The integration of storm water flooding and thermal stress potential in Tainan (Taiwan) and Groningen (Netherlands)

L'intégration des mesures contre l'inondation et stress thermique à Tainan (Taiwan) et Groningen (Les Pays Bas)

Project Description

Stormwater flooding and thermal stress of citizens are two important phenomena for most of the dense urban area. Due to the climate change, these two phenomena will occur more frequently and cause serious problems. Therefore, the sectors for public health and disaster management should be able to assess the vulnerability to stormwater flooding and thermal stress. To achieve this goal, two cities in different climate regions and with different urban context have been selected as the pilot areas, i.e., Tainan, Taiwan and Groningen, Netherlands. Stormwater flooding and thermal stress maps will be produced for both cities for further comparison. The flooding map indicates vulnerable low lying areas, where the thermal stress map indicates high Physiological Equivalent Temperature (PET) values (thermal comfort) in open areas without shading. The combined map indicates the problem areas of flooding and thermal stress and can be used by urban planners and other stakeholders to improve the living environment.

Methodology

■ Study area

Tainan is a highly developed city (22˚59'N, 120˚11'E) in the south of Taiwan in tropical areas. The total area of Tainan is 175.6 km2. Groningen(53˚13'N, 6˚34'E)has a population just over of 200.000 (in 2014).It is the largest city in the north of the Netherlands with 83.69 km2 total The comparisons indicate that the average temperature of each month are ranged between 18-30˚C in Tainan, whereas between 2-16 ˚C in Groningen
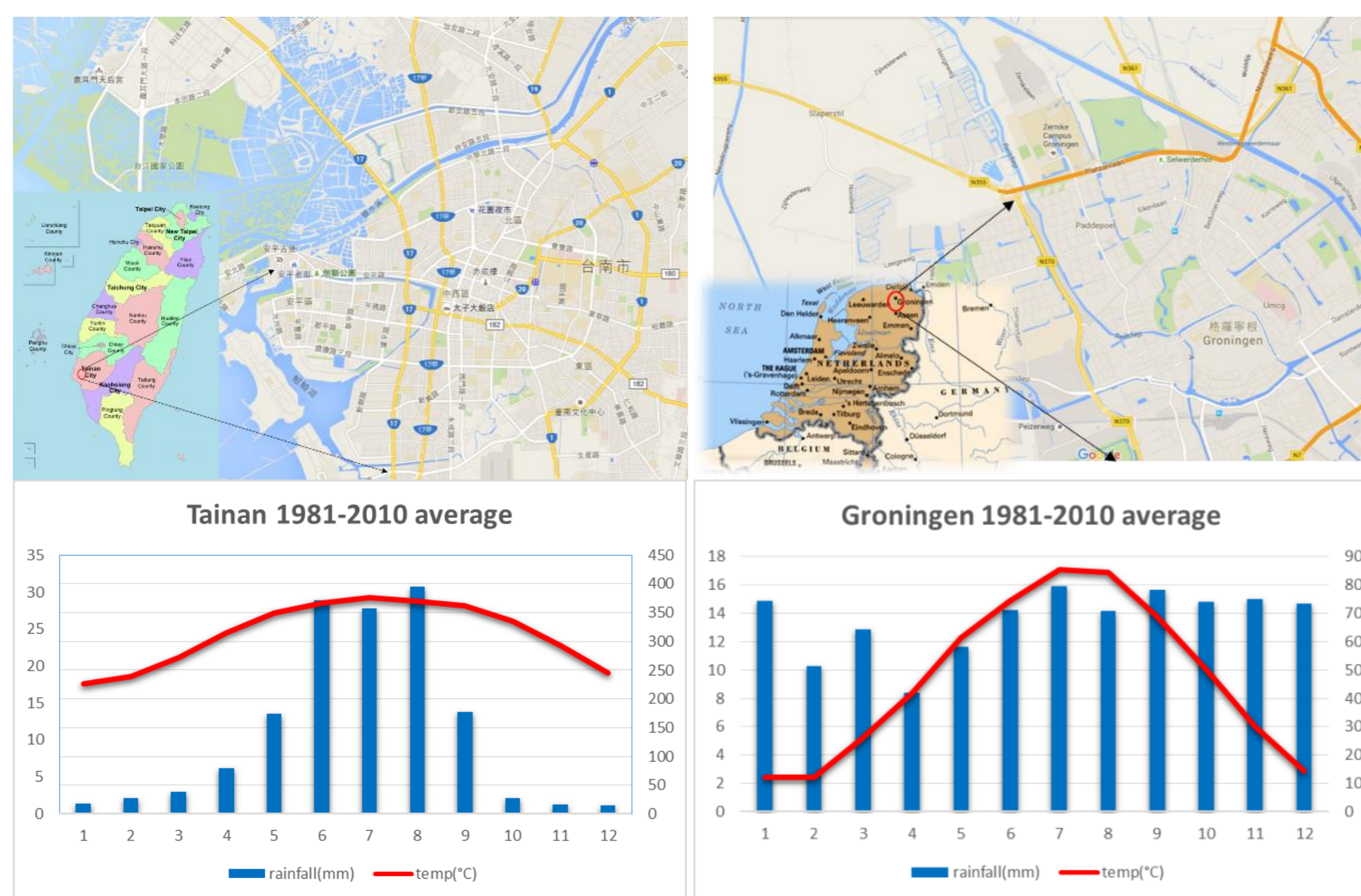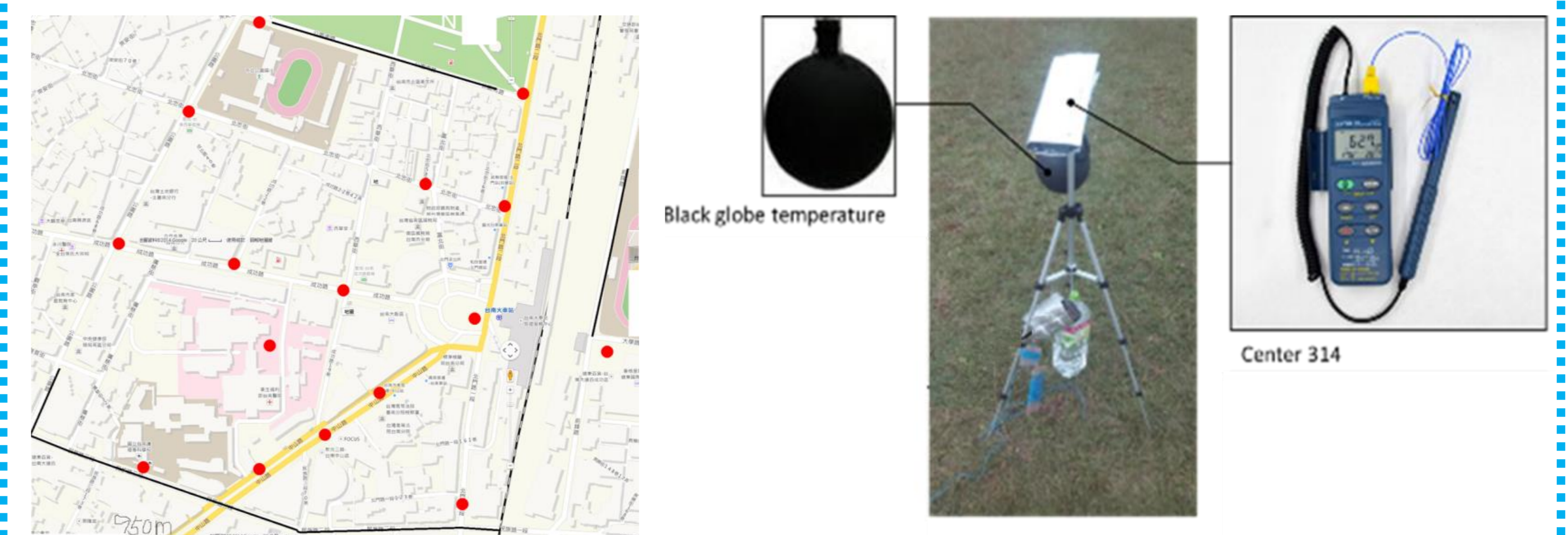

