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Deliverable Phase 3 – Climate risk management

Climate-Ready İzmir: Enhancing Resilience Strategies

Türkiye, İzmir

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Brief Description	The CRIZ-ERS project aims to strengthen İzmir's climate resilience by addressing risks like extreme weather, floods, droughts, and heatwaves. Through risk assessments, stakeholder engagement, and targeted interventions, it promotes a sustainable urban environment while aligning with international frameworks like the EU Green Deal and Horizon 2020.
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Abbreviations and acronyms

Abbreviation / acronym	Description
AFAD	Disaster and Emergency Management Presidency
CRA	Climate Risk Assessment
CRIZ-ERS	Climate-Ready İzmir: Enhancing Resilience Strategies
CRM	Climate Risk Management
DSI	Directorate General for State Hydraulic Works
ESHOT	Electricity, Water, Natural Gas, Buses and Trolleybuses
GCAP	Green City Action Plan
GCM	General Circulation Model
IMM	İzmir Metropolitan Municipality
IRAP	Provincial Disaster Risk Reduction Plan
IZSU	İzmir Water and Sewerage Administration
NGO	Non-Governmental Organization
SECAP	Sustainable Energy Climate Action Plan
SVI	Social Vulnerability Index
RCM	Regional Climate Model
TSMS	Turkish State Meteorological Services
UHI	Urban Heatwave Island
UKOME	Transportation Coordination Center

Executive summary

The CRIZ-ERS project aims to strengthen climate resilience in İzmir by producing locally relevant evidence on climate hazards, exposure, vulnerability and adaptive capacity, and translating this evidence into practical planning and adaptation measures. Konak District requires particular attention as İzmir's historical, administrative and commercial center, where coastal exposure, dense and ageing urban fabric, limited green areas, critical services, cultural heritage assets and socially vulnerable communities overlap.

The project followed a three-phase approach. Phase 1 established an İzmir-wide understanding of priority climate risks. Phase 2 deepened the assessment at district and neighborhood scales in Konak through higher-resolution climate and spatial data, social vulnerability analysis and stakeholder validation. Phase 3 translated these findings into CRM objectives, adaptation measures, institutional responsibilities, implementation periods and monitoring indicators.

The assessment identified heatwaves and the urban heat island effect, coastal flooding and sea level rise, river flooding, heavy rainfall and pluvial flooding as the main risks for Konak. Under RCP8.5, the intensity of 100-year extreme rainfall events is projected to increase by approximately 20-40% across most of İzmir by 2071-2100, with increases exceeding 40% in some coastal and northern areas. River flood depths may rise by around 10-30% in many locations compared with the historical period. These projections reinforce existing vulnerabilities related to impermeable surfaces, ageing drainage systems, raised road levels and limited water-retention capacity.

Heatwaves emerged as the most urgent risk. By the end of the century, average maximum temperatures may rise by approximately 3°C under a moderate-emission scenario and by up to 6°C under a high-emission scenario. Annual heatwave duration, historically generally limited to 5-10 days, may reach 40-60 days by 2050 and exceed 80-90 days toward the end of the century. Under SSP5-8.5, this corresponds to an estimated threefold to fourfold increase in heatwave duration. The impacts are expected to be greatest in dense coastal and central neighborhoods and among elderly people, children, people with disabilities or chronic health conditions, migrants and refugees, low-income households and outdoor workers.

Spatial analyses show that coastal flooding risk is concentrated around the İzmir Gulf and low-lying coastal areas. In Konak, Alsancak, Kültür, İsmet Kaptan, Akdeniz, Güzelyalı, Çankaya and Mithatpaşa stand out in relation to coastal risk, while several central and coastal neighborhoods also face high or very high heat risk. The concentration of infrastructure, commercial functions and cultural heritage increases the potential consequences of these hazards. Konak contains 12 of İzmir's 14 synagogues, corresponding to approximately 86%, in addition to numerous historic buildings, bazaars, inns, museums and water structures.

The risks were assessed through four complementary perspectives: urban planning, disaster risk management, socio-economic resilience and cultural heritage. Phase 3 consequently developed structural, nature-based, social and governance measures, including flood-resilient zoning, drainage and stormwater improvements, river restoration, coastal protection, green-blue infrastructure, cooling centers, shaded public spaces, accessible evacuation routes and multilingual early warning systems. Cultural heritage measures include removable flood barriers, regular maintenance and

strengthening of vulnerable buildings, monitoring of heat-sensitive materials and, in exceptional cases, relocation of irreplaceable assets.

Stakeholder engagement supported the validation and practical relevance of the results. Three workshops and two stakeholder meetings at İzmir and Konak scales were complemented by expert presentations, technical consultations, interviews and online engagement. Municipal departments, public institutions, utilities, universities, professional chambers, civil society organizations, private-sector actors, neighborhood representatives and vulnerable groups contributed to the process.

The findings provide a basis for updating municipal strategies, spatial plans, infrastructure investments, emergency procedures, public health and social service planning, coastal management and cultural heritage protection. They may also support İzmir's SECAP, GCAP, disaster risk reduction plans and local climate action planning. Progress can be monitored through percentage-based indicators such as the share of vulnerable people covered by early warning and social support systems, the percentage of priority risk areas addressed by adaptation measures, and the percentage of municipal investments screened for climate risk.

Important implementation gaps remain, particularly in neighborhood-level data, real-time monitoring, institutional coordination, data sharing and dedicated financing. Nevertheless, the project has established a shared evidence base and an operational framework linking scientific assessment with local policy, investment prioritization and long-term adaptation planning in İzmir and Konak.

1 Introduction

1.1 Main objectives of the project

The main objective of integrating the Climate Risk Assessment (CRA) results into planning and decision-making is to ensure that the evidence generated throughout the three project phases is translated into concrete and actionable climate risk management measures. Phase 1 provided an İzmir-wide understanding of key climate hazards and priority risks, creating the initial technical and strategic basis for climate resilience planning. Phase 2 deepened this assessment at the Konak District scale by producing higher-resolution risk and vulnerability findings, supported by local datasets, stakeholder inputs and the Key Risk Assessment Evaluation Dashboard. Phase 3 then built on these outputs by linking the identified priority risks with potential Climate Risk Management (CRM) measures, responsible institutions, implementation timelines, supportive conditions and monitoring indicators.

In this respect, the project outputs can directly support the revision and improvement of local policies, municipal strategies, spatial planning decisions, infrastructure investment priorities, emergency preparedness plans, public health and social service planning, coastal management, cultural heritage protection and municipal budgeting processes. The CRA findings are especially useful for informing metropolitan and district strategic plans, zoning and land-use decisions, disaster risk management plans, stormwater and drainage investments, coastal protection measures and public health responses to heatwaves. For example, flood and coastal risk maps can inform zoning rules, flood-resilient building standards, drainage upgrades, evacuation routes and the protection of critical infrastructure and cultural heritage assets. Similarly, heat risk and social vulnerability findings can guide the location of cooling centers, shaded public spaces, health outreach mechanisms and targeted social support for elderly people, children, people with disabilities, migrants/refugees, low-income households and outdoor workers.

The Phase 3 outputs also show that effective CRM requires coordination across multiple institutions and scales. İzmir Metropolitan Municipality (IMM), Konak Municipality, İzmir Water and Sewerage Administration (İZSU), Disaster and Emergency Management Presidency (AFAD), General Directorate of State Hydraulic Works (DSI), health and social service institutions, universities, professional chambers, civil society organizations and local communities all have roles in implementation. A key synergy is the availability of shared risk evidence that can support more coherent planning and investment decisions. However, potential tensions may arise from overlapping mandates, data-sharing constraints, budget limitations, fragmented implementation responsibilities and the need to balance urban development, heritage conservation, infrastructure renewal and social equity. These challenges can be addressed through formal coordination mechanisms, regular stakeholder engagement, clear responsibility allocation and the integration of CRA outputs into investment and municipal decision cycles.

