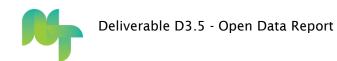


newTRENDs

Open Data Report

Deliverable D3.5

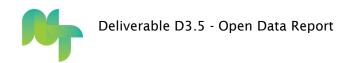




Grant agreement	No. 893311		Acrony	m	newTRENDs
Full title	New Trends in Energy Demand Modeling				
Торіс	LC-SC3-EE-14-2018-2019-2020				
Funding scheme	Horizon 2020, R	IA – Res	earch an	d Innovatic	on Action
Start date	September 2020 Duration 36 Months			36 Months	
Project website	https://newTREN	IDs202	<u>0.eu/</u>		
Project coordinator	Fraunhofer ISI				
Deliverable	3.5 - Open Data	Report			
Work package	3 - Transition Pathways for New Societal Trends and Methodological Improvement in Modelling such Trends				
Date of Delivery	Contractual	31.1	0.2023	Actual	31.10.2023
Status	Draft				
Nature	Report Dissemination level Public		el Public		
Lead beneficiary	Fraunhofer ISI				
Responsible author	Songmin Yu				
Authors	Leonidas Paroussos, Georgina Asimakopoulou, Alkisti Florou, Dimitris Fragkiadakis, Panagiotis Karkatsoulis, Ioannis Tsiropoulos, Philipp Mascherbauer, Andreas Müller, Lukas Kranzl, Khaled Al-Dabbas, Andrea Herbst, Meta Thurid Lotz, Martin Jakob, Michael Steck				
Reviewer(s)	Heike Brugger				
Keywords	Open data, Energy demand modeling, Macroeconomic modeling, Model development				



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 893311.



Content

Lis	t of tables	5	4
Int	roduction	- Data Summary	6
1.		ansition Pathways for New Societal Trends and logical Improvement in Modelling such Trends	7
	1.1	Macro-economic Modeling	7
	1.2	Industry Modeling	8
	1.3	Building Modeling	9
	1.4	Transport Modeling	10
2.	sources)	cus Study: Prosumagers and big data (new data in energy demand models related to the built nent	
	2.1	INVERT-FLEX Coupling	11
	2.2	PRIMES-Prosumager Modeling	13
3.	energy d	cus Study: Circular economy and digitalisation in emand models related to the sectors industry and	15
	3.1	Circular Economy Modeling	15
	3.2	Digitalization Modeling	18
4.		cus Study: New Societal Trends in Transport and Sector - The Impact of the Shared Economy	20



List of tables

Input & Output Data in GEM-E3 model	7
Code development in the GEM-E3 model	7
Input data for the simulation of the industry sector results with FORECAST	8
Final energy demand (FED), total energy demand (TED) and greenhouse gas emissions of the industry sector until 2050 simulated with FORECAST	·8
Final energy demand of buildings of the residential sector produced by INVERT	.9
Final energy demand of buildings of the tertiary sector produced by FORECAST	.9
Investments into heating systems and envelope of buildings of the tertiary sector produced by FORECAST	.9
Model results for the impact of teleworking in Transport1	0
Smart meter data1	1
Load-shifting indicator from INVERT-FLEX coupling1	1
Code of FLEX modeling suite1	1
Survey results on heating behavior1	2
Survey results on residential space use and home office pattern1	2
FED, GHG emissions and derived indicators of the residential sector until 2050 simulated with the PRIMES- Prosumager model1	3
Code of PRIMES-Prosumager module1	3
Material flow model of steel and concrete in EU buildings1	5
Material intensity data base of steel and concrete in EU buildings1	5
EU building stock development1	6
Circular economy action parametrization1	6
	Code development in the GEM-E3 model



Table 20	Model results for a circular economy in EU buildings1
Table 21	Statistical data on steel production and consumption1
Table 22	Code development in the Invert model: Insulation volume1
Table 23	Share of employees working remotely1
Table 24	Data Centers1
Table 25	Code extension to model teleworking in FORECAST1
Table 26	Code extension to model co-working in FORECAST1
Table 27	Model results for shared mobility in Transport2
Table 28	Code development for modeling shared mobility in Transport2



Introduction - Data Summary

Following the data management plan (D8.4), this Deliverable 3.5 summarizes the datasets used and generated in the newTRENDs project, as well as the model development to capture and quantify the new societal trends.

All the data or code are listed and described in Table 1 - Table 28 per work package. For those which the project team is allowed to publish, links are provided. For the closed datasets, explanations are given.



