Technical Webinar on Projection Tools for Eurasia, Central Asia and the Caucasus

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- Choice of the model
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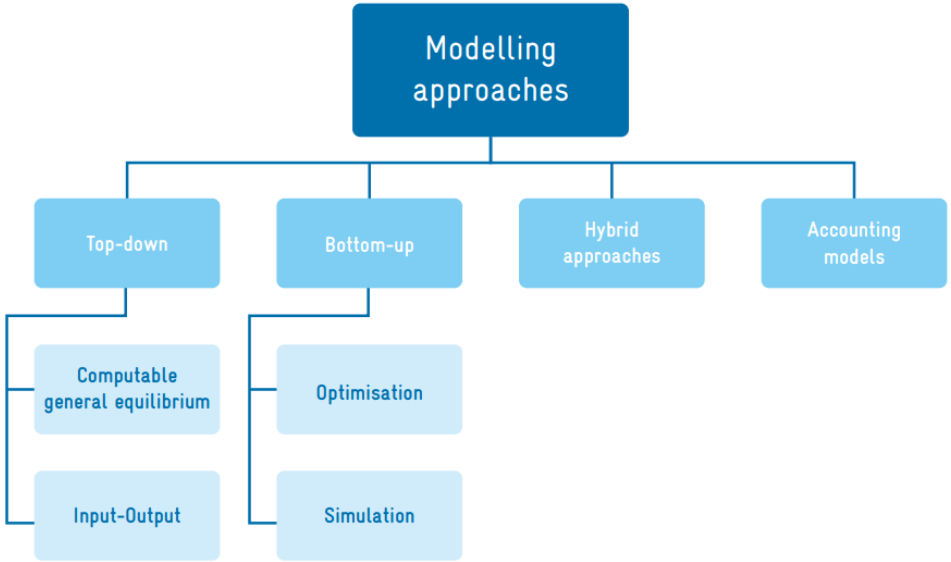
Overview of modeling approaches

Tools for GHG emissions projections
Choice of the model
Comparison of models

Tools for GHG emissions projections

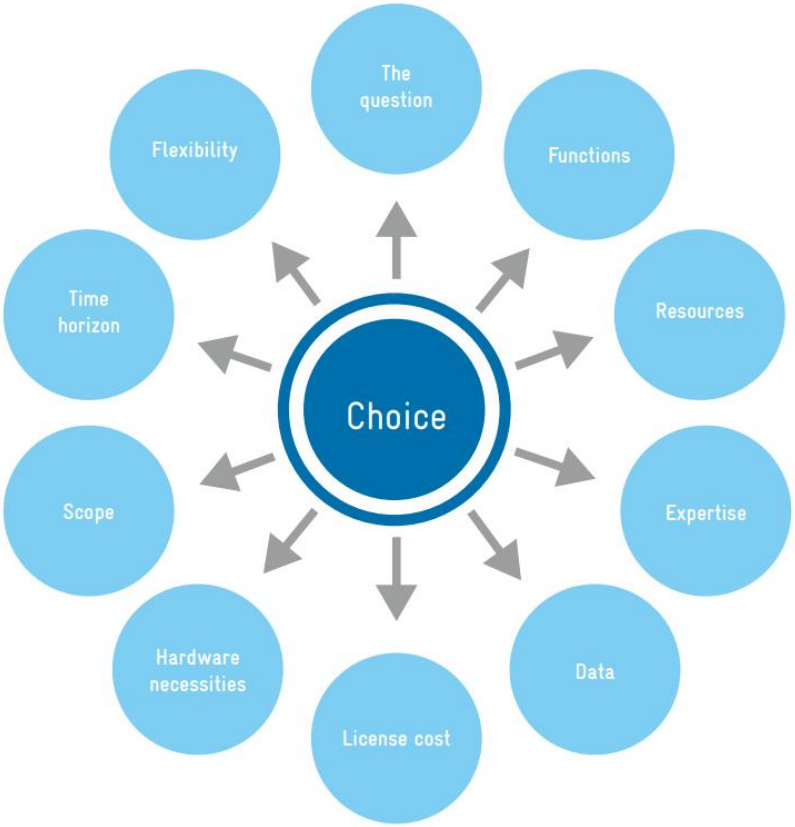
- **Top-down models** evaluate the system from aggregate economic
- **Bottom-up models** consider technological options or project-specific climate change mitigation policies.



Source: Partnership on Transparency in the Paris Agreement.
Projections of Greenhouse Gas Emissions and Removals: An Introductory Guide for Practitioners

Choice of the model

- There is no “best model”.
- The choice of model needs to consider a wide range of factors concerning what the users aim to achieve by using the model



Source: Partnership on Transparency in the Paris Agreement

Comparison of models' Functionality

Source https://newclimate.org/

		GACMO	PROSPECTS	LEAP	TIMES
FUNCTIONALITY	Coverage of emission sources	High-level	Mid / High-level	More detailed, particulary for energy sector	Detailed focus on energy sector
	Breadth/ granularity of technology	Mid breadth / limited granularity	Low-Mid	Low to high (user defined)	High
	Sectoral interlinkages	No	Energy supply and demand	Energy and some material flows	Energy and some material flows
	Temporal granularity	2020, 2025, 2030, 2050	Annual to 2050	Annual, unlimited timeframe. Within-year breakdown for seasonal and hourly variations.	Annual / multi-year time steps. Within-year breakdown for seasonal and hourly variations.
	Representation of costs	Yes (limited variation over time)	No	Yes (annual variation)	Yes
	Optimisation functionality	No	No	Within electricity supply sector	Yes, within energy system
	Summary	Low	Low	Mid	High

Comparison of models' Accessibility

Source https://newclimate.org/

		GACMO	PROSPECTS	LEAP	TIMES
ACCESSIBILITY	Platform	Excel, open-source	Excel, open-source	Windows relational database; requires licence	Windows; requires licence (for GAMS)
	User fee	Free	Free; optional use of IEA input data requires licence	Free to certain users in low & middle-income countries; fee charged for others	Fee charged for GAMS license and user tools (e.g. interface)
	User guidance	Limited	Limited	Extensive	Limited
	User community	Limited	None	Extensive	Mid
	Language options	English	English	Multiple: English, French, Spanish, Chinese, Portuguese + others under development	English
	Ease of navigation	High	Mid	High	Mid

Comparison of models' Analytical options

Source https://newclimate.org/

ANALYTICAL OPTIONS	GACMO	PROSPECTS	LEAP	TIMES
Scenario building and analysis	Limited to BAU and one alternative	Facilitates multi-scenario analysis (simulation possible)	Facilitates multi-scenario analysis and simulation	Facilitates multi-scenario analysis and simulation
Assessment of non-climate SD impacts	None	None (energy security indicators under development)	Air pollution-related impacts on health and agriculture; energy security indicators	Energy security indicators
Analysis of carbon pricing policies	No	No	In energy sector	In energy sector
Analysis of other policy instruments	No	Limited to simple representation of emission standards or national/sector carbon budgets	Limited to emission standards for some technologies or national/sector carbon budgets	Emission standards, carbon budgets and additional flow constraints
Linkages to other models	Low granularity limits linkage options	Yes, soft links to sector deep-dive modules and SD impact assessments	Yes, with API (programming code), or soft-links via Excel	High granularity facilitates many options for hard and soft links
Summary	**Analytical options limited to specific abatement measures**	**Facilitates multi-scenario analysis; deep-dive analysis requires links to other tools**	**Facilitates multi-scenario analysis and energy sector planning**	**Extensive analysis of energy sector and options for linking to other tools**

Questions modellers might aim to answer and suggestions for suitable modelling approaches

- Each model is designed to assist the modeller in answering specific questions.
- Key considerations include identifying the question you aim to address:
  - how will GHG emissions evolve with certain mitigation actions?
  - determining the necessary functions of the tool (e.g., generating MACC curves)
  - defining the time horizon (e.g., 2 or 50 years)
  - deciding the scope (e.g., the entire economy vs. the energy sector)
  - assessing whether the model should offer flexibility for future growth.