The project has generated new and more localized data on climate hazards, exposed areas, social vulnerability and potential adaptation measures. However, additional information is still needed to strengthen CRM implementation, particularly neighborhood-level data on vulnerable groups, critical infrastructure exposure, drainage capacity, heat-health outcomes, cultural heritage vulnerability and real-time monitoring of coastal and river flood risks. A suitable monitoring and evaluation system should therefore track both risk reduction and equity outcomes.

1.2 Project team

Project Team:

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    - Dr. Busen Özgür: Technical Advisor
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    - Dr. Emrah Alkaya: Technical Advisor (Environment and Urban Infrastructure)
    - Engin Koç: Technical Advisor (Ecosystem and Biodiversity)
    - Elif İrem Köse Kiper: Technical Advisor

1.3 Outline of the document's structure

The document is organized to present the Phase 3 climate risk management process in a structured way. Following the executive summary and introductory sections, Section 2 provides the local profile of İzmir and Konak, including key risk assessment results, policy context, relevant actors and lessons learned from past events. Section 3 presents the core Phase 3 outputs, covering CRM objectives, supportive enabling conditions, potential CRM measures and their integration into planning and decision-making. The final sections summarize project evaluation findings, conclusions, progress against project outputs, supporting documentation and references.

2 Local profile

2.1 Summary of Key Risk Assessment results

İzmir is a major coastal metropolitan area in Türkiye, with dense urban development, critical infrastructure, cultural heritage assets and socio-economically diverse communities. These characteristics increase their exposure and sensitivity to climate-related hazards such as heatwaves, heavy rainfall, river flooding, agricultural drought, sea level rise and coastal flooding. Within this metropolitan context, Konak District is particularly critical due to its role as İzmir's historical, administrative, commercial and cultural core, as well as its coastal location, dense built environment, limited green/open areas in several neighborhoods and concentration of vulnerable groups. The socio-economic assessment was further informed by targeted consultations with BAYETAV, İzmir Women's Solidarity Association, Mülteci-Der, İZ-AFED and Konak City Council, which helped reflect the experiences of vulnerable groups and community-based actors in the risk assessment.

Figure 2-1a presents the sea level rise and coastal flooding risk assessment results for İzmir Province. The assessment combines sea level rise and coastal inundation as the hazard component, built-up areas as exposure, social sensitivity and cultural heritage assets as vulnerability factors, and green area availability as adaptive capacity. As shown in figure below, most inland neighborhoods are classified as not affected or very low risk, while risk levels increase along the coastal belt. Higher risk areas are mainly concentrated around the İzmir Gulf and low-lying coastal zones, where dense urban development, infrastructure, public spaces and socio-economic activities are located close to the shoreline.

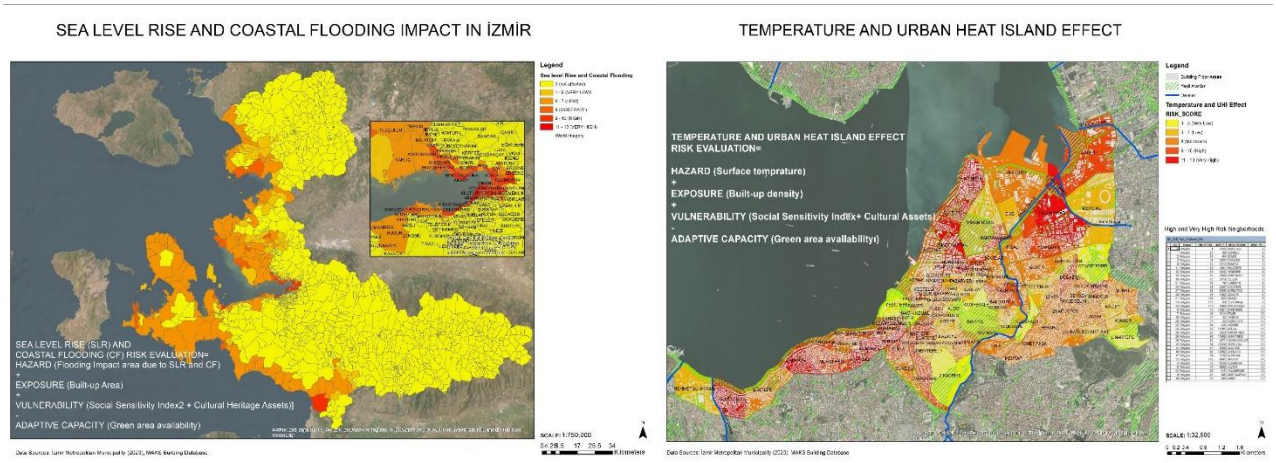


Figure 2-1 (a) Sea Level Rise and Coastal Flooding Impact in İzmir; (b) Temperature and Urban Heat Island Effect

Figure 2-1b presents the results of the temperature increase and urban heat island risk assessment for Konak District. The assessment combines surface temperature as the hazard component, built environment density as exposure, young and elderly population ratios and cultural heritage presence as vulnerability factors, and green area availability as adaptive capacity. As shown in the figure above, many coastal neighborhoods are classified as high or very high risk. In the southern coastal part of the district, neighborhoods such as Çankaya, Güzelyalı, Piri Reis and Kılıç Reis stand out as high-risk areas. In the northern coastal section, Alsancak, Kültür and İsmet Kaptan are among the neighborhoods with very high-risk levels. Risk levels generally decrease toward the inner parts of the

district, where some neighborhoods such as İmariye, Altay, Kadifekale, Cengiz Topel and Yeşiltepe are assessed as very low risk.

Many of Konak's coastal neighborhoods are classified as high or very high heat-risk areas. In the southern coastal section, Çankaya, Güzelyalı, Piri Reis and Kılıç Reis stand out as high-risk neighborhoods, while Alsancak, Kültür and İsmet Kaptan in the northern section are classified as very high risk. Risk levels generally decrease toward the inner parts of the district, where İmariye, Altay, Kadifekale, Cengiz Topel and Yeşiltepe are assessed as very low risk. The analysis was supported by 33 Landsat 8 satellite images from the June–August periods between 2022 and 2025, selected with cloud coverage below 20%, together with 2024 population data for residents aged 0–10 and over 60 years.

These spatial outputs increase the practical value of the assessment by showing where hazards, exposed assets and social vulnerability overlap. For example, under the Q500 river flood scenario using RCP8.5 projections, 54 neighborhoods and approximately 461 buildings in Konak were identified as directly exposed to floodwaters. Modelled flood depths may exceed 5–6 meters in some low-lying areas along the Meles Stream and its tributaries.

The project also has important institutional benefits. It created a common evidence base for İzmir Metropolitan Municipality, Konak District Municipality, public institutions, utilities, technical experts, civil society and local stakeholders. The results can help decision-makers prioritize adaptation actions, identify where investments are most needed, and ensure that climate resilience measures are designed with attention to vulnerable groups. The proposed measures and indicators can also serve as an initial reference for future monitoring, budgeting and reporting processes. Overall, the project strengthens the link between risk assessment, local policy development and practical adaptation planning in İzmir and Konak.

The table below summarizes the priority climate risks identified for İzmir Province and Konak District, together with their spatial scope, assessed resilience capacity, key capacity gaps, and the stakeholders involved in the key risk assessment process. Additional risks assessed at the İzmir Province scale, such as agricultural drought, are also included to reflect the broader climate risk context of the region.

