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CENTRAL PROJECT MANAGEMENT AGENCY

Climate Adaptation Workshop

PROF. DR. TUNCER DEMİR

Urban Adaptation Guide: Adaptation Measures in Urban Areas:

Possible Actions and Adaptation Strategies for Various Sectors to Make Cities More Resilient to the Adverse Impacts of Climate Change

26.07.2024

ANTALYA

This training is implemented by "EU4 Energy Transition: Covenant of Mayors in Western Balkans and Turkey" project

CLIMAX

- Climate Change Adaptation Mission
- ***The CLIMAAX risk and vulnerability Assessment framework (CLIMAAX) is a 4-year Horizon Europe project that will provide financial, analytical and practical support to improve regional climate and emergency risk management plans.***
- ***THE CLIMAAX PROJECT is designed to contribute to the practice and consolidation of climate risk assessment and to leave a legacy for future European initiatives.***
- ***The project started in January 2023 and will continue until December 2026.***
- ***Financial support for regional climate risk assessments is provided through CLIMAAX Project applications.***
- ***The CLIMAAX methodological framework is designed to encompass and support inclusive and harmonized regional climate risk assessments (CRAs). The Framework translates the objectives of the EU Harmonization Mission into practice. This EU mission unites European regions towards resilience and the ability to cope with climate extremes through the implementation of transformational adaptation and emergency management strategies. This is supported by the European Environment Agency, which has developed the Regional Adaptation Support Tool (RAST) which provides practical guidance for planning, implementation and evaluation of climate adaptation strategies. This tool is based on the Compliance Support Tool logic shown below.***

List of selected beneficiaries in the CLIMAAX 1st Open Call.

NAME OF THE ORGANISATION/INSTITUTION	COUNTRY	ACRONYM	TITLE	CODE NUTS2
Sanliurfa Metropolitan Municipality	Türkiye	CRAS	Climaax Risk Assessments Methodology Implementation for the Region Sanliurfa	Türkiye (TRC2)
National Institute of Hydrology and Water Management (NIHWM)	Romania	CARE-ROPutna	Climate change floods risk assessment for enhanced preparedness and resilience of vulnerable Putna river basin local communities in Romania	RO22
ANTALYA METROPOLITAN MUNICIPALITY	Türkiye	MUHIR	Strategies for Mitigating the Urban Heat Island (UHI) Effect in Antalya (Türkiye): Integrating High-Resolution Local Data for Enhanced Climate Resilience	Türkiye (TR61)
REGION OF CENTRAL MACEDONIA (RCM)	Greece	DATABLE	climate aDApTation for vulnerABLe regions using the "CLIMAAX" framEwork	EL52
The Greens Movement of Georgia / Friends of the Earth - Georgia	Georgia	CLIMATEGURGE	CLIMate risk and vulnerability Assessment Toolbox application for the European GUria Region of GEorgia	Georgia
Municipality of Rafina-Pikermi	Greece	RAFRVA – RAFina Risk and Vulnerability Assessment	RAFRVA – RAFina Risk and Vulnerability Assessment. RVA (Risk and Vulnerability Assessment) in Municipality of Rafina-Pikermi	EL30
MUNICIPALITY OF XANTHI	Greece	CARE_X	Climaax Action and Risk Evaluation of Xanthi	EL51
Municipality of Garmen	Bulgaria	CRAG	Climate risk analysis for Garmen	BG41
Municipality of Tirana	Albania	TRA4CRA[3]	Tirana for Climate Risk Assessment and Adaptation Actions	Albania

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DIMOS EGALEO	Greece	CLISTHENES	Climate Risk Assessment in the Socially Vulnerable Communities of Egaleo	EL30
Ruse Municipality	Bulgaria	Climate Ready	Climate Ready Ruse: Planning for Resilience and Sustainability"	BG32
Municipality of 12th District of Budapest (Hegyvidék Municipality)	Hungary	MARCAdapt	Managing Risks towards a Climate Adaptive Hegyvidék	HU11
Mesto Košice / City of Košice	Slovakia	SCOPE	Sustainable Climate Outcomes for People of Eastern Slovakia	SK04
Provincial Secretariat for Urban Planning and Environmental protection	Serbia	CLIMACHANGE	Adapt on clime change in APV	Serbia
Município de Viana do Castelo	Portugal	VC_Climaax	Viana do Castelo: Climate Action	PT11
MARCHE REGION	Italy	CLIMArcheX	CLIMATE RISK ASSESSMENTS in the ADRIATIC and MEDITERRANEAN BORDERS of the EUROPEAN REGIONS - the case of MARCHE REGION in ITALY	ITI3
Aydın İli Damizlik Sığir Yetiştiricileri Birliği (ADSYB)	Türkiye	CliResDairy	Climate Resilience Enhancement in Dairy Farming	Türkiye (TR32)
Comunidade Intermunicipal da Beira Baixa (CIM-BB)	Portugal	CLIMAAX-BeiraBaixa	CLIMAAX: High-Res Analysis & Wildfire Risk Assessment in Beira Baixa	PT16
Comunidade Intermunicipal do Baixo Alentejo - CIMBAL	Portugal	CLIMAAX-4-BA	CLIMAAX For Resilience in Baixo Alentejo - Evaluating Multi-Risks and Empowering Climate Adaptation Action	PT18
İzmir Metropolitan Municipality	Türkiye	CRIZ-ERS	Climate-Ready İzmir: Enhancing Resilience Strategies	Türkiye (TR31)

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WHAT IS GLOBAL CLIMATE CHANGE?

- Global climate change refers to a long-term and general change in the Earth's general climate conditions.
- These changes can be caused by a variety of factors, such as increases in greenhouse gases in the atmosphere, changes in ocean temperatures, melting glaciers, and rises in sea levels.
- As a result of these changes, climate patterns and weather conditions change around the world.
- Global climate change has accelerated due to the increase in greenhouse gases in the atmosphere, especially due to human activities such as industrial activities, fossil fuel use, deforestation and agriculture.
- This can lead to an increase in the Earth's average temperature, extreme weather events, rises in sea levels and changes in biological systems.
- The effects of global climate change include drought, floods, heat waves, forest fires, rise in sea levels, ecosystem changes, loss of productivity in agricultural areas and impacts on human health.
- Therefore, global climate change raises serious concerns worldwide on issues such as environmental protection, sustainability and climate action.
- International efforts aim to take measures to reduce greenhouse gas emissions, promote the use of renewable energy and adapt to climate change.

GLOBAL TEMPERATURE ANOMALIES

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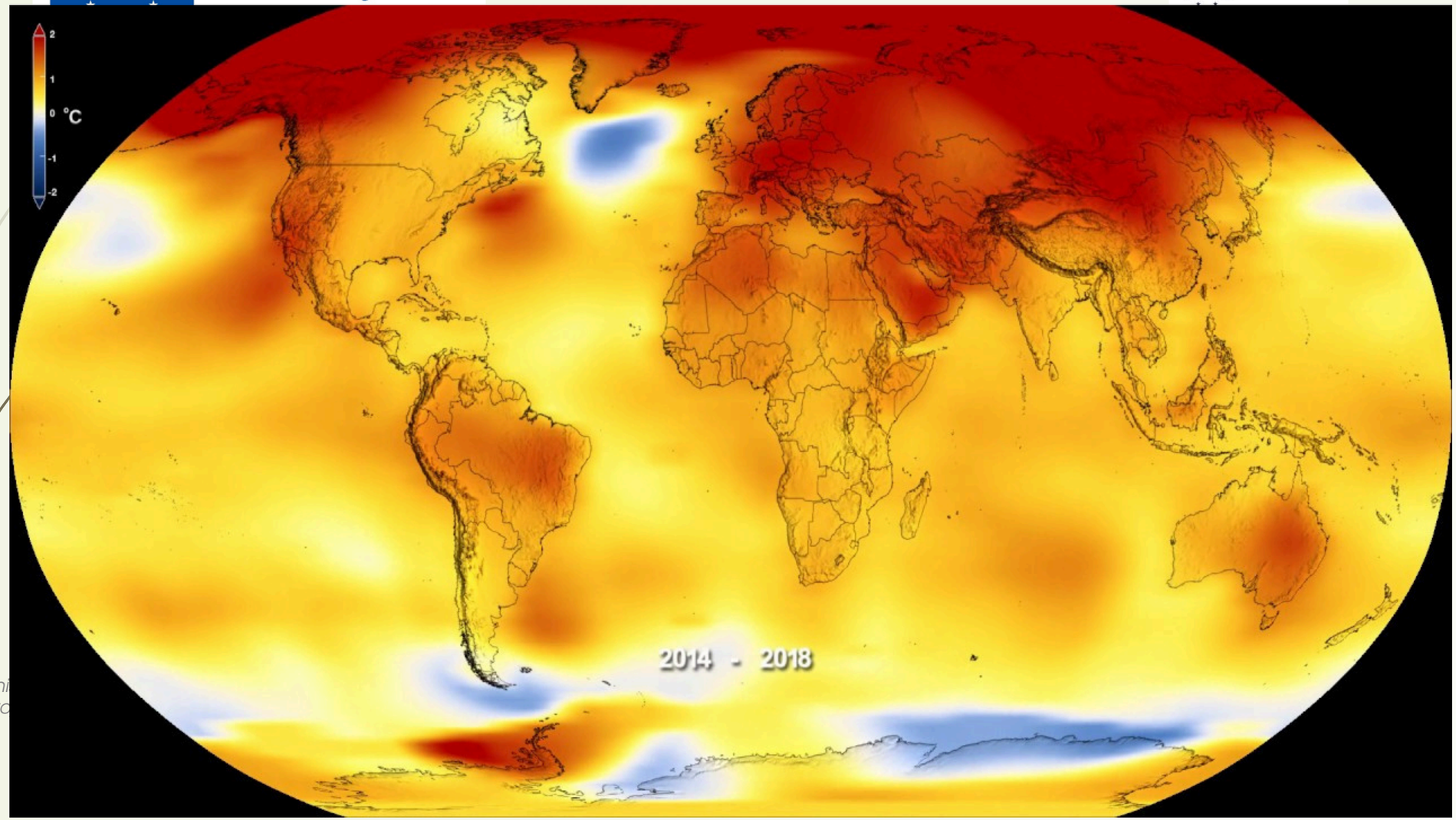

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Average Temperature Change on a Global Scale (1850 – 2020)

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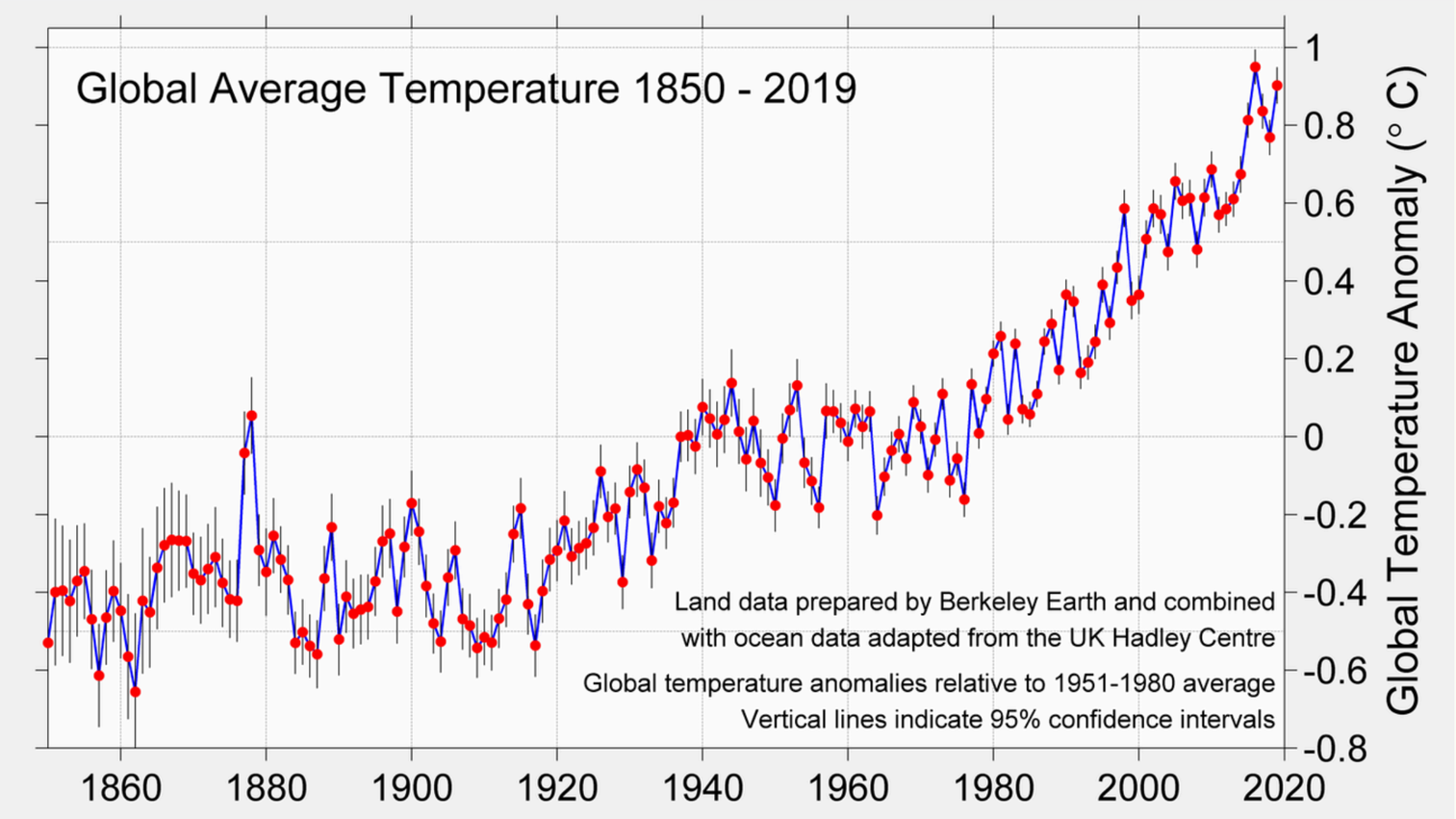
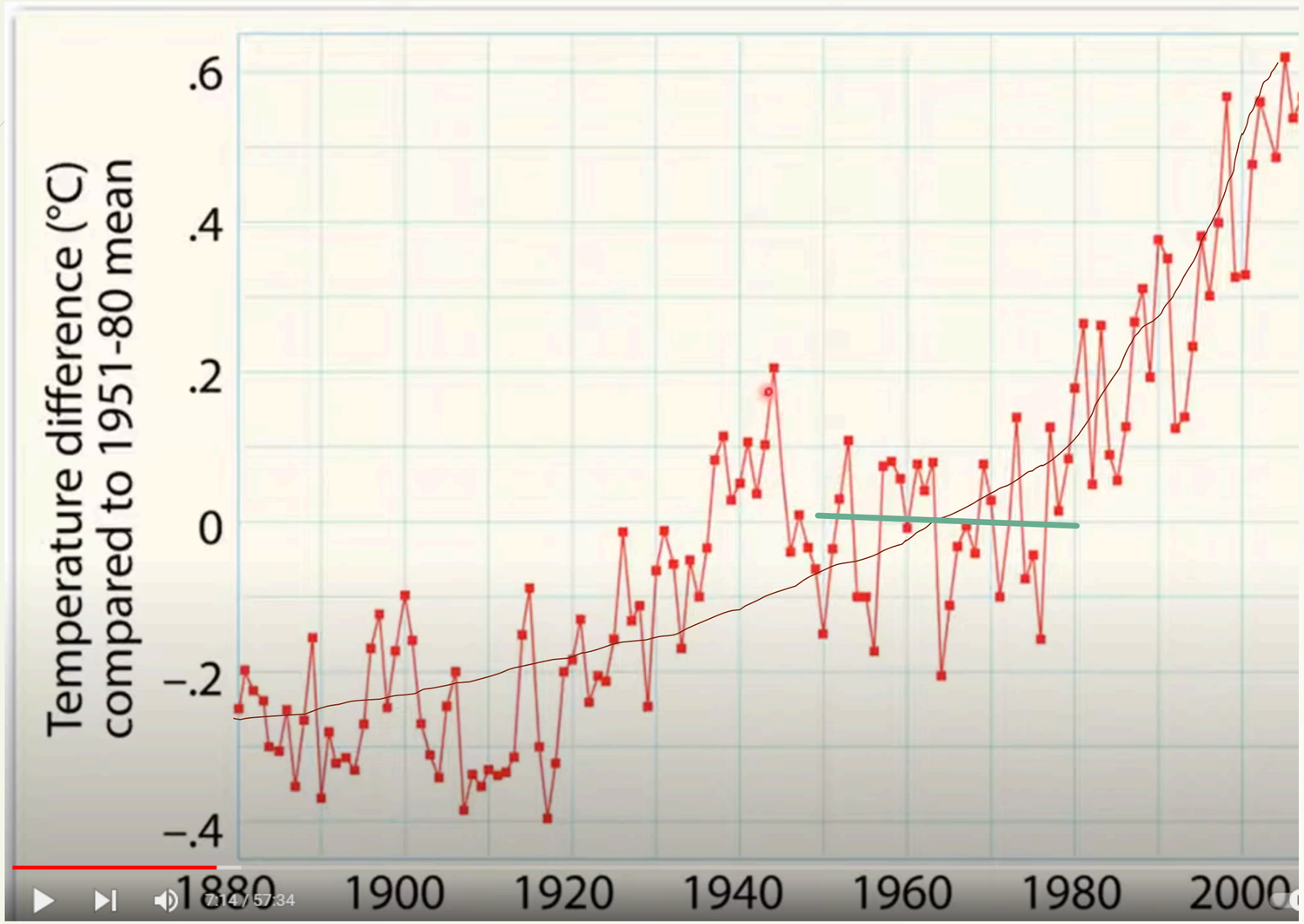
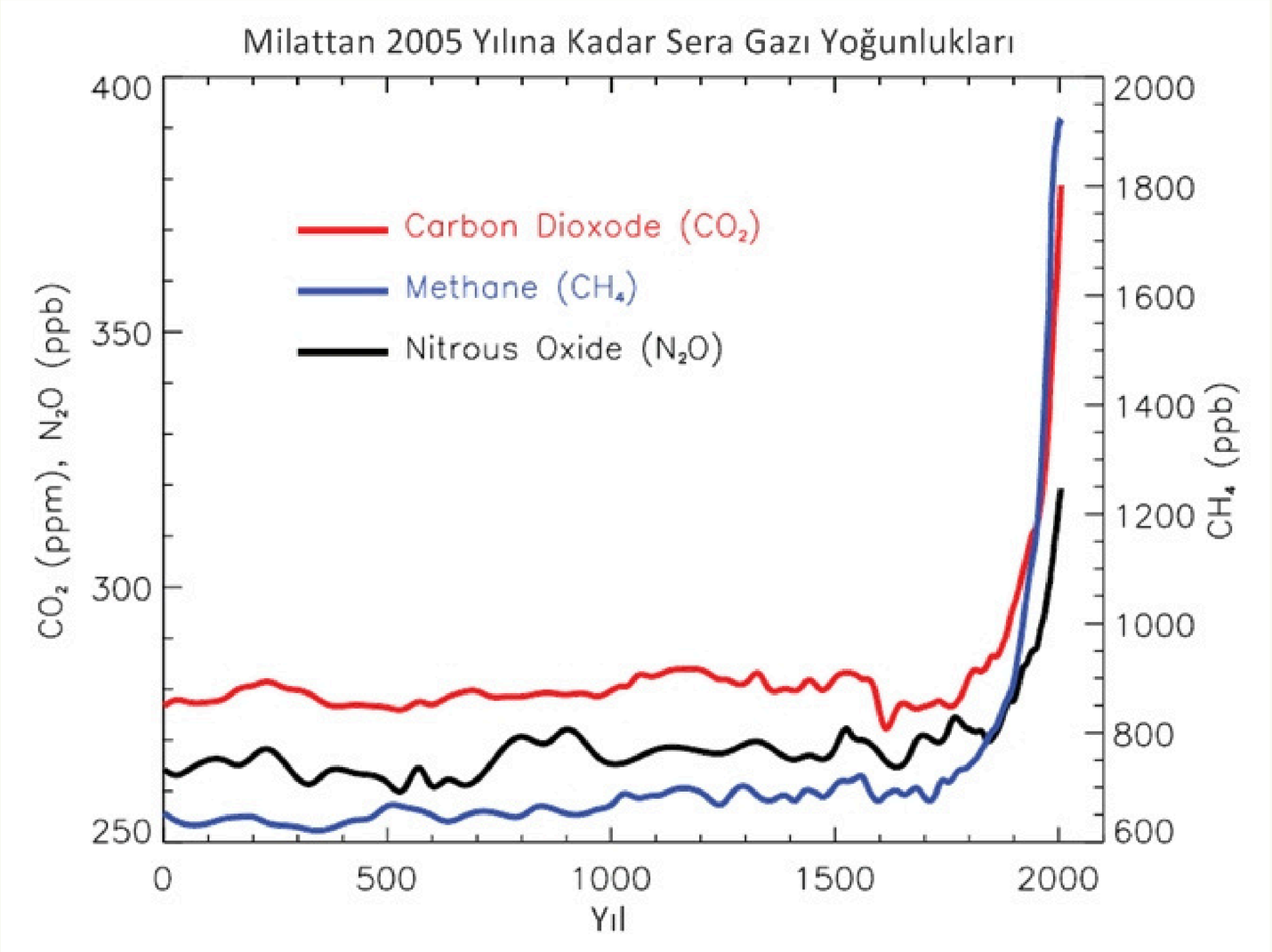



