect the strategies that businesses will determine according to each other and their understanding of competitive advantage.

Understanding the forces that shape sector competition is the starting point of strategy development. Each company needs to know the average profitability of its sector and the change it has undergone over time. Five Forces reveal why sector profitability is in its current state. Only then a company can incorporate sector conditions into its strategy. Five Forces reveal the most

important aspects of the competitive environment. They also provide the basis for measuring a company's strengths and weaknesses. Porter Five Force Analysis is a framework for measuring the level of sectoral competition and developing strategies based on it. Firms can build their core competencies, business models or networks to achieve a profit above the industry average. But we can say that an "unattractive" sector for investment is one where the combination of these five forces acts to reduce overall profitability.

In the analysis, there are 4 competitiveness together with "Competition in the sector" to see the process; "Threats from New Companies", "Market Dominance of Suppliers", "Threats from Substitute Products" and "Power of Buyers". The scoring specified according to the results of the survey was made according to the following principles. The answers between "Very Low" and "Very High" in the survey were scored between 1 and 10. Accordingly;

- Threats from New Companies: What is the rate of convenience for a new company to enter your market?

(1: Very Low 10: Very High)

The score in the analysis is 4.3, representing that the threat from new companies is "low".

- Power of Suppliers: What is your dependency on a limited number of suppliers?

(1: Very Low 10: Very High)

The score in the analysis is 6.5, which represents the strength of the suppliers is "high".

- Power of Buyers/Suppliers: What is your dependency on a limited number of buyers?

(1: Very Low 10: Very High)

The score in the analysis is 4.8, representing that the strength of the customers is moderate.

- Threats from Substitute Products: What is the danger of having equivalent / substitute products in the market?

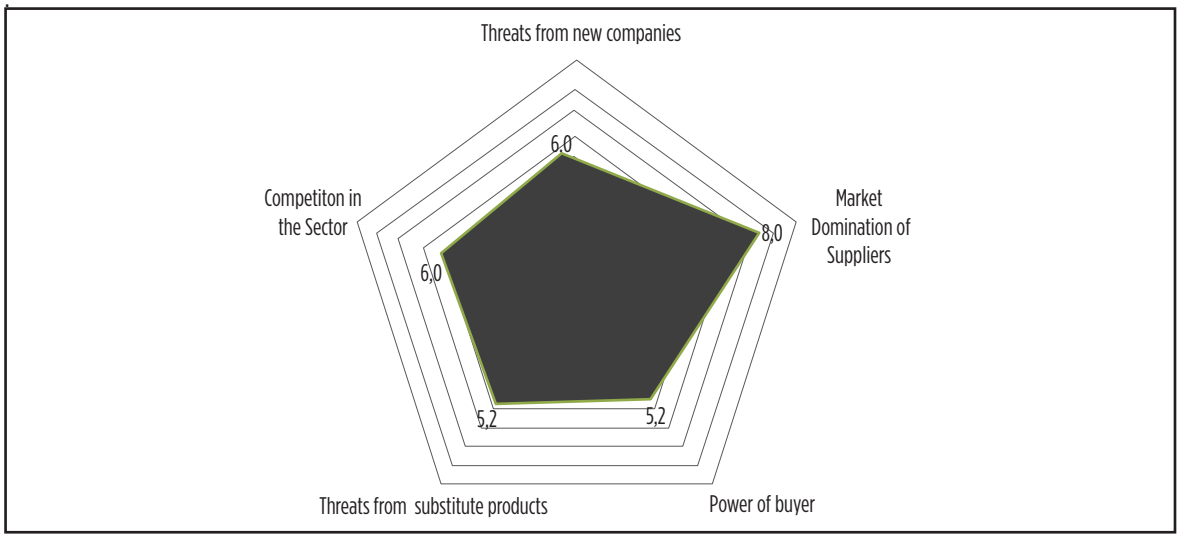
(1: Very Low 10: Very High)

The score in the analysis is 6.5 representing a relatively high level of substitution threat.

- Competition: What is the Level / Intensity of Competition in the Sector?

(1: Very Low 10: Very High)

The score in the analysis is 8.3, which represents a relatively high level of competition in the industry.



[FSR Machinery Sector Survey Results, 2021]

Figure 35. Survey Answers for 5 Forces Analysis of TRC1 Region's Machinery Sector

Threats from New Companies

Newcomers to an industry have the desire to gain market share that suppresses the price, cost and rate of investment required to compete in the market. Therefore, the threat of entry has an impact on an industry's profit and growth potential. When the threat is high, existing companies in the market may move towards making a new investment to lower their prices or compete with new companies. Threats from new companies in the region has been designated as “Low" considering the high investment cost, high requirements for profitable operations, and the size of the new investment in the sector.

Market Dominance of Suppliers

Strong suppliers can capture more value by demanding higher prices, limiting quality or services. Supplier power in the region is at "High" level due to density, replacement cost and differentiation. In this sense, it should be noted that the main inputs of the sector depend mainly on import products.

Power of Buyers

Strong Customers can capture more value by driving prices down, demanding better quality or more service (thus increasing costs) and often at the cost of destroying industry profitability. According to the sector participants, the buyer power did not appear to be threatening due to the medium bargaining power of the customers, medium exchange cost, existence of illegal practices and product differentiation.

Threats from Substitute Products

Companies in the region do not complain about the substitute product threat in the market. Industry profitability suffers when the threat of substitution is high. Substitute products or services limit the sectoral profit potential by suppressing prices. When this situation, which is valid mainly due to international competitors and their products, evaluated for the regional companies with high exports, it is not only related to the product itself, but also indirectly, such as providing better financial conditions and branding power.

Competition in the Sector

Competition between companies is in the form of quality, price, new product promotions, advertising campaigns and service improvements. The nature of competition takes a different form today, with joint action and cooperation that offer new ways to compete in the sector. Also, technology is reshaping the competition. As a result, it was found in the analysis that the sectors in the region have a "medium" level of competition. Capacity, product differentiation level, number of companies and the continuation of growth in the sector are the main drivers of competition.

Suppliers' Market Domiance
(High)

- The number of suppliers is high, access is easy
- High Maturities are provided by the supplier
- Sources and presentation alternatives of the supolier are high
- Supplier switching costs are high
- Alternative sources are not enuogh
- The product is not different and has the ability to create loyalty
- Supplier have low bargaining power
- The need for supply is not high

Threats from New Companies
(Medium)

- High investment cost
- Succes is not easy with single product
- Companies can enter the market as the supplier of main brands
- Copying is not easy
- Selling final products is hard
- Sector business potential is not low
- Sector profitability is not low
- Branding can take a long time
- Medium-Low level bureaucratic obstacles
- Medium-Low learning curve

Compeititon in the Sector
(Medium)

- Low number of competitors
- Medium variety of products
- Few and equal competitors
- The growing market
- The cost of switching suppliers is medium
- Fixed costs are not high
- Large companies have high promotional power
- Branding is important
- Financial burderns
- There are few dominant leaders in the market
- Medium competitor diversity

Threat from Substitute Products
(Medium)

- Medium risk for change
- Low potential for change in product properties depending on the techonology
- Availability of products with a completely new techonology is low
- Tendency towards service procurement
- Information available in the market on substitute products is low

Power of Buyers
(Medium)

- The number of customers is not low
- Contracted work, order-based production
- Purchases are not high
- No tendency to hold stock
- Brand perception available
- Demand for low price is not low
- Medium bargaining power
- Quality matters as much as price

Figure 36. TRC1 Region Machinery Sector 5 Forces Analysis

6.3. TRC1 Bölgesi Makine Sektörü Boşluk Analizi

The sectoral GAP analysis is shown in Figure 37, which has been prepared by showing the potential progress area that should be filled for the sector in each field through the simplified value chain.

