



European Green Capital Award 2025

Brescia application Indicator 7

7. Climate Change: Adaptation

7.A Present Situation

In this section we ask you to present the current situation of climate change adaptation in your city. Please, complete the following table with the most recent data available:

Table 1: Benchmarking Data - Climate Change: Adaptation

* Double left click the check box and select 'Default Value - Checked' where appropriate

** For EGL applicants the following applies: when the applicant cannot provide certain benchmark data, a brief description of the current situation regarding climate change adaptation.

Systematic climate risks and vulnerabilities assessment							
<input checked="" type="checkbox"/> Existing	If yes, year it was or will be finished:	[2017 – 2022 updating]	Considers:	<input checked="" type="checkbox"/> Heat	<input checked="" type="checkbox"/> Current climate risks		
<input type="checkbox"/> In preparation		[.....]		<input checked="" type="checkbox"/> Droughts	<input checked="" type="checkbox"/> Future climate risks		
<input type="checkbox"/> None				<input checked="" type="checkbox"/> Floods	<input type="checkbox"/> Sea level rise		
				<input checked="" type="checkbox"/> Other: [environmental, fire]			

Complement the information in the table by the following:

1. Explanation of:
 - a. Identified climate impacts (e.g. temperature, different types of flooding, droughts and vulnerability of certain population groups).
 - b. Sectors concerned (e.g. transport, energy, water management and health)
 - c. What is done to adapt the city to threats from heat, drought, food security, etc.
2. The organisation of the responsibility for adaptation in the administration and collaboration between different departments on this subject.
3. The way your city monitors progress in terms of the implementation of measures and of actual reduced vulnerability/risks.
4. The way your city involves stakeholders, like citizens, other sectors, public and private owners by awareness raising, planning and implementation.
5. An existing sustainable energy and climate action plan (SECAP)¹ under the Covenant of Mayors for Climate and Energy (CoM) and respective references will be positively noted.

(max. 1000 words and five graphics, images or tables)

¹ Local authorities joining the CoM commit to submitting an action plan within two years after formally signing up to the initiative. More information on the SECAPs and the relevant processes can be found in the FAQ of the CoM - <https://eu-mayors.ec.europa.eu/en/FAQs>

Regarding the climate, Brescia is classified within the homogenous macroclimatic region "Prealps and Northern Apennines" (Figure 1) [1].

	Temperatura media annuale - Tmean (°C)	Giorni con precipitazioni intense - R20 (giorni/anno)	Frost days - FD (giorni/anno)	Summer days - SU95p (giorni/anno)	Precipitazioni invernali cumulate - WP (mm)	Precipitazioni cumulate estive - SP (mm)	95° percentile precipitazioni - R95p (mm)	Consecutive dry days - CDD (giorni)
Macroregione 1 Prealpi e Appennino settentrionale	13 (±0.6)	10 (±2)	51 (±13)	34 (±12)	187 (±61)	168 (±47)	28	33 (±6)

Figure 1: macro-region 1 has intermediate values for winter and summer precipitation and high values for extreme precipitation phenomena

The main climatic impacts, already perceptible and increasingly evident in future years, concern the increase in:

- heat waves, which mainly affect the vulnerable population (children, the elderly and diseased people) and people in energy poverty;
- extreme weather phenomena affecting green areas, infrastructure and the construction sector
- drought periods that affect the energy, agricultural, and forestry sectors (increase fire risk on Mount Maddalena).

The awareness level and the need to act promptly to contrast the climate change impacts at the urban level is shown not only through the adoption of adaptation policies within planning tools, but also through participation in national and international initiatives to obtain financing sources, including the application to the "Experimental program of interventions for adaptation to climate change in urban areas" by the Ministry of Environment and Energy Security, the call *HORIZON-MISS-2022-CLIMA-01-02: Unlocking of financial resources for investments into climate resilience* [2] with the CLIMATEFIT project, and the call for ideas *Clima Strategy* promoted by Cariplo Foundation with UN FILO NATURALE project [3]. All of these projects have been financed for a total amount of about € 7 million and are being implemented.