QUESTION	SUGGESTION
What are the impacts of the mitigation actions planned and how much will they cost?	All of the model types described can be used to assess the impacts of mitigation actions, and nearly all of them include costs.[22] From this, assessments of the mitigation potential of the sector can be made.
What impact will these mitigation actions have on economic development e.g., job creation?	Top-down macro-economic models are best placed to "provide insights into economic impacts and job creation, taking account of interactions within the system."[22]
What is the most cost-effective route to achieve our target?	Optimisation models (e.g., TIMES) are built to output an "optimal" pathway based on the criteria selected by the modeller, for example the most cost-effective pathway to an emission reduction target.
What will our future emissions be?	An accounting model could be a good starting point for gathering the data needed to forecast future energy supply, demand and emissions, and to model the likely impact of economic growth, renewable energy and energy efficiency measures on future GHG emissions.[22]
How will emissions evolve in a certain sector?	A bottom up simulation model or a sectoral accounting model (e.g., EX-ACT for the AFOLU sector) can be a useful starting point for exploring how emissions in a specific sector might evolve.
How do we model a long-term target?	Hybrid modelling tools are most appropriate for this scenario, combining different approaches for different time horizons to help manage uncertainty.
We need a very quick assessment of the potential impact of mitigation actions but do not have much expertise or data	Simple accounting tools offering default data like GACMO seem most appropriate in this case.
We have limited data and expertise now and we would like to continue using the same model over time	Accounting tools like LEAP or PROSPECTS+ seem most suited.

Source: Partnership on Transparency in the Paris Agreement.
Projections of Greenhouse Gas Emissions and Removals: An Introductory Guide for Practitioners

How to ensure quality of projections?

- The IPCC has established principles for historical GHG inventories to ensure quality, and these principles can also be applied to GHG projections:
  - **Transparency:** Clear documentation for understanding projections.
    - There is sufficient and clear documentation such that individuals or groups other than the compilers can understand how the projections were compiled;
  - **Accuracy:** Projections are unbiased with minimized uncertainties.
  - **Completeness:** Includes all relevant sources, sinks, and gases.
  - **Consistency:** Uses the same data sources and methodologies across years.

Source: Partnership on Transparency in the Paris Agreement.
Projections of Greenhouse Gas Emissions and Removals: An Introductory Guide for Practitioners

The Mitigation-Inventory Tool for Integrated Climate Action (MITICA)

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Purpose:

- To project greenhouse gas (GHG) emissions and assess the impact of Policies and Measures (PAMs) on national emissions.

COP28

MITICA was presented by the UNFCCC and Gauss at COP28 in Dubai

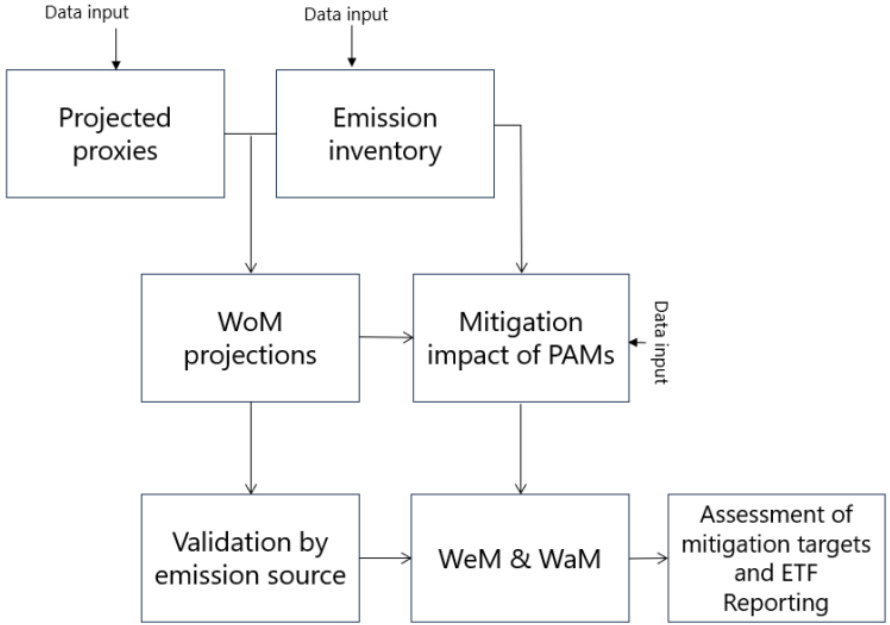
Developed by Gauss International in collaboration with the UNFCCC

Coverage

All inventory sectors outlined by the IPCC Guidelines, including Energy, Industrial Processes and Product Use (IPPU), Waste, and Agriculture, and Forestry and Land Use Change (AFOLU),

How can I obtain MITICA?

- MITICA will be made available by the UNFCCC Secretariat to UNFCCC focal points upon request. It will also be available to researchers. However, MITICA will not be shared for commercial purposes.
- Mitica – Gauss International



Manual_draft_Mitigation_toolrev_v6.pdf

The Mitigation-Inventory Tool for Integrated Climate Action (MITICA)

https://unfccc.int/sites/default/files/resource/2_Introduction_MITICA.pdf

Data Needs	Modelling Approach	Results
▪ GHG emissions by IPCC category from the inventory, from the IPCC software or excel files (mandatory). ▪ Macroeconomic proxies, historical and projected (mandatory). ▪ Sectoral proxies, historical and projected (optional).	▪ Without measures (WoM) scenario estimated through innovative statistical techniques (regression-based machine learning methods) which automatically define nationally-specific models at IPCC category based on time series (input data). ▪ MITICA is coded using Phyton in a desktop application. ▪ More than 60 PAMs predefined with default parameters, that need to be customised by users. ▪ With existing measures (WeM) and with additional measures (WaM) easily designed by users by selecting the PAMs by scenario.	▪ WoM, WeM, and WaM scenarios for NDC tracking. ▪ Rank PAMs by magnitude. ▪ Information needed to report projections and mitigation actions in CTF tables.

Introduction to GACMO

Introduction to the tool
Input data requirements
Use of the GACMO tool
Outputs
Methodology for estimating GHG projections

GACMO tool

- GACMO = Greenhouse gas Abatement Cost Model
- Main purpose of the tool- defining NDC target level
- Excel based bottom-up modelling tool for greenhouse gas emissions
- IPCC/CDM Methodologies
- Developed by Jørgen Fenhann at the UNEP CCC
- Available for free on the UNEP CCC website GACMO tool - UNEP-CCC (unepccc.org)
- User defines the mitigation options and their scale

Input data requirements

Basic country data	• Population, GDP
Key assumptions	• Grid emission factor, energy prices, emission factors, calorific values of fuels, GWPs, etc.
Energy balance	• Production and consumption data of fuels and electricity by sectors for the start year
GHG emissions for non-energy sectors	• Agriculture, Forestry, Waste, Industrial processes and Fugitive emissions
Growth factors	• Annual % change up to 2025, 2030, 2035 and 2050 (BAU scenario)
Mitigation options	• Units penetrating in the years 2025, 2030, 2035, and/or 2050
Technical and economical parameters of the technology/mitigation options	• E.g. solar insolation, annual distance for transport, number of hours usage of lighting, investment costs etc.

Use of the GACMO tool

GHG emissions projections for Business As Usual (BAU) scenario and for mitigation scenario in 2025, 2030, 2035 and 2050

% reduction of the GHG emissions compared to the BAU for **NDC development/update**

GHG reduction and the cost **for each mitigation option** compared to the technology used in the baseline.

Expected and achieved emissions reduction (annual, cumulative) from mitigation measures

Overview of the total mitigation effort: total GHG reduction, total investment, and total annual cost.

