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Turkey Resilience Project in
Response to the Syria Crisis (TRP)

Sectoral Roadmaps: **Plastic Sector in Turkey**

UNDP

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Designer: Arzu Çelik

Turkey Resilience Project in Response to the Syria Crisis (TRP)

JOB CREATION COMPONENT

2020

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1

Development of the Plastics Sector

1.1 Production and Developments in the Sector

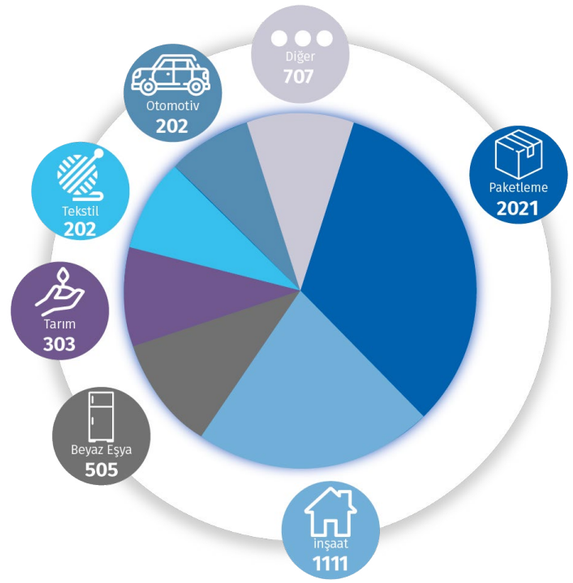
Plastics are materials that have many uses in everyday life. They are also the driving force of many national economies. They serve multiple functions in the chemicals industry. As mineral oils are the main raw materials for plastics, they are also considered to be a part of the petrochemicals industry. The plastics sector in general functions as a sector that supplies by-products to many other sectors.

In terms of production, Turkey is the second largest producer in Europe and the seventh largest producer in the world. In line with the use of technology, the number of companies that compete in the global market is continuously increasing. By 2023, Turkey aims to achieve USD 17 million worth of plastics exports out of the USD 50 million worth of exports foreseen for the chemical industry as a whole.[2]

The plastics sector creates high value in the value chain and contributes to socio-economic development. When transformed into a plastic product, the value of a ton of crude oil can increase to USD 1,600-1,900. The plastics sector supplies products to sectors such as automotives, agriculture, domestic appliances, electronics, textiles and construction. The development of these sectors also contributes to the plastics sector.

As can be seen in Figure 1, the packaging and construction sectors are the two main sub-sectors, accounting for 40% and 22% of plastic usage respectively.

Figure 1. User Shares in the Plastics Sector



[2] Plastics Industry Report, 2018 PAGDER

Plastics production in Turkey has developed over the years as shown in the table below:

Table 1: Plastic Materials Production in Turkey

Year	(Million tonnes)	(USD million)
2012	7.6	31.1
2013	8.3	35.2
2014	8.3	35.2
2015	8.6	32.8
2016	8.9	33.8
2017	9.6	36.8
2018	10.5	40

Source: TURKSTAT, PAGEV

Since 2012, Turkey's plastic materials production has increased by 38.2% from 7.6 million tonnes to 10.5 million tonnes (since 2018 it has increased by 5.5%). In line with this, the production value in dollars has increased by 28.5%, from USD 31.1 million to USD 40 million.[3]

The physical volume of production has increased to match the increase in domestic demand from various sectors, the growth of sectors making use of plastics domestically, and the increase in direct or indirect exports. In recent years, in line with the sharp fall in global crude oil prices, raw material costs have decreased. However, due to the depreciation of the Turkish lira against the US dollar, the decrease in raw material costs has not benefited companies in the sector. Prices and earnings in dollars have also been affected by the increase in foreign exchange rates.

1.2 Enterprise Analysis in Turkey and the Project Area

Enterprises in the project area account for 25% of the enterprises in the plastic packaging products group in Turkey, which is higher than any other region of the country. The project area also accounts for 15% of the market in pliofims, plastic films, pipes and plastic profiles. Among the registered businesses in the sector in the region, as many as 42% are engaged in the manufacture of plastic packaging products. Companies producing pliofilms, plastic films, pipes and plastic profiles follow with 26%.

The table below shows the labour force distribution in the project area and throughout Turkey for enterprises producing plastic packaging products.

Table 2: Labour Force Distribution of Enterprises by Location

	No. of Enterprises	No. of Engineers	No .of Technicians	No. of Foremen	No. of Workers	No. of Administrators	Total personnel number	Personnel per Enterprise	Percantage of Engineers and Technicians in the Labour Force
GAZİANTEP	91	129	122	313	4,485	685	5,734	63	5%
ADANA	74	47	60	167	1,966	270	2,510	34	5%
MERSİN	61	49	70	140	1,340	228	1,827	30	7%
HATAY	24	19	10	83	393	82	587	24	6%
KİLİS	2	0	0	2	12	4	18	9	0%
Total Project Provinces	252	244	262	705	8,196	1,269	10,676	42	5%
Other Provinces	741	996	1,160	1,934	22,651	3,943	30,684	41	8%
Turkey Total	993	1,240	1,422	2,639	30,847	5,212	41,360	42	7%
KOCAELİ	56	142	120	218	2,312	485	3,277	59	9%

As can be seen from the table, the sector is shaped by the dominance of small enterprises with 42 personnel per enterprise both in the project area and in Turkey. Among the project provinces, Gaziantep has the largest average enterprise size with 63 employees on average.

Labour force quality is another important benchmark when studying plastic packaging, as one of the sector's most important product groups in terms of adding competitiveness value to the sector. The percentage of skilled employees (engineers and technicians, not including administrative personnel) within the total productive labour force is used as a measure of labour force quality. Within the project area, the average proportion is 5%. This compares to 8% for other provinces and 7% in Turkey as a whole. The figure for Kocaeli is 9%. In short, the quality of the labour force for plastic packaging is lower in the project area than in other areas of Turkey.

[3] Turkey Plastics Sector Monitoring Report, 2018/6, PAGEV

The table below shows the quality of the labour force for companies in pliofilms, plastic films, pipes and profiles.

Table 3: Labour Force Distribution in Pliofilm, Plastic Film, Pipe and Profile Producers

	No. of Enterprises	No. of Engineers	No .of Technicians	No. of Foremen	No. of Workers	No. of Administrators	Total personnel number	Personnel per Enterprise	Percantage of Engineers and Technicians in the Labour Force
GAZİANTEP	74	181	263	330	5,144	685	6,603	89	8%
ADANA	41	99	71	190	2,286	418	3,064	75	6%
MERSİN	20	29	47	49	590	131	846	42	11%
HATAY	16	13	7	24	165	39	248	16	10%
KİLİS	2	1	0	3	14	2	20	10	6%
Total Project Provinces	153	323	388	596	8,199	1,275	10,781	70	7%
Other Provinces	863	1,895	2,356	3,923	41,231	8,093	57,498	67	9%
Turkey Total	1,016	2,218	2,744	4,519	49,430	9,368	68,279	67	8%

With 70 personnel on average, enterprises in the project provinces look like medium-sized companies. At 89 personnel per enterprise, Gaziantep has the largest companies. The average proportion of qualified employees is 7%, which is lower than the 9% average of other provinces.

1.3 Plastics Sector Exports

Between 2015 and 2018, exports of plastic products increased from 1.5 million tonnes to 1.7 million tonnes. The value of exports in 2016 was 6% lower than in 2015, but in 2017 it picked up again, rising by 8.9%. Non-cellular pliofilm, covers, films, foils and tapes account for the largest share of exports by value, with 23%. They are followed by plastic products used for packaging, plugs, lids and other plastic coverings, with 21%.

Table 4: Average Export Prices As the table shows, export prices have fallen for all product groups except hoses and pipes. The decline is linked to recent falls in the costs of oil and raw materials. The downstream demand for plastic construction materials is linked to global construction investments.

		2015	2018
GTIP	Amount: 000 tonnes Value: USD million	USD/tonne	USD/tonne
3916	Monofilaments, rods, poles and profiles	1,900.06	1,675.35
3917	Pipes, hoses, plastic fittings	2,535.31	2,617.76
3918	Floor covering, wall covering, ceiling cladding	2,013.61	2,000.00
3919	Plates, covers, films, foils, tapes and other flat products	5,948.45	4,994.87
3920	Plates, covers, films, foils, tapes made of non-cellular plastics, non-reinforced, lined	2,701.92	2,536.18
3921	Plates, covers, films, foils, tapes, reinforced, lined	2,999.22	2,805.50
3922	Plumbing equipment made of plastics, baths, shower trays, sinks, kitchen sinks, bidets, toilet bowls, seats, covers, flush tank and sanitary equipment	4,415.64	3,954.55
3923	Plastic materials for packaging and transporting goods, plugs, lids and other covering materials	2,495.22	2,486.33
3924	Tableware, kitchenware, other home appliances and hygienic or toilet products	3,110.61	2,749.84
3925	Plastics; construction tools	2,482.63	2,639.43
3926	Plastic products and other materials	5,106.26	4,895.17
	All product groups	2,753.09	2,655.85

As the table shows, export prices have fallen for all product groups except hoses and pipes. The decline is linked to recent falls in the costs of oil and raw materials. The downstream demand for plastic construction materials is linked to global construction investments.

1.4 Procurement of Raw Materials in the Plastics Sector

Procurement of Raw Materials

The raw materials used for plastic products are polyethylene (PE), polypropylene (PP) and polyvinyl chloride (PVC). The levels of domestic consumption are given in Table 5.

Table 5: Domestic Consumption of Plastics Raw Materials

Year	Production (tonnes)	Imports (tonnes)	Exports (tonnes)	Domestic Consumption (tonnes)	Net Generation / Domestic Consumption	Import / Domestic Consumption
2014	545.511	4.289.520	127.423	4.707.608	9%	91%
2015	629.000	4.375.000	94.444	4.909.556	11%	89%
2016	651.200	4.489.027	71.908	5.068.319	11%	89%
2017	646.000	4.810.000	163.000	5.293.000	9%	91%
2018	678.000	4.958.000	74.836	5.561.164	11%	89%

Source: PAGDER and PAGEV2,3

The table reveals a high levels of dependency on raw materials imports. This dependence on imports may be reduced by a new petrochemicals investment in the Ceyhan area.[4]

In terms of competitive pricing, dependency on raw material imports causes the following problems:

- Fluctuation of exchange rates makes pricing difficult and can lead to losses in sales.
- Customs duties levied on imports from countries outside the EU increase product costs.

[4] Raw Material Dependency Analysis Report, 29.08.2017, PAGDER

2

Value Chain Analysis

The main findings of the Value Chain Analysis are as follows:

- Domestic Logistics: Raw material dependency, exchange rate risks
- Operations: R&D and process innovation is insufficient, technological development is limited
- International logistics: No problems
- Sales and Marketing: No fundamental problem, but there is a need for better trained and multilingual personnel for exports
- After Sales Services: Customer satisfaction is tracked, problems are solved

The main weaknesses of the sector in the project region were found to be: pricing, dependence on raw materials imports, recent increase in capacity, the weight of standard products, and prioritized price competition.

Findings in operation, technology, R&D and product design are as follows:

- The customer is the driving force in product development.
- Aspirations to develop new machinery and technology are limited.
- Cooperation and vertical integration are limited.
- R&D and innovation are not institutionalized.
- Process innovation is limited. While medium-sized enterprises may aspire to innovation, the availability of qualified personnel is limited.
- There is a need for R&D and Innovation centres.

