Supplementary Material

1   I-CHANGE Day Implementation details - Details of implementation and materials in each LL - Temperature Perception in Urban Environments

As commented, *Temperature Perception in Urban Environments*, used a CS approach to engage participants in the different cities in collecting data related to temperature perception in urban environments. The activity was designed to promote behavioral change towards climate adaptation and mitigation while facilitating data collection on local meteorological conditions and public space usage. The data collection used MT sensors for the temperature and humidity variables and data tables with the observations from the participants.

The implementation of the activities in the different Living Labs followed the protocol developed with some adaptations and modifications to adapt it to the region and the local citizens.

1.1   Amsterdam

The volunteers met at the AMS Institute after lunch (13:00 CET). The AMLL team presented the topic of urban weather extremes, some climate resilience measures, and some results achieved in the Living Lab as well as some I-CHANGE materials such as the YouTube video or the Yeti App and I-CHANGE dashboard. Then they proceeded to the walking tour (14:00 CET), combining the MT measurements with a thermal camera and making different stops where they filled the individual table (Figure 1).
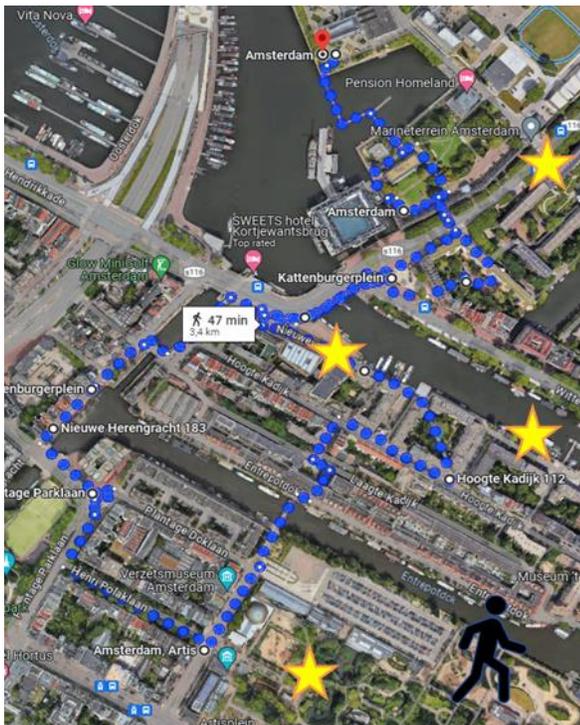

Figure 1: The Amsterdam LL walking tour with the stops labelled with a yellow star.

The walking tour was across green and blue NBS in order to quantify their effect relative to the environment without NBSs (Figure 2). Afterwards (16:00 CET) a plenary discussion on the activity took place on the AMS Institute where the citizens provide evidence, a concern, a proposal for improvement and an individual habit that we can change (Figure 3) for the different stops they visited during the walking tour. To close the event, they enjoyed together a drink while continuing with small groups sharing experiences.
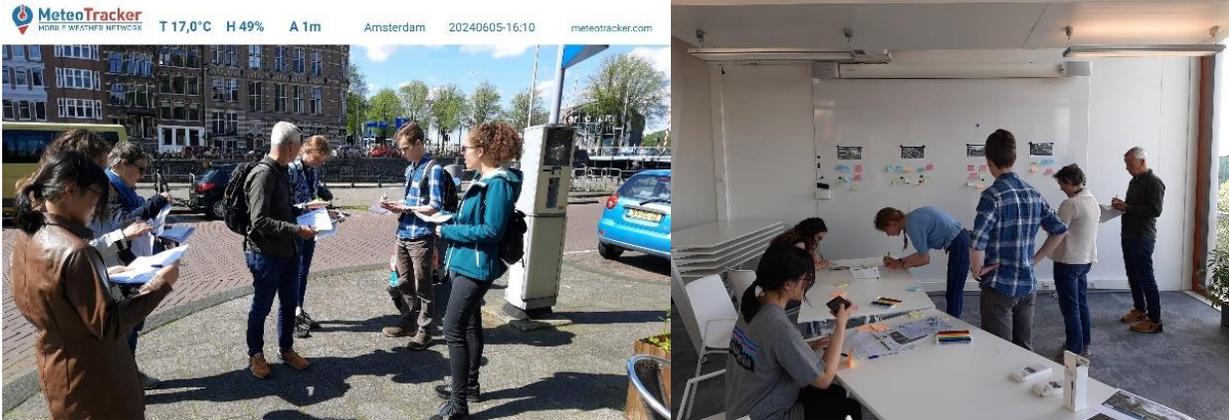