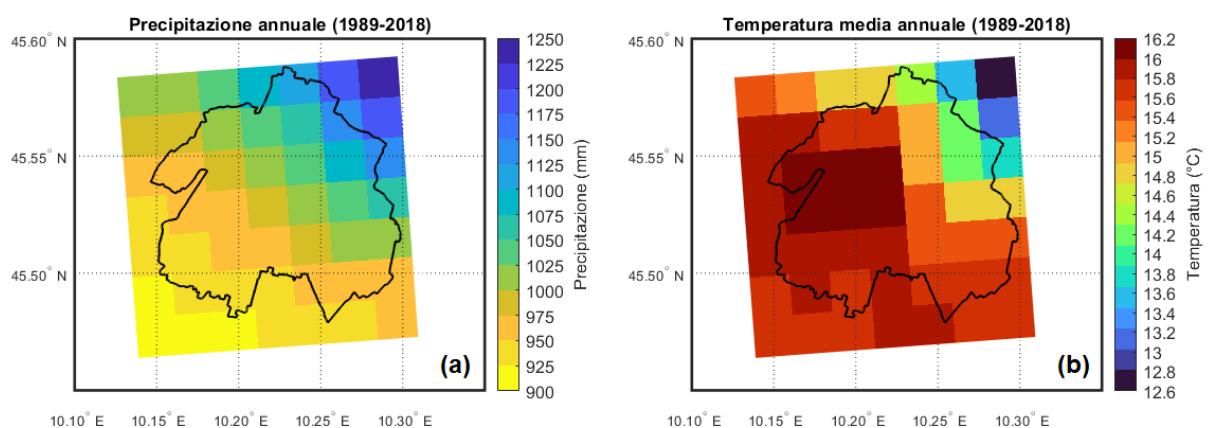


Figure 2: spatial distribution of the annual precipitation (a) and the average annual temperature (b) over the period 1989-2018

At the local level, climate variability analysis is an essential tool to achieve climate change awareness and support adaptation strategies developed locally. The high-resolution spatial analysis at 2 km

adopted by the municipality showed the evolution of the annual average temperature anomaly and the annual average precipitation anomaly, calculated with respect to the mean value over the period 1989-2018 (Figure 2): it was observed an increase of about 0.5-1°C in the period 2006-2018 compared to previous years (Figure 3) and also a frequency increase that regards rainfall, starting from 2008 (Figure 4).

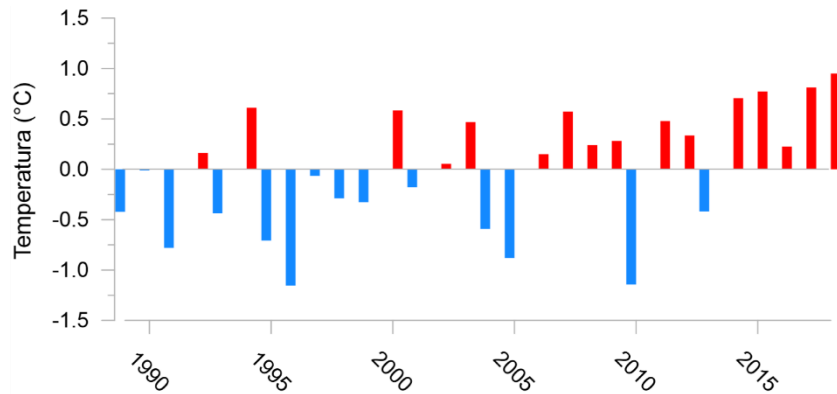


Figure 3: annual average temperature anomaly for the average annual temperature, over the period 1989-2018

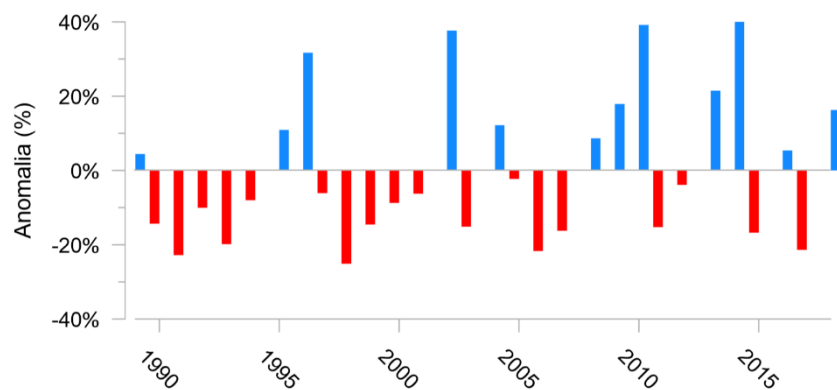


Figure 4: annual precipitation anomaly expressed as a percentage, over the period 1989-2018

To cope with these impacts, the city of Brescia has prepared and implemented strategic programmes and plans starting with the Strategic Urban Plan (SUP) [4], in which zero soil consumption was also achieved to limit soil sealing, passing through the Sustainable Urban Mobility Plan (SUMP) [5] to incentivise sustainable mobility, to the Sustainable Energy Action Plan (SEAP) [6] approved in May 2021, until the Climate Transition Strategy (CTS) [7] approved in June 2021, which contains long-term adaptation targets and pilot actions to be implemented in the short term. Finally, the 2022 updating of the Building Regulations (article n°31) [8] looks in this way and includes the mitigation and adaptation target also at the building level.