The findings of the Value Chain Analyses are summarized below:

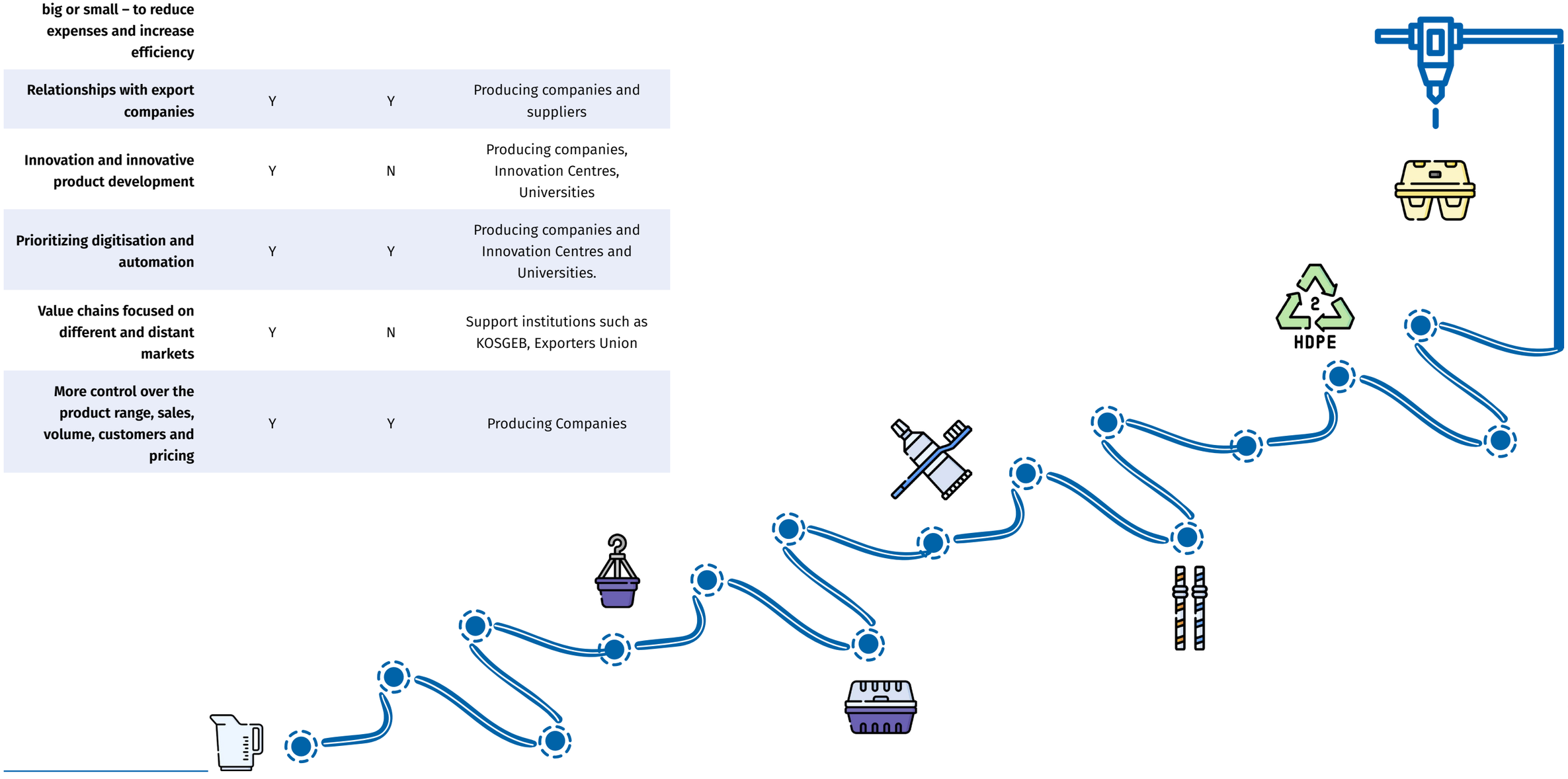
Table 6: Findings of the Value Chain Analyses

Limitations observed in value and supply chains and how these prevent development/ exports/ growth /competitiveness	Is it a critical drawback? (Y/N)	Can it be solved in the short term? (Y/N)	Who in the supply chain is responsible for the solution?
Smooth operation of primary activities, with integrated marketing	**Y**	**N**	**Producing Companies – Distributors and Retailers**
Post-production skills such as marketing and branding, using marketing to make products more desirable	Y	Y	Producing Companies and Suppliers
Production being low-technology and conventional	Y	N	Producing Companies and Technology Development Centres, Innovation Centres, Universities and opinion formers
Information flow and cooperation between producers, factories, merchants and retailers in terms of trade productivity and trade innovation.	Y	N	Producing companies – Distributors and Retailers
Lack of desire and skills to increase value added products and product innovation	Y	N	Producing Factories, Innovation Centres
Lack of branding within the Industry	Y	N	Producing Factories and Suppliers
Operation and transportation costs	N	N	Producing Companies
Bonds between companies and supporters should be strengthened	N	N	Producing Companies and Suppliers
Better access to financing	Y	N	Producing Companies and Suppliers
Human capital should be a more critical factor for competitiveness. In order to climb up the value chain, skill and labour force development are necessary.	Y	Y	Producing Companies and Vocational Schools, Innovation Centres and Consultants.
Lack of qualified personnel	Y	Y	Producing Companies and Suppliers
Lack of qualified and skilled engineers	Y	Y	Producing Companies and Suppliers
Lack of technicians	Y	Y	Producing Companies and Trade Schools
Interior and exterior design skills	Y	N	Producing Companies and Suppliers
Technological skills, mechanisation and automation	Y	N	Producing Companies and Technology Development Centres, Universities and Consultants

Limitations observed in value and supply chains and how these prevent development/ exports/ growth /competitiveness	Is it a critical drawback? (Y/N)	Can it be solved in the short term? (Y/N)	Who in the supply chain is responsible for the solution?
Insufficient management systems	**Y**	**N**	**Producing Companies, Consultants**
Lack of business support services	Y	N	Technology Development Centres, Universities
Standardization of supplies	H	N	Suppliers
Input and output analyses	Y	N	Producing Companies and Suppliers
Standardization of production	Y	N	Producing Companies
Lack of financial support for exports	Y	N	Financial Services
Lack of financial alternatives for sales	N	N	Producing Companies
Bonds between companies and supporters should be strengthened	Y	Y	Financial Services and related groups
Dependency on imported input and need for domestic raw material production	Y	Y	Petro-chemical Industry Producers, Suppliers Producing PP, PE and PVC, Policymakers, Banks
Lack of Financial Development Programmes	Y	N	Financial Services

Opportunities and necessary actions determined in the value chain	Is it a critical opportunity? (Y/N)	Short term Benefit (Y/N)	Who is responsible for the solution?
Focusing on demand pull instead of supplier push	**Y**	**Y**	**Producing Companies**
Product Development Incentive to produce products which can respond to trends in the target market	Y	Y	Producing Companies and Technology Development Centres.
Assessment exercises regarding infrastructure, skills and capacity	N	Y	Technology Development Centres and Universities
Use of modern marketing methods and ensuring the brand is perceived as valuable by the users	Y	Y	Producing companies and service providers
Developing current products to gain higher benefit and efficiency for better pricing and customer experience	N	Y	Producing Companies and Innovation Centres
Tracking technological development and research into machines to be used in the sector	N	N	Producing Companies
Establishing clusters at regional and national levels to create cooperation and synergy instead of competitiveness	Y	N	Producing companies and suppliers, policy makers

Making sub-supply, sub-product and sub-sales in order to create more competitive advantage. Opportunities for market value chain shareholders– big or small – to reduce expenses and increase efficiency	Y	N	Producing companies and suppliers
Relationships with export companies	Y	Y	Producing companies and suppliers
Innovation and innovative product development	Y	N	Producing companies, Innovation Centres, Universities
Prioritizing digitisation and automation	Y	Y	Producing companies and Innovation Centres and Universities.
Value chains focused on different and distant markets	Y	N	Support institutions such as KOSGEB, Exporters Union
More control over the product range, sales, volume, customers and pricing	Y	Y	Producing Companies

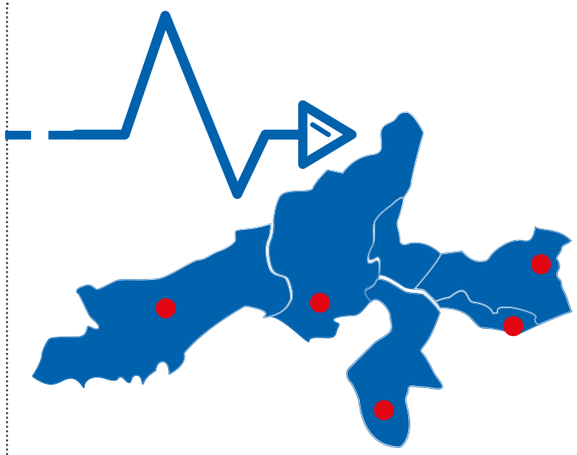


3

Field Work Findings

3.1 Results of Meetings

Companies in Gaziantep, Adana, Mersin, Kilis and Hatay were visited to examine the sector dynamics:



Marketing

When enterprises were asked about the issues they experience in marketing:

- The high input prices and demand changes on the market were the highest rated response for 26% of companies.
- Lack of loans for inputs and the difficulty in setting market prices in relation to input prices was the second most common response, given by 16%.

Human Resources

University graduate employees form between 5% and 30% of the personnel of companies in the region, with significant variation between enterprises. The proportion of employees who speak foreign languages is low for all businesses, ranging from 2% to 9%. The proportion of engineers ranges from 2% to 12%. These findings demonstrate the importance of training the labour force for supporting change in the project provinces.

Companies were also asked about their approach to employing Syrians in the workplace: 56% said they could fill vacancies with Syrians. Only four companies employed Syrians and among them, one was a primary school graduate, one had a secondary education and two had tertiary education.

Corporate Capacity

The companies were asked what positions were hard to fill. Their responses indicated that technicians were hardest to find, with 33%, followed by operators with 19%.

Operational Skills and Technological Performance

Companies were asked about the main problems they face in the global market in terms of competitiveness. Low product quality stood out as the most important factor, followed by challenges in reaching distribution channels and insufficient international demand for the sector's products followed.

Companies were also asked about operational risks. The primary risk in operations turned out to be price-sensitive demand, with 29%, followed by lack of sufficient technology and strong competition, with 19%.

When enterprises were asked what percentage of their sales revenue goes towards R&D and innovation, 50% said they set aside 0-10% for those purposes while 20% allocated 20-30%. These data indicate point to limited willingness to set aside budgets for R&D and innovation.

The responses given by the companies when asked about their innovation performance were as follows:

Table 7: Innovation Performance

	Yes (%)	No (%)
Private, official innovation, new product development strategy	67	33
Development of production flexibility in the last 3 years	100	0
Development of product quality in the last 3 years	56	44
Development of a product line	78	22
Development of a new product line	56	44
Official innovation process	67	33
Full time leader for innovation projects	22	78
R&D and Innovation budget	22	78
Innovation activities among teams	22	78
New process in the last 3 years	56	44
Some projects include people from different departments or subsidiaries	33	67
Risk appetite in new technologies	33	67
Digital technology in product innovation	0	100
Fast, innovative adaptation to change	89	11
Real time data in decision making	11	89
Remote access to all production information	22	78

Some significant points from the innovation performance survey are:

- 78% of respondents had enlarged product lines while 56% had set up new product lines.
- 22% have a leader and budget devoted to innovation.
- 33% had taken a risk on new technology.

