Työ- ja elinkeinoministeriö
Arbets- och näringsministeriet

19.6.2017

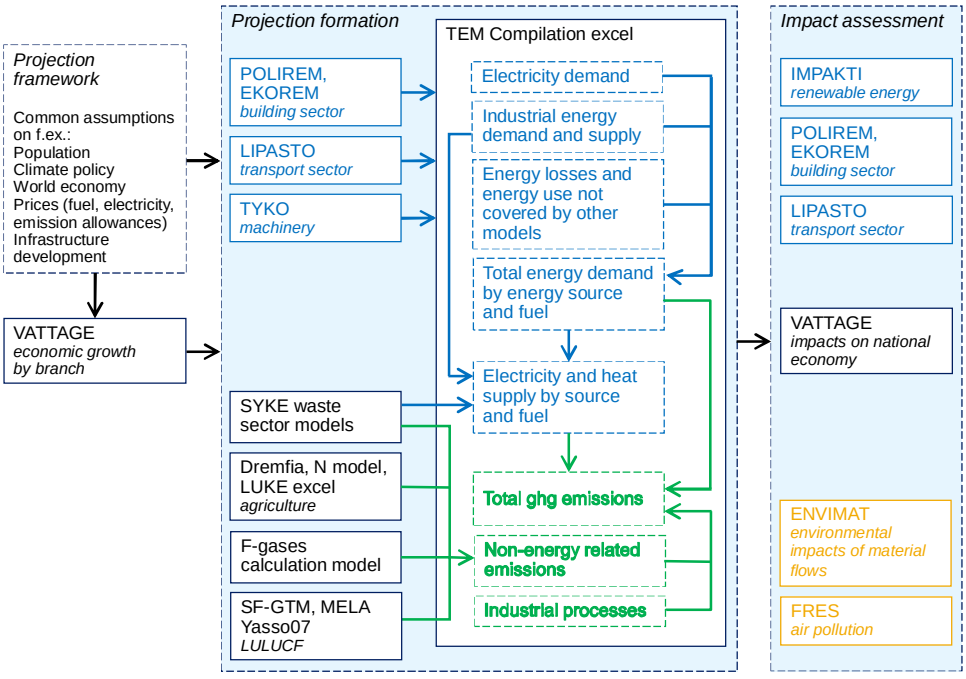
MALLIT ENERGIA- JA ILMASTOPOLITIIKAN SKENAARIOIDEN LAADINNASSA

Energia- ja ilmastopolitiikan skenaarioita valmisteltaessa kukin sektoriministeriö vastaa oman sektorinsa arvioinneista. Jotta sektoritarkastelut olisivat yhteneväiset ja kuvaisivat samaa kehityskulkua, ministeriöt tekevät tiivistä yhteistyötä.

Energia- ja ilmastostrategian skenaarioiden valmistelua varten on toiminnassa virkamiesten skenaario-jaos. Skenaariojaos valmistelee yleisen skenaariokehikon, johon on koottu skenaarioiden lähtökohdat. Skenaariokehikossa kuvataan tärkeimmät tulevaisuutta määrittelevät tekijät kuten väestökasvu, talouden kehitys, energiahintojen kehitys jne.

Kukin ministeriö arvioi itse oman sektorinsa kehityksen ja/tai teettää asiantuntijalaitoksilla sektoria koskevat tarvittavat selvitykset. Työ- ja elinkeinoministeriö koordinoi valmistelutyön ja kokoaa tiedot yhteen. Ministeriöiden välinen työnjako ja skenaarioiden laadinta kuvataan yksityiskohtaisemmin osoitteessa http://tem.fi/energia-ja-ilmastopolitiikan-skenaarioiden-valmistelu

Sektorikohtaiset laskelmat, skenaariotulokset ja politiikkatoimien vaikutusarvioinnit perustuvat pääsääntöisesti asiantuntijalaitosten laskelmiin ja malleihin. Skenaarion laadinnassa käytettävistä menetelmistä ja malleista on esitetty lyhyet kuvaukset YK:n ilmastosopimukselle toimitetun Suomen kuudennen maaraportin luvussa 5.8. Kaaviossa alla on periaatekuva skenaarioiden laadinnasta ja mallien välisistä kytköksistä. Keskeisimmät mallit kuvataan lyhyesti myös seuraavilla sivuilla olevissa taulukoissa (englanniksi).