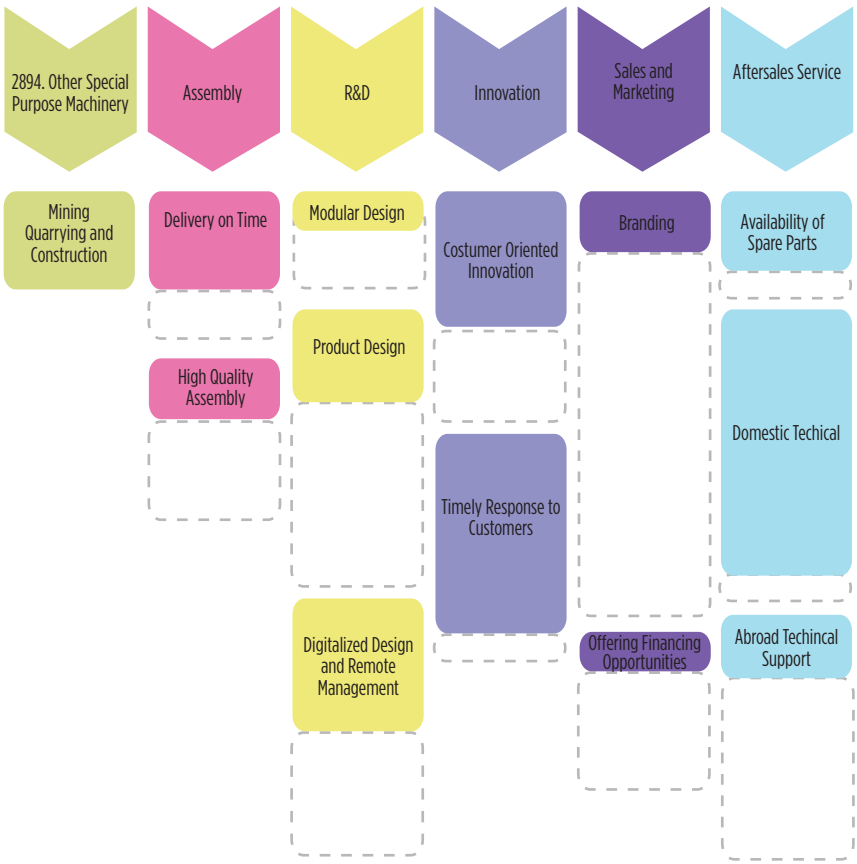


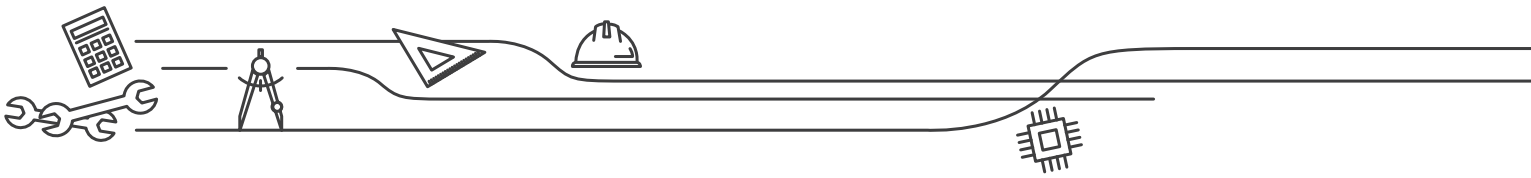
Figure 37: *TRC1 Region Food Machinery Sector Gap Analysis*

On-Time Delivery: It is very important in the eyes of customers and if there is nothing to reduce customer satisfaction within the product, is the strongest competitive feature. The value given to the customer, the promise of the enterprise and loyalty to job have the power to increase the image and brand value in the eyes of the customer.

The sector has sufficient power in this title, but the necessity to resolve the disruptions in the supply chain due to the logistical difficulties caused by Covid-19, enlarged the gap at this point.

High Quality Assembly: In Food Machinery sector, for the products that are not ready-to-use but require assembly, high quality assembly has a positive effect on the added value that the machine will provide to the customer. Especially in foreign sales, there may be cases where ongoing orders from the same customer are lost only due to problems in assembly quality. The problems experienced due to travel restrictions caused by Covid-19 enlarged the gap at this point [TRC1 Focus Group, 2020]. Augmented reality and virtual reality technologies and the technologies developed in the field of assembly will help to fill the gap here.

Product Design: With the Ministry of Industry's and Technology "R&D Center" application, 174 sector representatives across Turkey established R&D centers. There are a total of 6 R&D centers in the region. Only 1 of them is in Gaziantep and is in the Machinery and Equipment sector. Likewise, 364 Design Centers were established in Turkey, although there is no Design Center in the machinery manufacturing sector in the region, there is 1 Design Center in the Textile sector in Gaziantep. As a result, the sector does not have a design center in the region.



Modular Design: It is a method that must be applied in order to reduce the logistics costs that doubled during the Covid-19 crisis and to achieve better competitiveness and increase value added. The manufacturers which diagnosed the gap here and transformed their products into modular products, have differentiated themselves from their competitors by reducing the storage of end products, logistics, installation of the product at the customer site and all related costs. The gap at this point is open to development for the sector, in general.

Digital Design and Remote Management: When sector representatives collect and evaluate customer complaints with a goal of customer satisfaction, it creates a serious development motivation in companies. With this motivation, improvements have been made in the field of services, as well as improvements in operations and logistics. Most companies have installed remote control systems on their machines in order to instantly intervene in the troublesome situations that customers experience in machine use. In this way, they had the opportunity to solve the instant problems of the customers. At this point, the gap in the sector has been determined beforehand and started to be filled before the planned dates with the effect of Covid-19 crisis. However, there is still a gap across the sector and in order to close this gap, it is critical to recruit strategically important engineers and technicians who will bring this technology to the company.

Customer Oriented Innovation: Customer complaints from after-sales activities are accepted as important feedbacks to increase customer satisfaction by the machinery sector representatives. These feedbacks triggered the process of generating solutions by developing technology or changing operations to solve problems, and ultimately led to increased competitiveness in the company. These capabilities have enabled the product to be continuously improved in line with customer expectations and to gain competitive advantage in the short and medium term over competitors who do not have the same value but try to develop products directly through R&D. Because, although the same raw materials and production technology are used like the competitor, the changes and innovations made in operations without losing time in order to gain space, volume and process efficiency lead to the production of machines that produce higher added value or meet different customer demands. This process has an ongoing continuous improvement cycle.

Both Food and Textile Machinery manufacturers in TRC1 Region have high added value in this area. A gap can be defined in terms of adapting to the recently developing technology and changing customer demands. The gap to be filled herein will enable the customer-oriented innovation, which is the most important factor of the progress of both sectors in the region to date, to show itself to the customer with much more technological outputs and to increase the image of the companies.

Timely Response to Customer Demands: Timely response and flexibility are vital for the firm to easily navigate from the crisis environment to the non-competitive zone, especially in times of crisis. During the Covid-19 crisis, construction machinery sector representatives reacted quickly using these capabilities and were less affected by the effects of the crisis. There is still a gap to be filled in terms of the principle of continuous improvement by adapting to the developing technology.