3.2 Gaziantep Plastics Sector Workshop Findings

The findings obtained during the plastics sector workshop carried out in Gaziantep have been gathered together in the form of a SWOT analysis. The challenges discussed at the workshop were as follows:

Production

1. Logistics: Transport to Gaziantep is difficult and costly
2. Lack of qualified personnel
3. Training of semi-skilled workers, which lags global standards
4. Insufficiency of physical infrastructure (especially in shoe production)
5. Lack of personnel training

Exports

1. Lack of branding
2. Product quality issues
3. Lack of access to foreign markets
4. Inability to export to the Damascus area for safety reasons
5. Lack of personnel who can speak another language
6. Difficulty in exporting to customs unions which Turkey is not a part of; customs duty problems stemming from customs unions (especially in exports to Russia, Kyrgyzstan and Uzbekistan)
7. Inability to ensure standardisation of production of plastic in contact with food (BRC certificate)
8. Inability to develop products in line with EU regulations (REACH tests)

Raw Materials

1. Low number of companies producing raw materials
2. Transport costs
3. Challenges in the transport of petrochemicals
4. Exchange rate risks
5. Customs duties
6. Customs duty base prices

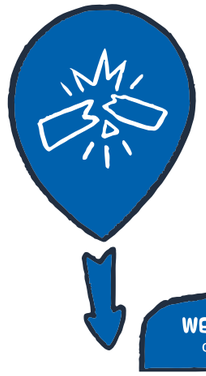
Technology

1. Low number of machinery companies able to produce technology
2. Outsourcing of machine repair and maintenance, which is costly and time consuming
3. High space, personnel and laboratory costs
4. Lack of R&D innovation centres open to joint tenancy
5. The fact that official support extended for R&D is aimed at medium sized companies employing at least 15 engineers

The Swot analysis derived from the sectorial road maps and analysis conducted during the workshop in Gaziantep is given below:

STRENGTHS of the Sector

- Long term record and local experience in production in the project area
- Low labour costs in the area
- Market experience from neighbouring markets
- Proximity to export markets that demand goods produced in the area
- Flexibility in meeting customer demands



WEAKNESSES of the Sector

- Lack of qualified human resources, especially lack of qualified technicians
- Insufficient human resources training within the companies
- Lack of personnel who can speak multiple languages
- Small-sized companies being unaware of the tools that can help them access export markets
- Dependency on imported raw materials resulting in exchange rate risks
- Dependency on imported machinery and equipment makes it hard to adjust or change machines
- Physical insufficiency in some production units such as shoe production
- Although branding exists at the domestic level, there is no branding strategy for export markets
- Lack of R&D personnel, laboratories and innovation for value-added products especially in small-scale companies
- Price competition at the local level
- Inability to recognise new and niche product opportunities
- Lack of university-private sector cooperation
- Lack of training opportunities especially for polymers
- Lack of vertical cooperation in the value chain in order to improve the products

S W O T

Table 8: SWOT Analysis

OPPORTUNITIES in the Sector

- Opportunities to produce high added-value products in sectors such as medical products and defence
- Demand for recyclable plastic products creates new market opportunities in some foreign markets
- Investments made in PP raw material production might reduce raw material dependency
- Support provided for new design centres such as GETHAM to develop technology
- Government's positive approach to opening R&D centres, and opportunities for small-scale businesses to open R&D and innovation centres
- High dependency on imports also brings opportunities for investments in raw material production
- R&D projects supported by TUBITAK and KOSGEB widen horizons of companies during new product development processes
- Automation and digitalization providing sectoral support with respect to Industry 4.0
- Turkey's membership of the Horizon 2020 programme can provide funding for recycling projects

SWOT

Table 8: SWOT Analysis

THREATS in the Sector

- Global consumer consciousness towards some plastic products; limited markets for some plastic products
- Some consumers are seeking alternative products such as glass bottles, putting competitive pressure on plastic products
- Frequent power cuts can cause serious losses in production
- Economies created by Industry 4.0 in developed countries might put competitive pressure on the plastics sector in developing countries
- Fragile foreign exchange market leads to significant pricing risks in the import-dependent sector

4

Future Scenarios

Changing customer behaviour and innovative developments are posing challenges and generating exciting opportunities for the plastics sector. The most distinct trends can be listed as follows[5]:

Four expected trends in the plastics sector

- **Specialisation:** Since most producers offer products that have specific uses, they will tend to be small.
- **Greater use of plastics:** The growth of the industry will be supported by increased use of plastic in high-growth industries such as construction, automotives, aviation and electronics. Plastics are lightweight, durable, airtight, rot-proof, cheap materials that can be transformed into multiple products.
- **Innovation:** Companies are finding new fields of use for plastics and producing plastics with new physical properties that make them suitable for new fields of use.
- **Environmentalism:** Fear of causing harm to the environment will lead to an increased focus on biodegradable plastics made from sustainable materials.

Four challenges the plastics sector will face

- **Seasonal demand:** Some plastic products are subject to seasonal demand. For example, vinyl producers stock up in the first half of the year for the spring and summer seasons.
- **Shortened product life cycle:** Product life cycles have shortened to months rather than years, with consequences for the entire plastic product supply chain. Obtaining rapid feedback on customer preferences will be critical for plastics companies seeking to remain competitive.
- **Raw materials prices:** Since plastics are usually made of petroleum products, the price and availability of raw materials depend on the prices of these resources. Producers may need to overcome price fluctuations caused by changes in oil prices.
- **Environmental concerns:** Since the use of plastic products contributes to environmental damage, producers will be subject to tighter regulations with regard to the production, disposal and cleaning of dangerous chemicals.

[5] Turkey Plastics Sector Developments and Prospects, Barbaros Demirci

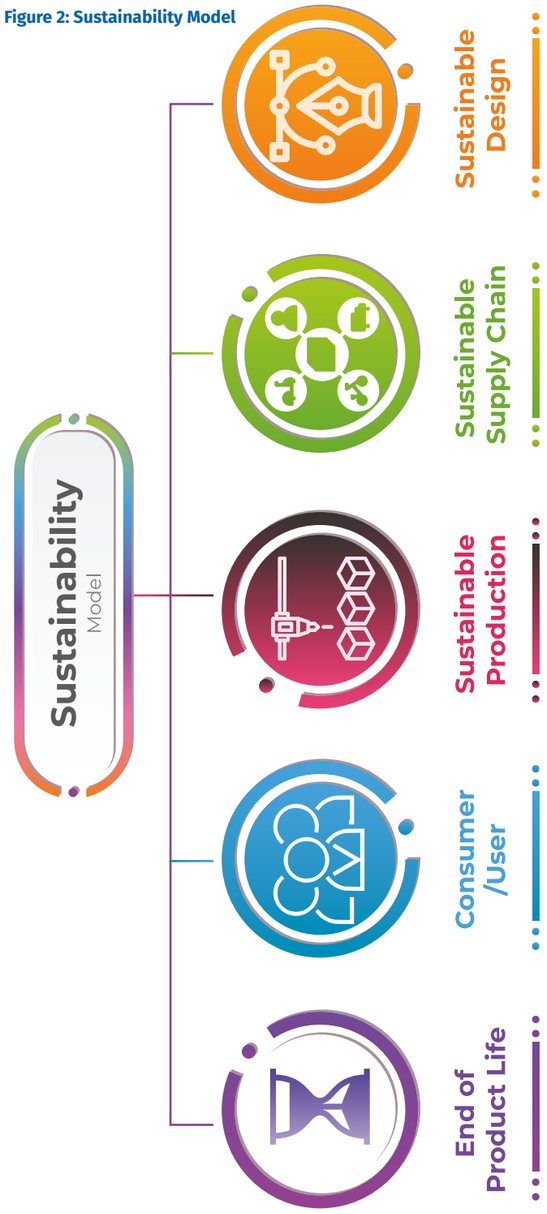
An environmentalist programme for the plastics sector

Significant changes are expected in the plastics sector with respect to consumer trends, environmental factors and the efficient use of resources. As in other industries, product design is continuously gaining importance. Products will need both to comply with design parameters (specifications, human health, respect for nature) and to ensure ease of use.

Sustainable structures will need to be targeted at all stages of production and distribution from the raw material to the finished product. Competitiveness will depend on finding the ideal balance between product inputs and outputs. Planning all aspects of production and raising the quality of human resources will contribute directly to producers' competitive strengths and support a strategy of managerial innovation.

The main focal point for plastic products is the consumer. The consumer is the key player in the purchasing and use of products. Conscious customers also play an important role in the recycling of plastic products. The support of local and national authorities for recycling can also have a direct impact on the sustainability of the process.

Figure 2: Sustainability Model



Compatibility	Material procurement and consultancy	Recycling content consultancy	Consumer thoughts	Design for recycling
Supply chain trials	Comparison and review of good practices	Review of resource effeciency and suggestions	Packaging Recovery Note (PRN) Compability/ Directory	Recyling messages and labeling
Technical specifications / consultancy	Sustainable resources and responsible procurement	Supply Chain trials	Environmental impact evaluation	Supplier contract
Consumer trials for new packaging products	Consumer insight	Recycling messages and communication	Best usage in consumer applications	
Recovery for products that are difficult to reuse/ annihilation methods; eg. flexible packaging	Compositional and operational waste supervision	Trials for the end-use of the materials	Best application consultancy	Recycling and waste policies

New resources, designs and business models for plastics in the global economy

In the past, the majority of R&D on plastics was focused on developing new resources for raw and special materials. The petrochemical industry is capital-intensive and has been optimised over the years. This makes scaling up for new products that are not compatible with the existing infrastructure difficult. Nevertheless, bio-based raw materials with the potential to create renewable chemical platforms can sometimes be included in this infrastructure. In addition, new, dynamic, small-scale decentralised bio-refineries will be needed. Greater cooperation is needed between chains and systems in order to evaluate the raw material diversity around Europe. Although innovative materials are very important, a circular economy framework fundamentally requires a change in business model and new product design-based approaches. Concepts like 'eco-design' and 'product-service in line with the waste hierarchy' challenge the existing linear paradigm of production and consumption. However, although some of these ideas are being tested in the plastics value chain, most design innovations have not yet embraced the systematic approach necessary to make the shift from the concept stage to feasible enterprises. For example, many R&D projects still focus on the development of new materials without addressing the circular process.

