



**Review for Public Defense
of the doctoral dissertation entitled**

**“Decision-Support Approaches for Urban Climate Action Planning and Environmental
Assessment”**

**prepared by Ph.D. student
Iskander BEN RJIBA**

General comments

The doctoral dissertation prepared by Iskander BEN RJIBA addresses the development of analytical and decision-support approaches for urban climate action planning and the environmental assessment of selected climate interventions. The topic is timely and scientifically relevant, considering the increasing need for evidence-based, transparent, and context-sensitive urban climate governance. The dissertation combines four related research components: the systematic categorisation of urban climate actions, the exploratory assessment of public awareness and education-related factors, the development of a decision-tree-based decision-support model, and the project-level environmental assessment of construction materials. The revised dissertation is approximately 124 pages long and contains 29 figures, 13 tables, a list of publications, appendices, and an extensive bibliography. Its structure has been substantially improved compared to the version submitted for the home defence. The new title is more precise and accurately reflects the main scientific components of the work. The logical relationship among the research questions, research assumptions, methodological steps, and research theses has also become considerably clearer. The integrated research framework appropriately presents the four parts of the dissertation as a consecutive process of categorising, understanding, selecting, and evaluating urban climate actions. The dissertation is based on a broad range of scientific literature and several datasets derived mainly from the Covenant of Mayors platform and related databases. The strongest elements of the work are the development of a structured urban climate action database, the interpretable decision-support model, and the material-centred environmental assessment framework. The revised version has addressed most of the substantive comments formulated in my previous review, particularly those concerning methodological transparency, the formulation of the research theses, model validation, and the scope of the environmental assessment.

Considering the structure and content of the revised dissertation, I make the following statements based on my previous review:

- The title of the dissertation has been corrected and made considerably more specific. The new title appropriately refers to urban climate action planning, decision support,

and environmental assessment and is therefore consistent with the actual scientific content of the dissertation.

- The research gap is now presented more clearly and systematically. The revised text identifies the limited comparability of heterogeneous climate actions, the underutilisation of publicly available climate action plan databases for operational decision support, and the insufficient integration of planning, social, and material-related environmental assessment approaches. These gaps are directly connected to the methodological contributions of the dissertation.
- The relationship among the research questions, research assumptions, and research theses has been clarified. Four research questions are now formulated, corresponding to the four main research components. A summary table at the end of the dissertation also presents the respective research questions, assumptions, and theses together, which significantly improves the transparency of the research logic.
- The role of the exploratory analysis of the SECAP reports has been appropriately explained. The revised dissertation identifies this analysis as a pilot study that tested the applicability of the text-mining approach and produced the initial categorisation scheme. It is also clearly stated that the initial dataset was insufficient for model development and was therefore enlarged to 454 reports from 443 European cities in 32 countries.
- The methodological limitations of the public-awareness analysis are now described more explicitly. The author acknowledges that the comparison of Germany, Brazil, and Kenya is exploratory, is based primarily on national-level indicators, and cannot provide evidence of causal relationships.
- The dependent variable of the decision-tree model has been clarified. Although cities generally implement several climate actions simultaneously, the model predicts the dominant or most extensively represented action category identified in each report.
- The validation of the decision-tree model has been substantially improved. The revised dissertation includes held-out test results, five-fold stratified cross-validation, macro- and weighted-F1 scores, precision, recall, baseline comparisons, category-level performance measures, and a confusion matrix.
- The interpretation of the decision-support model has also become more precise. The revised research thesis appropriately describes the model as identifying the action category most consistent with the observed practices of cities with similar characteristics. However, expressions such as “optimal”, “high-impact”, or “cost-effective” should still be used with caution because these characteristics were not directly validated by the model.
- The environmental assessment component has been methodologically strengthened. The revised dissertation clearly states that the analysis is a material-centred application of life-cycle-assessment principles rather than a complete ISO 14040/14044-compliant LCA. The cradle-to-gate system boundary, the excluded life-cycle stages, the GaBi characterisation data, the selected GWP, ODP, and HT indicators, and the category-specific functional units are now properly described.
- The author now distinguishes appropriately between comparisons within the same climate action category and comparisons across heterogeneous categories. Category-specific functional units are used for building renovation, green-space development, heating and insulation projects, and flood-prevention interventions.
- The presentation quality of the figures has partly improved, and the complete decision tree and confusion matrix are included in the appendices. However, the full decision tree remains difficult to interpret in the main text. Some linguistic, cross-referencing, table-numbering, and formatting errors also remain.

Specific comments regarding the theses

1. **Thesis 1 can be accepted as a new scientific result.** The author developed a bottom-up categorisation of urban climate actions based on an exploratory sample of 99 SECAP reports and a subsequently enlarged database of 454 reports from 443 European cities in 32 countries. The classification into ten functionally equivalent action categories and the associated categorisation of co-benefits provide a structured basis for comparative analysis and subsequent modelling. The novelty lies particularly in deriving the categorisation from observed municipal practices rather than applying only an existing top-down sectoral taxonomy.
2. **Thesis 2 can be accepted as a limited and exploratory scientific result.** The analysis draws attention to the potential supporting role of public awareness and education in urban climate action and identifies associations with air-quality and greenhouse-gas-emission trends. However, the empirical basis consists of three national cases, the indicators refer to different years, and the analysis does not control for the numerous socioeconomic, technological, and structural factors affecting national emissions. Consequently, the novelty of this thesis is primarily the integration of social and educational factors into the broader climate-action-planning framework.
3. **Thesis 3 can be accepted as a new scientific result.** The author compiled and structured a database containing 454 climate action reports and 24 geodemographic, spatial, and action-related variables and developed an interpretable Gini-based classification-tree model supported by SHAP analysis and post-pruning. The scientific novelty is provided by transforming a large body of municipal climate-planning experience into a transparent and reproducible decision-support structure. The moderate predictive performance and the low performance of some rare categories should be regarded as limitations, but they do not eliminate the methodological contribution of the model.
4. **Thesis 4 can be accepted as a new scientific result.** The author developed a material-centred environmental assessment framework based on project-level material quantification, the calculation of GWP, ODP, and HT impacts, and the application of category-specific functional units. The results demonstrate that material composition and material intensity may lead to substantial differences even between projects belonging to the same climate-action category. The combination of absolute project impacts and normalised impact intensities provides a useful methodological contribution to the environmental evaluation of urban climate projects.

Overall opinion

Overall, I consider the submitted doctoral dissertation to be the candidate's own, independent scientific work. The candidate has demonstrated that he possesses the professional knowledge, methodological competence, and analytical skills required for independent scientific activity. The revised dissertation addresses a relevant interdisciplinary research problem and contains identifiable new scientific results in the fields of urban climate action categorisation, data-driven decision support, and material-based environmental assessment. I endorse the submission of the doctoral thesis for public defense.

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