Temperature difference (°C)
compared to 1951-80 mean
.6
.4
.2
0
−.2
−.4
1880
1900
1920
1940
1960
1980
2000
7:14 / 57:34


25km

Greenhouse-Gas Concentrations in the Atmosphere



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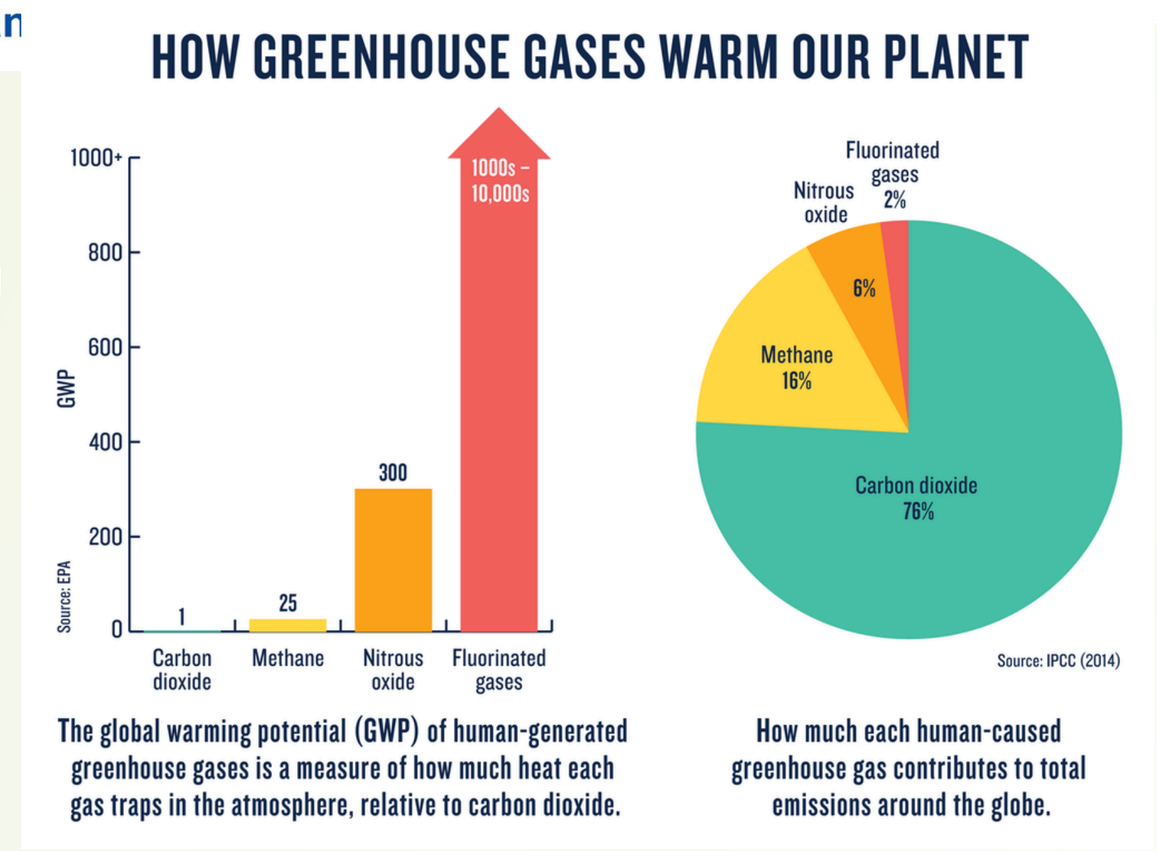
The global warming potential of human-caused greenhouse gases is a measure of how much heat each gas traps in the atmosphere relative to carbon dioxide.



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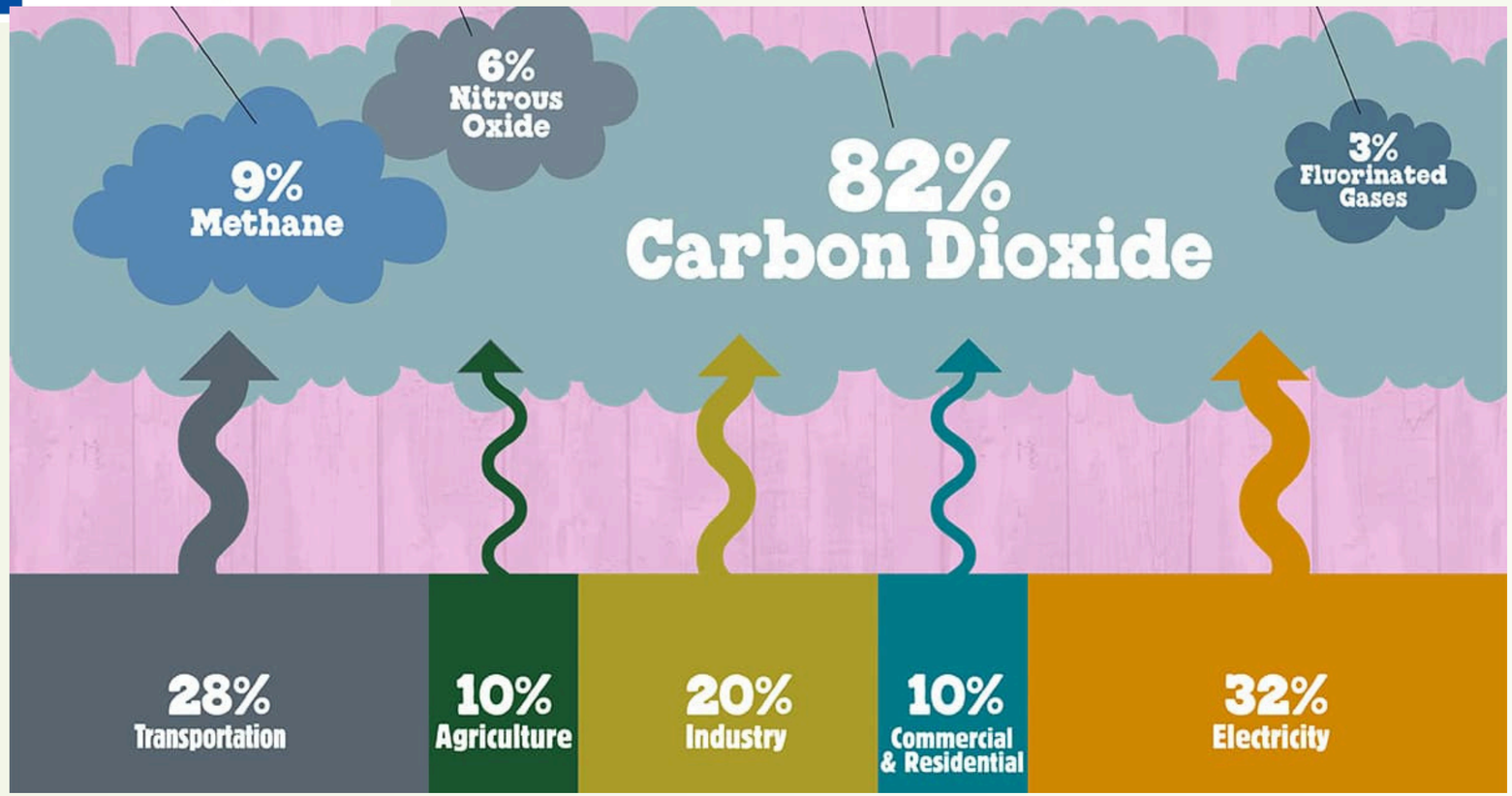


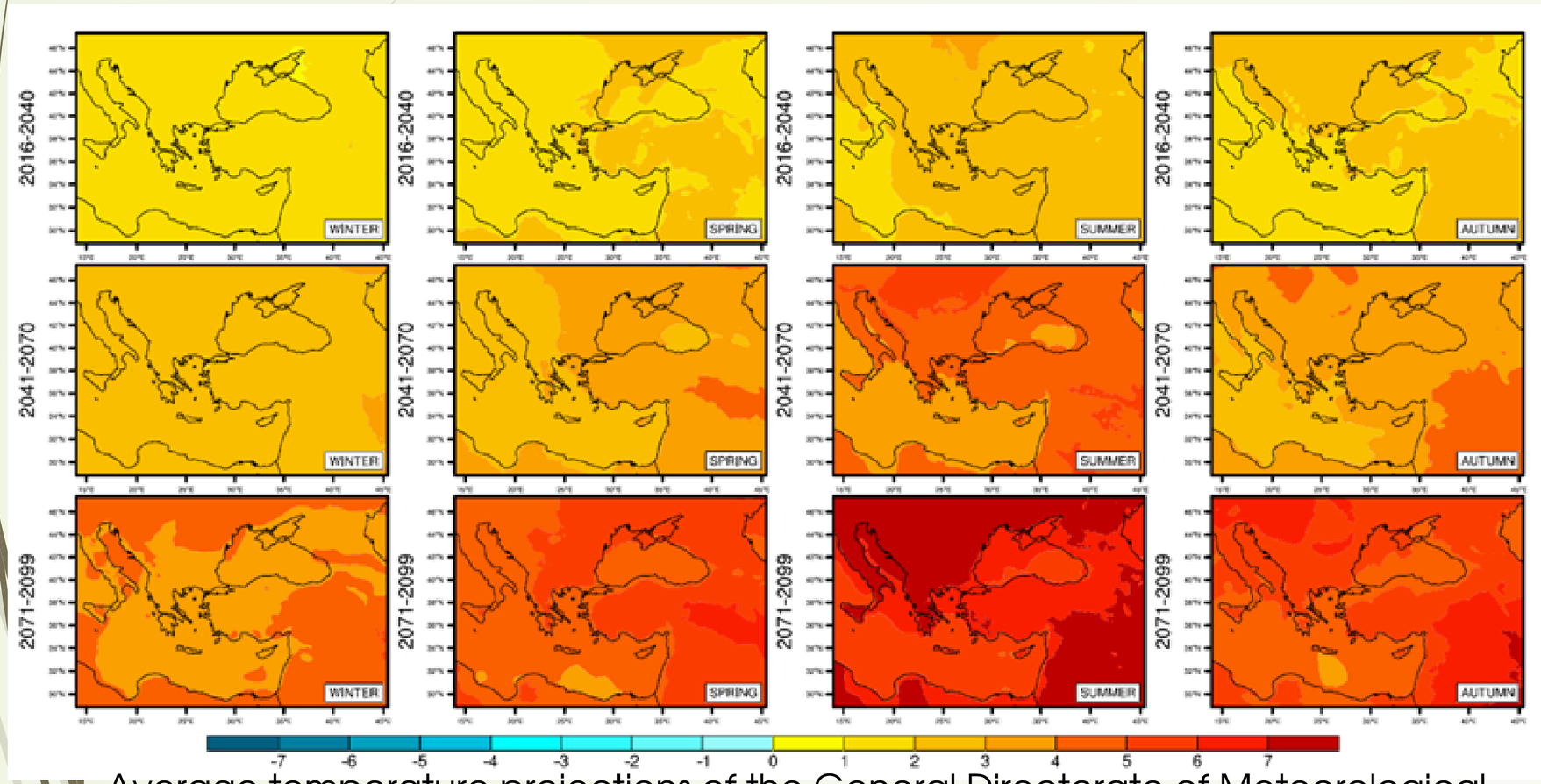
EFFECTS OF GLOBAL WARMING AND CLIMATE CHANGE

FRANCE
AFP/GETTY IMAGES

EFFECTS OF CLIMATE CHANGE

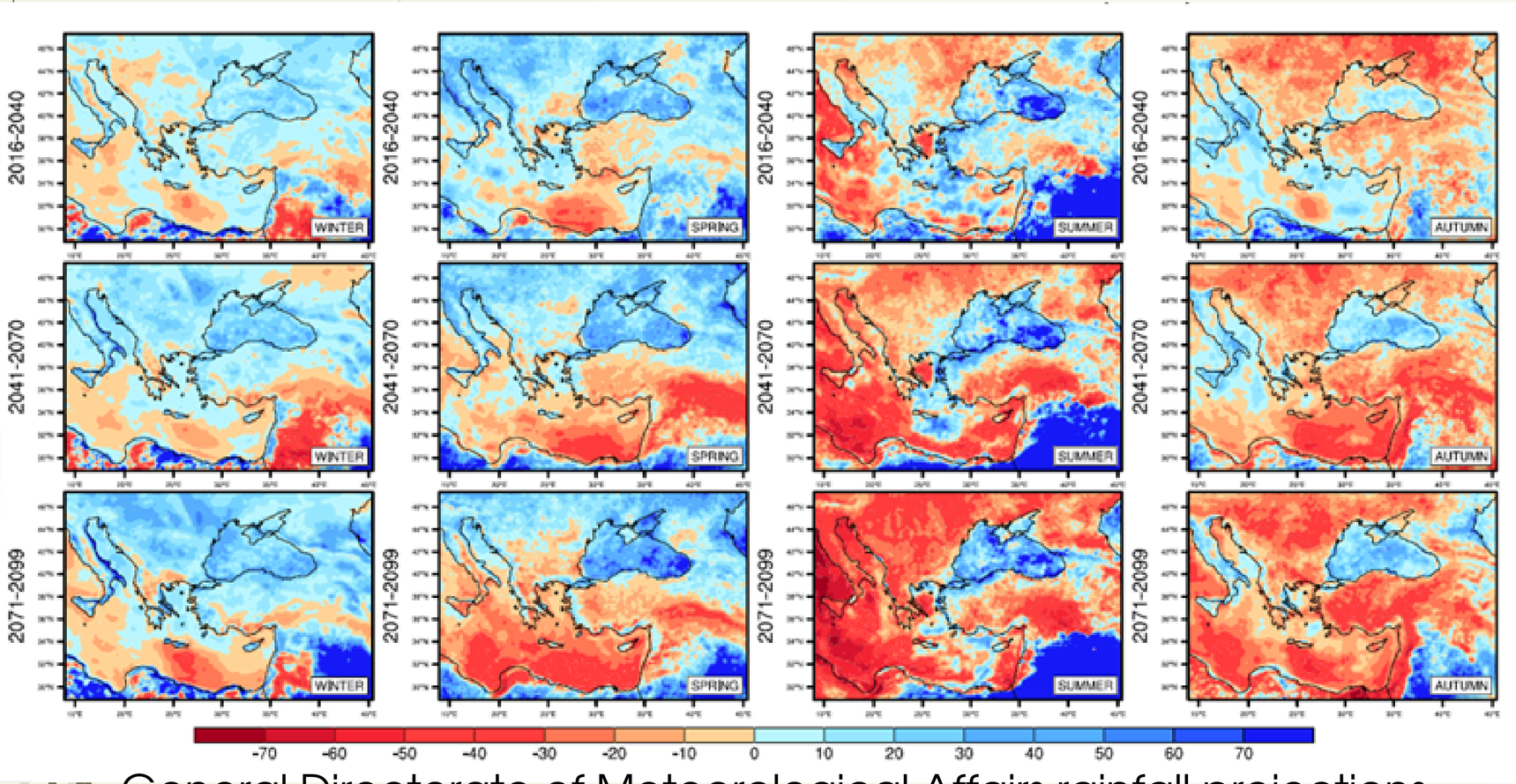
Türkiye

Increasing Air Temperatures



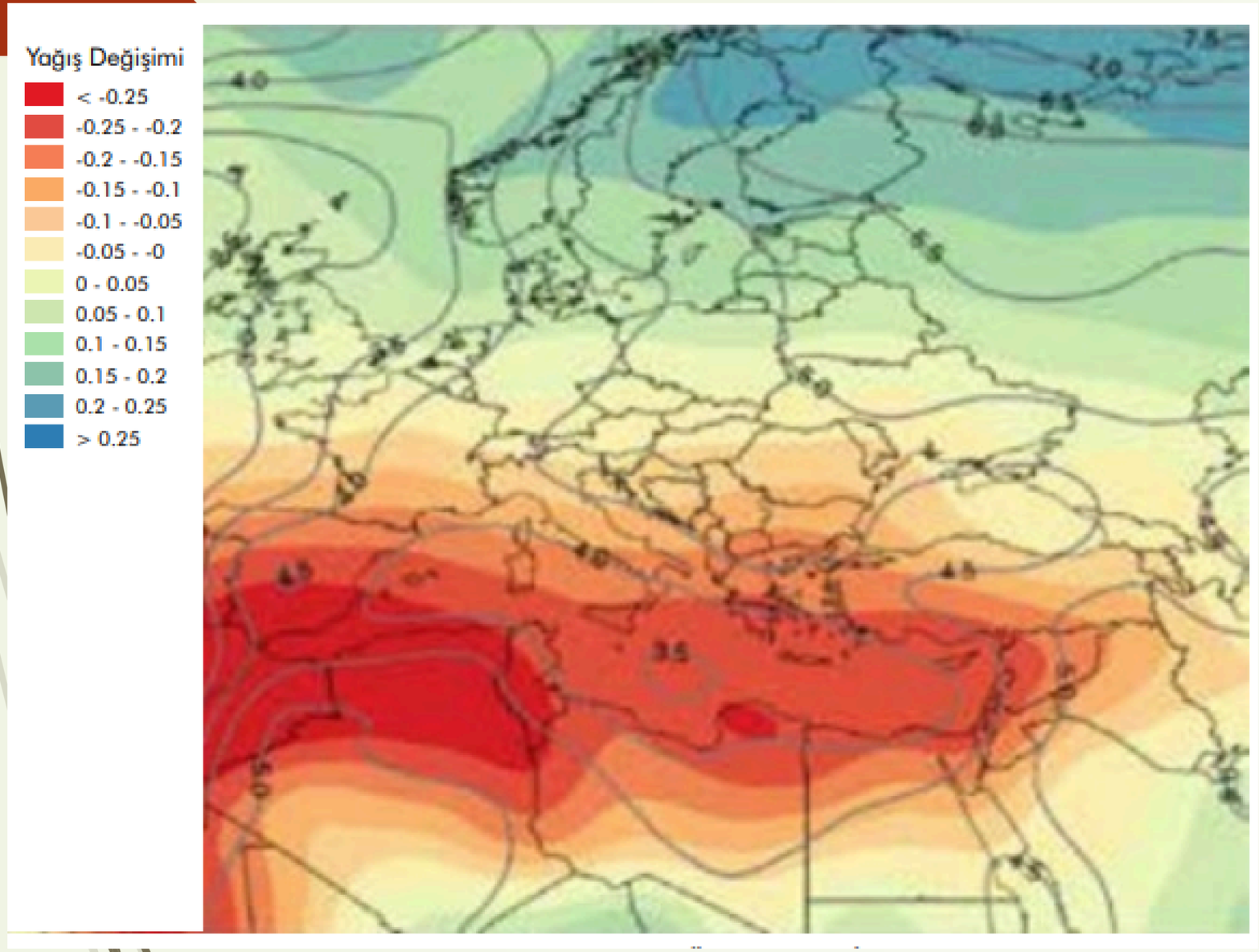
Average temperature projections of the General Directorate of Meteorological Affairs

Decreasing Rainfall



General Directorate of Meteorological Affairs rainfall projections

Projected Climatic Changes in Europe (According to RCP8.5 Scenario)



- It is predicted that the southern parts of all countries located in the north of the Mediterranean basin, from Spain to Greece, will be similarly exposed to drought in the future.