The CTS is the main implementation and planning tool to achieve the challenging urban adaptation objectives. The overall objectives (Figure 5) are to transform the city of Brescia into an oasis city - characterized by high and widespread levels of climatic comfort and biodiversity – into a sponge city - with high levels of water quality and urban drainage - and into a city for people - made of attractive, healthy, liveable and inclusive spaces - at the same time.

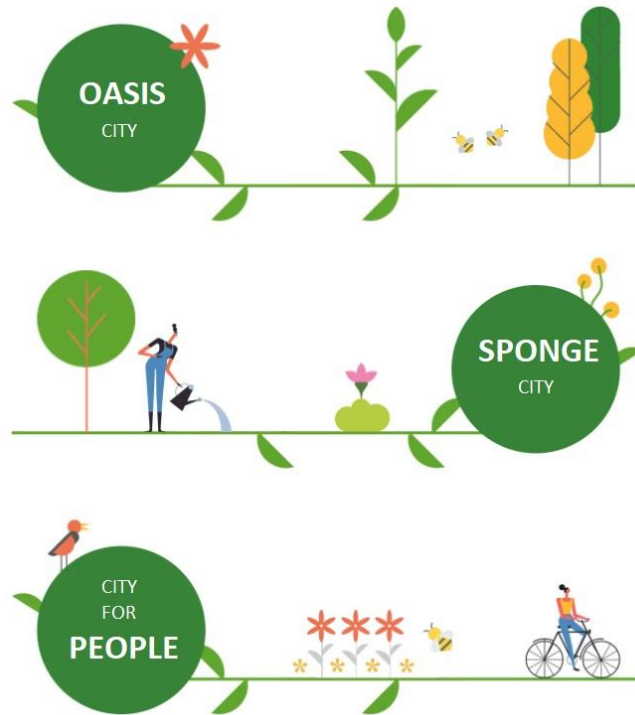


Figure 5: the three keywords on which “Un filo Naturale” project is based

The CTS integrates and makes the city's general and sectorial plans and planning instruments dialogue with each other and is implemented through the active and responsible contribution of municipal administrators and technicians.

For the strategy implementation and the involvement of all territorial actors, governance has been envisaged as follows:

- a) internal governance within the municipal administration, to overcome the traditional function of the Municipality and adopt an approach towards shared objectives;
- b) external governance, to connect the entities that are part of the internal governance structure with all the other external stakeholders and citizens, who can contribute their own expertise and peculiarities.

The CTS overall coordinating role is assigned to the **Climate Transition Manager**, a figure expressly identified within the municipal administration who is responsible for operating the collaboration between the different municipal sectors on mitigation and adaptation, flanked by the **Energy manager**, who promotes the rational and efficient use of energy, encouraging the use of renewable sources, and enhance the fight against climate change by identifying actions and procedures.

CTS and SEAP are strongly integrated: climate change mitigation actions are contained in the SEAP, while adaptation actions are contained in the CTS. The proposed actions are part of a single package of measures based on the regeneration of the urban environment, built according to a vision of resilience and liveability and its interconnection with peri-urban green areas. In particular, the strategic vision is divided into three main strands:

- environmental regeneration of the urban environment with nature-based solutions;
- rehabilitation of existing structures in a resilient way;

- integrated management of connections between the urban area and peri-urban green areas, aims to increase the natural heritage.

The CTS currently provides several pilot actions that will be extended to the entire Brescia area in the near future, including [7]:

- promoting green roofs;
- de-sealing of urban open spaces with nature-based solutions;
- tactical urban planning measures;
- urban forestation.

Underlying what has been described so far is the desire to create a sense of co-responsibility from all stakeholders to act organically in the urban adaptation direction. For this reason, awareness-raising activities on the topic have been organised, such as conferences and seminar cycles open to citizenship, educational courses for schools, capacity-building trails for public personnel, and participatory paths for citizens to design resilient urban spaces using the tactical urbanism method.

The CTS has a monitoring system designed to be able not only to support the Strategy's ongoing verification, with the work-in-progress variations and additions that will be necessary, but even the communication and participation of citizens and stakeholders in this long path towards climate neutrality. SEAP also monitors activities, reporting them to the competent Commission annually. The two monitoring reports are designed to be integrated.

7.B Past Performance

In this section we ask you to describe the city's development of climate change adaptation in the past ten years to reach the present situation. Please provide the following information:

1. The trends: the development of the actual vulnerability and risks in your city to the different aspects of climate change.
2. Actions and measures taken by the city authorities in the last 10 years that significantly affected the trends and changes mentioned under point 1.

