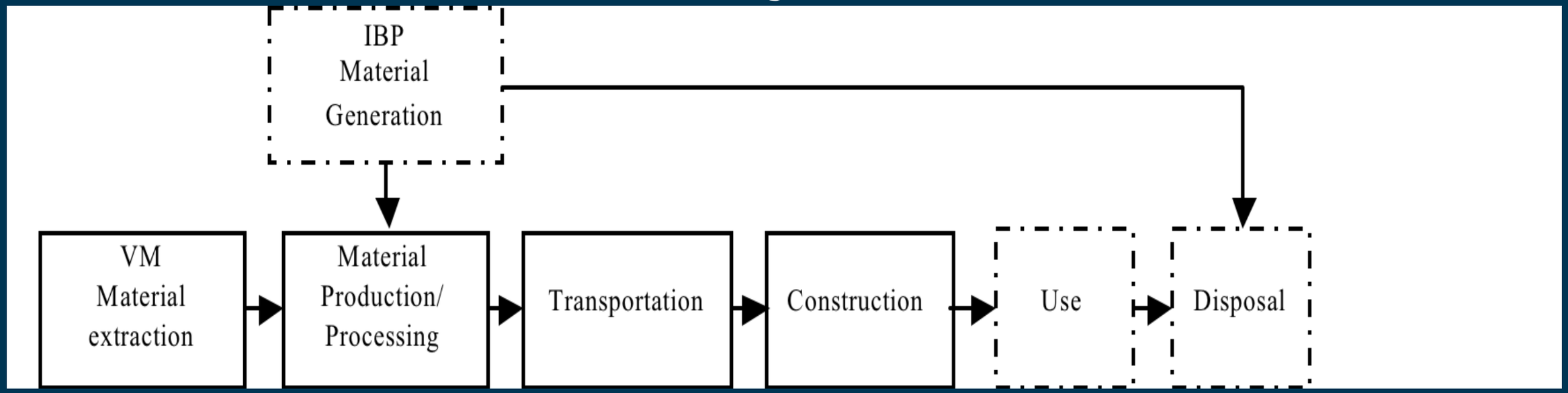
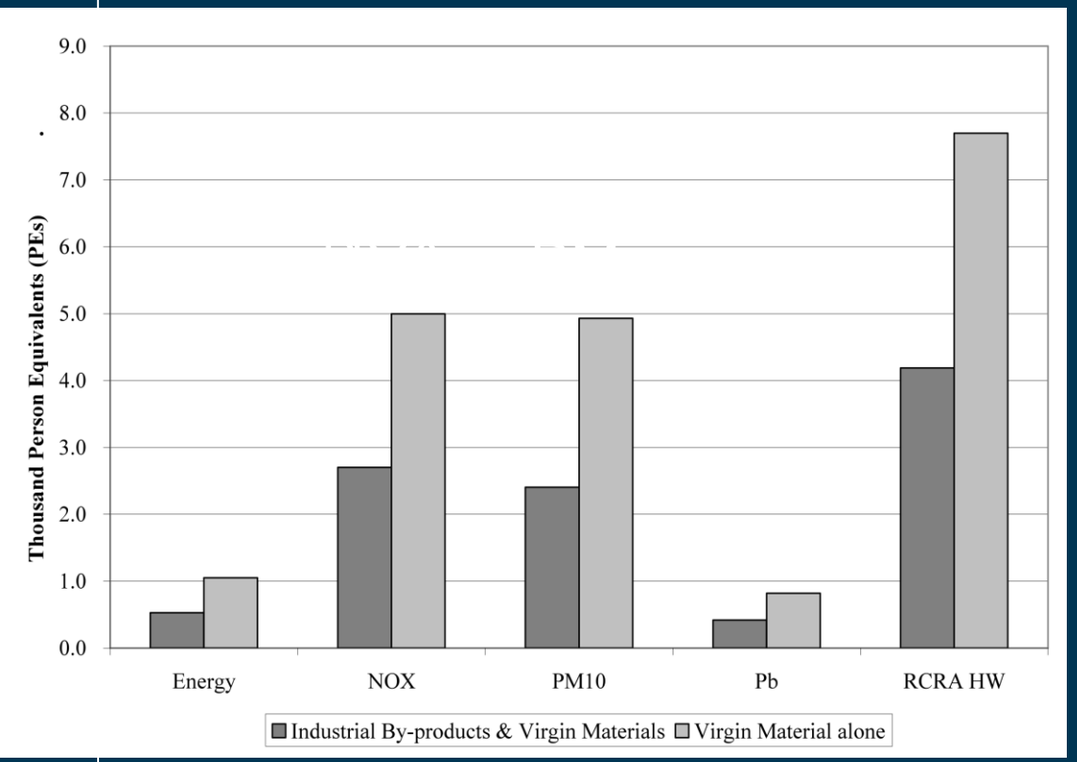
