

## Geologic carbon dioxide utilization assessment methodologies

- **A probabilistic assessment methodology for carbon dioxide enhanced oil recovery and associated carbon dioxide retention:**  
[USGS Scientific Investigations Report 2019-5115](#) (12/31/2019)

The U.S. Geological Survey in accordance with the Energy Independence and Security Act of 2007, developed a probabilistic assessment method to estimate how much oil and gas could be produced by injecting carbon dioxide (CO<sub>2</sub>) into petroleum reservoirs. A way to estimate the CO<sub>2</sub> remaining in the reservoir after the completion of the CO<sub>2</sub> enhanced oil recovery process is also included in the methodology. The implementation of CO<sub>2</sub> enhanced oil recovery (CO<sub>2</sub>-EOR) techniques could increase the U.S. recoverable hydrocarbon resource base. Use of anthropogenic CO<sub>2</sub> in the CO<sub>2</sub>-EOR process could reduce the amount of CO<sub>2</sub> released to the atmosphere by allowing a percentage of the injected CO<sub>2</sub> to remain in reservoir pore space once occupied by produced oil and water or by CO<sub>2</sub> dissolution in oil and water in the reservoir.

- **National Assessment of Geologic Carbon Dioxide Storage Resources—Methodology Implementation:**  
[USGS Open-File Report 2013-1055](#) (05/10/2013)

In response to the 2007 Energy Independence and Security Act, the U.S. Geological Survey (USGS) conducted a national assessment of potential geologic storage resources for carbon dioxide (CO<sub>2</sub>). Storage of CO<sub>2</sub> in subsurface saline formations is one important method to reduce greenhouse gas emissions and curb global climate change. This report provides updates and implementation details of the assessment methodology of Brennan and others (2010, <http://pubs.usgs.gov/of/2010/1127/>) and describes the probabilistic model used to calculate potential storage resources in subsurface saline formations.

- **A Probabilistic Assessment Methodology for the Evaluation of Geologic Carbon Dioxide Storage:**  
[USGS Open-File Report 2010-1127](#) (07/01/10)  
[USGS Technical Announcement](#) (07/06/10)  
[USGS PowerPoint Presentation](#) (07/01/10)

The U.S. Geological Survey (USGS), in accordance with the Energy Independence and Security Act of 2007, developed a methodology to estimate storage potential that could be applied uniformly to geologic formations across the United States. An initial methodology was developed and published in March 2009 ([Burruss and others, 2009](#)), and public comments were received. The report was then sent to a panel of experts for external review.



This updated [methodology report](#) is in response to those external comments and reviews and describes the revised methodology. The resource that is assessed is the technically accessible storage resource, which is defined as the mass of CO<sub>2</sub> that can be stored in the pore volume of a storage formation. The methodology that is presented in this report is intended to be used for assessments at scales ranging from regional to subbasinal in which storage assessment units are defined on the basis of common geologic and hydrologic characteristics. The methodology in this report uses fully probabilistic methods to incorporate geologic uncertainty in calculations of storage potential.

- **Development of a Probabilistic Assessment Methodology for Evaluation of Carbon Dioxide Storage [Draft of methodology]:**  
[USGS Open-File Report 2009–1035](#) (03/16/09)  
[Press Release](#) (03/16/09)

The USGS has developed an initial methodology to assess the nation's resources for geologic carbon sequestration in oil and gas reservoirs and saline formations. The methodology estimates storage resource potential that can be applied uniformly to geologic formations across the United States. The assessed resource is the volume of pore space into which CO<sub>2</sub> can be injected and retained for tens of thousands of years. The methodology builds geologic models of the areas to be assessed and then uses probabilistic methods to account for the uncertainties associated with natural variations in geologic storage formations. In addition, the range of numbers of likely storage sites and their potential sizes are statistically evaluated to estimate the distribution of the storage resource. The estimated mass of storage resource is further evaluated with parameters that describe the probability of successful containment of CO<sub>2</sub> above a minimum size. This assessment methodology for CO<sub>2</sub> storage resources focuses on what will be called the technically accessible resource, not a total in-place resource volume. This is a resource that may be available using present day geological and engineering knowledge and technology for CO<sub>2</sub> injection into geologic formations. No economic factors are used in the estimation of the volume of storage resource.



