BANDIRMA
MUNICIPALITY

SECAP
BANDIRMA

SUSTAINABLE ENERGY AND CLIMATE ACTION PLAN

2024

SUSTAINABLE ENERGY AND CLIMATE ACTION PLAN

(SECAP)

2024

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This report was prepared by Bandırma Municipality SECAP project team with the support of EU4 Energy Transition: Covenant of Mayors in the Western Balkans and Türkiye Project team.

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ABBREVIATIONS

ABBREVIATION	EXPLANATION
BAU	Business As Usual
BM	Bandırma Municipality
BMM	Balıkesir Metropolitan Municipality
BEI	Basline Emission Inventory
EPB	Energy Performance of Buildings
ICT	Information Communication Technologies
BASKI	Balıkesir Water and Sewerage Administration
CDP	Carbon Disclosure Project
cm	Centimetre
CH4	Methane
CO_2	Carbon Dioxide
CoM	Covenant of Mayors
DSI	State Water Works
ECMWF	European Centre for Medium-Term Weather Forecasts
ESCO	Energy Service Company
EPC	Energy Performance Contracts
EMRA	Energy Market Regulatory Authority
GWh	Gigawatt hour
Ha	Hectare
ICLEI	International Council for Local Initiatives
IEAP	International Local Government Greenhouse Gas Emissions Analysis Protocol
IFRC	International Federation of Red Cross and Red Crescent Societies
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Convention on Climate Change
CCCB	Climate Change Coordination Board
JRC	Joint Research Centre
kWh	Kilowatt hour
m^2	Square Metre
m	Metre
mm	Millimetre
MGM	General Directorate of Meteorology
MWh	Megawatt hour
N2O	Nitrous oxide
n.a.	Not applicable
NZEB	Nearly Zero Energy Buildings

PV	Photovoltaic - solar panel
SECAP	Sustainable Energy and Climate Action Plan
NGO	Non Governmental Organisation
TAMP	Türkiye Disaster Response Plan
tCO_2e	Tonnes of carbon dioxide equivalent
TUIK	Turkish Statistical Institute
UNFCCC	United Nations Framework Convention on Climate Change
RES	Renewable Energy Source
YMEP	Green Consensus Action Plan
SDG	Sustainable Development Goals
SPP	Solar Power Plant
LCA	Life Cycle Analysis
GHG	Greenhouse Gas Emissions
GWP	Global Warming Potential

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FOREWORD BY THE MAYOR

The Earth is no longer able to bear the burden imposed by mankind. Climate change is the most obvious indicator of this. The earth consumes the oxygen it can use before the middle of the year and starts to use the next year's oxygen. This is the point where the balance is disturbed. We have burdened the earth with more than it can bear and we continue to do so.

The signs of climate crisis in our country and our city in recent years are very clear. We are facing events such as floods and droughts. Precipitation has deviated from normal and so have temperatures. These situations prove the accuracy of the disaster scenarios that scientists warned years ago. Environmental problems are no longer in the future, but in our lives. Due to the geographical location of our country, we are likely to face negativities such as water scarcity. It is now necessary to take action individually and collectively.

We should endeavour to leave a more livable world for our children. The sky, seas, forests, living creatures in nature and soil also have a future. The future of humanity is closely related to the world. For this reason, we have to create and implement sustainable and environmentally friendly policies. Measures such as energy saving, use of renewable energy sources, protection and increase of forests will enable us to leave a better world to future generations. Maintaining the balance of nature is both our responsibility and our guarantee of survival.

The European Union Global Covenant of Mayors for Climate and Energy is a platform of mayors who have adopted the EU Climate and Energy targets. As Bandırma Municipality, we signed this declaration in 2023 and committed to take various measures to reduce the effects of climate change and adapt to these changes until 2030. In this direction, our SECAP Preparation Team in Bandırma has started the process of preparing the Sustainable Energy and Climate Action Plan with the information received from all our stakeholders. Due to our industrial areas, main arterial roads and many public institutions, we harbour many factors that can contribute to climate change. Therefore, the measures and practices to be taken will play an important role in minimising the effects of climate change.

In 2017, we started electricity production in Bandırma with a solar power plant with a power of 1 MW, which we established on a total area of 19,500 m^2 in our Erikli Neighbourhood. This power plant meets approximately 90% of the electricity consumption of our municipality and is one of the first solar power plants built by municipalities in the Marmara Region. This successful project is an important step in achieving Bandırma's sustainable energy targets and sets an example for our future work. We aim to meet our energy needs from renewable sources and reduce our environmental impact by implementing similar projects in other neighbourhoods in our district. In this way, we will continue to work with determination to minimise the negative effects of climate change and create a more livable environment.

Yours sincerely,

Dursun MIRZA
Mayor of Bandırma Municipality

EXECUTIVE SUMMARY

Industrial Revolution and the Impact of Fossil Fuels

Fossil fuels, which started to be used more intensively with the Industrial Revolution, pose a great threat to all living life by spreading into the atmosphere. The Physical Science Basis of Climate Change Report (2013) and the Fifth Assessment Report (2014) of the Intergovernmental Panel on Climate Change (IPCC) reveal that climate change is definitely (95-100 per cent) caused by human activities. It has been proven that since the industrial revolution, carbon dioxide emissions from fossil fuel consumption have increased much faster than the oceans and forests can absorb. It is predicted that the continuation of the current habits of societies will lead to serious climate change consequences, resulting in massive environmental destruction and possible mass deaths.

Commitments and Targets of Bandırma Municipality

Bandırma Municipality has committed to reduce CO_2 emissions by 40% by 2030 by joining the Covenant of Mayors in 2023, which is supported by the European Commission and to which nearly 12,000 local governments around the world are parties. 2023 was determined as the baseline year in which the most reliable data could be obtained and a greenhouse gas inventory was prepared based on this year. This inventory will be used to reveal the current situation of Bandırma and to determine long-term targets.

Greenhouse Gas Emission Status of Bandırma

As a result of the 2023 based greenhouse gas emission analysis, total greenhouse gas emission is calculated as 713,686 tCO_2 e. In the distribution of emissions, the stationary energy sector has the highest share with 431,437 tCO_2 e. This is due to the high density of industrial and commercial establishments and the high circulation of people and vehicles in Bandırma. In the second place is the transport sector with 255.089 tCO_2 e and accounts for 35.8% of total emissions. In the third place is the waste sector with 27.190 tCO e.$_2$

Emission Reduction Targets and Actions

Bandırma Municipality has voluntarily committed to reduce greenhouse gas emissions and increase the city's resilience to climate change by signing the Covenant of Mayors. The targets set in this context are as follows:

- Reduction of CO_2 emissions by at least 40% compared to the baseline year

- Increasing resilience to climate change

- Ensure access to sustainable and low-cost reliable energy by integrating mitigation and adaptation plans

In 2030, the total amount of greenhouse gas emissions is expected to be 798,311 tCO_2e. With the implementation of emission mitigation actions, total greenhouse gas emissions are envisaged to be reduced by 40% to 478,987 tCO_2 e by 2030.

Türkiye and Bandırma's Struggle with Climate Change

With the implementation of emission mitigation actions, it is envisaged that the total greenhouse gas emission value will be reduced by 41 % to approximately 695 Mt tCO_2 e by 2030[1] . As of 31 December 2022, 57 million 934 thousand 583 people live in settlements classified as dense cities, which constitute only 1.6% of the total surface area of our country. In other words, 67.9 per cent of Türkiye's population resides in these settlements. In settlements classified as rural, which constitute 93.5% of Türkiye's surface area, 17.3% of the total population resides. As can be seen from the figures, there is a disproportion in our urban and rural population in a way that is inversely proportional to the area. The fact that our urban populations are high increases the energy expenditure, especially in our regions where industrialisation is taking place.

The Government of the Republic of Türkiye submits its updated First Nationally Determined Contribution (NDC) in the context of the Glasgow Climate Accord adopted by the Parties at the 26th Conference of the Parties as a supplement to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. With this declaration, Türkiye confirms that it will reduce its GHG emissions by 41% by 2030 (695 Mt CO_2 equivalent in 2030) compared to the baseline scenario set out in the First NDC (and Intended NDC), where 2012 is considered as the baseline year (reference year). Türkiye 's updated NDC covers the whole economy and includes comprehensive mitigation and adaptation actions as well as assessments of means of implementation. Türkiye intends to peak its emissions no later than 2038. The new reduction target represents significantly more ambitious on the basis of science and equity and is a step forward towards achieving a net zero target by 2053 .[2]

Cities are responsible for 80 per cent of global GDP, presenting a huge opportunity to accelerate climate action. For this reason, cities are the key to a net zero emission future where sustainable energy is accessible to everyone. Bandırma Municipality continues to work in this direction.

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[1] Republic of Türkiye Ministry of Environment, Urbanisation and Climate Change, Climate Change Presidency, www.iklim.gov.tr Access Address: https://iklim.gov.tr/db/turkce/icerikler/files/%C4%B0klim%20De%C4%9Fi%C5%9Fikli%C4%9Fi%20Azalt%C4%B1m%20Stratejisi%20ve%20Eylem%20Plan%C4%B1%20(2024-2030).pdf

[2] Republic of Türkiye Ministry of Environment, Urbanisation and Climate Change, Climate Change Directorate, www.iklim.gov.tr Access Address: https://netsifirturkiye.org/wp-content/uploads/2023/07/Turkiye-Cumhuriyeti-Guncellenmis-Birinci-Ulusal-Katki-Beyani.pdf

INTRODUCTION

In the early 21st century, climate science has conclusively demonstrated that human activities, particularly carbon dioxide and other greenhouse gases from fossil fuels used in energy production, are causing global warming. Fossil fuel use, changes in land use and agricultural activities are among the main causes of greenhouse gas increase.

There are numerous observations and studies showing that air and ocean temperatures are increasing, snow and glaciers are melting extensively and sea levels are rising. The continuation of current production and consumption patterns will lead to serious climate change consequences, causing massive environmental destruction and possible mass deaths, and paving the way for related humanitarian disasters. Since the Industrial Revolution, it has been proven that carbon dioxide emissions from human activities due to fossil fuel consumption have increased much faster than the oceans and forests can absorb. This danger, clearly demonstrated by climate science, has led to calls for urgent action around the world.

However, intergovernmental climate change negotiations progress slowly and fall short of taking the steps recommended by science. Local governments, which are in closer contact with society, are increasingly involved in this problem, which directly affects people's quality of life and health. Local Governments for Sustainability (ICLEI), which was established in the 1990s, and other unions and coalitions have shown that they can play an important role in the fight against climate change by setting more advanced targets than their governments since the early 2000s. Today, coalitions formed by local governments have an increasing weight in climate negotiations.

Within the scope of the Covenant of Mayors established by the European Commission, Bandırma Municipality commits to reduce greenhouse gas emissions by at least 40% by 2030 based on the year 2023 in order to reduce greenhouse gas emissions of city, encourage urban mitigation plans and promote the use of clean energy sources. Bandırma Municipality aims to reduce the negative impacts of climate change and prepare the district for future climate changes with the Sustainable Energy and Climate Action Plan (SECAP) prepared in cooperation with local stakeholders.

1.1. Purpose

Bandırma Municipality has taken a pioneering role in sustainable development and environmental protection and joined the "Covenant of Mayors", which is supported by the European Commission and to which nearly 12,000 local governments around the world are parties. In this context, the SECAP of Bandırma Municipality has been established. The main objective of this plan is to reduce carbon emissions by 40% by 2030 and make Bandırma more resilient to climate change.

Aims and Objectives

The main objectives and targets of Bandırma Municipality within the scope of SECAP are as follows:

1. Reducing Carbon Emissions: Reducing Bandırma's carbon emissions by 40% by 2030. This target will be realised by reducing energy consumption and greenhouse gas emissions in the city. Reducing fossil fuel consumption and increasing the use of renewable energy sources are the main components of this process.

2. Adaptation to Climate Change: Increasing the resilience of Bandırma against climate change. With the measures to be taken against the negative effects of climate change, it is aimed to make the infrastructure systems and society in the city more resilient to these changes.

3. Sustainable and Reliable Energy Access: Ensuring sustainable, low-cost and reliable energy access in Bandırma by integrating mitigation and adaptation plans. In this context, energy efficiency projects, renewable energy investments and energy management strategies will be developed and implemented.

Key Elements of SECAP

Bandırma Municipality's SECAP includes various strategic steps and activities to achieve the set targets:

1. Energy Efficiency Projects: Various projects will be implemented to increase energy efficiency in municipal buildings, residences and commercial buildings. These projects include insulation of buildings, use of energy efficient appliances and integration of renewable energy systems.

2. Renewable Energy Investments: The use of solar energy, wind energy and other renewable energy sources will be encouraged in Bandırma. It is planned to install solar panels on the roofs of municipal buildings and to develop wind energy projects.

3. Reducing Carbon Footprint in Transport: In order to reduce carbon emissions in the transport sector, the use of electric and hybrid vehicles will be encouraged, cooperation will be made with Balıkesir Metropolitan Municipality (BMM) to develop public transport systems, and the number of bicycle paths and pedestrian roads will be increased.

4. Waste Management: Projects to ensure recycling and utilisation of wastes for energy generation will be implemented. It is aimed to increase the capacity of biogas production and recycling facilities from organic wastes.

5. Climate Change Adaptation Strategies: Infrastructure projects will be developed for the city to adapt to climate change. Water management, flood risk mitigation projects, green infrastructure solutions and public health measures are important components of these strategies.

Bandırma Municipality aims to prepare the city for a sustainable future with SECAP. By reducing carbon emissions, using renewable energy sources, energy efficiency projects and climate change adaptation strategies, Bandırma will become an environmentally sensitive and economically sustainable city. All the works carried out in this context will improve the quality of life in Bandırma and ensure that the inhabitants of the city continue their lives in a healthier and safer environment.

1.2. Background

The 2015 Paris Agreement sets out a global framework to limit global warming to well below 2°C, preferably 1.5°C (degrees Celsius) compared to pre-industrial levels. To achieve this global temperature target, countries aim to reduce greenhouse gas emissions as soon as possible, based on the best available scientific, economic and social feasibility.

The impacts of climate change are already evident with rising air temperatures, melting glaciers and shrinking polar ice caps, rising sea levels, increasing desertification, as well as more frequent extreme weather events such as heat waves, droughts, floods and storms. Climate change is not uniform globally and affects some regions more than others. In section 1.4. you can see how climate change has affected the Bandırma region in the last 40 years. The data source used is ERA5, the fifth generation European Centre for Medium-Range Weather Forecasts (ECMWF) atmospheric reanalysis of the global climate, which covers the time period from 1979 to 2021 and has a spatial resolution of 30 km.

The data will not show conditions at a precise location. Microclimates and local variations will not be visible. Therefore, temperatures will generally be higher than shown, especially in cities, and precipitation may vary locally depending on topography.

1.3. General Information of the City

Bandırma is a district of Balıkesir province, centred in the southern part of the Marmara Sea, in the innermost part of the Bay of Bandırma. It is the third largest district of Balıkesir in terms of population after Altıeylül and Karesi.

Developing rapidly in recent years, Bandırma is also a district that has one of the largest harbours in Türkiye. There are regular ferry services from Istanbul to Bandırma Port every day. Bandırma, which is quite strong economically, is an important industrial and poultry district for Türkiye. The city, which hosts culture and art events, attracts tourists with great intensity every year.

Bandırma lands are quite flat in the coastal region. These plains interrupted by slight hills rise towards the south. Kocaavşa Stream, which originates from the territory of Bandırma, flows into Bird Lake. Gönen Stream, which originates from Çanakkale province, passes through the north of the district and flows into the Marmara Sea from the west of Kapıdağ Peninsula. Bandırma is in the 1st degree earthquake zone[3] and there is a fault line entering into the gulf.

[3] General Directorate of Mineral Research and Exploration, Resident Fault Map,

Table 1: Population of Balıkesir Bandırma by Years[4]

Year	Bandırma Population	Male Population	Female Population
2023	166.836	84.232	82.604
2022	164.965	83.381	81.584
2021	161.894	81.890	80.004
2020	158.857	80.307	78.550
2019	156.787	79.255	77.532
2018	154.359	77.986	76.373
2017	152.480	77.131	75.349
2016	149.469	75.438	74.031
2015	146.688	73.947	72.741
2014	145.089	73.337	71.752
2013	143.117	72.181	70.936
2012	139.874	69.515	70.359
2011	138.206	68.923	69.283
2010	135.094	66.899	68.195
2009	132.077	65.339	66.738
2008	130.474	64.758	65.716
2007	128.603	63.857	64.746

https://www.mta.gov.tr/v3.0/hizmetler/yenilenmis-diri-fay-haritalari

[4] Turkish Statistical Institute, www.tüik.gov.tr

Table 2: Balıkesir Bandırma Population in 2023 by Neighbourhoods

Sequence No	Neighbourhood Name	Total	Male	Woman
1	17 September	15.736	7.858	7.878
2	100th Year	15.043	7.652	7.391
3	600 Houses	8.977	4.065	4.912
4	Akçapinar	384	186	198
5	Aksakal	899	445	454
6	Ayyildiz	2.451	1.274	1.177
7	Bentbashi	2.767	1.352	1.415
8	Fertile	506	273	233
9	Beykoy	103	54	49
10	Bezirci	225	109	116
11	Cakilkoy	306	158	148
12	Hardworking	371	184	187
13	Charikkoy	150	78	72
14	Çepni	182	93	89
15	Cinarli	7.257	3.551	3.706
16	Cinge	82	42	40
17	Dedeoba	417	217	200
18	Creek	1.392	623	769
19	Nature	573	287	286
20	Doganpinar	293	152	141
21	Straight through	775	456	319
22	Dutliman	192	97	95
23	Edincik	4.102	2.048	2.054
24	Emre	229	123	106
25	Ergili	321	179	142
26	Erikli	471	246	225
27	Eskiziraatli	256	133	123
28	Goyaka	253	126	127
29	Good morning	1.895	883	1.012
30	Haji Yusuf	9.385	4.581	4.804
31	Haydar Sergeant	1.357	653	704
32	Hidirkoy	144	81	63
33	Ihsaniye	14.624	7.198	7.426
34	Blackthorn	120	67	53
35	Kayacik	4.203	2.316	1.887
36	Cherry	164	87	77
37	Bird Sanctuary	484	241	243
38	Külefli	409	203	206
39	Levent	4.918	2.399	2.519
40	Mahbubeler	145	79	66
41	Misakça	384	211	173
42	Orhaniye	244	124	120
43	Omerli	4.755	4.417	338
44	Pashabayir	14.203	7.013	7.190
45	Pasakent	10.257	4.982	5.275
46	Pashakonak	10.328	5.027	5.301
47	Pasamescit	2.154	1.017	1.137
48	Sahil Yenice	869	449	420
49	Sunullah	13.720	6.698	7.022
50	Sirinçavuş	164	95	69
51	New	5.802	2.615	3.187
52	Yenisığığırcı	241	124	117
53	Yeniyenice	604	313	291
54	Yeniziraatli	150	81	69
55	Yesilchomlu	400	217	183
TOTAL		**166.836**	**84.232**	**82.604**

HUMAN DEVELOPMENT INDEX

What is Human Development?

Human development is the process of increasing the opportunities and freedoms of individuals while generating economic growth.

What is the Human Development Index?

It was developed by Pakistani economist Mahbub ul Haq and has been presented by the United Nations Development Programme in its annual Development Report since 1993.

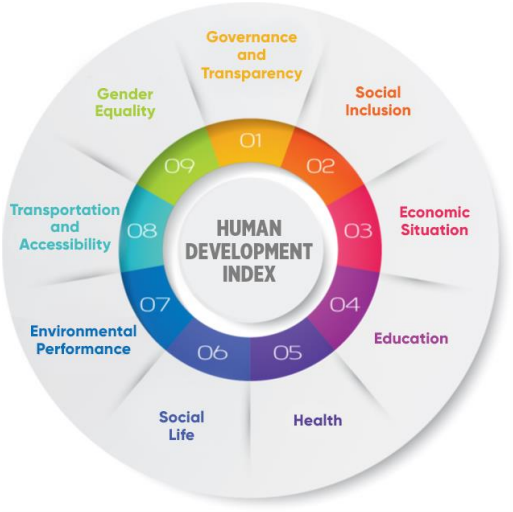
The United Nations' Human Development Index comprises 3 dimensions. These three basic dimensions:

- To live a long, healthy and creative life;
- Having the opportunity to receive information and training;
- Access to the resources necessary for a decent life.

In the HDI-I model, the data that will form the basis of the research are grouped in 9 main categories[5] .

1. Governance and Transparency
2. Social Inclusion
3. Economic Situation
4. Education
5. Health
6. Social Life
7. Environmental Performance
8. Gender Equality
9. Transport and Accessibility

[5] Human Development Foundation, Human Development and Sustainable Development: Districts (Ige-I) Report, 2021. https://ingev.org/ingev-tam-raporlar/



HDI-I's report basically includes 188 districts with a population of more than 150 thousand in 30 metropolitan cities. However, municipalities that published their 2019 annual reports as of 17 November 2020 were included in the study. As a result, 50 districts were excluded from the study and the report was prepared to cover 138 districts.

According to the Human Development Index - Districts Report, the human development of the districts is divided into 4 different classes according to their scores as above. In terms of this classification, Bandırma is in the "High Human Development" category according to the analyses of 2020 and ranks 53rd among 138 districts included in the research.

The index scores of Bandırma according to the categories in the HDI-I report are as follows;

Graphic 1: According to HDI-I report, Bandırma's scores according to categories

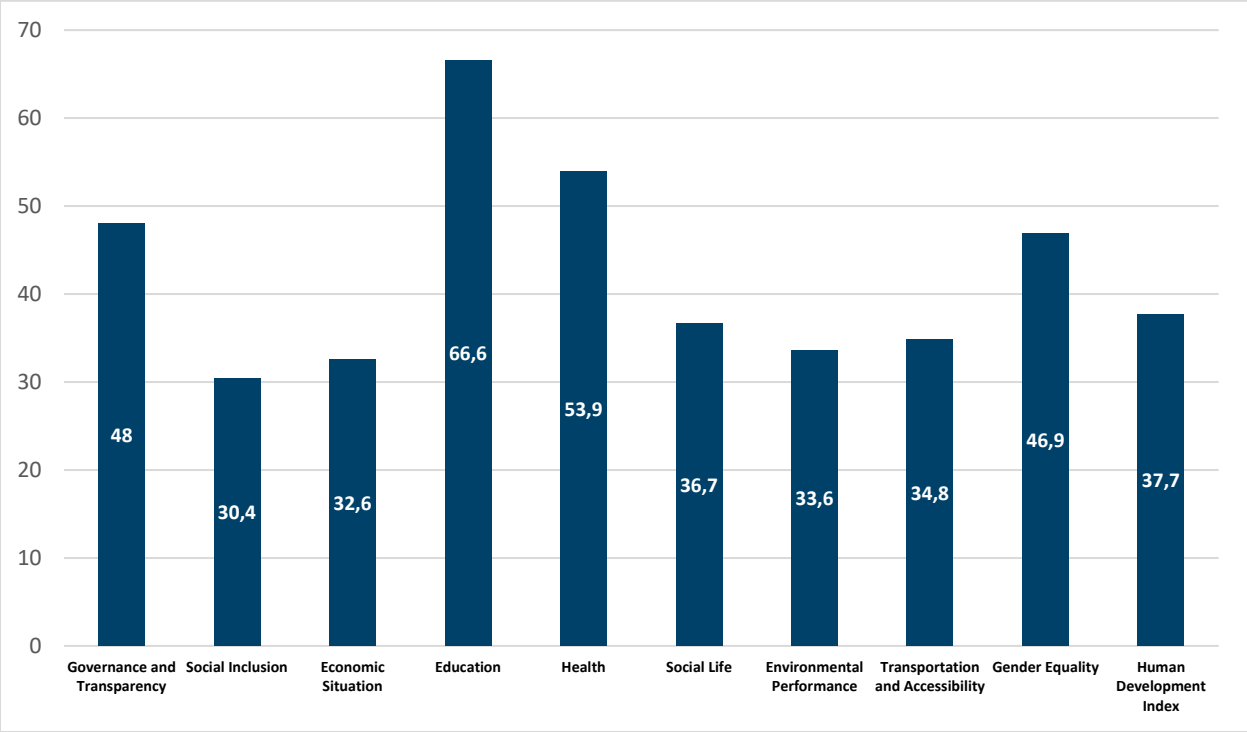


Table 3: Ranking of Bandırma according to categories in HDI-I reports

Categories	2017 (150 PROVINCES)	2020 (138 PROVINCES)
Governance and Transparency	112	126
Social Inclusion	79	47
Economic Situation	82	80
Education	36	29
Health	126	64
Social Life	14	62
Environmental Performance	83*	31
Transport and Accessibility	83*	130
Gender Equality	-	20
HDI-General Index	74	53

(*) Note: *In the 2017 Report, "Environmental Performance" and "Transport and Accessibility" categories were analysed under a single heading and Bandırma ranked 83rd in this report. The "Gender Equality" category was included in the report in 2020.*

1.4. Climate

Bandırma is within the sphere of influence of both the Mediterranean climate and the Black Sea climate in Türkiye. In addition, due to the fact that it is located on the transition area of the continental climate coming from the Balkans, various climate characteristics are observed in the

district. According to 52-year values, the lowest temperature in Bandırma was -14.6 °C (15 January 1954) and the highest temperature was 42.4 °C (9 July 2000).

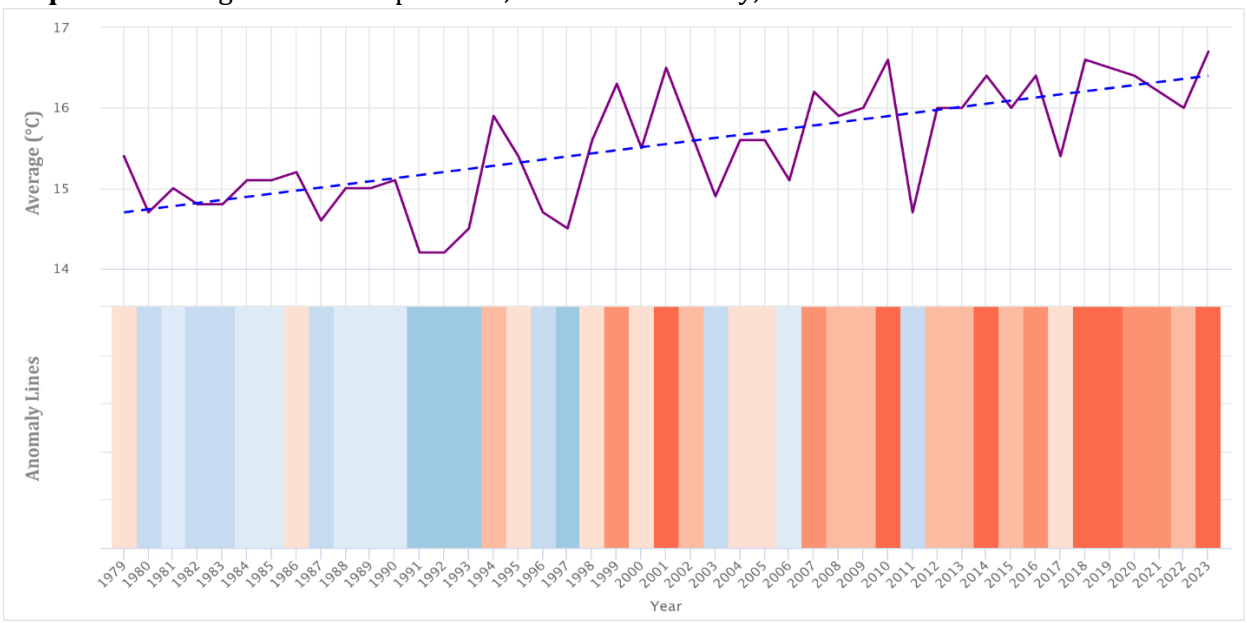
The average annual temperature is 14 °C. The dominant wind direction is North-Northeast. The average wind speed is 15 km/hour. The average annual precipitation in the district is 703.3 kg/m. The average annual relative humidity is 73%.