Kuva 1. Periaatekuva skenaarioiden laadinnasta ja mallien välisistä kytköksistä.

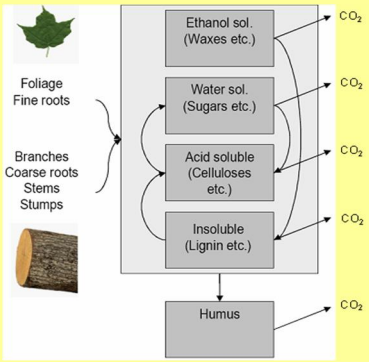
Model name	TEM compilation excel
Full model name	No name
Model version and status	Continuously developing
Latest date of revision	2017
URL to model description	No
Model type	Excel
Model description	File with large number of sheets for calculating total emissions and energy use from sectoral data and converting it into reporting format
Summary	
Intended field of application	Scenario studies, reporting
Description of main input data categories and data sources	Main input data: Sectoral emission and energy data. Data source: sectoral models, statistics, various studies
Validation and evaluation	No
Output quantities	Main output: energy consumption and production by fuel type, energy indicators, ghg-emissions
GHG covered	CO2, CH4, N2O, F-gases
Sectoral coverage	Overview of ghg emissions from all sectors, energy sector more detailed
Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	Annual data, 1990-2035
Interface with other models	No
Input from other models	Sectoral emission and energy data
Model structure(if diagram please add to the template)	

Model name	REMA
Full model name	REMA building stock energy model
Model version and status	1
Latest date of revision	2011
URL to model description	https://dx.doi.org/10.1016/j.buildenv.2014.02.001
Model type	Bottom-up building stock energy model
Model description	REMA is an archetypal engineering model of energy use in the building stock in the bottom-up type that includes a simplified model of energy production.
Summary	REMA is a bottom-up model that uses representative building types (archetypes) for estimating energy consumption in different segments of the building stock. Future developments are estimated using annual rates of new construction, renovations and removals from the building stock. REMA has been used to calculate the development of energy use in the building under various policy changes under consideration. REMA also includes a simplified model of the energy sector allowing CO2 emission calculations.
Intended field of application	Energy modelling, scenario studies, policy analysis
Description of main input data categories and data sources	Main inputs: building stock data, energetic properties of buildings, composition of energy production. Sources: statistics, previous studies.
Validation and evaluation	Comparison with other estimates & statistics as presented in: Pekka Tuominen, Riikka Holopainen, Lari Eskola, Juha Jokisalo, Miimu Airaksinen 2014: Calculation method and tool for assessing energy con-sumption in the building stock. Building and Environment 75, pp. 153-160.
Output quantities	Main outputs: time series of energy consumption including a breakdown to fuel/electricity/district heat, and CO2 emissions
GHG covered	CO2
Sectoral coverage	Building stock
Geographical coverage	Finland (with possibility to adapt to other countries)
Temporal coverage,(e.g. time steps, time span)	Time step: one year, time span: user defined, 40 years default
Interface with other models	No direct interface. Dynamic energy modelling of buildings has been used for input data. Outputs have been used as inputs for economic modelling.
Input from other models	Dynamic energy modelling of buildings has been used for input data.
Model structure(if diagram please add to the template)	Buildings categorized to detached houses, apartment buildings, commercial buildings and holiday homes as well as according to age.

