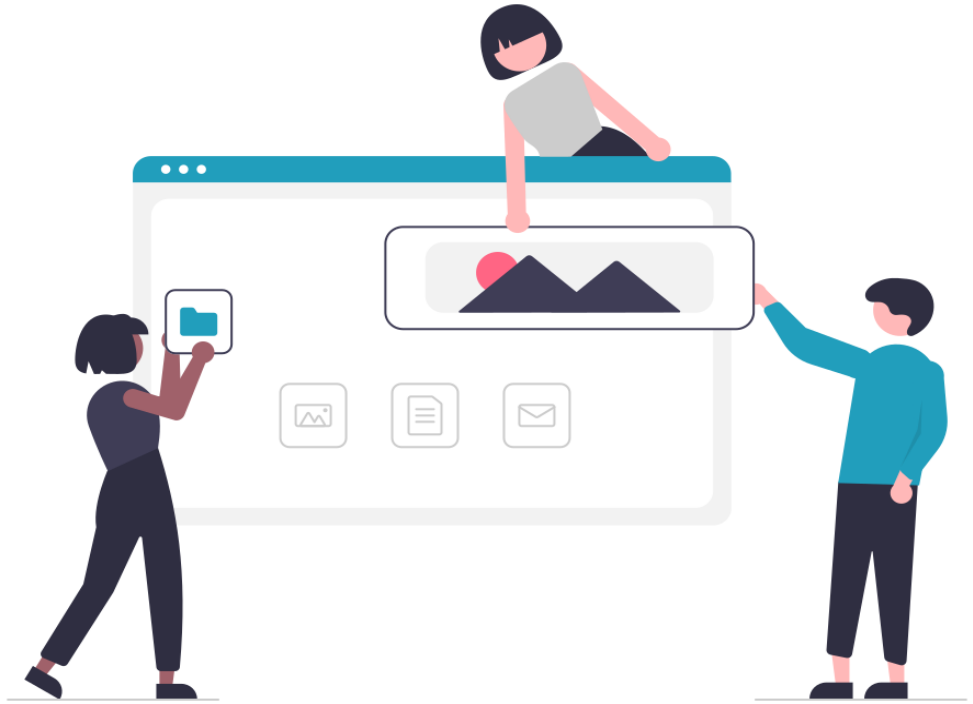
Efficient SWAT+ input maps generation with an open-source QGIS-Google Earth Engine plugin

Adrián López-Ballesteros, Raghavan Srinivasan, Javier Senent-Aparicio

2024 Strasbourg, France SWAT Conference

"We are all good individually, but together we are better."

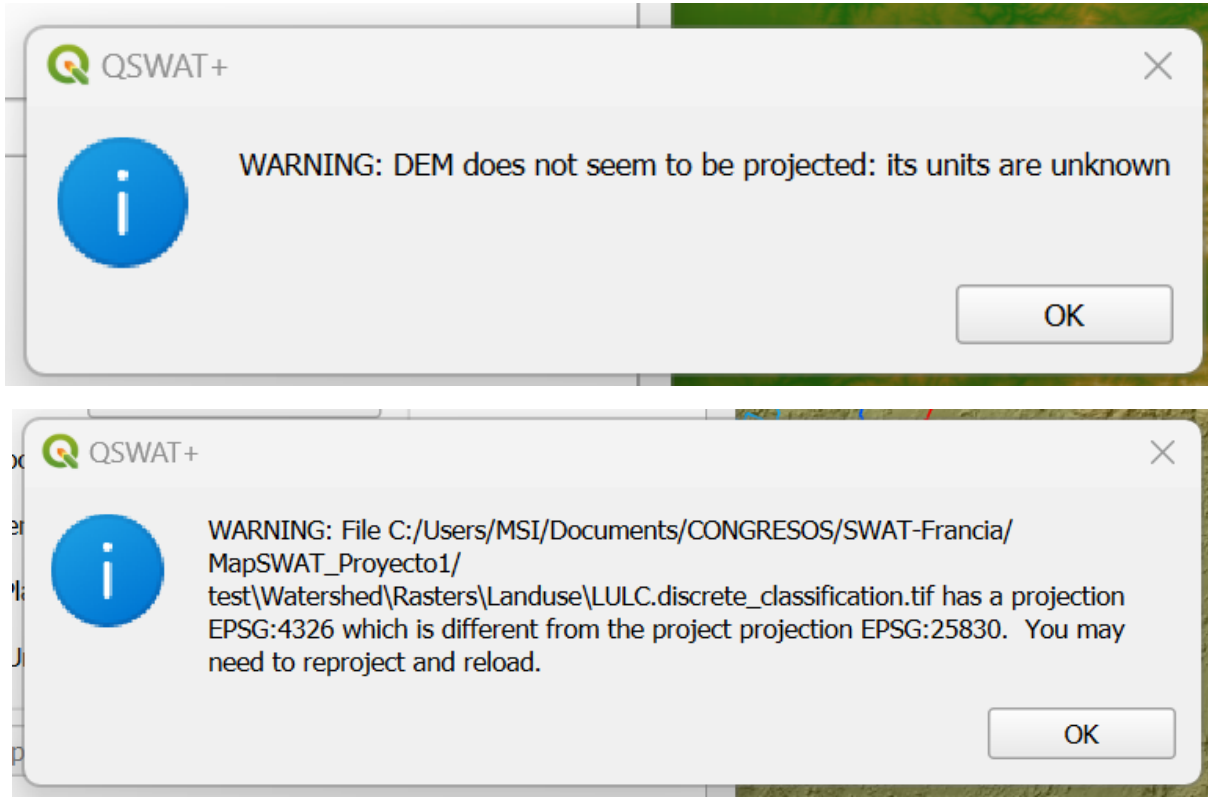



QUICK TEST

1. Who knows what the SWAT/SWAT+ model is?

2. When starting a SWAT+ model, who has spent a lot of time collecting and preparing the input maps?

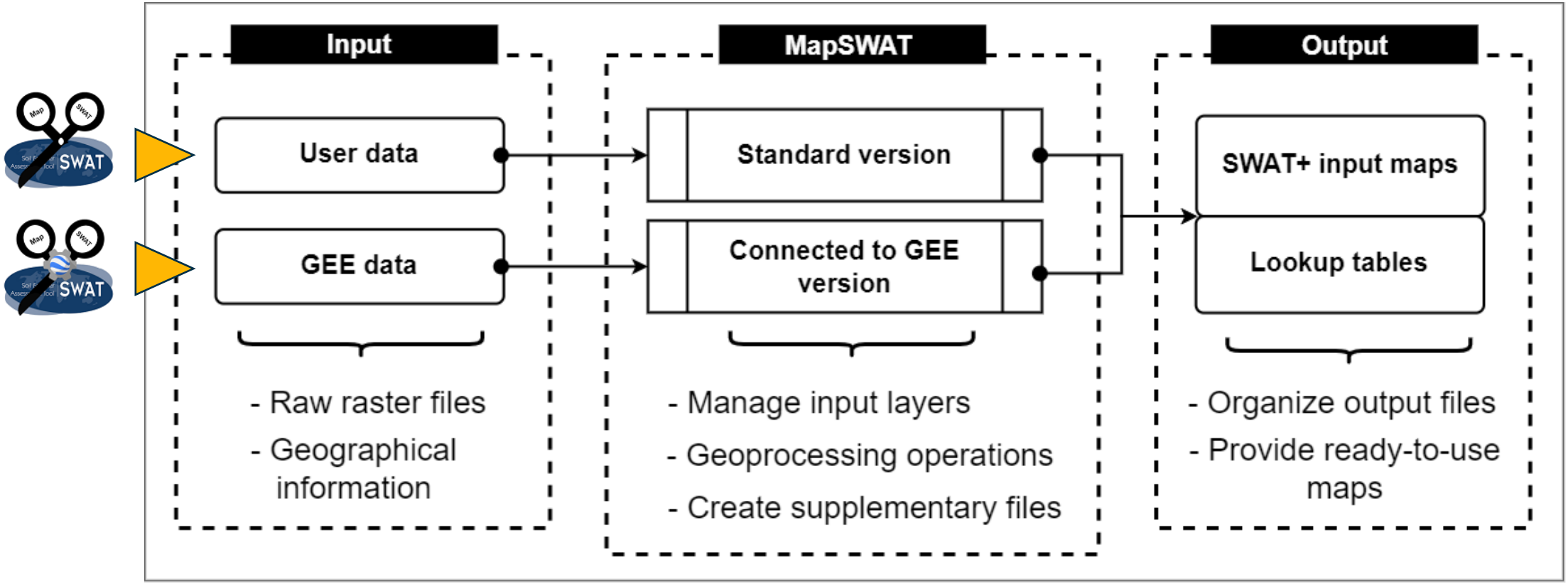
3. Who has ever had a formatting error?



