GENERAL DIRECTORATE OF
DEVELOPMENT AGENCIES

İZMİR
DEVELOPMENT
AGENCY

GREEN TRANSFORMATION AND BLUE
OPPORTUNITIES PERSPECTIVE FOR İZMİR

SECTORAL and SPATIAL PRIORITIZATION

BACKGROUND DOCUMENTS NO. 2

2022

GREEN TRANSFORMATION AND BLUE OPPORTUNITIES PERSPECTIVE FOR İZMİR - SECTORAL and SPATIAL PRIORITIZATION
BACKGROUND DOCUMENTS - NO. 2
2022, İZMİR

Published by
İzmir Development Agency (İzmir Kalkınma Ajansı)
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Printing
Metro Matbaacılık
Yahya Kemal Beyatlı Cad. No: 94
Begos 3. Bölge Buca 35400 İzmir

Printing Information
1. Pressing
September 2022
500 Pcs

ISBN
978-605-5826-30-7

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ABBREVIATIONS

EU	: European Union
CO_2	: Carbon Dioxide
PDoEU	: Provincial Directorate of Environment and Urbanization
EMRA	: Energy Market Regulatory Authority
FAO	: Food and Agriculture Organization
EIS	: Entrepreneurship Information System
SES / SEPP	: Solar Energy System / Power Plant
ISIC	: International Standard Industrial Classification of All
İZKA	: İzmir Development Agency
İZSU	: İzmir Water and Sewerage Administration
KMB	: Küçük Menderes Basin
NACE	: European Union Nomenclature of Economic Activities
OIZ	: Organized Industrial Zone
PROMETHEE	: Preference Ranking Organization Method for Enrichment Evaluations
WES / WEPP	: Wind Energy System / Power Plant
SSI	: Social Security Institution
TOE	: Ton of Oil Equivalent
TurkSTAT	: Turkish Statistical Institute
WFN	: Water Footprint Network

GLOSSARY OF CONCEPTUAL TERMS

Dominance, Scale and Specialization Quotients

The most common method used to measure the degree of concentration or specialization of a sector in a certain region is the location quotient (LQ). The fact that the value of the location quotient is greater than 1 indicates that the relevant sector is concentrated above the country average in the region in question, therefore its strategic importance for the region is higher. In the calculation made using the formula below, two different localization coefficients were determined for each sector by using the 2-digit NACE level employment data and net sales data.

$$LQ = \frac{\text{The share of the region's employment in the industry “S” within the region's total employment}}{\text{the share of countrywide employment in the industry “S” within Turkey's total employment}}$$

The indicator exhibiting how much of a sector within the country is located in the relevant region is called the scale, and the indicator exhibiting the value of the selected sector among all sectors within a region is called dominance and is calculated by using the formulas given below. Within the scope of the analysis, scale values are calculated using 2-digit NACE level insured numbers, and dominance values are calculated using 2-digit NACE level net sales data.

Scale =(d_S)/D_S x 100

Dominance =(d_S)/d x 100

d_S : Value of sector "S" in the region

d : Total value in the region

D_S : Value of sector "S" in Turkey

D: Total value in Turkey

PROMETHEE Method

Prioritization analyzes require the evaluation of sectors over multiple and different criteria and the most appropriate selection for each criterion. Multi-criteria (multiple) decision making method has a widespread use in choosing the alternative that will meet all criteria at the highest level. In this method; there are many decision making techniques that differ in terms of calculation, criterion weighting and application.

The PROMETHEE method is a method that gives results in a short time through software support, and the rankings are obtained in an understandable way in the form of tables and graphics. In addition to providing a wide and comprehensive visual reporting opportunity, the method also allows decision makers to make various statistical analyzes. It gives stable and effective results due to performing normalization and using different functions for each evaluation in pairwise comparisons.

Water Footprint

Water footprint refers to the amount of clean water consumed directly or indirectly by producers or consumers. A product's water footprint includes the water consumed throughout the entire supply chain. Water footprint is a multidimensional concept, it refers to the volume of water consumed according to its source, as well as the volume of polluted water according to the element of pollution and is determined by time and geography. There are three types of water footprints: blue, green and gray:

The blue water footprint indicates the amount of surface and groundwater consumed along the supply chain in the production of a product, while the green water footprint indicates the amount of rainwater consumed. Gray water footprint is the amount of fresh water used to reduce the pollution load that occurs during the production process to current water standards. While the green and blue water footprints are used for the amount and source of fresh water, the amount of gray water is a concept related to the amount of polluted water.

Carbon Footprint

Carbon footprint is defined as the amount, in carbon dioxide equivalent, of the total greenhouse gas produced directly or indirectly by an individual, organization, product or activity.

Greenhouse gases were determined as carbon dioxide, methane, nitrogen oxides, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. Carbon dioxide is the most abundant greenhouse gas, so the amount of greenhouse gas emissions is calculated as carbon dioxide equivalent and is referred to as the carbon footprint. Thus, greenhouse gases are collected on a common denominator and the emission calculations are made more understandable. In fact, the carbon footprint is accepted as an indicator of the share of an individual, activity, country or product in global warming.

CHAPTER 1.
Purpose and Scope

Green Transformation and Blue Opportunities Perspective for İzmir has been prepared by using a methodology that differentiates and specializes in line with the general framework of national green and blue transformation strategies, taking into account the needs of İzmir.

In this perspective study initiated with the methodology preparation process, qualitative and quantitative evaluations are included at all stages from macro level to sub-sectors, in determining the areas to focus on and the benefits to be obtained. The perspective study is based on a long process of research, learning, analysis and synthesis in the background. The studies carried out in these processes not only form the basis of the perspective document, but also include various analyses, evaluations and calculations.

The Background Documents are organized as a series of reports in which these studies that provide input to the perspective document are presented in detail. The Sectoral and Spatial Prioritization Report, the subject of this document as the second report of this series, includes the analyzes and evaluations carried out in order to identify the prominent sectors and the areas where these sectors are concentrated.

Sectoral and spatial prioritization analysis is a two-stage focus analysis covering macro and sectoral levels. Within the scope of the analysis, it is aimed to highlight the sectors that need the most focus in terms of transformation and opportunities that will arise with transformation in the fields of waste, water and energy, together with their spatial connections.

CHAPTER 2.
Methodology and Data

Sectoral and spatial prioritization analysis consists of various measurements, calculations and evaluations that follow and feed each other at two different levels, namely the macro and the sectoral levels, as defined in the general methodology. In this context, the study includes data-based analytical measurement methods as well as qualitative evaluations.

Considering its known advantages, the PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation) method was preferred for ranking the sectors according to certain criteria within the scope of the sectoral prioritization study and creating the scores for the relevant sectors. In the calculations made using the Visual PROMETHEE (Version 1.4.0.0) software, criterion weights were determined in accordance with expert opinions.

In the sectoral prioritization study, data were used in different areas, primarily economic, environmental performance and resource use, at the sectoral level in İzmir. First of all, open databases were used as the data source, official letters were written to the relevant institutions and organizations for the data that could not be obtained in this manner, and interviews were held with the institutions. In this context, the sectoral data and data sources provided for the indicator sets determined for the targets of waste, water and energy transformation/opportunity fields determined in the macro framework are as follows.

- **Data on waste**

The waste data of the enterprises registered in the Waste Declaration System database obtained from the İzmir Provincial Directorate of Environment, Urbanization and Climate Change for the year 2019 were used as the basis. The necessary data for the indicators (waste generation, hazardous waste generation, amount of recycled waste etc.) for the targets set in the field of waste were calculated using the aforementioned database. The business data in the database were classified according to NACE Rev.2 two, three, and four digit activity codes and relevant sector-based data were obtained.

In order to determine the amount of fertilizers and pesticides used in agricultural production, district-based fertilizer and pesticide sales data obtained from İzmir Provincial Directorate of Agriculture and Forestry were used.

- **Data on water**

The necessary data sets for the indicators determined in the field of water (water consumption, wastewater production, pollution etc.) were obtained from different sources. For the water consumption of the enterprises, the monthly water consumption data of the industrial subscriber enterprises registered with the İzmir Water and Sewerage Administration (İZSU) for the period of 2019-2020 were taken as basis. In addition, water consumption and wastewater production data from the organized industrial zones operating in İzmir (Aliağa OIZ, Bağyurdu OIZ, Buca Ege OIZ, Bergama OIZ, Atatürk OIZ, Menemen Plastic Specialized OIZ, Pancar OIZ, Kemalpasa OIZ, Torbalı OIZ and Tire OIZ) as of 2019 were provided and included in the analysis. Sectoral data were calculated by classifying these data obtained on a business basis

according to NACE Rev.2 two, three, and four digit activity codes.

In the estimation of wastewater pollution loads at the sectoral level, scientific studies in the literature were evaluated and indicative values (pollutant loads) representing the sector were determined and used as evaluation criteria in the prioritization studies.

In respect to the water footprint calculations of agricultural products, the agricultural production data set containing the product amount, cultivation area and yield indicators according to the product groups of 2020 were obtained from the İzmir Provincial Directorate of Agriculture and Forestry and used for study purposes.

- **Data on energy**

In calculating the sectoral energy consumption data, the consumption data of the industrial electricity subscriber enterprises from Gediz Elektrik Satis A.S. for the year 2019 were used. Sector data were obtained by aggregating monthly electricity consumption amounts at the enterprise level according to sectoral activity classes. In addition, electricity consumption data for 2019 on the basis of enterprises belonging to the organized industrial zones operating in İzmir (Aliağa OIZ, Bağyurdu OIZ, Buca Ege OIZ, Bergama OIZ, Atatürk OIZ, Menemen Plastic Specialized OIZ, Pancar OIZ, Kemalpaşa OIZ, Torbalı OIZ and Tire OIZ) were also included in the analysis.

- **Economic data**

In addition to the data for the indicators, the data on the number of businesses, the number of social insured persons, foreign trade, production and value added for the industrial sector belonging to the existing economic indicators at the enterprise level were used in the prioritization study. In this direction, the data on the number of businesses and the number of insured persons at the provincial and district level were obtained from the Social Security Institution (SSI), and sectoral production data were obtained from the Entrepreneur Information System (EIS).

Foreign trade data (import and export data) were obtained from TurkSTAT according to the United Nations' ISIC classification (International Standard Industrial Classification of All). Since the NACE and ISIC classifications are compatible with each other at two digit levels, the data obtained according to the ISIC classification system were converted to the NACE classification system at two digit levels.

Value added and production amounts at the sectoral level were obtained from the database created for İzmir Input - Output Analysis to be used. While agricultural production data were obtained from the Provincial Directorate of Agriculture and Forestry, the "Manufacturing Inputs Guide of Agricultural Products Produced in Turkey" published by the abolished General Directorate of Rural Services was taken as basis in determining the product-based diesel consumption amount.

CHAPTER 3.

3. Sectoral Prioritization Analysis at Macro Level

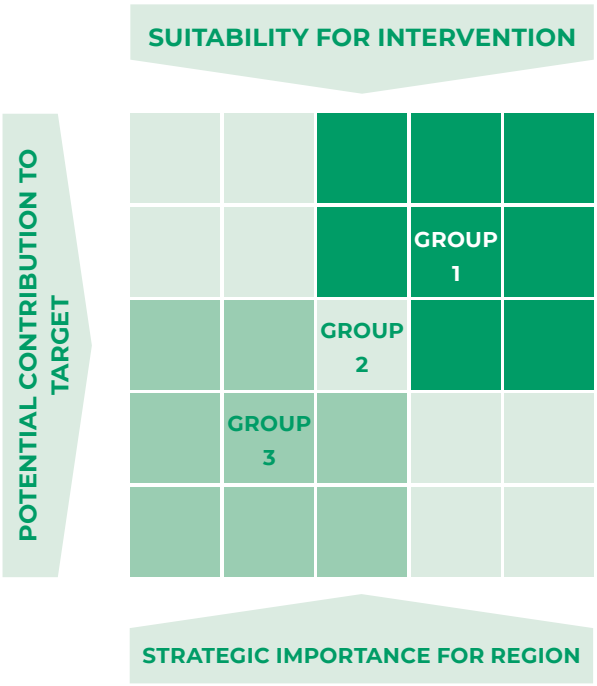
A three-dimensional evaluation framework was developed in order to identify the priority areas for green and blue transformation in İzmir and the prominent sectors and focus of intervention in order to realize the strategic targets developed in this direction. The qualitative and quantitative analysis methods developed within this framework differ within themselves depending on the problem/opportunity-based targets. In respect to the problem-based targets, the sectors that are the lead cause of the relevant problem were considered as the sectors that will create the most impact with the solution of the problem, and thus indicator sets that reveal the current situation of the sectors towards the target were created. The indicator set created for problem-based targets was re-evaluated in the light of the data available at İzmir province level, and the final indicators were thus determined. For instance, “waste amount annually generated” and “hazardous waste amount generated” are indicators determined under the target of “reducing waste”.

Opportunity-based targets determined in the fields of waste, water and energy were differentiated as blue economy opportunities and green transformation opportunities. Since green transformation opportunities have the potential to emerge in all sectors on the current economic system, a sectoral and spatial focus was not defined for these targets. In respect to opportunity-based targets, sectors were analyzed and prioritized on the basis of their development, performance and development potentials in order to reveal the opportunity only in regards to blue economy opportunities. For this reason, the prioritization analysis performed at the macro level in the report is presented in two separate sections, namely green transformation and blue opportunities.

3.1. Sectoral Prioritization for Green Transformation

An evaluation matrix consisting of three components, namely Potential Contribution to the Target, Strategic Importance for the Region and Suitability for Intervention, was prepared to identify the sectors that stand out in respect to the problem-based targets. Through the synthesis study carried out afterwards, the prominent sector groups were determined to provide input to the prioritization analysis to be carried out at the sector level with the results of the evaluation matrix.

FIGURE 1. Three-component evaluation matrix used in macro level sectoral prioritization analysis matrisi



The studies carried out at this stage are explained in detail below, respectively.

3.1.1. Calculating the Potential Contribution to the Target

Data were obtained for the final indicators determined as priority for each problem-based target under the fields of waste, water and energy, and the data obtained at the enterprise level were aggregated in 2 steps, and then the sectoral data for all sectors operating in İzmir were calculated and tabulated for each target. The top twenty sectors (in case the difference between values occurs to be very small or large, this number was either increased or decreased) were selected among the sectors ranked from the largest to the smallest over the indicator values, and a multi-criteria evaluation method was applied to these sectors. While ranking the sectors in relation to the targets with more than one indicator, the size of the values for both indicators has been taken into account to the maximum extent. The indicator determined for the target of “reducing water consumption” under the water transformation/opportunity field and the sectors that are in the top twenty in terms of this indicator are presented in Table 1 as example, and the ranking tables created for all targets are presented in ANNEX 1.

TABLE 1. Indicator-based sectoral ranking for the "reducing waste consumption" target

Transformation/ Opportunity Field	Target 1. Reducing Waste Generation		
	Sectors	1 Amount of Waste Generated (tons/year)	2 Amount of Hazardous Waste Generated (tons/year)
WASTE	24-Manufacture of basic metals	428,706	26,593
	10-Manufacture of food products	189,071	572
	23-Manufacture of other non-metallic mineral products	135,429	1,989
	17-Manufacture of paper and paper products	109,123	1,828
	20-Manufacture of chemicals and chemical products	70,500	24,626
	01-Crop and animal production, hunting and related service activities	68,997	6
	29-Manufacture of motor vehicles, trailers and semi-trailers	51,419	8,398
	25-Manufacture of fabricated metal products, except machinery and equipment	48,868	5,424
	28-Manufacture of machinery and equipment n.e.c.	43,374	12,858
	35-Electricity, gas, steam and air conditioning supply	38,476	1,259
	38-Waste collection, treatment and disposal activities; materials recovery	28,590	4,364
	11-Manufacture of beverages	24,961	470
	22-Manufacture of rubber and plastic products	23,379	2,760
	52-Warehousing and support activities for transportation	20,784	1,021
	27-Manufacture of electrical equipment	17,750	410
	12-Manufacture of tobacco products	16,331	379
	13-Manufacture of textiles	11,161	1,379
	18-Printing and reproduction of recorded media	10,924	1,903
	19-Manufacture of coke and refined petroleum products	10,774	7,691
	14-Manufacture of wearing apparel	6,264	1,194
	15-Manufacture of leather and related products	5,607	76
	16-Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	4,819	48

Source: Indicator-based sectoral ranking for the "reducing waste consumption" target

3.1.2. Developing the Strategic Importance for the Region Index

In this part of the study, an index of strategic importance for the region was created for 39 sectors that stand out in the fields of waste, water and energy in respect to problem-based targets. In the analysis performed with PROMETHEE, one of the multi-criteria decision-making methods, initially the criteria and the weights of such criteria were determined. In the evaluation made in the light of the available data, the criteria to be used for the index were determined as the foreign trade balance calculated by subtracting the import amount from the export amount, the export amount, the specialization calculated according to the number of insured persons and net sales, the scale calculated according to the number of insured, the dominance calculated according to the net sales and the value added per production.

Foreign trade data is critical in determining the strategic importance of a sector. In this context, while the high amount of exports of the relevant sector increases its strategic importance, the high level of import dependency of production reduces the strategic importance of the same sector. In the analysis carried out in this direction, the export amounts and foreign trade balance amounts of the sectors were included, and the foreign trade scores of the sectors with higher values in both criteria were calculated as higher.

The last criterion in the strategic importance analysis is the rate of added value per production. Today, it is stated that high value-added products are an effective tool in closing the current account deficit, accelerating regional development and increasing competitiveness. In the analysis carried out, the value added amounts per production were calculated by proportioning the added value amounts of the sectors to the production amounts.

Some assumptions were made in determining the criteria data of the sectors. Import and export data are provided according to the United Nations ISIC classification (International Standard Industrial Classification of All). Since the NACE and ISIC classifications are fully compatible with each other at the 2-digit level, the data obtained according to the ISIC classification system were used as the NACE classification system data at the 2-digit level. Value added and production amounts at the sectoral level were obtained from İzmir Input Output Analysis. Some of the data in the analysis cover more than one sector at the 2-digit NACE level, and the ratios of the net sales amounts of the relevant sectors were used in the sorting of the grouped data. The weights of the criteria were determined by expert evaluation, and the strategic importance scores calculated with Promethee for 39 sectors that stand out in terms of contribution to the target are shown in Table 2. The tables regarding the criteria data of the sectors are presented in ANNEX 2.

TABLE 2. Strategic importance index scores of sectors

S.N.	Economic Sector	Strategic Importance Score
1	28- Manufacture of machinery and equipment n.e.c.	**0,6241**
2	20- Manufacture of chemicals and chemical products	**0,4211**
3	10- Manufacture of food products	**0,3684**
4	12- Manufacture of tobacco products	**0,3459**
5	01- Crop and animal production, hunting and related service activities	**0,3383**
6	14- Manufacture of wearing apparel	**0,3308**
7	52- Warehousing and support activities for transportation	**0,3233**

S.N.	Economic Sector	Strategic Importance Score
8	3- Fishing and aquaculture	**0,3158**
9	22- Manufacture of rubber and plastic products	**0,2857**
10	17- Manufacture of paper and paper products	**0,2256**
11	46- Wholesale trade, except of motor vehicles and motorcycles	**0,188**
12	25- Manufacture of fabricated metal products, except machinery and equipment	**0,1729**
13	47- Retail trade, except of motor vehicles and motorcycles	**0,1654**
14	29- Manufacture of motor vehicles, trailers and semi-trailers	**0,1617**
15	15- Manufacture of leather and related products	**0,1504**
16	11- Manufacture of beverages	**0,0602**
17	56- Food and beverage service activities	**0,0489**
18	49- Land transport and transport via pipelines	**0,0451**
19	18- Printing and reproduction of recorded media	**0,0376**
20	24- Manufacture of basic metals	-0,0451
21	23- Manufacture of other non-metallic mineral products	-0,0526
22	70- Activities of head offices; management consultancy activities	-0,0902
23	38- Waste collection, treatment and disposal activities; materials recovery	-0,1053
24	86- Human health activities	-0,1053
25	79- Travel agency, tour operator reservation service and related activities	-0,1053
26	61- Telecommunications	-0,1654
27	19- Manufacture of coke and refined petroleum products	-0,1992
28	32- Other manufacturing	-0,218
29	8- Other mining and quarrying	-0,2293
30	5- Mining of coal and lignite	-0,2368
31	26- Manufacture of computer, electronic and optical products	-0,282
32	16- Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-0,3008
33	55- Accommodation	-0,3045
34	9- Mining support service activities	-0,3045
35	35- Electricity, gas, steam and air conditioning supply	-0,3534
36	7- Mining of metal ores	-0,3647
37	36- Water collection, treatment and supply	-0,3684
38	27- Manufacture of electrical equipment	-0,3797
39	13- Manufacture of textiles	-0,3985

Source: Calculated by the authors.

3.1.3. Analysis by Target of Potential Contribution to the Target and Strategic Importance Indices

The Contribution to the Target Index values calculated by the Promethee method for the 39 sectors that stand out in terms of their potential contribution to the target were handled together with the Strategic Importance Index values, and the prominent sectors were classified under three groups in terms of strategic importance and contribution to the target.

In the classification process, sectoral prioritization graphs were created with the "potential contribution to the target index" calculated separately for each target in the fields of waste, water and energy located on the x-axis, and the strategic importance index that do not change based on targets located on the y-axis. Then, by considering the positive values for both indices in the sectoral prioritization graphs, half of the highest positive values were determined as the limit value for the separation of the groups, and one horizontal and one vertical line passing through these values were added to the graph.

The chart was divided into 9 sections with boundary value lines parallel to the x and y axes. These 9 sections were classified into 3 groups within themselves and the sectors that were charted according to the strategic importance index and the potential contribution to the target index were grouped according to their regions. The first group is the sectors with high scores in the index of strategic importance and/or contribution to the target, while the second group consists of sectors with partially high strategic importance but low potential contribution to the target or sectors with partially high potential contribution to the target but low strategic importance points, and the third group consists of sectors with one or two negative strategic importance or potential contribution to the target scores, below the limit values.

In Figure 2, the grouping of the prominent sectors in respect to the 1st target of the field of waste according to their index scores is presented. Indices and graphs for other areas and targets are provided under Annex 3. In conclusion of the grouping, the sectors in the 1st and 2nd groups were discussed in the following evaluation stages, while the sectors in the 3rd group were excluded from the evaluation. In Table 3, the sectoral distribution of target-based groups in the fields of waste, water and energy is presented.

FIGURE 2. Grouping of sectors within the scope of the field of waste in respect to Target 1

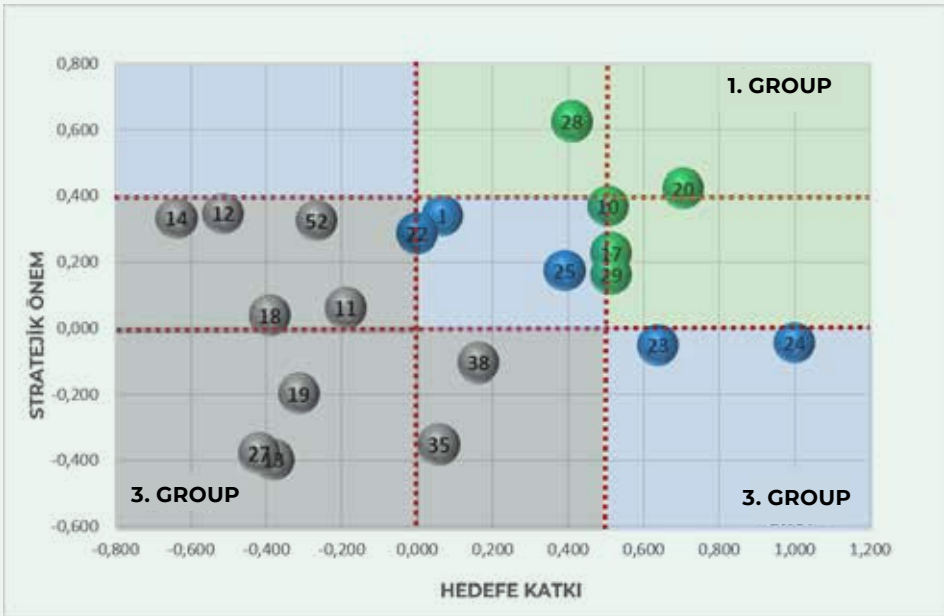


TABLE 3. Target-based sector grouping in the fields of waste, water and energy

SECTOR CLASSES																							
WASTE												WATER						ENERGY					
Target 1			Target 2			Target 3			Target 4			Target 1			Target 2			Target 1			Target 2		
1. Group	2. Group	3. Group	1. Group	2. Group	3. Group	1. Group	2. Group	3. Group	1. Group	2. Group	3. Group	1. Group	2. Group	3. Group	1. Group	2. Group	3. Group	1. Group	2. Group	3. Group	1. Group	2. Group	3. Group
28	22	12	17	24	12	20	28	10	10	14	22	1	25	12	28	22	1	1	20	14	1	52	14
20	1	52	10	25	52		23	25	17	15	25	11	22	17	20	25	12	22	17	52	10	22	17
29	25	14	1	29	22		38	32	20	23	29	10	14	47	10		15	10	47	29	20	49	3
10	23	13	20	28	27		24	27		24	70	20		18	11		17		49	25		23	25
17	24	27			36		17	19		86	38	28		29			29		24	56		38	29
		38			11		46	13			13	46		23			23			46		35	47
		18			35			16			26			24			35			38			61
		11			38			8			19			32			13			5			79
		19			23			22			9			27			19			55			27
		35									7			13			38			13			13
																	24			35			24
																				23			

3.1.4. Evaluation of Suitability for Intervention

The last leg of the evaluation matrix used in the determination of priority sectors for transformation is the stage where the suitability of sectors for intervention is evaluated. This section includes the qualitative evaluation of the sectors in the 1st and 2nd groups, classified according to the Strategic Significance and Potential Contribution to the Target Indices analysis results, using the **Suitability for Intervention Matrix** over certain criteria. In the evaluation, sectors are scored over 3 stars based on the criteria of importance for the regional intervention, potential to be a model and become widespread, sectoral multiplier effect, suitability and feasibility for the regional intervention, and extrinsic motivation/mandatory harmonization requirement.Approaches and assumptions based on scoring for each criterion in evaluation are summarized below:

1. Importance for the regional intervention

Scoring was made according to the groups in which the sectors included in the assessment of suitability for the intervention are placed according to their evaluation of potential contribution to the target and strategic importance, wherein 3 stars were given to the sectors in the 1st group and 2 stars to the sectors in the 2nd group.

2. Potential to be a model and become widespread

Each sector is scored in terms of becoming a model for transformation and creating expansion potential for other sectors. While scoring, the potential of the sector to make social, technological, financial innovations and adaptability to other areas, the suitability of the product life cycle to systemic intervention and the orientation of different interest groups to collaborative solutions, the potential to create behavioral change in the context of environmental sustainability and its potential contribution to social welfare, inclusion and participation in the region were taken into account as sub-criteria. According to the number and level of criteria contributed, the sectors were scored with a minimum of 1 star and a maximum of 3 stars, based on expert evaluation.

3. Sectoral Multiplier Effect

In this section, sectors are evaluated in terms of their ability to affect each other. At this stage, the results of the İzmir Input-Output Analysis study, in which the current economic structure in İzmir has been analyzed at the sectoral level and the inter-sectoral relations are determined, were taken as basis. İzmir Input Output Analysis, prepared by İZKA in 2021, reveals the potential effects of possible sectoral demand and production changes on other sectors, that is, the forward and backward linkage relations of the sectors. The forward linkage effect of a sector is how important the output of that sector is as an intermediate input in other sectors; while the backlink effect, on the other hand, quantitatively shows to what extent it stimulates the production of other sectors through intermediate input demand.

Scoring in the evaluation was made to give 3 stars to the sector with the highest score according to the forward linkage index values.

4. Suitability for Regional Intervention and Feasibility

The suitability of the sector for regional intervention is important in the realization of transformational goals. In the evaluation of this criterion, the existence of auditable stakeholder composition and institutional/social depth, spatial and managerial organizational capacity, rapid localization, prioritization at international, national, local and sectoral levels, internalization by stakeholders and investment attractiveness level were taken into consideration for the sectors. According to the number and level of criteria contributed, the sectors were scored with a minimum of 1 star and a maximum of 3 stars, based on expert evaluation.

5. Extrinsic Motivation/Mandatory Harmonization Requirement

Mandatory and harmonizing legislative arrangements, international agreements (EU Green Deal, Paris Agreement etc.) and national strategies for the transformation of current economic activities are the main motivation sources for the transformation of sectors. Under this criterion, sectors were evaluated considering the necessity of adapting to changes in foreign trade rules and standards, the necessity of complying with national legal and administrative policies and regulations, and motivation factors for eliminating risks that reduce productivity and profitability.

Using the suitability for intervention matrix, sectors were evaluated for problem-based targets in the transformation fields of waste, water and energy based on the five main criteria described above, and the total intervention score of each sector was obtained by adding the scores from each criterion. For each target, the first two sectors with the highest scores were selected in order to make a final evaluation at the synthesis stage, and all sectors were included in the selection in case of sectors with equal scores.

Table 4 is presented as an example evaluation made within the scope of Target 1 under the waste recycling field. Accordingly, 10-Manufacture of food products that came up with the highest score and the following sectors of 29- Manufacture of motor vehicles, trailers and semi-trailers, 17-Manufacture of paper and paper products and 22-Manufacture of rubber and plastic products were selected as the priority sectors for this target.