Figure 2: The participants in the AMLL during the temperature Perception in Urban Environments activity
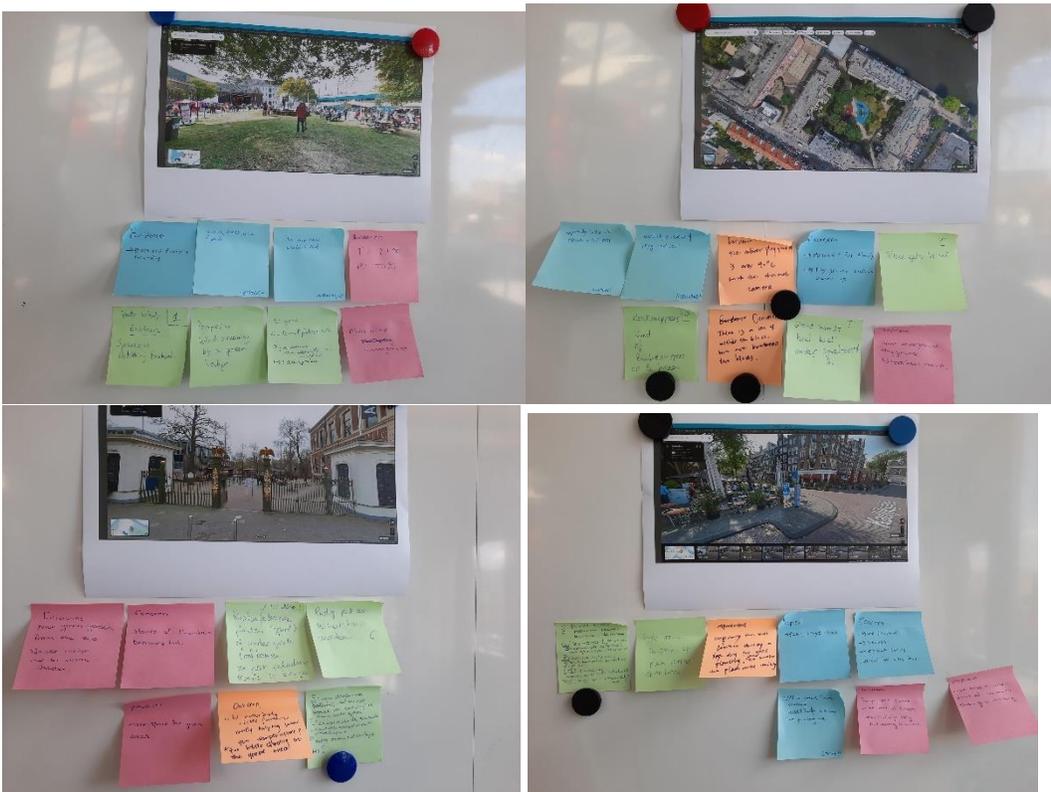

Figure 3: feedback provided by participants in the plenary discussion for the different stops of the walking route