MapSWAT

MapSWAT plugin

MapSWAT is a freely available QGIS plugin, developed in Python, that streamlines the preparation of the SWAT+ input maps.



MapSWAT application area

MapSWAT application area

MapSWAT application area

MapSWAT application area

MapSWAT application area

OCEANIA

MapSWAT application area

MapSWAT application area

The MOON

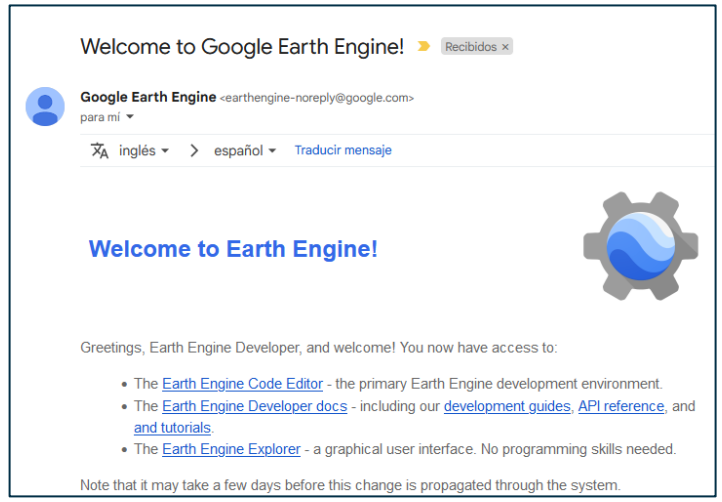
MapSWAT plugin

Standard version

Google Earth Engine

Connected to GEE version

GEE is a cloud-based platform that hosts a multi-petabyte collection of satellite imagery and geospatial data.



Welcome to Google Earth Engine! Recibidos ×

Google Earth Engine <earthengine-noreply@google.com>
para mí

inglés > español Traducir mensaje

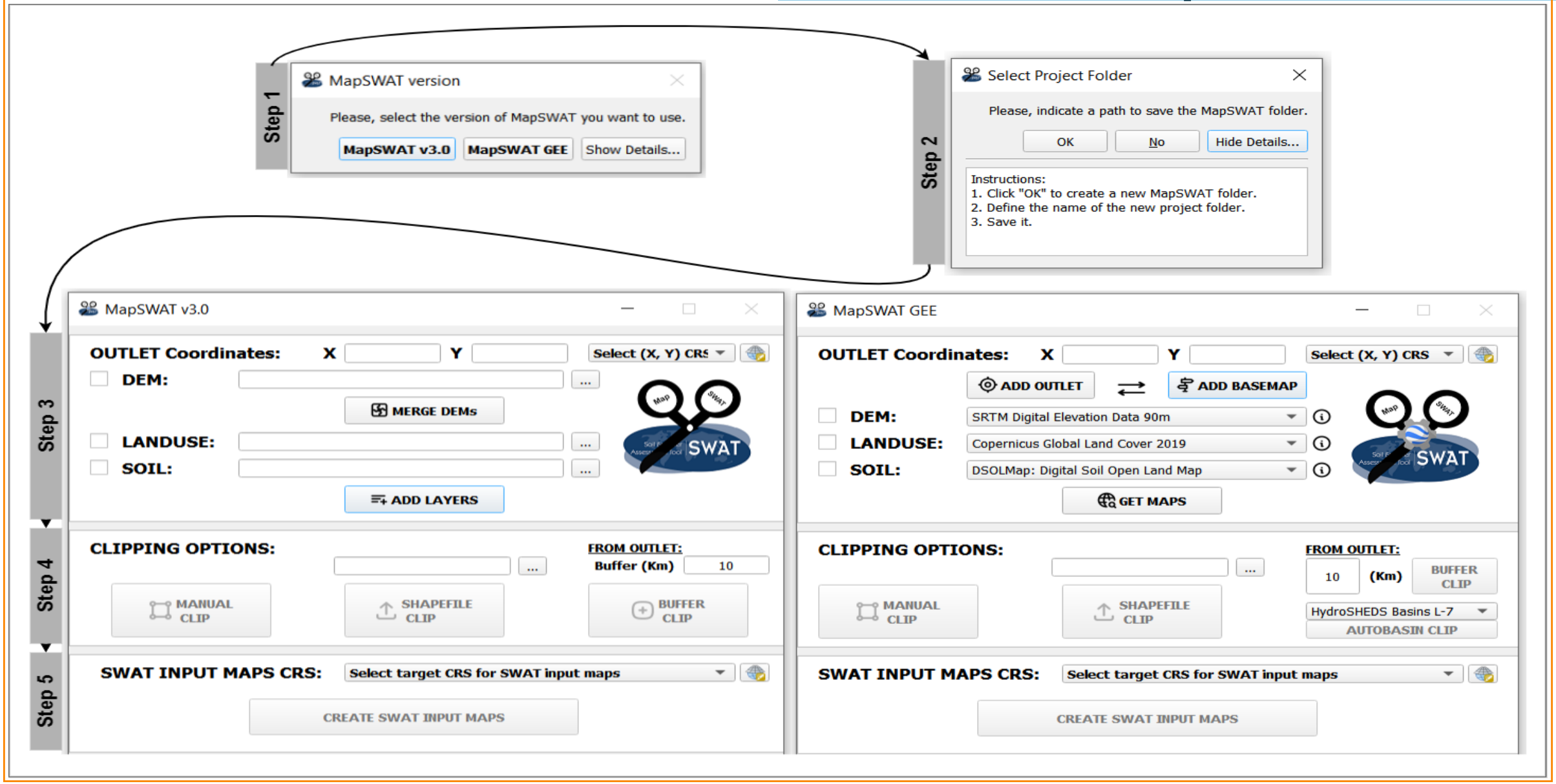
Welcome to Earth Engine!

Greetings, Earth Engine Developer, and welcome! You now have access to:

- The Earth Engine Code Editor - the primary Earth Engine development environment.
- The Earth Engine Developer docs - including our development guides, API reference, and and tutorials.
- The Earth Engine Explorer - a graphical user interface. No programming skills needed.

