Prioritizing cost-effective deployment of biofuels across transportation modes

TRB 90th Annual Meeting
Event 319: The “Green” and “Green” of Biofuels: Considering cost effectiveness and financial implications of biofuels alongside environmental benefit

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Overview of the study

- The use of biofuels in the UK is mandated by the Renewable Transport Fuels Obligation
- The European Commission has also introduced legislative targets for 2020 deployment of renewable energy in transportation (10% energy content and 6% reduction in GHG intensity)
- Need to understand the most cost effective ways of reaching these targets
- Beyond 2020, what are the most cost effective ways of deploying limited bioenergy resources in the transportation sector

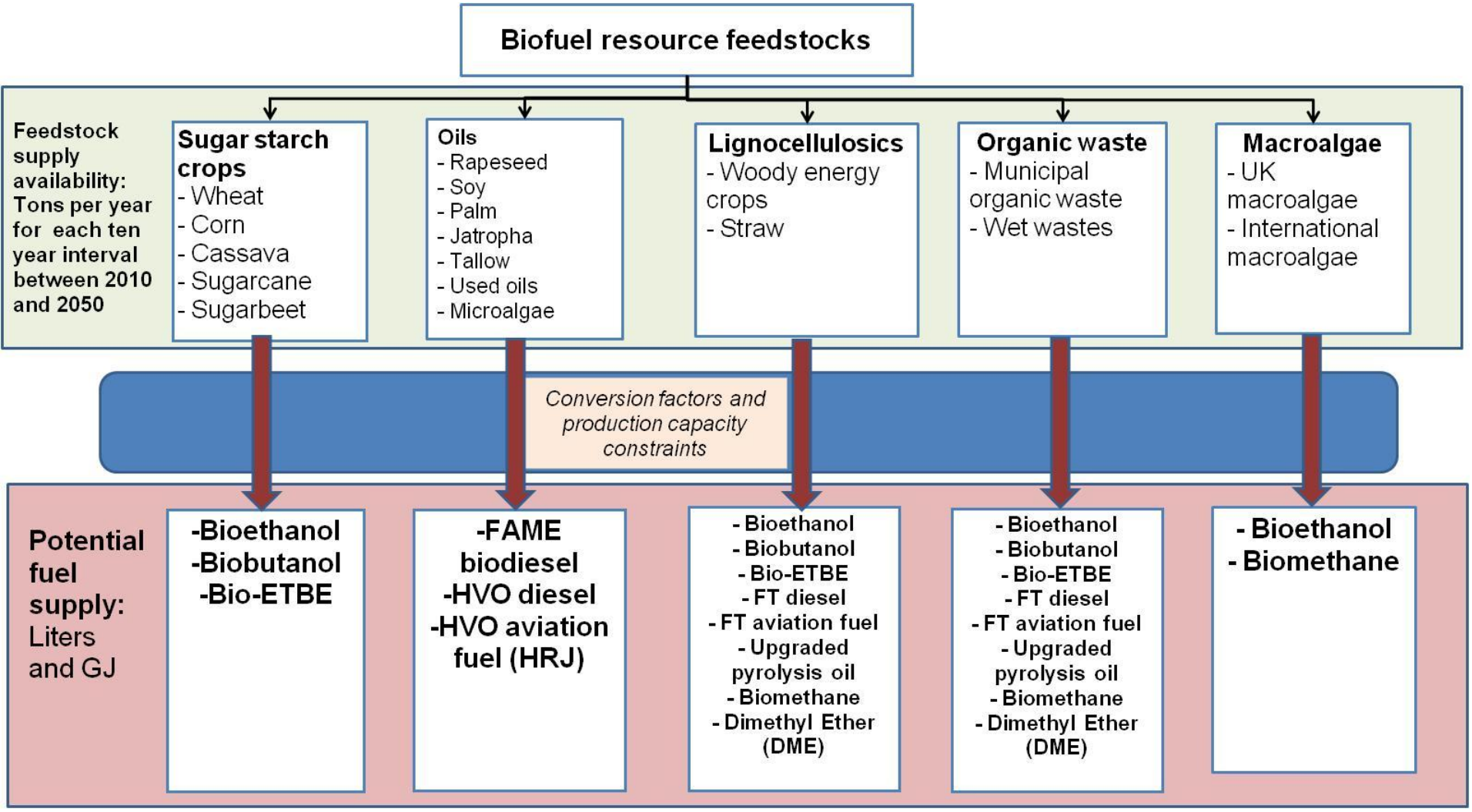
Aims

- Objective of the study was to develop a model capable of analyzing the cost effectiveness of different biofuels deployment scenarios
- Must cover time frame from 2010 to 2050
- Must include current and future feedstocks and fuels
- Must cover all modes of transportation (road, rail, shipping, aviation)
- Ability to model total costs, total emissions savings, and cost effectiveness (£/ton CO_2e saved and £/GJ bioenergy deployed)