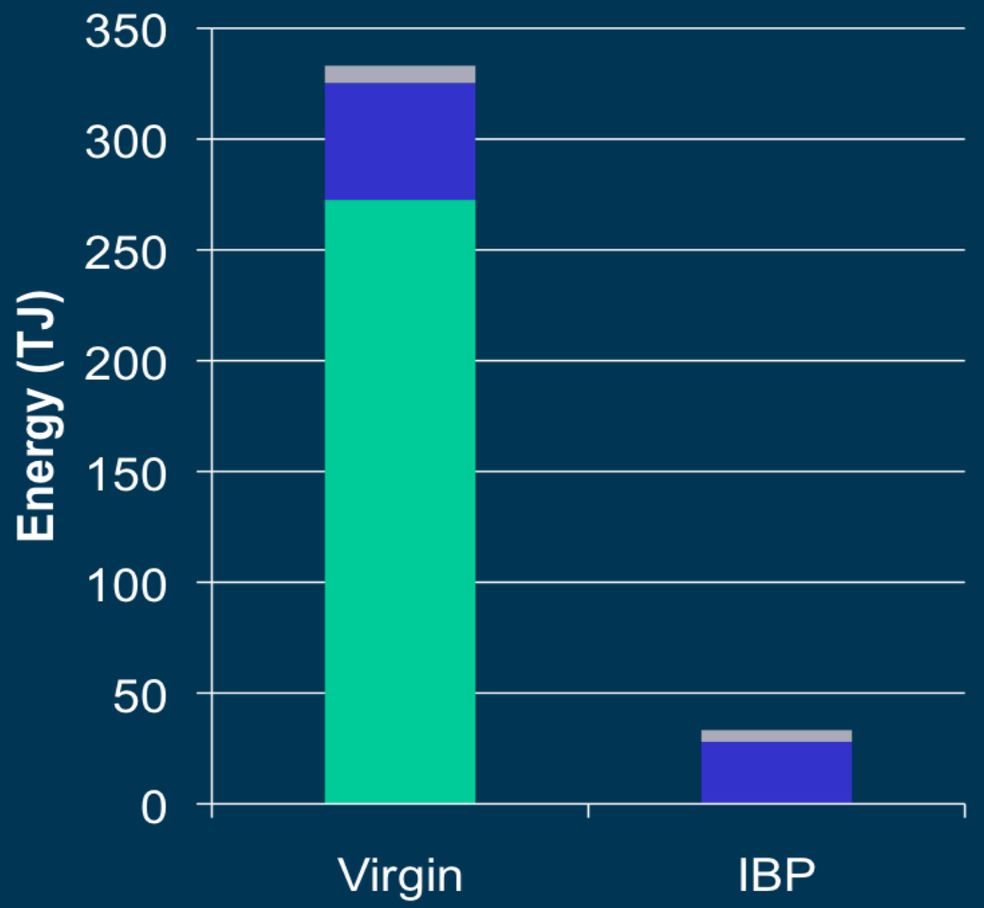
Roadways as part of the urban industrial ecosystem.