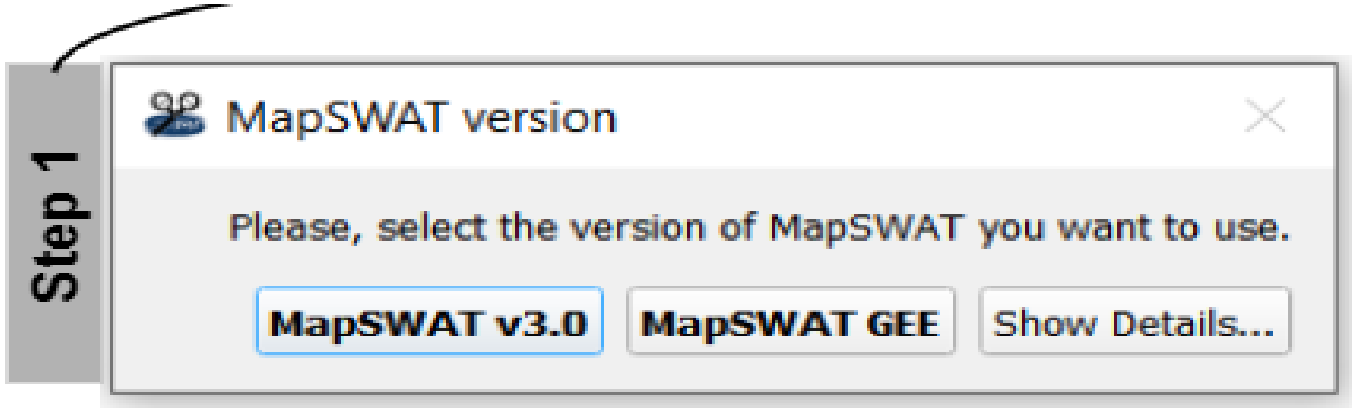
Note that it may take a few days before this change is propagated through the system.