Graphic 2: Average annual temperature, trend and anomaly, 1979-2023

Bandırma Climate													
Months	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Highest Temperature (°C)	20	22	26	31	33	38	37	37	36	37	27	22	38
Average Highest Temperature (°C)	8	8	11	16	20	25	27	26	24	20	14	10	17
Average Temperature (°C)	5	5	7	12	16	20	23	23	20	16	11	7	14
Average Lowest Temperature (°C)	1	2	3	7	11	15	18	19	15	12	7	3	10
Lowest Temperature (°C)	−10	−12	−6	−1	−2	5	7	10	5	--	−3	−6	−12
Average Precipitation	81	52	60	52	39	16	9	16	38	45	81	102	49

Source: *www.weatherbase.com*

Graphic 3: Average annual temperature, trend and anomaly, 1979-2023

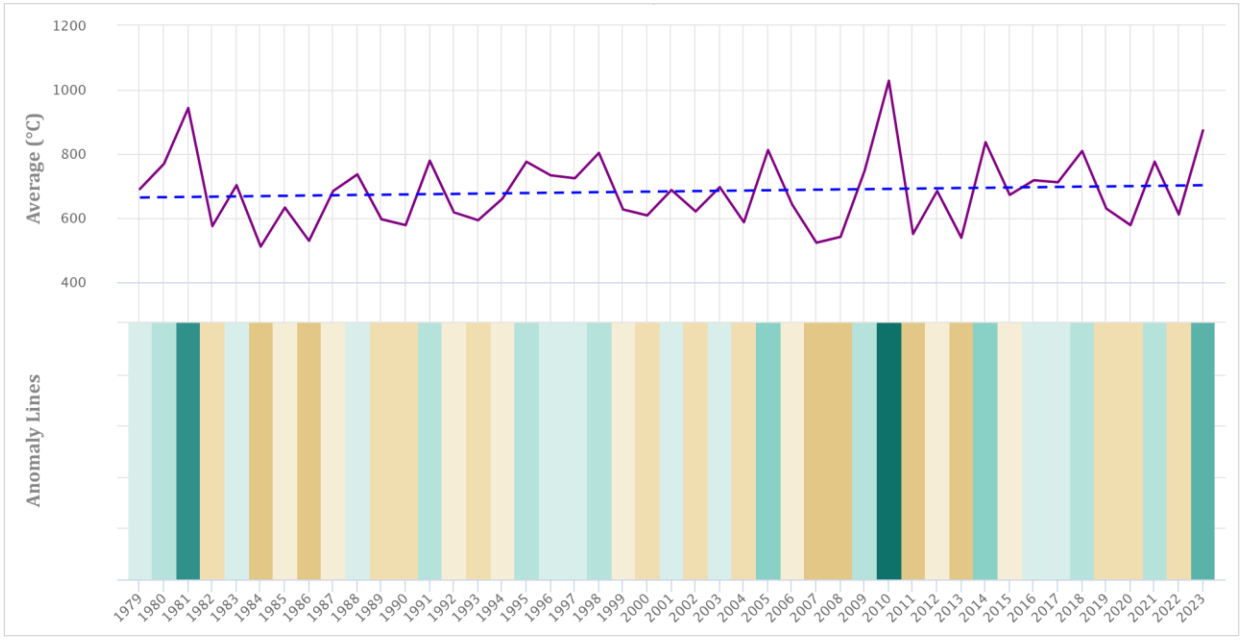


Source: *www.meteoblue.com*

The top graph shows an estimate of the average annual temperature for the wider region of Bandırma. The dashed blue line is the linear climate change trend. If the trend line is rising from left to right, the temperature trend is positive and the temperature is increasing. If it is horizontal, there is no clear trend, and if it is falling, conditions in Bandırma are becoming negative over time.

At the bottom, the graph shows the warming bands. Each coloured stripe represents the average temperature for a year. Colder years are shown in blue and warmer years in red.

Graphic 4: Average annual precipitation, trend and anomaly, 1979-2023

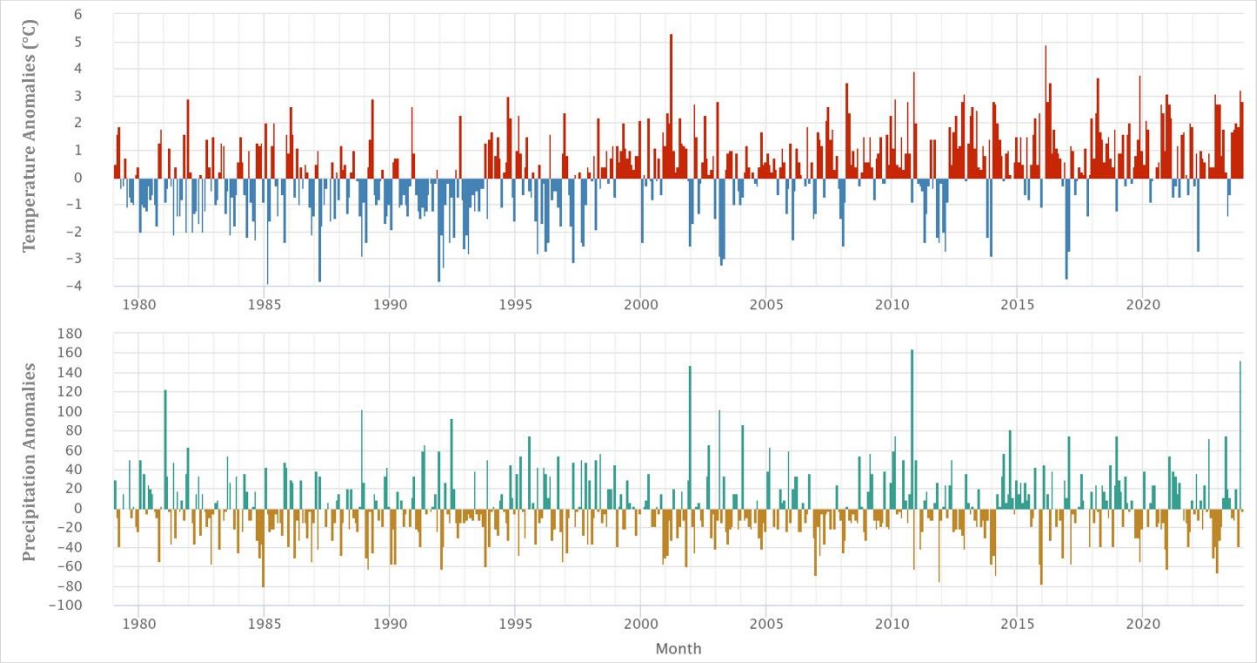


Source: *www.meteoblue.com*

The graph above shows the average total precipitation forecast for Bandırma for the wider region. The dashed blue line is the linear climate change trend. If the trend line runs from left to right, the precipitation trend is positive, indicating that precipitation is increasing in Bandırma due to climate change. If it is horizontal, there is no clear trend and if it is decreasing, it indicates that conditions are becoming more arid in Bandırma over time.

At the bottom the graph shows the so-called rainfall bands. Each coloured stripe represents the total precipitation of a year - green for wetter years and brown for drier years.

Graphic 5: Monthly temperature and precipitation anomalies

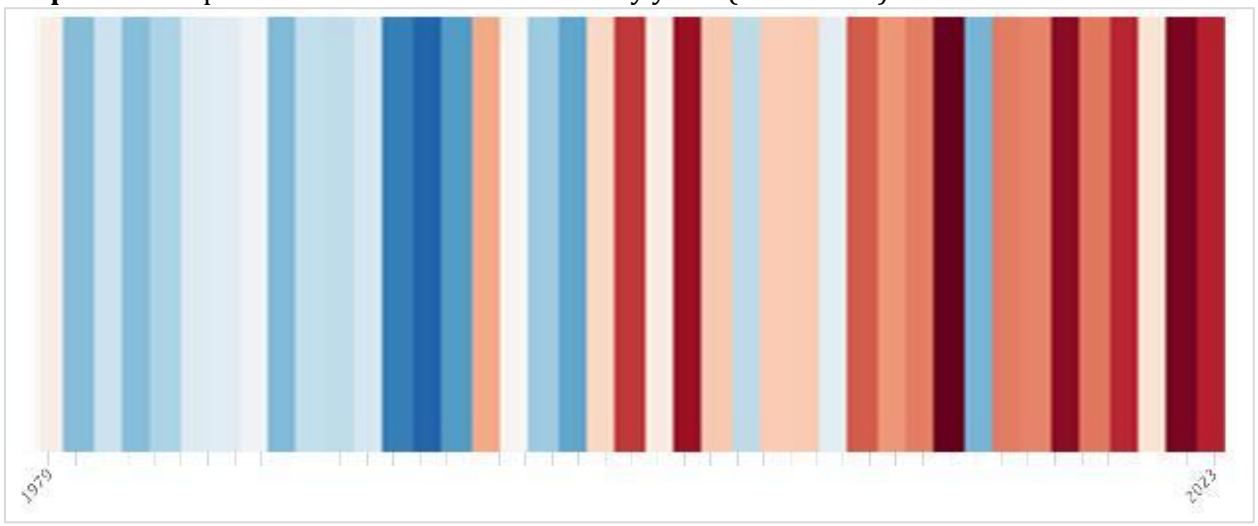


Source: *www.meteoblue.com*

As seen in the graph, the temperature anomaly for each month from 1979 to today shows variations. The anomaly tells how much warmer or colder 1980-2010 was than the 30-year climate average. Thus, months in red are warmer and months in blue are colder than normal. In most places, warmer months have increased over the years, reflecting global warming linked to climate change.

The bottom graph shows the precipitation anomaly for each month from 1979 to today. The anomaly shows whether a month had more or less rainfall than the 30-year climate average of 1980-2010. Months coloured in green are wetter and months coloured in brown are drier than normal.

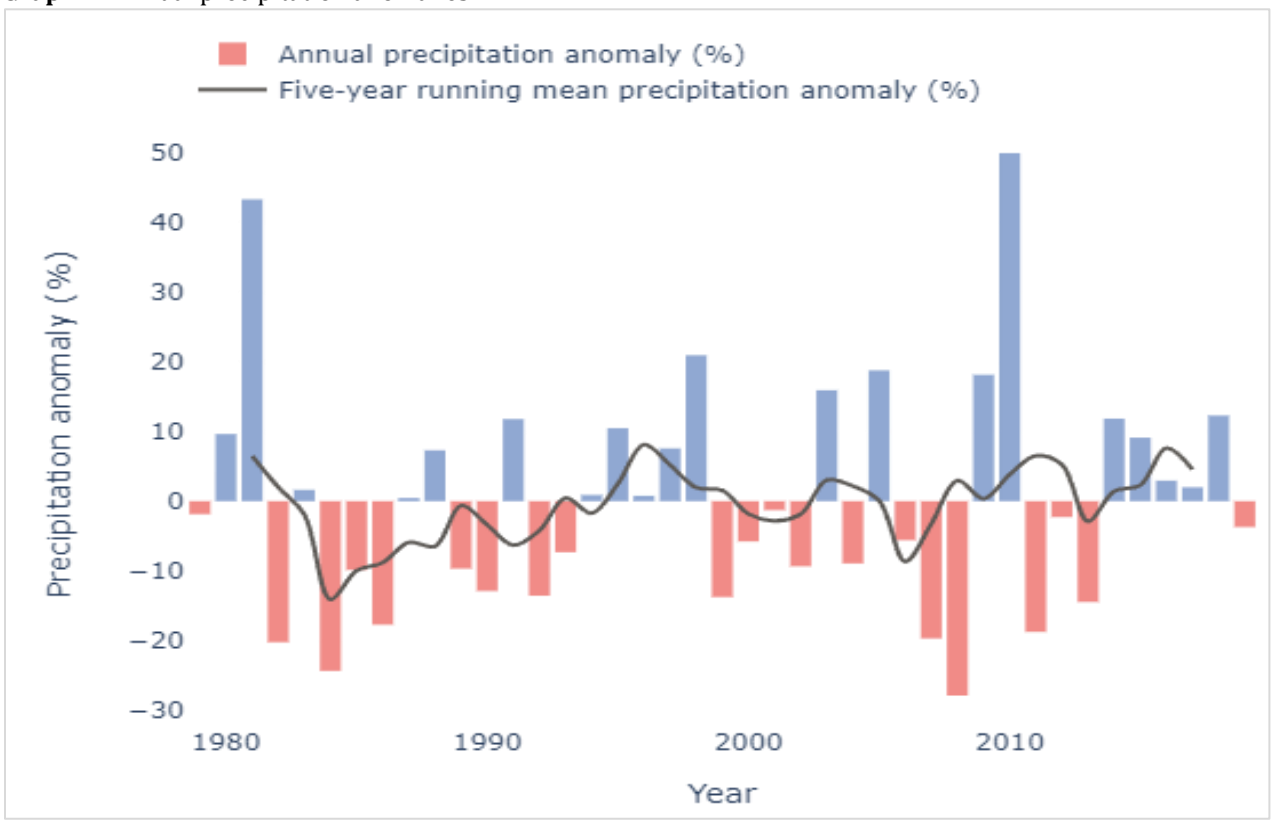
Graphic 6: Temperature anomalies of Bandırma by years (1979-2023)



Source: w*ww.climatedata.org*

The warming bands allow one to see the annual temperature trends in Bandırma for the period 1979-2023. The colour of each strip represents the temperature anomaly for a given year, or how much warmer (red) or colder (blue) that year is relative to the 1981-2010 long-term reference period.

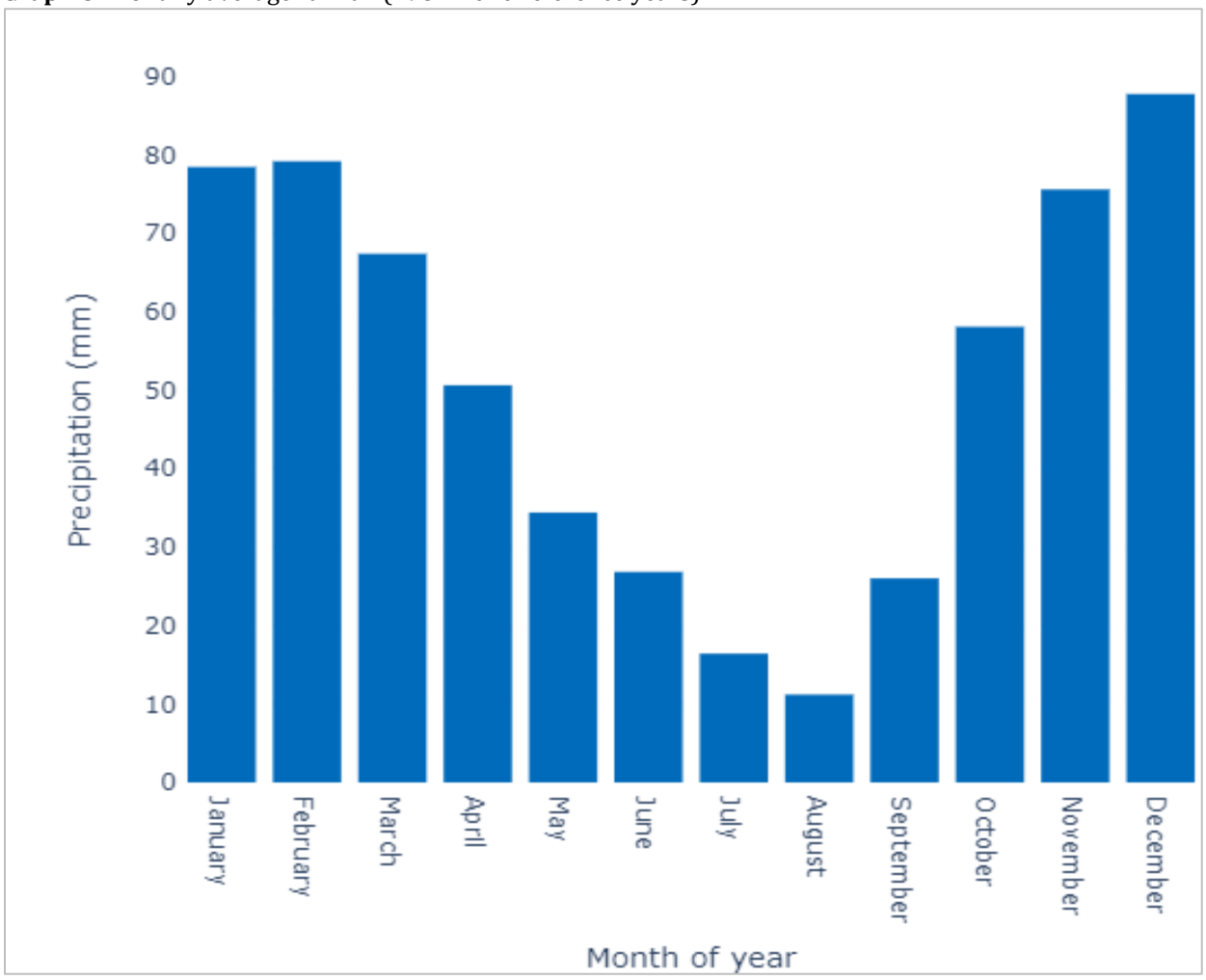
Graph 7: Annual precipitation anomalies



Source: *Climate Data Store Era 5*

The graph above shows the precipitation anomaly for each year in the 1979-2020 period, or how much more (blue) or less (red) precipitation falls each year as a percentage relative to the 1981-2010 long-term reference period.

Graph 8: Monthly average rainfall (1981-2010 reference years)



Source: *Climate Data Store Era 5*

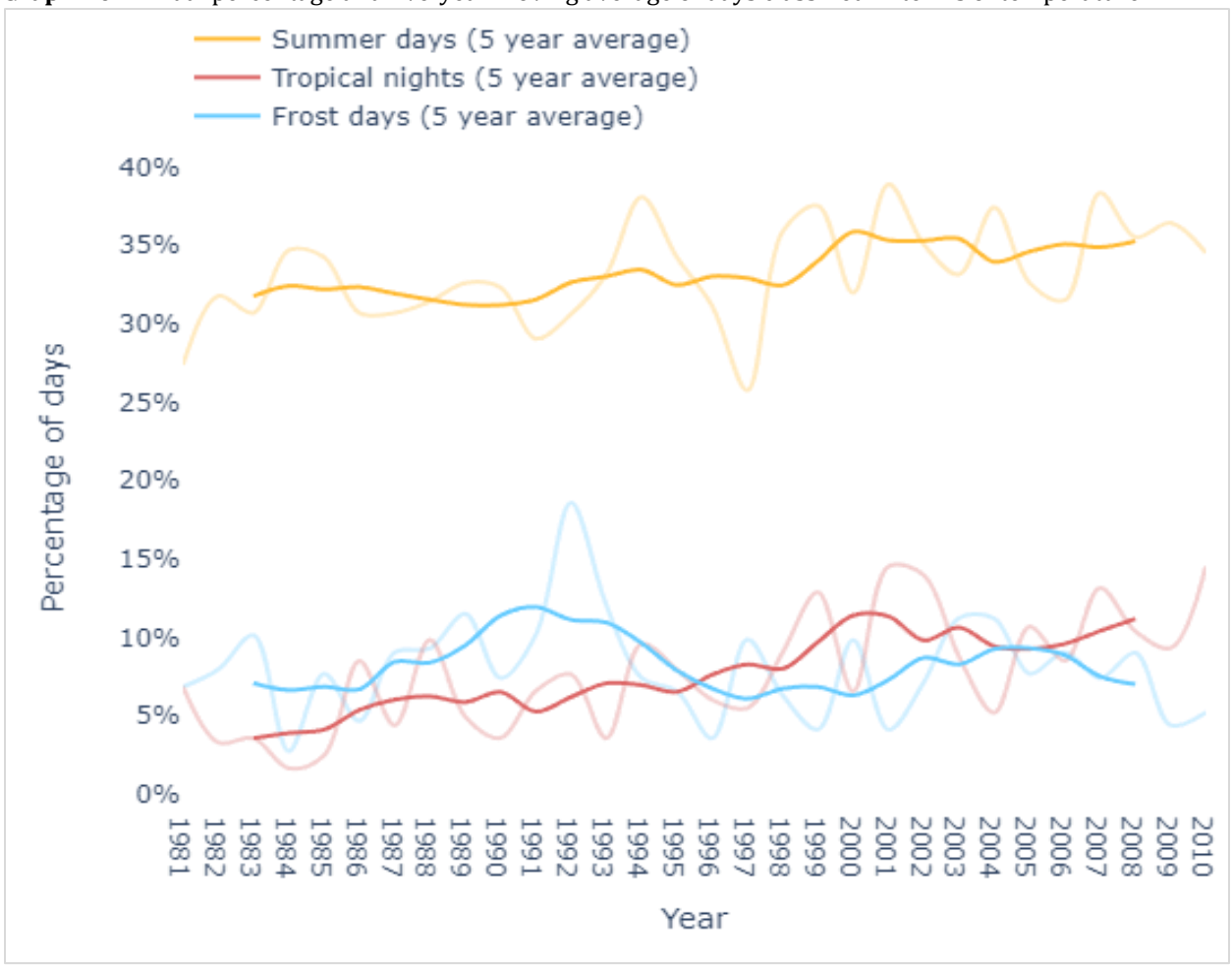
- The average annual total precipitation in Bandırma for the 1981-2010 reference period is 612.4 mm.
- The average monthly rainfall varies between 11.2 mm (August) and 87.8 mm (December).

Graphic 9: Monthly average wind speed (ms-^{1}) (reference years 1981-2010)

Source: *Climate Data Store Era 5*

- The annual average wind speed in Bandırma for the reference period 1981-2010 is 3.0 ms-^{1}.
- The monthly mean wind speed varied between 2.6 ms-^{1} (May) and 3.6 ms-^{1} (August).

Graph 10: Annual percentage and five-year moving average of days classified in terms of temperature

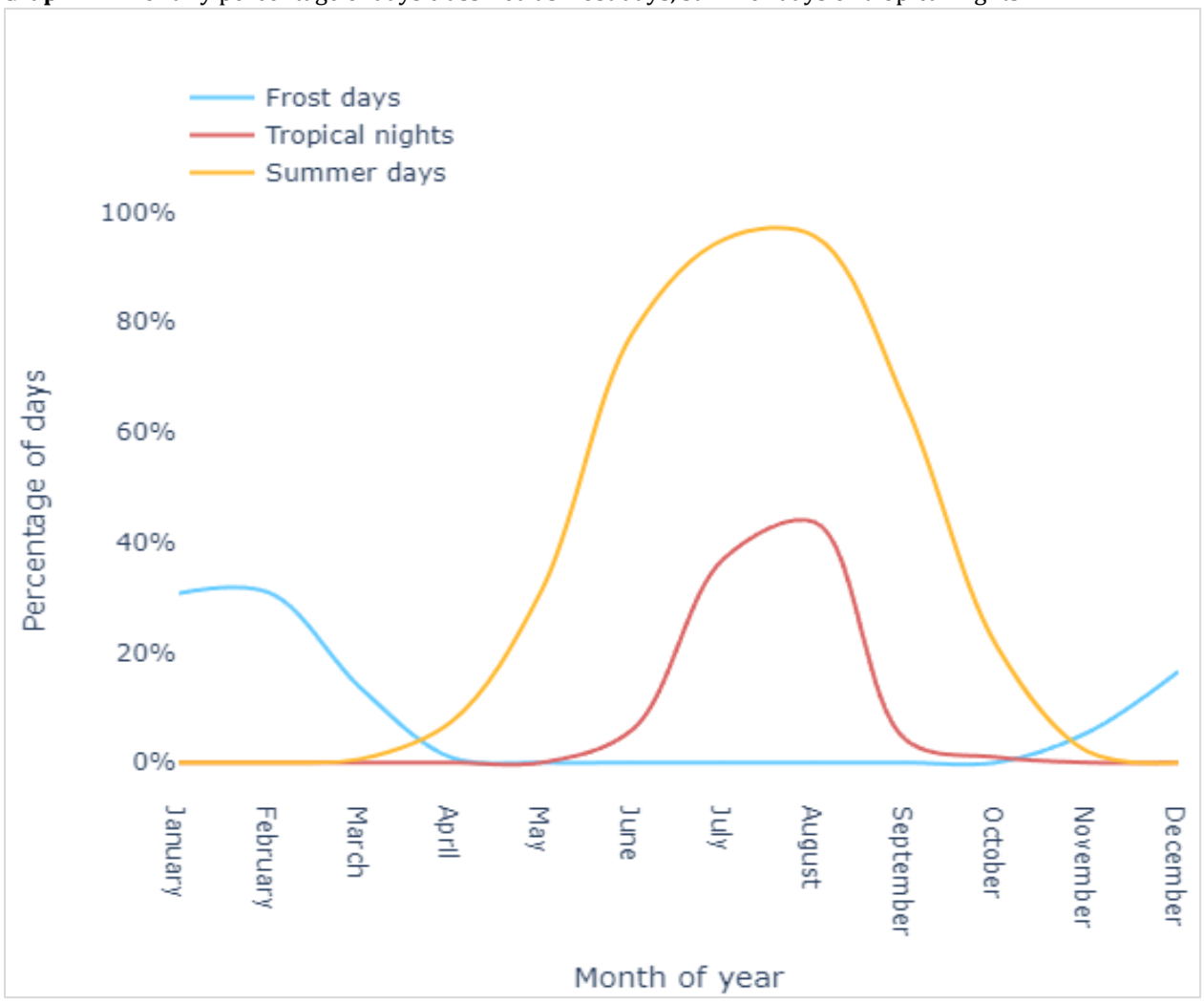


Source: *Climate Data Store Era 5*

The graph above shows the annual percentage of days classified as frost days, summer days or tropical nights[6] in Bandırma with a five-year average, with the average for the period 1981-2010.

[6] Frost day: A day when the lowest temperature is below 0°C.
Summer day: A day with a maximum temperature above 25°C.
Tropical night: A day with a minimum temperature above 20°C.

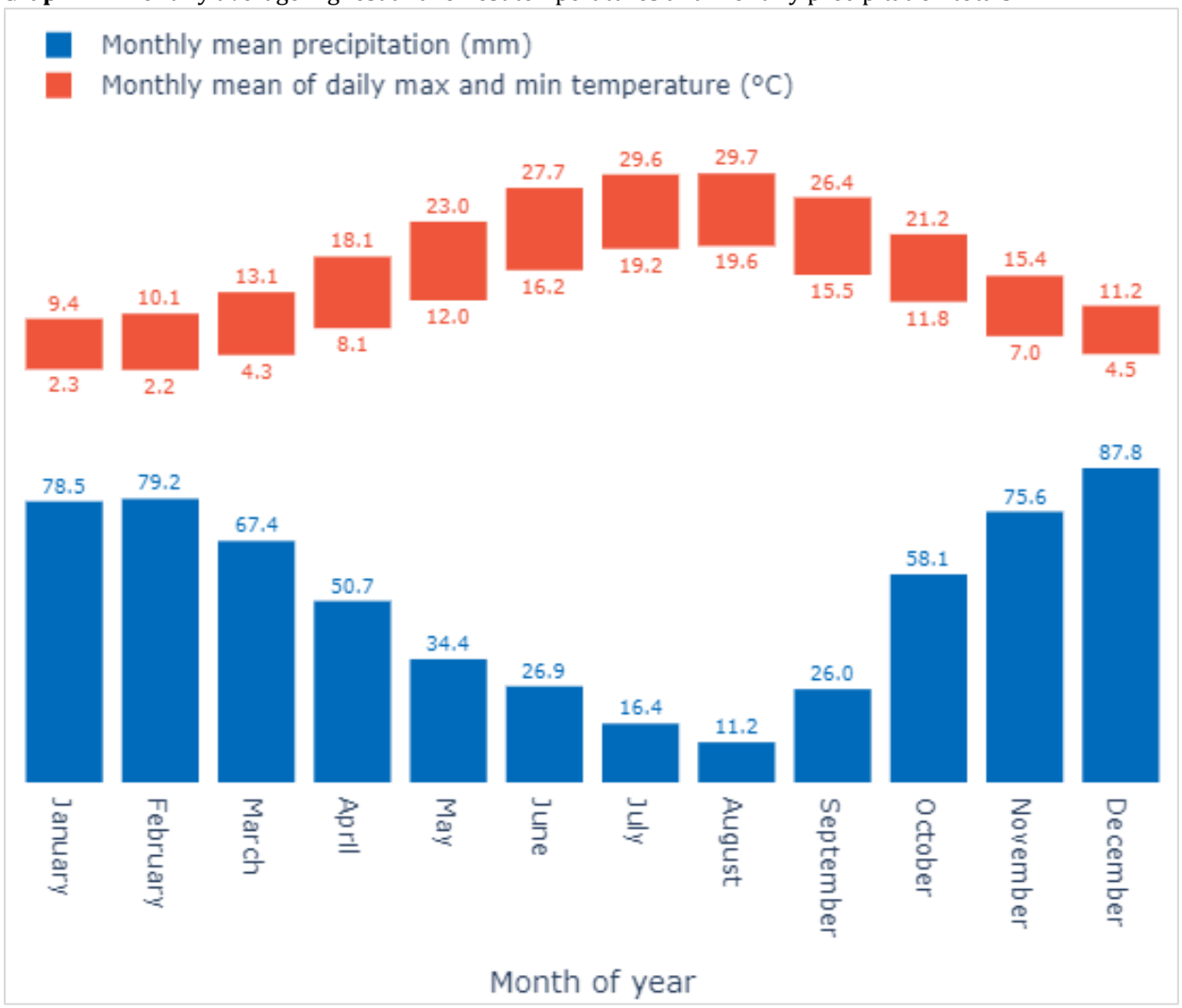
Graph 11: Monthly percentage of days classified as frost days, summer days or tropical nights



Source: *Climate Data Store Era 5*

The graph above shows the typical monthly percentage of days classified as frost days, summer days or tropical nights in Bandırma during the period 1981-2010.