Priority climate risk	*Scope*	*Resilience capacity (low, medium, substantial, high)*	*Description of the resilience capacity (such as existing knowledge, planned measures, gaps)*	*Stakeholders, experts and priority groups involved in the key risk assessment & modality of engagement*
Heatwaves	İzmir Province and Konak District	Low	Risk knowledge has improved through climate projections, land surface temperature analysis, urban morphology assessment and social vulnerability mapping. However, dense urban form, limited green/shaded areas and high exposure of vulnerable	İzmir Metropolitan Municipality, Konak Municipality, health and social service actors, technical experts, universities, ICLEI, civil society organizations and vulnerable groups.

			groups limit resilience. Key gaps include heatwave-related public health measures, cooling infrastructure, early warning and coordination with health and social services.	Engagement through İzmir and Konak stakeholder meetings, workshops, expert presentations, online consultations and targeted interviews.
Coastal flooding and sea level rise	İzmir Province and Konak District	Medium	Coastal flood and sea level rise modelling improved the understanding of exposed coastal areas, particularly around the Konak coastline, Alsancak–Kordon and Kemeraltı. Resilience is constrained by exposed infrastructure, public spaces, transport routes and cultural heritage assets. Key needs include integrating coastal risk maps into spatial planning, infrastructure investment, emergency planning and heritage protection.	Municipal departments, İZSU, planning and disaster risk units, cultural heritage experts, universities, professional chambers, civil society and coastal communities. Engagement through technical presentations, map-based discussions, stakeholder meetings and adaptation options workshop.
River flooding	Konak District	Medium	Hydrodynamic modelling and exposure datasets strengthened the evidence base. Existing disaster risk management experience supports resilience, but localized preparedness, infrastructure upgrades and integration of flood maps into district planning remain limited.	Municipal planning, infrastructure, disaster affairs and GIS units, İZSU, relevant basin-level actors, technical experts and local communities. Engagement through stakeholder consultations, technical meetings and expert-led discussions.
Heavy rainfall/ Extreme precipitation	İzmir Province and Konak District	Medium	Extreme precipitation projections and stakeholder feedback improved risk awareness. However, dense impermeable surfaces, ageing drainage infrastructure and limited stormwater capacity create vulnerabilities. Key gaps include green-blue infrastructure, permeable surfaces, drainage maintenance and integration	İzmir Metropolitan Municipality, Konak Municipality, İZSU, transport/infrastructure/ disaster units, universities, neighborhood representatives and civil society. Engagement through stakeholder meetings, workshops, interactive feedback and expert consultations.

			of rainfall risk into urban planning.	
Agricultural drought	İzmir Province	Substantial	Agricultural drought was assessed as an additional provincial risk. The analysis considered temperature, humidity, agricultural lands, water bodies, wetlands and irrigation availability. The risk was classified as High, with critical future severity and significant urgency, especially for inland agricultural districts.	İzmir Metropolitan Municipality, Izmir Provincial Directorate of Agriculture and Forestry, DSI, agricultural cooperatives, irrigation-related actors, universities, farmers and rural communities. Engagement through technical assessment, stakeholder consultations, expert input and review of additional hazard analysis.
Wildfires	İzmir Province	Low	Forest fire risk was assessed as an additional but increasingly important provincial risk. The analysis considered temperature, forest areas, fuel factors, settlements, critical assets and natural firebreaks. The risk was classified as Very High due to increasing temperatures, frequent heatwaves, exposure in urban–forest interface areas and limited resilience capacity.	İzmir Metropolitan Municipality, forestry authorities, AFAD, district municipalities, fire department, universities, rural communities, settlements near forest areas and relevant infrastructure operators. Engagement through additional risk assessment, expert analysis, stakeholder discussions and integration into future adaptation strategy considerations.

2.2 Key implementation mechanisms and policy context for CRM

Climate risk management in İzmir and Konak is situated within a multi-level policy and planning framework extending from national climate legislation and adaptation policies to provincial disaster risk reduction instruments, metropolitan climate plans and district-level strategic planning. Within this framework, the CRIZ-ERS results do not need to be implemented through a separate planning system. Instead, risk maps, vulnerability assessments and proposed CRM measures can strengthen existing plans by providing more detailed spatial evidence, identifying priority groups and locations, and defining possible responsibilities, timelines and monitoring indicators.

At the national level, Climate Law No. 7552 provides the legal and institutional basis for climate change mitigation and planning. The Law requires Local Climate Change Action Plans (YİDEP) to be prepared as integrated province-wide plans under the coordination of the governor; in metropolitan

provinces, the metropolitan municipality is responsible for their preparation in cooperation with relevant institutions and organizations. These plans are required to be completed by 31 December 2027. The project outputs can therefore provide a direct technical input to İzmir's future YİDEP, particularly for the identification of priority adaptation risks, spatially differentiated measures, vulnerable groups, responsible institutions and monitoring indicators.

The national policy framework is further supported by Türkiye's Climate Change Adaptation Strategy and Action Plan for 2024–2030, which promotes the integration of adaptation into sectoral and local planning, investment decisions, institutional capacity development and monitoring processes. The CRIZ-ERS approach is consistent with this direction because it connects climate hazards with urban systems, infrastructure, public health, social vulnerability, ecosystems, disaster risk management and cultural heritage rather than addressing each risk in isolation.

At the metropolitan level, İzmir's Sustainable Energy and Climate Action Plan (SECAP), Green City Action Plan (GCAP) and Provincial Disaster Risk Reduction Plan (IRAP) provide the main entry points for implementation. SECAP and GCAP already establish complementary frameworks covering climate adaptation, water management, land use, green infrastructure, biodiversity, public health, transport and emergency preparedness. İzmir Metropolitan Municipality also updated its SECAP in 2026, extending the city's climate vision to 2050 and placing greater emphasis on climate justice, energy poverty, citizen participation and resilience. The CRIZ-ERS findings can support the spatial and risk-based refinement of these plans, particularly through the Konak-focused assessment and the identification of neighborhoods where heat, flooding, social vulnerability and cultural heritage risks overlap.

At the district level, the findings are relevant to the implementation of the Konak Municipality Strategic Plan 2025–2029 Strategic Plan, which identifies resilience, sustainability and inclusive development among its strategic priorities. The neighborhood-scale analysis provides a practical basis for linking these priorities with municipal responsibilities concerning public spaces, social services, local preparedness, cultural heritage surroundings and support for vulnerable communities. It also helps address the gap between metropolitan-scale climate planning and district-level implementation identified during Phase 2.

Within this policy context, four implementation mechanisms are particularly important. First, CRA maps should be used in spatial planning, zoning and development-control processes to identify heat, flood- and coastal-risk areas and to guide the location and design of new investments. Second, municipal investment programmes should include climate-risk screening so that drainage, coastal infrastructure, public-space, transport and social infrastructure projects are assessed against future climate conditions. Third, emergency preparedness and municipal service protocols should incorporate early warning, accessible evacuation, heatwave response, continuity of critical services and targeted support for vulnerable groups. Finally, the proposed CRM measures should be connected to responsible departments, indicative budgets, implementation periods and measurable indicators.

Effective implementation will therefore depend on incorporating the project outputs into regular municipal planning and management cycles rather than treating them as stand-alone technical findings. Annual investment programmes, strategic plan performance indicators, departmental budgets, GIS systems and institutional reporting processes can be used to monitor implementation. Formal data-sharing and coordination mechanisms between metropolitan and district

municipalities, infrastructure authorities, disaster management institutions, health and social service providers and other relevant actors would also help ensure that updated risk information is consistently reflected in decisions. In this way, the CRIZ-ERS outputs can serve as a technical bridge between national climate obligations, metropolitan strategies and practical adaptation delivery in Konak and across İzmir.

