

Sectorial Activity Data for GHG Emissions (SAGE)



The SAGE tool provides a first-of-its-kind, user-friendly interface for gathering and processing activity data in conjunction with indispensable documentation for greenhouse gas emissions inventories, projections, and mitigation impact analyses. Existing greenhouse gas (GHG) calculation tools use activity data as inputs that are, all too often, assumed to be readily available and in a standard and precise format. But, in practice, data providers rarely produce primary data in the exact formats needed for GHG estimation. Therefore, GHG emissions inventory compilers and mitigation analysts must construct ad-hoc methods and tools (e.g., spreadsheets) to "process" messy and raw statistical data into the complete and clean "useable" data required by existing emissions calculation, projections, and reporting tools.

SAGE Overview

- **SAGE is a web-based greenhouse gas inventory data collection tool** designed to support national climate measurement, reporting, and verification (MRV) systems, especially in developing countries, through robust data collection and storage, as well as intelligent data processing.
- **SAGE is fully compatible with the 2006 IPCC guidelines** for national greenhouse gas inventories and was developed to support governments collecting activity data to meet the reporting requirements under the Enhanced Transparency Framework (ETF) of the Paris Agreement.
- **SAGE can accept simple data inputs and produce downloadable outputs in Excel or CSV format.** SAGE outputs can be used for data entries to IPCC emissions calculations software. The output data is consistent in form and units for estimating emissions by applying IPCC equations.
- **SAGE outputs can be used as the basis for calculating projections and mitigation impact quantification.** As a dedicated GHG data management system with enabled business intelligence capabilities, data can be collected from multiple sources, processed, and then exported to GHG inventory estimation spreadsheets or software that quantifies, projects, and/or analyzes GHG emissions and removals.
- **SAGE can serve as a reliable repository for documenting and storing input data** while offering the functionality to assist with processing data, conducting quality control, querying GHG inventory activity data, and performing analytics on the available data sets.
- **SAGE can be run on a local network or via the cloud** using version synchronization so that it can support multiple users accessing the tool simultaneously.

- **SAGE's administrative interface provides security and flexibility** of views and access for different groups of users. The underlying database is robust and designed for speed and scalability.

Key features

Currently in its pilot testing phase, this initial version of SAGE covers IPCC Energy sector categories. The key features of this version allow users to:

- Record and store activity data (e.g., 10,000 gallons of fuel consumed by the commercial vehicle fleet) and fuel properties (e.g., fuel density or net calorific value) as a time series or on an ad-hoc basis.
- Collate activity data, keep track of data origins, and uncertainties.
- Apply automatic conversions to energy units in System International (metric system) as required in the 2006 IPCC equations.
- Map energy sector emissions source category classifications between the IPCC and UNFCCC categories to provide flexibility of category reporting for developing countries under the UNFCCC and the ETF under the Paris Agreement.
- Business intelligence to resolve data gap issues. This includes identifying gaps in the data set, classifying them by fuel categories, and utilizing best approach methodologies to fill the identified gaps.
- Establish default uncertainty estimates in-line with the 2006 IPCC Guidelines.
- Enable input/output of Excel files for all configuration tables and produce CSV files compatible with emission calculating tools (e.g., IPCC emissions calculating software).
- Analyze historical trends, data comparisons between years, sums and ranking by category and fuels, calculating performance indicators and intensities (e.g., fuel use by industry, GDP per capita, economic outputs).
- Set user permissions through the administrative and user management interface.

Questions & Answers

General

Who would benefit from using SAGE?

- Any technical GHG inventory personnel
- Personnel that use activity data for analyses (e.g., policy assessment, NDC) and projections
- Personnel and organizations that use activity data for mitigation projects (e.g., fuel consumption for transport used by local government's city planners)

How can SAGE support NDCs?

- Providing data analysis and comparisons such as energy consumption between years, per capita, per unit of product or GDP, helping to inform NDC target development and tracking performance toward NDC achievement.

Can SAGE interface with other systems?

- If the system can import Excel or CSV files, SAGE can export data in those formats. It is also important to note that SAGE can produce inputs that are compatible with the IPCC inventory software. To explore data output customization, contact the UNFCCC secretariat and [SAGE developers at the GHG Management Institute](#).

SAGE and IPCC software

Is SAGE a replacement for IPCC software?

- No, the IPCC software is a tool for calculating GHG emissions and removals. In contrast, SAGE is a tool to record, store, analyze, and fill any activity data gaps. These activity data are essential inputs to the IPCC inventory software. SAGE helps to record raw activity data and transforms it into data that can be put directly into the IPCC emission calculating equations in the required units. SAGE also allows estimating activity data uncertainties in-line with the 2006 IPCC good practice and records the metadata.