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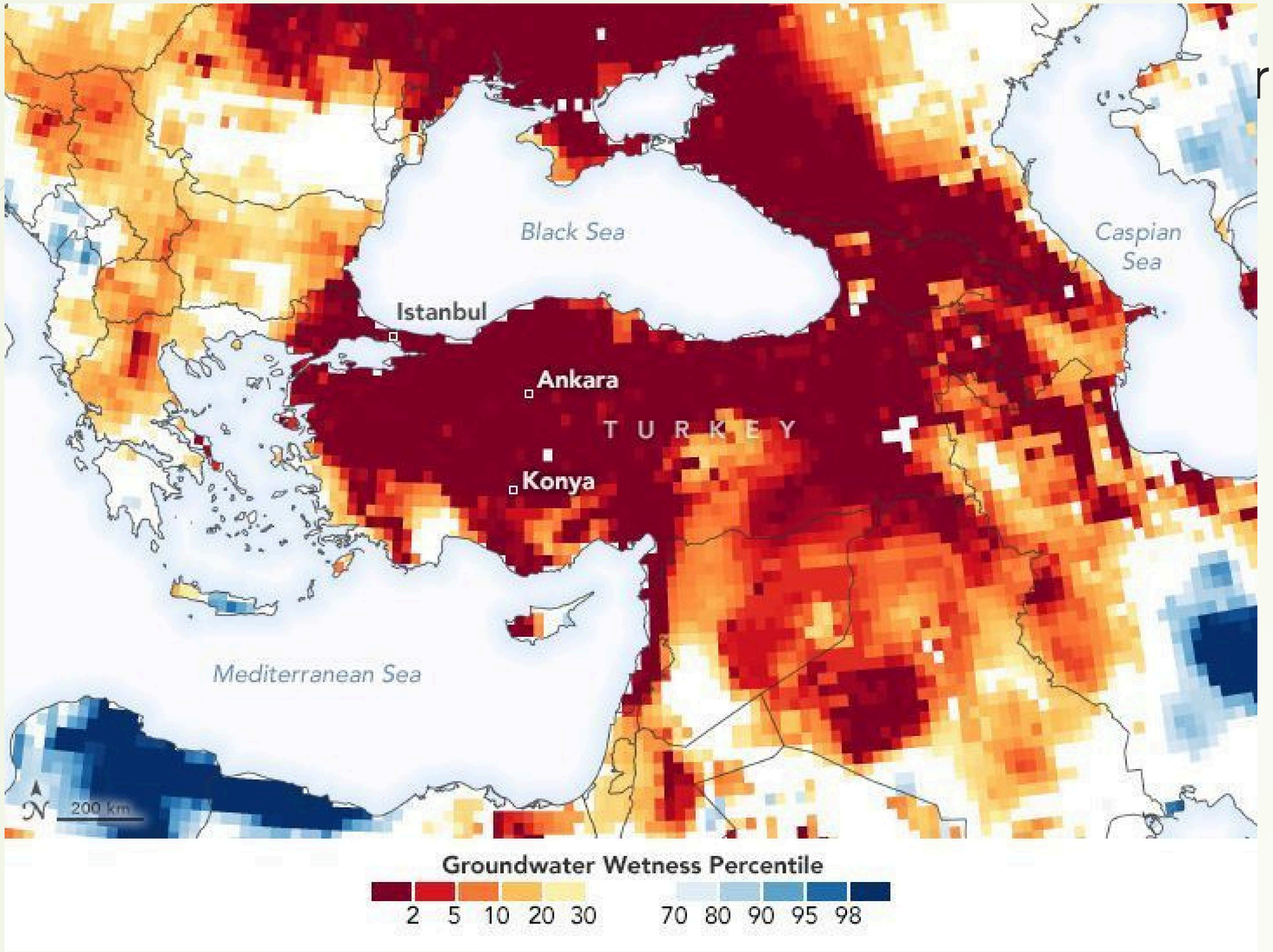
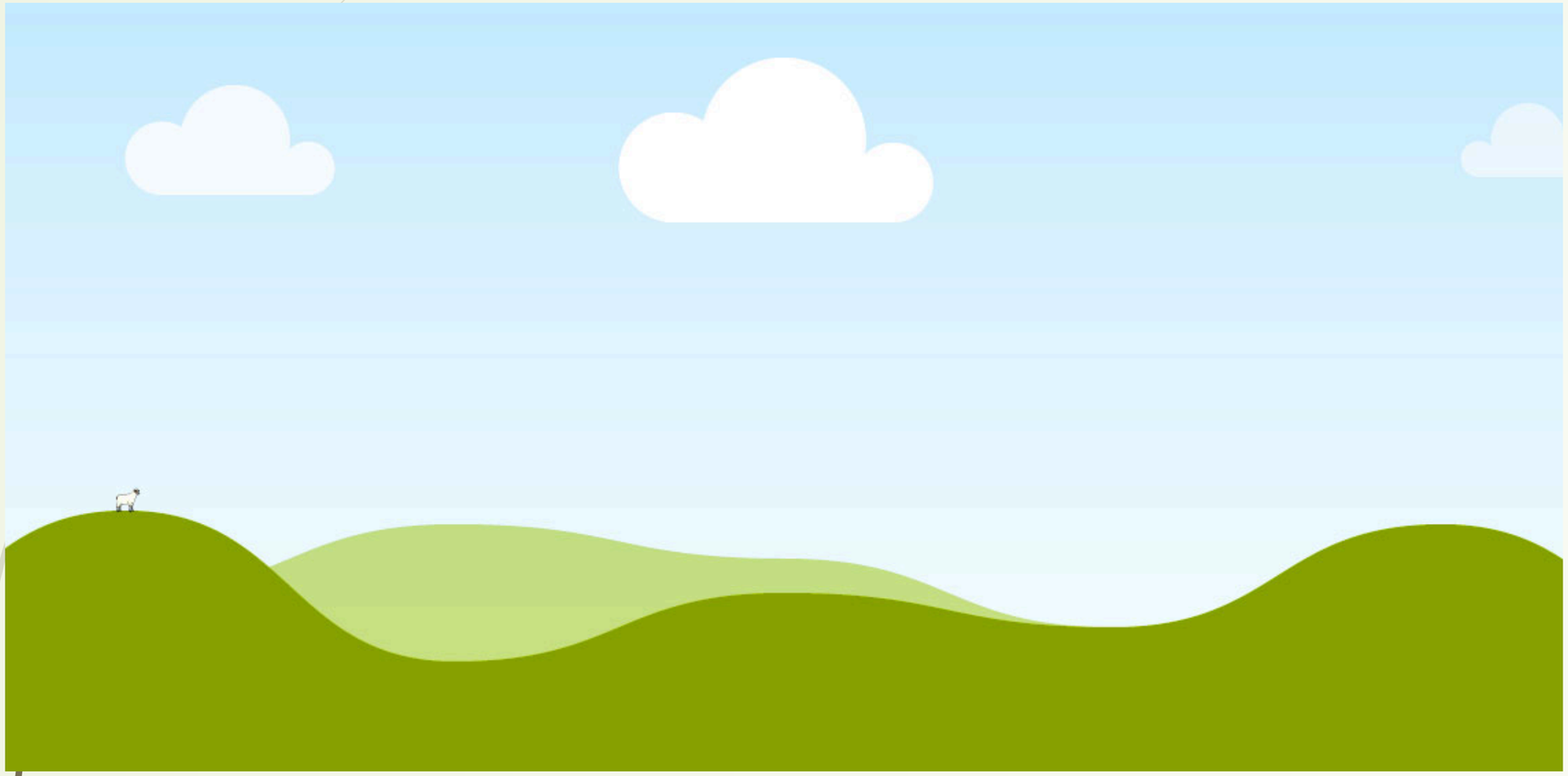

Black Sea
Caspian Sea
Istanbul
Ankara
TURKEY
Konya
Mediterranean Sea
200 km
Groundwater Wetness Percentile
2 5 10 20 30
70 80 90 95 98

What is Turkey's Climate Change and Agriculture Strategy?

Extreme Weather Events

Increasing Extreme Weather Events



Natural disaster events in Turkey between 2010-2017

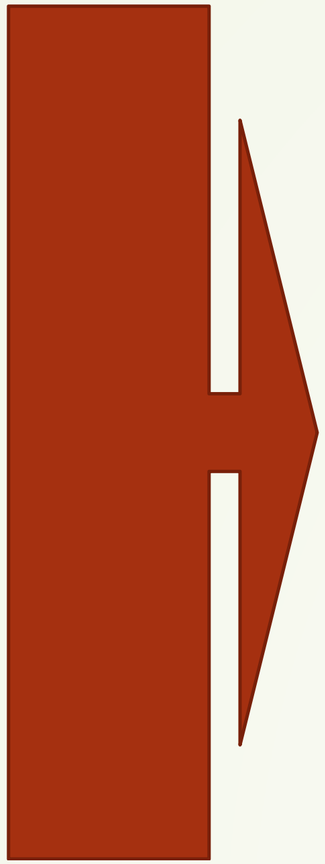
Meteorological Disasters

Meteorological disasters in Turkey between 1971-2017. (Source: MGM 2021)

What's at stake?

What's at stake?

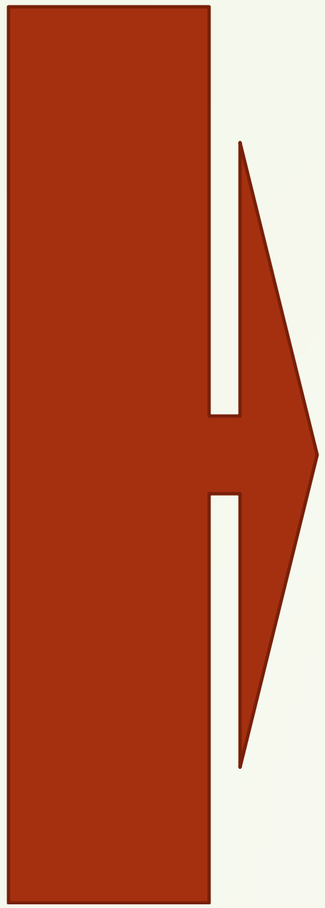
- biodiversity
- underground life
- Aboveground life
- Seas and marine life
- Fresh water sources (lakes, rivers)
- human and animal health
- Forests



ECOLOGICAL Systems in Danger

What's at stake?

- Cities
- transportation
- Agriculture
- farming
- Forestry
- Fishery
- Energy
- Tourism
- Health sector
- insurance
- Banking and finance



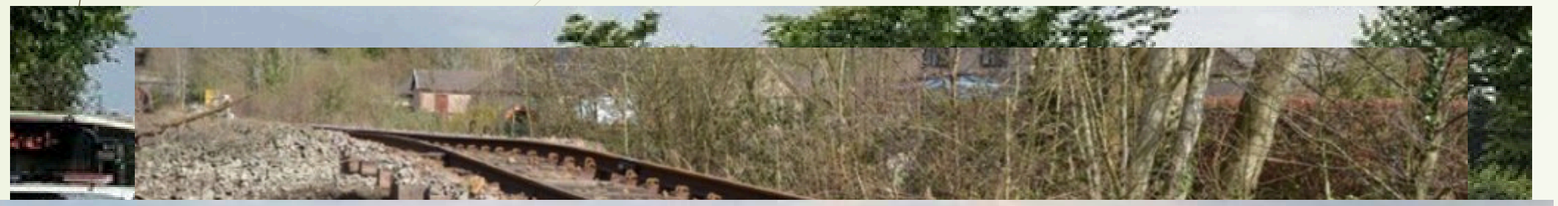
ECONOMIC Systems in Danger

Cities

- endangered systems
  - Roads and Bridges
  - Water and sewer infrastructure
  - Buildings

- Loss of life and damage to infrastructure in extreme weather events
- Increased maintenance and repair costs

transportation



- endangered systems
  - highways
  - railways
  - Aviation

- Loss of life and damage to infrastructure in extreme weather events
- Increased maintenance and repair costs

Climate Change is both an ENVIRONMENTAL, SOCIAL and ECONOMIC problem... If the necessary measures are not taken at both national and global levels;
Climate Change could become a NATIONAL SECURITY PROBLEM

Climate Change May Cause Social Unrest and Civil Conflicts

- Access to basic needs such as water and food
  - Availability
  - Decrease in affordability
- social inequality
- In combination with poor natural resource management, it can cause social unrest and civil conflict.

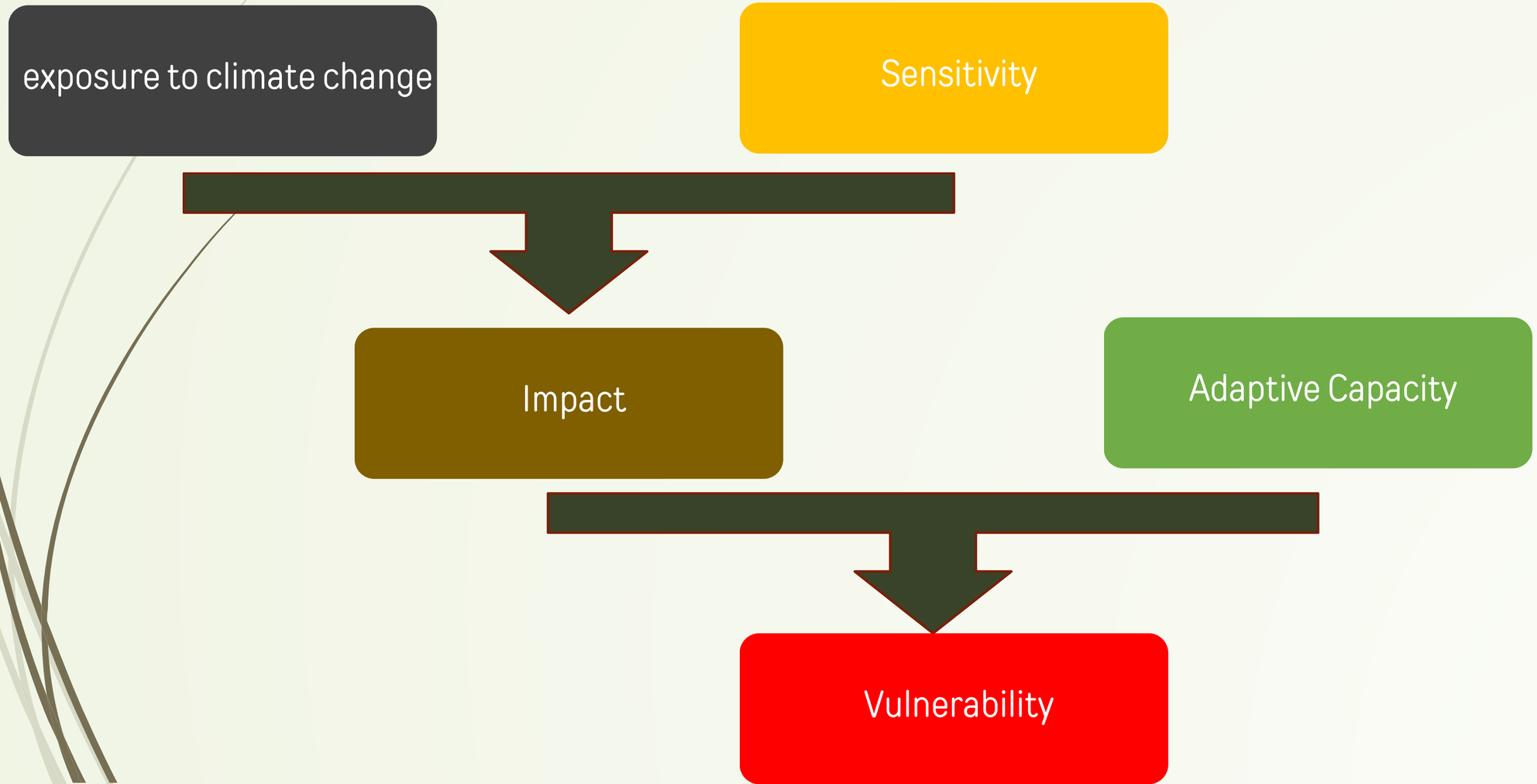
Adaptation to Climate Change

- Why is compliance the goal?
  - Minimizing damages caused by climate change
- What fits?
  - All ecological (natural resources, living life) and economic systems (all economic sectors) and society
- Who should adapt to climate change and at what levels?
  - At the local level (city, town..)
  - At the sectoral level (agricultural sector, financial sector..)
  - At the corporate level (companies…)

Adaptation to Climate Change

- What should it adapt to?
  - The effects of climate change vary according to administrative, human and geographical systems and the living and non-living entities affected.
  - For this reason, the society, municipality, institution, organization that is affected
- How to adapt?
  - Climate Change impact and vulnerability analysis
    «You can't manage what you can't measure»
  - Prioritize: Which of these effects is causing me the most harm?
  - Benefit cost analysis:
    - What will be my loss if I don't comply?
    - What will be my benefit/cost under different compliance plans?
  - Selection of compliance plans
  - Start easy…

Vulnerability



POTENTIAL HAZARDS FOR CITIES FROM GLOBAL CLIMATE CHANGE

AŞIRI YAĞIŞ
ve TAŞKIN

AŞIRI HAVA
OLAYLARI

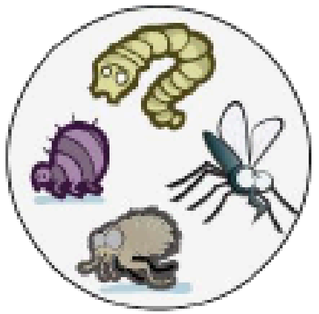
SOĞUK HAVA
DALGASI

DENİZ SEVİYESİNİN
YÜKSELMESİ

SICAK HAVA
DALGASI ve KURAKLIK

ORMAN
YANGINLARI

SULARIN
KİRLENMESİ



BULAŞICI
HASTALIKLAR

SAĞLIK ve AFET YÖNETİMİ

TARIM

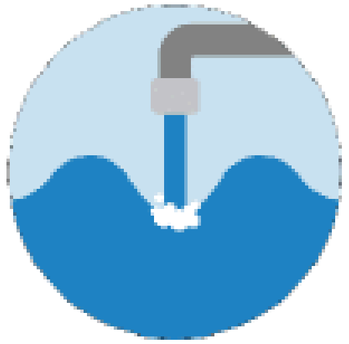
TURİZM

EKOSİSTEM HİZMETLERİ ve BİYOÇEŞİTLİLİK

YEŞİL ALANLAR

KENT, ALTYAPI ve ATIK YÖNETİMİ

SU YÖNETİMİ



Şekil 98: İklim uyum eylem alanları

Şekil 66: Risk ve etkilenebilirlik değerlendirmesinde belirlenen sektörler

CURRENT AND POTENTIAL EFFECTS OF CLIMATE CHANGE ON THE BASIS OF SECTORS

- Ecosystems and Biodiversity
- Forestry
- Agriculture and Livestock
- Water resources
- Coastal Areas
- Transport
- Tourism
- Health
- Socio-Cultural Structure
- Cities and Infrastructure
- Waste
- Energy
- Industry

CURRENT AND POTENTIAL EFFECTS OF CLIMATE CHANGE ON THE BASIS OF SECTORS

1. Ecosystems and Biodiversity

- Events such as temperature increases, decrease in precipitation, drought, extension of the growth period, heat waves and storms predicted in climate projections directly affect living societies (Istanbul Climate Change Action Plan Final Report, 2018).

