Author Comments (ACs)

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Review of article: Towards a global database on building architecture and construction materials for urban climate models
Submitted to Earth System Science Data

Reviewer 1

The manuscript presents a methodological framework for standardizing global building typology data, addressing an important gap by providing detailed information on building materials and systems that complements existing datasets focused on morphological parameters. The approach tackles data heterogeneity through protocols for survey response assessment, data correction, and validation against external databases such as Tabula and the World Housing Encyclopedia, with reliability assessed using Cohen's and Fleiss' Kappa. While the focus on residential buildings provides reasonable global coverage, the inclusion of non-residential typologies remains limited. More importantly, the reliance on survey data introduces significant coverage gaps, which are addressed through various imputation methods — raising questions about the proportion of data that is empirically grounded versus modelled. The paper would also benefit from clearer structuring to help readers follow the methodological steps more easily.

Thank you for taking the time to provide such a careful review of our submission. We have revised the manuscript; the answers to your comments are given below.

General Comments
● Urban Heat Islands versus Urban overheating: though the urban heat island is the most well known phenomenon in the field of urban climate, there is a general tendency to move away from this concept - especially in the context of heat mitigation, and focus more on urban overheating, e.g. following the paper of Martilli et al (2020, http://doi.org/10.1016/j.uclim.2019.100541) and Nazarian et al. (2022, https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2022EF002682). I would suggest the authors to reflect on this change in terminology, and put more emphasis on urban overheating instead of urban heat island.

The reviewer is right. UHI is only one component of overheating. The introduction has been modified to put overheating as the main issue, with climate change and UHI contributing to it. The new text is:

One of the most pressing challenges is the urban overheating (Martilli et al 2020, Nazarian et al 2022), which is more and more important due to climate change. Overheating in cities occur during day but also at night, due to the Urban Heat Island (UHI) effect.

● Section 2 Objectives: By identifying the critical gaps in the introduction, the objectives are implicitly already mentioned. The current section on Objectives in my opinion is more about the workflow used to come up with nation-specific maps/databases of urban properties other than morphological ones. I am not sure this Section is needed here. I do understand that the global LCZ map / Urban Atlas database and their built-up classes are an interesting vehicle to use in combination with the databases. However, I don't think this deserves a separate section. I would suggest to integrate this section with Section 3, and perhaps use a more general Section title, e.g. "Database Design Framework".

Section 2 on objectives has been reframed to encompass more generally the overall methodology. The content of the section more clearly separates aspects linked to the database (that will be presented in section 3) and to how data is acquired, as will be presented in section 4. These also lead to changes in section 3, which is now named "Database Design Framework", as suggested.
However, we prefer to keep both sections 2 and 3 separated, especially to clearly separate what is linked to the survey(introduced in section 2, then described in section 4, see comment below) and what is linked to the database structure (section 3).

Stating explicitly the objectives in this section 2 "Overall Methodology" section instead of just relying on implicit objectives (that should be deduced by the reader from the introduction section) allows to bring more clarity.

● Survey: In lines 148 and following, the survey is mentioned at various occasions, with some details. As a reader, I believe it would be relevant - at this point in the paper - to obtain more context on the survey, how it was designed, to whom it was sent etc … However, the survey is now a separate section 4, even though many parts of it are already addressed in the current Section 3. I believe it would be clearer for the reader to re-structure this, in combination with the suggestion on a new integral section "2 - Database Design Framework". Finally, the Survey section is rather long, and might be distracting the reader a bit. Perhaps it is better to reduce the length of this topic to key elements, and put additional information into a supplementary section.

Section 3 is now focusing only solely on the database design framework, as proposed by the reviewer. Precisions on the survey initially included in this section have been removed, in order to separate data types and how these data are acquired. This suggestion from the reviewer indeed increases the clarity of the text.

The only part of section 3 where reference to the survey are done is for Table 2, which is at the end of the section and allows to do a smooth transition to section 4 on the survey. A transition sentence has also been added at the beginning of section 4.

The length of section 4 is less than 4 pages, including figures, while the article, excluding appendices and references, is 30 pages long in total. Therefore, we chose to keep the section 4 on survey as is, because it is the main tool used to gather the building data for the database, and analysis of the responses is necessary. However, removal of non-essential information on the survey that were removed from section 3 allows to shorten the overall information on the survey.