Use of the GACMO tool

National Communications

- Albania has used this for its NC1 (2002), NC2 (2009), NC3 (2016), NC4 (2022)

INDC/NDC

- Maldives (INDC, 2014); Cameroon (NDC1, 2021); Ghana (NDC1, 2021); Niger (NDC1, 2021)

BUR

- Maldives (BUR1, 2019); Albania (BUR1, 2021); Ghana (BUR3, 2021)

BTR

- Many countries are using the GACMO tool to prepare their first BTR

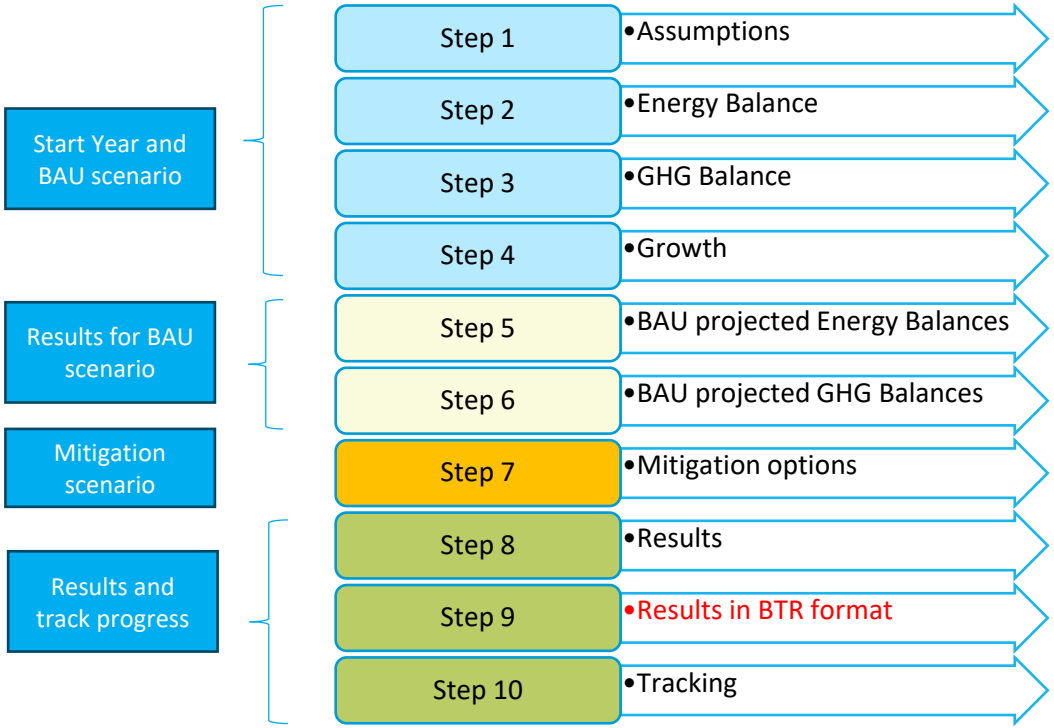
National Action Plan or Long-Term Strategy

- Maldives (National action plan on air pollutants, 2019); Tunisia (inputs for LTS); Jordan (inputs for LTS)

Regional analysis

- Zero carbon Latin America a pathway for net decarbonisation of the regional economy by mid-century (UNEP, 2015);
- Net Zero Carbon Scenarios for the Energy Sector in West Asia (UNEP, 2022)

Main steps to develop the GACMO tool



New step was added

New versions of the GACMO tool

Version 2.0

Released January 2024

Supported by ICAT

Step-wise approach for model development

Navigation throughout the tables by clicking on button

An improved interface through improved tables and figures throughout the model.

Version 2.1

Released August 2024

2040, 2045 were added

Version 2.2

Released March 2025.

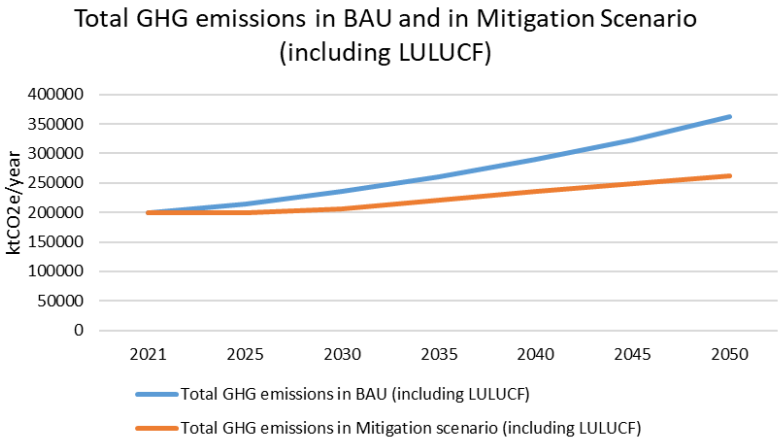
Updated results Sheet

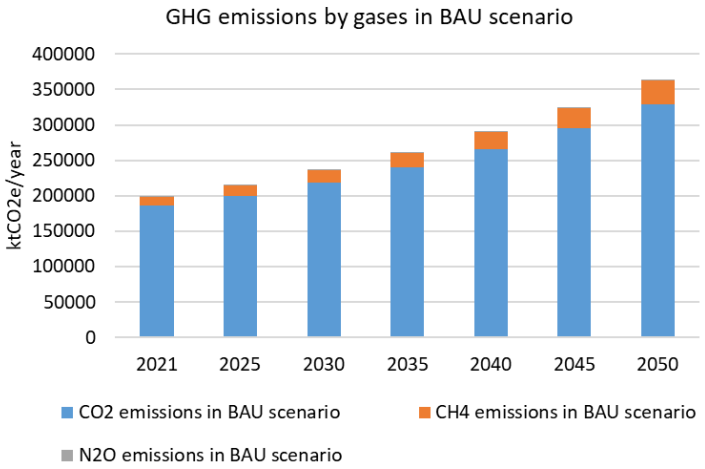
- A revised sectoral disaggregation in line with CRT
- Gases: CO2, CH4, and N2O in kt of CO2 equivalent.
- Projections with and without LULUCF

An additional Step 9 “Results BTR” was added.

Outputs

Total GHG emissions

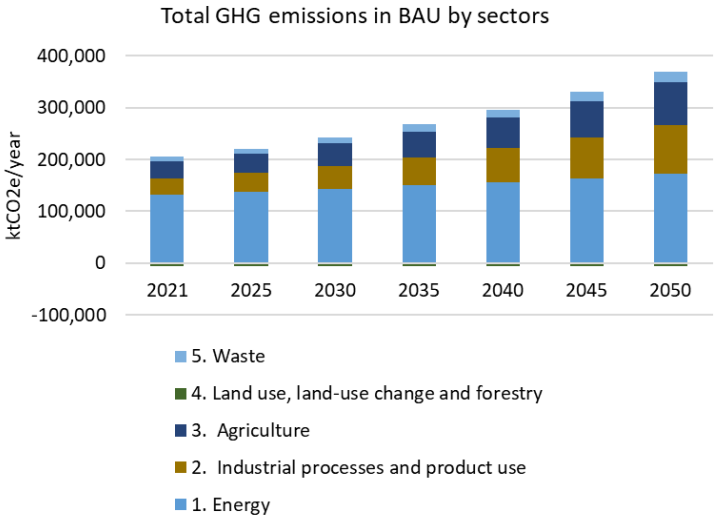


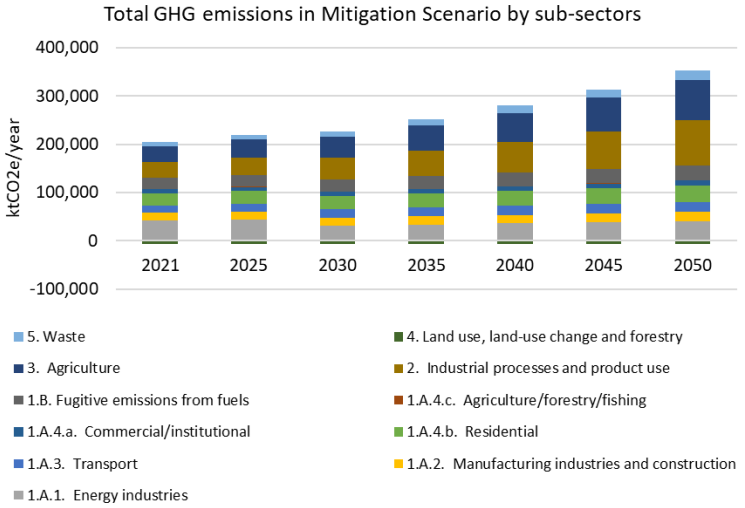


- Total GHG emissions by scenarios
- GHG emissions by individual gases and scenarios
- Including and excluding LULUCF

Outputs

GHG emissions projections by sectors





Results are presented for **5 categories and 11 sub-categories**

The categories are defined in accordance with the **Common Reporting Tables (CRT) agreed upon by the Parties to the Paris Agreement**.