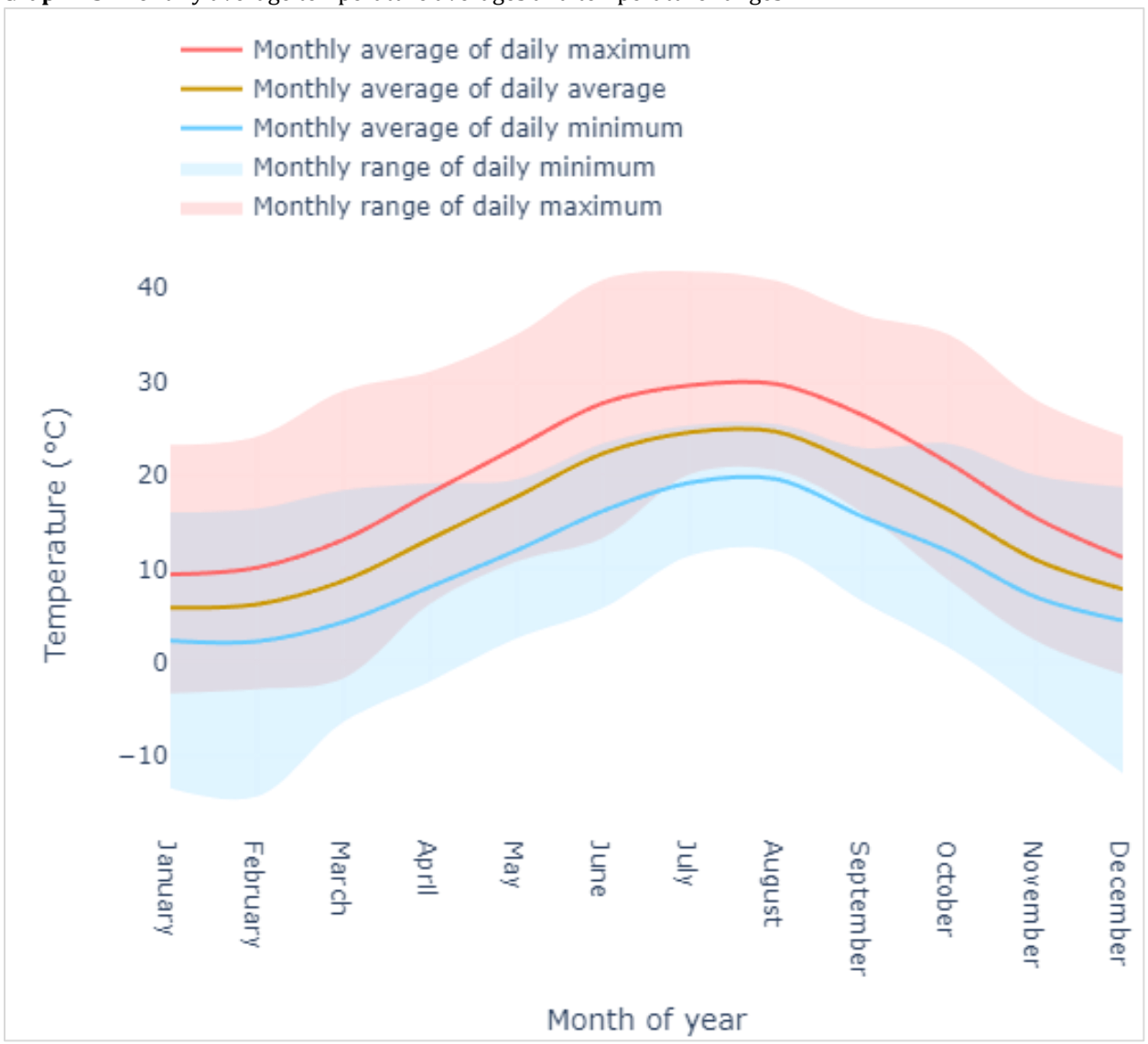
Graph 12: Monthly average highest and lowest temperatures and monthly precipitation totals



Source: *Climate Data Store Era 5*

The climatology graph above shows the average daily maximum and minimum temperatures for each month of the year and typical monthly rainfall totals averaged over the 1981-2010 reference period.

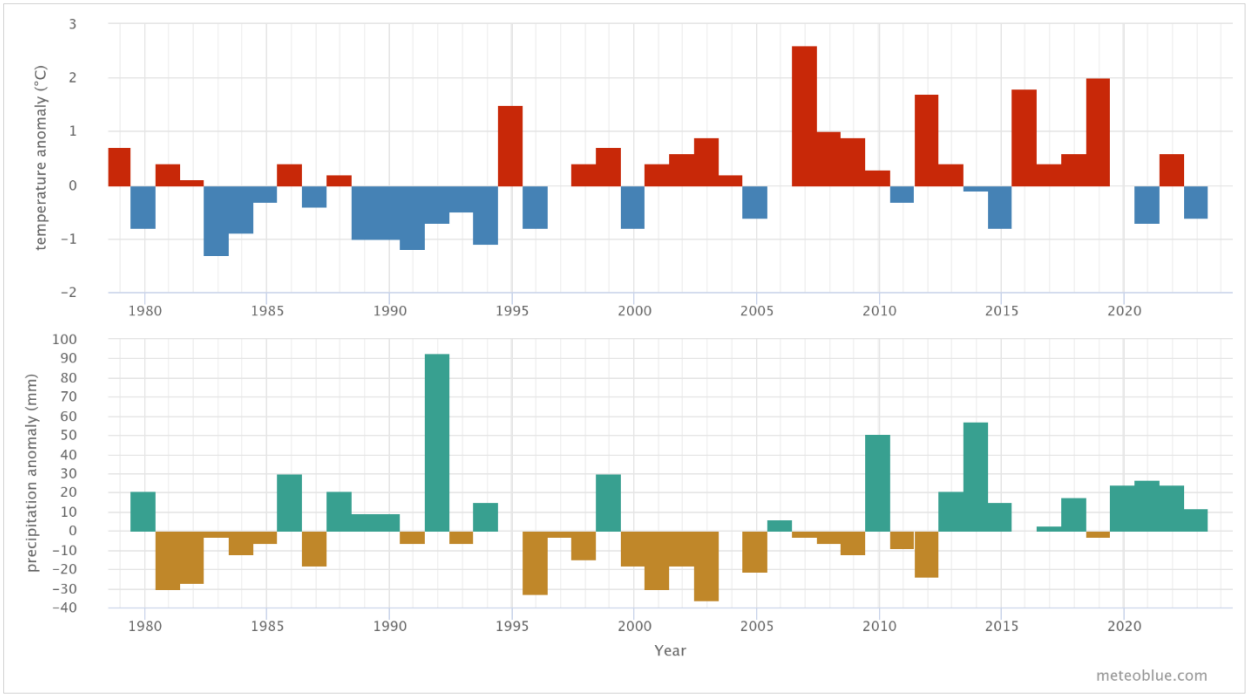
Graph 13: Monthly average temperature averages and temperature ranges



Source: *Climate Data Store Era 5*

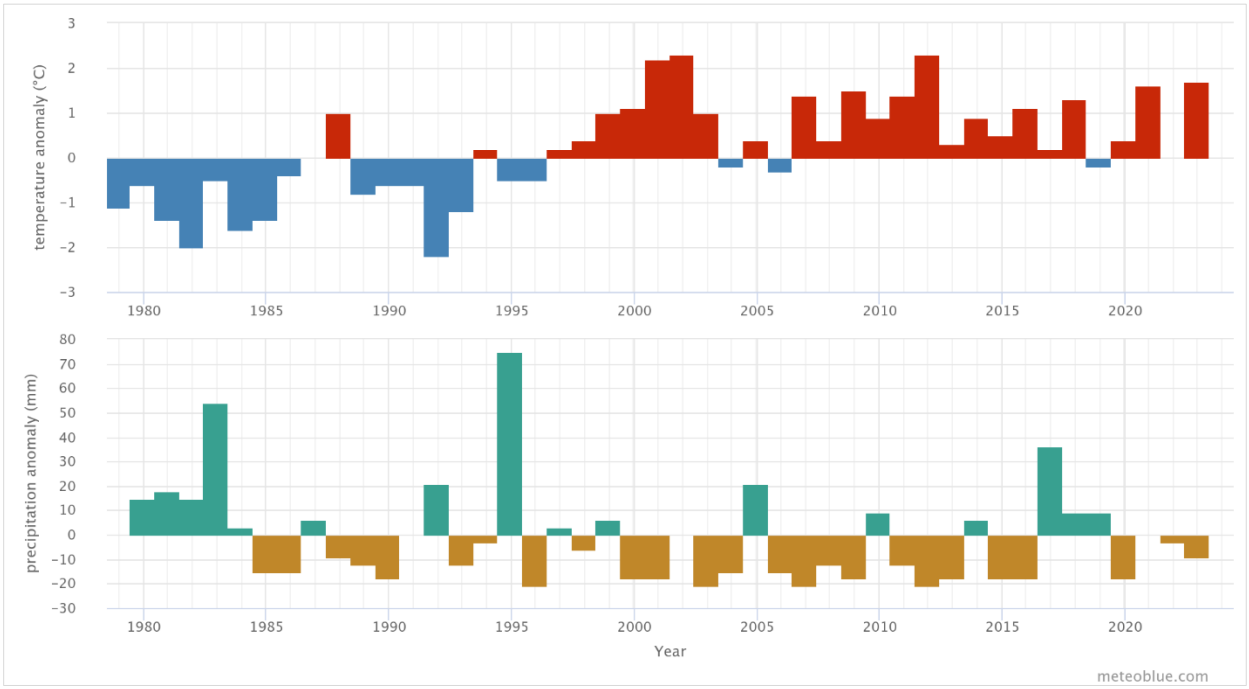
The average annual temperature in Bandırma for the reference period 1981-2010 is 14.9°C. The monthly average temperature varies between 5,9°C (January) and 24,6°C (August).

Graph 14: Temperature and precipitation anomaly for June by years (1979-2023)



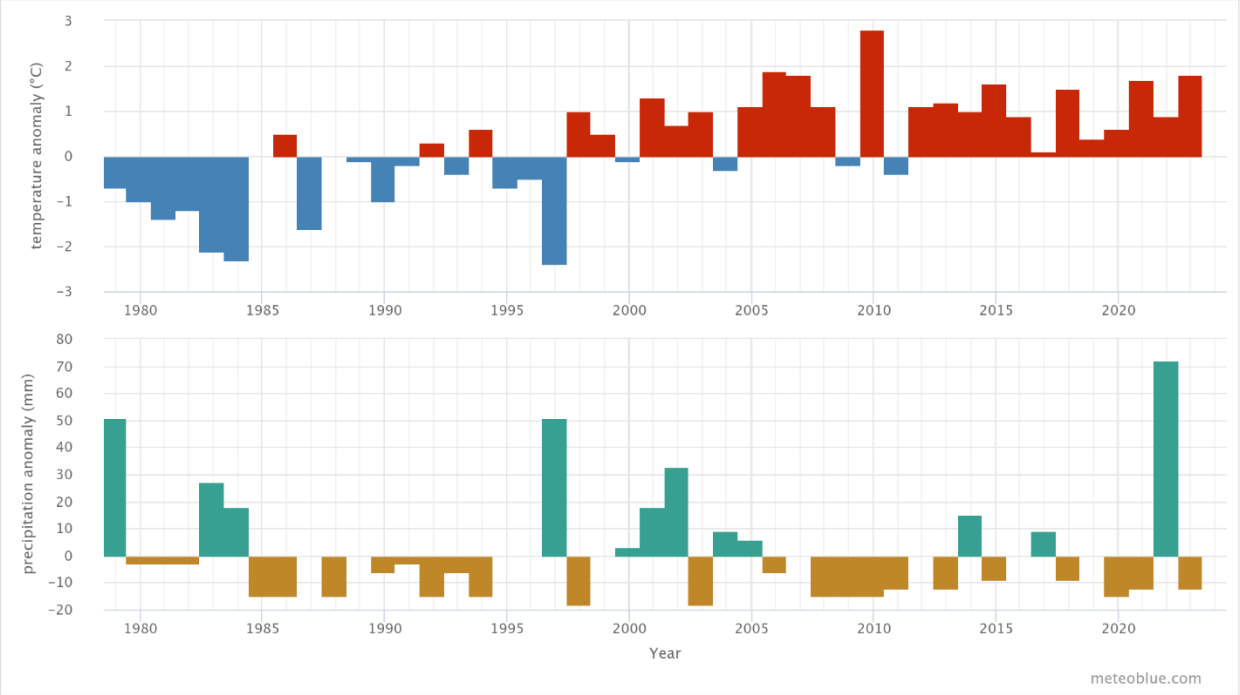
Source: *www.meteoblue.com*

Graph 15: Temperature and precipitation anomaly for July by years (1979-2023)



Source: *www.meteoblue.com*

Graph 16: Temperature and precipitation anomaly for August by years (1979-2023)



Source: *www.meteoblue.com*

In the 3 graphs above, comparisons are given for the months of June, July and August in which years it was warmer or wetter than normal. For example, August shows the temperature and precipitation anomaly for each August since 1979. Thus, you can see in which years August was warmer or colder (drier or wetter) than normal.

1.4.1. Ecosystems and Biodiversity

Ecosystem and Biodiversity of Bandırma District

Bandırma is an important district bordering the Marmara Sea and home to various ecosystems, both natural and man-made. Geographical location, climatic conditions and historical processes have enriched the biodiversity here.

Ecosystem Diversity

There are different ecosystems in Bandırma as follows:

Coastal Ecosystems:

- The coasts of the Marmara Sea are home to various marine species. Different coastal structures such as dunes, rocks and seagrass meadows form the habitats of different species.

Image 1: Marmara Sea - Seagrass meadows

Wetlands:

- Wetlands around Bandırma are important breeding and feeding areas, especially for migratory birds. These areas are very rich in terms of biological diversity.

Image 2: Bandırma Kuşcenneti National Park - White Pelicans

Forested Areas:

- There are forested areas in the district, especially in coastal areas and mountainous areas. These forests provide suitable habitats for plant and animal species.

Agricultural Areas:

- Bandırma is a district where agriculture is important. Agricultural areas are ecosystems where different plant species are grown and various insects live.

Urban Ecosystems:

- The settlement areas of the district are ecosystems shaped by human impact and inhabited by different plant and animal species.

Biodiversity:

The biodiversity of Bandırma is very rich due to its geographical location and climatic conditions. In the region;

Plant Species: Various plant species occur in forests, agricultural areas and wetlands. Especially endemic plant species make important contributions to the biodiversity of Bandırma.

Animal Species: Many animal species such as birds, mammals, reptiles, amphibians and fish live in Bandırma. It is an important stopping point especially for migratory birds.

Underwater World: Many species of fish, shellfish and marine plants living in the Marmara Sea constitute the underwater biodiversity of Bandırma.

Threats and Protection Activities

Bandırma's biodiversity faces various threats such as human activities, climate change and habitat loss. For this reason, various studies are carried out to protect biodiversity in the region. Among these studies;

Creation of Protection Areas: Various protection areas are established for the protection of wetlands and forest areas.

Sustainable Agricultural Practices: The dissemination of sustainable agricultural practices in agricultural areas contributes to the protection of biodiversity.

Image 3: Bandırma-Sustainable production greenhouses

Awareness Raising: Raising public awareness about the importance of biodiversity increases the effectiveness of conservation efforts.

Bandırma is an important district that attracts attention with its natural beauties and rich biodiversity. The protection of these values is of great importance in order to leave a healthier environment for future generations.

Tourism and Culture

Bandırma is a district in the north of Balıkesir, on the coast of the Marmara Sea. With a population of approximately 166.836 it is among the top 10 residential areas of the Marmara Region and is the second largest port city of Southern Marmara. Located in the middle of a triangle formed by the corners of Istanbul, Bursa and Izmir, Bandırma is the most developed district of Balıkesir with its ability to carry out all land, sea and railway transport. With its harbour, it is a gateway to Istanbul.

Road transport; Bursa highway, İzmir highway with Balıkesir connection and Çanakkale connection highways are available.

Maritime transport; There are regular fast ferry services between Bandırma - Istanbul and Istanbul - Bandırma every day by IDO. Railway transportation; There is a railway network between Bandırma and Izmir.

The first foundation date of Bandırma is not known for certain. From various researches, it is concluded that Bandırma may have been founded between the 8th and 9th centuries BC, at the same time as the city of Kyzikos on the Kapıdağ peninsula. Bandırma, which was a fishing village and also used as the harbour of the city-state of Kyzikos, was called PANORMOS, meaning "Reliable Harbour" in those years. Bandırma region, which was under the sovereignty of Phrygians, Mysians, Thracians and Persians at various times, was conquered by the Macedonian king Alexander the Great in 334 BC, and in the following years it was taken over by the Romans and Byzantines. The first arrival of the Turks to Bandırma took place in 1076 when Kutulmuşoğlu Süleymanbey, who founded the first Turkish State in Anatolia, conquered Aydıncık and Bandırma together with Kyzikos. In 1106, after the death of the Seljuk Sultan Kılıçarslan I, the region passed back to Byzantine sovereignty.

Bandırma came under the patronage of Karesi Principality in the early 13th century and was taken over by the Ottomans in 1336 during the reign of Orhan Gazi. In 1530, Bandırma was a village in the Aydıncık (Edincik) kaza of the Anatolian Vilayeti Hüdavendigar Sanjak. As a settlement, it was located north-east of its current location and about 2 km away in the area known today as Livatya and Ağıldere. The present location of the city was used as a pier (harbour). During the reign of the eleventh Ottoman sultan Selim II, Haydar Çavuş, one of the Dergah-ı Ali Sergeants responsible for the implementation or delivery of the decisions taken in the Divan-ı Hümayun to the relevant places, built foundation works in the area where the pier is located, which formed the basis of today's urban settlement of Bandırma. In 1830, Bandırma was connected to the Kapıdağ Sub-province of Erdek district and became a sub-province of Erdek district with the administrative restructuring after the proclamation of Tanzimat. In 1856, ferries started to be operated to Bandırma. In 1874, almost all of Bandırma, which suffered a great fire in 1874, was devastated in this fire. After the fire, Bandırma was restored in a short time, and Haydarçavuş Mosque was rebuilt in masonry in eleven years.

At the end of the Ottoman-Russian War of 1876-1878, the settlement of Tatars migrating from Crimea and Romania in Bandırma led to a revival in the city and an increase in the population. Following these developments, Bandırma was turned into an accident (district centre) under the Karesi Sanjak (Balıkesir) of Hüdavendigar Province in 1877 and then the Municipality was established. In the 1879 salnament, it is stated that the Municipality was newly elected. In 1882, the construction of a new dock and pier was started in Bandırma, which was the only port connecting the Aegean Region to Istanbul in those years, and was completed in 1902. In the 1898 salnament, it is stated that merchant ships arrived in Bandırma every day from Istanbul.

At the beginning of the 20th century, the port of Bandırma was used for import and export purposes by western capital, which benefited from the rights brought by the capitulations. Completed in 1912, the Bandırma-İzmir railway facilitated transportation, thus increasing the use of the harbour. Bandırma, which was occupied by the Greeks in 1920 after the First World War, regained its freedom on 17 September 1922. While leaving the city, it was badly damaged by the fire set by the Greeks and became a ruin. Bandırma, which healed its wounds in a short time and entered into a rapid development with the Republic, completed important infrastructure works by 1940. In 1973, with the commissioning of the new harbour, a new horizon was opened in the development of the city, and with the incentives and investment discounts provided after 1980, large investments were

made especially in the food sector. In this development process, Bandırma has become one of the important industrial cities of our country.

In 1993, Bandırma was introduced to university education and reached a population of 100 thousand in 2000. In 2014, after Balıkesir was made a metropolitan city, the city area became 63.500 hectares and the total population of the city became 145 thousand. According to 2020 TUIK data, the population in 2023 is 166.836. In 2015, Bandırma On Yedi Eylül University was established and the current number of students is around 23.000 as of 2024.

1.4.2. Industry and Trade

According to a ranking made in 2004 among all provincial centres and districts in Türkiye, Bandırma is the 23rd most developed district in Türkiye. In addition, the district ranked 3rd among 87 districts in the list of districts that could be made a province according to various criteria.

The district is the fastest developing district among the districts of Balıkesir province. Today, Bandırma has become the industrial economic centre of Balıkesir province. According to 2008 data, 34 of the 100 companies paying the highest corporate tax in Balıkesir province and 4 of the top 10 companies are located in Bandırma. The share of the district in corporate tax in the province is 20,6%. Again, according to 2008 data, 17 out of the 100 highest income tax payers and 5 out of the 10 highest income tax payers are in Bandırma. With these numbers, the share of Bandırma taxpayers in the province is 29%.

The district economy employs 10.000 people. Of this employment volume, 50 per cent work in industry, 20 per cent in agriculture and 30 per cent in the service sector. Of the population working in the industrial sector, 30% work in the agriculture-based industry, 10% in the chemical industry, 5% in mining and 5% in the machinery industry. Today, 15% of the chemical fertiliser, 25% of broiler chicks, 20% of laying chicks, 22% of white meat and 22% of eggs produced in Türkiye are produced in the district.

While 25% of Balıkesir provincial economy is produced by the centre, 14% is produced by Bandırma.

Trade in Bandırma is generally carried out by sea. Bandırma Port is the second largest port in the Marmara Sea after Istanbul and the fifth largest port in Türkiye. The depth of the port is 12 metres and 15 ships up to 20 thousand gross tonnage can load and unload at the same time. Bandırma's export products consist of minerals, chicken meat, eggs, sea and water products. The trade volume is around 800 million dollars.

The most intensive activity in rural areas in Bandırma is crop production. Corn, oats, sugar beet and broad beans are the most produced crops. Wine grapes are produced in vineyards. Parsley production is important in the district where vegetable production is also developed.

Cattle and sheep are also raised in the district. In the Merino breeding farm established in the district, breeding rams and sheep are raised. Poultry farming, which is generally concentrated in and

around big cities, is also an important source of livelihood in the district. In addition, fishing is carried out on the shores of the Marmara Sea and Manyas Lake.

- Population: 166.836 (according to data from the Turkish Statistical Institute in 2023)
- Urbanisation rate 85,27
- Population density 215
- Proportion of employees in the industrial sector (%): 15,77
- Proportion of employees in agriculture (%): 31,83
- Proportion of employees in the service sector (%): 52,40
- Unemployment rate (%): 6,97 (287th in Türkiye)
- Literacy rate (%): 93,10 (37th place)
- General budget revenue per capita (TL): 706,831 (12th place)
- Share of tax revenues in the country (%): 0,32643 (19th place)

Industries in Bandırma

1st Group Industry-Chemical Industry: It is the chemical industry where 5 chemical establishments are located. The most important chemical industry factories, most of which were established in the 1970s, produce boric acid, borax, sodium perborate, sulfuric acid and artificial fertiliser.

2nd Group Industry-Machinery Industry: It is the machinery industry consisting of 15 Machinery Industry Plants. These facilities, which mostly produce agricultural machinery, constitute an industrial gathering.

3rd Group Industry-Food Industry: It is an industrial group consisting of 14 flour-feed and paddy factories.

4th Group Industry-Packaging Industry: It is an industrial group consisting of 7 packaging and textile factories.

5th Group Industry - White Meat Industry: It is an industrial group consisting of 9 chicken breeding and processing plants.

6th Group Industry-Mining: It is an industrial group consisting of 16 mining and marbling facilities.

In Bandırma, a developing industrial city, the Organised Industrial Zone, which was established in 1997 on an area of 150 hectares, contributes greatly to the economy and employment in the region. All of the 50 parcels in the Organised Industrial Zone (OIZ) have been allocated and 42 companies are in production, 7 companies are under construction and 1 company is at the project stage. When all of the companies start production, employment will exceed 3000. As a result of the intense demand for land in the region, a new area of 205 hectares has been allocated to the OIZ as the 2nd stage expansion area, which will make a significant contribution to the development of trade. In addition, the fact that Bandırma Organised Industrial Zone is a partner of the Great Anatolian

Logistics Organisation (BALO) A.Ş., which is in operation for the purpose of transporting the goods collected for export in various centres of Anatolia to Europe via Bandırma Port, will provide an important logistics power and an inevitable benefit for the economy of Bandırma by connecting Bandırma OIZ to Bandırma Port by railway.

In addition, the foundations of Marmara OIZ, which was registered in 2018, were laid in Bandırma as Türkiye's first innovative organised industrial zone. "Marmara OIZ aims to be a pioneer in Türkiye as an environmentally sensitive Green OIZ institution that invests in high technology with leading industrial enterprises in sectors such as machinery, automotive, defence industry, energy, satellite, aviation, informatics. Marmara OIZ was established on an area of 220 hectares and has 190 industrial parcels, currently 70 industrial parcels have been opened to the service of investors and the foundations of 7 factories have been laid.

2.VISION AND OBJECTIVES

2.1.Vision

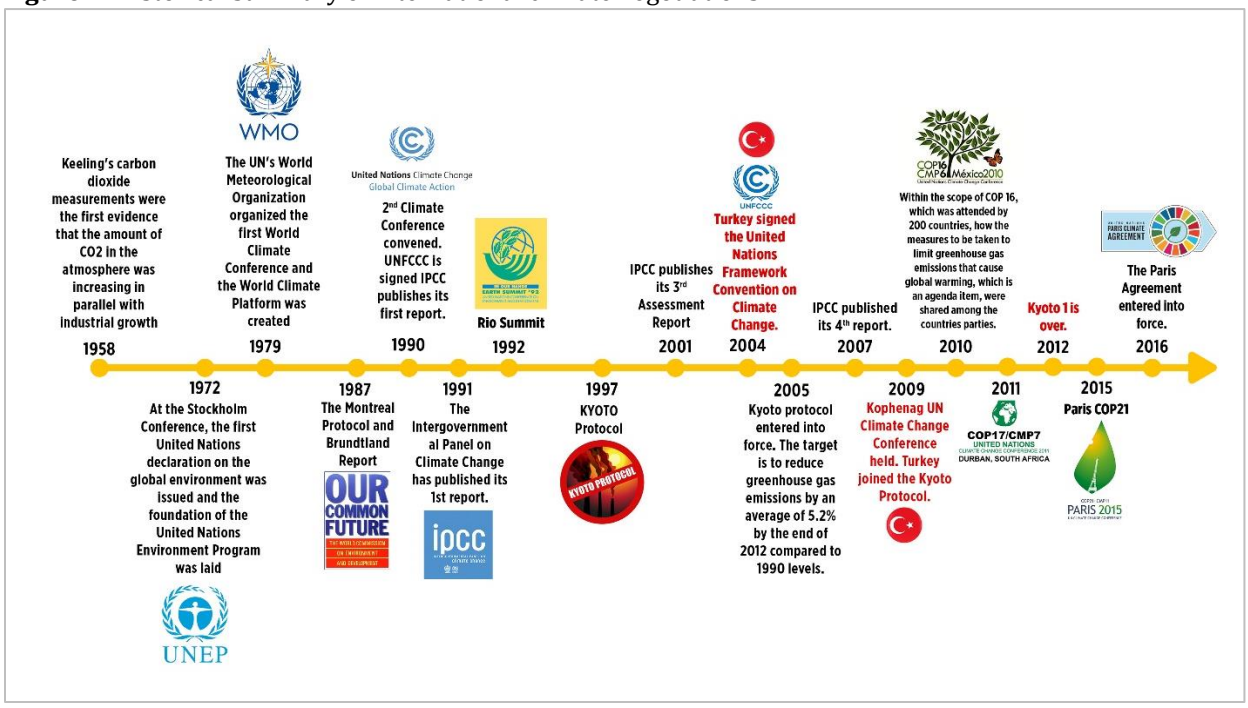
Climate Change in a Global Context

The general framework of cooperation against climate change was laid with the UNFCCC in 1992. The Paris Agreement, which was adopted in 2015 and entered into force in November 2016, is a turning point in the issue of climate change on which intensive international studies have been carried out since then. Today, it has become a necessity to evaluate the production and consumption activities carried out in cities at the scale of climate change and to include them effectively in strategy determination processes. Since 2016, the agreement has been signed and ratified by nearly 200 countries, and Türkiye became a party to the agreement by signing it in 2021.

