Report on the outcomes of a Short-Term Scientific Mission[1]

Action number: **CA20108**

Grantee name: Gamil Gamal

Details of the STSM

Title: Knowledge Exchange and Collaborative Research on Urban Microclimate studies in Bratislava and Cairo cities

Start and end date: 24/09/2025 to 30/09/2025

Description of the work carried out during the STSM

My seven-day STSM visit to the Department of Atmospheric Physics at the Slovak Academy of Sciences in Bratislava, focused on establishing a robust framework for a comparative Urban Heat Island (UHI) study between hyper-arid Cairo and temperate Bratislava.

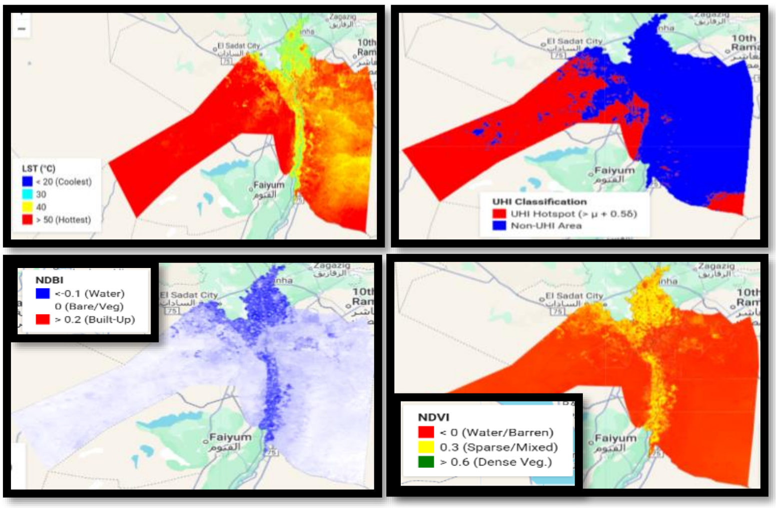
1. My host, Dr. Pavol Nejedlik, welcomed me when I arrived on Day 1 (September 24). A summary of the week's events was followed by an insightful city orientation led by Dr. Pavol, who immediately contrasted Cairo's arid climate with Bratislava's diverse landscape and graphically highlighted areas of urban climate relevance.

2. Data transfer and model review took up Day 2 (September 25). The main accomplishment was the effective transfer of extensive high-resolution meteorological and geospatial datasets, such as LST, NDVI, and NDBI, from the Greater Cairo Region (GCR). After reviewing Cairo's UHI modelling assumptions, which prioritize SUHI because of high solar flux.
3. Field validation and data consistency were the main topics of days three and four (September 26–27). I took part in joint site visits to several locations in Bratislava, such as a cool island (Sad Janka Kráľa), a dense urban hotspot (Petržalka), and a core monitoring station run by Slovak Hydrometeorological Institute.
4. . To compare in-situ measurements with satellite-derived data and harmonize our methodologies to guarantee that the results would be truly comparable across the two contrasting climate zones, this joint field test was essential.
5. Day 5 (September 28), We jointly discussed the factors influencing the in each city, finding that Building Materials/Heat Storage is the driving force behind both, while Vegetation Cover/Evapotranspiration has a high impact in Bratislava but a low impact in Cairo. I presented

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

the comprehensive plan for our upcoming collaborative manuscript, which will cross-test Cairo's urban geometry using Bratislava's Urban Canopy Model to validate the robustness of modeling approaches and concentrate on events during peak heatwaves.

6. On Day 6 (September 29), I presented the UHI characteristics analysis for August 2022 and gave a seminar on Cairo's microclimate challenges. Also, how to analyze high resolution data using tools like Google Earth Engine (GEE). Due to the high thermal mass in Cairo, I emphasized the severity of the persistent SUHI and its extreme intensity (Max LST: 61.74∘C). some results and analysis of UHI presented here in the following figures.



7. The last day, the seventh (September 30), was dedicated to talking and collaborating on future plans for joint research and proposed scientific visits.

Description of the STSM main achievements and planned follow-up activities

Achievement Assessment of Planned Goals: All three primary goals were successfully realized:

- All the extensive high-resolution geospatial and meteorological datasets (LST, NDVI, and NDBI) were shared.
- On Days 3 and 4, I carried out collaborative technical reviews and field validation to make sure our approaches were consistent.
- I synthesized Cairo's and Bratislava's distinct drivers into a well-organized comparative case study.

The STSM made a direct contribution to the COST Action's core mission by:

- I successfully established an interdisciplinary network linking North Africa (Cairo) with Central Europe (Bratislava), significantly expanding the geographical diversity of the research.
- I secured a commitment for a co-authored publication.
- I ensured the exchange of shared datasets (FAIR principles) and contributed to empowering early career researchers (ECRs) through hands-on training and inclusion in the forthcoming publication.
- The research and visit findings will be incorporated into the curricula of my postgraduate courses at Cairo University (Applied Meteorology and Urban Climate).

A special thanks to my host and collaborator, Dr. Pavol Nejedlik, for his contribution during my short visit and extend my sincere gratitude to COST CA20108 project team and staff. This STSM visit was made possible through the generous financial support of COST CA20108 project.