

Snapshot of - VESPA

Archive of VESPA, version: 1.0

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Reference card - VESPA

The reference card is a clearly defined description of model features. The numerous options have been organized into a limited amount of default and model specific (non default) options. In addition some features are described by a short clarifying text.

Legend:

not implemented

implemented

implemented (not default option)

About

Name and version VESPA 1.0

| | |
|----------------------|---|
| Model link | https://www.ewaluacja.gov.pl/media/83313/ENG_Bukowski_Maciej.pdf |
| Institution | Wise-Europa (Wise-Europa), Poland, https://wise-europa.eu/en/ . |
| Documentation | VESPA documentation is limited and consists of a reference card |
| Process state | published |

Model scope and methods

| | | |
|---------------------------|--|---|
| Model type | <input type="checkbox"/> Integrated assessment model <input type="checkbox"/> Energy system model | <input checked="" type="checkbox"/> CGE <input type="checkbox"/> CBA-integrated assessment model |
| Geographical scope | <input type="checkbox"/> Global | <input checked="" type="checkbox"/> Regional |
| Objective | Policy impact analysis | |
| Solution concept | <input type="checkbox"/> Partial equilibrium (price elastic demand) <input type="checkbox"/> Partial equilibrium (fixed | demand) <input checked="" type="checkbox"/> General equilibrium (closed economy) |
| Solution horizon | <input type="checkbox"/> Recursive dynamic (myopic) | <input checked="" type="checkbox"/> Intertemporal optimization (foresight) |
| Solution method | <input type="checkbox"/> Simulation <input type="checkbox"/> Optimization | <input checked="" type="checkbox"/> Steady state path (dynamic recursive) plus perturbation around state state (short term dynamics) |
| Temporal dimension | Base year:2010, time steps:annual, horizon: 2070 | |
| Spatial dimension | Number of regions: | |

Note: Country plus its regions (NUTS2 level)

| | | |
|------------------------------|--|---|
| Time discounting type | <input type="checkbox"/> Discount rate exogenous | <input checked="" type="checkbox"/> Discount rate endogenous |
|------------------------------|--|---|

Policies

- | | |
|---|--|
| <input checked="" type="checkbox"/> Emission tax | <input type="checkbox"/> Capacity targets |
| <input checked="" type="checkbox"/> Emission pricing | <input type="checkbox"/> Emission standards |
| <input checked="" type="checkbox"/> Cap and trade | <input checked="" type="checkbox"/> Energy efficiency standards |
| <input checked="" type="checkbox"/> Fuel taxes | <input type="checkbox"/> Agricultural producer subsidies |
| <input checked="" type="checkbox"/> Fuel subsidies | <input type="checkbox"/> Agricultural consumer subsidies |
| <input checked="" type="checkbox"/> Feed-in-tariff | <input type="checkbox"/> Land protection |
| <input type="checkbox"/> Portfolio standard | <input type="checkbox"/> Pricing carbon stocks |

Socio-economic drivers

- | | | |
|--|--|---|
| Population | <input checked="" type="checkbox"/> Yes (exogenous) | <input type="checkbox"/> Yes (endogenous) |
| Population age structure | <input checked="" type="checkbox"/> Yes (exogenous) | <input type="checkbox"/> Yes (endogenous) |
| Education level | <input checked="" type="checkbox"/> Yes (exogenous) | <input type="checkbox"/> Yes (endogenous) |
| Urbanization rate | <input type="checkbox"/> Yes (exogenous) | <input type="checkbox"/> Yes (endogenous) |
| GDP | <input type="checkbox"/> Yes (exogenous) | <input checked="" type="checkbox"/> Yes (endogenous) |
| Income distribution | <input type="checkbox"/> Yes (exogenous) | <input type="checkbox"/> Yes (endogenous) |
| Employment rate | <input type="checkbox"/> Yes (exogenous) | <input checked="" type="checkbox"/> Yes (endogenous) |
| Labor productivity | <input type="checkbox"/> Yes (exogenous) | <input checked="" type="checkbox"/> Yes (endogenous) |
| Total factor productivity | <input type="checkbox"/> Yes (exogenous) | <input checked="" type="checkbox"/> Yes (endogenous) |
| Autonomous energy efficiency improvements | <input type="checkbox"/> Yes (exogenous) | <input checked="" type="checkbox"/> Yes (endogenous) |