1 WP3 - Transition Pathways for New Societal Trends and Methodological Improvement in Modelling such Trends

1.1 Macro-economic Modeling

Table 1 Input & Output Data in GEM-E3 model		
Name	Input & Output Data in GEM-E3 model	
Туре	Received and Generated data	
Description	FED in industry, tertiary, households, macroeconomy indicators and sectoral production data for the four defined scenarios.	
Source	H2020-newTRENDs · GitHub	
Note	Update to include the input from the transport model.	

Table 2Code development in the GEM-E3 model

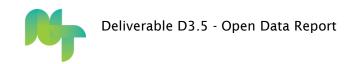
Name	Code development in the GEM-E3 model
Туре	Open code
Description	New development of the code in the GEM-E3 model to capture heterogeneity among households.
Source	H2020-newTRENDs · GitHub
Note	Update to include the input from the transport model.



1.2 Industry Modeling

Table 3	Input data for the simulation of the industry sector results with FORECAST		
Name	Input data for the simulation of the industry sector results with FORECAST		
Туре	Collected closed/open data		
Description	Input data for simulation of the industry results including driving factors, e.g. production projections, policies, energy and CO ₂ prices, structural information and sector-specific techno-economic assumptions.		
Source	Data set was collected and compiled before the newTRENDs project and are partly underlying third party rights, the data that can be made available are presented in deliverable D3.3: <u>Publications - newTRENDs (newtrends2020.eu)</u>		
Note	Data set partly confidential, no updates foreseen		

9	Final energy demand (FED), total energy demand (TED) and greenhouse gas emissions of the industry sector until 2050 simulated with FORECAST		
Name	Final energy demand (FED), total energy demand (TED) and greenhouse gas emissions of the industry sector until 2050 simulated with FORECAST		
Туре	Generated data		
Description	Industry sector results for FED, TED and GHG emissions until 2050 in the four defined scenarios differentiated by energy carrier, process and/or sub-sector		
Source	Deliverable 3.3: <u>Publications - newTRENDs</u> (newtrends2020.eu)		
Note	No updates foreseen		



1.3 Building Modeling

Table 5	able 5 Final energy demand of buildings of the residential sector produced by INVERT		
Name	Final energy demand of buildings of the residential sector produced by INVERT		
Туре	Generated data		
Description	This dataset contains the results of residential building final energy demand under different scenarios produced by the INVERT model.		
Source	H2020-newTRENDs · GitHub		
Note	no updates planned		

Table 6Final energy demand of buildings of the tertiary sector
produced by FORECAST

Name	Final energy demand of buildings of the tertiary sector produced by FORECAST
Туре	Generated data
Description	By country, yearly resolution, period 2019 - 2050
Source	H2020-newTRENDs · GitHub
Note	no updates planned

Table 7Investments into heating systems and envelope of buildings
of the tertiary sector produced by FORECAST

Name	Investments into heating systems and envelope of buildings of the tertiary sector produced by FORECAST
Туре	Generated data



Description	By country, yearly resolution, period 2019 - 2050
Source	H2020-newTRENDs · GitHub
Note	no updates planned

1.4 Transport Modeling

Table 8Model results for the impact of teleworking in Transport	
Name	Model results for teleworking in Transport
Туре	Generated data
Description	EU model results by country for the scenarios reference and decarbonisation with and without the new trend teleworking in transport. Results focus on energy demand reduction in transport.
Source	Results: <u>H2020-newTRENDs · GitHub</u> Deliverables D7.3 <u>Publications - newTRENDs</u> (newtrends2020.eu)
Note	Confidential until journal submission and publication



2. WP5 - Focus Study: Prosumagers and big data (new data sources) in energy demand models related to the built environment

Table 9 Smart meter data	
Name	Smart meter data
Туре	Collected closed data
Description	This dataset contains the smart meter data collected from the households in Italy and Poland. The data is used in Task 5.1 to analyze the demand patterns.
Source	n/a
Note	Commercial, third party data

2.1 INVERT-FLEX Coupling

Table 10	Load-shifting indicator from INVERT-FLEX coupling
Name	Load-shifting indicator from INVERT-FLEX coupling
Туре	Generated data
Description	This dataset includes the results on energy consumption and load shifting indicators of four scenarios from the INVERT-FLEX coupling.
Source	H2020-newTRENDs · GitHub
Note	No update planned.

Table 11 Co	e 11 Code of FLEX modeling suite	
Name	Code of FLEX modeling suite	
Туре	Open code	



Description	The code developed for the FLEX modeling suite in the project.
Source	H2020-newTRENDs · GitHub
Note	Will be updated during further development.

