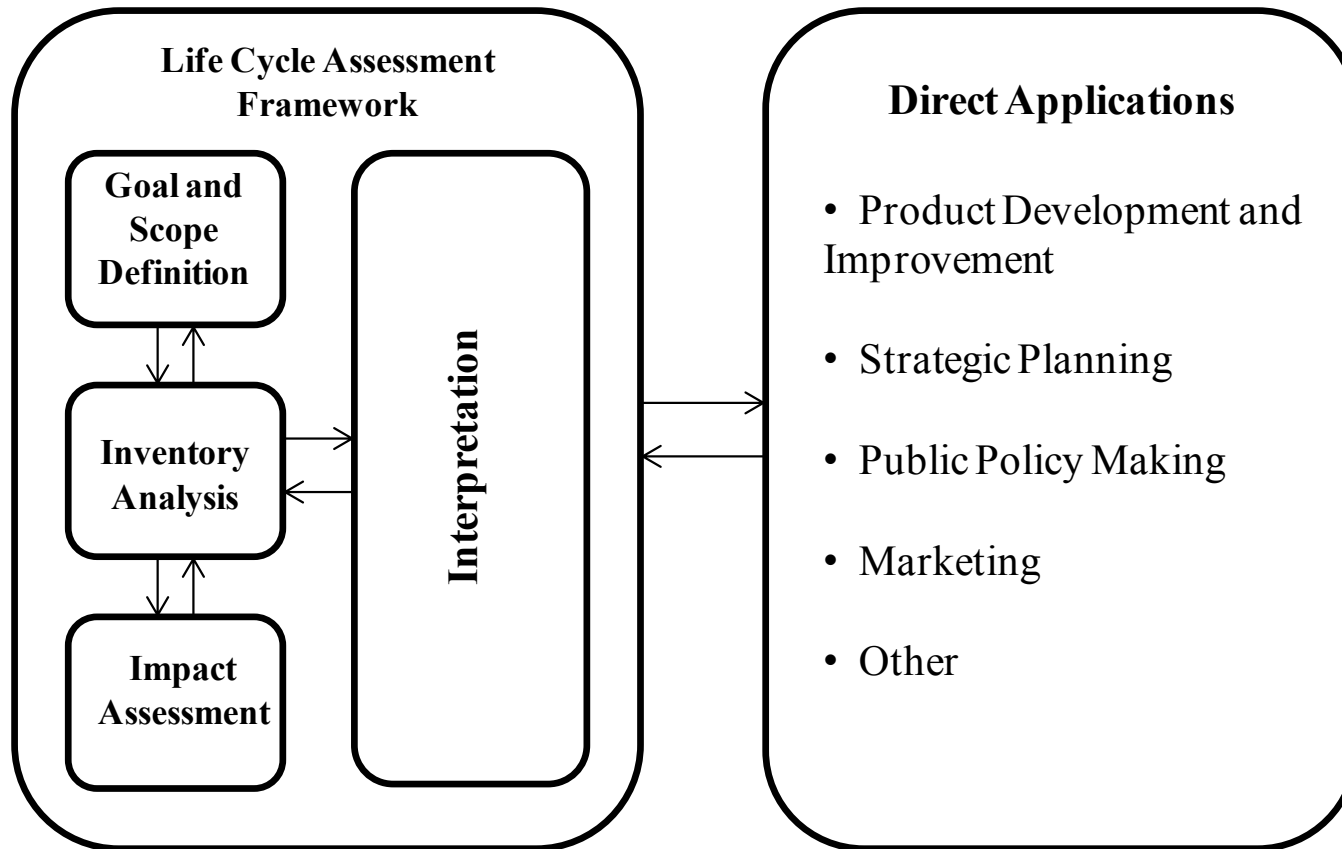


Life-cycle Assessment (LCA) of concrete mixtures

Importance of LCA

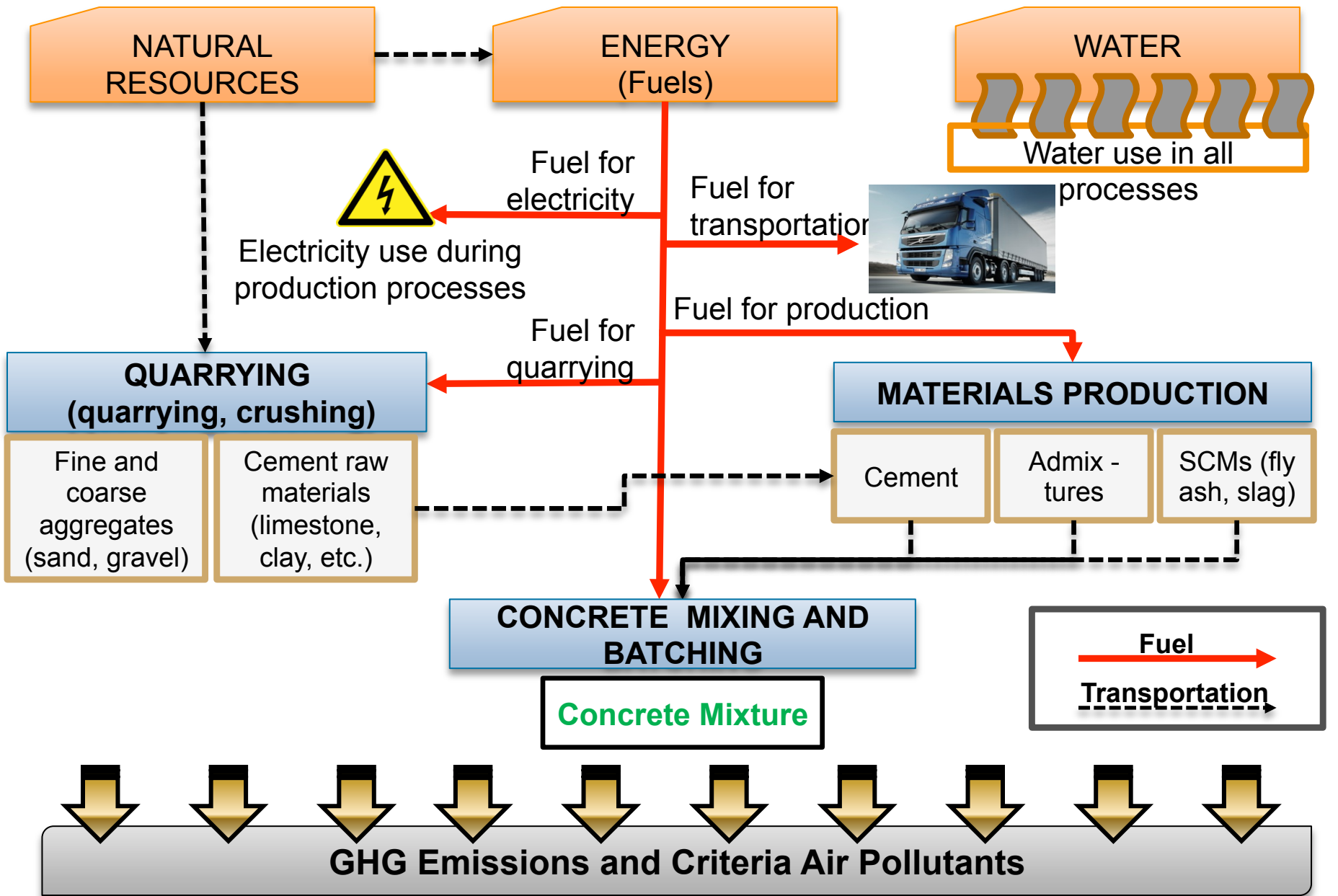
- studies the environmental impact of concrete,
- quantifies resource inputs and environmental outputs (life-cycle inventory),
- estimates the impact of these inputs and burdens on humans and nature (impact analysis),
- reveals areas with improvement potential

