



EBS & MAED

Hands-on 5: Setting Up the Structure Part II

Learning outcomes

By the end of this exercise, you will be able to:

1. Navigate subsectors
2. Add and delete subsectors
3. Define the structure of the household sector
4. Define the structure of the transport sector
5. Configure the end-use categories

Activity 1: Navigating Subsectors

In the previous hands-on we learnt how to manage case studies and declare the case definitions. The next step in establishing the model structure is the defining of the subsectors of the economy.

Let us open the Demo MAEDD 1 case study that we created in hands-on 4. The economic sectors are predefined and are shown in the main menu under Energy Intensities. You will have to click the drop-down menu to view them. In MAED-D, the industry sector is further divided into the Agriculture, Construction, Mining, and Manufacturing sectors. From now on we shall refer to all of tabs in the Sectors & Clients block as sectors.



MAED Model for Analysis of Energy Demand

General information

Name of the case study **Demo MAEDD 1**

Definitions (name, years, description)

Name of the case study
Demo MAEDD 1

Years
2010,2015,2020,2025,2030,2035,2040,2045,2050

Case description
The data used in this demonstration case correspond to a hypothetical scenario for a hypothetical country. They are there only for illustration purposes and will need to be replaced by actual country and scenario specific data by the user of the model.

Units

Population
 Thousand Million

GDP
 Million [10⁹] Billion [10⁹] Trillion [10¹²] US Dollar

Transport Passenger (pkm)
 Million [10⁹] Billion [10⁹] Trillion [10¹²]

Transport Freight (tkm)
 Million [10⁹] Billion [10⁹] Trillion [10¹²]

Energy unit
 GWyr PJ Tcal Mtoe GBTU

Sectors & Clients

Agriculture Construction Mining Manufacturing Energy Service Household Transport

Farming

Specific Electricity use Thermal use Motive Power

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However, even though sectors are predefined and fixed in MAED-D, users can define the subsectors that they want to study. The number of subsectors to be defined by the user depends on the information available regarding both the economy and the energy consumption, which will be discussed in upcoming lectures.

For now, let us see how the model was structured for the Demo MAEDD 1 case study. This can be seen in the bottom half of the general information page in the Sectors & Clients block. The agriculture sector only has one subsector defined: Farming. Each sector needs to have at least one subsector, that is why the first subsector cannot be deleted.



The screenshot shows the MAED software interface. The 'General information' tab is active. The 'Definitions' section contains the following information:

- Name of the case study: Demo MAEDD 1
- Years: 2010,2015,2020,2025,2030,2035,2040,2045,2050
- Case description: The data used in this demonstration case correspond to a hypothetical scenario for a hypothetical country. They are there only for illustration purposes and will need to be replaced by actual country and scenario specific data by the user of the model.

The 'Units' section shows the following settings:

- Population: Million
- GDP: Million [10⁹]
- Transport Passenger (pkm): Billion [10⁹]
- Transport Freight (tkm): Billion [10⁹]
- Energy unit: GWyr

The 'Sectors & Clients' section is highlighted with a red circle. It shows a list of sectors: Agriculture, Construction, Mining, Manufacturing, Energy, Service, Household, Transport. The 'Farming' subsector is also highlighted with a red circle. The 'Farming' subsector has the following settings:

- Specific Electricity use:
- Thermal use:
- Motive Power:

The subsectors for other sectors can be accessed by clicking on their names. Please pause and explore the subsectors defined in other sectors of Demo MAEDD 1 case study.

The screenshot shows the MAED software interface. The 'General information' tab is active. The 'Sectors & Clients' section is highlighted with a red circle. It shows a list of sectors: Agriculture, Construction, Mining, Manufacturing, Energy, Service, Household, Transport. The 'Agriculture' subsector is also highlighted with a red circle. The 'Agriculture' subsector has the following settings:

- Specific Electricity use:
- Thermal use:
- Motive Power:

Click on the Agriculture sector to look at the subsectors that are defined inside. We currently only have one subsector defined: Farming. All tables in MAED-D should have this subsector. Let us check, for example, the table of the GDP structure

Social economic data
Name of the case study: Demo MAEDD 1

Demography: **GDP**

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
GDP	US\$ Million	54.13092	67.78036	84.06328	103.26305						
GDP Growth rate	% p.a.	-	4.60000	4.40000	4.20000						
GDP per capita	US\$/Cap	2229.86802	2516.56917	2840.79860	3207.55620						
Sectorial shares of GDP											
Agriculture	%	21.50000	19.40000	17.40000	15.50000						
Construction	%	2.30000	2.30000	2.30000	2.20000						
Mining	%	5.10000	4.80000	4.30000	3.80000						
Manufacturing	%	15.20000	16.10000	16.80000	16.90000						
Energy	%	5.90000	5.60000	5.00000	4.30000						
Service	%	50.00000	51.80000	54.20000	57.30000						
Total	%	100.00000	100.00000	100.00000	100.00000						

* Enter GDP data for first Year & Average annual growth rate for each period/timestep

Data notes

Distribution of GDP by subsectors

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000									
Construction											
Buildings	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000									

Let us also check the energy intensity of motive power.

Energy intensities
Name of the case study: Demo MAEDD 1

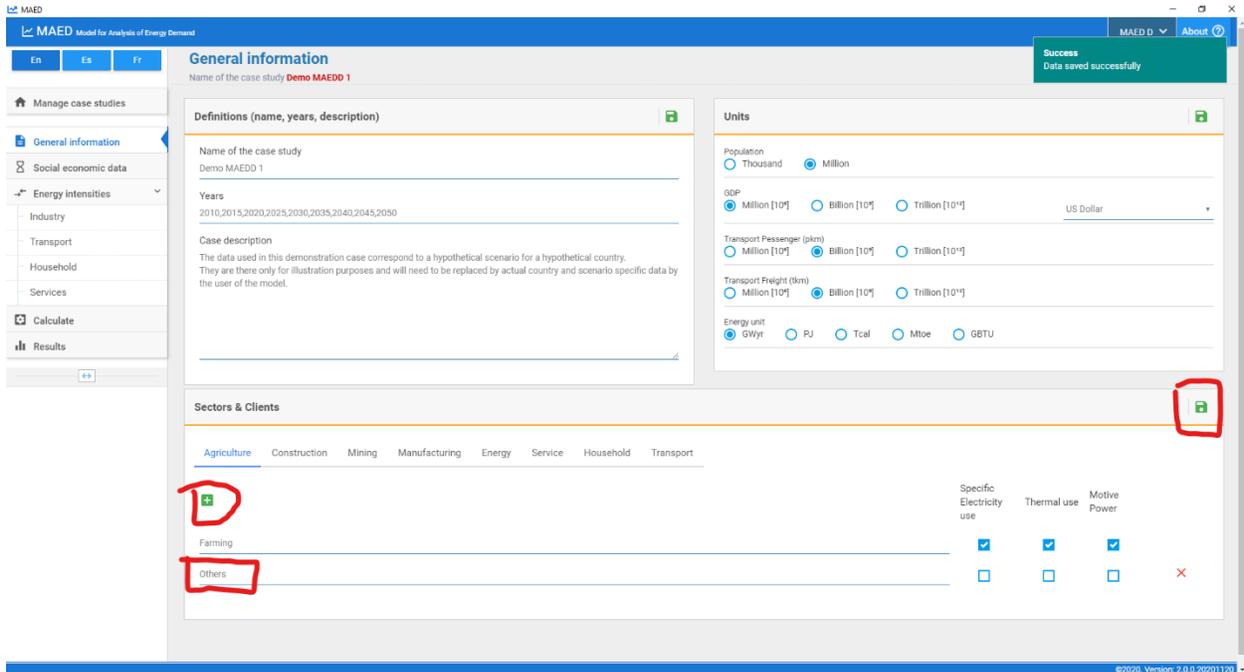
Energy intensities of Motive Power (final energy per unit of value added)