Model name	N model
Full model name	N model
Model version and status	N model
Latest date of revision	1.1.2016
URL to model description	http://hdl.handle.net/10138/38030
Model type	Excel
Model description	Calculates ammonia- and N2O emissions for agriculture.
Summary	The N model includes emissions from livestock by animal category and manure management stage, and emissions from mineral fertilizers.
Intended field of application	Reporting to the UNFCCC and UNECE CLRTAP
Description of main input data categories and data sources	Animal numbers, N excretionfertilizer N, manure management practices from agricultural statistics
Validation and evaluation	project in 2006-2008
Output quantities	tonnes NH3 and N2O
GHG covered	N2O
Sectoral coverage	Agriculture
Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	annual
Interface with other models	no
Input from other models	Agricultural sector model Dremfia has been used as data source for the scenarios
Model structure(if diagram please add to the template)	The model for the calculation of ammonia and N2O emissions from Finnish agriculture is composed on an Excel spreadsheet. The animal categories are dairy cows, suckler cows, heifers, bulls, calves (<1 yr), sows (with piglets), fattening pigs (>50 kg), boars, weaned pigs (20–50 kg), laying hens, broilers, chickens, cockerels, broiler hens, turkeys, other poultry, sheep with lambs, goats with gilts, horses, ponies, minks and fitches, foxes and raccoons, and reindeer. The manure management systems considered are slurry, deep litter, solid manure (farmyard manure: urine+dung+litter), urine (dung stored separately) and dung (urine stored separately). Emissions from grazing were calculated in a separate module. The model calculates emissions from manure separately for each animal category and, within each animal category, separately for each manure management system. The calculation is based on the mass flow approach, where the starting point is the amount of excreted nitrogen calculated from animal numbers and animal specific nitrogen excretion rates. The fate of the excreted nitrogen is then followed during the manure management chain. Ammonia and nitrous oxide emissions into the atmosphere are calculated in each phase of the chain. Adding up the phase specific emissions gives the total emissions. Animal specific ammonia emission factors are calculated by dividing the total emission of an animal category by the number of animals in the category. The model enables calculating not only present and past emissions but also emission estimates for the future. Emissions for the past years are calculated based on existing statistics and other information available for those years. Emission projections are mainly based on the assumed development of animal numbers in Finland while other factors like manure management systems and manure nitrogen content are assumed to be somewhat the same as in previous years.

Model name	Excel sheets with no name
Full model name	No name
Model version and status	2016
Latest date of revision	2016
URL to model description	http://tilastokeskus.fi/tup/khkinv/khkaasut_raportointi_en.html
Model type	Excel
Model description	Different files where CH4, N2O and CO2 emissions from agriculture are calculated
Summary	The calculation is done according to the IPCC guidelines
Intended field of application	Agricultural emission reporting under the UNFCCC
Description of main input data categories and data sources	Animal numbers, animal characteristics, land areas based on agricultural statistics and forest inventory
Validation and evaluation	see NIR, http://tilastokeskus.fi/tup/khkinv/khkaasut_raportointi_en.html
Output quantities	Gg
GHG covered	CH4, N2O and CO2
Sectoral coverage	Agriculture, LULUCF
Geographical coverage	Finland

Temporal coverage,(e.g. time steps, time span)	Annual
Interface with other models	NO
Input from other models	Dremfia sector model, N model
Model structure(if diagram please add to the template)	see NIR, http://tilastokeskus.fi/tup/khkinv/khkaasut_raportointi_en.html