TABLE 4. Example Evaluation of Suitability for Intervention Matrix

SUITABILITY FOR INTERVENTION MATRIX									
Indicators and Criteria				1 Importance for Regional Intervention	2 Potential to Be a Model And Become Widespread	3 Sectoral Multiplier Effect	4 Suitability for Regional Intervention and Feasibility	5 Extrinsic Motivation/ Mandatory Harmonization Requirement	SCORE
WASTE	Reducing waste generation	Problem-based target	28- Manufacture of machinery and equipment n.e.c.	***	*	*	**	***	10
			20- Manufacture of chemicals and chemical products	***	*	**	*	***	10
			29- Manufacture of motor vehicles, trailers and semi-trailers	***	*	***	**	***	12
			10- Manufacture of food products	***	***	**	***	***	14
			17- Manufacture of paper and paper products	***	**	***	**	**	12
			22- Manufacture of rubber and plastic products	**	**	***	***	**	12
			01- Crop and animal production, hunting and related service activities	**	***	*	*	***	10
			25- Manufacture of fabricated metal products, except machinery and equipment	**	**	**	**	**	10
			23- Manufacture of other non-metallic mineral products	**	*	**	*	**	8
			24- Manufacture of basic metals	**	*	**	*	**	8

3.2. Sectoral Prioritization for Blue Opportunities

In determining the priority sectors for opportunity-based targets, a different evaluation method was used that differs from the approach followed for problem-based targets in respect to certain features. In this direction, the sectors that will contribute to the blue economy potential were first defined in the determination of priority sectors for the opportunity-based target of "utilizing the blue economy potential" under the water transformation/opportunity field. The definitions, subgroups and activity codes of these sectors, which are determined by taking into account the international strategies and acceptances on blue growth, are presented in ANNEX 5.

Afterwards, blue growth sectors were analyzed in terms of development, performance and development potentials. In the determination of the sectors to be prioritized, the relevant sectors were analyzed on the basis of employment-based specialization, dominance and scale indicators and classified as 'advanced' and 'growing'. In addition, 'promising' blue growth sectors were determined in the expert evaluation carried out using innovation, competitiveness, policy compliance, spillover effect and sustainability criteria.

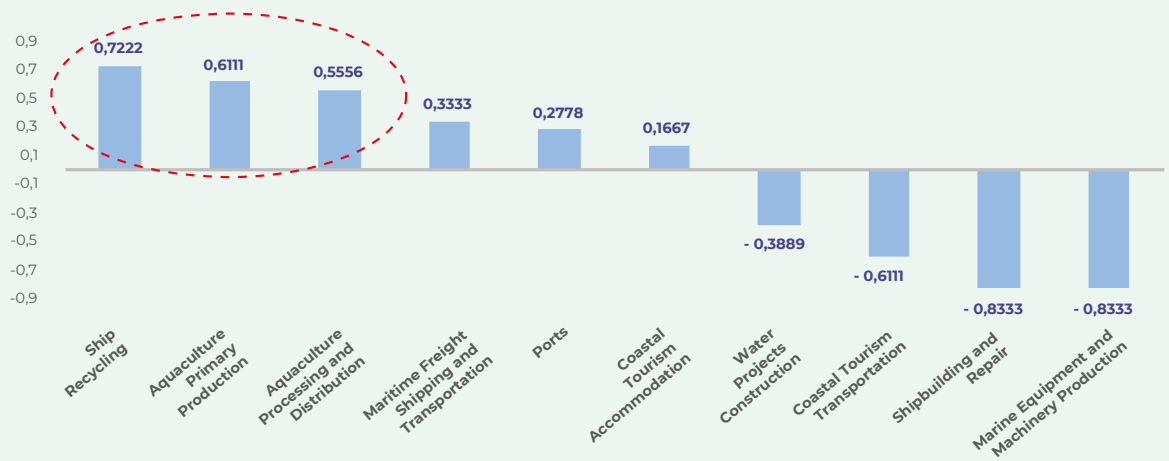
Using the 2019 data, the development of the sectors in terms of their current values was determined. The development scores of the sectors were calculated with the PROMETHEE method based on employment-based specialization, scale and dominance criteria. Sectoral ranking results according to the development scores are presented in Table 5 and Figure 3.

TABLE 5. Sectoral development scores

Sektör	Puan
Ship Recycling	**0,7222**
Aquaculture Primary Production	**0,6111**
Aquaculture Processing and Distribution	**0,5556**
Maritime Freight Shipping and Transportation	**0,3333**
Ports	**0,2778**
Coastal Tourism Accommodation	**0,1667**
Water Projects Construction	-0,3889
Coastal Tourism Transportation	-0,6111
Shipbuilding and Repair	-0,8333
Marine Equipment and Machinery Production	-0,8333

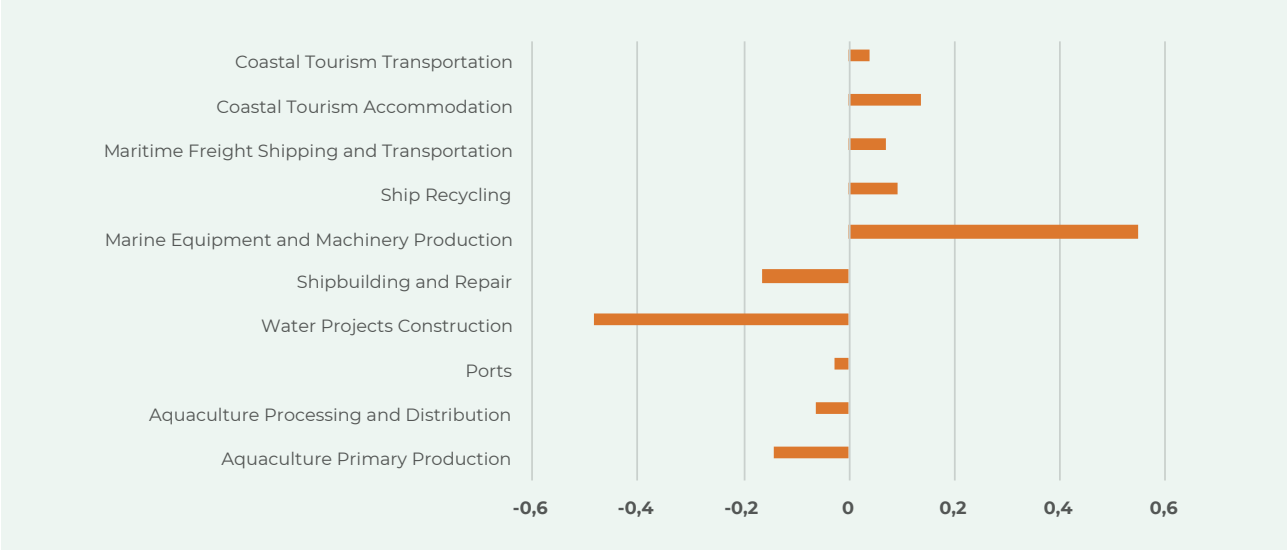
According to the development score ranking, aquaculture primary production, aquaculture processing and distribution, and ship recycling sectors were among the top three sectors with the highest scores and thus were classified as developed sectors.

FIGURE 3. Developed blue growth sectors



In the second stage, the status of the employment-based specialization values of the sectors between the years 2015-2019 was analyzed and the change scores were calculated (Annex 6), thus the development performances of the sectors within five years were evaluated and the 'growing' blue economy sectors were determined. Accordingly, the sectors in which the specialization increased the most were determined as maritime equipment and machinery production and coastal tourism accommodation, which were thus classified as growing sectors (Figure 4).

FIGURE 4. Growing blue growth sectors



The sectors that remain outside the developed and growing sectors while showing growth potential with the transformation in the future were also evaluated by using the criteria of innovation, competitiveness, compliance with policies, spillover effect and sustainability in line with expert opinions (Table 6). At this stage, the sector that stands out in terms of blue opportunities among the sectors classified as promising could not be selected.

TABLE 6. Evaluation of promising sector classification

Sectors	Promising Sectors					
	Innovation	Competitiveness	Compliance with Policies	Spillover Effect	Sustainability	SCORE
Marine Biotechnology	***	**	***	**	**	12
Marine Energy (Wave, tides, hydrogen)	***	*	*	*	***	9
Offshore oil and gas extraction	***	**	*	*	*	8
Marine Mining	***	*	*	*	*	7
Coastal Tourism (Cruise, yachting and marinas, marine recreation)	*	**	***	*	*	8
Preventing hydrological disaster risks	***	*	*	*	***	9
High-tech marine products and equipment	***	***	***	***	***	15

3.3. Synthesis

Sectors that stand out in each target under waste, water and energy transformation/opportunity fields have been finalized through a synthesis study and priority sectors to be addressed at the sectoral level have thus been determined. At this stage, after the evaluation of the suitability for the intervention matrix, the top three sectors with the highest score on target basis were tabulated as presented in Table 17. In the selection of priority sectors, the critical importance level of the sector in terms of contributing to the target the most and realizing the target has been taken into consideration. When the sectors are analyzed in terms of the number of targets they contribute in this direction, it is seen that the 10-Manufacture of food products sector contributes to the seven targets under the field of waste, water and energy in the first rank. From the same point of view, 17- Manufacture of paper and paper products sector stands out for contributing to five targets in the second rank, 20-Manufacture of chemicals and chemical products sector stands out for one target from the second rank and seven targets from the third rank. 22-Manufacture of rubber and plastic products contributes to four targets at the second rank and one goal at the third rank, while 01-Crop and animal production activities stands out contributing to five targets at the third rank. 38- Waste collection, treatment and disposal activities; materials recovery contribute to two targets in total, but since it stands out for the 3rd target of the waste field, it has been considered as a sector of critical importance for this target.

It has not been possible to prioritize the sector in the opportunity-based targets in the waste, water and energy fields. These targets, which include increasing the R&D and innovation potential for transformation, have been evaluated to cover all sectors. In this direction, as given in Table 8, the opportunity-based targets determined in the fields of waste, water and energy were combined and determined as the targets that should be addressed in all of the priority sectors determined in the continuation of the study.

The priority sectors identified for blue opportunities are summarized in Table 9.

TABLE 7. Target-based priority sectors in the synthesis phase

Ranking	Green Transformation Sectors							
	WASTE			WATER	ENERGY	WASTE	WATER	ENERGY
	Target 1.	Target 2.	Target 3.	Target 1.	Target 1.	Target 4.	Target 1.	Target 2.
1	10	10	38	10	10 22	10	10	10
2	17 22 29	17	17	22	17	17 20	22	38
3	20 28 01 25	01 20 24 25	20	01 20 14	01 20	14 15	20	01 20 22

TABLE 8. Opportunity-based targets for transformation

TECHNOLOGY AND SERVICES INNOVATION		
WASTE	WATER	ENERGY
Target 5.	Target 5.	Target 3.
a)) Development of techniques and technologies related to water management and efficiency, energy efficiency, raw material efficiency and recycling		
b) Producing clean energy equipment and development of sustainable energy systems and technologies		

TABLE 9. Priority sectors for blue opportunities

Aquaculture (Primary Production)
Aquaculture (Processing and Distribution)
Marine Equipment and Machinery Production
Ship Recycling
Coastal Tourism (Accommodation)
Marine Biotechnology
Marine Energy (Wave, tides, hydrogen)
Marine Equipment Machine Production

CHAPTER 4.

Sub-Sector Analysis at Sector Level

A sub-sector analysis was carried out with the aim of in-depth analysis on the basis of sub-sectors and determining spatial concentrations for the main sectors, which were determined through the sectoral prioritization analysis carried out at the macro level for green transformation and blue opportunities. The sub-sector analysis was conducted on the basis of the main sectors gathered under three main groups, namely agriculture, industry and blue opportunities in the synthesis section. Within the scope of the analysis, different approaches and methods were used for each group, and the studies carried out are thus presented under the headings of industry, agriculture and blue opportunities.

4.1. Industry

The main priority sectors determined for green transformation in line with the targets defined in the fields of waste, water and energy with the sectoral prioritization analysis carried out at the macro level are presented below:

- 24-Manufacture of basic metals
- 10-Manufacture of food products
- 17-Manufacture of paper and paper products
- 29-Manufacture of motor vehicles, trailers and semi-trailers
- 20-Manufacture of chemicals and chemical products
- 38-Waste collection, treatment and disposal activities; materials recovery
- 25-Manufacture of fabricated metal products, except machinery and equipment
- 28-Manufacture of machinery and equipment n.e.c.
- 22-Manufacture of rubber and plastic products
- 15-Manufacture of leather and related products
- 14-Manufacture of wearing apparel

The sub-sector analysis includes an in-depth examination of the sub-sectors under the main sectors with the target-based evaluation approach adopted at the macro level, and also the determination of the spatial concentrations of these sectors. In this direction, initially the sub-sectors at the NACE four-digit level under the main sectors were defined and an evaluation matrix was created.

The first evaluation criterion on the basis of sub-sectors was the contribution indicators to the target used in determining the main sectors at the macro level. For this purpose, sub-sector data was provided for the indicators determined in the fields of waste, water and energy, and sub-sectors were listed in terms of the size of the contribution made to the target. Afterwards, sub-sectors were evaluated in terms of specialization, dominance and scale criteria according to the number of employees and businesses. The aim here is to determine the strategic ones for the regional economy among the sub-sectors that do not show a significant differentiation in terms of target indicators.

By using the evaluation matrices created for each of the waste, water and energy fields, an example of which is given in Table 10, the sub-sectors that stand out in respect to the target indicators and also have strategic importance for the region, are determined to be aggregated at a higher level and presented in Table 11.

TABLE 10. Evaluation matrix for sub-sector selection in the field of waste

WASTE			TARGET INDICATORS*				
Sector	**Sub Sector - Nace4**	**Sub Sectors**	**1 Amount of Waste Generated (%)**	**2 Amount of Hazardous Waste Generated (%)**	**3 Ratio of Recyclable Waste (%)**	**4 Ratio of Stored Waste (%)**	
10-Manufacture of food products	10.12-Processing and preserving of poultry meat	**10.1-Processing and preserving of meat and production of meat products**	1,77	0,06	2,20	0,71	
	10.13-Production of meat and poultry meat products		0,44	0,04	0,40	0,77	
	10.11-Processing and preserving of meat		0,05	0,00	0,06	0,00	
	10.39-Other processing and preserving of fruit and vegetables	**10.3-Processing and preserving of fruit and vegetables**	15,53	0,05	5,43	68,86	
	10.32-Manufacture of fruit and vegetable juice		1,21	0,02	0,54	4,79	
	10.41- Manufacture of oils and fats	**10.41- Manufacture of oils and fats**	3,14	0,65	3,31	3,54	
15-Manufacture of leather and related products	15.11-Tanning and dressing of leather; dressing and dyeing of fur	**15.11-Tanning and dressing of leather; dressing and dyeing of fur**	0,73	0,12	0,43	2,40	
17-Manufacture of paper and paper products	17.12-Manufacture of paper and paperboard	**17.12-Manufacture of paper and paperboard**	6,41	1,57	7,57	3,60	
	17.21-Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	**17.2-Manufacture of articles of paper and paperboard**	6,03	1,19	7,75	0,30	
	17.22-Manufacture of household and sanitary goods and of toilet requisites		1,70	0,11	1,24	4,58	
	17.23-Manufacture of paper stationery		0,27	0,09	0,35	0,00	

	2019 NUMBER OF INSURED EMPLOYEES			2019 NUMBER OF BUSINESSES		
	LQ Number of Employees	Scale	Dominance	LQ Businesses	Scale	Dominance
	3,07	18,81	0,42	1,21	8,33	0,01
	1,77	10,85	0,12	0,92	6,36	0,04
	1,09	6,68	0,08	0,58	3,98	0,03
	2,56	15,67	0,79	1,57	10,82	0,16
	1,03	6,30	0,03	0,41	2,81	0,00
	2,20	13,49	0,21	2,07	14,24	0,15
	1,53	9,35	0,10	0,96	6,59	0,04
	2,46	15,10	0,12	1,48	10,22	0,03
	1,78	10,93	0,33	1,66	11,43	0,12
	0,29	1,79	0,02	0,52	3,60	0,01
	1,18	7,24	0,02	1,44	9,92	0,02

WASTE			TARGET INDICATORS*				
Sector	Sub Sector - Nace4	Sub Sectors	1 Amount of Waste Generated (%)	2 Amount of Hazardous Waste Generated (%)	3 Ratio of Recyclable Waste (%)	4 Ratio of Stored Waste (%)	
20-Manufacture of chemicals and chemical products	20.16-Manufacture of plastics in primary forms	**20.16-Manufacture of plastics in primary forms**	3,53	14,94	2,47	4,94	
	20.30-Manufacture of paints, varnishes and similar coatings, printing ink and mastics	**20.30-Manufacture of paints, varnishes and similar coatings, printing ink and mastics**	2,26	22,94	0,58	0,01	
24-Manufacture of basic metals	24.10-Manufacture of basic iron and steel and of ferro-alloys	**24.10-Manufacture of basic iron and steel and of ferro-alloys**	47,57	39,20	58,09	0,00	
29-Manufacture of motor vehicles, trailers and semi-trailers	29.32-Manufacture of other parts and accessories for motor vehicles	**29.3-Manufacture of parts and accessories for motor vehicles**	5,83	12,25	6,22	1,17	
38-Waste collection, treatment and disposal activities; materials recovery	38.31-Dismantling of wrecks	**38.3-Materials recovery**	2,99	6,50	2,87	3,34	
	38.32-Recovery of sorted materials		0,54	0,27	0,48	0,99	

** Consumption values are stated as ratios due to data privacy.*

	2019 NUMBER OF INSURED EMPLOYEES			2019 NUMBER OF BUSINESSES		
	LQ Number of Employees	Scale	Dominance	LQ Businesses	Scale	Dominance
	5,32	32,65	0,32	0,96	6,62	0,03
	3,43	21,02	0,26	1,40	9,64	0,05
	1,69	10,34	0,56	1,21	8,32	0,10
	1,43	8,75	1,14	1,26	8,66	0,15
	6,28	38,53	0,12	2,19	15,08	0,07
	1,22	7,50	0,06	1,54	10,65	0,08

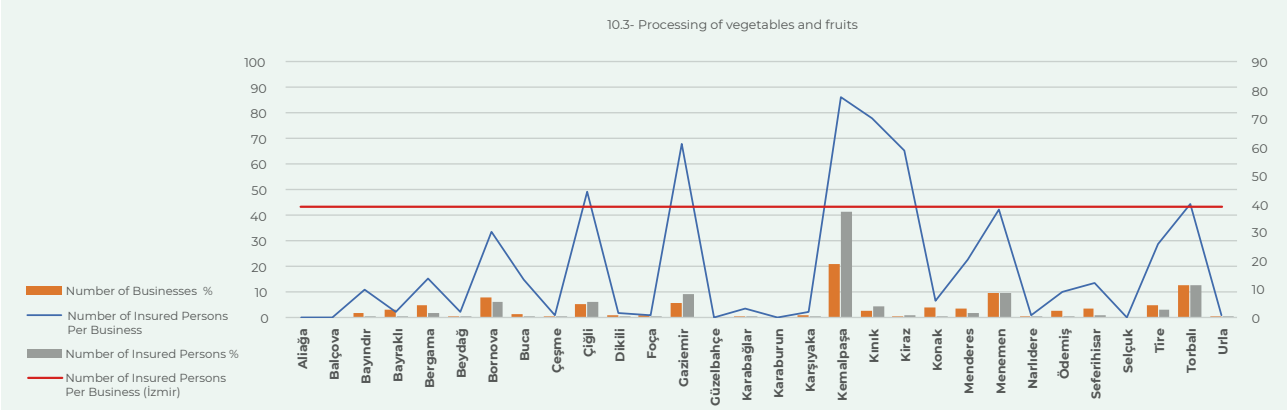
TABLE 11. Priority sectors and sub-sectors in the fields of waste, water and energy

Transformation Field	Sector	Sub Sectors
WASTE	10-Manufacture of food products	10.3-Processing and preserving of fruit and vegetables
	15-Manufacture of leather and related products	15.11-Tanning and dressing of leather; dressing and dyeing of fur
	17-Manufacture of paper and paper products	17.12-Manufacture of paper and paperboard
		17.2-Manufacture of articles of paper and paperboard
	24-Manufacture of basic metals	24.10-Manufacture of basic iron and steel and of ferro-alloys
	29-Manufacture of motor vehicles, trailers and semi-trailers	29.3-Manufacture of parts and accessories for motor vehicles
	38-Waste collection, treatment and disposal activities; materials recovery	38.3-Materials recovery
WATER	10-Manufacture of food products	10.41-Manufacture of crude vegetable oils (olive oil, sunflower oil and other vegetable oils)
		10.51-Operation of dairies and cheese making
	14-Manufacture of wearing apparel	14.1- Manufacture of wearing apparel, except fur apparel
	20-Manufacture of chemicals and chemical products	20.1-Manufacture of plastics in primary forms
ENERGY	22-Manufacture of rubber and plastic products	22.2- Manufacture of plastics products
	10-Manufacture of food products	10.3-Processing and preserving of fruit and vegetables
		10.61-Manufacture of grain mill products
	17-Manufacture of paper and paper products	17.2-Manufacture of articles of paper and paperboard
		17.12-Manufacture of paper and paperboard
	20-Manufacture of chemicals and chemical products	20.41-Manufacture of soap and detergents, cleaning and polishing preparations

In order to determine the spatial distribution of the prominent sub-sectors, a district-based evaluation was made by using the data on the number of businesses and the number of insured employees. In this direction, the share of each sub-sector in İzmir in terms of the number of businesses and the number of insured employees was calculated and the concentrations specific to the districts were revealed.

In addition, in order to understand the potential size of businesses operating in sub sectors, the number of employees per business was used. By creating spatial distribution charts with the data obtained, the districts to be focused on in the sub sectors were determined. Graphics prepared for the "processing of vegetables and fruits" sub-sector are presented in Figure 5 as an example, and graphics for all other sub-sectors are presented under ANNEX 9.

FIGURE 5. 10.3-Spatial distribution of the processing and preserving of fruit and vegetables sub sector



Source: Calculated by the authors.

4.2. Agriculture

Considering the nature of the data existing and available for the agriculture sector, it was not possible to make an assessment at the 4-digit NACE level similar to the method followed in the manufacturing industry. While some of the data is available at the district and agricultural product level, some of the data is available only at the district level, without any agricultural product linkage. Differences in data level also required different approaches in the analyzes carried out in the fields of waste, water and energy. In this context, the analyzes carried out in each field are as explained below:

4.2.1. Identification of Prominent Sub Sectors and Spatial Focuses in the Field of Water

In the analyzes carried out in the field of water, the initial aim was to determine the amount of water used for each of the agricultural products grown in İzmir. However, the amount of water used in agricultural production activities varies greatly according to factors such as the level of consciousness of the producer, the irrigation technique used and the water source they can access, and currently there is no manner available to measure and determine such data. For this reason, it was decided to calculate the water footprint of each product based on the types and amounts of agricultural products produced in İzmir.

Although it is known that the blue water footprints calculated by the water footprint method do not indicate the amount of water used in agricultural production, and the actual amount of water used may be much higher, a comparison was made regarding the water requirement of the current agricultural pattern in İzmir through this approach. The Water Footprint Network (WFN) has a large product-based water footprint database covering many countries and cities for the years 1996-2005. The green, blue and gray water footprint values determined on a product basis for İzmir in the WFN database were used in the calculation of the water footprint of the agricultural products produced in İzmir. The values in the database indicate the annual green, blue and gray water footprints for one ton of the relevant product, and the study carried out in this direction has progressed over the production quantities of the products.

Agricultural production data obtained from İzmir Provincial Directorate of Agriculture and Forestry were used in water footprint calculations. In the data set consisting of the main groups of field crops, vegetables, fruit and ornamental plants, there is information contained about the amount of products, production area and yield per area on an annual basis. Agricultural products in each main group are listed in Table 12.

WATER FOOTPRINT

The water footprint of a product is the total amount of fresh water used in its production and is determined throughout the supply chain. The water footprint addresses the water that the product, service, process, business or industry consumes and pollutes directly and indirectly throughout the supply chain. There are three types of water footprints: green, blue and gray.

Green water footprint is rainwater found in the soil in the root zone of plants, consumed by plants or lost through evaporation and transpiration, and is mostly used for agricultural and forestry products.

Blue water footprint indicates the amount of ground and surface water used. It refers to the water contained in the product, lost by evaporation, transferred from one water source to another water source, or returned to the same source at a different time. Irrigated agriculture, industrial use and domestic use have blue water footprints.

Gray water footprint is the amount of fresh water used to reduce the pollution load to current environmental and water standards. The gray water footprint addresses the point pollutants that are piped directly to a freshwater source or the diffuse pollutants that leach indirectly out of the soil (WFN, 2022).

While the green and blue water footprint is for the amount and source of fresh water, the amount of gray water is a concept related to the amount of polluted water.;

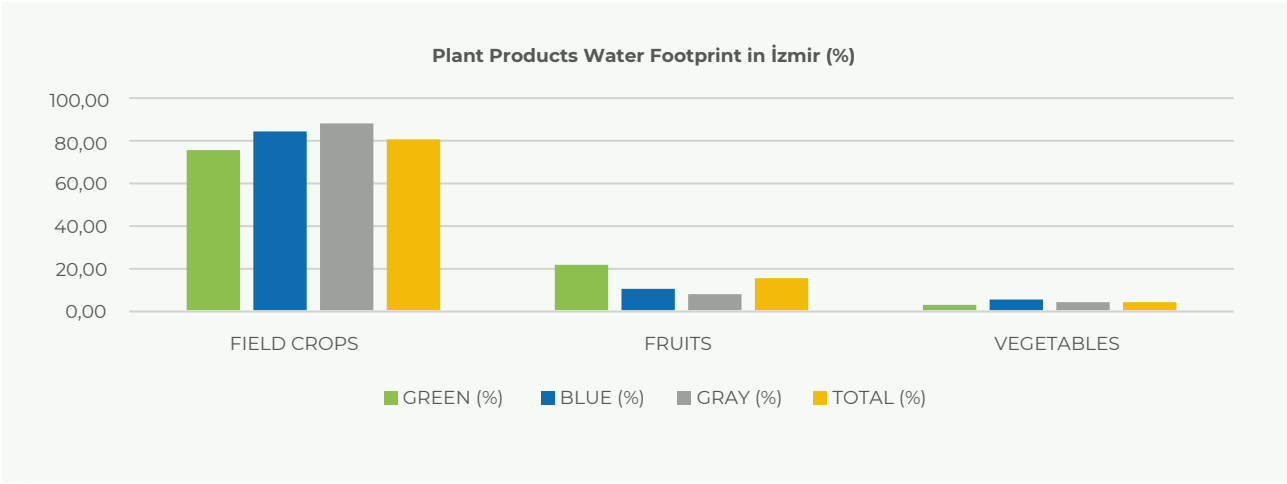
TABLE 12. Contents of product groups

Product Group	Content
Field Crops	Cabbage, Celery, Lettuce, Spinach, Leek, Purslane, Artichoke, Parsley, Arugula, Cress, Mint, Dill, Zucchini, Cucumber, Eggplant, Okra, Tomato, Pepper, Melon, Watermelon, Beans, Black-eyed Peas, Peas, Kidney Beans, Beans, Garlic, Onion, Carrot, Radish, Beet, Cauliflower, Broccoli, Mushroom, Chard, Acurd, Barley, Wheat, Rye, Peanut, Oats, Sunflower, Cotton, Sesame, Sugar Beet, Tobacco, Broad Bean, Green Peas, Potato, Onion, Garlic, Anise, Thyme, Vetch, Sainfoin, Corn (Whole) Corn (Grained), Maize (Silage), Sorghum, Triticale, Turnips, Alfalfa, Oats, Paddy, Sweet Potato, Fodder Beet, Plum, Italian Ryegrass
Fruits	Pear, Quince, Apple, Almond, Walnut, Chestnut, Raspberry, Strawberry, Mulberry, Fig, Pomegranate, Persimmon, Kiwi, Grape, Medlar, Plum, Spinach, Apricot, Cherry, Peach, Cherry, Wild Apricot, Pistachio, Olive, Lemon, Tangerine, Mandarin, Orange
Vegetables	Cabbage, Celery, Lettuce, Spinach, Leek, Purslane, Artichoke, Parsley, Arugula, Cress, Mint, Dill, Zucchini, Cucumber, Eggplant, Okra, Tomato, Pepper, Melon, Watermelon, Beans, Black-eyed Peas, Peas, Kidney Beans, Beans, Garlic, Onion, Carrot, Radish, Beet, Cauliflower, Broccoli, Mushroom, Chard, Gherkin

In the study, for which the data set covering the years 2015-2020 was used, initially the last 5 years average of the amount of agricultural products produced in each district was calculated. With this approach, it has been tried to minimize the effects of the annual changes in the crop pattern and the yield fluctuations due to factors such as climatic conditions on the analysis. Then, using the agricultural product water footprint data determined for İzmir in the Water Footprint Network, blue, green and gray water footprints of agricultural products were calculated for İzmir in general.

When the change in the last 5 years of livestock and animal products is examined, it is seen that there is a continuous upward trend in contrast to the rising and declining trends in plant products. In this context, in order to calculate the most up-to-date water footprint values, 2020 data for livestock and animal products were taken as basis. By comparing the obtained results proportionally, the prominent product groups in İzmir in terms of water footprint were determined. Water footprint comparisons of herbal products grown in İzmir are shown in Figure 6, and water footprint graphics for other product groups are presented in Annex 10.

FIGURE 6. Water footprint rates of plant products grown in İzmir



At the following stage, the products that stand out in terms of water footprint in each main group and the districts where these products are produced the most were determined. Figure 7 shows the prominent products in the field crops group, and Table 13 shows the distribution of the blue water footprints of the prominent crops by districts, while the results obtained on the basis of other groups are given in ANNEX 11.