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	kWh/US\$	1.40000	1.30000	1.25000	1.20000						
Construction											
Buildings	kWh/US\$	0.10000	0.10000	0.10000	0.10000						
Mining											
Metal ores	kWh/US\$	0.30000	0.30000	0.30000	0.30000						
Non-metal ores	kWh/US\$	0.20000	0.20000	0.20000	0.20000						
Manufacturing											
Basic materials	kWh/US\$	0.15000	0.15000	0.15000	0.15000						

Data notes

Activity 2: Adding and Deleting Subsectors

Let us now see how to add and delete subsectors in a sector. Return to the general information page and select the agriculture tab in the Sectors & Clients block. We can add a subsector to the agriculture sector by clicking the plus button. This should create a new subsector called Agr_2. To change the name simply type it in the field. Change the name of the new subsector to Others. Remember to click save to save the changes.



The screenshot shows the MAED software interface. The 'General information' page is displayed, with the 'Sectors & Clients' section active. The 'Agriculture' tab is selected, and a table lists subsectors. The 'Others' subsector is highlighted with a red box, and a plus icon is also highlighted with a red box. A 'Success' message is visible at the top right.

Subsector	Specific Electricity use	Thermal use	Motive Power
Farming	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Let us examine the same tables that we saw a moment ago. Go to the GDP page. We can now see the Others subsector under the Agriculture Sector.



MAED Model for Analysis of Energy Demand

MAED D About

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Social economic data

Name of the case study Demo MAEDD 1

Demography GDP

GDP

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
GDP	US\$ Million	54.13092	67.78036	84.06328	103.26305						<input type="checkbox"/>
GDP Growth rate	% p.a.	-	4.60000	4.40000	4.20000						<input type="checkbox"/>
GDP per capita	US\$/Cap	2229.86802	2516.56917	2840.79860	3207.55620						<input type="checkbox"/>
Sectorial shares of GDP											
Agriculture	%	21.50000	19.40000	17.40000	15.50000						<input type="checkbox"/>
Construction	%	2.30000	2.30000	2.30000	2.20000						<input type="checkbox"/>
Mining	%	5.10000	4.80000	4.30000	3.80000						<input type="checkbox"/>
Manufacturing	%	15.20000	16.10000	16.80000	16.90000						<input type="checkbox"/>
Energy	%	5.90000	5.60000	5.00000	4.30000						<input type="checkbox"/>
Service	%	50.00000	51.80000	54.20000	57.30000						<input type="checkbox"/>
Total	%	100.00000	100.00000	100.00000	100.00000						<input type="checkbox"/>

* Enter GDP data for first Year & Average annual growth rate for each period/timestep

Data notes

Distribution of GDP by subsectors

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											<input type="checkbox"/>
Farming	%	10.00000	100.00000	100.00000	100.00000						<input type="checkbox"/>
Others	%										<input type="checkbox"/>
Total	%	100.00000	100.00000	100.00000	100.00000						<input type="checkbox"/>
Construction											
Buildings	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	<input type="checkbox"/>

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Let us now go to the Energy Intensities of Motive Power. We note that the Others subsector does not appear under the Agriculture Sector.

MAED Model for Analysis of Energy Demand

MAED D About

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Energy intensities

Name of the case study Demo MAEDD 1

EI-Motive Power EI-Specific Electricity use EI-Thermal use Penetration of Energy Forms in ACM Efficiencies in ACM Temperature level in Manufacturing Penetration of Energy Forms in Manufacturing Efficiencies in Manufacturing

Energy intensities of Motive Power (final energy per unit of value added)

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											<input type="checkbox"/>
Farming	kWh/US\$	1.40000	1.30000	1.25000	1.20000						<input type="checkbox"/>
Construction											
Buildings	kWh/US\$	0.10000	0.10000	0.10000	0.10000						<input type="checkbox"/>
Mining											
Metal ores	kWh/US\$	0.30000	0.30000	0.30000	0.30000						<input type="checkbox"/>
Non-metal ores	kWh/US\$	0.20000	0.20000	0.20000	0.20000						<input type="checkbox"/>
Manufacturing											
Basic materials	kWh/US\$	0.15000	0.15000	0.15000	0.15000						<input type="checkbox"/>

Data notes

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This is because the programme has not been informed about the end-use categories to be studied in the Others subsector. We must go to the general information page and select the End-Use categories for the



Others subsector. Check all three end-use categories for the Others Subsector to include them as end-uses. Remember to save the changes.

The screenshot shows the MAED (Model for Analysis of Energy Demand) software interface. The 'General information' section is active, displaying 'Demo MAEDD 1' as the case study name and a list of years from 2010 to 2050. The 'Units' section is also visible, with 'Million' selected for population and 'Billion [10⁹]' selected for GDP. The 'Sectors & Clients' section is expanded to show 'Others' as the selected subsector. Under 'Others', three checkboxes are checked: 'Specific Electricity use', 'Thermal use', and 'Motive Power'. These three checked boxes are enclosed in a red rectangular highlight.

The programme will now build tables for input data in the energy intensities of Specific Electricity use, Thermal use, and Motive Power. Let us look at the energy intensities of motive power to confirm this.



MAED Model for Analysis of Energy Demand

Energy intensities

Name of the case study: Demo MAEDD 1

Energy intensities of Motive Power (final energy per unit of value added)

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	kWh/US\$	1.40000	1.30000	1.25000	1.20000						
Others	kWh/US\$										
Construction											
Buildings	kWh/US\$	0.10000	0.10000	0.10000	0.10000						
Mining											
Metal ores	kWh/US\$	0.30000	0.30000	0.30000	0.30000						
Non-metal ores	kWh/US\$	0.20000	0.20000	0.20000	0.20000						
Manufacturing											
Basic materials	kWh/US\$	0.15000	0.15000	0.15000	0.15000						

Data notes

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Let us now look at the mining sector. There are 2 subsectors defined.

MAED Model for Analysis of Energy Demand

General information

Name of the case study: Demo MAEDD 1

Definitions (name, years, description)

Name of the case study: Demo MAEDD 1

Years: 2010,2015,2020,2025,2030,2035,2040,2045,2050

Case description: The data used in this demonstration case correspond to a hypothetical scenario for a hypothetical country. They are there only for illustration purposes and will need to be replaced by actual country and scenario specific data by the user of the model.