● Data accuracy and reliability: Section 5 discusses the data quality and completeness at length, and also provides a detailed - at times a bit lengthy - description of how missing data is treated. However, what is missing in my opinion, is an overview of the % of data per data source, across nations and variables. For example, how many values in the final database are actually sourced from the original survey results? And what about the other data sources? How does this look globally? This type of information can then also be used to identify the strengths and weaknesses of the product, and what should be improved in follow-up research.

Thank you for this valuable comment. We agree that an overview of the contribution of the different data sources would improve the transparency of the final database and help identify its main strengths, limitations, and priorities for future data collection.

To address this point, we have added Appendix E, which provides a global overview of the percentage of data attributed to each source, both across countries and weighted by population, for each building typology variable (Figs. E1 to E6). This allows the relative contribution of the original survey data and the different imputation sources to be assessed at a glance, and highlights where further primary data collection could most improve the database.

Technical suggestions

● Line 40: Add reference to the work of Cathy Li on air-conditioning adoption rates: https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2023MS004107
Thanks for this interesting new reference on the influence of air conditioning on the urban climate under consideration of a realistic air conditioning adoption rate. It is now cited.

● Lines 60-66: I agree with the narrative here, and the identified critical gaps. However, it might be good to provide some additional background information on the wealth of (mostly morphological) building data that has become available in the past few years, such as (non-exhaustive):
○ Urban land cover data, see review by Chakraborty et al (2024, https://www.nature.com/articles/s41467-024-52241-5)
○ Section 6 in Lean et al (2024, https://rmets.onlinelibrary.wiley.com/doi/10.1002/qj.4858)
○ Building footprints via Overture
○ Global Building Atlas: https://essd.copernicus.org/articles/17/6647/2025/
○ GHS-OBAT R2024A, https://data.jrc.ec.europa.eu/dataset/f41a22f1-5741-4c41-86eb-6384654f6927
○ Open Building Map: https://www.nature.com/articles/s41597-025-06132-z
○ EUBUCCO, Europe only: https://eubucco.com/files/v0.2

○ UT-Globus: https://www.nature.com/articles/s41597-024-03719-w
Thanks, we now make it more clear that much progress has been made on urban land cover and form, and much less on the construction materials. A text was added to the fourth paragraph of the introduction.

● Line 67: Clarify this paragraph is about existing datasets on construction materials, wall and roof albedo, window types, and HVAC systems. Note that there is now a "successor" of the Jackson et al. dataset, in the form of U-SURF from Cheng et al (2025, https://doi.org/10.5194/essd-17-2147-2025)
Thanks, it is now clarified and the more recent database is cited.

● Line 80: in an open-source …
Corrected.

● Line 87: LCZ (Sect. 2), (add comma)
Done.

● Lines 89-91: Section numbering is off, there is two times section 6. This happens throughout the manuscript … make sure all numbers are consistent.
Thanks, corrected.

● Line 96: is there no formal reference for Urban Atlas?
No peer-reviewed publication describing the Urban Atlas dataset has been found. Therefore, the most recent version (2026) of the product user manual provided by the European Environment Agency (EEA) is cited.

● Line 97: "These land cover classes provide …" is positioned directly after Urban Atlas, whilst the sentence is about Local Climate Zones?
Thanks for raising this point. With the more detailed discussion on urban land cover and form datasets in the introduction, these lines are no longer required here. They have been deleted.

● Line 108: building materials, architectural practices, practices and systems … Not sure what "systems" refers to here (and in other parts of the manuscript)?
Depending on the context it refers to "HVAC systems" or "temperature control systems". This has been corrected in the manuscript such that the word "systems" is no longer employed stand-alone as it was the case in several instances.

● Line 127: the maps are rather small? Perhaps you can provide the figure as portrait instead of landscape, to make the illustrative maps larger, to better see the spatial variability?
We prefer to keep Figure 1 as it is. The maps are just examples, it is not necessary that the reader can see all their content. Changing Figure 1 to portrait will require turning the page, which is not convenient for the reader.

● Line 167: did the authors integrate nation- or region-specific database, as a complement to the information received via the surveys?

Yes, the global World Housing Encyclopedia (WHE) and the European Tabula Database have been taken as additional sources to the survey. However, this Section only discusses the database design framework and we do not include such detail here anymore. The WHE and Tabula are discussed in Section 5.3.

