



POLITECNICO
DI TORINO

Honors thesis

MASTER OF SCIENCE DEGREE IN
ARCHITECTURE CONSTRUCTION CITY
ARCHITECTURE FOR THE SUSTAINABILITY DESIGN

Abstract

**Sustainability assessment of Sieben Linden ecovillage.
Ecological Footprint, Embodied Energy, Embodied Carbon**

Tutor

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by

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September 2017

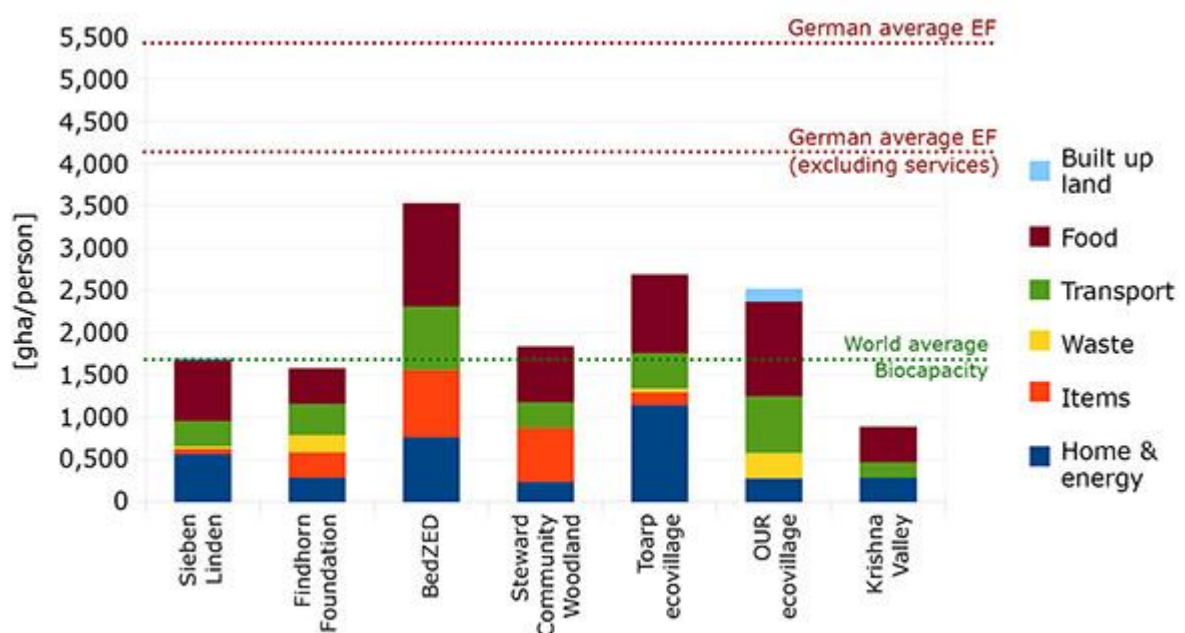
The present study was born out of an agreement between the Sieben Linden community (an ecovillage established in 1997 in Sachsen-Anhalt, Germany) and the Politecnico di Torino (DIST), approved on May 9, 2013. The Politecnico team, led by professor Andrea Bocco, intended to perform an overall analysis of the way of living in the ecovillage, including a number of areas among which agriculture, biodiversity, building, decision-making, diet, economy, energy, land husbandry, etc. The Sieben Linden community, on the other hand, was particularly interested in having a new ecological impact assessment done, a dozen years after that by the University of Kassel.

In 2014 a first phase of information gathering began, leading to the formulation of a thesis proposal at the Politecnico di Torino by Professor Andrea Bocco.

In November 2016, we began this thesis project, which focuses on some specific aspects of the life in the ecovillage: the daily activities of residents (use of buildings, alimentation, travel, etc.) and the construction activities. In the first few months the available data were analysed and a preliminary definition of the goal and the boundaries of the study was elaborated. Then, it was considered appropriate to meet the community for a discussion on the purpose and the limits of our analysis. In March 2017 we went to Sieben Linden to present the advancement of work, analyse the critical issues, and collect more data. The following months were characterized by the constant cooperation between us and the ecovillage, in order to produce complete results that are of interest for the community.