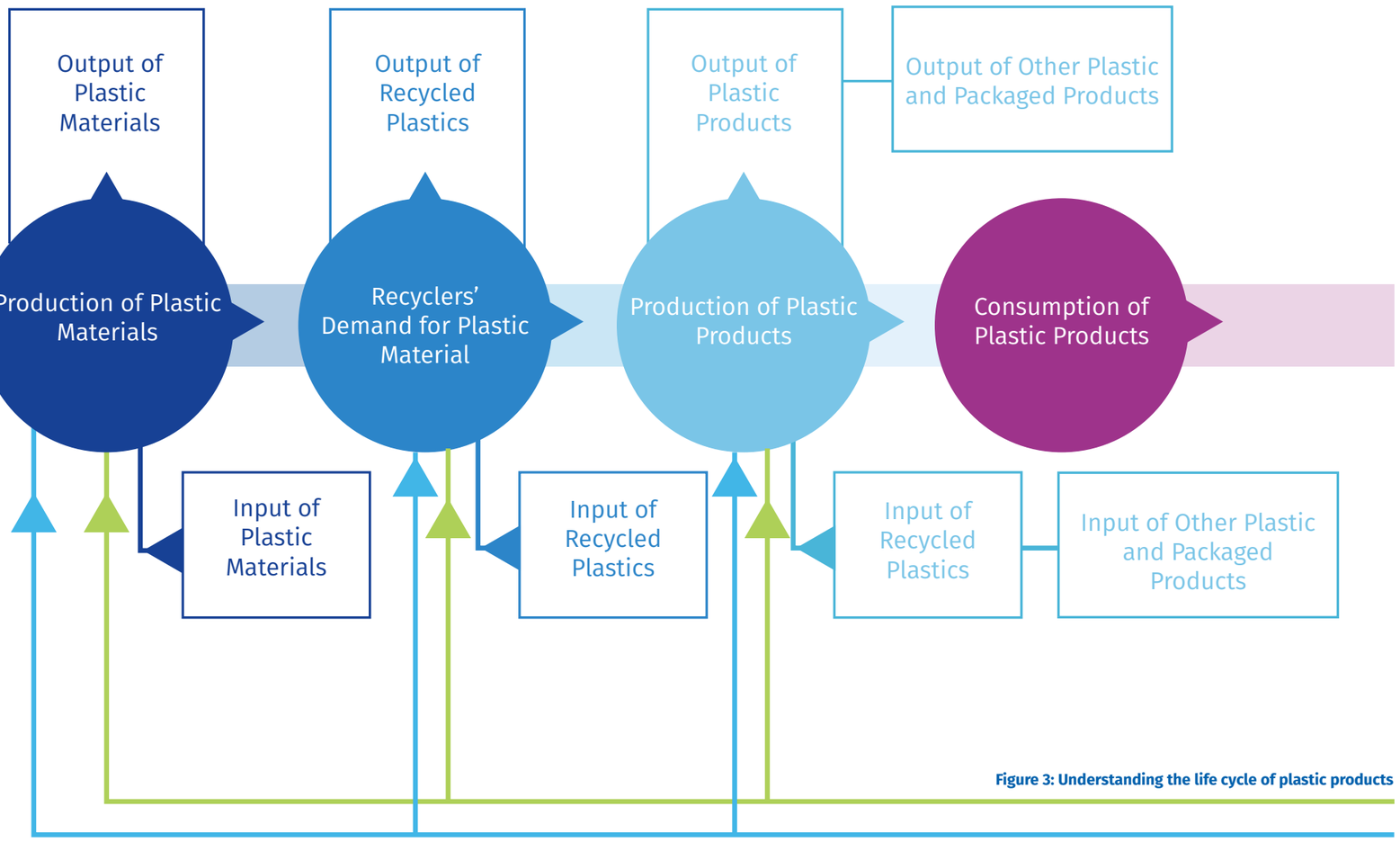


Figure 3: Understanding the life cycle of plastic products

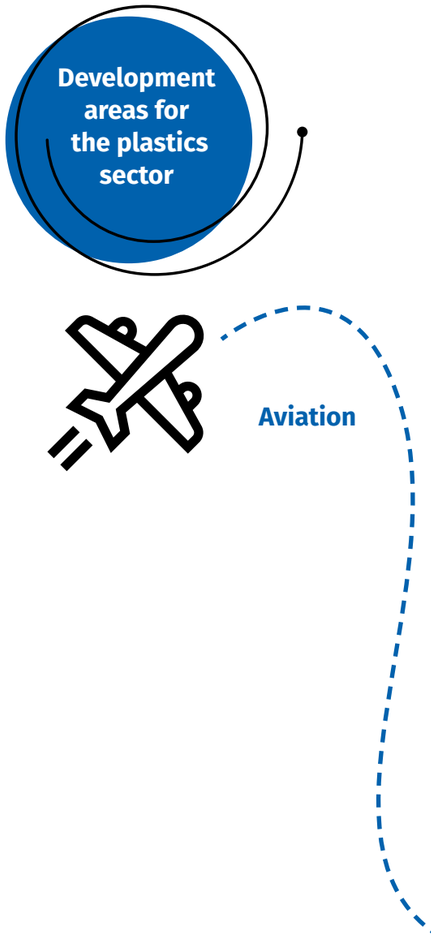
The plastics system will need to be more transparent in providing information about the use of products and materials. This transparency will need to be combined with high-quality design and production and effective recovery, classification and recycling after use. Technological developments and social trends may help establish increased transparency, but many such systems are usually only examined at the research stage.

Ways forward in after-use of plastics

The recovery, classification and recycling of plastics offer economic and environmental benefits. Existing systems, however, face capacity and modernisation challenges all around Europe.

There is considerable potential for the processing of used plastics, and for increases in the volume, quality and efficiency of reprocessed plastics. Improvements in this area will benefit from technical innovations including semi-automatic and robot-aided collection and sorting and new chemical recycling methods to obtain virgin grade plastics. Many questions remain unanswered regarding how to set up a solid after-use system adapted to the increasingly complicated plastics landscape. Mechanical recycling can play an important complementary role in terms of widening the chemical recycling of plastics and the processing of complicated material flows, as well as providing virgin quality recycled materials. In addition, the use of biodegradable materials for selected applications can contribute to the organic recycling of biological waste. At the same time, all recycling options face challenges in terms of economic viability, technical performance, legal status, environmental concerns and supporting infrastructure. What all these after-use solutions have in common is that the performance and the amount of value created depends on the design and selection of all the plastic objects in the market. This is an important insight, which underlines the importance of design and of the flow of innovation. A strategic vision is therefore needed of how the clusters of after-use methods that are needed to preserve the value of materials and provide direction for future innovations can be integrated into the general plastics system.

Table 9: Present and Estimated Usage of Plastic Products in Some Main Sectors[6]



The global aviation plastics market was estimated at USD 690.3 million in 2016. Demand for plastics in a variety of aviation applications including cabin interiors, airframes, fuselages and tails is expected to steer the market in the next eight years. Reducing the weight of a plane directly affects its performance and efficiency. A reduction of just 1 kg in the weight of an aeroplane leads to significant operating cost savings over its lifetime. Light and durable plastics are used as an alternative to aluminium and steel components, and their overall share in the general structure of aeroplanes is increasing.

Source: Aerospace Plastics Market Analysis by Application (Aerostructure, Components, Cabin Interiors, Propulsion Systems, Satellites), By End-use, And Segment Forecasts, 2018 – 2025. **(www.grandviewresearch.com)**

The leading plastics used in the aviation sector are as follows:

• Polychlorotrifluoroethylene (PCTFE), a product with very high resistance to heat and cold

• Polyamide-imide (PAI), known ffor its flame-retardant qualities and ability to maintain structural integrity at high temperatures

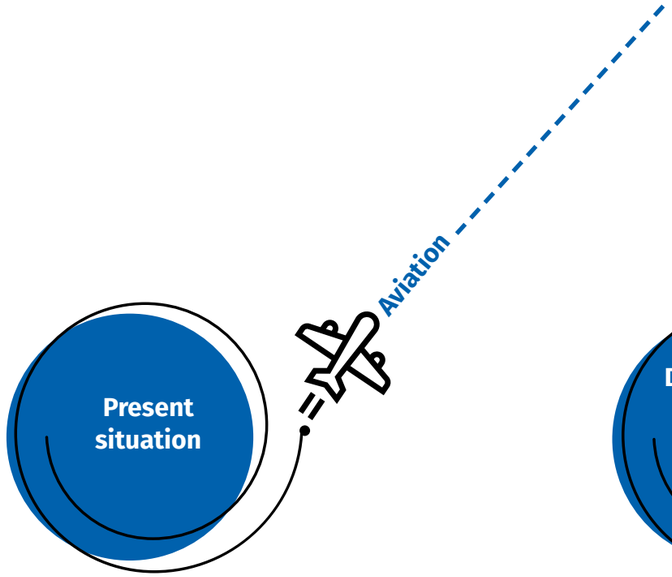
35,000 new planes are expected to be built in the next 20 years, and the aviation industry will use thermoplastic composites as a low-cost solution to support this growth. The size of the global aviation plastics market is forecast to be USD 1.1 billion in 2025.

In order to increase efficiency and meet the demands for faster plane production there is an increasing interest in the use of polyetheretherketone (PEEK)-based thermoplastic carbon-fibre composites.

Thermoplastic composite technology is very promising in terms of decreasing the costs of aerostructure production.

Source: www.assemblymag.com - The Growing Role of Plastics in Aerospace Assembly.

[6] Aviation and Space Plastic Market Analysis by Application (Aerostructure, Components, Cabin Interiors, Propulsion Systems, Satellites), End Use and Segment Forecasts, 2018-2025



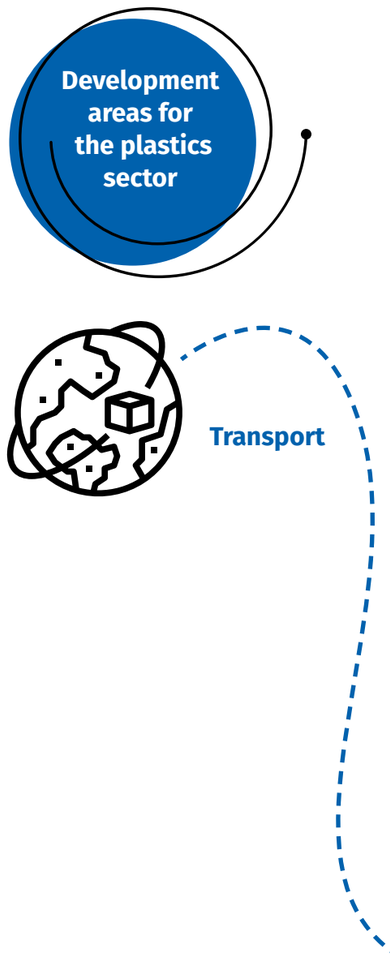
• Polytetrafluoroethylene (PTFE), a leading plastic material for wires and cables which is tear and insulation resistant and fire retardant.

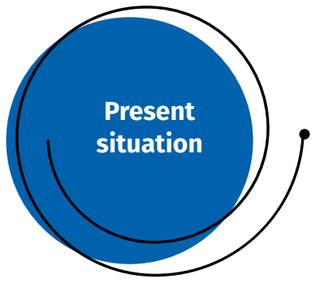
• Polyetheretherketone (PEEK) can resist a range of temperatures and is flexible; pump gears and valve seats are popular uses for this product.

• Thermoset Polyimide is used to save on weight, provide insulation and resist chemicals. It is used on the gear nuts on planes.

Source: Watching: Transport

A Series on Economic, Demographic, Consumer & Technology Trends in Specific Plastics End Markets Winter 2019, Plastics Industry Association, Inc.





In the Transport sector there are four interlinked trends at work:

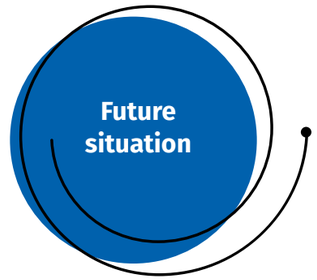
1. Electric vehicles / activation: Electric Vehicles (EVs) use electricity as their primary source of activation, making use of rechargeable batteries. EV engines do not discharge exhaust pipe emissions.

2. Autonomy: Self driving or autonomous cars (AVs) use cameras, radar or lidar (laser technologies) to detect the environment and to proceed along roads with little or no human intervention.

3. Connectedness: Connected Vehicles (CVs) are connected to the Internet via wireless local area networks or shortwave radio signals to receive information about the equipment in the car and to share information about the infrastructure with other vehicles.

4. Sharing: Shared transport or shared mobility resolves ownership responsibilities and helps users access transport services in times of need or demand. Shared vehicles may be cars, bicycles, scooters etc. Services include peer-to-peer car sharing as well as application-based driving services and micro transit services (service vehicles, minibuses etc.).

Producers of all land, sea and air vehicles are aiming to reduce the weight of their vehicles and improve



The International Energy Agency predicts 127 million cars will be produced in 2030 and 280 million cars in 2040.

