Report on Decomposition Modelling session at the 2nd ICLRS in Asheville

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Those in attendance joined in discussions related to the research presentations and related to broader questions on decomposition modeling. The results of those discussions can be thought of as addressing three questions:

1. What mechanisms need to be better described in decomposition models?
2. How can the research community help each other to improve decomposition models?
3. What, besides the technical detail, will lead to more valuable landfill decomposition models?

The most often mentioned mechanisms that need improvement in decomposition models were:

- material-specific decay rates
- role of heterogeneity
- role of inoculum
- heat transfer and transport

Some of those in attendance suggested that landfill decomposition models need to move away from having one decay rate applicable to all waste, and instead consider more material-specific decay rates. This could help when assessing variable waste composition at municipal landfills, and also to assess the effects of decomposition at more mono-fill landfills (eg, paper mill sludge landfills). There were comments that heterogeneity is important in decomposition and because of differences in heterogeneity between landfills, a parametric description of heterogeneity could be useful. Two of the presentations touched on the importance of methanogenic seed clusters within a landfill, and it was thought that more study was needed of its importance and of an effective way to model any effect. In addition, temperature is increasingly considered a key state variable for landfill decomposition; however, heat generation and transfer models are believed to be too simplistic to help researchers analyze today's complex landfill decomposition problems (eg, bioreactor design).

There was significant comment in the session on how modelers need to work together and more closely with practitioners. One suggestion for improving the links needed to advance decomposition modeling was to have a database of relevant data available to all modelers. Currently, there are databases, but there are concerns that they are either of low quality, contain data that do not help in validating decomposition models, are of short duration, or are from multiple landfills in similar settings. Another suggestion was to develop a benchmark model similar to the IWA Anaerobic Digestion (of sludge) Model. Some people saw long-term value in developing such a model now, while others preferred to wait until more data are available from the current field bioreactor studies.

The session also highlighted a few truths about decomposition modeling that should be remembered. One truth mentioned was that the best models focus on answering practical questions (such as the required spacing of leachate recirculation pipes in a bioreactor). Another truth mentioned was that more decomposition modeling effort needs to be conducted by multi-disciplinary teams. These teams could be a mixture of geotechnical and environmental researchers to deal with the interrelated processes of decomposition and settlement. A related point was that modeling and data collection need to be integrated into research programmes, rather than seen as separate projects. Finally, the session believed that landfill decomposition models should neither be too complex nor too simple. Effective models need to find the right balance in terms of detail to be accurate, verifiable, and useable.