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WP2 contributions for the final CEESA report

The overall outputs from this work package are divided into two:

i. Biomass resources
ii. Transport scenarios

In the report these two overall themes will be divided into two sections. Biomass is strongly connected to the different transport scenarios and technologies, and is also included in the consideration in the transport scenarios. However the overall energy system also requires different types of biomass for CHP generation. The section about biomass could be divided into:

1. Present situation for all types of biomass
    a. Present Danish biomass production and area uses (farm land and nature).
    b. Current residual biomass resources (collaboration with WP5).
    c. Identification of the connections between nature and to food and livestock production.
    d. Present Danish biomass consumption.
    e. The present global production, area usage and consumption
2. Identification of conversion pathways for biomass fuels for CHP plants and transport (qualitative data and technical, economic, LCA and area usage data)
    a. Identification of energy crops.
    b. Data for conversion technologies using energy crops and residual resources.
3. Future biomass resources and production potentials
    a. Danish biomass potentials. A list of potentials depending on the context – theoretical potential, technical potential, economic potential, ecological potential, social potential. A scenario for business-as-usual development in residual biomass resources and a scenario for increasing biomass output by a food production output neutral redistribution of crops are included (collaboration with WP5).
    b. Global biomass potentials

The transport scenarios section can be structured as listed in the following. Please note that all sections should include passenger transport and goods transport if possible.

1. Transport demands
    a. Actual 2010 transport demands
    b. Business-as-usual 2050 transport demands
2. Potentials for managing transport demands
    a. Experiences from case studies
    b. Elaboration of potential economic and technical incentives (collaboration with WP4)
3. Potentials for changes between modes of transport
    a. Experiences from case studies
    b. Elaboration of potential economic and technical incentives (collaboration with WP4)

4. Transport technologies (including all relevant up-stream technologies as well as economic, LCA and km/HA data)
    a. Present actual technologies used
    b. Possible technologies which could be used today
    c. Ideal future technologies which are under development
5. Construction of transport demand scenarios
    a. Transport demand scenarios (high and low 2050 scenarios)
    b. Scenario(s) for changes in modes of transport
6. Construction of technology scenarios for meeting transport demands
    a. Actual 2010 energy demands for transport
    b. Possible 2010 energy demands for transport
    c. 2050 energy demands for transport based on *possible* technologies
    d. 2050 energy demands for transport based on *ideal* technologies
    e. Recommendable scenario for 2050 based on possible and ideal technologies

The types of results expected

The residual biomass resources can cover the biomass demand in the low-demand wind scenario. The residual biomass resources and the outputs from food neutral redistribution of crops can cover the low-demand biomass scenario. In the high demand scenario both types of biomass resources are required, but these have to be supplemented by biomass from lower food production, less area for nature (biodiversity), imports or an acceptance of a lower efficiency because of extensive use of wind and electrolysers.

For transport the demands have been projected for all modes of passenger and goods transport until 2050. Simply meeting such demands with biomass in internal combustion engines reveals that the Danish farming area can not meet such demands, and that this would make it hard to meet other demands for biomass from CHP plants. It would be possible to cover such demands with pure electric technologies, because areas can be identified for significant amounts of offshore wind. However pure electric technologies are limited in range and the technology cannot meet demands in aviation. A recommendable transport scenario is presented, where electricity based technologies are used as much as possible. In this scenario the technical and economic limitations as well as infrastructure is taken into consideration. The scenario concludes that efforts on limiting the growth in transport demand is crucial, that changes in modes of transport for both passenger and goods transport is required, and that as much as possible should be based on pure electricity technology.

So far preliminary results have been presented on the biomass potential, conversion paths for biomass for transport taking into consideration area usage, transport demands and the connected energy demands, present and future transport technologies as well as transport energy demand scenarios.