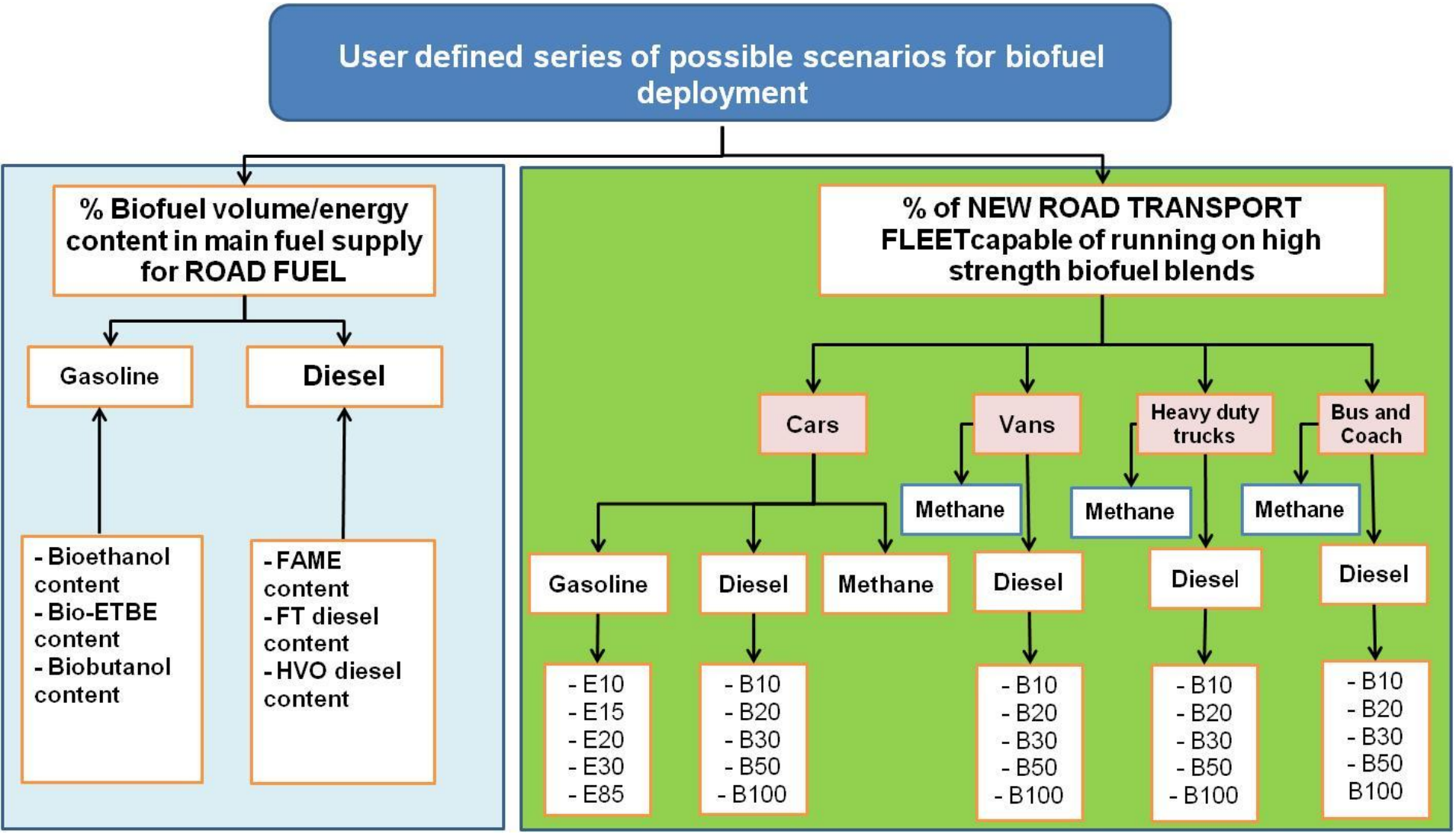
Overview of modeling framework

- In order to achieve these challenging aims, a new analytical model was developed
- Model consists of three primary modules
  - Fuel supply module
  - Fuel allocation model
  - Fuel deployment, vehicle stock and cost effectiveness module
- Builds on previous work AEA has carried out for the UK Government on global biomass future supply scenarios