Branding: Although the exports of the regional sector representatives are high, it is obvious that they lag behind their European competitors in brand awareness and brand image creation. For these reasons, establishing a sales and marketing company in countries with high brand image and trying to sell the products produced in Turkey with different country origins is expressed as a solution applied by many regional representatives. With the TURQUM brand, in which sector representatives are included, a sectoral alternative has been created in terms of branding.

The TURQUM Brand is a certification system that certifies the following standards for the Turkish machinery sector,

- Company and production system competence
- Production in accordance with the Quality Management System
- Product Safety
- Product quality
- Service and after sales services
- Constant surveillance

Offering Finance Opportunities: Sector representatives cannot compete with the financial alternatives offered by their European competitors in sales financing. It is difficult to compete as competitors, can offer alternative financing or grace periods. The difficulty, sector representatives encounter to sell their higher quality products in national market even at lower prices, indicates the development potential of this value.

There are many customer financing alternatives such as 5-6-7 years of low interest loans, leasing financing, buyer financing that can compete with Hermes and Coface which are open to development and form the gap in this value.

Availability of Spare Parts: Although largely seen as a fulfilled value, this problem manifested itself during Covid-19 crisis within the difficulties experienced in the supply of parts which is dependent on foreign suppliers. Spare parts availability for products sold abroad is a value that can be fulfilled more successfully with effective international after-sales organizations.

Domestic Technical Support: Domestic technical support is an important added value, and it is the first requirement to work in the field, especially for Machinery. Filling the gaps of adaptation to new technological developments will increase its value.

Foreign Technical Support: Foreign technical support has a gap where Food Machinery industry is open to development in terms of added value and is difficult to fulfill with individual efforts of companies. Progressing by individual efforts with new technologies and remote management will be beneficial in this regard, but these are solutions with a partial added value. Taking into consideration of the fact that a machine is under constant maintenance and monitoring, concrete and customer-satisfying actions should be taken with fast and rigid steps to fill the gap in this value with sectoral merger and government support for constantly reliable and growing export figures.

7. Horizontal Issues

7.1. Crisis Management

The Covid-19 pandemic caused a significant contraction in the world economy and trade in 2020. The assumptions that the pandemic will take place in a single wave, that it will be taken under global control at the end of the summer months and the vaccine will be found and implemented in 2021 are the basis of optimism in predictions regarding the world economy and trade.

During this period, as in all sectors, the representatives of the machinery sector in the region were directly exposed to the effects of the crisis. Some companies have been able to show high resistance to the crisis. This endurance has been achieved thanks to their ability to quickly implement the solutions they developed with innovation to customer demands with their flexibility in production. Synchronized operation of these three is the definition of resilience in a crisis period [AT Kearney, How to Rebound..., 2021].

As stated in the formula fast response to the customer, adaptation of production and machines according to customer demand, coordination with global logistics chains, increasing the brightness of production with new methods and increasing the cooperation between companies to solve the problems encountered are also expressed in the studies on the Covid-19 Crisis [TRC1 Focus Group, 2020].

Crisis management has also been implemented in terms of occupational and worker health and to minimize the effect of the virus on production and the Sector has taken hygiene and social distance measures in the workshop and business services in general to minimize the impact of the virus on production and employees with chronic illnesses and / or those over 55 years old were given the opportunity to take leave.

In crisis management, additional precautions were taken in order to prevent strategic personnel with high added value from being out of work due to illness, and difficulties in operational processes [TRC1 Focus Group, 2020].

In TRC1 Region, there have been troubled times due to exchange rate movements in 2018-2019. It has been stated that with the quarantine that came first with the Covid-19 Crisis, there was a phase of confusion and shock, but adaptation was provided in a short time. Difficulty in logistics and travel restrictions affected the sector negatively. Transport costs more than doubled and voyage frequencies dropped to one quarter. The problems experienced due to the inability of foreign buyers to come to Gaziantep for control during the delivery of goods with travel restrictions have been overcome by the use of an inspector [TRC1 Focus Group, 2020].

As the opportunity brought by the crisis to the region, the increasing demand for food due to stocking increased the demand for food machinery and the demand for the production of masks for personal protection increased the demand for mask production machines. These increases in demand have been an important lifeline for the Regional Machinery Sector to get out of the crisis. In addition, with the increasing demand for bicycles, motorcycles and scooters due to the preference of individual transportation to ensure social distance, producers in the region experienced significant capacity utilization increases during the crisis period [TRC1 Focus Group, 2020].

Although the solutions produced for operational problems in the region were implemented immediately and progress was achieved at a certain rate, the impact of the Covid-19 crisis on decision processes was profound. In case the Covid-19 crisis lasts for 2-3 years, the lack of scenarios and the lack of action plans for crisis periods were evident. In this process, the necessity of institutional changes to alleviate managerial effects has emerged [TRC1 Focus Group, 2020].

7.2. Resource Efficiency

Resource efficiency is defined by the United Nations Environment Program (UNEP) as the sustainable production, processing and consumption of natural resources, as well as the reduction of negative environmental impacts during the production and consumption of products throughout their entire life cycle.

Energy Efficiency

When it comes to resource efficiency, the first thing that comes to mind is energy, water and raw material efficiency. In reducing greenhouse gas emissions in the industry, especially energy efficiency comes to the fore. Energy efficiency can be defined as the conversion of each unit of energy consumed into more service or products [TMMOB, 2008]. Although the concept of energy efficiency is perceived as intangible for businesses in our country, it is a concept that can have serious financial, environmental and economic benefits.

Unfortunately, the machinery sector is far from successful positions it has at other subject matters in terms of energy efficiency. It is estimated that there are not many companies that have energy efficiency analysis and/or implementations of energy efficiency increasing measures according to efficiency analysis. Unfortunately, the reason for this is lack of awareness and the projects, practices that will increase this awareness in our country should be increased in quantity and diversity.

Raw Material Efficiency

The most commonly used raw materials in the sector are steel and steel products. Steel is successful in terms of raw material efficiency, as it is recycled at a high rate. However, the production trend from recyclable materials, which are very effective in raw materials used in equipment other than steel, is recently being adopted by the sector representatives.