2.3 Key actors and systems for CRM

The CRM process in İzmir and Konak is based on a multi-stakeholder governance structure involving municipal departments, public institutions, utilities, academia, professional chambers, civil society organizations, private sector actors and local communities. The Stakeholder Engagement Plan was developed at the beginning of the Phase 1 to identify critical stakeholders, clarify their roles and responsibilities on both İzmir and Konak district and establish a structured basis for their involvement throughout the CRA and CRM process. The plan mapped a broad range of actors, including public institutions, municipal departments, private sector representatives, professional chambers, academia, civil society organizations and local communities. It classified these stakeholders according to their potential roles in climate risk identification, data provision, exposure and vulnerability, decision-making, implementation and communication. As part of the stakeholder identification methodology, an interest–influence analysis and a RACI-based role allocation approach were used to assess each actor's level of influence, interest and potential responsibility in the CRM process. The table below summarizes the key actors involved in the development and implementation of climate risk management in İzmir and Konak.

Key actors	*Role and responsibility*	*Motivation and needs*	*Opportunities related to the their active involvement in CRM*	*Barriers related to the their active involvement in CRM*	*Type of engagement*
İzmir Metropolitan Municipality and relevant departments	Overall coordination of climate resilience, spatial planning, infrastructure, social services, communication and integration of CRA results into local strategies.	Strengthen İzmir's resilience and use risk evidence in planning and investment decisions.	Strong mandate, access to municipal data and ability to mainstream CRM into SECAP, GCAP, disaster risk reduction and investment processes.	Interdepartmental coordination, budget limitations and need for long-term implementation capacity.	Project coordination, scoping, data sharing, stakeholder meetings, workshops, technical review and reporting.
Konak District Municipality and relevant departments	District-level implementation of CRM actions, neighborhood-scale planning, social services, local disaster preparedness, public space management and support for vulnerable groups.	Address climate risks affecting dense urban neighborhoods, coastal areas, vulnerable communities, cultural heritage surroundings and local public services.	Direct knowledge of local needs, access to neighborhood-level actors, ability to support pilot actions and integration of CRA findings into district-scale municipal services and planning.	Limited financial and technical capacity, dependence on metropolitan and national-level decisions, and need for stronger interdepartmental coordination.	Konak-scale stakeholder meeting, local data contribution, risk validation, consultations, adaptation options workshop and discussion of district-level CRM measures.
Public institutions and utilities *(AFAD, Provincial Directorates, İZSU, DSI, Meteorology,*	Disaster risk reduction, water and drainage management, climate and hazard	Reduce climate-related losses, protect infrastructure and services, and	Technical data, operational capacity and sectoral mandates for water, flood, heat-health and emergency management.	Institutional silos, data-sharing limitations, mandate overlaps and investment needs.	Stakeholder meetings, technical consultations, data requests, risk

health and social service institutions, migration/social assistance actors)	data, public health, social protection and support to vulnerable groups.	improve preparedness.			exploration and validation.
Academia and technical experts	Climate modelling, hazard and vulnerability analysis, urban planning, disaster risk management, social policy, public health and cultural heritage expertise.	Produce robust, locally relevant and actionable climate risk knowledge.	Strengthens evidence base, supports capacity building and links scientific outputs to municipal practice.	Data availability, continuity of expert involvement and research funding constraints.	Expert analysis, presentations, workshops, scoping, risk exploration and interpretation of CRA findings.
Civil society organizations, city councils, professional chambers and local communities	Represent vulnerable groups, professional knowledge, local needs and lived experience of climate risks.	Ensure inclusive, socially just and locally accepted CRM actions.	Local knowledge, access to priority groups and support for awareness-raising and community-based adaptation.	Limited resources, engagement and varying technical capacity.	Stakeholder workshops, consultations, targeted interviews, feedback sessions and participation in adaptation discussions.
Private sector and local economic/cultural heritage actors *(e.g. utilities, energy distributors, TARKEM, small businesses and heritage-related actors)*	Support continuity of services, infrastructure resilience, protection of economic activity and cultural heritage assets.	Reduce disruption risks and protect assets, services and local economic functions.	Can support investment, innovation, service continuity and heritage-sensitive adaptation.	Financing needs, fragmented ownership and regulatory/implementation constraints.	Stakeholder mapping, consultation, workshops and adaptation options discussions.

2.4 Lessons learned from past events

Past climate-related events and project findings in İzmir show that heatwaves, extreme rainfall, flooding and sea level rise should be managed as interconnected urban resilience challenges rather than isolated hazards. For example, the heat risk assessment for Konak shows that dense coastal and central neighborhoods such as Alsancak, Kültür, İsmet Kaptan, Çankaya, Güzelyalı, Piri Reis and Kılıç Reis are exposed to high or very high heat risk due to limited green areas, dense built-up fabric and vulnerable population groups. Similarly, coastal flooding and sea level rise risks are particularly relevant for the Konak coastline, Alsancak–Kordon and Kemeraltı surroundings, where public spaces, transport routes, commercial functions and cultural heritage assets overlap. Past flood experiences and stakeholder feedback also indicate that raised road levels, ageing drainage infrastructure and ground-floor openings in historic buildings can increase water entry and damage during heavy rainfall events. These examples underline the need to integrate risk maps into spatial planning, drainage and coastal infrastructure investments, early warning systems and emergency preparedness. They also show that adaptation measures must be socially inclusive, with specific attention to elderly people, children, people with disabilities, migrants, low-income households, outdoor workers and other vulnerable groups, particularly in dense and exposed districts such as Konak.

3 Climate risk management – phase 3

3.1 CRM objectives

The CRM objectives for İzmir and Konak were defined in line with the priority climate risks identified in the Phase 2 Climate Risk Assessment: heatwaves and urban heat island effect, coastal flooding and sea level rise, river flooding, and heavy rainfall/pluvial flooding. These objectives aim not only to reduce physical climate risks, but also to strengthen institutional preparedness, protect vulnerable groups, improve infrastructure resilience, and support the integration of risk information into urban planning and municipal investment decisions. Justice and equity considerations are particularly important for Konak, where climate risks overlap with dense urban fabric, ageing infrastructure, cultural heritage areas and socially vulnerable groups such as elderly people, children, women, people with disabilities, migrants and low-income households.

Primary objectives	*Examples of assessment indicators*
Reduce health and social risks from heatwaves and urban heat island effect	• Number of people exposed to high heat risk • Number/share of vulnerable people covered by heat-health measures • Increase in shaded/green public areas • Number of cooling points • Number of heat-health awareness or capacity-building activities
Reduce exposure and damage from coastal flooding and sea level rise	• Population and critical assets exposed to coastal flood risk • Length/area of coastline covered by protection or nature-based solutions • Number of cultural heritage assets with risk reduction • Measures integration of coastal flood maps into spatial planning
Reduce river flooding and pluvial flooding risks	• Number of people/buildings exposed to flood risk • Area covered by updated flood and drainage risk maps • Number of drainage/stormwater infrastructure improvements • Reduction in average flood damage • Number of emergency preparedness actions
Integrate climate risk information into urban planning and infrastructure investments	• Number of municipal plans using CRA outputs • Number of investment decisions screened for climate risk • Share of priority risk areas addressed through zoning, spatial planning or infrastructure measures
Strengthen emergency preparedness and institutional coordination	• Number of early warning and response protocols updated • Number of interdepartmental coordination meetings; number of staff trained in CRM • Response time during climate-related emergencies
Protect cultural heritage, public spaces and local economic functions	• Number of heritage assets assessed for climate risk • Number of adaptation measures implemented in historic/coastal areas • Continuity of key public and economic services during extreme events
Promote justice, equity and inclusive adaptation	• Number of adaptation actions explicitly targeting vulnerable groups • Participation of women, elderly people, children, people with disabilities, migrants/refugees and low-income groups in consultations