MapSWAT workflow



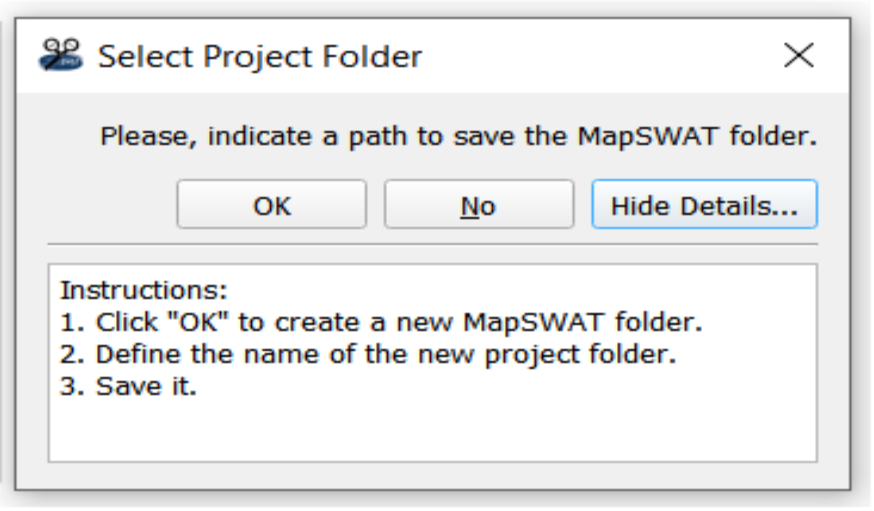
MapSWAT workflow

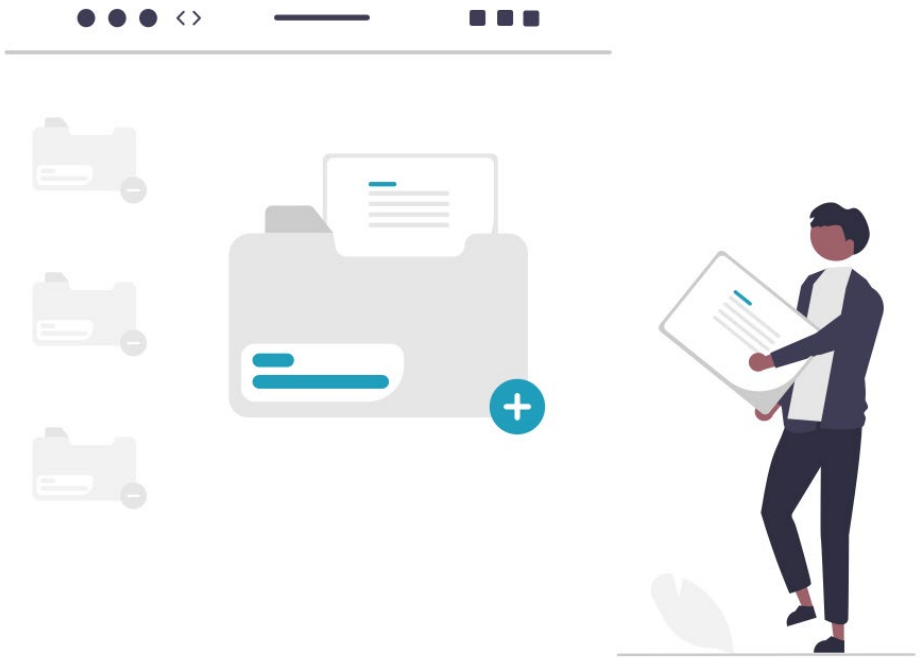
Step 1



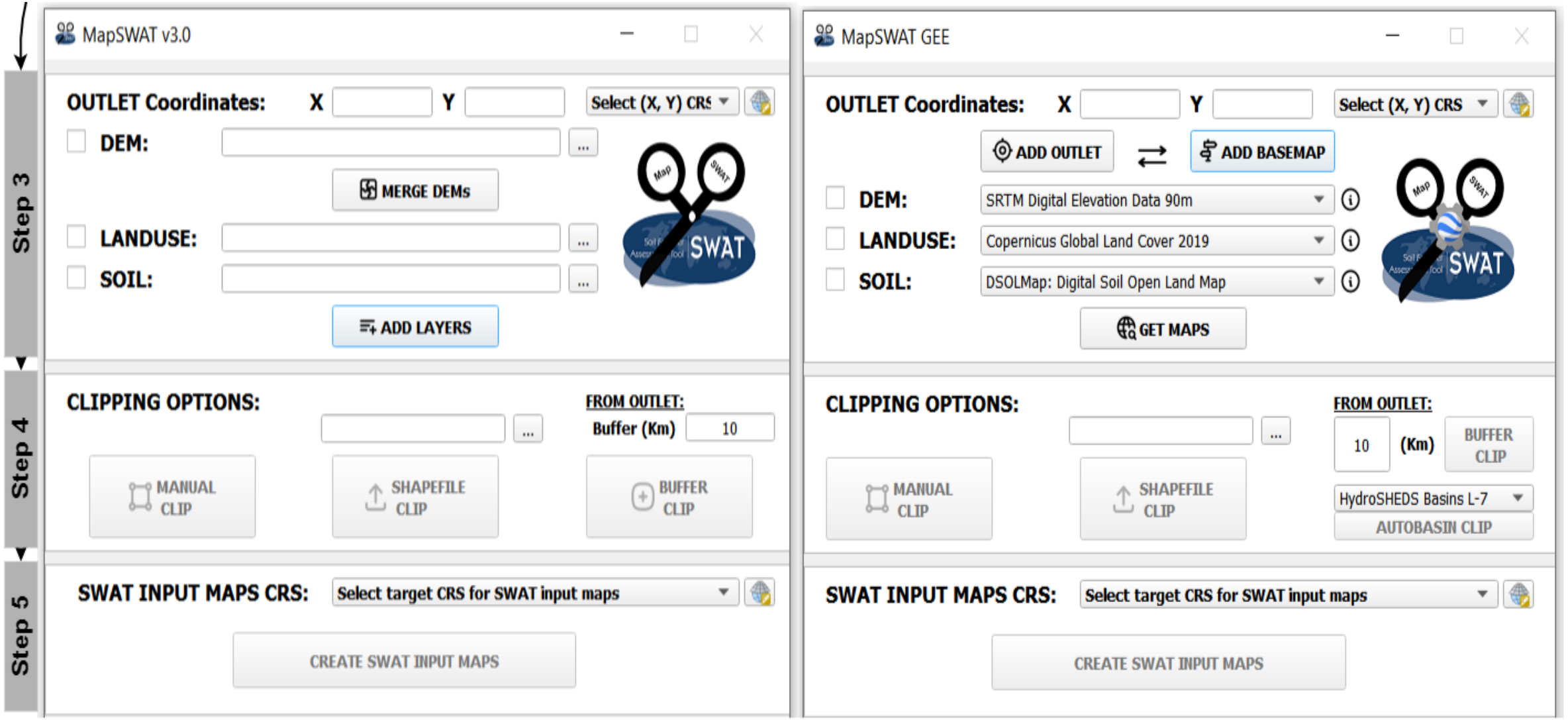
MapSWAT workflow

Step 2

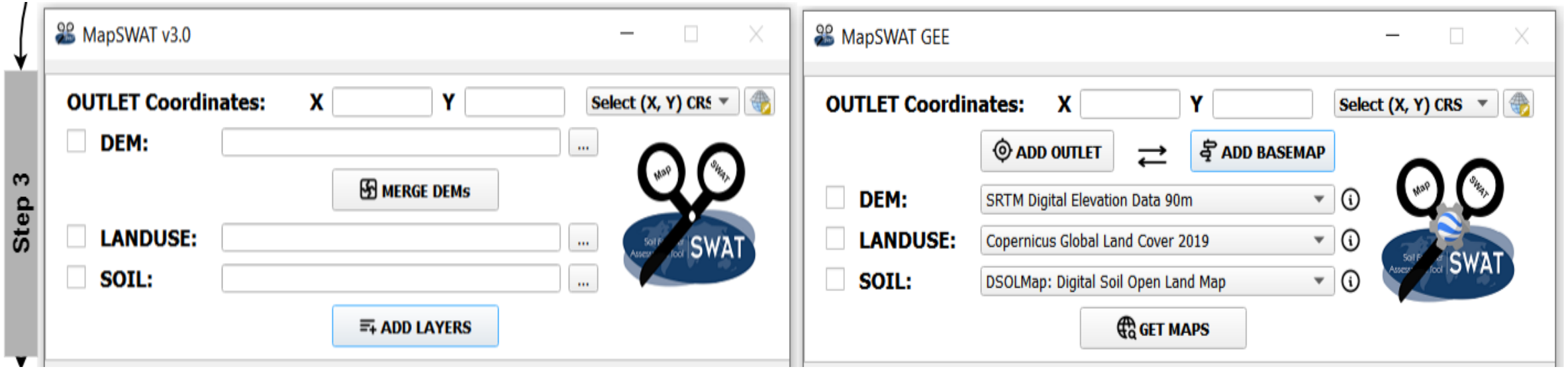


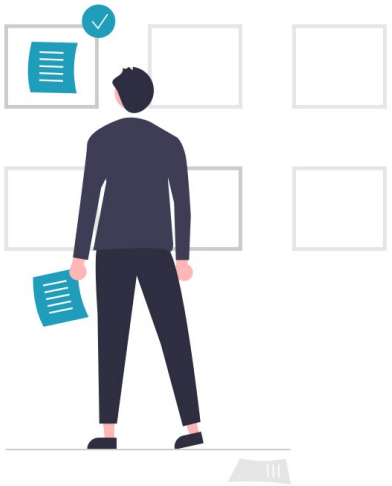


MapSWAT workflow

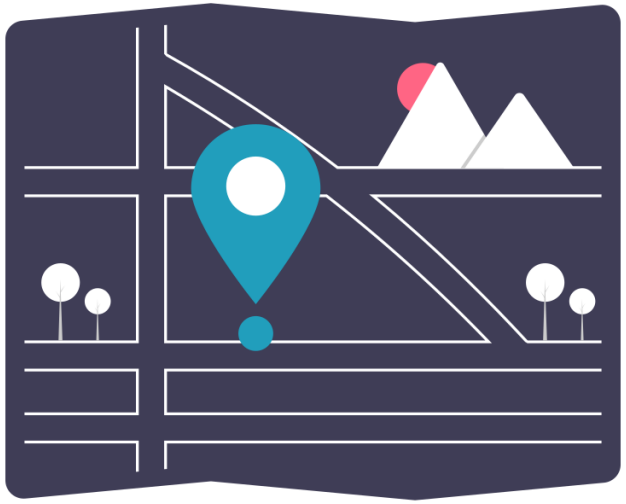


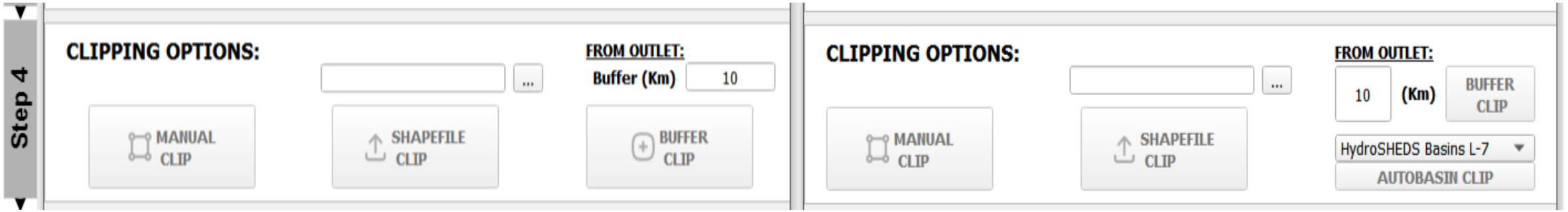
MapSWAT workflow





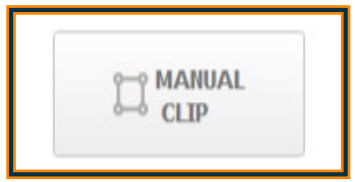
MapSWAT workflow

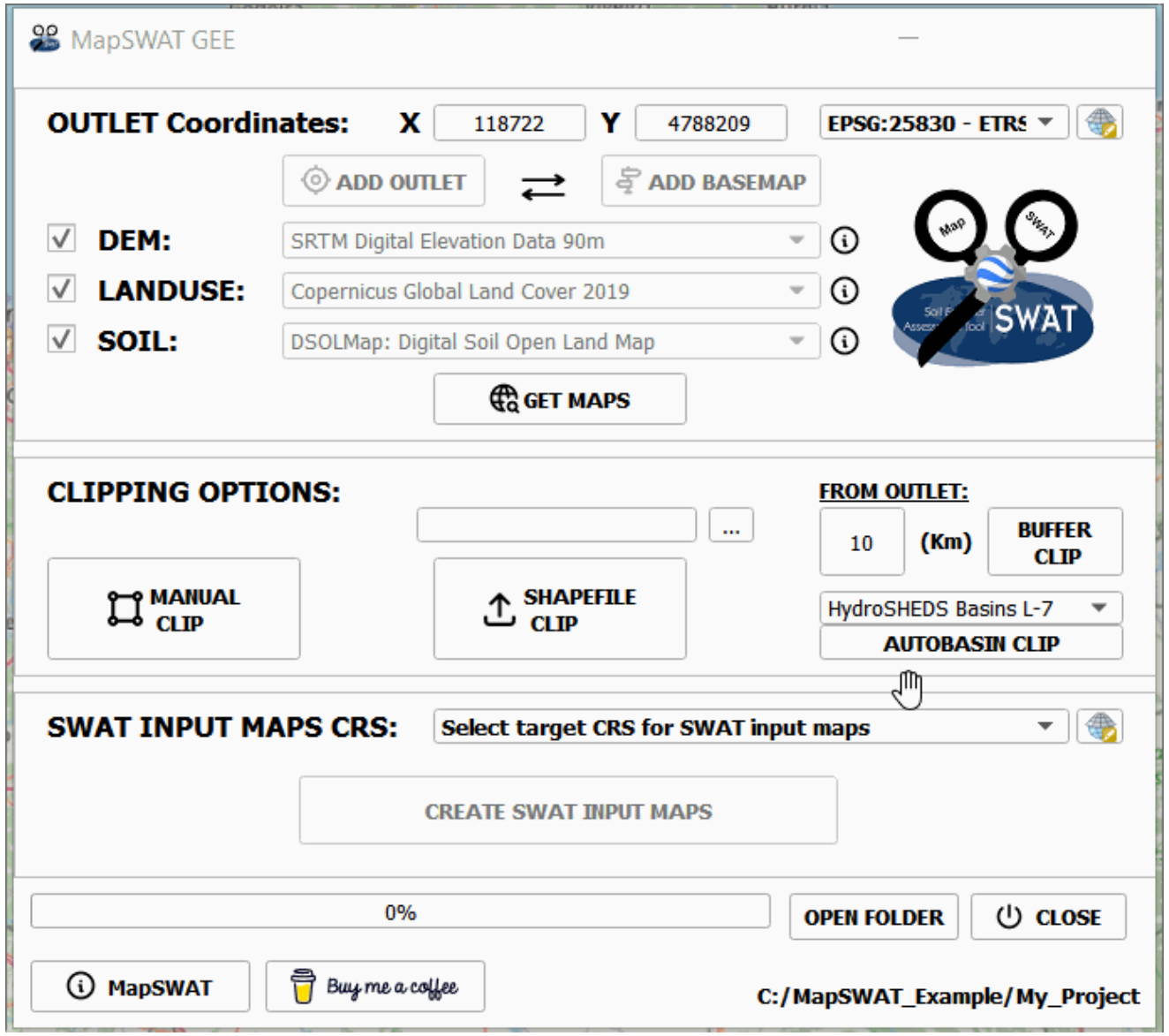




MapSWAT workflow

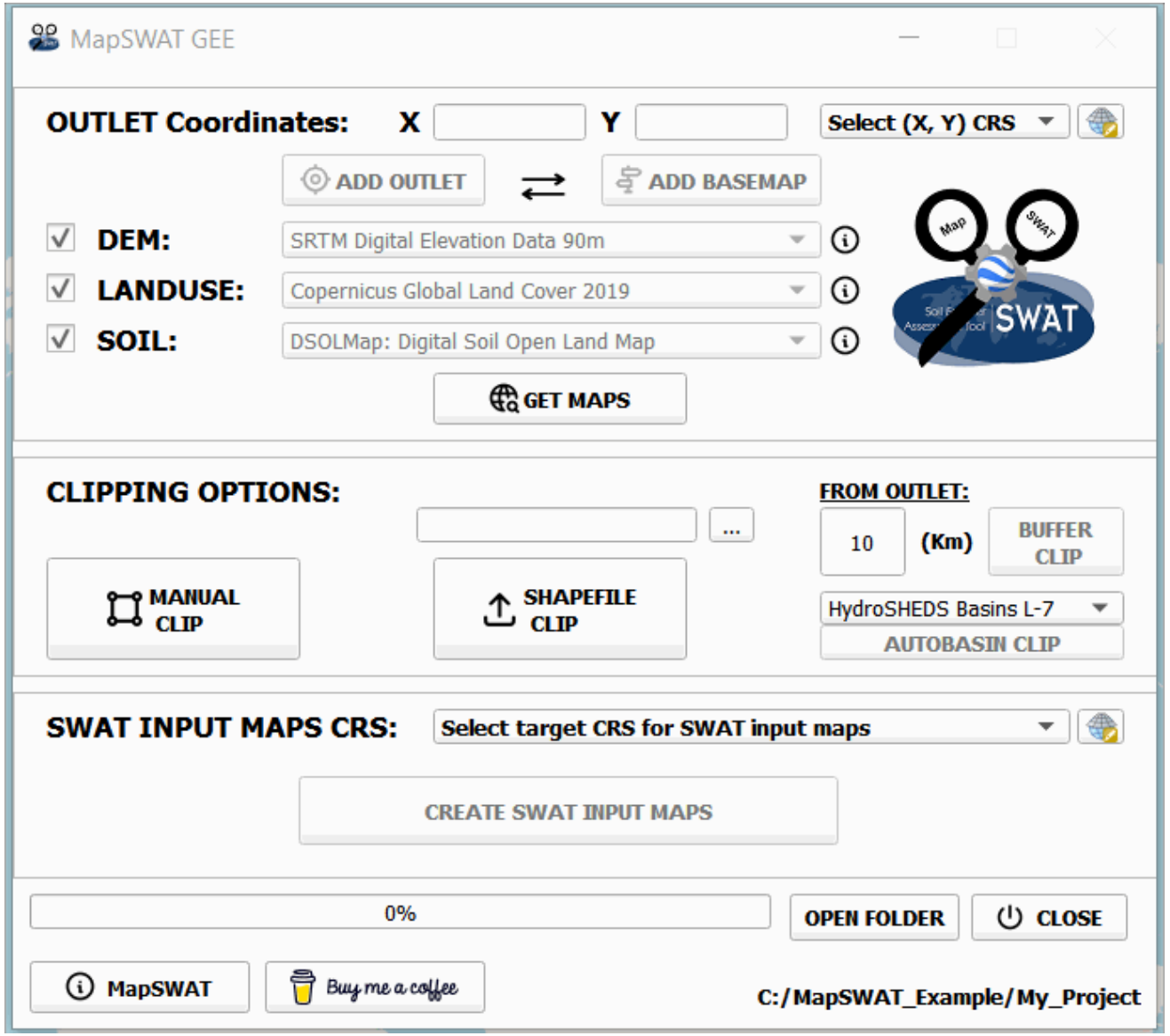
Manual Clip





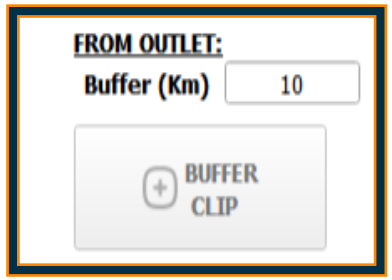
MapSWAT workflow

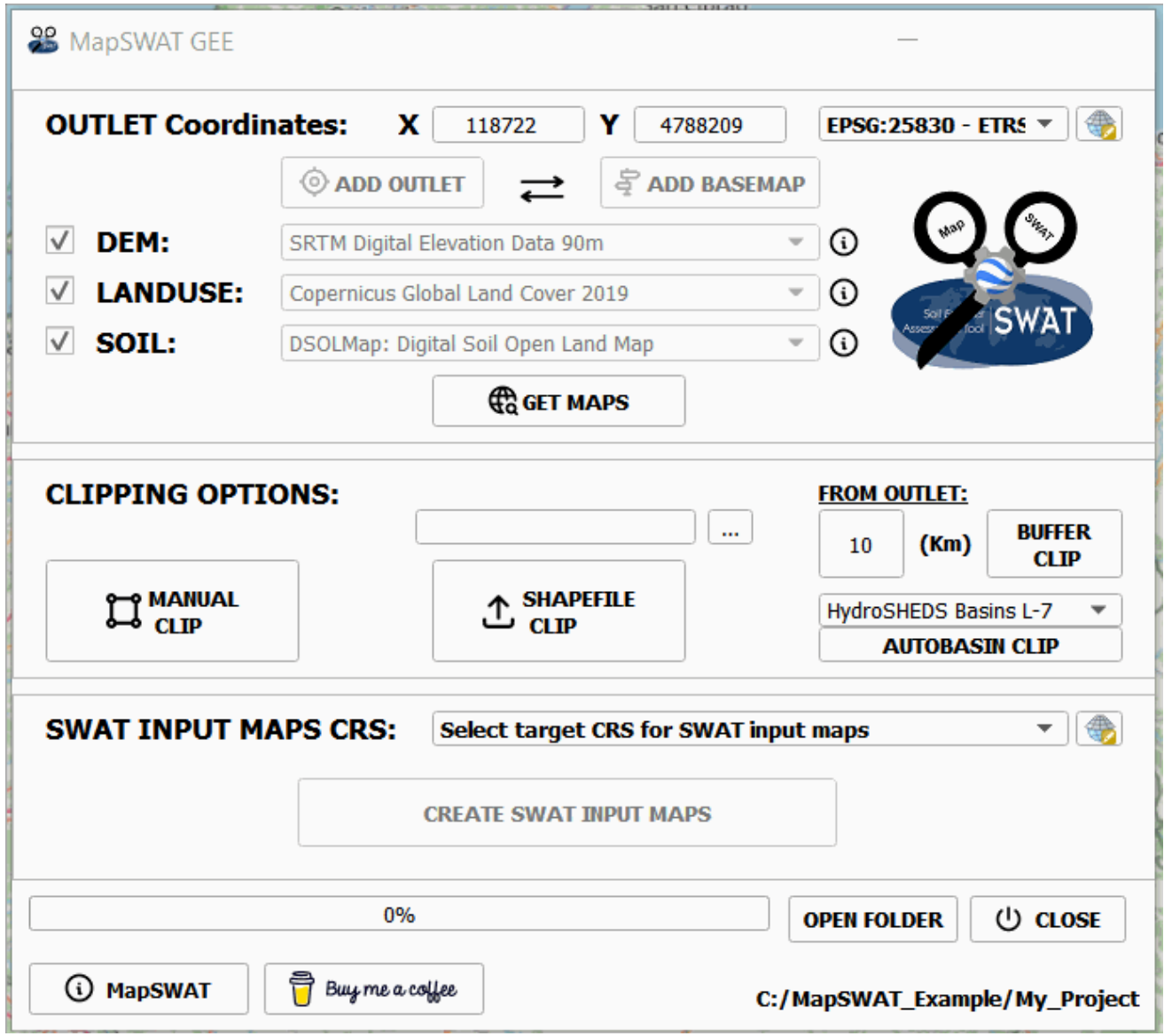
Shapefile Clip



MapSWAT workflow

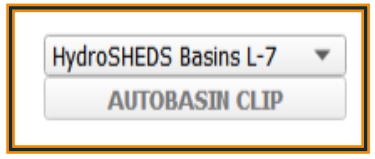
Buffer Clip

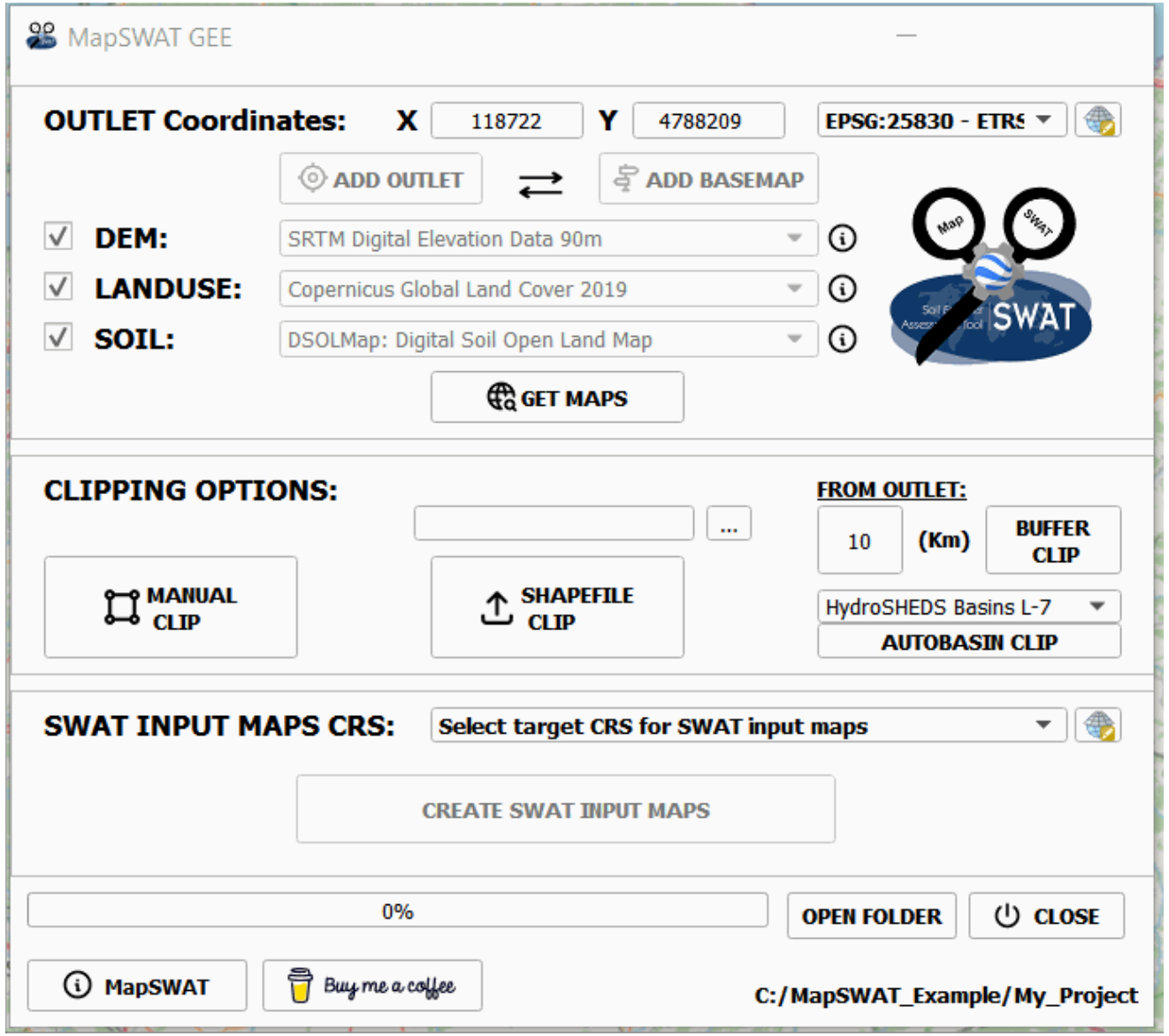




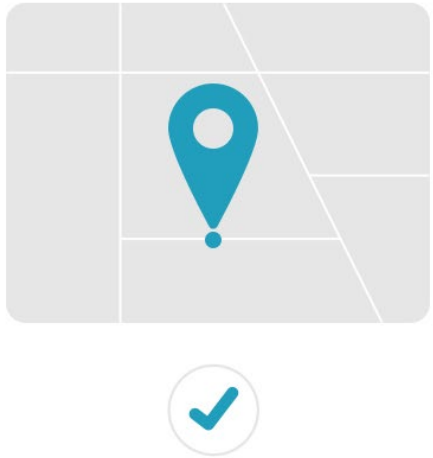
MapSWAT workflow

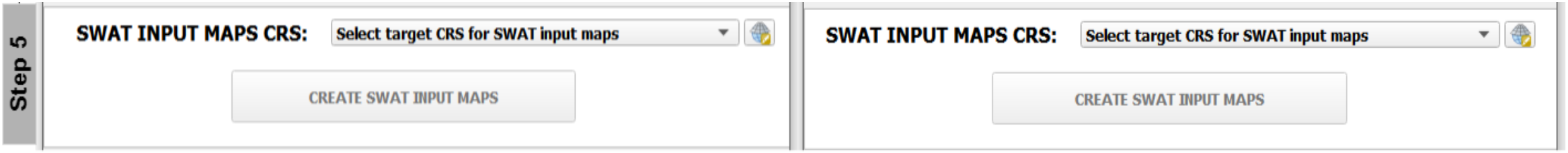