Units

Population: Thousand Million

GDP: Million [10⁹] Billion [10⁹] Trillion [10¹²] US Dollar

Transport Passenger (pkm): Million [10⁶] Billion [10⁹] Trillion [10¹²]

Transport Freight (tkm): Million [10⁶] Billion [10⁹] Trillion [10¹²]

Energy unit: GWyr PJ Tcal Mtoe GBTU

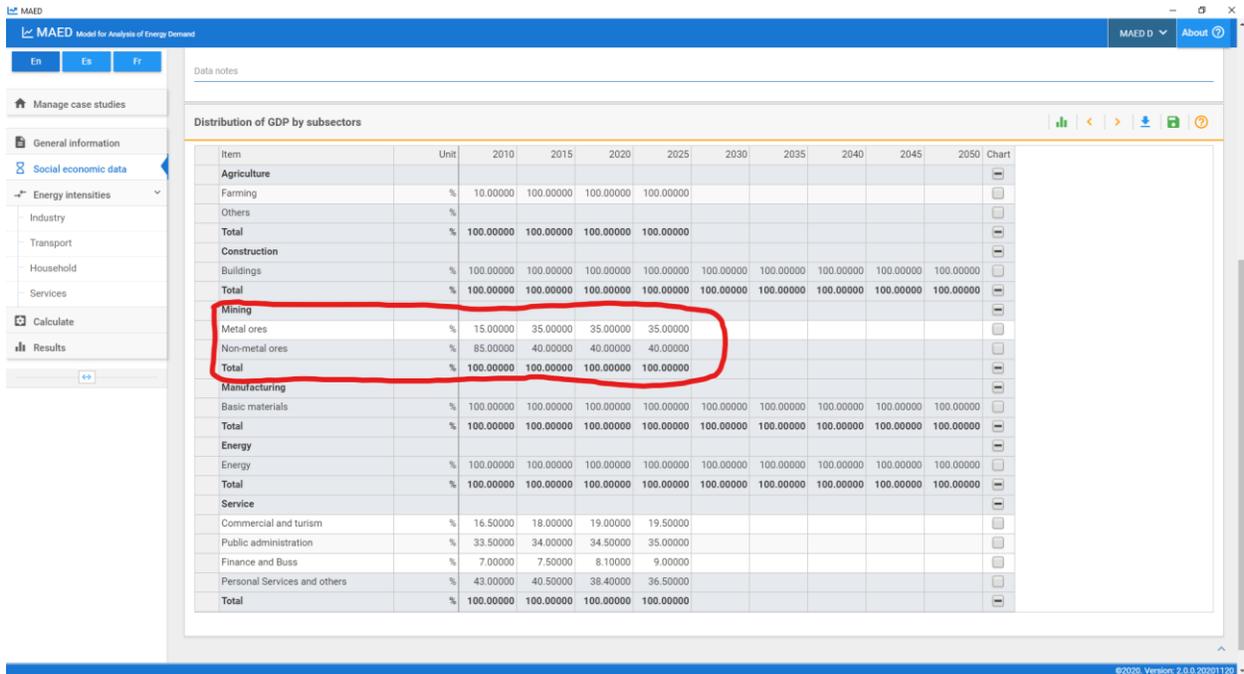
Sectors & Clients

Agriculture Construction **Mining** Manufacturing Energy Service Household Transport

	Specific Electricity use	Thermal use	Motive Power
Metal ores	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Non-metal ores	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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And we confirm this by looking at its corresponding GDP table.



Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	%	10.00000	100.00000	100.00000	100.00000						
Others	%										
Total	%	100.00000	100.00000	100.00000	100.00000						
Construction											
Buildings	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000									
Mining											
Metal ores	%	15.00000	35.00000	35.00000	35.00000						
Non-metal ores	%	85.00000	40.00000	40.00000	40.00000						
Total	%	100.00000	100.00000	100.00000	100.00000						
Manufacturing											
Basic materials	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000									
Energy											
Energy	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000									
Service											
Commercial and tourism	%	16.50000	18.00000	19.00000	19.50000						
Public administration	%	33.50000	34.00000	34.50000	35.00000						
Finance and Buss	%	7.00000	7.50000	8.10000	9.00000						
Personal Services and others	%	43.00000	40.50000	38.40000	36.50000						
Total	%	100.00000	100.00000	100.00000	100.00000						

Note that, in each sector the rows of the last subsectors are shaded. This means that those rows are results of calculations performed by the programme, and the cells are locked from user editing. MAED-D is calculating the last subsector so that the sum of the participation of all subsectors is 100.

MAED Model for Analysis of Energy Demand

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Distribution of GDP by subsectors

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	%	10.00000	100.00000	100.00000	100.00000						
Others	%										
Total	%	100.00000	100.00000	100.00000	100.00000						
Construction											
Buildings	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Mining											
Metal ores	%	15.00000	35.00000	35.00000	35.00000						
Non-metal ores	%	85.00000	40.00000	40.00000	40.00000						
Total	%	100.00000	100.00000	100.00000	100.00000						
Manufacturing											
Basic materials	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Energy											
Energy	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Total	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	
Service											
Commercial and tourism	%	16.50000	18.00000	19.00000	19.50000						
Public administration	%	33.50000	34.00000	34.50000	35.00000						
Finance and Buss	%	7.00000	7.50000	8.10000	9.00000						
Personal Services and others	%	43.00000	40.50000	38.40000	36.50000						
Total	%	100.00000	100.00000	100.00000	100.00000						

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Let us try deleting a subsector. We can delete the same one that we added earlier. We must go to the structure of the agriculture sector in the general information page. Click the delete button (red cross next to the subsector name) on the subsector, Others. The subsector disappears from this menu. And, after clicking the Save; proceed, button, this subsector disappears from all tables in MAED.



Let us return to the GDP table. Note that the Energy Sector appears shaded in the GDP table. This is because MAED calculates the share of this sector of the economy so that the sum of all sectors is set to 100.



MAED Model for Analysis of Energy Demand

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Social economic data

Name of the case study: Demo MAEDD 1

Demography: GDP

GDP

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
GDP	US\$ Million	54.13092	67.78036	84.06328	103.26305						<input type="checkbox"/>
GDP Growth rate	% p.a.	-	4.60000	4.40000	4.20000						<input type="checkbox"/>
GDP per capita	US\$/Cap	2229.86802	2516.56917	2840.79860	3207.55620						<input type="checkbox"/>
Sectorial shares of GDP											
Agriculture	%	21.50000	19.40000	17.40000	15.50000						<input type="checkbox"/>
Construction	%	2.30000	2.30000	2.30000	2.20000						<input type="checkbox"/>
Mining	%	5.10000	4.80000	4.30000	3.80000						<input type="checkbox"/>
Manufacturing	%	15.20000	16.10000	16.80000	16.90000						<input type="checkbox"/>
Energy	%	5.90000	5.60000	5.00000	4.30000						<input type="checkbox"/>
Service	%	50.00000	51.80000	54.20000	57.30000						<input type="checkbox"/>
Total	%	100.00000	100.00000	100.00000	100.00000						<input type="checkbox"/>

* Enter GDP data for first Year & Average annual growth rate for each period/timestep

Data notes

Distribution of GDP by subsectors

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	<input type="checkbox"/>
Total	%	100.00000	<input type="checkbox"/>								
Construction											
Buildings	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	<input type="checkbox"/>
Total	%	100.00000	<input type="checkbox"/>								

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Also note that the transport sector does not appear in the sectoral share of GDP in this table. The GDP component of the transport sector must be added to the service sector. And the same must be done with the energy consumed in the facilities associated with transportation. For example, electricity consumed at airports.