Activity data collection and processing

Which sectors does SAGE cover?

- When complete, SAGE will include all sectors other than Land-Use, Land-Use Change, and Forestry (LULUCF). SAGE will in future version include the Agriculture sector. Currently SAGE is in its pilot testing phase and covers the IPCC Energy sector. The next phase of development will include Industrial Processes and Product Use sector.

Does SAGE cover fugitive emissions categories?

- Yes, the current version of SAGE covers fugitive emissions from solid, liquid, and gaseous fuels within the IPCC Energy sector.

Is it possible to map IPCC and UNFCCC (CRF¹) categories in SAGE?

- Yes, when you select/enter an IPCC category, SAGE automatically maps it to the corresponding UNFCCC (CRF) category.

Is it possible to calculate “apparent consumption” using a reference approach in SAGE?

- Yes, SAGE can calculate annual apparent consumption using the IPCC reference approach in TJ and kt (= Gg).

What if we do not have enough data to enable bottom-up calculation of energy consumption within each category? Does SAGE provide a top-down approach option?

- Yes, SAGE can estimate the energy consumption using the top-down reference approach applying national level defaults and assumptions. SAGE can pro-rate the use of each fuel type for each category and provides users the ability to enter the proportion of fuel consumed by specified categories or sub-categories.

What if we do not know the uncertainty value for fuel consumption?

¹ CRF stands for the Common Report Format Reporter tool. The CRF is a GHG inventory reporting tool mandatory for all Annex I Parties. The tool accommodates the categorization of anthropogenic activities leading to GHG emissions that is currently accepted by the Conference of Parties. Because this categorization is adapted by UNFCCC and the COP, it is also referred to as “used by CRF” or a “CRF” categorization.

- SAGE can calculate uncertainties by applying the logic described in the 2006 IPCC Guidelines.

Data Gaps

What if there are data gaps? Can SAGE help?

- Yes, through the “Data Gaps” functional block SAGE assists users in finding and filling in the data gaps automatically using different splicing techniques described in the 2006 IPCC Guidelines.

What if proxy data exists to model activity data for a particular category, does SAGE accept proxy data?

- Yes, SAGE uses a surrogate method that allows users to model the required time period by applying proxy data and then scaling it using the known data points.

Does SAGE automatically build graphs from the input data?

- Yes, graphs are included in SAGE’s functionality. For example, you can view historical trends, comparisons between years, the indicators, the data gaps, etc., all in integrated graphs following the input of the appropriate data.

Data entry and customization

Is SAGE customizable? For example, if some categories are not relevant to my country (e.g., the country does not produce metals) can they be removed? Or if there are limited types of fuel or technologies used in my country can the tool be simplified?

- Yes, SAGE has a very powerful “configuration” layer where technical inventory experts can fine-tune and adjust which fuels, categories, units of measurement, geographical aggregation levels, technologies, etc. are included or applied for use by the tool. The functionality exists to adjust SAGE so it can be relevant to any national circumstance.
- SAGE allows users to download and save configuration tables (as an Excel/CSV file), which is a recommended practice if a user makes substantial adjustments from the defaults.

Can data be entered and stored in SAGE at the sub-national level? For example, by province, island, district, city, or facility?

- Yes. SAGE provides a flexible aggregation-level menu that can be adjusted by users to match the desired level of jurisdictional disaggregation.

Can SAGE help to recognize what data is needed to collect for different IPCC methodological tiers (because, the data required for a Tier 1 calculation can be very different from the data required for higher tiers)?

- Yes, for most categories (with rare exceptions) SAGE invites you to choose the methodological tier that you are planning to apply for subsequent emission estimations and provides corresponding menus and fields that present the appropriate data to input based upon the selected Tier of calculation method.

What if some fuel parameters (e.g., fuel density or a calorific value) are not available?

- SAGE has a dedicated table with the pre-defined fuel properties at the configuration level, where data are entered from the default 2006 IPCC values or from the engineering and scientific references. This table can be extended further to include country-specific values and customized to keep only the relevant sets of data.

- Users can elect to automatically apply the default values by selecting the option “set from defaults” on the data entry form.
- If relevant fuel characteristics are not available, a default value is assigned automatically.

Does SAGE build a record of annual data for each year?

- Yes, the data collections are designed on an annual basis. If users wish to create a time-series, simply use the same AD collection name and specify the year for each annual collection.

Can data from Excel files be entered into SAGE directly?

- Yes, this function is a key benefit of SAGE, as data entry templates for each group of categories or configuration tables are provided. You can enter the data for those groups of categories for the entire time series in one file or for input into configuration tables.