Autobasin Clip



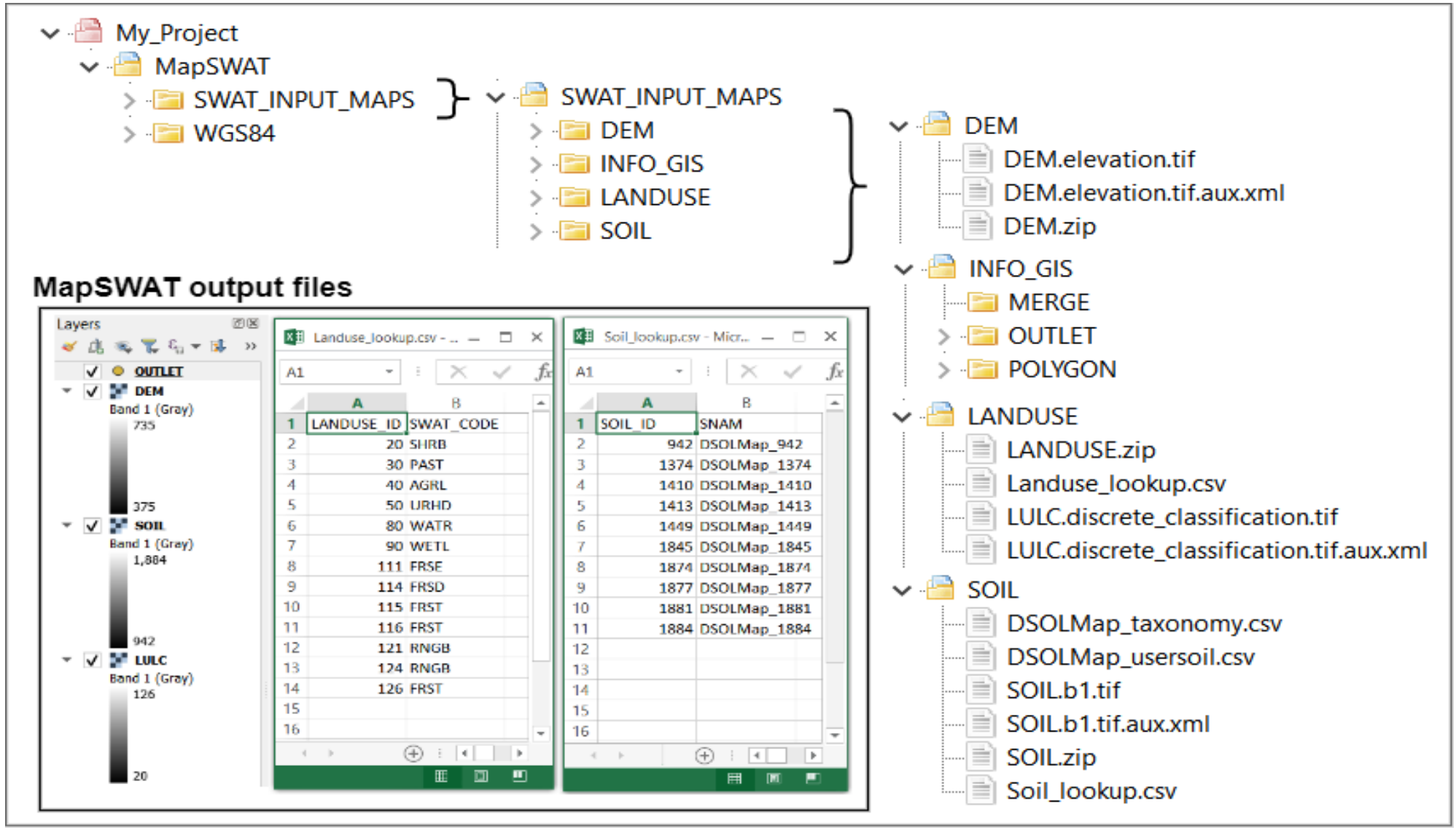


MapSWAT workflow

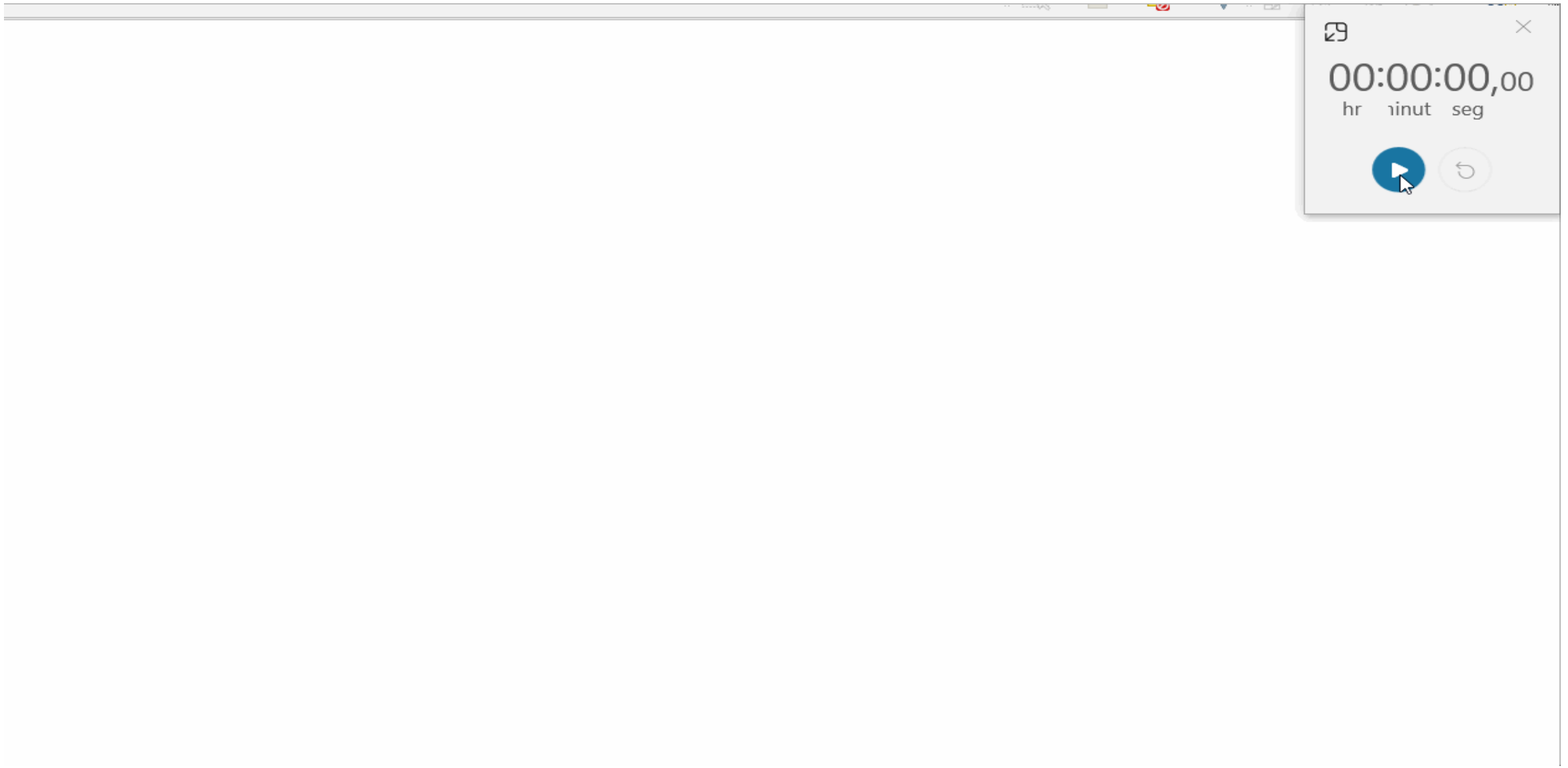




MapSWAT outputs



MapSWAT application example



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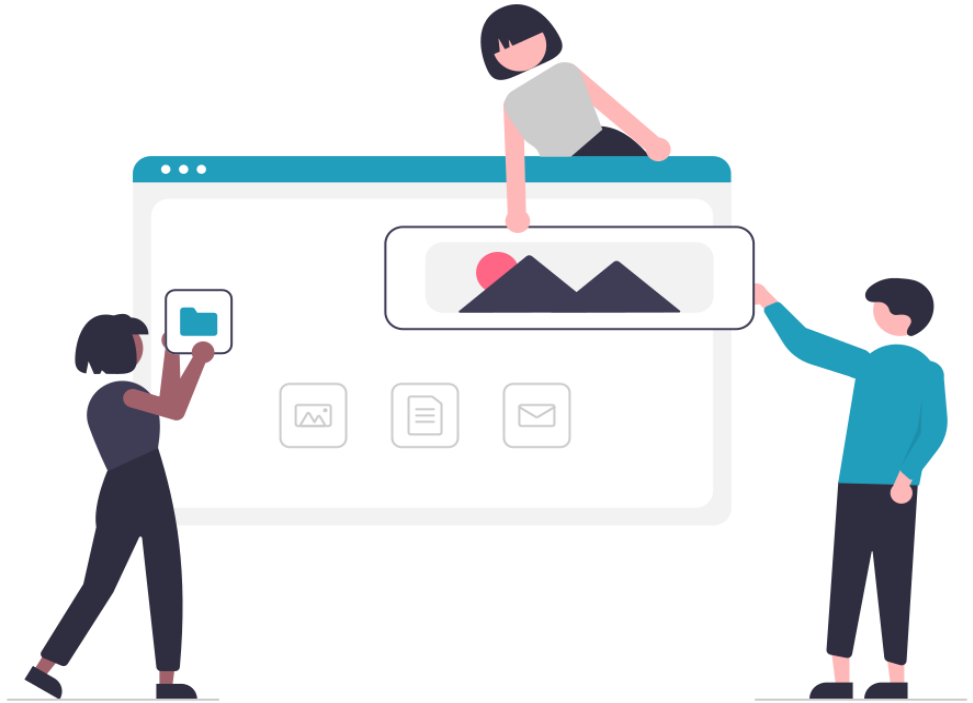
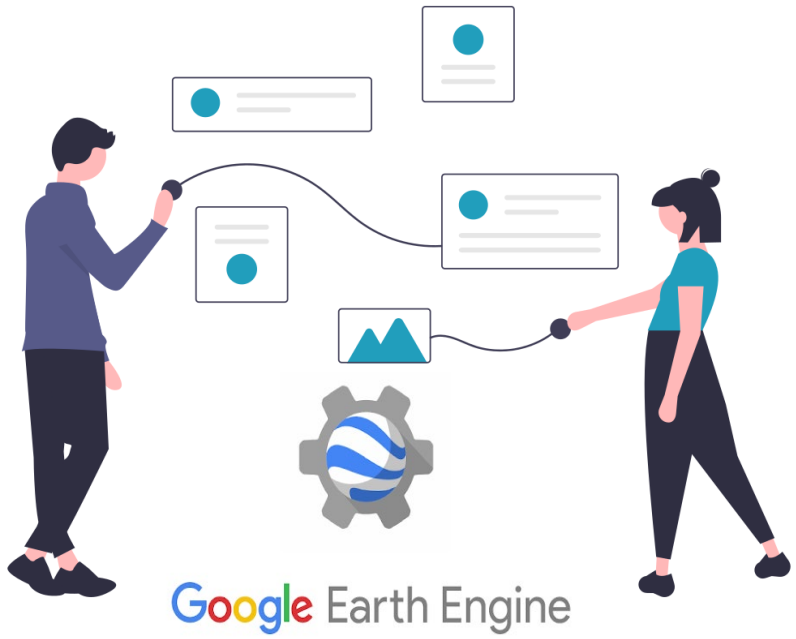


Looking for collaboration

Table 1. Databases included in the Connected to GEE version of MapSWAT.

Data	Name	Spatial resolution	Reference
DEM			
	SRTM Digital Elevation Data 90m	90 m x 90 m	Jarvis et al. (2008)
	NASADEM Digital Elevation 30m	30 m x 30 m	NASA (2020)
	Copernicus DEM GLO-30m	30 m x 30 m	ESA (2022)
LULC			
	Copernicus Global Land Cover 2019	100 m x 100 m	Buchhorn et al. (2020)
	GlobCover: Global Land Cover Map 2009	300 m x 300 m	Bontemps et al. (2013)
	Copernicus CORINE Land Cover 1990, 2000, 2006, 2012 and 2018	100 m x 100 m	EEA (2020)
Soil			
	DSOLMap: Digital Soil Open Land Map	250 m x 250 m	López-Ballesteros et al. (2023b)