MAED Model for Analysis of Energy Demand

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Name of the case study: Demo MAEDD 1

Demography: GDP

GDP

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
GDP	US\$ Million	54.13092	67.78036	84.06328	103.26305						<input type="checkbox"/>
GDP Growth rate	% p.a.	-	4.60000	4.40000	4.20000						<input type="checkbox"/>
GDP per capita	US\$/Cap	2229.86802	2516.56917	2840.79860	3207.55620						<input type="checkbox"/>
Sectorial shares of GDP											
Agriculture	%	21.50000	19.40000	17.40000	15.50000						<input type="checkbox"/>
Construction	%	2.30000	2.30000	2.30000	2.20000						<input type="checkbox"/>
Mining	%	5.10000	4.80000	4.30000	3.80000						<input type="checkbox"/>
Manufacturing	%	15.20000	16.10000	16.80000	16.90000						<input type="checkbox"/>
Energy	%	5.90000	5.60000	5.00000	4.30000						<input type="checkbox"/>
Service	%	50.00000	51.80000	54.20000	57.30000						<input type="checkbox"/>
Total	%	100.00000	100.00000	100.00000	100.00000						<input type="checkbox"/>

* Enter GDP data for first Year & Average annual growth rate for each period/timestep

Data notes

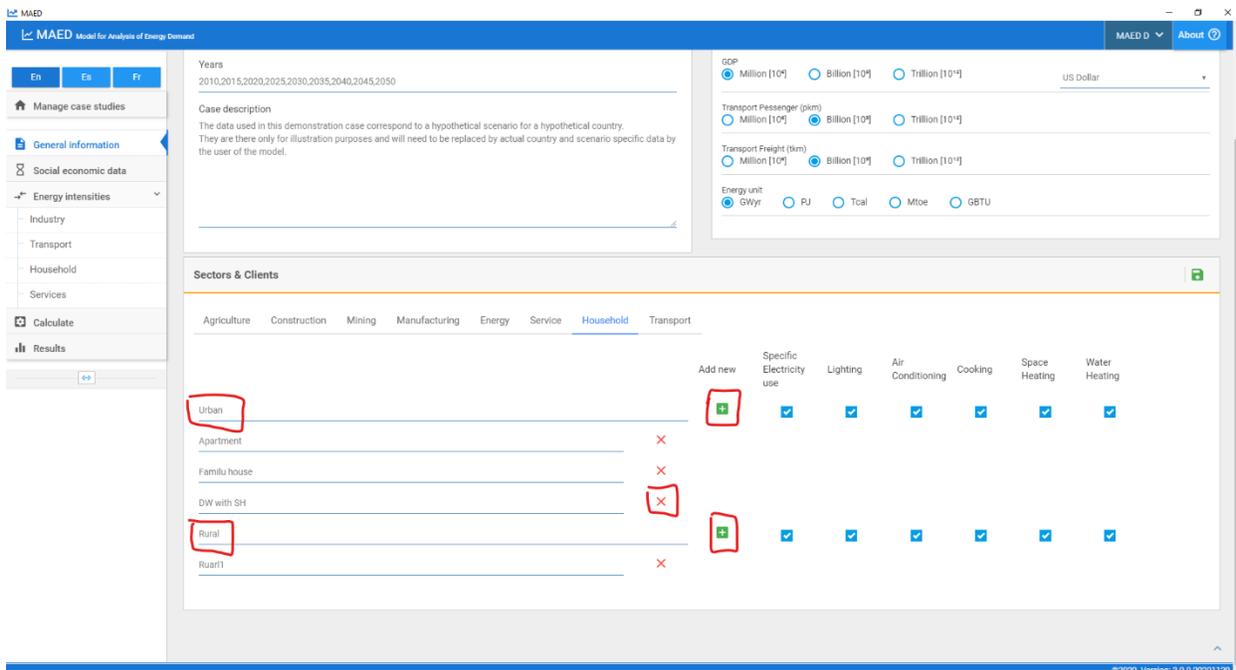
Distribution of GDP by subsectors

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	<input type="checkbox"/>
Total	%	100.00000	<input type="checkbox"/>								
Construction											
Buildings	%	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	<input type="checkbox"/>
Total	%	100.00000	<input type="checkbox"/>								

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Activity 3: Household Sector

We are now going to work with the structure of the residential sector; this is referred to as the household sector in MAED. Let us go to the Household tab in the Sectors & Clients block on the General Information page. In this case study, a few types of household have been established for urban and rural areas. In each area, you can add or delete household types. Again, the number of different types of households to be included depends on the availability of information or the type of study to be done. For example, in this case, we wish to study the different types of urban households. There are three urban household types. However, there is only one rural household type, this is because all sectors/clients in MAED need to have at least one subsector/sub-client.



The screenshot shows the MAED Model for Analysis of Energy Demand interface. The 'Sectors & Clients' section is active, with the 'Household' tab selected. The interface displays a table of household types and their associated energy services. The 'Urban' and 'Rural' categories are highlighted with red boxes. The 'Add new' button is also highlighted with a red box. The table shows the following configuration:

Household Type	Add new	Specific Electricity use	Lighting	Air Conditioning	Cooking	Space Heating	Water Heating
Urban	<input checked="" type="checkbox"/>						
Apartment	<input type="checkbox"/>						
Family house	<input type="checkbox"/>						
DW with SH	<input type="checkbox"/>						
Rural	<input checked="" type="checkbox"/>						
Ruar1	<input type="checkbox"/>						

Activity 4: Fuel Types

Now, let us move on to define the structure of the transportation sector. We must first specify the fuels we want to model. To access the fuel types, click the Fuel Types Definition button in the Transport tab.



Case description
The data used in this demonstration case correspond to a hypothetical scenario for a hypothetical country. They are there only for illustration purposes and will need to be replaced by actual country and scenario specific data by the user of the model.

