**1 Introduction**

* 1. **Background**

Climate change has a detrimental impact on both human and natural systems, namely global warming, which is caused by increasing greenhouse gases (GHGs) in the atmosphere (Wuebbles et al., 2017). The severity of the matter was proven by the Intergovernmental Panel on Climate Change (IPCC), in a special report, showing global temperature increase of 1.5oC which in turn threatens ecological balance (Allen et al., 2018). Our main goal is the reduction of carbon dioxide (CO2) concentrations in the atmosphere, as it equates for more than 70% of anthropogenic GHG emissions and is rapidly increasing in terms of annual emissions (Change et al., 2014). There are many technologies that mitigate CO2 emissions, that either decrease CO2 discharge or reduce the amount of CO2 from the atmosphere (Minx et al., 2018). An example of the latter is the collection of bioenergy from agriculture, forests, and general land, utilising the technology of carbon capture and storage (CCS), in attempt to reduce the use of traditional fossil fuels. In addition, other technologies to reduce CO2 levels have been employed in many countries since the late twentieth century, such as direct capture from the air and carbon geologic sequestration (Torp and Gale, 2004; U.S. Department of Energy).

**1.1.1 Carbon geologic sequestration and saline aquifers**

Carbon geologic sequestration (geologic CCS) is widely recognized as an effective method of storing large amounts of CO2 discharge from industrial sources in deep rock formations for prolonged periods of time. Generally, three main types of geologic formations are suitable storage sites; depleted oil and gas reservoirs, coal seams, and deep saline aquifers (Cook, 1999; Metz et al., 2005; Global CCS Institute, 2016; Oelkers and Cole, 2008). Deep saline aquifers are composed of sedimentary rock layers and are enclosed by caprock and bedrock layers, which are characterised by their low permeability. These are in turn saturated with formation brine that is not suitable for human consumption or for agricultural use (Metz et al., 2005; Bachu et al., 1994). Additionallytreatmentscannot be applied within Thanks to saline aquifers’ large CO2 storage capacity and widespread global distribution, this technique has attracted the attention of many as an effective CCS method and has been implemented as part of many industrial projects over the past three decades (Metz et al., 2005; Michael et al., 2010; Smith and Survey, 2010; MacMinn et al., 2011; Fang et al., 2010; Aminu et al., 2017a).