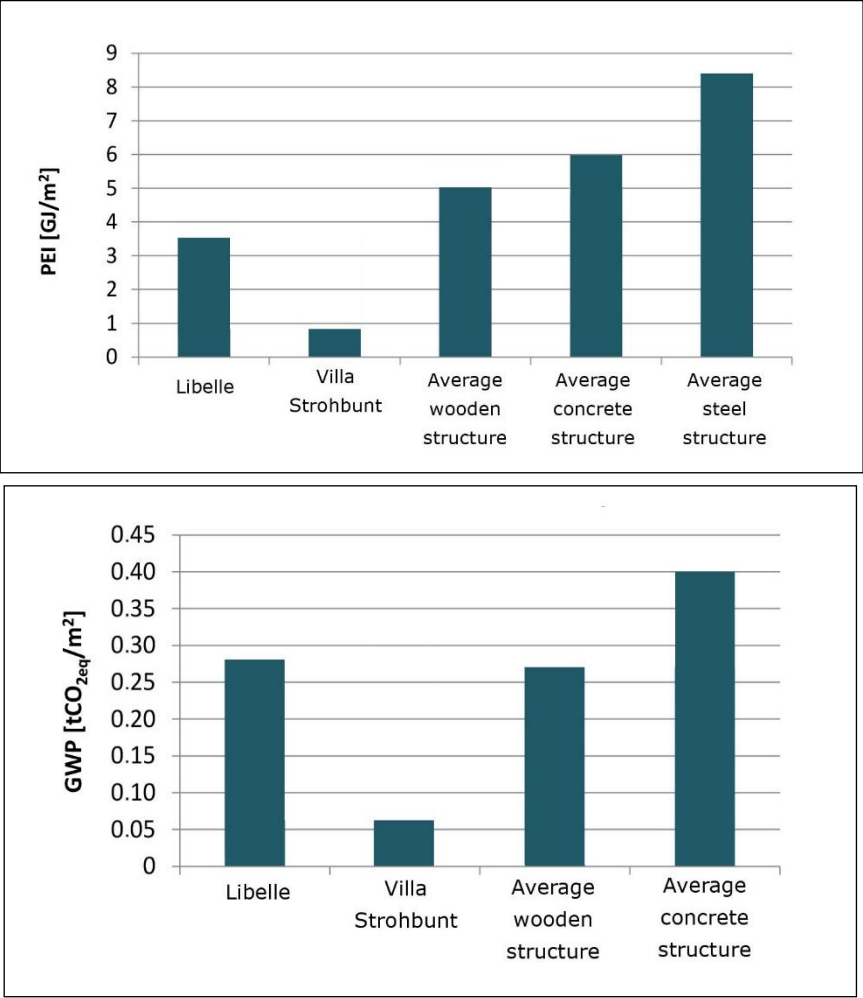
The methodology chosen for the sustainability assessment is twofold:

- the environmental impact of the ecovillage residents' lifestyle (that is, recurrent activities which are performed on an everyday basis) was assessed with reference to the Ecological Footprint (EF) method, as it appeared an appropriate tool to produce an inclusive picture of the most relevant activities, and quantify them in a single unit of measurement (global hectares), that is easy to visualise and communicate. The results obtained were then compared with the German average ecological footprint and other selected cases.



- the environmental impact of the construction of Sieben Linden buildings (that is, one-off activities aimed at creating items having an indeterminate 'service life') was assessed

with reference to two basic sustainability indicators, ('embodied energy' or PEI and greenhouse gases emission or GWP) and also 'translated' into EF terms. Since no data could be collected regarding the energy expenditures at the building site, only the 'cradle to gate' phase was accounted for. The results obtained were than compared with the average impact for different construction systems (timber, reinforced concrete and steel).



Finally, the results obtained through the two methodologies have been merged and discussed.