■ Flooding map

The tool CLOUDS (Calamity Levels of Urban Drainage Systems) was used as a quick scan method to simulate storm water floodings. CLOUDS is based on a DEM and visualizes the water flow from high to low, while filling up lower areas with water as the final situation. The quick scan is based on only the following readily available data.
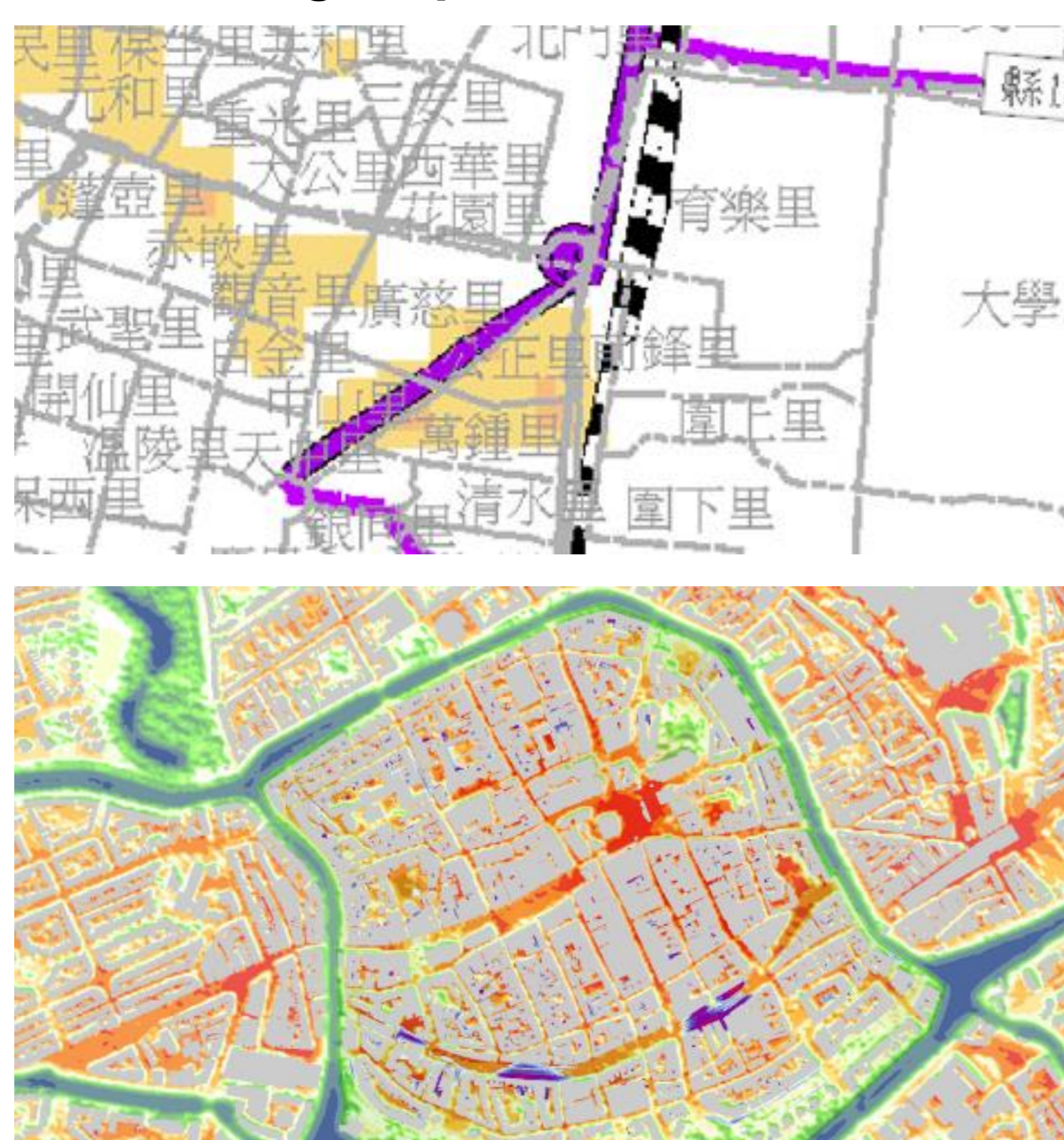
■ Thermal stress map

