

Introduction

In Indonesia, the utilization of nuclear energy to support achieving Indonesia's four pillars of sustainability (social, economy, environment, and law and governance) is increasing yearly. Based on Balis Licensing System (B@lis) data, there are more than 7.000 customers are accounted using nuclear energy in Indonesia, especially in industrial and medical sector. Various types of nuclear technology utilization in Indonesia are presented in Fig. 1.

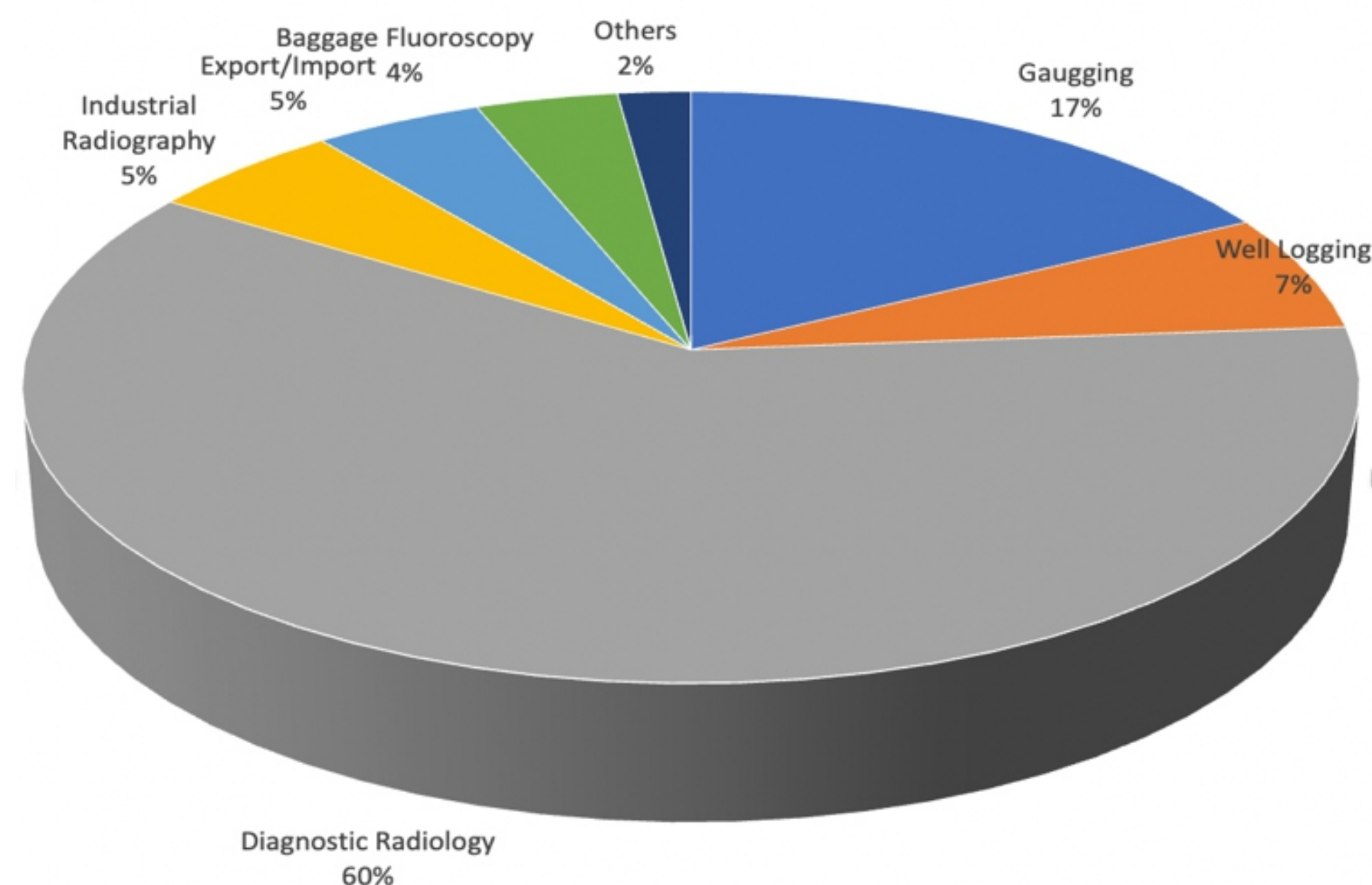


FIG. 1. Nuclear technology utilization in Indonesia

Regulations and Policies

Several regulations and policies have been established as references for radioactive waste management to ensure that radioactive waste management continues to protect present and future generations without causing an undue burden on future generations. Fig. 2 shows the legislative hierarchy of radioactive waste management in Indonesia.