7.3. Climate Change

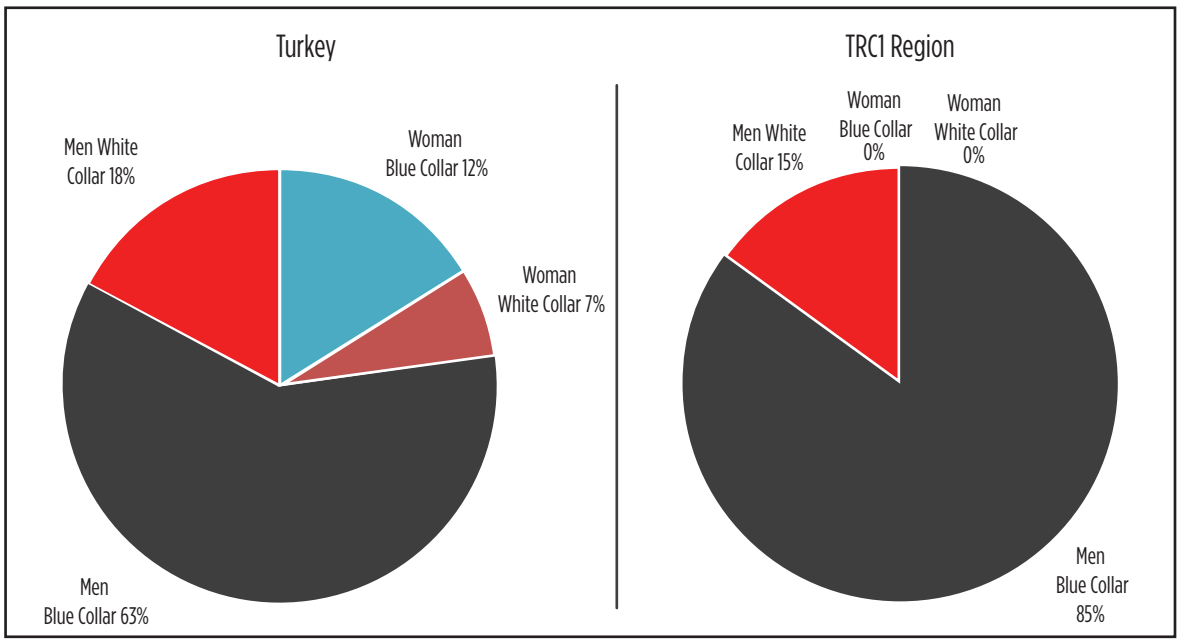
47.2% of net electricity consumption in Turkey is consumed by the industrial sector and more than 70% of the electricity used in industry is consumed by electric motors. In other words, approximately 35% of the total net electricity consumption of our country is consumed by the electric motors in manufacturing industry activities. However, 88% of the electric motors used in industry are in the low efficiency class [MOIT, Electric Motor Inventory Study, 2017]. It is observed that the sensitivity of the machinery sector customers in terms of both reducing their carbon footprint and saving electricity has increased and the tendency to use IE3 class motors and variable speed drive instead of IE2 class motors has also increased. The machinery sector is of key importance in terms of reducing the amount of electricity used in the industry and thus the carbon footprint of industrial production.

Sector representatives state that the motors accoupled to their machines, are selected according to the demand of customers. But, the establishment of green economies and the energy consumption classes of the supplied products are of greater importance in the developing world. So, that will encourage the sector both to protect nature by increasing the use of more energy-efficient motors and to strengthen their position in the supplier lists of European customers with the help of the importance they hold for nature.

7.4. Gender Equality

Currently, women working in the sector focus predominantly on low-skilled and low-paid jobs. Sector representatives generally prefer female employees because of their discipline and self-motivation. As their skills adapt to market demands, women have a chance to find a job in the machinery sector.

According to the results of the survey conducted within the scope of the project, as shown in Figure 39, in the TRC1 Region, women are employed in white-collar and executive positions well above the Turkey average. There are many women managers in the machinery sector, this is normal and even the image of women managers is very high.



[FSR Machinery Sector Survey Results, 2021]

Figure 38. Gender Distribution of Machinery Sector Employees

8. Policy, Strategy and Action Plan Recommendations

8.1 Policy Recommendations

1. For Encouraging Purchase of Domestic Machinery

1. Effective implementation of supervisory and regulatory practices in the sector while insisting on the choice of domestic products in government purchases
2. Cancelling income tax on scrap value of old machines in domestic machine purchases
3. VAT discount for domestic machine purchases
4. Social security support for domestic machinery producers

2. For Increasing Exports

1. Performing efforts to improve the image of Turkey and Turkish goods
2. Support for strengthening the image of Turkish machine brands
3. Providing logistic support in maritime and rail transportation of exports
4. Eximbank's allocation of more resources for buyers' loans and receivables insurances and increasing the loan term over 1 year
5. Applying competitive interest rates for the machinery sector on buyer credit by Eximbank compared to rival banks
6. Supplying low-interest loans from Turkish banks or leasing institutions abroad to foreign customers who will purchase Turkish machinery

3. For Decreasing Raw Material Prices

1. Promoting high quality steel production in the iron and steel sector. Focusing on producing alloy flat, stainless, coated and more special steels that the sector needs, investing in products with high added value with advanced engineering knowledge, technology and government support

4. For Increasing R&D Structure

1. Establishment of institutes developing R&D

5. Directing SMEs to efficiency increasing activities

1. Model factories giving practical lean production training in the workshops of SMEs
2. With the Mobile Model Factory, making the model factory concept more accessible, expanding it and focusing more on in-plant applications
3. Promoting result-oriented lean practices and consultancy services on the production line

6. Promoting Environmental Regulations

1. Activating energy efficiency incentives for SMEs
2. Preparing policies for harmonization with the European Green Deal

7. Developing Human Resources

1. Conducting comprehensive training organizations to increase the technical capacity of companies on e-commerce, Export / Import, Management, Human Resources, Market Research, Customer Relationship Management, Purchasing, Marketing and Sales, Digital Marketing, Intellectual Property, Design, Language.
2. Regional differentiation of the coordination between vocational, technical high schools and industry, based on the sub-sector
3. Developing the concept of a "Producing University" and budgeting universities according to their production in areas such as Social, Economic, Cultural, Artistic, Industry, allocating staff and benchmarking the production potential of universities

8. Developing of export-oriented transportation

Having the opportunity to compete with China based on product price, via government support in exports, especially in maritime shipping

8.2 Short, Medium and Long-Term Strategy Recommendations

Sub Strategy 1.

Making a Move Towards Branding

Without understanding and applying modern marketing techniques and product marketing strategies that highlight product characteristics and brand, achieving success and competitiveness with product pricing is still used.

Branding is one of the biggest hurdles of the industry. Although some companies in our country manage to create a strong brand for foreign markets, in general, most industry representatives cannot effectively use their post-production capabilities, such as marketing and branding. Success can be achieved with the development of TURQUM, which is an alternative sectoral solution for branding.

Sub Strategy 2.

Fast completion of the transition to operational efficiency and lean production

Establishment and dissemination of smart factories covering multi-functional production processes including lean production applications and production bands are among the expected developments.

In the sector, all production operations should be reviewed with lean production techniques and a systematic and general approach should be carried out for continuous development, increase in value addition, total efficiency improvement, cost reduction and processes of localization.

Sub Strategy 3.

Training strategic human resources

The need for qualified human resources that can carry out applications and processes for adapting to R&D and innovation-enhancing studies and digitalization processes is deepening. Individuals who follow innovations in technology, make an effort to adapt to them and effects of innovation can be observed in their lives, are individuals that demand and direct innovation and development. Therefore, companies that internalize the R&D culture and select their new employees from these technology-compatible individuals and invest in the necessary processes to train their human resources will be competitive in the sector.

Sub Strategy 4.

Ensuring localization

The importance of reducing the external dependency in the supply chain of the industry have once again demonstrated itself with the Covid-19 Crisis. Continuity and sustainability of sales, logistics cost advantage, being aware of product changes, reducing imports and increasing exports are issues that need to be studied at every opportunity for our country to close its current account deficit.

The insufficiency of domestic production diversity, deeply felt with the Covid-19 Crisis makes it difficult or impossible to complete the production process of the final product not only in times of crisis, but also in any logistic setback, policy changes, exchange rate fluctuations, supplier strike and embargo. For these reasons, the prerequisite for increasing the resilience of the sectors against crises and setbacks is to increase the proportion of domestic goods in manufactured products.

Sub Strategy 5.

Focusing on alternative markets

The sector should focus on the China-Pakistan economic corridor connecting China and

Central Asia, or the modern Silk Road Corridor, RCEP, Russia, South America and Africa markets. In Asian markets, the sector should benefit from the fact that Turkish goods have the image of "Made in Europe".

Sub Strategy 6.

Developing intra and inter-sectoral cooperation

In addition to manufacturing within the industry's own internal structures, inter-sectoral cooperation is also becoming more important every day. In this sense, technology transfer, product development and joint business opportunities from both inside and outside the sector should be investigated. The machinery sector should enter into close cooperation with defense, energy and automotive industries.