Life Cycle Impacts

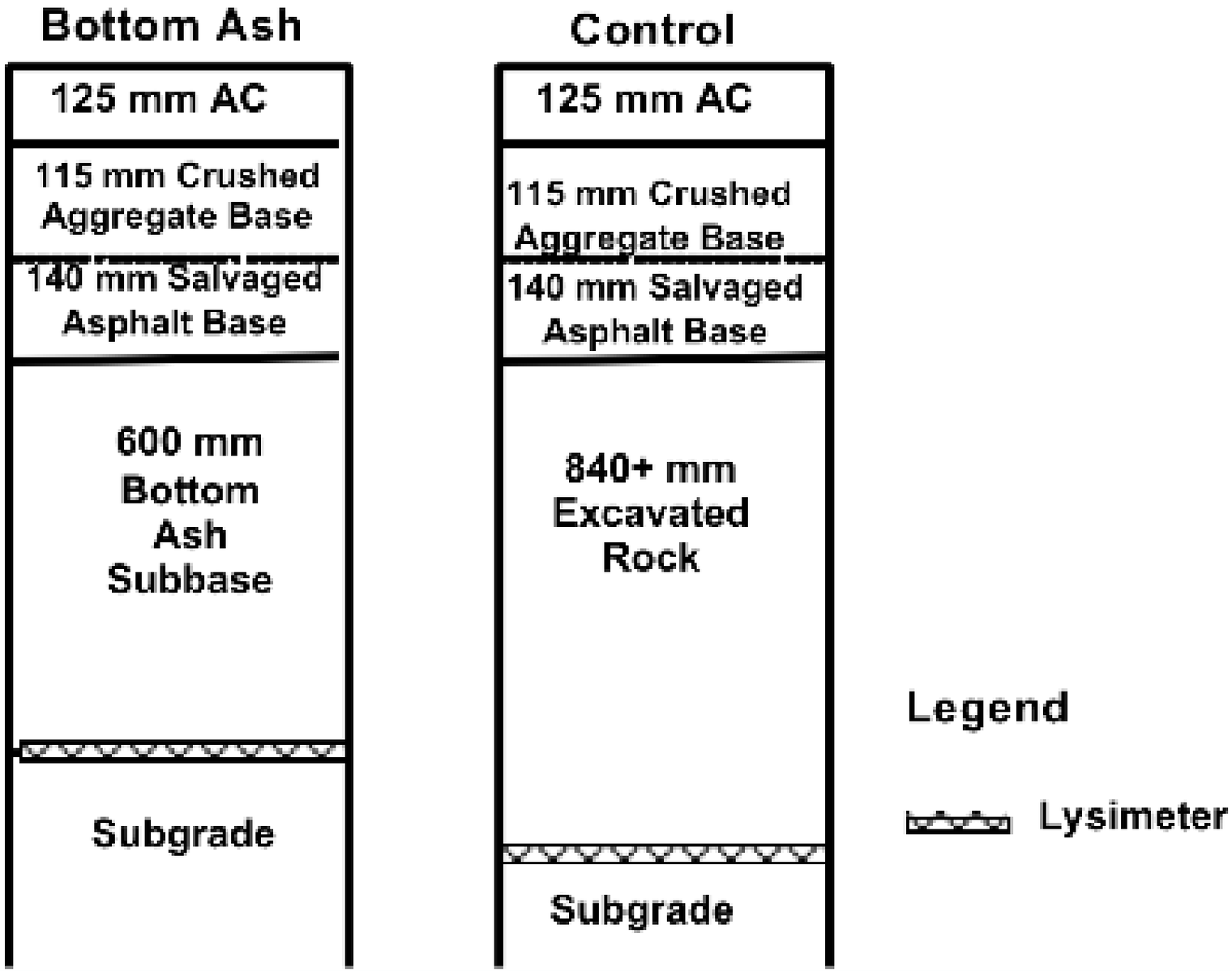




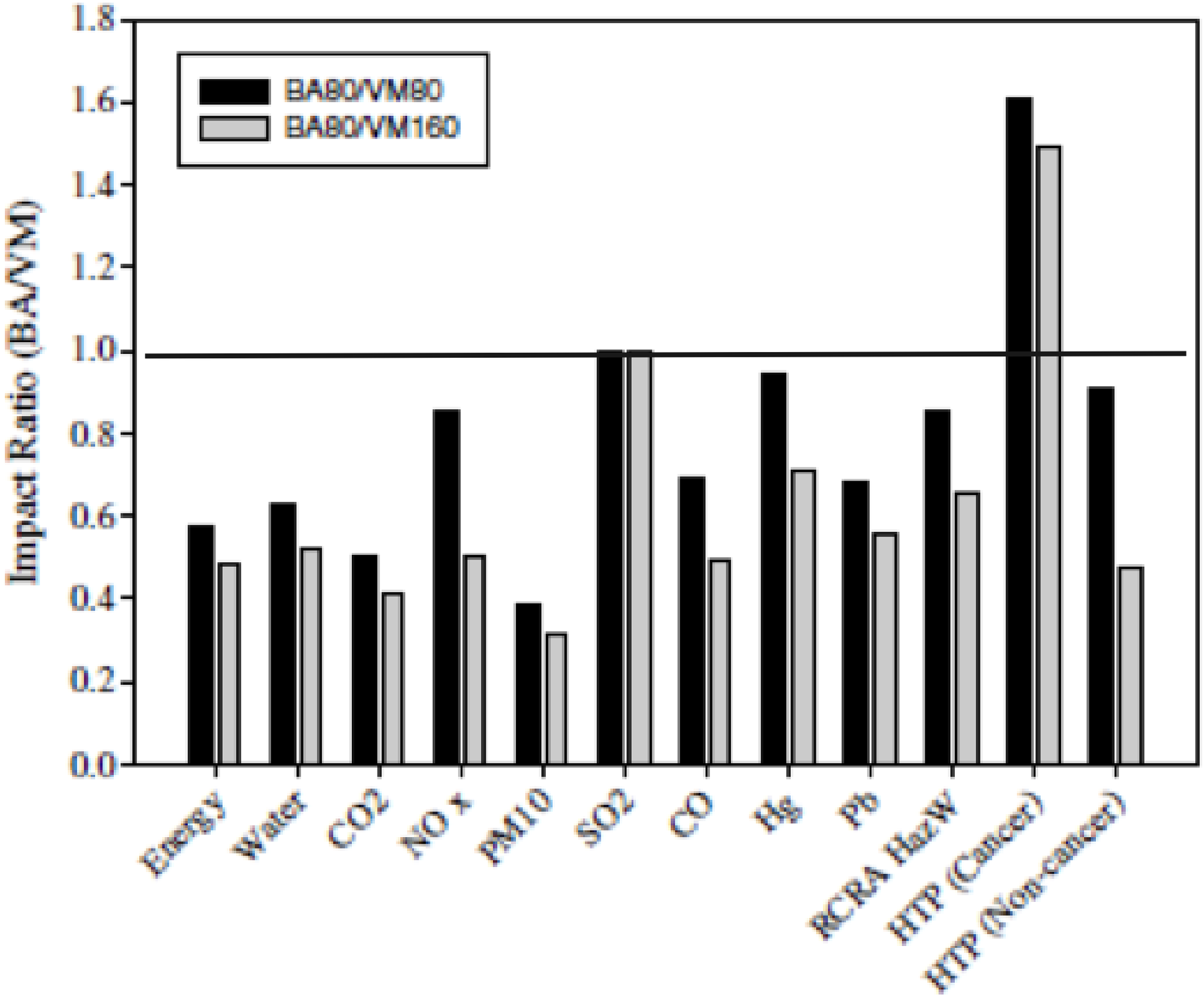
Contributions to more sustainable solutions

- Which material or system is better environmentally, economically, socially: e.g., recycled or virgin, bio-based, how maintained, which design?
- Will changing the recycled material content in a particular pavement affect its environmental performance?
- Which maintenance options will minimize environmental and economic effects (or optimize performance)? For example, should full depth reclamation be performed instead of more frequent, smaller maintenance procedures?