Your suggestions and contributions are greatly appreciated.

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https://doi.org/10.1016/j.envsoft.2024.106108

(Free access until August 01, 2024)

López-Ballesteros, A., Srinivasan, R., & Senent-Aparicio, J. (2024). **Introducing MapSWAT: An open source QGIS plugin integrated with Google Earth Engine for efficiently generating ready-to-use SWAT+ input maps.** *Environmental Modelling & Software*, 106108.

https://adrlballesteros.github.io/MapSWAT/

https://swat.tamu.edu/software/

SWAT Soil & Water Assessment Tool

Software Docs Data Workshops Conferences Publications Support Jobs

SWAT Community Tools

MapSWAT

MapSWAT is an open-source QGIS plugin integrated with Google Earth Engine (GEE) that obtains and prepares SWAT+ input maps. It aims to help new or advanced users streamline the setup of their SWAT+ models. MapSWAT makes the preparation of SWAT+ input maps less error-prone, time-consuming and resource-intensive and facilitates model application in any study area worldwide. Additional information and the MapSWAT user manual and executable are available online. View reference paper.

SWAT-C

SWAT-Carbon is a watershed scale model that converges terrestrial and aquatic carbon cycles at the watershed scale. It is based on the SWAT2012 and has unique functions to assess impacts that agricultural management and climate change have on a wide range of processes and indicators, such as soil organic carbon storage, nitrous oxides emissions, freeze-thaw cycles/water temperature, and riverine carbon fluxes.

R-SWAT

Free, open source, graphical user interface for SWAT/SWAT+ calibration, parameter sensitivity/uncertainty analysis. For help see the user group and tutorial videos.

SWAT+ Toolbox