Table 12Survey results on heating behavior

Name	Survey results on heating behavior
Туре	Collected closed data
Description	Dataset containing data collected through an online survey conducted in four European countries. It includes data on the heating behavior of households. The result of the data analysis together in combination with the results of the INVERT/EE-Lab modelling of residential heating energy consumption will be published as scientific papers.
Source	The data will be made publicly available after the publication of the scientific paper
Note	The dataset will be partially released after the publication of the first paper and gradually updated

Table 13Survey results on residential space use and home office
pattern

Name	Survey results on residential space use and home office pattern
Туре	Collected closed data
Description	Dataset containing data collected through an online survey conducted in four European countries. It includes data on residential space use and home office patterns. Part of the data will be partially used as input for the FLEX model. The results of the modelling and further data analysis will be published as scientific papers
Source	The data will be made publicly available after the publication of the scientific papers



Nata	The dataset will be partially released after the publication of
Note	the first paper and gradually updated

2.2 PRIMES-Prosumager Modeling

Table 14FED, GHG emissions and derived indicators of the residential
sector until 2050 simulated with the PRIMES-Prosumager
model

Name	FED, GHG emissions and derived indicators of the residential sector until 2050 simulated with the Prosumager model
Туре	Generated data
Description	Residential sector results for FED, GHG emissions and derived indicators until 2050 in the four defined scenarios
Source	H2020-newTRENDs · GitHub
Note	No updates foreseen

Table 15Code of PRIMES-Prosumager module

Name	Code of PRIMES-Prosumager module
Туре	Open code
Description	This module introduces the prosumager model, developed within the newTRENDs project. The model describes the decision-making processes of individual households, exploring investments in building envelope renovation, appliances, equipment, onsite generation units (solar photovoltaic – PV), and battery energy storage systems (BESS).
Description	The prosumager model provides a mathematical formulation for the management of the hourly operations of appliances, equipment, onsite PV, and BESS. It strategically determines the optimal configuration for a household's energy system, balancing the occupants' energy demand with cost- effectiveness. The model considers bidirectional power transfer



	between the distribution electricity network and the household.
Source	H2020-newTRENDs · GitHub
Note	No updates foreseen



3 WP6 - Focus Study: Circular economy and digitalisation in energy demand models related to the sectors industry and tertiary

3.1 Circular Economy Modeling

Table 16Material flow model of steel and concrete in EU buildings	
Name	Material flow model of steel and concrete in EU buildings
Туре	Open code
Description	Stock-driven material flow analysis developed within task 6.1 soft linking Invert/EE-Lab and FORECAST-Industry to assess endogenously the impact of selected circular economy actions
Source	Model code: <u>H2020-newTRENDs · GitHub</u> Deliverables D6.1 and D6.4: <u>Publications - newTRENDs</u> (newtrends2020.eu)
Note	Publicly available soon, no updates foreseen

Table 17Material intensity data base of steel and concrete in EU
buildings

Name	Material intensity database of steel and concrete in EU buildings
Туре	Generated data
Description	Database indicating the use of steel and concrete per square meter in residential and non-residential buildings depending on age cohort and region according to the characteristics of the Invert/EE-Lab data structure, used for stock-driven material flow analysis
Source	Database: <u>H2020-newTRENDs · GitHub</u> Deliverables D6.1 and D6.4: <u>Publications - newTRENDs</u> (newtrends2020.eu)
Note	Publicly available soon, no updates foreseen



Table 18 EU building stock development	
Name	EU building stock development
Туре	Generated data
Description	Floor space development differentiated by building type, age cohort and country extracted from Invert/EE-Lab, used for stock-driven material flow analysis
Source	Database: <u>H2020-newTRENDs · GitHub</u>
Note	Publicly available soon, no updates foreseen

Table 19Circular economy action parametrization

Name	Circular economy parametrization
Туре	Collected open data
Description	Data for the parametrization of circular economy actions in the stock-driven material flow analysis
Source	Database: <u>H2020-newTRENDs · GitHub</u> Deliverables D6.1: <u>Publications - newTRENDs</u> (newtrends2020.eu)
Note	Publicly available soon, no updates foreseen

Table 20Model results for a circular economy in EU buildings	
Name	Model results for a circular economy in EU buildings
Туре	Generated data
Description	National model results for the scenarios reference, lifestyle, construction and mix as well as for individual circular economy actions including steel and concrete demand, steel, cement and clinker production as well as available secondary material
Source	Results: <u>H2020-newTRENDs · GitHub</u>