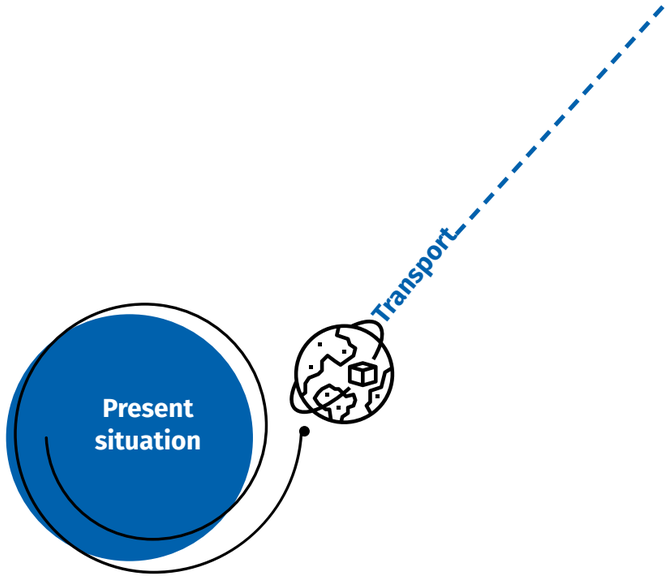
Even entities with interests in oil predict growth in electric vehicles (EVs). British Petroleum's forecast for EVs on the road in 2035 has increased from 72 million to 210 million. OPEC has increased its 2040 projection of 46 million vehicles to 253 million.

By 2025, more than half of the cars produced, whether with electric or traditional motors, will have a back-trunk lid that opens with an upward motion. Magna International's Global Director of Innovation Brian Krull says they are ready to offer a thermoplastic trunk lid which is lighter than traditional steel products by 25% to 40%.

As the world of transport enters an era of artificial intelligence (AI), self- driving, information sharing and electric motors, many companies see this as an opportunity. Analysts predict that the revenue from self-driving will be USD 2.3 trillion and suggest that Waymo might capture 60% of this market.

Source: Watching: Transport

A Series on Economic—Demographic— Consumer & Technology Trends in Specific Plastics End Markets Winter 2019, Plastics Industry Association, Inc.



their fuel economy. Plastics play an important role in engines, interiors and exteriors. Electric cars are heavy due to the weight of the accumulators, increasing the importance of using materials that help save on weight. Accumulators and other parts of electric cars also produce heat. Thermoplastics can help with heat management systems in EVs.

No major automotive producer has been able to make electrical vehicles profitable. Tesla has produced 300,000 vehicles by entering to the top end of the market. The field also includes a variety of new models, self-driving technologies and electric battery and solar power companies.

Plastic vehicle parts weigh 50% less than parts made with materials like steel. Low weight can increase the fuel economy of a car by 25% to 30%. Low weight lowers fuel consumption per kilometre and also lowers carbon dioxide emissions. According to Plastics Europe, a reduction of 1 kg in the weight of a car lowers the amount of carbon dioxide emitted during its lifetime by 20 kg. Some of the products used by engineers and designers in cars include:

• Polypropylene (PP), a thermoplastic polymer used in car bumpers, fuel tanks, cable isolation, fuel cans and carpet weaving yarn.

• Polyurethane (PUR), a flexible material which is also resistant to severe climatic conditions and chemicals. It is essential for seats with foam, foam isolation panels, automotive damper caps, airbags, solder paste components, and hard plastic parts.

• Polyvinyl Chloride (PVC), a material that can be milled, injected or blow moulded to be fire resistant and flexible, or used to make solid parts with good thermal stability. PVC is used in automobile dashboards, doors, tubes and the isolation of power cables.

• Acrylonitrile Butadiene Styrene (ABS), used in the production of hubcaps.

• Polyamide (PA, Nylon 6/6, Nylon 6), used in the production of gears, cam lobes, ball and roller bearings, climate-resistant coatings, and airbag compartments. It can be used in conjunction with other materials like steel.

• Polystyrene (PS), a material that can be used to produce slots for gadgets, buttons, fittings and indicators.

• Polyethylene (PE), which can be used to shape the vehicle body (with glass fibre reinforcement) and for electric isolation.

• Polyoxymethylene (POM), a material used in inner and outer trimmings, fuel systems and small gears.

• Polycarbonate (PC), used for vehicle bumpers and headlight lenses.

• Acrylic (PMMA), a glass alternative which can be used in windows, displays and screens.

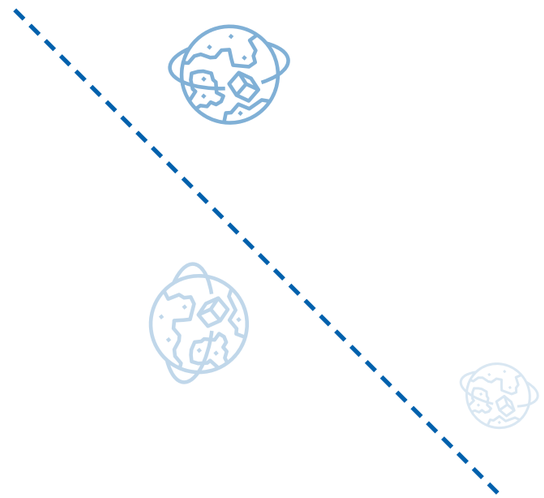
• Polybutylene terephthalate (PBT), used for door handles, bumpers and carburettor parts.

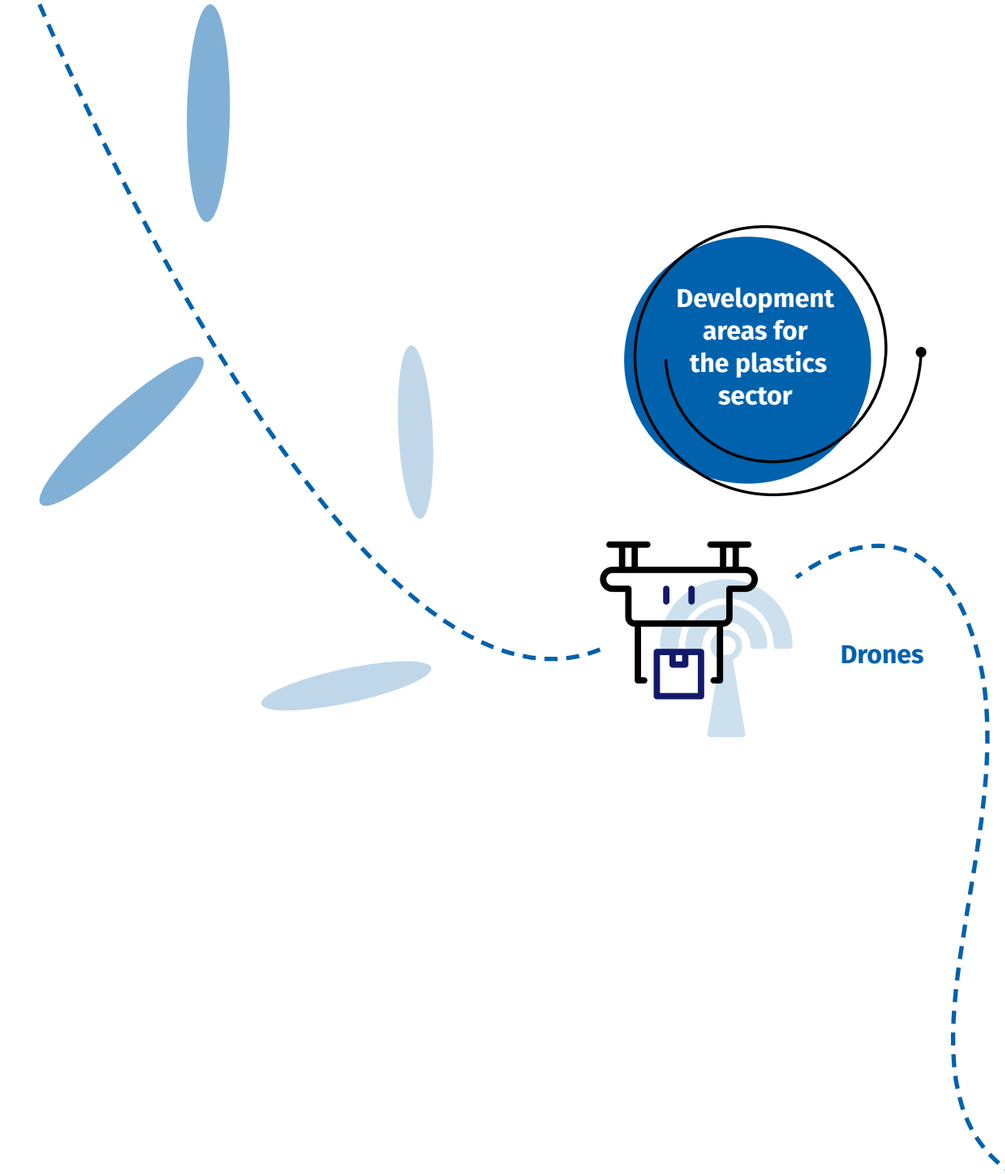
• Polyethylene terephthalate (PET) is used in the production of widescreen wiper arms, headlamp housing, gear bearings, and connector housing.

• Acrylonitrile Styrene Acrylate (ASA), used in housing, profile, and outdoor applications.

Source: Watching: Transport

A Series on Economic—Demographic— Consumer & Technology Trends in Specific Plastics End Markets Winter 2019, Plastics Industry Association, Inc.





Present situation

Camera drones are more than just a tool for creating social media content. In a growing range of industries, drones and unmanned aerial vehicles (UAV) prove to be vital time and cost-saving tools and can sometimes even be life-saving.

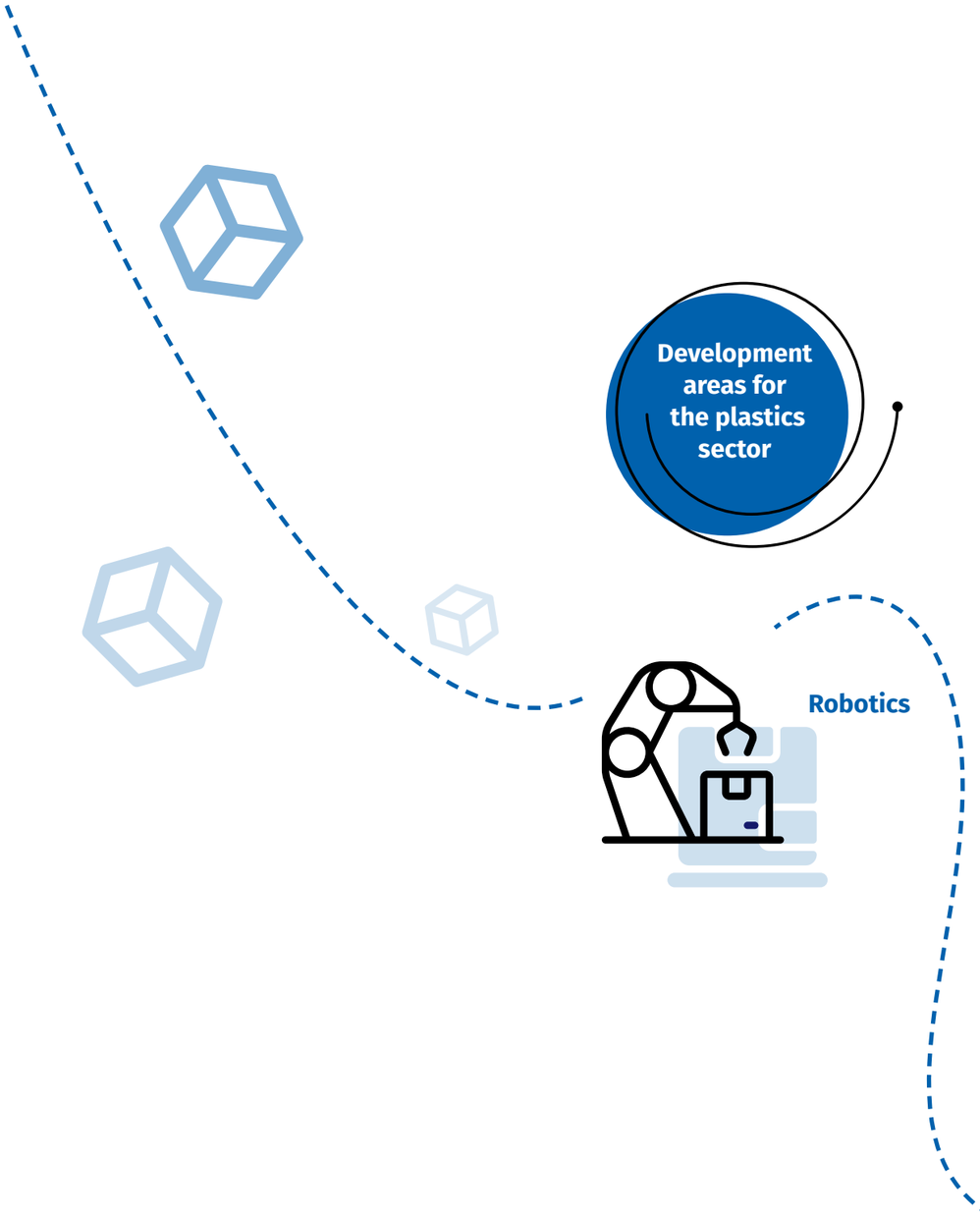
It is remarkable how the drone has moved from being a hobby toy to an industry disruptor within the space of just a few years. Drones are now used daily in agriculture, public services, construction and maintenance, remote search and rescue and firefighting. Commercial drones serve as companies' eyes and ears. They are used for real time applications in industries that want to collect large quantities of data or to reach remote places. Today drones are used in all of the following sectors:

