





# CLIMATE CHANGE AND EUROPEAN CITIES: ADAPTATION TO URBAN HEAT ISLAND EFFECT AND NATURE-BASED SOLUTIONS SECOND T4EU STAKEHOLDER CHALLENGE 2-4 JUNE 2025 SOFIA UNIVERSITY ST. KLIMENT OHRIDSKI PROGRAMME

T4EU Environmental Transformation Lab (T-Lab) "Smart cities & regions" is organizing the second Stakeholder challenge for T4EU students and young researchers. During the three-day event participants will get to know the topic of adaptation of cities to the challenges related to climate change (in particular – the heat island effect) and how to tackle them with nature-based solutions.

With the parallel T-Lab Fair, participants will also have the opportunity to get to know the activities of the T4EU Labs, participate in thematic discussions and workshop, in a Geospatial Research & Technologies Fair and meet stakeholders & businesses.

Cities and urban areas are parts of the habitable geographical space of our planet that are most affected by the deep and comprehensive transformation processes, turning natural landscapes and geosystems into highly modified natural-social systems (artificial habitats), saturated with anthropogenic and artificial objects and coverings. These, in turn, lead to significant deviations and modifications of natural processes, which significantly affect the state of urban ecosystems and the ecosystem services they provide to local populations and their quality of life. The increasingly intense urbanization that we are witnessing in Europe and worldwide, combined with deepening climate change, will lead to an even more serious intensification of the manifestation of natural and climatic risk phenomena, including the so-called urban heat island effect and its role in increasing the risk for European city populations and worsening their living comfort. These effects will be particularly pronounced under conditions of prolonged heat waves, something that is already occurring in a number of places.

Smart and resilient cities and regions adapt effectively to changing climates and geographies. They mobilize applied science and knowledge to meet the serious









challenges they face, while striving to maintain a high quality of life and comfort for their residents and local communities.

The main stakeholders of the Challenge are National University Center of Geospatial Research and Technologies (NUCGRT) and Sofia Municipality.

Event partners are Bulgarian Geographical Society, Faculty of Geology and Geography, Sofia University St. Kliment Ohridski, Forest Research Institute, Bulgarian Academy of Sciences, SELINA Project.

### Aim

- to engage in an active dialogue between university and stakeholders
- to create opportunities for real-life learning by doing
- to mobilise the potential of young people (students and young researchers) to solve tasks driven from a particular stakeholder context
- to reach out to the general community

### Types of activities

- Getting to know the work of the Stakeholders: NUCGRT and Sofia Municipality
- Introduction to the Stakeholder Challenge context, tasks, means of solving the task, expected results
- Hands-on work in groups
- Sharing and discussions on the results reached by the students











Sofia University St. Kliment Ohridski Sofia, Bulgaria







### Programme /local time zone EEST/

#### 02 June 2025/ Venue: Sofia University St. Kliment Ohridski

09:30-10:00 Registration, Coffee & Opening

- **10:00-12:00** Introduction to the Stakeholder Challenge and the topic of urban adaptation to climate change and presentation of the Transform4Europe Transformation Labs /online available/
- 12:00-13:30 Lunch & Coffee
- 13:30–15:00 Student group formation and getting to know each other
- 15:00-15:30 Break
- **15:30-20:00** Smart technologies for spatial data collection of the urban environment workshop and case study visit (Transport will be arranged for the participants to the fieldwork venue Lyulin housing complex, Sofia City, Bulgaria). More information about research in the housing complex can be found here: <u>I. II. III.</u>

#### 03 June 2025/ Venue: Sofia University St. Kliment Ohridski

- **O9:O0-09:30** Presentation of the spatial data collected from the case study visit and demonstration of its use
- 09:30-13:00 Students group work
- 13:00-14:00 Lunch & Coffee
- 14:00-16:00 Students group work
- 16:00-18:00 Cocktail & Business communication

#### 04 June 2025/ Venue: Sofia University St. Kliment Ohridski

- 09:00-12:00 Students group work
- **12:00–14:00** Lunch & Coffee
- 14:00-16:00 Stakeholder challenge students' presentations, awarding of certificates and closing







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### Introduction to the topic of the Stakeholder Challenge

During the three-day event participants have to produce a final product in the form of a presentation containing a realistic, innovative and sight-specific nature-based solution intervention inspired by tactical urbanism aimed at mitigating the urban heat island effect (UHI) and enhancing urban climate resilience for the case study of Sofia municipality.

Every team formed will be supported in the process by mentors (young researchers and PhD students) from NUCGRT.

Participants will also have access to GIS tools, satellite data, and stakeholder input during work sessions.

On the last day in the afternoon each team will have a 5-minute presentation slot followed by Q&A from the jury/stakeholders.

### **Expected presentation content**

1. Problem identification (Use of the provided data and information from the field to identify a key local climate issue).

2. Design solution (Description of a nature-based solution or more that fits the tactical urbanism approach considering scale, temporality versus permanence, cost, and community engagement).