Outputs

Results in BTR format

- The results can be used as inputs for the biennial transparency report (BTR)

- In particular, for the Common tabular formats (CTF) for the electronic reporting of the "Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement".
    - **CTF Table 7** Information on projections of greenhouse gas emissions and removals under a **'with measures' scenario**
    - **CTF Table 9** Information on projections of greenhouse gas emissions and removals under a **'without measures' scenario**
    - **CTF Table 8** Information on projections of greenhouse gas emissions and removals under a **'with additional measures' scenario**
        - To be created in a second GACMO file

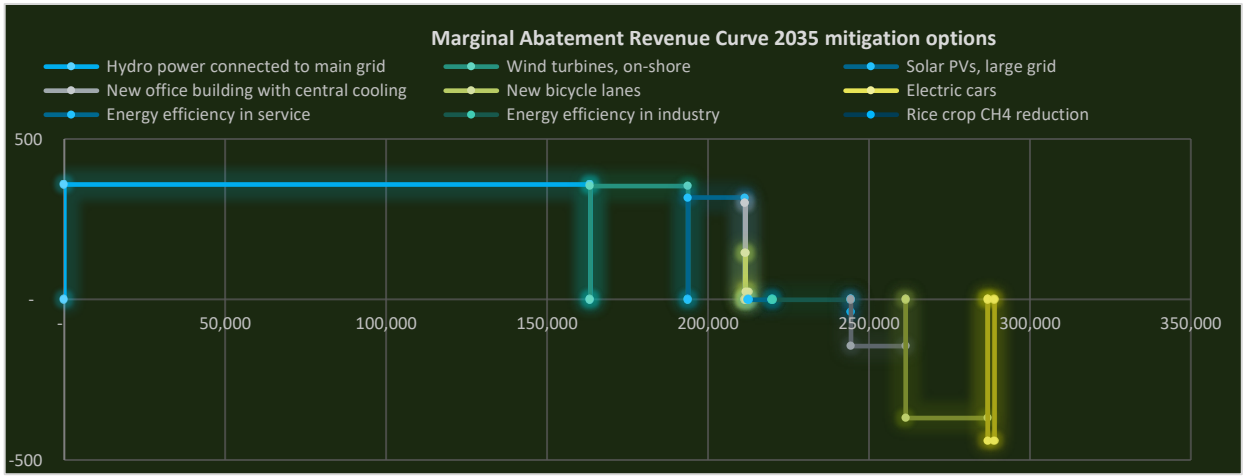
Information on projections of greenhouse gas emissions and removals under BAU scenario

	Most recent year in the Party's national inventory report (kt CO2 eq) [c]	*Projections of GHG emissions and removals, (kt CO2 eq)* [c]					
	2021	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*
Sector [d]							
Energy	116327	120649	126279	132173	138344	144803	151565
Transport	15536	16116	16871	17662	18489	19356	20262
Industrial processes and product use	31975	36950	44376	53416	64419	77812	94115
Agriculture	32255	36757	43277	50954	59993	70635	83166
LULUCF	-6350	-6350	-6350	-6350	-6350	-6350	-6350
Waste	9150	10183	11640	13305	15208	17383	19870
Other (specify)							
Gas							
CO2 emissions including net CO2 from LULUCF	185583	199239	218491	240575	266015	295433	329579
CO2 emissions excluding net CO2 from LULUCF	191933	205589	224841	246925	272365	301783	335929
CH4 emissions including CH4 from LULUCF	12959	14702	17223	20187	23673	27773	32596
CH4 emissions excluding CH4 from LULUCF	12959	14702	17223	20187	23673	27773	32596
N2O emissions including N2O from LULUCF	351	364	380	397	415	434	453
N2O emissions excluding N2O from LULUCF	351	364	380	397	415	434	453
HFCs							
PFCs							
SF6							
NF3							
Other (specify)							
Total with LULUCF	198893	214305	236093	261159	290103	323640	362629
Total without LULUCF	205243	220655	242443	267509	296453	329990	368979

Outputs

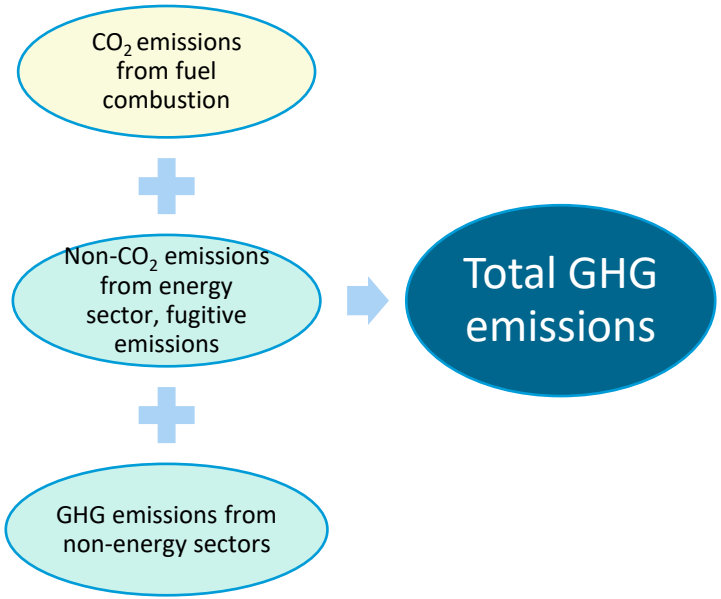
Marginal abatement revenue curve (MAR curve)

- Y-axis: Revenue of an option to reduce one tonne of CO_2 equivalent (expressed in US$/t$CO_2$-eq)
- X axis: GHG emission reduction potential of an option (expressed in ktCO_2-eq / year)



BAU scenario

Approach for estimating total GHG emissions



BAU scenario

CO_2 emissions from fuel combustion

CO_2 emissions from fuel combustion in BAU = $\sum$ Energy consumption in $BAU_{sector, fuel}$ × Emission factor $_{sector, fuel}$

Energy consumption in BAU scenario $_{sector, fuel}$ = Energy consumption $_{Start Year, sector, fuel}$ × Growth rate$_{sector, fuel}$

Mitigation scenario

List mitigation options for one/two mitigation scenarios

Unconditional scenario

Title of the mitigation measure	2025	2030	2035	2050

Conditional scenario

Title of the mitigation measure	2025	2030	2035	2050

Mitigation scenario

Defining the list of mitigation options for the mitigation scenario

119 pre-defined mitigation options

User selects mitigation options applicable for the country

For each mitigation option chosen, **the user will have to insert** (in the column I) **the number of units in** the year 2025, 2030, 2035, or 2050.

User can refer to national reports such as sectoral policy planning documents, national development strategies, NDCs, etc.

It is good practice to **involve a representative group of national experts** from the different sectors/ministries in the development of list of mitigation options

Mitigation scenario

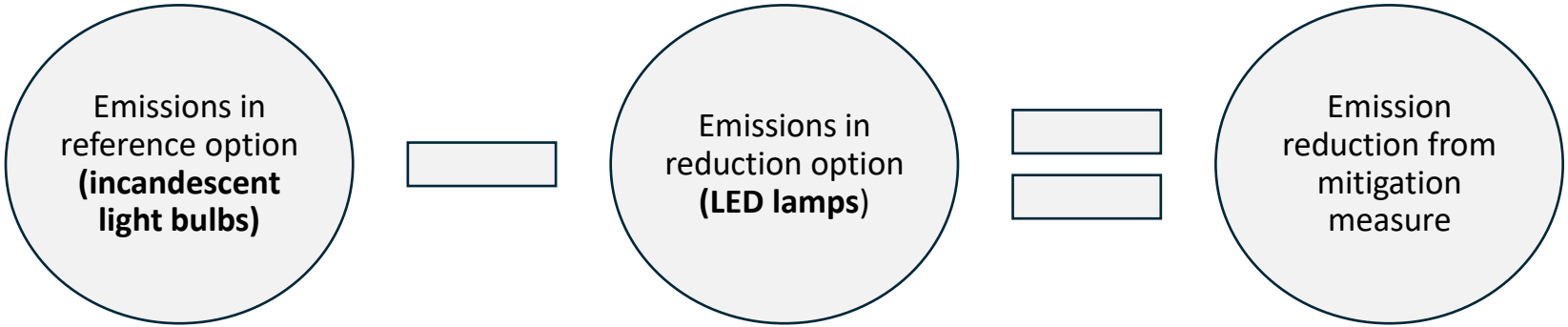
$$\text{Emissions}_{\text{Mitigation scenario}} = \text{Emissions}_{\text{BAU scenario}} - \text{Total emissions reduction}_{\text{Selected mitigation options}}$$

$$\text{Total emissions reduction}_{\text{Selected mitigation options}} = \sum \text{Emissions reduction}_{\text{one mitigation option}}$$

$$\text{Emissions reduction}_{\text{one mitigation option}} = \text{Emissions}_{\text{reference option}} - \text{Emissions}_{\text{reduction option}}$$