● Line 210: does this statement also hold for many of the developing regions?
Thanks for pointing this out. We have now precised that this movement emerged in Europe and North America and then was spread globally.

● Line 229: there are various schemes to identify household income levels, such as from the World Bank, United Nations, OECD, … Can you clarify what scheme / definition is adopted here?
This is a good point. No official scheme of household income level has been used, which might be a shortcoming of the methodology. However, given that the survey has been sent to experts in building construction in various countries, it was left up to their judgement what is the household income level in the respective country, relative to the country average (not on a world generic scale). This is now mentioned in the manuscript.

● Line 365: Section references in the intro paragraph are wrong (referring to Section 4)
Thanks for pointing this out, the mentioned section references have been corrected, and other references in the manuscript have been checked.

● Line 379, rephrase: "Both measures quantify the extent to which agreement between survey responses exceeds what would be expected by chance."
Thanks for this very helpful reformulation suggestion.

● Line 396: add reference to Appendix after “Many Windows” category.
Thank you for the comment. Indeed this term was not previously defined, making it difficult for readers to follow the text. Now we have added an indication to Appendix A, where all survey variable categories are presented.

● Lines 426-429: in these cases, is there also a metadata field in the GIS database that indicates the origin of the final parameter choice? The same question also applies to what is described in Lines 415-424.
Thanks for pointing this out. In the final database, a flag is provided for each parameter, providing the source and treatments given to the data. The flags are described in detail in Section 5.4. For Lines 426-429, we now specify in the manuscript that this is marked with the flag ‘M’ (‘Manual’) in the database. However, the description in Lines 415-424 is about choosing between different responses for the same country in the survey. All data originating from the survey is marked using the flag ‘S’ (‘Survey’).

● Line 430: Since U-Surf (Cheng et al., 2025) is a globally explicit database on a 1km² resolution, developed for (urban) climate models, and partly based on LCZs. I would suggest that the authors explore whether an additional comparison is useful here.
Thank you for this precision. We have added a comparison of the covered territories by the survey responses and Jackson et al. (2010) in Table 4. Except for roof albedo, all the other parameters of U-Surf were built on Jackson et al. (2010) data and this comparison is also valid to it.

● Line 432: space missing between “the survey.The Tabula”
Thanks, corrected.

● Line 466: out of curiosity: is building greening also part of the database, such as various types of green roofs, vertical green, …
Thanks for raising this important point. It is not included in our database because these buildings are not representative, and this restriction is now mentioned in the section on the building descriptive data. Tabula and WHE do not include roof or facade vegetation.

● Line 475: this sentence is unclear to me: “...contain non-exhaustive building lists focused on typologies relevant to their original contexts”
This means that the World Housing Encyclopedia and Tabula do not have the objective to provide building types usable for urban climate simulations. Instead, the World Housing Encyclopedia was constructed with the main goal to describe buildings at risk of being damaged by earthquakes. Therefore, it might focus more on vernacular buildings more vulnerable to earthquakes than on high standard modern buildings. Tabula focuses on residential energy consumption and does therefore not contain any non residential buildings.

● Line 495: Meaning that the database contains no information on these topics? In that case, perhaps suggestions can be made for alternative sources of information, such as this one: https://zenodo.org/records/10633387
This particular paragraph is about building airtightness (relevant for infiltration) and mechanical ventilation systems. The mentioned dataset on Zenodo is about air conditioning adoption rate. We therefore do not want to reference this dataset here. The air conditioning adoption dataset is already cited in the Introduction.

● Line 500 and others: I am not sure the term “lighting” is appropriate to describe the variables window share and the types of solar shading. "Lighting" typically refers to artificial light sources or illuminance levels. I would suggest to use either “Daylighting” or “Fenestration” variables.
Thanks, this has been changed to fenestration in the manuscript, except at one instance where actually lighting is meant to be used.

● Line 535: Reference for “GDUBP database regions”? Write the acronym in full.
The acronym GDUBP (Global Data Set of Urban and Building Properties) is now removed. It is now referred to as Jackson et al. (2010).

● Line 547: Where do the “default” values come from?
Thanks for this question. We have added information to clarify this point directly in this line and also in the end of Appendix E.