1.2 Barcelona

The activity was implemented in the Verdum Artesania Civic of Verdum from 16:30 to 20:30 in the afternoon. Verdum neighborhood is in one of the smallest neighborhoods of Barcelona, in an area a bit far from the city center but with a very active community. 24 participants signed up for the activity senior citizens in its majority. The activity consisted of walking in small groups (3-4 people) to five selected spaces of the neighborhood that were meaningful for the participants while using the MT and taking notes on the participants perceptions and feelings related with the space's usage (Figure 4 and Figure 5). A brief introduction of the project and the local extreme temperatures problem was combined with self-introductions dynamic and the CS activity. To overcome the possible technological barriers, senior participants were mixed with the younger ones. The walking journey lasted for about 75 minutes, and the participants returned to the civic center to have a sank while commenting on their experiences. The results were shown in situ using the I-CHANGE dashboard map while one volunteer from each group summarized their experience and feelings. To conclude the workshop, each group provided at least a fact, a concern, an improvement and a behavioral change based on what they learned during the session.

Figure 4: Images from the BALL activity. On the left, the I-CHANGE Day poster displayed at the entrance of the civic center and the participants working to decide the journey to record the data. On the rigth and example of the mao with the stops from one of the gopups and the individual classification and perception table of the spaces.
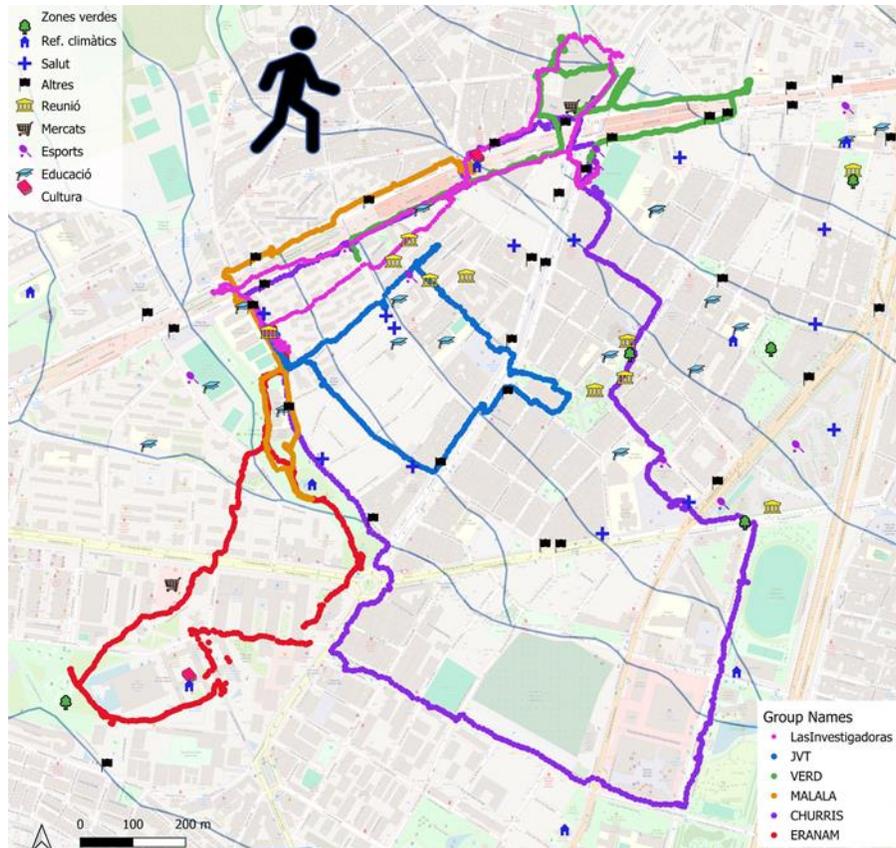
Figure 5: Walking routes with MateoTracker data recording during the activity in Barcelona LL.

1.3 Bologna

They engaged both new and experienced I-CHANGE participants, using cycling routes to collect meteorological data while comparing rural and urban areas. An open communication strategy was employed to engage citizens with previous contact with the project, while the new participants were recruited through social media, emails, and phone calls. The aim was to attract individuals who had not been involved in prior I-CHANGE activities to compare their responses with those who had participated before.