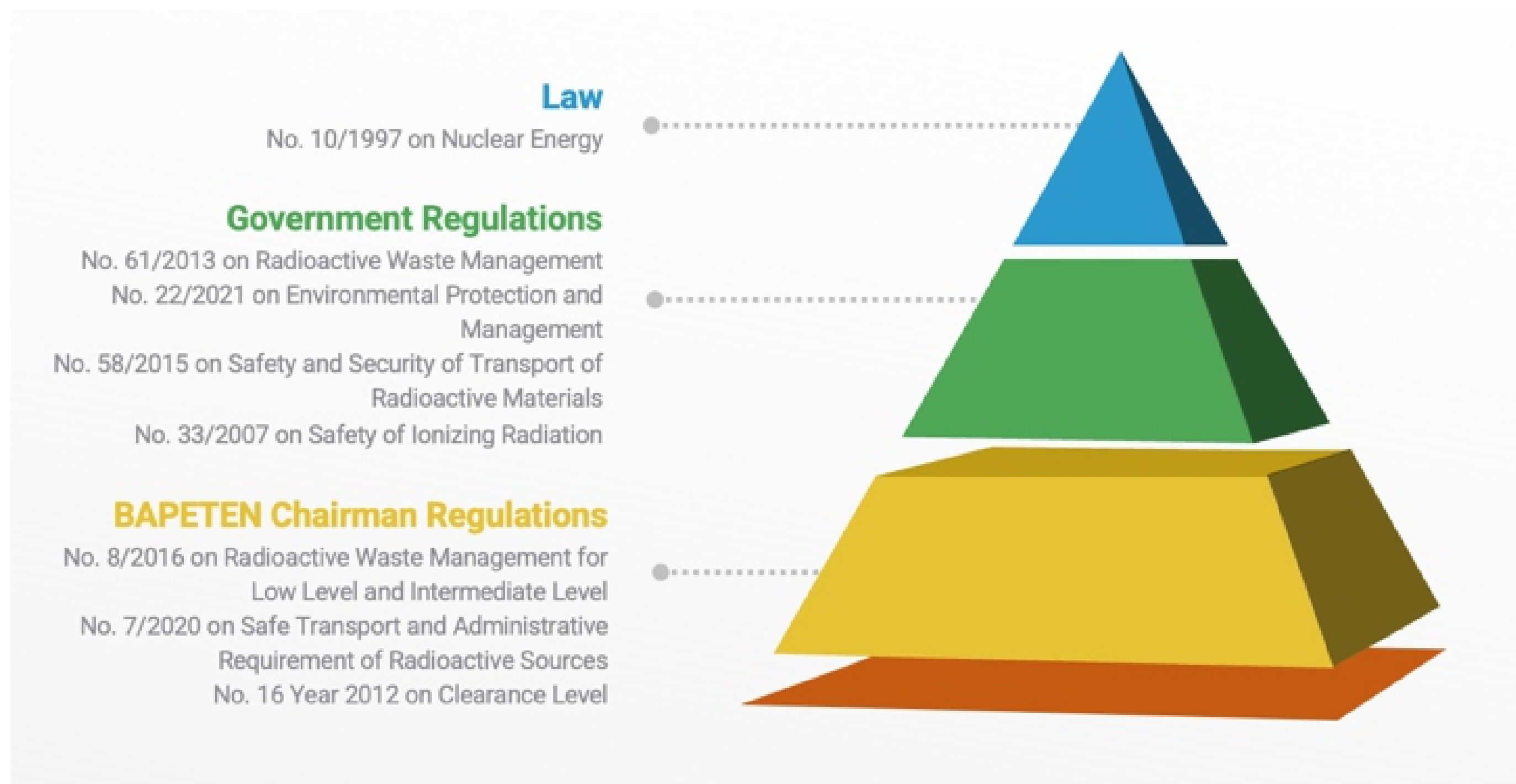


FIG. 2. Legislative hierarchy of radioactive waste management in Indonesia

In general, Government's policies on radioactive waste management as formulated in the Nuclear Energy Law and derived regulations are that:

- Radioactive waste management shall be accomplished by the Executing Body, which may designate a state or private company or cooperative to conduct commercial waste management activities.
- Users generating low and intermediate levels of radioactive wastes shall be obliged to collect, segregate, or treat and temporarily store the waste before its transfer to the Executive Body.
- The Executing Body provides the final repository for high level radioactive waste.
- Radioactive waste must be repatriated to the country of origin or transferred to the Executive Body.
- BATAN as the Executing Body is responsible for conducting assessment to justify reuse or recycling of DSRS.

Conclusions and Acknowledgements

The analysis results show that implementing regulations and policies for radioactive waste management in Indonesia presents various challenges for regulators and operators to ensure that radioactive waste management remains safe, secure, and sustainable. Coordination between various stakeholders and related parties is crucial for realizing sustainable radioactive waste management. Given the complexity and long-term nature of radioactive waste management, effective collaboration ensures that all aspects of waste generation, handling, storage, transportation, and disposal are addressed responsibly. By fostering effective coordination and collaboration among relevant parties, sustainable radioactive waste management can be achieved, ensuring the protection of people, the environment, and future generations.

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Achievements and Challenges

Based on activity, activity concentration, half-life, and/or type of radiation, the radioactive waste are classified into Low-Level Waste (LLW), Intermediate Level Waste (ILW), and High-Level Waste (HLW). By volume, the majority of radioactive waste held in Indonesia is LLW generated from a variety of sources, primarily in the nuclear industry such as nuclear medicine or DSRS from medical, industrial, agriculture, and research applications. The government provides options for managing DSRS and spent fuel to be repatriated to producing countries or handed over to BATAN. For some reason, there are many DSRS that cannot repatriated to the origin country. Most of the radioactive waste then stored in BATAN. As a form of BATAN's responsibility in radioactive waste management, a centralized radioactive waste management organization, namely PTLR, has been formed which manages radioactive waste. Current national inventory of radioactive waste which is managed in PTLR shown in Fig. 3 and Fig. 4.