- Increase in sea water temperature and sea water rise cause loss of marine biodiversity (Turkey 7th National Communication on Climate Change, 2018).

- There will be significant changes in the number and rates of endemic species.

- The increase in sea water temperature and the arrival of new species from the Suez Canal cause irreversible changes in the marine ecosystem (Turkey 7th National Communication on Climate Change, 2018)

Forestry

- Destruction in forests is generally expected to increase as extreme weather events such as storms and floods occur more frequently.
- Biodiversity in the forest is expected to decrease due to climate change.
- Climate change; It seems likely that it will further change the intensity and frequency of forest damage, including wildfires, storms, insect outbreaks, and the introduction of invasive species.
- Climate change is predicted to worsen the problems forests already face due to deforestation, degradation and air pollution.
- It is predicted that climate change may pose a risk on some valuable products and services obtained from forests (Strategic Plan for Adaptation to Climate Change in Forestry, 2020)

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The most important effects of Climate Change will be on the fragility of cities (Vulnerability).

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- Vulnerability: It is defined as the conditions of a community, system or material asset that make it susceptible to the negative effects of a hazard (EC, 2013; Kaya, 2018).

- Vulnerability of cities in the context of climate change can be defined as the degree to which a city is unable to cope or is sensitive to the adverse effects of climate change, including climate instability and extreme weather events.

- Vulnerability is accepted as a function of the nature, magnitude and degree of climate change and the sensitivity and adaptation capacity of the system exposed (IPCC, 2007: 883).
- In this framework, vulnerability consists of three elements: exposure to danger, sensitivity and adaptation capacity.

Factors that determine a city's vulnerability, that is, its degree of exposure to danger, its susceptibility and its capacity to cope:

Physical factors, Economic factors, Demographic factors, Social factors, Environmental factors Institutional factors

The fragility of the city may vary depending on different dimensions of fragility.

- While some cities show fragility in the context of physical factors such as geographical location, geological features, hydrological structure, some cities can be fragile in the context of demographic, socio-economic and institutional features.

living in cities to varying degrees. Here are some of the possible dangers caused by global climate change predicted for cities:

- Rising Temperatures: Rising temperatures can reduce air quality in cities, increase energy consumption and cause health problems.
- Extreme Weather Events: Cities may be exposed to extreme weather events such as floods, storms, hurricanes and droughts. These events can cause infrastructure damage, floods and loss of life.
- Sea Level Rise: Sea level rise can lead to flooding and saltwater intrusion in coastal cities. Infrastructure and property in coastal areas may be damaged.
- Decrease in water resources: Climate change can lead to a decrease in water resources and water scarcity in cities. Factors such as less rainfall, drought and melting glaciers can create difficulties in the supply of drinking water and cause competition for agriculture, industry and water supplies.
- Fires: High temperatures and drought can make it easier for forest fires to spread to cities. This could leave cities at risk of fire.
- Epidemic Diseases: Climate change may change the distribution areas of vectors (e.g. mosquitoes) and, accordingly, increase the risk of epidemic diseases in cities.
- Food Security Issues: Climate change may affect agricultural conditions and reduce food production in some regions. This can lead to food security problems in cities.
- Infrastructure Damage: Extreme weather events, floods, and other climate change-induced impacts can damage city infrastructure (roads, bridges, water and sewer systems).
- Economic impacts: Global climate change can negatively impact city economies. The agricultural sector may suffer due to reduced water resources and extreme weather events. Additionally, costs such as infrastructure damage and increased energy demand can also have economic impacts.
- Air Pollution: Climate change may increase air pollution. Heat waves and low wind speeds can negatively affect air quality, leading to an increase in respiratory diseases and other health problems.

CLIMATE CHANGE COMBAT AND ADAPTATION ACTIONS

CLIMATE CHANGE MITIGATION AND ADAPTATION ACTIONS

HEAD OF ADASI

4.1 Adaptation Actions

Adaptation and mitigation actions to offset the harmful effects of heat islands in cities, together with strategies for municipalities to implement these actions, are vital to improve urban resilience and reduce the effects of extreme heat. Here are some actions and strategies:

- **4.1.1 Cool Roofs and Green Roofs:**
  - **Action: Apply cool roofs that reflect high solar radiation, thus reducing heat absorption by buildings. Green roofs, on the other hand, provide insulation by planting vegetation on top of buildings and cool the surrounding air through evaporation and transpiration.**
  - **Municipal Strategy: Establish building codes or guidelines that encourage or mandate cool roofs and green roof installation; Encourage green roof installation through tax credits, grants or other financial incentives.**
- **4.1.2 Urban Greening and Tree Planting:**
  - **Action: Provide shade, reduce surface temperatures, and increase evapotranspiration by increasing urban green spaces, parks, and tree cover.**
  - **Municipal Strategy: Develop urban greening plans with a priority on planting trees and creating green spaces. Allocate resources for tree planting initiatives, collaborate with community organizations, and involve citizens in tree planting campaigns.**
- **4.1.3 Heat Resistant Urban Design:**
  - **Action: Implement urban design strategies that reduce heat absorption and increase ventilation, for example, use light-coloured materials for roads, add shading structures and optimize the location of buildings.**
  - **Municipal Strategy: Incorporate heat-resistant design guidelines into urban planning and development regulations. Provide incentives or grants to developers who use heat-resistant design features in new construction projects.**
- **4.1.4 Thermal Adapted Building Standards:**
  - **Action: Increase the energy efficiency and thermal resilience of buildings through measures such as improved insulation, efficient air conditioning systems and natural ventilation strategies.**
  - **Municipal Strategy: Implement and update building codes and standards that meet thermally adapted requirements for new construction and renovations. Offer incentive or support programs to encourage the renovation of existing buildings with energy-efficient and heat-resistant technologies.**

- **4.1.5 Cool Coatings and Permeable Surfaces:**
  - Action: Install cool pavements with high solar reflectivity to reduce surface temperatures. Apply permeable surfaces to cool ground temperatures and reduce heat build-up.
  - Municipal Strategy: Specify cool pavement features in road construction projects and prioritize permeable surfaces in parking lots, sidewalks and other urban areas. Implement these measures in collaboration with transportation agencies and contractors.
- **4.1.6 Heat Warning Systems and Public Health Interventions:**
  - Action: Develop heat warning systems that alert the public to extreme heat events and provide guidance on protective measures. Implement public health interventions such as cooling centers and heat emergency action plans.
  - Municipal Strategy: Establish heat early warning systems that include weather forecasts, trigger thresholds and community participation. Develop and implement hot emergency action plans in collaboration with public health agencies, emergency management units, and community organizations.
- **4.1.7 Public Participation and Education:**
  - Action: Engage residents, businesses, and community organizations in heat island mitigation efforts through education, awareness campaigns, and citizen science initiatives.
  - Municipal Strategy: Develop educational materials, conduct workshops, and organize community events on heat island effects and mitigation strategies. Involve the community in heat resilience initiatives through partnerships with local schools, neighborhood associations, and environmental groups.
- **4.1.8 Data Monitoring and Analysis:**
  - Action: Implement monitoring systems that include temperature mapping, land surface temperature monitoring, and urban heat island intensity assessment to collect and analyze data on urban heat islands.
  - Municipal Strategy: Invest in temperature monitoring infrastructure and establish partnerships for data analysis with universities, research institutions or private companies. Use data to make decisions, target interventions, and evaluate the effectiveness of heat mitigation actions.

CITY FLOODS AND FLOODS

Adaptation Actions

- ## Structural Adaptation Actions:

- 1. **Levees and Embankments**: These are physical barriers constructed along the banks of rivers or around urban areas to prevent floodwaters from entering sensitive areas. They provide important protection by protecting critical infrastructure and properties from flood waters.
- 2. **Flood Control Channels**: These are artificial canals or canals designed to divert flood waters away from urban areas and into larger bodies of water. These channels help manage water flow during flood events, reducing the risk of flooding in urban areas.
- 3. **Stormwater Retention Ponds and Delay Ponds**: These structures temporarily store excess water during heavy rainfall or flooding, reducing peak runoff and regulating water by releasing it slowly. They act like reservoirs that help prevent sudden surges that can lead to flash floods.
- 4. **Flood Gates and Flood Barriers**: These are movable barriers that can be closed to prevent water entry into certain areas during flood events. Flood gates are often placed at critical points at entrances to underground infrastructure or low-lying areas and are used to control water intrusion.
- 5. **River Sewerage**: It involves altering the natural course of rivers and streams to increase their flow capacity and reduce the risk of flooding. Drainage techniques increase the carrying capacity of river channels to reduce the likelihood of flooding by deepening, widening or straightening them.
- 6. **Urban Drainage Systems**: Construction or improvement of stormwater drainage systems to collect and effectively transport excess water in urban areas. These systems consist of components such as pipes, retention ponds, reservoirs, culverts and rainwater collection ponds and capture and transport rainwater runoff, reducing the risk of urban flooding.

Non-Structural Adaptation Measures:

1. **Land Use Planning**: Implementation of land use policies that limit or direct development in areas at risk of flooding. This includes encouraging no construction in floodplains, enforcement of setback requirements, and protection of natural flood storage areas.
2. **Flood Mapping and Early Warning Systems**: Developing accurate flood maps to identify high-risk areas and implementing early warning systems to provide timely warnings to residents. Flood mapping helps identify areas at risk of flooding, while early warning systems ensure residents take necessary precautions and evacuate if necessary.
3. **Flood Insurance and Financial Incentives**: Encouraging people living and doing business in flood-risk areas to get flood insurance to reduce their financial losses. Governments may also provide financial incentives or subsidies to implement flood resilience measures, such as elevating structures or installing flood protection measures.
4. **Green Infrastructure**: Encouraging the use of natural features such as wetlands, green roofs and permeable pavements reduces runoff volume by absorbing and retaining water. Green infrastructure helps manage stormwater by allowing water to infiltrate the ground, reducing the load on drainage systems and minimizing flood risks.
5. **Public Awareness and Education**: Conducting public awareness campaigns to educate residents about flood risks, emergency preparedness, and proper response during flood events. This includes disseminating information about evacuation routes, emergency shelters and safety measures, and increases community resilience.
6. **Disaster Response and Recovery Planning**: The development of plans for rapid and coordinated response to flood events includes evacuation procedures, emergency shelters, and post-flood recovery efforts.
7. **Urban Design and Building Standards**: Adopting flood resilient design principles and implementing building codes that include flood resilient features. This may include measures such as elevating electrical systems above flood levels, using flood resistant materials, implementing appropriate drainage systems and raising ground levels in buildings.
8. **Community Education and Awareness**: Educating residents about flood risks, evacuation procedures and the importance of flood preparation.

These measures, both structural and non-structural, increase the resilience of communities and reduce the impacts of flood events by reducing the negative impacts of flood events in urban areas.

6.2 Public Participation in Flood Mitigation Efforts

- By adopting a comprehensive approach that combines infrastructure development, policy implementation, community engagement and continuous evaluation, municipalities can effectively reduce flood impacts in urban areas. Involving the public in flood mitigation efforts is important to create a sense of ownership, raise awareness, and gather valuable local information. Here are some ways municipalities can involve the public in flood mitigation efforts:
- - **Public Awareness Campaigns**: Launch public awareness campaigns to educate the public about flood risks, mitigation measures, and the importance of individual and community actions. This can be done in a variety of ways, including community meetings, workshops, social media, newsletters and local media channels.
- - **Public Awareness Meetings : Hold meetings and workshops where residents can learn about flood risks, mitigation strategies, and comment on proposed plans. Encourage open discussions, address concerns, and collect feedback to ensure community perspectives are considered in decision-making processes.
- - **Volunteer Programs**: Create volunteer programs focused on flood mitigation. Encourage residents to participate in activities such as cleaning storm drains, monitoring water levels, planting trees, or assisting with emergency response efforts. This fosters a sense of community involvement and ownership.
- - **Citizen - Science Initiatives**: Involve the public in data collection and monitoring efforts. Encourage residents to report local flood events, measure rainfall or monitor water levels in rivers and streams. This citizen science approach can provide valuable data to improve flood prediction and response systems.
- **- **Public-Private Partnerships**: Collaborate with businesses, nonprofits, and community groups to jointly implement flood mitigation initiatives. Encourage local businesses to adopt flood resilient practices, support community awareness campaigns, or provide resources and expertise.**
- **- **Flood and Flood Preparedness Programs**: Develop and promote flood preparedness programs that provide residents with information and tools to protect themselves and their property during flood events. This may include training materials, emergency response plans, evacuation routes, and property securing guides.**

- - **Feedback Mechanisms**: Establish mechanisms for residents to provide feedback, report concerns, and suggest ideas for flood mitigation. This can be done through dedicated helplines, online platforms or regular community surveys. Actively respond to feedback and inform residents of actions taken.
- - **School and Educational Programs**: Collaborate with schools and educational institutions to integrate flood awareness and preparedness into the curriculum. Build a culture of resilience from a young age by organizing workshops, simulations and educational campaigns targeting students and their families.
- - **Flood Insurance Information**: Provide information and resources about flood insurance options and the importance of getting insurance. Educate residents about the benefits and limitations of insurance and explain how it supports post-flood recovery efforts.
- - **Showing Successful Examples**: Highlight successful flood mitigation projects and case studies from the community or other areas. This can encourage wider participation by inspiring residents and demonstrating the effectiveness of mitigation measures.
- Effective public participation requires open communication, active listening and ongoing dialogue. By involving the public in flood mitigation efforts, municipalities can reinforce a sense of shared responsibility and increase the overall resilience of the community.

Some Recommendations on Stream Bed Management to Reduce the Effects of Floods and Floods in Cities:

- - To preserve the natural flow and integrity of river channels, avoid constructing buildings or any other structures in these channels.
- - Maintain the natural state of river beds and avoid paving them, as this disrupts natural hydraulic processes and can lead to increased erosion and flooding.
- - Minimize the narrowing of stream channels due to road and embankment construction, ensuring that sufficient area is maintained to accommodate water flow.
- - When constructing culverts, outlets and other structures in stream channels, ensure that they are appropriate, authorized and designed to minimize adverse effects on the natural flow and ecology of the stream.
- - Avoid unauthorized bridge construction across stream channels, ensuring that any bridge construction is carried out with appropriate permits and is designed to preserve the natural hydraulic balance of the stream.
- - Avoid activities that may obstruct the natural flow of streams and increase the risk of flooding.
- - Prevent illegal mining of sand and gravel in stream channels, as this can cause serious damage to the stream bed, disrupt the natural sediment balance and adversely affect aquatic habitats.
- - Implement planned urbanization that takes into account the downstream conditions of river beds, ensuring that development activities are carried out in a way that does not endanger the health and functionality of the river.
- - Maintain the connection between streams and floodplains, as this is crucial for the continuation of natural hydraulic processes, supporting biodiversity and reducing flood risks.

- By following these recommendations, it is possible to promote responsible river channel management, protect the natural environment and reduce possible negative impacts on water resources and ecosystems.

ADAPTATION AND IMPLEMENTATION ACTIONS ON COASTAL FLOODING AND EROSION

- 7.1 Adaptation and Implementation
- Adaptation and enforcement actions for coastal flooding and erosion due to global climate change typically involve a combination of policy measures, engineering solutions, community engagement, and ecosystem-based approaches. Here are some main strategies:
- ### 7.1.1 Constructing and Maintaining Coastal Defenses:
- **Building or strengthening seawalls, levees, and levees to protect coastal communities against storm surges and rising sea levels. Strengthening coastal defenses such as seawalls, levees and levees provides many benefits, including dissipating wave energy, flood prevention, erosion control, land reclamation and infrastructure protection. However, it also has disadvantages such as degradation of ecosystems, alteration of natural processes and high costs. A holistic approach integrating structural and non-structural measures is needed to promote resilience and sustainability in coastal management.**
- ### 7.1.2 Shore Supply:
- **To restore and strengthen coastal resilience by adding sand or sediment to eroded beaches. Beach nourishment increases coastal resistance by widening and sloping eroded beaches and provides protection against wave energy and erosion. It restores habitats, attracts tourists and supports local economies. It requires careful planning to minimize environmental impacts.**
- ### 7.1.3 Dune Restoration:
- **Natural or engineered dune systems absorb wave energy, providing valuable protection against erosion and storm surges. As natural barriers, dunes provide protection against waves and floods. It stabilizes beaches, supports ecosystems and adapts to sea level rise. Dunes raise conservation awareness and encourage community participation. Incorporating dunes into management strategies is vital for resilient coastal communities.**
- ### 7.1.4 Controlled Withdrawal:
- **In some cases, removing structures and communities from high-risk coastal areas may be necessary to reduce exposure to flood and erosion hazards. Relocating structures and communities from high-risk coastal areas reduces vulnerability to flooding and erosion. It involves moving buildings and people to safer interior or higher locations. This approach requires planning, coordination, investment and community participation. Despite the challenges, it increases resilience to climate change and reduces long-term risks.**
- ### 7.1.5 Zoning of the Coast and Land Use Planning:
- **Enforcing coastal zoning regulations, setback requirements, and building codes protects coastal ecosystems, increases resilience, and protects communities. It limits development, protects sensitive areas, reduces risks from erosion and sea level rise, and promotes sustainable resource management. Environmental impact assessments guide mitigation measures for projects, and monitoring and enforcement ensure compliance and prevent environmental degradation.**

- ### 7.1.6 Infrastructure Upgrade:
- Elevating buildings, roads and other critical infrastructure reduces the risk from flood damage. Elevating coastal buildings, roads and infrastructure reduces the risk of flooding. Structures are raised above predicted flood levels, roads are raised with levees or bridges, and critical infrastructure is relocated or elevated. Flood proof measures and natural drainage systems are implemented. Planning and zoning regulations keep development away from areas at risk of flooding. Public awareness campaigns encourage investment in upgrade measures. This minimizes flood damage and increases resilience to climate change.
- ### 7.1.7 Green Infrastructure:
- Using nature-based solutions such as wetland restoration, mangrove planting, and oyster reef construction to provide natural barriers against coastal hazards and increase ecosystem services. Nature-based solutions such as wetland restoration, mangrove planting, and oyster reef construction provide natural defenses against coastal hazards. It absorbs wave energy, reduces erosion and attenuates storm surges. These habitats support biodiversity, sequester carbon dioxide and increase ecosystem health. Protecting and restoring these ecosystems promotes sustainable livelihoods, economic development and community resilience in coastal areas.
- ### 7.1.8 Early Warning Systems:
- Implementation of effective monitoring and early warning systems to provide coastal communities with timely warnings about impending flood events. Effective monitoring and early warning systems provide timely flood warnings to coastal communities. Continuous monitoring, remote sensing and forecasting models provide accurate forecasts. Warnings spread quickly through sirens, text messages and social media. Community engagement and coordination between agencies increases resilience. Evaluation allows protocols to be refined for better preparation.

- ### 7.1.9 Insurance and Financial Mechanisms:
- Developing insurance programs and financial incentives to encourage property owners to invest in flood-resistant infrastructure and adopt resilient building practices. Creating insurance programs and financial incentives can encourage property owners to invest in flood-resistant infrastructure and adopt resilient building practices:
- - Offering discounts or reduced premiums by insurance companies for implementing flood resilience measures encourages proactive risk reduction.
- - Requiring flood insurance for properties at risk of flooding and providing premium subsidies to policyholders who undertake flood mitigation measures provides adequate protection and encourages resilience investments.
- - Providing grants or subsidies to cover retrofitting costs or building resilient infrastructure makes flood mitigation measures more accessible.
- - Offering tax incentives, rebates, or credits for investing in flood-resistant upgrades or durable building practices eases the financial burden and promotes long-term resiliency.
- - Offering low-interest loans or financing options for flood mitigation projects allows property owners to undertake improvements that reduce flood risk.
- - Developing innovative insurance products such as parametric or index-based insurance ensures rapid payments and encourages resilience investments.
- - Creating public-private partnerships facilitates comprehensive risk management strategies that combine insurance incentives with regulatory measures and community engagement efforts.
- - Raising public awareness of the benefits of flood resilient infrastructure and resilient building practices through educational campaigns encourages the adoption of mitigation measures.
- ### 7.1.10 Public Participation and Education:
- Raising awareness of coastal flooding and erosion risks, encouraging community participation in adaptation planning, and building a culture of resilience. Community engagement and education are important to raise awareness of coastal flooding and erosion risks and promote resilience. Through workshops, campaigns and programs, communities address their vulnerabilities.