Stages and applications of an LCA



GreenConcrete LCA Tool

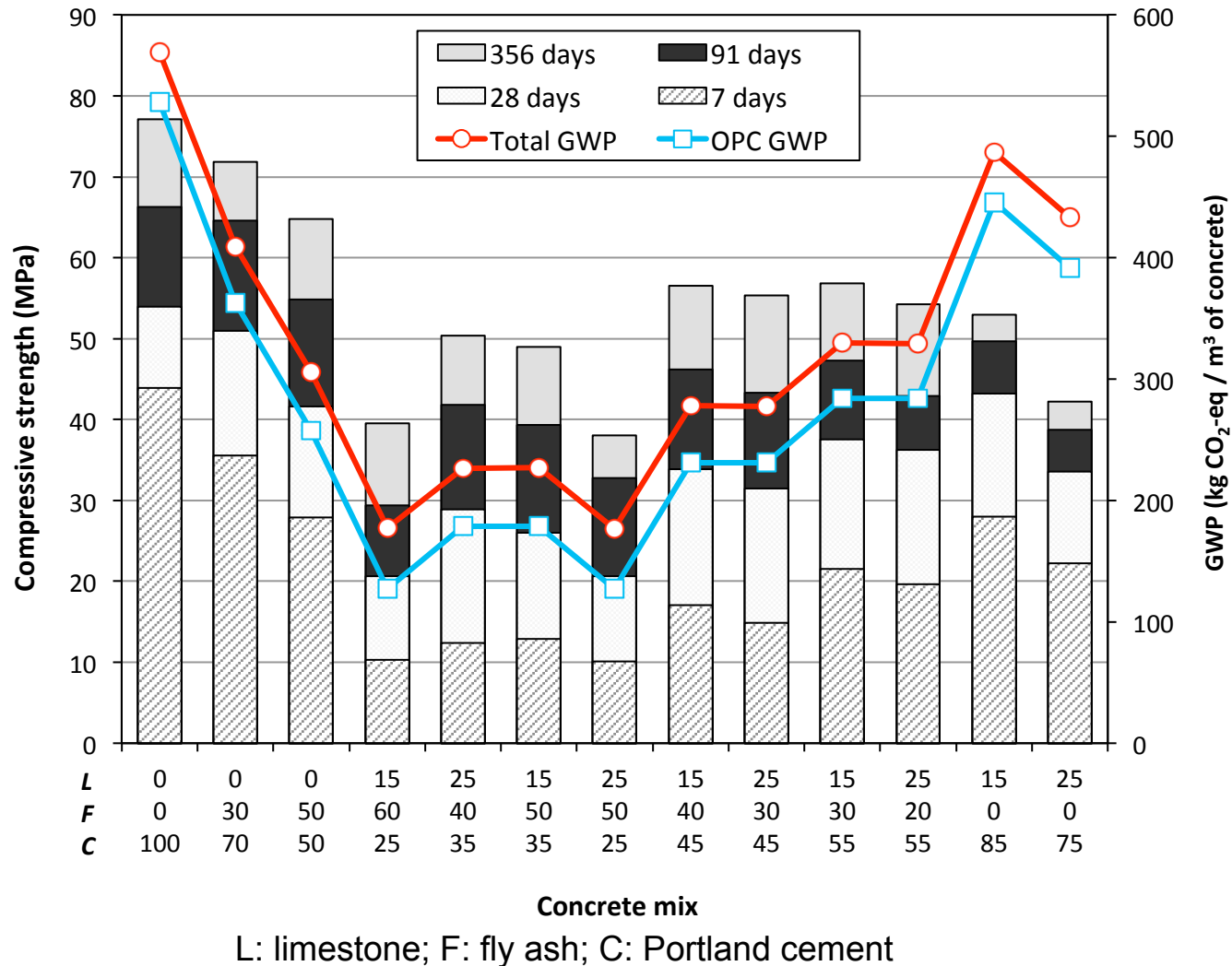
- Developed by A. P. Gursel, and A. Horvath at U.C. Berkeley
- Goal: to analyze the life-cycle environmental burden of concrete mixtures defined by the user
- Web version:
<http://greenconcrete.berkeley.edu>



List of LCA calculation items in GreenConcrete

- Cement manufacturing
- Fine aggregates and coarse aggregates mining and processing
- Processing of supplementary cementitious materials (SCMs), such as fly ash and granulated blast furnace slag (GBFS)
- Production of chemical admixtures
- Fuel use (pre-combustion and combustion- related) (User-defined fuel mix)
- Electricity generation impacts associated with the processes considered (User-defined electricity mix, in addition to electricity mix for States and national U.S. average)
- Production technology options
- Transportation of selected materials within the system.

Comparison of Global Warming Potential (GWP) for various concrete mixtures



References

- Gursel, A.P., 2014b. *Life-Cycle Assessment of Concrete: Decision-Support Tool and Case Study Application*, Ph.D. Thesis, University of California, Berkeley, CA.
- Gursel, A. P., Masanet, E., Horvath, A. and Stadel, A. 2014a. Life-cycle inventory analysis of concrete production: A critical review. *Cement and Concrete Composites*, 51, 38-48.

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- Celik, K., Meral, C., Gursel, A. P., Mehta, P. K., Horvath, A. and Monteiro, P. J. M., 2015. Mechanical properties, durability, and life-cycle assessment of self-consolidating concrete mixtures made with blended portland cements containing fly ash and limestone powder. *Cement and Concrete Composites*, 56, 59-72.
- Miller, Sabbie; Horvath, Arpad; Monteiro, Paulo; Ostertag, Claudia, Greenhouse gas emissions from concrete can be reduced by using age as a design factor, *Environmental Research Letters*, 10 (2015) 114017.