	• Number of neighborhood-scale social vulnerability indicators integrated into CRM monitoring

Additional objectives	*Examples of assessment indicators*
Public health and social well-being	• Number of heat- or flood-related health incidents recorded in priority neighborhoods • Share (%) of vulnerable residents reached by early warning and targeted support services • Number of cooling centers, shaded public spaces and accessible safe areas established
Critical infrastructure and service continuity	• Share (%) of critical facilities assessed for climate risks • Number of infrastructure and service-continuity plans updated using CRA results • Duration of climate-related disruptions to essential services • Share (%) of priority drainage and stormwater investments completed
Cultural heritage resilience	• Number and share (%) of priority heritage assets assessed for climate risks • Number of heritage buildings covered by maintenance, flood protection or material-monitoring programmes • Share (%) of high-risk heritage assets with emergency-response protocols • Climate-related damage and restoration costs recorded for heritage assets
Institutional capacity and governance	• Number of municipal plans and investment programmes using CRA output • Share (%) of relevant municipal investments screened for climate risk • Number of inter-departmental coordination meetings and staff training activities • Share (%) of responsible institutions regularly contributing data to the monitoring system

3.2 Supportive elements for effective CRM

Effective CRM implementation in İzmir and Konak depends on strengthening the enabling conditions that allow risk assessment results to be translated into practical adaptation measures. The Phase 2 assessment and stakeholder engagement process showed that key supportive elements include improved climate risk data, integration of risk maps into planning and infrastructure systems, stronger institutional coordination, inclusive citizen engagement, and targeted financing for adaptation actions. The table below summarizes the main supportive elements required for effective CRM implementation in İzmir and Konak, including knowledge and data, technology and infrastructure, social and behavioral factors, citizen engagement, financing, and governance arrangements. These elements are particularly important for Konak, where climate risks intersect with dense urban development, coastal exposure, ageing infrastructure, cultural heritage assets and socially vulnerable groups.

Continued engagement with neighborhood representatives, city councils and civil society organizations—such as BAYETAV, İzmir Women's Solidarity Association, Mülteci-Der and İZ-AFED—can improve the local relevance, accessibility and equity of CRM measures.

Supportive elements for effective CRM	*Description*
Knowledge and data	High-resolution climate projections, risk maps, exposure datasets and social vulnerability information provide a strong basis for CRM. Further improvement is needed in neighborhood-level data on vulnerable groups, critical services, infrastructure exposure and monitoring indicators.
Tech and infrastructure	Early warning systems, GIS-based monitoring, stormwater and drainage upgrades, coastal protection, green-blue infrastructure, shaded public spaces and cooling areas are key technical enablers for reducing heat, flood and coastal risks.
Social-behavioral aspects	Risk awareness, preparedness culture and behavioral change are essential, particularly for heatwave response, flood preparedness and protection of vulnerable groups. Trust between institutions and communities can support faster response and better uptake of adaptation measures.
Citizen engagement	Continued engagement with neighborhood representatives, city councils, civil society organizations and vulnerable groups can improve the relevance, acceptance and equity of CRM measures.
Finances and resources	CRM implementation requires dedicated municipal budgets, access to national and EU funds, climate-sensitive investment planning and resources for pilot adaptation actions, infrastructure upgrades and social support mechanisms.
Governance arrangements and political leadership	Clear roles, interdepartmental coordination, metropolitan–district cooperation and political ownership are needed to mainstream CRM into spatial planning, infrastructure investment, emergency management, public health, social services and cultural heritage protection.

3.3 Potential CRM measures

The table below lists the potential CRM measures compiled from the Phase 3 actions shared for urban planning, disaster risk management, socio-economic analysis and cultural heritage. The measures include structural, non-structural, nature-based, human/social and governance-related actions, with equity considerations reflected through vulnerable groups, accessibility, gender-sensitive design, social protection and inclusive early warning mechanisms.

Key climate risk	*CRM measure*	*Effectiveness / Risk reduction (high, medium, low)*	*Contribution to CRM objectives*	*Possible co-benefits*	*Timeline (short, medium, long term)*	*Responsible organization*	*Possible adaptation limits*
Coastal flooding & sea level rise	Establish inclusive coastal and neighborhood-based early evacuation teams, accessible routes and gender-sensitive safe areas	High	Reduces life-safety risks for vulnerable groups	Improved accessibility, community preparedness, safer public spaces	Short	IMM, Konak Municipality, social services, disaster units	Dense historic urban fabric may limit accessible evacuation routes
Coastal flooding & sea level rise	Set up inclusive climate risk monitoring, multilingual early warning and hybrid communication systems	High	Improves early warning and risk communication	Digital inclusion, multilingual outreach, improved trust	Short–medium	IMM IT, smart city, social services and climate departments	Data privacy, digital exclusion and reluctance of migrants to share data
Coastal flooding & sea level rise	Develop rights-based social protection, just transition subsidies and legal protection against displacement	Medium	Reduces socio-economic vulnerability after flood events	Income security, migrant protection, reduced displacement	Medium	IMM/Konak social services, economic units, legal actors	Budgetary and legal constraints for direct compensation

Coastal flooding & sea level rise	Introduce climate adapted OHS protocols, service continuity plans and protection for precarious workers	Medium	Protects outdoor workers and maintains critical public services	Safer working conditions, reduced service disruption	Short	IMM HR, labour authorities, Konak Municipality	Private-sector compliance and legal alignment may be difficult
Coastal flooding & sea level rise	Ensure mobility justice, accessible transport arrangements and protection protocols for temporary coastal workers	High	Maintains access to services and safe evacuation	Inclusive mobility, protection of informal workers	Short	IMM, ESHOT, UKOME, Konak Municipality	Dense urban morphology and informal work patterns may limit implementation
Coastal flooding & sea level rise	Establish inclusive, gender-sensitive shelter infrastructure, care support points and intersectional risk data systems	High	Supports safe sheltering and care during coastal emergencies	Better care services, inclusive data, stronger social resilience	Medium	IMM/Konak social services, IT and climate units	Limited public space and accessibility constraints in central areas
Coastal flooding & sea level rise	Develop integrated early warning, mobile evacuation guidance and inclusive shelter infrastructure in coastal belts	High	Reduces acute exposure in high-risk coastal zones	Better preparedness, reduced evacuation delays	Short–medium	IMM disaster, social services, smart city units	High land values and dense coastal development may restrict evacuation corridors
Coastal flooding & sea level rise	Create social protection, just transition and climate-sensitive	Medium	Protect small businesses, informal workers	Economic continuity, social justice, reduced livelihood loss	Short	IMM/Konak social and economic units	Informal employment and fragmented small businesses may be hard to reach