FIGURE 7. Top 5 products in the field crops group in respect to their blue water footprints

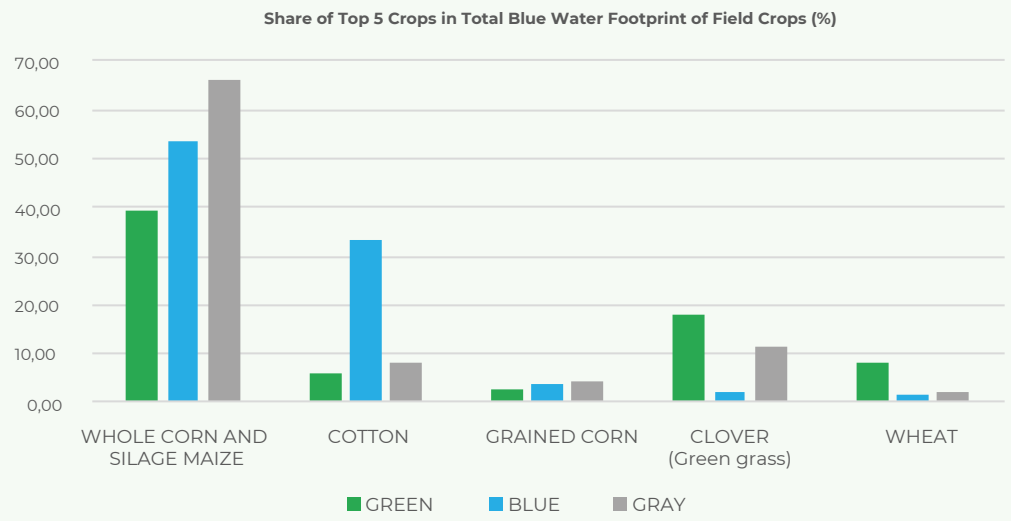


TABLE 13. Blue water footprint of the prominent products in the field products group by districts

DISTRICT	WHOLE AND SILAGE MAIZE (%)	COTTON (%)	GRAIN CORN (%)	CLOVER (Green grass)(%)	WHEAT (%)
Aliağa	0,73	0,59	1,93	3,62	10,25
Balçova	0,00	0,00	0,00	0,01	0,01
Bayındır	15,18	0,35	3,33	18,34	6,46
Bayraklı	0,00	0,00	0,00	0,00	0,00
Bergama	3,22	32,35	19,84	15,36	15,87
Beydağ	3,13	0,00	0,00	0,28	0,42
Bornova	0,05	0,00	0,16	0,00	0,05
Buca	0,51	0,03	0,91	0,22	0,66
Çeşme	0,00	0,00	0,00	0,00	0,19
Çiğli	0,12	1,58	0,16	0,09	0,66

DISTRICT	WHOLE AND SILAGE MAIZE (%)	COTTON (%)	GRAIN CORN (%)	CLOVER (Green grass)(%)	WHEAT (%)
Dikili	1,85	4,42	2,68	2,86	6,87
Foça	0,92	2,78	0,59	2,72	1,30
Gaziemir	0,00	0,00	0,00	0,01	0,17
Güzelbahçe	0,02	0,00	0,02	0,00	0,07
Karabağlar	0,00	0,00	0,00	0,00	0,00
Karaburun	0,00	0,00	0,00	0,12	0,03
Karşıyaka	0,00	0,00	0,00	0,00	0,00
Kemalpaşa	0,51	0,00	0,01	0,93	3,04
Kınık	0,32	7,92	8,33	1,88	2,65
Kiraz	10,20	0,00	0,00	3,90	7,93
Konak	0,00	0,00	0,00	0,00	0,00
Menderes	0,93	0,75	14,31	7,99	14,41
Menemen	1,59	33,18	2,76	8,14	6,15
Narlıdere	0,00	0,00	0,00	0,00	0,00
Ödemiş	33,28	0,00	0,04	7,69	4,06
Seferihisar	0,06	0,00	0,00	1,32	0,33
Selçuk	0,34	2,03	0,86	0,87	0,62
Tire	15,62	0,76	10,42	8,55	10,10
Torbalı	11,17	13,26	33,58	13,74	6,63
Urla	0,25	0,00	0,04	1,36	1,08

Source: Calculated by the authors.

When the agricultural product groups are compared in terms of blue water footprints, it is observed that the blue water footprint of field crops constitutes 73.08% of the total blue water footprint of İzmir province. This observation reveals that most of the ground and surface water resources are used in the cultivation of field crops within the scope of agricultural activities carried out in İzmir (Table 14).

Data on red meat covered among the product groups is created according to the number of slaughtered animals only in the districts with slaughterhouses. In this context, it has not been possible to determine the amount of red meat obtained from animals raised in İzmir and slaughtered in other provinces, or from animals raised in other provinces and slaughtered in İzmir. Nevertheless, the existing data were included in the analysis, considering that not including the red meat data group in the analysis would increase the water footprint to be calculated for other product groups. The water footprint values required for the analyzes for the ornamental plants product group could not be obtained. In the analysis based on the water footprint values used for cut flowers in the Risk Assessment Study for Critical Agricultural Products for the İzmir Küçük Menderes Basin, it was observed that the blue water footprint of the ornamental plants group was lower than the vegetables with the lowest blue water footprint among the plant products. However, this analysis was not included in the study because data source for the water footprint value could not be verified.

TABLE 14. Water footprint of agricultural products

Product Group	Green (%)	Blue (%)	Gray (%)	Total (%)
Field Crops	29,36	73,08	64,38	43,03
Fruit	8,54	8,61	6,00	8,30
Vegetables	0,94	4,77	2,74	2,01
Bovine	26,46	3,46	6,01	19,06
Ovine	1,21	0,23	0,09	0,87
Poultry	1,23	0,35	0,83	0,99
Milk	10,57	3,99	7,77	8,77
Red Meat	5,47	0,74	1,24	3,95
White Meat	11,80	3,48	7,91	9,49
Egg	4,39	1,28	3,02	3,54
Total	**100**	**100**	**100**	**100**

Source: Calculated by the authors.

When the water footprint distributions of the field crops group are examined, it is observed that the total blue water footprint of silage maize and cotton corresponds to 87.19% of the total blue water footprint of all field crops (Table 15). As a result, it has been understood that the product group with the highest blue water footprint in the agricultural production activities carried out in İzmir is the field crops group, while the prominent products in this group are cotton and silage maize. The blue water footprint of bovine livestock farming constitutes 3.46% of the blue water footprint of total agricultural production. However, considering that the corn/maize production standing out within the blue water footprints in İzmir is mainly caused by bovine livestock farming activities, it is considered that it is a necessity in the study to consider maize in the context of cause-effect relationship with bovine livestock farming.

TABLE 15. Water footprint distribution of field crops

	Green (%)	Blue (%)	Gray (%)	Total (%)
Whole Corn And Silage Maize	39.40	53.65	65.96	49.07
Cotton	5.75	33.53	8.05	16.95
Grained Corn	2.67	3.64	4.48	3.33
Clover (Green Grass)	17.99	2.13	11.44	10.79
Wheat	8.20	1.78	2.21	4.77
Potato	0.37	1.73	0.40	0.90
Vetch	15.45	1.72	4.34	8.37
Italian Ryegrass	4.16	0.90	1.12	2.42
OATS(Grained)	1.01	0.23	0.25	0.59

	Green (%)	Blue (%)	Gray (%)	Total (%)
Tobacco	0.12	0.19	0.08	0.14
Sunflower	0.24	0.18	0.13	0.20
Barley	2.52	0.12	0.59	1.28
Fodder Beet	0.79	0.07	0.53	0.47
Onion	0.02	0.04	0.03	0.03
Triticale	0.71	0.04	0.22	0.37
Sorghum	0.38	0.02	0.03	0.18
Garlic	0.01	0.01	0.01	0.01

Kaynak: İzmir Çevre ve Şehircilik İl Müdürlüğü 2019 verileri kullanılarak yazarlar tarafından hesaplanmıştır.

4.2.2. Identification of Prominent Sub Sectors and Spatial Focuses in the Field of Waste

In the analysis carried out for the field of waste, primarily districts that stand out in terms of diffuse pollutants and organic losses in agricultural production were determined due to the constraints experienced in obtaining data at the product level. In this context, the districts were handled in terms of three basic criteria and ranked using PROMETHEE, as a multi-criteria decision-making method. The three criteria used in the analysis are organic wastes caused by losses in the harvesting process of agricultural products, the amounts of nitrogen and phosphorus caused by livestock activities, and the amounts of fertilizers and pesticides used per decare in agricultural production.

District-based fertilizer and pesticide sales data obtained from İzmir Provincial Directorate of Agriculture and Forestry were used in order to determine the amount of fertilizers and pesticides used in agricultural production. Within the scope of the analysis, it was assumed that the fertilizer and pesticides were used in the district where they were sold and the surplus consumption was around the same level in all districts. The average sales amount was found over the data set covering the years 2016-2020 and the ratio of the relevant district's agricultural production area and the amount of fertilizer and pesticide use per decare were determined.

Bovine, ovine and poultry data at the district level were used to determine the diffuse pollutant load resulting from livestock activities. In the literature review carried out in this context, annual wet manure amounts were determined based on the average weight assumptions used for bovine, ovine and poultry species. Then, using the literature data on nitrogen and phosphorus ratios in wet manure for all three species, nitrogen and phosphorus amounts resulting from livestock activities in the relevant district were calculated.

Finally, in order to determine the amount of organic waste arising from agricultural activities, agricultural product loss rates and agricultural production amounts were used on the basis of the product group included in the report titled Food Losses and Waste in Turkey, published by FAO. The data based on the calculations for all three criteria are presented in Annex 12.

By using the determined criteria, the prominent districts in the field of waste were determined through PROMETHEE. The weights of the criteria were determined in three different manners according to the equal distribution of the main criteria and sub-criteria, and expert opinion (Table 16). The prominent districts found as a result of all three distributions are listed in Table 17, and it is seen that the first 5 districts of the province are the same even though there are minor ranking changes in the analysis.

TABLE 16. Weight scores of criteria

Main Criteria	Organic Waste	Fertilizer and Pesticide			Nitrogen and Phosphorus from Animal Manure	
Criteria Indicators	Total Organic waste (tons/ year)	Fertilizer (kg/da)	Pesticide (kg/da)	Pesticide (L/ da)	Total Nitrogen Load (tons/ year)	Total Phosphorus Load (tons/ year)
Main Criteria Sum Equal Distribution (%)	30	17,50	8,75	8,75	20	15
Sub Criteria Equal Distribution (%)	16,66	16,66	16,66	16,66	16,66	16,66
Expert Opinion(%)	10	20	20	20	20	10

TABLE 17. Districts standing out in different weight scores

District	Main Criteria Sum Equal Distribution	Sub Criteria Equal Distribution	Expert Opinion
Ödemiş	1	1	1
Tire	2	2	2
Bergama	3	4	3
Menemen	4	3	4
Bayındır	5	5	5
Torbalı	6	7	8
Foça	7	8	9
Dikili	8	6	10
Kiraz	9	9	6
Kemalpaşa	10	13	7
Kınık	11	10	11
Seferihisar	12	12	14
Menderes	13	14	13
Selçuk	14	11	16
Beydağ	15	15	12
Urla	16	16	15
Çeşme	17	17	18
Karabağlar	18	18	19
Aliağa	19	19	17
Karaburun	20	20	20
Gaziemir	21	21	21

The data pertaining to all districts regarding the aforementioned criteria are given in Table 18. When the criteria data of 5 districts that stand out according to the multi-criteria decision-making method are examined, it is observed that Bergama and Menemen districts stand out in terms of fertilizers and/or pesticides used in plant production, and the other 3 districts mostly in terms of diffused pollutants originating from livestock.

TABLE 18. Criteria data on districts

Criteria	Organic Waste	Diffuse Pollutant (Pesticide-Fertilizer)			Diffuse Pollutant (Nitrogen-Phosphorus)	
Districts	Total Organic Waste (From Herbal and Animal Products) (tons/year)	Fertilizer (kg/da)	Fertilizer	Pestisit (lt/da)	Total Nitrogen Load from Animal Manure (tons/year)	Total Phosphorus Load from Animal Manure (tons/year)
Aliağa	647,63	Pesticide	0,00	0,01	179,31	19,03
Bayındır	16.050,43	(kg/da)	Fertilizer	0,27	871,79	95,49
Bergama	7.161,77	Pesticide	0,36	0,46	717,68	88,96
Beydağ	4.555,08	(L/da)	0,03	0,02	266,70	29,39
Çeşme	72,57	11,63	0,20	0,30	26,82	2,29
Dikili	1.012,75	131,54	0,19	0,32	181,60	14,10
Foça	4.468,31	40,26	0,16	0,26	276,50	31,34
Gaziemir	14,82	10,51	0,00	0,00	5,53	0,46
Karabağlar	29,68	18,02	1,56	0,09	8,54	0,42
Karaburun	149,95	1,96	0,00	0,01	48,60	4,04
Kemalpaşa	40.006,28	8,84	0,06	0,12	666,93	69,36
Kınık	1.428,16	33,98	0,06	0,31	250,09	28,07
Kiraz	15.934,83	33,86	0,02	0,05	899,07	97,90
Menderes	2.505,57	36,96	0,06	0,19	241,29	25,20
Menemen	10.238,63	72,41	0,32	1,14	302,31	29,13
Ödemiş	36.361,94	73,76	0,32	0,32	1.747,81	190,01
Seferihisar	786,46	31,80	0,49	0,23	114,06	9,14
Selçuk	520,50	16,77	0,87	0,72	37,96	1,93
Tire	19.695,36	55,68	0,22	0,47	1.067,53	115,26
Torbalı	4.056,76	45,24	0,13	0,16	559,28	64,52
Urla	604,00	44,70	0,07	0,02	66,15	5,96

Source: Calculated by the authors.

4.2.3. Identification of Prominent Sub Sectors and Spatial Focuses in the Field of Energy

The energy consumed in agricultural activities is mainly electricity and petroleum products as well as some clean energy resources. When the national energy balance table for 2020 is examined, it is observed that 65% of the total 4964 TOE energy consumed in the agriculture and livestock sector is composed of petroleum products and 19% of electrical energy. When the energy consumption values of the manufacturing industry are compared, it is seen that petroleum products and electrical energy consumed in agriculture and livestock activities correspond to 88.69% and 9.54% of those consumed in the manufacturing industry, respectively. This table reveals that petroleum products, namely diesel, come to the fore as the main energy resource consumed in agricultural activities. Diesel consumption arises from the use of agricultural machinery as in tillage and harvesting in agricultural production, and the amount of consumption per decare varies according to the quality of the vegetable product. Electricity consumption mainly comes to the fore in irrigation and greenhouse production activities.

PROMETHEE, as a multi-criteria decision-making method, was used to determine the districts that stand out in terms of energy consumption in agricultural activities. Since energy consumption data at the agricultural product level is not available, data that are proportional to energy consumption within the scope of the analysis within the framework of some assumptions are used as indicator. One of the electrical energy consumption criteria in agricultural production is the data on irrigated agriculture area at the district level. Within the scope of this criterion, it is assumed that water is drawn from similar depths in all districts and that similar technologies are used in irrigation activities. Greenhouse production is a form of production that increases energy consumption in agricultural activities. In this context, the greenhouse production areas in the districts are considered as one of the criteria affecting their energy consumption. In respect to this criterion, it is assumed that the cover type, heating system, plant optimum temperatures and outdoor temperatures show a similar distribution among the districts. In determining the product-based diesel consumption, the “Guidelines on the Manufacturing Inputs for Agricultural Products Produced in Turkey” published by the abolished General Directorate of Rural Services was taken as basis. The amount of diesel fuel per decare for agricultural products is presented based on this guidelines documentin Table 19. The amount of diesel fuel consumed in the plant production activities of the districts was calculated by using the data on product cultivation areas obtained at the district level from the İzmir Provincial Directorate of Agriculture and Forestry

TABLE 19. The amount of diesel used in production

Crop	Amount of Diesel Used in Production (liter/da)
Wheat	6,54
Barley	4,98
Corn	11,88
Cotton	20,76
Paddy	20,40
Sugar beet	12,18
Sunflower	7,50
Tobacco	6,66
Chickpeas	6,60
Lentil	6,06
Potato	23,28
Tomato	16,98
Apricot	11,16
Orange	24,84
Grape	7,02
Hazelnut	5,40
Olive	5,76

Kaynak: Türkiye'de Üretilen Tarım Ürünlerinin Üretim Girdileri Rehberi

In determining the districts that stand out in terms of energy consumption in plant production, three different rankings were made, by giving different weights to the criteria, one of which was equal distribution ranking. In Table 20, the weight scores used in all three rankings are indicated. The energy consumption data of the Agriculture and Livestock sector were taken into account as per the National Energy Balance Table for 2020 at the weights determined by the expert opinion.

The districts that stand out in terms of energy consumption within plant production in the analysis carried out with PROMETHEE according to equal distribution and expert opinions are determined as follows. Central districts with lower agricultural production activities were not included in the analysis. Although there are ranking and score variations according to the criteria weights used, the first 5 districts that stand out in energy consumption were determined as Bergama, Torbalı, Ödemiş, Menderes and Menemen.

When the districts standing out in respect to energy consumption are examined, it is observed that Torbalı and Bergama stand out in all 3 criteria, Menemen and Ödemiş in irrigated area and diesel consumption criteria, and Menderes in greenhouse production criteria (Table 22).

TABLE 20. Criteria weight table

Criteria Indicators	Diesel Consumption (liter)	Irrigated Area (da)	Greenhouse Production Area (da)
Equal Distribution (%)	33,33	33,33	33,33
Expert Opinion-1 (%)	50	25	25
Expert Opinion -2 (%)	50	30	20

TABLE 21. District rankings according to criteria weights

District	Equal Distribution	Expert Opinion-1	Expert Opinion-2
Bergama	1	1	1
Torbalı	2	2	3
Ödemiş	3	2	2
Menderes	4	5	5
Menemen	4	4	4
Bayındır	6	6	7
Tire	7	6	5
Dikili	8	8	9
Kemalpaşa	9	9	8
Kınık	10	11	11
Kiraz	11	10	10
Seferihisar	12	12	12
Urla	13	13	14
Aliağa	14	15	14
Selçuk	15	13	13
Foça	16	16	16
Çeşme	17	18	18
Beydağ	18	17	17
Buca	19	19	19
Karaburun	20	20	20
Gaziemir	21	21	21

Source: Calculated by the authors.

TABLE 22. Districts that stand out in energy consumption

District	Irrigated Area (%)	Irrigated Area (%)	Greenhouse Production Area (%)
Aliağa	2,08	1,78	0,13
Bayındır	7,21	7,85	1,82
Bergama	12,95	11,85	19,67
Beydağ	1,13	1,56	0,02
Buca	0,28	0,49	0,42
Çeşme	0,32	0,43	0,55
Dikili	4,51	3,29	4,98
Foça	1,25	1,49	0,10
Gaziemir	0,01	0,04	0,00
Karaburun	0,16	0,59	0,00
Kemalpaşa	7,32	5,00	0,08
Kınık	3,30	3,58	0,52
Kiraz	4,82	5,10	0,05
Menderes	5,00	5,61	57,52
Menemen	11,50	9,03	1,49
Ödemiş	12,36	15,66	1,43
Seferihisar	1,65	2,09	2,17
Selçuk	3,87	3,46	0,00
Tire	7,95	9,75	0,14
Torbalı	10,38	10,04	5,81
Urla	1,95	1,32	3,08

Source: Calculated by the authors.

4.2.4. Prominent Products and Spaces in the Fields of Water, Waste and Energy in Agricultural Production

Transformation Field	Sector / Sub Sector	Space
WASTE	Livestock (Cattle)	Küçük Menderes Havzası, Kemalpaşa
	Field Crops Production	Bergama, Menemen, Selçuk
	Fruit Production	Kemalpaşa, Küçük Menderes Havzası, Menemen
WATER	Field Crops Production (Forage Crops)	Küçük Menderes Havzası
	Field Crops Production (Cotton)	Bergama, Menemen, Torbalı
	Fruit Production (Olive)	Küçük Menderes Havzası, Kemalpaşa
	Fruit Production (Figs)	Küçük Menderes Havzası
	Livestock (Bovine)	Küçük Menderes Havzası
ENERGY	Greenhouse Agricultural Production	Dikili,Bergama, Torbalı, Menderes
	Field Crops Production (Corn, Potato)	Küçük Menderes Havzası
	Field Crops Production (Cotton)	Bergama, Menemen
	Fruit Production (Cherry, Olive)	Kemalpaşa
	Fruit Production (Olive, Mandarin, Peach)	Selçuk, Bayındır

Source: Calculated by the authors.

4.3. Blue Opportunities

In order to determine the priority sectors for the opportunity-based target of "utilizing the blue economy potential", the blue growth sectors were analyzed on the basis of employment-based specialization, dominance and scale indicators, and estimations have been made about which sectors are 'developed' and 'growing' sectors.

In terms of their current sectoral performance, 'ship recycling', 'aquaculture primary production' and 'aquaculture processing and distribution' sectors stood out as the most developed sectors in our region. In addition to these sectors, it has been observed that 'maritime freight shipping and transportation', 'ports' and 'coastal tourism accommodation' sectors are also developed sectors within the region. Evaluation of the development performances in the last five years revealed that 'maritime equipment and machinery production' and 'coastal tourism accommodation' came to the fore as the growing blue growth sectors. Promising sectors were highlighted as 'high-tech marine products and equipment' and 'marine biotechnology' as per expert opinions.

After these evaluations, an approach was developed to focus on the sectors to be studied and to prioritize certain development scenarios for these sectors. In this context, the studies carried out by the agency for the relevant sectors, the regional internalization as of the point reached in these studies and the capacities to analyze the related development scenario were also taken into consideration.

Opportunity Fields	Sector / Sub Sector	Subject of the Study/Development Scenario	Space
Blue Opportunities	Ports	Restructuring of Northern Aegean (Çandarlı) Port	Bergama - Çandarlı
		Revitalization of TCDD İzmir (Alsancak) Port	Konak - Kemalpaşa
	Aquaculture Processing and Distribution	Identification of Opportunity Areas	Urla - Çeşme - Karaburun - Dikili
	Ship Recycling	Development of the Rehabilitation Program	Aliağa

Considering the development of the seafood industry in the region, its remarkable performance especially during the pandemic period, and its potential as one of the parties representing the need for the development of high-tech blue growth sectors, it was decided to determine it as one of the focus areas. Within the scope of this sub-study, it is aimed to determine the sub-sectors/activities along with a more detailed analysis of the sector, and thus to reveal a higher-scale intervention framework compared to the other blue growth sector sub-study titles.

Two development scenarios were described for ports, another developed blue economy sector of İzmir, and the objective of revealing the intervention design and cost-benefit analysis necessary for their implementation was determined. In the scope of the first scenario, it was decided to work on structuring the North Aegean Port, of which construction activities were unfinished, in accordance with the export of wind energy equipment, and as another scenario, the expansion of Alsancak Port and the establishment of a railway connection with Kemalpaşa Logistics Center were determined as the subject of study.

The ship recycling industry operates in a limited geographical area in İzmir Aliağa region, which represents the only spatial clustering in our country. In this context, as a result of the calculations, it has emerged as the most developed sector among the blue growth sectors. On the other hand, it is known that there are problems that are frequently reflected to the public in environmental and occupational and worker health issues, but there is also a lack of a comprehensive information base on the depth of these problems. In this regard, an in-depth evaluation as a third sub-study subject required to reveal the current situation of the Ship Recycling Industry, to evaluate its place in the region at different scales from regional to local, to make predictions about the future of the industry, to minimize the problems and to reveal the steps to be taken in the sector from the perspective of opportunities was determined as the objective of this sub-study.

CHAPTER 5.
Priority Sectors and Spatial Focuses for Transformation

In conclusion of data-based analyzes and expert assessments carried out within the scope of sectoral and spatial prioritization analysis, the final sector groups, sub-sectors and relevant spatial focuses that stand out in the fields of transformation/opportunity for the green and blue transformation of İzmir are presented in Table 23.

TABLE 23. Identified priority sectors and spatial focuses

Sector Groups	Sub-sector	Transformation / Opportunity Fields	Space
Green Transformation in Agriculture	Livestock (Bovine)	Waste, Water, Energy	Küçük Menderes Havzası
	Forage Crops Production		Küçük Menderes Havzası
	Cotton Production		Gediz Havzası (Bergama-Menemen)
Green Transformation in Industry	Processing/Preservation of Fruits and Vegetables	Waste, Energy	Kemalpaşa ve Torbalı
	Manufacture of Paper and Paperboard		Kemalpaşa
	Materials Recovery	Waste	Bornova ve Torbalı
	Manufacture of Plastic Products	Energy	Çiğli, Menemen, Torbalı, Kemalpaşa
	Manufacture of Plastic Products	Water	Küçük Menderes Havzası, Çiğli, Aliağa
	Operation of Dairies and Cheese Making		
Blue Opportunities	Ports	Restructuring of Northern Aegean (Çandarlı) Port	Çandarlı
		Revitalization of TCDD İzmir (Alsancak) Port	Alsancak - Kemalpaşa
	Aquaculture and Fisheries	Identification of Opportunity Areas	İzmir
	Ship Recycling	Development of the Rehabilitation Program	Aliağa

Annex 1. Indicator Based Sector Rankings for Targets

Transformation / Opportunity Field	Target 1. Reducing Waste Generation		
	Sectors	1 Amount of Waste Generated (tons/year)	2 Amount of Hazardous Waste Generated (tons/year)
WASTE	24-Manufacture of basic metals	428.706	26.593
	10-Manufacture of food products	189.071	572
	23-Manufacture of other non-metallic mineral products	135.429	1.989
	17-Manufacture of paper and paper products	109.123	1.828
	20-Manufacture of chemicals and chemical products	70.500	24.626
	01-Crop and animal production, hunting and related service activities	68.997	6
	29-Manufacture of motor vehicles, trailers and semi-trailers	51.419	8.398
	25-Manufacture of fabricated metal products, except machinery and equipment	48.868	5.424
	28-Manufacture of machinery and equipment n.e.c.	43.374	12.858
	35-Electricity, gas, steam and air conditioning supply	38.476	1.259
	38-Waste collection, treatment and disposal activities; materials recovery	28.590	4.364
	11-Manufacture of beverages	24.961	470
	22-Manufacture of rubber and plastic products	23.379	2.760
	52-Warehousing and support activities for transportation	20.784	1.021
	27-Manufacture of electrical equipment	17.750	410
	12-Manufacture of tobacco products	16.331	379
	13-Manufacture of textiles	11.161	1.379
	18-Printing and reproduction of recorded media	10.924	1.903
	19-Manufacture of coke and refined petroleum products	10.774	7.691
	14-Manufacture of wearing apparel	6.264	1.194
	15-Manufacture of leather and related products	5.607	76
	16- Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	4.819	48

Transformation /Opportunity Field	Target 2. Obtaining economic benefit from waste		
	Sectors	1 Recyclable Waste Amount (tons/year)	2 Raw Material Imports (USD)
WASTE	24-Manufacture of basic metals	380.845	288.448.803
	20-Manufacture of chemicals and chemical products	41.224	859.685.839
	17-Manufacture of paper and paper products	96.283	336.638.534
	10-Manufacture of food products	88.541	333.035.535
	23-Manufacture of other non-metallic mineral products	121.862	69.162.601
	01-Crop and animal production, hunting and related service activities	68.829	-
	22-Manufacture of rubber and plastic products	19.074	115.579.776
	25-Manufacture of fabricated metal products, except machinery and equipment	42.773	-
	29-Manufacture of motor vehicles, trailers and semi-trailers	41.582	-
	35-Electricity, gas, steam and air conditioning supply	37.217	-
	28-Manufacture of machinery and equipment n.e.c.	30.514	-
	11-Manufacture of beverages	24.433	-
	38-Waste collection, treatment and disposal activities; materials recovery	20.630	-
	52-Warehousing and support activities for transportation	19.733	-
	27-Manufacture of electrical equipment	17.339	-
	12-Manufacture of tobacco products	15.951	-
	36-Water collection, treatment and supply	14.816	-

Transformation /Opportunity Field	Target 3. Improving waste management	
	Sectors	1 Amount of Waste Processed (tons/year)
WASTE	38-Waste collection, treatment and disposal activities; materials recovery	380.845
	23-Manufacture of other non-metallic mineral products	41.224
	100- Renewable energy generation by incineration and compost	96.283
	24-Manufacture of basic metals	88.541
	46-Wholesale trade, except of motor vehicles and motorcycles	121.862
	08-Other mining and quarrying	68.829
	20-Manufacture of chemicals and chemical products	19.074
	17-Manufacture of paper and paper products	42.773
	22-Manufacture of rubber and plastic products	41.582
	16-Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	37.217
	13-Manufacture of textiles	30.514
	25-Manufacture of fabricated metal products, except machinery and equipment	24.433
	10-Manufacture of food products	20.630
	28-Manufacture of machinery and equipment n.e.c.	19.733
	19-Manufacture of coke and refined petroleum products	17.339
	27-Manufacture of electrical equipment	15.951
	32-Other manufacturing	14.816

Transformation /Opportunity Field	Target 4. Ensuring the disposal of waste and preventing its pollution	
	Sectors	1 The Amount of Waste Stored (tons)
WASTE	10-Manufacture of food products	99.873,50
	24-Base metal industry	16.178,18
	23-Manufacture of other non-metallic mineral products	12.101,08
	17-Manufacture of paper and paper products	10.614,78
	86-Human health services	9.121,08
	20-Manufacture of chemicals and chemical products	7.433,42
	38-Waste collection, reclamation and disposal activities; recovery of substances	5.460,51
	70-Administrative center activities; administrative consulting activities	4.067,68
	15-Manufacture of leather and related products	3.062,08
	13-Manufacture of textile products	2.604,87
	29-Manufacture of motor vehicles, trailers and semi-trailers	1.592,79
	14-Manufacture of clothing items	1.559,49
	22-Manufacture of rubber and plastic products	1.537,92
	26-Manufacture of computers, electronic and optical products	1.309,11
	25-Manufacture of fabricated metal products (excluding machinery and equipment)	1.203,00
	19-Manufacture of coking coal and refined petroleum products	245,97
	07-Mining of metal ores	202,26
	09-Service activities supporting mining	118,82

Transformation /Opportunity Field	Target 1. Reducing water consumption	
	Sectors	1 Water Consumption Amount (m³/year)
WATER	01-Crop and animal production, hunting and related service activities	31.661.755
	11-Manufacture of beverages	2.196.037
	10-Manufacture of food products	1.892.356
	20-Manufacture of chemicals and chemical products	759.198
	25-Manufacture of fabricated metal products, except machinery and equipment	645.442
	22-Manufacture of rubber and plastic products	616.566
	14-Manufacture of wearing apparel	399.839
	28-Manufacture of machinery and equipment n.e.c.	248.171
	24-Manufacture of basic metals	228.950
	13-Manufacture of textiles	182.078
	29-Manufacture of motor vehicles, trailers and semi-trailers	150.701
	23-Manufacture of other non-metallic mineral products	137.483
	18-Printing and reproduction of recorded media	107.906
	17-Manufacture of paper and paper products	106.215
	12-Manufacture of tobacco products	78.572
	27-Manufacture of electrical equipment	61.618
	19-Manufacture of coke and refined petroleum products	25.676
	15-Manufacture of leather and related products	19.379
	38-Waste collection, treatment and disposal activities; materials recovery	11.152
	16-Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	7.874
	35-Electricity, gas, steam and air conditioning supply	7.014

