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Strengthening Transport Safety of Radioactive Material through Standardization and Conformity Assessment: Indonesia Challenges and Opportunities

Abstract

The safe transport of radioactive material requires robust regulatory systems, standardization, and accredited conformity assessment bodies (CABs). Indonesia has adopted several regulations [6] [18] and national standards [11–15], yet faces critical challenges in aligning with updated international standards such as IAEA SSR-6 Rev.1 [1] and the quality management system standard SNI ISO 19443 [16][18]. Currently, only three CABs operate (one Certification Body and two Testing Laboratories), and there is no Management System CB under the scope of SNI ISO 19443 [Table1]. Furthermore, standards ISO 2919, ISO 12807, ISO 9978, ISO 7195, and ISO 1496-1 [2][3][8-10] have yet to be adopted into national standard and conformity assessment scopes. This creates a significant gap in implementing quality assurance and regulatory compliance [1].
Standardization contributes between 0.3% and 1% annually to a country's GDP [19][20]. Indonesia has initiated national roadmaps and inter-agency coordination strategies [4][5] to address these gaps. A comparative analysis of ASEAN and selected countries [Fig.3][Table 2] reveals varying maturity in integrating technical regulations, standards, and conformity infrastructure. Standardization and Conformity Assessment (SCA) and CABs are vital for safety, quality, competitiveness, and regulatory recognition [17]. Of 96 identified potential CABs (18 CBs, 10 TLs, and 86 MS CBs) [Fig.2] [Table 1], their development is essential to meet national SCA needs. International benchmarking, harmonization, capacity building are key strategies to support Indonesia' s safe, standards-based transport system for radioactive materials.
Keywords: radioactive material transport, standardization, conformity assessment, Indonesia, SSR-6, ISO, CABs

Standardization and Conformity Assessment (SCA) and CABs Mapping.

Indonesia currently has three CABs, one Certification Body (CB) and two Testing Laboratories (TL), but no Management System CBs (MS CBs) under the SNI ISO 19443 scope to support Standardization and Conformity Assessment (SCA). This limited availability creates gaps in regulatory [1] and quality assurance standard implementation. Furthermore, ISO 2919, ISO 12807, ISO 9978, ISO 7195, and ISO 1496-1 have yet to be adopted, with no CABs operating under these scopes. To address this, 96 potential CABs, comprising 18 (19%) CBs, 10 (10%) TLs, and 86 (71%) MS CBs could be developed. Strengthening CAB capacity is essential to support Indonesia's strategic plan [4][5].

Country Readiness Assessment and Comparative Study

Most countries assessed have adopted ISO standards (2919, 12807, 9978, 7195, 1496-1) through national equivalents, with SSR-6 fully integrated[A] and partial alignment remains[B]. Regulatory frameworks vary in maturity. Indonesia has Regulation No. 7/2020 and adopting SSR-6 (2012). Common challenges include limited CAB capacity[B], fragmented inter-agency coordination[*], technical complexity[#], and workforce aging[@] also face logistics and enforcement constraints[Y]. Key improvement strategies involve digital licensing, CAB capacity building and international training. Conformity assessment systems led by national bodies vary in strength and shows the need for SCA strategic expansion is important to ensure standard, regulatory compliance and international recognition

Conclusion

National strategic are need to be align with national laws, regulations and standards, expand CAB accreditation scope in radioactive transport, digitalize tracking and supervision systems, enhance human resources through internationally-based training, promote international and regional collaboration for benchmarking and harmonization[Figure 3].
Most countries assessed [Table 2] have adopted ISO standards, SSR-6 Rev1 and have common challenges in limited CAB capacity, fragmented inter-agency coordination, technical complexity, workforce aging, face logistics and enforcement constraints. Conformity assessment systems led by national bodies vary in strength. Indonesia's limited CAB capacity—three active bodies and no MS CBs under SNI ISO 19443 [Table1, figure 2] —creates critical gaps in implementing standards and regulations [1]. Key international standards (ISO 2919, 12807, 9978, 7195, 1496-1) remain unadopted, with no accredited CABs in these scopes. Developing 96

identified potential CABs is essential to strengthen national SCA and support strategic regulatory goals [4][5].

Country or International Organization

Instructions

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