Transport Passenger (pkm)
 Million [10⁶] Billion [10⁹] Trillion [10¹²]

Transport Freight (tkm)
 Million [10⁶] Billion [10⁹] Trillion [10¹²]

Energy unit
 GWyr PJ Tcal Mtoe GBTU

Sectors & Clients

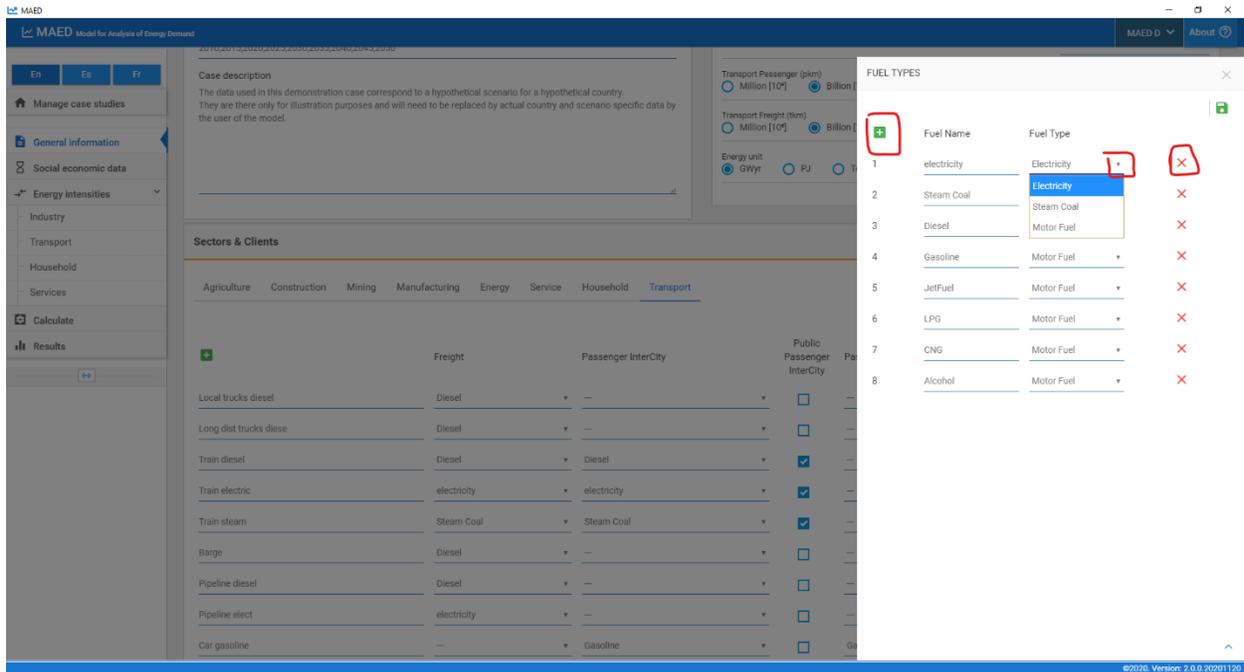
Agriculture Construction Mining Manufacturing Energy Service Household **Transport**

FUEL TYPES DEFINITION

	Freight	Passenger InterCity	Public Passenger InterCity	Passenger Urban	Car	Air plane
Local trucks diesel	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Long dist trucks diese	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Train diesel	Diesel	Diesel	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Train electric	electricity	electricity	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Train steam	Steam Coal	Steam Coal	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Barge	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pipeline diesel	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pipeline elect	electricity	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Car gasoline	—	Gasoline	<input type="checkbox"/>	Gasoline	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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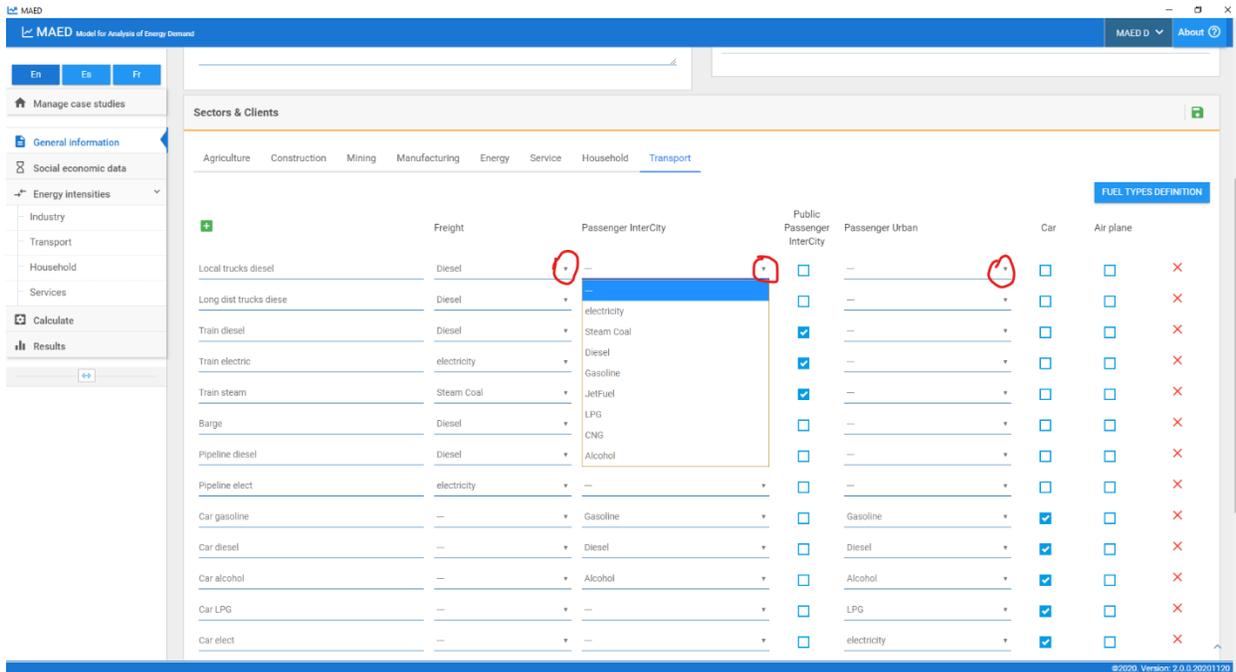
You can add or delete fuels using the respective buttons from this menu. Each fuel specified needs to be associated with a fuel type using the drop-down menu. The MAED methodology groups fuel into three fuel types: electricity, steam coal, and motor fuel.