(max. 600 words and five graphics, images or tables)

The analysis of local future climate scenarios obtained with the COSMO-CLM model, at a resolution of about 8 km, showed:

- for the frost days indicator, an annual average decrease for the winter season of 10 days for the RCP4.5 scenario and 19 days for the RCP8.5 scenario;
- for extreme minimum temperatures, an average annual decrease, for all seasons and for both scenarios;
- for summer days, an average annual increase of about 13 days for both scenarios;
- for the tropical nights' indicator, an important change for the summer season, where for both scenarios there is an average annual increase of about 12 days;
- for the extreme maximum temperatures, an increase of days affected by these, for all seasons and for both scenarios

Some examples of what is already happening:

- May 2010 rainfall peak of 180 mm;
- May 2010 flood in Costalunga and Sant'Eufemia;
- VAIA storm on 29 October 2018, which felled 411 urban plants;
- a storm cell on 29 August 2019, with peak wind speeds of 170 km/h and 567 urban plants destroyed;
- forest fire near Mount Maddalena in March 2022
- drought in summer 2022 for which dead plants are still being counted.

Extreme weather events and fire risk

For years, Civil Protection has activated specific agreements and memorandum of understanding with associations specialized in fire and hydrogeological risk operating in the territory. Since 2019, with the Alert System's AvvisaBrescia app [10], Civil Protection of Brescia has been sending emergency communications to citizens regarding extreme events and the various related risks.

For local and detailed weather analysis, the municipality is equipped with two SODAR (Sonic Detection And Ranging) weather stations capable of providing the wind rose at different altitudes: 12m, 50m, 90m, 150m, 190m, and 250m.

Heatwave risk

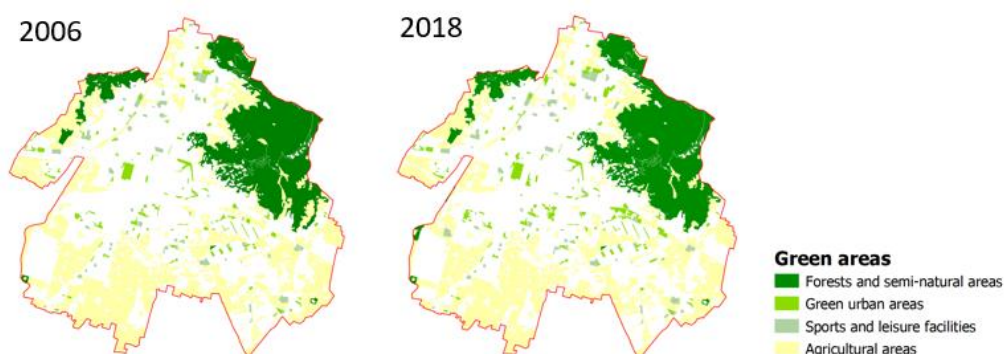


Figure 6: Green development over the last 10 years

To cope with the heatwave risk, the Brescia Health Protection Agency with the municipal administration has drawn up a plan to protect the vulnerable population. Moreover, since the beginning of the millennium, it has constantly implemented the presence of greenery and trees within the city (Figure 6).

Flood risk

Brescia is characterized by a high flood and hydrogeological risk, mainly due to the particular position of the city below the hills and the high level of urbanisation after the Second World War: when exceptional meteoric events occur, the flows drained from the hills reach the city and due to the soil impermeability, cause flooding.

Over the last decade, several hydraulic studies [11] [12] have been carried out on the main watercourses, which have led to the delimitation of the areas most affected by hydraulic risk. Several measures have been/will be implemented to make these areas safer from a hydraulic and hydrogeological point of view, like the construction of a hydraulic weir on the mountain hills aimed at slowing down the downstream flows and retaining the solid material carried by the current, and the area's perimeter for possible controlled flooding to secure the surrounding urbanised areas.

Soil protection and hydraulic safety measures were also carried out in the Overall City. In 2018, a drainage canal was built in Nuvolera downstream of the confluence of the Giava River into the Rudone River (Figure 7), financed with 6'200'000 € from the Lombardy Region. This artificial channel, 3 km long and with a maximum flow of 30 cubic meters per second, was built to safeguard the areas of Mazzano, Rezzato, and the Brescia district of Sant'Eufemia from flooding when extraordinary meteorological events cause the Garza River to overflow.

