CARBON AND WATER RESOURCES ISSUES, IMPACTS, AND MANAGEMENT ASSESSMENT FOR OIL SHALE DEVELOPMENT

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Industry, stakeholder groups, regulatory bodies, and Congress have identified carbon management and water resources impacts as the most prominent concerns associated with oil-shale development in the United States. However, a renewed interest in `harder-to-get' unconventional fuels has emerged in both industry and government with focus on the world-class oil shale in the western Rocky Mountains. Therefore, this study investigates the viability and limitations of oil shale development in a carbon-neutral and environmentally acceptable manner, and the interrelationships of various energy resource development plans in the same hydrocarbon rich region.

Our multi-scale analysis framework integrates a basin-wide system dynamics (SD) simulator with process-level models including (a) LANL's CO2-PENS for carbon sequestration assessment in alternative geologic formations of western Colorado and (b) the Watershed Analysis and Risk Management Framework (WARMF) for hydrologic investigations of the spatial relationships of water rights and requirements, reservoir locations, and climate change impacts. With this model, we seek to quantify how much fuel can be produced in a basin while adhering to regulatory constraints, evaluate alternative management and technology insertion options with regard to CO2 and water resources impact mitigation, and provide quantitative sensitivity and uncertainty analysis of the complex system behavior associated with oil shale production. There is a strong link between this study and ongoing CO2 sequestration analyses because shale-oil development potentially produces more carbon emissions than conventional petroleum and the production involves additional common interdependent issues associated with water, energy requirements, infrastructure optimization, population growth, risk assessment, and planning for climate change impacts.