The event started at 11:00 AM in the sociology department of the University of Bologna in the city center, where a theoretical introduction was given to the participants, followed by two presentations. Afterwards, the group cycled to the Department of Physics at the main facilities of CNR, using the MT to register meteorological data. Due to technical difficulties when setting up the MT devices, not all of them completed the full route collecting data. There was a green area where they had lunch together. In the afternoon, they returned to more urbanized areas again using the MT. The activity had a total of 30 participants but not all of them completed the cycling route. In addition, due some technical difficulties the number of data sets collected with the MT was reduced. During the activity, the participants filled the individual table to compare expectations, perceptions and the MT data. Additionally, a Bioblitz was conducted, to collect and map all plant species along a city canal, with a workshop on the importance of this NBS in maintaining biodiversity and urban air quality.

Figure 6: Different moments with the participants in the BOLL during the Temperature Perception in Urban Environments activity
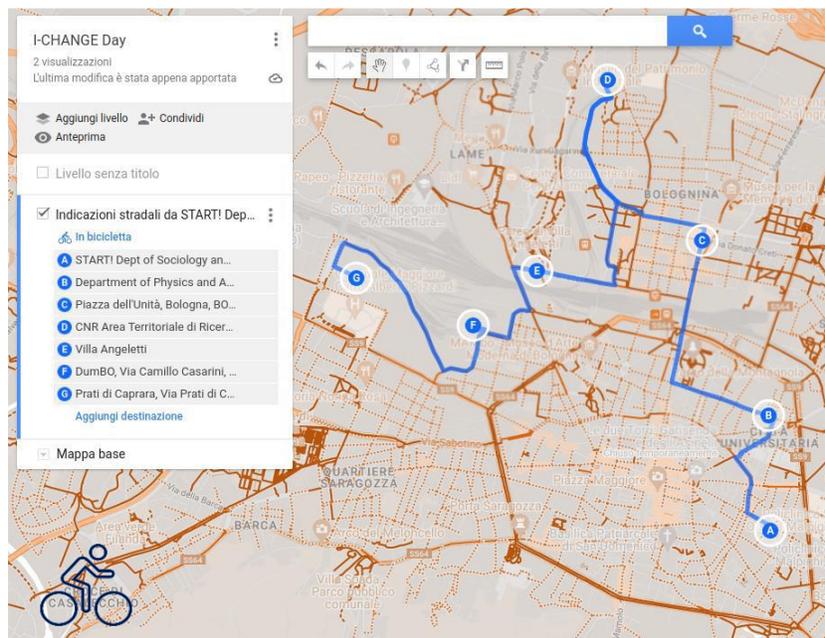

Figure 7: Itineraries in the BOLL during the Temperature Perception in Urban Environments activity

1.4 Dublin

A small group of volunteer participants assessed temperature perception across different areas, including a university campus, residential, and commercial zones. The campaign was launched through mailing lists, university newsletters, and social media, gathering 11 participants. The participants were divided into two groups: one group walked while the other cycled, each group covering approximately 1.3 km. The event was organized in collaboration with the Dublin Bike Library and UCD Citizen Science Community. Routes were pre-designed by Living Lab members to prioritize safety and respect university restrictions, but participants also contributed to route selection.