Sub Strategy 7.

Providing financial support for export

Sales financing and loans that competitors obtain from abroad are the most effective reasons in sales where our companies cannot be competitive. Sector representatives will be more competitive by expanding the Sales Finance alternatives and opportunities to be provided to potential investors at a competitive level compared to foreign examples such as Hermes and Coface. The financial product alternatives should be defined in the financial system and then offered to all SMEs in an easily accessible manner.

Sub Strategy 8.

Supporting Export Shipment

Reducing shipping costs, which is an important source of cost when exporting from provinces far from the port and increasing competitiveness is an important condition for the increase and development of the export potential of Anatolian provinces.

Identifying intermodal transportation alternatives and supporting transportation costs for exporters will be an important milestone for regional development.

Sub Strategy 9.

Adapting to innovative technologies

Industry 4.0 Applications started to be implemented in the sector. Computer and Information Technologies make a great contribution to the efficiency of the sector. However, vertical and horizontal integration technologies such as ERP, Big Data, Cloud Technologies, Internet of Things (IoT), Artificial Intelligence and Cyber Security Technologies, and the level of use of Industrial Digital Technologies contain great development potential.

What is desired to be achieved with Industry 4.0 is productivity, quality, security, economic growth, easy manageability and improvement in employment. The advantages of Industry 4.0 applications can be listed as follows: tracking the system from input to end product and thus making diagnosis easier, self-awareness of systems and components, sustainability of resource-saving systematics, ensuring high efficiency, increasing flexibility in production, reducing costs and developing new service and business models.

Sub Strategy 10.

Developing innovative production models in accordance with environmental policies

Production capacity in accordance with current and renewed domestic and international regulations regarding environmental policies should be developed. This requirement will prevent a decrease in machinery exports, especially to developed markets, and has the potential to contribute significantly to paving the way for export growth.

Innovative technologies should be used to protect nature and support sustainable living, respecting both domestic and international environmental standards. The sector should reduce the environmental impact of both its factories and products day by day. Besides this requirement, compliance with the new environmental standards that will be demanded in the future markets of developed countries, especially the European Green Deal, will be a proof of both the infrastructure and competence of the sector in compliance with these standards and it will make an unaffordable contribution to the rise of the brand image.

Sub Strategy 11.

Optimizing operational processes with new technologies

Supply chains and inventory management should be optimized, risk and safety management and project planning processes should be improved by using new technologies. Examples include implementing digital purchasing, adapting to digital logistics channels, and adapting ERP systems to operations management in a value-added way.

Sub Strategy 12.

Technology transfer from start-ups

Major players in the sector should improve their existing technologies by recruiting technology-developing start-ups. The implementation of this strategy, which is very common in the world, will save a lot of time in terms of gaining the ability to catch up with high technology and develop new products.

Sub Strategy 13.

Leaving the follower status in technology and producing more innovative products

In most of the sector representatives, the motivation to develop a brand new product that works with different systematics in different technologies instead of existing products is weak or does not work. One of the reasons for this deficiency is that industrialists focus on short-term solutions rather than producing long-term R&D strategies. This understanding will only allow a progress towards working with a similar technology and imitating a new product when released by competitors. Currently, product prices are also much lower than European competitors due to lack of branding and the earnings will not allow the companies to endure long-term R&D studies.

For these reasons, the goal of companies should be to move from the "follower" status in technology to the "leader" position by turning to more innovative products, together with branding and sales-increasing strategies. It is also important to start production of critical components such as engine and powertrain in terms of reducing dependency on suppliers.

Sub Strategy 14.

Establishing a joint after-sales organization abroad

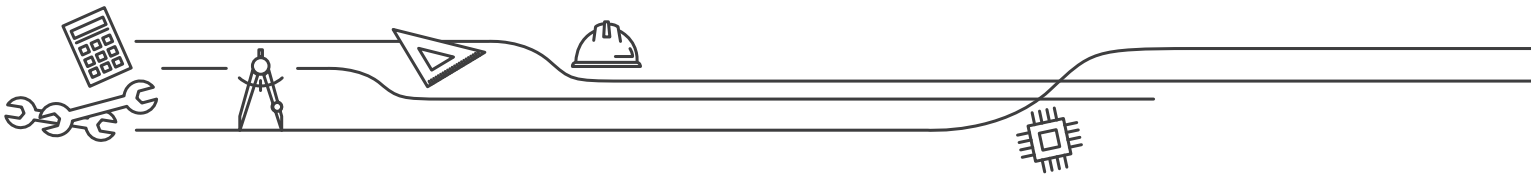
This structure should be supported by creating a new model in public-private sector cooperation for international after-sales service. In the focus group meetings held with the sector representatives, it was determined that the companies had difficulties in fulfilling their after-sales services due to the high costs. Each company tries to create its own after-sales service model. Some of the leading exporter companies of the sector create after-sales support offices abroad, and some assign technical personnel. Both the establishment of an office and the assignment of personnel do not constitute a sustainable structure for companies. An abroad organizational structuring should be established that will provide after-sales service for the products of companies which want to participate, keep spare parts inventory, and support assembly works.

8.3 Sectoral Action Plan

The Estimated Budget of the Actions of the Plan prepared below include the budget figures envisaged for the relevant study to be carried out for 259 Machinery Sector Firms in TRC1 Region. Actions within the sub-strategies have been increased or decreased in TRC1 Region, depending on the industrial structure and requirements of the region.

Strategy and sub-strategies are colored as follows, according to their status as National, Regional and Global Vision Developers: National/Regional/Global Vision Developer. **National**/**Regional**/**Global Vision Developer.**

Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 1: **NATIONAL AND REGIONAL STRATEGIES**	Strategy 1.1. **Making a Move Towards Branding**	Action 1.1.1. **Conducting research to raise awareness about patents, trademarks and design**	• Increasing the number of patents, utility models, brands and designs • Ensuring production of high technology product alternatives, encouraging R&D, increasing competitiveness	3-10 Years (Long Term)	Micro Investment (<100 Million TL)
		Action 1.1.2. **Promoting the TURQUM brand and supporting participation**	• Sectoral branding with quality standards certificate	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)
		Action 1.1.3 **Increasing awareness and diversity of consulting services for international brand identity development**	• Increasing international image and awareness • Increasing the capacity to export • Raising awareness of the need for coaching, mentoring and consultancy	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)
		Action 1.1.4. **Increasing the participation to Turquality program**	• Increasing international image and awareness • On company base, developing branding in the market, organization and brand management issues, strategically and export-focused	3-10 Years (Long Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.1.5. **Developing software with common user interface for Agricultural Machinery**	• Developing the brand identity of the companies in the region • Increasing customer communication and brand loyalty	3-10 Years (Long Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.1.6. **Developing the capacity to export with E-commerce**	• Developing international brand identity • Providing companies with the ability to export via e-commerce	3-10 Years (Long Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.1.7. **Raising awareness of the need for development-oriented HR in companies**	• Employing HR with the ability to develop international brand identity • Employing or training HR capable of exporting with e-commerce	3-10 Years (Long Term)	Meso Investment (>100 Million & <1 Billion TL)



Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 1: **NATIONAL AND REGIONAL STRATEGIES**	Strategy 1.2. **Fast completion of the transition to operational efficiency and lean production**	Action 1.2.1. **Awareness Raising Activities on Productivity**	• Understanding the operational efficiency potential • Understanding operational efficiency alternatives • Understanding alternatives of quality improvement studies	0-1 Years (Short Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.2.2. **Ensuring Company-Specific Operational Efficiency Analysis**	• Understanding the production methodology and creating development potential • Understanding cost-effective alternatives • Seeing the potential for improvement in productivity	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.2.3. **Ensuring that the Company-Specific Operational Efficiency Studies are Made in the Production Lines**	• Improvement in Production Methodology • Cost reduction (Labor, Consumables and Natural Resources) • Productivity improvement • Guidance, mentoring and practical lean trainings in the factory, especially Kaizen training	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.2.4. **Performing Company-Specific Energy Efficiency Analysis**	• Increasing awareness of energy costs in production • Cost reduction in energy, providing understanding of alternatives • Raising environmental awareness • Supporting the analysis of EVD companies, increasing participation in free analysis support	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.2.5. **Supporting Energy Efficiency Efforts**	• Reducing the energy cost share in production • Cost reduction (Labor, Consumables and Natural Resources) • Reducing the carbon footprint	3-10 Years (Long Term)	Mega Investment (>5 Billion TL)

Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 1: NATIONAL AND REGIONAL STRATEGIES	Strategy 1.3. **Training Strategic Human Resources**	Action 1.3.1. **Training Intermediate Staff, Putting Special Workshops for the Machinery Sub-Sector and Lessons Determined by the Industrialist in Vocational High Schools, Applying Internship Programs**	• Tracking qualified intermediate workforce from the first stage of education, training and monitoring in school and industry, and ensuring adequate and competent development, • Increasing the institutionalization levels of companies • Increasing HR competitiveness • Training operators who can use the machines produced in the region • Opportunity to anticipate labor deficits and take measures	3-10 Years (Long Term)	Meso Investment (>100 Million & <1 Billion TL)
	Strategy 1.4. **Focusing on alternative markets**	Action 1.4.1. **Helping Companies Take Advantage of Marketing Opportunities** **Designing, Collecting, Interpreting and Reporting Market Information**	• Awareness of Asia, Silk Road, RCEP (Regional Comprehensive Economic Partnership), Russia, South America and Africa Markets • Marketing awareness • Enabling companies to understand their position in international markets • Raising awareness of preparing a marketing plan and designing a roadmap	0-1 Years (Short Term)	Micro Investment (<100 Million TL)
	Strategy 1.5. **Developing intra and inter-sectoral co-operation**	Action 1.5.1. **Clustering Support and Developing Clustering Strategies for Existing and New Companies**	• Creating export and expansion opportunities • Determination of cluster location and organization • Setting up the necessary infrastructure • Cost reduction, increasing the attractiveness of the industry • Joint supply, sales, R&D and marketing training	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL))
	Strategy 1.6: **Providing financial support for export**	Action 1.6.1. **Ensuring that companies get the maximum benefit from Incentives and Supports in Marketing and Exports**	• Increasing entry to new markets abroad • Increasing the foreign marketing activities of companies • Increasing the brand image	3-10 Years (Long Term)	Mega Investment (>5 Billion TL)
		Action 1.6.2. **Regulating Buyer Financing Terms According to Competitors and Providing More Convenient Access to Financing**	• Defining a competitive grace period in buyer's credit • Long Maturities in buyer's credit • Cash loans, export creation, guarantees etc. under more favorable conditions • Increasing competitiveness	1-3 Year (Medium Term)	Mega Investment (>5 Billion TL)

Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 1: NATIONAL AND REGIONAL STRATEGIES	Strategy 1.7. Increasing of Localization	Action 1.7.1. Preparing the List of Imported Products on Provincial Basis for the Sector	• Identification of sector-based imported products to encourage the production of substitutes	0-1 Years (Short Term)	Micro Investment (<100 Million TL)
		Action 1.7.2. Ensuring the Understanding that Imported Products for the Sector Can Be Produced Locally	• Increasing the use of imported substitute products	0-1 Years (Short Term)	Micro Investment (<100 Million TL)
		Action 1.7.3. Ensuring the Understanding that Imported Products for the Sector Can Be Available Locally	• • Ensuring the production of imported substitutes	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)
		Action 1.7.4. Localization by Simplifying Imported Products	• Reducing the rate of imported products	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.7.5. Establishing a Company-Specific Localization Mechanism	• Accelerating the use of substitute products	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.7.6. Establishing Internal Supply Mechanisms	• Reducing import dependency on intermediate goods and facilitating the access of industry to alternative domestic producers	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 1.7.7. Modular Design of Food Machinery and Development of Domestic Suppliers for Modular Design	• Enabling customers to spend their increasing production capacity needs with lower investment and space usage. • Developing domestic production • Increasing customer loyalty	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)

Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 2: GLOBAL VISION DEVELOPING STRATEGIES	Strategy 2.1: **Adapting to innovative technologies**	Action 2.1.1. **Engaging in Industry 4.0 Awareness Raising Activities**	• Ensuring that the details of Industry 4.0 are understood • Internalizing the Industry 4.0 specific to each company and implementing alternatives specific to the company • Ensuring that the added value to be produced by the company with Industry 4.0 is recognized	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 2.1.2. **Making Sectoral Diagnostics Study and Industry 4.0 Needs Analysis**	• Ensuring that the details of Industry 4.0 are understood per company • Ensuring that Industry 4.0 is internalized and implemented on a company-specific basis. • Ensuring that the value-increasing effect of Industry 4.0 can be calculated.	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
		Action 2.1.3. **Increasing Value with Industry 4.0, Reducing Costs, Increasing Productivity (IoT, Autonomous Robots, Additive Manufacturing, Artificial Intelligence, AR, VR, Big Data, Machine Learning, etc.)**	• Increasing the added value • Developing competitive technologies • Responding to technology-based requests from customers • Providing customers with ease of use • Reducing costs, increasing productivity • Reducing the carbon footprint • Increasing the resilience of companies to crises	1-3 Year (Medium Term)	Mega Investment (>5 Billion TL)
		Action 2.1.4. Dissemination of Remote Access Technology in Food Machinery in the Region	• Ensuring transition to Industry 4.0 with the most suitable step • Increasing brand attractiveness with low investment in food machinery with Industry 4.0 support • Increasing the speed of responding to foreign customer demands and problem solving ability after sales	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
	Strategy 2.2: **Developing innovative production models in accordance with environmental policies**	Action 2.2.1. **Making Environmentally-Friendly R&D, Production and Establishing Organization, Transforming Production Processes**	• European Green Deal • Energy efficient production • Energy efficient product • Reuse of waste • Zero waste factory	3-10 Year (Long Term)	Mega Investment (>5 Billion TL)

Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 2: GLOBAL VISION DEVELOPING STRATEGIES	Strategy 2.3. **Optimizing operational processes with new technologies**	Action 2.3.1. **Increasing Awareness of the Digitalization of Processes with New Technologies**	• Ensuring that the details of Industry 4.0 are understood • Internalizing the Industry 4.0 specific to each company and implementing alternatives specific to the company • Ensuring that the added value to be produced by the company with Industry 4.0 is recognized	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)
		Action 2.3.2. **Analyzing Digital Transformation Opportunities in Processes**	• Ensuring that the details of Industry 4.0 are understood per company • Ensuring that Industry 4.0 is internalized and implemented on a company-specific basis. • Ensuring that the value-increasing effect of Industry 4.0 can be calculated.	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)
		Action 2.3.3. **Digitalizing Processes with New Technologies (Cloud Systems, Digital Twins, Digital Call Center, Digital Logistics, Virtual Fair etc.)**	• Increasing the added value • Reducing costs (Labor, Consumables and Natural Resources) • Increasing productivity • Reducing the carbon footprint	1-3 Year (Medium Term)	Mega Investment (>5 Billion TL)

