

Decision Support System for Biofuel Assessment and Selection

BioAS is a specialized Decision Support System aimed at helping decision-makers to make a desirable choice among different liquid and gaseous biofuels using multiple criteria. This system provides decision support in biofuel selection using the PROMETHEE II and ELECTRE III algorithms as its basis.

The biofuels and criteria are hierarchically organized using tree structures. A user is free to define the tree structures by adding/deleting/modifying biofuel groups, biofuels, criterion groups and criteria.

The initial template used in Multi-Criteria Analysis contains 6 liquid and gaseous biofuels for Combined Heat and Power (CHP) production and 44 technological, financial, socio-economic and environmental criteria.

The template supports the comparison of the following liquid biofuels used in CHP production:

- rape-seed vegetable oil
- rape-seed methyl ester (RME)
- flash pyrolysis oil

and the following processes using gaseous biofuels:

- slow pyrolysis (EDITTh process)
- waste methanization
- gasification from wood

Criteria

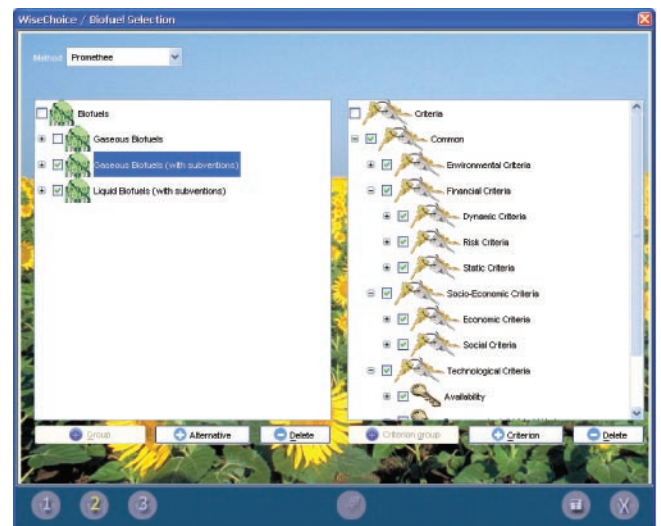
The technological criteria include: energy content, non-renewable energy consumed, availability, carbon residue, sulphur content, viscosity and density.

The financial criteria are grouped into static, dynamic and risk criteria. Static criteria include standard financial and efficiency criteria: levelized cost of biofuel, net profit plus interest to investment, long-term debt to net worth, net cash flow to total sales, etc.

Dynamic criteria are: net present value (NPV), internal rate of return (IRR), normal and dynamic payback period, etc.

Some statistical indicators are used as risk measure: mean values for NPV and IRR, standard deviations, intervals of variation, zero risk equivalent, etc.

The socio-economic criteria include quality of life, avoided rural depopulation, rural diversification and land management, economic gain, incomes, economic activity, related industry support, employment generated.



The environmental criteria are represented by emissions of: CO₂, CO, HC, NO_x, particulates and SO₂.

All input data and results of each biofuel selection session can be exported to MS Excel and stored.

Technical information

BioAS is implemented using Java programming language, Java 2 Platform, Enterprise Edition (J2EE) and three-tier architecture. In its development and implementation, Open Source database, Integrated Development Environment (IDE) and Application Server are used.