Transformation /Opportunity Field	Target 1. Protection of aquatic ecosystems and water reserves	
	Sectors	2 Amount of Wastewater (m^3/year)
WATER	11-Manufacture of beverages	2.196.037
	25-Manufacture of fabricated metal products, except machinery and equipment	645.442
	10-Manufacture of food products	1.892.356
	22-Manufacture of rubber and plastic products	616.566
	24-Manufacture of basic metals	228.950
	29-Manufacture of motor vehicles, trailers and semi-trailers	150.701
	12-Manufacture of tobacco products	78.572
	19-Manufacture of coke and refined petroleum products	25.676
	38-Waste collection, treatment and disposal activities; materials recovery	11.152
	13-Manufacture of textiles	182.078
	15-Manufacture of leather and related products	19.379
	01-Crop and animal production, hunting and related service activities	2.682
	17-Manufacture of paper and paper products	106.215
	20-Manufacture of chemicals and chemical products	759.198
	23-Manufacture of other non-metallic mineral products	137.483
	28-Manufacture of machinery and equipment n.e.c.	248.171
	35-Electricity, gas, steam and air conditioning supply	7.014

Transformation /Opportunity Field	Target 1 Reducing energy demand and energy consumption	
	Sectors	1 Energy Consumption (kWh/year)
ENERGY	47-Retail trade, except of motor vehicles and motorcycles	188.990.526
	46-Wholesale trade, except of motor vehicles and motorcycles	81.690.789
	10-Manufacture of food products	75.431.789
	22-Manufacture of rubber and plastic products	61.949.025
	17-Manufacture of paper and paper products	53.661.319
	55-Accommodation	45.967.314
	56-Food and beverage service activities	37.338.630
	24-Manufacture of basic metals	30.146.803
	05-Mining of coal and lignite	29.723.973
	49-Land transport and transport via pipelines	19.309.411
	01-Crop and animal production, hunting and related service activities	19.283.459
	23-Manufacture of other non-metallic mineral products	18.594.481
	25-Manufacture of fabricated metal products, except machinery and equipment	18.099.304
	13-Manufacture of textiles	17.406.343
	52-Warehousing and support activities for transportation	14.428.849
	20-Manufacture of chemicals and chemical products	13.343.629
	14-Manufacture of wearing apparel	13.120.391
	35-Electricity, gas, steam and air conditioning supply	9.585.445
	38-Waste collection, treatment and disposal activities; materials recovery	6.690.427

Transformation /Opportunity Field	Target 2 Increasing and generalizing the use of clean energy production	
	Sectors	1 CO_2 Emmission (tons/year)
ENERGY	35-Electricity, gas, steam and air conditioning supply	4.784.423
	01-Crop and animal production, hunting and related service activities	4.153.256
	10-Manufacture of food products	2.199.12 6
	38-Waste collection, treatment and disposal activities; materials recovery	1.931.914
	23-Manufacture of other non-metallic mineral products	1.599.460
	24-Manufacture of basic metals	1.253.073
	49-Land transport and transport via pipelines	1.107.638
	22-Manufacture of rubber and plastic products	1.085.736
	20-Manufacture of chemicals and chemical products	932.433
	52-Warehousing and support activities for transportation	827.676
	13-Manufacture of textiles	687.742
	17-Manufacture of paper and paper products	598.414
	14-Manufacture of wearing apparel	518.400
	25-Manufacture of fabricated metal products, except machinery and equipment	464.580
	03-Fishing and aquaculture	349.559
	29-Manufacture of motor vehicles, trailers and semi-trailers	293.036
	27-Manufacture of electrical equipment	239.833
	79-Travel agency, tour operator and other reservation service and related activities	231.189
	61-Telecommunication	192.300
	47-Retail trade, except of motor vehicles and motorcycles	169.626

Annex 2. Table of Sectoral Data in Strategic Importance Index

CRITERIA		FOREIGN TRADE		SPECIALIZATION (LQ)		SCALE	DOMINANCE	VALUE ADDED
NACE Code	NACE Description	Export (Dollars) 2019	Foreign Trade Balance (Dollars) 2019	Number of Insured Employees 2019	Net Sales 2018	Number of Insured Employees 2019	Net Sales 2018	Value Added Ratio (GVA/Total production)
01	Crop and animal production, hunting and related service activities	728.521.646	224.809.180	1,4	1,21	8,6%	0,7%	0,661
03	Fishing and aquaculture	133.106.194	132.223.440	2,2	2,43	13,5%	0,2%	0,577
05	Mining of coal and lignite	78.001	- 103.516.803	0,5	3,29	3,2%	0,4%	0,707
07	Mining of metal ores	35.464.934	33.512.211	0,8	0,01	5,1%	0,0%	0,707
08	Other mining and quarrying	128.630.981	113.395.287	0,6	0,88	3,5%	0,4%	0,707
09	Mining support service activities	-	-	0,7	0,42	4,0%	0,0%	0,707
10	Manufacture of food products	1.389.365.392	767.432.348	1,3	1,69	8,1%	5,9%	0,272
11	Manufacture of beverages	18.163.723	-87.908.468	1,6	2,36	9,6%	0,4%	0,272
12	Manufacture of tobacco products	378.746.430	-4.179.472	8,6	13,36	52,9%	1,7%	0,272
13	Manufacture of textiles	345.703.829	27.575.403	0,3	0,41	1,9%	0,9%	0,388
14	Manufacture of wearing apparel	1.484.334.183	1.456.479.320	1,1	1,74	6,7%	2,8%	0,388
15	Manufacture of leather and related products	141.015.982	108.203.464	1,5	1,48	9,1%	0,4%	0,388
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	16.080.655	-13.925.410	0,9	0,72	5,8%	0,3%	0,493
17	Manufacture of paper and paper products	388.692.876	- 132.783.105	1,6	2,67	9,6%	1,8%	0,274

CRITERIA		FOREIGN TRADE		SPECIALIZATION (LQ)		SCALE	DOMINANCE	VALUE ADDED
NACE Code	NACE Description	Export (Dollars) 2019	Foreign Trade Balance (Dollars) 2019	Number of Insured Employees 2019	Net Sales 2018	Number of Insured Employees 2019	Net Sales 2018	Value Added Ratio (GVA/Total production)
18	Printing and reproduction of recorded media	9.814.910	2.908.363	1,5	1,69	9,1%	0,4%	0,335
19	Manufacture of coke and refined petroleum products	259.253.598	-359.325.984	5,8	0,14	35,3%	0,2%	0,168
20	Manufacture of chemicals and chemical products	875.848.914	-778.159.972	1,9	2,81	11,7%	4,7%	0,365
22	Rubber and Manufacture of plastics products	565.688.313	279.744.876	1,4	1,60	8,8%	2,3%	0,273
23	Manufacture of other non-metallic mineral products	308.695.923	132.607.015	0,7	1,32	4,4%	1,7%	0,410
24	Manufacture of basic metals	423.589.820	-151.879.849	1,3	0,61	7,9%	2,4%	0,268
25	Manufacture of fabricated metal products, except machinery and equipment	575.978.216	347.900.165	1,2	1,28	7,1%	2,2%	0,355
26	Manufacture of computer, electronic and optical products	63.074.803	-81.773.981	1,4	0,55	8,8%	0,2%	0,240
27	Manufacture of electrical equipment	693.780.296	419.067.799	0,6	0,38	3,9%	0,6%	0,240
28	Manufacture of machinery and equipment n.e.c.	1.358.294.106	521.155.435	1,9	1,72	11,4%	2,2%	0,666
29	Manufacture of motor vehicles, trailers and semi-trailers	1.328.156.562	931.874.964	1,2	0,98	7,7%	3,0%	0,168
32	Other manufacturing	130.263.878	-2.801.194	1,3	0,58	7,8%	0,4%	0,313
35	Electricity, gas, steam and air conditioning supply	-	-	0,7	0,60	4,0%	2,1%	0,266
36	Water collection, treatment and supply	6.105.267	6.086.481	0,7	0,60	4,0%	2,1%	0,386
38	Waste collection, treatment and disposal activities; materials recovery	47.048.106	-483.923.895	1,9	0,60	11,5%	0,0%	0,460

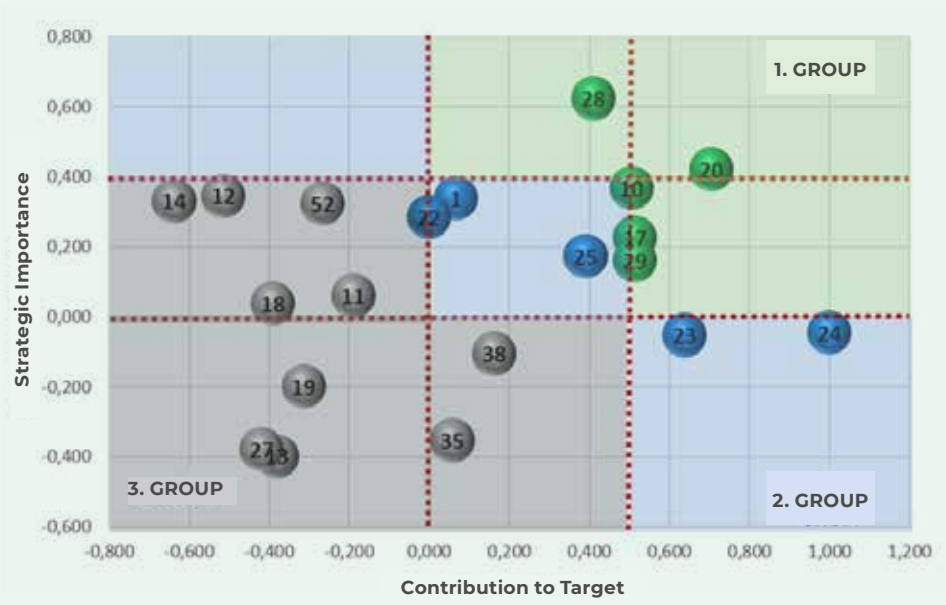
CRITERIA		FOREIGN TRADE		SPECIALIZATION (LQ)		SCALE	DOMINANCE	VALUE ADDED
NACE Code	NACE Description	Export (Dollars) 2019	Foreign Trade Balance (Dollars) 2019	Number of Insured Employees 2019	Net Sales 2018	Number of Insured Employees 2019	Net Sales 2018	Value Added Ratio (GVA/Total production)
46	Wholesale trade, except of motor vehicles and motorcycles	-	-	1,1	1,15	7,0%	27,9%	0,547
47	Retail trade, except of motor vehicles and motorcycles	-	-	1,1	0,92	6,7%	9,8%	0,605
49	Land transport and transport via pipelines	-	-	1,0	0,86	6,2%	2,4%	0,580
52	Warehousing and support activities for transportation	-	-	1,3	2,11	7,8%	2,6%	0,611
55	Accommodation	-	-	0,7	0,52	4,3%	0,4%	0,485
56	Food and beverage service activities	-	-	1,2	1,09	7,1%	1,1%	0,485
61	Telecommunication	-	-	1,1	0,19	6,4%	0,1%	0,711
70	Activities of head offices; management consultancy activities	-	-	0,9	1,01	5,4%	0,4%	0,635
79	Travel agency, tour operator and other reservation service and related activities	-	-	0,8	0,68	5,2%	0,6%	0,603
86	Human health activities	-	-	0,8	1,05	5,1%	0,5%	0,557

Source: TURKSTAT data were used in foreign trade indicators, Izmir Input-Output Analysis data were used in value added indicator; specialty, size, dominance indicators were calculated by the authors using SGK data.

Annex 3. Grouping Sectors According to the Indexes Of Strategic Importance And Potential Contribution to Target

WASTE-Target 1: Reducing Waste Generation

Sectors	Contribution to Target	Strategic Importance	Group No
24-Manufacture of basic metals	1,000	-0,045	2
20-Manufacture of chemicals and chemical products	0,705	0,421	1
23-Manufacture of other non-metallic mineral products	0,638	-0,053	2
17-Manufacture of paper and paper products	0,514	0,226	3
29-Manufacture of motor vehicles, trailers and semi-trailers	0,514	0,162	1
10-Manufacture of food products	0,505	0,368	1
28-Manufacture of machinery and equipment n.e.c.	0,410	0,624	1
25-Manufacture of fabricated metal products, except machinery and equipment	0,391	0,173	2
38-Waste collection, treatment and disposal activities; materials recovery	0,162	-0,105	3
01-Crop and animal production, hunting and related service activities	0,067	0,338	2
35-Electricity, gas, steam and air conditioning supply	0,057	-0,353	3
22-Manufacture of rubber and plastic products	0,000	0,286	2
11-Manufacture of beverages	- 0,191	0,060	3
52-Warehousing and support activities for transportation	- 0,267	0,323	3
19-Manufacture of coke and refined petroleum products	-0,314	-0,199	3
13-Manufacture of textiles	- 0,381	-0,399	3
18-Printing and reproduction of recorded media	- 0,391	0,038	3
27-Manufacture of electrical equipment	- 0,419	-0,380	3
12-Manufacture of tobacco products	- 0,514	0,346	3
14-Manufacture of wearing apparel	- 0,638	0,331	3
15-Manufacture of leather and related products	- 0,876	0,150	3
16- Manufacture of wood and of products of wood and cork	- 0,971	-0,301	3



Source: Calculated by the authors.

WASTE-Target 2: Increasing the Use of Waste as a Raw Material and Energy Source

Sektörler	Hedefe Katkı	Stratejik Önem	Grup No
24-Manufacture of basic metals	0,469	-0,045	2
17-Manufacture of paper and paper products	0,469	0,226	1
10-Manufacture of food products	0,344	0,368	1
01-Crop and animal production, hunting and related service activities	0,281	0,338	1
25-Manufacture of fabricated metal products, except machinery and equipment	0,250	0,173	2
23-Manufacture of other non-metallic mineral products	0,219	-0,053	3
29-Manufacture of motor vehicles, trailers and semi-trailers	0,188	0,162	2
20-Manufacture of chemicals and chemical products	0,125	0,421	1
28-Manufacture of machinery and equipment n.e.c.	0,000	0,624	2
11-Manufacture of beverages	-0,063	0,060	3
38-Waste collection, treatment and disposal activities; materials recovery	-0,125	-0,105	3
52-Warehousing and support activities for transportation	-0,188	0,323	3
22-Manufacture of rubber and plastic products	-0,250	0,286	3
27-Manufacture of electrical equipment	-0,375	-0,380	3
35-Electricity, gas, steam and air conditioning supply	-0,406	-0,353	3
12-Manufacture of tobacco products	-0,438	0,346	3
36-Water collection, treatment and supply	-0,500	-0,368	3

Source: Calculated by the authors.

WASTE-Target 3: Improving Waste Management

Sectors	Contribution to Target	Strategic Importance	Group No
38-Waste collection, treatment and disposal activities; materials recovery	1,000	-0,105	2
23-Manufacture of other non-metallic mineral products	0,875	-0,053	2
24-Manufacture of basic metals	0,625	-0,045	2
46-Wholesale trade	0,500	0,188	2
08-Other mining and quarrying	0,375	-0,229	3
20-Manufacture of chemicals and chemical products	0,250	0,421	1
17-Manufacture of paper and paper products	0,125	0,226	2
22-Manufacture of rubber and plastic products	0,000	0,286	3
16- Manufacture of wood and of products of wood and cork	-0,125	-0,301	3
13-Manufacture of textiles	-0,250	-0,399	3
25-Manufacture of fabricated metal products, except machinery and equipment	-0,375	0,173	3
10-Manufacture of food products	-0,500	0,368	3
28-Manufacture of machinery and equipment n.e.c.	-0,625	0,624	2
19-Manufacture of coke and refined petroleum products	-0,750	-0,199	3
27-Manufacture of electrical equipment	-0,875	-0,380	3
32-Other manufacturing	-1,000	-0,218	3
38-Waste collection, treatment and disposal activities; materials recovery	1,000	-0,105	2

Source: Calculated by the authors.

WASTE-Target 4: Ensuring Waste Disposal and Preventing Pollution

Sectors	Contribution to Target	Strategic Importance	Group No
10-Manufacture of food products	1,000	0,368	1
24-Manufacture of basic metals	0,882	-0,045	2
23-Manufacture of other non-metallic mineral products	0,765	-0,053	2
17-Manufacture of paper and paper products	0,647	0,226	1
86-Human health activities	0,529	-0,105	2
20-Manufacture of chemicals and chemical products	0,412	0,421	1
38-Waste collection, treatment and disposal activities; materials recovery	0,294	-0,105	3
70-Activities of head offices; management consultancy activities	0,177	-0,090	3
15-Manufacture of leather and related products	0,059	0,150	2
13-Manufacture of textiles	-0,059	-0,399	3
29-Manufacture of motor vehicles, trailers and semi-trailers	-0,177	0,162	3
14-Manufacture of wearing apparel	-0,294	0,331	2
22-Manufacture of rubber and plastic products	-0,412	0,286	3
26-Manufacture of computer, electronic and optical products	-0,529	-0,282	3
25-Manufacture of fabricated metal products, except machinery and equipment	-0,647	0,173	3
19-Manufacture of coke and refined petroleum products	-0,765	-0,199	3
07-Mining of metal ores	-0,882	-0,365	3
09-Mining support service activities	-1,000	-0,305	3

Source: Calculated by the authors.

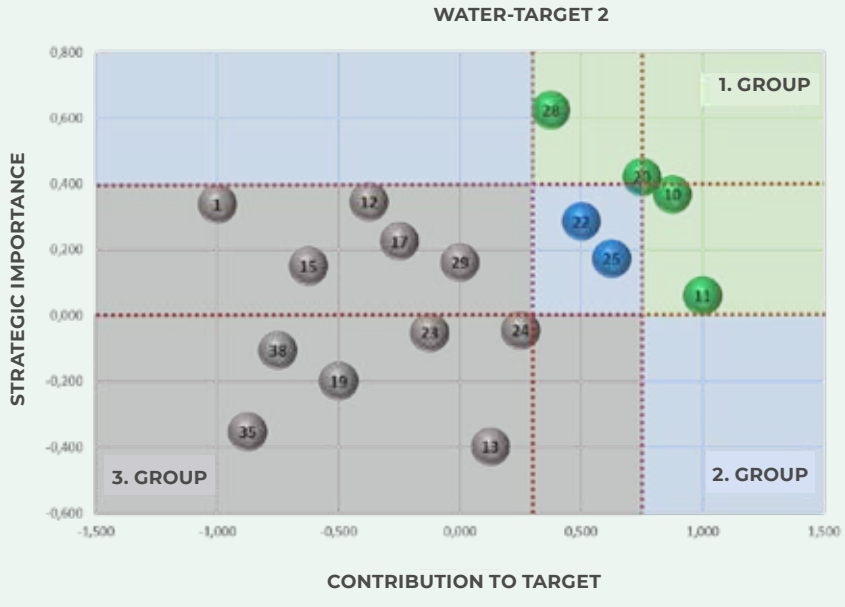
WATER-Target 1: Reducing Water Consumption

Sectors	Contribution to Target	Strategic Importance	Group No
01-Crop and animal production, hunting and related service activities	1,000	0,338	1
11-Manufacture of beverages	0,895	0,060	1
10-Manufacture of food products	0,790	0,368	1
46-Wholesale trade	0,684	0,188	1
20-Manufacture of chemicals and chemical products	0,579	0,421	1
25-Manufacture of fabricated metal products, except machinery and equipment	0,474	0,173	2
22-Manufacture of rubber and plastic products	0,368	0,286	2
14-Manufacture of wearing apparel	0,263	0,331	2
28-Manufacture of machinery and equipment n.e.c.	0,158	0,624	1
24-Manufacture of basic metals	0,053	-0,045	3
13-Manufacture of textiles	-0,053	-0,399	3
29-Manufacture of motor vehicles, trailers and semi-trailers	-0,158	0,162	3
23-Manufacture of other non-metallic mineral products	-0,263	-0,053	3
18-Printing and reproduction of recorded media	-0,368	0,038	3
17-Manufacture of paper and paper products	-0,474	0,226	3
47-Retail trade	-0,579	0,165	3
12-Manufacture of tobacco products	-0,684	0,346	3
27-Manufacture of electrical equipment	-0,895	-0,380	3
32-Other manufacturing	-1,000	-0,218	3

Source: Calculated by the authors.

SU-Hedef 2: Sucul Ekosistemlerin ve Su Rezervlerinin Korunması

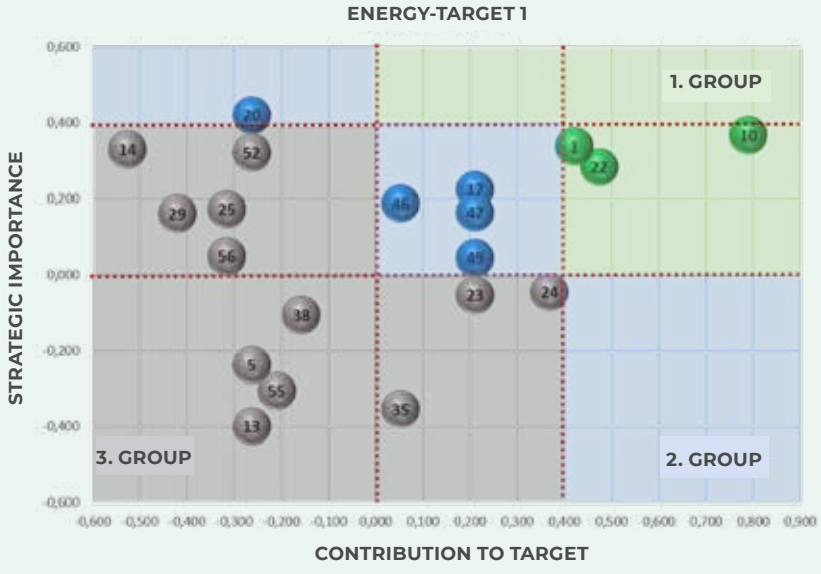
Sectors	Contribution to Target	Strategic Importance	Group No
11-Manufacture of beverages	1,000	0,060	1
10-Manufacture of food products	0,875	0,368	1
20-Manufacture of chemicals and chemical products	0,750	0,421	1
25-Manufacture of fabricated metal products, except machinery and equipment	0,625	0,173	2
22-Manufacture of rubber and plastic products	0,500	0,286	2
28-Manufacture of machinery and equipment n.e.c.	0,375	0,624	1
24-Manufacture of basic metals	0,250	-0,045	3
13-Manufacture of textiles	0,125	-0,399	3
29-Manufacture of motor vehicles, trailers and semi-trailers	0,000	0,162	3
23-Manufacture of other non-metallic mineral products	-0,125	-0,053	3
17-Manufacture of paper and paper products	-0,250	0,226	3
12-Manufacture of tobacco products	-0,375	0,346	3
19-Manufacture of coke and refined petroleum products	-0,500	-0,199	3
15-Manufacture of leather and related products	-0,625	0,150	3
38-Waste collection, treatment and disposal activities; materials recovery	-0,750	-0,105	3
35-Electricity, gas, steam and air conditioning supply	-0,875	-0,353	3
01-Crop and animal production, hunting and related service activities	-1,000	0,338	3



Source: Calculated by the authors.

ENERGY-Target 1: Reducing Energy Losses and Energy Consumption

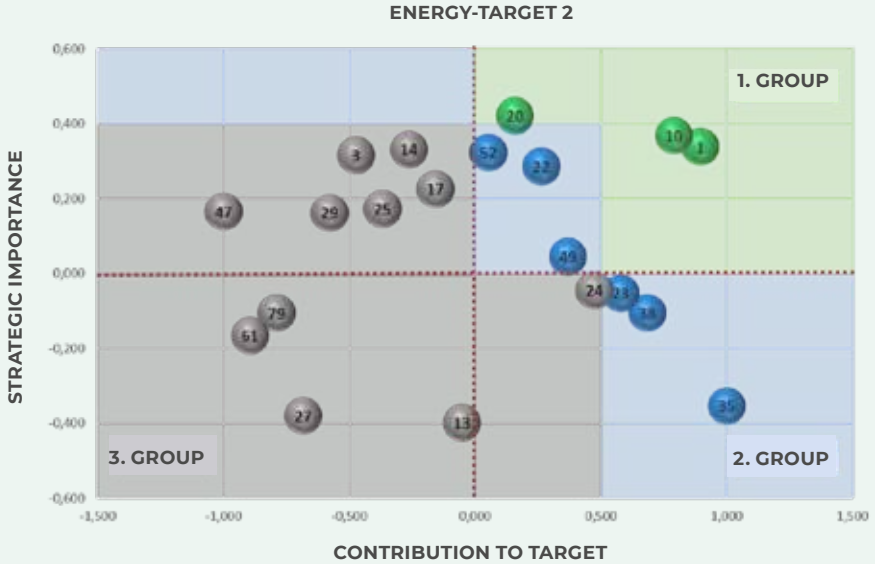
Sectors	Contribution to Target	Strategic Importance	Group No
10-Manufacture of food products	0,7895	0,368	1
22-Manufacture of rubber and plastic products	0,4737	0,286	1
01-Crop and animal production, hunting and related service activities	0,4211	0,338	1
24-Manufacture of basic metals	0,3684	-0,045	3
23-Manufacture of other non-metallic mineral products	0,2105	-0,053	3
17-Manufacture of paper and paper products	0,2105	0,226	2
47-Retail trade	0,2105	0,165	2
49-Land transport and transport via pipelines	0,2105	0,045	2
35-Electricity, gas, steam and air conditioning supply	0,0526	-0,353	3
46-Toptan ticaret	0,0526	0,188	2
38-Waste collection, treatment and disposal activities; materials recovery	-0,1579	-0,105	3
55-Accommodation	-0,2105	-0,305	3
13-Manufacture of textiles	-0,2632	-0,399	3
20-Manufacture of chemicals and chemical products	-0,2632	0,421	2
52-Warehousing and support activities for transportation	-0,2632	0,323	3
05-Mining of coal and lignite	-0,2632	-0,237	3
56-Food and beverage service activities	-0,3158	0,049	3
25-Manufacture of fabricated metal products, except machinery and equipment	-0,3158	0,173	3
29-Manufacture of motor vehicles, trailers and semi-trailers	-0,4211	0,162	3
14-Manufacture of wearing apparel	-0,5263	0,331	3



Source: Calculated by the authors.

ENERGY-Target 2: Increasing and Generalizing the Use of Clean Energy Production

Sectors	Contribution to Target	Strategic Importance	Group No
35-Electricity, gas, steam and air conditioning supply	1,000	-0,353	2
01-Crop and animal production, hunting and related service activities	0,895	0,338	1
10-Manufacture of food products	0,790	0,368	1
38-Waste collection, treatment and disposal activities; materials recovery	0,684	-0,105	2
23-Manufacture of other non-metallic mineral products	0,579	-0,053	2
24-Manufacture of basic metals	0,474	-0,045	3
49-Land transport and transport via pipelines	0,368	0,045	2
22-Manufacture of rubber and plastic products	0,263	0,286	2
20-Manufacture of chemicals and chemical products	0,158	0,421	1
52-Warehousing and support activities for transportation	0,053	0,323	2
13-Manufacture of textiles	-0,053	-0,399	3
17-Manufacture of paper and paper products	-0,158	0,226	3
14-Manufacture of wearing apparel	-0,263	0,331	3
25-Manufacture of fabricated metal products, except machinery and equipment	-0,368	0,173	3
03-Fishing and aquaculture	-0,474	0,316	3
29-Manufacture of motor vehicles, trailers and semi-trailers	-0,579	0,162	3
27-Manufacture of electrical equipment	-0,684	-0,380	3
79-Travel agency, tour operator and other reservation service and related activities	-0,790	-0,105	3
61-Telecommunication	-0,895	-0,165	3
47-Retail trade	-1,000	0,165	3



Source: Calculated by the authors.