	employment security protocols in central commercial axes		and street workers				
Coastal flooding & sea level rise	Conduct detailed risk analyses for coastal ecosystems, habitats, saltwater intrusion and coastal wells	Medium	Protects ecosystems, water resources and critical coastal assets	Biodiversity protection, water security, ecosystem services	Medium	DSI, İZSU, environmental authorities	Data gaps and long-term monitoring budget needs
Coastal flooding & sea level rise	Develop nature-based liveable waterfronts and protect/restore wetlands and delta areas	High	Reduces coastal flood exposure and strengthens natural buffers	Biodiversity, recreation, carbon sinks, livelihoods	Long	IMM, district municipalities, DSI, environmental authorities	Land-use conflicts, high initial costs, displacement concerns
Coastal flooding & sea level rise	Develop sea-level and storm risk monitoring and early warning systems	High	Improves preparedness and evacuation timing	Better public awareness, faster emergency response	Medium	IMM, AFAD, Meteorology, village heads	Sensor maintenance, operational funding and low compliance with warnings
River flooding	Develop nature-based flood infrastructure, restore river corridors and prevent capacity loss in channels	High	Reduces flood probability and severity	Green-blue infrastructure, improved water quality, biodiversity	Long	IMM, İZSU, DSI, AFAD, district municipalities	High costs, technical complexity and limited municipal borrowing capacity
Heavy rainfall & river flooding	Include flood-resilient planning principles and zoning rules for new	Medium	Reduces exposure of buildings and settlements	Safer buildings, risk-sensitive urban growth	Medium	District municipalities, IMM, planning authorities	Higher construction costs and affordability risks for low-income groups

	and existing development						
Heavy rainfall	Update infrastructure design standards for flash flood resilience and integrate them into planning rules	Medium	Improves resilience of roads, bridges, drainage and buildings	Lower infrastructure damage, service continuity	Medium	IMM, İZSU, district municipalities	Retrofitting existing infrastructure may be technically difficult
River flooding	Inventory covered streams and roads built over riverbeds; daylight and integrate them as green-blue corridors	Medium	Restores natural flow paths and reduces flood risk	Urban cooling, ecological connectivity, public space quality	Long	IMM, district municipalities, environmental authorities	Costly urban transformation and disruption during works
Extreme Precipitation/ Heavy rainfall	Separate sewerage and stormwater systems and increase sewer network carrying capacity	High	Reduces urban flooding and system overload	Improved sanitation, lower pollution, fewer service failures	Medium	İZSU, IMM, district municipalities	Dense infrastructure networks and high investment needs
River flooding	Prepare emergency plans for post-flood epidemic risks, water supply, mobile treatment and tanker distribution	Medium	Protect public health after flood events	Improved emergency logistics, water security	Short (annual)	İZSU, IMM, DSI, district municipalities, health authorities	Plans may become outdated; equipment and maintenance budgets may be limited
Heatwaves & urban heat island	Establish community-based public health adaptation and	High	Reduces heat-related morbidity and mortality	Stronger local care networks, health resilience	Short	Health authorities, IMM/Konak social services	Requires continuous outreach and staffing capacity

	hybrid early warning infrastructure						
Heatwaves & urban heat island	Reduce energy poverty through targeted social assistance, cooling kits and rights-based protection	High	Supports vulnerable households during heatwaves	Lower energy poverty, improved health and social protection	Short	IMM/Konak social services	High operational costs and difficulty reaching unregistered groups
Heatwaves & urban heat island	Introduce emergency working hours, public transport protocols and inclusive data systems	Medium	Protects workers and vulnerable transport users	Safer mobility, improved service planning	Short–medium	IMM, Electricity, Water, Natural Gas, Buses and Trolleybuses (ESHOT), Transportation Coordination Center (UKOME), labor authorities	Legal coordination and private-sector compliance may be difficult
Heatwaves & urban heat island	Install microclimatic infrastructure, temporary shading and multilingual digital networks	High	Reduces heat exposure in dense streets and public spaces	Public comfort, inclusive communication, tactical urbanism	Short	IMM, Konak Municipality	Temporary measures require seasonal maintenance
Coastal flooding & sea level rise	Install removable flood barriers before sea surge events to prevent or reduce damage to cultural heritage assets located along the coastline.	Medium	Reduces direct flood and sea surge damage to coastal heritage buildings by preventing water from reaching vulnerable	Improved emergency preparedness for heritage assets; increased awareness among owners/users; lower post-disaster repair needs.	Medium term / 5 years	İzmir Metropolitan Municipality; building owners/users as secondary responsible actors;	Cost of barrier systems; limited previous implementation experience; dependence on effective early warning systems.

			structures and ground-floor openings.			coordination with the Ministry of Environment, Urbanization and Climate Change.	
Coastal flooding & sea level rise	Identify high-value heritage buildings that cannot be protected in place and plan their relocation to safer areas where necessary.	High	Protects rare, unique or socially significant heritage assets that face high risk of irreversible loss from sea surge and coastal flooding.	Long-term preservation of high-value heritage assets; stronger disaster preparedness for irreplaceable cultural assets.	Medium term / planning within 5 years for very high-risk assets	Property-owning institution; Ministry of Culture and Tourism; General Directorate of Foundations; municipalities.	High cost; bureaucratic approval processes; legal permissions; possible public opposition to relocation.
Heavy rainfall & river flooding	Install temporary/removable flood barriers, flood gates, water diversion elements and drainage mechanisms to protect heritage assets located near old stream beds or flood-prone routes.	High	Minimizes flood damage to cultural heritage buildings by diverting water away from structures and preventing water entry through ground-floor openings.	Protection of historic urban fabric; reduced restoration costs; improved coordination between early warning and heritage protection.	Short term	Governorship, municipalities, Ministry of Culture and Tourism, property owners/legal users.	Cost; lack of awareness; weak institutional cooperation mechanisms; need for functioning early warning systems.
Heavy rainfall &	Carry out maintenance, repair, restoration and	High	Improves the physical resilience of	Preventive conservation; improved living/usage conditions;	Short term	Property owners/legal users; Ministry	Cost; labour needs; lengthy bureaucratic procedures; unclear

river flooding	strengthening works for heritage buildings exposed to extreme rainfall and flood risks.		vulnerable heritage buildings by repairing drainage elements, strengthening structures and installing post-flood water removal systems where needed.	reduced long-term damage; increased awareness among owners and users.		of Culture and Tourism.	mandates and ownership-related challenges.
Agricultural drought	Develop controlled rental procedures, user awareness activities and maintenance responsibilities for structurally vulnerable historic houses with long-term neglect or intensive multi-family use.	Low	Reduces user-related deterioration, unauthorized interventions and neglect in historic housing stock under socio-economic pressure.	Increased heritage awareness among users and owners; improved conservation of historic housing; better local monitoring through municipalities and mukhtars.	Long term / 5–10 years	Ministry of Culture and Tourism.	Resistance from property owners; high need for personnel and monitoring capacity; difficulty enforcing rental-related procedures.
Heatwaves & urban heat island	Develop nature-based solutions to reduce urban heat island effects and establish regular monitoring, non-destructive testing,	Medium	Reduces heat-related material deterioration in porous heritage structures and supports appropriate	Improved material monitoring; preventive conservation; reduced unauthorized cooling interventions; contribution to cooler urban public spaces.	Medium term / tests every 5 years	Municipalities; Ministry of Environment, Urbanization and Climate Change for urban heat	Cost; need for continuity; technical approval requirements; risk of inappropriate cooling systems affecting heritage authenticity.

	laboratory analysis and periodic maintenance for heat-sensitive heritage materials.		integration of cooling systems without damaging heritage authenticity.			island reduction; property owners/legal users; Ministry of Culture and Tourism for heritage interventions.	
Wildfires	Community-led forest monitoring and reporting networks, multi-lingual rural early warning systems for forest-fringe villages, and livestock/animal evacuation infrastructure.	High	Eliminates loss of human, agricultural worker, and livestock lives in rural settlements near forest boundaries during peak fire seasons.	Preserves local biodiversity and forest ecosystems; secures rural livelihoods and livestock assets; enhances local volunteerism and community awareness.	Short term	IMM (Fire Department), Regional Directorate of Forestry, Village Cooperatives, Local Search and Rescue Volunteers.	Extreme megafires with high wind speeds that completely override standard suppression capabilities, aerial firefighting resources, and safe evacuation timelines.
Wildfires	Develop rapid wildfire detection, early warning and coordination systems, including fire watch towers, drone monitoring, remote sensing and settlement-level alert mechanisms.	High	Improves early detection and response capacity, reducing the time between fire ignition, warning, evacuation and suppression.	Faster emergency response; better protection of vulnerable settlements; improved coordination among firefighting, forestry and municipal units.	Short–medium term	İzmir Metropolitan Municipality Fire Department, forestry authorities, AFAD, district municipalities,	High technology and maintenance costs, signal/connectivity limitations, need for trained staff and long-term operational funding.