Activity 5: Transport Modes

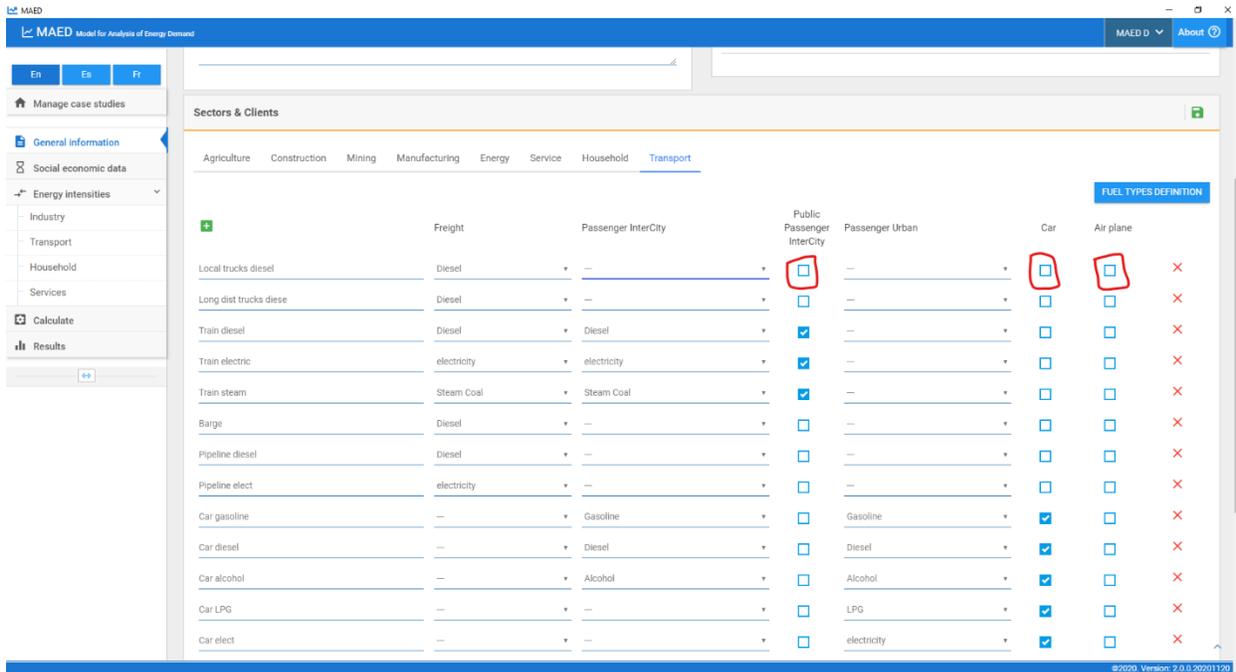
The next step is to define the transport modes. The transport modes can be accessed using the Transport tab in the Sectors & Clients block in the General Information page. Each transport mode can be associated with the three transport subsectors: Freight, Passenger InterCity, and Passenger Urban.

With the buttons, add, or delete, the user creates or deletes transport modes. And with the check boxes the user decides in which subsector the transport mode defined belongs to. For example, long-distance trucks belong to freight transport. Each transport mode can be associated with any of the subsectors but must be associated with at least one subsector. We can associate a transport mode with a subsector by selecting the fuel type used for that subsector for that transport mode; this is done using the drop-down menu. If no fuel type is selected for a transport subsector, then that transport mode will not be modelled for that transport subsector.



	Freight	Passenger InterCity	Public Passenger InterCity	Passenger Urban	Car	Air plane
Local trucks diesel	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Long dist trucks diese	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Train diesel	Diesel	—	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Train electric	electricity	—	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Train steam	Steam Coal	—	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Barge	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pipeline diesel	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pipeline elect	electricity	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Car gasoline	—	Gasoline	<input type="checkbox"/>	Gasoline	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Car diesel	—	Diesel	<input type="checkbox"/>	Diesel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Car alcohol	—	Alcohol	<input type="checkbox"/>	Alcohol	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Car LPG	—	—	<input type="checkbox"/>	LPG	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Car elect	—	—	<input type="checkbox"/>	electricity	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Finally, we must tell the programme which transport modes are cars or airplanes. We must also tell the programme if the transport mode for intercity passengers is considered public. These can be done by using the checkboxes. There is no limit to the number of modes you want to use.



	Freight	Passenger InterCity	Public Passenger InterCity	Passenger Urban	Car	Air plane
Local trucks diesel	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Long dist trucks diese	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Train diesel	Diesel	Diesel	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Train electric	electricity	electricity	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Train steam	Steam Coal	Steam Coal	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Barge	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Pipeline diesel	Diesel	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Pipeline elect	electricity	—	<input type="checkbox"/>	—	<input type="checkbox"/>	<input type="checkbox"/>
Car gasoline	—	Gasoline	<input type="checkbox"/>	Gasoline	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Car diesel	—	Diesel	<input type="checkbox"/>	Diesel	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Car alcohol	—	Alcohol	<input type="checkbox"/>	Alcohol	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Car LPG	—	—	<input type="checkbox"/>	LPG	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Car elect	—	—	<input type="checkbox"/>	electricity	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Activity 6: End-Use Categories

The final step in defining the structure of the model is the configuration of end-use categories. We must remember that, in MAED, there are 3 end-use categories: motive power, thermal uses, and specific uses of electricity. In the previous version of MAED the user was forced to fill in data tables for the three categories, in each sector or subsector defined. However, some end-use categories may not exist or may not be significant in some subsectors. Furthermore, even if that end-use exists, the data for that end-use may not be available for some subsectors. In the new version, we can define which categories of end-uses are present in each subsector. This is done by using check boxes. Let us focus, for instance, on the farming subsector of the agriculture sector. Note that all end-uses have been chosen in the sector definition block.



MAED Model for Analysis of Energy Demand

MAED D About

En Es Fr

Manage case studies

General information

Social economic data

Energy intensities

- Industry
- Transport
- Household
- Services

Calculate

Results

General information

Name of the case study **Demo MAEDD 1**

Definitions (name, years, description)

Name of the case study
Demo MAEDD 1

Years
2010,2015,2020,2025,2030,2035,2040,2045,2050

Case description
The data used in this demonstration case correspond to a hypothetical scenario for a hypothetical country. They are there only for illustration purposes and will need to be replaced by actual country and scenario specific data by the user of the model.

Units

Population
 Thousand Million

GDP
 Million [10⁹] Billion [10⁹] Trillion [10¹²] US Dollar

Transport Passenger (pkm)
 Million [10⁶] Billion [10⁹] Trillion [10¹²]

Transport Freight (tkm)
 Million [10⁶] Billion [10⁹] Trillion [10¹²]