Model name	Yasso07
Full model name	Yasso07
Model version and status	Yasso07
Latest date of revision	2007
URL to model description	http://en.ilmatieteenlaitos.fi/yasso
Model type	Process model
Model description	Yasso07 is a dynamic soil carbon model developed from the earlier Yasso model (Liski et al. 2005). It is based on three assumptions of litter decomposition: (1) Non-woody litter consists of four compound groups, i.e. compounds soluble in a non-polar solvent, ethanol or dichloromethane (denoted using E), or in water (W), and compounds hydrolysable in acid (A) and neither soluble nor hydrolyzable at all (N). Each group has its own mass loss rate independent of the origin of the litter. (2) The mass loss rates of the compound groups depend on the climatic conditions that can be described simply by using temperature and precipitation. (3) Decomposition of the compound groups results in mass loss from the system and in mass flows between the compound groups. In addition, the mass loss of the four compound groups results in formation of more recalcitrant humus (H) (Tuomi et al. 2009). Coarse woody litter decomposition depends on its chemical quality (EWAN), but also on its physical size (diameter) (Tuomi et al. 2010).
Summary	Yasso07 is used for simulating results for C stock change factors in the UNFCCC reporting
Intended field of application	Mineral soil C stock changes in Forest land and Cropland
Description of main input data categories and data sources	Crop residues, litter input from living trees, harvest and deadwood (MELA) climate (Finnish meteorological institute)
Validation and evaluation	Several projects see e.g. 1) Heikkinen J., Kurganova I., Lopes de Gerenyu V., Palosuo T. and Regina K. (2014) Changes in soil carbon stock after cropland conversion to grassland in Russian temperate zone: measurements vs. model simulations. Nutr. Cycl. Agroecosyst. DOI 10.1007/s10705-014-9599-8 2) Karhu K., Wall A., Vanhala P., Liski J., Esala M. and Regina K. (2011) Effects of afforestation and deforestation on boreal soil carbon stocks – comparison of measured C stocks with Yasso07 model results. Geoderma 164: 33-45. 3) Rantakari, M., Lehtonen, A., Linkosalo, T., Tuomi, M., Tamminen, P., Heikkinen, J., Liski, J., Mäkipää, R., Ilvesniemi, H. & Sievänen, R. 2012. The Yasso07 soil carbon model - Testing against repeated soil carbon inventory. Forest Ecology and Management 286: 137-147. 4) Ortiz, C., Liski, J., Gärdenäs, A., Lehtonen, A., Lundblad, M., Stendahl, J., Ågren, G. & Karltun, E. 2013.Soil organic carbon stock changes in Swedish forest soils—A comparison of uncertainties and their sources through a national inventory and two simulation models. Ecological Modelling 251:221-231. doi:10.1016/j.ecolmodel.2012.12.017
Output quantities	kt C
GHG covered	CO2
Sectoral coverage	LULUCF
Geographical coverage	global (Cropland), scandinavia (Forest land)
Temporal coverage,(e.g. time steps, time span)	annual or more frequent
Interface with other models	no
Input from other models	climate models, MELA (Forest land)
Model structure(if diagram please add to the template)	

Model name	MELA
Full model name	MELA2012
Model version and status	MELA Version 2012
Latest date of revision	Latest MELA Version 2012 is released 27 November 2012
URL to model description	http://mela2.metla.fi/mela/index-en.html
Model type	Program package including several models
Model description	MELA program consists of two parts: (1) an automated stand simulator based on individual trees and (2) the optimization package based on linear programming, JLP (Lappi 1992). MELA simulates automatically a finite number of alternative management schedules for the management units according to the given simulation instructions. Management schedules differ, for example, in timing or in magnitude of activities. LP is applied to select among the simulated management schedules both an optimal production programme for the whole forest area and corresponding management schedules for the individual management units according to the goals and restrictions defined by the user
Summary	MELA is a forestry model and an operational decision support system for solving such problems as (1) what are the production potentials of forests, and (2) how to manage forest stands in order to achieve the overall goals for forestry.
Intended field of application	Future development of forest resources and timber availability
Description of main input data categories and data sources	National forest inventory sample plot and tree data (initial state), Demand of domestic roundwood derived from roundwood consumption by the forest industries (Pöyry Management Consulting. 2016. Suomen metsäteollisuus 2015–2035. Loppuraportti X304203 19.1.2016. Available: https://www.tem.fi/files/44609/2016_Poyry_Suomen_metsateollisuus_2015-2035.pdf)
Validation and evaluation	
Output quantities	Volume of growing stock (m3), increment of growing stock (m3), harvest removals (m3), natural mortality (m3)
GHG covered	Model does not produce directly any GHGs but resulst were used as an input for GHG computations
Sectoral coverage	LULUCF: Forest land
Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	Output results for 10 years time steps
Interface with other models	no
Input from other models	no
Model structure(if diagram please add to the template)	MELA program consists of two parts: (1) an automated stand simulator based on individual trees and (2) the optimization package based on linear programming, JLP (Lappi 1992).

