Alternative Fuels for Sustainable Mobility

A recent Norwegian study analyses the implications of alternative fuels policies for promoting sustainable mobility, by assessing the ecological footprints of different energy chains. The results suggest that it would be possible to reduce the ecological footprints of fuels by up to 75% using alternative fuels and introducing new and conventional technologies. However, the transport policy needs to include other measures to meet the requirements of sustainable mobility.

The White Paper, European Transport Policy: Time to decide for 2010, which defines the European Commission’s objectives for the next 10 years, highlights the necessity for a change in the European Transport Policy, stating the sustainable mobility as the core goal. There are three different strategies towards the sustainable mobility: the efficiency strategy, based on the use of new and conventional technologies and alternative fuels; the substitution strategy, that promotes the change of means and habits in transportation; and the reduction strategy, which targets to reduce the transportation itself. The use of alternative fuels, such as hydrogen or biomass, is part of the efficiency strategy, and has become more and more important in political agendas.

A group of Norwegian researchers has investigated the relationship between alternative fuels and the development and promotion of sustainable mobility. They have used ecological footprint assessments to compare the environmental consequences of 16 different energy chains for 2010. The ecological footprint analysis for fuels characterizes their environmental impact by measuring the aggregated land area required to produce a specific fuel and to absorb the waste and pollution that is generated during its entire life cycle (from cradle to grave). The ecological footprint for fuels consists on three aggregates: the amount of land needed for energy production, the land to sequester greenhouse gases’ emissions, and the land for the safe deposit of nitrogen and sulphur.

Conventional crude-oil based petrol used in an internal combustion engine in 2010 has been taken as reference energy chain for comparison. Overall, the results show that:

- The hydropower-based energy chains have the best ecological footprint, 45% less than the reference chain. However, even if hydropower is a renewable resource, the reserves are not enough to meet the increasing demand of the transport systems.
- Natural gas-based chains also have a very low ecological footprint that varies from 45% to 75% smaller than that of the reference energy chain. Although, in this case, there are less resource limitations, it is not a renewable energy and therefore it does not meet the long-term requirement of sustainable mobility.
- Through the raw-oil based chains, it is possible to achieve cuts in the footprint size by introducing new technologies such as raw-oil based hybrid diesel and hybrid petrol engines, thus reducing by 30% and 15% respectively compared to the reference ecological footprint.
- In the case of the biomass-based energy chains, even though biomass is globally available in large volume and is a renewable resource, they have the highest ecological footprint from all the alternative fuels considered, with a footprint of about the same size as the reference chain. This is because it takes a lot of energy to produce this type of fuel from feedstock and the biomass feedstock has a very low energy density per area.

The study demonstrates that it is possible to reduce fuels’ ecological footprint within a decade by using alternative fuels and introducing both conventional and new technologies. However, the authors conclude that these measures alone won’t be enough to meet the long-term requirements of sustainable mobility. It will also be necessary to encourage new means of transportation (substitution strategy) and to minimize the growth of transportation (reduction strategy). The European Union is working now towards the definition and implementation of a strategy to promote sustainable mobility in the urban context.


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