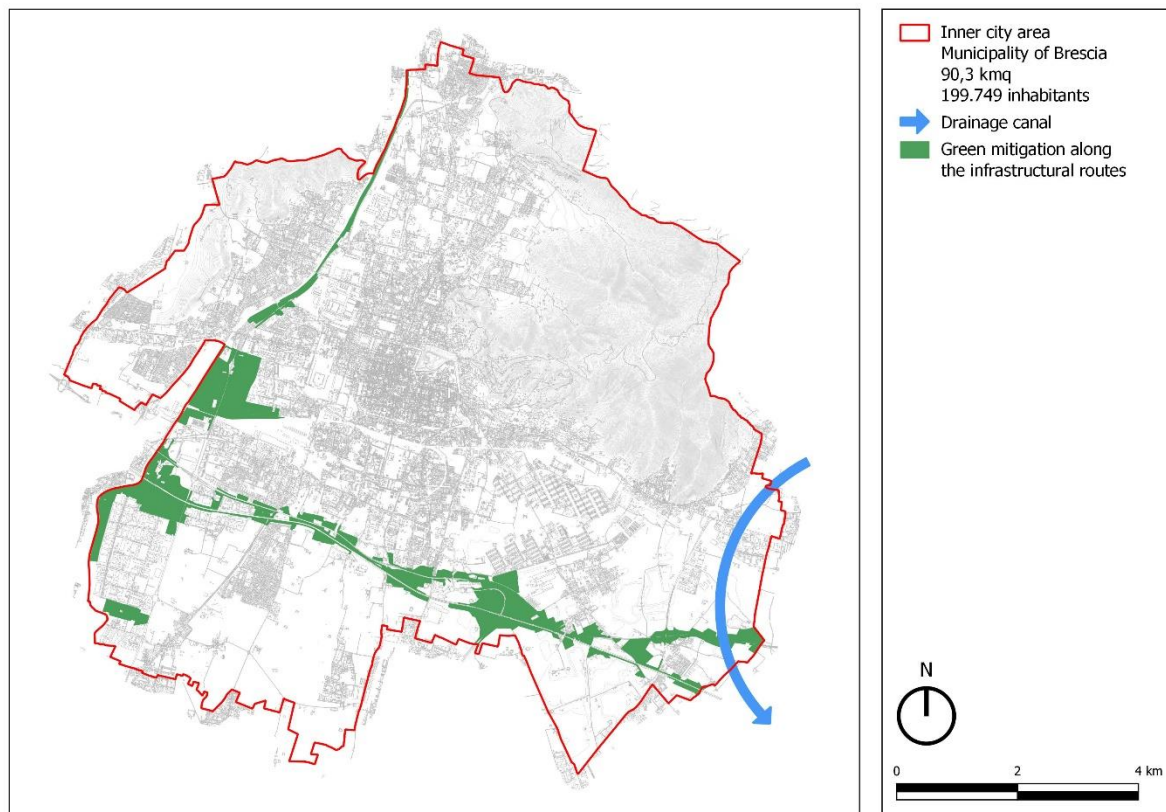


Figure 7: Early 2000s adaptation actions

7.C Future Plans

Please describe the following:

1. The medium term (2030) and long term (2050) objectives regarding climate adaptation. An existing SECAP under the CoM should be referenced.
2. The planned measures to achieve the ambitions described under 1. Please indicate whether the city has a climate change adaptation strategy and/or action plan. Provide information about the following:
 - a. Status of implementation.
 - b. Relation to overall city planning and other plans and strategies.
 - c. The impacts and sectors considered.
 - d. Targets set.
 - e. Innovative approaches your city is planning to use.
3. To what extent measures and ambitions described under 1 and 2 are supported by:
 - a. strategic and policy commitments
 - b. budget and resource allocations
 - c. plans for monitoring of impacts
 - d. participatory approaches

(max. 600 words and five graphics, images or tables)

The two climate change policy plans approved in 2021, SECAP and CTS, set medium-term (2030) mitigation and adaptation targets, such as:

- promoting sustainable consumption and production models;
- improve the energy-environmental quality of existing buildings;
- promoting a sustainable mobility model;
- increase resilience and adaptation to climate change for territory and citizens within the city's CTS;
- reduce CO2 emissions by at least 50% by 2030.

The 2030 targets will then be consolidated and implemented in the long term (2050).

The STC is the main medium and long-term planning (30 years) and implementation tool that aims to achieve the challenging objectives of the climate transition. 30 "pilot" actions will be implemented in the coming years, and others will be implemented in a longer-term vision, based on plans, strategies and guidelines in progress implementation (Figure 8). To reduce the emissions deriving from the main road infrastructures urban reforestation projects have been activated to mitigate their effects.