Annex 4. Sector Intervention Suitability Matrix Analysis

Indicators and Criteria				Importance for Regional Intervention	Potential to Be a Model And Become Widespread	Sectoral Multiplier Effect	Suitability and Feasibility for Regional Intervention	Extrinsic Motivation/ Mandatory Harmonization Requirement	SCORE
A. Reducing resource consumption, increasing resource potentials and efficiency									
ATIK	Target 1. Reducing waste generation	Problem based target	28-Manufacture of machinery and equipment n.e.c.	***	*	*	**	***	10
			20-Manufacture of chemicals and chemical products	***	*	**	*	***	10
			29-Manufacture of motor vehicles, trailers and semi-trailers	***	*	***	**	***	12
			10-Manufacture of food products	***	***	**	***	***	14
			17-Manufacture of paper and paper products	***	**	***	**	**	12
			22-Manufacture of rubber and plastic products	**	**	***	***	**	12
			01-Crop and animal production, hunting and related service activities	**	***	*	*	***	10
			25-Manufacture of fabricated metal products, except machinery and equipment	**	**	**	**	**	10
			23-Manufacture of other non-metallic mineral products	**	*	**	*	**	8
			24-Manufacture of basic metals	**	*	**	*	**	8
	Target 3. Improving waste management	Problem based target	20-Manufacture of chemicals and chemical products	***	*	**	*	***	10
			28-Manufacture of machinery and equipment n.e.c.	**	*	*	**	***	9
			23-Manufacture of other non-metallic mineral products	**	*	**	*	**	8
			38-Waste collection, treatment and disposal activities; materials recovery	**	***	**	***	**	12
			24-Manufacture of basic metals	**	*	**	*	**	8
			17-Manufacture of paper and paper products	**	**	***	**	**	11
			46-Wholesale trade, except of motor vehicles and motorcycles	**	*	*	*	*	6

Indicators and Criteria				Importance for Regional Intervention	Potential to Be a Model And Become Widespread	Sectoral Multiplier Effect	Suitability and Feasibility for Regional Intervention	Extrinsic Motivation/ Mandatory Harmonization Requirement	SCORE
ATIK	Target 2. Obtaining economic benefit from waste	Problem based target	17-Manufacture of paper and paper products	***	***	***	**	**	13
			10-Manufacture of food products	***	***	**	***	***	14
			01-Crop and animal production, hunting and related service activities	***	**	*	*	***	10
			20-Manufacture of chemicals and chemical products	***	*	**	*	***	10
			24-Manufacture of basic metals	**	***	**	*	**	10
			25-Manufacture of fabricated metal products, except machinery and equipment	**	**	**	**	**	10
			29-Manufacture of motor vehicles, trailers and semi-trailers	**	*	***	**	*	9
			28-Manufacture of machinery and equipment n.e.c.	**	*	*	**	***	9
WATER	Target 1. Reducing water consumption	Problem based target	01-Crop and animal production, hunting and related service activities	***	***	*	*	***	11
			11-Manufacture of beverages	***	**	**	*	**	10
			10-Manufacture of food products	***	***	**	***	***	14
			20-Manufacture of chemicals and chemical products	***	**	**	*	***	11
			28-Manufacture of machinery and equipment n.e.c.	***	*	*	**	***	10
			46-Wholesale trade, except of motor vehicles and motorcycles	***	*	*	*	*	7
			25-Manufacture of fabricated metal products, except machinery and equipment	**	*	**	**	**	9
			22-Manufacture of rubber and plastic products	**	**	***	***	**	12
			14-Manufacture of wearing apparel	**	**	**	**	***	11
ENERGY	Target 1. Reducing energy demand and energy consumption	Problem based target	01-Crop and animal production, hunting and related service activities	***	**	*	*	***	10
			22-Manufacture of rubber and plastic products	***	***	***	***	**	14
			10-Manufacture of food products	***	***	**	***	***	14
			20-Manufacture of chemicals and chemical products	**	**	**	*	***	10
			17-Manufacture of paper and paper products	**	**	***	**	**	11
			47-Retail trade, except of motor vehicles and motorcycles	**	*	*	*	*	6
			49-Land transport and transport via pipelines	**	*	*	*	*	6
			24-Manufacture of basic metals	**	**	**	*	**	9

Indicators and Criteria				Importance for Regional Intervention	Potential to Be a Model And Become Widespread	Sectoral Multiplier Effect	Suitability and Feasibility for Regional Intervention	Extrinsic Motivation/ Mandatory Harmonization Requirement	SCORE
B. Protection of natural resources and prevention of pollution									
WASTE	Target 4. Ensuring waste disposal and preventing pollution	Problem based target	10-Manufacture of food products	***	***	**	***	***	14
			17-Manufacture of paper and paper products	***	**	***	**	**	12
			20-Manufacture of chemicals and chemical products	***	***	**	*	***	12
			14-Manufacture of wearing apparel	**	*	**	**	***	10
			15-Manufacture of leather and related products	**	**	**	**	**	10
			23-Manufacture of other non-metallic mineral products	**	**	**	*	**	9
			24-Manufacture of basic metals	**	**	**	*	**	9
			86-Human health activities	**	*	*	*	*	6
WATER	Target 2. Protection of aquatic ecosystems and water reserves	Problem based target	28-Manufacture of machinery and equipment n.e.c.	***	*	*	**	***	10
			20-Manufacture of chemicals and chemical products	***	*	***	*	***	11
			10-Manufacture of food products	***	***	**	***	***	14
			11-Manufacture of beverages	***	**	**	*	**	10
			22-Manufacture of rubber and plastic products	**	**	***	***	**	12
			25-Manufacture of fabricated metal products, except machinery and equipment	**	*	**	**	**	9
ENERGY	Target 2. Increasing and generalizing the use of clean energy production	Problem based target	01-Crop and animal production, hunting and related service activities	***	***	*	*	***	11
			10-Manufacture of food products	***	***	**	***	***	14
			20-Manufacture of chemicals and chemical products	***	*	***	*	***	11
			52-Warehousing and support activities for transportation	**	*	*	*	*	6
			22-Manufacture of rubber and plastic products	**	*	***	***	**	11
			49-Land transport and transport via pipelines	**	*	*	*	*	6
			23-Manufacture of other non-metallic mineral products	**	*	**	*	**	8
			38-Waste collection, treatment and disposal activities; materials recovery	**	***	**	***	**	12
			35-Electricity, gas, steam and air conditioning supply	**	*	*	*	*	6

Annex 5. Blue Growth Sectors

Sector	NACE Code	Description
Aquaculture Primary Production	31101	Fishing in sea and coastal waters (including purse seine fishing, diving)
	31102	Collection of shellfish (mussels, lobsters, etc.), mollusks, other sea creatures and products
	32101	Fish farming in the sea (including bream, bream, mullet, etc., and culture fish, roe and juveniles)
	32102	Other aquaculture in the sea (mussels, oysters, lobsters, shrimps, arthropods, crustaceans, seaweeds, etc.) (except fish)
Aquaculture Processing and Distribution	102003	Processing and storage of fish, shellfish and mollusks (freezing, drying, cooking, smoking, salting, pickling, canning, etc. activities)
	102004	Production of fish, shellfish and mollusk products (fish fillets, roe, caviar, caviar substitutes, etc.)
	102005	Production of fishmeal and pellets from fish (for human consumption)
	102006	Activities of boats and ships operating solely for the processing and storage of fish
	102007	Manufacture of uncooked fish dishes (fermented fish, fish dough, fish cakes, etc.)
	102008	Production of fishmeal and pellets of fish, crustaceans, mollusks or other aquatic invertebrates (not fit for human consumption) and other inedible products thereof
	104110	Obtaining oil from fish and marine mammals
	108501	Manufacture of ready meals (vacuum packed or preserved) (excluding restaurant and catering services)
	108901	Manufacture of ready-made soup (including traditional and locally produced) and ready-made broth, fish broth, chicken broth and concentrates
	463801	Wholesale trade of fish, crustaceans, mollusks and other aquatic products
	472301	Retail trade of fish, crustaceans and mollusks in specialized stores (including live, fresh, chilled and frozen, and products made from them such as fish fillets)
Ports	522206	Operation of ports and waterways to support maritime transport (operation of ports, piers, docks, maritime pools, sea terminals, etc.) (except for the operation of lighthouses, pontoons, etc.)
	522207	Service activities provided with navigation aids such as lighthouse, light barge, light ship, buoy, channel signs, etc. to support maritime transport
	522208	Pilotage and docking activities in sea, coastal and inland waters (including docking and undocking of the ship)
	522210	Ship salvage and refloating activities in sea, coastal and inland waters
	522290	Other services supporting maritime transport
	522408	Loading and unloading of goods or passengers' luggage for maritime transportation (including container loading and unloading services)
	521003	Activities of grain storages and warehousing (operation of grain silos etc.)
	521004	Activities of storage and warehouses of petroleum, petroleum products, chemicals, gas , etc.
	521005	Activities of storage and warehouses of bulk liquid (including oil, wine, etc., except petroleum, petroleum products, chemicals, gas, etc.)

Sector	NACE Code	Description
Water Projects Construction	429101	Construction of coastal and port buildings and construction of related hydro-mechanical structures (structures such as water ways, ports and marinas, coastal arrangements, piers and wharves, breakwaters, channels etc.)
	429102	Screening and cleaning of the water and ground water (sea, rivers, lakes, etc.)
	429103	Construction of shipyards, docks and canal pools (for shipbuilding and repair)
Shipbuilding and Repair	301101	Activities for construction of floating and submerged drilling platforms
	301102	Building of passenger ships and boats, ferries, tankers, refrigerated vessels, dry bulk vessels, trailer and repellent towboats, dredgers, offshore vessels, hover crafts and other vessels (except those for sports and leisure purposes)
	301104	Building of fishing ships and boats and factory ships towards seafood processing and storage
	301105	Manufacture of floating docks, pontoons, coffer-dams, floating piers, buoys, floating tanks, barges, barge and floating cranes, inflatable boats not for entertainment purposes, etc.
	301106	Manufacture of seating places for vessels and floating structures
	301107	Manufacture of internal chambers for ships and floating structures
	301108	Large-scale modification and reconstruction of ships, floating platforms and floating structures
	301201	Manufacture of personal water crafts such as jet ski, etc.
	301203	Manufacture of inflatable motorized / non-motorized boats (entertainment and sporting ones)
	301204	Manufacture of entertainment and sporting motorized / non-motorized sailboats, motor boats and yachts, rowboats, schooners, canoes, and recreational hover craft and similar vehicles (including polyester boats)
	331501	Maintenance and repair of ships and boats (including maintenance and repair of floating structures, boats, kayaks, etc. and caulking of them)
	331902	Maintenance of ropes, ship sail clothes and cloth shrouds and sailclothes, rope and cloth lined linoleum
Marine Equipment and Machinery Production	139207	Manufacture of life jackets and life-saving wheels
	139402	Manufacture of nets and net products from cord, cordage, twine or rope (fishing net, unloading nets, etc.)
	265108	Manufacture of compasses and other navigation devices and tools and radar equipment and sonar (including the ones used in air, land, sea transportation)
	281109	Manufacture of spark-ignition or compression-ignition internal combustion engines and their parts used at marine vehicles, railway vehicles and for industrial use (except aircrafts, motor road vehicles and motorcycles)
	323019	Manufacture of sport purpose climbing, hunting or fishing equipment (helmets, fishing rods, fishing casts and hooks, automatic fishing reels, hand shovels, butterfly nets, artificial fish, artificial baits such as flies, bullets, artificial
Ship Recycling	383101	Fragmentation (dismantling) of ships and floating structures for recovery of scrap materials
Maritime Freight Shipping and Transportation	501012	Hiring of cruise ship and boats on sea and coastal waters with the crew (including excursion boats)
	501013	Transportation of passengers via ferries, cruise ships and boats on coastal waters (including water bus operations; except those made on international seas and lakes and rivers)
	501014	Yacht operation on sea and coastal waters
	501015	Operation of excursion or tour boats and vessels on sea and coastal waters (except yacht operation)
	501016	Transportation of passengers via ships on international seas
	501090	Other passenger transportation on sea and coastal waters (including water taxi, etc.)

Sector	NACE Code	Description
Maritime Freight Shipping and Transportation	502017	Transportation of crude oil, petroleum products and chemicals on international waters by tanker ships (except gases)
	502018	Transportation of dry bulk cargo on international waters (except transportation of chemicals)
	502019	Towing and pushing (towboats) services on international waters and coastal navigation line (transportation of barges, oil rigs, etc.) (except inland waters)
	502020	Transportation of frozen or refrigerated goods via refrigerated ship on international waters
	502021	Transportation of containers via container ships according to multiple types of transportation on international waters
	502022	Hiring of freight transportation vessels with crew on international waters and coastal navigation lines (except inland waters)
	502023	Transportation of other bulk liquids by tanker vessels on international waters (except transportation of crude oil, petroleum products, gases and chemicals)
	502024	Transportation of gases on international waters by tanker ships
	502025	Transportation of crude oil, petroleum products and chemicals at the coastal line by tanker ships (except gases) (except inland waters)
	502026	Transportation of dry bulk cargo at coastal line (except transportation of chemicals) (except inland waters)
	502027	Transportation of frozen or chilled goods by refrigerated transport at the coastal line (except inland waters)
	502028	Transportation of containers via container ships according to multiple types of transportation at coastal line (except inland waters)
	502029	Transportation of other liquids via tanker vessels at the coastal line (except transportation of crude oil, petroleum products, gases and chemicals)
	502030	Transportation of gases at the coastal line by tanker ships (except inland waters)
	502090	Other freight transportation on international waters
	502091	Other freight transportation at the coastal line (except inland waters)
	503008	Passenger transportation on inland waters (those made on rivers, canals and lakes, etc.) (including those for excursion purposes)
	503009	Hiring of passenger ships and boats with their crews on inland waters
	504005	Freight transport on inland waters (those on rivers, canals and lakes, etc.)
	504007	Services for hiring of freight transportation ships and boats on inland waters (rivers, canals and lakes, etc.)
	504008	Towing and pushing services (towboats) on inland waters (transportation of barges, buoys, etc.) (on rivers, canals and lakes, etc.)
	773401	Renting and leasing of maritime transportation equipment without operator (including boats and ships for passenger and freight transportation; excluding excursion boats)
	522901	Activities of maritime freight transportation agencies and brokers
	522902	Activities of international maritime freight forwarding agencies
	522918	Activities of coastal line maritime freight transportation agencies

Sector	NACE Code	Description
Coastal Tourism Accommodation	551002	Activities of accommodation places such as hotels, etc. (activities of places providing daily cleaning and bed-making activities) (except those that do not provide restaurant service to its customers and timeshares)
	551005	Activities of accommodation places such as hotels, etc. (activities of places providing daily cleaning and bed-making activities) (except those providing restaurant service to its customers and timeshares)
	552001	Holiday and other short-term accommodation activities (in hostels, timeshare, holiday homes, apart hotels, bungalows, chalets, etc.) (excluding room or suite accommodation activities with daily cleaning and bed making service)
	552003	Accommodation activities for less than one month in own or rented furnished houses
	552004	Activities of holiday hostels
	553036	Activities of camping areas, parking areas for motor caravans, etc. (providing outdoor facilities for camping with tents or caravans, providing accommodation services for adults or children in camping programs and hunting camps, etc.)
	559002	Activities of accommodation such as guesthouses, military lodge houses, police lodge houses and teacher's lodge houses as well as educational and recreational facilities
	559003	Activities of other accommodation facilities (including sleeping cars, etc. when operated by another unit; excluding guesthouses, teacher's house, etc.)
Coastal Tourism Transportation	501012	Chartering of cruise ships and boats with crew (including recreational boats) in sea and coastal waters
	501013	Transport of passengers by ferries, cruise ships and boats in coastal waters
	501014	Yacht operation in sea and coastal waters
	501015	Operation of excursion or tour boats and ships in sea and coastal waters (except yacht operation)
	501016	Transport of passengers by ship on international seas
	501090	Other passenger transportation in sea and coastal waters (including sea taxi, etc.)
Other		Marine Biotechnology
		Marine Energy (Wave, tides, hydrogen)
		Offshore oil and gas extraction
		Marine Mining
		Coastal Tourism (Cruise, yachting and marinas, marine recreation)
		Preventing hydrological disaster risks
		High-tech marine products and equipment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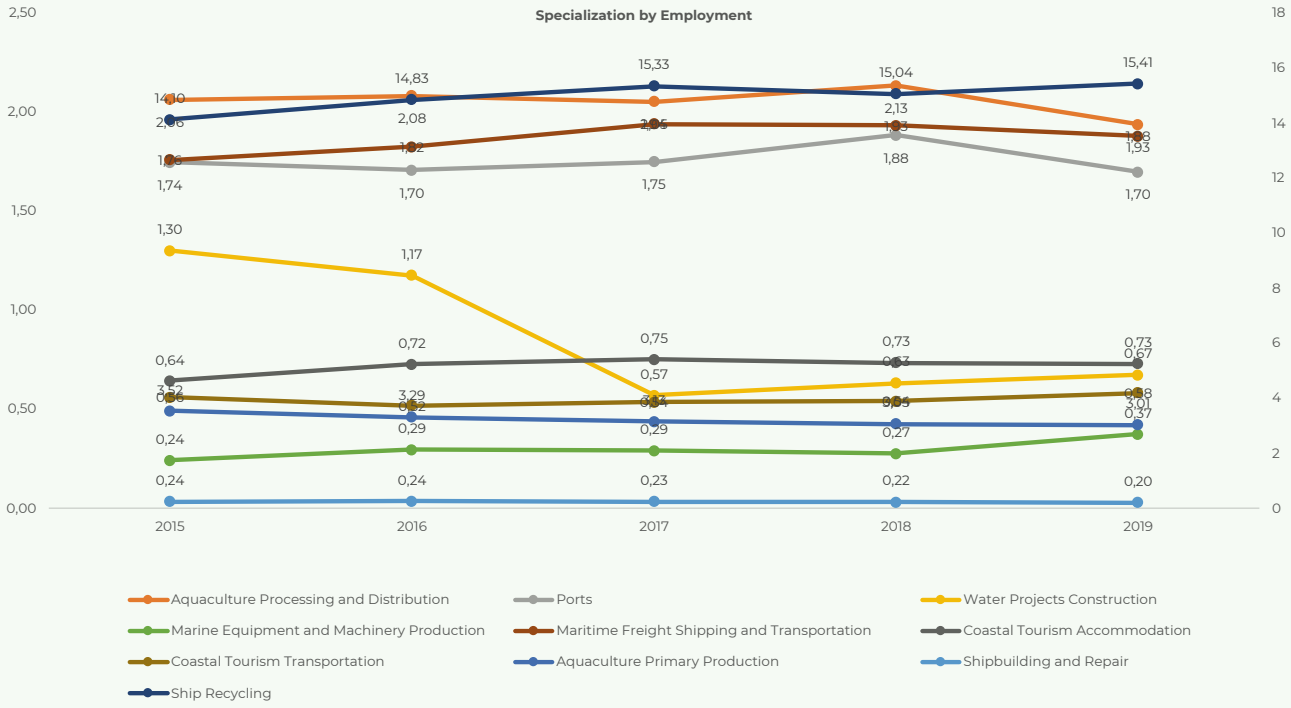
Annex 6. Specialization, Scale and Dominance in Blue Growth Sectors

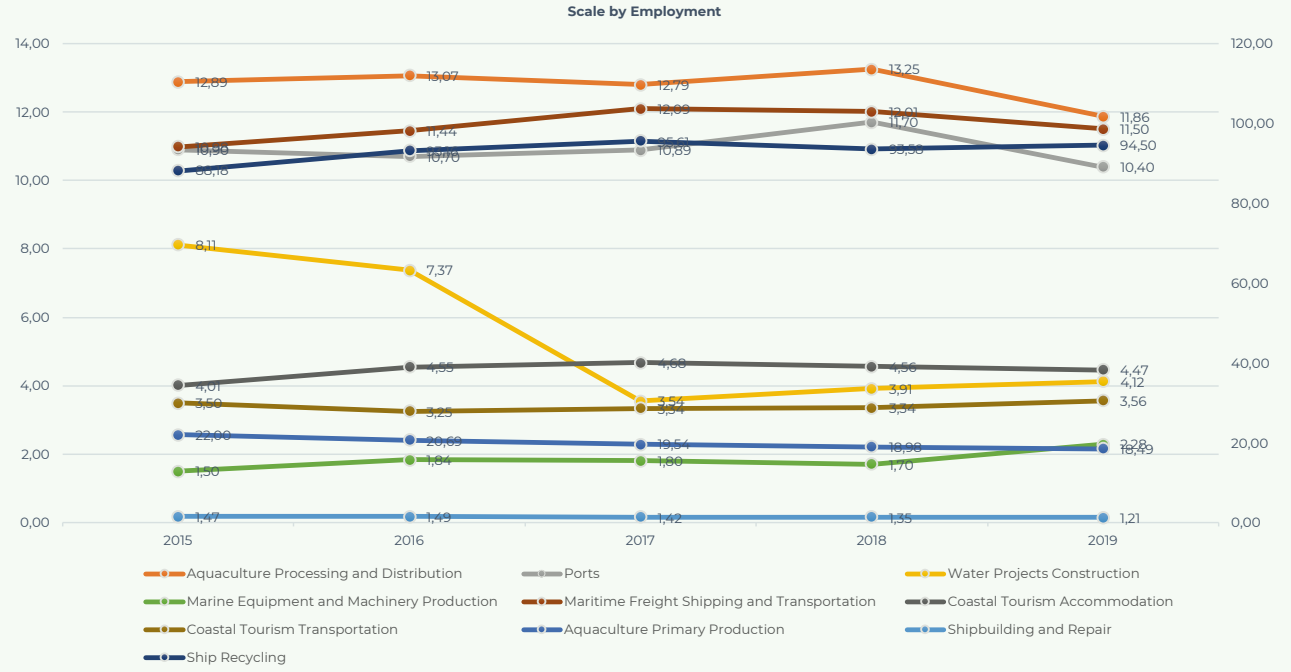
Sectors	2015						2016					
	EMPLOYMENT			NUMBER OF BUSINESSES			EMPLOYMENT			NUMBER OF BUSINESSES		
	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE
Aquaculture Primary Production	3,52	22,00	0,12	1,91	13,38	0,07	3,29	20,69	0,12	1,82	12,81	0,07
Aquaculture Processing and Distribution	2,06	12,89	0,35	1,65	11,56	0,26	2,08	13,07	0,36	1,55	10,91	0,26
Ports	1,74	10,90	0,39	1,25	8,80	0,12	1,70	10,70	0,41	1,24	8,71	0,11
Water Projects Construction	1,30	8,11	0,11	0,66	4,64	0,02	1,17	7,37	0,08	0,60	4,19	0,02
Shipbuilding and Repair	0,24	1,47	0,06	0,69	4,81	0,07	0,24	1,49	0,06	0,73	5,16	0,07
Marine Equipment and Machinery Production	0,24	1,50	0,00	0,52	3,67	0,00	0,29	1,84	0,01	0,50	3,51	0,00
Ship Recycling	14,10	88,18	0,09	8,93	62,71	0,03	14,83	93,16	0,10	9,06	63,64	0,03
Maritime Freight Shipping and Transportation	1,76	10,98	0,34	1,17	8,21	0,22	1,82	11,44	0,34	1,19	8,39	0,22
Coastal Tourism Accommodation	0,64	4,01	0,90	0,87	6,12	0,64	0,72	4,55	0,89	0,90	6,35	0,66
Coastal Tourism Transportation	0,56	3,50	0,02	0,69	4,81	0,05	0,52	3,25	0,02	0,70	4,95	0,05

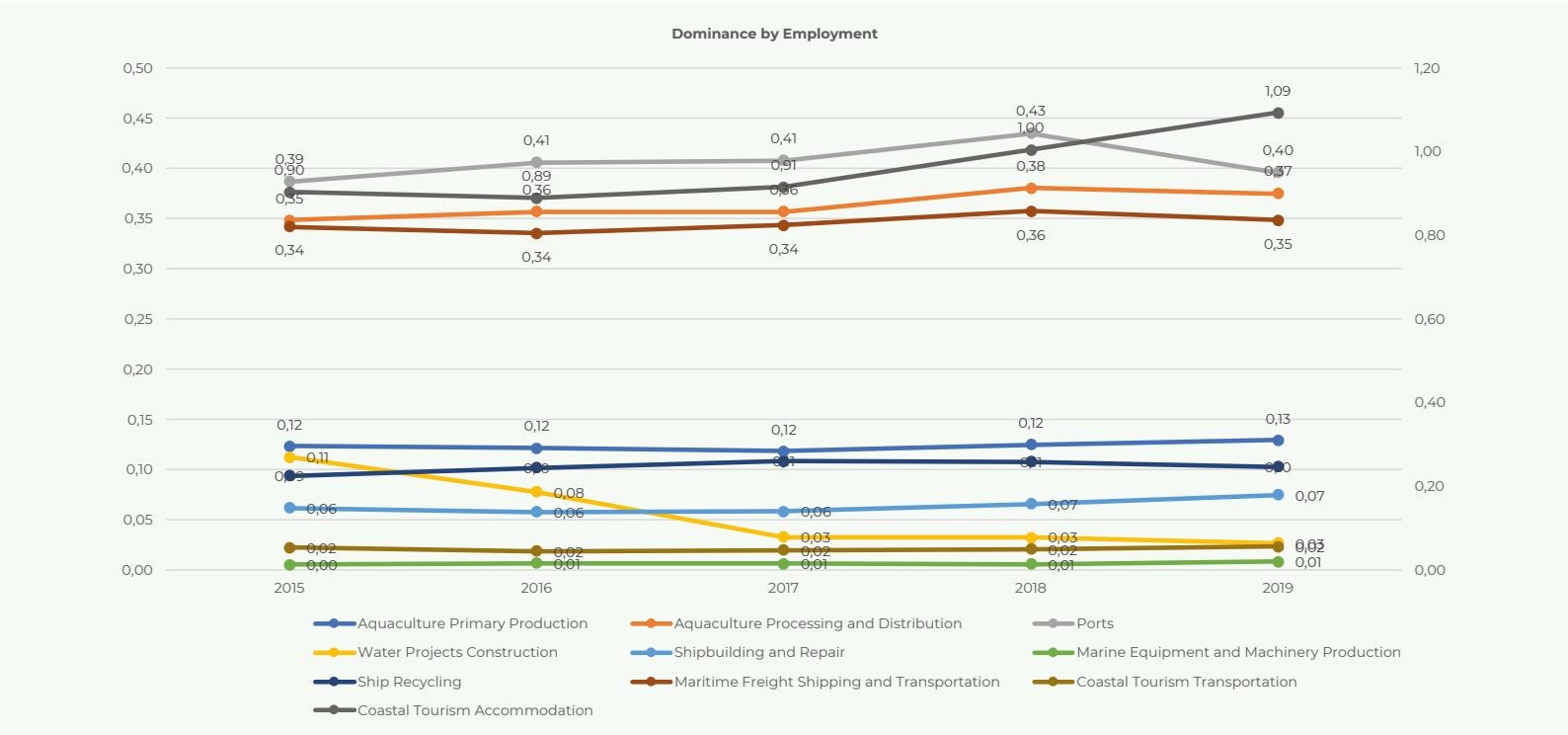
Source: Calculated by the authors.

	2017						2018						2019					
	EMPLOYMENT			NUMBER OF BUSINESSES			EMPLOYMENT			NUMBER OF BUSINESSES			EMPLOYMENT			NUMBER OF BUSINESSES		
	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE	SPECIALIZATION	SCALE	DOMINANCE
	3,13	19,54	0,12	1,74	12,15	0,06	3,05	18,98	0,12	1,83	12,75	0,07	3,01	18,49	0,13	1,81	12,46	0,07
	2,05	12,79	0,36	1,55	10,80	0,27	2,13	13,25	0,38	1,56	10,86	0,27	1,93	11,86	0,37	1,67	11,49	0,31
	1,75	10,89	0,41	1,24	8,63	0,11	1,88	11,70	0,43	1,26	8,81	0,11	1,70	10,40	0,40	1,19	8,18	0,10
	0,57	3,54	0,03	0,74	5,14	0,02	0,63	3,91	0,03	0,88	6,12	0,02	0,67	4,12	0,03	1,02	7,06	0,02
	0,23	1,42	0,06	0,74	5,14	0,07	0,22	1,35	0,07	0,76	5,26	0,07	0,20	1,21	0,07	0,68	4,70	0,07
	0,29	1,80	0,01	0,50	3,48	0,00	0,27	1,70	0,01	0,60	4,20	0,00	0,37	2,28	0,01	0,81	5,56	0,01
	15,33	95,61	0,11	9,55	66,67	0,03	15,04	93,58	0,11	10,33	71,93	0,03	15,41	94,50	0,10	10,93	75,41	0,04
	1,94	12,09	0,34	1,22	8,52	0,23	1,93	12,01	0,36	1,24	8,61	0,25	1,88	11,50	0,30	0,25	1,88	11,50
	0,75	4,68	0,91	0,96	6,70	0,69	0,73	4,56	1,00	0,96	6,67	0,73	0,73	4,47	1,09	0,97	6,68	0,79
	0,54	3,34	0,02	0,63	4,37	0,05	0,54	3,34	0,02	0,73	5,07	0,07	0,58	3,56	0,02	0,77	5,30	0,08

Annex 7. Blue Opportunities Sector Classification






Dominance by Employment
0,50
0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
1,20
1,00
0,80
0,60
0,40
0,20
0,00
2015
2016
2017
2018
2019
Aquaculture Primary Production
Aquaculture Processing and Distribution
Ports
Water Projects Construction
Shipbuilding and Repair
Marine Equipment and Machinery Production
Ship Recycling
Maritime Freight Shipping and Transportation
Coastal Tourism Transportation
Coastal Tourism Accommodation

Annex 8. Evaluation Matrices For Sub-Sector Selection

WASTE			TARGET INDICATORS*			
Sector	Sub Sector - Nace4	Sub Sectors	1 Ratio of Waste Generated (%)	2 Ratio of Hazardous Waste Generated (%)	3 Ratio of Recyclable Waste (%)	
10-Manufacture of food products	10.12-Processing and preserving of poultry meat	10.1-Processing and preserving of meat and production of meat products	1,77	35	0,06	
	10.13-Production of meat and poultry meat products		0,44	24	0,04	
	10.11-Processing and preserving of meat		0,05	1	0,00	
	10.39-Other processing and preserving of fruit and vegetables	10.3-Processing and preserving of fruit and vegetables	15,53	28	0,05	
	10.32-Manufacture of fruit and vegetable juice		1,21	12	0,02	
	10.41- Manufacture of oils and fats	10.41- Manufacture of oils and fats	3,14	389	0,65	
15-Manufacture of leather and related products	15.11-Tanning and dressing of leather; dressing and dyeing of fur	15.11-Tanning and dressing of leather; dressing and dyeing of fur	0,73	73	0,12	
17-Manufacture of paper and paper products	17.12-Manufacture of paper and paperboard	17.12-Manufacture of paper and paperboard	6,41	935	1,57	
	17.21-Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	17.2-Manufacture of articles of paper and paperboard	6,03	712	1,19	
	17.22-Manufacture of household and sanitary goods and of toilet requisites		1,70	65	0,11	
	17.23-Manufacture of paper stationery			51	0,09	
20-Manufacture of chemicals and chemical products	20.16-Manufacture of plastics in primary forms	20.16-Manufacture of plastics in primary forms	3,53	8.922	14,94	
	20.30-Manufacture of paints, varnishes and similar coatings, printing ink and mastics	20.30-Manufacture of paints, varnishes and similar coatings, printing ink and mastics	2,26	13.703	22,94	
24-Manufacture of basic metals	24.10-Manufacture of basic iron and steel and of ferro-alloys	24.10-Manufacture of basic iron and steel and of ferro-alloys	47,57	23.413	39,20	
29-Manufacture of motor vehicles, trailers and semi-trailers	38.31-Dismantling of wrecks	29.3-Manufacture of parts and accessories for motor vehicles	5,83	7.317	12,25	
38-Waste collection, treatment and disposal activities; materials recovery	38.32-Recovery of sorted materials	38.3-Materials recovery	2,99	3.883	6,50	
	38.32-Tasnif edilmiş materyallerin geri kazanımı		0,54	159	0,27	

** Consumption values are stated as ratios due to data privacy.*

Source: Calculated by the authors.

