

Toward a Generalized Scale-Up Methodology for chemical/materials production in Prospective LCA

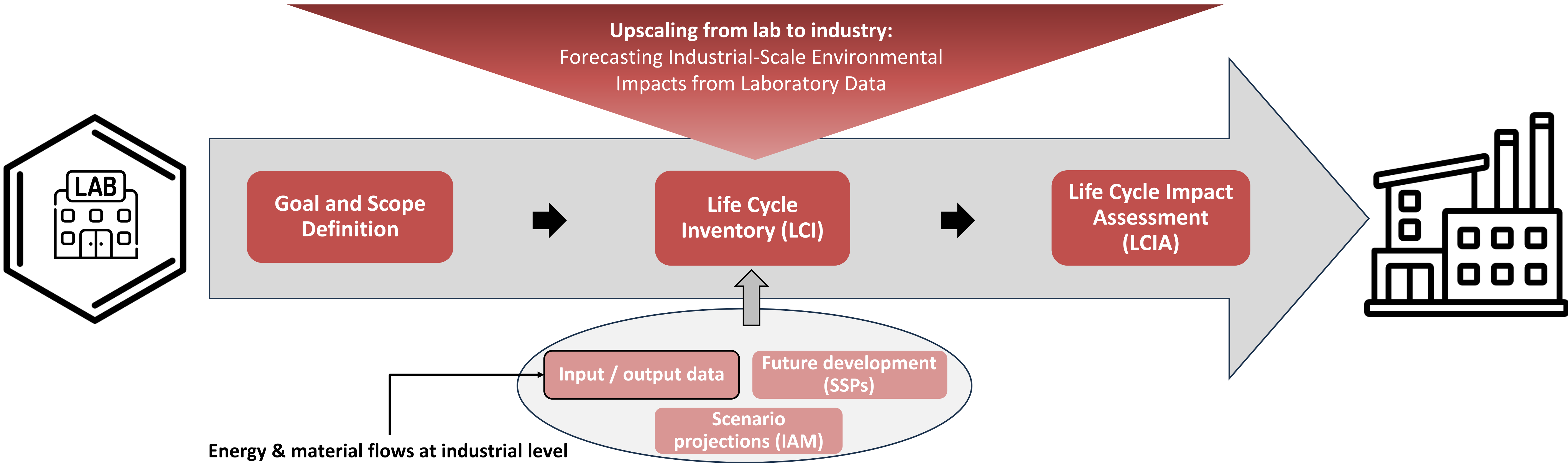
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Context

Assessing the sustainability of **emerging chemicals/materials** requires shifting the focus toward a higher TRL by building an **industrial-scale Life Cycle Inventory (LCI)**. However, for novel substances, environmental data are limited and often non-representative of industrial conditions. Having a proper upscaled LCI will enable accurate calculation of future impacts through **Prospective Life Cycle Assessment (pLCA)**

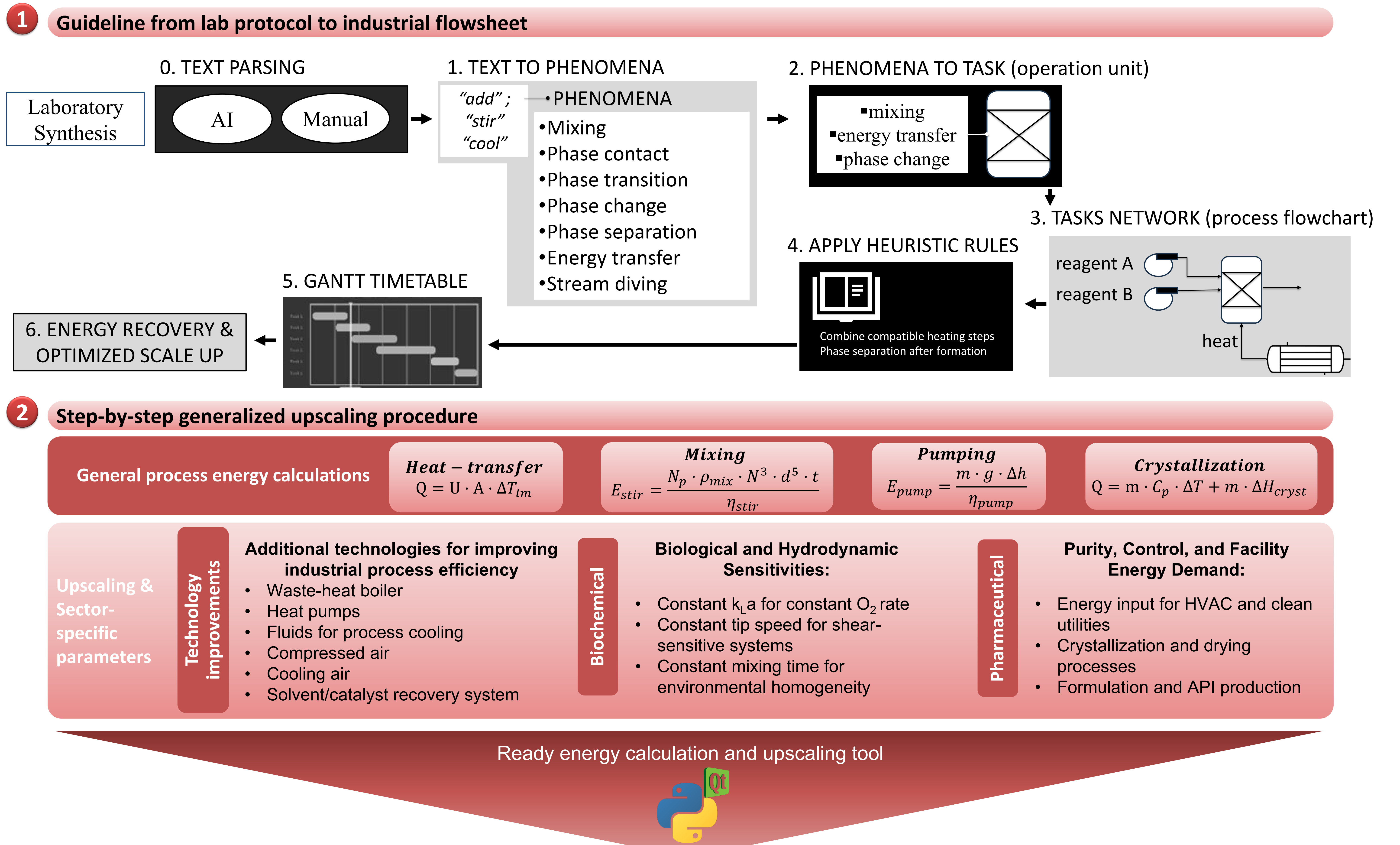
	Production energy (MJ/m³)	Deviation
Lab-Scale → Industrial benchmark	204532	+2414%
Upscaling methodology → Industrial benchmark	12209	+50%
Industrial benchmark	8139	-

Comparison of production energy of an aerogel: lab scale vs industrial benchmark. Dowson et al. 2012



The lack of a generalized approach to translate laboratory data into realistic industrial inventories within pLCA leads to limited comparability and a resource- and time-intensive implementation. This work develops a **generalized guideline** helping translate lab-protocols into industrial flowsheets and a **step-by-step upscaling and calculation tool** to support early-stage assessments under the Safe and Sustainable by Design (SSbD) framework.

Our approach



Prepare foundation for data-driven prediction, enabling a guided upscaling and energy calculation for automated LCI generation