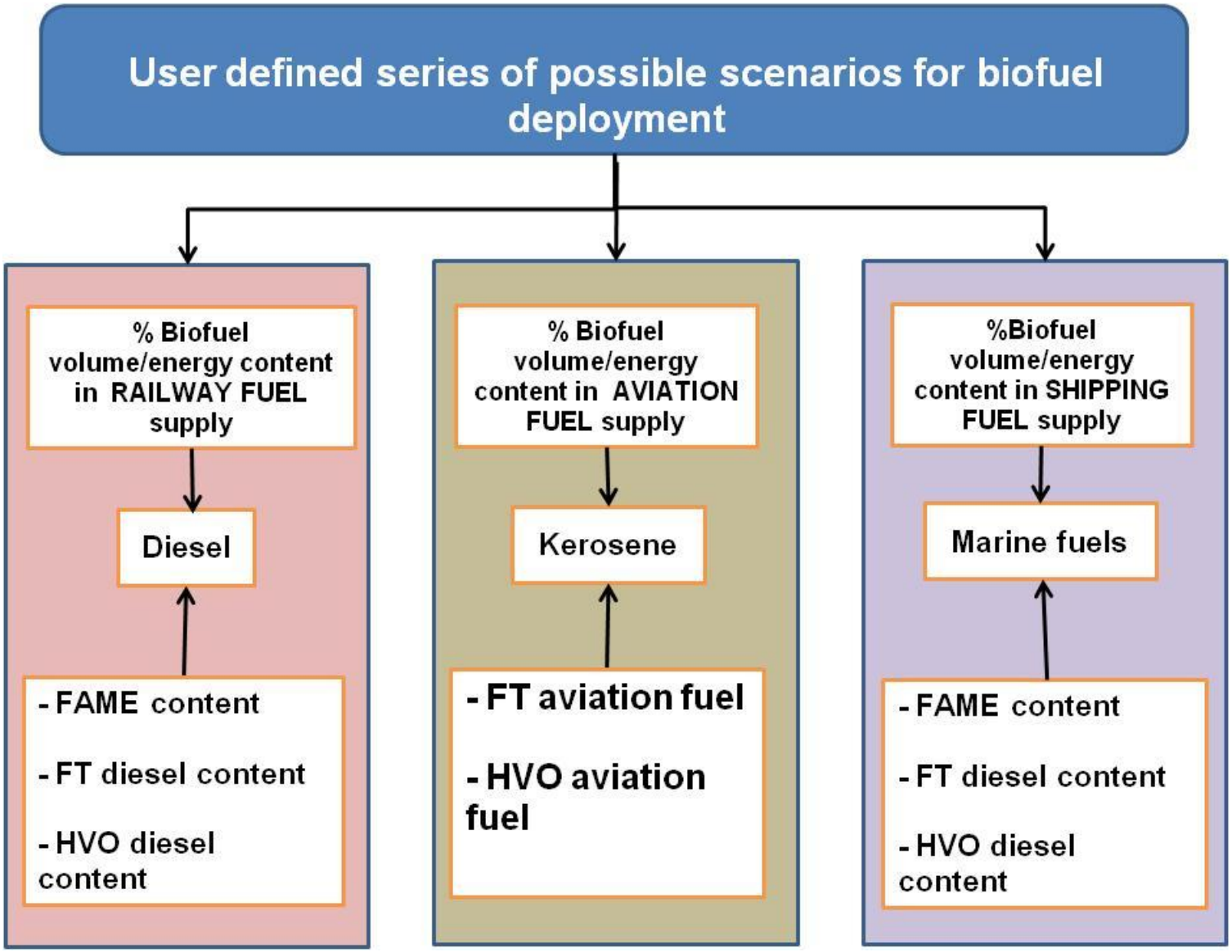
Biofuel supply module