● Line 629: Norway pops-out on the map, with “metal” as the dominant wall material inMR-buildings. This surprises me. Has this been verified?

The Norwegian value was based on a single survey response. We verified the comment associated with this response, which indicated that “the building described here is a student residence at the University of Stavanger, in southern Norway.” We therefore considered this entry to describe a specific building rather than being representative of the Norwegian MR

building stock.
To address this issue, we replaced the survey entry with the corresponding TABULA data available for Norway. The following variables were updated: wall material (metal → concrete), window type (triple → double), roof cover (gravel → concrete), wall insulation (16–25 cm → 5–15 cm), and roof insulation (none → 16–25 cm). The relevant figures were updated accordingly (Figures 11, 12 and C2).

● Line 659: or because of lack of (financial) resources?
That might be the case, but maybe it is better not to speculate too much.

● Lines 690 and following: since non-residential typologies are global, how are these then distinct from the information obtained e.g. from the LCZ look-up tables for corresponding building uses?
The LCZ are not directly linked to being residential or non-residential. The only exceptions are LCZ8 and LCZ10. Therefore, the presented database does still provide a higher precision.

● Table 6: should LLR be LR?
No, this is Large low-rise.

● Line 698: Make the discussion subsection a separate section
Done.

● Line 708: This sentence is unclear? “only the main typological variables (country, use and form) were prioritised over the auxiliary ones”
To make this sentence clearer, the main and auxiliary typological variables are repeated in the text, the reference to Figure 1 is no longer made.

● Line 716: This was the case for some African nations
Thanks, corrected.

● Line 726: I think it would be good to also describe the fact that LCZ 7 is missing as a limitation. A typology that is often ignored, even though these areas are host to the most vulnerable populations. Please add this, and add some ideas - based on recent literature - on how future efforts can address this shortcoming.
Indeed the LCZ 7, Informal settlements, is not covered by this database, as already precised in Table 1. This was not considered to be the most representative typology in most countries, although further investigation should be done to verify if it stands real for specific countries in the Global South. This aspect was added into the end of the fourth paragraph of the discussion.

● Line 742: Note that there is also a CONUS LCZ map available (Demuzere et al., 2020, https://doi.org/10.1038/s41597-020-00605-z) as well as a longitudinal multitemporal version, from Qi et al (2024, https://www.nature.com/articles/s41597-024-03042-4). Given the latter product, does this new database on building materials also allow the construction of multi-temporal properties, based on the era of construction?
We do not judge the data availability related to the construction period to be sufficient to provide a multi-temporal database.

● Line 750: “This database should address a crucial data gap …” does it address this issue or not?
Thanks, it has been reformulated to say that it addresses a crucial gap.

● Line 748: Conclusion and outlook. Some of the outlook sections are in my opinion linked to the limitations described in the previous Section. I would revise both sections, and merge them together. Or, move outlook to the limitation section, and keep the conclusion short, only describing what is actually presented in the paper.
The separate discussion and conclusions sections are kept, but some rather redundant parts of the outlook conclusions have been deleted.

● Line 810: Also reference the supplementary tables in figures in the main text. I e.g. do not see a reference to Fig. B1, B2
The references to all Figures and Tables from the Appendix have been added to the main text, except for the Tables B1 to B5, since these references would be difficult to match.

● Line 838 - Tables 1 and 2:
○ I am not sure if it is useful to have a “yes” and “no” answer indicating agreement. If it’s no, would a user not want to know what the difference is?
Thank you for this comment. The purpose of this analysis was to assess the consistency of our survey data with external reference databases. Therefore, we used a binary indicator (“yes”/“no”) to indicate whether the studied parameters agreed with the external data, without analysing the nature or magnitude of the differences.
To clarify this objective, we revised the titles of Tables B1 and B2 to: WHE - Agreement between our database and WHE external database for countries covered by WHE for wall and roof materials and window share for low-rise buildings.

○ What is the hashtag number in the last column?
The hashtag number presents the report number. We added an indication to that in the column title, to clarify this.

● Tables B3 and B4: I don’t understand what these Tables are about?
Tables B3 and B4 indicate which WHE reports were used to fill missing data in our database. They provide traceability of the information used and identify the corresponding sources.

● Line 990: Sentence is repeated 3 times
Corrected.