						ICT/smart city units.	
Wildfires	Integrate preventive wildfire measures into urban and rural development plans, particularly in settlement–forest interface areas.	High	Reduces exposure of communities located near forests by guiding land-use decisions, buffer zones, access roads, emergency routes and fire-safe settlement planning.	Safer rural and peri-urban settlements; stronger coordination between spatial planning and disaster risk reduction; increased public awareness.	Medium term	İzmir Metropolitan Municipality, district municipalities, forestry authorities, planning departments, AFAD.	Existing settlements in risk-prone areas, fragmented planning authority, private property constraints and potential resistance to land-use restrictions.

3.4 Integration into planning and decision making

The results of the CRA can be integrated into local planning and decision-making by using risk maps, vulnerability analyses and Phase 3 CRM measures as direct inputs for municipal strategies, spatial plans, infrastructure investment programmes and emergency management protocols. For Konak and İzmir, the most relevant integration areas are the revision of spatial planning rules, zoning decisions in flood- and heat-prone areas, drainage and stormwater investment planning, coastal protection and nature-based solutions, public health measures for heatwaves, public space design, social service planning, cultural heritage protection and emergency response procedures. The proposed actions already identify practical mechanisms such as flood-resilient zoning principles, early warning systems, inclusive evacuation routes, cooling centers, green-blue infrastructure, stormwater separation, river corridor restoration and climate-sensitive occupational health and safety protocols.

At the national level, the integration of CRA outputs is also consistent with Türkiye's evolving climate governance framework. Climate Law, published in the Official Gazette on 9 July 2025, provides the legal and institutional framework for climate change mitigation and adaptation, including planning and implementation tools. In addition, the Local Climate Change Action Plan process and related national efforts to strengthen municipal climate action create an important entry point for translating the project findings into local plans, investment priorities and monitoring mechanisms. In this context, the CRIZ-ERS outputs can support future updates of İzmir's SECAP, GCAP, disaster risk reduction plans, municipal strategic plans, sectoral investment programmes and district-level planning instruments.

This policy context creates an opportunity to position the CRA findings as a shared evidence base for metropolitan, district and national-level actors. At the implementation stage, metropolitan and district-level municipal units, water and infrastructure authorities, disaster and emergency management institutions, health and social service providers, universities, professional chambers, civil society organizations and local community representatives can use the CRA results to coordinate their actions around shared risk priorities. To make this integration effective, the findings should be embedded into municipal strategic planning and budgeting cycles, investment screening processes and regular stakeholder consultation mechanisms. Clearer role allocation, for example through RACI-based responsibility mapping, can also support coordination across institutions and reduce implementation gaps. New data produced during the project includes higher-resolution hazard and risk maps, Konak-focused vulnerability assessments, social vulnerability considerations, stakeholder inputs and proposed CRM measures. Further improvements are still needed in neighborhood-level data on vulnerable groups, critical infrastructure exposure, informal workers, migrants/refugees, heat-health outcomes, cultural heritage vulnerability, drainage capacity and real-time monitoring of coastal and pluvial flood risks. Additional technical capacity, financial resources, GIS-based monitoring tools, participatory data collection and applied research would strengthen future CRM implementation.

A dedicated monitoring and evaluation system should be established to track progress against the CRM objectives. This system could include indicators such as the number of people and assets exposed to heat and flood risks, the length of accessible evacuation routes, number of cooling centers and shaded public spaces, drainage/stormwater upgrades completed, area of restored green-blue infrastructure, number of vulnerable households covered by early warning and social

support systems, number of municipal plans using CRA outputs and the number of CRM-related trainings and coordination meetings. The system should be updated regularly and aligned with municipal strategic planning and budgeting processes, so that it can track both progress in reducing climate risks and improvements in adaptive capacity.

4 Project Evaluation

4.1 Usability of the results

The project provides a practical and policy-relevant basis for strengthening climate risk management in İzmir and Konak. By moving from a city-wide assessment to a district- and neighborhood-level analysis, the project generated more detailed knowledge on priority climate risks, exposed areas, vulnerable groups and local adaptive capacity. This makes the results directly usable for municipal planning, infrastructure investment, emergency preparedness, social service planning and stakeholder coordination. In particular, the risk maps, vulnerability assessments and Phase 3 CRM measures can support the integration of climate risk considerations into spatial planning decisions, zoning and land-use regulations, stormwater and drainage investments, coastal protection, public health measures for heatwaves, green-blue infrastructure planning and cultural heritage protection.

The usability of the results is strengthened by the way the assessment links scientific outputs with concrete planning and implementation needs. The project does not only identify where climate risks are concentrated but also shows how these risks intersect with urban planning, disaster risk management, socio-economic vulnerability and cultural heritage. This provides decision-makers with a more targeted basis for prioritizing adaptation actions, directing investments to high-risk areas, and designing measures that respond to the needs of vulnerable groups. The proposed measures and indicators can also serve as an initial reference for future monitoring, budgeting and reporting processes. Overall, the project strengthens the link between climate risk evidence, local policy development and practical adaptation planning in İzmir and Konak.

4.2 Lessons learned

The third phase of the project showed that climate risk management requires not only technical risk analysis, but also clear implementation pathways, institutional ownership and sustained stakeholder engagement. One of the main lessons learned was the importance of translating risk maps and vulnerability findings into concrete, feasible and locally relevant adaptation measures. The most challenging aspect was to balance a wide range of risks, sectors and stakeholder expectations within a coherent CRM framework, while also addressing data gaps, institutional mandates, budget limitations and the specific needs of vulnerable groups.

Stakeholders played a central role in validating risk findings, identifying implementation barriers and shaping CRM recommendations. Their feedback helped ensure that the proposed measures were not limited to physical infrastructure investments, but also included social protection, inclusive early warning, community-based evacuation, occupational safety, public health, green-blue infrastructure and governance-related measures. This process also showed that learning is strengthened when technical analysis is combined with participatory discussions, workshops, expert input and targeted consultations. The final outcomes were communicated through stakeholder meetings, Phase 3 workshops, technical presentations, draft actions and reporting outputs.

The project worked well in terms of producing localized climate risk knowledge, engaging a diverse group of actors and developing a wide range of potential CRM measures. The participatory approach helped improve the relevance and legitimacy of the results. However, some challenges remained, particularly in relation to the availability of detailed neighborhood-level data, continuity of stakeholder participation, cross-institutional coordination and the need to convert

recommendations into budgeted and legally embedded actions. Available resources were used efficiently by building on previous project outputs, existing municipal plans, stakeholder inputs and expert knowledge. The overall impact of the CRM process can be valued as positive, especially in terms of improving institutional understanding of climate risks, increasing awareness of social vulnerability, supporting future investment prioritization and creating a stronger basis for integrating adaptation into local decision-making.