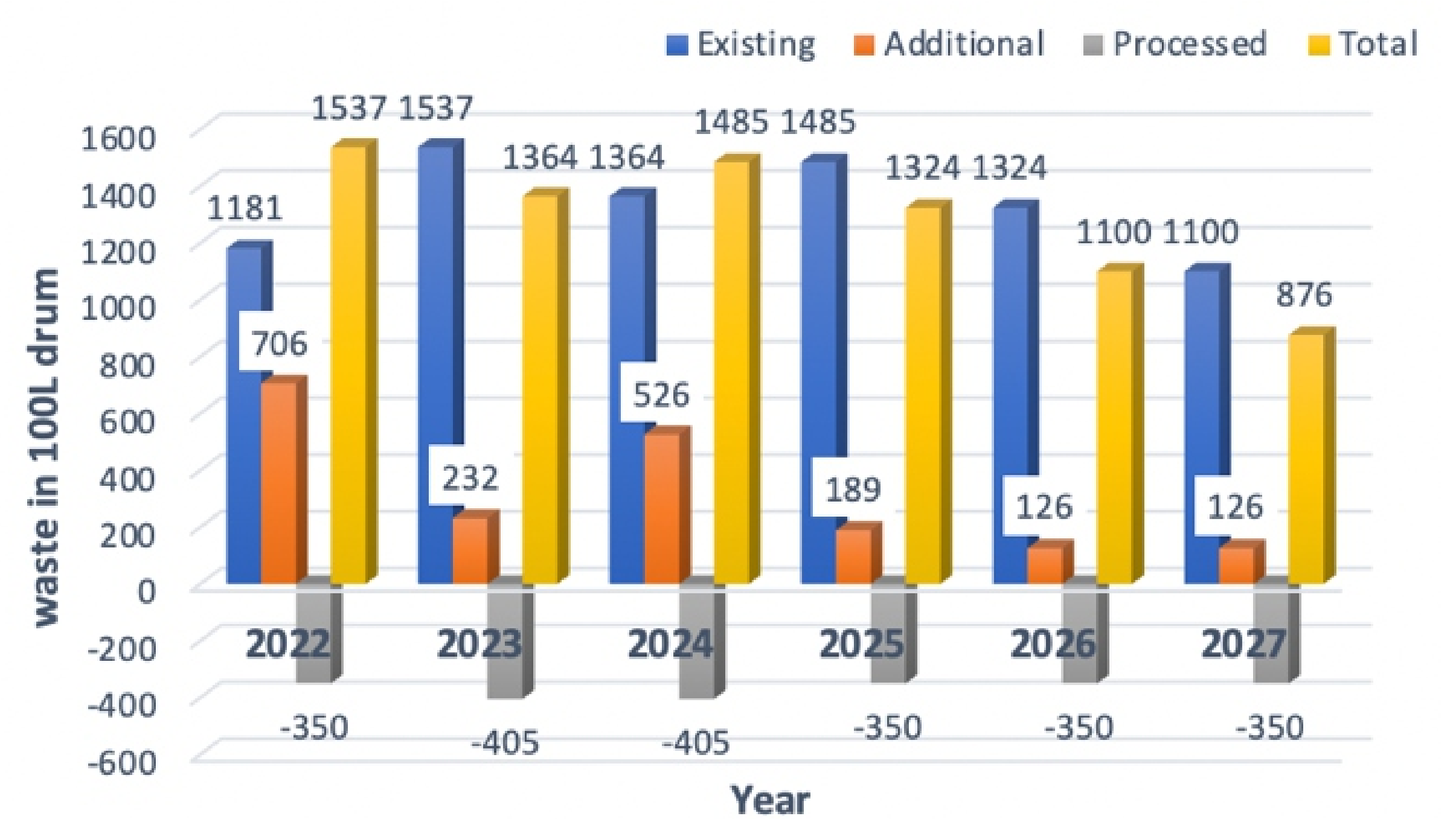


FIG. 3. Radioactive waste inventory in IS-1.



FIG. 4. Radioactive waste inventory in IS-2.

Several challenges on radioactive waste management in Indonesia, namely:

- Considering government directives on energy policies that include the use of nuclear technology as a new and renewable energy source, coupled with plans for the decommissioning of Bandung research reactor in near future and IS-2 facility conditions, Indonesia needs to prepare disposal facilities to ensure that nuclear waste can be managed properly.
- Indonesia is an archipelago country and the tendency of waste producers to hand over their waste to PTLR, the transportation of radioactive waste from facilities to PTLR poses a considerable challenge.
- Radioactive waste transport requires quite high costs. several radioactive waste-producing facilities are also facing financial problems and are unable to manage their radioactive waste.
- In Indonesia, NORM/TENORM, though containing radioactive substances, is not included as part of radioactive waste. The challenge of radioactive waste management has not considered the presence of industrial waste containing NORM/TENORM.
- Processed radioactive waste is predicted to exceed Interim Storage (IS-2) capacity by 2027.