Review Regulation on The Determination of Fly Ash and Bottom Ash from Coal Fired Power Plant as Hazardous Waste in Effort to Increase Utilization in Indonesia

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Abstract. Recent The development of power generation capacity is directed to meet the load growth, and in certain areas it is preferred to meet the shortage of electricity supply (RUPTL, 2017). The planned addition of combined generating capacity throughout Indonesia such as coal-fired power plants (CFPP) will dominate the type of power plant to be built, reaching 31.9 GW or 53.0% in the year 2017 to 2026, and by 2019 the addition of very high-power plants reaches 18.7GW. This is in line with the 35,000MW program targeted for completion in 2019. Coal demand continues to increase every year, until the year 2026 reached 152.8 million tons per year. The CFPP operation produce solid waste as Fly Ash and Bottom Ash (FABA) or generally named by Coal Combustion Products (CCPs). Formation of the CCPs in general is 3 - 5% of total coal used, then will required wide land for the placement of FABA product if it cannot be utilized. Characteristics of the CCPs could substitute cement for infrastructure. The utilization of the CCPs in Indonesia still very small amount only 0.47%. Comparative method applied to analyze the regulation in Indonesia with other countries in regulate the CCPs from CFPP. Regulation for CCPs as hazardous waste make some difficulties in utilize the CCPs for construction material. In the other side Indonesia need to build infrastructure with low cost. Through review regulation on determination of FABA from CFPP as hazardous waste could be an effort to increase the utilization of FABA in Indonesia.

1. Introduction
The Government of Indonesia has set a General Plan for Electricity Supply (RUPTL) for the 2017-2026 period, with the dominance of the use of coal as the main energy source of power generation at 53%. Supply of electricity using coal in addition to producing waste emissions, also produces Fly ash and Bottom ash (FABA) which is generally called coal combustion products (CCPs). According to Government Regulation number 101 of 2014 (PP 101) concerning the management of hazardous waste, FABA is categorized as a waste containing hazardous material, its management regulations and permits are needed to reduce environmental impact. Meanwhile Indonesia is currently increasing infrastructure development. The construction of both roads and housing requires materials which can
be substituted by FABA. But based on BPPT research results in PLN [13], that Fly ash produced from the power plant has not been maximally utilized by the cement industry, so that the waste accumulates and can have an impact for the surrounding environment. This is different from the conditions in several other countries, which apply different regulations to the management of FABA, so that their countries can use FABA to reach 97% [21].

2. Methodology
There are many concerns in utilize the waste especially the concentration of hazardous unsure and the composition of the waste to use as raw material. Then this concern grouping as quality of FABA. This paper will use the comparative method to review literature on the utilization of FABA in several countries [6]. The process of analyze construct the min map as Fig 1.

![Mind map of increase utilization of FABA](Source: Researchers, 2019)

3. Result and Discussion
Regulations on the management of FABA as CCPs are different in several countries, as well as the amount of utilization of the CCPs produced were different too. How regulation encourage sustainability in case of utilized CCPs that UNEP [21] has analyzed that Japan experience shows that a mix of policies helped it turn challenges into opportunities. Regulations to hold waste generators responsible, voluntary measures for industries, market-based instruments to subsidize city-level action, and awareness-raising programmes were all part of the mix that helped change attitudes and practices in industrial waste management [21]. The results were soon apparent: between 1990 and 2010, landfill of industrial waste decreased by 84 per cent, while the resource productivity rate between 2000 and 2010 increased by 51 per cent. In sharing the Japanese experience, this publication aims to contribute to more effective policy responses to industrial waste issues around the world, and ultimately to assist in the transition to an inclusive Green Economy [21].