Energy unit
 GWyr PJ Tcal Mtoe GBTU

Sectors & Clients

Agriculture Construction Mining Manufacturing Energy Service Household Transport

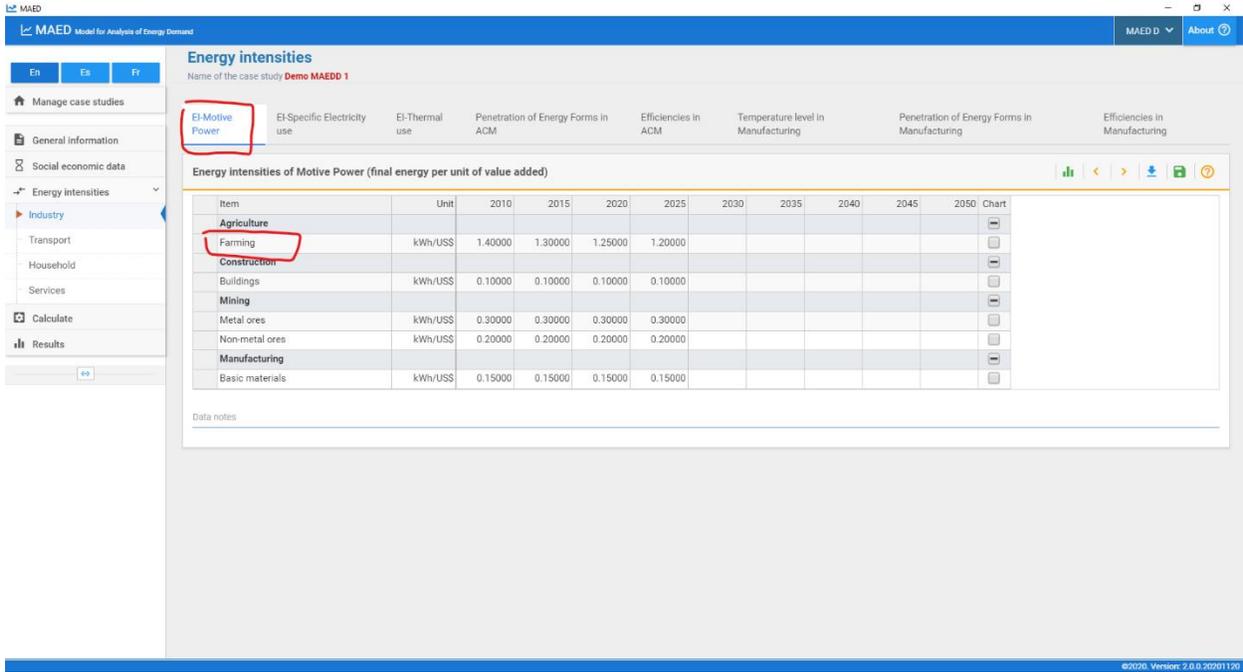
+

Farming

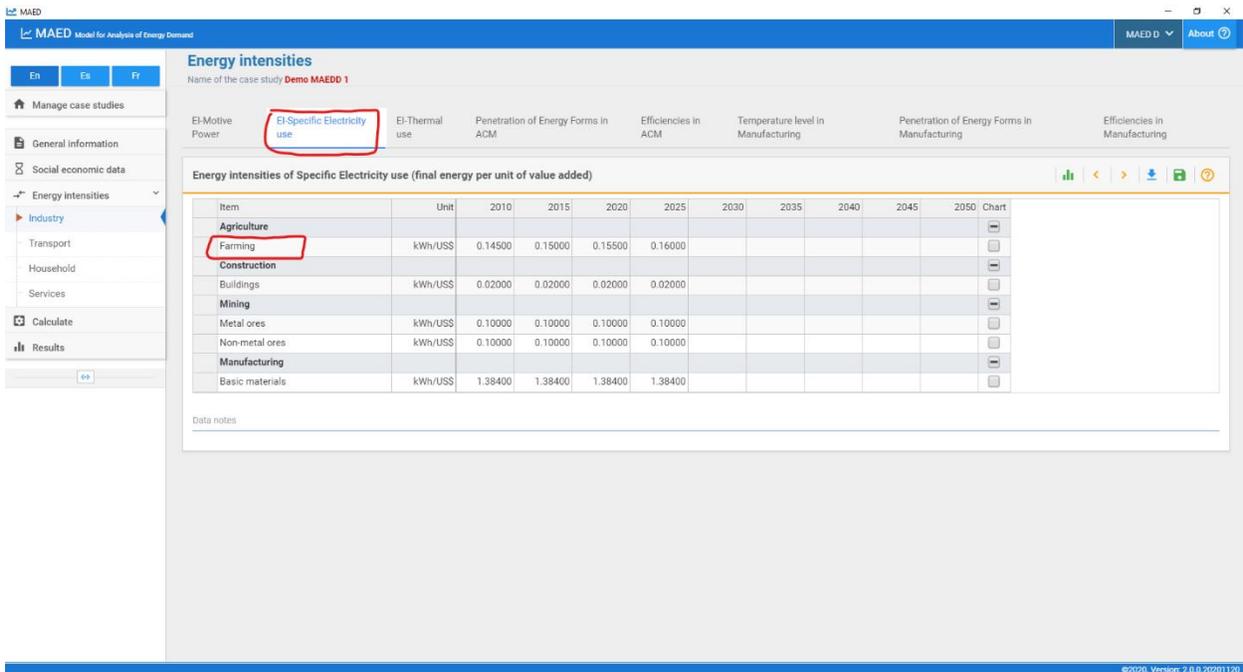
Specific Electricity use	Thermal use	Motive Power
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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We should now be able to enter energy usage data for each of the three end-use categories. Let us confirm this by looking at the usage tables of the three end-use categories. Let us first look at the energy intensities of motive power.



Let us now look at energy intensities of specific electricity use.



Let us finally look at energy intensities of thermal use.