The event began with presentations on the I-CHANGE project, climate change, and air pollution. The main goal was to assess the participants' temperature perceptions and compare them with data collected by the MT. Additionally, a second round of measurements was conducted in a residential and commercial area, using the materials provided by the organizers. The study evaluated the strengths and weaknesses of the experiment, following the common protocol.
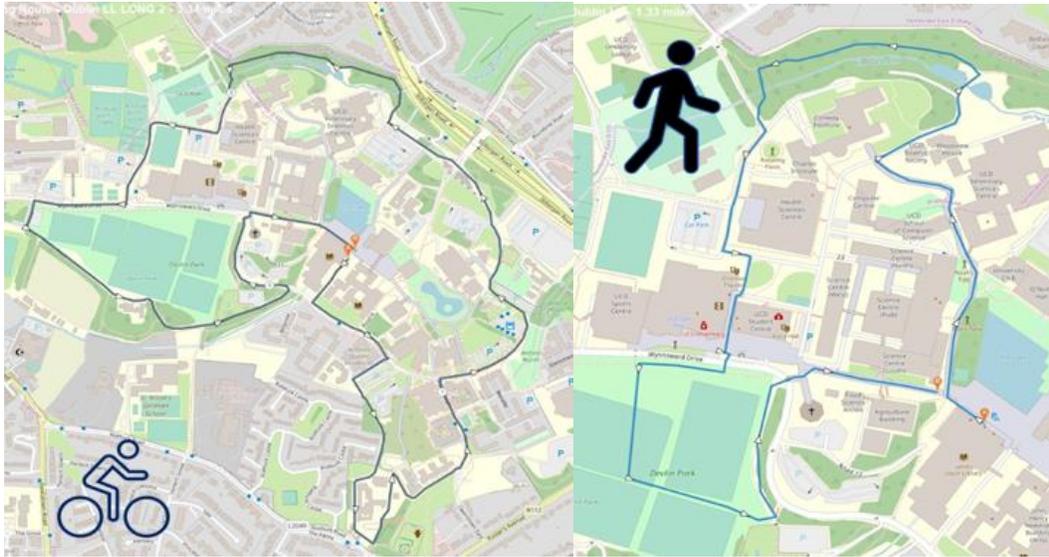

Figure 8: Itineraries in Dublin LL during the Temperature Perception in Urban Environments activity

Participants were asked to predict the temperature conditions across various campus locations before collecting data. Their expectations were as follows:

Cool (blue): The coolest areas were expected to be near bodies of water, such as The Lake, and around Roebuck Castle, a historic building surrounded by trees. The shade and building materials were thought to contribute to a cooler microclimate.

Refreshing (green): Green areas such as Elm Park, Delvin Park, and other peripheral zones were considered refreshing due to their vegetation and proximity to water sources.

Tolerable (yellow): Mixed-use areas on the campus edges, such as Richview Office Park and Merville residence hall, were deemed tolerable. One participant highlighted the blue athletics track, noting that it absorbs heat, creating a warmer environment.

Hot (pink): Car parks and bus stops at the campus periphery were identified as some of the hottest locations.

Too Hot (red): The central areas of the campus, including the UCD bus station and construction zones, were expected to be the hottest, with little vegetation and large buildings increasing heat retention.

Figure 9: Results of the co-participative activity in the DULL

During the walking and cycling tours, participants used the MT to measure temperature and humidity at different locations on campus. Interestingly, the data collected did not fully align with participants' expectations. For example:

The temperature difference between Roebuck Castle (expected to be cool) and the university residences (expected to be hot) was minimal, contrary to what participants had anticipated.

The bus stop on the main avenue, considered one of the hottest spots by participants, recorded one of the lowest temperatures, possibly due to wind exposure in the open area.

In Elm Woods, expected to be the coolest and most humid, the MT recorded one of the highest temperatures. The change in humidity was minimal, and participants speculated that the lack of wind and the slight humidity increase made it feel warmer.

The only location where the data matched expectations was the construction site and large buildings in the campus center. This area was noted by participants to feel significantly warmer, and the MT recorded the highest temperature of the entire route.

Figure 10: Different moments with the participants in the DULL during the Temperature Perception in Urban Environments activity.