Mitigation scenario

Approach for the calculation of emission reduction from the mitigation measure
Example of efficient lighting



III. Conclusions

- GACMO tool is a **simple tool, easily adaptable** to a specific national context used to make analysis of mitigation options and their effects in terms of GHG emissions reduction in the context of NDC preparation or update
- The GACMO calculations are transparent and easy to follow, in line with the methodologies established by the IPCC and CDM
- GACMO tool allows to establish a Business As Usual (BAU) projections by 2025/2030/2035/2050
- GACMO tool allows to establish a mitigation scenario projection (percentage of reduction of GHG emissions in comparison with BAU)
- GACMO tool allows to calculate the reduction of GHG and the cost related to each mitigation option compared to a technology used as a reference
- GACMO tool allows to "play" with the scale of application of any mitigation option to reach a global reduction target
- New version of GACMO has an improved interface and follows step-wise approach

Introduction to LEAP model

What is LEAP?
Example of outputs
Structure
User interface
How do you get LEAP?
Scenarios in LEAP
Demand Analysis
Transformation Analysis
Data requirements

What is LEAP? (I)

A **Windows-based tool** for energy planning and GHG mitigation assessment developed over the last 40 years by the Stockholm Environment Institute (SEI).

Applied in **almost 200 countries**.

At least 60 countries used LEAP to help develop their INDCs.

> 5000 active users.

A **scenario-based modeling tool** that explores how emissions may change in the future under alternative policy settings (e.g. baselines and low emissions development scenarios).

Typically used at the national scale but also works for cities, regions and multi-country analyses.

Source: SEI

What is LEAP? (II)

Primarily focused on **energy sector** GHG emissions but can be used across all sectors (e.g. industrial processes, solid waste, land-use change and forestry).

Not just for modeling: supports data management & documentation, results visualization & stakeholder engagement.

Examines GHGs, local **air pollutant emissions**, economic costs, energy security, resource requirements, and technology and activity trends.

Closely follows **IPCC Inventory Guidelines**.

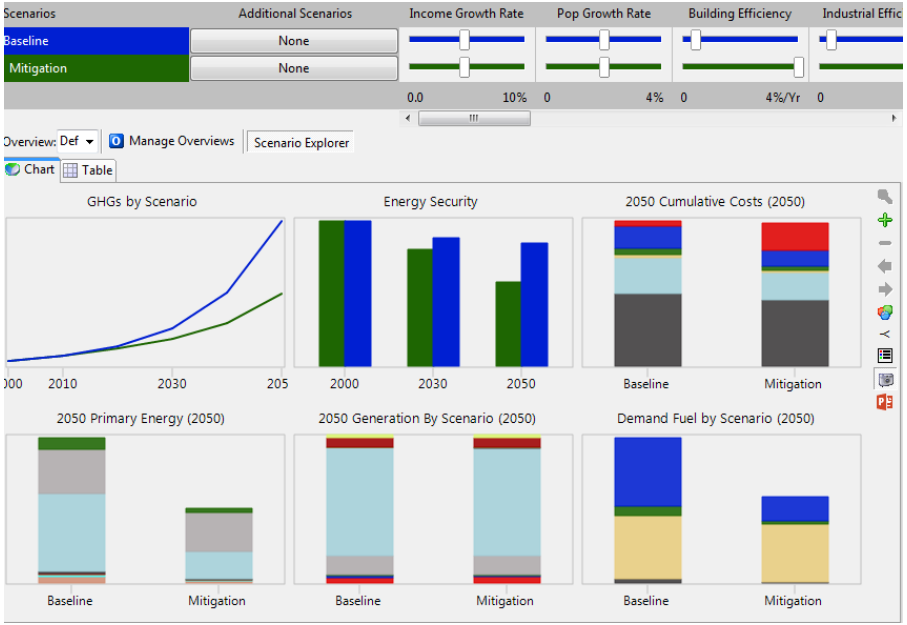
Includes Tier 1 & 2 default emissions factors and **standard GWPs**.

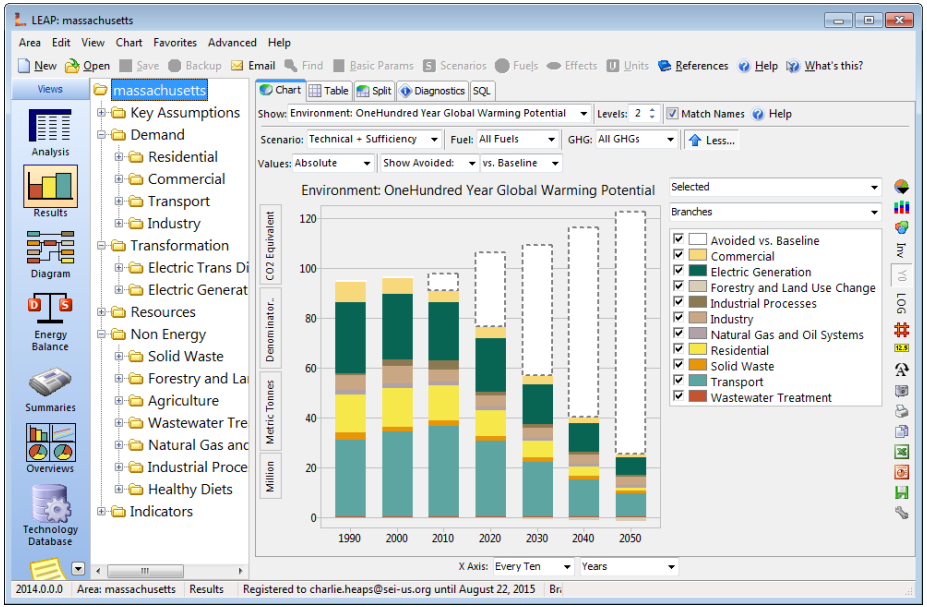
LEAP for GHG Mitigation Analysis

1. **Low initial data requirements** make LEAP usable in situations where good data is in short supply and expertise is limited.
2. **User-friendly design** and emphasis on results communication helps make NDC analyses more broadly accessible: to planners, decision makers and other stakeholders (not just modelers).
3. **Demand-first**, end-use oriented structure helps frame mitigation analysis within broader development goals.
4. **Fast, interactive calculations** encourage users to take an iterative "build and refine" approach to mitigation modeling.
5. LEAP's bottom-up approach is well suited for exploring **technology-oriented** energy and climate policies.
6. Its linkage to the Integrated **Benefits Calculator (IBC),** allows important climate mitigation co-benefits such as air pollution health impacts to be quantified and explored.