Model name	LIPASTO
Full model name	Calculation system for traffic exhaust emissions and energy consumption in Finland
Model version and status	LIPASTO 2015. Updated yearly.
Latest date of revision	15.6.2016
URL to model description	http://lipasto.vtt.fi/en/index.htm
Model type	Deterministic, a series of models implemented in Excel software
Model description	LIPASTO model includes all traffic modes except air traffic. It is the official model for calculation of Finlands transportation GHG emissions and six other compounds.
Summary	LIPASTO is a name for a series of models partly linked together. It includes all combustion engines in Finland except airplanes. Traffic modes are road traffic, railway traffic, waterborne transportation including ships, working boats and leisure boats. It also includes 50 different types of working machines and off-road vehicles. The model has been thoroughly renovated in 2013-2015. The new model allows the time span of 1980 – 2050 and a large number of vehicle types and technologies. Especially in road traffic new vehicle types and technologies emerge quickly. The LIPASTO model has 40 different road vehicle categories and technologies allowing any future vehicle combinations and fuel types.
Intended field of application	All traffic modes except air traffic. Also working machines.
Description of main input data categories and data sources	Activity data includes vehicle fleet, vehicle sales, mileage, train kilometres, port visits, fuel sales, forecasts of the activity. Activity sources are national statistics and registers. Forecasts are made by authorities and experts.
Validation and evaluation	As the model is part of the Finnish GHG emission reporting system, it is under the strict evaluation and validation process required by IPCC and EU.
Output quantities	
GHG covered	CO2, CH4, N2O
Sectoral coverage	Transportation except air transportation. Working machines.

Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	Yearly base, 1980 - 2050
Interface with other models	
Input from other models	No
Model structure(if diagram please add to the template)	LIPASTO is a series of models implemented in Excel software with energy balance between models.

Model name	2016 Calculation model for F-gas emissions and projections from refrigeration and air conditioning equipment in Finland
Full model name	
Model version and status	Updated annually
Latest date of revision	15.1.2017
URL to model description	No
Model type	Ms Excel calculation model
Model description	Calculation model for F-gas emissions and emission projections in the refrigeration and air conditioning equipment sector (CRF 2.F.1). The sector constitutes more than 90 percent of the total F-gas emissions in Finland. The model has 15 different subsectors (equipment types) and the total F-gas emissions of the sector 2.F.1 are sums of the subsector emissions. Each of the 15 subsectors is linked to one one of the six 2.F.1.a-f reporting sectors under the UNFCCC GHG inventory reporting. The model covers the years 1990 to 2050. The emissions estimatation methodology in the the model is the Tier 2 emission factor approach of the 2006 IPCC Guidelines (Volume 3, chapter 7.5).
Summary	Calculation model for F-gas emissions and emission projections in the refrigeration and air conditioning equipment sector (CRF 2.F.1).
Intended field of application	GHG emission projections calculation
Description of main input data categories and data sources	Primary data sources: a number of various statistics, F-gas activity data collected via annual surveys for greenhouse inventory, emission factors and other parameters from IPCC or country specific estimates, international literature and technical data from the industry.
Validation and evaluation	No
Output quantities	HFC and PFC emissions
GHG covered	HFCs and PFCs
Sectoral coverage	CRF 2.F.1
Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	1990-2050
Interface with other models	Emission projections of other F-gas sectors (2.E, 2.G and 2.H, covering HFCs, PFCs and SF6) are calculated in separate simplified Excel spreadsheet calculation models and the overall annual F-gas emission projections are the sums of the different models.
Input from other models	No
Model structure(if diagram please add to the template)	No

Model name	Summary results model for GHG emissions on Waste sector
Full model name	Kaatopaikat_jatevedet_kompostointi_madatys_politiikka_tammikuu2015
Model version and status	1
Latest date of revision	12.3.2015
URL to model description	No
Model type	Excel
Model description	Summary results model for GHG emissions on Waste sector including imported data from landfill model and from wastewater model and calculating future emission from biological treatment of waste (composting and anaerobic digestation). Includes balanced waste amounts for different treatment methods of municipal solid waste
Summary	Summary results model for GHG emissions on Waste sector
Intended field of application	GHG emission calculation
Description of main input data categories and data sources	Modified inventory model for landfills, modified inventory model for wastewater treatment, inventory model for composting, emission results from anaerobic digestation
Validation and evaluation	No
Output quantities	Methane and nitrous oxide emissions

GHG covered	Methane, nitrous oxide
Sectoral coverage	Waste sector
Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	1990-2050 (yearly)
Interface with other models	No
Input from other models	Modified inventory model for landfills, modified inventory model for wastewater treatment, inventory model for composting
Model structure(if diagram please add to the template)	Emission by subsectors and totally.

