

Interaction between land use, energy consumption and temperature on the city scale.

Citation for published version (APA):

Chen, H. (2017). Interaction between land use, energy consumption and temperature on the city scale. In *Energy : Annual Research Report 2016* (pp. 99). Eindhoven University of Technology.

Document status and date:

Published: 01/01/2017

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
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Department
Built Environment

Research theme / Cluster

- Chemistry
- Solar PV
- Urban energy / Smart buildings
- Nuclear fusion

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Cooperations

CH Philipp (Singapore-ETH Centre)

Funded by

Scholarship for studying abroad,
Ministry of Education, Taiwan (ROC)
Delta/ NTIO (The Netherlands Trade
and Investment Office) Joint
Environmental Scholarship

Funding % per money stream

Scholarship 100 %

Start of the project

2013 (September)

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Interaction between Land Use, Energy Consumption and Temperature on the City Scale

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Project aim

According to a report from Royal Netherlands Meteorological Institute (KNMI, 2013), by the year 2050, the temperature will rise globally by 1.0 -2.3°C. The aim of this project is to adapt the climate change in an active way, which will accomplish through the urban land use remodify. The target is developing an urban interaction model for the local government to simulate various scenarios. Policy makers could adjust it to access their sustainable urban plans and policies that deal with the climate change, by reducing the temperature fluctuation while also reducing the energy usage. The dynamics between land use (L), energy consumption (E) and temperature (T) change is the main focus of this project.

Progress

The following progress has been achieved during the third year of the project:

- Investigated the temporal change of the dependency between land use and LST from 2000 to 2010.
- The influence on land surface temperature from neighboring land use types and buffer distance to the central cell are analyzed.
- The result shows that land surface material is equally significant as the built-up area density for the UHI effect in Eindhoven city.
- Eindhoven is not a typical UHI city based on the land use map and land surface temperature map analyzes. High temperature areas are found in high density areas, but also other areas.
- For the next step, the spatial analysis of land use and energy dynamics will be investigated.

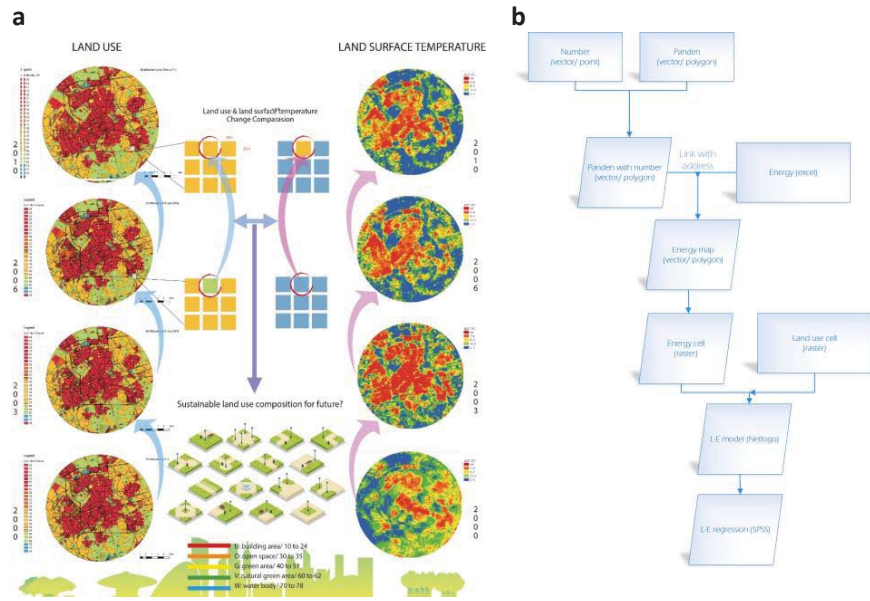


Figure: (a) Hypothetical T-L model. (b) T-L-E model framework.

Scientific publications

Chen, H.C., Vries, de, B. & Han, Q. (2015). The new modelling method in urban development between land use and energy consumption: case study in Rotterdam. In G.T. Papanikos (Ed.), Fifth Annual International Conference on Urban Studies & Planning 8-11 June 2015, Athens, Greece (pp. 1-17). (Atiner conference paper series, No. PLA2015-1730). Athens, Greece: The Athens Institute for Education and Research.

Chen, H.C., Vries, de, B. & Han, Q. (2015). An urban model for analyzing thermal effects dependent on spatial parameters. 9th International Conference on Urban Climate (CCMA5: UHI mitigation strategies II: urban planning). Toulouse, France, The International Association for Urban Climate.

Chen, H.C., Vries, de, B., Han, Q. & Philipp, C.H. (2016). Analysis of the Dependency among Neighbouring Land Use, Gross Floor Area, and Land Surface Temperature to Adapt the Future Climate. 22nd International Sustainable Development Research Society Conference, School of Science and Technology, Universidade Nova de Lisboa, Lisbon, Portugal, 13 – 15 July 2016.