The Paris Agreement has brought different approaches to the international climate cooperation model. The Agreement, which recognises the priority of countries' own climate policies in the global fight against climate change, is based on the "logic of nationally orientated climate action". In this framework, from the Kyoto model, where mitigation obligations were determined at the international level and bound to strict rules and sanctions, the cooperation model consisting of voluntary contributions determined by the Parties according to their own national conditions was adopted. While the focus was on greenhouse gas reductions in order to mitigate climate change before, after the Paris Agreement, the issue of adaptation to climate change has also entered the agenda of more countries. The impacts of climate change show regional and local differences in terms of floods, droughts, heat waves, etc. Therefore, the measures that can be implemented everywhere are different.

Since the process of struggle against climate in European cities started much earlier than in Turkish cities, both inventory determinations and mitigation strategies are more comprehensive. The European Union plans to gradually reduce the greenhouse gas effect and carbon emissions until 2050 with the climate action plans it has prepared. Among the targets are to reduce greenhouse gas emissions by at least 40% in 2030 compared to 1990s, to provide 40% of energy consumption from renewable energy sources and to reduce energy use by 40%. In the current months, the European Union has decided to revise these targets to raise them even higher.

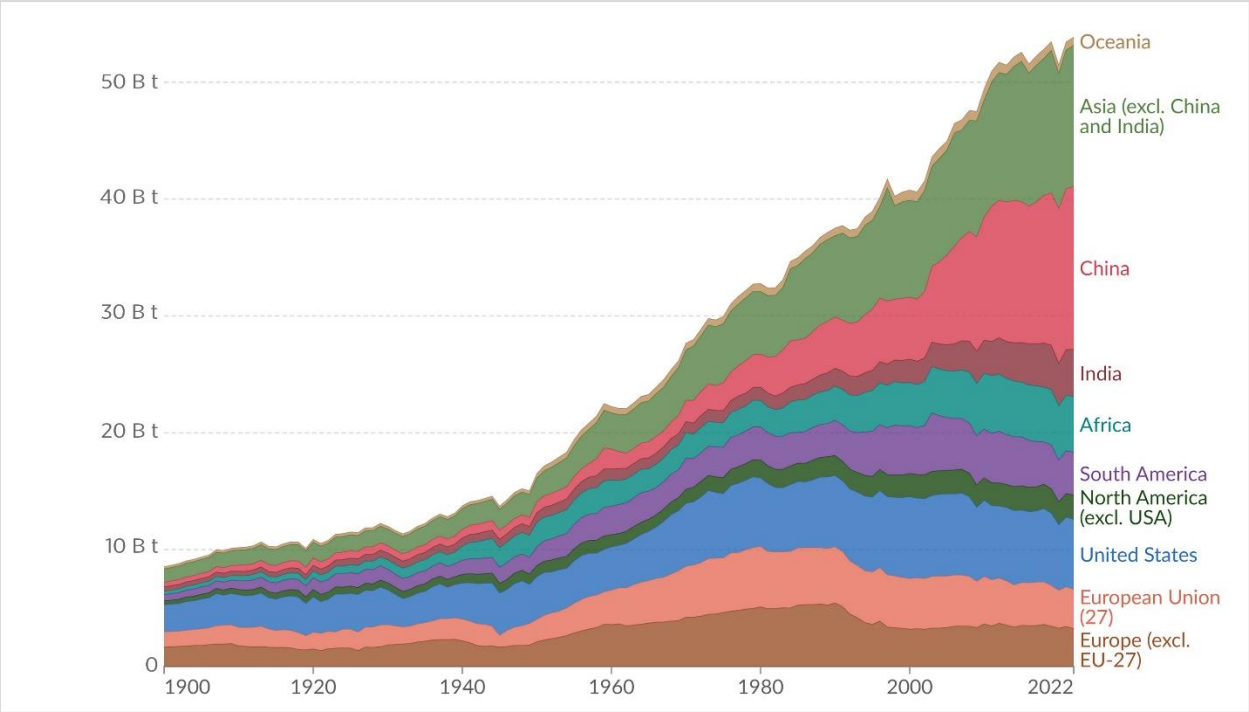
Figure 4: Historical summary of international climate negotiations



Human-induced greenhouse gas accumulation in the atmosphere has been increasing since the industrial revolution. Especially the size of the accumulation in the atmosphere and the rate of increase are more remarkable between 50-200 years. At the beginning of the 21st century, it is now definitively stated by climate science that global warming has occurred due to carbon dioxide and equivalent greenhouse gases caused by the use of fossil fuels. It is also observed with the increase in the examples of extreme natural events encountered in daily life that maintaining the current production and consumption methods and habits of societies will cause significant climate change consequences, which will lead to great environmental destruction, possible mass deaths and other humanitarian disasters related to this issue.

CO_2 accumulation in the Earth's atmosphere is increasing rapidly. The current level of CO_2 accumulation in the atmosphere is far above the natural CO_2 accumulation variations (between 180-300 ppmv on average) in the 700 thousand year record. When the monthly average CO_2 change is analysed, the pre-industrial level of about 280 ppmv (one molecule per million volume or parts per million) reached 411 ppmv in May 2018.

Graph 17: Annual greenhouse gas emissions by world regions (1900-2022)

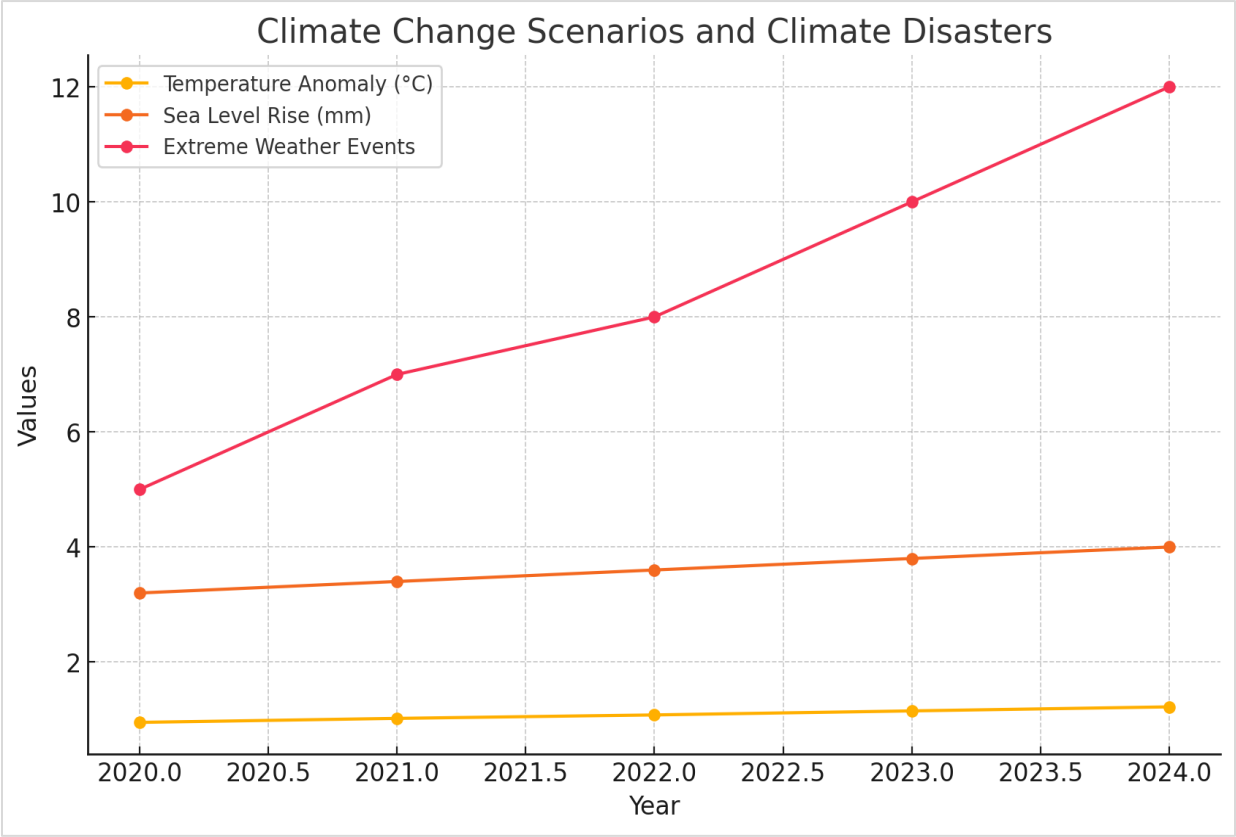


Source: www.ourworldindata.org (https://ourworldindata.org/grapher/ghg-emissions-by-world-region?time=1900..latest)

Since the industrial revolution, it has been proven that carbon dioxide emissions from human activities, especially due to fossil fuel consumption, have increased much faster than the oceans and forest areas can absorb. This dangerous situation, which has been clearly demonstrated by climate science, has led the world more towards this issue and mobilised cities. Local governments have started to be more and more involved in this problem, which closely concerns the quality of life and health of people.

Unlike the decision-making process of governments, the dominance of local governments in solving regional problems and the ability to utilise the advantages of being local in process management have made the position of local governments indispensable in the face of the negative effects of climate change, and local governments and the associations and coalitions formed by them have shown that they can start to play important roles in the fight against climate change by setting more advanced targets than their governments since the early 2000s.

Graph 18: Change in extreme weather events for 2020-2024



Source: *www.ipcc.ch*

General Status of Climate Change in Türkiye

Türkiye became a party to the United Nations Framework Convention on Climate Change (UNFCCC) in 2004. Before becoming a party to the UNFCCC, Türkiye established the Climate Change Coordination Board in 2001. After Türkiye became a party to the UNFCCC, the CBCC was restructured in 2004 and its mandate was expanded to include new members in 2010. Türkiye published a "National Climate Change Strategy" in May 2010 to contribute to global efforts to mitigate the impacts of climate change, taking into account its specific conditions and capacity. The strategy includes a series of targets related to transport, industry, buildings, waste and agriculture to be implemented in the short term (within one year), medium term (within 1-3 years) and long term (to be initiated in the next 10 years).

The Government of the Republic of Türkiye submits its updated First Nationally Determined Contribution (NDC) in the context of the Glasgow Climate Accord adopted by the Parties at the 26th Conference of the Parties as a supplement to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. With this declaration, Türkiye confirms that it will reduce its GHG emissions by 41% by 2030 (695 Mt CO_2 equivalent in 2030) compared to the baseline scenario set out in the First NDC (and Intended NDC), where 2012 is considered as the base year (reference year). Türkiye's updated NDC covers the whole economy and includes comprehensive

mitigation and adaptation actions as well as assessments of means of implementation. Türkiye intends to peak its emissions no later than 2038. The new reduction target represents significantly more ambitious on the basis of science and equity and is a step forward towards achieving a net zero target by 2053.

Türkiye's Mitigation Policies

Cogeneration and district heating use of local renewable energy sources as well as local coal increasing the efficiency of buildings In terms of legal duties and responsibilities, the regulations introduced by the Energy Efficiency Law cover all sectors of the economy as well as all persons and organisations at national, regional and local level. These regulations include new obligations, support and actions for industry, buildings and transport sectors. The Regulation on Energy Performance in Buildings has also entered into force and in this framework, it has become compulsory to issue Energy Performance Certificates for new buildings as of 2011. The Regulation on Increasing Efficiency in the Use of Energy Resources and Energy, issued under the same law, includes practical measures and some examples of these measures are given below:

Believing that the Paris Agreement offers a unique opportunity to realise a green and just transition, Türkiye supports the implementation of mitigation and adaptation policies included in this agreement. In addition, as one of the candidate countries to the European Union (EU), Türkiye closely monitors EU policies and develops legislation on climate change and environment in order to comply with the relevant acquis. Türkiye's climate change policy is organised through various sectoral, local and national policy documents, strategies and action plans related to mitigation and adaptation. In this context, there are various plans and strategies created, updated or being prepared by executive ministries and public institutions to identify and realise Türkiye's mitigation potential. General legislation and policy documents guiding sectoral policies towards sustainable and climate resilient development are as follows:

- Eleventh Development Plan (2019-2023)
- Environmental Law (1983)
- Energy Efficiency Law (2007)
- Regulation on Fluorinated Greenhouse Gases (2022)
- Regulation on Substances that Deplete the Ozone Layer (2017)
- Regulation on Monitoring of Greenhouse Gas Emissions (2014)
- Regulation on Strategic Environmental Assessment (2017)
- Communiqué on Monitoring and Reporting of Greenhouse Gas Emissions (2014)
- Communiqué on Verification of Greenhouse Gas Emission Reports and Accreditation of Verification Bodies (2017)
- Medium Term Programme (2023-2025)
- National Climate Change Strategy (2010-2023) and Action Plan (2011-2023)
- National Climate Change Adaptation Strategy and Action Plan (2011-2023)
- Energy Efficiency Strategy and National Energy Efficiency Action Plan (2017-2023)

- National Transport and Logistics Master Plan (2053)
- Türkiye Green Deal Action Plan (2021)
- Türkiye National Energy Plan (2020-2035)
- Climate Council Decisions (2022)
- Türkiye Hydrogen Technologies Strategy and Roadmap (2023)

Resource-efficient and sustainable circular economy is of utmost importance for achieving the net zero target by 2053, protecting the natural environment and increasing competitiveness. In this context, Türkiye's "Green Consensus Action Plan" (GCAP) was published on 16 July 2021 with Presidential Circular No. 2021/15. The Action Plan, which includes 32 targets and 81 actions under nine main headings, emphasises the green transformation of industries in Türkiye and the adoption of measures, especially in areas related to trade and industry. The ACAP includes actions in a wide range of areas such as Combating Climate Change; Green and Circular Economy; Green Finance; Carbon Regulations at the Border; Clean, Accessible and Secure Energy Supply; Sustainable Agriculture; Sustainable Smart Transport and Diplomacy in order to facilitate green transformation towards a low carbon, resource efficient and circular economy.

Türkiye's Adaptation Policies

The Paris Agreement aims to strengthen the global climate change response by increasing adaptive capacity and resilience and reducing vulnerability. Türkiye is among the most vulnerable countries to the negative impacts of climate change such as heavy rainfall, floods, storms, landslides, heat waves and forest fires. These hazards are becoming more frequent and severe, especially in the last two decades. Türkiye therefore recognises the importance of adaptation and has included the adaptation component as a complementary chapter in the updated NDC. As emphasised by the Intergovernmental Panel on Climate Change (IPCC), the Mediterranean region is considered to be one of the 'hotspots' of climate change, with warming values exceeding the global average increase by 20 %, as well as a decrease in precipitation in the temperate zone between latitudes 30°N and 46°N, in contrast to the general increase in the hydrological cycle. In the 6th Assessment Report of IPCC titled Climate Change 2022: Impacts, Adaptation and Vulnerability, it is stated that cities, especially coastal cities, will be more affected by climate change in the coming period. In this context, the need to seriously address urban areas where 70 per cent of the world's population will live by 2050 cannot be ignored. Unless adequate measures are taken today, our cities will probably be exposed to at least one natural disaster. Furthermore, river surface water flows and low flows are expected to decrease (possibly by 12-15 per cent or more) in many places due to reduced rainfall.

As a country vulnerable to the adverse impacts of climate change, Türkiye has taken important measures for adaptation to climate change and is determined to continue its efforts in many action areas such as impact, vulnerability and risk assessments; information systems, legal and policy instruments at national and local level; capacity building, financing; monitoring and implementation. In the context of harmonisation efforts: Türkiye published its first National Climate Change Adaptation Strategy and Action Plan (NCCAP) in 2012, covering the period until 2023. The process

of updating the NCCAP is ongoing on the basis of detailed impact, vulnerability and risk analyses, including in sectors such as agriculture and fisheries/livestock, ecosystems and biodiversity, water management, disaster risk management, urban and social development, industry, energy, tourism, cultural heritage and public health. The NCCAP aims to contribute to the achievement of the global adaptation target under the 2015 Paris Agreement. Türkiye aims to formulate climate policies at the local level through Regional and Local Climate Change Action Plans. At the regional level, regional climate change action plans have been prepared for seven geographical regions. These Action Plans include priority actions to combat climate change for different sectors. At the local level, municipalities in Türkiye are committed to increasing their climate resilience through local climate change action plans.

According to the studies, changes in extreme weather and climate events in Türkiye, especially in the 1990s, there has been a significant increase in the number of summer and tropical days, while the number of days with frost and snowfall has decreased significantly. Since 2000, about 50 per cent of the records for maximum temperatures in Türkiye have been realised, while this rate has decreased to 10 per cent for minimum temperatures. When Türkiye's meteorological change over more than two decades is analysed, it is found that both the temperature regime has changed significantly towards milder and warmer conditions and that significant changes have occurred in the frequency and severity of heat waves.

In 2009, a "Climate Change Department" was established under the General Directorate of Environmental Management of the Ministry of Environment and Urbanisation to address issues related to climate change. Taking into account its specific conditions and capacity, Türkiye published a "National Climate Change Strategy" in May 2010 in order to contribute to global efforts to mitigate the impacts of climate change. The strategy includes a series of targets related to transport, industry, buildings, waste and agriculture to be implemented in the short term (within one year), medium term (within 1 to 3 years) and long term (to be initiated within the next 10 years). The strategy also includes measures such as

- Cogeneration and district heating
- Utilisation of local renewable energy sources as well as local coal
- Increasing the efficiency of buildings

In terms of legal duties and responsibilities, the regulations introduced by the Energy Efficiency Law cover all sectors of the economy as well as all individuals and organisations at national, regional and local level. These regulations include new obligations, support and actions for industry, buildings and transport sectors. The Regulation on Energy Performance in Buildings has also entered into force and in this framework, it has become compulsory to issue Energy Performance Certificates for new buildings as of 2011. The Regulation on Increasing Efficiency in the Use of Energy Resources and Energy, issued under the same law, includes practical measures and some examples of these measures are given below;

- Establishment of institutional structure and certification programmes for the Energy Service Company sector

- Providing training and capacity building for all public and private sector stakeholders
- Establishing mechanisms to support energy efficiency projects
- Appointment of energy managers in the industrial sector and buildings

Regulation No. 28097 on Increasing Efficiency in the Use of Energy Resources and Energy also includes various incentives to be given to those who voluntarily commit to reduce energy intensity by undertaking projects that increase energy efficiency. Legislative work on the development of local renewable energy sources has made progress and there has been a large increase in wind and solar energy BAU scenario Mitigation scenario installations in Türkiye. Some of the planned actions related to energy efficiency and utilisation of new energy sources are as follows:

- The establishment of zero-emission energy production technologies, such as renewable energy sources and nuclear energy, on condition of local content,
- Increasing the overall efficiency of existing thermal power plants,
- Reduction of energy densities to 2004 levels,
- Increasing the share of local renewable energy sources in total energy production to 25 per cent,
- Maximising the utilisation of energy efficiency potential in the industrial sector,
- Utilising the energy efficiency potential of the built environment

Climate Change in Bandırma

Bandırma Municipality completed the Solar Power Plant with a capacity of 1MW in 2017 and started to generate electricity in the power plant, which was the first in Balıkesir Province at the time it was built, meeting the entire total electricity consumption. Bandırma Municipality has been a pioneer in renewable energy investments and has helped many public and private sector institutions, organisations and businesses to switch to renewable energy by encouraging renewable energy applications.

In 2021, an electric vehicle was rented within the Directorate of Cleaning Works and this vehicle was actively used in the field, which was both a vital step in reducing fossil fuel costs and an example for other public institutions and organisations.

In 2021, an Energy Management Unit was established within the municipality's organisational structure and energy efficiency and renewable energy practices were monitored by this unit and roadmaps were created. The active work of this unit played an accelerating role for the signing of the Mayors' Agreement and other preparations.

Bandırma Municipality is a signatory of the Covenant of Mayors (CoM), which was established by the European Commission to encourage and support urban mitigation plans to reduce greenhouse gas emissions from cities and to promote the use of clean energy sources and supported by the European Commission, to which approximately 12.500 local governments in Europe and 78 local governments in Türkiye are parties. In this context, Bandırma Municipality it commits to reduce greenhouse gas emissions by at least 40% in 2030 compared to the baseline year of 2023 and to

implement the steps specified for adaptation to climate change. Bandırma Municipality, under the leadership of the Climate Change Directorate, has taken an important step to reduce the negative impacts of climate change and prepare the district for future climatic changes by preparing a Sustainable Energy and Climate Action Plan (SECAP) in coordination with local stakeholders. Bandırma Municipality, as a party to the Covenant of Mayors in 2023, has determined the baseline year for emission reduction targets as 2023, since it is important to prepare the inventory of the most reliable year in which all error-free data can be found. After taking a picture of the current situation by determining the district emissions, Bandırma Municipality aims to create a road map where long-term targets will be set by preparing a "Sustainable Energy and Climate Action Plan-SECAP". The targets that the contracting parties of the Covenant of Mayors must achieve by 2030 are as follows:

- Reduction of CO_2 emissions by at least 40% compared to the expected value of GHG emissions in 2030
- Increasing resilience against climate change,
- Ensuring access to sustainable and low-cost reliable energy by integrating mitigation and adaptation plans.

Bandırma Municipality takes part as a stakeholder in consortiums and projects established for the testing and development of hydrogen-powered public transport vehicles on designated routes in order to pioneer the use of Green Hydrogen, which is planned to be produced within the borders of the district, in public transport vehicles and to contribute to green transformation.

3. BASELINE EMISSION INVENTORY

This chapter focuses on the calculation of (2023 baseline year) greenhouse gas emissions and energy consumption amounts that lead to climate change in Bandırma district, as well as the details of the actions planned in buildings, energy, transport and waste management in order to reduce these emissions. The calculations have been carried out in accordance with the internationally recognised IPCC methodology. Assumptions made in line with GHG reduction targets are explained in detail under the relevant headings for each sector.

In the projection process, data obtained from organisations such as Bandırma Municipality, TurkStat, natural gas and electricity distribution company, etc. were used. In addition, emission reduction action tags were created in line with national strategies and action plans such as Bandırma Municipality 2020-2024 Strategic Plan, Türkiye Energy Efficiency 2030 Strategy and 2nd National Energy Efficiency Action Plan (2024-2030), Türkiye Transport and Communication Strategy 2023, National Intelligent Transport Systems Strategy Document and Action Plan (2020-2023) and National Waste Management and Action Plan (2016-2023), Twelfth Development Plan (2024-2028).

In order for Bandırma Municipality to achieve its sustainability and energy efficiency targets, a comprehensive and holistic approach has been adopted in line with these plans, and projects that will contribute to these targets have been discussed in detail.

Introduction

One of the most important steps in combating climate change is the accurate calculation and monitoring of greenhouse gas emissions. These calculations allow local governments to develop the necessary strategies by creating emission inventories. Within the scope of SECAP (Sustainable Energy and Climate Action Plan) of Bandırma Municipality, greenhouse gas calculation methodology will be carried out in accordance with internationally recognised methods developed by IPCC (Intergovernmental Panel on Climate Change).

3.1. Greenhouse Gas Calculation Methodology

Municipalities that are members of the Covenant of Mayors are required to quantify greenhouse gas emissions for climate studies, both from the local government's own activities and from the entire population within its geographical jurisdiction. For this purpose, the International Council for Local Environmental Initiatives (ICLEI) has developed the International Local Government Greenhouse Gas Emission Analysis Protocol (IEAP), which is an easy-to-implement guide and contains common rules and standardised approaches for local governments to identify greenhouse gases concretely and make comparable reductions. Thanks to IEAP, greenhouse gas auditing processes have been facilitated, the gains achieved as a result of the activities of different communities have been brought together and reported, and a reliable database has been established. ICLEI assists local governments in their efforts to reduce greenhouse gases that cause both climate change and reduced air quality. It has provided analytical tools and methods for local governments

to set and achieve reduction targets by measuring their emissions. Each of the many fields of activity under the jurisdiction of a local government requires the preparation of specific GHG management programmes. Local government greenhouse gas emission inventories consist of two parts:

1. Emissions related to the local government's own activities,
2. Emissions related to the activities of the community in the administrative area for which it is responsible.

Emissions from local government activities are similar to those of a private sector organisation with a somewhat complex structure. Therefore, the calculations do not differ much from the emission inventory requirements in the Corporate Accounting and Reporting Standard under the Greenhouse Gas Protocol developed by the World Resources Institute and the World Business Council for Sustainable Development.

For the calculation **of emissions at the city scale**, it is necessary to take a different approach and follow a different methodology than the one used in the calculation of national GHG emission inventories. One of the important reasons for this is the difficulties encountered in determining the local level of activities that lead to GHG emissions.

Emission categories in the **Activity Boundary** GHG Protocol are categorised as follows:

• **Scope 1 - direct greenhouse gas emissions:** Emissions from all fixed and mobile emission sources owned or directly controlled by the organisation. Owned, leased or leased assets are included in these sources. The scope limit is all emission sources that can be controlled. This should include refrigerant gases from air conditioning systems used for operations.

- **Combustion of Fossil Fuels**: Emissions from municipal vehicles, generators and other equipment using fossil fuels.

Image 5: Bandırma Municipality service vehicles

- **Industrial Processes**: Emissions from municipal production facilities or processes.

Image 6: Bandırma Municipality Asphalt Plant

- **Waste Management**: Methane (CH_4) emissions from the municipality's waste management processes, in particular from the digestion of organic waste.

These emissions typically include greenhouse gases such as carbon dioxide (CO_2), methane (CH_4) and diazot monoxide (N_2O).

• **Scope 2 - indirect energy greenhouse gas emissions:** Emissions resulting from energy purchased for the activities of the organisation. In this chapter, grid electricity used or other types of energy used for heating/cooling purposes should be included.

- **Electricity Consumption**: Emissions from the generation of electricity used in municipal buildings, street lighting and other electrically powered facilities.
- **Heating and Cooling**: Emissions from the production of energy used for heating or cooling of municipal buildings.

Emissions calculated in this context are calculated using data from energy providers and emission factors determined by IPCC.

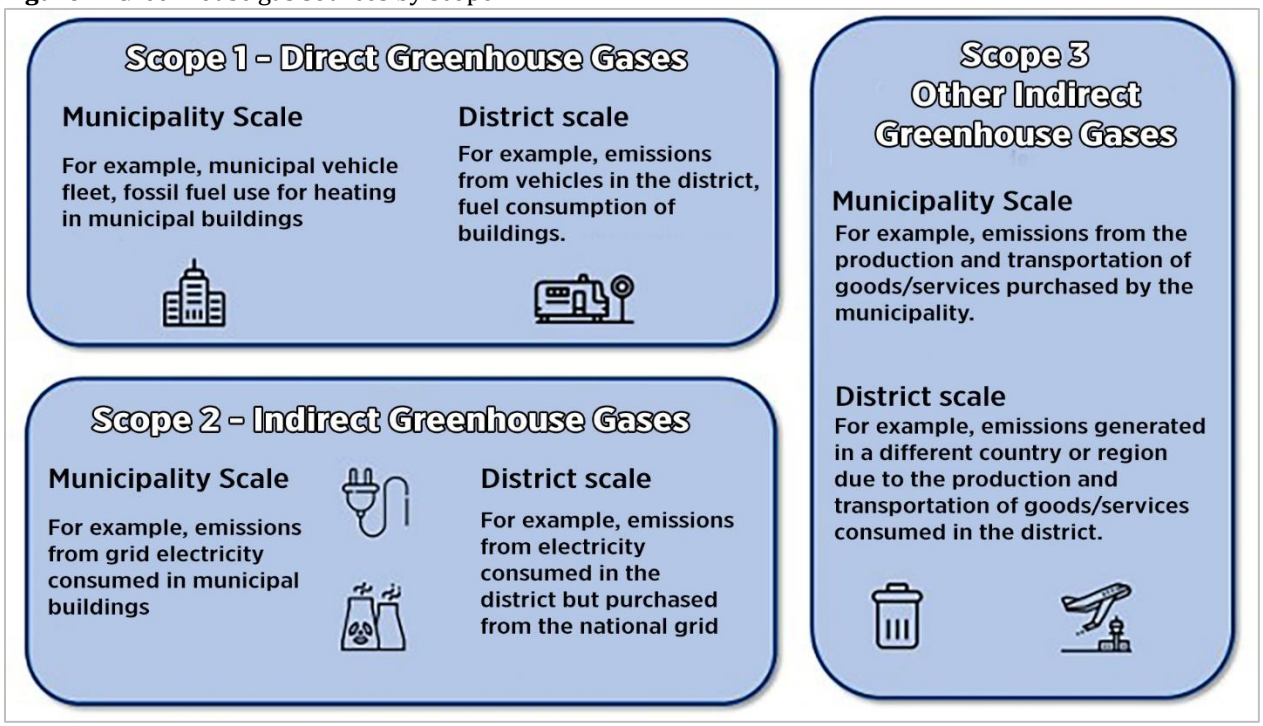
• **Scope 3 - other indirect greenhouse gas emissions:** GHG emissions caused by the organisation's activities and under its control, other than indirect emissions. These may arise from activities beyond or behind the core activities of the organisation, employee travel or sub-contractor activities. In this context, the decision parameter should be the level and quality of available data.