Data analysis

Can SAGE build activity data historical trends?

- Yes, the “Analytic” block allows you to view historical trends for any selected category(ies) or subcategory(ies) which are provided in table and graph form.

Can SAGE rank consumption by year?

- Yes, you can rank energy consumption by category and by energy or fuel type, and view results for any selected year.

Can SAGE calculate comparisons across multiple indicators?

- Yes, SAGE can calculate user-defined indicators that show the amount of energy consumed by any user-defined parameter for a single year or as a time series. Comparison results can be visualized in a table or graph.

SAGE distribution and costs

When can we access to SAGE?

- SAGE is currently in the pilot testing phase and limited to covering the Energy sector. The full package for country use is expected to be released early 2023.

Can we participate in the pilot testing phase?

- Yes, but you will have to sign the “testing agreement”. Provided you complete the agreement you can test the pilot version of SAGE that covers the Energy sector.

How will SAGE be distributed when fully released?

- The UNFCCC secretariat will govern this process when the tool is ready for distribution. Sign up for [SAGE updates here](#) to stay connected throughout the development process.

How much will SAGE cost?

- SAGE is planned to be distributed by the UNFCCC free of charge to all middle- and low-income countries. The pricing for high-income countries will be publicized when available.

User assistance

How do I become trained to use SAGE?

- A detailed user manual will be provided with the release of the tool. A video tour of SAGE's key features will be accessible to users. And the UNFCCC plans to organize regional hands-on tutorials. Additionally, if a country requests in-person assistance to install SAGE a tutorial to set up and use SAGE can be organized.

Does SAGE require knowledge of any programming language(s) to set up or use?

- No knowledge of programming languages is required to set-up and use SAGE. Familiarity with data tables and Excel (or similar software) is beneficial to using SAGE.

Is troubleshooting and general assistance included with SAGE?

- The UNFCCC secretariat plans to organize a basic helpdesk to field requests for assistance from SAGE users. Additionally, the UNFCCC secretariat is planning to organize tutorials for SAGE users to provide further support.

Software requirements

What computer operating systems are able to run SAGE (e.g., can it be run on Mac or Windows computers?)

- SAGE is platform-independent and can be run on any computer, tablet, or mobile phone using a common web browser as long as you are connected to the internet (if using cloud version) or the local network where it is installed.

Data approval process

What if we have an internal data approval process, would SAGE support this?

- Yes, SAGE is capable of supporting data review and any approval process(es) through the "activity data collection" block.

SAGE installation and security

How is data accessed through SAGE? Is data storage secure? How are multiple user's inputs tracked through SAGE?

- Access to SAGE is password protected. The SAGE administrator can set up SAGE to accommodate different permission levels (e.g., administrator, technical expert, data entry contributor, policy user) and assign people to different user groups with different access rights. SAGE administrators can set up user groups and customize their access to the tool using a group access interface.
- Users accessing SAGE can be monitored through the administrative interface, which includes an auditable system log and access log showing who accessed SAGE, when, and what changes were made. SAGE also includes an error log which records any errors that may occur so they may be shared with the SAGE developers to resolve the issue and improve the tool.
- The administrative interface allows for users with administrative rights to monitor the IP addresses of users accessing SAGE and functionality exists to block any unwanted addresses.
- Each module has a history tab that records the actions performed which is also only accessible to the "admin" access level.
- SAGE can be installed on a local network to provide for additional security.

- Two-factor authentication can be enabled for specified users or all users (as determined by the admin user).

Does each country have its own unique SAGE access? Will SAGE be installed at one location for use by all countries or can countries choose the installation location themselves?

- SAGE will be installed for each country individually at the web address provided by the country – whether on the cloud or on their own intranet. SAGE can be used as a web-based application on the cloud with an individual country access (the country can choose the specific cloud servers they want to install their version of SAGE). SAGE can be installed to run on a local network, which means only the organization and individuals who have access to that local network would be able to access SAGE and the data maintains. This solution is recommended if there are data confidentiality concerns.

Is SAGE data and information publicly available or is it kept confidential?

- The data in SAGE are not assumed to be publicly available, although the level of accessibility of data in SAGE is defined by each country. The national SAGE administrator will set up the user groups and user access as they see fit. If a country wishes to make all or some data publicly available, this can be done. If the data are meant to be accessed only by particular group or set of individuals, the relevant access accounts can be set up at the administrative interface of SAGE without the need to know any programming languages or have coding capabilities. If the data safety is a primary concern, we would recommend installing SAGE on a secure intranet with a limited access to the data and set up user groups on a “need-to-know” basis.