

## The Ecology of Scale: Further Examples and Comments.

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**Background, Aims and Scope.** As a conclusion of our latest studies, presented at InLCA 2003, we supposed, that the food production and distribution ecology is depending on the number of produced items. Additionally, our results demonstrated a minimum business size, which is necessary for energy saving food production and distribution. Because of these findings the term of “**Ecology of Scale**” was claimed [Schlich 2003]. To support that idea further examples are investigated.

**Objective.** The specific energy turnover, calculated in kJ per functional unit, comparing non food items is investigated. Examples from traffic, housing and physiology are researched. In a case study the transport by car, bus, train and plane inside Germany is evaluated. Additionally, different types of households are compared. These examples of human economy are compared with physiological data from different mammals, to find out correspondence.

**Methods.** As a part of LCA the energy turnover of comparable units is investigated. These primary results are allocated to the functional units. Regarding the traffic example, the basic data are in all cases related to 100 Pkm<sup>1</sup>. The household data are related to the number of people living there. The physiological and nutritional data of mammals are related to their body mass, in order to get specific data.

**Results and Discussion.** In all cases, the results demonstrate a strong digressive relation between the specific energy turnover and the functional unit. The huge number of individual transports with private cars cannot compete with bus or train - of course only in case, there are busses or trains. On the long distance, even the plane comes out energy saving, compared with the cars.

The examples of housing demonstrate clearly, that larger units in all cases need less energy per person than smaller. Especially singles are wasting a lot of energy. In both examples of human economy we can see a more or less strong digressive relation, leading to a “Ecology of Scale”.

Not surprisingly, the physiological data of mammals demonstrate that dependency as well. The frequency of heart beats and the specific energy turnover correlate in reverse with the body mass.

**Conclusions.** The presented examples support our idea of “Ecology of Scale”. This should not be surprising, because nature knows this as well. Further examples of energy saving behavior are bees and ants, which construct colonies and hills, or sheep, crowding together at night.

**Recommendation and Outlook.** The coincidence of economic and ecological facts is obvious. Additionally, natural processes and biological systems know about the “Ecology of Scale” as well. Human hedonism and individualism turn out to be a energy wasting lifestyle.

[Schlich 2003] Schlich, E.; Fleissner, U.: Comparison of Regional Energy Turnover with Global Food. InLCA. Seattle (2003).

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<sup>1</sup> 100 Pkm: 100 Personenkilometer, calculated as the product of distance (km) and the number of transported people, divided by 100.