Model name	Modified inventory model for landfills
Full model name	SWDS_FOD_2015_PAMs
Model version and status	1
Latest date of revision	17.1.2015
URL to model description	No
Model type	Excel
Model description	GHG Inventory model for landfills which has been modified so that also future years are calculated
Summary	GHG Inventory model for landfills which has been modified so that also future years are calculated
Intended field of application	GHG emission calculation
Description of main input data categories and data sources	Landfill waste data in five waste categories (Municipal solid waste, municipal sludge, industrial sludges, industrial solid waste, construction waste) from official registry of the Environment administration for monitoring of polluting activities (Vahti). Landfill gas recovery data from the University of Eastern Finland
Validation and evaluation	No
Output quantities	Methane generation and methane emission on landfills (totals)
GHG covered	Methane
Sectoral coverage	Waste sector, Landfills
Geographical coverage	Finland (including Aland)
Temporal coverage,(e.g. time steps, time span)	1900-2050 (yearly)
Interface with other models	No
Input from other models	Waste data from Vahti database, landfill gas recovery data from the University of Eastern Finland
Model structure(if diagram please add to the template)	Five main waste categories (Municipal solid waste, municipal sludge, industrial sludges, industrial solid waste, construction waste) divided according to the degrading rates.

Model name	Modified inventory model for wastewater treatment
Full model name	Wastewater_2015_PAMs
Model version and status	1
Latest date of revision	5.2.2015
URL to model description	No
Model type	Excel
Model description	GHG Inventory model for wastewaters which has been modified so that also future years are calculated
Summary	GHG Inventory model for wastewaters which has been modified so that also future years are calculated
Intended field of application	GHG emission calculation
Description of main input data categories and data sources	Wastewater load data (BOD, COD and Ntot) from the official registry and data base of the Environment administration for monitoring of polluting activities (Vahti), population data
Validation and evaluation	No
Output quantities	Methane and nitrous oxide emissions from wastewater treatment (totals)
GHG covered	Methane, Nitrous oxide
Sectoral coverage	Waste sector, Wastewater Treatment
Geographical coverage	Finland (including Aland)
Temporal coverage,(e.g. time steps, time span)	1990-2050 (yearly)
Interface with other models	No

Input from other models	Wastewater load data from the official registry and data base of the Environment administration for monitoring of polluting activities (Vahti), Population data from Statistics Finland
Model structure(if diagram please add to the template)	Activity data from domestic wastewater plants and from industry and fish farming multiplied by emission parameters

Model name	Inventory model for composting
Full model name	Kompostointi_2015_PAMs
Model version and status	1
Latest date of revision	5.2.2015
URL to model description	No
Model type	Excel
Model description	GHG Inventory model for composting
Summary	GHG Inventory model for composting
Intended field of application	GHG emission calculation
Description of main input data categories and data sources	Composting waste data in four waste categories from the official registry and data base of the Environment administration for monitoring of polluting activities (Vahti)
Validation and evaluation	No
Output quantities	Methane and nitrous oxide emissions from composting (totals)
GHG covered	Methane, Nitrous oxide
Sectoral coverage	Waste sector, Composting
Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	1990-2013 (yearly)
Interface with other models	No
Input from other models	Wastewater load data from the official registry and data base of the Environment administration for monitoring of polluting activities (Vahti), population data from Statistics Finland
Model structure(if diagram please add to the template)	Activity data from domestic wastewater plants and from industry and fish farming multiplied by emission parameters