- **Supply Chain**: Emissions from the production and transport of goods and services purchased for the Municipality.

- **Transport**: Indirect emissions from transport services used by the municipality (e.g. emissions from non-municipal transport vehicles).
- **Business Travel**: Emissions generated during business travelling of municipal staff.

Scope 3 emissions are often the most difficult to calculate because they involve a large data collection process and various emission factors.

Figure 7: Greenhouse gas sources by scope



For the warming potentials of different greenhouse gases, the greenhouse gases and global warming potentials determined in the Kyoto Protocol and required to be included in greenhouse gas inventories were used.

- **Global Warming Potential (GWP):** A measure of the ability of greenhouse gases to trap heat in the Earth's atmosphere compared to carbon dioxide over a given time period.
- **Carbon dioxide equivalent (CO_2 e):** It is a unit of measurement used to compare the global warming potential of different greenhouse gases and allows their contribution to global warming to be expressed in terms of carbon dioxide.

Table 4: Greenhouse gases and GWP values according to IPCC and Kyoto Protocol

Greenhouse Gases	Chemical Formula	Atmosphere Residence Time (Year)	Global Warming Effect* (CO_2 e)[4]
Carbon Dioxide	CO_2	5-200	1
Methane	CH_4	12	28
Diazot monoxide	N_20	114	265
Perfluorocarbons	PFC_S	50.000**	6.630-9.200
Hydro fluorocarbons	HFC_S	226**	148-12.400
Sulphur hexafluoride	SF_6	3.200	23.500
*: Time dependent **: The highest values are shown for this group of greenhouse gases			

Source: *IPCC Global Warming Potential Values, Greenhosue Gas Protocol, https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf*

The direct and indirect GHG emissions of each energy carrier were calculated by multiplying the final energy consumption by the corresponding emission factor. In addition, CH_4 and N_2 O emissions from waste, wastewater treatment were calculated and converted to CO_2e.

Table 5: CO_2 emission factors used in the calculations (t/MWh)

Electricity		Fossil Fuels							
National	Local	Natural Gas	Liquid gas (LPG)	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other Fossil Fuels
0.507	0.507	0.203	0.228	0.281	0.271	0.261	0.367	0.357	0.232

While preparing the baseline Emission Inventory, the activity-based approach most commonly used by cities was used. This approach includes all CO2eq emissions from direct energy consumption (through fuel combustion) or indirect (through electricity consumption) in Bandırma. Most GHG emissions are CO2 emissions, while CH4 and N2O emissions are secondary to combustion processes in the residential and transportation sectors. All CO2, CH4 and N2O emissions are calculated for all fuel types along with their global warming potential (GWP) taken from the IPCC's Fifth Assessment Report (AR5) in 2013.

Data Collection: In order to create this data inventory, an effective division of labour has been made between the administrative units of the local government at the institutional scale and with other organisations (other public institutions, various associations and chambers, energy suppliers, etc.) that can affect both institutional and urban activities and provide information at the city scale.

Calculation: For greenhouse gas calculations within the borders of Bandırma Municipality, the following formulae and variables were used in the calculations according to the types of Scope 1, Scope 2 and Scope 3 greenhouse gas sources.

$$Emission_{SG,\ fuel} = Emission_{CO2,\ fuel} + Emission_{CH4,\ fuel} + Emission_{N2O,\ fuel} + ...$$

$$Emission_{CO2,\ fuel} = Consumption\ Amount_{CO2,\ fuel} + Emission\ Factor_{CO2,\ fuel}$$

Data Collection and Assumptions

The data requested for the preparation of greenhouse gas inventory for Bandırma Municipality and district were collected at the end of official correspondence with the relevant institutions. Greenhouse gas emission assumptions for the targeted year 2030 have been made by taking into account the population growth rate, growth rate of the building and service sector, energy consumption trends in the last decade and legislative changes in the jurisdiction of Bandırma Municipality. The assumptions by which we calculate the greenhouse gas development of the city if the sector-based current situation continues are listed below. Assumptions regarding the reductions are stated separately in the content of each activity.

a) Population projection: When the population increase between 2007 and 2023 is analysed, it is observed that the highest increase was 2,38% in 2012, but the average increase in the last 5 years was 1,57%. The population has always continued to increase in the analysed year interval. While creating the population projection, an annual average population increase of 1,64% is foreseen for Bandırma. With this rate, it is estimated that the population residing in Bandırma will reach 186.958 people in 2030.

b) Buildings: GHG emissions related to buildings are increased with the assumptions made according to the following building typologies.

i. Residential buildings: Energy consumption is considered to be directly proportional to population growth and the rate of increase is taken as 1,64 % per year. Determining an increase rate in energy consumption by considering the change in previous years leads to an unreliable assessment since issues such as infrastructure changes, increase in natural gas penetration rate will radically affect this increase rate. For this reason, a change in direct proportion to the population growth is foreseen. In order to elaborate the reduction calculations, electricity consumption in residential buildings has been broken down with some assumptions based on the consumption habits prevailing in Türkiye. It is assumed that 5% of residential electricity consumption is cooling, 15% is heating, 45% is other electrical appliances and 35% is lighting.

ii. Non-Residential Buildings: Energy consumption increases have been determined by considering the trends in the last 5 years and the development status of the service sector. Assumptions are as follows:

1. **Natural gas:** Natural gas consumption is projected to increase by 3 %.
2. **LNG:** 1% is projected according to the average annual increase rate in the last 5 years.
3. **Electricity:** 3% according to the average annual increase rate in the last 5 years.

iii. Municipal Buildings: The following assumptions have been made regarding the energy consumption of municipal buildings, taking into account the increase in service points and their sizes and the stable course to be achieved after the transition to new service points:

1. **Natural gas:** An annual increase rate of 3 % is foreseen.
2. **Electricity** An annual increase rate of 3 % is foreseen.

c) Transport: In the transport sector, the current situation and number of vehicles in the municipality and the private vehicle situation in the city have been taken into consideration separately. While it is foreseen that the number of vehicles in the city will increase similar to the population growth, the decrease in fuel consumption of the renewed vehicles with the developing technology has also been evaluated. The rates of increase in fuel consumption and greenhouse gas emissions in the transport sector are as follows:

i. Municipality Vehicle Fleet:

1. Diesel: An annual increase rate of 1% is foreseen.
2. Gasoline: No annual change is foreseen.

ii. Specialised Vehicles:

1. Diesel private vehicles: An annual increase rate of 2 % is foreseen.
2. Private vehicles with petrol: An annual increase rate of 2% is foreseen.
3. LPG: No annual change is foreseen.

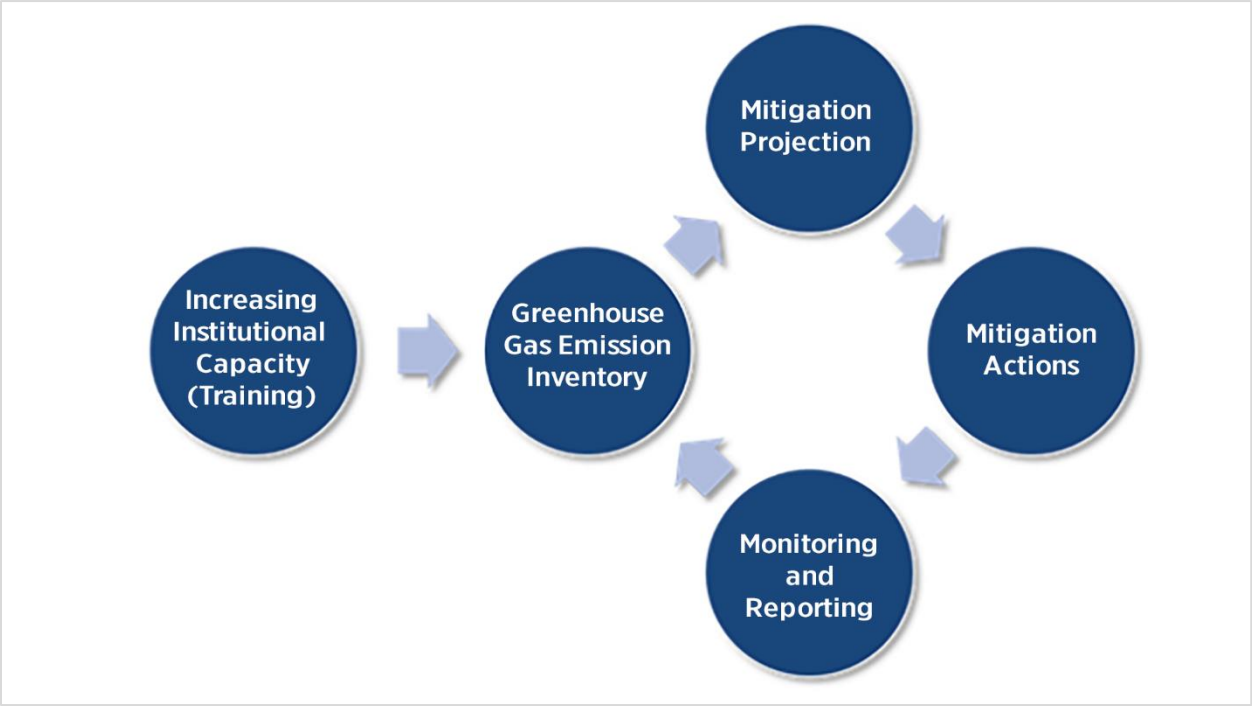
d) Waste and wastewater: Emissions related to waste and wastewater are increased according to the population growth rate of 3 % per year, as they are directly linked to citizen activities.

e) Agriculture: Emissions related to agriculture and animal husbandry are not foreseen to change significantly considering the parameters of animal presence and manure management in the province.

3.2. Greenhouse Gas Management

In the Sustainable Energy and Climate Action Plan, the methods and standards adopted by the Covenant of Mayors were utilised while preparing the greenhouse gas inventory and setting mitigation targets. Figure 17 shows the steps followed in the greenhouse gas management process.

Figure 8: Greenhouse gas management process



a) Increasing Institutional Capacity (Training): Providing training to municipality employees to increase institutional capacity.

b) Greenhouse Gas Inventory: Collection of greenhouse gas sources consumption data of Bandırma and preparation of greenhouse gas inventory by determining the most greenhouse gas emission sources of the city.

c) Mitigation Projection: Establishment of actions on buildings, renewable energy, transport, waste and waste water management in the greenhouse gas mitigation section of the Sustainable Energy and Climate Action Plan prepared for Bandırma.

d) Mitigation Actions: Implementation of the actions included in the Sustainable Energy and Climate Action Plan.

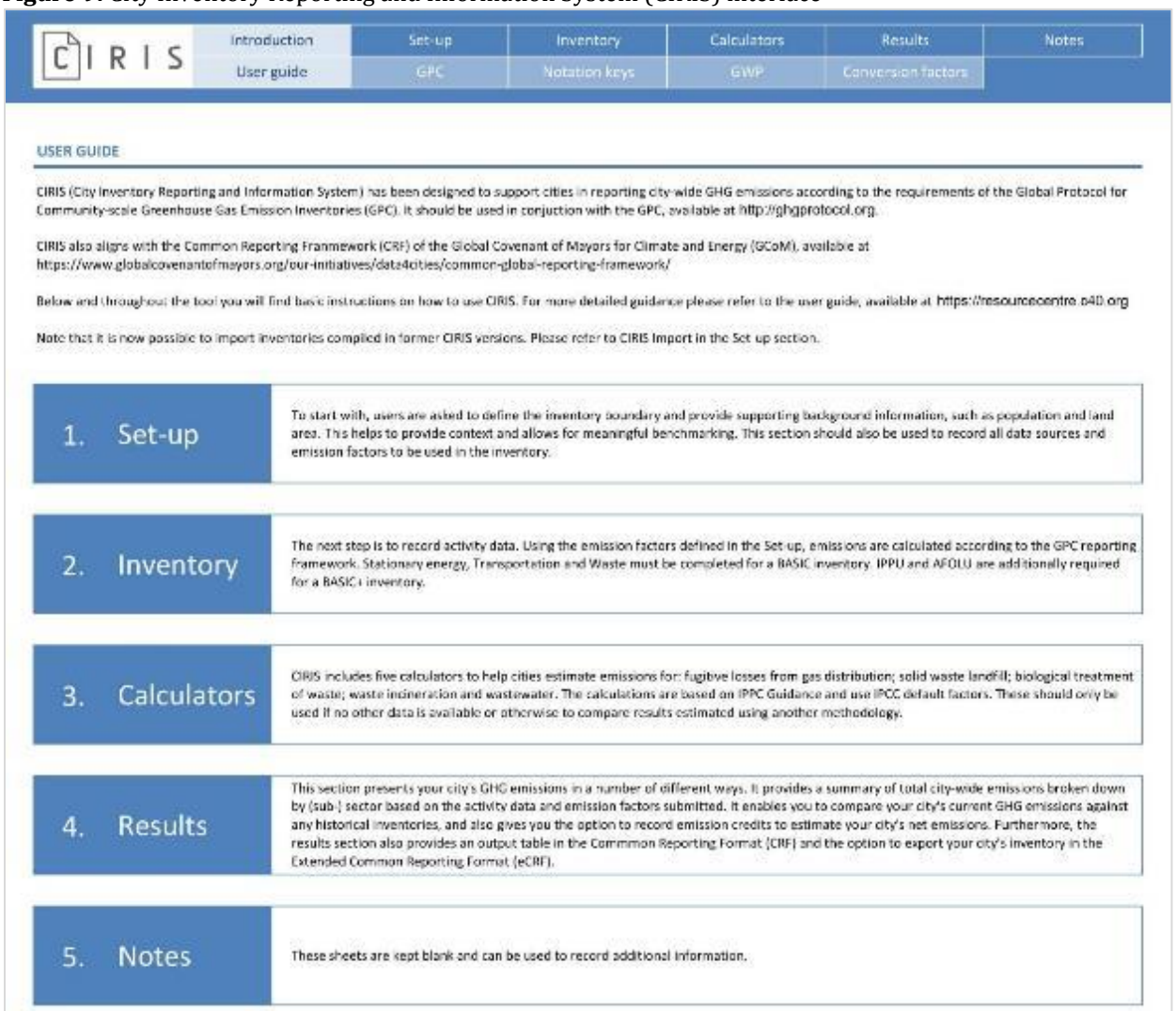
e) Monitoring and Reporting: Monitoring and reporting of changes in greenhouse gas source and energy consumption amounts according to the determined base year.

3.3. Greenhouse Gas Inventory

Greenhouse Gas Inventory Preparation Tool

Bandırma Municipality used the City Inventory Reporting and Information System (CIRIS) tool developed by C40, ICLEI and World Resources Institute (WRI) while preparing its greenhouse gas inventory. CIRIS is a tool prepared in accordance with IPCC's emission source categories and enables local governments to standardise their inventories. The inventory of Bandırma Municipality was prepared using the current version of CIRIS.

Figure 9: City Inventory Reporting and Information System (CIRIS) interface



Greenhouse gas calculations carried out within the scope of Bandırma Municipality SECAP are a critical tool for determining the city's carbon footprint and developing emission mitigation strategies. These calculations, made in line with the IPCC methodology, will contribute to the achievement of Bandırma's sustainability goals and enable more effective implementation of local climate policies. In this context, a comprehensive city-wide greenhouse gas inventory has been created by monitoring the energy use, industrial processes, waste management and other indirect emissions of the municipality.

In line with the data collected from Bandırma Municipality and external stakeholders (electricity and gas distribution companies, EMRA, BASKİ, etc.), the greenhouse gas inventory of Bandırma district for 2023 has been prepared. The inventory includes buildings, energy, transport, waste and wastewater sectors which are selected sectors within the boundary of Bandırma Municipality. Since Bandırma Municipality does not have any sanctioning authority in the industrial sector, industry is not included in the inventory study. Greenhouse gas emissions and energy consumption amounts were calculated in line with the data obtained from TurkStat, electricity and natural gas distribution companies. The 2023 baseline greenhouse gas emission inventory calculated for SECAP is presented in Table 13.

Table 6: Greenhouse Gas Inventory Sources

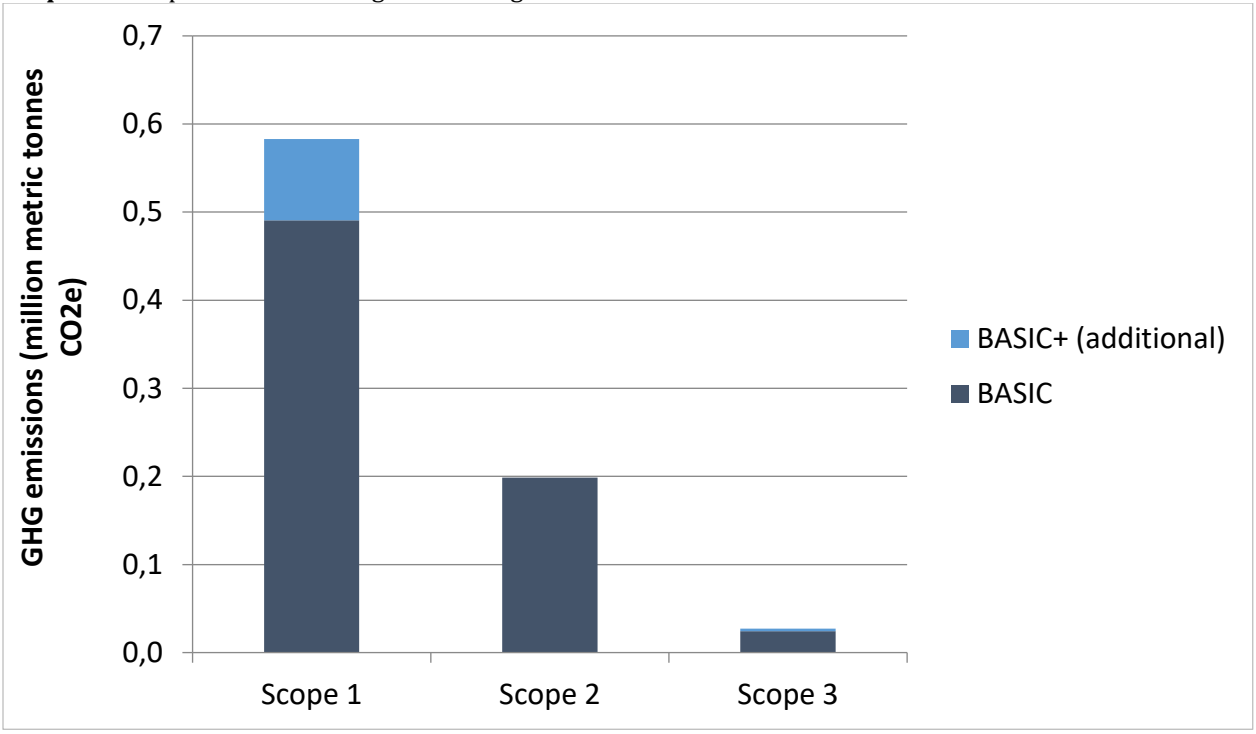
Data	Name of Source
EXAMPLE: Emission factors	*National emissions factor database*
Natural Gas	Aksa Natural Gas 2023
Hard Coal (Corporate)	Bandırma District Governorship 2023 Coal
Electricity Consumption	Uludag Electricity 2023
Livestock breeding	TUIK 2023
Fuel Oil	EMRA 2023 - Fuel Oil Provincial Data
Gasoline (Corporate)	Corporate Gasoline Inventory 2023
Diesel (Corporate)	Corporate Diesel Inventory 2023
LPG (PROVINCIAL DATA)	EMRA 2023 - LPG PROVINCIAL DATA
Recyclable Waste	Bandırma Municipality 2023
Gasoline (PROVINCE-WIDE)	EMRA 2023 - PETROL PROVINCIAL DATA
DIESEL (PROVINCE-WIDE)	EMRA 2023 - DIESEL PROVINCIAL DATA
Gas Oil	EMRA 2023 Gas Oil Provincial Data
Domestic Garbage Waste	Bandırma Municipality 2023 Garbage
Purified Water	BASKI 2023
Corporate Inventory	Bandırma Municipality Data
Waste Water	BASKI 2023
Diesel (Marine)	IDO 2023
Electricity Consumption (Marine)	IDO 2023

Figure 10: Baseline greenhouse gas emission inventory

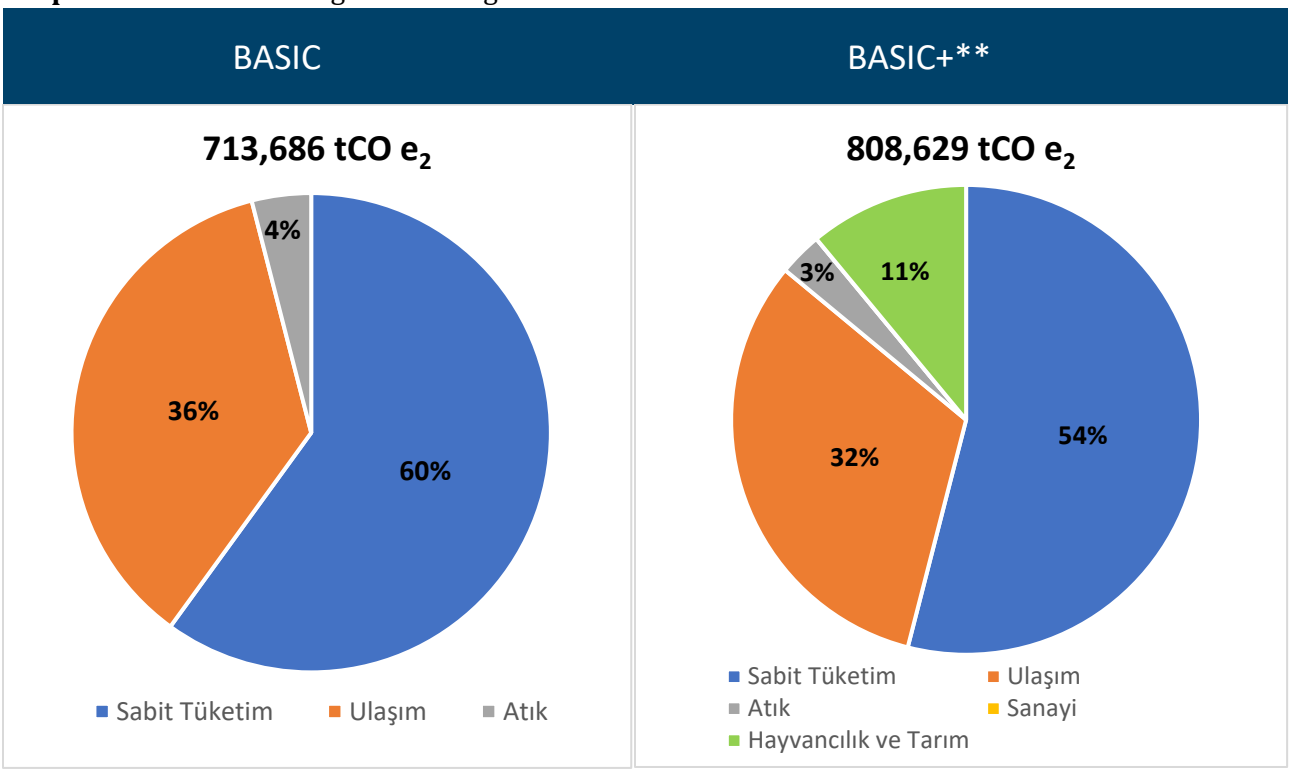
NAME OF CITY:	Bandırma/BALIKESİR, Türkiye	POPULATION:	166.836
BOUNDARY:	BASIC+	LAND AREA (km2):	690
INVENTORY YEAR:	2023/2024	GDP (US$ million):	

tCO2e	BASIC+ Other Scope 3	Scope 1	Scope 2	Scope 3
	Stationary	234.751	196.656	2.674
	Transportation	253.009	2.080	
	Waste	2.840		24.350
	IPPU			
	AFOLU	92.269		
	Other Scope 3			
	TOTAL	808.629		

Graph 19: Scope distribution of greenhouse gas emissions



Graph 20: Total values of greenhouse gas emissions



** This inventory (BASIC) includes sections on Stationary energy, Transport and Waste.*

*** This inventory (BASIC+) includes IPPU (Industrial Processes and Product Use) and AFOLU (Agriculture, Forestry and Other Land Use) data in addition to the Fixed energy, Transport and Waste sections.*

Note: *"Industry" (IPPU-Industrial Processes and Product Utilisation) in the BASIC+ inventory is excluded*

Table 7: Summary of Bandırma district greenhouse gas inventory

Sector	2023 Base Year		2030 Projection		2050 Projection	
	Scope 1	Scope 2	Scope 1	Scope 2	Scope 1	Scope 2
	tonnes CO e/year$_2$	tonnes CO e/year$_2$	tonnes CO e/year$_2$	tonnes CO e/year$_2$	tonnes CO e/year$_2$	tonnes CO e/year$_2$
I- CONSTANT ENERGY	**234.751**	**196.656**	**262.452**	**219.861**	**363.233**	**304.288**
I.1 Residential Buildings	108.650	57.267	121.471	64.025	168.115	88.610
I.2 Commercial and Institutional Buildings	34.204		38.240	0	52.924	0
I.2.1 Bandırma Municipality Buildings	533	860	596	961	825	1.331
I.2.2 General Lighting	0	9796	0	10.952	0	15.157
I.3 Industrial Plants	91.364	128.733	102.145	143.923	141.369	199.190
I.4 Energy Facilities	0	0	0	0	0	0
I.5 Agriculture, Forestry, Fisheries	0	0	0	0	0	0
I.6 Unidentified Resources	0	NO	0		0	NO
I.7 Coal Mining leakages	0	0	0	0	0	0
I.8 Oil/natural gas leaks	0	0	0	0	0	0
II-TRANSPORT	**253.009**	**2.080**	**282.864**	**2.325**	**391.484**	**3.218**
II.1 Road	251.645	0	281.339	0	389.373	0
II.1.1 Bandırma Service Vehicles	1.142	0	1.277	0	1.767	0
II.1.2 Public Road Transport	0	2076	0	2321	0	3.212
II.2 Railway Public Transport (Tram	**0**	0	0	0	0	0
II.3 Seaway	222	4	248	4,472	344	6
II.4 Airline	NO	NO	NO	NO	NO	NO
II.5 Land, Off Road	IE	IE	IE	NO	IE	IE
III-WASTE	**2840**	**24350**	**3.175**	**27.223**	**4.394**	**37.677**
III.1 Solid Waste Disposal (Landfill)	15	24350	17	27223	23	37.677
III.2 Biological Treatment of Solid Wastes	0	IE	0	0	0	0
III.3 Waste Incineration	0	IE	0	0	0	0
III.4 Wastewater Treatment and Discharge	2825	IE	3.158	0	4.371	0
Total	**490.600**	**223.086**	**548.736**	**249.522**	**759.780**	**345.488**
Grand Total Tonnes CO e$_2$	**713.686**		**798.258**		**1.105.268**	

Table 8: Energy consumption data for 2023 in SECAP format

Sector		2023 ENERGY CONSUMPTION [MWh]						
		Electricity	Fossil Fuels					
			Natural Gas	LPG	Fuel-oil	Diesel	Gasoline	Total
BUILDINGS AND INDUSTRIAL PLANTS								
Municipality Buildings and Facilities		**21.018**	**2.626**	**0**	**0**	**0**	**0**	**23.644**
	Municipality Buildings	1.696	2626	0	0	0	0	
	Street/park Lighting	19.322	0	0	0	0	0	
	Other	0		0	0	0	0	
Tertiary (non-municipal) Buildings and Facilities		**5.274**	**168.493**	**0**	**5630**	**0**	**0**	**179.397**
	Commercial and Institutional Buildings	0	168.493	0	5630	0	0	
	Other	5274	0	0	0	0	0	
Housing		**112.953**	**526.133**	0	**6566**	0	0	**645.652**
Industrial Plants		**253.911**	**442.276**	0	0	0	0	**696.187**
Sub Total		**393.156**	**1139528**	**0**	**12196**	**0**	**0**	**1.544.880**
TRANSPORT								
Municipality Vehicle Fleet		**0**	**0**	**0**	**0**	**4.111**	**107**	**4.218**
	Motorway	0	0	0	0	4.111	107	
	Other	0	0	0	0	0	0	
Public Transport		**0**	**0**	**0**	**0**	**8.495**	**0**	**8.495**
	Motorway	0	0	0	0	7.661	0	
	Sea Transport	0	0	0	0	834	0	
Private and Commercial Vehicles		**0**		**145.482**		**683.875**	**126.992**	**956.349**
	Motorway	0		145.482	0	683.875	126.992	
	Other	0	0	0	0	0	0	
Sub Total				**145482**		**696.481**	**127.099**	**969.062**
OTHER								
Agriculture and Livestock								
Other unspecified								
Sub Total								
TOTAL								**2.513.942**

Total energy consumption (excluding livestock) was calculated as 2.513.942 MWh and greenhouse gas emission as 713.686 tCO_2 eq. The greenhouse gas emission value per capita is 4,27 tCO_2 eq. According to the table, the share of emissions from fuel and electricity consumption of buildings in total emissions is 60,4%. Greenhouse gas emissions from transport are 35,8% and greenhouse gas emissions from solid waste and waste water treatment are 3,8%. While preparing the Sustainable Energy and Climate Action Plan, the short and long term strategic plans of Bandırma Municipality, the opinions of academicians, chambers of industry and commerce, public institutions, provincial directorates and professional organisations were taken into consideration. As a result of the assumptions made, greenhouse gas emissions (excluding industry and animal husbandry) in Bandırma district were calculated as 798.311 tCO_2 e in 2030 (BAU scenario). The per capita emission amount of 4,27 tCO_2 e in 2023 is expected to be 2,56 tCO_2 e per capita in 2030 with the action plans to be implemented.