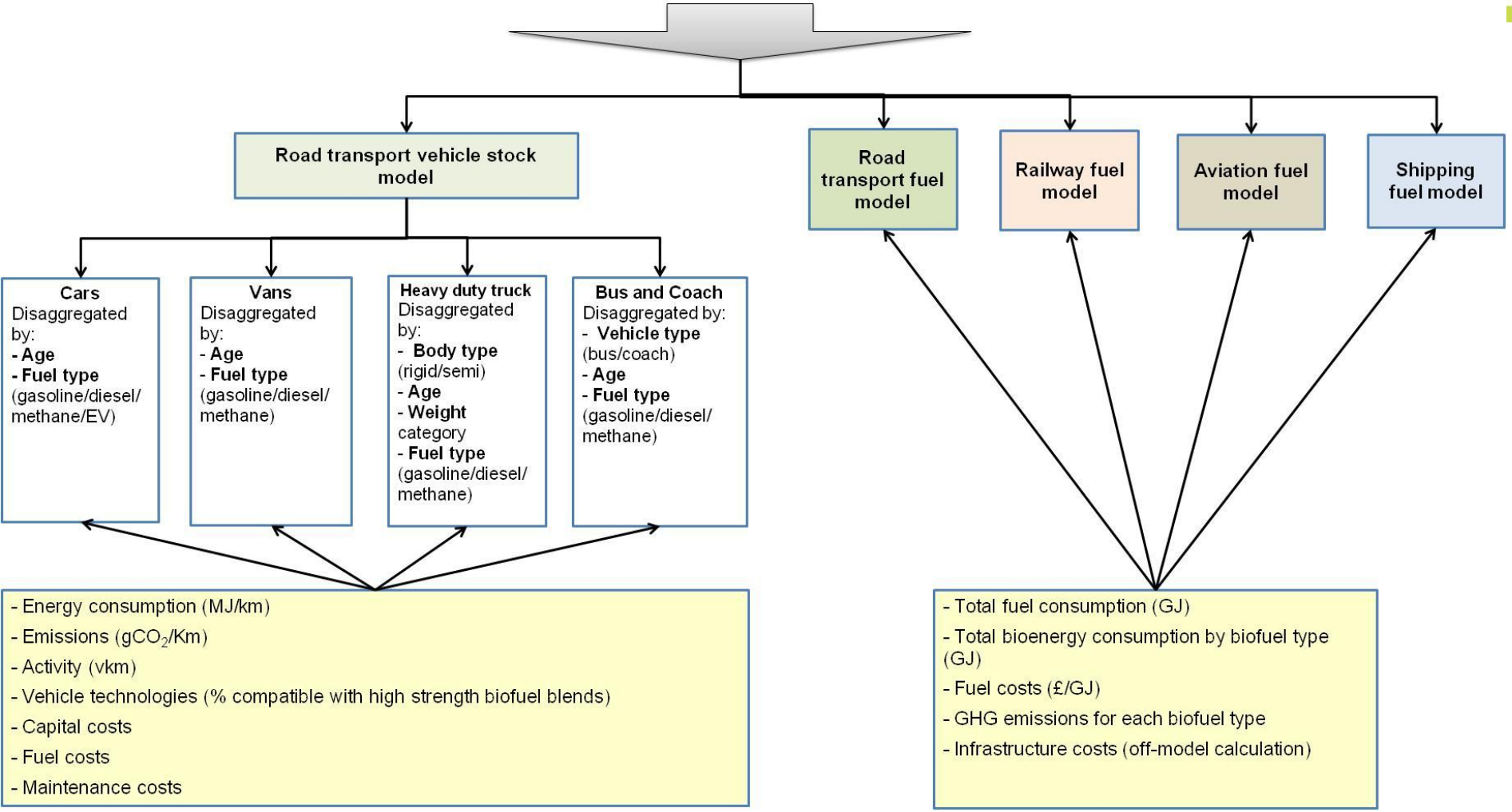
Biofuels allocation module – road transport