3. Implementation strategy (Key timelines, roles, resources and involvement of local stakeholders and citizens).

4. Expected impact (How does the proposal reduce climate risk or improve local resilience? What are its specific potential co-benefits?)

### Problem context exploration and stakeholders information

Citizen engagement in the response to climate change is key to preventing the risks associated with global warming. Sofia, like many European cities, is exposed to infrastructural, social and economic risks as a result of expected climate change. In Bulgaria, the climate change projection predicts that the country will warm by 0.75-1.5°C in 2050 under the most optimistic scenario and by 2.5-3.5°C under the most









pessimistic scenario. This poses a number of challenges for local municipalities and the need for a cross-sectoral and holistic approach to address this issue.

Sofia Municipality has committed to the Mayors' Climate and Energy Agreement initiative to reduce municipal emissions by at least 40% by 2030. As part of the process of developing Sofia Municipality's Sustainable Energy and Climate Action Plan 2021–2030, a climate change vulnerability and risk assessment has been carried out. The climate risks identified for Sofia are extreme heat, extreme precipitation, storms, droughts, floods, fog and the potential for atmospheric pollution.

To reduce Sofia's vulnerability to climate change, the plan develops 36 specific climate change adaptation measures. The total budget foreseen is BGN 90.262 million for the period until 2030, divided into five categories:

- Legal, administrative and governance framework for climate policy
- Improving institutional, expert and financial capacity
- Applied research and urban development
- Investment in technical and green infrastructure, buildings and public works

• Establishing a system of broad public participation in the implementation of measures.

The plan also includes the following projects:

- Integration of the ecosystem approach and implementation of environmentally friendly solutions in the conservation of protected areas of the Natura 2000 network
  for areas with ecological connection to the Vitosha Mountain and other areas of the Natura 2000 ecological network within Sofia Municipality
- Assessment of the capacity of transport systems in relation to climate change
- Strategic planning for the reconstruction and expansion of the green system and infrastructure
- Study of vulnerability to climate change among socio-demographic groups within the Sofia Municipality and development of an action plan
- Introduction of eco-labelling of tourist enterprises in Sofia









• Improve rapid response to fires in forest, agricultural and urban areas (Source: <a href="https://sofiagreen.bg/klimatichni-promeni-adaptirane/">https://sofiagreen.bg/klimatichni-promeni-adaptirane/</a>).

The Climate, Energy and Air Directorate (Section Green system, ecology and land use) of Sofia Municipality performs the following functions:

• Coordinates, organises and participates in the preparation and updating of plans, programs, strategies and ordinances of Sofia Municipality, aimed at energy, air quality protection, mitigation, coping with the effects of and adaptation to climate change.

• Prepares reasoned proposals to the Mayor for the Clean Air Act standards.

• Monitoring the implementation of the activities set out in the Sustainable Energy and Climate Action Plan of Sofia Municipality 2021–2030 and preparing biannual monitoring reports by organising the appropriate public communication on the content of the programmes to promote the use of renewable energy and biofuels.

The Directorate maintains a Scientific Council on Climate and Climate Change. One of the main tasks of the council is to plan actions to <u>mitigate the effects of the urban</u> <u>heat island in the city</u>. As a result, the main achievements of the topic is the creation of the following strategic documents:

- <u>Study of best practices for heat islands on the territory of Sofia Municipality</u>
- Local Climate Adaptation Plan for the Lyulin residential area of the city through digital twinning (Source: <u>https://www.sofia.bg/climat</u>).

The adaptation plan to climate change of the Lyulin area is developed on the basis of a digital twin and nature-based solutions. It was developed for the first time jointly by Sofia Municipality and NUCGRT - Sofia University "St. Kliment Ohridski". The creation of a digital twin is used as a basis for simulations and more effective climate characterisation and localisation of the area's problems in the context of intensifying climate change. On this analytical basis, local adaptation plans for the urban area of the residential areas are to be developed for the whole territory of Sofia. The project has been systematically implemented through in several stages:





# TRANSFORM





# TRANSFORMATION LAB FAIR & STAKEHOLDER CHALLENGE

• Creation of a complete digital twin of the territory of Lyulin with high spatial resolution

• Analysis of expected climate changes within the study area

• Spatial analysis and identification of problem locations and areas in the context of climate issues, identification of parameters of expected changes and related problems and problem locations

• Development of a local plan with specific measures and actions.

The National University Centre for Geospatial Research and Technologies (NUCGIT) implements scientific and applied research activities in the field of geospatial and geoinformation systems and technologies and their application in the field of spatial research and analysis, territorial and urban planning, spatial modelling and creation of digital spatial models, applicable in mapping and risk assessment related to climate change, adverse hydrosphere phenomena and geospatial information systems.

NUCGIT carries out activities related to the provision of educational certification services in the field of: geographic information technologies and GIS (Geographic Information Systems), application of UAS (Unmanned Aerial Systems) in the collection, processing and analysis of geospatial data and information, spatial research and analysis, territorial and urban planning, spatial modeling and creation of digital spatial models applicable to mapping and risk assessment related to climate change, geoecological issues, ecosystem services etc.







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