Two types of models have been used to assess the thermal stress. A quick scan GIS-based thermal stress map for large scale, and a prognostic model EVNI-met for small scale.
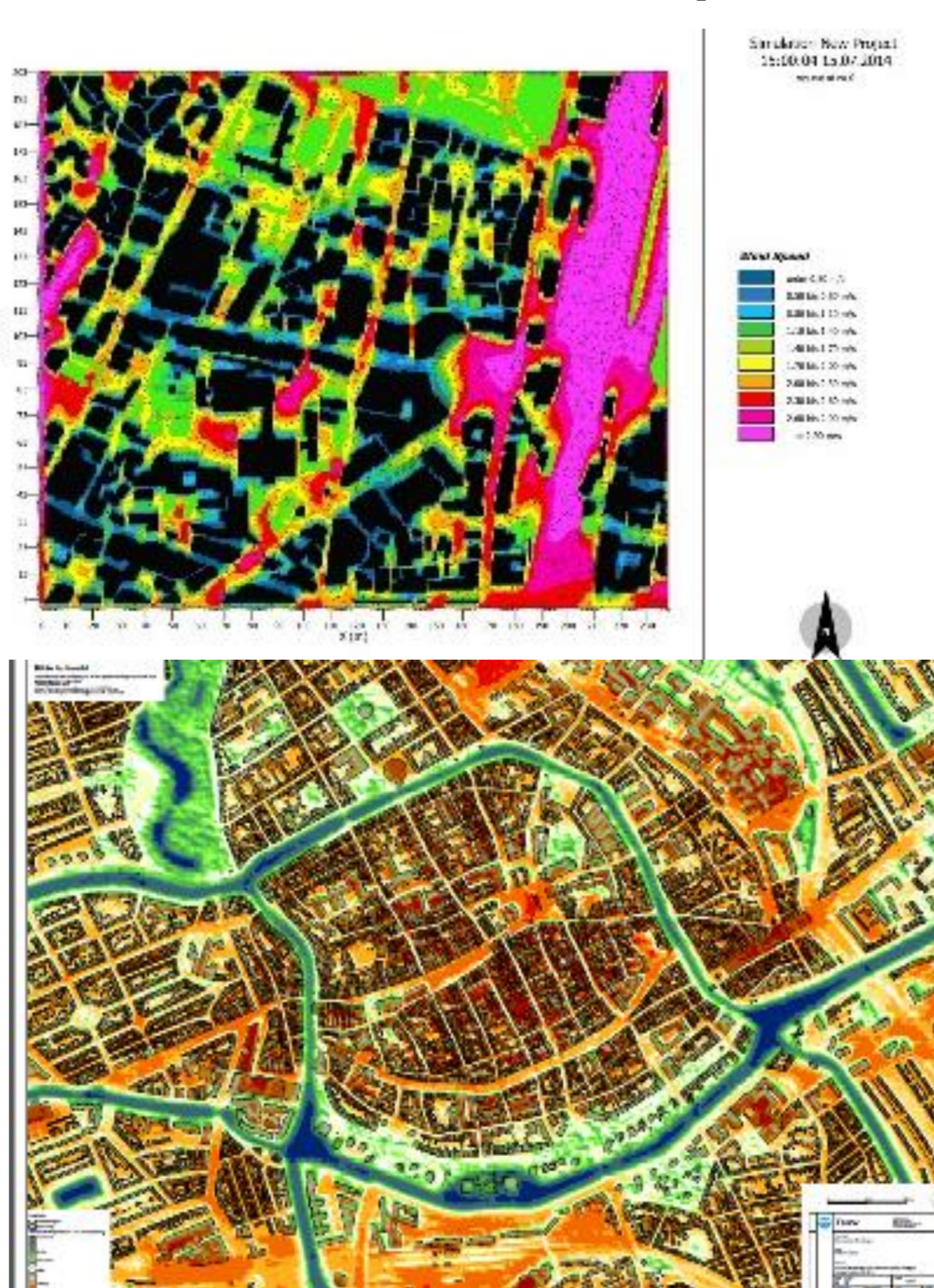
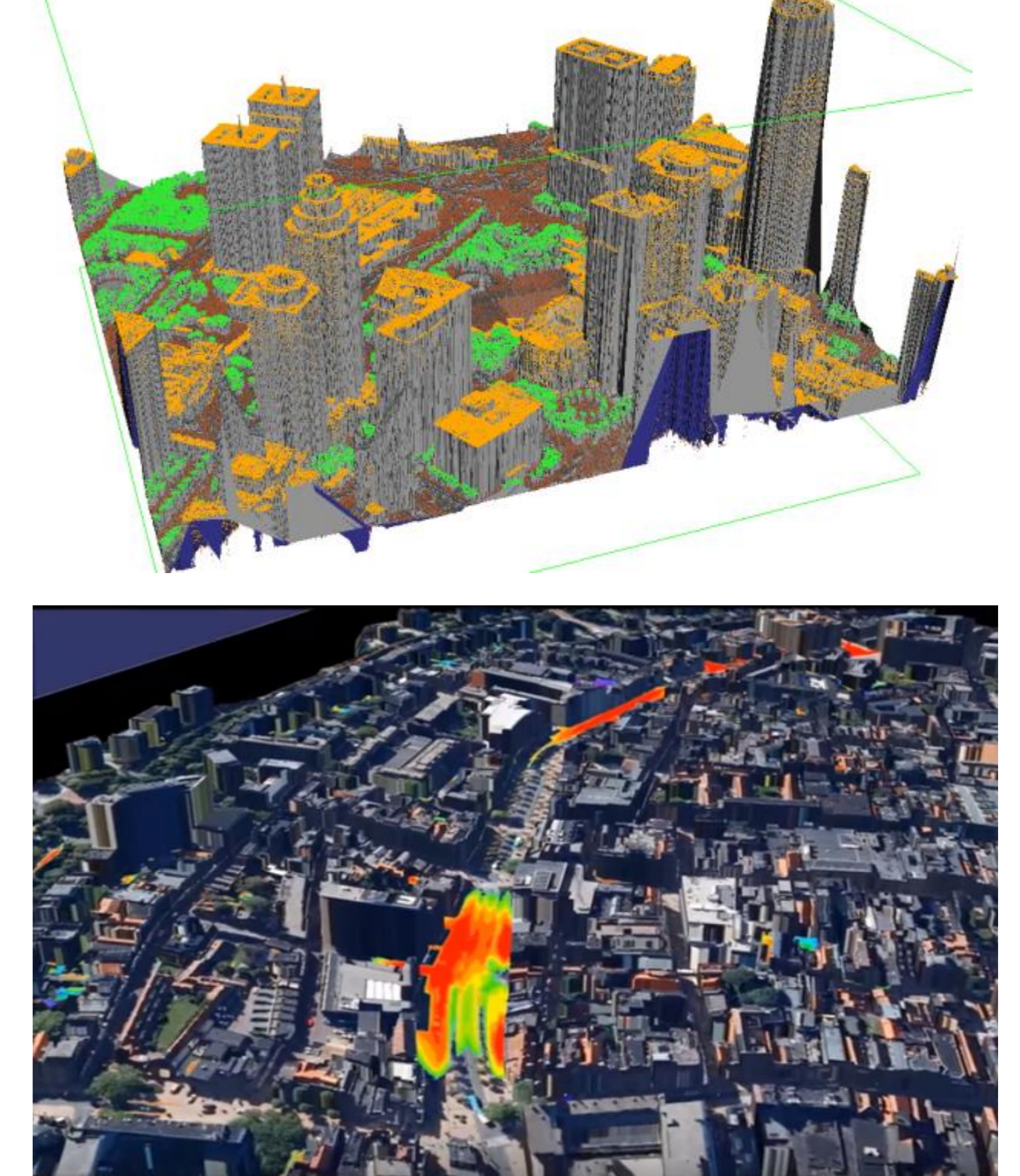#### ■ Measurement survey validation

Results

■ Flooding map

■ Thermal stress map

■ 3-D visualization

Conclusions

Challenges and further development: with combining thermal stress and floodings and even more climate issues in dense urban areas the datasets are getting bigger and researchers and customers get more demanding andwant fast and good visual results. DEMs (digital elevation maps) are becoming more common and better,improving the accuracy with a higher resolution. The comparison of Netherults of the models will indicate up to what level quick scan mapping is sufficient and when the more accurate and complete modelling is needed. The choice between coarse and fine modelling will vary within each situation, depending on the needs. The more accurate and complete models lack the abilityto perform on a large scale. This will be solved by using our High Performance computing facilities, running the model on the high performance clusters and 3Dvisualizations.

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