Source: SEI

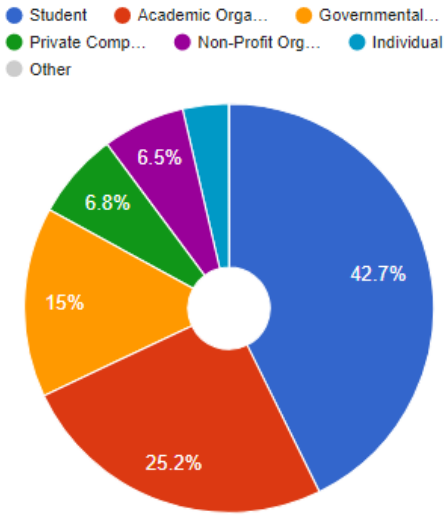
Examples of outputs of LEAP





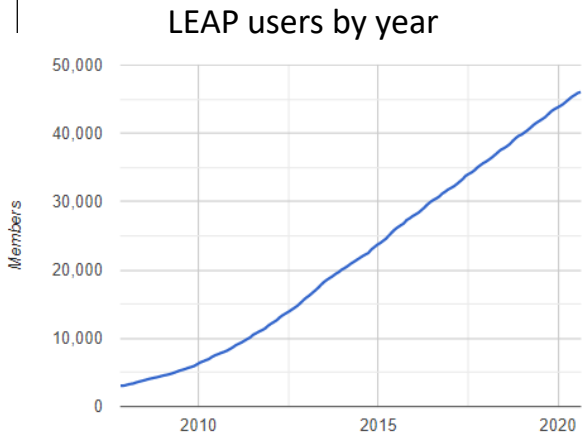
Source: SEI

Widely Used for NDC Preparation and National Communications



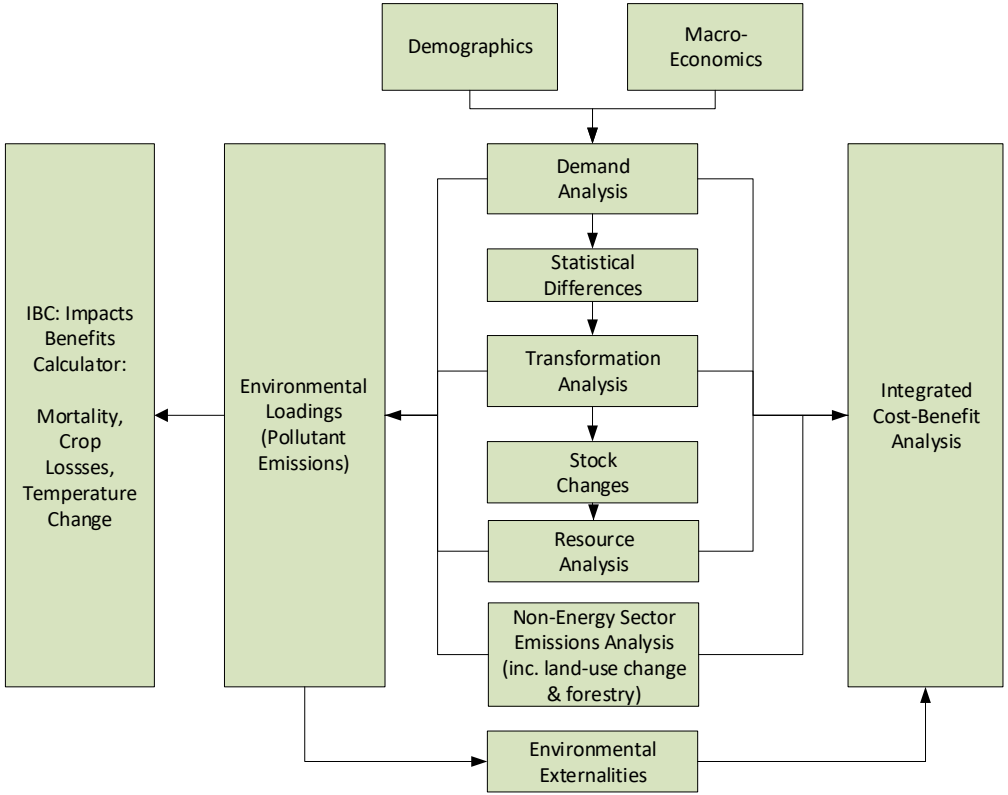
At Least 38 Countries Used LEAP for INDC Preparation		
Armenia	Ghana	Myanmar
Albania	Haiti	Niger
Antigua & Barbuda	Iraq	Nigeria
Azerbaijan	Israel	Palau
Bahamas	Jamaica	Palestine
Bangladesh	Jordan	Philippines
Belarus	Lebanon	Serbia
Bosnia and Herzegovina	Liberia	Uganda
Botswana	Mauritania	Vietnam
Cambodia	Mongolia	Yemen
Chile	Montenegro	Zambia
Ecuador	Morocco	Zimbabwe
Micronesia	Mozambique	

Others using LEAP to help develop National Communications, Biennial Update Reports (BURs), Low Emission Development Strategies (LEDS), Nationally Appropriate Mitigation Actions (NAMAs), etc.



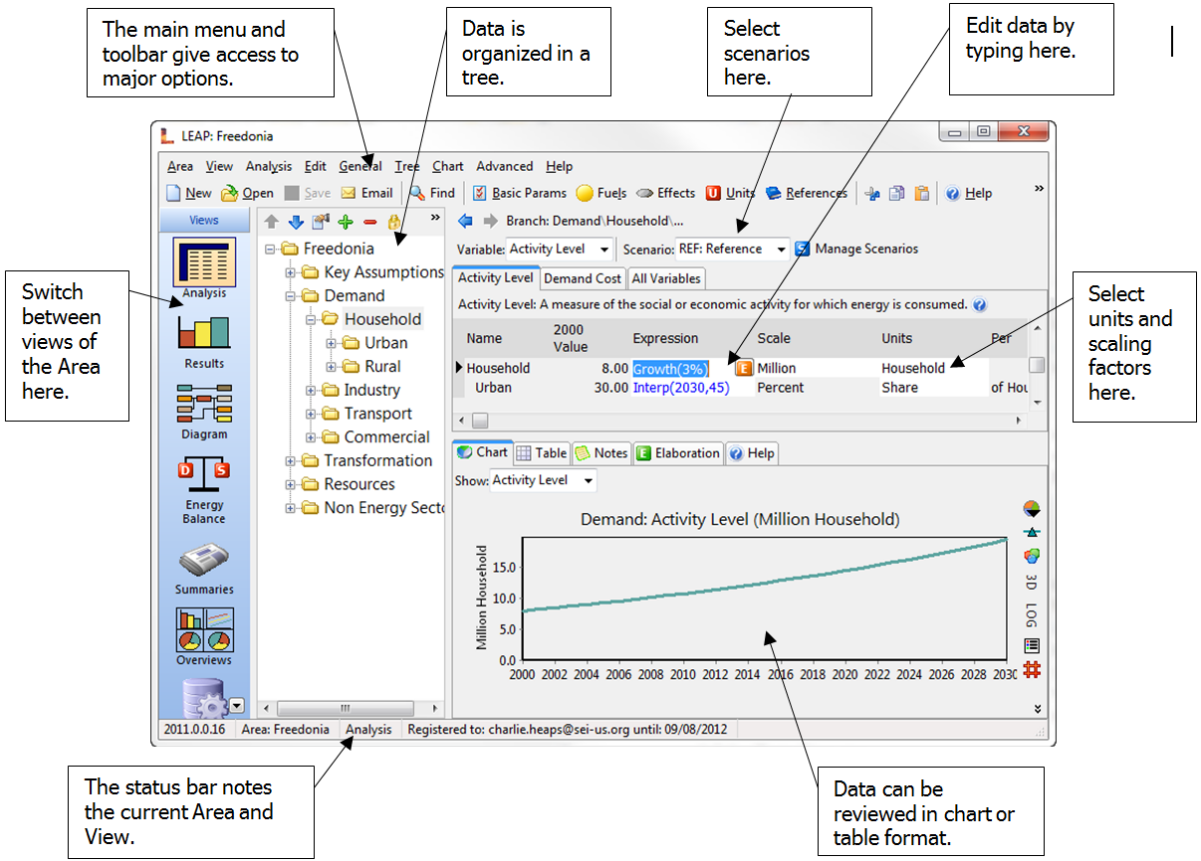
Source: SEI

LEAP Structure



Source: SEI

LEAP: User Interface



Source: SEI

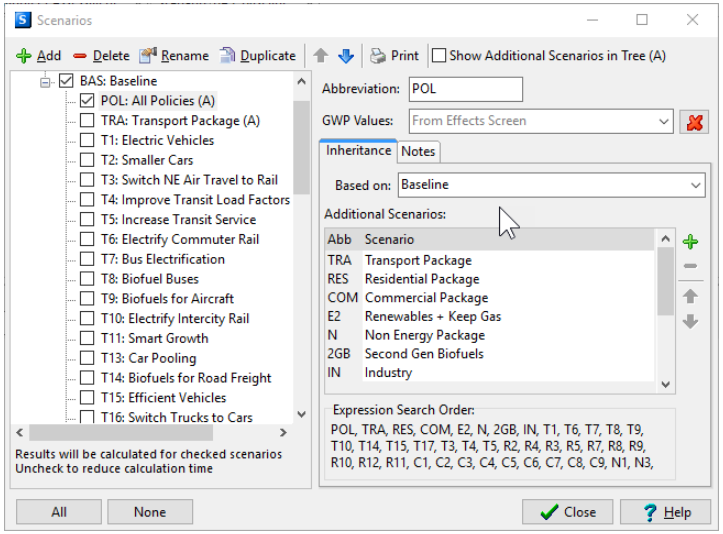
How Do You Get LEAP?