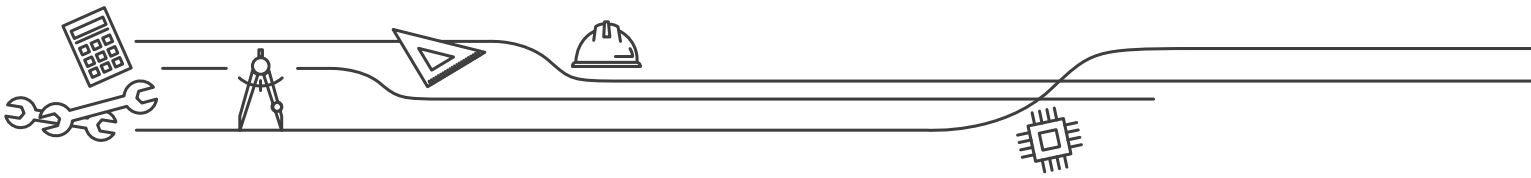
Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 2: GLOBAL VISION DEVELOPING STRATEGIES	Strategy 2.4. **Technology Transfer from Start-Ups**	Action 2.4.1. **Establishing a Special Incubation Center for the Food Machinery Sub-Sector**	• Strengthening the Food Machinery Sector • Creating a company for needs • Better fulfillment of supply • Technological product and process supply	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
	Strategy 2.5. **Establishing a joint after-sales organization abroad**	Action 2.5.1 **Reducing the Need for abroad Sales and Aftersales Structuring by Using New Technologies Specific to the Food Machinery Sector**	• Increasing exports • Increasing customer satisfaction • Increasing the brand image • Reducing after sales costs	1-3 Year (Medium Term)	Meso Investment (>100 Million & <1 Billion TL)
	Strategy 2.6. **Increasing the Number of R&D Centers in the Sector**	Action 2.6.1. **Increasing the Number of R&D Centers in the Sector in the Region**	• Creating the R&D infrastructure for the company by taking advantage of the existing state support • Accelerating sectoral technology development • Creating R&D infrastructure	3-10 Years (Long Term)	Mega Investment (>5 Billion TL)
	Strategy 2.7 **Increasing the Number of Design Centers in the Sector**	Action 2.7.1. **Increasing the Number of Design Centers in the Food Sector in the Region**	• Creating the R&D infrastructure for the company by taking advantage of the existing state support • Accelerating sectoral technology development • Creating R&D infrastructure	3-10 Years (Long Term)	Meso Investment (>100 Million & <1 Billion TL)

Main Strategy	Sub Strategy	Action	Explanation	Term	Estimated Budget [TL]
Strategy 3: REGIONAL STRATEGIES	Strategy 3.1. **Training Strategic Human Resources**	Action 3.1.1. **Provision of On-the-Job Training Services to Senior Company Employees and Company Owners** (Especially Family Constitution, Institutionalization and Financial Literacy Trainings)	• Capacity building • Increasing the institutionalization levels of companies • Increasing HR competitiveness • Vision and values	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)
		Action 3.1.2. **Developing Social, Economic and Cultural Infrastructures to Keep Strategic and / or Qualified Human Resources in the Region**	• Keeping or attracting strategic and / or qualified HR in the region • Increasing strategic and qualified HR training capacity	3-10 Years (Long Term)	Meso Investment (>100 Million & <1 Billion TL)
	Strategy 3.2. **Focusing on alternative markets**	Action 3.2.1 **Designing the Necessary Actions for the Selected Markets and Segments for the Food Machinery Sector and Sharing them with the Companies in the Sector**	• Marketing according to company and market dynamics • Determination of target positions for companies in national and international markets • Draft marketing plan and roadmap design	0-1 Years (Short Term)	Micro Investment (<100 Million TL)
		Action 3.2.2. **Determining Empty Segments in Food Machinery Market, if any, and Making Product Definition according to These Segments**	• Increasing market share with current technology and production competence • Filling the segments where there are no competitors • Increase profitability	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)
	Strategy 3.3. **Developing intra and inter-sectoral cooperation**	Action 3.3.1. **Cooperating with Food and Medical Sectors**	• Developing hybrid technologies and products with primarily Food and Medical sectors • Accelerating technological adaptation and staying up-to-date through collaborations to be established with the software industry	1-3 Year (Medium Term)	Micro Investment (<100 Million TL)

9. TRC1 Region Machinery Sector Analysis Summary

TRC1 Region Machinery Sector Analysis Summary
THE MOST IMPORTANT STRENGTHS OF TRC1 REGION
Strong structuring and export competence in the Food and Textile Machinery sector
International branding and recognition in food machinery
Strong manufacturer position and industry awareness
Competence to develop added value with customer-oriented innovation
MAIN STRATEGIES FOR INCREASING INTERNATIONAL COMPETITIVENESS FOR TRC1 REGION
Branding and enhancing the country image
Structuring R&D organizations in the region to increase R&D capability of SMEs in developing applications for the industry
Supporting and increasing localization
Focusing on competitive products with high added value and high return with Industry 4.0
Developing abroad after-sales services to increase customer satisfaction and sales
Ensuring that customer-oriented innovation is embedded in the company culture
MAIN STRATEGIES FOR INCREASING INTERNATIONAL COMPETITIVENESS FOR TRC1 REGION
Increasing the effectiveness and awareness of TURQUM
Increasing the participation of Food and Textile Machinery sector representatives to TURQUALITY program
Extending the use of modular design in food machinery production throughout the region
Implementing technology transfer and training activities to increase added value in production with Industry 4.0 and Digitalization
Dissemination of remote access technology, which started to be used in Food Machinery produced in the region, to manufacturers throughout the region
Following up customer demands regularly and in a distribution of responsibilities. Reporting and standardizing innovative solutions developed based on these demands

10. Conclusion and Evaluation



As the first shock was experienced due the Covid-19 Crisis, the cash flows of companies were disrupted and the policies and practices aimed at solving this problem enabled companies to survive financially. However, the crisis has shown that companies that can react to the crisis and change operationally, much more than surviving, have found new customers and increased their sales during the crisis period. These companies are the ones that respond quickly to customers, realize customer demands with innovation, and easily adapt these innovations to their production and meet customer expectations with new products, these are, companies that are resilient against crisis.

Certain strategies have been developed and policy recommendations have been made in order, for all companies in the sector to gain these characteristics. Moreover, although these strategy and policy suggestions were methods foreseen before the Covid-19 Crisis, the crisis clearly revealed the necessity of these methods in order to catch up with the new industrial revolution.

In TRC1 Region, the Covid-19 Crisis, which manifested itself in the form of exchange rate fluctuations, travel restrictions and problems in raw material production, consequently caused companies to experience cash flow shortages. The problems have been alleviated by using loans to overcome cash shortages and government subsidies such as short-time work allowance and thus the companies took a deep breath and stepped out of the crisis. However, as the travel restriction could not be exceeded for the delivery of the orders, the control process was carried out by inspectors, but still they were left with the finished product stock due to the high number of customer orders. Although this situation delayed the exit from the crisis, there was an increase in demand for food and textile machinery after the crisis. With this increase in demand, the opportunity to reach a safer point from the crisis has been created by conditioning the new orders in accordance with the crisis period. Briefly mentioned, this management style and flexibility in production have been the formula of providing both sufficient and fast response to customer demands in the TRC1 Region.