When the emissions of the greenhouse gas inventory (excluding industry) are analysed, buildings have the highest share in the inventory (60,4%) in Bandırma, as detailed under the title 3.1 Greenhouse Gas Emission Inventory of this report. With the actions detailed under 3.3.2 Contents of the Actions, a total reduction of 49,4% or 238.263 tCO_2 e is targeted in the buildings and energy sector by 2030. The transport sector has the second most important share in the inventory (35,8%). With the actions detailed under the title of 3.3.2 Contents of the Actions, 48,1% or 137.176 tCO_2 e reduction is targeted in the transport sector by 2030. Mitigation actions are envisaged for waste and wastewater and other emission sources, which constitute the remaining 3,8% of the Bandırma inventory. With the actions detailed under the heading 3.3.2 Contents of the Actions to be implemented in these sectors, a reduction of 59,9% or 18.208 tCO_2 e is targeted by 2030. In Table 14, the improvement scenarios that constitute the basis for GHG mitigation targets are summarised in the following table.

Table 9: Emission Reduction Scenario Analysis

Sector	Sectoral Mitigation Targets	2030	2050
Electricity	Renewable + Nuclear Energy Share	69%	90%
Electricity	Emission Factor, kg C02e/KWh	0,188	0,040
Buildings	Conversion to LED Lighting	100%	100%
Buildings	Conversion to Heat Pump in Heating and Cooling	10%	45%
Buildings	Increase in the Rate of Heat Insulated Buildings	25%	80%
Buildings	Increase in the Rate of Buildings with Rooftop SPP	15%	40%
Irrigation	Irrigation Energy Reduction with Agricultural SPP	40%	50%
Motorway	Increase in the Rate of Electric Vehicles in Traffic	40%	75%
Motorway	Increased Fuel Efficiency in Traffic and Vehicles	30%	40%
Motorway	Conversion to Electric Vehicles in Public Transport	75%	100%
Highway	Conversion to Electric Vehicles in Municipality Fleet	75%	100%
Highway	Increase in conversion from car to public transport	20%	50%
Highway	Increase in conversion to pedestrian or micro-mobility	10%	30%
Waste	Increase in waste recovery	25%	60%
Waste	Increase in methane collection efficiency	10%	15%
Waste	Increase in methane combustion efficiency	10%	15%

3.4. National and Regional Greenhouse Gas Reduction Targets

At the 26th Conference of the Parties, the Government of Türkiye notified its updated First Nationally Determined Contribution (NDC) in the context of the Glasgow Climate Accord, in addition to the Paris Agreement. With this submission, Türkiye confirms that it will reduce its GHG emissions by 41% by 2030 (695Mt CO_2 equivalent in 2030) compared to the baseline scenario set out in its First NDC (and Intended Nationally Determined Contribution), with 2012 as the base year (reference year). Türkiye's updated NDC covers the whole economy and includes comprehensive mitigation and adaptation actions as well as assessments of means of implementation. Türkiye intends to peak its emissions no later than 2038. The new reduction target represents significantly more ambitious on the basis of science and equity and is a step forward towards achieving a net zero target by 2053.

Türkiye's National Energy Plan was prepared in 2022 and the study horizon covers the period until 2035 based on Türkiye's 2053 Net Zero Emission Target. According to Türkiye's National Energy Plan, the installed electricity capacity will increase from 95,9 GW in 2020 to 189,7 GW in 2035. The share of renewable+nuclear energy sources, which was 52% of the installed capacity in 2020, will reach 68,5% by 2035.

According to the Plan, it is aimed to reduce energy intensity (energy consumed per unit of production) by 35 per cent in the period 2020-35 with energy efficiency projects to be carried out especially in the industrial sector.

In Türkiye's National Energy Plan, the targets for the 2035-2053 period are envisaged as follows:

- In 2020, per capita primary energy consumption increases from 1,7 toe/person to 2,4 toe/person.
- The share of renewable energy sources in primary energy consumption increases from 16,7% in 2020 to 50% by 2053. Nuclear energy reaches a share of 29,3%.
- The share of fossil resources, which was 83,3% in 2020, is 20.8% in 2053. The share of coal decreases to 3,6%, oil to 5,6% and natural gas to 11,7%.

In the report "Türkiye's Decarbonisation Roadmap-Transformation Calendar and Geography 2020-2050" published by Istanbul Policy Center and Sabancı University in November 2023, the development of electricity generation installed capacity by resources is analysed. According to the Net-Zero scenario, it is predicted that the ratio of renewable + nuclear energy in electricity generation should reach 90% in 2050. When the greenhouse gas emission distribution of Bandırma Municipality is analysed, the sectors with the highest mitigation potential are electricity, road transport and housing, respectively.

Bandırma district is a region with high wind energy potential due to its geographical location. Average wind speeds in Bandırma generally vary between 4-7 m/s. These speeds are particularly favourable for wind energy production and there are many licensed Wind Power Plants in the region. It is also one of the important solar energy production regions of our country with an average total solar radiation of 1550 KWh/m^2/year and an average sunshine duration of 10 hours.

The transport sector is the second sector that causes the highest greenhouse gas emissions after energy production. In the "Mobility Vehicles and Technologies Roadmap" published by the Ministry of Industry and Technology, the 2030 targets for road transport are defined as follows:

- Increasing the electric vehicle market share to 35%,
- To reach at least 75 % of electric vehicle localisation rate,
- Reaching approximately 2,5 million vehicles in the electric vehicle stock,
- To export with the solutions developed in the field of micro-mobility and to be in the top 5 in the world in this ranking,
- Install a total of 251.000 public charging sockets.

In line with the 2019/601 directive of the European Union, the production of internal combustion passenger cars and light commercial vehicles will be gradually reduced across Europe and will be zeroed in 2035. The Turkish automotive industry, which exports approximately 75% of its production to European countries, also focuses on electric vehicle investments in this direction. Between 2035 and 2050, electric vehicles are expected to increase significantly in road traffic, especially in urban centres.

With the Presidential Circular dated 04/11/2023 and numbered 2023/15, the energy saving target for public buildings obliged to appoint an energy manager according to the Energy Efficiency Law No. 5627 was set as minimum 30% by 2030. The actions defined in the "Saving Target and Implementation Guide for Public Buildings (2024-2030)" prepared under the coordination of the Ministry of Energy and Natural Resources will be implemented in order to achieve the determined saving target and ensure energy efficiency and emission reduction. Buildings with a total construction area of 2000 m^2 or more must be constructed as "Nearly Zero Emission Buildings", the energy performance class in the Energy Performance Certificate must be B or better, and at the same time, the building must use renewable energy at least 10% of its primary energy requirement.

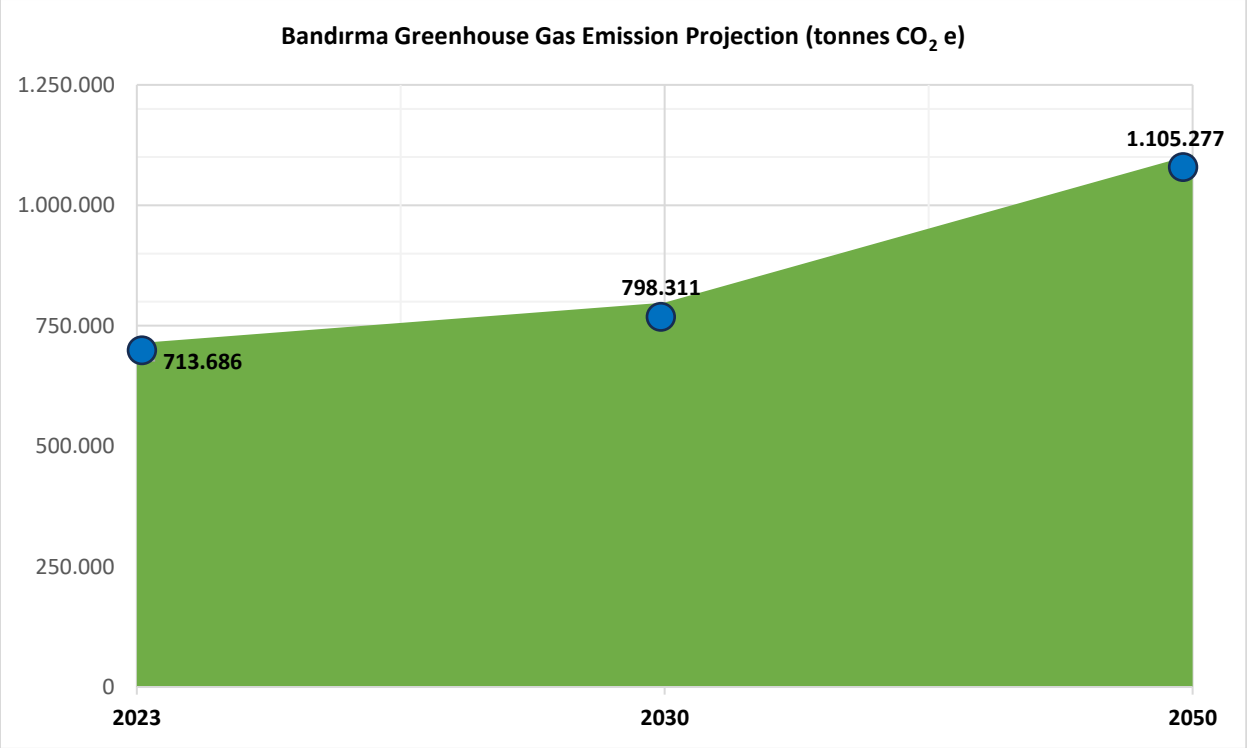
3.4.1. Emission Projection

For Bandırma, 2023 was selected as the baseline year and emissions for the years 2030 and 2050 were calculated from these baseline year emissions, taking into account the population growth rates. Projected population growth rates and emissions are shown in the table and graph below:

Table 10: Emission Projections

Baseline Projection	Base Year: 2023	Intermediate Target: 2030	Target: 2050
Population Growth Rate	**Iller Bank Method**		
Bandırma Population, person	166.836	186.958	258.847
Greenhouse Gas Emission, tonnes CO_2e/year	713.686	798.311	1.105.277
Greenhouse Gas Emissions, tonnes CO_2e/person	4,27	4,27	4,27

Graph 21: Bandırma Greenhouse Gas Emission Projection



3.4.2. Bandırma Greenhouse Gas Emission Reduction Targets

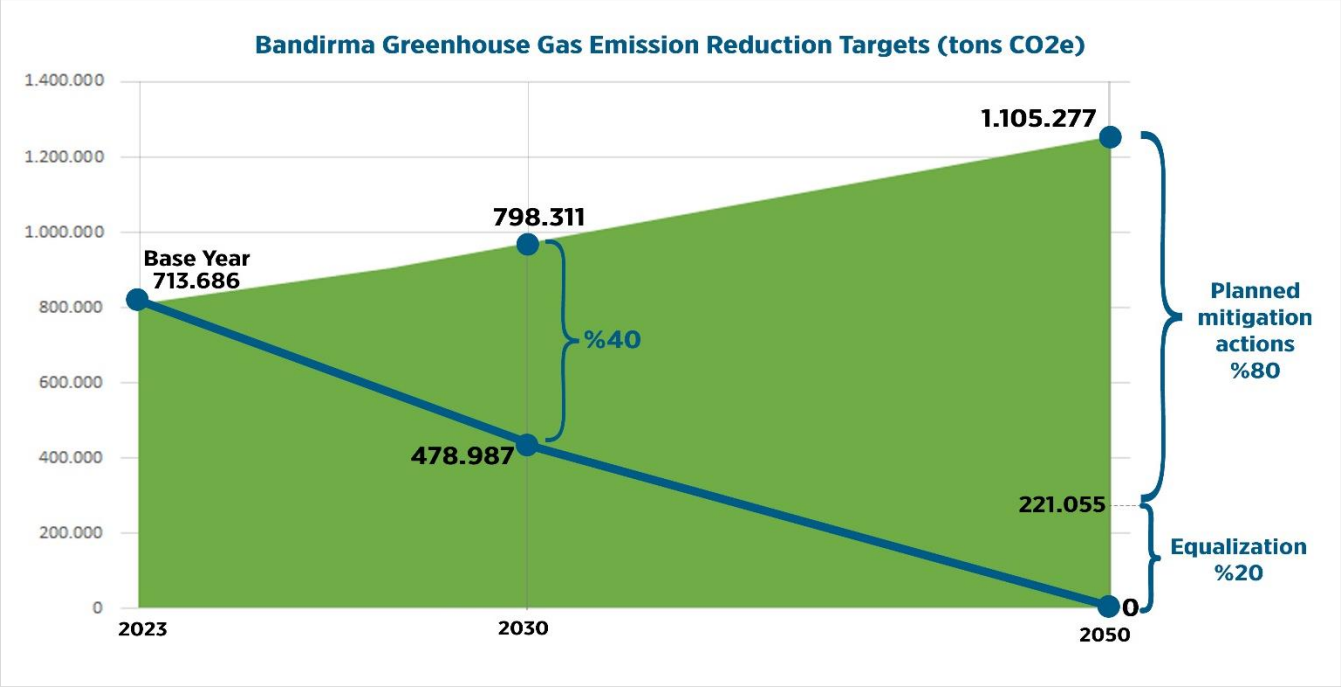
In line with the sectoral mitigation scenarios, the following targets have been determined for the years 2030 and 2050 both in absolute value and per capita emission amount. Accordingly, 80% reduction is targeted from the emission amount of 1.105.277 tonnes CO_2 e, which is the current projection for 2050. As a result of the reduction actions in the amount of emission per capita, it is aimed to decrease from 4,27 tonnes CO_2 e/person to 0,85 tonnes CO_2 e/person with 80% reduction and to make the residual emissions carbon neutral by offsetting method. Türkiye's National Contribution Declaration Target for 2030 is 41% reduction according to the baseline projection (BAU), 2053 is determined as carbon neutral, and Bandırma greenhouse gas reduction targets are in line with Türkiye's target.

Greenhouse gas mitigation targets are shown in total absolute value and per capita emission intensity in the table and graphs below.

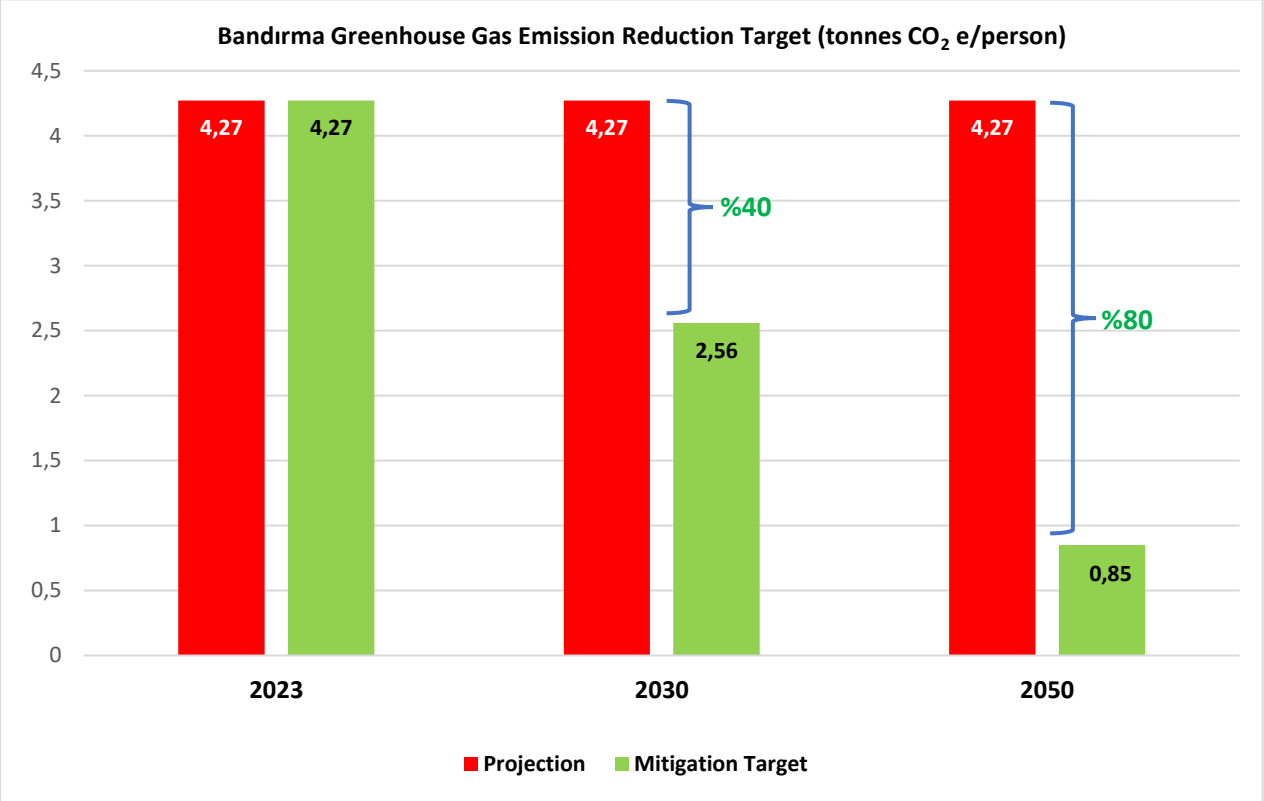
Table 11: Emission Reduction Targets

Targets	Base Year: 2023	Intermediate Target: 2030	Target: 2050
Emission Projection, tonnes CO e_2	713.686	798.311	1.105.277
Absolute Greenhouse Gas Emissions, tonnes CO e_2	713.686	478.987	221.055
Absolute Greenhouse Gas Emission, % Reduction	-	40%	80%
Greenhouse Gas Emissions, tonnes CO e/person$_2$	4,27	2,56	0,85

Graph 22: Greenhouse Gas Emission Reduction Scenario Graph



Graph 23: Per Capita Greenhouse Gas Emission Reduction Target



3.4.3. Residual Emissions and Offsetting

In 2050, total greenhouse gas emissions will increase by approximately 55% compared to the base year 2023. Despite this increase, this plan, which is prepared to reduce absolute value emissions by 80% in 2050 compared to 2023, shows the determination of Bandırma Municipality. With this ambitious SECAP, Bandırma Municipality will make up-to-date calculations of residual emissions through annual emission inventory reporting and future emission modelling. Bandırma Municipality will plan and annually review its residual emissions offsetting (renewable energy productions) and carbon sinks (afforestation) projects to achieve net zero emissions by 2050. As defined in the SECAP process, annual senior management review meetings will be held to ensure that planned actions are implemented and new actions are included in the plan. In line with this process model, SECAP will be kept up-to-date as a management system tool.

4. RISK AND VULNERAILITY ASSESSMENT

4.1. Risk and Vulnerability Assessment for Bandırma

Climate change is a major problem worldwide. However, the effects of these changes are felt intensely not only at the general level but also at the local level. The results of human activities such as excessive consumption of natural resources, greenhouse gas emissions, rapidly growing urban areas and industrialisation increase the concentration of greenhouse gases in the atmosphere and lead to global warming. In this context, climate change-related disasters experienced worldwide in recent years show that urban areas suffer the most.

Cities are important regions that are both responsible for 75 % of human activities and produce 80 % of global greenhouse gas emissions. Therefore, the role of cities in combating climate change is becoming critical. Increasing world population and increasing rate of urbanisation further increase the importance of cities in combating climate change. Therefore, it is necessary to develop sustainable urban planning and management strategies.

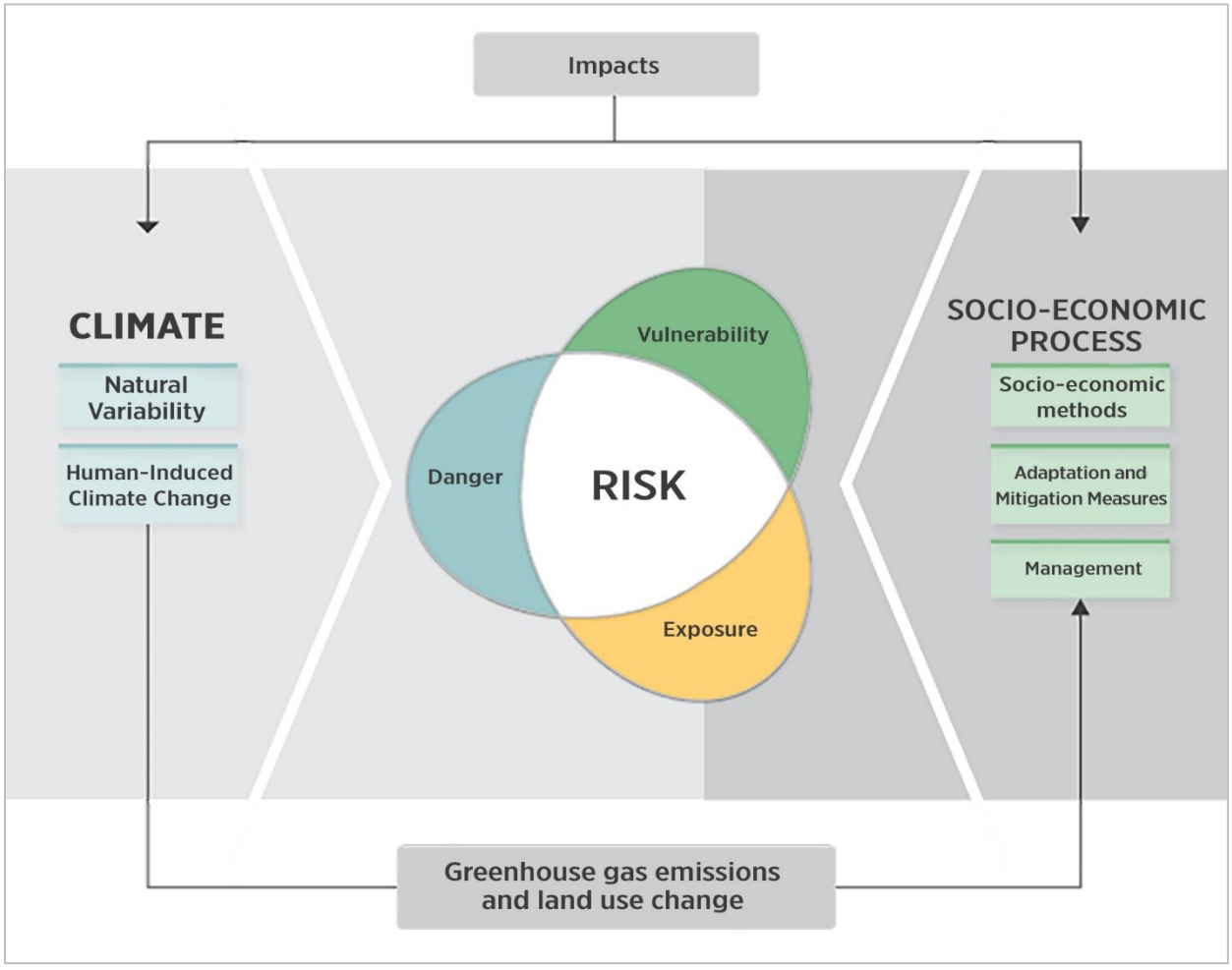
Risk and Vulnerability Assessment for Bandırma

Risk and vulnerability analyses are vital for coping with climate change. In this context, we see that urban areas such as Bandırma district are facing expected weather and climate hazards and earthquake risk due to its location in the first degree earthquake zone.

A detailed risk and vulnerability analysis is needed for Bandırma to reveal the risks and impact areas that climate change will bring about in the future. With this risk and vulnerability analysis, it will be possible to determine a road map about the climate risks that cities will face in the future. Risk analyses will form the basis of adaptation action plans. Although the negative consequences of climate change appear to be similar, it is important to identify the specific hazards of regions and cities in order to make cities more resilient.

Bandırma has many factors affecting its vulnerability to climate impacts with its geographical location, natural and cultural characteristics, development pattern, spatial configuration, built environment, physical infrastructure, environmental conditions, socio-economic characteristics and institutional structure. Therefore, it can be said that risk and vulnerability analyses play an important role in determining the adaptation strategies of the district to climate change.

Figure 11: Process of climate risk, hazard, exposure and vulnerability



Source: *IPCC, Managing The Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, 2012.*

As seen in the figure above, the combination of the concepts of hazard, exposure and vulnerability constitutes climate risk. Exposure of societies with high vulnerability to a climatic hazard means the emergence of climate risk. The preparation of climate adaptation action plans by cities will enable these fragile societies to become much more resilient against the climate problems they will face. This planning is of great importance in terms of developing adaptation capacity to shock and stress situations due to climate change.

Accordingly, before developing such adaptation actions, assessments should be made in accordance with the specific risks of the region or city and strategies should be determined in accordance with these analyses. Therefore, a risk and vulnerability assessment has been made for Bandırma by taking into consideration the secondary consequences that will occur in addition to the primary impacts such as heat and cold waves, excessive precipitation, floods, sea level rise, storms and tornadoes, water scarcity and drought, forest fires.

4.2. Methodology

The methodologies for climate change risk and vulnerability assessment used in the Covenant of Mayors (CoM) risk and vulnerability assessment and the Ireland - Fingal Climate Change Action Plan 2019-2024 have formed the basis for the methodology in this document. The first step for climate change risk and vulnerability analysis is to put forward a projection according to different climatic disasters. The climatic events considered for Balıkesir-Bandırma have been selected considering the risks faced by Bandırma and Balıkesir. Accordingly, extreme weather events caused by variables such as hail, storms, floods risks have been determined. In addition, sea level rise risk has also been taken into consideration, considering that the seaside coast of Bandırma district may be directly affected by a possible sea level rise.

The areas and sectors that will be affected by these climate events are determined as infrastructure systems and transport, green infrastructure, water management, waste management, public health and disaster management. These selected areas also reflect the action areas to be addressed within the scope of the climate change action plan. The result of the risk and vulnerability analysis will provide guidance for the development of actions for emergency response areas by identifying priority issues for Bandırma. Accordingly, in order to reveal the risky situations for Bandırma, the probability of occurrence of the hazard and the exposure situation should be evaluated. With this assessment, the risk level will be obtained.

Risk is a function of the probability of a hazard effect and the overall consequence of the exposure situation. Accordingly (Risk = Exposure x Probability). Accordingly, by focusing on the most vulnerable, it is ensured that the systems, assets and groups most at risk are prioritised.

Exposure Score x Probability Score = Risk Level

The results can also be expressed as an estimate of the disruptions caused by climatic disasters and variables. The table below shows the scoring matrix. In this methodology, risk levels are calculated by giving points from 1 to 5 to the concepts of probability and exposure. Exposure score shows the impacts that will occur as a result of climatic events. The grading of these impacts is determined as minor, moderate, significant and critical. The probability rating expresses the predictions of the realisation of the climatic event. These rating values are stated as rare, unlikely, possible, probable, highly probable and almost certain. Finally, the risk level that emerges from the evaluation of these two situations reveals the areas of the district that need to be addressed urgently. The risk level is graded with 1-6, 7-14 and 15-25 point intervals, which are obtained by multiplying

the exposure and probability situations scored from 1 to 5[7] . The risk level is given by colour in the graph below.