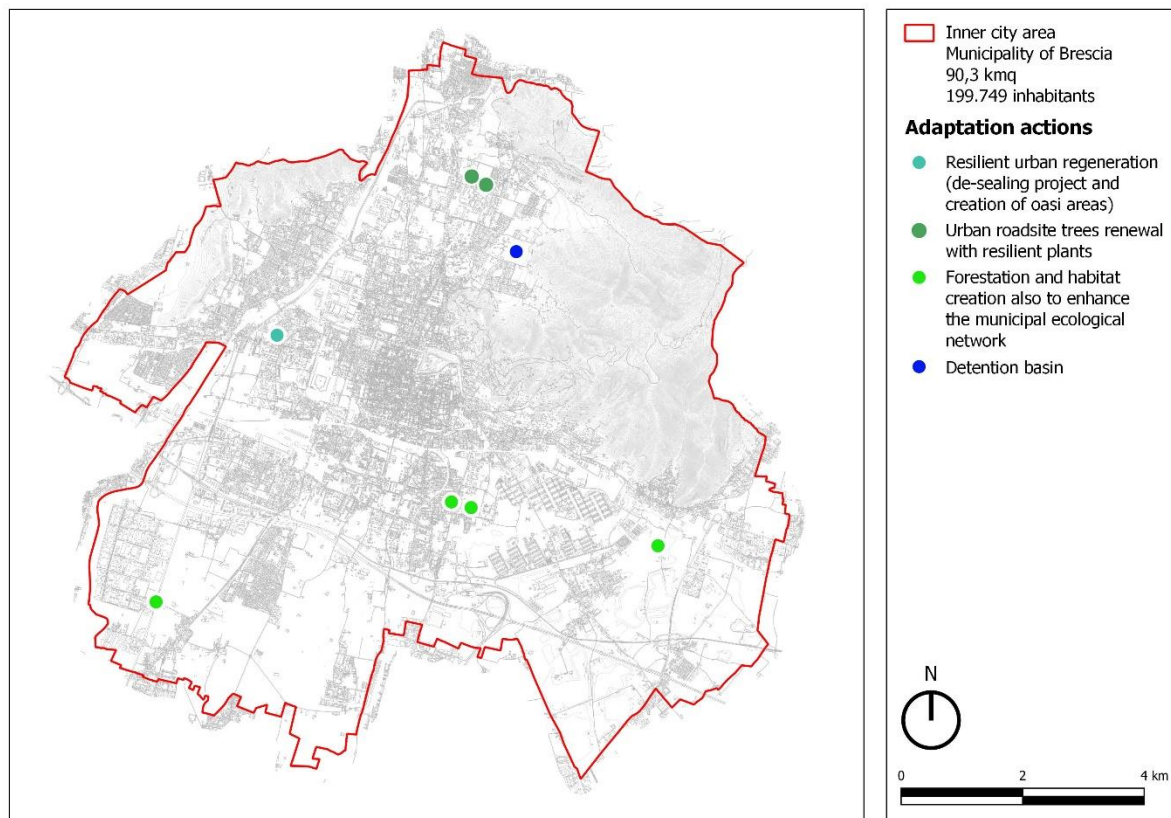


Figure 8: some adaptation actions

Therefore, the city promotes the implementation and dissemination of sustainable urban drainage interventions aimed at reducing the contribution of rainwater in the water and sewerage network, through reuse and infiltration into the soil. These interventions include filter trenches, rain gardens, and bioretention ponds, which have multiple positive effects on the urban environment, such as reducing hydraulic risk, water table feeding, increasing biodiversity, and improving water quality and the microclimate.

Together with the SECAP, the CTS seeks to achieve the following main objectives:

- reduction of urban heat islands;
- increase urban drainage through nature-based solutions;
- make safer against high-intensity atmospheric phenomena;
- increase in natural green capital and biodiversity, and resilience vegetation;
- increase urban open spaces availability characterized by high livability and attractiveness;
- increase the absorption and storage capacity of greenhouse gases;
- improve capacity-building skills and tools available to the municipality and others involved in the CTS' management, implementation and monitoring;
- increase awareness and responsiveness to climate change for the municipality, partners, stakeholders and citizens;
- increase the vegetation resilience and integrated connections management between urbanized and peri-urban green areas;
- reduction of greenhouse gas emissions through energy efficiency and fuels decarbonisation;
- mitigation of air pollution;
- mitigation of high-intensity atmospheric phenomena.