Strategies developed in conjunction with the Covid-19 Crisis and will be developed afterwards should include both innovative and self-renewable solutions and enable local industries to switch from low-medium value-added to high-value-added and efficient production, and make it sustainable.

The machinery sector companies in TRC1 Region have a common awareness that supports continuous development and innovation regarding the need for change and the necessary sectoral transformation, as is the case with all Turkish Machinery sector stakeholders. This awareness is the most important reason for the development of the Machinery Sector, which is a strategic sector for our country, to look at the future with hope. Sectoral development, which must be completed and then constantly renewed in acyclic manner, should be supported by professional management and qualified employees via going forward in exports. In order to start or progress in this transformation cycle, it is necessary to manage digital transformation, and ensure the transition to technology-based production with high value addition.

The proposed policies to achieve these goals, short, medium and long-term strategies, sub-strategies and actions under sub-strategies are shared in the relevant sections. Actions within the sub-strategies are arranged in accordance with the industrial structure and requirements of the region specific to TRC1 Region.

As a result, in order to complete this transition as soon as possible, the most important Policies and related Strategies proposed for TRC1 Region are summarized below. Strategic actions may vary by region and are shared in detail in the relevant section.

Policy Recommendations

1. Increasing Exports

1. Performing efforts to improve the image of Turkey and Turkish goods
2. Support for strengthening the image of Turkish machine brands
3. Providing logistic support in maritime and rail transportation of exports
4. Allocating more resources for buyers' credit and receivables insurances and providing 5-6-7-year loan opportunities in Eximbank. Applying competitive interest rates for the machinery sector on buyer credit by Eximbank compared to rival banks

2. Increasing R&D Structure

1. Establishment of institutes developing R&D for SMEs.
2. Continuing to encourage R&D and design centers

3. Directing SMEs to efficiency increasing activities

1. Model factories giving practical lean production training in the workshops of SMEs
2. Promoting result-oriented lean practices and consultancy services on the production line

4. Promoting Environmental Regulations

1. Activating energy efficiency incentives for SMEs
2. Preparing policies for harmonization with the European Green Deal

5. Developing Human Resources

1. Conducting comprehensive training organizations to increase the technical capacity of companies on e-commerce, Export / Import, Management, Human Resources, Market Research, Customer Relationship Management, Purchasing, Marketing and Sales, Digital Marketing, Intellectual Property, Design, Language.
2. Regional differentiation of the coordination between vocational, technical high schools and industry, based on the sub-sector

Suggested Strategies for TRC1 Region

1. Making a Move Towards Branding
2. Fast completion of the transition to operational efficiency and lean production
3. Optimizing operational processes with new technologies
4. Focusing on alternative markets
5. Developing intra and inter-sectoral cooperation
6. Leaving the follower status in technology and producing more innovative products
7. Technology transfer from start-ups
8. Adapting to innovative technologies
9. Establishing a joint after-sales organization abroad
10. Providing financial support for export
11. Development and supporting of export transport
12. Developing innovative production models in accordance with the new regulations

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Annexes

Annex.1 TRC1 Machinery Sector Focus Group Participant List

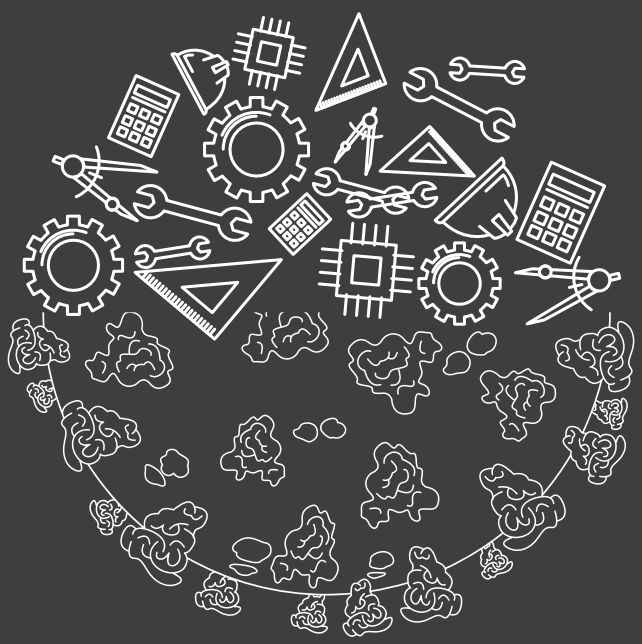
Name/Surname	Organization
İrfan CANÖZLER	Gaziantep Chamber of Industry
Bünyamin KAHRAMAN	Gaziantep Technopark
Nursel IŞIL	Hasan Kalyoncu University
Aydın KUTLU	Southeastern Anatolia Exporters Union
İlke ÖZKILIÇ EZİCİ	Southeastern Anatolia Exporters Union
M. Murat SAKAR	Kilis Chamber of Commerce and Industry
Elif ŞAHİN	ÇİLTUĞ Heatery
Barış ÖZPOLAT	ÖZPOLAT Machinery
Eray TAN	TANIŞ Milling
Halil İbrahim ÜNLÜ	İKA
Mehmen Emin ÖZSAN	Ministry of Industry and Technology
Arzu KARAASLAN	UNDP
Tamer ÖZTİN	FSR Project Team Leader
Gürol AK	FSR Machinery Sector Specialist

Annex.2 TRC1 Machinery Sector Working Group Participant List

Name/Surname	Organization
Sn. Ahmet Alıcı	Coordinator / Expert, T.C. Ministry of Industry and Technology
Sn. Onur Karakurt	Coordinator / Expert, T.C. Ministry of Industry and Technology
Sn. Z. Tuğba Şavlı	Investment Support Expert - Ankara Development Agency
Sn. Halil İbrahim Ünlü	Expert – İKA
Sn. Zehra Betül Pekergin	Expert – MEVKA
Sn. Tuğba Purtul	Investment Support Expert – OKA
Sn. Arzu Karaaslan Azizoğlu	Inclusive and Sustainable Growth Portfolio Local Socio-Economic Development Specialist, UNDP Turkey
Sn. Aslı Aygün	Inclusive and Sustainable Growth Portfolio Project Assistant, UNDP Turkey
Sn. Cemre Arcak	Inclusive and Sustainable Growth Portfolio Project Intern, UNDP Turkey
Sn. Tamer Öztin	Fragile Sector Analysis Team Leader, UNDP Turkey
Sn. Cihat Gök	Fragile Sector Analysis Sector Analyst, UNDP Turkey
Sn. Gürol Ak	Fragile Sector Analysis Machinery Sector Expert, UNDP

Annex.3 TRC1 Machinery Sector Working Group Meeting Schedule

Sector	Date, Meeting Hour
Meeting 1	
Machinery (4 regions)	3 December 2020, 14:00 – 15:30
Meeting 2	
Machinery (4 regions)	17 December 2020, 14:00 – 15:30
Meeting 3 (Changed due to New Year)	
Machinery (4 regions)	4 January 2021, 14:00 – 15:30
Meeting 4	
Machinery (4 regions)	14 January 2021, 14:00 – 15:30
Meeting 5 (Draft Report)	
Machinery (4 regions)	28 January 2021, 14:00 – 15:30
Meeting 6 (Draft Report)	
Machinery (4 regions)	4 February 2021, 14:00 – 15:30
Verification Meeting	
Machinery (4 regions)	18 February 2021, 14:00 – 15:30



COVID-19 Crisis Response
and Resilience Project

MACHINERY SECTOR ANALYSIS REPORT and GUIDELINES

TRC1 REGION