The consequences of the hazard and/or risks of a climatic event:			The likelihood of risks occurring in the future:			The level of risk that means it needs to be addressed urgently:	
Exposure Score			Probability Score			Risk Level	
Critical	5		Almost Certain	5		Almost certain	15-25
Important	4	**X**	High Probability	4	**=**	High Probability	7-14
Centre	3		Possible	3		Possible	1-6
Less	2		Low Probability	2			
Negligible	1		Nadir	1			

Possible						Great Possibility								Almost Certain									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

[7] The calculation method and methodology details in this section are adapted from the climate change action plan report of Ireland-Fingal for 2019-2024.

Table 12: Risk assessment matrix

CONCLUSION					
	Asset damage/engineering losses	**Health & Safety**	**Environment**	**Service Priority**	**Reputation**
Critical (5)	It is the disaster that causes the closure or collapse of the asset or property.	Single or multiple deaths and permanent injuries occur.	Critical and significant damages caused by widespread impact. In this case, recovery takes more than one year and complete recovery is unlikely.	It results in failure to provide priority services.	It has national and long-term implications with the potential to affect the stability of the government.
Important (4)	A critical incident where only the continuity of extraordinary or emergency activities can be ensured.	Large and numerous significant injuries occur, resulting in long-term disability.	Significant damage caused by localised impact. In this case, recovery will take more than one year and adaptation to the surrounding environment will not be possible.	It has a major impact on the provision of priority services.	It receives unfavourable coverage in the national press and leaves a bad impression on public opinion.
Medium (3)	Requires an emergency Activities Continuity It is a serious event that can be provided.	Moderate requiring professional intervention Injuries or multiple minor injuries occur.	Moderate damage caused by moderate impact. In this case, recovery is achieved in one year.	Moderate impact on the provision of priority services (positive or negative)	It is reported in the national press and has an adverse effect on public opinion.
Less (2)	It is the unfavourable event in which the activities can be carried out.	Minor injuries occur that require minimal intervention or treatment.	Events that have an effect within certain limits. In this case, measurable improvement is achieved within one month after the effect.	It has a minor impact on the provision of priority services (positive or negative).	It has a short-term effect on public opinion for a certain segment.
Negligible (1)	It affects the ability to continue activities at a normal level.	Only minimal injuries requiring first aid occur.	The environment has no impact on the key findings. Point source utilisations are present and do not need remediation.	It has a positive impact on the service or priority service.	It has a temporary effect on public opinion for a certain segment of the population.

4.3. Weaknesses of the Region

Sudden downpours represent one of the most potentially hazardous conditions for coastal cities worldwide. Climate change is rapidly increasing the frequency of extreme and sudden extreme meteorological events, exposing coastal areas, especially densely populated and populated coastal areas, to potential damage and hazardous conditions.

Bandırma receives wind in general during the year in terms of climate. Since the amount of area open to the wind is high, the amount of existing and planted trees and green areas remains limited. However, high wind rates during the year also offer opportunities for Renewable Energy (RES).

Bandırma is a city with a settlement among areas with high slope as physical characteristics. For this reason, houses and workplaces are flooded in the city centre after heavy and prolonged rains. The most important reasons for this are infrastructure problems and low amount of green areas and trees. Again, due to these physical characteristics, there is a risk of landslides on the high slopes close to the sea.

Bandırma district is located in the 1st degree earthquake zone and is shown by experts as one of the areas with high probability of destructive earthquakes. High-rise and aged buildings in the building stock in the city centre carry risks both in terms of disaster management and environmental impacts in the event of a possible earthquake disaster.

In Bandırma, a significant portion of the population lives in apartment buildings. This situation makes it difficult for car owners to install personal car charging units and forces them to use the units in common areas. This increases costs and charging times. This is seen as a problem that needs to be solved in the long term.

The coronavirus pandemic, which started in early 2020, has shown variability with factors such as the survival time of the virus, sun rays and air temperature, even if it is not directly related to climate change. In addition, mankind's effort to dominate nature causes changes in other living things and natural areas and can increase the spread of such viruses. As in the coronavirus pandemic, climatic conditions affect the spread of viruses, parasites or bacteria that are not directly caused by climate change.

Table 13: Climate hazards, risks and affected sectors in Bandırma district

Climate Hazards	Climate Risks	Affected Sectors	Affected Vulnerable Segments of Society
Floods	Damage to infrastructure, inundation of transport lines, residential areas and agricultural lands due to floods	Settlement Areas Food, Agriculture, Forestry, Transport Waste-Wastewater	Poor, Small Producers, Students
Storm	Damage to building roofs as a result of excessive wind and storms. Damage to seedlings during flowering period	Buildings, Transport Food, Agriculture, Forestry	Disabled, Small Producers, Elderly, Sea Transport
Earthquake Risk	Bandırma district is located in the 1st degree earthquake zone and is shown by experts among the areas with a high probability of destructive earthquakes.	Emergency Management. Settlements, Buildings, Agriculture, Transport, Health, Energy and Water Supply, Public Health	All Segments
Heat Wave / Heat Island Effect	Life-threatening for the chronically ill, the elderly and the poor. Forest fires due to extreme temperatures. Decline in agricultural and animal production	Food, Agriculture, Forestry Public Health Energy and Water Supply	Elderly, Chronically ill, Small Producers, Poor people
Drought	Decline in agricultural production, soil salinisation due to over-irrigation. Decline in energy production and water reserves and water supply.	Food, Agriculture, Forestry Energy and Water Supply	Small Producers, Poor, Chronically Ill
Insect Invasion	Decrease in agricultural yields due to infestation by harmful insects (olive fly, etc.).	Food, Agriculture, Forestry Public Health Emergency Management.	Small Producers, Poor
Airborne and Waterborne Diseases	Life-threatening for the chronically ill and elderly due to airborne or waterborne diseases	Public Health Food, Agriculture, Forestry Emergency Management. Education	Elderly, Chronically Ill, Students
Vector Diseases	Life-threatening for the chronically ill and elderly due to diseases transmitted by insects and flies	Public Health Emergency Management. Food, Agriculture, Forestry	Elderly, Chronically Ill, Students
Fires	Decrease in forest areas. Fire and danger to life for settlements close to forests. Decrease in bee and other insect populations. Life threatening for wild animals	Food, Agriculture, Forestry Emergency Management Energy and Water Supply Housing Settlement	Small Producers, Poor, Disabled, Elderly
Hail	As a result of excessive hail, it affects fruit and vegetable production during the flowering period. Damage to vehicles due to excessive hail	Food, Agriculture, Forestry Transport	Small Producers
Fog	Interruption of air and maritime traffic due to excessive fog	Transport	All Segments
Sea Level Rise	Risks for both freshwater and marine ecosystems in flooded areas	Marine ecosystem, Food, Emergency management, Public health, Settlements	All Segments
Landslide / Collapse	Disruption of transport. Danger of collapse for constructions in landslide-prone areas.	Buildings-Settlements	All Segments

4.4. Identification of Adaptation Strategies

Climate change adaptation action plan studies are extremely important in order to make cities resilient to climate change. In order to mitigate the impacts of climate change, the study of Bandırma's current greenhouse gas inventory calculations is one of the most important steps in putting forward mitigation scenarios and commitments.

In addition to this, the issue of developing adaptation actions by reconsidering the cities and increasing the social, economic and environmental resilience of the city through these actions should be kept on the agenda despite the inevitable situations and impacts that will arise due to climate change. In this context, climate change adaptation actions of Bandırma are evaluated together with other strategic plans of the city and put forward as a solution proposal. These actions have been grouped in parallel with the methodology of the Covenant of Mayors and considering the current situation of Bandırma. Action groups have been formed as ecosystem services, biodiversity and green areas, water management, urban, infrastructure and waste management, public health and disaster management, agriculture and tourism.

In order to eliminate the needs of the city in the climatic context and the risks faced or to minimise their impacts, actions should be determined by considering the results of risk and vulnerability assessment. In this section, adaptation actions are put forward by considering the current situation of Bandırma and risk and vulnerability assessment. These actions were determined within the scope of the workshop (survey) where internal and external stakeholders of Bandırma came together in the context of ensuring public awareness and included in this study.

5 ENERGY POVERTY

5.1. Definition and Scope of Energy Poverty

Energy poverty is defined as the inability of individuals and households to access sufficient resources to meet their basic energy needs. This includes the inability to meet basic needs such as heating in winter and cooling in summer. Energy poverty is closely related to economic poverty, but it is an issue that needs to be addressed in a broader framework. Factors such as insufficient income, high energy costs and buildings with low energy efficiency contribute to energy poverty. Energy poverty is not only an individual but also a social problem and needs to be addressed in the context of social justice and human rights.

The International Energy Agency (IEA) defines energy access as "households with reliable and affordable access to both clean cooking facilities and electricity, with an electricity level initially sufficient to provide a basic package of energy services and then increasing over time to reach the regional average". According to Article 7 of the UN Sustainable Development Goals, it is aimed to "invest in clean energy sources to ensure that everyone has access to affordable energy by 2030, reduce electricity consumption in buildings and industry through the adoption of cost-effective standards, expand infrastructure to provide clean energy in all developing countries, and promote growth and contribute to the environment by upgrading technology".

Measuring Energy Poverty:

According to studies, a household is considered "energy poor" when its total energy expenditure (electricity + water + natural gas) exceeds 25% of its monthly or annual budget. According to the research conducted in the EU, while the rate of those who cannot be sufficiently heated at the residential level was 8,2% in 2017, it is 22,3% in Türkiye. The second important result obtained from the study is related to households experiencing financial difficulties in paying bills such as electricity, water and gas. While the rate of those who have problems in paying bills is 8.1% in the EU, this rate is 24.2% in Türkiye (Selçuk and Köktaş, 2018). In the electricity sector, households that consume less than 100 kWh per month or 1200 kWh per year or allocate more than 10 % of their total budget for electricity costs are called electricity poor.

Dimensions of Energy Poverty:

Energy poverty is a problem with economic, social and environmental dimensions. Each of these dimensions is addressed separately:

Economic Dimension: Households experiencing energy poverty struggle to meet other basic needs due to high energy costs. This is particularly evident in low-income households.

Social Dimension: Energy poverty can lead to social exclusion. Individuals living in cold and damp houses have difficulties in participating in social life. Especially children may fall behind in education.

Environmental Dimension: Energy poverty also affects environmental sustainability. Households living in old buildings with low energy efficiency often consume more energy, which increases carbon emissions.

Social Impacts of Energy Poverty:

When we analyse the social impacts of energy poverty in depth, health problems, social exclusion and economic challenges are the main ones. Living in cold or inadequately heated homes can lead to respiratory diseases, cardiovascular problems and other health problems. Furthermore, energy poverty can increase social exclusion, as individuals in this situation have difficulty participating in social activities.

5.2. Causes of Energy Poverty

Income Inequalities:

The most obvious cause of energy poverty is income inequalities. Low-income households have difficulty in meeting their energy bills. Households experiencing energy poverty usually have to allocate a large portion of their income to energy expenditures. This situation causes these households to have difficulty in meeting other basic needs (such as food, shelter, health). It is also observed that these groups with low income levels tend to live in houses with low energy efficiency and therefore have higher energy bills.

Energy Prices:

Higher energy prices contribute negatively to the increase in energy poverty. Higher fossil fuel prices lead to higher energy bills for households. In particular, the liberalisation of energy markets and the reduction of energy subsidies negatively affect low-income households. Fluctuations in energy prices and global energy markets have negative impacts on poor households.

Low Energy Efficient Houses:

Another important reason is housing with low energy efficiency. Older buildings consume more energy due to factors such as inadequate thermal insulation, old windows and doors, inefficient heating systems. This increases energy bills and deepens energy poverty. It is observed that energy poverty has become widespread, especially since a large part of the housing stock in Türkiye has low energy efficiency. It is observed that people living in old and uninsulated buildings have to spend more energy, thus increasing energy poverty.

Inadequacies in Energy Infrastructure:

Inadequate energy infrastructure leads to energy poverty, especially in rural areas. Energy infrastructure deficiencies are known to make energy supply unstable in some areas, making it difficult for households to meet their energy needs. Rural dwellers in particular may have older and inefficient energy systems, which exacerbates energy poverty. It is also a fact that inadequacies in energy infrastructure increase energy costs.

Political and Structural Factors:

Considering political and structural factors as another cause of energy poverty, the failure of energy policies to adequately protect poor households further deepens energy poverty. Inadequate energy subsidies or lack of regulations to facilitate access to energy make it difficult for low-income households to access energy. More inclusive and equitable energy policies are needed to overcome energy poverty. Energy policies need to be geared towards ensuring social equality. It should not be forgotten that these policies can be a fundamental tool in the fight against energy poverty.

Climate Change and Environmental Factors:

When we consider how climate change affects energy poverty, climate change causes fluctuations in energy demand; for example, extreme temperatures increase the need for cooling, while extreme cold increases the need for heating. This situation exacerbates energy poverty. In addition, factors such as rising energy prices due to climate change, the decline of fossil fuels and the cost of switching to renewable energy sources also contribute to energy poverty. Energy poverty must also be taken into account in the fight against climate change. These two problems are fundamentally interlinked.

5.3. Consequences of Energy Poverty

Energy poverty causes various negative impacts on individuals and society:

Health Impacts: Inadequate heating or cooling conditions pose serious health risks, especially for the elderly, children and people with chronic diseases. Health problems such as respiratory diseases and cardiovascular diseases are among the direct consequences of energy poverty.

Social Exclusion: Individuals experiencing energy poverty may be excluded from social life. Especially the results such as children falling behind in education, cold home environments making it difficult to study are part of the social effects of this poverty.

Economic and Psychological Effects: Persistently high energy bills can lead to psychological problems such as economic stress and depression. In addition, lack of access to energy can negatively affect labour force participation.

5.4. Energy Poverty in Türkiye

A detailed analysis of the energy poverty situation in Türkiye shows that energy poverty in Türkiye is particularly prevalent in rural areas and among low-income households. Türkiye's energy policies need to be reshaped towards upgrading old buildings with low energy efficiency and expanding renewable energy sources. Moreover, high energy prices and inadequate energy subsidies are cited as the main causes of energy poverty in Türkiye.

5.5. Strategies to Combat Energy Poverty

Improving Energy Efficiency: Renovation projects to improve the energy efficiency of buildings play a key role in combating energy poverty. Government incentives and support programmes are very important in this regard.

Utilisation of Renewable Energy Sources: Increased use of renewable energy sources such as solar and wind can alleviate energy poverty by reducing energy costs.

Outreach Programmes: Outreach programmes for households struggling to pay energy bills can reduce the impacts of energy poverty. Such programmes need to be expanded.

Information and Awareness Campaigns: Raising public awareness on energy saving and reducing energy poverty is an important part of this struggle.

5.6. Solution Suggestions for the Future

Reforming Energy Policies: Energy policies in Türkiye need to be reformed to facilitate access to energy for poor households. This could include steps such as increasing energy subsidies and introducing special energy tariffs for low-income households.

International Co-operation: International co-operation and information sharing have an important place in the fight against energy poverty. There are many examples of good practices that Türkiye can learn from other countries in this field.

Social Equity and Justice: Preventing energy poverty is also critical for ensuring social equality and justice. Energy poverty should be considered as a violation of human rights and policies should be formulated with this perspective.

5.7. Energy Poverty and Bandırma

Energy poverty is an increasing problem in both developed and developing countries. Factors such as global warming, limited resources of fossil fuels, rising energy prices and income inequalities make it difficult for societies to access energy, leaving many households unable to meet their basic energy needs. This situation not only reduces the quality of life of individuals, but also threatens broader social welfare and sustainable development.

Energy poverty is the inability of households to meet heating, lighting, cooking and other basic energy needs due to difficulties in accessing adequate energy resources. This situation leads to serious social and health problems, especially in low-income households and vulnerable groups such as the elderly population and children. Energy poverty also constitutes a significant obstacle in combating climate change. Households with energy access problems are often forced to use old and dirty energy sources with low energy efficiency, leading to increased greenhouse gas emissions.

As Bandırma Municipality, combating energy poverty, implementing a sustainable energy management approach and improving the quality of life of our citizens are among our main priorities. In this direction, we develop strategies to reduce energy poverty within the scope of SECAP (Sustainable Energy and Climate Action Plan). These strategies include innovative solutions to increase energy efficiency, the use of renewable energy resources and social awareness campaigns.

SECAP has been prepared to ensure that everyone living in Bandırma district has access to energy and to ensure that this access is sustainable. This plan includes targets and action steps to reduce energy poverty and also strengthens the role of local governments in combating climate change. Our goal is to create a pioneering model for energy management in Bandırma and to ensure that this model sets an example for other regions.

In this framework, as Bandırma Municipality, we are determined to combat energy poverty while at the same time implementing climate-friendly energy policies and encouraging the participation of our citizens in this process. The most fundamental components of SECAP are to use energy efficiently for a sustainable future, to disseminate renewable energy resources and to ensure that all segments of society are involved in this process.

Strategic Approach of Bandırma Municipality within the Scope of Energy Poverty and Climate Action Plan (SECAP)

Energy poverty is a critical issue at the intersection of social inequalities and climate change in today's world. Millions of people globally face serious challenges in accessing sufficient energy, which creates major difficulties in meeting heating, cooling, lighting and basic household needs. Energy poverty is not only an economic and social problem, but also directly affects environmental sustainability. Communities with no or limited access to energy are often dependent on low-efficiency, high-carbon emission energy sources, which further triggers global warming.

Current Status of Energy Poverty in Bandırma:

Bandırma district is one of the regions that feel the effects of energy poverty significantly due to its climatic conditions and demographic structure. The intense cold weather conditions, especially in winter months, cause low-income households to have difficulty in meeting their heating costs. In addition, a large part of the old housing stock in the district consists of buildings with low energy efficiency, which increases energy costs and makes it difficult for households to access energy. Field studies and surveys show that approximately 25 % of households in Bandırma are at risk of energy poverty.

Strategic Approach of Bandırma Municipality:

In this context, as Bandırma Municipality, we have developed a comprehensive strategy to reduce energy poverty within the scope of SECAP (Sustainable Energy and Climate Action Plan). This strategy includes the following key elements:

1. Energy Efficiency Projects:

Energy efficiency projects will be initiated to improve the energy performance of the existing housing stock in Bandırma. In this context, thermal insulation of buildings, renovation of windows and doors, use of energy efficient appliances will be encouraged and financial support for households will be introduced. These initiatives will minimise the risk of energy poverty by reducing energy costs.

2. Dissemination of the Use of Renewable Energy Sources:

Bandırma Municipality will implement various support programmes to encourage the use of renewable energy sources, especially solar energy. Especially for low-income households, grants and low-interest loan opportunities for the installation of solar panels will be explored, thus aiming to reduce energy bills in a sustainable way.

3. Social Support and Awareness Campaigns:

In order to raise public awareness in the fight against energy poverty, comprehensive education and information campaigns will be organised. These campaigns aim to raise citizens' awareness on energy saving and encourage them to use sustainable energy. In addition, direct support programmes will be developed for energy-poor households and solutions to facilitate access to energy will be provided within the scope of social services.

4. Green Infrastructure and Climate Resilience:

Green infrastructure projects will be implemented to reduce the negative impacts of climate change and make Bandırma a more resilient city. These projects will reduce the risks of natural disasters, increase energy efficiency and make the local population more resilient to energy poverty.

5. Policy and Regulations:

Bandırma Municipality will develop local regulations and policies aiming to reduce energy poverty and increase national and international co-operation in this field. The targets to be set within the scope of SECAP will concretise the measures to be taken against energy poverty and make them applicable.

Future Goals:

As Bandırma Municipality, with the implementation of SECAP, we aim to reduce energy poverty in our district by 40% by 2030. In this context, the risk of energy poverty will be reduced by improving the energy efficiency of a certain number of households each year, the rate of renewable energy use will be increased to 20%, and equality of access to energy will be ensured in all communities. In the long term, our main goal is to make Bandırma an energy sustainable, climate-friendly city.

Combating energy poverty is not only an energy policy, but also a matter of social justice and sustainable development. As Bandırma Municipality, we act with this awareness and take decisive steps to end energy poverty within the framework of SECAP. We expect the active participation of our citizens in this process and believe that we will continue to work together for a greener and fairer Bandırma.

6. ACTION PLAN AND IMPLEMENTATION

6.1. Mitigation Actions

Strategy 1- Sustainable Buildings and Waste Management

Action 1.1- Improving Institutional Capacity for Energy Efficiency and Greenhouse Gas Reduction

Action 1.2- Pilot Practices for Net Zero Emission in Municipal Buildings

Action 1.3- Supporting Energy Efficiency in Existing Buildings

Action 1.4- Zoning Plans for Net Zero Emission in New Settlements

Action 1.5- Supporting Renewable Energy Production in Bandırma

Action 1.6- Improving Waste Management and Increasing Waste Recovery

Action 1.1 - Improving Institutional Capacity for Energy Efficiency and Greenhouse Gas Reduction	
Related Sub-Sector	Municipal Buildings and Facilities
Share in Total Base Year Emissions	11.189 tonnes CO_2e/year
Available Mitigation Capacity	Low
Sub-Actions and Activities	1. Establishing ISO 50001 Energy Management System in Bandırma Municipality and conducting annual internal audits and reviewing the system performance annually 2. Development of internal structure and organisation within the Municipality to manage SECAP and Energy Management System processes. 3. Conducting energy efficiency studies in Bandırma Municipality facilities, monitoring and reporting energy loss analyses annually. 4. Leading information and project sharing meetings with energy management units of other public institutions in Balıkesir. 5. Preparation of a "General Green Procurement Specification" to enable decision-making based on "lifetime cost, energy efficiency and sustainability" instead of "procurement cost" in public procurement.
Time Interval	Short Term < 5 years
Responsible Institutions and Organisations	Balıkesir Metropolitan Municipality, Bandırma Municipality
Mitigation Impact of the Action (%)	%15
Approximate Cost	12.500 €

Action 1.2 Pilot Practices for Net Zero Emission in Municipal Buildings	
Related Sub-Sector	Municipal Buildings and Facilities
Share in Total Base Year Emissions	11.189 tonnes CO_2e/year
Available Mitigation Capacity	Low
Sub-Actions and Activities	6. Ensuring at least 30% energy efficiency in municipality-owned buildings by 2030 and "Nearly Zero Energy Building" Obtaining B class energy identity certificate within the scope. 7. At least 100% of the energy needs of the buildings belonging to the Municipality to be provided from renewable energy sources. 8. New buildings to be constructed by the municipality are smart and green buildings systems. (Self-sufficient energy generating solar PV panels, green roof application, natural architecture supporting lighting, high thermal insulation, LED lighting, heating-cooling with heat pump) 9. Energy efficiency, renewable energy efficiency for training and awareness purposes including examples of energy and water saving practices, an Energy programme that shows the efficiency differences of the applications with measurements. Realisation of the Efficiency Park project. 10. Determined as a result of energy audits in the buildings and facilities belonging to the municipality improvements aimed at reducing energy losses realisation. 11. PV solar panels on the roofs of municipal buildings and facilities realisation of renewable energy production. 12. Indoor market areas with PV solar panels on the roofs realisation of renewable energy production. 13. All street, alley and car park lighting (possible integrated with PV panel where available) LED luminaire realisation of transformation.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality
Impact of Action on Mitigation (%)	%100
Approximate Cost	460.000 €

Action 1.3 Supporting Energy Efficiency in Existing Buildings	
Related Sub-Sector	Residential Buildings Stationary Energy - Institutional and Commercial Buildings
Share in Total Base Year Emissions	420.218 tonnes CO_2e/year
Available Mitigation Capacity	High
Sub-Actions and Activities	14. Inspection of the insulation projects of existing buildings by the relevant municipalities during the construction phase, in this regard requesting a modification project. 15. Making it compulsory for existing buildings to obtain Energy Performance Certificate and supervision. 16. "Nearly Zero Energy Building" in buildings larger than 2000 m^2 auditing criteria. 17. Focus group with energy managers of commercial buildings in the district Organising meetings and sharing good practice examples 18. Natural gas from coal use for heating purposes in residential buildings use of the new technology. 19. Energy efficient renovations in existing residential and commercial buildings (heat insulation) 20. PV SPP applications in existing residential and commercial buildings (facilitating the provision of information and documents, roof static project support etc.) 21. Energy efficient LED lighting in existing residential and commercial buildings To carry out awareness-raising activities for its dissemination. (Giving LED bulbs as a gift for environmentally sensitive behaviours, poster, banner, wall painting etc.) 22. Efficient system for space cooling in residential and non-residential buildings and switching to devices. 23. Install electrical appliances with high energy class in residential buildings to popularise its use. 24. Sector stakeholders should be involved in energy efficiency in buildings raising awareness and increasing public awareness.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality
Impact of Action on Mitigation (%)	%52
Approximate Cost	1.675.000 €

Action 1.4 Zoning Plans for Net Zero Emission in New Settlements	
Related Sub-Sector	Residential Buildings Stationary Energy - Institutional and Commercial Buildings
Share in Total Base Year Emissions	420.218 tonnes CO_2e/year
Available Mitigation Capacity	Low
Sub-Actions and Activities	25. Updating the Municipal Zoning Regulation to be compatible with roof solar energy systems, rain harvesting, grey water systems, thermal insulation, LED lighting and other energy efficiency criteria. 26. Energy efficient buildings to be constructed within the scope of urban transformation applications and determination of performance criteria. 27. In urban regeneration applications, centralised heating and cooling projects and/or, where appropriate, high project design using efficient heat pump applications 28. Taking energy efficiency practices as a threshold criterion in master and implementation zoning plans. 29. Unusual landscaping that generates its own renewable energy of ecological housing estates/sites that realise the arrangements (with competitions) to be rewarded.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality
Mitigation Impact of the Action (%)	%30
Approximate Cost	1.162.000 €

Action 1.5 Supporting Renewable Energy Production in Bandırma	
Related Sub-Sector	Stationary Energy - Energy Plants
Share in Total Base Year Emissions	-
Available Mitigation Capacity	High
Sub-Actions and Activities	30. Ensuring cooperation with experts to conduct awareness studies on renewable energy and energy efficiency in residences. 31. Popularisation of solar energy systems in areas unsuitable for agriculture. 32. Planning investments in solar energy systems under the control of the Municipality to balance the greenhouse gas emissions of municipal facilities. 33. Organising national/international symposiums to ensure capacity development on the issues of Solar/Wind Power Plants and other renewable energies in the region. 34. Joint efforts of relevant ministries, municipalities and industrial facilities to increase the production of waste-derived fuels for emission reduction purposes.
Time Interval	Long Term, >15 years
Responsible Institutions and Organisations	Bandırma Municipality
Mitigation Impact of the Action (%)	-
Approximate Cost	Cost unpredictable

Action 1.6 Improving Waste Management and Increasing Waste Recovery	
Related Sub-Sector	Waste - Storage of Solid Waste
Share in Total Base Year Emissions	27.190 tonnes CO_2e/year
Available Mitigation Capacity	Low
Sub-Actions and Activities	35. Develop innovation and private sector co-operation in waste collection services. 36. Organised Industrial Zone recyclable waste collection mainstreaming. 37. Establishment of recycled waste - organic product swap markets 38. Integrated Waste Management Project. 39. Collection of usable clothes/shoes and waste oil/batteries/bottles units to be rolled out. 40. Establishment and optimisation of a system for separate collection of recyclable waste from households. 41. Establishment of a central facility for compost production from biodegradable waste within the scope of integrated waste management. 42. Encouraging the public to use compost in buildings and rural areas; developing standard projects, purchasing the produced compost by local governments.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality Balıkesir Metropolitan Municipality OIZ Directorates
Impact of Action on Mitigation (%)	%45
Approximate Cost	1.513.000 €

Strategy 2- Green Transport - Green Corridors

Action 2.1- Encouraging micro-mobility and pedestrian transport and developing bicycle lanes

Action 2.2- Emission Reduction in Municipal Vehicle Fleet

Action 2.3- Encouraging and Supporting the Use of Electric Vehicles

Action 2.1 Encourage micro-mobility and pedestrian transport and develop bicycle lanes	
Related Sub-Sector	Highway
Share in Total Base Year Emissions	251.871 tonnes CO_2e/year
Available Mitigation Capacity	Low
Sub-Actions and Activities	1. Preparation of Bicycle Transport Master Plan (BISUAP) and its integration into development plans. 2. Creating afforested green corridors that will provide easy pedestrian and/or bicycle access to Bandırma Onyedi Eylül University. 3. Extending bicycle lanes throughout Bandırma District. 4. Create incentive mechanisms to ensure that pedestrian and bicycle routes are more preferred. 5. Prioritisation of areas that can be used as bicycle and pedestrian routes in order to make bicycle paths safe. 6. Expanding micro-mobility applications such as shared electric scooters or shared bicycles. 7. Bicycle parking area and repair station application-mobile application development. 8. Increasing the number of streets and areas closed to traffic.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality
Impact of Action on Mitigation (%)	%35
Approximate Cost	1.300.000 €