- ### 7.1.11 Integrated Coastal Management:
- Adopting a holistic approach to coastal management to ensure sustainable development and resilience, taking into account ecological, social and economic factors. Holistic coastal management considers ecological, social and economic factors for sustainable development and resilience. It integrates ecological protection, community participation and balanced economic development. Integrated planning and adaptive management enable multiple objectives to be achieved. By considering these factors together, coastal management achieves sustainable results by balancing the needs of people and nature and increasing resilience to climate change and other threats.
- ### 7.1.12 International Cooperation:
- Collaborate with other countries to address cross-border coastal issues and share information, technology, and resources for adaptation and mitigation efforts. International cooperation is important to address cross-border coastal issues and share knowledge, technology and resources. It enables capacity building for coordinated management, data exchange and resilience. Collaborative efforts improve early warning systems, disaster preparedness, and marine protection. Collaborative frameworks encourage regional cooperation and policy development. Working together, countries address challenges, secure coastal communities and ecosystems, and combat coastal flooding and erosion in the context of climate change.

DROUGHT AND WATER SHORTAGE

Adaptation Actions:

- Water Conservation and Efficiency:
- - It is critical to implement water conservation measures to reduce water demand. Municipalities can promote public awareness campaigns that encourage residents and businesses to save water through practices such as reducing outdoor water use, repairing leaks, and using water-saving appliances and fixtures.
- - Implementation of water-saving landscaping techniques, for example, xeriscaping and drip irrigation systems using drought-tolerant plants, can significantly reduce outdoor water consumption. Municipalities can provide incentives, reimbursements, or guidelines to encourage the adoption of water-saving landscaping practices.
- - Equipping public buildings and infrastructure with water-saving technologies, for example, low-flow toilets, efficient shower heads and sensor-based irrigation systems, can help municipalities reduce water consumption in their operations.
- Gray Water and Rainwater Harvesting:
- - Collecting and reusing gray water (sink, shower and bleach) and rainwater can reduce the demand for freshwater resources. Municipalities can encourage the installation of gray water recycling systems and rainwater harvesting systems in residential and commercial buildings.
- - Developing guidelines and regulations for gray water and rainwater harvesting systems ensure the safe and effective implementation of these systems. Municipalities can provide educational resources and incentives to encourage property owners to adopt these practices.
- Sustainable Stormwater Management:
- - Implementing sustainable stormwater management practices can help reduce pressure on freshwater resources by capturing and using rainwater. Green infrastructure solutions such as rain gardens, biopathways, and permeable pavements can replenish groundwater levels and reduce runoff by absorbing and filtering rainwater.
- - Municipalities can include green infrastructure in urban planning and development regulations. Encouraging or requiring developers to include stormwater management features in their projects encourages the use of nature-based solutions to mitigate the effects of drought and water scarcity.

Water Source Diversification:

- - Diversification of water sources reduces dependence on a single source and increases resilience to drought and water scarcity. Municipalities can explore alternative water sources such as recycled water, desalination and groundwater replenishment.
- - Investing in water purification and cleaning technologies allows municipalities to treat and reuse wastewater, reducing the pressure on freshwater resources. The application of advanced water treatment plants and distribution systems provides a safe and reliable source of recycled water for non-potable uses such as irrigation and industrial purposes.

- Water Demand Management:
- - Management of water demand is critical to ensure efficient use of existing water resources. Municipalities can implement pricing mechanisms such as tiered fee structures or water budgets that encourage water conservation and discourage excessive water use.
- - Implementation of water-saving building codes and standards can encourage the use of water-saving fixtures and appliances in new construction and renovations. Municipalities can provide guidance and incentives to encourage property owners to upgrade to water-saving technologies.
- Integrated Water Resources Management:
- - It is important to adopt an integrated water resources management approach to optimize water allocation, minimize losses and increase water use efficiency. Municipalities can develop water resources management plans that take into account the entire water cycle, including supply, demand, infrastructure and ecosystem needs.
- - Collaboration with neighboring municipalities, water utilities and relevant stakeholders is essential for effective water resources management. Joint efforts may include sharing data and information, coordinating water allocations, and implementing regional conservation strategies.
- Implementation Strategies for Municipalities:
- Policy and Regulation:
- - The development and implementation of water-related policies, regulations and standards are important for effective implementation. Municipalities can establish water conservation ordinances, water-efficient building codes, and regulations for gray water and rainwater harvesting systems.
- - Reviewing and updating water pricing structures to reflect the true cost of water supply and wastewater treatment could provide economic incentives for water conservation. It is important to implement drought response plans and water restriction measures to manage demand and ensure equitable water distribution during drought periods.
- Infrastructure Development:
- - Investing in water infrastructure improvements and upgrades increases the reliability and efficiency of water supply. Municipalities can prioritize the maintenance and rehabilitation of aging water distribution systems to minimize leaks and losses.
- - Developing or expanding water reuse and recycling facilities enables municipalities to maximize the use of existing water resources. This includes the construction of decentralized treatment systems for gray water recycling or centralized facilities for advanced wastewater treatment and reuse.

- **Education and Information:**
- - It is essential to raise public awareness about the importance of water conservation and the effects of drought. Municipalities can implement educational campaigns, workshops and information programs that encourage water-saving behaviors and provide practical tips to reduce water consumption.
- - Collaborating with local schools, community organizations, and businesses can help reach a broader audience. Engaging residents, businesses, and other stakeholders through workshops, events, and social media campaigns fosters a sense of ownership and encourages active participation in water conservation efforts.
- **Monitoring and Reporting:**
- - Establishing comprehensive monitoring and reporting systems allows municipalities to track water consumption, identify inefficiencies and measure the effectiveness of implemented measures. Monitoring water supply sources, distribution systems, and water use patterns helps identify areas for improvement and inform decision-making processes.
- - Using data-driven approaches and implementing smart water management technologies such as water meters and remote monitoring systems enable municipalities to collect real-time data and optimize water use.
- **Financial and Economic Incentives:**
- - Providing financial incentives, rebates, or grants can encourage residents, businesses, and property owners to adopt water-saving practices and technologies. Municipalities can offer financial assistance to implement gray water and rainwater harvesting systems, water-efficient landscaping, and upgrades to water-saving fixtures.
- - Developing innovative financing mechanisms, such as low-interest loans or green bonds, by collaborating with financial institutions and private sector partners can facilitate investment in water conservation and resilience projects.

- **Cooperation and Partnerships:**
- - Collaboration between municipalities, water utilities, state agencies, nonprofit organizations, and community groups is critical for effective implementation. Sharing knowledge, resources, and best practices fosters innovation and prevents duplication of efforts.
- - Participation in regional or national water management initiatives and networks provides municipalities with access to expertise, financing opportunities and technical support. Collaborative platforms can facilitate information exchange and coordination among stakeholders.
- The specific actions and strategies adopted by municipalities may vary depending on their geographical location, available resources and local water management challenges.

Ecosystem services, biodiversity and green spaces
(Ecosystem services, biodiversity and green spaces)

Ecosystem services, biodiversity and green spaces

- Preparation of vulnerability maps in the context of urban heat island.
- Afforestation of stream banks and floodplain borders.
- Establishment of orchards in the city.
- Giving green corridor functionality to transportation axes.
- Conducting long-term monitoring activities for ecosystem restoration.
- Ensuring the integration of blue infrastructure into green areas.
- Making green roof mandatory in commercial buildings
- Fighting forest fires, inter-institutional communication

E1: Preparation of vulnerability maps in the context of urban heat island.

- Identifying areas with urban heat island effects and transforming these areas into ecosystem services with natural-based solutions is of great importance for cities.
- Considering the urbanization rate and population density, it is generally possible to talk about the existence of many areas in cities where the urban heat island effect is intense.
- In this context, it is necessary to create risk and vulnerability maps by expert teams in order to reduce and prevent the impact. These maps can help guide decision-makers in urban planning and environmental regulation to develop strategies to minimize the negative effects of heat waves.

Application details:

- City governments and citizens are warned in advance of a possible heat wave.
- Cooperating with institutions that collect weather data, measure and forecast in order to ensure reliable weather forecasts.
- Identifying the population that may be affected to the first degree in the event of a possible heat wave (respiratory, heart diseases, pregnancy, etc.) and being prepared for awareness and intervention types.
- Covering urban buildings and their surroundings with trees and various plants that are natural coolers.
- **Stakeholders to collaborate with:**
- **district municipalities,**
- **Provincial Directorates of Environment, Urbanization and Climate Change,**
- **Regional Directorate of Meteorology-Antalya, Antalya Provincial Directorate of Agriculture and Forestry, Antalya Provincial Health Directorate,**
- **Provincial Disaster and Emergency Directorate (AFAD)**

E2: Afforestation of stream bed edges and floodplain boundaries.

- The materials used on the edges of streams and streams passing through the urban area should be preferred as water permeable, and intensive afforestation work should be carried out in these areas. This is one of the effects that will significantly reduce the risk of floods and floods.
  Application details:
- Increasing the cool air corridor effect by afforesting the surroundings of stream beds.
- Ensuring the protection of existing old and large trees while afforestation is carried out throughout the province.
- Ensuring tree planting and planting (arid landscaping practices) that require less water.
- Stakeholders to collaborate with:
- Provincial and district municipalities,
- Provincial Directorate of Environment, Urbanization and Climate Change, 4th Regional Directorate of Meteorology
- Provincial Directorate of Agriculture and Forestry,
- Provincial Health Directorate,
- Provincial Disaster and Emergency Directorate (AFAD)

E3: Benefits of Creating Green Areas (Parks, Gardens, etc.) in the City

- Creating urban green spaces can provide a number of benefits in combating climate change. Here are some of these benefits:
- **Carbon Sequestration: Green spaces absorb carbon dioxide from the atmosphere and produce oxygen through the process of photosynthesis. Therefore, urban green areas can reduce the release of greenhouse gases into the atmosphere by increasing carbon sequestration.**
- **Temperature Balancing: Plants can cool their environment through shade and evaporation. This can offset temperature increases as the city gets wetter and prevent the formation of urban heat islands.**
- **Water Management: Green areas absorb and retain rainwater, thus preventing floods and floods in the city. It also supports groundwater levels and regulates the water cycle.**
- **Biodiversity: Green spaces can increase urban biodiversity by hosting a variety of plant and animal species. This can contribute to the health and resilience of ecosystems.**
- **Stress Reliever: Green spaces allow people to interact with nature, which can reduce stress. A healthier and happier society can be more effective in combating climate change.**
- **Air Quality: Plants can reduce air pollution and produce clean air. This can improve the respiratory health of urban residents and improve air quality.**
- **Energy Efficiency: Green spaces can reduce energy consumption by protecting buildings from sunlight. Additionally, trees and plants blocking the wind can save energy.**
- **Preventing Soil Erosion: Vegetation can prevent soil erosion and play an effective role in combating erosion.**
- **Social Connections: Urban green spaces can encourage people to come together and strengthen communities. This is important for finding common solutions to combat climate change.**
- **Increasing green areas in cities can increase the capacity to cope with climate change by creating sustainable and resilient societies.**
- **Stakeholders to collaborate with.**
- **: Provincial and district municipalities, Provincial Directorate of Agriculture and Forestry**

E-4: Giving Green Corridor Function to Transportation Axes in Cities

- Adding green corridors to transportation axes in cities has a number of important effects in combating climate change:
- **Carbon-Free Transport Promotion: Green corridors can focus on sustainable transport modes such as bike paths, walking paths and public transport lines. This can reduce urban air pollution and lower greenhouse gas emissions by encouraging individuals to choose carbon-neutral transport options.**
- **Air Quality: Green corridors along transportation axes can improve air quality. Roadside trees and plants can absorb carbon dioxide while also reducing other air pollutants, thus improving urban air quality.**
- **Reducing Urban Hot Islands: Dense construction and roads in cities can cause the formation of hot islands. Green corridors can reduce the effects of hot islands and maintain urban temperature balance by planting trees and plants in these areas.**
- **Biodiversity and Ecosystem Services: Green infrastructure in transportation corridors can increase biodiversity by hosting different plant species. This can improve the health and resilience of local ecosystems. It can also contribute to better management of natural resources and provision of ecosystem services.**
- **Water Management: Green corridors can promote rainwater harvesting and infiltration. Water-absorbing plants and natural landscape designs can prevent flooding and erosion, protect water resources, and improve urban water management.**
- **Visual Aesthetics and Quality of Life: Green corridors beautify the urban landscape and can increase people's well-being. This can encourage urban dwellers to have closer contact with nature, reducing stress and improving quality of life.**
- **Application details:**
- **-Planning urban green roads, bicycle parking areas and travel routes.**
- **-In order to ensure the accessibility of green areas, their integration with rail systems must be ensured.**
- **-Increasing bicycle paths and encouraging the public to use bicycles.**
- **-Ensuring the greening of horizontal and vertical transportation axes**
- **-Increasing green areas to encourage walking and public transportation.**
- **Stakeholders to collaborate with:**
- **Provincial and district municipalities,**
- **Provincial Directorate of Environment, Urbanization and Climate Change, Republic of Turkey Ministry of Transport and Infrastructure,**
- **Police Department**

E.5: Conducting long-term monitoring activities for ecosystem restoration

Ecosystem restoration is an important strategy to combat climate change, and long-term monitoring of this process plays a critical role in assessing success, learning and adapting. Here are some points that explain the importance of such monitoring activities:

- **Effectiveness Evaluation: Evaluating the long-term impacts of ecosystem restoration projects is important to determine how successful the projects are. Monitoring activities help us understand progress by assessing the impacts of restoration efforts on biodiversity, soil quality, water quality, and other ecosystem characteristics.**
- **Adaptation and Adaptability: Monitoring helps us understand the long-term effects of ecosystem restoration and adapt to changing conditions. It is important to evaluate the adaptability and adaptability of projects to cope with dynamic factors such as climate change.**
- **Learning and Improvement: Long-term monitoring activities encourage learning for other restoration efforts by sharing experiences and successes from projects. This can help future projects be more effective and prevent similar mistakes from recurring.**
- **Community Engagement and Communication: Monitoring processes are important to continue to engage communities, stakeholders and other interested parties. Community involvement and open communication can increase the sustainability of projects and leverage local knowledge and experiences.**
- **Risk Assessment: Monitoring activities can help identify and eliminate potential risks that projects may face. This allows preventive measures to be taken to ensure that projects continue successfully.**
- **Policy and Strategy Development: Monitoring results can be used to shape ecosystem restoration policies and strategies. This could contribute to broader strategies to combat climate change by enabling management plans and policies to be improved.**
- ***Application details:***
- ***Increasing the number and area of protected areas for the protection of biodiversity and rare ecosystems and declaring them urgently.***
- ***Conducting poaching inspections.***
- ***Conducting information and training activities.***
- ***Rehabilitation of forests, implementation of the action plan and national afforestation campaign.***
- ***Preparation of environmental bases for natural ecosystems using GIS and satellite images.***
- ***Stakeholders to collaborate with:***
  Municipalities, Provincial Directorate of Agriculture and Forestry, Regional Directorate of Forestry

E.6: Ensuring the integration of blue infrastructure into green areas

Integrating blue infrastructure into green spaces is an important concept in terms of environmental sustainability and urban planning. This integration involves combining green spaces with blue infrastructure elements for issues such as sustainable water management, energy efficiency and environmental impact reduction. Here are examples of this type of integration:

Rain Gardens and Urban Ponds:

- **Rain gardens can be created in green areas where rainwater collects and drains naturally. These gardens clean rainwater and direct it to the underground water table and also contribute to city ponds.**
- **City ponds allow water to be collected, stored and used when needed.**

Water Permeable Floors:

By using water permeable ground materials in green areas, it is possible to ensure that rainwater drains directly into the ground. This prevents water from accumulating, reducing the risk of floods and feeding underground water resources.

Green Roofs and Solar Energy Integration:

- **Roofs of buildings can be covered with green roofs, which absorb rainwater and filter it through vegetation.**
- **At the same time, by integrating solar panels on the roofs, green energy production can be achieved and the water evaporation rate can be increased by creating shade for the vegetation on green roofs.**

Tree-Lined Streets and Waterways:

- **By creating tree-lined avenues in city planning, it is possible to ensure better absorption of water in these areas and to maintain the water balance.**
- **At the same time, it is possible to direct and use rainwater by creating waterways on these streets.**
- **Wastewater Treatment and Irrigation Systems:**
- **Wastewater treatment systems integrated into green areas can increase water resources available for irrigation by cleaning gray water.**
- **These systems ensure the efficient and sustainable use of water.**
- **Integrating blue infrastructure into green areas is an important strategy for urban planning and environmental management. These examples can help achieve water management, energy efficiency and environmental sustainability goals.**

Application details:

Expansion of xeric landscaping and anhydrous grass application areas.

Ensuring that dry stream beds are transformed into green corridors

Raising awareness by establishing green rings in districts.

Planning the green corridor to be created for adaptation to climate change in a way that connects green areas in coastal areas and green areas in the city.

As a precaution against the risk of decrease in expected rainfall, ensuring the planting of trees and vegetation in green areas that require less water.

Stakeholders to collaborate with:

Provincial and district municipalities, Provincial Directorate of Agriculture and Forestry, Regional Directorate of Forestry, Regional Directorate of State Hydraulic Works

Application details:

- Preservation and expansion of forest areas, protection of vegetation on coastlines, creation of sheltered areas for the survival of plants, protection and increase of urban green areas.
- Identifying areas with high fire risk and taking precautions in line with these risks
- Proper planning along with the creation of response systems and risk maps.
- Ensuring that studies are carried out in cooperation with public institutions and organizations.