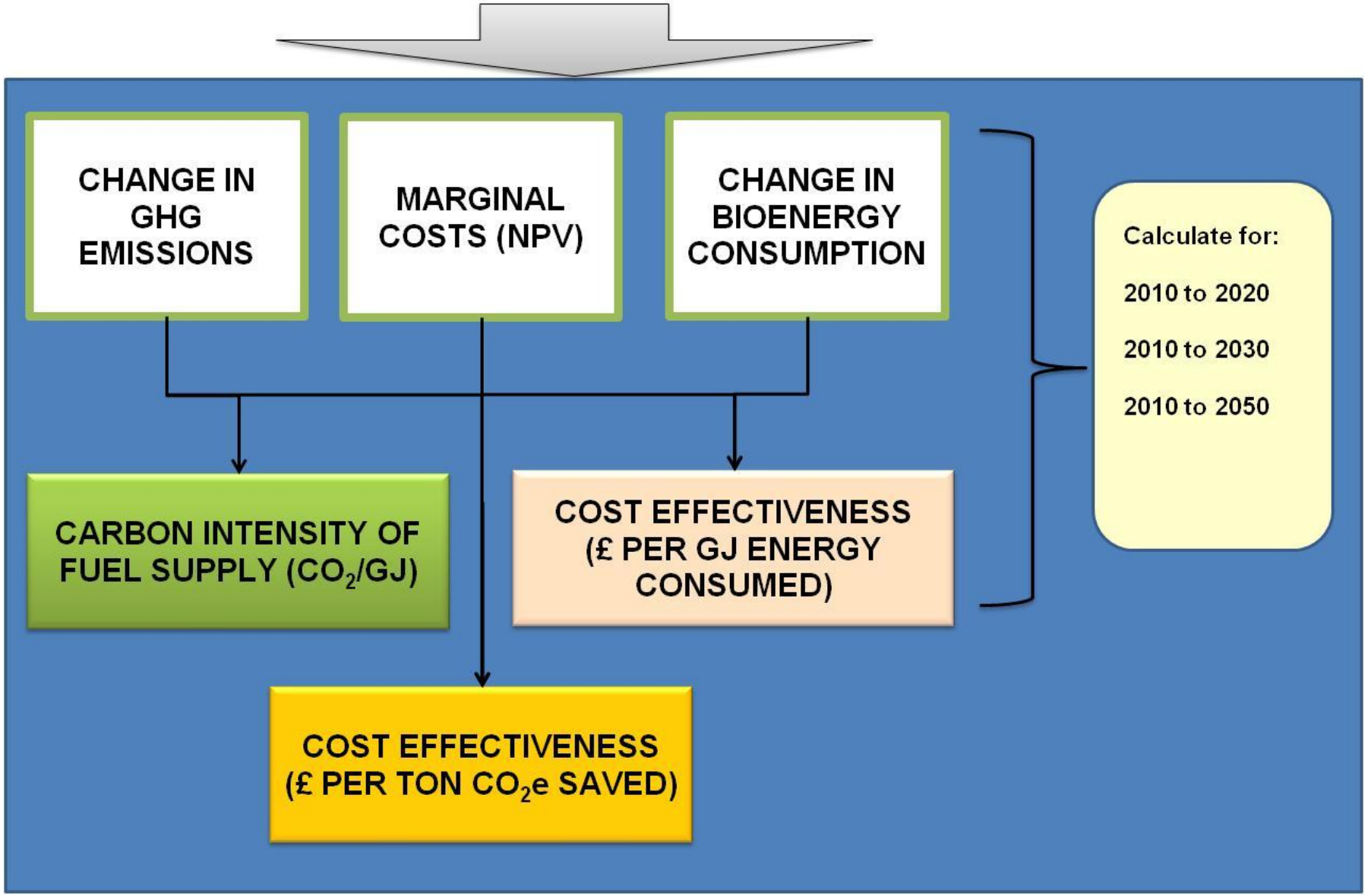
Biofuels allocation module – railway, aviation and shipping