Action 2.2 Emission Reduction in Municipal Vehicle Fleet	
Related Sub-Sector	Municipal Transport Vehicles
Share in Total Base Year Emissions	3.128 tonnes CO_2e/year
Available Mitigation Capacity	Low
Sub-Actions and Activities	9. Development of waste collection optimisation with GIS based digital mapping. 10. Conducting a feasibility study for the substitution of the municipal vehicle fleet with low carbon vehicles. 11. Ensuring the conversion of service vehicles within the municipality into electric vehicles. 12. Providing training on economic and safe driving techniques for municipal service vehicle personnel, public transport, etc. vehicle drivers .
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality
Impact of Action on Mitigation (%)	%65
Approximate Cost	1.243.000 €

Action 2.3 Encouraging and Supporting the Use of Electric Vehicles	
Related Sub-Sector	Highway
Share in Total Base Year Emissions	251.871 tonnes CO_2e/year
Available Mitigation Capacity	High
Sub-Actions and Activities	13. Organising seminars etc. to encourage the use of electric vehicles and ensuring cooperation with relevant stakeholders. 14. Expanding charging stations and providing free service for a certain period of time. 15. Establishment of car parks where fast charging can be done in integration with SPP for electric vehicles. 16. Banning internal combustion fossil fuel vehicles from entering the district centre and zero emission zones. 17. Popularisation of the use of electric tractors in agriculture. 18. Introduce regulations for the withdrawal and collection of internal combustion cars over 20 years old. 19. Determination and planning of infrastructure requirements for hydrogen fuelled vehicles. 20. Encourage initiatives for shared car application.
Time Interval	Long Term, >15 years
Responsible Institutions and Organisations	Relevant Ministries and provincial organisations Bandırma Municipality Balıkesir Metropolitan Municipality
Impact of Action on Mitigation (%)	%55
Approximate Cost	4.270.000 €

6.2. Adaptation Actions

Strategy 3- Urban Life Resilient to Climate Risks

Action 3.1 - Emergency Response, Prevention and Capacity Building Programme against Climate Risks

Action 3.2 - Increasing urban green areas in accordance with international standards

Action 3.3 - Climate Resilient Settlement and Urban Development Planning

Action 3.4 - Supporting vulnerable segments of society against climate hazards

Action 3.5 - Improving Preventive Activities against Climate Borne Diseases

Action 3.6 - Reducing water consumption and developing effective demand management solutions

Action 3.7 - Supporting irrigation efficiency and organic agriculture

Action 3.8 - Training and Awareness Raising Activities on Climate Change

Action 3.1 Emergency Response, Prevention and Capacity Building Programme against Climate Risks	
Climate Hazards	Extreme Rainfall and Floods, Extreme Temperatures, Drought, Sea Level Rise
Available Compliance Capacity	Medium
Important Sectors Affected	Transport, Agriculture, Housing
Sub-Actions and Activities	1. Identification of critical urban infrastructures and risk analysis to assess their deformation due to climate impacts. 2. Strengthening emergency response vehicle/equipment capacity. 3. Improving the effectiveness of Disaster Emergency Response Plans and Procedures. 4. Creation and monitoring of climate risks and affected area maps. 5. Remote controlled and sensor supported emergency early warning systems. 6. Development of emergency warning mobile applications against hail, excessive rainfall and heat waves 7. Preparation and monitoring of 20, 50, 100-year rainfall intensity maps and City Flood Master Plan 8. Construction and/or expansion of stormwater and sewerage infrastructure investments in problematic areas. 9. Separation of stormwater and sewerage systems in areas with combined systems. 10. Programming of preventive maintenance activities in stormwater channel systems / renewal / expansion / capacity increase 11. Increasing porous pavements, green and wetland recreational areas against surface flood risks. 12. Extending the practices enabling the participation of rainwater to groundwater in urban areas 13. Explaining and implementing agricultural drought control methods that will minimise the effects of drought to small agricultural producers in the district 14. Inspection of roof systems. Creation and licensing of building roof systems according to wind intensity. 15. To reduce the use of asphalt pavement in transportation as much as possible and to make natural stone pavement applications widespread (use of asphalt with water absorption capability). 16. Use of environmentally friendly materials with non-slip texture on pedestrian roads
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality, AFAD, BASKİ, DSI
Effect of Action on Harmony	High
Approximate Cost	5.000.000 €

Action 3.2 Increasing urban green areas in accordance with international standards	
Climate Hazards	Extreme Heat Waves and Heat Island Effect
Available Compliance Capacity	High
Important Sectors Affected	Public Health, Agriculture, Housing
Sub-Actions and Activities	1. To ensure a homogeneous distribution throughout the city, establishing accessible green areas and parks of not less than 0.5 hectares in each neighborhood and increasing the amount of urban green areas to 4 m^2 in the medium term and to 7 m^2 in the long term. 2. Arranging suitable areas in the city centre as hobby gardens. 3. Creation of a blue-green infrastructure and ecological corridors through the development of nature-based solutions. 4. Increasing porous pavements, green and wetland recreational areas against the heat island effect. 5. Organising the city assembly areas as protection areas against heat waves by afforestation. 6. Carrying out afforestation works in areas open to disasters (stream beds, landslide risk, etc.). 7. Increasing urban afforestation, green and recreational areas with spray pools against heat waves. 8. Developing forest areas with afforestation projects suitable for the climate of the region. 9. Dense afforestation with broad-leaved trees suitable for the regional climate along sidewalks to protect pedestrians from extreme heat waves. 10. Creation of seating and resting areas in parks.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality, Balıkesir Metropolitan Municipality
Effect of Action on Harmony	High
Approximate Cost	1.621.000 €

Action 3.3 Climate Resilient Settlement and Urban Development Planning	
Climate Hazards	Extreme Heat Waves and Heat Island Effect Extreme Precipitation and Floods, Drought
Available Compliance Capacity	Medium
Important Sectors Affected	Public Health, Agriculture, Housing, Transport
Sub-Actions and Activities	1. Plans such as zoning plans, disaster plans and other policy documents or strategic plans should be addressed with a holistic approach, taking into account the Sustainable Energy and Climate Change Action Plan, and revised if necessary. 2. Prevent urban development from spreading to areas vulnerable to extreme climate impacts. 3. Indication of areas subject to flood disasters or flooding in the environmental plan. 4. Planning the relocation of existing settlements in disaster-prone areas (stream beds, landslide-prone areas, etc.) 5. Development of zoning standards for the installation of roof gardens. 6. Making zoning regulations that will prevent construction that will prevent wind paths / air flow.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality, Balıkesir Metropolitan Municipality
Effect of Action on Harmony	High
Approximate Cost	622.000 €

Action 3.4 Protecting and supporting vulnerable segments of society against climate hazards	
Climate Hazards	Extreme Heat Waves and Heat Island Effect Drought Airborne and Waterborne Diseases Vector-borne Diseases
Available Compliance Capacity	Medium
Important Sectors Affected	Public Health, Agriculture, Housing
Sub-Actions and Activities	1. Designing a network for potable water fountains and water fountains in every 5-10 min. walking distance throughout the city. 2. Placing reusable clothes, shoes, textile piggy banks near social buildings such as schools, mosques, etc. and establishing social stores accessible to poor segments of society. 3. Free collection of reusable furniture by the municipality and distribution to the poor. 4. Identification and prioritisation of the physical, social and financial difficulties of vulnerable segments of society through surveys. 5. Develop social support programmes to increase the resilience of vulnerable segments of society against extreme climate impacts. 6. Develop a support programme for the protection of stray animals against extreme climate impacts. 7. Pilot programmes to improve the livelihoods of vulnerable segments of society. 8. Improving the settlement needs of communities that are critically vulnerable to climate impacts. 9. Addressing climate migration issues with a process management approach. Determining the potential impacts of climate migration on public service provision and employment, such as water, energy, transportation, education, and preparing a regional action plan that includes measures to reduce problems that put pressure on the ecosystem in line with these findings. 10. To conduct research to better analyse heat-related morbidity and mortality. 11. Create cold refuge areas for vulnerable groups against the heat island effect. 12. Develop social solidarity projects and campaigns to reach vulnerable segments of society (Pending invoice etc.) 13. In case of heavy rainfall or heat waves, in line with meteorological data, stop working in open areas, use flexible working and remote working and training methods and warn citizens accordingly.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality Balıkesir Metropolitan Municipality Provincial Health Directorate Provincial Directorate of Family and Social Services BASKI
Effect of Action on Harmony	Medium
Approximate Cost	662.000 €

Action 3.5 Developing Preventive Activities Against Climate Borne Diseases	
Climate Hazards	Airborne and Waterborne Diseases; Vector-borne Diseases
Available Compliance Capacity	Medium
Important Sectors Affected	Public Health, Agriculture, Housing
Sub-Actions and Activities	1. Cleaning and spraying of stream beds and flood water channels against vector breeding. 2. Adoption of a single health approach that combines different fields such as medicine, veterinary medicine, food and agriculture (holistic ecological approach). 3. Development of physical and biological methods instead of pesticides in vector control. 4. Developing sustainable methods of intervention to vector focal points at the right time. 5. Strict inspection, licensing, periodic cleaning and maintenance of school water tanks. 6. Rehabilitation of wetlands at risk of disease. Monitoring and control of water sources for water-borne diseases. 7. Development/dissemination of telemedicine applications and devices. 8. To take measures to break their biological cycles in order to prevent the increase in the distribution and number of mites such as ticks due to global warming. 9. Insect control in dry and stagnant wetlands. 10. Ensuring partridge and quail production for natural control of vectors. Effective implementation of hunting bans. 11. Raising awareness of the society against vector-borne diseases. 12. Avoiding unconscious vector spraying. Obtaining service from authorised biocidal product applicators.
Time Interval	Short Term, <5 years
Responsible Institutions and Organisations	Bandırma Municipality Balıkesir Metropolitan Municipality Balıkesir Provincial Health Directorate
Effect of Action on Harmony	High
Cost	54.000 €

Action 3.6 Reducing water consumption and developing effective demand management solutions	
Climate Hazards	Drought
Available Compliance Capacity	Medium
Important Sectors Affected	Agriculture, Energy, Housing
Sub-Actions and Activities	1. Training and awareness campaign on water saving 2. Pricing application for efficient use of water. Water demand management solutions. (Prepaid meter, gradual tariff, limitation, etc.) 3. Technical regulations and examples of grey water systems support with applications. 4. Supporting rainwater harvesting systems with technical regulations and sample applications. 5. Dissemination of devices and sensors that provide savings in taps. (Pilot applications in public institutions, educational institutions and municipal buildings) 6. Use of efficient irrigation system in green areas. 7. Utilisation of the water treated at the Wastewater Treatment Plant in urban green areas.
Time Interval	Medium Term, 5-15 years
Responsible Institutions and Organisations	Bandırma Municipality Balıkesir Metropolitan Municipality BASKI
Effect of Action on Harmony	High
Approximate Cost	650.000 €

Action 3.7 Promoting irrigation efficiency and organic agriculture	
Climate Hazards	Drought
Available Compliance Capacity	Medium
Important Sectors Affected	Agriculture, Energy, Water Supply
Sub-Actions and Activities	1. Raising awareness of producers about the bad consequences of excessive and unconscious irrigation (salinisation, rising ground water). 2. Rainwater harvesting techniques in fields, gardens and vineyards Increasing productivity by using, reducing water erosion. 3. Selecting plants resistant to water stress and with high frequency production. 4. Water consumed instead of agricultural irrigation fee per decare to be collected according to the amount. 5. Early warning system for drought-related water resource scarcity Establishment. 6. Establishment of the necessary station to increase irrigation efficiency in agriculture by measuring meteorological parameters. 7. Necessary for the dissemination of efficient irrigation systems Providing incentives and ease of financing. 8. Measured irrigation taking into account plant water needs. 9. Taking soil protection measures to reduce plant water consumption. 10. Planning agricultural production that can be more adaptable to climate projections and impacts (drought, etc.). 11. Ancestral seed support and awareness-raising activities for producers 12. Establishment of "Organic Market" areas in cities and districts 13. Organic agriculture clustering and co-operation support and encouragement.
Time Interval	Long Term, > 15 years
Responsible Institutions and Organisations	Bandırma Municipality, DSI, Provincial Directorate of Agriculture and Forestry Irrigation Unions and Cooperatives
Effect of Action on Harmony	High
Approximate Cost	1.756.000 €

Action 3.8 Training and Awareness Raising Activities on Climate Change	
Climate Hazards	All Negative Effects of Climate Change
Available Compliance Capacity	Medium
Important Sectors Affected	Education, Housing, Energy
Sub-Actions and Activities	1. Organizing campaigns and events to inform citizens about the effects of climate change and encouraging participation in these events. 2. Disseminating news, research and solution proposals about climate change through the media and informing the public. 3. Organizing public opinion surveys and research to measure citizens' level of knowledge about climate change and thus developing awareness strategies and reaching target audiences more effectively. 4. Organizing panels and forums to inform the society about climate change and to share different opinions. 5. Organizing education and awareness activities in schools 6. Creating informative and impressive visuals, infographics, videos, documentaries and written content about climate change. Reaching a wide audience by sharing these contents on social media and other platforms. 7. Providing information about green technologies and sustainable solutions that can be used in the fight against climate change and creating incentives for these technologies.
Time Interval	Short Term, <5 years
Responsible Institutions and Organisations	Bandırma Municipality, District Directorate of National Education
Effect of Action on Harmony	Low
Approximate Cost	27.000 €

6.3. Energy Poverty

Strategy 4- Combating Energy Poverty

Action 4.1 Planned Actions to Combat Energy Poverty	
Climate Hazards	Energy Access and Scarcity, Economic Challenges due to Climate Change
Available Compliance Capacity	Medium
Important Sectors Affected	Energy, Housing, Social Services, Economy
Sub-Actions and Activities	1. Establish programmes to increase energy efficiency for low-income households; encourage practices such as insulation, window and roof renovations in buildings. 2. Initiate projects to install solar panels and mini wind turbines for low-income households to increase access to renewable energy. 3. Enabling communities to meet their own energy needs by establishing energy co-operatives. 4. Provide direct financial support for low-income households on energy bills. 5. To enable households to manage their energy consumption more effectively by installing smart meters and energy monitoring systems. 6. Organise awareness-raising campaigns on energy poverty; educate society on energy saving and transition to renewable energy. 7. Organise trainings on energy efficiency and renewable energy in schools and community centres. 8. Provide incentives for green technologies and energy efficient devices; develop practices such as tax reduction and financial support. 9. Establishment of Energy Desk within Bandırma Municipality.
Time Interval	Short Term, <5 years
Responsible Institutions and Organisations	Bandırma Municipality, District Social Welfare Directorate, Ministry of Energy
Effect of Action on Harmony	Medium
Approximate Cost	190.000 €

7. STAKEHOLDER ENGAGEMENT, SECAP MONITORING AND REPORTING

7.1. Stakeholder Identification

Bandırma Municipality has created the stakeholder list in Table 14 in order to understand the current situation in the ecosystem in which it is located, to evaluate the positive and negative effects of various factors in the external environment and to create input for SWOT analysis.

Table 14: Bandırma Municipality stakeholder list

Stakeholder List	
KEY STAKEHOLDERS	1. ***All citizens*** 2. ***Mukhtars*** A total of 55 mukhtars, including 35 mukhtars of rural neighbourhoods and 20 mukhtars of central neighbourhoods
INTERNAL STAKEHOLDERS	All employees working under 24 directorates 1. 133 Officer 2. 75 Permanent Labourer 3. 18 Contracted Officer 4. 438 Under a Decree Law
BUSINESS AND MANAGEMENT STAKEHOLDERS	1. District Governorship 2. Municipality Council 3. Balıkesir Metropolitan Municipality 4. Ministry of Environment, Urbanisation and Climate Change 5. Court of Auditors 6. Ministry of National Education 7. Ministry of Agriculture and Forestry 8. Ministry of Treasury and Finance 9. Ministry of Family and Social Policies 10. Ministry of Interior
EXTERNAL STAKEHOLDERS	1. Suppliers for all goods and services procured under the Public Procurement Law 2. District Governorship 3. Bandırma Seventeen September University 4. Professional Chambers 5. Co-operatives 6. Balıkesir Metropolitan Municipality 7. Türk Telekom - Super Online etc. infrastructure institutions 8. 6th Main Jet Base Command 9. District Health Directorate 10. Bird Paradise National Park 11. District Police Directorate 12. District Directorate of Agriculture and Forestry 13. Civil Society Organisations 14. Neighbouring Municipalities (Manyas, Gönen etc.) 15. Associations 16. All visitors to our district 17. Civil Society Organisations and City Council, 18. Various sponsorships in the fields of culture, arts and sports 19. Provincial Directorate of Culture and Tourism 20. 20. State Water Works

Bandırma Municipality has identified the stakeholders with whom it communicates, influences and is influenced in its ecosystem. In order to involve its stakeholders in decision-making and management processes, it receives feedback through various methods. While preparing top policy documents such as Strategic Plan, Performance Programme and SECAP, it conducts surveys and interviews to involve relevant stakeholders in the processes.

Ensuring stakeholder participation is an important element in the creation of the Sustainable Energy and Climate Action Plan. A series of survey studies were carried out by Bandırma Municipality on 24.09.2024 on greenhouse gas mitigation in order to identify priority areas in combating climate change in the preparation of the action plan and to obtain important locally specific information.

The SECAP External Stakeholder survey was conducted with 77 individuals and organisations and the awareness of renewable energy and saving practices was measured in general. The preparation process of the Sustainable Energy and Climate Action Plan includes a series of multi-actor and multi-disciplinary activities. The content of the surveys organised in this context was determined within the scope of the following working groups:

- Buildings
- Transport
- Solid Waste and Wastewater Management
- Electricity
- Agriculture and Livestock

According to the results of the survey, the rate of those who are aware of the practices related to energy saving and those who try to implement them is around 80%.

87,3% of the participants stated that they are planning to use renewable energy applications.

While private vehicles ranked first as the most frequently used means of transport with 49%, 55% of the participants stated that they would prefer to use public transport to reduce their carbon footprint.

Bandırma Municipality takes the participation of its stakeholders as a basis in both the preparation of SECAP and the implementation of adaptation and mitigation activities and ensures their participation in decision-making processes.

7.2. Monitoring and Reporting of Greenhouse Gas Reduction Activities

Table 15: Bandırma district greenhouse gas mitigation monitoring plan

Sector	Required Data	Responsible Unit (Data, Mitigation)	Data Collection Frequency	Areas for Improvement
Buildings and Facilities				
Municipality Buildings/Facilities	All fuel and electricity	Bandırma Municipality Support Services Directorate, Public Works Directorate, Machinery Supply Maintenance and Repair Directorate	Annual	Regular data collection by creating templates for data collection from the units, ensuring that the consumption is reduced by warning the relevant units when fuel and electricity consumption increases, supporting with training, encouraging reduction with rewards
Tertiary Building	All fuel and electricity	Bandırma Municipality Directorate of Zoning and Urbanisation, Directorate of Public Works, Directorate of Cleaning Works	Annual	Obtaining more information on the building stock (year of construction, building characteristics, m^2 , fuel type, etc.)
Housing	All fuel and electricity	Bandırma Municipality Directorate of Zoning and Urbanisation, Directorate of Public Works, Directorate of Cleaning Works	Annual	More information on building stock (year of construction, building characteristics, m^2 , fuel type, etc.), reducing uncertainty about solid fuel consumption
Street Lighting	Electricity	Bandırma Municipality Directorate of Public Works, Directorate of Parks and Gardens, Directorate of Zoning Affairs	Annual	Ensuring LED luminaire conversion of street lighting systems

Transport				
Municipality Fleet	All fuel and electricity	Bandırma Municipality Machinery Supply Maintenance and Repair Directorate, Support Services Directorate	Annual	Implementing a system for data collection and storage within the Municipality of Bandırma and supporting it with training
Public Transport	All fuel and electricity	Bandırma Municipality Machinery Supply Maintenance and Repair Directorate, Directorate of Public Works, Directorate of Cleaning Works	Annual	Increasing efforts to encourage public transport
Private vehicles	All fuel and electricity	Bandırma Municipality Machinery Supply Maintenance and Repair Directorate, Support Services Directorate	Annual	Carrying out studies on popularising the purchase of electric vehicles
Other Sources				
Solid waste	Amount of waste	Bandırma Municipality, Directorate of Cleaning Affairs	Annual	Improvement in data collection and storage systems
Waste water	Amount of waste water	Bandırma Municipality, Directorate of Public Works, Directorate of Cleaning Works, BASKİ	Annual	Improvement in data collection and storage systems
Local energy production	Sun, wind, biogas geothermal vs.	Bandırma Municipality, Directorate of Public Works, Directorate of Zoning and Urbanisation	Annual	Requesting production quantities from the distribution company, requesting data from EMRA on licensed and unlicensed installations

7.3. Monitoring and Reporting of Adaptation Actions

Table 16: Adaptation actions monitoring plan

Field and Sector	Indicators of impact
Buildings	Number or % of buildings damaged due to extreme weather conditions/events (public/residential/non-residential)
Transport Energy, Water, Waste, Civil Defence and Emergency	Number or % of transport/energy/water/waste/ICT infrastructure damaged due to extreme weather conditions/events
Land Use	% of grey/blue/green areas affected by extreme weather conditions/events (e.g. Heat Island Effect, Flood, Rockfall and/or Landslide, Forest/Land Fire)
Transport Energy, Water, Waste, Civil Defence and Emergency	Number of days with public service interruptions (e.g., energy/water supply, health/civil protection/emergency services, waste)
Transport Energy, Water, Waste, Civil Defence and Emergency	Average length (in hours) of public service interruptions (e.g., energy/water supply, public transport traffic, health/civil protection/emergency services)
Public Health	Number of people injured/rescued/resettled due to extreme weather event(s) (e.g. heat or cold waves)
Public Health	Number of deaths associated with extreme weather event(s) (e.g. heat or cold waves)
Civil Defence & Emergency	Average response time of police/fire/emergency services in case of extreme weather events (in minutes)
Public Health	Number of water quality warnings issued
Public Health	Number of air quality alerts issued
Environment and Biodiversity	% of area affected by soil erosion / soil quality degradation
Environment and Biodiversity	% habitat loss due to extreme weather event(s)
Environment and Biodiversity	% change in the number of native species
Environment and Biodiversity	% of native (animal/plant) species affected by diseases associated with extreme weather conditions/events
Agriculture and Forestry	% agricultural loss due to extreme weather conditions/events (e.g. drought/water shortage, soil erosion)
Agriculture and Forestry	% loss of animal stock due to extreme weather conditions
Agriculture and Forestry	% change in crop yield/evolution of annual grassland productivity
Agriculture and Forestry	% loss of animal stock due to pests/pathogens
Agriculture and Forestry	% timber loss due to pests/pathogens

Agriculture and Forestry	% change in forest composition
Agriculture and Forestry	% change in water extraction
Finance	Annual direct economic loss in Euros from extreme weather event(s) (e.g., in the commercial, agricultural, industrial/touristic sectors)
Finance	Annual compensation received in euros (e.g. insurance)
Climate	Number of days/nights with extreme temperatures (day/night time relative to reference annual/seasonal temperatures)
Climate	Frequency of heat/cold waves
Climate	Number of days/nights with extreme precipitation (day/night time relative to reference annual/seasonal precipitation)
Climate	Number of consecutive days/nights without rain
Socio-economic	Comparison of current population and projections 2023/2030/2050
Socio-economic	Population density (relative to national/regional average in country/region X in year X)
Socio-economic	% share of vulnerable population groups (e.g. older (65+)/younger (25-) people, lone pensioner households, low-income/unemployed households) - in country X relative to the national average in year X
Socio-economic	% of the population living in areas at risk (e.g. flood/drought/heat wave/forest or land fire)
Socio-economic	% of areas without access to emergency / fire services
Physical and Environmental	% change in average annual/monthly temperatures
Physical and Environmental	% change in average annual/monthly rainfall
Physical and Environmental	Length of the transport network (e.g. road/rail) in areas at risk (e.g. flood/drought/heat wave/forest or land fire)
Physical and Environmental	Length of coasts/streams affected by extreme weather conditions/soil erosion (no adaptation)
Physical and Environmental	% of areas at low altitude or elevation
Physical and Environmental	% of area on coasts or in rivers
Physical and Environmental	% of protected areas (ecologically and/or culturally sensitive) / % of forest cover
Physical and Environmental	% of areas (e.g. residential/commercial/agricultural/industrial/touristic) at risk (e.g. flood/drought/heat wave/forest or land fire)

Physical and Environmental	Comparison of current energy consumption per capita and projections 2023/2030/2050
Physical and Environmental	Comparison of current water consumption per capita and projections 2023/2030/2050
Socio-economic	% of land area hosting industry/agriculture located in areas at risk of climate hazards (floods, droughts, heat waves, forest fires or fires difficult to extinguish)
Socio-economic	Percentage of available public funds that address a climate hazard and its impacts (e.g. fire, flood, heat wave, etc.)
Socio-economic	% share of vulnerable population groups (e.g. older (65+)/younger (25-) people, lone pensioner households, low-income/unemployed households) - in country X relative to the national average in year X
Socio-economic	Number of households trained on energy / water / waste management
Socio-economic	Population density (relative to national/regional average in country/region X in year X)
Socio-economic	Percentage of population living in areas at risk (e.g. flood / drought / heat wave / forest or land fire)
Management and Corporate	Change in the green / blue infrastructure / areas of the city (%)
Physical and Environmental	Length of the transport network (e.g. road/rail) in areas at risk (e.g. flood/drought/heat wave/forest or land fire)
Physical and Environmental	Average time required to reach a health facility (min/hr)
Physical and Environmental	% of areas (e.g. residential/commercial/agricultural/industrial/touristic) at risk (e.g. flood/drought/heat wave/forest or land fire)
Physical and Environmental	Percentage of inaccessible areas for emergency response (e.g. fire-fighting services)
Information and Technology	Time required to inform the population about a risk through an early warning system (min/hr)

SOURCES

Bandırma Municipality Strategic Plan, 2025-2029.

Republic of Türkiye Ministry of Environment, Urbanisation and Climate Change, Climate Change Presidency, www.iklim.gov.tr Access Address: https://iklim.gov.tr/db/turkce/icerikler/files/%C4%B0klim%20De%C4%9Fi%C5%9Fikli%C4%9Fi%20Azalt%C4%B1m%20Stratejisi%20ve%20Eylem%20Plan%C4%B1%20(2024-2030).pdf

Republic of Türkiye Ministry of Environment, Urbanisation and Climate Change, Climate Change Directorate, www.iklim.gov.tr Access Address: https://netsifirturkiye.org/wp-content/uploads/2023/07/Turkiye-Cumhuriyeti-Guncellenmis-Birinci-Ulusal-Katki-Beyani.pdf

Republic of Türkiye Ministry of Environment, Urbanisation and Climate Change, Climate Change Directorate, www.iklim.gov.tr , https://iklim.gov.tr/eylem-planlari-i-19

Presidency of the Republic of Türkiye, Presidency of Strategy and Budget, "Twelfth Development Plan (2024-2028)", https://www.sbb.gov.tr/wp-content/uploads/2023/12/On-Ikinci-Kalkinma-Plani_2024-2028_11122023.pdf

Republic of Türkiye Energy Market Regulatory Authority, Annual Reports, https://www.epdk.gov.tr/Detay/Icerik/3-0-107/yillik-sektor-raporu

General Directorate of Mineral Research and Exploration, Resident Fault Map, https://www.mta.gov.tr/v3.0/hizmetler/yenilenmis-diri-fay-haritalari

Turkish Statistical Institute, TurkStat, https://biruni.tuik.gov.tr/

Republic of Türkiye Ministry of Agriculture and Forestry, General Directorate of Meteorology, "Global Climate Modelling, https://mgm.gov.tr/iklim/iklim-degisikligi.aspx?s=kuresel

Türkiye's Updated First National Communication of Contribution (NDC)

Mobility Vehicles and Technologies Roadmap" Ministry of Industry and Technology

Savings Target and Implementation Guide for Public Buildings (2024-2030)

Human Development Foundation, Human Development and Sustainable Development: Districts (Ige-I) Report, 2021. https://ingev.org/ingev-tam-raporlar/

IPCC Global Warming Potential Values, Greenhosue Gas Protocol, https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf

IPCC, Managing The Risks of Extreme Events and Disasters To Advance Climate Change Adaptation, 2012.

IPCC, Sixth Assessment Report (AR6)

www.ourworldindata.org

www.weatherbase.com

www.meteoblue.com

www.climatedata.org

Climate Data Store Era 5

www.ipcc.ch