		2019 NUMBER OF ISURED EMPLOYEES			2019 NUMBER OF BUSINESSES		
	4 Ratio of Stored Waste (%)	LQ Number of Employees	Scale	Dominance	LQ Businesses	Scale	Dominance
	2,20	3,07	18,81	0,42	1,21	8,33	0,01
	0,40	1,77	10,85	0,12	0,92	6,36	0,04
	0,06	1,09	6,68	0,08	0,58	3,98	0,03
	5,43	2,56	15,67	0,79	1,57	10,82	0,16
	0,54	1,03	6,30	0,03	0,41	2,81	0,00
	3,31	2,20	13,49	0,21	2,07	14,24	0,15
	0,43	1,53	9,35	0,10	0,96	6,59	0,04
	7,57	2,46	15,10	0,12	1,48	10,22	0,03
	7,75	1,78	10,93	0,33	1,66	11,43	0,12
	1,24	0,29	1,79	0,02	0,52	3,60	0,01
	0,35	1,18	7,24	0,02	1,44	9,92	0,02
	2,47	5,32	32,65	0,32	0,96	6,62	0,03
	0,58	3,43	21,02	0,26	1,40	9,64	0,05
	58,09	1,69	10,34	0,56	1,21	8,32	0,10
	6,22	1,43	8,75	1,14	1,26	8,66	0,15
	2,87	6,28	38,53	0,12	2,19	15,08	0,07
	0,48	1,22	7,50	0,06	1,54	10,65	0,08

WATER			TARGET INDICATORS		
Sector	Sub Sector - Nace4	Sub Sectors	1 Water Consumption Rate * (%)	2 Chemical Oxygen Demand (mg/L)	
11. Manufacture of beverages	11.02- Manufacture of wine from grape	11.0-Manufacture of beverages	0,27	5000	
	11.05- Manufacture of beer		38,34		
10-Manufacture of food products	10.51-Operation of dairies and cheese making	10.51-Operation of dairies and cheese making	16,54	4.500	
	10.41- Manufacture of oils and fats	10.41- Manufacture of oils and fats	8,65	30000	
	10.82- Manufacture of cocoa, chocolate and sugar confectionery	10.8-Manufacture of other food products	0,04	3500	
	10.83-Processing of tea and coffee		0,02		
	10.84-Manufacture of condiments and seasonings		2,17		
	10.85- Manufacture of prepared meals and dishes		0,80		
	10.86- Manufacture of homogenized food preparations and dietetic food		0,00		
20-Manufacture of chemicals and chemical products	20.16-Manufacture of plastics in primary forms	20.1-Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	9,22	2.000	
	20.13- Manufacture of other inorganic basic chemicals		0,71		
	20.12- Manufacture of dyes and pigments		0,09		
	20.15- Manufacture of fertilizers and nitrogen compounds		0,02		
	20.14- Manufacture of other organic basic chemicals		0,01		
	20.11- Manufacture of industrial gases		0,00		
	20.30-Manufacture of paints, varnishes and similar coatings, printing ink and mastics	20.30-Manufacture of paints, varnishes and similar coatings, printing ink and mastics	1,29	1200	
22-Manufacture of rubber and plastic products	22.21-Manufacture of plastic plates, sheets, tubes and profiles	22.2- Manufacture of plastics products	6,66	900	
	22.22-Manufacture of plastic packing goods		2,37		
	22.23-Manufacture of builders' ware of plastic		0,27		
14-Manufacture of wearing apparel	14.11-Deri Manufacture of wearing apparel, except fur apparel	14.1-Manufacture of wearing apparel, except fur apparel	0,08	5600	
	14.13- Manufacture of other outerwear		4,36		
	14.14-İç Manufacture of wearing apparel, except fur apparel		2,39		
25-Manufacture of fabricated metal products, except machinery and equipment	25.61- Treatment and coating of metals	25.6-Treatment and coating of metals; machining	2,67	5635	
	25.62- Machining		1,70		
	25.11- Manufacture of metal structures and parts of structures	25.1-Manufacture of structural metal products	0,68	3630	
	25.12- Manufacture of doors and windows of metal		0.67		

** Consumption values are stated as ratios due to data privacy.*

Source: Calculated by the authors.

	2019 NUMBER OF ISURED EMPLOYEES			2019 NUMBER OF BUSINESSES		
	LQ Number of Employees	Scale	Dominance	LQ Businesses	Scale	Dominance
	2,4	14,9	0,0	1,8	12,2	0,0
	8,5	51,8	0,1	3,1	21,1	0,0
	1,6	10,0	0,3	1,2	8,6	0,1
	2,2	13,5	0,2	2,1	14,2	0,1
	0,1	0,8	0,0	0,5	3,6	0,0
	0,3	1,7	0,0	0,7	4,9	0,0
	5,0	30,8	0,2	2,0	13,5	0,0
	1,7	10,3	0,2	0,7	5,1	0,0
	0,7	4,0	0,0	1,2	8,3	0,0
	5,3	32,6	0,3	1,0	6,6	0,0
	0,7	4,2	0,0	0,8	5,4	0,0
	1,5	9,0	0,0	1,2	8,6	0,0
	1,8	10,8	0,1	1,8	12,7	0,0
	1,8	11,1	0,1	1,0	7,0	0,0
	1,1	6,6	0,0	0,9	6,3	0,0
	3,4	21,0	0,3	1,4	9,6	0,1
	2,1	13,0	0,6	1,2	8,3	0,1
	1,1	6,5	0,3	1,0	6,7	0,1
	1,5	9,3	0,3	1,0	6,7	0,3
	2,1	12,7	0,2	1,7	12,0	0,1
	1,2	7,3	3,1	1,0	6,8	1,3
	1,2	7,6	0,6	1,0	6,9	0,2
	1,5	9,3	0,2	1,1	7,5	0,1
	1,0	6,1	1,3	1,0	6,8	0,7
	1,2	7,4	0,2	0,9	6,5	0,1
	1,4	8,5	0,4	1,4	9,3	0,6

ENERGY			TARGET INDICATORS	
Sector	Sub Sector - Nace4	Sub Sectors	Electricity Consumption Rate (%)*	
10-Manufacture of food products	10.11-Processing and preserving of meat	10.1-Processing and preserving of meat and production of meat products	2,68	
	10.12-Processing and preserving of poultry meat		0,00	
	10.13-Production of meat and poultry meat products		0,90	
	10.31-Processing and preserving of potatoes	10.3-Processing and preserving of fruit and vegetables		
	10.32-Manufacture of fruit and vegetable juice		0,02	
	10.39-Other processing and preserving of fruit and vegetables		9,34	
	10.41- Manufacture of oils and fats	10.41- Manufacture of oils and fats	1,38	
	10.51-Operation of dairies and cheese making	10.51-Operation of dairies and cheese making	2,28	
	10.61-Manufacture of grain mill products	10.61-Manufacture of grain mill products	4,26	
	10.71-Manufacture of bread; manufacture of fresh pastry goods and cakes	10.71-Manufacture of bread; manufacture of fresh pastry goods and cakes	6,11	
	10.83-Processing of tea and coffee	10.83-Processing of tea and coffee	2,27	
	10.84-Manufacture of condiments and seasonings	10.84-Manufacture of condiments and seasonings	3,27	
	10.91-Manufacture of prepared feeds for farm animals	10.91-Manufacture of prepared feeds for farm animals	3,04	
17-Manufacture of paper and paper products	17.12-Manufacture of Paper and Paperboard	17.12-Manufacture of Paper and Paperboard	8,47	
	17.21-Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	17.21-Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	14,66	
	17.29-Manufacture of other articles of paper and paperboard	17.29- Manufacture of other articles of paper and paperboard	3,05	
20-Manufacture of chemicals and chemical products	20.41-Manufacture of soap and detergents, cleaning and polishing preparations	20.41-Manufacture of soap and detergents, cleaning and polishing preparations	5,31	
22-Manufacture of rubber and plastic products	22.21-Manufacture of plastic plates, sheets, tubes and profiles	22.2- Manufacture of plastics products	2,82	
	22.22-Manufacture of plastic packing goods		18,53	
	22.23-Manufacture of builders' ware of plastic		5,03	
	22.29-Diğer - Manufacture of plastics products		4,15	
38-Waste collection, treatment and disposal activities; materials recovery	38.31-Dismantling of wrecks	38.3-Materials recovery	0,29	
	38.32-Recovery of sorted materials		2,15	

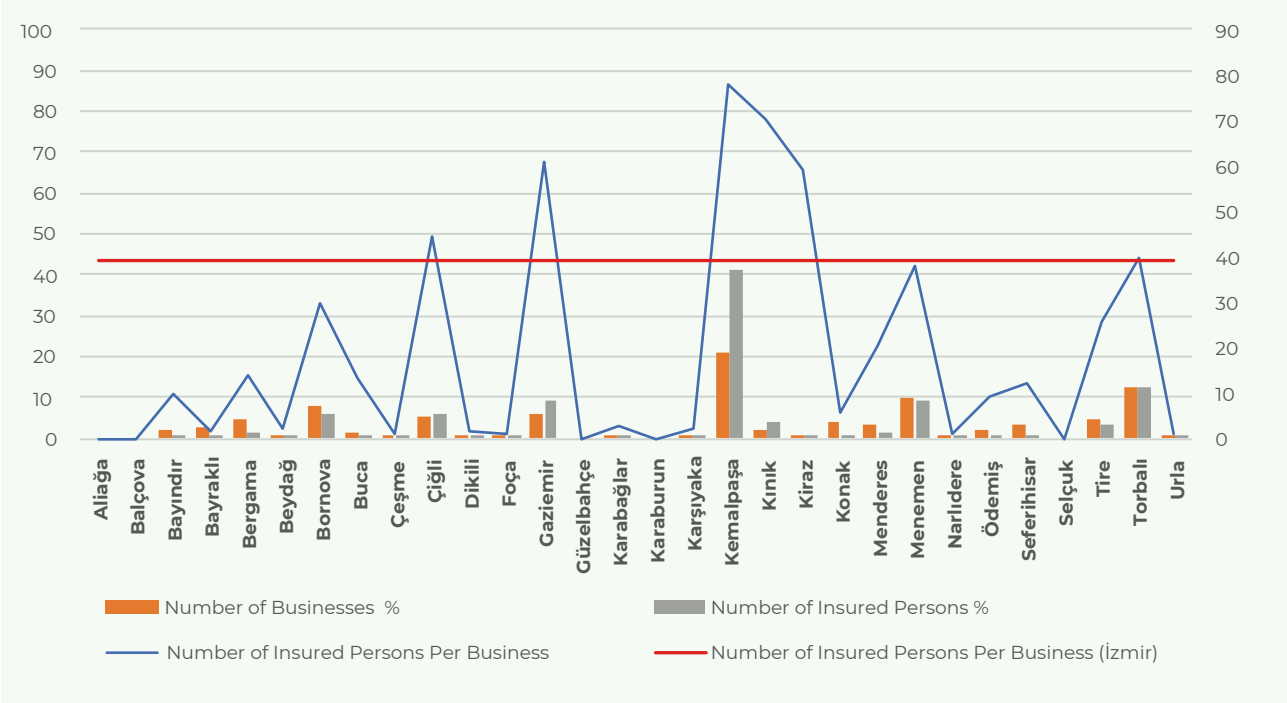
** Consumption values are stated as ratios due to data privacy.*

Source: Calculated by the authors.

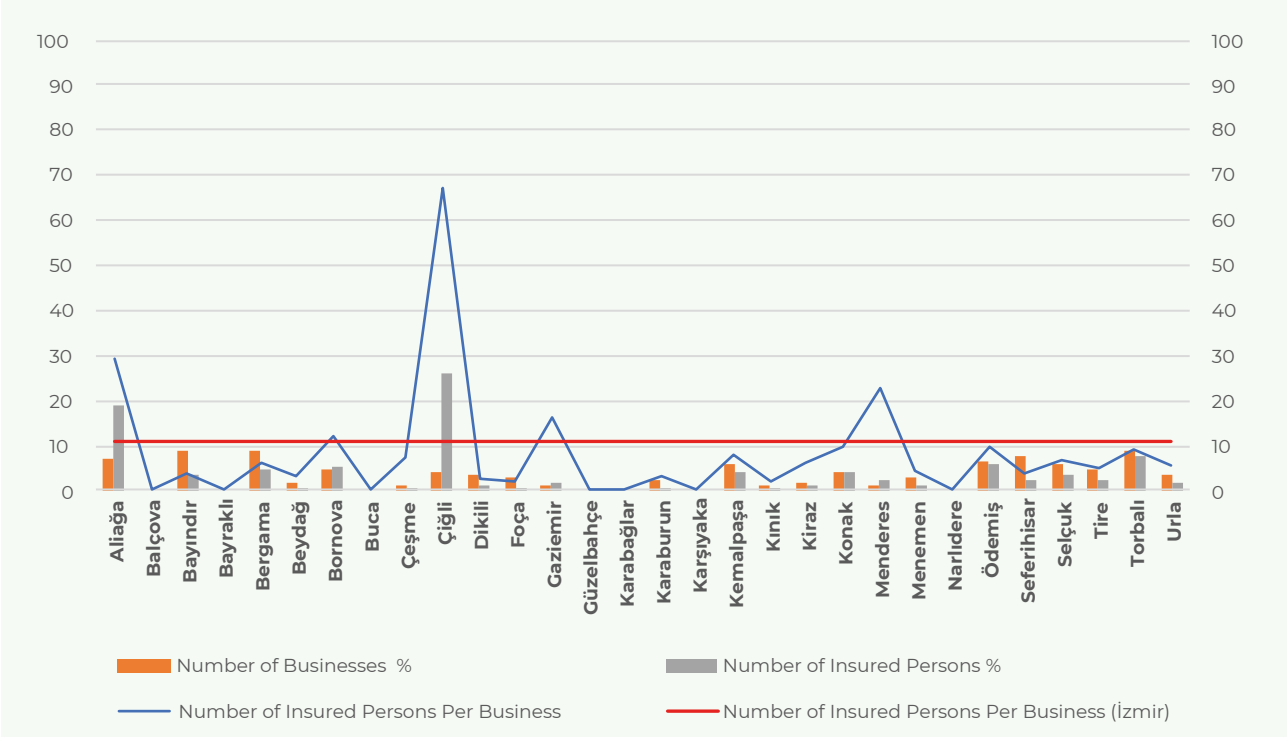
	2019 NUMBER OF ISURED EMPLOYEES			2019 NUMBER OF BUSINESSES		
	LQ Number of Employees	Scale	Dominance	LQ Businesses	Scale	Dominance
	1,09	6,68	0,08	0,58	3,98	0,03
	3,07	18,81	0,42	1,21	8,33	0,01
	1,77	10,85	0,12	0,92	6,36	0,04
	3,71	22,77	0,10	0,55	3,80	0,00
	1,03	6,30	0,03	0,41	2,81	0,00
	2,56	15,67	0,79	1,57	10,82	0,16
	2,20	13,49	0,21	2,07	14,24	0,15
	1,63	9,97	0,33	1,25	8,60	0,12
	0,25	1,53	0,04	0,34	2,34	0,03
	0,99	6,06	0,87	0,83	5,73	1,18
	0,28	1,74	0,03	0,70	4,85	0,02
	5,02	30,80	0,17	1,95	13,48	0,04
	1,38	8,49	0,10	1,17	8,06	0,04
	2,46	15,10	0,12	1,48	10,22	0,03
	1,78	10,93	0,33	1,66	11,43	0,12
	1,32	8,08	0,05	1,04	7,18	0,02
	2,11	12,96	0,17	1,30	8,96	0,05
	2,12	12,97	0,58	1,21	8,32	0,13
	1,05	6,45	0,32	0,97	6,72	0,12
	1,51	9,27	0,29	0,97	6,68	0,25
	1,77	10,87	0,56	0,88	6,04	0,13
	6,28	38,53	0,12	2,19	15,08	0,07
	1,22	7,50	0,06	1,54	10,65	0,08

Annex 9. Spatial Distribution Of Sub-Sectors

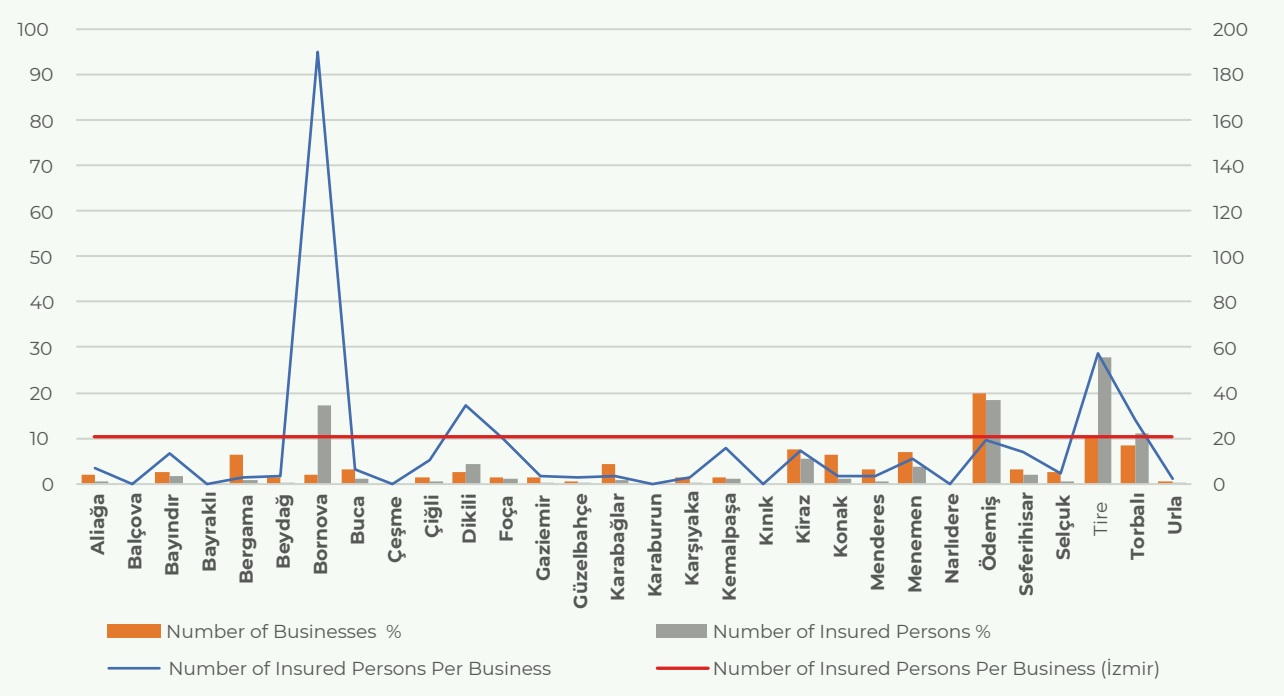
10.3-Processing and preserving of fruit and vegetables



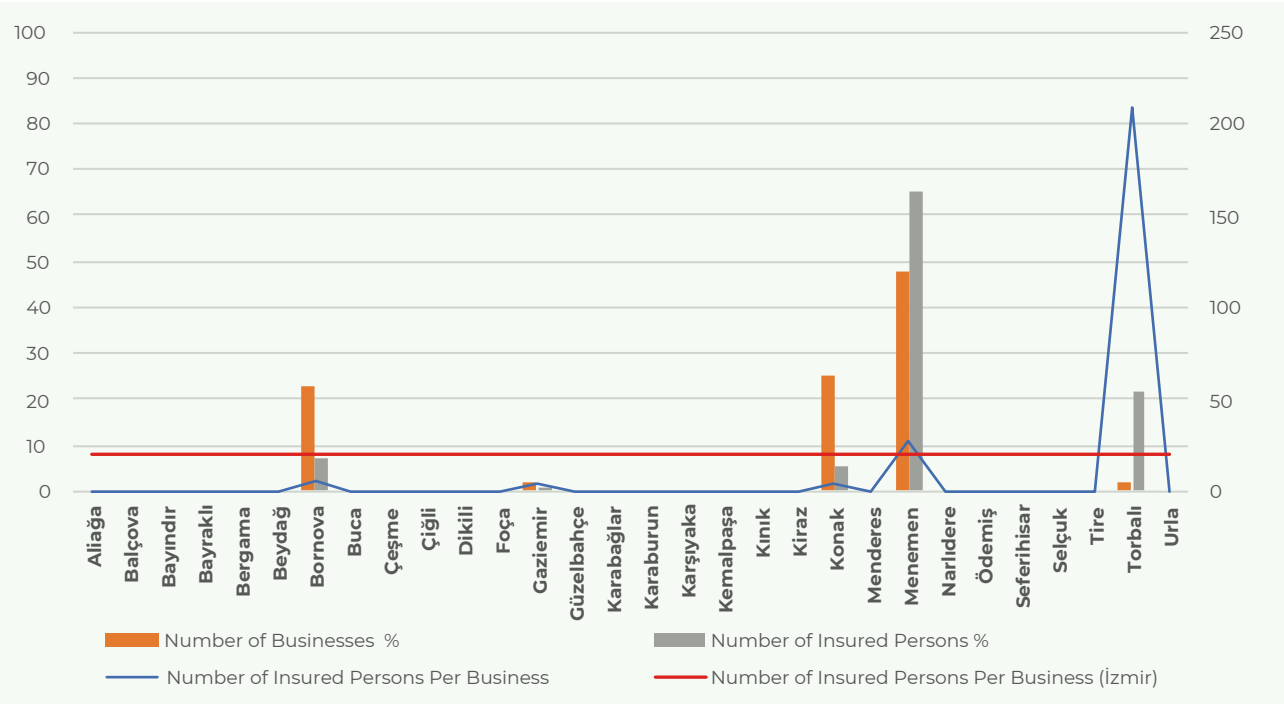
10.41-Manufacture of crude vegetable oils (olive oil, sunflower oil and other vegetable oils)



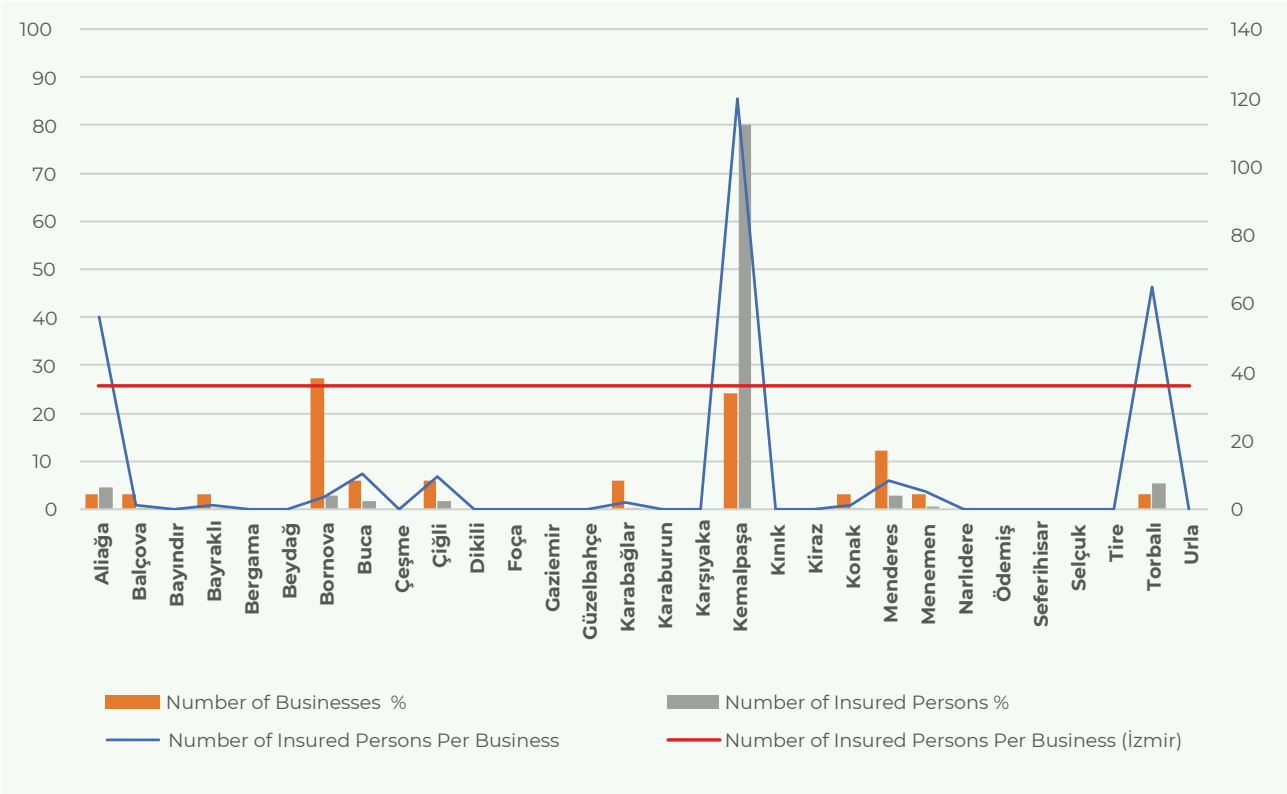
10.51-Operation of dairies and cheese making



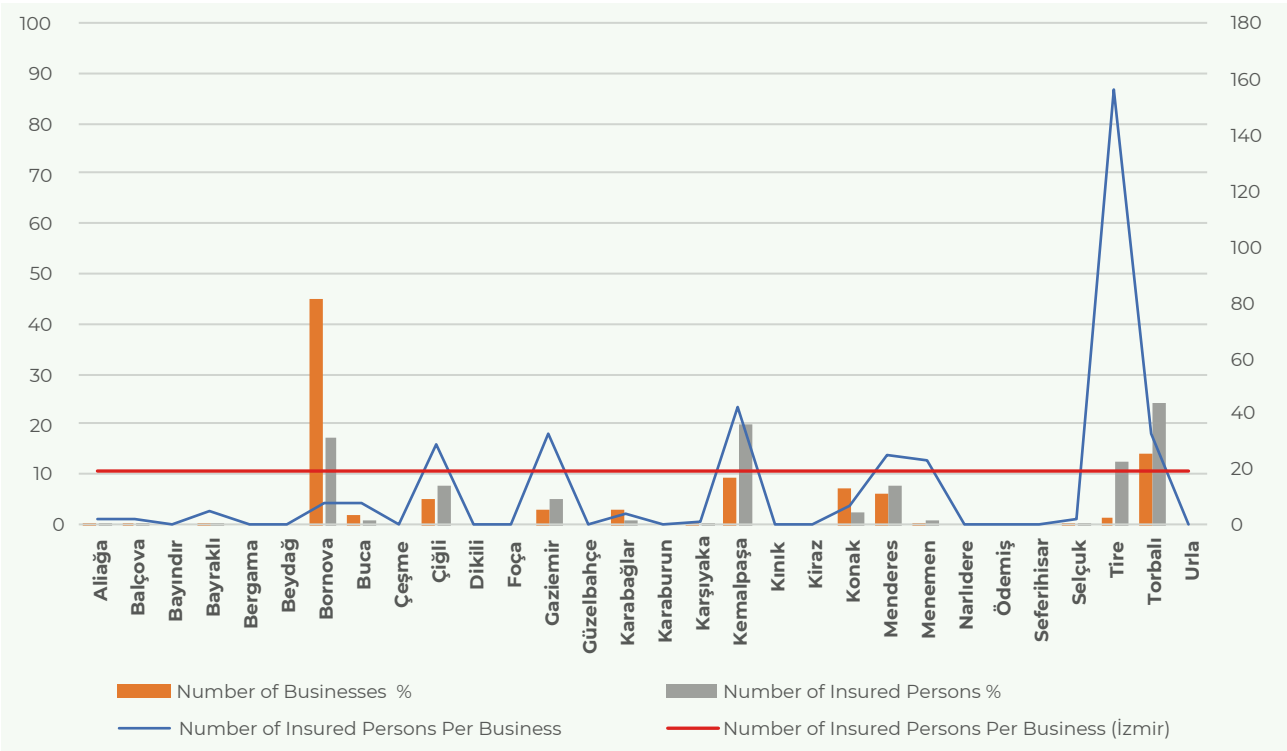
15.11-Tanning and dressing of leather; dressing and dyeing of fur



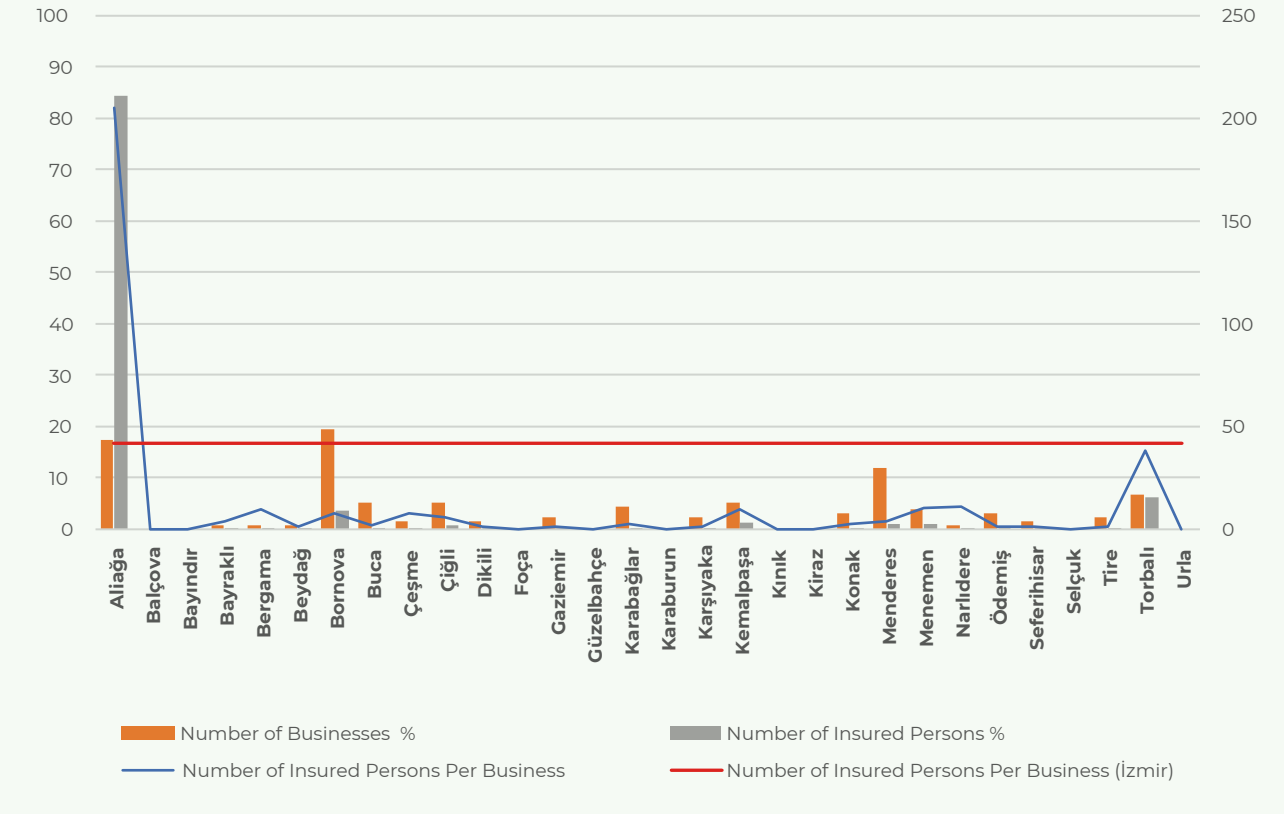
17.12-Manufacture of paper and paperboard