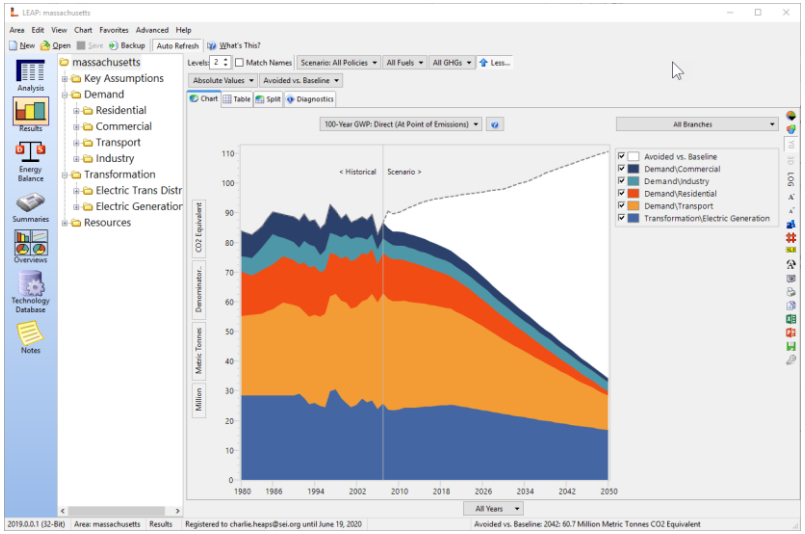
- Download from LEAP web site: https://leap.sei.org/download.
- User name and password required to fully enable downloaded software. Provided to licensed users.
- Licenses are available at no charge to non-profit, academic and governmental institutions based in low-income and lower-middle-income countries. Available at low cost in upper-middle income countries. All others required to purchase a standard license. Simple and quick process to apply online.
- Technical support from SEI though LEAP web site or via email.
- Most users will need training: available through SEI or regional partner organizations.
- Check LEAP web site for news of training workshops.

Source: SEI

Scenarios in LEAP

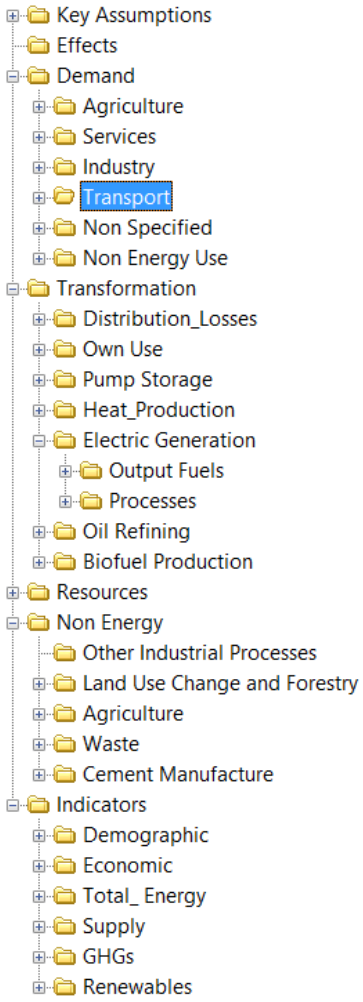
Source: SEI





The Tree

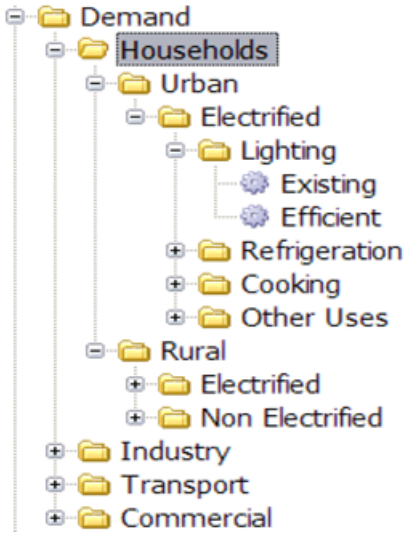
- The main data structure used for **organizing data** and **reviewing results**.
- User **can edit** the tree structure.
- The tree **supports standard editing functions** (copying, pasting, dragging & dropping of groups of branches)
- The **tree is constant across all regions** scenarios. However, you can hide branches of the tree either temporarily or in particular regions (e.g. some states may only have certain industries).

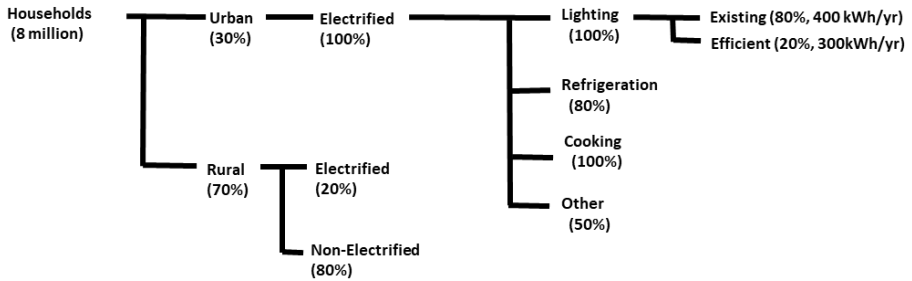


Source: SEI

Demand Analysis in LEAP

Source: SEI





Demand Analysis in LEAP

E = A x I

Energy demand (E) = Activity Level (A) x Energy Intensity (I).

- Hierarchical data structure breaks down overall activity level (A) into smaller, manageable pieces.
  - For example: number of urban households using efficient electric lighting is broken down by multiplying total households x urban fraction x electrified fraction x saturation of lighting x efficient device share of lighting.

Source: SEI

Transformation Analysis in LEAP

- Covers analysis of **energy conversion, transmission and distribution, and resource extraction.**
- Demand-driven engineering-based simulation.
- Basic hierarchy: “modules” (sectors), each containing one or more “processes”. Each process can have one or more feedstock fuels and one or more auxiliary fuels.
- Allows for simulation of both **capacity expansion** and **process dispatch**.
- Calculates imports, exports and primary resource requirements.
- Tracks costs and environmental loadings.
- Choice of two overall methodologies: **simulation** or **optimization**.

Source: SEI

Putting Demand & Supply Together: Energy Balances

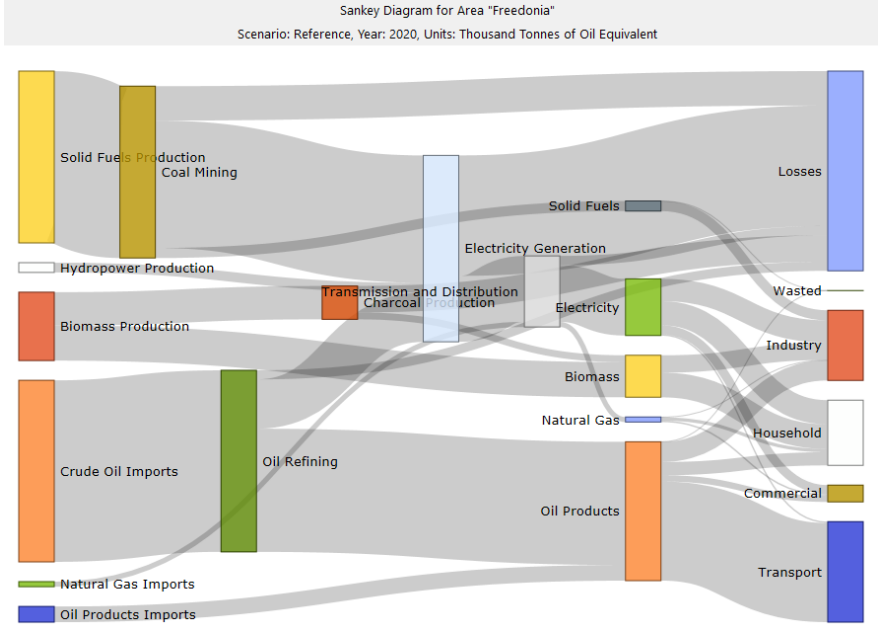
- **Demand and supply** results are **combined** in LEAP's integrated framework.
- **Results** are automatically formatted and can be **displayed as standard energy balance table**s.
- Balances can be viewed for any year, scenario or region in different units.
- Balance columns can be switched among fuels, fuel groupings, years, and regions.
- Balance rows are the Demand and Transformation sectors. Optionally can show subsectoral results
- Balances can be viewed in table, chart, or sankey diagram formats.