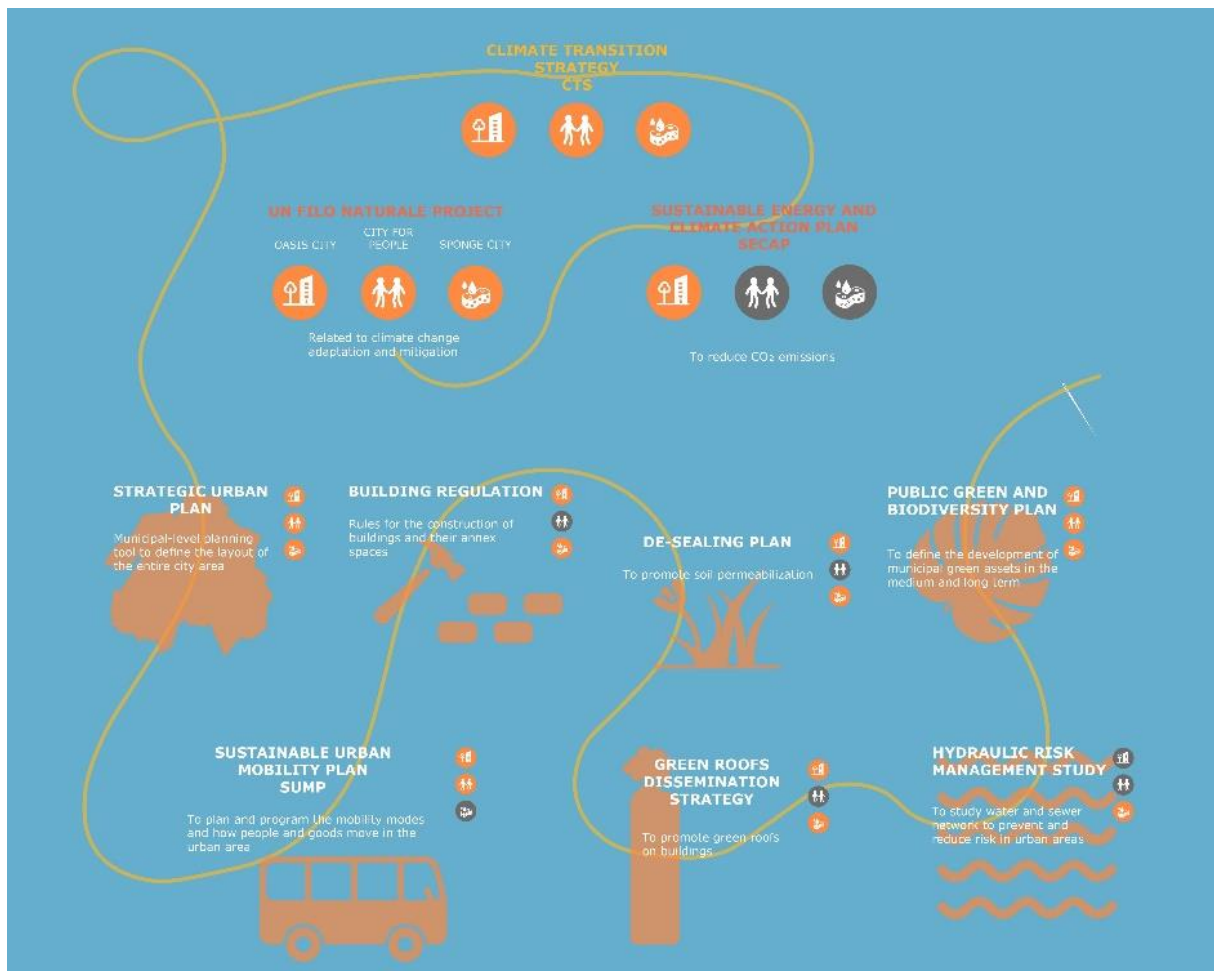



Figure 9: general and sectoral programmatic and planning tools integrated with CTS and SECAP

The CTS integrates and dialogues with all the general and sectoral programmatic and planning tools (Figure 9), such as the SUP, the SUMP, and the drafted “Public Green and Biodiversity Plan”.

The specific adaptation actions have been identified by the CTS: the pilot projects find in it the financial resources amounting to 6’112’000 € among the contributions allocated by CARIPO Foundation, Lombardy Region, Municipality of Brescia and other partners, divided among the different planned actions planned by the strategy (Table 1).



Adaptation actions	Climate change risk				Cost €
	hydrogeological	flood	heat	extreme meteoric events	
2.1 RESILIENT URBAN REGENERATION (de-sealing projects and creation of oasis areas)	X	X	X	X	1’986’500
2.2 GREEN ROOFS PILOT PROJECT AND MAKE KNOWN FOR THEIR REPLICATION			X	X	475’000
2.3 URBAN ROADSIDE TREES RENEWAL WITH RESILIENT PLANTS		X	X	X	150’000
2.4 RESPONSIBLE FOREST MANAGEMENT BASED ON MAKING AN ASSOCIATED GOVERNANCE MODEL	X	X		X	238’000
2.5 POLLUTION RISK CONTROL AND IMPROVEMENT OF THE ENVIRONMENTAL QUALITY OF AGRICULTURAL AREAS IN THE SOUTH PART OF THE CAFFARO PLANT			X	X	200’000
2.6 PILOT ACTIONS DESIGN TO REDUCE THE CHANNELS FLOODING RISK FOR THE LESSER WATER NETWORK	X	X		X	30’000
2.7 FORESTATION AND HABITAT CREATION ALSO TO ENHANCE THE MUNICIPAL ECOLOGICAL NETWORK	X	X	X	X	500’000

Table 1: adaptation actions planned in the CTS: entity of investments

To have a broad future development, all these actions cannot only be promoted by the single municipality but need the involvement of all citizens and stakeholders. A synergistic vision in this sense is needed, to promote urban adaptation also through the implementation of private initiative projects and urbanisation works.