Stakeholders to collaborate with:
Municipalities, Provincial Disaster and Emergency Directorate (AFAD), Provincial Directorate of Agriculture and Forestry, Regional Directorate of Forestry, Public institutions and organizations

E7: Making green roof mandatory on commercial buildings

- There are a number of benefits to requiring green roofs on commercial buildings. This practice covers many areas such as environmental sustainability, energy efficiency, urban ecosystem health and overall urban quality of life. Here are some of these benefits:
- **Temperature Balancing: Green roofs can stabilize temperature fluctuations around the building. In summer, it absorbs sunlight and keeps buildings cool. In winter, it can reduce heat loss thanks to its insulation properties.**
- **Energy Efficiency: Green roofs can increase the energy efficiency of buildings. It cools buildings by absorbing heat and reduces heat losses. This provides a more consistent temperature indoors and reduces the need for air conditioning.**
- **Rainwater Management: Green roofs contribute to water management by absorbing and retaining rainwater. In this way, it can reduce erosion caused by floods and rainwater runoff in the city.**
- **Air Quality: Plants absorb carbon dioxide and produce oxygen. Thanks to green roofs, air quality in the city can be improved and carbon footprint can be reduced.**
- **Increasing Biodiversity: Green roofs support urban biodiversity by providing habitats for local flora and fauna. It offers a variety of habitats for birds, insects and other creatures.**
- **Noise Reduction: Green roofs can reduce noise levels inside the building by absorbing external noise. This creates a quieter and more comfortable interior for employees or residents.**
- **Visual Aesthetic and Psychological Benefits: Green roofs provide an aesthetic contribution to the building environment and can have a positive impact on people. Green spaces can reduce stress and improve overall psychological health by providing opportunities to interact with nature.**
- **Long-Term Investment: Green roofs can contribute to the longevity and sustainability of buildings. In the long term, it can provide economic advantages such as reduction in energy costs, decrease in maintenance costs and increase in building value.**
- **Green roof mandates can contribute to cities' overall fight against climate change by increasing the environmental and economic sustainability of commercial buildings. This practice aims to achieve sustainability goals in urban planning and building regulations.**
- **Application details:**
- **Green roof sample applications.**
- **Supporting rainwater retention with green roof applications.**
- **Encouraging the application of green roofs in large buildings such as municipal buildings, industrial facilities and shopping malls.**
- **Adding green roof applications to the new regulations.**
- **Giving priority to green roof applications in new architectural works and carrying out feasibility studies, including load calculations.**
- **Applying green roofs to all possible areas gradually, starting from the largest areas.**
- **Stakeholders to collaborate with: Municipalities, Professional Chambers, Public institutions and organizations, Chamber of Commerce and Industry (ATSO).**

E8: Fighting Forest Fires, The Importance of Inter-Institutional Communication

- Within the scope of combating climate change, forest fires have become a bigger problem, especially due to factors such as increasing temperature, dryness and fire risk under the influence of climate change. A successful strategy to combat forest fires requires effective inter-agency communication. Here is the importance of inter-institutional communication in this regard:
- **Quick Response and Coordination: Forest fires are among the emergencies that require immediate response. Effective interagency communication is critical to ensuring rapid fire response and coordination. Effective communication between the fire brigade, forestry directorates, civil defense and other relevant institutions responding to the fire contributes to a more effective and coordinated response in firefighting.**
- **Resource Sharing and Cooperation: Forest fires are events that can spread to large areas and require many resources. Effective communication is required to combine the resources, equipment and expertise of different institutions. This can help ensure efficient use of resources and coordinated action in firefighting.**
- **Risk Assessment and Information Sharing: A successful strategy in combating forest fires must be based on up-to-date and accurate information. Understanding the course of fire, assessing risks and effectively sharing fire-related information is possible through inter-institutional communication and cooperation.**
- **Community Information and Confidence Building: Wildfires often impact local communities. Interagency communication can help accurately communicate up-to-date fire information to the community. Additionally, through this communication, trust can be built about the community's firefighting efforts.**
- **Determining Second and Third Stage Strategies: Forest fires often go through different stages, initial response, control and suppression, followed by rehabilitation. Interagency communication coordinates the identification and implementation of strategies at these different stages.**
- **Long-Term Planning and Preparation: Communication should be part of long-term planning for wildfires. Among strategies to combat climate change, it is important to create long-term plans to reduce fire risk and review these plans regularly.**

WATER RESOURCES MANAGEMENT

Water Resources Management Adaptation Methods
(Water Resources Management Adaptation Methods)

- E.1: Integrating adaptation to the effects of climate change into water resources management policies
- E.2: Integrated management of water resources in water basins for adaptation to climate change
- E.3: Creating guidelines to save water in commercial buildings.
- E.4: Expansion of rain gardens and water pools.
- E.5: Use of water transfer schemes
- E.6: Expanding the use of water-saving mechanisms.
- E.7: Use of sustainable urban drainage system.
- E.8: Changing water treatment lines according to drought and increasing temperature factors.

E.1: Creating Guidelines for Saving Water in Commercial Buildings

- Against the risk of drought and water scarcity, water saving practices must be implemented throughout the city. If water saving is started, especially in public and commercial buildings, an example can be set for residential areas and the water saving mechanism can be spread throughout the city. A guide can be created for water saving practices of commercial buildings, and some incentive mechanisms such as tax deductions can be created for those who can save water within the determined targets.
- **Application details:**
  -Collecting rainwater and using it in facilities to save water
  -Providing incentives for the reuse of wastewater in the industrial sector
  - Holding meetings where inter-sectoral experiences will be shared
  -Increasing investments in new water-saving technologies.
  Stakeholders to collaborate with:
  municipalities,
  General Directorate of Water and Wastewater Administration (ASAT),
  Chamber of Commerce and Industry (TSO)

E.2: Expansion of Rain Gardens and Water Pools

- The use of nature-based solution strategies can make a big difference in areas where urbanization is intense and it is difficult for rainwater to meet the soil. Rain gardens and water ponds are effective methods of collecting rainwater and then using it. Collecting rainwater and using it in irrigation activities both in urban areas and in agricultural areas will be very beneficial in terms of saving water and reducing resource use.

Application details:

- **-Using underground tanks for effective management of rainwater.**
- **-Creating rainwater retention ponds, using the accumulated water for purposes such as street washing and plant irrigation.**
- **use in areas.**
- **-In street renewal and landscaping projects, permeable materials should be used in intermediate arteries, excluding main arteries.**
- **Ensuring that its use is made compulsory.**
- **-Conducting studies on the use of rainwater for personal needs in sites and buildings (garden**
- **irrigation, use as gray water).**
- **-Creating urban water retention reservoirs to increase rainwater harvesting.**
- **-Application of natural urban coatings (stone, soil), base that prevents groundwater recharge**
- **Avoiding coatings.**
- **Stakeholders to collaborate with:**
- **Provincial and district municipalities, General Directorate of Water and Wastewater Administration (SAT), Trade and Industry**
- **Chamber (TSO), professional chambers**

E.3: Use of Urban Water Transfer Schemes

Drought and shortage of water resources sometimes affect the whole city, and sometimes they can affect certain regions more. The region where underground water resources are located or the frequency of use in that region is also a factor that affects the capacity of water resources. In such cases, water can be supplied to areas experiencing water scarcity and drought by using water transfer schemes from distribution centers where the main water resources are located. In addition, reducing the loss and leakage rates that occur during the circulation of mains water is very important in terms of saving water and protecting water resources.

Application details:

- **Preventing water losses by renovating drinking water tanks. -Providing water control thanks to the SCADA system.**
- **Carrying out coordinated work during the planning process.**
- **Establishing the holistic management of groundwater and surface water.**
- **Ensuring the participation of stakeholders while conducting feasibility studies.**
- **Stakeholders to collaborate with:**
- **municipalities,**
- **General Directorate of Water and Wastewater Administration (SAT),**
- **State Hydraulic Works Regional Directorate**

E. 4: Expanding the Use of Water-Saving Mechanisms.

Despite the risks of drought and water scarcity, water-saving mechanisms need to be expanded throughout the city. Water-saving practices that can be achieved through nature-based solutions in public areas should be expanded throughout the city. In addition, it is important to carry out studies on harmonizing existing systems in households, public and commercial buildings with water saving.

Application details:

- **Encouraging the use of aerators that save water by attaching to tap heads in households, public buildings and commercial buildings.**
- **-Increasing the use of photocell batteries in public and commercial buildings to save water.**
- **-Increasing the use of common water fountains instead of disposable products (bottles, glasses, etc.) in public and commercial buildings.**
- **-Conducting information and awareness activities regarding water saving.**
- **-Drawing attention to the issue of climate change by organizing events throughout the city on World Water Day.**
- **Stakeholders to collaborate with:**
- **municipalities,**
- **General Directorate of Water and Wastewater Administration (SAT)**

E.5: Use of Sustainable Urban Drainage System.

Changing weather and temperature conditions along with the effects of climate change cause changes in infrastructure systems. It is very important to adapt drainage systems to the effects of climate change in terms of protecting water resources and supplying recyclable water. It is possible to say that in addition to the cost of the negative effects that may occur in possible risks, the cost of adapting the drainage system to climate change may be much higher. It is clear that infrastructure systems throughout the city need to be adapted to the climate as a long-term investment.

Application details:

- **Ensuring the implementation of urban drainage solutions.**
- **Creating a sustainable urban drainage system and ensuring rainwater management.**
- **Conducting R&D studies on sustainable drainage system and water-sensitive urban design.**
- **Within the scope of developing green infrastructure strategies, implementation of sustainable urban drainage and water-sensitive urban design principles in all planned green areas and buildings.**
- **Separate collection of rainwater to reduce the load on the drainage network and wastewater treatment plants.**
- **. Stakeholders to collaborate with:**
- **municipalities,**
- **General Directorate of Water and Wastewater Administration (SAT)**

E.6: Changing Water Treatment Lines According to Drought and Increasing Temperature Factors.

- Increasing temperatures due to climate change cause water losses by increasing the amount of evaporation in dams and open water pools. Therefore, these systems need to be revised according to new climatic conditions. However, in order to protect natural water resources, it is essential to establish water treatment lines and adapt them to the climate.
- **Application details: -Installation of solar power systems (solar energy systems) on water channels. -Covering the water surface with white-painted, light, water-insoluble and non-poisonous objects.**
- **Stakeholders to collaborate with:**
- **municipalities,**
- **General Directorate of Water and Wastewater Administration (ASAT)**

Urban Infrastructure and Waste Management
(Urban Infrastructure and Waste Management)

Within the framework of adaptation to climate change, local governments can create a sustainable environmental policy by raising awareness about waste in cities. Some strategies that local governments can apply in raising awareness about waste:

- **Domestic Waste Separation Campaigns:**
- Local governments can organize campaigns that encourage households to separate household waste. In these campaigns, a major emphasis should be on separating waste into different categories such as organic, paper, glass, metal and plastic.

Information Materials and Communication Campaigns:

- Information campaigns about waste management can be organized through colorful brochures, posters, flyers and other printed materials.
- Local governments can publicize awareness messages using local media and social media platforms.

Educational Programs in Schools:

- It can contribute to the awareness of young generations by organizing training programs on waste management and recycling in schools.
- Awareness programs can be developed for families through schools.

Community Events and Seminars:

- Local governments can organize seminars, workshops and clean-up events to engage the community on waste.
- Participation of environmental experts and local leaders can increase the impact of these events.

Recycling Stations and Easy Accessibility:

- By establishing recycling stations throughout the city, citizens can be provided with an infrastructure where they can easily recycle their waste.
- The locations of recycling stations can be made easily accessible by announcing them to the public with maps and information boards.

Reward and Incentive Programs:

- Local governments can organize reward programs for individuals and businesses that are successful in waste reduction and recycling.
- Such incentives can increase society's efforts on waste.

Urban, Infrastructure and Waste Management

- E.1: Minimizing food waste.
- E.2: Carrying out awareness raising activities on waste.
- E.3: Placing recycling bins in public areas.
- E.4: Separate collection of hotel, restaurant and cafe waste.
- E.5: Using light colored materials in floor coverings.
- E.6: Increasing water permeable surfaces (pavements, roads, areas closed to traffic, parks)
- E.7: Increasing bicycle paths and ensuring their integration with green corridors.

E.1: Minimizing Food Waste

Collecting and recycling food waste in cities is very important in the fight against climate change. Encouraging municipalities, especially hotels and restaurants, to separate food waste in their own businesses will be conducive to popularizing this system. Collecting and recycling sorted waste will both create a circular economy and minimize waste.

Application details:

- **Separation of waste through recycling.**
- **Conducting feasibility studies to develop a penalty and reward system for solid waste disposal for businesses.**
- **Conducting research to put the waste disposal tax on the agenda and spread it throughout the province.**
- **Stakeholders to collaborate with:**
- **Ministry of Environment, Urbanization and Climate Change,**
- **Provincial Directorate of Environment, Urbanization and Climate Change,**
- **municipalities,**
- **commercial enterprises**

E.2: Conducting Awareness Raising Studies on Waste

The society needs to be informed in order to reduce uses such as plastic use, which has increased in recent years, to separate and collect household waste, or to ensure waste separation in households. Waste awareness needs to be raised in schools, especially from a young age. Local governments should organize reward-based campaigns to encourage citizens to separate waste at home.

Application details:

- **Identifying businesses that use single-use plastics extensively in cities.**
- **Creating an incentive mechanism to reduce single-use plastics in local businesses.**
- **Reducing the use of single-use plastic in public institutions and organizations.**
- **Establishing incentive mechanisms to increase recycling and recovery and organizing events on this subject.**
- **Carrying out information and awareness raising activities for students and citizens.**

Stakeholders to collaborate with:

- **Ministry of Environment, Urbanization and Climate Change,**
- **Provincial Directorate of Environment, Urbanization and Climate Change, Municipalities,**
- **Provincial Directorate of National Education**

E.3: Placing Recycling Bins in Public Areas

In addition to waste separation and minimum waste generation, recycling bins should be placed in public open and closed areas and buildings according to the type of waste. Local governments should collect these recycling bins separately according to frequency of use and type of waste and deliver them to recycling centers. Thus, over time, society's habits regarding waste will change for the better.

Application details:

- **Developing pilot projects with universities for sustainable and innovative waste management.**
- **Smart route planning for waste collection and transfer vehicles.**
- **Identifying the recycling infrastructure needed throughout the province.**
- **Cooperating with relevant institutions to invest in recycling.**
- **Developing R&D projects together with universities for investment planning in waste separation and recycling facilities.**

Stakeholders to collaborate with:

- **Ministry of Environment, Urbanization and Climate Change,**
- **Provincial Directorate of Environment, Urbanization and Climate Change, Municipalities,**
- **commercial enterprises,**
- **universities,**
- **Public institutions and organizations**

E.4: Separate Collection of Hotel, Restaurant, Cafe Waste

Collecting food waste from restaurants, cafes, hotels and food and beverage venues and ensuring that the waste is converted into fertilizer to be used in agricultural production. Creating guidelines for places that produce food waste to minimize waste separation and waste, thus saving money on waste disposal and transformation processes.

Application details:

- Making separate collection of materials with a high recycling rate mandatory.
- Carrying out incentive activities for citizens regarding waste that can be turned into compost and organizing events for the municipality on composting.
- Investigating the potential of waste collection services for the food industry.

Stakeholders to collaborate with:

- **Ministry of Environment, Urbanization and Climate Change**
- **Provincial Directorate of Environment, Urbanization and Climate Change, Municipalities,**
- **Provincial Directorate of National Education**

E.5: Using Light Colored Materials in Floor Coverings

Increasing air temperatures and the urban heat island effect, especially in summer, are closely related to the type of material in the environment. In areas with dense buildings, ensuring that floor coverings are light-coloured can help absorb less sunlight and reduce the urban heat island effect. In order to disseminate this measure, pilot regions should be determined and temperature monitoring should be carried out periodically. This monitoring process will allow us to observe the positive impact of light-colored materials on the urban heat island. Later, the aim can be to replicate the pilot applications and expand the use of light-colored materials in floor coverings throughout the city.

- **Application details:**
- **Ensuring that the spatial development of the city is carried out by considering the creation of green areas and green corridors.**
- **Establishing and implementing a green infrastructure system compatible with nature.**
- **Identifying places where pilot studies can be carried out for sustainability purposes and preparing feasibility reports.**

Stakeholders to collaborate with:

- **Ministry of Environment, Urbanization and Climate Change,**
- **Provincial Directorate of Environment, Urbanization and Climate Change,**
- **district municipalities,**
- **Public institutions and organizations**

K6: Increasing Water Permeable Surfaces (Sidewalks, Roads, Areas Closed to Traffic, Parks)

The rapidly increasing population in recent years has led to the expansion of artificial areas in cities. This situation prevents rainwater from reaching the ground, increasing the risk of floods and floods. For this reason, it is necessary to cover certain areas in the city, primarily in risky areas, with water permeable surfaces. Then, the use of water permeable surfaces should be expanded throughout the city. Covering hard surfaces, especially in areas closed to traffic, sidewalks, bicycle paths and parks, with such materials is one of the effective solutions to minimize the risk of floods and floods in these areas during rainy weather.

Application details:

- **Covering the floors of areas such as commercial areas, building gardens, parking areas and public areas with permeable surfaces.**
- **Implementation of good practice examples regarding the design of permeable surfaces in infrastructure works.**

Stakeholders to collaborate with:

- **Ministry of Environment, Urbanization and Climate Change,**
- **Provincial Directorate of Environment, Urbanization and Climate Change, district**
- **municipalities,**
- **Public institutions and organizations**

E.7: Increasing bicycle paths and ensuring their integration with green corridors

Increasing emission rates due to intensive vehicle use are among the important factors that trigger climate change. Therefore, integrating it with nature-based solutions for mitigation is of great importance. It is of great importance for the bicycle network to function as a green corridor and to encourage the use of low-emission, hybrid and electric vehicles in achieving heat island targets. It is also critical to encourage cycling and increase walkability in cities. Increasing bicycle paths in cities and converting existing roads into ecosystem services will be effective in increasing biodiversity.

Application details:

- **Ensuring increased accessibility by establishing green rings in neighborhoods (bicycle path, fusion of passive and active green areas).**
- **Using web-based systems to configure a bicycle transportation network**
- **Making arrangements to transform bicycle paths into ecosystem services by integrating them with nature-based solutions.**
- **Ensuring that electric vehicle use is preferred in public institutions and organizations.**

Stakeholders to collaborate with:

- **municipalities,**
- **Regional Directorates of Transport and Infrastructure,**
- **Energy and Natural Resources Ministry,**
- **Provinces Bank,**
- **vehicle manufacturers**

PUBLIC HEALTH AND DISASTER MANAGEMENT

(PUBLIC HEALTH AND DISASTER MANAGEMENT)

Public Health and Disaster Management

- Rising Temperatures Related Diseases:
  - *Heat Stroke: High temperatures can trigger conditions such as heat stroke. For protection, one should avoid staying outside on hot days, drink enough water and seek shelter in cool places.*
  - *Food Poisonings: Increased temperature and humidity can increase food poisonings. It is important to store and cook food correctly.*
- *Waterborne Diseases:*
  - *Mosquito-Borne Diseases: Temperature changes can affect the distribution of mosquitoes and increase the spread of diseases such as malaria and Zika virus. To protect against mosquito bites, appropriate clothing should be worn and insect repellents should be used.*
  - *Waterborne Diseases: Increased rainfall may increase the risk of spreading waterborne diseases (e.g., cholera). Access to clean water sources and hygiene measures are important.*
- *Air Quality Related Issues:*
  - *Respiratory Diseases: Air pollution can cause an increase in respiratory diseases such as asthma and bronchitis. Using clean energy and reducing industrial emissions can improve air quality.*
- *Natural Disasters and Psychological Effects:*
  - *Earthquake, Flood etc.: Climate change may increase the frequency and severity of natural disasters. This can cause trauma, loss and psychological problems. Societies should be prepared for disasters and receive psychosocial support.*
- *Appropriate Health Infrastructure:*
  - *Health systems must be appropriately strengthened to reduce the effects of diseases associated with climate change. Early warning systems and rapid response capacity should be developed.*

- E.1: Providing information about diseases caused by climate change and prevention methods.
- E.2: Implementation of practices to prevent vector reproduction.
- E.3: Monitoring air and water quality values and developing a warning system

E.4: Identifying the areas that will be most affected by extreme weather events.

E.5: Ensuring food and nutrition security against drought risk.

E.6: Explaining climatic disaster risks to the society.

E.7: Development of disaster early warning systems

E.8: Development of GIS-based risk maps.

E.1: Providing information about diseases and prevention methods.

It is extremely important to prevent infectious diseases and explain them to the society. Every citizen should be periodically informed about infectious diseases and methods of protection from them.

Application details:

- **-Carrying out awareness-raising activities to protect against the negative effects of climate change on health.**
- **-Raising awareness of primary health care (community health and family health center) workers about health risks due to climate change.**
- **-Placing the issue of climate change in the curriculum**
- **-Training managers and staff working in public living spaces (dormitory, nursery, nursing home, retirement home, etc.) to improve their behavioral capacity in extraordinary weather events.**
- **-Organizing climate education in adult education centers.**
- **-Integrating the issue of adaptation to climate change into in-house training programs.**

Stakeholders to collaborate with:

- **Ministry of Health,**
- **Provincial Health Directorate,**
- **Provincial Directorates of National Education**
- **Provincial Disaster and Emergency Directorate (AFAD)**
- **General Directorate of Water and Wastewater Administration (SAT)-**
- **Public institutions and organizations**

E.2: Implementing practices to prevent vector reproduction

Separate studies should be carried out against vector diseases, especially in areas where pollution and population density are excessive. At the same time, the reproduction of vector-borne diseases that are infectious, as well as vectors that are harmful to plants and forests due to climate change, should be prevented.

Application details:

- **Taking appropriate steps to prevent vector reproduction and observe air flows in urban planning.**
- **Investigating the increase in vector-borne diseases due to climate change and environmental problems.**
- **Establishment of working groups throughout the city.**

Stakeholders to collaborate with:

- **Ministry of Health,**
- **Provincial Health Directorate,**
- **Public institutions and organizations**

E.3: Monitoring air and water quality values and developing a warning system.