1.5 Genoa

They meet at Genoa city center and divide the 12 participants into three groups to explore various city areas with bikes, focusing on the perception of temperature gradients and environmental features. They met in the center of Genoa, spending half an hour explaining the project to the stakeholders and how the MT device works. One group stayed in the center of Genoa in the morning, another near the bay, and the third location was unclear. All participants had to record their perceptions and the most interesting observations. They concluded with a discussion over drinks, sharing observations and using dashboards to visualize data. They attempted to explain the temperature gradient they observed.
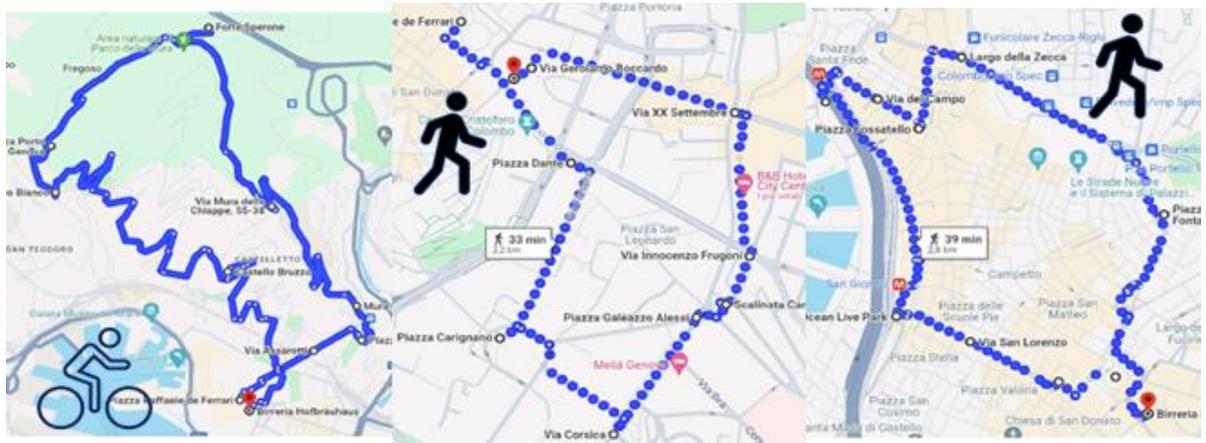
Figure 11: Itineraries in the GELL during the Temperature Perception in Urban Environments activity

Figure 12: Different moments with the participants in the GELL during the Temperature Perception in Urban Environments activity

1.6 Hasselt

The event had around 23 participants and was initially challenging to organize. It was carried out in collaboration with Avansa Limburg. The event began with presentations on the I-CHANGE project, climate change, and air pollution (Figure 13). They also ask the participants to fill up the questionnaire which is part of the T3.5 to gauge their general awareness on climate change issues before the activity. They then explained the CS notion to the participants and then provided training on MT installation before the data collection activity. During the activity, participants analyzed their perceptions of temperature and humidity, while also calculating their carbon footprint using a web-based calculator. The participants of the Hasselt Living Lab were then divided in four groups—two walking and two cycling—through city routes (Figure 14). The main goal was to assess the participants' temperature and humidity perceptions and compare this before and after the data. The Living Lab staff pre-designed routes for walk and bike around the Hasselt city (Figure 14) and asked participants to locate important points they would like to visit as per the guided protocol and provide their initial assessment of temperature and humidity in a given form. Participants then were asked to collect data using MTs on temperature and humidity and note down these observations on the same form (Figure 15). Before closing the activity, participants reconvened, and they all together looked at the data collected using the MT platform. They exchanged experiences and reflected on their perceptions before and after data collection. Also, they discussed ways to overcome negative effects of extreme temperatures and how one can reduce their carbon footprint by changing what behaviors. In addition, participants were given an introduction of the Yeti App and I-CHANGE dashboard.