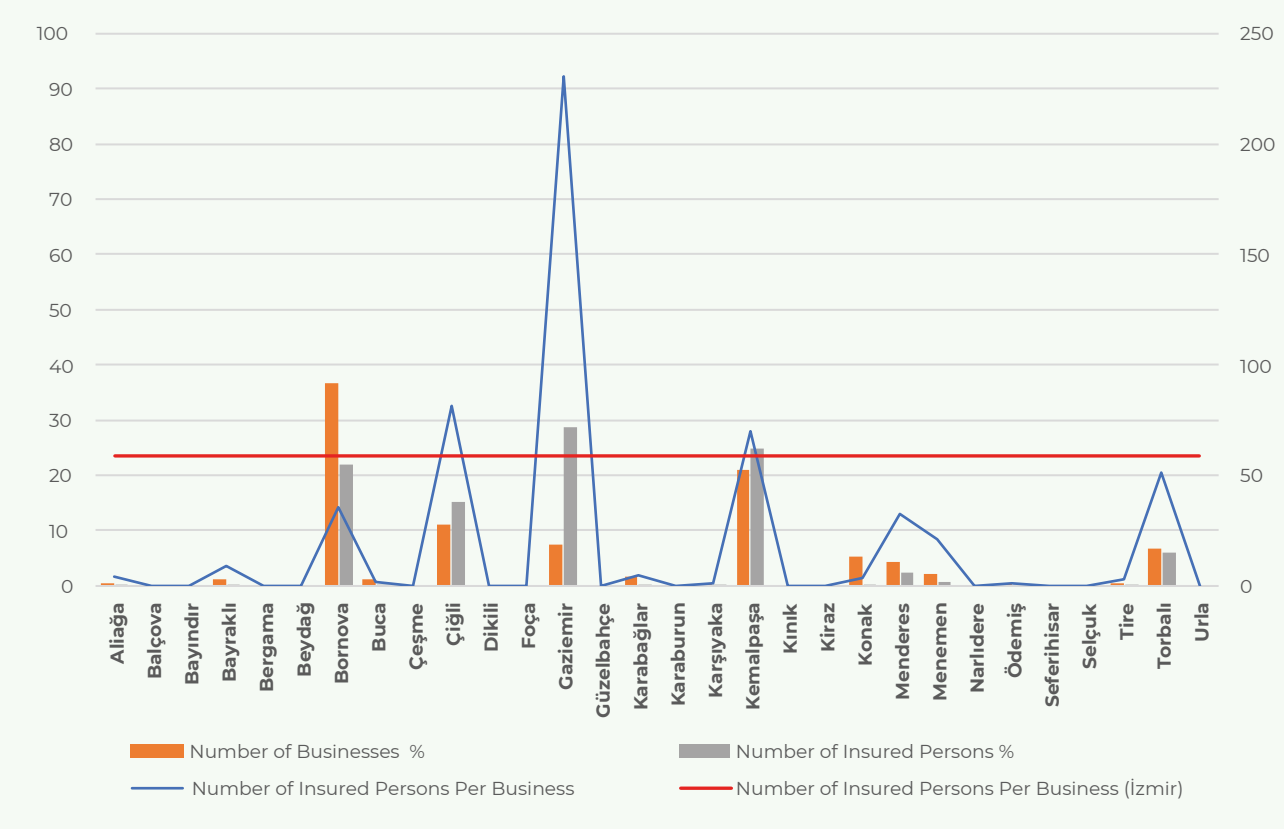
17.2-Manufacture of articles of paper and paperboard



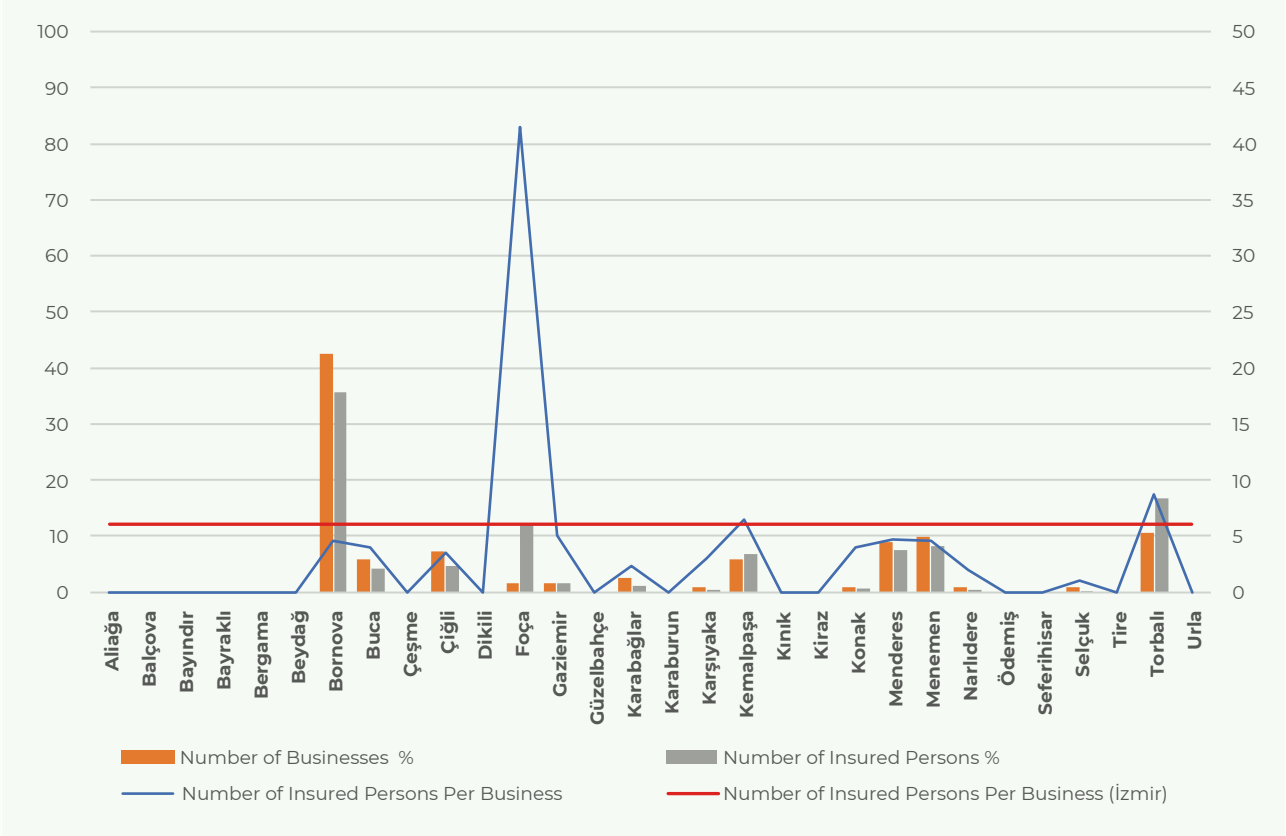
24.10-Manufacture of basic iron and steel and of ferro-alloys



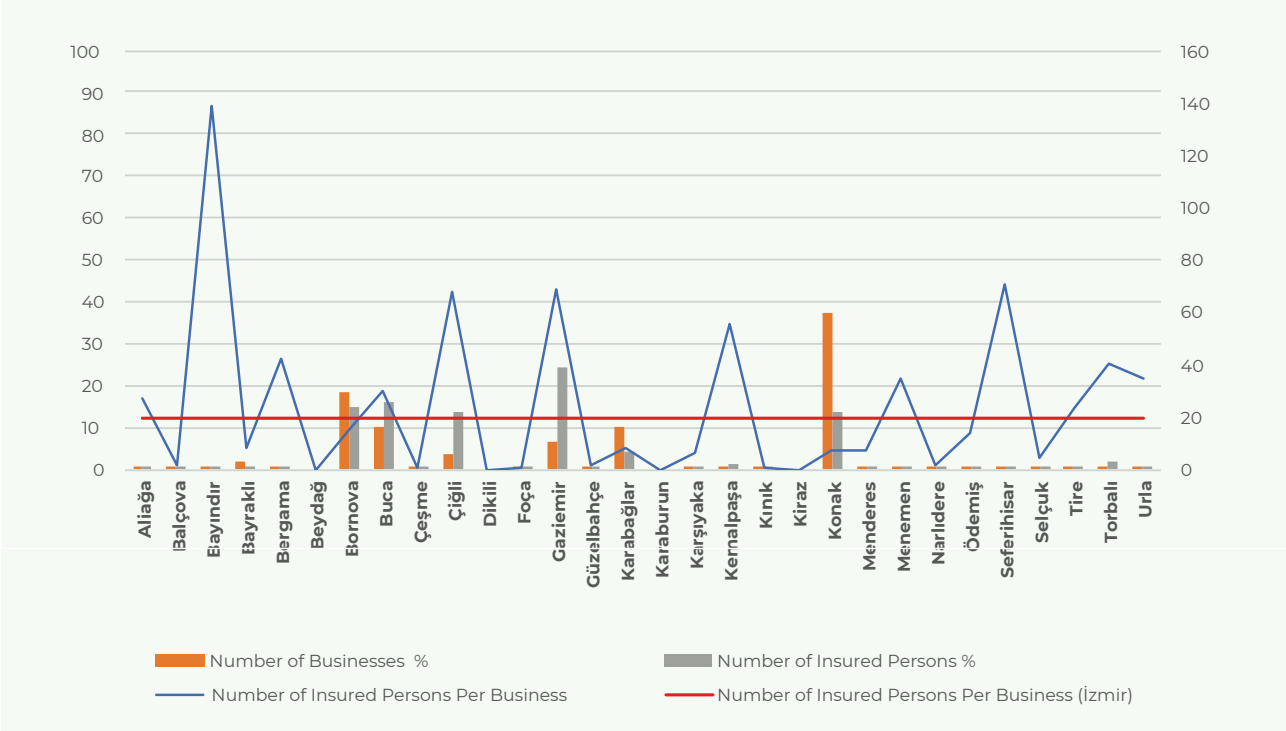
29.3-Manufacture of parts and accessories for motor vehicles



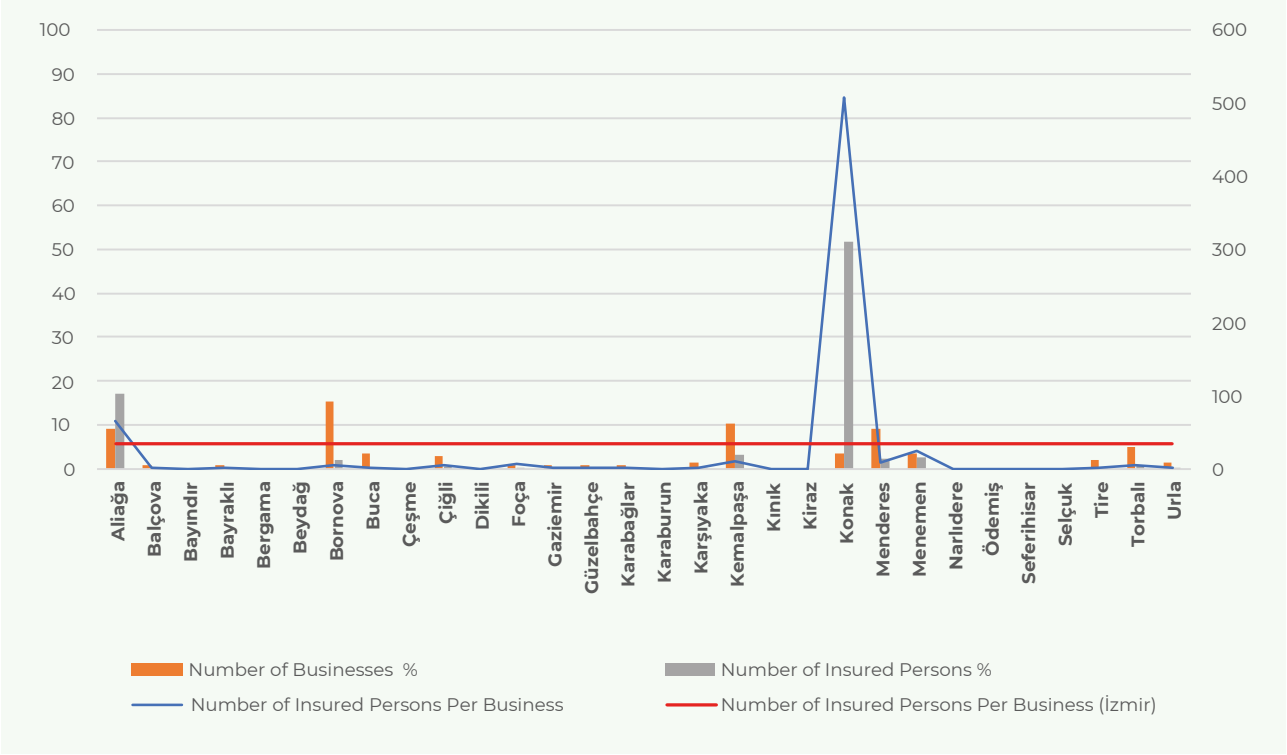
38.3-Materials recovery



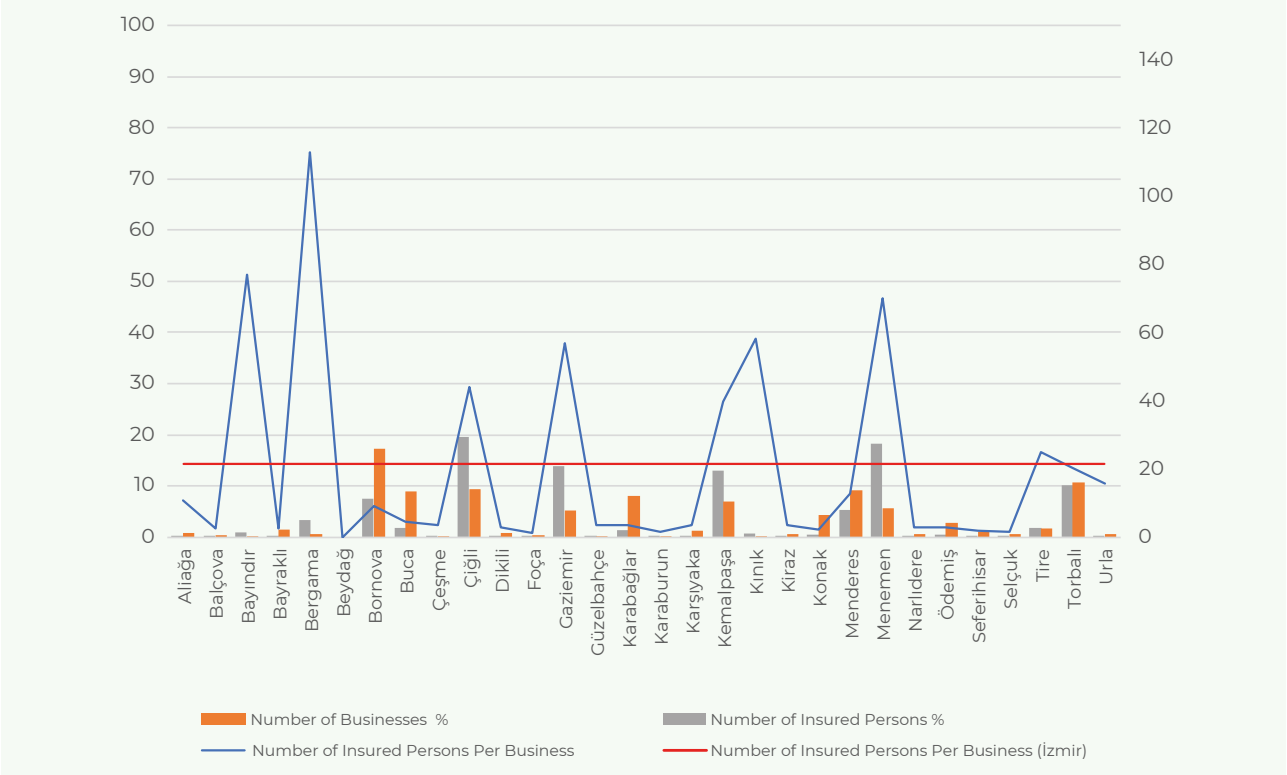
14.1- Manufacture of wearing apparel, except fur apparel



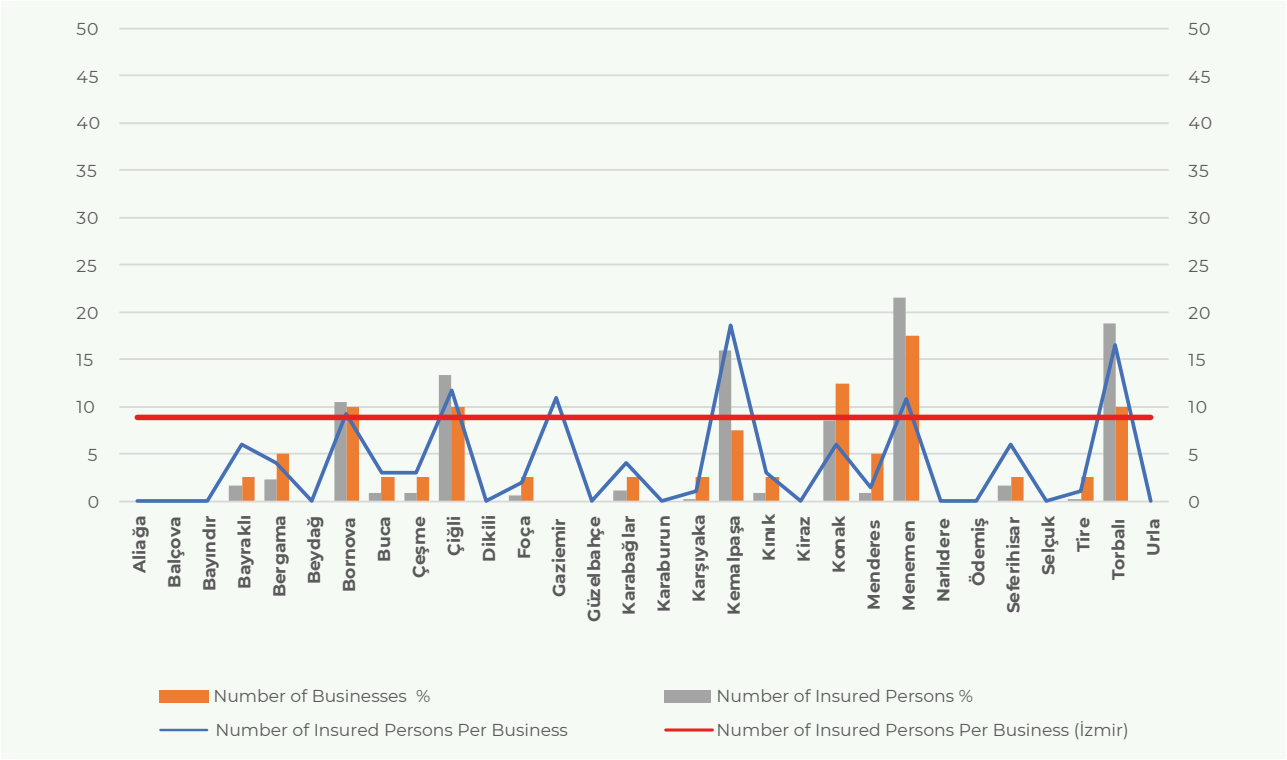
20.1-Manufacture of plastics in primary forms



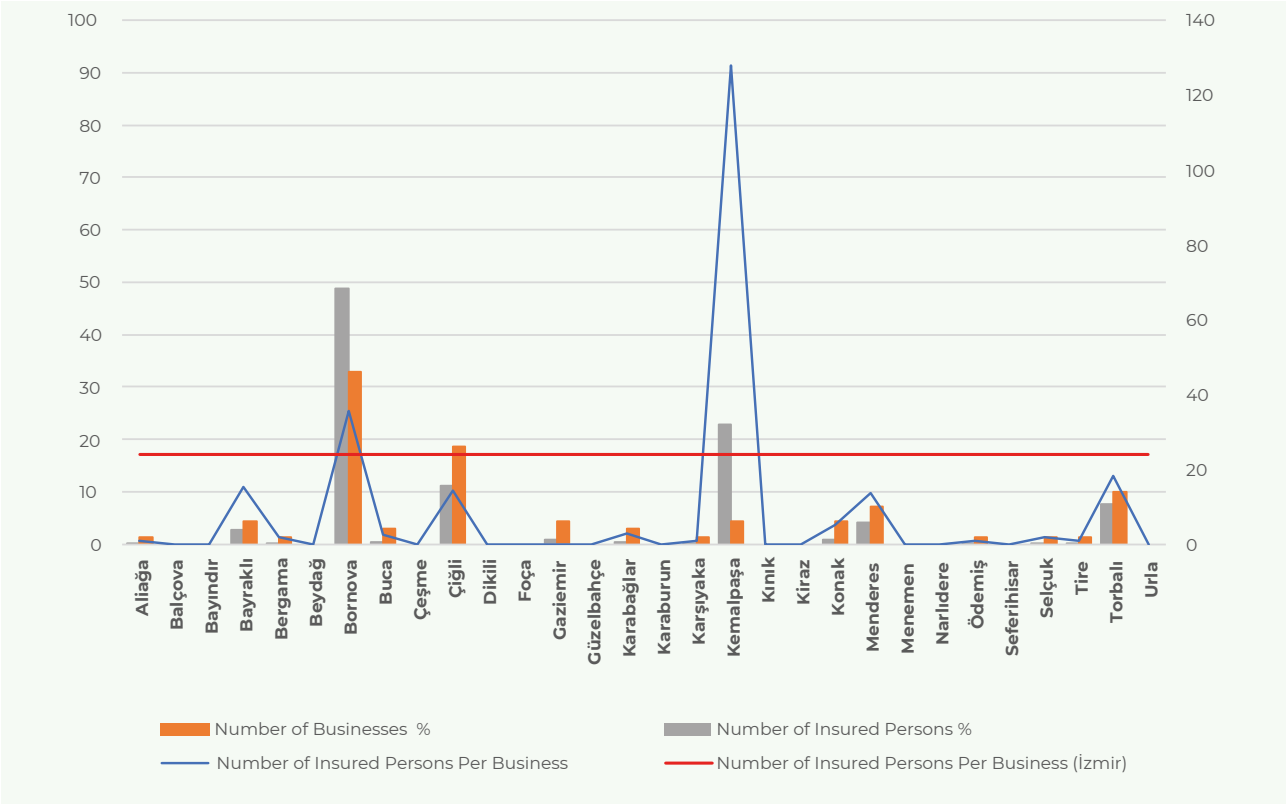
22.2-Manufacture of plastics products



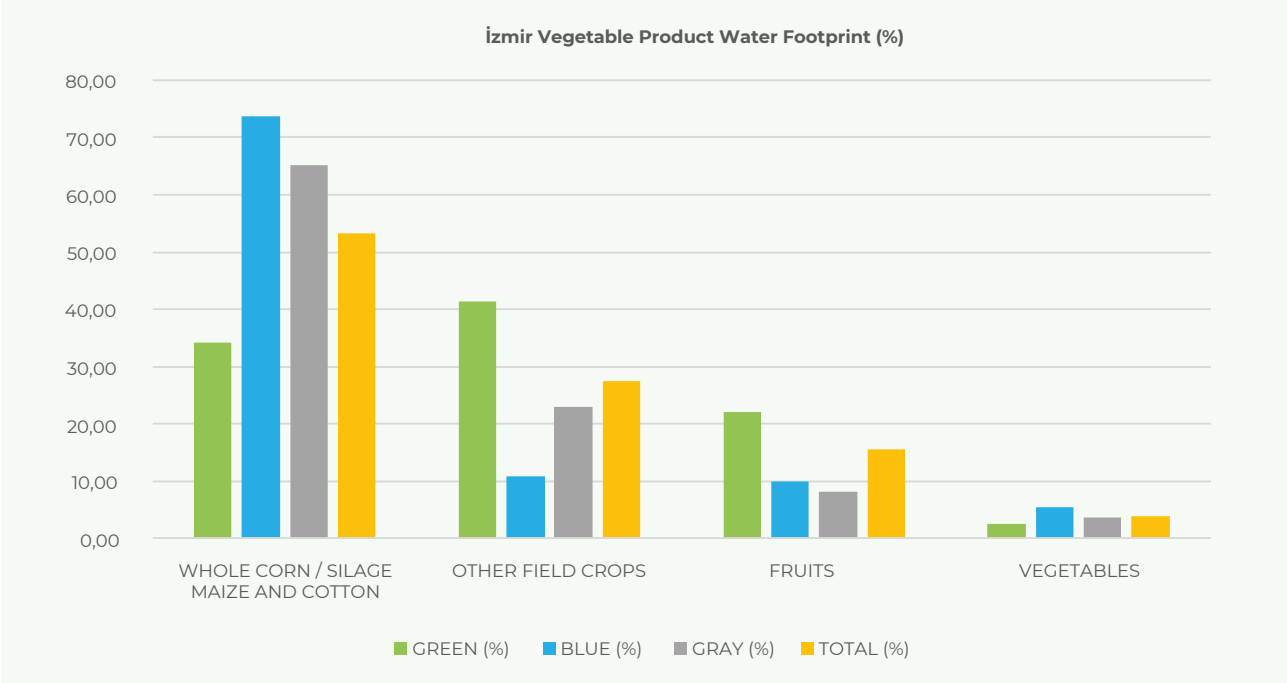
10.61-Manufacture of grain mill products

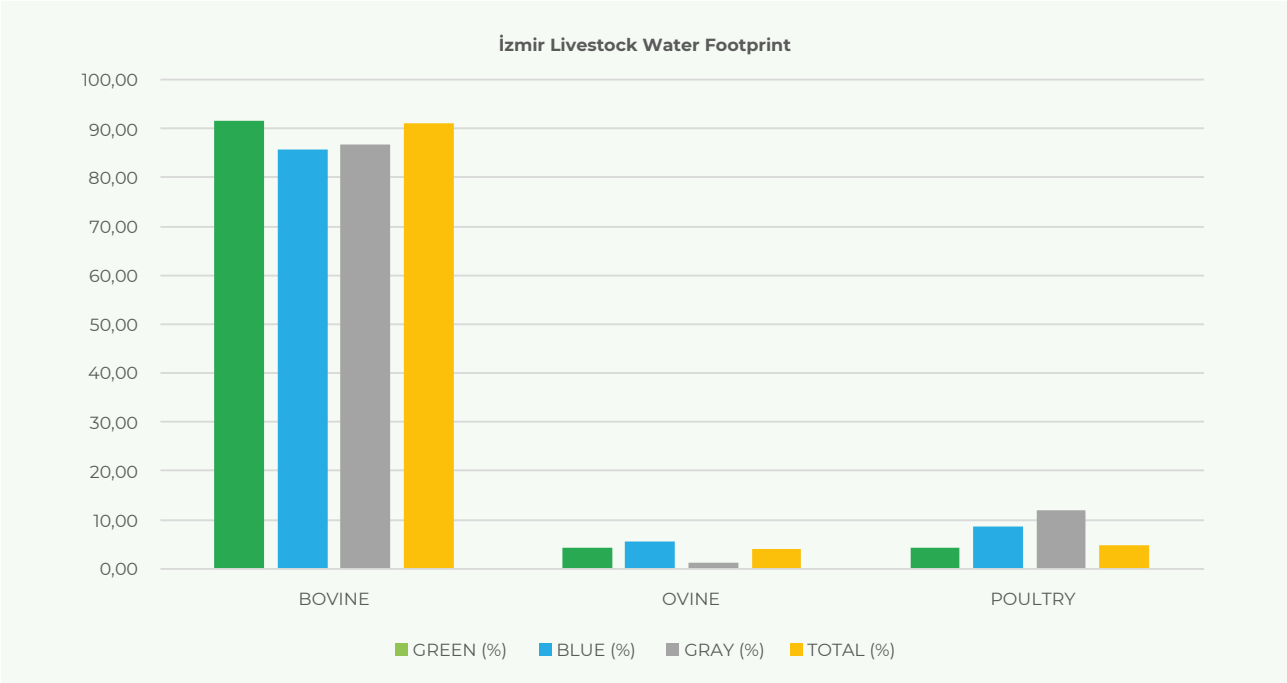


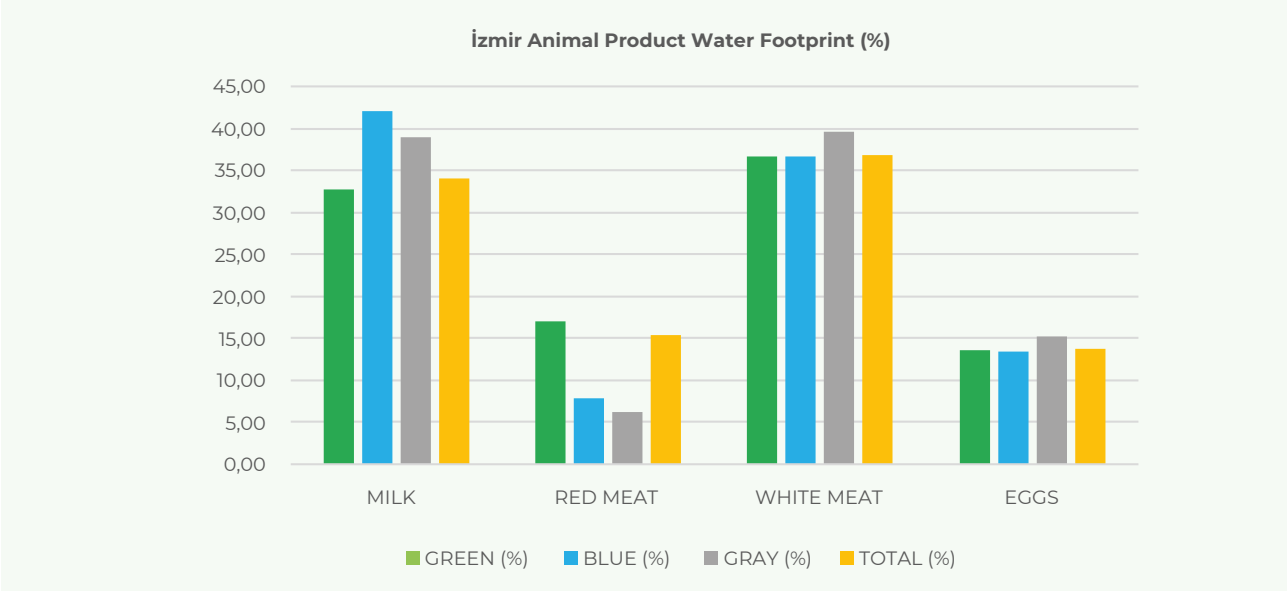
20.41-Manufacture of soap and detergents, cleaning and polishing preparations