It is very important to follow water and air quality values in cities. Developing warning systems against possible risks will both enable precautions to be taken and minimize vulnerability.

Application details:

- **Strengthening existing early warning systems.**
- **Providing appropriate shelter conditions for those adversely affected by extreme weather events.**
- **Adding diseases related to climate change to the early warning system and ensuring follow-up on a case-by-case basis.**
- **-Developing an early warning system by eliminating the lack of interface in areas where measurement and monitoring are carried out, especially air quality and water quality.**
- **-Developing early warning systems on issues such as changes in air quality and heat wave risk within the scope of action plans.**
- **Stakeholders to collaborate with:**
- **Ministry of Health,**
- **Provincial Health Directorate,**
- **Public institutions and organizations,**
- **Ministry of Environment, Urbanization and Climate Change**
- **Provincial Directorate of Environment, Urbanization and Climate Change**

E.4: Identifying the areas that will be most affected by extreme weather events

While the effects of climate change are not seen equally in all areas of the city, their impact on some groups is different. The impact of climatic risks is generally greater, especially in areas where urbanization is intense and green areas are few. In addition, vulnerable groups such as the elderly population, those with chronic diseases, and low-income groups are much more affected by the effects of climate change. For this reason, the implementation of climate adaptation actions should be expanded throughout the city, starting from fragile and more at-risk areas.

Application details:

- Carrying out studies to prevent extreme weather events from adversely affecting the health of those with chronic diseases, disabled people, newborns, the elderly and other vulnerable groups.
- Providing appropriate shelter conditions for those adversely affected by extreme weather events.
- Planning of areas sensitive to allergies.
- Carrying out awareness-raising activities to protect against the negative effects of climate change on health at the social and individual level.

Stakeholders to collaborate with:

- Ministry of Health,
- Provincial Health Directorate,
- Public institutions and organizations,
- Provincial Disaster and Emergency Directorate (AFAD)

E.5: Ensuring food and nutrition security against drought risk

Although drought and water scarcity negatively affect all sectors, they affect agricultural production more seriously. For this reason, it is important to disseminate agricultural production models that can be developed by taking advantage of new and technological developments in Antalya.

Application details are as follows:

- **Diversification of temperature-resistant food and beverage options.**
- **Expanding the production of the appropriate product pattern to be determined by the Ministry of Agriculture and Forestry, taking into account the climatic conditions, soil structure and food needs of the region.**
- **Guiding manufacturers to develop suitable product varieties.**
- **Analyzing the effects of climate change on important agricultural products in the region.**
- **Measuring the awareness level of the public and agricultural sector stakeholders on the impact of climate change on agricultural production and food security.**
- **Determining the effects of drought, new diseases due to excessive precipitation and drought, hail and frost events on the plant pattern and taking the necessary precautions.**
- **Conducting information and awareness activities on hygiene, especially during dry periods.**

Stakeholders to collaborate with:

- **Municipalities, Governorships, Ministry of Health,**
- **Provincial Health Directorate, Public institutions and organizations, Provincial Directorate of Agriculture and Forestry**

E.6: Raising Public Awareness on Climate Disaster Risks

Explaining the effects of climatic disasters and climate change to all segments of society is very important in reducing possible risks. The precautions to be taken against climatic risks should be periodically explained to all age groups in schools. In addition, information meetings should be organized for everyone involved in agricultural production and in the tourism sector, and all segments of society, from rural to urban, should be reached.

- **Application details:**
- **-Developing a communication strategy for target audiences based on the findings.**
- **-Operationalization and implementation of educational and instructional activities.**
- **-Increasing the effectiveness of activities (in terms of resource management) by developing collaborations with non-governmental organizations.**
- **-Concretely revealing the risks of climate change on living beings' health and quality of life and conveying these effects to the public and raising awareness**
- **-Creating plans for informing the public.**
- **-Conducting awareness raising activities by experts on global warming and climate change, especially starting from primary school level.**
- **-Organizing informational meetings for everyone involved in agricultural production and in the tourism sector.**
- **-Informing sector stakeholders and local people about the purpose of early warning systems, their functioning and how their findings can be used.**
- **Stakeholders to collaborate with:**
- **Municipalities, Governorships, Ministry of Health, Provincial Health Directorate, Public institutions and organizations, Provincial Directorate of National Education**

E.7: Development of disaster early warning systems

It is very important to develop and use early warning systems to prevent possible loss of life and property in cities. Along with the preparation of risk maps of the city, warning systems that will warn the society using technological tools according to the current risks should be disseminated throughout the city. Although warnings about possible weather conditions are currently being conveyed to citizens via the internet and television channels, more advanced systems are needed to cover rural areas. Another important point is to ensure that citizens heed the warnings during such warnings.

Application details:

- **-Working together with AFAD at the national level for strategies and capacities to monitor the indicators that need to be followed, and also cooperating with the General Directorate of Meteorology.**
- **Conducting studies based on SECAP risk and vulnerability assessment in order to better identify physical, social and economic vulnerabilities associated with floods throughout the city.**
- **-Increasing opportunities to access climate information**
- **Strengthening early warning systems.**

Stakeholders to collaborate with:

- **Governorships, Ministry of Health, Provincial Health Directorate, Public institutions and organizations, Regional Directorate of Meteorology, Provincial Disaster and Emergency Directorate (AFAD)**

E.8: Development of GIS-based risk maps

As one of the most important steps in disaster management, it is very important to develop risk maps based on geographic information system, starting from the most risky areas throughout the city. Clearly revealing the vulnerability and risk status of cities from climate change will be possible with GIS risk maps that technical teams can create using scientific methods.

Application details:

- **Increasing technical capacity by providing theoretical and technical training on measurement and monitoring methods for the early warning system to relevant unit and field employees.**
- **Completely processing the work to be done throughout the city into the geographical information system environment**
- **Developing a decision support mechanism built on the geographical information system for more effective management of disasters and able to effectively manage all resources in case of disaster.**
- **Ensuring the coordination of institutions and processing risky areas and risk maps throughout the province into the GIS information program.**
- **Stakeholders to collaborate with:**
- **Municipalities, Governorships, Public institutions and organizations**

TARIM (Agriculture)

Sustainable adaptation measures should be taken to reduce the effects of climate change on the agricultural sector and to adapt to these changes. Here are some sustainable adaptation measures that can be implemented in the agricultural sector:

Effective Use of Water Resources:

- Adopting irrigation techniques that enable more effective and efficient use of water, such as drip irrigation and sprinkler systems.
- Use of cover crops and organic materials to retain soil moisture.

Growing Durable Agricultural Products:

- Developing and choosing agricultural products and plant varieties that are resistant to climate change, drought and high temperatures.

Diversified Production:

- Growing different products and creating a diversified agricultural structure, thus distributing the risk by reducing dependence on a single product.

Fertile Soil Management:

- Adopting sustainable soil management practices, adding organic matter to prevent soil erosion and increase soil fertility.

Access to Meteorological Information:

- The use of technological tools and applications that provide farmers with access to meteorological information helps plan agricultural activities and prepare for climate change.

Education and Awareness Raising:

- Providing training and awareness to farmers about climate change and sustainable agricultural practices.

Use of Renewable Energy:

- Diverting the energy used in agricultural operations to renewable energy sources can reduce the carbon footprint.

Use of Appropriate Technology:

- Adoption of climate-compatible agricultural technologies, for example, climate-sensitive irrigation systems, climate prediction models and sensor technologies.

Promoting Good Agricultural Practices:

- To promote and support certified organic agriculture and good agricultural practices.

Agriculture

- E.1: Creating vegetated buffer strips along agricultural irrigation channels.
- E.2: Informing farmers about climatic risks.
- E.3: Applying nature-based solutions in appropriate areas.
- E.4: Making greenhouses resistant to climatic risks.
- E.5: Providing support to farmers to increase production diversity and quantity
- E.6: Creating rainwater tanks for agricultural irrigation.

E. 1: Creating vegetated buffer strips along agricultural irrigation channels

In order to collect rainwater and reduce the risk of erosion, rain collection and irrigation edges should be opened in agricultural areas and supported by planted buffer strips.

Application details:

- **Carrying out work to release rainwater to the soil and underground.**
- **Development and dissemination of water harvesting techniques and technologies.**
- **Informing the manufacturer.**

Stakeholders to collaborate with:

- **State Hydraulic Works Regional Directorate,**
- **Provincial Directorate of Agriculture and Forestry,**
- **irrigation cooperatives,**
- **farmers**

E.2: Informing farmers regarding climatic risks

The effects of climate change have a serious pressure on agricultural production and food security. Changing climate and temperature conditions cause changes in many issues such as the production times and regions of agricultural products. It is essential to share such changes and solution suggestions with the manufacturer. Farmers need to be informed periodically about the effects of climate change, depending on the product type and production needs. In addition, it is important to explain to farmers the types of production that will adapt to climate change.

Application details:

- **Establishing relationships with farming communities and cooperatives to determine the most effective training formats and the support needed to transition to more sustainable practices.**
- **Working with farming communities and cooperatives to increase field biodiversity.**
- **Organizing appropriate training workshops in agricultural basins.**
- **Measuring the awareness levels of the public and agricultural sector stakeholders on the impact of climate change on agricultural production and food security.**
- **Developing a communication strategy for target audiences based on the findings.**

Stakeholders to collaborate with:

- **Provincial Directorate of Agriculture and Forestry,**
- **irrigation cooperatives,**
- **farmers**

E-3: Implementing nature-based solutions in suitable areas

Nature-based solutions can be applied not only in cities but also in agricultural areas. Applications such as building rainwater collection areas for agricultural irrigation, especially in regions facing the risk of water scarcity and drought, applying vegetated buffer strips to the edges of agricultural areas, leaving soils uncultivated according to the type of soil and products, and erosion control systems are nature-based solutions. These types of practices need to be implemented and disseminated according to the needs of agricultural areas.

Application details:

- **-Increasing the use of basin erosion control works and the construction of dry stone terraces on slopes and streams in order to release basin rainfall water to the soil and underground.**
- **-Conducting a study on the quality and interconnectedness of natural habitats**
- **-Changing irrigation methods and agricultural patterns**
- **-Taking institutional and technical measures to reduce water consumption**
- **-Increasing public investments to improve soil quality (increasing organic matter, etc.).**
- **-Increasing support mechanisms for sustainable land management and climate-friendly agricultural practices.**

Stakeholders to collaborate with:

- **Provincial Directorate of Agriculture and Forestry,**
- **irrigation cooperatives,**
- **farmers,**
- **State Hydraulic Works 13th Regional Directorate Antalya**

Action-6: Creating rainwater tanks for agricultural irrigation

Especially in areas where greenhouses are concentrated, the inability of rainwater to meet the soil increases the risk of floods and prevents its collection. For this reason, rainwater collection ponds need to be increased, especially starting from these areas. In addition, in areas where greenhouse agriculture is not carried out, rainwater collection systems should be created and used for agricultural irrigation.

- **Application details:**
- **Establishment of agricultural drought management coordination board.**
- **-Ensuring effective rainwater management.**
- **-Establishing rainwater collection systems and ensuring their use in agricultural irrigation.**
- **-Making it mandatory to create rainwater collection systems in agricultural areas over a certain m^2.**
- **-Establishing rainwater collection systems in areas where greenhouse agriculture is not carried out.**
- **Stakeholders to collaborate with:**
- **Provincial Directorate of Agriculture and Forestry, farmers, Agriculture council**

TOURISM

- The Mediterranean Region, one of the world's leading tourism destinations, has been identified as a major hotspot vulnerable to the impact of climate change. Rising temperatures have been identified as a significant hazard, leading to heat stress for tourists and thus a potential reduction in the attractiveness of the area.
- Tourism is an important industry for Mediterranean countries. Therefore, the possibility of climate change is a concern (Bigano et al., 2008). International tourist arrivals (overnight visitors) to Mediterranean countries reached a record 342 million in 2014, approximately one-third of total arrivals worldwide (1,133 million). Considered as a single geographical area, the Mediterranean Basin is by far the world's largest tourism destination (UNWTO, 2015).
- Among all tourism types, coastal/beach tourism is expected to be more affected by the effects of climate change. Because this type of tourism depends significantly on climate and weather conditions. It has been determined that a 1 °C increase in temperature is expected to gradually shift tourism destinations to the north and the mountains, which will affect the preferences of tourists coming from Western and Northern Europe with the trinity (sun, sea and sand) (Alcamo et al., 2007; Hamilton et al., 2005).
- According to the IPCC (2013), global mean sea level will rise between 9 and 88 cm by 2100, which is an increase rate two to four times higher than in the 20th century. Regarding the oceans, the IPCC (2013) predicts that sea level will rise over approximately 95% of the ocean area. Additionally, it is estimated that approximately 70% of coastal areas around the world will experience sea level change.

Main Impacts and Consequences of Climate Change for Tourism Destinations Source: (IPCC, 2013: 198-199) (Noreen, 2024)

EFFECT	EFFECTS ON TOURISM
higher temperatures	Changing seasonality, heat stress for tourists, cooling costs, plant, wildlife, insect populations and distribution, infectious disease ranges
Decreasing snow cover and shrinking glaciers	Lack of snow in winter sports destinations, increase in snowmaking costs, shortening of winter sports seasons, decrease in landscape aesthetics
Increasing frequency and intensity of extreme storms	Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs
Less rainfall and increased evaporation in some areas	Water scarcity, competition for water between tourism and other sectors, desertification, increased forest fires that threaten infrastructure and affect demand
Increased frequency of heavy rainfall in some regions	Floods damage historical, architectural and cultural assets, damage tourism infrastructure, change seasonality
sea level rise	Coastal erosion, loss of beach area, higher costs for protecting and maintaining water fronts
Sea surface temperatures rise	Increasing coral bleaching and aesthetic degradation of marine resources in diving and snorkeling destinations
Changes in terrestrial and marine biodiversity	Loss of natural attractions and species from destinations, higher disease risk in tropical-subtropical countries
More frequent and larger wildfires	Loss of natural attractions; increased flood risk, damage to tourism infrastructure

E.1: Establishing sustainable tourism policies that adapt to climate change

- In order to make tourism activities and businesses sensitive to climate change, the concept of responsible tourism should be disseminated by establishing various incentive mechanisms.

Application details:

- **Green Infrastructure Development: Developing projects that support green infrastructure in touristic regions. This includes protecting natural areas and ensuring appropriate environmental conditions for sustainable tourism.**
- **Energy Efficiency and Renewable Energy Use: Tourist facilities must comply with energy efficiency standards and, if possible, switch to renewable energy sources.**
- **Water Resources Management: Implementation of policies to reduce water consumption in tourist areas and sustainable use of water resources.**
- **Protection of Natural and Cultural Heritage: Establishing planning and conservation policies to protect natural and cultural heritage in tourist areas. Managing particularly sensitive ecosystems and historical areas in line with sustainable tourism.**
- **Community Participation and Awareness: Education and communication campaigns to increase local communities' participation in tourism policies and raise their awareness of sustainable tourism.**
- **Environmentally Friendly Transportation: Promoting sustainable transportation systems to direct tourists' transportation to environmentally friendly options and reduce damage to local communities and nature.**
- **Disaster Risk Management: Creating emergency plans to be prepared for disasters caused by climate change and including tourist facilities in these plans.**
- **Sustainable Tourism Certifications: Issuing certificates to touristic businesses proving that they comply with sustainable tourism standards.**

Stakeholders to collaborate with:

- **T.R. Ministry of Culture and Tourism Antalya Provincial Culture and Tourism Directorate, NGOs carrying out tourism activities, tourism operators**

E.2: Encouraging the use of renewable energy in businesses.

Various incentive systems can be applied to support tourism businesses' transition to renewable energy sources. For example, businesses that prioritize the use of recycled materials and minimum waste production can be evaluated in a category determined by local governments or ministries and can benefit from incentives such as tax reductions, promotion and brand support. In addition, businesses that meet a certain part of their energy needs with renewable energy sources can be evaluated in a different category and supported with various incentives. This approach can help businesses in the tourism sector reduce their environmental impact by encouraging their transition to sustainable energy use.

- **Application details:**
- **-Implementation of incentive systems such as tax reduction, promotion and brand support to encourage tourism businesses to use renewable energy.**
- **-Including local governments in planning, management and tourism development processes and increasing their powers.**
- **Stakeholders to collaborate with:**
- **T.R. Ministry of Culture and Tourism, Provincial Directorate of Culture and Tourism, NGOs carrying out tourism activities, tourism operators, Municipalities**

E.3: Ensuring cooperation between tourism businesses to protect the environment

In the context of protecting the natural environment and the effects of climate change, tourism enterprises, ministries, non-governmental organizations (NGOs) and local governments should work in cooperation. In this context, it should be aimed to disseminate sustainable tourism models in the city by creating sustainable tourism guides. Issues such as encouraging the use of renewable energy resources, ensuring minimum waste production, supporting the use of green supply products, and developing and promoting alternative tourism activities can be addressed in these guides and disseminated through collaborations. These efforts can strengthen the adoption of sustainable practices in the tourism industry and the protection of the natural environment.

Application details:

- **-Preparing a situation analysis for tourism businesses in the region regarding the use of renewable energy resources, sustainable production and consumption strategy and green purchasing and supply chain management strategy.**
- **-Increasing the awareness of tourism businesses on energy efficiency and renewable energy use.**
- **-Creating a sustainable tourism guide.**
- **-Ensuring the dissemination of the sustainable tourism model by collaborating with stakeholders throughout the city.**
- **-Ensuring that tourism enterprises, ministries, NGOs and local governments work in cooperation in the context of protecting the natural environment and the effects of climate change.**

Stakeholders to collaborate with:

- **T.R. Ministry of Culture and Tourism, Provincial Directorate of Culture and Tourism, NGOs carrying out tourism activities, Tourism operators**

TRANSPORTATION

TRANSPORT

- Another infrastructure element that is fragile in cities is the transportation system.
- The fact that cities are important logistics centers, rapid population growth and urban sprawl increases the dependence of cities on the transportation system.
- It is known that transportation has been an important problem for Istanbul for many years, especially in our big cities.
- Istanbul is the sixth most congested city in the world (Euromonitor International, 2017).
- Transportation systems in Turkey, dominated by highways, not only cause climate change due to high carbon emissions, but also show high vulnerability to climate change.
- Ignoring ecological, geological and topographic conditions in transportation planning causes the transportation network to become unusable in case of any extreme weather event.
- Especially roads, underpasses and tunnels built in fill areas and flood areas are at high risk.


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A View from the Streets of Amsterdam


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IT IS IMPORTANT TO TAKE THE FOLLOWING ADAPTATION ACTIONS AND MEASURES TO ADAPT THE TRANSPORTATION SECTOR AGAINST THE NEGATIVE EFFECTS OF CLIMATE CHANGE IN MAJOR CITIES

1. Promoting Sustainable Transportation Methods:
- Improving and expanding the infrastructure of pedestrian and bicycle transportation
- Increasing the accessibility and efficiency of public transport services
- Supporting the use of electric and low-emission vehicles

2. Increasing the Resilience of Transportation Networks:
- Strengthening road and bridge infrastructures against extreme weather events and flooding
- Increasing the resilience of transportation systems against floods, storms and heat waves
- Improving emergency planning and response capacity

3. Expanding the Use of Intelligent Transportation Systems:
- Implementation of real-time traffic management and information systems
- Promoting shared transportation services
- Supporting the use of autonomous and connected vehicles

4. Implementation of Regulatory and Incentive Policies:

- Setting targets to reduce greenhouse gas emissions of the transportation sector
- Providing financial incentives for the development and diffusion of energy efficient and low carbon technologies
- Integrating climate change impacts into urban planning and design processes

5. Supporting Research and Information Sharing:

- Monitoring and analyzing the effects of climate change on the transportation sector
- Sharing urban adaptation strategies and best practices
- Increasing cooperation and capacity building activities among sector stakeholders
- These adaptation actions and measures are critical to increasing the resilience and sustainability of cities against climate change.

These adaptation actions and measures are critical to increasing the resilience and sustainability of cities against climate change.