- Agriculture
- Forestry
- Surveillance
- Infrastructure supervision
- Public services
- Construction
- Extraction
- Entertainment
- Insurance surveys of buildings and larger facilities (Automobile accidents can also be evaluated with a simple camera used by the insurance client or insurance company employer).

Future situation

There are several possible future uses for drones (both in the air and on land). Their use for cargo services and shipments is being tested. Test flights are being made with passengers. Amazon is actively testing drone shipments and recently secured a patent for a drone that reacts to human movements.

To improve air taxi services, Boeing is studying drone technology and design with a number of partners. In the next ten years, air taxis are predicted to carry passengers from one city to another. Former Boeing CEO Dennis Muilenburg, told Bloomberg TV that the necessary engine technology was "within arm's reach," and in five years a regulatory traffic management system might be built. Uber Elevate expects to launch a flying car system in 2020.



Development areas for the plastics sector

Robotics

Present situation

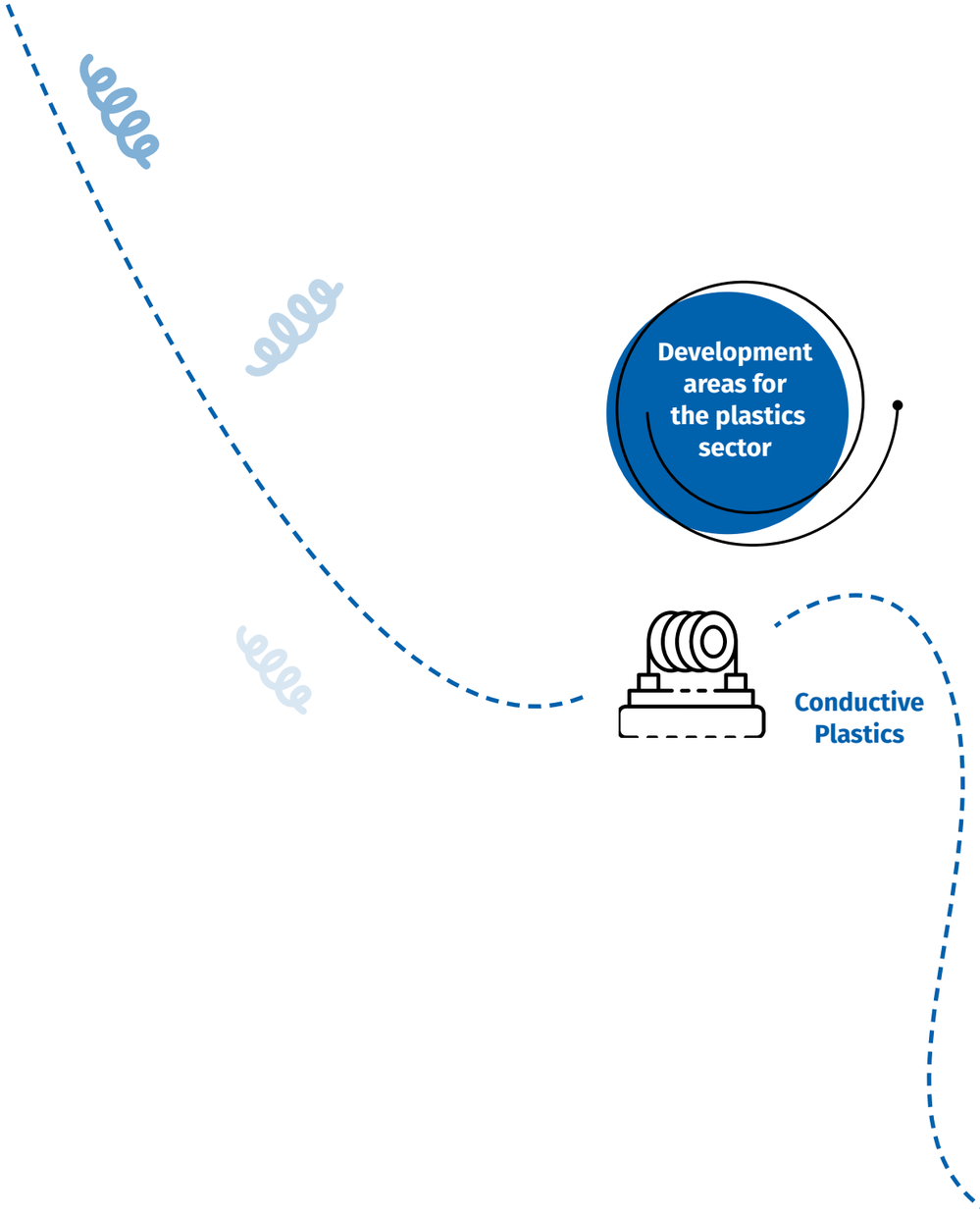
Since 2009, the rubber and plastics sectors have steadily increased the number of their robot facilities. In 2015 the number of such facilities jumped from 5,800 to 17,300. After a decline in 2016, the number of facilities exceeded 17,000 in 2017. The sector's share in the total demand was below 5% in 2017. Between 2012 and 2017, sales increased by an average of 8% annually.

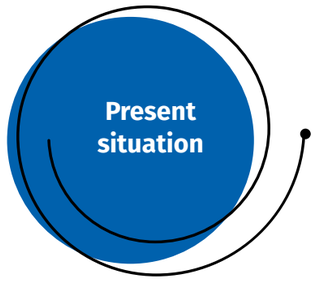
Source: International Federation of Robotics - Executive Summary World Robotics 2018 Industrial Robots

Future situation

In 2017, the stock of operational industrial robots increased by 15%. Predictions for robot facilities suggest that a similar growth rate will be achieved in 2018. Having passed the two million mark in 2017, the stock of operating robots is likely to reach three million in 2020 and approach 3.8 million in 2021. In Asia, the stock of robots is expected to increase by 19% in 2018 and by an average of 20% per year until 2021. In America and Europe, the stock of operational robots is expected to increase by 8% in 2018 and by an annual average of 10% and 9% respectively until 2021.

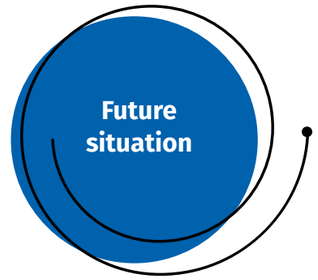
Source: International Federation of Robotics - Executive Summary World Robotics 2018 Industrial Robots





Electroactive polymers (EAP) are a class of polymers that change shape and size when an external electrical field is applied. Electroactive polymers' primary advantage is that they are light, easy to produce and low cost. Electroactive polymers are used in actuators, sensors, electrostatic discharge (ESD) and electromagnetic interference (EMI) protection, drug delivery systems, robotics and electrostatic plastics. Their increased use in robotics, coatings, energy harvesting, e-textiles and pharmaceuticals is causing the market to grow rapidly. Naturally conductive polymers have useful qualities such as improved transparency, environmental stability and high workability. According to Statista, revenue from the sales of consumer electronics rose to USD 339 billion in 2017 from USD 318 billion in 2016.

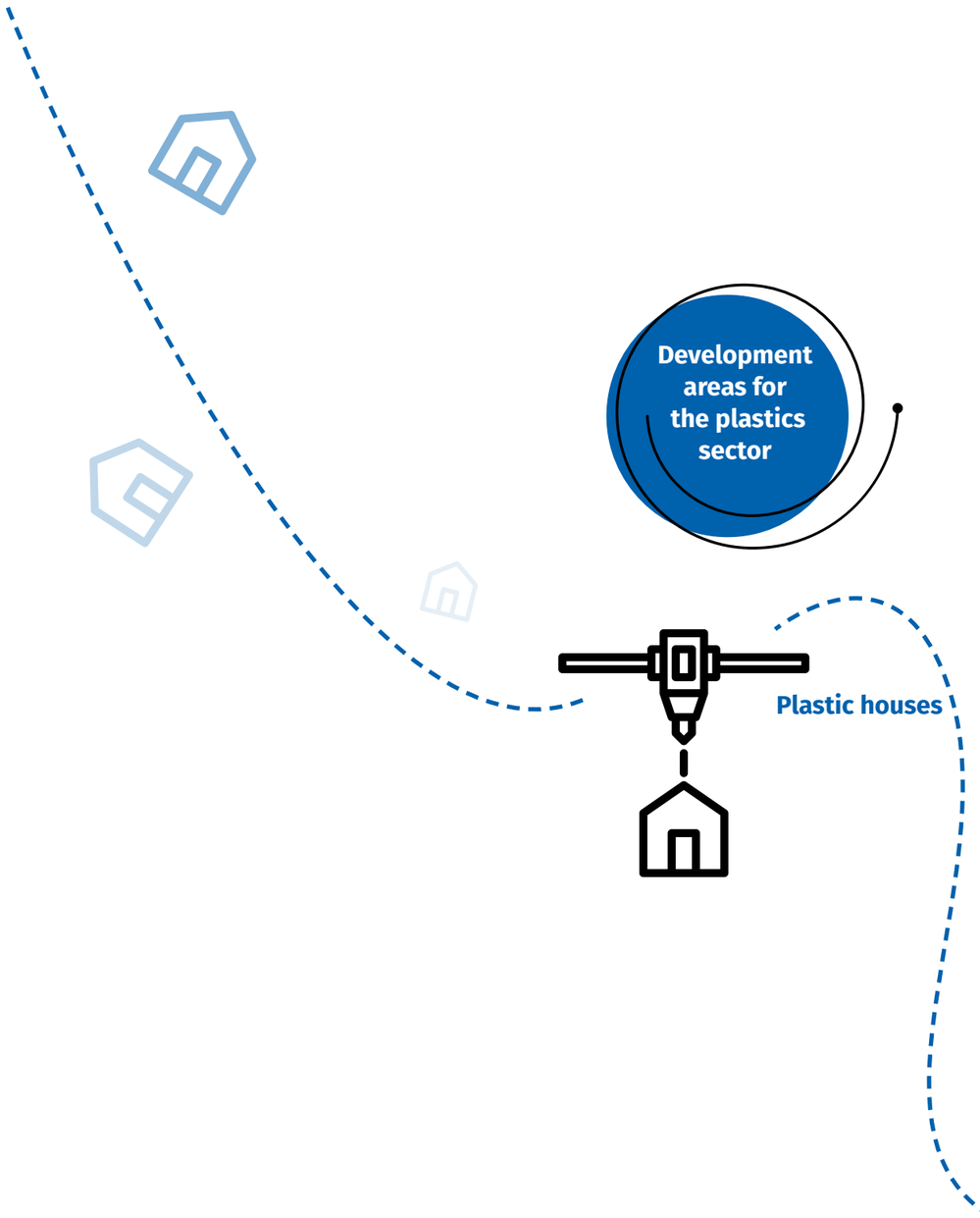
Source: Global Electroactive Polymers Market Research: Information by Product Type (Conductive Polymers, Inherently Dissipative Polymers, Others) by Application (Actuators, Sensors, ESD and EMI Protection, Others) – Forecast To 2023



Between 2017 and 2027, the market is forecast to grow by an average of more than 7% per year due to increased demand in the indicator industry, which supplies products for intelligent devices, consumer electronics, photovoltaics, medical devices, and defence.