These structural actions are accompanied by other actions for the active involvement of citizens with the “Spazi Attivi” (Figure 10), a participatory planning project [12] which identifies open urban spaces to be transformed into places of social aggregation, through regeneration interventions urbanization and adaptation to climate change.

The CTS include a monitoring plan for the actions’ implementation and the achievement of the adaptation objectives, which should be developed in close synergy with the SEAP monitoring plan and the other plans mentioned above, but at the same time involve citizens and stakeholders to achieve the goal of climate neutrality.



FIGURE 10: organized by Urban Center Brescia, “Spazi Attivi” participatory project wants to plan resilient urban spaces

7.D References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

[1] National Climate Change Adaptation Plan (NCCAP)

[Piano Nazionale di Adattamento ai Cambiamenti Climatici | Ministero dell'Ambiente e della Sicurezza Energetica \(mase.gov.it\)](https://www.mase.gov.it/it/temi/ambiente-e-clima/piano-nazionale-di-adattamento-ai-cambiamenti-climatici)

[2] HORIZON-MISS-2022-CLIMA-01-02: Unlocking of financial resources for investments into climate resilience [2] with the CLIMATEFIT project

<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-miss-2022-clima-01-02;callCode=HORIZON-MISS-2022-CLIMA-01;freeTextSearchKeyword=;matchWholeText=true;typeCodes=1;statusCodes=31094501,31094502,31094503;programmePeriod=null;programCcm2Id=null;programDivisionCode=null;focusAreaCode=null;destinationGroup=null;missionGroup=null;geographicalZonesCode=null;programmeDivisionProspect=null;startDateLte=null;startDateGte=null;crossCuttingPriorityCode=null;cpvCode=null;performanceOfDelivery=null;sortQuery=sortStatus;orderBy=asc;onlyTenders=false;topicListKey=callTopicSearchTableState>

[3] Municipality of Brescia (2021). Climate Transition Strategy (CTS)

https://www.comune.brescia.it/sites/default/files/imported/servizi/urbancenter/unfilonaturale/Documents/210720_UC_AT_188-RELAZIONE_STC_BS_rev2.pdf

[4] Municipality of Brescia (2016). General Report PGT 2016

https://www.comune.brescia.it/servizi/urbanistica/PGT/Documents/PGT%202016/DC_DOCUMENTAZIONE%20COMUNE/V-DG00%20Relazione%20Generale.pdf

[5] Municipality of Brescia (2018). Urban Plan for Sustainable Mobility (SUPM)

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[6] Municipality of Brescia (2021). Sustainable Energy and Climate Action Plan (SECAP)

https://www.comune.brescia.it/sites/default/files/imported/servizi/ambienteeverde/Documents/PAESC_MAGGIO%202021.pdf

[7] Climate Transition Strategy (CTS) website

<https://www.unfilonaturale.it/>

[8] Municipality of Brescia (2022). Building regulations

<https://www.comune.brescia.it/sites/default/files/imported/servizi/casa/SUE/Documents/Regolamento%20edilizio.pdf>

[9] Alert System “AVVISA BRESCIA” service

<https://registrazione.alertsystem.it/brescia>

[10] Municipality of Brescia (2021). Adaptation variant of the geological and hydrogeological component of the SUP to the PGRA

<https://www.comune.brescia.it/aree-tematiche/urbanistica/piano-di-governo-del-territorio/pgt-variante-adequamento-componente-geologica-e>

[11] Municipality of Brescia (2019). Hydrogeological variant approval

<https://www.comune.brescia.it/aree-tematiche/urbanistica/piano-di-governo-del-territorio/pgt-variante-idrogeologica-approvazione-2019>

[12] Spazi Attivi project

<https://www.comune.brescia.it/aree-tematiche/urban-center/progetto-un-filo-naturale/spaziattivi-2022>

Word Count Check

Please complete the below word count check.

Section	Number of words in graphics/images/tables	Number of words in body of text	Total number of words in graphics/ images/ tables and body of text	Max. words
7A		945	945	1000
7B		582	582	600
7C		593	593	600