5 Conclusions Phase 3

Phase 3 marks the transition of the CRIZ-ERS project from climate risk assessment to climate risk management and adaptation planning. Building on the İzmir-wide assessment in Phase 1 and the high-resolution Konak District assessment in Phase 2, this phase focused on translating risk findings into practical, locally relevant and equity-oriented CRM objectives and measures. The main priority risks addressed in this phase were heatwaves and urban heat island effect, coastal flooding and sea level rise, river flooding, and heavy rainfall/pluvial flooding. Additional risks, including agricultural drought and wildfires at İzmir Province scale, were also considered to ensure continuity with the wider metropolitan risk profile.

The main conclusion of Phase 3 is that effective climate risk management in Konak and İzmir requires a multi-dimensional approach that goes beyond technical risk reduction. The proposed CRM framework was structured around key thematic areas: urban planning, disaster risk management, socio-economic resilience and cultural heritage protection. This allowed the project to reflect different types of exposure, vulnerability and adaptive capacity, including dense urban morphology, ageing infrastructure, limited green/open areas, coastal exposure, drainage constraints, public health risks, vulnerable groups, informal or precarious livelihoods, and the sensitivity of cultural heritage assets.

The Phase 3 work identified a broad set of potential CRM measures, including structural, non-structural, nature-based, governance-related and social measures. These include flood-resilient zoning, drainage and stormwater upgrades, river corridor restoration, coastal protection, green-blue infrastructure, heatwave preparedness, cooling centers, shaded public spaces, inclusive early warning systems, accessible evacuation routes, social protection mechanisms, climate-sensitive occupational health and safety protocols, and cultural heritage-specific monitoring and preventive conservation actions. These measures provide a practical basis for future integration into municipal strategies, spatial plans, infrastructure investment programmes, emergency preparedness, social service planning and cultural heritage management.

A key finding is that heatwaves require urgent attention due to their very high-priority level, public health implications and disproportionate impacts on elderly people, children, people with disabilities, chronically ill people, migrants/refugees, outdoor workers and low-income households. Coastal flooding and sea level rise also emerged as major risks due to the concentration of infrastructure, transport corridors, public spaces, local economic activity and cultural heritage assets along the coastline. River flooding and heavy rainfall/pluvial flooding remain important due to drainage limitations, impermeable surfaces, ageing infrastructure and potential cascading impacts on urban services. Additional assessments on wildfires and agricultural drought broadened the understanding of climate risk at the provincial scale and highlighted the importance of land-use planning, ecosystem-based measures, water management and rural resilience.

The project also highlighted several challenges that remain only partially addressed. These include limited neighborhood-level data on vulnerable groups, informal workers and care-dependent populations; gaps in real-time monitoring systems for heat, coastal flooding and pluvial flooding; fragmented institutional mandates; limited implementation budgets; and the need to convert CRM recommendations into legally embedded and budgeted actions. Despite these constraints, Phase 3 created a strong foundation for coordinated implementation by combining technical analysis, stakeholder knowledge, thematic action planning and proposed monitoring indicators.

6 Progress evaluation

6.1 Project outputs

In this phase, adaptation options were structured around the main climate risks and four thematic dimensions: urban planning, disaster risk management, socio-economic resilience and cultural heritage protection. The process included stakeholder engagement activities, expert contributions, actions development, review of implementation responsibilities, and the identification of possible indicators for monitoring progress. Overall, the work carried out in Phase 3 supports the project's objective of ensuring that climate risk assessment results are not treated only as technical outputs, but are translated into practical planning, governance and investment tools.

The main progress achieved in this phase includes the preparation of CRM objectives, the identification of supportive elements for effective CRM, the development of a comprehensive list of potential CRM measures, the integration of cultural heritage considerations into the adaptation framework, and the preparation of monitoring-oriented indicators. Stakeholder engagement also continued through workshops, consultations, technical meetings and thematic expert inputs. These activities contributed to strengthening institutional ownership, validating proposed measures and improving the usability of project results for local decision-making.

The following tables provide a summary of progress against the Key Performance Indicators and Milestones defined in the project's following plan. The structure builds on the KPI and milestone tables used in the previous deliverable, while updating the status of Phase 3 outputs.

Table 6-1 Overview key performance indicators

Key performance indicators	***Progress***
Number of detailed neighborhood-level risk assessments completed: 1	*Phase 2 (31 Dec 2025)*
Number of stakeholders involved in the risk assessment and adaptation planning activities: 30	*Phase 1 (31 Mar 2025)*
Number of multi-sectoral RVA reports generated: 2	*1st Report – Phase 1 (31 Mar 2025)* *2nd Report – Phase 3 (28 Feb 2026)*
Number of workshops, meetings, and training sessions conducted: 6	*Phase 1–3 (Various dates between Jan 2025 and Jul 2026)*
Number of adaptation action plans developed for Konak district: 1	*Phase 3 (Deadline: 31 Jun 2026)*
Number of publications, digital maps, and dissemination materials produced: 2	*Phase 1 (30 Nov 2025) Phase 2 (30 Jun 2026)*
Number of conferences and public info sessions held to present RVA findings: 2	*Phase 2 (31 Dec 2025) Phase 3 (31 Jul 2026)*
Number of media articles and mentions about the project: 5	*Phases 1–3 (Various dates: Mar 2025 – Jul 2026)*
Number of workflows successfully applied to Deliverable 1: 3	*Phase 1 (Deadline: 31 Mar 2025)*

Table 6-2 Overview milestones

Milestones	***Progress***
M1: Data Collection and Literature Review Completed	*Achieved (Jan 2025)*
M2: Subcontracting Tender Completed	*Achieved (Jan 2025)*
M3: Initial Stakeholder Meeting Held	*Achieved (Jan 2025)*
M4: Data Analysis Completed	*Achieved (Feb 2025)*
M5: City-Wide RVA Report Prepared	*Achieved (Mar 2025)*
M6: Dissemination Workshop Held	*Achieved (Mar 2025)*
M7: Konak District Stakeholder Meetings Held	*Achieved (Apr 2025)*
M8: Data Collection and Analysis for Konak Completed	*Achieved (Jul 2025)*
M9: Attend the CLIMAAX Workshop Held in Barcelona	*Achieved (Jul 2025)*
M10: Socio-Economic Impact Assessment Completed	*Achieved (Oct 2025)*
M11: Konak District RVA Report Prepared	*Achieved (Dec 2025)*
M12: Dissemination Workshop for Konak Held	*Achieved (Dec 2025)*
M13: Stakeholder Engagement on Adaptation Options Completed	*Achieved (Feb 2026)*
M14: Adaptation Action Plan Developed	*Achieved (Mar 2026)*
M15: Training Sessions Conducted	*Achieved (May 2026)*
M16: Monitoring and Evaluation Framework Established	*Achieved (Jun 2026)*
M17: Final Conference and Presentation of Results	*Achieved (Jul 2026)*

7 Supporting documentation

The additional document was uploaded to the Zenodo platform (LINK). The content of the files are as follows:

- Main Report (PDF)
- Phase 3 Dissemination Report (Additional document)
- Visual Outputs (infographics, maps, charts) (*The relevant information will be uploaded to the system by mid-September*)
  - Heavy Rainfall (extreme precipitation) Workflow (Maps and Graphs)
    - Hazard Workflow Outputs
    - Risk Assessment Outputs
  - Heatwaves Workflow (Maps and Graphs)
    - Hazard Workflow (xclim) Outputs
    - Risk Assessment (UHI) Outputs
  - River Flooding (Maps and Graphs)
    - Hazard Workflow Outputs
    - Risk Assessment Outputs
  - Coastal Flooding (Maps and Graphs)
    - Hazard Workflow Outputs
    - Risk Assessment Outputs
- Datasets Collected
    - İzmir region boundary
    - Konak district

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