

# FRAMES: Multi-Agency Development of an Integrated Environmental Modeling Software Platform

In mid-1990's, the United States was in the middle of a major national effort to clean-up hazardous waste sites. The U.S. Environmental Protection Agency (USEPA) was being pressed to define target nationwide clean-up levels for hazardous waste sites that would be protective of the environment without being overly protective.

In 1997, to provide a tool to address these and similar future needs, USEPA's Office of Research and Development (ORD) and the Office of Solid Waste, along with other U.S. Federal Agencies initiated the development of an integrated environmental modeling system. These efforts resulted in the development of the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES), a powerful Windows-based modeling platform which currently supports a number of widely-recognized integrated environmental assessment systems such as 3MRA, MEPAS, GENII, ARAMS, and TREECS.

This undertaking by the cooperating agencies was a massive effort. USEPA had a need for a platform to support the development of integrated environmental modelling software capable of providing probabilistic assessment of impacts across many environments. This need largely defined the capability that the FRAMES software would have to achieve. USDOE's previous efforts developing the MEPAS software provided a starting point for developing the new software.

A large part of the success of the FRAMES development effort was that the USEPA developed the integrated environmental modeling system, 3MRA, concurrently with the FRAMES development. As a result the FRAMES development effort was highly focused on creating an operational system that could be immediately applied to a nationwide hazardous waste assessment. The success of the 3MRA software system represents a state-of-the-science human and ecological exposure and risk assessment technology for contaminant waste management can be conducted using an integrated modeling system.

Two versions of the FRAMES software are currently available which are very similar -- both provide strong support for the development of integrated environmental modeling systems. The main difference is that FRAMES V1 uses between-model flux file definitions to connect models and allow model interchange. And the same capability is provided in FRAMES V2 using model input/output dictionary files to define the data transfers between models. The latter approach was implemented to provide a more formal (and flexible) definition of data parameters.

The FRAMES development efforts underway mainly at the USEPA and PNNL are currently addressing new challenges identified by the users of FRAMES. Current FRAMES development efforts include parallel processing support, remote database access, web-based execution, expanded statistical capabilities, and implementation of regulatory models.

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