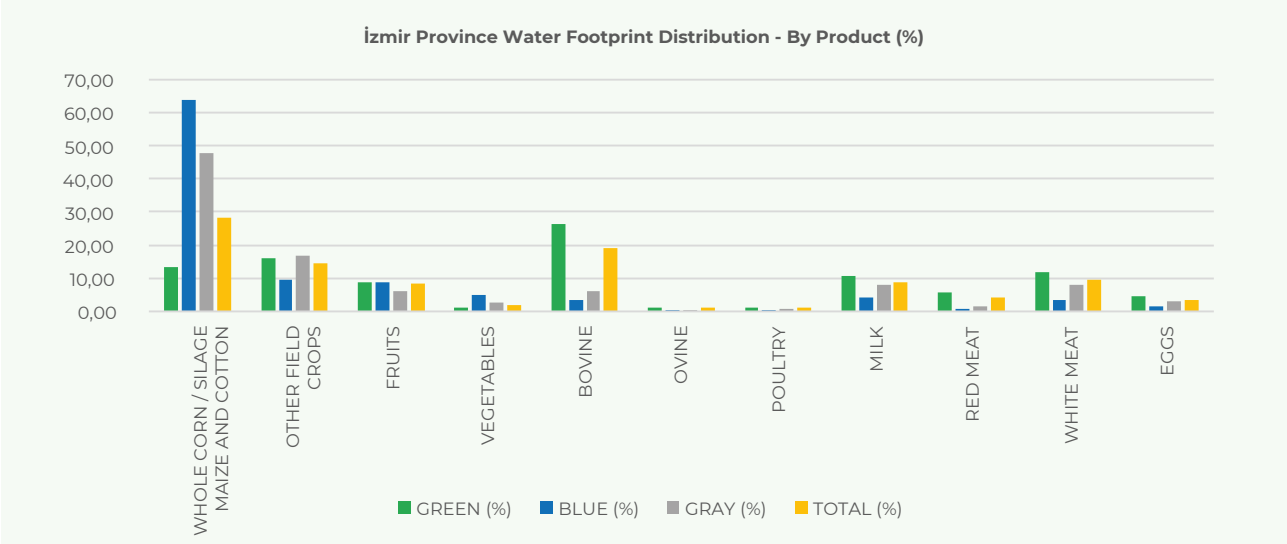


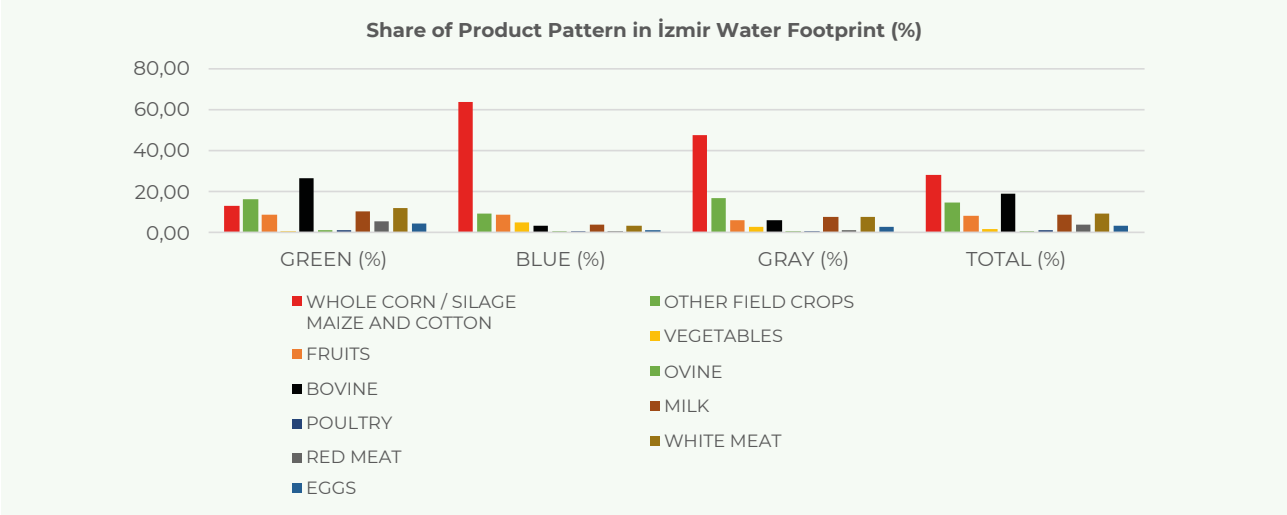
Annex 10. Water Footprint Distributions by Agricultural Product Groups





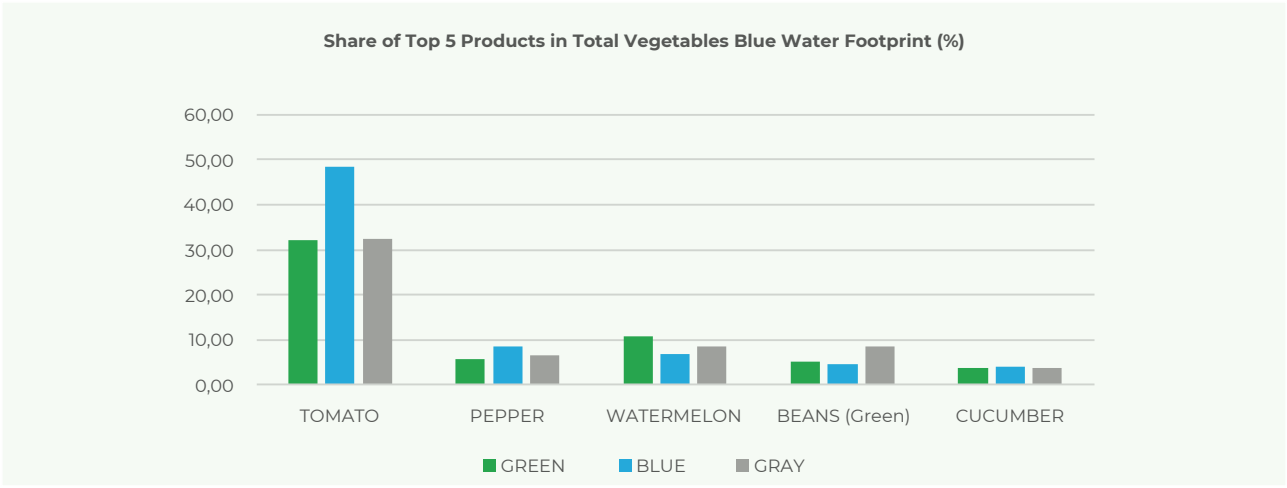

İzmir Animal Product Water Footprint (%)
45,00
40,00
35,00
30,00
25,00
20,00
15,00
10,00
5,00
0,00
MILK
RED MEAT
WHITE MEAT
EGGS
GREEN (%)
BLUE (%)
GRAY (%)
TOTAL (%)


İzmir Province Water Footprint Distribution - By Product (%)
70,00
60,00
50,00
40,00
30,00
20,00
10,00
0,00
WHOLE CORN / SILAGE MAIZE AND COTTON
OTHER FIELD CROPS
FRUITS
VEGETABLES
BOVINE
OVINE
POULTRY
MILK
RED MEAT
WHITE MEAT
EGGS
GREEN (%)
BLUE (%)
GRAY (%)
TOTAL (%)


Share of Product Pattern in İzmir Water Footprint (%)
80,00
60,00
40,00
20,00
0,00
GREEN (%)
BLUE (%)
GRAY (%)
TOTAL (%)
WHOLE CORN / SILAGE MAIZE AND COTTON
OTHER FIELD CROPS
FRUITS
VEGETABLES
BOVINE
OVINE
POULTRY
MILK
RED MEAT
WHITE MEAT
EGGS

Annex 11. Outstanding Agricultural Products and Districts in The Blue Water Footprint

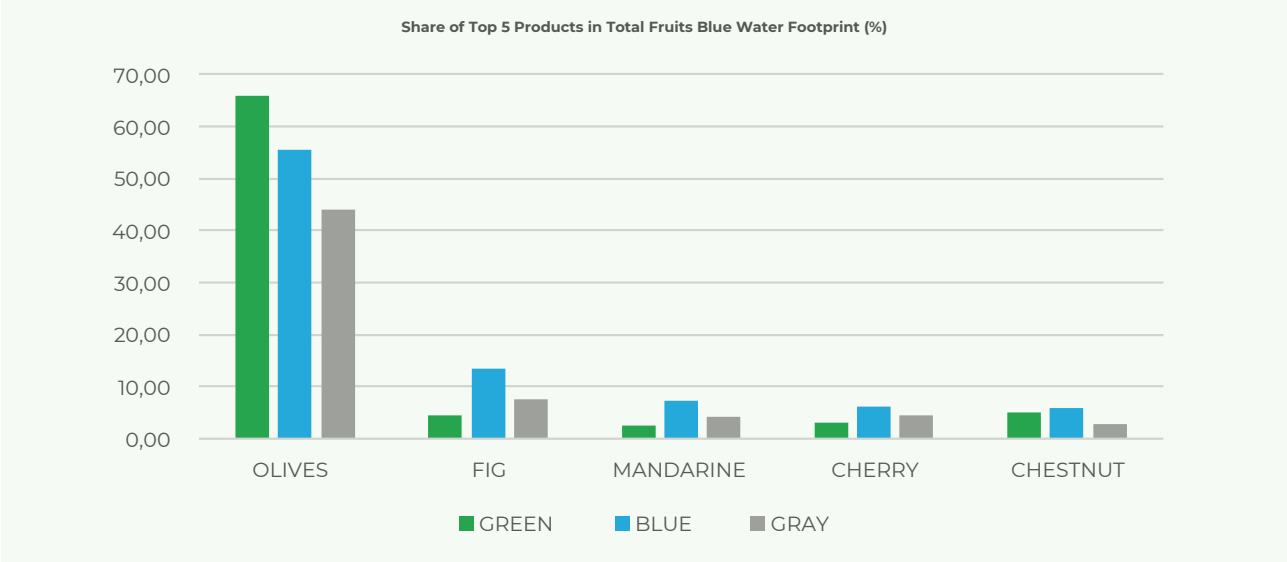
Vegetables Group



DISTRICT	PEPPER (%)	TOMATO (%)	BEANS (%)	CUCUMBER(%)	WATERMELON(%)
Aliağa	0,29	0,17	0,09	0,31	0,34
Balçova	0,08	0,00	0,02	0,04	0,00
Bayındır	10,29	8,54	6,33	15,19	10,35
Bayraklı	0,01	0,01	0,00	0,00	0,00
Bergama	7,07	14,10	2,86	3,54	1,82
Beydağ	0,39	0,09	0,23	0,47	0,14
Bornova	0,13	0,05	0,07	0,00	0,03
Buca	0,63	0,36	0,09	0,21	0,17
Çeşme	0,18	0,33	0,05	0,08	0,10
Çiğli	0,02	0,02	0,00	0,00	0,00
Dikili	0,62	0,52	0,06	0,20	0,95
Foça	0,63	2,27	0,00	0,34	0,13
Gaziemir	0,04	0,01	0,00	0,00	0,00
Güzelbahçe	0,14	0,05	0,03	0,29	0,02
Karabağlar	0,02	0,01	0,00	0,00	0,00
Karaburun	0,08	0,04	0,01	0,02	0,00
Karşıyaka	0,06	0,06	0,01	0,17	0,02
Kemalpaşa	2,76	2,25	0,12	1,07	0,40
Kınık	8,08	9,30	3,88	4,43	1,14
Kiraz	3,76	1,24	14,69	28,48	1,31
Konak	0,16	0,56	0,01	0,25	0,10
Menderes	11,16	1,31	5,78	8,91	11,01
Menemen	1,80	4,75	0,32	0,60	2,26
Narlıdere	0,09	0,22	0,11	0,07	0,16
Ödemiş	11,94	7,35	21,66	25,15	47,13
Seferihisar	2,31	7,79	7,52	0,52	0,76
Selçuk	0,39	1,17	0,56	0,22	0,90
Tire	25,43	6,73	10,10	2,34	17,08
Torbalı	10,83	30,47	24,58	7,09	3,48
Urla	0,65	0,25	0,82	0,00	0,22

Source: Calculated by the authors.

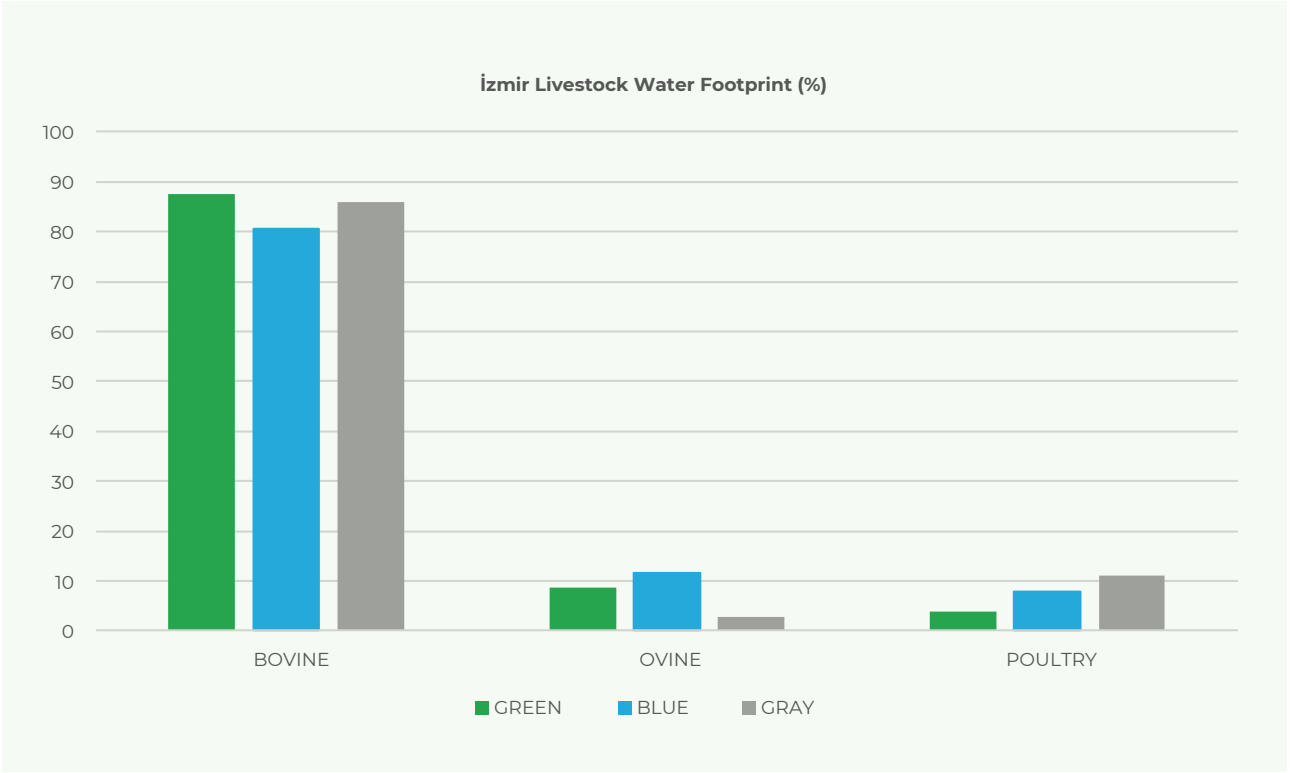
Fruits Group

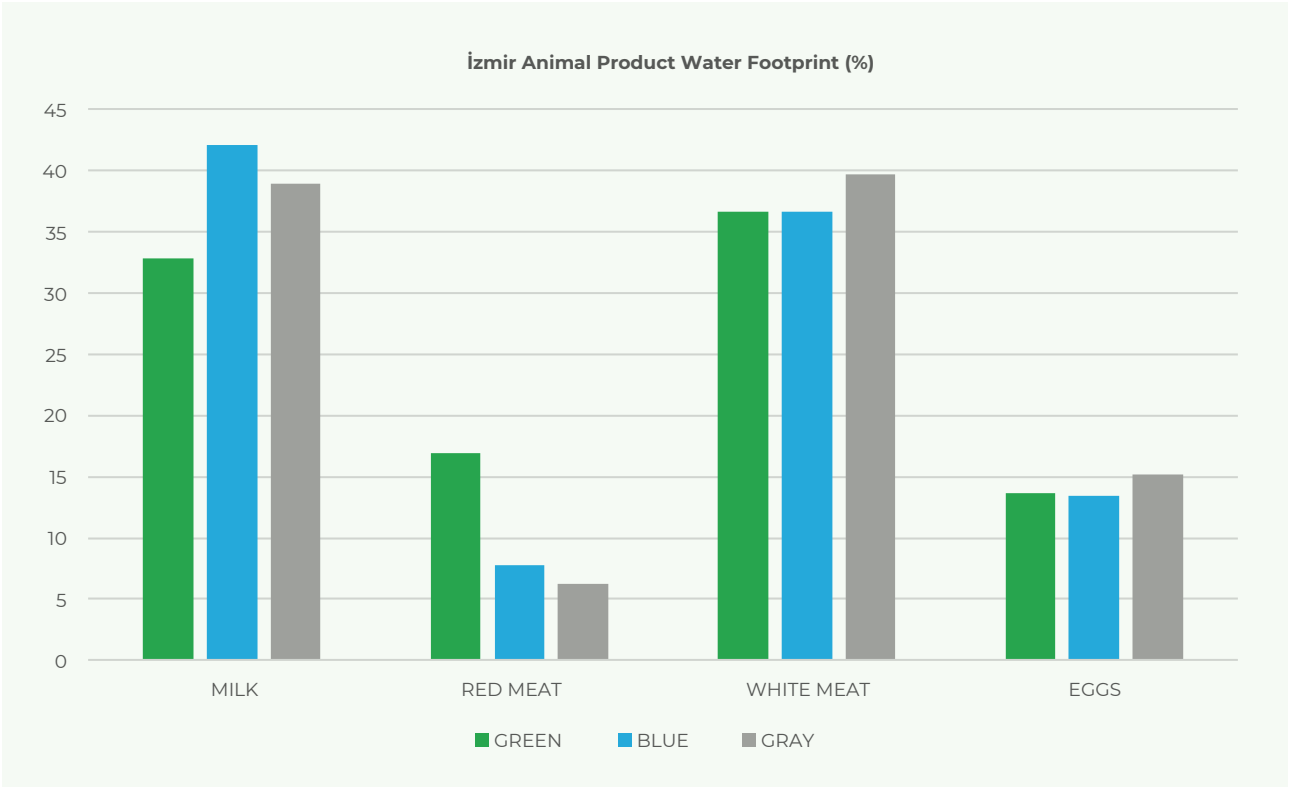


DISTRICTS	OLIVES (%)	FIG (%)	MANDARINE (%)	CHERRY (%)	CHESTNUT (%)
Aliağa	4,85	0,19	0,01	0,00	0,00
Balçova	0,05	0,00	3,14	0,00	0,00
Bayındır	17,40	0,74	0,13	6,83	2,35
Bayraklı	0,00	0,00	0,00	0,00	0,00
Bergama	4,75	0,40	0,02	0,16	0,98
Beydağ	2,03	12,45	0,06	0,74	20,18
Bornova	0,74	0,07	0,00	1,31	0,00
Buca	0,44	0,15	0,00	0,66	0,00
Çeşme	0,87	0,26	0,08	0,00	0,00
Çiğli	0,00	0,00	0,00	0,00	0,00
Dikili	6,02	0,00	0,11	0,00	0,00
Foça	2,05	0,01	0,03	0,00	0,00
Gaziemir	0,38	0,01	0,00	0,00	0,00
Güzelbahçe	0,31	0,01	2,02	0,00	0,00
Karabağlar	0,01	0,01	0,00	0,01	0,00
Karaburun	3,52	0,03	1,06	0,00	0,00
Karşıyaka	0,04	0,01	0,02	0,00	0,00
Kemalpaşa	9,74	0,15	0,00	66,29	1,39
Kınık	0,66	0,17	0,00	0,17	0,42
Kiraz	1,89	11,84	0,00	15,23	11,66
Menderes	5,17	0,22	37,24	0,39	0,00
Menemen	1,42	0,29	1,66	0,26	0,00
Narlıdere	0,04	0,01	2,20	0,00	0,00
Ödemiş	6,21	14,10	0,38	7,23	57,30
Seferihisar	5,73	0,27	33,61	0,00	0,00
Selçuk	7,12	7,39	17,68	0,15	0,00
Tire	5,07	47,97	0,08	0,29	5,71
Torbalı	11,58	3,14	0,22	0,25	0,00
Urla	1,90	0,13	0,24	0,02	0,00

Source: Calculated by the authors.

Livestock and Animal Products





Districts	BOVINE	OVINE	POULTRY	MILK	RED MEAT	WHITE MEAT	EGGS
Aliağa	0,98	2,04	6,04	0,48	1,31	0,00	0,00
Balçova	0,05	0,12	0,00	0,03	0,00	0,00	0,00
Bayındır	12,41	1,66	2,89	12,05	10,31	0,00	8,41
Bayraklı	0,02	0,03	0,00	0,01	0,00	0,00	0,00
Bergama	6,47	5,74	10,34	5,56	4,38	0,00	0,06
Beydağ	4,06	0,18	0,03	3,58	0,00	0,00	0,63
Bornova	0,53	0,74	0,03	0,45	0,00	0,11	0,09
Buca	0,55	0,42	0,31	0,00	0,00	0,00	0,15
Çeşme	0,24	0,48	0,03	0,06	0,00	0,00	0,00
Çiğli	0,42	0,95	0,00	0,28	0,00	0,00	0,00
Dikili	1,13	4,40	0,79	0,80	0,00	0,00	0,10
Foça	2,29	1,50	8,20	2,12	0,00	0,00	30,11
Gaziemir	0,05	0,11	0,00	0,01	0,00	0,00	0,00
Güzelbahçe	0,17	0,50	0,11	0,18	0,00	0,00	0,01
Karabağlar	0,00	0,37	0,01	0,02	0,00	0,00	0,01
Karaburun	0,03	1,59	0,02	0,12	0,00	0,00	0,00
Karşıyaka	0,02	0,18	0,00	0,03	0,00	0,00	0,00
Kemalpaşa	3,84	2,16	36,40	2,46	67,48	99,89	41,55
Kınık	1,75	56,62	0,00	1,13	0,00	0,00	0,10
Kiraz	13,22	1,61	0,81	12,63	0,45	0,00	0,09
Menderes	3,47	0,24	1,80	1,72	1,78	0,00	4,60
Menemen	2,88	3,75	2,77	7,77	5,06	0,00	4,46
Narlıdere	0,00	0,03	0,00	0,00	0,00	0,00	0,01
Ödemiş	24,85	4,04	4,58	28,67	5,88	0,00	0,30
Seferihisar	0,60	2,73	1,20	0,57	0,00	0,00	1,23
Selçuk	0,46	0,58	0,05	0,41	0,03	0,00	0,09
Tire	14,66	3,31	4,02	15,55	2,46	0,00	0,17
Torbalı	4,49	2,63	18,17	3,02	0,00	0,00	4,19
Urla	0,32	1,29	1,40	0,28	0,87	0,00	3,60

Source: Calculated by the authors.

Annex 12. Assumptıons For Calculation of Waste Amount in Agricultural Production

Annual Amount of Fresh Manure by Animal Type

Bovine wastes (ton/year)	Ovine wastes (ton/year)	Poultry wastes (ton/year)
3,6	0,7	0,022

Source: Tırınk, 2021

Assumptions of Distributed Pollutant Loads by Animal Type

	Bovine kg/year	Ovine kg/ year	Poultry kg/ year
Total Nitrogen	8,213	1,035	0,057
Total Phosphorus	0,913	0,049	0,008

Source: Tırınk, 2021

Turkey Food Loss Ratios (FAO, 2013

Product Group	Agricultural Production (%)
Grains	5,1
Root and Tuber Plants	7
Oily Seeds	15
Fruits and Vegetables	20
Meat	10
Fish and Sea Products	10
Milk	10
Eggs	6

Source: FAO, 2013

FAO 2013. Food Losses and Waste in Turkey.
Tırınk, S. (2021), Environmental Effects of Animal Waste and Pollutant Load Calculation in Iğdır Province and Its Districts, Black Sea Journal of Engineering and Science, Volume 4, Issue 2:43-50

Animal Manure Based Diffuse Pollutant Loads

Districts	Total Wet Manure Amount (ton/year)	Total Nitrogen Load (ton/year)	Total Phosphorus Load (ton/year)
Ödemiş	785.080,106	1.747,81	190,01
Tire	483.288,834	1.067,53	115,26
Kiraz	402.258,74	899,07	97,90
Bayındır	389.334,322	871,79	95,49
Bergama	304.135,112	717,68	88,96
Kemalpaşa	316.935,87	666,93	69,36
Torbalı	248.272,37	559,28	64,52
Menemen	150.994,666	302,31	29,13
Foça	124.309,7	276,50	31,34
Beydağ	117.876,08	266,70	29,39
Kınık	109.801,206	250,09	28,07
Menderes	115.808,766	241,29	25,20
Dikili	102.809,9	181,60	14,10
Aliağa	8.5919,86	179,31	19,03
Seferihisar	63.968,77	114,06	9,14
Urla	35.097,8	66,15	5,96
Bornova	26.598,41	51,61	4,68
Çiğli	23.499,37	48,83	4,92
Karaburun	26.392,4	48,60	4,04
Buca	22.226,236	43,61	4,02
Selçuk	25.181,856	37,96	1,93
Çeşme	14.344,704	26,82	2,29
Güzelbahçe	13.011,922	23,66	1,94
Karabağlar	5.714,1	8,54	0,42
Karşıyaka	3.257,7	5,98	0,49
Balçova	3.471,574	5,71	0,37
Gaziemir	3.001,464	5,53	0,46
Bayraklı	861,12	1,65	0,15
Narlıdere	522,638	0,89	0,06

Source: Calculated by the authors.

Organic Loss Amounts

Districts	Field Crops Organic Loss (ton/year)	Vegetables Organic Loss (ton/year)	Fruits Organic Loss (ton/year)	Animal Products Organic Loss (ton/year)	Aquaculture Organic Loss (ton/year)
Kemalpaşa	1602,471	1129,4	28826,2	45037531,28	0
Foça	2624,256	7148	305	32609194,95	73744
Bayındır	27390,825	27197,2	5784,4	9125109,4	0
Menderes	5021,766	40982,6	16549,4	4988231,337	7417,5
Menemen	9537,714	19592,8	14601,8	4839972,98	0
Torbalı	26518,623	118809,4	6177	4536027,49	0
Urla	610,929	3473,6	1602,6	3900389,504	11942,1
Seferihisar	243,015	691,6	13882,4	1336612,986	3960,5
Beydağ	8612,574	717	3261,8	687797,502	190,4
Ödemiş	72664,647	31913,6	13442	366343,789	0
Tire	35618,961	23831,6	9456,2	207185,043	0
Buca	1294,839	968,6	215,4	165840	0
Kiraz	22787,82	7792	5259,4	114929,383	0
Kınık	3161,286	24678,4	587,6	109422,223	0
Dikili	6605,979	3186,8	1641,4	107446,892	32534,4
Selçuk	1268,88	3613,6	18957	102514,891	0
Bornova	14,229	94,2	363,8	101397,349	0
Bergama	12738,474	41870,4	2843,6	71748,218	896
Güzelbahçe	117,402	444	828,4	12223,525	69615
Karabağlar	0	0	497,2	9029,182	0
Narlıdere	0	0	369,2	8562,128	0
Çeşme	29,376	2856,8	589,6	5472,274	10196,9
Gaziemir	35,904	16	120,4	2846,661	0
Karşıyaka	0	35	25,8	2439,417	56199,2
Balçova	8,67	185	425,6	1837,354	0
Aliağa	2578,866	806	1324,8	1641,296	25592
Karaburun	0,969	220,8	1317	1601,875	6474,8
Bayraklı	0	22,4	1,6	916,987	0
Çiğli	712,164	308,4	8,2	352,773	0

Source: Calculated by the authors.

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