Policies through regulation for the management of CCPs that are almost the same as Japan are also carried out by India. To address environmental problem of fly ash disposal, the Ministry of Environment & Forest and Climate Change (MoEF) issued Notification on fly ash utilization in 1999 prescribing therein the targets for fly ash utilization for Coal/Lignite power based Thermal Power Stations with an aim to achieve 100% utilization in a phased manner. The objectives of the notification are to protect environment, conserve the top soil, and prevent dumping of fly ash from Thermal Power Stations on land and to promote utilization of ash in the manufacture of building materials and construction activity. The implementation of this Notification has resulted in steady increase in the utilization of fly ash. The fly ash utilization in the country has been increased from 13.51% to 57.63% in the year 2013-14 [6].
Table 1. Comparative data on the status of CCPs waste and the number of CCPs utilized (Source: Adapted from Moon, 2013, MoE of India, 2015, and UNEP, 2013)

| Country | Regulation for CCPs | CCPs Utilization |
|---------|---------------------|------------------|
| Japan   | Non Hazardous       | 97%              |
| China   | Non Hazardous       | 60%              |
| India   | Non Hazardous       | 57.63%           |
| America | Non Hazardous       | 45%              |
| Europe  | Non Hazardous       | 33%              |
| Indonesia | Hazardous        | 0.4%             |

According to Table 1. China has 60% utilized the CCPs, but there is other report that China only utilized 30% of the CCPs [7]. From the data it can be seen that Indonesia is the country that uses the least CCPs and only Indonesia sets CCPs as hazardous waste. It can be concluded that there is a correlation of regulation with the use of waste as a sound material-cycle society driver to support sustainability in terms of SDGs number 12 and number 17. In terms of achieving SDGs number 17 for the context of CCPs utilization, it is necessary for government partnerships in setting regulations with industry in terms of utilization. Japan and India are best practices in policies that encourage the use of CCPs. Government partnerships in setting regulations with industry roles in harmony this is related to concept of environmental science [5]. India even utilizes CCPs not only for construction but also as fertilizer, land restoration, increased absorption of ground water etc. all efforts to increase the utilization of these CCPs while still monitoring the utilization process. However, it does not require complex permit for these uses. The power generation industry that operate CFPP has produce CCPs as a waste material. The properties of these materials were recognized as cementitious and pozzolanic especially the Fly Ash [1, 2, 20]. In several countries the products were tested to understand their physical properties, chemical properties and suitability as a construction material [20]. During the last few decades these ‘waste’ materials have seen a transformation to the status of ‘by-products’ and more recently ‘products’ that are sought for construction and other applications [20]. The fine combustion product is called fly ash, and the cinders that are relatively coarser are called bottom ash. As environmental awareness and landfilling costs have grown, CCPs generator and government regulators have encouraged the beneficial use of industrial by-products, including coal ash [20].

Difference with Japan and India, regulations governing in Indonesia for the management of CCPs. The role of policy characteristics is the inability of the policy to provide the level of clarity as expected resulting in misinterpretation, lack of consistency in policies made by the implementor with the above policy (government), especially coal ash stockpiling policy so as to create a gap between expectations and reality, and lack of quality implementation of policies through external coordination which is caused by the lack of mastery of government officials in technical matters and the attitude of the implementor which tends to be passive [3]. Furthermore Hamidi [3] concluded that the occurrence of ineffectiveness in the management of fly ash and bottom ash, the factors that play a dominant role influence are the characteristics of the problem and the characteristics of the policy.

Both countries show that how regulation could encourage sustainability in case of utilized CCPs. It is different policies in Indonesia, that CCPs regulate as hazardous waste although many research has result that the concentration of hazardous un­sures as toxic and radioactive are below the safety limit for human and environment [9, 10, 11, 22, 24]. Then it is needs to review the designation of FABA waste as hazardous waste. The review carried out included by establishing special regulations that facilitate the relationship between FABA producers and FABA beneficiaries to form regulations with the use of waste as a sound material-cycle society driver to support sustainability in terms of SDGs number 12 and number 17 [23].
4. Conclusion
The best practice in managing FABA as CCPs through government regulations is in Japan and India regulations. Review Regulation on The Determination of Fly Ash and Bottom Ash from Coal Fired Power Plant as Hazardous Waste in Effort to Increase Utilization in Indonesia. The review can be done by changing the status of FABA to non-hazardous waste or by establishing regulatory regulations with the use of waste as a sound material-cycle society driver to support sustainability in terms of SDGs number 12 and number 17.

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