● Appendix D: What are the references for the physical parameters in Tables D1 - D5
References for the physical parameters have been added in accordance with Point 5 raised by Rev. #2.

● Line 948: “Table D2” is missing in the title.
Corrected.

Reviewer 2:

This study presents a timely and valuable contribution by developing a global preliminary database of building architecture and construction materials for urban climate models based on expert surveys. While satellite remote sensing effectively characterizes global high-resolution urban morphology (e.g., impervious surface fraction and building height), representing building construction materials, architectural details, and thermophysical properties remains a major bottleneck in current urban climate modeling. The strong interest from the community, reflected by up to 800 downloads of the published dataset to date, underscores the practical value of this research direction. However, from the perspective of a global climate modeler, several key aspects of the dataset and manuscript could be further improved.

Thank you for taking the time to provide such a careful review of our submission. We have revised the manuscript; the answers to your comments are given below.

Specific comments:

1. The manuscript lacks a systematic comparison with established baseline datasets currently implemented in Global Climate Models (GCMs), particularly Jackson et al. (2010), which provides the standard urban property dataset for GCMs like the Community Land Model Urban (CLMU) within the Community Earth System Model (CESM) (Oleson et al., 2010). To demonstrate the value of this new database for global climate modeling, the authors should benchmark their dataset against Jackson et al. (2010) and explicitly highlight the updates, improvements, or regional value it offers over existing datasets.

We thank the reviewer for highlighting the importance of benchmarking our database against established datasets used in global climate models. We agree that this comparison is essential to demonstrate the added value of the present database.

In the revised manuscript, we have added Table 4 (Number of territories per continent with survey data by building form, and number of territories with data in Jackson et al.) to compare the geographical coverage of our survey with Jackson et al. (2010), by continent and building form. The corresponding discussion, added immediately before Table 4 on page 15, is:

Tab. 4 demonstrates the substantial expansion of the geographical evidence base achieved by the present survey compared with Jackson et al (2010). While Jackson et al. provides particularly detailed coverage for North America, its representation is more limited across several other continents. This analysis considers the standard continent definition, where Central America is part of North America. The present survey broadens this coverage substantially, with data available for 115 territories for low-rise (LR) buildings and 76 for mid-rise (MR) buildings, distributed across all continents. The expansion is especially pronounced in Africa and Asia, where the survey provides LR data for 38 and 28 territories, respectively, compared with 5 and 7 territories represented in Jackson et al., and also contributes substantially to MR coverage. Additional values are provided for South America and Oceania, further improving the geographical balance of the database. For high-rise (HR)

buildings, coverage remains more limited, with survey data available for 28 territories, reflecting the greater scarcity of detailed information for this building form.

2. There is a structural mismatch between the height-based building classification used in this database (Low-rise, Mid-rise, and High-rise) and the urban land cover typologies implemented in GCMs, which are typically categorized by density—such as Low-Density (LD), Medium-Density (MD), High-Density (HD), and Tall Building Districts (TBD) (Oleson et al., 2010). The authors should provide a clear mapping matrix or translation protocol showing how modelers can directly convert these LR/MR/HR parameters into standard GCM urban density classes.

We thank the reviewer for pointing out this important issue regarding the compatibility between our height-based classification and the density-based urban typologies commonly used in GCMs.

To facilitate the use of our database in existing urban climate modelling frameworks, we have added a column in Table 1 translating the categories of Oleson et al. (2010). This new column in the table provides thea correspondence between the Low-Rise (LR), Mid-Rise (MR), and High-Rise (HR) building classes used in our database and the urban density land-cover classes of Oleson et al (2010): commonly implemented in GCMs, including Low-Density (LD), Medium-Density (MD), High-Density (HD), and Tall Building Districts (TBD).

This correspondence should be considered a translation protocol rather than a one-to-one equivalence, because building height and urban density describe different aspects of urban form. The proposed mapping is therefore intended to facilitate the integration of our building-material and architectural parameters into existing GCM frameworks while retaining the distinctions inherent in the original database.

3. Figures 9–16 in the main text show notable redundancy with Figures C1–C3 in the Appendix. To make the presentation more concise and readable, I suggest replacing or consolidating Figures 9–16 with the comprehensive global parameter maps from Figures C1–C3 directly in the main text.