The demand for indium tin oxide technology is now at its peak. The plastics sector should focus on developing conductor plastic product kits with new properties – such as flexible intelligent device screens – as well as on reducing costs and adding new volume to the market.

Source: Smither Rapra -The Future of Conductive Plastics to 2027



Present situation

The emergence of light and low-cost materials and the increasing popularity of eco-friendly buildings in the construction sector will generate significant growth in the global construction plastics market. The growing use of expanded polystyrene plastics and PVC in the construction sector is underpinned by the eco-friendly building movement. According to the International Energy Agency, buildings and the construction sector account for approximately 39% of carbon dioxide emissions. Eco-friendly buildings and recycled plastic resources with low environmental impact and high durability are needed to minimise emissions caused by the construction sector. The increasing popularity of the green building concept is expected to increase the demand for plastics in construction.

Source: Orbis Research - Global Construction Plastics Market 2019 by Plastic Type, Industry, Key Manufacturer, Application - Cost, Trends, Demand Analysis and Investment Opportunities to 2025

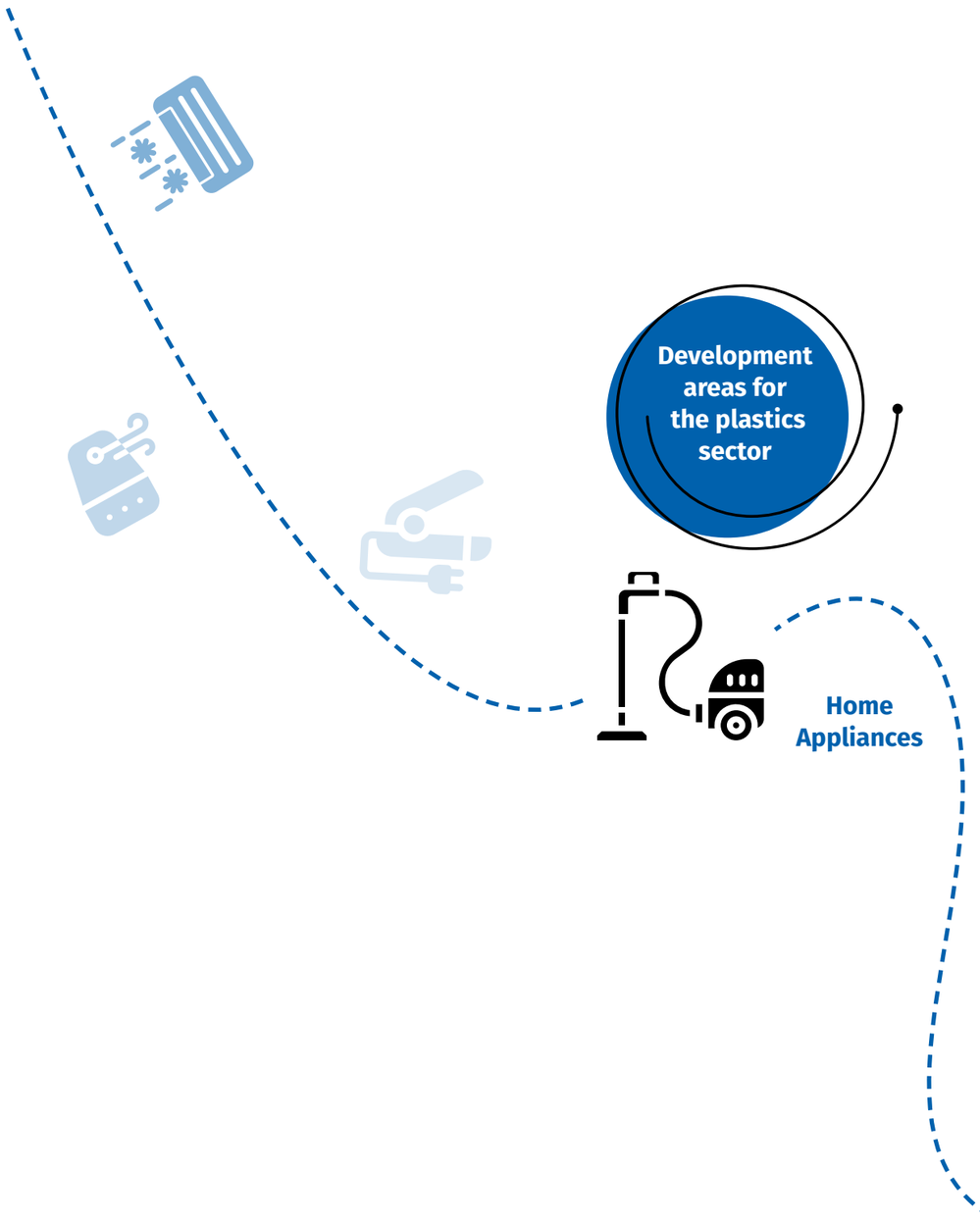
Future situation

The global construction plastics market was valued at approximately USD 70.4 billion in 2017 and is expected to show growth of more than 7% during the period from 2018 to 2025.

Increased demand for panels, windows and sunroofs, semi-transparent walls, surfaces, roof domes and shutters, safety glass and roofing in the residential and non-residential construction sectors is expected to drive rapid growth in the global construction plastics market. Additionally, the lightness of construction plastics has increased demand in a range of construction applications. However, surge pricing in raw materials could obstruct the growth of the plastic construction market.

The increased demand for green buildings is expected to be another source of growth opportunities for the construction plastics market in the years ahead.

Source: Orbis Research - Global Construction Plastics Market 2019 by Plastic Type, Industry, Key Manufacturer, Application – Cost, Trends, Demand Analysis and Investment Opportunities to 2025



Present situation

The home appliance industry manufactures devices which support a clean and healthy home environment, save time and energy and keep food fresh. In order to produce these appliances, the industry uses 6 million tonnes of raw materials including 3 million tonnes of steel and stainless steel, 1.1 million tonnes of plastic and over half a million tonnes of copper, aluminium, glass and concrete per year. Although these are significant amounts, they represent only a small part of the global consumption of the materials in question. The average plastic content of the major home appliances is 1.1%, For small home appliances, the corresponding ratio is 27.4%. The amount of plastic material in appliances already in use in homes and currently in stock was 12 million tonnes in 2016.

Source: CECED, the European Committee of Domestic Equipment Manufacturers, Material Flows of the Home Appliance Industry

The size of the global demand for white goods and home electronics is demonstrated by the 80 million refrigerators, 70 million washing machines, 60 million room air-conditioners and 200 million televisions sold annually.

Source: Hitachi, Makoto Katagishi, Koichi Yamamoto, Hisao Suka Takahiko, Yoshida - Home Electronics and Appliances for Environmentally Conscious Lifestyles

Future situation

Global sales of home appliances are predicted to reach 2,461 million units by 2022. Of the total, small home appliances are expected to account for 1.6 million units and large appliances for 0.8 million.

Source: Keith Miller, Business Director, The Martec Group, Competitive Analysis of the Appliances Market 2018.

By 2020, within the extension of the Internet of Things (IoT) approximately 50 million devices, or 6.58 devices per person, will be connected to the internet.

Source: IoT-based control of appliances - Ravi Kishore Kodali, Sree Ramya Soratkal and Lakshmi Boppana, Department of Electronics and Communication Engineering, National Institute of Technology, Warangal

5

Conclusions and The Way Forward

The concrete steps summarised below need to be taken to assist the transformation of the sector in the project region

Sectoral Roadmaps: **Plastic Sector in Turkey**

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Forming a polymers industry base in Gazi-antep	**B**	Carrying out R&D on polymers and providing polymer technology training to benefit from the project area's high polymer production capacity	*Ministry of Trade (MoT), Gaziantep Chamber of Industry	Macro obstacles like funding, construction equipment and material supply and capacity development These obstacles can be solved via government investment or projects with national/ international funding Companies can transfer funds for the setup of these facilities	The scale and cost of an institute and R&D centres might be discussed. It would be a model in terms of developing new products, prototyping and R&D subjects. An institute and R&D centres would create beneficial results in terms of developing qualified human resources. The promotion of new technologies and designs would break down prejudices. Centres such as PAGEV'S Centre of Excellence could function as both excellence and design centres.
Setting up R&D Centres that are specialized in plastic products. Producers can contribute to these R&D Centres financially.	**B**	Promoting R&D activities in the plastics sector and among the producers	*Under the guidance of the Chambers of Industry in the project area		
Creating a platform, preparing clustering projects among plastic products producers, acceleration of the clustering initiatives for the purpose of providing consultancy about clustering	**C**	Creating platforms for the purpose of the improvement of production and processes and the improvement of the integration of producers and users with similar techniques.	*MoT, Chambers of Industry		

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Setting up factory laboratories	**B**	Digital production and the implementation of digital applications	*MoT	Financial resources	Could be subjected to Grant Programmes / Funding Programmes/ Development Programmes.
Setting up R&D Centres that are specialized in plastic products. Producers can contribute to these R&D Centres financially.		Determining the technologies that will receive investment, implementation of pilot project and cost benefit analysis	*Development Agencies	Lack of cooperation among regional partners	
		Cooperation with the Digital Transformation Centres that are stated to have opened in the area	*Universities	Companies' lack of interest	
Sector specific diagnosis study and needs analysis for digitalization	**A**	Determining Current Technologies	*TOBB (The Union of Chambers and Commodity Exchanges of Turkey)	Companies' lack of interest	Strategic selection process should be followed, and companies that were not selected should be informed about the reason and the requirements they lack.

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
What needs to be done?	Level of Importance A, B or C	What is the purpose?	Who should act to undertake this step?	Potential challenges which may prevent completion	Comments
		Company skills	*Chamber of Commerce and Industry	Setting up fair selection criteria	
		Export potential	*Sectoral Associations	Lack of cooperation among regional partners	
		Infrastructure	*Organised Industrial Zone	Companies' lack of interest	
		Capacity	*TMMOB (The Union of Chambers of Turkish Engineers and Architects)	Companies' lack of interest	

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
What needs to be done?	Level of Importance A, B or C	What is the purpose?	Who should act to undertake this step?	Potential challenges which may prevent completion	
Efficiency per company research	**A**	Consultancy and Mentoring	*TOBB, Chambers of Industry in the Area	Necessary technical skills	
		Determination of investment needs	*Chamber of Commerce and Industry	Necessary technical skills	
		Improvement in production methodology	*Sectoral associations	Necessary technical skills	
		Increase in efficiency	*OIZ (Organised Industrial Zone)	Necessary technical sufficiency	
		Increase in Quality	*TMMOB	Necessary technical skills	
Establishing programmes to develop strategies and evaluate production processes for efficiency	**B**	Analysing Work Flow, Comparing Personnel, Process, Technology and Equipment with Competitors	*SMEs	*Limited Human Resources	Companies should determine the reason for low competitiveness and develop strategies according to the results.