Energy Balance for Area "Freedonia"

Scenario: Reference, Year: 2020, Units: Thousand Tonnes of Oil Equivalent

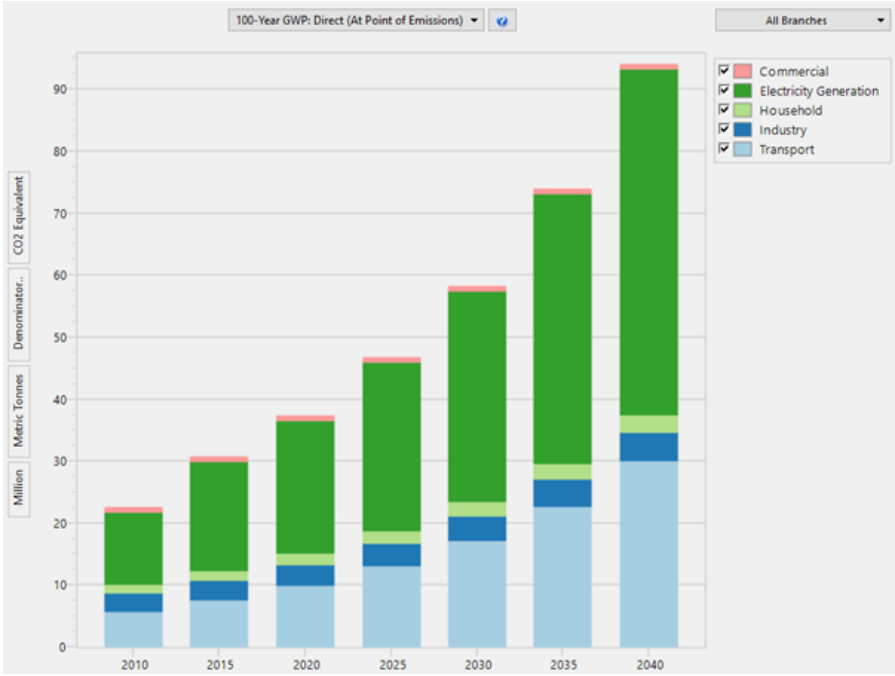
	Solid Fuels	Natural Gas	Crude Oil	Hydropower	Biomass	Electricity	Oil Products	Total
Production	5,685	-	-	321	2,263	-	-	8,269
Imports	-	170	6,006	-	-	-	517	6,693
Exports	-	-	-	-	-	-	-	-
Total Primary Supply	5,685	170	6,006	321	2,263	-	517	14,962
Coal Mining	-1,137	-	-	-	-	-	-	-1,137
Oil Refining	-	-	-6,006	-	-	-	5,705	-300
Charcoal Production	-	-	-	-	-874	-	-	-874
Electricity Generation	-4,215	-	-	-321	-	2,182	-1,632	-3,986
Transmission and Distribution	-	-3	-	-	-	-306	-	-309
Total Transformation	-5,352	-3	-6,006	-321	-874	1,877	4,073	-6,606
Household	-	108	-	-	815	797	436	2,157
Industry	332	10	-	-	573	736	667	2,320
Transport	-	-	-	-	-	46	3,280	3,326
Commercial	-	49	-	-	-	297	207	554
Total Demand	332	167	-	-	1,389	1,877	4,590	8,356
Unmet Requirements	0	-	-	-	-	0	0	0

Source: SEI



Emissions Analysis

- Emission factors for **any GHG or local air pollutant** can be entered in LEAP.
- These can be specified in any physical unit and **denominated by units of either energy consumption or production** (e.g. kg/ton of coal) or **distance driven for transport** factors (e.g. grams/mile).
- They can also be **specified in terms of the chemical composition of fuels** (e.g. sulfur). This automatically adjusts standard emission factors based on specific fuels used in each area.
- LEAP includes **default IPCC Tier 1 emission factors** for GHG inventories.
- Results can be shown for individual pollutants or summed to show overall Global Warming Potential (GWP).



Source: SEI

Data requirements in LEAP I

Demographic Data

- National population data (historical and official government projections)
- Rates of urbanization (historical and official government projections)
- Average household sizes (historical and official government projections)

Macroeconomic Data

- GDP data (historical and projections)
- You may wish to link your LEAP energy sector analysis to a broader macro-economic analysis or macroeconomic model.

General Energy Data

- Current and past national energy balances with data on energy consumption and production by sector or sub sector. NB: Energy balance data is the single most important data requested here!
- Documents describing national energy policies and plans and GHG mitigation assessments for the country.

Data requirements in LEAP II

Energy Price Data

- Available data describing current and historical national energy prices for major fuels (coal, natural gas and major oil products) as well as for electricity. If possible please distinguish the prices charged to major sectors (households, industry, commercial sales).
- Elasticities: Any studies that have examined the elasticity of energy demand with respect to prices and/or income levels.

Demand Forecasting

- Activity Levels: Energy forecasts rely on projections both of energy intensities (energy per unit activity) and overall activity levels.
- Activity data varies from sector to sector.

Data requirements in LEAP III
Energy supply

- **Current and historical installed capacities (MW)** of each major type of power plant.
- **Historical generation (GWh)** from each major type of power plant.
- Average **energy efficiencies or heat rates** of each major type of power plant.
- **Costs:** Any data describing capital ($/MW), fixed ($/MW) and variable ($/MWh) operating and maintenance and fuel costs ($/GJ) of each major type of power plant.
- Data describing the seasonal **load shape** for your electric system e.g. MW hourly peak load.
- Data describing the percentage **maximum availability** and, if possible, the dispatch priority of each type of power plant. If possible provide data showing planned vs. unplanned outages of each major type of power plant.
- **Feedstock fuels:** please describe the types of fuels used by each major type of power plant.
- Any capacity expansion plans describing what types of power plants are likely to be built in the future.
- **Transmission and distribution losses (%)** if possible including both technical and non-technical losses.
- Provide similar types of data for CHP as listed above for electricity generation. Also if possible describe the production efficiencies for both electricity and heat.

Data requirements in LEAP IV

Oil Refining

- Try to provide current and historical data describing the different feedstock fuels and products produced by refineries, their efficiency and the capacity of the refineries (TOE/year) as well as data describing historical imports and exports of crude and oil products.

Other Major Sectors

- if your country has other major energy conversion sectors such as charcoal making, coal liquefaction, gas works, ethanol production, heat production, combined heat and power, etc. please try to provide basic data describing these sectors including descriptions of the fuels used and produced, process efficiencies, and current and future planned capacities of processes.

Extraction Sector Data

- If extraction sectors such as coal mining or oil and gas production are important, try to provide data describing the efficiency and capacity of these sectors as well as information on the fuels produced and the energy consumed during extraction. If possible provide data on fossil reserves in the country.

Renewables

- Renewable energy is becoming increasingly important in many countries and may be an important focus of any GHG mitigation analysis. If possible, provide data describing the technical and economic resource potential for each major type of renewable (e.g. GJ/Year for hydro, wind, solar, geothermal, biomass, etc.)

Data requirements in LEAP V

Energy Sector Emission Factors

- For a first cut GHG mitigation assessment IPCC “Tier 1” emission factors are generally used. However, these can be overridden by more specific national emission factors where appropriate.

Non-Energy Sector Sources and Sinks of GHGs

- The EDGAR database from PBL provides estimates of non-energy sector GHG sources and sinks for most countries. However, national estimates of non-energy sector emissions and sinks may be more accurate and appropriate.

Fuel Characteristics

- Default international data describing fuels and their characteristics (energy content, chemical composition, etc.) is generally sufficient to meet the needs of most studies. However, in some countries, these characteristics are very different from international average values.

CBIT-GSP
CLIMATE TRANSPARENCY

Thank you!
Questions?

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