We thank the reviewer for this suggestion. We agree that there is some visual overlap between Figures 9–16 in the main text and Figures C1–C3 in the Appendix.

However, we have retained both sets of figures because they serve complementary purposes. Figures C1–C3 provide the complete global overview of all parameters included in the database, and are therefore intended as a comprehensive reference for users of the dataset. In contrast, Figures 9–16 focus on a selection of key parameters that are particularly relevant to the discussion and allow us to examine their spatial patterns and regional differences in greater detail.

Rather than reproducing all parameter maps in the main text, we have therefore prioritized the presentation and interpretation of the most relevant variables in the main manuscript, while retaining the comprehensive set of maps in the Appendix. This structure also helps keep the main text focused and avoids substantially increasing its length while ensuring that all parameter maps remain readily accessible to users of the database.

4. While concrete usage generally increases from low-rise to high-rise structures, the finding showing that Low-Rise (LR) buildings across parts of Africa (e.g., Sahara) predominantly use concrete for both exterior walls and roofs appears counter-intuitive (Figure C1). The authors should clarify whether this high prevalence reflects actual local construction practices or is an artifact resulting from data imputation and extrapolation due to sparse survey responses in that region. Further local ground-truthing or literature cross-verification is needed.

We thank the reviewer for raising this important point. We agree that the high prevalence of concrete reported for low-rise (LR) buildings in parts of Africa, including the Sahara region, may initially appear counter-intuitive, particularly in light of traditional and vernacular construction practices.

To further assess this point, we have added **Table 4 (Number of territories per continent with survey data by building form, and number of territories with data in Jackson et al.)** and **Figure E2 (Data provenance of LR building typology variables, weighted by share of population)** to the revised manuscript. Table 4 shows that the survey provides LR data for 38 African territories, corresponding to approximately 70% of African countries, while in Figure 6 we can see the territory coverage of African countries. This substantial coverage suggests that the observed pattern is not primarily driven by extrapolation from a very limited number of survey responses.

The result should also be interpreted in the specific context of this database, which focuses on urban building typologies for application in urban climate modelling. Although traditional and vernacular construction commonly relies on materials such as earth or stone, rapid urbanization has increased the prevalence of concrete-based construction in African urban centres. The results therefore primarily reflect contemporary urban building typologies rather than rural or historical vernacular construction. Importantly, we do not interpret these results as indicating that concrete is universally dominant across all African building types or regions, but rather as reflecting the main urban typologies.

We have therefore clarified this point in the revised manuscript in the third paragraph of Section 6.1 Structural variables in residential buildings, by adding the following text:

The prevalence of concrete in African low-rise buildings should be interpreted in the context of the database's focus on urban typologies. While traditional and vernacular construction often relies on earth, stone, and other locally available materials, rapid urbanization has increased the use of concrete in African urban centres. The results therefore primarily reflect contemporary urban building typologies rather than the full diversity of rural and traditional construction

5. Regarding Appendix D ("Look-up tables for physical parameters", Line 937), what are the physical sources, standards, or literature references behind these values? In addition to thermal conductivity, heat capacity, and surface albedo, GCMs require parameters such as radiative emissivity and physical layer thicknesses of roofs and exterior walls (Oleson et al., 2010). Can the authors incorporate these additional parameters—along with plausible uncertainty ranges—into the look-up tables to make the dataset fully operational for GCMs?

These are good points, we have improved Appendix D such as to make it more useful. For the walls, heat conductivity, volumetric heat capacity, and thickness are given with peer-reviewed references when possible. The wall colour can be used for albedo, whereas for emissivity it is pragmatic to assume 0.9-0.95, except for metal where a very large range could prevail. For the roofs, heat conductivity, volumetric heat capacity, thickness, albedo, and emissivity are given, with peer-reviewed references where possible.

Reference:

Jackson, T. L., Feddema, J. J., Oleson, K. W., Bonan, G. B. & Bauer, J. T. Parameterization of Urban Characteristics for Global Climate Modeling. *Ann Assoc Am Geogr* 100, 848–865 (2010).

Oleson, K. W., Bonan, G. B., Feddema, J., Vertenstein, M., & Kluzek, E. (2010). Technical description of an urban parameterization for the Community Land Model (CLMU). *NCAR, Boulder*, *10*, D6K35RM9.