The most serious effects of climate change on the transportation sector are generally seen in the following cities:

Coastal Cities:

- Cities exposed to flooding, coastal erosion and infrastructure damage due to sea level rise (e.g. New York, Miami, Venice, Bangkok)
- Ports and inland transportation systems affected by storms, typhoons and hurricanes (For example, Manila, Shanghai, New Orleans)

Tropical and Semi-tropical Cities:

- Cities that disrupt public transportation, aviation and road transportation due to extreme heat waves (For example, Cairo, New Delhi, Kuala Lumpur)
- Cities with roads, bridges and rail systems affected by heavy rains and floods (For example, Istanbul, Mumbai, Dhaka, São Paulo)

Mountainous and High Altitude Cities:

- Cities where transportation infrastructure is damaged due to glacier melting and changes in snowfall (For example, Erzurum, Kars, Ağrı, Ardahan, La Paz, Kathmandu, Quito)
- Transportation networks affected by landslides, avalanches and road closures (For example, Trabzon, Rize, Giresun, Thimphu, Innsbruck)

Arid and Semi-arid Cities:

- **Cities where public transportation and transportation services are affected due to water shortage and drought (For example, Şanlıurfa, Mardin, Gaziantep, Cape Town, Phoenix, Nairobi)**
- **Cities where desertification and dust storms disrupt road and aviation transportation (For example, Şanlıurfa, Gaziantep, Dubai, Riyadh, Ulan Bator)**

THE REGIONS AND CITIES WITH THE MOST SERIOUS EFFECTS OF CLIMATE CHANGE ON THE TRANSPORTATION SECTOR IN TURKEY ARE AS FOLLOWS:

- The most serious effects of climate change on the transportation sector in Turkey are seen especially on coastal cities, high and mountainous regions and urban areas due to factors such as sea level rise, extreme weather events and drought.

Aegean and Mediterranean Regions:

- **Damages to port and transportation infrastructure in coastal cities due to sea level rise**
- **Extreme heat waves and drought disrupt public transportation, aviation and road transportation**
- **Road, bridge and rail system infrastructures affected by increasing flood and flood risks**
- **(For example, Izmir, Antalya, Mersin)**

Eastern Black Sea Region:

- **Heavy rains, landslides and avalanches interrupt road and rail transportation**
- **Frequent damage to transportation infrastructure and increased repair costs**
- **(For example, Rize, Trabzon, Artvin)**

Central Anatolia and Eastern Anatolia Regions:

- **Drought and water scarcity affect public transport services**
- **Reduced functionality of transportation vehicles and infrastructure due to extreme heat**
- **Decrease in snowfall and changes in icing risk negatively affect road transportation**
- **(For example, Konya, Kayseri, Erzurum)**

Marmara Region:

- **Damages caused by floods and overflows to urban transportation networks, especially in Istanbul**
- **Extreme heat reduces the use of public transportation and damages the infrastructure**
- **(For example, Istanbul, Bursa, Kocaeli)**

MAIN MEASURES TO BE TAKEN BY LOCAL GOVERNMENTS TO REDUCE THE EFFECTS OF CLIMATE CHANGE ON THE TRANSPORTATION SECTOR

Increasing Infrastructure Resilience:

- Making transportation infrastructures such as roads, bridges, ports, airports and train stations resilient to climate change
- Strengthening the infrastructure against climate hazards such as floods, landslides and extreme temperatures
- Supporting critical transportation links with redundant systems

Transportation Planning Adaptable to the Changing Climate:

- Preparation of transportation master plans that take climate change scenarios into account
- Adopting planning approaches that prioritize public transportation, pedestrian and bicycle transportation
- Designing flexible and durable transportation systems

Early Warning and Emergency Action Plans:

- Establishing early warning systems for extreme weather events
- Preparing emergency action plans against transportation disruptions and conducting drills
- Development of alternative transportation routes and scenarios

Technological Transformation and Innovation:

- Dissemination of electric, autonomous and shared transportation systems
- Use of green infrastructure and smart transportation technologies
- Promoting solutions for energy efficiency and emission reduction

Awareness and Capacity Building:

- Training transportation workers on climate adaptation
- Awareness raising activities for citizens to adopt climate-friendly transportation options
- Ensuring cooperation and coordination with stakeholders (transportation companies, users, etc.)

Ministry of Environment and Urbanization Turkey's National Climate Change Adaptation Strategy and Action Plan Tables

NATURAL DISASTER RISK MANAGEMENT

PURPOSE UA1. Determining Threats and Risks for the Management of Natural Disasters Due to Climate Change

Target UA1.1. Floods, floods, avalanches, landslides, etc. due to climate change. Identifying natural disaster risks				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UA1.1.1. Preparation of disaster, hazard and risk maps such as floods and landslides that will form the basis for risk management processes against the effects of climate change and integrating these maps into plans for land use.	4	Flood hazard and risk maps	CHS, OSIB, DSI, AFAD	MGM, YY, Governorships
UA1.1.2. Preparation of application and inspection guides regarding flood and landslide risk reduction and management plans	4	Related plans and guides	OSİB, AFAD	DSİ
UA1.1.3. Making disaster management plans for sectors affected by natural disasters due to climate change	9	Management plans	AFAD	GTHB, OSİB, ŞŞB, DSI,
UA1.1.4. Establishing, disseminating and developing monitoring, forecasting and early warning systems for natural disasters due to climate change	5	Establishing relevant systems (flood, early warning, etc.), making early warnings, risk maps	DSİ, MGM, AFAD	MFWW, MEU, Governorships, University
UA1.1.5. Determining the social, economic and environmental impacts of natural disasters due to climate change	5	Impact analysis reports	AFAD	OSİB, ŞŞB, GTHB, OGM,

Target UA1.2. Reviewing the legislation regarding natural disasters due to climate change and determining the principles of implementation				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UA1.2.1. Identifying natural structures that reduce the effects of natural disasters due to climate change and developing the necessary legislation to protect ecosystems and ensuring its implementation.	2	Relevant legal regulations	OSIB	ÇŞB, GTHB, OGM, AFAD
UA1.2.2. Carrying out studies to expand private and public insurance mechanisms among all economic sectors and citizens	2	Increase in the use of insurance mechanisms	HM	MB, EB
UA1.2.3. Developing and ensuring the implementation of legislation regarding the structural effects of natural disasters due to climate change	2	Legal regulations	HM	MEU, DSI, AFAD

PURPOSE UA2. Strengthening response mechanisms in natural disasters due to climate change

Target UA2.1. Strengthening the capacities of provincial organizations in responding to natural disasters related to climate change and reaching the level of ability to carry out exercises				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UA2.1.1. Improving the workforce/technical capacities of the provincial organizations of relevant institutions	4	Education and infrastructure	governorships	YY, STK'lar
UA2.1.2. Improving coordination between provincial organizations at the local level	4	Carrying out joint projects	AFAD	Governorships, YY, NGOs

Target UA2.2. Establishing community-based disaster management in combating disaster risks that may be caused by climate change				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UA2.2.1. Determining and developing the capacities of relevant institutions and organizations covering all administrative levels, including headmen's offices, on a local scale, in terms of risk reduction, emergency response and post-disaster short and long-term recovery approaches and practices.	4	Training needs analysis, trainings, capacity building programs	governorships	AFAD, YY, NGOs, Village Service Unions
UA2.2.2. Developing and distributing application guides and procedures on disaster risk reduction, emergency response and post-disaster short and long-term recovery approaches and practices, and providing relevant training 2011-2015 Disaster response	4	Disaster response manuals and procedures, training programs	governorships	AFAD, YY,

Target UA2.3. Continuing educational activities that will increase social awareness and participation regarding the disaster and risk effects that may be caused by climate change.				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UA2.3.1. Carrying out awareness raising activities for all segments of society	4	Awareness raising activities	AFAD	Governorships, YY, NGOs, Village Service Unions
UA2.3.2. Carrying out joint work with NGOs related to the subject	10	Joint projects	AFAD	Governorships, YY, NGOs, Village Service Unions

- WATER RESOURCES MANAGEMENT

PURPOSE: Integrating adaptation to the effects of climate change into water resources management policies

Target UA1.1. Floods, floods, avalanches, landslides, etc. due to climate change. Identifying natural disaster risks				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US1.1.1. Inclusion of measures to be taken against the impact of climate change on water resources in development plans and programs	2	Preparation of plans and programs that include measures	KB	Relevant public institutions and organizations
US1.1.2. Establishment of a single institution responsible for water allocation and quality, which will include surface and groundwater resources to enable holistic water resources management.	3	Making institutional arrangements	Premiership	MENR, MFAL, MFWW, KB, DSI, GAP Administration, MTA, İller Bankası A.Ş., Municipalities
US1.1.3. Strengthening the understanding and institutional structure of the authorized/relevant institutions in the water legislation in line with the duties, powers and responsibilities of combating climate change.	4	Water law comes into force	OSIB, DSI	ETKB, BSTB, MEU, MFAL, KTB, DSI, MoH, İller Bankası A.Ş., YY
US1.1.4. Integrating the issue of combating climate change into the corporate and sectoral strategy plans of organizations involved in water management (industry, agriculture, energy, tourism, urban, drinking water, etc.)	4	Inclusion of climate change impacts in sector strategies	OSIB, DSI	ETKB, BSTB, MEU, MFAL, KTB, İller Bankası A.Ş., YY
US1.1.6. In order to use water resources effectively and efficiently, determining economic tools according to the water usage purposes, taking into account the principles of user pays, polluter pays and socio-economic conditions.	4	Economical use of water	KB, OSIB	GTHB, MB, DSİ, YY, ÇŞB

PURPOSE: Strengthening the capacity, inter-institutional cooperation and coordination in adaptation to climate change in water resources management

Target US2.1. Increasing the institutional capacity of institutions and organizations authorized and relevant in the management of water resources				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US2.1.1. Strengthening the capacity of the Water Management Coordination Board	3	Alignment with the EU acquis	KB	Relevant public institutions and organizations
US2.1.2. Strengthening the institutional structure for protecting water quality and quantity, improving observation and evaluation capacity, and creating a database	4	Ensuring sustainability in managing water resources	CB	MENR, MFAL, MFWW, KB, DSI, GAP Administration, MTA, İller Bankası A.Ş., Municipalities
US2.1.3. Strengthening the capacities of relevant institutions to carry out detailed studies to determine water potential, usage purposes, consumption and classification.	4	Water law comes into force	OSIB, DSI	ETKB, BSTB, MEU, MFAL, KTB, DSI, MoH, İller Bankası A.Ş., YY
US2.1.4. Training and informing irrigation unions and farmers about conscious and adequate water use	3	Inclusion of climate change impacts in sector strategies	OSIB, DSI	ETKB, BSTB, MEU, MFAL, KTB, İller Bankası A.Ş., YY

PURPOSE US3. Developing and disseminating R&D and scientific studies to ensure adaptation to the effects of climate change in water resources management

Target US3.1. Strengthening existing systems and creating new systems to monitor the effects of climate change				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US3.1.1. Development of hydrological drought assessment and impact studies	6	Hydrological drought assessment system	OSIB, DSI	GTHB, MGM
US3.1.2. Conducting research and evaluations to determine the impact of climate change on water resources and integrating the results into water resources planning studies	4	Impact assessment reports	OSIB, DSI	GTHB, İÖİ, MGM
US3.1.3. Making projections for sectoral water needs in basins, taking into account climate scenarios	9	Projections that take into account climate change scenarios	OSIB, DSI, TUBITAK	Universities, AE

Target US2.1. Increasing the institutional capacity of institutions and organizations authorized and relevant in the management of water resources				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US2.1.1. Strengthening the capacity of the Water Management Coordination Board	3	Alignment with the EU acquis	KB	Relevant public institutions and organizations
US2.1.2. Strengthening the institutional structure for protecting water quality and quantity, improving observation and evaluation capacity, and creating a database	4	Ensuring sustainability in managing water resources	CB	MENR, MFAL, MFWW, KB, DSI, GAP Administration, MTA, İller Bankası A.Ş., Municipalities
US2.1.3. Strengthening the capacities of relevant institutions to carry out detailed studies to determine water potential, usage purposes, consumption and classification.	4	Water law comes into force	OSIB, DSI	ETKB, BSTB, MEU, MFAL, KTB, DSI, MoH, İller Bankası A.Ş., YY
US2.1.4. Training and informing irrigation unions and farmers about conscious and adequate water use	3	Inclusion of climate change impacts in sector strategies	OSIB, DSI	ETKB, BSTB, MEU, MFAL, KTB, İller Bankası A.Ş., YY

PURPOSE US3. Developing and disseminating R&D and scientific studies to ensure

Target US3.1. Strengthening existing systems and creating new systems to monitor the effects of climate change

Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US3.1.1. Development of hydrological drought assessment and impact studies	6	Hydrological drought assessment system	OSIB, DSI	GTHB, MGM
US3.1.2. Conducting research and evaluations to determine the impact of climate change on water resources and integrating the results into water resources planning studies	4	Impact assessment reports	OSIB, DSI	GTHB, İÖİ, MGM

Target US3.2. Determining the vulnerability of water resources and coastal management to climate change, developing adaptation options, and making periodic revisions based on monitoring results.

Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US3.2.1. Determining the vulnerability of river basins to climate change, developing and implementing adaptation options	9	Evaluation report	OSIB, DSI	GTHB, KB, AFAD, YY, İÖİ, KA
US3.2.2. Determining the vulnerability of groundwater to climate change, developing and implementing adaptation options	9	Evaluation reports	OSIB, DSI	YY, İÖİ, KA, Water User
US3.2.3. Determining the risks of coasts (including streams, natural and artificial lake shores) being affected by climate change (including natural disasters), developing and implementing adaptation options	9	Evaluation report	OSIB, DSI	GTHB, KB, AFAD, YY, İÖİ, KA

PURPOSE US4. Integrated management of water resources in water basins for adaptation to climate change

Target US4.1. Planning studies to develop water resources on a basin basis with a holistic approach and in a way that provides flexibility to meet changing consumption demands.				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US4.1.1. Preparation of River Basin Management Plans, taking into account the effects of ecosystem services and climate change	8	Adapting to climate change in water resources management	OSIB	GTHB, OGM, DSİ, YY
US4.1.2. Taking into account the effects of climate change and making necessary revisions in existing and planned "Basin Protection Action Plans" and "Protected Areas Maps"	8	More effective protection of basins	OSIB	ÇŞB, DS
US4.1.3. Accelerating erosion and sediment control projects in all basins, especially dam and pond basins	8	. Extending the life of water storage facilities	DSİ	OSIB, OGM
US4.1.4. Protecting groundwater in basins, preventing illegal groundwater use and raising public awareness on this issue	Continually	Awareness raising activities, protection of water resources	OSIB, DSI	MFAL, Governorships, MEB, YY,

Target US4.2. Considering the water management of cities from the perspective of adaptation to climate change				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
US4.2.1. Planning the scale expansion in metropolitan area management (big cities, metropolitan municipalities) by taking climate change into consideration	Continually	Climate compatible urban management	KB	MEU, YY
US4.2.2. Carrying out integrated water management and planning in residential areas, meeting the drinking, domestic and industrial water needs of municipalities in sufficient quantity and quality.	12	2011-2023 Rational water resources management in residential areas	DSİ	MFWW, MEU, LA, İller Bankası AŞ., İÖİ, Provincial Organization of Ministries
US4.2.3. Separation of sewage and rainwater collection systems in residential areas	6	Efficient use of water resources in cities	YY	MEU, MFWW, DSI, Provinces
US4.2.5. Developing a pricing policy and making legal regulations, taking into account socioeconomic conditions, in order to increase water use efficiency in cities.	9	Efficient use of water resources in cities	OSIB, YY	MEU, İller Bankası A.Ş.
US4.2.6. Detecting water leaks and illegal water use in cities and taking measures to reduce the loss-illegal rate, disseminating the SCADA System at the national level	10	Significant reduction in water losses	YY	MEU, MFWW, İller Bankası A.Ş., Governorships, Provincial Organizations of Ministries
US4.2.7. Ensuring that mains water is delivered to consumers in drinkable quality	10	Efficient water consumption	YY	MEU, MFWW, İller Bankası A.Ş., Governorships, Provincial Organizations of

ECOSYSTEM SERVICES, BIODIVERSITY AND FORESTRY

PURPOSE UO1. Integrating the climate change adaptation approach into ecosystem services, biodiversity and forestry policies

Review of existing strategies in the context of adaptation to climate change impacts				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UO1.1.1. Revision of the National Forestry Program (2004–2023) and GDF Strategic Plan (2010–2014) for adaptation to the effects of climate change		Revised plan and program	GMO	OSIB, KB, NGOs
UO1.1.2. Preparation of regional strategies on adaptation to climate change in protected areas		2015 Regional Strategies	OSIB	KTB, SSC, OGM
UO1.1.3. Integrating and disseminating adaptation to climate change into existing planning in selected/priority protected areas		Protected area plans that include adaptation to climate change	OSIB	
UO1.1.4. Identifying water resources feeding wetlands and creating planning studies		Effective and sustainable water resources planning	OSIB	DSİ
UO1.1.5. Preparation of regional strategies for natural and cultural heritage areas on adaptation to climate change		Regional Strategies	OSİB, KTB	

PURPOSE UO2. Identifying and monitoring the effects of climate change on biodiversity and ecosystem services

Target UO2.1. Detection and monitoring of the effects of climate change on species in forest areas				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UO2.1.1. Identifying and monitoring the effects of climate change on forestry activities, forest ecosystem and species.		Impact assessment reports	GMO	OSIB
UO2.1.2. Conducting research in agricultural-forestry activities to reduce disaster risks that may occur as a result of climate change		Research reports	GTHB	GMO
UO2.1.3. Ensuring the integration of data related to natural disasters such as floods, avalanches, landslides, etc. with the Forest Inventory and Monitoring System		Early warning system integrated with Land Monitoring System	GMO	GTHB, OSİB, ŞŞB, MGM
UO2.1.4. Allocating more resources to projects on climate change and forest-pasture-agricultural ecosystems from existing R&D financial resources, especially GDF's R&D support mechanisms.		Project outcome reports, number and size of projects financed	GMO	MFWW, MFAL, DSI, TUBITAK, Municipalities, Universities

Target UO2.2. Detection of land use change in forest areas resulting from the effects of climate change				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UO2.2.1. Identifying areas that have transformed from forest areas into meadows, pastures and pastures		Impact assessment reports	GMO	OSIB
UO2.2.2. Identifying areas that have transformed from forest areas into settlements (settlement areas)		Research reports	GTHB	GMO
UO2.2.3. Identifying areas that have transformed from forest areas into wetlands		Early warning system integrated with Land Monitoring System	GMO	GTHB, OSİB, ŞŞB, MGM
UO2.2.4. Identifying areas that have been transformed from forest areas into agricultural areas		Project outcome reports, number and size of projects financed	GMO	MFWW, MFAL, DSI, TUBITAK, Municipalities, Universities
UO2.2.5. Identifying areas that have transformed from forest areas to other areas		Current status reports	GMO	MFAL, Governorships, SPA

Target UO2.3. Monitoring the health of forest ecosystems				
Actions	Possible Duration (Years)	Outputs and Performance Indicators	Responsible Organization	Related Organizations
UO2.3.1. Determining the effects of atmospheric pollution, climate change and other factors on forests by the end of 2014 and evaluating the findings.		Impact analyzes and evaluation reports	GMO	MFWA, Universities
UO2.2.2. Identifying areas that have transformed from forest areas into settlements (settlement areas)		Research reports	GTHB	GMO
UO2.2.3. Identifying areas that have transformed from forest areas into wetlands		Early warning system integrated with Land Monitoring System	GMO	GTHB, OSİB, ŞŞB, MGM
UO2.2.4. Identifying areas that have been transformed from forest areas into agricultural areas		Project outcome reports, number and size of projects financed	GMO	MFWW, MFAL, DSI, TUBITAK, Municipalities, Universities
UO2.2.5. Identifying areas that have transformed from forest areas to other areas		Current status reports	GMO	MFAL, Governorships, SPA