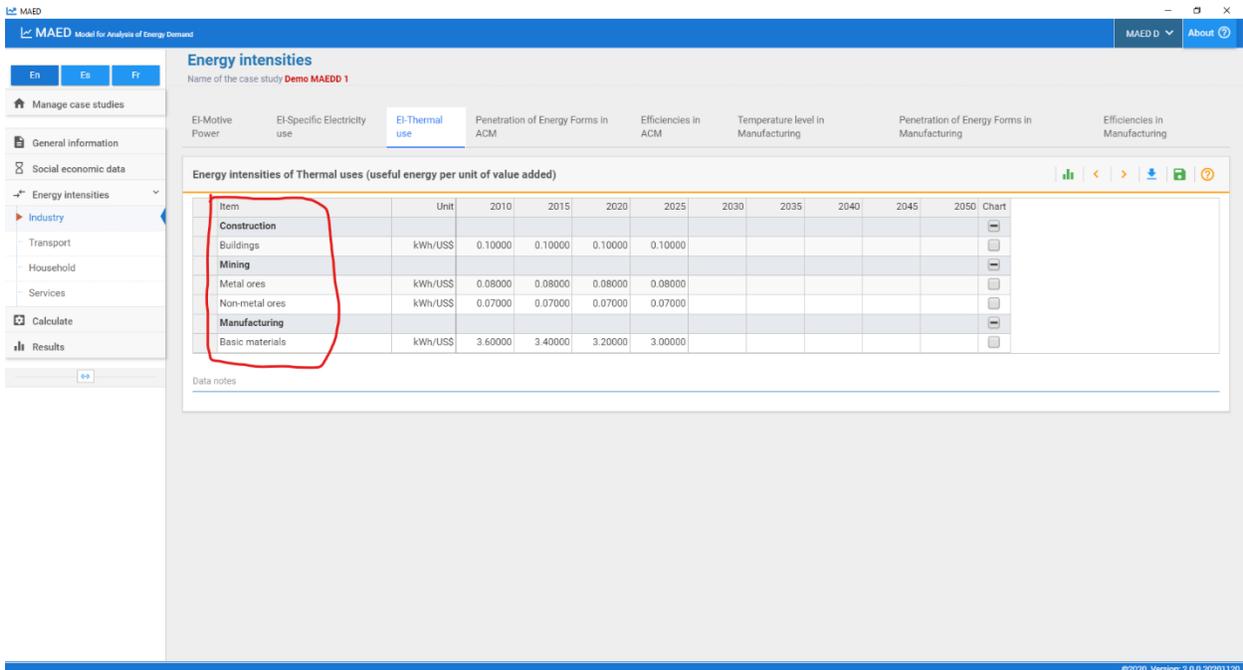
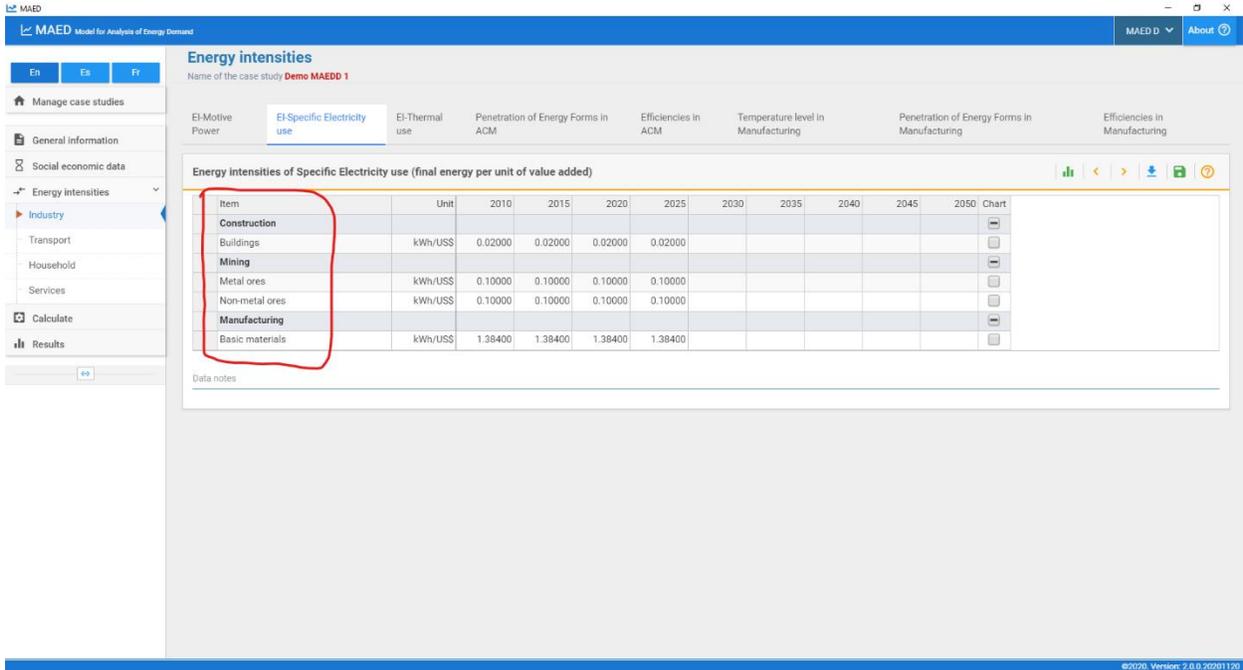
The screenshot shows the MAED (Model for Analysis of Energy Demand) software interface. The main window displays the 'Energy intensities' section for a case study named 'Demo MAEDD 1'. A red box highlights the 'EI-Thermal use' tab in the top navigation bar. Below the navigation bar, a table titled 'Energy intensities of Thermal uses (useful energy per unit of value added)' is shown. The table has columns for 'Item', 'Unit', and years from 2010 to 2050. The 'Farming' row under the 'Agriculture' category is highlighted with a red box. The 'Farming' row shows values of 0.05800 in 2010, 0.05700 in 2015, 0.05600 in 2020, and 0.05500 in 2025. Other categories include Construction, Mining, and Manufacturing.

Item	Unit	2010	2015	2020	2025	2030	2035	2040	2045	2050	Chart
Agriculture											
Farming	kWh/US\$	0.05800	0.05700	0.05600	0.05500						
Construction											
Buildings	kWh/US\$	0.10000	0.10000	0.10000	0.10000						
Mining											
Metal ores	kWh/US\$	0.08000	0.08000	0.08000	0.08000						
Non-metal ores	kWh/US\$	0.07000	0.07000	0.07000	0.07000						
Manufacturing											
Basic materials	kWh/US\$	3.60000	3.40000	3.20000	3.00000						

Let us consider the scenario where the specific uses of electricity and thermal uses are not present in the farming subsector. To model this, we uncheck the Specific Electricity Use and Thermal Use boxes and click save.



Let us now look at the three energy usage tables again. Farming is still present in the energy intensity of motive power. However, it is no longer present in the energy intensities of specific electricity use and the energy intensities of thermal use.



In the manufacturing sector, thermal usage is further divided into three temperature ranges: Temp High, Temp Medium, and Temp Low. When modelling thermal use of subsectors in the manufacturing sector,



we also need to select which temperature ranges of thermal use to model for each subsector. In this case study, all three temperature ranges have been chosen for Basic Materials.

The screenshot displays the MAED software interface. The 'General information' section includes the following details:

- Name of the case study: Demo MAEDD 1
- Years: 2010, 2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050
- Case description: The data used in this demonstration case correspond to a hypothetical scenario for a hypothetical country. They are there only for illustration purposes and will need to be replaced by actual country and scenario specific data by the user of the model.

The 'Units' section shows the following selected units:

- Population: Million
- GDP: Billion [10⁹]
- Transport Passenger (pkm): Billion [10⁹]
- Transport Freight (tkm): Billion [10⁹]
- Energy unit: GWyr

The 'Sectors & Clients' section shows a table with the following columns: Specific Electricity use, Thermal use, Temp High, Temp Medium, Temp Low, and Motive Power. The 'Basic materials' row has checkboxes for all these categories, with the 'Thermal use', 'Temp High', 'Temp Medium', and 'Temp Low' columns highlighted by a red box.

The household sector contains the following additional end-use sub-types: Lighting, Air Conditioning, Cooking, Space Heating, and Water Heating.



The screenshot shows the MAED (Model for Analysis of Energy Demand) software interface. The main window is titled "MAED Model for Analysis of Energy Demand". On the left, there is a navigation menu with options: "Manage case studies", "General information", "Social economic data", "Energy intensities" (with a dropdown menu showing "Industry", "Transport", "Household", "Services"), "Calculate", and "Results".

The main content area is divided into several sections:

- Case description:** A text box containing a disclaimer: "The data used in this demonstration case correspond to a hypothetical scenario for a hypothetical country. They are there only for illustration purposes and will need to be replaced by actual country and scenario specific data by the user of the model."
- Transport Passenger (pkm):** Radio buttons for "Million [10⁶]", "Billion [10⁹]", and "Trillion [10¹²]", with "Billion [10⁹]" selected.
- Transport Freight (tkm):** Radio buttons for "Million [10⁶]", "Billion [10⁹]", and "Trillion [10¹²]", with "Billion [10⁹]" selected.
- Energy unit:** Radio buttons for "GWyr", "PJ", "Tcal", "Mtoe", and "GBTU", with "GWyr" selected.
- Sectors & Clients:** A table configuration interface. The "Household" sector is selected. The table has columns for "Add new", "Specific Electricity use", "Lighting", "Air Conditioning", "Cooking", "Space Heating", and "Water Heating". The "Urban" and "Rural" rows have "Add new" buttons and checkboxes for all seven categories, all of which are checked. The "Apartment", "Family house", "DW with SH", and "Ruarf1" rows have red "X" marks in the "Add new" column, indicating they are not active.

At the bottom right of the interface, the text "©2020, Version: 2.0.0.20201120" is visible.

The model structure is now configured. And all input data tables, and output tables, correspond to the defined structure.

The model is ready to be loaded with the input data.