SEI Tool Factsheet: Watershed Topology Tool (WaTT)

Basic information

Tool name	Watershed Topology Tool (WaTT)
Tool pitch	WaTT supports water management processes operating at multiple scales - from local such as water supply to small domestic users or individual farmers to processes operating at watershed scales (e.g., climate, energy and food production and trade). WaTT allows users to extract and explore interconnections within components of a WEAP model and to perform topological operations such as accumulation, attenuated accumulation, and fragmentation to analyse the interaction of different processes at multiple and concurrent scales.
Tool objectives	1. Visualise how factors such as patterns of size, spatial distribution and interconnection of resource production and demands or the nested and hierarchical character of freshwater systems influence the cumulative pressure exerted on the freshwater system. 2. Map the spatial patterns of resource import and export across different scales and regions of a freshwater system. 3. Quantify the scales of the process required to sustain the resource supply of multiple users sharing the same provisioning freshwater system.
Year Tool launched	Pilot stage
Tool Lead(s) / Contact(s)	Camilo González camilo.gonzalez@sei.org Claudia Coleoni claudia.coleoni@sei.org Tania Santos tania.santos@sei.org
Tool team	Claudia Coleoni, Camilo González, Tania Santos, Jack Sieber
Tool users in SEI	Claudia Coleoni, Camilo González, Tania Santos, Nilo Lima, Angélica Moncada, Cristo Pérez, Uttam Ghimire
Tool website(s)	Not available
Tool type	• Excel Macro based on WEAP API
Tool purpose	• Decision-support (planning and policy) • Research/Analytical
Relevant sector(s)	• Climate • Water • Land • Energy • Governance • Economy
Level(s)/scale(s) of focus	• Local • Urban • National

	• Regional • Global
Target users:	Professionals working with water management at multiple scales, professionals working with land use and planning, and researchers interested in quantifying cumulative impacts in freshwater systems.
Focus regions	Can be customised to be applied globally. Ongoing pilot applications include river basins in Bolivia, Colombia and Thailand.
Tool access	• Closed/internal use only: Restricted to SEI users only within the scope of the Water Beyond Boundaries initiative and the Bolivia WATCH programme. SEI staff who are not part of either of those projects may request access to WaTT by contacting the tool leads.
Computer requirements	Have WEAP installed on computer, which requires: Windows XP or later.
Tool training materials	There are no training materials, but an introductory video with WaTT applications can be found at the Water Beyond Boundaries channel in Teams [link]. A PowerPoint presentation detailing WaTT applications to date is also available for internal reference [link]. A Beta version of WaTT applied in the Tupiza watershed, Bolivia, is available for consultation and use [link] within the scope of the Water Beyond Boundaries initiative and the Bolivia WATCH programme.
Level of training needed before the tool can be used appropriately	Medium
How the tool meets its objectives | Theory of Change	Current approaches to water systems analysis generally focus on the characterisation of certain processes at predetermined scales associated with biophysical boundaries (e.g., watersheds, sub-watersheds, micro-watersheds). WaTT tackles this gap by quantifying processes occurring at multiple and concurrent scales (e.g., teleconnections). The tool serves as an important water planning component for water managers at different levels, providing the argument for implementing integrated water planning instruments. WaTT results may support local and regional participatory decision-making processes in the water sector, which have the potential to contribute to new forms of environmental governance within the framework of the UN Sustainable Development Goals.

How the Tool works

Does the Tool use or provide projected, modelled or simulated data?	WaTT operations rely on the topology extraction from an existing WEAP model: catchments (river topology); river network topology; water sources (users' topology).

	Therefore, WaTT implementation requires an existing WEAP model or the development of a WEAP model for the user's water system of interest. Prior to running any analysis in WaTT, users should choose the variable they would like to accumulate throughout the water system. WaTT implementation may require post-processing (e.g., other calculations to obtain the desired indicators). Besides WaTT and WEAP, users may choose to perform spatial tasks with a Geographic Information System (GIS) of their choice (e.g., for data visualisation).
Does the Tool use or provide empirical data?	Not applicable.
Do users need to create a profile and log in? If so, why?	Users must create a profile on the WEAP Forum to download WEAP.
How often is the tool updated? Are the updates new data, new functionality, or both?	WaTT does not currently have anticipated future updates. However, it is possible that new features will be added as the tool is applied to new watersheds to understand different water-related processes as part of SEI's Water Beyond Boundaries initiative and the Bolivia WATCH programme.

Funding

Approximate annual budget	$0
Funding model	No ongoing funding required. Updates to WEAP software allow the users to apply WaTT. However, since the tool is yet at a pilot stage, its full implementation may require additional funding.
Main donors	Tool development currently funded as part of SEI's Water Beyond Boundaries initiative and the Bolivia WATCH programme.

Key challenges faced and any lessons about tool development

WaTT application relies on an existing WEAP model, which means our first pilot programmes include case studies where WEAP has been implemented for hydrological modelling. Although WaTT can accumulate any user-defined variable, it is important to make sure the variable of interest indeed has an influence within the water system, especially those that are land-based processes.

Activities, Proposals & Next Steps

Current/ongoing activities	As of Q4 2021, WaTT is applied as a pilot tool to run cumulative analyses for SEI's Water Beyond Boundaries initiative in the Mekong and Magdalena-Cauca river basins and in three pilot river basins (Tupiza, Pampa-Huari, Choqueyapu-La Paz) of the Bolivia WATCH programme.

Planned activities	Cross-centre collaboration between SEI-LA, SEI-Asia and SEI-Africa to apply the tool as part of the Water Beyond Boundaries initiative.
Activities wanting to fund | Sought collaborations | New areas of work/application	WaTT can be used to explore biophysical and socioeconomic processes beyond an established geographic and/or jurisdictional boundary. An ongoing collaboration includes the Memorandum of Understanding between SEI-LA and Colombia's Ministry of Environment and Sustainable Development to analyse the cumulative impacts of hydropower generation and coffee production at multiple scales, having the Magdalena-Cauca river basin as a starting point. From this MoU, there is potential for expanding these analyses for other sectors in Colombia. Within SEI, there could be research synergies with TraseH2O project [link], further expanding WaTT application for the agriculture sector.