SWAT+ Toolbox is a user-friendly tool for SWAT+ model adaptations. Get the most recent version from the Additional Tools section of the SWAT+ page.

Weather Tools

CMhyd

Climate model data for hydrologic modeling

WGN Parameters Estimation Tool

Microsoft Access tool to store and process daily weather data

WGN Excel macro

Calculate statistics needed to create weather station files

SWAT Precipitation Input Preprocessors (pcpSTAT)

Calculate statistical parameters of daily precipitation data used by WGN

Dewpoint Estimation

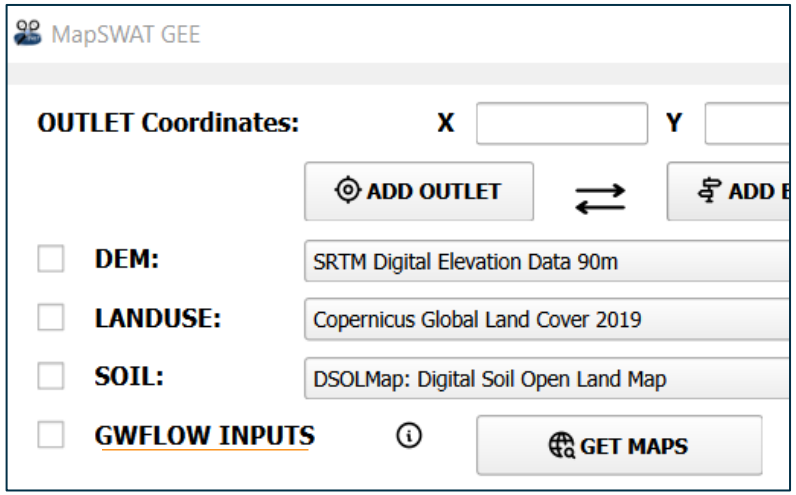
Calculate average daily dewpoint temperature per month

Global Data

Get weather, grid, landuse and soil map data for your SWAT models from our global data page.

Future Developments

- ❑ More DEM, LULC, and SOIL databases.
- ❑ Include global input maps require by GWFLOW.
- ❑ Add a Climate Data Extraction Tool.
- ❑ Upload to the QGIS plugin repository.



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