Figure 13: Images of some instants in the HALL during I-CHANGE Day

Figure 14: Followed routes for walking participants (left) and for those with the bikes (right) in Hasselt LL.
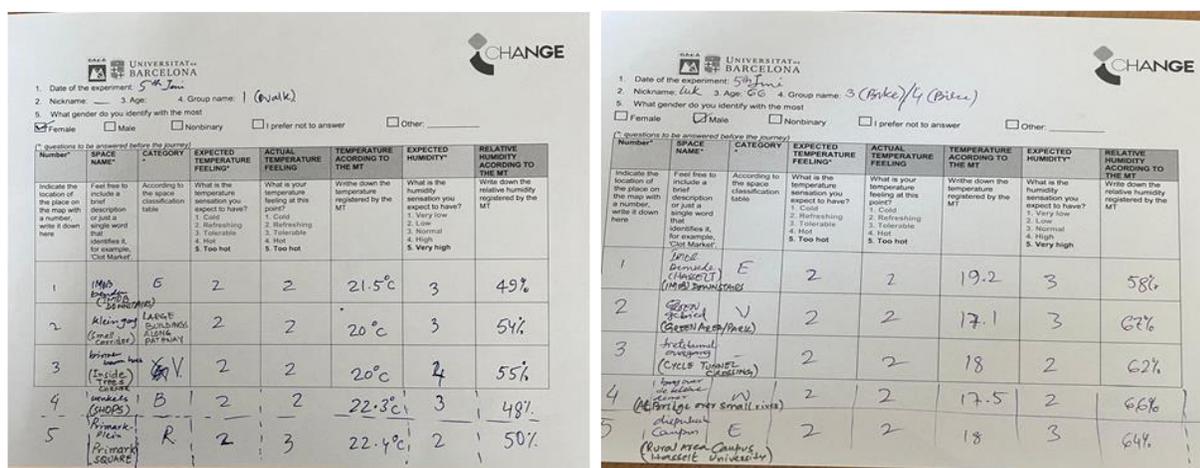

Figure 15: Perception tables filled by the participants in Hasselt LL during the activity

1.7 Jerusalem

The workshop took place from 10:00 to 12:40 and included brief presentations on climate, air quality, and the I-CHANGE project (Figure 16). They had 41 participants divided in four groups that

walked for 30 minutes around the meeting location, the botanical garden (Figure 17). The groups explored different areas of the garden. They shared their experiences and completed a questionnaire. The participants came from diverse backgrounds, and the experience was also shared with the local media. Professor Alpert emphasized the significant precipitation gradient in Jerusalem and its surroundings and explained how participants' perceptions changed before and after the activity. It was a breakthrough for many to move from understanding microclimates to larger-scale climate concepts, as well as to understand the importance of using smartphones in the data collection process. The event was promoted through the botanical garden, which has strong ties to Tel Aviv University.

Figure 16: The participants in Jerusalem LL during the Temperature Perception in Urban Environments activity
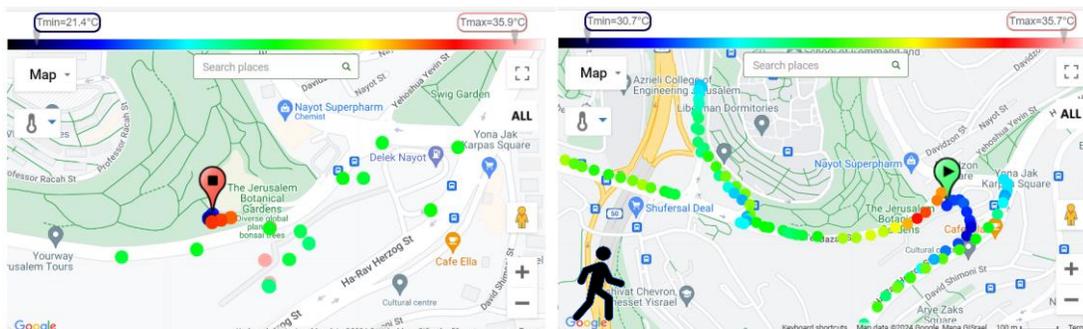

Figure 17: MT data from the MT platform (https://meteotracker.com/) collected during the walking routes of the Jerusalem LL itineraries in the Botanic Garden.