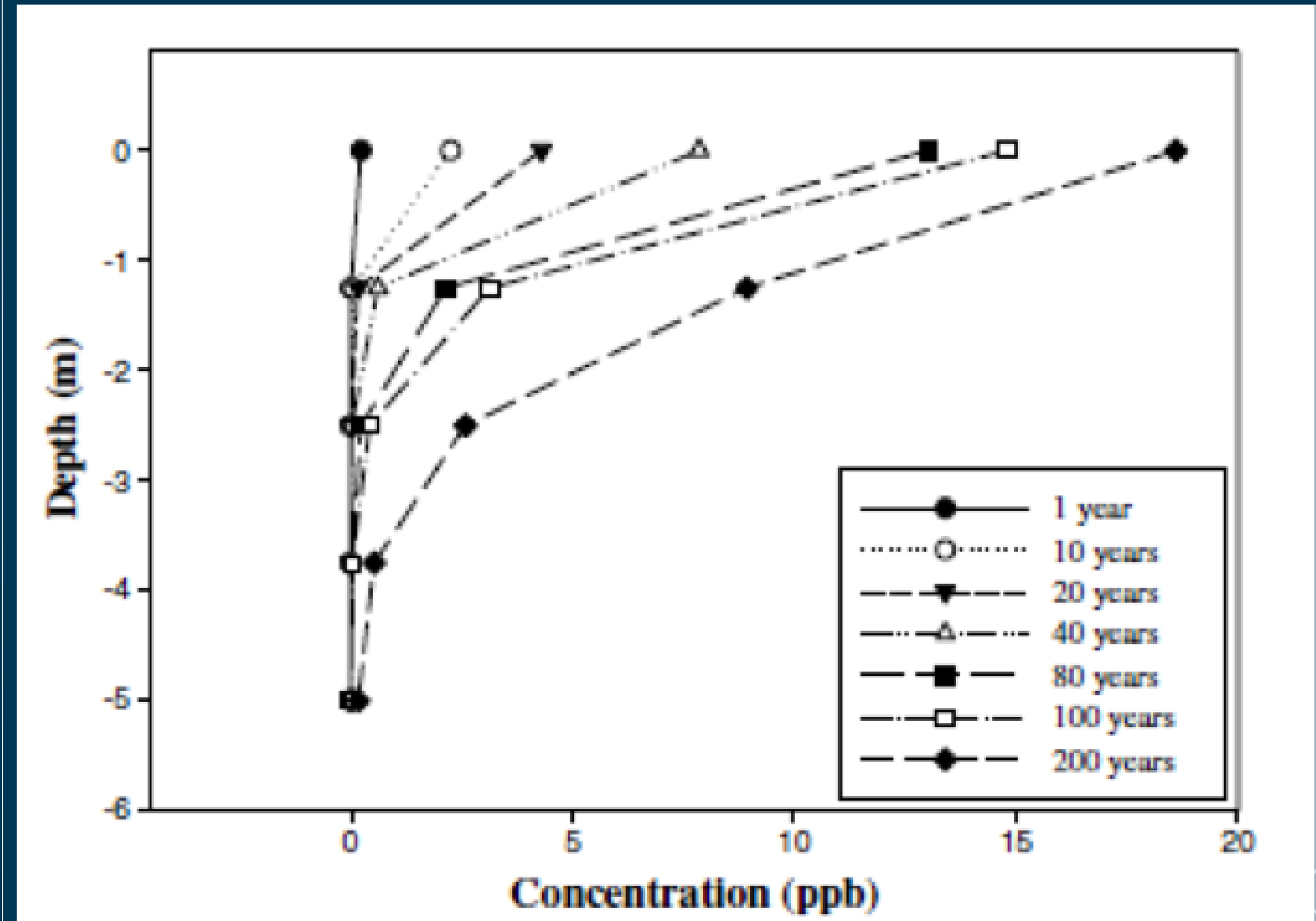
Combining site-specific risk and LCA



Impact Ratio of Bottom Ash/Virgin Material



Cr transport



Knowledge/Data gaps

- What are the life cycle impacts?
- What is environmental performance of a roadway system? How defined, measured, audited?
- How do we incorporate social factors into sustainability analysis?

- **Multi-attribute decision methods and support for tradeoffs and optimization (materials performance, environmental performance).**

ASTM Symposium

- International symposium on testing and specification of recycled materials for sustainable geotechnical construction. February 2011, Baltimore, MD.