Macro-economy

Economic sector

- | | | |
|-----------------------------------|---|--|
| Industry | <input type="checkbox"/> Yes (physical) | <input type="checkbox"/> Yes (physical & economic) |
| | <input checked="" type="checkbox"/> Yes (economic) | |
| Energy | <input type="checkbox"/> Yes (physical) | <input type="checkbox"/> Yes (physical & economic) |
| | <input checked="" type="checkbox"/> Yes (economic) | |
| Transportation | <input type="checkbox"/> Yes (physical) | <input type="checkbox"/> Yes (physical & economic) |
| | <input checked="" type="checkbox"/> Yes (economic) | |
| Residential and commercial | <input type="checkbox"/> Yes (physical) | <input type="checkbox"/> Yes (physical & economic) |
| | <input checked="" type="checkbox"/> Yes (economic) | |
| Agriculture | <input type="checkbox"/> Yes (physical) | <input type="checkbox"/> Yes (physical & economic) |
| | <input checked="" type="checkbox"/> Yes (economic) | |
| Forestry | <input type="checkbox"/> Yes (physical) | <input type="checkbox"/> Yes (physical & economic) |
| | <input type="checkbox"/> Yes (economic) | |

Macro-economy

- | | | |
|--|--|--|
| Trade | <input checked="" type="checkbox"/> Coal | <input type="checkbox"/> Bioenergy crops |
| | <input checked="" type="checkbox"/> Oil | <input checked="" type="checkbox"/> Food crops |
| | <input checked="" type="checkbox"/> Gas | <input checked="" type="checkbox"/> Capital |
| | <input type="checkbox"/> Uranium | <input checked="" type="checkbox"/> Emissions permits |
| | <input checked="" type="checkbox"/> Electricity | <input checked="" type="checkbox"/> Non-energy goods |
| Cost measures | <input checked="" type="checkbox"/> GDP loss | <input type="checkbox"/> Area under MAC |
| | <input checked="" type="checkbox"/> Welfare loss | <input type="checkbox"/> Energy system cost mark-up |
| | <input checked="" type="checkbox"/> Consumption loss | |
| Categorization by group | <input type="checkbox"/> Income | <input type="checkbox"/> Gender |
| | <input type="checkbox"/> Urban - rural | <input type="checkbox"/> Education level |
| | <input type="checkbox"/> Technology adoption | <input type="checkbox"/> Household size |
| | <input type="checkbox"/> Age | |
| Institutional and political factors | <input type="checkbox"/> Early retirement of capital allowed | <input checked="" type="checkbox"/> Technology costs differentiated by country/region |
| | <input checked="" type="checkbox"/> Interest rates differentiated by country/region | <input checked="" type="checkbox"/> Technological change differentiated by country/region |
| | <input checked="" type="checkbox"/> Regional risk factors included | <input type="checkbox"/> Behavioural change differentiated by country/region |

Constraints on cross**country financial transfers****Resource use**

| | | |
|---------------------------|---|--|
| Coal | <input checked="" type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Conventional Oil | <input checked="" type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Unconventional Oil | <input type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Conventional Gas | <input checked="" type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Unconventional Gas | <input type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Uranium | <input checked="" type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Bioenergy | <input type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Water | <input type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Raw Materials | <input checked="" type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |
| Land | <input type="checkbox"/> Yes (fixed) <input type="checkbox"/> Yes (supply curve) | <input type="checkbox"/> Yes (process model) |

Technological change

| | | |
|---------------------------------------|---|--|
| Energy conversion technologies | <input type="checkbox"/> No technological change <input type="checkbox"/> Exogenous technological change | change <input checked="" type="checkbox"/> Endogenous technological change |
| Energy End-use | <input type="checkbox"/> No technological change <input type="checkbox"/> Exogenous technological change <input type="checkbox"/> No technological change | change <input checked="" type="checkbox"/> Endogenous technological change |

Material Use

Exogenous technological change

Endogenous technological change

Agriculture (tc)

No technological change

change

Exogenous technological

Endogenous technological change

Energy

Energy technology substitution

Energy technology choice

No discrete technology choices

Linear choice (lowest cost)

Logit choice model

Lowest cost with adjustment penalties

Production function

Nested CES function

Energy technology substitutability

Mostly high substitutability

Mixed high and low substitutability

Mostly low substitutability

Energy technology deployment

Expansion and decline constraints

System integration constraints

Energy

Electricity technologies

Coal w/o CCS

Solar power

Coal w/ CCS

Solar power-central PV

Gas w/o CCS

Solar power-distributed PV

Gas w/ CCS

Solar power-CSP

Oil w/o CCS

Wind power

Oil w/ CCS

Wind power-onshore

Bioenergy w/o CCS

Wind power-offshore

Bioenergy w/ CCS

Hydroelectric power

Geothermal power

Ocean power

Nuclear power

Hydrogen production

Coal to hydrogen w/o CCS

Natural gas to hydrogen w/o CCS

Coal to hydrogen w/ CCS

- Natural gas to hydrogen w/ CCS
- Oil to hydrogen w/o CCS
- Oil to hydrogen w/ CCS
- Biomass to hydrogen w/o CCS