	Deliverables D6.1 and D6.4: <u>Publications - newTRENDs</u> (newtrends2020.eu)
Note	Publicly available soon, no updates foreseen

Table 21Statistical data on steel production and consumption

Name	Statistical data on steel production and consumption
Туре	Collected closed data
Description	Access to the database of the World Steel Associations, data used to estimate in-use stocks of steel and future availability of secondary material
Source	n/a
Note	Commercial, third party data

Table 22	Code development in the Invert model: Insulation volume
	code development in the invert model. Insulation volume

Name	Code development in the Invert model: Estimated insulation volume for refurbishment activities, derived from Invert Scenarios
Туре	Open code
Description	Post-simulation analysis code in the Invert model to extract the estimated insulation demand, stemming from renovation activities.
Source	H2020-newTRENDs · GitHub
Note	No updates planned



3.2 Digitalization Modeling

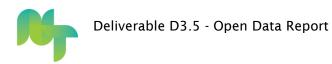
Table 23Share of employees working remotely	
Name	Share of employees working remotely
Туре	Generated data
Description	By country, yearly resolution, period 2019 - 2050
Source	H2020-newTRENDs · GitHub
Note	no updates planned

Table 24	Data Centers	
Name	Data on data centers	
Туре	Collected closed data	
Description	Per EU country, period 2017-2021: number of data center, floor area, installed capacity and consumption, PUE	
Source	Grand View Research	
Note	Commercial, third party data	

Table 25	Table 25Code extension to model teleworking in FORECAST	
Name	Code extension to model teleworking in FORECAST	
Туре	Open Code	
Description	This method is called as a pre-process in the course of the FORECAST simulation. It programs the calculation of the share of teleworking and of the specific floor area per employee in the tertiary sector.	
Source	H2020-newTRENDs · GitHub	
Note	No updates planned, creativecommons: created by, non commercial, share alike	



Table 26Code extension to model co-working in FORECAST	
Name	Code extension to model co-working in FORECAST
Туре	Open Code
Description	This method is called as a pre-process in the course of the FORECAST simulation. It programs the impact of co-working spaces on the floor area and on the energy demand for data center services in the tertiary sector.
Source	H2020-newTRENDs · GitHub
Note	No updates planned, creative commons: created by, non commercial, share alike



4 WP7 - Focus Study: New Societal Trends in Transport and Tertiary Sector – The Impact of the Shared Economy

Table 27Model results for shared mobility in Transport	
Name	Model results for a shared mobility in transport
Туре	Generated data
Description	EU model results by country for the reference scenario, and a decarbonisation scenario with and without shared mobility policies on car-pooling, car-sharing and car-services. Generated data are on the activity shares of shared mobility options in passenger cars
Source	Results: <u>H2020-newTRENDs · GitHub</u> Deliverables D7.1 <u>Publications - newTRENDs</u> (newtrends2020.eu)
Note	Will be updated during further development

Table 28Code development for modeling shared mobility in Transport	
Name	Code development for modeling shared mobility in Transport
Туре	Open code
Description	To capture the shared mobility and its impact on the energy demand in the transport sector, we developed the PRTRANS model. The code of the model is published here.
Source	H2020-newTRENDs · GitHub
Note	Will be updated during further development



Imprint

Citation:

Yu, Songmin; Leonidas Paroussos, Georgina Asimakopoulou, Alkisti Florou, Dimitris Fragkiadakis, Panagiotis Karkatsoulis, Ioannis Tsiropoulos, Philipp Mascherbauer, Andreas Müller, Lukas Kranzl, Khaled Al-Dabbas, Andrea Herbst, Meta Thurid Lotz, Martin Jakob, Michael Steck (2021): Open data report. (newTRENDs - Deliverable No. D3.5). Fraunhofer ISI, Karlsruhe.

Institutes:

Fraunhofer Institute for Systems and Innovation Research ISI (Fraunhofer ISI) E3 Modelling (E3M) Technische Universität Wien (TU Wien) e-think TEP Energy GmbH (TEP)

Authors

Corresponding author: Songmin Yu (<u>songmin.yu@isi.fraunhofer.de)</u>

Leonidas Paroussos, Georgina Asimakopoulou, Alkisti Florou, Dimitris Fragkiadakis, Panagiotis Karkatsoulis, Ioannis Tsiropoulos, Philipp Mascherbauer, Andreas Müller, Lukas Kranzl, Khaled Al-Dabbas, Andrea Herbst, Meta Thurid Lotz, Martin Jakob, Michael Steck

Date of release

10/2023



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 893311.