Model name	EKOREM
Full model name	EKOREM building stock energy model
Model version and status	Excel-model version 2.0, program based model version 1.0
Latest date of revision	Excel 2012, Program based 2015
URL to model description	http://www.sciencedirect.com/science/arti-cle/pii/S0959652614005319
Model type	Bottom-up building stock energy model
Model description	EKOREM is a bottom-up engineering model of energy use in the build-ing stock that deals with building archetypes. The buildings are divided into five-year classes based on the construction year. The basis is amount (m2) of building elements and the HVAC systems and the en-ergy efficiency of these elements and systems.
Summary	The modeling approach to building energy consumption is based mainly on the international standard ISO-13790. The model uses also data from the Building Code (Ministry of the Environment 2007) for cal-culating for example effects of energy requirements for the heating of buildings.
Intended field of application	Energy and greenhouse gas emission modelling of the whole or part of the building stock
Description of main input data categories and data sources	Main inputs: building stock data, energetic properties of buildings, com-position of energy production. Sources: Building statistics, building codes, international standard ISO-13790, experts.
Validation and evaluation	Comparison with Energy statistics and other estimates & statistics.
Output quantities	Main outputs: energy consumption and greenhouse gas emissions in-cluding a breakdown to fuel/electricity/district heat, and emissions. En-ergy use is divided to building elements and ventilation and warm do-mestic water.
GHG covered	At least CO2-eq, other gases if included in the used emission factors.
Sectoral coverage	The whole building stock. Normally the calculations are made only in residential and service buildings.
Geographical coverage	Finland (with possibility to adapt to other countries), or part of the building stock.
Temporal coverage,(e.g. time steps, time span)	User defined four time steps for example 2010, 2020, 2030, 2050
Interface with other models	No direct interface. Program-based model can be easily linked with other models (e.g. POLIREM)
Input from other models	No
Model structure(if diagram please add to the template)	Buildings categorized as in the building

Model name	POLIREM
Full model name	POLIREM building stock policy scenario model
Model version and status	Excel -model version 1.2, program based model version 1.0
Latest date of revision	8.7.
URL to model description	https://helda.helsinki.fi/bitstream/han-dle/10138/164571/SYKEre_26_2016.pdf
Model type	Top down and bottom-up scenario model
Model description	POLIREM is a top down and bottom-up scenario model that uses official energy and building stock statistics of Finland and gives as an output energy consumption, greenhouse gas emission as well as the shares of the renewable energy sources and emissions belonging to the emission trading system. The model was developed to give answers to various questions related to the energy use of the building stock and for scenario work. These answers sup-port the outlining of climate politics and the related decision making, and help in the impact assessment of policies, as well as assist in fulfilling the re-porting obligations that the Ministry of Environment has.
Summary	The energy statistics are implemented and used by the model to calculate estimates of the future energy consumption and the related emissions. The model is suitable for analyzing the impacts of changes on national level in: - Building use and maintenance (impacts on energy consumption), - Specific consumption of the building types (impact on energy consumption), - Renovation volumes (impact on energy-savings), - Heating modes (fuel split, impact on the greenhouse gas emissions), - Emission factors (impact on the greenhouse gas emissions)
Intended field of application	Energy, greenhouse gas emission, renewable energy and impact to emission trading modeling. Results are scenario studies and policy analysis in the whole building stock.
Description of main input data categories and data sources	Main inputs: Buildings categorized as in the 13 building classification of Statistics Finland when giving the inputs. Energy as Energy Statistics in the beginning of scenarios. Inputs are building statistics, energy statistics, manufacturing of buildings, specific energy consumptions of buildings, choice of heating systems, emission factor estimates.
Validation and evaluation	Comparison with EKOREM-model and other models.
Output quantities	Main outputs: Time series of energy consumption including a breakdown to fuel/electricity/district heat, and greenhouse gas emissions, the shares of the renewable energy sources and emissions belonging to the emission trading system. The main results are divided into residential buildings and service buildings.
GHG covered	At least CO2-eq , other gases if included in the used emission factors.
Sectoral coverage	Building stock without agriculture and forestry building. Normally calculations are made without industry buildings.
Geographical coverage	Finland
Temporal coverage,(e.g. time steps, time span)	Time step: one year, time span: user defined. Excel format until 2100, program code with unlimited time span.
Interface with other models	No direct interface. Program-based model can be linked with other model easily.
Input from other models	EKOREM –model has been used for input data.
Model structure(if diagram please add to the template)	Buildings categorized as in the building classification of Statistics Finland, Energy as in Energy Statistics