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
What needs to be done?	Level of Importance A, B or C	What is the purpose?	Who should act to undertake this step?	Potential challenges which may prevent completion	
		Training employees			
		Outsourcing consultancy services if necessary			
		Designing future steps based on strategies			
Development of cost analysis systems and cost accountancy	**B**	Evaluation of all costs	*SMEs		
Certified Technical Training	**A**	Development of intermediate work force	*Chamber of Commerce and Industry	Determining the needs of the sector	
		Increasing Institutionalisation	*TOBB		
		Increasing HR competitiveness	*OIZ *ISKUR (Turkish Employment Agency) *Vocational Qualification Institute		

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Developing a new digitalisation strategy for each chosen company	**A**	Consultancy and Mentorship	*TOBB	Companies' lack of interest	
		Determining the future direction of the enterprises (exports)	*Chamber of Commerce and Industry	Various actors in the value chain	
		Determining investment needs	*Sectoral Associations		
		Determining areas for incentives and support programmes in the area	*OIZ		
		Cooperation with the new Digital Transformation Centres in the area	*TMMOB		
Establishing Innovation Centres/ Excellence Centres	**B**	Increasing innovation and entrepreneurship. Building bridges between the academy and industry digital transformation	*Ministry of Industry and Technology	Financing resources	Could be subject to Grant Programmes / Funding Programmes/ Development Programmes.
		Leadership, best applications research, support and/or training	*Development Agencies		
		· Industry 4.0 Applications for plastics sector	*Universities	Necessary feasibility study	
		· Lean production methods	*Universities	Bureaucratic barriers	
		· 3-D production	*Universities		
		· Easy prototyping	*Universities		

Competition

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Preventing the imitation of products via intellectual property rules and increasing the penalties for violating intellectual property rules.	**B**	Preventing the imitation of products and increasing product differentiation in the project area, creating awareness among producers regarding the protection of intellectual property rights for the plastic products they design	*MoT, Chambers of Industry		
Inspections against off-the-record production. These inspections should include producers employing Syrian workers illegally.	**A**	Decreasing unfair competition in the area with tighter controls	*Unions in cooperation with local security forces		
Defining new investment areas such as medicinal products, defence etc. for the plastic products sector.	**B**	Creating new potential markets for the plastics sector in the project area, promoting added-value products and contributing to other sectors through the installed capacity of the plastic products sector	*MoT, Chambers of Industry in the area		

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Developing new market strategies	**A**	Defining a target market for the sector	*Chamber of Commerce and Industry		
		Information about the qualities, needs and requests of the target market	*Chamber of Commerce and Industry		
		Design, collection, interpretation and reporting of information that will help companies benefit from marketing opportunities	*Consultants and the companies themselves		
		Designing action for the chosen markets	*Companies themselves	Sectoral associations	
Increasing awareness of patent, brand and design	**A**	Increase in the number of patents, small patents, brands and design	Turkish Patent and Trademark Office	Process	Example: the Hezarfen Project

University- Private Sector Industry Cooperation

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Students who want to go on to academic careers should be obliged to run projects in the private sector	**A**	Triggering cooperation with relevant universities and university personnel	*Chambers of Industry can act as a mediator between Technology Development Centres, private sector and universities.	Both managers in the plastics sector and university personnel are unwilling to cooperate.	
Preparing a PhD thesis on a subject suggested by an industrialist	**B**	Increasing industry – university cooperation	*Chamber of Commerce and Industry, Universities and Companies		
Creating awareness regarding cooperation with start-ups	**A**	Bringing industry companies together with start-ups bringing innovative yet low-cost solutions to sectoral problems	*SMEs *Universities *Technoparks	Low awareness of the start-up ecosystem and cooperation issues.	For example, MarinaTex is a start-up producing raw material from waste fish to be used in the production of plastics. Companies should cooperate more with innovative start-ups.

Human Resources

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
What needs to be done?	**Level of Importance A, B or C**	**What is the purpose?**	**Who should act to undertake this step?**	**Potential challenges which may prevent completion**	**Comments**
Presentation of business services (training, consultancy, mentorship etc.)	**A**	Capacity development	*Chamber of Commerce and Industry	Determining who will be served and how	* Development programmes E-commerce, Export / Import, Management, Human Recourses, Market Research, Customer Relations Management, Intellectual Property, Design, Language etc.
		Increasing companies' institutionalisation	*TOBB, Chambers of Industry in the area		
		Increasing HR competitiveness	*TOBB, Chambers of Industry in the area		

Operations / Production

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Workshops can be conducted for the sectors in need of personnel under the GASIMEP Project	**B**	Meeting the qualified labour force need of the plastics sector Production groups can be developed at these workshops GETHAM can contribute to design and product development phases	*Chambers of Industry can act as a mediator between Technology Development Centres, private sector and universities.	Including the SMEs senior management, an extensive communication strategy and awareness raising activities targeting the SMEs in the sector.	
Raising awareness among producers regarding the moulding machines present in GETHAM and GSOMEM	**A**	Preventing cost and time loss in relation to imported machinery	*Gaziantep Chamber of Industry	An extensive communication strategy and awareness raising activities are needed.	
Improvement of the physical infrastructure of the Organised Industrial Zone in the project area	**B**	Gaziantep Organised Industrial Zone needs TRY 2 Million financial support for the improvement of its physical infrastructure	*UNDP, Gaziantep Organised Industrial Zone	Sufficient funding	

Exports

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Support packages for institutionalisation and branding should be scaled-up.	**A**	Tackling the institutionalisation issue among the producers in the project area and improving the institutional capacity of branding	*KOSGEB, Export Promotion Centre	Provision of sufficient funds to increase the extent of current support packages	
Benefiting from Gaziantep Chamber of Industry's Foreign Trade Academy and Foreign Trade Ambassadors Projects and preparing similar projects on international financing opportunities.	**B**	Increasing the technical capacity of the personnel for international trade, benefiting from the potential of the foreign national students who speak Arabic as a native language, including Syrians under Temporary Protection, exporting to their countries	*Chambers of Industry in Project Areas	Finding new international financing opportunities for projects such as Foreign Trade Academy and Foreign Trade Ambassador	
Exports / Smart Partnership / Strategic Alliance	**A**	Determining international strategies	*SMEs	Limited resources	Allocation of costs, transport issues, and cost of trading with foreign states will affect success.
		Urging all value chain actors to cooperate	*SMEs	Physical, Human, Financial and Intellectual Resources	
		Determining necessary steps	*SMEs	Lack of organisational structure	

Raw Materials

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Providing more development funding to the Yumurtalık-Ceyhan refinery area to accelerate the creation of petrochemical production capacity including raw material for plastics	**C**	Finding a solution to the raw material production issue	*Ministry of Industry and Technology	Finding financing opportunities to accelerate petrochemical investments	
Providing support to SMEs regarding financial and currency management, training enterprises on protection against currency risks	**A**	Fighting currency risks in the purchase of imported raw materials by increasing producers' capacity for financial and currency management	*Chambers of Industry and Commerce in project areas		

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Training and development of marketing activities	**A**	Determining/researching suitable markets for current and new product opportunities	*Chambers of Industry, SMEs	Limited Resources	
		Determining new target market	*Chambers of Industry, SMEs	Physical, Human, Financial and Intellectual Resources	
		Development of “Value Proposition” and “Positioning” for the product, the company and branding	*Chambers of Industry, SMEs	Lack of organisational structure	
		Using marketing channels to promote product and services better and create market-driven marketing messages. Development of new strategies for digital marketing	*Chambers of Industry, SMEs		
Creating awareness regarding cooperation with start-ups	**A**	Identifying objectives and goals	*SMEs	Limited Resources	
		Identifying objectives and goals	*SMEs	Limited Resources	
		Planning of operations, products and services	*SMEs	Physical, Human, Financial and Intellectual Resources	
		Market planning	*SMEs	Lack of organisational structure Limitations and weaknesses caused by the traditional management structures and management processes	

Incentives

Action	Importance	Purpose	Possible Person / Institution in Charge	Potential Challenges	Comments
Incentives for attending fairs and exhibits to be disaggregated by transport and attendance to exhibit areas and financed separately	**A**	Support funding for high transport costs for the plastics producers in the project area to attend to fairs and exhibits	*MoT		
New sector-specific incentives and support for R&D	**B**	Simple, smooth, accessible, common, reliable and declaration-based R&D incentives	*MoT, TUBITAK, Development Agencies		

Financing

Better access to financing and provision of better buyer financing	**A**	Longer grace period	*Eximbank	Economic problems	Being solution partners with exporters
		More instalments	*CGF		
		Loans with better conditions, export credit, security deposits etc.	*National Banks		
		Increasing competitiveness			

The strategy for the transformation of the sector in the region should be different for small and medium sized enterprises.

Most small enterprises consider their products to be standard and believe that development efforts would have limited impact in terms of increasing their profitability. At the same time, these companies are not displaying any effort to review the methods they use to reduce their costs and increase their efficiency. Consequently, any initiative to transform the sector would need to support small enterprises by raising their awareness. In the short term, it would appear more feasible to implement actions for medium-sized enterprises which are already more conscious of R&D and innovation .

Technology Development Centres can support enterprises that want to renew their factories and factory-laboratory technologies.

Experts at these centres could evaluate existing technologies, identify technological needs and generate options for upgrading technology levels. Such an evaluation process could determine operational options regarding machinery efficiency and waste reduction, and highlight opportunities for reducing costs and increasing the quality and variety of the goods produced. Moreover, Technology Development Centres could also help companies prepare R&D projects that are eligible for TUBITAK and EU Programmes. The Model Factories could function as implementation centres for new technologies and develop methods for producing higher value-added products. In addition to learning about new technologies and processes, producers could use these factories to test their ideas for innovation.

Innovation Centres could be built in the Project Centre to support the transformation of the plastics sector.

Innovation centres could assist companies without the capability to carry out R&D. Additionally, these centres could support cooperation between the companies and their customers for R&D and the joint development of new products. This would ensure vertical coordination between companies within the value chain. The centres could both foster innovation in processes and allow companies carry to out the related activities at the centre. By cooperating with universities, Innovation Centres could also support the training of R&D personnel, which is seen as a shortcoming by many companies.

Producers in the project area should seek new consumer markets to avoid the price competition caused by imitation products.

Since sectors like medicinal products and defence require similar production technologies, they can provide opportunities for producers in the area and also enable them to produce high value-added products.

Companies should be provided with incentives and consultancy services to institutionalise innovation.

Only a few companies were found to have a full-time leader, designated personnel and a separate budget for innovation. Some companies do not have much awareness of the potential in this area. Companies should be provided with incentives and advice for institutionalizing innovation.

Vocational schools could be built and supported in cooperation with the relevant NGOs, companies, and government agencies.

By setting up a board including all the shareholders and paying close attention to the transformation needs of the sector in the project region, it should be possible to keep the schools up to date. Companies could be provided with consultancy services to assist with the development of high value-added products for markets where they are in demand.

Cooperation between universities and the private sector could be built and strengthened in the plastics sector in the project region.

Through university-private sector cooperation, the needs of the sector in the areas of technology and innovation could be identified and common R&D projects could be developed . Universities could also make major contributions to the development of the human resources in the sector.

Turkey Resilience Project in Response to the Syria Crisis (TRP)

JOB CREATION COMPONENT

2020

Sectoral Roadmaps: **Plastic Sector in Turkey**