- Biomass to hydrogen w/ CCS
- Nuclear thermochemical hydrogen
- Solar thermochemical hydrogen
- Electrolysis

Refined liquids

- Coal to liquids w/o CCS
- Coal to liquids w/ CCS
- Gas to liquids w/o CCS
- Gas to liquids w/ CCS
- Bioliquids w/o CCS
- Bioliquids w/ CCS
- Oil refining

Refined gases

- Coal to gas w/o CCS
- Coal to gas w/ CCS
- Oil to gas w/o CCS
- Oil to gas w/ CCS
- Biomass to gas w/o CCS
- Biomass to gas w/ CCS

Heat generation

- Coal heat**
- Natural gas heat**
- Oil heat
- Biomass heat
- Geothermal heat
- Solarthermal heat
- CHP (coupled heat and power)

Grid Infra Structure**Electricity**

- Yes (aggregate)
- Yes (spatially explicit)

Gas

- Yes (aggregate)
- Yes (spatially explicit)

Heat

- Yes (aggregate)
- Yes (spatially explicit)

CO2

- Yes (aggregate)
- Yes (spatially explicit)

Hydrogen

- Yes (aggregate)
- Yes (spatially explicit)

Energy end-use technologies**Passenger transportation**

- Passenger trains
- Buses
- Light Duty Vehicles (LDVs)
- Electric LDVs
- Hydrogen LDVs
- Hybrid LDVs
- Gasoline LDVs
- Diesel LDVs
- Passenger aircrafts
- Aggregate transport technologies that correspond to fuel consumption**

Freight transportation

- Freight trains
- Heavy duty vehicles
- Freight aircrafts

- Freight ships

Aggregate transport technologies that correspond to fuel consumption

Industry

- Steel production**
- Aluminium production
- Cement production**
- Petrochemical production**

- Paper production
- Plastics production
- Pulp production

Residential and commercial

- Space heating**
- Space cooling
- Cooking

- Refrigeration
- Washing
- Lighting

Land-use

Land cover

- Cropland
- Cropland irrigated
- Cropland food crops
- Cropland feed crops
- Cropland energy crops
- Forest

- Managed forest
- Natural forest
- Pasture
- Shrubland
- Built-up area

Agriculture and forestry demands

- Agriculture food
- Agriculture food crops
- Agriculture food livestock
- Agriculture feed
- Agriculture feed crops
- Agriculture feed livestock
- Agriculture non-food

- Agriculture non-food crops
- Agriculture non-food livestock
- Agriculture bioenergy
- Agriculture residues
- Forest industrial roundwood
- Forest fuelwood
- Forest residues

Agricultural commodities

- Wheat
- Rice
- Other coarse grains
- Oilseeds

- Sugar crops
- Ruminant meat
- Non-ruminant meat and eggs
- Dairy products

Emission, climate and impacts

Greenhouse gases

- CO2 fossil fuels**
- CO2 cement**
- CO2 land use**
- CH4 energy

- CH4 land use
- CH4 other
- N2O energy
- N2O land use

- N2O other
- CFCs
- HFCs

- SF6
- PFCs

Pollutants

- CO energy
- CO land use
- CO other
- NOx energy
- NOx land use
- NOx other
- VOC energy
- VOC land use
- VOC other
- SO2 energy
- SO2 land use
- SO2 other
- BC energy
- BC land use
- BC other
- OC energy
- OC land use
- OC other
- NH3 energy
- NH3 land use
- NH3 other

Climate indicators

- Concentration: CO2
- Concentration: CH4
- Concentration: N2O
- Concentration: Kyoto gases
- Radiative forcing: CO2
- Radiative forcing: CH4
- Radiative forcing: N2O
- Radiative forcing: F-gases
- Radiative forcing: Kyoto gases
- Radiative forcing: aerosols
- Radiative forcing: land albedo
- Radiative forcing: AN3A
- Radiative forcing: total
- Temperature change**
- Sea level rise
- Ocean acidification

Carbon dioxide removal

- Bioenergy with CCS
- Reforestation
- Afforestation
- Soil carbon enhancement
- Direct air capture
- Enhanced weathering

Climate change impacts

- Agriculture**
- Energy supply
- Energy demand**
- Economic output**
- Built capital**
- Inequality

Co-Linkages

- Energy security: Fossil fuel imports & exports (region)
- Energy access: Household energy consumption
- Air pollution & health: Source-based aerosol emissions
- Air pollution & health: Health impacts of air Pollution
- Food access
- Water availability
- Biodiversity

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