ABSTRACT
Development of deep ocean hydrothermal poly-metallic ore mining is a highly anticipated industry in Japan to increase self-sufficiency of metals and bring economic benefits, however there are many issues still to be clarified, including waste disposal and its economic feasibility impact. This paper examines the current applicable regulations in Japan to understand what the potential barriers and problem waste elements may be. The results show that waste water treatment under three different sets of regulations may require at least 99.9% removal of As, Hg and suspended solids from the slurry before it is released.

KEY WORDS: Deep ocean mining, deep ocean hydrothermal ore, economic feasibility impact, Japan,

INTRODUCTION
According to the Basic Energy Plan revised in April 2014, the Japanese government has the intention to develop deep ocean hydrothermal poly-metallic ore extraction in Okinawa. The economic feasibility of such deep ocean mining has yet to be demonstrated, although exploration results have inferred resources of around 50Mt in Japan. Besides the possibility of improvement of domestic resource self-sufficiency, deep ocean mining is connected with other auxiliary marine engineering industries and it is expected that the development of these resources will bring a great economic impact by creating many jobs. On the other hand, there are regulatory and policy frameworks currently in place in Japan. Since laws were written-up some decades ago, before deep ocean mining was in the potential commercial stages, they were enacted in the specific context of onshore mining, leaving this new endeavor outside the current scope of legislation. Furthermore, many of the peripheral regulations regarding environmental impacts are yet to be specifically amended or tested in this context.

Of particular interest to this current study is the fate and regulation of waste water from mining and ore processing, as its disposal at sea is currently banned by regulations if the disposal water contains concentration of minerals above specified thresholds. Some of this water may be able to be released, but the environmental credentials of deep ocean mining and obtaining a social license to operate also need to be considered.

This study presents a framework and assessment of the impact on economic feasibility of deep sea mining that is attributable to the various different water treatment technologies required to meet alternative regulated release standards. The framework correlates existing policy, regulations and treatment technologies and the cost for treating alternative deep ocean ore waste water streams to give an indication of regulatory impact on economic feasibility. Fig. 1 gives an outline of the concept of this paper. Suitable regulations to meet both environmental and economic needs will be investigated in this paper.