CO_2 sequestration option in Indian coal fields – a brief analysis

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ABSTRACT

Carbon dioxide (CO_2) is the most important anthropogenic green house gas (GHG) responsible for global warming. It makes up almost 80% of anthropogenic GHG emissions. Associated with the other GHG emissions, CO_2 has a major contribution to the global warming. CO_2 sequestration is used to describe both natural and deliberate processes by which CO_2 is either removed from the atmosphere or diverted from emission sources and stored securely. The sequestration options include direct injection into geological strata, terrestrial sequestration, ocean sequestration and mineralogical sequestration. Injection into unmineable coal seams is one of the subsurface geological storage options. It involves CO_2 storage in uneconomic coal seams. The coal seams for CO_2 sequestration are better when the seams occur beyond a depth of 1 km. Such depth provides the necessary cap rock to seal the stored gas from possible leakage. However, CO_2 sequestration is not advisable in a coal seam which may be mined in the future. This paper presents an analysis of rock formation in major coalfields of India and their suitability for CO_2 sequestration.

Keywords: sequestration, coalfield, geological map, stratigraphy, unmineable.

INTRODUCTION

The global atmospheric concentration of CO_2 has increased 22.6% from the 1959 annual average level of 315.98 parts per million (ppm) to a level of 387.35 ppm in 2009 (NOAA, 2010). The annual CO_2 concentration growth-rate was larger between 1995 and 2005 (average: 1.9 ppm per year) than it has been since the beginning of continuous direct atmospheric measurements (1960–2005 average: 1.4 ppm per year) although there is year-to-year variability in growth rates (IPCC, 2007). The atmospheric CO_2 concentration is increasing at about 2 ppm annually during the last seven years (NOAA, 2010). With continuation of this trend, the concentration will cross 400 ppm by the end of this decade. The recent trend of global CO_2 emissions from fuel combustion is shown in Figure 1.

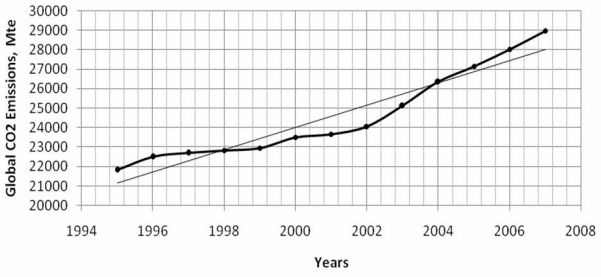

Figure 1 Recent trend of global CO_2 emissions (IEA, 2009)

CO_2 is released to the atmosphere by natural phenomena like volcanic eruption, bush fires etc. However, anthropogenic activities of last few decades have changed the balance adversely. There are a number of anthropogenic sources of CO_2 emissions, such as combustion of fossil fuels in power generation, industrial facilities, buildings and transportation, and increased international wars. However the predominant source is the burning of fossil fuels (IPCC, 2003). This problem is continuously escalating with the increasing consumption of fossil fuel both in industrial and non-industrial sector.