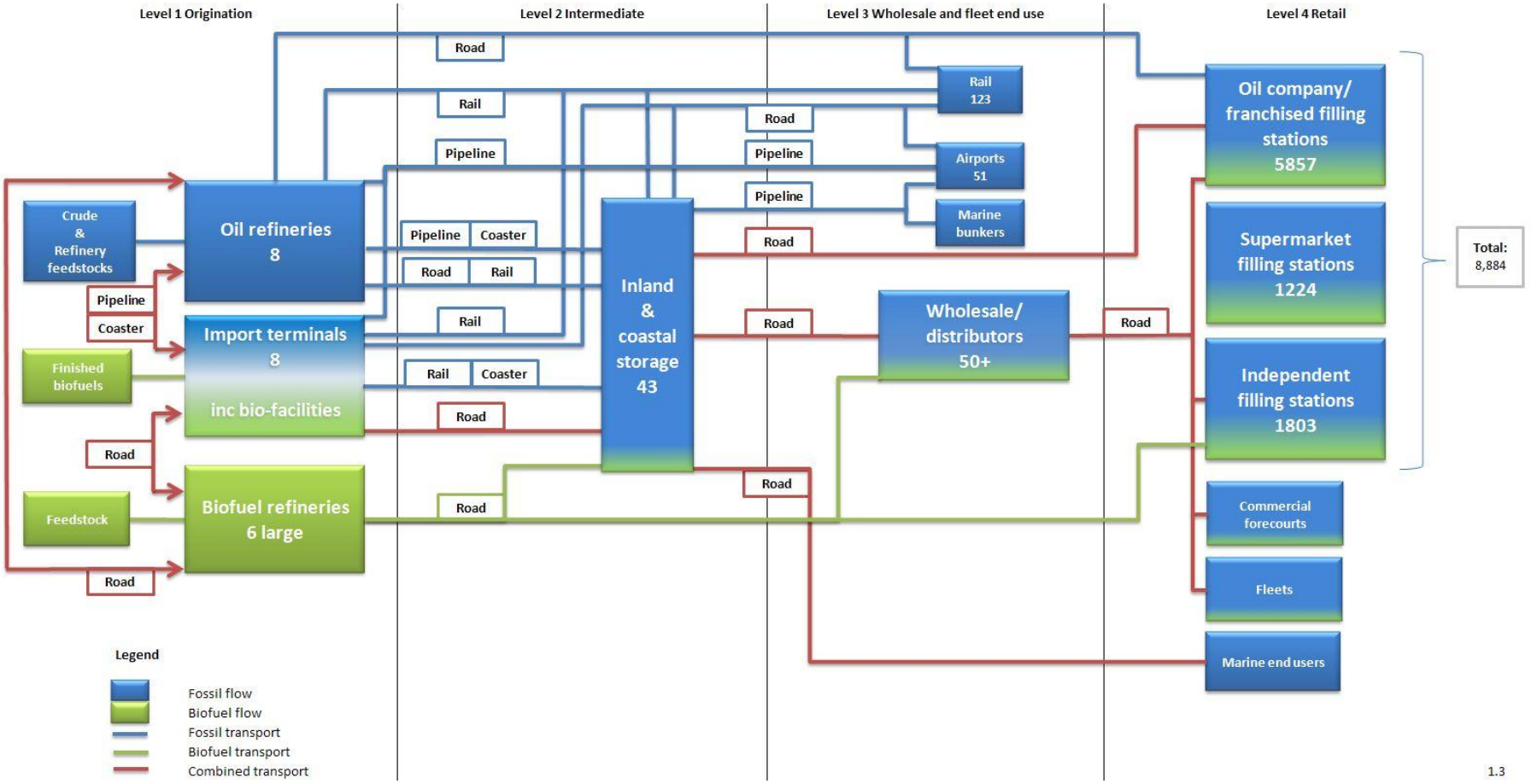
Deployment and cost effectiveness module



Model outputs



What about infrastructure costs?



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Interim findings from the study

- **Project not yet complete** so full findings not yet available
- However, initial findings indicate that:
  - There may be a shortage of **sustainable biodiesel** meaning that it could be difficult to meet 2020 targets for the deployment of biofuels
  - Costs of changes to fuel supply and distribution infrastructure needed to support the deployment of biofuels are **small relative to other costs** (fuel costs, vehicle costs, etc)
  - Deployment of advanced / second generation biofuels likely to be **limited by production capacity** rather than availability of feedstocks
  - Deployment of high strength blends in the road transport sector may require changes to the way in which aviation fuels are distributed

Next steps

- Once model is complete, we will analyze wide range of different deployment scenarios
- Analysis will be used to identify the most **cost effective** deployment scenarios across all modes of transport for 2020 and 2050
- Detailed analysis will be carried out to identify options for meeting 2020 targets for 10% deployment of bioenergy in the transportation sector and 6% reduction in the GHG intensity of transportation fuels

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